

FIRE ADMINISTRATIVE AND OPERATIONAL ANALYSIS

Larkin Township, Michigan

Final Report-November 2023



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SECTION 1. INTRODUCTION

The service demands and challenges generated by the community for a volunteer fire department are numerous and includes membership sustainability challenges; fire, technical rescue, hazardous materials, building risk challenges; transportation emergencies; rural response with no municipal fire hydrants, and other non-emergency responses typical of fire departments and EMS providers.

A significant component of this report is the completion of a Community Risk Analysis. The All-Hazards Risk Assessment of the Community contemplates many factors that cause, create, facilitate, extend, and enhance risk in and to a community. The All-Hazards Risk Assessment of the Community is an important component of this report as it links directly to staffing and deploying fire and rescue assets in the community.

The response time and service delivery components discussions of this report are designed to examine the current level of service provided by the Larkin Township Fire Department (LTFD) as a baseline and are compared to national best practices and standards. As well, these components provide incident data and relevant information to be utilized for future planning and self-review of service levels for continued improvement. This analysis and self-review are intended to help the department to continue to meet community expectations and mitigate emergencies effectively and efficiently.

Additional work includes an analysis of the current deployment of resources and the performance of these resources in terms of response times and the KFD fire management zones; a comprehensive review of the current ISO Public Protection Classification report; current membership and response levels and patterns; department resiliency (ability to handle more than one incident); critical tasking elements for specific incident responses and assembling an effective response force; community risk reduction and training; fleet; alternatives the township may consider regarding fire service delivery for future planning.

The comprehensive risk assessment and review of deployable assets, which are critical aspects of a fire department's operation, will first assist the LTFD in quantifying the risks that it faces. Second, the LTFD will be better equipped to determine if the current response resources are sufficiently staffed, equipped, trained, and positioned. The factors that drive the service needs are examined and then link directly to discussions regarding the assembling of an effective response force and when contemplating the response capabilities needed to adequately address the existing risks, which encompasses the component of critical tasking.

Based upon CPSM's detailed assessment of the LTFD, it is our conclusion that overall, the LTFD, as other volunteer fire departments we have assessed, proudly provide service to their community, and do so because they are committed to service. The fire staff are dedicated to the mission of their agency, were transparent during our discussions, and were focused on a continuum of service to their community.

This report also contains a series of observations, planning objectives, and recommendations that are intended to help the township deliver services more efficiently and effectively. CPSM recognizes there may be recommendations and considerations offered that first must be budgeted, or for which processes must be developed prior to implementation.

RECOMMENDATIONS

Governance, Bylaws, and Procedures

(See pp. 11-15.)

1. The LTFD fire chief should form a committee to develop a comprehensive Rules and Regulations document that identifies anticipated, acceptable/ permitted, and prohibited behaviors. This document should be distributed to and signed for by each member of the department. It will also provide important guidance to new employees.
 - Some suggested sections for the Rules and Regulations document could include, but are by no means limited to:
 - A preamble.
 - Department vision statement and mission statement.
 - Purpose of the rules and regulations.
 - Organization structure and chain of command.
 - Membership requirements.
 - General rules of conduct.
 - Officer qualifications and selection (May just reference current department procedure).
 - Officer duties and responsibilities (May just reference current department procedure).
 - Training (May just reference current department procedure).
 - Apparatus, equipment, and protective clothing (May just reference current department procedure).
 - Uniforms and grooming.
 - Discipline.
 - Conflicts between various documents (state statutes, township policy, rules and regulations, standard operating guidelines, other orders, company bylaws).
 - Other areas that may be agreed upon for inclusion.
2. The LTFD should review and update its Respiratory Protection Plan (29 CFR 1910.134).
3. The LTFD should review and update its Bloodborne Pathogens Control Plan (29 CFR 1910.1030).
4. The LTFD should consider instituting a "Special Notice" (SN) or "General Orders" (GO) process to inform staff of current LTFD (and township) business items, changes in SOGs, and other announcements.
5. The LTFD should consider implementing the issuance of "Training Bulletins" covering training specific updates, training calendar updates, required trainings, etc.
6. The LTFD should consider posting most of its operational and business items online or in a fire department staff portal.

Position Descriptions

(See pp. 18-19.)

7. Working collaboratively, the Fire Chief and Board of Trustees should develop and/or revise the current job descriptions for all positions within the LTFD.

Training and Education

(See pp. 19-24.)

8. The LTFD should begin the development of a comprehensive training program that addresses, but is not limited to: applicable OSHA training, recommended NFPA training, every operational mission and responsibility of the department, and specialized training including personnel/officer development. The training should comply with accepted and/or recommended practices and standards, should include standardized evolutions, and should be consistent with newly developed and/or updated operational guidelines and Standard Operating Guidelines (SOGs).
9. Formal training of some type, lasting a minimum of two hours, should occur weekly. The training should be skill driven, and when appropriate, EMT continuing education credit hours should be applied for, through the State of Michigan. Additional opportunities for training can be found during related activities such as weekly/monthly apparatus and equipment inspections, and building pre-planning and safety check activities.
10. Additional, high-intensity training on various subjects, including periodic live fire training, should be conducted on a minimum of an annual basis at a formal fire academy where appropriate training facilities, structures, and props are available.
11. All LTFD personnel should be required to complete a minimum of 72 hours of documented training per year (an average of 6 hours per month) including all mandatory training.
12. To the extent possible, training should be delivered and/or conducted utilizing formal, standardized lesson plans that include objectives and performance criterion. However, when this is not possible or practical (a frequent occurrence in the fire service), a detailed description of the training should be included in the narrative section of the training report.
13. All training that is conducted, no matter how brief or inconsequential it may seem, MUST result in the completion of a formal training report. Training reports should include the date, time training commenced, time duration of the training, the instructor, the officer in charge, names of all personnel trained, and include a detailed description of the training or reference the formal lesson plan utilized. All persons trained should sign or initial either a printed hard copy of the training report, or if this is not practical, a sign-in sheet should be attached. The officer in charge, and when possible, the instructor, should also sign the hard copy training report.
14. As part of the development of a new comprehensive training program, the department should implement periodic basic skills proficiency evaluations for ALL personnel. These proficiency evaluations, consisting of standardized evolutions, can be based upon recognized standards and benchmarks, in conjunction with performance criterion and benchmarks established through evaluation of, and based upon, LTFD operations and procedures.
15. The LTFD should establish a formal “performance “improvement” process for fire suppression operations. The process should include the adoption of performance standards such as NFPA 1720 , the creation of a formal review and critique process for all incidents, and a process for modifying SOGs, SOPs, training priorities, and equipment as determined by the performance improvement program.

NFPA 1720 includes several on-scene performance indicators such as:

- ❑ On-scene to charged line at the front door of a structure fire: two minutes or less, 90 percent of the time.
- ❑ Water from hydrant to supply engine: three minutes or less, 90 percent of the time.

16. In order to assist with the large amount of training that needs to be done, and in recognition of their important role in the delivery of training and the success of the program, all officers should be formally certified at a minimum at Fire Instructor Level I.
17. The LTFD should ensure that all department members are trained/certified to the minimal NIMS level required for their duties/responsibilities and ranks. The department should also further enhance the level of incident management training provided to the members of the department. In addition to the basic I-100/I-700 training mandated, it is recommended that all personnel be trained to the ICS-200 level (IMS Level I). All officers should be trained to the ICS-300 level (IMS Level II). The chief-level officers should be trained to the ICS-400 level (IMS Level III).
18. The LTFD should strongly encourage its officers to obtain a certain level of fire officer certification as a position requirement such as Fire Officer I and II for lieutenant, Fire Officer III for assistant fire chief, and Fire Officer Level IV for fire chief.
19. The LTFD should require that all officers be certified as Incident Safety Officers. Additional personnel who may be interested should be encouraged to take this training and obtain this important firefighter safety certification.
20. The LTFD should mandate that all officers participate in additional officer related training each year in order to be eligible to retain their position.

A reasonable requirement might be 32 hours of training consisting of:

- Firefighting strategy and tactics, incident management, or safety training (16 hours)
 - Leadership or management training (16 hours)
21. The LTFD should encourage personnel to seek additional training on their own, and to the financial and practical extent possible, send personnel to outside training opportunities. Information gained at this training can then be brought back and delivered to other members of the department.
 22. The LTFD should seek annual funding in the training budget to upgrade its training resources such as manuals, DVDs, and subscriptions to other available training resources.

Community Risk Reduction

(See pp.24-28.)

Building Codes

23. Larkin Township should consider the formal adoption of the 2012 edition of the International Fire Code as adopted by the State of Michigan as its local fire code. Adoption of the code will allow the Township and/or fire department personnel to conduct formal fire inspections that require code compliance and abatement of violations, issue permits of various types, etc.
24. If Larkin Township chooses to adopt a formal fire code enforcement function it must ensure that the LTFD is provided appropriate formal training in performing routine fire prevention inspections to all personnel who will be conducting inspections (Fire Inspector 1 / NFPA 1031, per Michigan State Fire Chiefs Association). The State of Michigan has many resources to help with fire prevention, fire investigation, and public outreach.

Water Supply

25. The LTFD should seek opportunities for entering into public/private partnerships with private property owners to facilitate the installation of cisterns on private properties in selected

locations throughout the township that are outside of the water district. As an additional incentive, the township might consider a property tax abatement for the installation of cisterns on private property.

Fire Investigations

26. The LTFD should develop a standard operating procedure to ensure that every fire that causes damage, results in any loss, and/or causes any injury or fatality, has an initial fire origin and cause investigation completed at the time of the incident. With a limited number of fires this could be an area to explore a shared services agreement with the City of Midland.

Fire Education

27. The LTFD should consider implementing a voluntary home inspection and assistance program. The program should also include the distribution of smoke detectors to the community. In addition, the LTFD should provide an inventory of smoke alarms on all apparatus to take on all calls. Fire department personnel should offer free smoke alarm checks on all calls when possible. This could also be used as a new member recruitment tool.

Township-LTFD Relationship

(See pp. 28-36.)

28. One of the first, most important, and ongoing, priorities that should come from the recommendations contained in this report is there needs to be a concerted attempt by all parties to attempt to rebuild the critical bridge between the township governing body and administration and the LTFD leadership. An inclusive, team-based approach will be essential to moving the department forward.
29. The Board of Trustees, Township Supervisor, and the Fire Chief must come to agreement on the proper role each plays when it comes to the operations of the Larkin Township Fire Department. There must also be an acknowledgment by the Fire Chief of the rights of the Township's governing body in determining acceptable levels of service, funding, and establishing administrative policies and procedures that impact the fire department. Operational issues—provided they do not conflict with the governing body's established goals, objectives, and policies—should remain the purview of the Fire Chief. Once a working consensus is achieved, agreement to live within its bounds must be acknowledged and maintained.
30. The Board of Trustees and Township Supervisor should take an active role in setting appropriate service level expectations and goals for the fire department. Township officials should include residents and the department in an open and honest discussion within the goal setting process. This process could provide the foundation for the formation of a long-range strategic planning committee comprised of a cross-section of community stakeholders that will evaluate recommendations contained within this report.
31. The Board of Trustees and the Township Supervisor should establish an annual goal-setting workshop with the Fire Chief to develop the sense of common vision necessary to improve the department and the quality of fire and EMS services that Larkin Township receives.
32. Working collaboratively, the Larkin Township Board of Trustees, and the members of the LTFD should commence a process for creating fire department-specific mission, vision, and core values statements. Once complete, these should be prominently posted in the fire station.
33. The LTFD Fire Chief should utilize his office in the township building on a regular basis. This should include having consistent weekly office hours.

34. The LTFD Fire Chief should attend the monthly Board of Trustees meeting to provide the Board with his report, and to answer any questions members of the board and/or the public may have.

Fiscal Management

(See pp. 36-39.)

35. Larkin Township should implement a fiscal management policy/process that includes the use of requisitions and purchase orders for any expenditures that involve municipal/public funds.
- Prior to any purchases being made a requisition should be completed and submitted for approval. The requisition should include a detailed description of what is being requested and the anticipated cost.
 - Once the requisition has been approved, a purchase order should be prepared and issued.
 - Once the requested product or service has been received the purchase order should be submitted for payment along with an attached bill or invoice and a signature from the chief that the requested product or service has been received.
 - Based upon state law and/or local policy, potential purchases above a certain dollar threshold should require three quotes, which should be attached to the requisition.
 - Based upon state law and/or local policy, potential purchases above a certain dollar threshold should be required to undergo a formal bid process.

Fleet

(See pp. 39-45.)

Larkin Township should consider the following fleet changes and opportunities to right size its fire apparatus fleet.

36. Upon delivery of the new engine, combine the operations of Engine 520 and Rescue 550 on the new engine, thus creating a single rescue-engine configuration. Designate Engine 520 and Rescue 550 as surplus and sell them. With both of these vehicles, particularly Rescue 550, in good condition and with relatively low mileage, they should command a decent resale value. This money should then be placed in the CIP account for future apparatus purchases.
37. When fiscally possible, circa 2030, replace Engine 521 and Tender 530 with an engine-tender configuration.
38. Consider replacing Utility 551 with a heavier duty (3/4 or one-ton) utility vehicle primarily for medical and service calls such as CO alarms with no report of illness.

Summary of recommended fleet reconfiguration:

Unit No.	Primary and Secondary Purpose	Description
New engine	Structure engine with rescue capabilities	Engine – Rescue
530	Combination engine/water tender	Engine - Tender
540	Vegetation/off road fires (no change)	Brush Engine
551	Quick response vehicle (QRV) medical and service calls (no change)	QRV

39. For future fire fleet vehicle purchases, Larkin Township should consider co-purchasing (piggybacking) with other agencies in the region to reduce costs and production time, while increasing uniformity and consistency between neighboring agencies.
- An alternative is to consider making apparatus purchases through a purchasing consortium much like the Houston-Galveston Area Council (H-GAC) cooperative purchasing program known as HGACBuy.

Facility

(See pp. 45-60.)

40. Larkin Township should begin the process of planning for a new fire station as soon as possible. If planning starts in 2023, the new station will probably not be completed and ready for occupancy until 2028/2029.

A potential timeline for this project might be:

- 2024: Formation of a building committee.
 - 2025/2026: Feasibility study conducted on new station.
 - 2026/2027: Architectural design developed, and funding procured.
 - 2028/2029: Construction and occupancy of new station.
41. Larkin Township and the City of Midland should enter discussions and explore potential shared and/or regional fire facility opportunities. This concept is developed later in the report in Section 6, Options for a Sustainable Fire and EMS System.
42. In the interim, Larkin Township should periodically conduct third-party air quality testing of its fire station.
43. In the interim, Larkin Township and the LTFD should consider taking steps to address and mitigate some of the station issues identified.

Some options the township may want to consider include, but are certainly not limited to:

- Lease a temporary, modular-type structure to serve the personnel needs of the fire station (kitchen, office space, rest area, bathroom/shower, training/conference room), etc. It should be equipped for full accessibility. This option could also provide a “clean shop” (a very clean/sanitary area) for the purpose of dedicated SCBA and medical equipment repairs / storage.
- Upgrade the current building with a carbon monoxide source capture vehicle exhaust extractor system. **Note:** Funding for this project would not need to be duplicated as often these systems can be dismantled and installed in a new facility.

ISO-PPC

(See pp. 78-83.)

44. CPSM recommends to the extent possible the LTFD address the deficiencies within the ISO-PPC rating criterion, with a focus on first improving the areas listed in Table 4-9.

Fire / EMS Operations

(See pp. 93-162.)

45. The LTFD should build at least a portion of its training regimens and tactical strategies around the exterior or transitional attack for when the fire scenario and the number of available units/responding personnel warrants this approach.
46. The LTFD should revise and enhance its initial dispatch and response protocols to include the immediate and automatic dispatch of additional firefighting resources from surrounding communities for any reported structure fire to attempt to provide for the quicker establishment of a larger ERF of 15 personnel to these types of emergencies.
47. The LTFD should implement a policy that the first apparatus responds with a minimum of three personnel, namely, a qualified driver/operator, an officer, and a minimum of one (two is preferable) qualified/certified firefighter.
48. The LTFD should implement a policy that ALL apparatus responding to emergency incidents beyond the first apparatus should be staffed with a minimum of two personnel. For an apparatus that has additional seating capacity, three personnel is even more desirable and should be mandated.
49. The LTFD should discontinue the practice of allowing apparatus to respond with just one firefighter unless specifically authorized by a chief officer.
50. The LTFD should consider the adoption of a duty crew program on nights and weekends to ensure the response of a minimum number of personnel while simultaneously easing the burden on the remainder of the personnel to respond to minor incidents.
51. The LTFD should develop a guideline that outlines the use of the Active9-1-1 wireless phone platform and make this system mandatory for all responders who have access to a wireless phone to ensure accountability of all responders and also provide an update status of member availability.
52. The LTFD should revise and enhance its initial dispatch and response protocols to include the immediate and automatic dispatch of at least two water tenders from surrounding communities for any reported structure fire in the areas of the township where there are no fire hydrants. Additional tenders can be dispatched, if necessary, after the arrival of a chief officer on the scene, and the completion of an initial size-up.

Safety Officer, Accountability System

(See pp. 122-124.)

53. The LTFD should ensure that the critical role of Safety Officer is filled on every significant incident regardless of whether the department's designated Safety Officer is on the scene or not.
54. The LTFD should ensure the use of an on-scene accountability function on every incident and which incorporates individual and apparatus accountability tags as well as accountability boards in all apparatus and response vehicles. The personnel accountability guideline should incorporate language from NFPA standards 1720, 1500, and 1561.

Fire Preplanning

(See pp. 125-126.)

55. The LTFD should continue to make pre-fire/incident plan development a high priority and ensure they remain accessible via computers/tablets and the CAD system so they will be more readily available to personnel on the incident scene.

56. The LTFD should compile an inventory of the locations of any vacant and unsafe structures throughout the Township and mark them accordingly regarding offensive or defensive only fire suppression operations.

Staffing, Recruitment, and Retention

(See pp. 126-135.)

57. The LTFD should make the recruitment and retention of additional personnel one of its highest priorities. A key component of this priority should be to apply for a federal SAFER grant for on-call recruitment and retention, citing in the application an attempt to meet the provisions of NFPA 1720. This grant should be utilized to develop a comprehensive marketing program to attract new members, and provide incentives for the retention of those personnel.
58. The Larkin Township Fire Department should make it a priority to develop an active on-call recruitment program led by a ranking officer.
- At a minimum this program should consist of:
- Developing a recruitment brochure and mailing it to all residents.
 - Holding periodic open houses at the fire station.
 - Performing public outreach and advertising through the local media.
 - Contacting community and service groups.
 - Developing an eye-catching banner on the township and fire company websites.
 - Placing signs to recruit volunteers at key, well-traveled locations in the township.
 - Placing a temporary signboard at various rotating locations within the community.
 - Placing signs in the township building and local businesses, particularly high-volume locations.
 - Placing lawn signs recruiting on-call personnel at locations throughout the community.
 - The proposed SAFER grant could be utilized to cover many of these expenses.
59. In collaboration with surrounding communities Larkin Township should give consideration to hiring a call/volunteer "Recruitment and Retention Coordinator" to develop, implement, and coordinate recruitment and retention efforts and programs for the cooperating communities.
60. The LTFD should take steps to aggressively recruit, train, and utilize on-call firefighters to increase daily fire suppression staffing and establish realistic recruitment, retention, and volunteer member utilization goals.
61. The LTFD should work to foster a recruitment and retention program that focuses on: membership flexibility; marketing the on-call program to millennials; and continuous retention efforts focused on increasing the retention rate of on-call members through recognition of efforts, a friendly and diverse work environment, mentoring for advancement in the organization, sustaining current incentives, and researching and implementing new incentives as funds are made available.
62. The LTFD should set a realistic goal of recruiting at least 10 to 12 new members over the next three years, and simultaneously set a goal of increasing the overall call member force to between 25 and 30 active, qualified personnel.

63. Larkin Township should explore various additional financial incentives for on-call firefighters including exploring the feasibility of providing incentives such as implementing a Length of Service Awards Program (LOSAP) program for personnel who meet certain training and response criterion.
64. The hiring of all new on-call firefighters should be done through Larkin Township in coordination with fire department leadership. All prospective members should be subject to:
- Interview.
 - State and federal background investigations including fingerprinting.
 - Child abuse check.
 - Driving record check.
 - Credit check.
 - Social media check.
 - Medical screening.
 - Reference check.
65. The LTFD should develop a "Welcome Wagon" program that can be used to welcome new residents to the area and to provide information on, and recruiting information for, the on-call fire protection delivery system.

Agency Collaboration

(See pp. 152-156.)

66. Larkin Township and the LTFD should explore and be open to opportunities for more regional and/or shared services collaborations that would provide for a more robust emergency services delivery system.
67. Larkin Township and the LTFD should consider joining the MABAS system to assist with streamlining the calling for and response of necessary resources to significant incidents.
68. Larkin Township and the LTFD should require that personnel who staff fire and rescue organizations that respond into the township on mutual aid possess the same minimum levels of training (Firefighter I and II) that Larkin Township personnel are required to maintain. The mutual aid agreements with surrounding fire departments should stipulate the minimum required training standards for personnel who may respond into the township to assist.

SECTION 2. AGENCY REVIEW AND CHARACTERISTICS

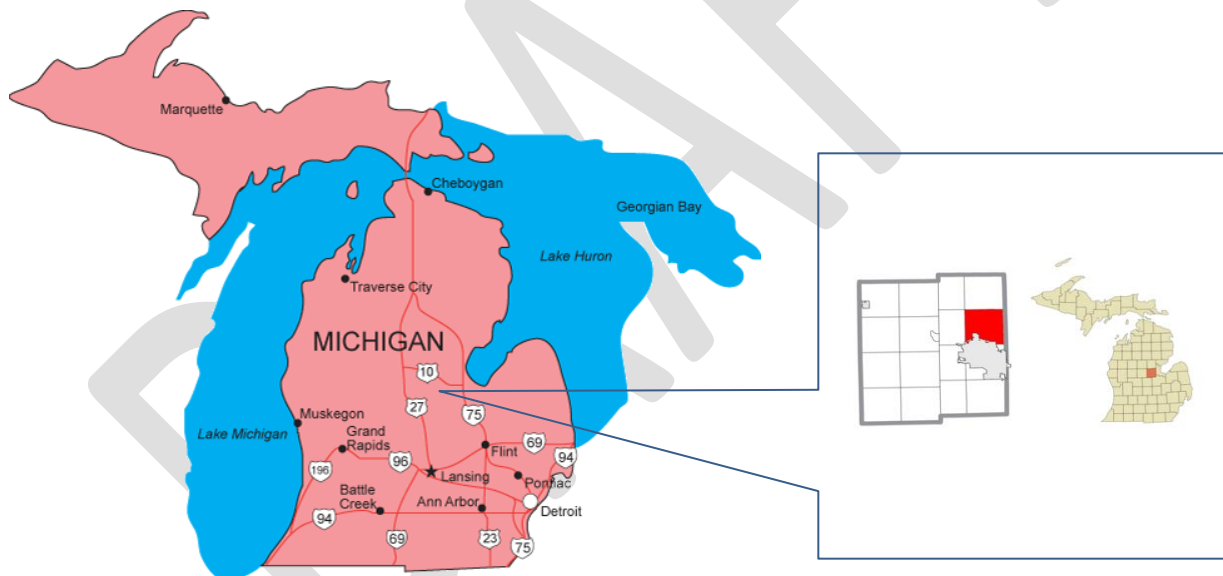
LARKIN CHARTER TOWNSHIP



Larkin Charter Township is located in northeast Midland County, Michigan. Townships are a product of Michigan's early history. Larkin Township was formed in 1879 and named after esteemed Midland founder John Larkin. Over the last 150 years, Larkin Township has grown from a logging and farming community in the 1880s to a still primarily rural community of newer subdivisions, agriculture, and

light industry. Today, the township is experiencing a bit of a transition to a suburban community with new development, particularly near the border with the City of Midland.

FIGURE 2-1: Larkin Charter Township



According to the U.S Census Bureau there were approximately 5,375 people residing in the township in 2022. The township has a total area of about 32.16 square miles.¹ It should be noted that most charter townships in Michigan have dimensions of six miles by six miles for a total of 36 square miles. The nearly four-square miles "missing" than Larkin Township is the result of the formation of the City of Midland Urban Growth Area (MUGA) and related annexation of township land into the city.

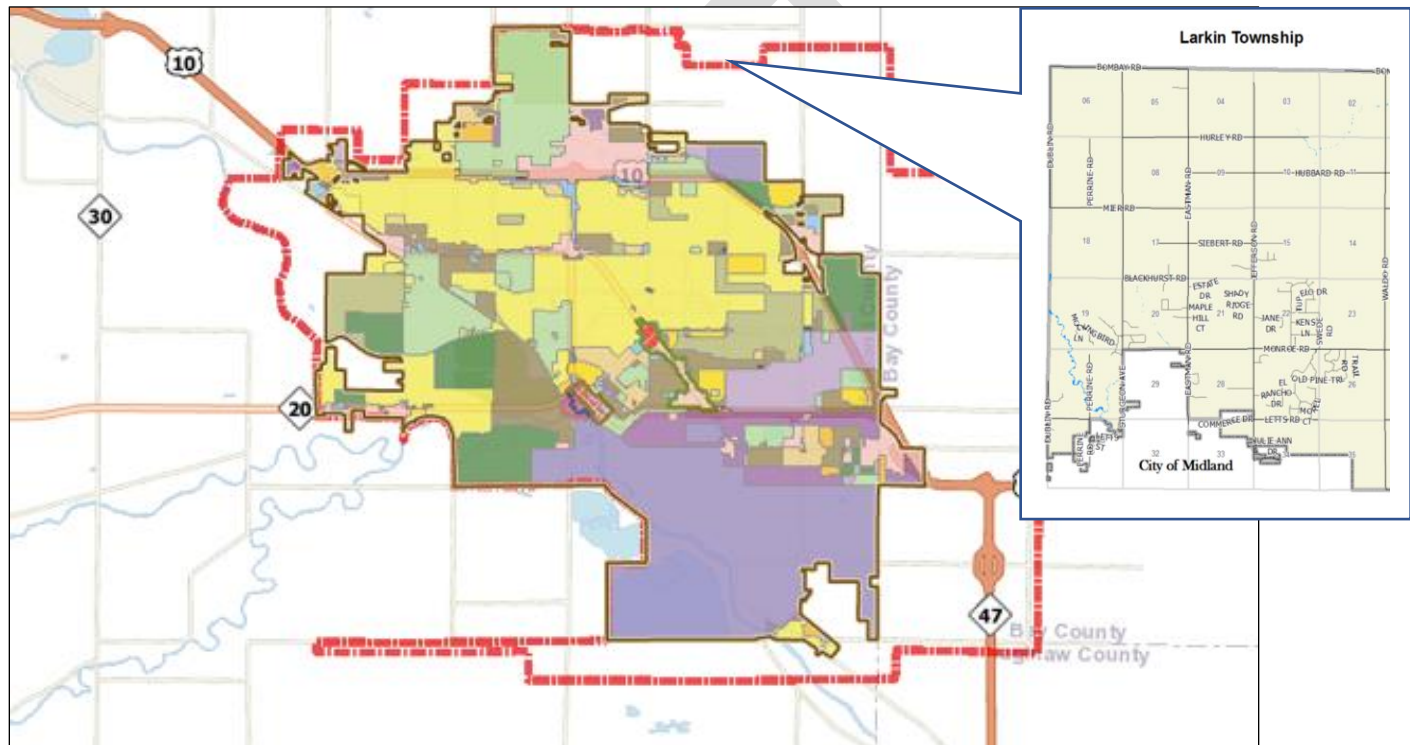
The MUGA was initially established in 1969 as the area around the city that could eventually be provided water and sewer service as the city limits were expanded. Over the last four decades, MUGA boundaries have been modified and the city limits have expanded incrementally into

1. U.S. Census, 2022.

the MUGA. Simply put, the MUGA is a band around the city limits that serves as the potential, long-range City of Midland limits. Properties within the MUGA must be annexed by the city if the landowners desire city water and sanitary sewer services for their property.²

Seven townships, including Midland, located in three different counties make up the area known as the MUGA (Next figure). Each of these townships has their own future land use and zoning plans in place. The City of Midland Master Plan does not change the designation of any land outside the city limits. However, Michigan law allows the city to plan beyond its borders to help ensure coordinated and compatible development in the future, especially where the land is intended to be added to the city.³

FIGURE 2-2: Midland Urban Growth Area (MUGA)



Larkin Township Governance

The township is governed by the statutes sanctioned by state law. The two main laws dealing with township administration and governance are State Statutes 1846.46 and the Charter Township Act Chapter 42 of Michigan Compiled Laws.⁴

The legislative/governing body for the township is the *Larkin Township Board of Trustees*. The Board of Trustees consists of seven-elected members: Supervisor, Clerk, Treasurer, and four Trustees. The Trustees are elected by the citizenry to serve four-year terms. They meet the second Tuesday of each month.

2. <https://cityofmidlandmi.gov/DocumentCenter/View/22485/Full-Master-Plan-?bidId=>

3. <https://cityofmidlandmi.gov/DocumentCenter/View/22485/Full-Master-Plan-?bidId=>

4. <https://michigantownships.org/about-townships/mi-twps/>

The Township Trustees' statutory duties include serving as municipal legislators along with fiduciary oversight and the performance of the township staff and divisions that provide services to the community. The Township Trustees oversee the Tax Assessor, Building Department, Cemetery, Roads, Public Waste/Trash Service, water districts, and Fire Department. The County of Midland Township Code Authority consortium provides plumbing, mechanical, electrical, and building inspections to Midland County municipalities including Larkin.⁵ CPSM could not locate an organizational chart outlining divisions.

LARKIN TOWNSHIP FIRE DEPARTMENT OVERVIEW AND ORGANIZATIONAL STRUCTURE



The Larkin Township Fire Department (LTFD) is an on-call fire department that performs fire suppression, EMS, and other related emergency and non-emergency services to the Larkin Township community. It also covers a small part of Midland Township. The LTFD is established under the authority of the Larkin Township Board of Trustees.⁶

The LTFD was established in 1955, at which point it consisted of a small group of volunteers. The original LTFD station was located on the corner of Waldo and Monroe Roads.⁷ The LTFD was created for the same reasons most volunteer fire departments are created; the distance between communities and between residents within those communities results in challenges related to fires and medical emergency services. Indeed, fire death rates in rural areas are very high as is the loss of property and livestock, all of which have emotional and economic impacts on residents.⁸ The LTFD was created and organized for the purpose of answering fire alarms, extinguishing fires, and providing other emergency services.

Over the years, the LTFD has developed into a larger and more modern emergency services provider with up-to-date equipment and PPE, improved training, and established mutual aid agreements. In 1974, the LTFD moved to a larger facility on Jefferson Road. The photographs that follow illustrate the growth of the LTFD from the 1950s (single bay barn with one engine) to 2023 (four bays with two engines, water tender, brush truck, and utility vehicle).

Today, the Larkin Township Fire Department exists to provide emergency medical first response, fire suppression and protection, and specialized public assistance to the residents of Larkin Charter Township.⁹ The department responds to approximately 300 calls per year with between 15 and 20 on-call personnel. The Fire Chief is the division head and is responsible for all leadership, command, management, and oversight of the department. The Fire Chief reports to the Township Supervisor and ultimately the entire Board of Trustees. The LTFD currently has 16 members including the chief, one assistant fire chief, two lieutenants, one safety officer (who also holds the rank of lieutenant), and 11 firefighters. There is also a part-time secretary.

5. <https://www.townshipcodeauthority.com/>

6. LTFD State of the FD Presentation to Trustees (slide 3)

7. http://www.larkintownship.org/downloads/history_of_the_larkin_township_fire_department_1.pdf

8. NFPA Public Education, Rural Areas.

9. Larkin Township Fire Department Purpose Statement.

FIGURE 2-3: Larkin Township Volunteer Fire Department 1950s¹⁰

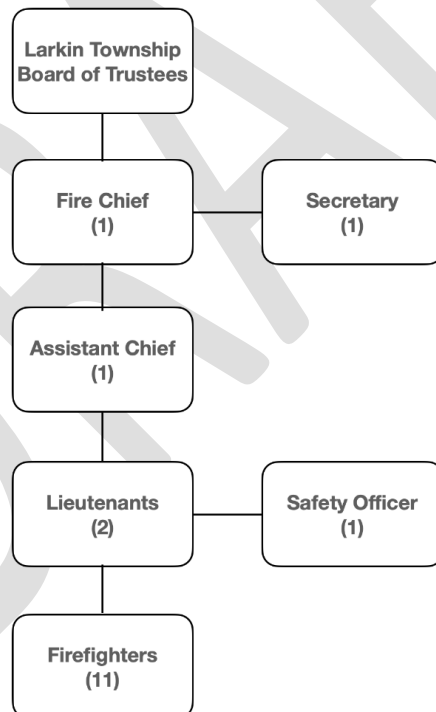


FIGURE 2-4: Larkin Township Volunteer Fire Department 2023¹¹



As with most fire departments, the LTFD is set up in a hierarchical format as illustrated in the next figure. The LTFD operates on a budget within the Township's general fund, reviewed annually.

FIGURE 2-5: Larkin Township Fire Department Organizational Chart



The LTFD is considered an all-hazard (all-risk) emergency services provider. The key operational responsibilities of the LTFD include (but are not limited to):

- Fire protection and suppression.
- EMS first responder (BLS level).

10. http://www.larkintownship.org/firedept_history.asp

11. CPSM Site Visit Photo 2023.

- Fire cause and origin identification (first tier).
- Technical rescue, water/flood rescue, and motor vehicle entrapments.
- Hazardous materials first responder.
- Public education.

The LTFD also performs:

- Fleet and facilities logistics, care, and management.
- Special event support.
- Fire and life safety advisories.
- Response to miscellaneous, non-emergency calls for services.

LARKIN TOWNSHIP FIRE DEPARTMENT GOVERNANCE, BYLAWS, AND PROCEDURES

Effective communications systems are key to the successful operation of any emergency services organization. Standard operating guidelines (SOGs) and standard operating procedures (SOPs) are mission critical components of fire department daily operations and contribute to consistent, effective, and safe operations. Without them there is a tendency to “freelance” and personnel may not all be on the “same page” regarding a wide range of emergency and administrative operations.

Generally speaking, policies are set and/or issued by the governmental authority having jurisdiction, in this case Larkin Township. Fire department rules, regulations, and policies should work in tandem with and be consistent with the overarching ordinances, rules, regulations, and policies that have been adopted by the township.

The use of rules and regulations, operational procedures, and various other forms of written communications are vital parts of a fire department's overall operations. Rules and regulations establish expected levels of conduct and general obligations of department members, identify prohibited activities, and provide for the good order and discipline necessary for the credible operation of a quasi-military emergency services organization. Operational procedures ensure the consistent, effective, efficient, and safe operation of various aspects of the department's operations, both emergency and routine. One of many common denominators among the best fire departments across the United States is that they have a comprehensive and up-to-date operational procedural manual, and their personnel are well-versed and well-trained in those procedures. The inclusion of written documents, such as training and safety bulletins, serves to make the system more effective.

Bylaws – CPSM could not locate any bylaws or constitution for the LTFD. Bylaws are a set of rules or laws established by an organization to regulate itself, as allowed or provided for by some higher authority. Bylaws for an organization are outlined—generally in about 4 to 8 pages—items such as the agency's purpose, official name, officers' titles and responsibilities, requirements for membership, how the officers will be assigned, how meetings will be conducted, and how often these meetings will be held. Bylaws most often dictate the way the group will function in addition to what the roles and responsibilities of the officers will be. Bylaws often provide the written guidance so everyone will know what the purpose and the daily operations are.

Standard Operating Procedures and Standard Operating Guidelines – Standard Operating Guidelines (SOGs) and Standard Operating Procedures (SOPs) are essential components of fire department operations. They spell out the do's and don'ts for fire department personnel, sometimes as strict requirements (SOPs) and other times as recommended best practices (SOGs). SOGs/SOPs are mission-critical components of fire department daily operations and contribute to consistent, effective, and safe operations. Without SOGs/SOPs, there is a tendency to “freelance” or personnel may not all be on the “same page” regarding a wide range of emergency and administrative operations. There are subtle differences between SOGs and SOPs. SOGs tend to have more leeway or room for interpretation and are often an action preceded by the word “may,” which can imply greater flexibility. SOPs, on the other hand, tend to be more rigid, often an action preceded by the word “shall,” which is more definitive. Whether agencies use SOGs, SOPs, or a blend of both, well-written SOGs/SOPs are essential in fire service operations. The following chart illustrates the differences between SOGs and SOPs.

TABLE 2-1: The Difference Between SOGs and SOPs

Standard Operating Guidelines (SOGs)	Standard Operating Procedures (SOPs)
SOGs tend to have more leeway or room for interpretations.	SOPs tend to be more rigid, more of a rule and not flexible.
SOGs are often an action preceded by the word “may” or “should,” which can imply greater flexibility.	SOPs are often an action preceded by the word “shall” or “will,” which is more definitive.

CPSM was provided a copy of the LTFD SOG manual (it is not on line). CPSM noted the LTFD has about 60 Standard Operating Guidelines (SOGs), most of which were created recently (within the past three years). It appears that the manual was obtained and copied from another source, which is fine provided the documents reflect actual LTFD operations. CPSM would consider the LTFD SOG manual as blended—the policies and guidelines are combined. The LTFD SOGs include title, policy number, original issue date, revision date, and a fire chief approval block. The LTFD's SOGs are organized by the following sections: Personnel, Operations, and Safety.

Several of the LTFD SOGs are personnel-oriented (specifically Section 100), which CPSM finds more often in stand-alone fire agencies (LTFD is part of a township). Personnel policies such as recruiting, hiring, (including background checks, finger printing), alcohol and drug use, sexual harassment and unwanted behaviors, illness and injury prevention programs, firearms, performance objectives, grievance procedures, disciplinary issues, and job description are commonly found in the oversight municipality's procedure manual (or employee handbook). These types of policies generally apply to all within the municipality and typically are not exclusive to the fire department.

Fire departments face an array of constant challenges and must adapt to many things including expanding missions, increasing legal and regulatory requirements, increasing complexity in emergency response techniques and equipment, and much more. **For those reasons, procedures specific to fire department operations are more commonly found in a fire department's SOP/SOG manuals.** The increasing acceptance of electric vehicles (EVs) is an example of the fire service needing to learn an all-new technology, to retool, and to develop comprehensive procedures and guidelines on an array of issues from new ways to provide patient extrication to extinguishing complex battery fires. The coronavirus pandemic (COVID-19) is another example where response procedures and use of personal protective clothing changed. These examples are what CPSM finds important to cover in specific fire department SOPs/SOGs.

CPSM was unable to locate "Special Notices" (SNs) or "General Orders" (GOs) either online or posted on the fire station bulletin board. The use of SNs or GOs is a process for communicating important updates or changes within the department. SNs and GOs can cover various facets of department operations and are developed between additions or updates to SOGs/SOPs. Likewise, CPSM didn't see "Safety Bulletins" or "Training Bulletins." The use of safety and training bulletins is a process for communicating important training and safety updates or reminders. CPSM couldn't find policies, procedures, special notices, training bulletins, and other general business items either online or via a staff portal. Posting documents online (or in an employee portal) provides an easy way to find information and promotes transparency (and promotes a "paperless" environment).

In addition to the following recommendations, CPSM provides additional recommendations for SOGs in other sections of the report.

Governance, Bylaws, and Procedures Recommendations:

- The LTFD fire chief should form a committee to develop a comprehensive Rules and Regulations document that identifies anticipated, acceptable/ permitted, and prohibited behaviors. This document should be distributed to and signed for by each member of the department. It will also provide important guidance to new employees. (Recommendation No. 1.)
 - Some suggested sections for the Rules and Regulations document could include, but are by no means limited to:
 - A preamble.
 - Department vision statement and mission statement.
 - Purpose of the rules and regulations.
 - Organization structure and chain of command.
 - Membership requirements.
 - General rules of conduct.
 - Officer qualifications and selection (May just reference current department procedure).
 - Officer duties and responsibilities (May just reference current department procedure).
 - Training (May just reference current department procedure).
 - Apparatus, equipment, and protective clothing (May just reference current department procedure).
 - Uniforms and grooming.
 - Discipline.
 - Conflicts between various documents (state statutes, township policy, rules and regulations, standard operating guidelines, other orders, company bylaws).
 - Other areas that may be agreed upon for inclusion.
- The LTFD should review and update its Respiratory Protection Plan (29 CFR 1910.134). (Recommendation No. 2.)
- The LTFD should review and update its Bloodborne Pathogens Control Plan (29 CFR 1910.1030). (Recommendation no. 3.)
- The LTFD should consider instituting a "Special Notice" (SN) or "General Orders" (GO) process to inform staff of current LTFD (and township) business items, changes in SOGs, and other announcements. (Recommendation No. 4.)

- The LTFD should consider implementing the issuance of "Training Bulletins" covering training specific updates, training calendar updates, required trainings, etc. (Recommendation No. 5.)
- The LTFD should consider posting most of its operational and business items online or in a fire department staff portal. (Recommendation No. 6.)

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LARKIN TOWNSHIP FIRE DEPARTMENT POSITION JOB DESCRIPTIONS AND DUTIES

A job description is a useful, plain-language tool that explains the tasks, duties, functions, and responsibilities of a position.¹² It details who performs a specific type of work, how that work is to be completed, and the frequency and the purpose of the work as it relates to the organization's mission and goals.

Job descriptions are used for a variety of reasons, such as conducting performance reviews, clarifying missions, establishing titles and pay grades, and creating reasonable accommodation controls, working conditions, etc. They can also be an important tool for recruiting new personnel to an organization. Job descriptions are beneficial for career development planning, offering position-specific training and related exercises, and establishing legal requirements for compliance purposes. An important component in developing job descriptions within the fire service are job performance requirements (JPRs). JPRs identify minimum job performance requirements for career and volunteer firefighters.¹³

As part of this assessment, CPSM reviewed LTFD job descriptions that were located in the LTFD Standard Operating Guidelines manual. The LTFD has six job descriptions (Position Descriptions), one for each position in the fire department. These are Fire Chief, Deputy/Assistant Fire Chief, Health & Safety Officer, Lieutenant, Training Officer, and Firefighter. CPSM found the job descriptions light on content and out of date:

- The job descriptions have not been updated since 2016.
- Job descriptions are missing:
 - Status (full-time, part-time, volunteer, other).
 - Work hours (Fire Chief).
 - Supervision given and exercised.
 - Number of approved positions.
 - Probation periods.
 - Requisite knowledge of and ability to perform functions.
 - Time in grade in lower position (to be used for promotional and career succession).
 - Minimum educational and/or professional certification requirements.
 - Physical demands.

12. <https://www.shrm.org/resourcesandtools/hr-topics/talent-acquisition/pages/why-you-should-have-job-descriptions.aspx>

13. NFPA 1001

- Working conditions.
- Required state or national certification or education requirements.
- Job performance requirements (JPRs).

Position Descriptions Recommendation:

- Working collaboratively, the Fire Chief and Board of Trustees should develop and/or revise the current job descriptions for all positions within the LTFD. The following format is recommended: (Recommendation No. 7.)
 - Date.
 - Job Title.
 - Salary Range (if applicable).
 - Detailed Job Description.
 - Key Job Responsibilities.
 - Minimum Education and Training Requirements.
 - Job Performance Requirements (JPRs) and Professional Qualifications. Examples are:
 - NFPA 1001 – Firefighter.
 - NFPA 1002 – Fire Apparatus Driver/Operator.
 - NFPA 1021 – Fire Officer.
 - Essential Skills and Abilities.
 - Other Requirements such as Time in Grade in Lower Position for Promotional Positions.
 - Probationary Period.
 - Physical Demands.
 - Working Conditions.

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LARKIN TOWNSHIP FIRE DEPARTMENT EDUCATION AND TRAINING

Training is, without question, one of the most essential functions that a fire department should be performing on a regular basis. One could even make a credible argument that training is, in some ways, more important than emergency responses because a department that is not well trained, prepared, and operationally ready will be unable to fulfill its emergency response obligations and mission. Education and training are vital at all levels of fire service operations to ensure that all necessary functions are completed correctly, safely, and effectively. A comprehensive, diverse, and ongoing training program is critical to the fire department's level of success.

An effective fire department training program must cover all the essential elements of that department's core missions and responsibilities. The level of training or education that is required must target a given set of tasks that vary with the jobs to be performed. The program must include an appropriate combination of technical/didactic training, manipulative or hands-on/practical evolutions, and training assessment to gauge the effectiveness of these efforts.

Most of the training, but particularly the practical, standardized, hands-on training evolutions should be developed based upon the department's own operating procedures and operations while remaining cognizant of widely accepted practices and standards that could be used as a benchmark to judge the department's operations for any number of reasons.

Certain Occupational Safety and Health Administration (OSHA)¹⁴ regulations dictate that minimum training must be completed on an annual basis, covering assorted topics that include:

- A review of the respiratory protection standard, self-contained breathing apparatus (SCBA) refresher and user competency training, SCBA fit testing (29 CFR 1910.134).
- Blood Borne Pathogens Training (29 CFR 1910.1030).
- Hazardous Materials Training (29 CFR 1910.120).
- Confined Space Training (29 CFR 1910.146).
- Structural Firefighting Training (29 CFR 1910.156).

In addition, National Fire Protection Association (NFPA) standards contain recommendations for training on diverse topics such as a requirement for a minimum of 24 hours of structural firefighting training annually for each fire department member. Also, the ISO-Fire Suppression Rating System (ISO-FSRS) has certain training requirements that the fire department receives credit for during the ISO-FSRS review.

Because so much depends upon the ability of the emergency responder to effectively deal with an emergency, education and training must have a prominent position within an emergency responder's schedule of activities when on duty. Education and training programs also help to create the character of a fire service organization. Agencies that place a real emphasis on their training tend to be more proficient in performing day-to-day duties. The prioritization of training also fosters an image of professionalism and instills pride in the organization.

Training standards for firefighting personnel are promulgated by the Michigan Fire Fighters Training Council, and Michigan OSHA (MIOSHA) Part 74 regulations. Medical First Responder (MFR) and Emergency Medical Technician (EMT) certifications are issued by the Michigan Department of Community Health.

At the time of this assessment, CPSM would judge the LTFD training program as fair overall. According to current policy, the department holds three what they refer to as "meetings" each month. One of these sessions is dedicated to training, while another is for truck and equipment inspections, which can be counted as training if they are thorough. The LTFD does not have a dedicated Training Division, as the department is small and comprised entirely of volunteer personnel. This is not uncommon for a department of this size. Training for the department is coordinated by the Assistant Chief.

Apparently, for purposes of pay (\$15 stipend for attendance at "meetings"), time sheets do not differentiate between meetings, training, and truck/equipment checks. Therefore, it is difficult to ascertain how many personnel are attending the training sessions as opposed to meetings and equipment checks. However, it appears that most personnel—12 out of 20 in 2022—attended 20 or more meetings.

14. The Michigan Firefighters Training Council and MIOSHA Part 74 have adopted NFPA and federal OSHA standards and incorporate them by reference into the regulations which cover firefighters in the State of Michigan.

According to documents provided to CPSM by the fire department, at the time of this assessment the LTFD listed 18 personnel as being active firefighters. The list provided by the township included 20 personnel, with two of those names no longer appearing on the fire department's list. A later list indicated a membership of 16 personnel, as three members had left the department while one new member had joined.

CPSM was informed that all personnel have a minimum of Firefighter I certification (although all certificates were not available to review) with most personnel also certified at the Firefighter II level. Personnel also possess hazardous material operations level certification. New personnel can start as a junior member or cadet doing support tasks until they successfully complete Firefighter I and II. Basic training is conducted through the state at various locations, including county fire academies. Of the 18 personnel listed on the active roster, all except three are certified as interior firefighters, so the department in essence has 15 fully qualified firefighters.

For medical certification, three personnel are certified EMTs, 10 possess MFR certification, and five do not have any EMS certification except CPR. While the personnel who only possess CPR and basic first aid certification can assist on cardiac or respiratory arrest calls, their ability to provide care on other types of medical emergencies is limited.

It was reported to CPSM that most of the department's personnel are certified as drivers and have also completed the required state Apparatus Operator course. Once again, not all certificates were available for review.

A water tender, sometimes known as a water tanker, is a type of firefighting apparatus that specializes in the transport of water from a water source to a fire scene, which is a practice often known as a water shuttle. Water tenders are capable of drafting water from a stream, lake, or a hydrant. When reviewing the national statistics regarding fire apparatus crashes, it becomes very apparent that a disproportionately high number of rollover crashes involve fire department water tenders (tankers) apparatus. Indeed, these vehicles are very heavy, and weight can transfer and shift during driving. The U.S. Fire Administration (USFA) estimates that while water tankers account for only 3 percent of the fire apparatus in the United States, they have accounted for more than 20 percent of the vehicle response-related fatalities over the past two decades. This is more than pumpers and aeriels combined.¹⁵ Only personal vehicles operated by volunteer firefighters account for more response-related deaths than tankers. ***These vehicles require specialized driving skills and frequent training in safe operations. Larkin Township should pay particular attention to those personnel who drive the department's water tender and ensure that their training and driving skills are maintained constantly.***

All LTFD officers are reported to have earned Fire Officer I certification issues by the state, but again certificates were not available for review.

When training is conducted, a formal lesson plan for each session is generally not formulated. Although fully understanding the time constraints facing the members of the department, who are voluntarily attempting to provide some level of training, the lack of formal lesson plans is a serious issue. Each training session should have a written lesson plan with goals and objectives and measured performance standards. If training is conducted without a lesson plan, which often happens in the fire service, the training report should include a detailed narrative regarding the training that was conducted and what objectives were met. Our review of the department's training reports indicates that it is deficient in this area as well.

15. <https://www.firefighternation.com/leadership/reducing-fire-department-tanker-tender-crashes-and-fatalities/#gref>

The critical need for all members to maintain their basic skills proficiency dictates that a comprehensive training program with proper documentation is required. The LTFD should have a comprehensive fire and rescue training program based upon the Michigan State Firefighter I and II model, with supporting training aids from NFPA, IFSTA, and the National Fire Academy systems. Unfortunately, the demands, particularly time, to develop a quality training program are significant, making the development of a reliable training program, even with support from multiple members, an extremely difficult undertaking. However, there are numerous opportunities for firefighters, even volunteer personnel with limited time, to engage in training at least weekly. The LTFD should seek to maximize, support, and encourage, these opportunities.

There are several ways to evaluate the effectiveness of the fire department's training program. One increasingly common way is through the use of annual skills proficiency evaluations where all members of the department are required to successfully perform certain skills and/or complete standardized evolutions, either individually or as part of a team. Post-course evaluations, post-incident critiques, and evaluation of incident operations and statistics can also provide important feedback regarding the training program. It is important that all training, no matter how minor or inconsequential, be documented in detail. Failure to do so can expose the department and township to significant liability.

Professional development for fire department personnel, especially officers, is also an important part of overall training. There are numerous opportunities for firefighters and officers to attend training on a wide range of topics outside of Larkin Township including the county fire academies, the Firehouse Expo in Columbus, Ohio, the Fire Department Instructor's Conference in Indianapolis, and the Volunteer Incentive Program (VIP) at the National Fire Academy in Emmitsburg, Maryland. Beyond the practical benefits to be gained from personnel participating in outside training, encouraging personnel to earn and/or maintain various specialized certifications, such as Fire Instructor or Fire Officer, increases the positive professional perception of the organization and can help to demonstrate a commitment to continued excellence.

A final important component of an effective personnel and officer development program is that these members continue to cultivate their skills through ongoing training and education. This training and education should be in addition to the normal training requirements for all firefighters. Officers unequivocally have more responsibilities, and as a result, should have higher standards for their knowledge, skills, and abilities. Management and leadership skills are important for officers to develop.

Training and Education Recommendations:

- The LTFD should begin the development of a comprehensive training program that addresses, but is not limited to: applicable OSHA training, recommended NFPA training, every operational mission and responsibility of the department, and specialized training including personnel/officer development. The training should comply with accepted and/or recommended practices and standards, should include standardized evolutions, and should be consistent with newly developed and/or updated operational guidelines and Standard Operating Guidelines (SOGs). (Recommendation No. 8.)
- Formal training of some type, lasting a minimum of two hours, should occur weekly. The training should be skill driven, and when appropriate, EMT continuing education credit hours should be applied for, through the State of Michigan. Additional opportunities for training can be found during related activities such as weekly/monthly apparatus and equipment inspections, and building pre-planning and safety check activities. (Recommendation No. 9.)

- Additional, high-intensity training on various subjects, including periodic live fire training, should be conducted on a minimum of an annual basis at a formal fire academy where appropriate training facilities, structures, and props are available. (Recommendation No. 10.)
- All LTFD personnel should be required to complete a minimum of 72 hours of documented training per year (an average of 6 hours per month) including all mandatory training. (Recommendation No. 11.)
- To the extent possible, training should be delivered and/or conducted utilizing formal, standardized lesson plans that include objectives and performance criterion. However, when this is not possible or practical (a frequent occurrence in the fire service), a detailed description of the training should be included in the narrative section of the training report. (Recommendation No. 12.)
- All training that is conducted, no matter how brief or inconsequential it may seem, MUST result in the completion of a formal training report. Training reports should include the date, time training commenced, time duration of the training, the instructor, the officer in charge, names of all personnel trained, and include a detailed description of the training or reference the formal lesson plan utilized. All persons trained should sign or initial either a printed hard copy of the training report, or if this is not practical, a sign-in sheet should be attached. The officer in charge, and when possible, the instructor, should also sign the hard copy training report. (Recommendation No. 13.)
- As part of the development of a new comprehensive training program, the department should implement periodic basic skills proficiency evaluations for ALL personnel. These proficiency evaluations, consisting of standardized evolutions, can be based upon recognized standards and benchmarks, in conjunction with performance criterion and benchmarks established through evaluation of, and based upon, LTFD operations and procedures. (Recommendation No. 14.)
- The LTFD should establish a formal "performance "improvement" process for fire suppression operations. The process should include the adoption of performance standards such as NFPA 1720 , the creation of a formal review and critique process for all incidents, and a process for modifying SOGs, SOPs, training priorities, and equipment as determined by the performance improvement program. (Recommendation No. 15.)

NFPA 1720 includes several on-scene performance indicators such as:

- On-scene to charged line at the front door of a structure fire: two minutes or less, 90 percent of the time.
- Water from hydrant to supply engine: three minutes or less, 90 percent of the time.
- In order to assist with the large amount of training that needs to be done, and in recognition of their important role in the delivery of training and the success of the program, all officers should be formally certified at a minimum at Fire Instructor Level I. (Recommendation No. 16.)
- The LTFD should ensure that all department members are trained/certified to the minimal NIMS level required for their duties/responsibilities and ranks. The department should also further enhance the level of incident management training provided to the members of the department. In addition to the basic I-100/I-700 training mandated, it is recommended that all personnel be trained to the ICS-200 level (IMS Level I). All officers should be trained to the ICS-300 level (IMS Level II). The chief-level officers should be trained to the ICS-400 level (IMS Level III). (Recommendation No. 17.)

- The LTFD should strongly encourage its officers to obtain a certain level of fire officer certification as a position requirement such as Fire Officer I and II for lieutenant, Fire Officer III for assistant fire chief, and Fire Officer Level IV for fire chief. (Recommendation No. 18.)
- The LTFD should require that all officers be certified as Incident Safety Officers. Additional personnel who may be interested should be encouraged to take this training and obtain this important firefighter safety certification. (Recommendation No. 19.)
- The LTFD should mandate that all officers participate in additional officer related training each year in order to be eligible to retain their position. (Recommendation No. 20.)

A reasonable requirement might be 32 hours of training consisting of:

- Firefighting strategy and tactics, incident management, or safety training (16 hours)
- Leadership or management training (16 hours)
- The LTFD should encourage personnel to seek additional training on their own, and to the financial and practical extent possible, send personnel to outside training opportunities. Information gained at this training can then be brought back and delivered to other members of the department. (Recommendation No. 21.)
- The LTFD should seek annual funding in the training budget to upgrade its training resources such as manuals, DVDs, and subscriptions to other available training resources. (Recommendation No. 22.)

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LARKIN TOWNSHIP COMMUNITY RISK REDUCTION PROGRAMS

A community risk reduction program (CRR) is a process to identify and prioritize local risks, followed by the integrated and strategic investment of resources to reduce their occurrence and impact. It is a process to help communities find out what their risks are and develop a plan to reduce the risks viewed as high priority.¹⁶ CRR activities are important undertakings of a modern-day fire department.

A comprehensive CRR system in every jurisdiction should include, at a minimum, the key functions of fire prevention, code enforcement, inspections, and public education. Preventing fires before they occur, and limiting the impact of those that do, should be priority objectives of every fire department. Fire investigation is a mission-important function of fire departments, as this function serves to determine how a fire started and why the fire behaved the way it did, providing information that plays a significant role in fire prevention efforts. Educating the public about fire safety and teaching them appropriate behaviors on how to react should they be confronted with a fire is also an important life safety responsibility of the fire department.

Fire suppression and response, although necessary to protect property, have minor impact on preventing fires. Rather, it is public fire education, fire prevention, and built-in fire protection systems that are essential elements in protecting citizens from death and injury due to fire, smoke inhalation, and carbon monoxide poisoning. The fire prevention mission is of utmost importance, as it is the only area of service delivery that dedicates 100 percent of its effort to the reduction of the incidence of fire.

¹⁶. NFPA 1300 Standards on Community Risk Assessment and Community Risk Reduction Plan Development.

Fire prevention is a key responsibility of every member of the fire department, and fire prevention activities should include all personnel. On-duty personnel can be assigned with the responsibility for “in-service” inspections to identify and mitigate fire hazards in buildings, to familiarize firefighters with the layout of buildings, identify risks that may be encountered during firefighting operations, and to develop pre-fire plans—such as the LTFD does currently.

Fire prevention should be approached in a truly systematic manner, and many community stakeholders have a personal stake and/or responsibility in these endeavors. A significant percent of all the requirements found in building/construction and related codes are related in some way to fire protection and safety.

The Community Risk Reduction (CRR) function in the LTFD is very limited. All construction/ pre-occupancy building code plans review, code compliance, inspections, and approvals are handled by the Midland County Code Authority. Larkin Township has not adopted local provisions for code enforcement of any type. The township does not require any fire permits, burn permits, etc.

Being a primarily rural community, Larkin Township has a limited number of non-residential—that is, commercial, assembly, and industrial—occupancies. The LTFD does not do formal fire inspections. Rather it attempts to do what it refers to as safety walk-throughs on the businesses in the township. It completed 49 of these walk-throughs in 2022. While it identifies potential fire hazards and points them out to the business owner or representative, it has no authority to formally cite violations or force code compliance. According to the LTFD personnel, they achieve about a 95 percent compliance rate with their recommendations. While these safety walk-throughs are definitely a positive, the lack of enforcement authority is problematic in that known fire hazards may be allowed to continue unabated and eventually result in a fire. This may create unintentional liability for the Township.

There are many reasons why existing buildings should be formally inspected for fire code compliance. The obvious purpose is to ensure that occupants of the building are living, working, or occupying a building that is safe for them to do so. Some buildings are required to have specific inspections conducted based on the type of occupancy and the use of the buildings such as but not limited to healthcare facilities (hospitals, nursing homes, etc.), schools, restaurants, and places of assembly. These inspections are mandated by various statutes, ordinances, and codes. The inspections themselves are often limited to specific areas within the building and to specific time frames. Fire inspectors will also witness tests of required fire protection systems and equipment. Conversely, many businesses are not required to have any type of periodic fire safety inspections.

Fire inspections can also identify violations and make follow-up inspections to ensure that violations are addressed and that the fire code is enforced. In fire prevention, the term “enforcement” is most often associated with inspectors performing walk-throughs of entire facilities, looking for any hazards or violations of applicable codes. Educating the owner to the requirements, as well as the spirit and intent of the code, can also attain positive benefits for fire and life safety.

Building Code Recommendations:

- Larkin Township should consider the formal adoption of the 2012 edition of the International Fire Code as adopted by the State of Michigan as its local fire code. Adoption of the code will allow the Township and/or fire department personnel to conduct formal fire inspections that require code compliance and abatement of violations, issue permits of various types, etc. (Recommendation No. 23.)

- If Larkin Township chooses to adopt a formal fire code enforcement function it must ensure that the LTFD is provided appropriate formal training in performing routine fire prevention inspections to all personnel who will be conducting inspections (Fire Inspector 1 / NFPA 1031, per Michigan State Fire Chiefs Association). The State of Michigan has many resources to help with fire prevention, fire investigation, and public outreach. (Recommendation No. 24.)

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Being able to develop an adequate water supply for firefighting purposes is perhaps the most critical, non-safety, aspect of firefighting operations. If an adequate water supply cannot be established quickly, and maintained, effective firefighting operations will simply not be possible.

Rural communities that do not have a municipal, pressurized water supply must supply their needs from other sources. Sometimes static water sources (lakes, rivers, ponds, cisterns) are drafted out of, either manually, or with dry hydrants, to achieve the needed water supply to fight a fire. In cases where static water sources are not readily available, and oftentimes even if they are, fire departments must utilize water tankers/tenders to carry or shuttle the needed water supply from the source to the incident scene.

In communities without staffed fire stations such as Larkin Township, there is an inherent delay in the fire department response to a building fire. This delay is due to the fire department members having to respond to the station to staff and respond with the apparatus. This inherent delay allows the fire to increase in size before the arrival of the fire department. This situation can exacerbate the need for an adequate and sustainable water supply.

Only a limited part of the LTFD response area is equipped with a municipal water supply system. Even in that area there are a limited number of connections available. The remainder of the district does not have a water system, which requires the fire department to establish, and then maintain, an adequate supply of water to fight the fire.

Establishing a water supply operation in a rural area requires significant resources, both personnel and equipment, in addition to a closely coordinated effort. Portable tanks are set up near the fire scene to supply engines operating to attack the fire. Water tenders transport water from water supply sources to the dump tanks near the incident. The larger the fire, and the distance from the fire to the closest source(s) of water, will both directly impact the size and complexity of this type of operation.

There are almost no usable static water supply sources located in Larkin Township. That fact eliminates the ability of the fire department to install and use dry hydrant or standpipe connections. This further limits its water supply options.

Water Supply Recommendation:

- The LTFD should seek opportunities for entering into public/private partnerships with private property owners to facilitate the installation of cisterns on private properties in selected locations throughout the township that are outside of the water district. As an additional incentive, the township might consider a property tax abatement for the installation of cisterns on private property. (Recommendation No. 25.)

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The investigation of the cause and origin of fires is also an important part of a comprehensive CRR system. Determining the cause of fires can help with future prevention efforts. At the time of this evaluation, fire investigations in Larkin Township are primarily left to the insurance companies to perform. For fires that are deemed to be suspicious, result in a large loss, or involve a serious injury or fatality, assistance is requested from either the Midland County Sheriff or State Fire Marshal.

It is important that every fire that causes damage, or any type of injury, even minor ones, is subjected to a fire origin and cause determination process. Important information, including determining if a fire is suspicious, or if there are underlying causes that contributed to its ignition or spread, can be missed if the fire is not investigated.

Fire Investigations Recommendation:

- The LTFD should develop a standard operating procedure to ensure that every fire that causes damage, results in any loss, and/or causes any injury or fatality, has an initial fire origin and cause investigation completed at the time of the incident. With a limited number of fires this could be an area to explore a shared services agreement with the City of Midland. (Recommendation No. 26.)

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The LTFD has a limited public fire education program. These programs are an important component of an overall fire prevention program, particularly in the residential areas of the community. Nearly 75 percent of all fires, fire deaths, and injuries occur in the home, an area where even aggressive code enforcement and inspection programs have little to no jurisdiction. Public education is the area where the fire service will make the greatest impact on preventing fires and subsequently reducing the accompanying loss of life, injuries, and property damage through adjusting people's attitudes and behaviors with regard to fires and fire safety.

With no schools, only a few dozen businesses, and a couple of churches, face-to-face public education opportunities in the township are going to be limited. However, there are ways the LTFD can increase the spread of its fire safety (and all hazard) messages. These include, but are certainly not limited to:

- Add signs or marquees to the fire station and the municipal building and post regular fire and life safety messages.
- Include fire safety messages in township messages to the community and on the township website.
- Increase social media presence for the community to learn about their fire department and its services, along with frequent social media postings (Facebook, Instagram, etc.) on department events, disaster preparedness, all hazards injury prevention, etc.
- Social media addresses can be advertised on apparatus, department letterhead, etc.
- Development of a LTFD YouTube page.
- Increased social media activity during holidays (when there is an uptick of cooking fires), prior to and during major weather and during public education events (Facebook Live, for example), live dispatch or live updates from the PIO on incidents.

Fire Education Recommendation:

- The LTFD should consider implementing a voluntary home inspection and assistance program. The program should also include the distribution of smoke detectors to the community. In addition, the LTFD should provide an inventory of smoke alarms on all apparatus to take on all calls. Fire department personnel should offer free smoke alarm checks on all calls when possible. This could also be used as a new member recruitment tool. (Recommendation No. 27.)

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TOWNSHIP-LTFD RELATIONSHIP

CPSM met both virtually and in person with the Larkin Township Board of Trustees, including the Supervisor, Township Clerk, and planning staff. The team met in person with the Fire Chief, Assistant Fire Chief, and several of the on-call members. Additional on-call members of the department also dropped in while we were performing site visits. CPSM also developed and administered a 50-question on-line anonymous survey for fire department personnel to complete. The survey was open from April 15 to May 11. A total of 12 personnel (75 percent) completed the survey. This is an excellent return for this type of survey instrument. The complete survey can be found in Appendix A of this report.

Observations made by CPSM during our visit, stakeholder interviews, and the LTFD membership survey indicate communication issues currently exist or are perceived to exist between the township and the LTFD.

An effective leadership-management relationship enables an organization's leadership/management and its members to resolve disputes, enhances the public's perception of the fire department, moves the fire department and the community it serves forward, and creates an environment that allows innovative problem solving. Developing an atmosphere of trust and respect is beneficial for all concerned. The goal is to solve disputes in an atmosphere of cooperation without resorting to protracted and costly disputes. In today's environment, there's no room for ongoing conflict between various levels of public management. Such situations can impact service delivery and morale and can impede fire department successes.

A key component to the success of a fire department and the Fire Chief is a strong relationship with his/her manager—in this case the Township Supervisor, and the governing body, in this case the Board of Trustees. This needs to be a very open and collaborative relationship with frank and open lines of communication that flow both ways. The lack of effective communications is probably the number one reason for conflicts within agencies.

Conversely, the lack of cooperation from the Fire Chief regarding the Supervisor and Trustees complicates the working relationship. For instance, CPSM was informed that the township Trustees only found out that the LTFD had participated in a standby for President Biden at MBS when it was posted on social media. This is the type of information that—for multiple reasons—the Chief should be providing to the Supervisor prior to the event occurring. It should also be included in his monthly report to the Board. Although the Fire Chief needs autonomy to operate his/her department, it does not make him/her and their department a totally independent entity not subject to any oversight by either the municipal administration and/or governing body.

Among the concerns that were expressed to and/or identified by CPSM regarding the fire department's administration were:

- The Fire Chief should increase participation in Board of Trustees meetings.
- The Fire Chief should meet with the Board as a whole and/or the Township Supervisor to set annual goals for the LTFD and review progress at achieving the established service level and performance objectives.
- The Fire Chief should be required to develop, provide, and present a written monthly report to the Board of Trustees regarding the department's operations and how well it is meeting established national benchmarks.
- The monthly report provided to the township should be posted and e-mailed to all members.
- The hiring process for call personnel should be coordinated through the township.
- The Township Supervisor or Township Clerk should receive timely reports regarding discipline of members, vehicle accidents with department units, etc.

CPSM was also informed that since overall information exchange appears to be lacking, members of the Board have, on occasion, pursued alternative means—other than the formal chain of command—to try to obtain information, especially if requested information is not provided by the chief in a timely manner. Whatever the root causes, the absence of effective organizational communications through the established chain of command can result in a breakdown in organizational discipline.

Difficulty in achieving teamwork is not at all uncommon within governmental agencies (including volunteer agencies) or the private sector and there are countless leadership, management, and teamwork tools and perspectives on this topic. The following is a sampling of best practices CPSM has observed in high-performing governmental agencies. These high-performing agencies typically have:

- Effective communications procedures and methods to work on differences.
- Well-crafted Mission, Vision, and Core Values (and/or guiding principles) statements
- Master plan with agreed-upon goals and strategic strategies.
- Up-to-date and relevant policies and procedures (embraced and enforced).
- A culture that is very transparent and forthcoming.
- A culture of trust.

Effective communications and procedures and methods to work on differences – Healthy (and frequent) communication is essential at all levels and aspects of any workplace, and a lack of communication is a very common workplace problem.¹⁷ Effective communications is the process of exchanging ideas, thoughts, opinions, knowledge, and data so that the message is received and understood with clarity and purpose. When we communicate effectively, both the senders and receivers feel satisfied. Effective communication builds bridges and connects people in a powerful way. Communication is the key to influencing others and creating powerful teams, relationships, and joint forces to achieve successful outcomes. Communication occurs in many forms, including verbal and non-verbal, written, visual, and listening. It can occur in person, on the internet (on forums, social media, and websites), over the phone, by mail, internal special notices, memos, staff meetings, newsletters, staff gatherings, etc. A good

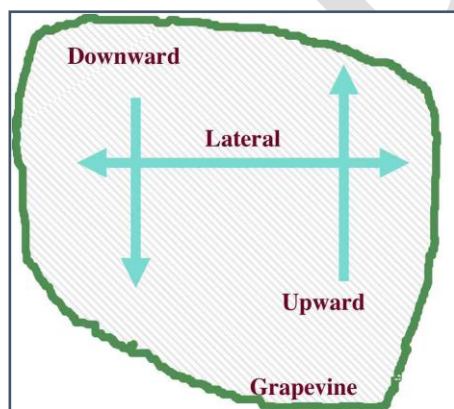
17. [Indeed.com/common-workplace-challenges](https://www.indeed.com/common-workplace-challenges)

relationship is one that allows individual differences in opinion. See more regarding strengthening communications below.

Up-to-date and relevant policies and procedures – Well-written and up-to-date standard operating guidelines and procedures, in their simplest form, are very much a “how-to” guideline for firefighters to follow to achieve a desired goal. They build consistency, safety, and discipline within the agency. Without them there is a tendency to “freelance” and personnel may not all be on the “same page” regarding a wide range of emergency and administrative operations.

Transparency – Transparency requires honesty and openness, and leaders to be forthcoming about their decisions and challenges. Transparent leaders are seen as trustworthy and approachable. To create a work environment with greater transparency, agencies can start with regular discussions during meetings to address any significant changes or challenges in the workplace. Moreover, a review of Michigan State law finds Michigan Freedom of Information Act¹⁸ provides that all persons are entitled to full and complete information as to a public body's fulfillment of statutory functions and concerning the inner working of government in general. This includes electronic records, physical records, recordings, films, microfilms, and more. A person has the right to inspect public records. Statutes are broadly written and applies to any form of communication or record kept. All agencies and public bodies are subject to the law.¹⁹

Trust – Trust, in concert with honesty and openness, is the foundation of effective teams and successful originations. Open dialogue and transparency need to be encouraged and practiced. Being open and honest means that some discussions will be difficult. However, a fear of retribution or other negative consequence destroys the lines of communication and will erode the trust. Cohesive teams are more creative and adaptable when dealing with complex situations. Leaders set the stage by creating an environment in which cohesive teams thrive, establishing a foundation of trust. Trust builds teamwork and collaboration and then produces improved efficiency. Trust empowers ethical decision-making and increases loyalty and safety.



Strengthening Communications – Effective communications in any organization is critical to its success. Effective communication is the process of exchanging ideas, thoughts, opinions, knowledge, and data so that the message is received and understood with clarity and purpose. When we communicate effectively, both the sender and receiver feel satisfied. The inherent communication challenges and breakdowns throughout an organization that is decentralized, both vertically and laterally, often result in miscommunication. (See figure at left.) The lack of formal communication channels can feed communication through the “grapevine,” in which most employees get their information from informal sources, and

it is often very inaccurate. It is in this type of organizations that inaccurate information becomes fodder for the rumor mill.

Despite the tremendous advances in communication and information technology, communication among people in organizations leaves much to be desired. The importance of effective communication, established communication processes, and ongoing follow-up cannot be overstated. Developing a communication model that provides a consistent means for communication within and among various levels of the organization and encourages

18. MCL 15L231 et seq.

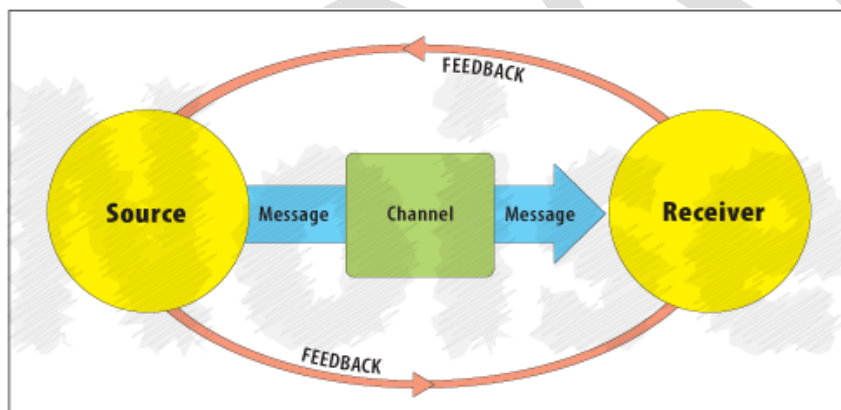
19. Mich. Comp. Laws Ann. § 15.232.

feedback that can be integrated into continuous improvement supports a healthy organizational culture.²⁰ Developing a basic communication model that, when followed, enhances communication across any organization, particularly those experiencing communication challenges regardless of where the root cause lies. Having a “channel” by which information flows is key to ensuring effective ongoing communication—both written and oral. A lack of effective communication and direction, or disconnect at the channeling stage, particularly between senior staff and middle managers creates morale issues, promotes inconsistencies, and fuels grapevine communication.

High-performing organizations communicate effectively both laterally and vertically with fact and not perception regarding organizational planning; issues and challenges and the resolutions to the issues and challenges; and decision-making. Consideration is given to the current reality of the issue and where the organization is in the present, and where the organization wants to be. Communication generally occurs when the root cause is communicated, or when enablers, restrainers, fiscal impacts, and alternatives are clearly and factually communicated.

The following figure represents a basic communication model that, if followed, enhances communication. Having a “channel” by which information flows is key to ensuring effective ongoing communication, written and oral. A lack of communication and direction, or disconnect at the channeling stage creates morale issues, promotes inconsistencies, and fuels grapevine communication.

FIGURE 2-6: Connecting Communications Format



From: Communication Model, Sanctioning Agent Communication Consultancy.

Another key to having a productive relationship, and in fact making sure that everyone is not only in the same boat but is rowing in the same direction can be achieved by having strong mission, vision, values (or guiding principles) statements, and predetermined methods and procedures to work through differences (the ability to “agree to disagree” as an example) as well as systems in place for both celebrating successes and for addressing differences as mentioned above.²¹ LTFD is established under the authority of the Larkin Township Board of Trustees.²² Neither the township or the fire department can be at full effectiveness without a clear mission and expectations.

20. See James L. Gibson, John M. Ivancevich, James H. Donnelly, and Robert Konopaske, *Organizations: Behavior, Structure, Processes*, Eighth Edition (New York: Irwin/McGraw-Hill, 2002).

21. <https://www.cpse.org/2021/01/20/10-recommendations-for-fire-chiefs-and-city-managers-to-develop-and-maintain-a-great-relationship/> (paraphrased).

22. LTFD State of the FD Presentation to Trustees (slide 3).

Well-crafted Mission, Vision, and Core Values Statements – For an organization to reach its full potential, it must have a strategic plan. An organization that knows where it is going, knows the environment in which it must operate, and identifies how to get there will have the best chance of meeting the needs of the community and achieving its goals in a team-like manner. Well-crafted Mission, Vision and Core Values statements serve as the foundation for an organization's strategic plan. Well-crafted **mission**, vision and values convey the purpose, direction, and underlying values of the organization. When developed and implemented in a thoughtful and deliberate manner, these statements can serve as powerful tools that provide organizations with meaningful guidance, especially under times of rapid change. The following table illustrates in more detail the mission, vision, and values statement development process.

TABLE 2-2: Mission, Vision, and Core Values Explanation

Mission / Purpose	A mission / purpose statement is a concise explanation of the organization's reason for existence. It describes the organization's purpose and its overall intention. The mission statement supports the vision and serves to communicate purpose and direction to employees, customers, vendors, and other stakeholders. ²³ What we do today, who we serve, what we are trying to accomplish, what impacts do we want to have?
Vision Statement	A vision statement is an organization's declaration of its goals, stating what it wants to become in the future. Vision statements act as a goal for an agency or division to strive toward. Vision statements are essential because they reveal a common goal and direction. Visionary, where are we going, what do we want to achieve, what future society do we envision?
Core Values (and/or guiding principle)	A core values statement defines how you want the people in your organization to behave . Together with your mission and vision statement, they are a foundational part an organizational structure. They articulate the underlying beliefs and purpose that each member of the organization is committed to embodying. Having strong core values often develops a fire station culture that places the community and the interests of the public first. In a teamwork-centric culture, firefighters ask themselves continually, "Is this best for the community?" These common values lead to high integrity, respect, and trust. Fire departments must create and sustain a culture that encourages integrity, open communication, trust, and ethical behavior. ²⁴

Publicly developed and published mission, vision, and core value statements (and ultimately goals) provide a transparent "roadmap" for the agency to follow and to use when making key decisions. The LTFD provided the following purpose and mission statements. Missing from the LTFD materials are vision and values statements.

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23. <https://www.iafc.org/iCHIEFS/iCHIEFS-article/company-officer-leadership-principles-of-effective-organizational-structures>

24. <https://www.firerescue1.com/career-1/articles/core-values-16-ways-to-consider-your-contributions-to-the-fire-service-mEK1P4WwYrh5EtIT/>

FIGURE 2-7: LTFD Mission and Purpose Statements

 Mission • The Larkin Fire Department will perform its duties according to the priorities of life safety, incident stabilization, and property conservation. • To accomplish our mission, we provide professionally trained firefighters, emergency medical responders as well as other emergency services to our local community. • Through mutual aid agreements, we provide and receive services from other communities upon request.	 Purpose Under the authority of the Larkin Township Board of Trustees, the Larkin Township Fire Department exists to provide emergency medical first response, fire suppression and protection, and specialized public assistance to the residents of Larkin Charter Township
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The following figures provide samples of mission, vision, and values statements for fire departments. These statements are typically created by an inclusive process whereby internal and external strengths problems, opportunities, and threats' (S.P.O.T.) are defined. Based on knowing the environment, the agency can then create goals and strategic strategies. The end result can be very powerful.

FIGURE 2-8: Sample Fire Department Mission, Vision, Values Statements

 Our Vision We will position the Fire District to provide fiscal sustainability while providing excellence in emergency response and community preparedness. Our Mission To compassionately care for the safety of our communities and our visitors through progressive professional emergency preparedness and response. Our Guiding Principles ➤ We believe in providing the highest level of professionalism to our communities; therefore, we will remain committed to honesty and integrity. ➤ We believe in a positive and professional work environment; therefore, we will treat everyone with respect and honesty. ➤ We believe in the importance of flexibility and adaptability; therefore, we will welcome growth and change. ➤ We believe that honesty is essential; therefore, we will be transparent in every aspect of service. ➤ We believe being compassionate is essential; therefore, we will treat everyone with kindness.	 MISSION STATEMENT We, the members of the Central County Fire Department, are dedicated to providing the highest level of service for our communities. OUR CORE VALUES Everyday, everywhere, with everyone. Honesty and Integrity We are committed to honest and ethical behavior. We know integrity is the key to holding the public's trust, and the trust of each other. Respect We show respect by valuing all members of our organization. We earn respect by working hard, listening, and displaying humility. Leadership We lead with consistency, transparency, and open communication. We value selfless leaders who unify and inspire others. Accountability We hold ourselves and each other accountable. We accept responsibility for our actions at all levels of our organization. Teamwork We work as a team to achieve our common goals. We trust in each other, depend on each other, and succeed because of each other. Professionalism We approach every day and every challenge with a positive attitude. We provide professional service at all times by treating others with compassion, dignity, and respect. <i>~ I am not here for me. I am here for we, and we are here for them. ~</i>
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Agreed-upon Goals and Strategic Strategies – Once the agency has established a solid mission, vision and set of values, the next step is to set one-, three-, and five-year goals. Well-crafted goals help measure progress and can provide transparent milestones that can help an organization measure its success. Goals are an objective or target that an organization is working on achieving. Goals should be specific measurable, attainable, relevant, and time bound (SMART). CPSM could not locate goals or a strategic plan for the department. The LTFD

does have recommended apparatus and fire station goals. See the figure below that outlines the SMART process for setting goals.

FIGURE 2-9: SMART Process



Township-LTFD Relationship Recommendations:

- One of the first, most important, and ongoing, priorities that should come from the recommendations contained in this report is there needs to be a concerted attempt by **ALL** parties to attempt to rebuild the critical bridge between the township governing body and administration and the LTFD leadership. An inclusive, team-based approach will be essential to moving the department forward. (Recommendation No. 28.)
- The Board of Trustees, Township Supervisor, and the Fire Chief must come to agreement on the proper role each plays when it comes to the operations of the Larkin Township Fire Department. There must also be an acknowledgment by the Fire Chief of the rights of the Township's governing body in determining acceptable levels of service, funding, and establishing administrative policies and procedures that impact the fire department. Operational issues—provided they do not conflict with the governing body's established goals, objectives, and policies—should remain the purview of the Fire Chief. Once a working consensus is achieved, agreement to live within its bounds must be acknowledged and maintained. (Recommendation No. 29.)
- The Board of Trustees and Township Supervisor should take an active role in setting appropriate service level expectations and goals for the fire department. Township officials should include residents and the department in an open and honest discussion within the goal setting process. This process could provide the foundation for the formation of a long-range strategic planning committee comprised of a cross-section of community stakeholders that will evaluate recommendations contained within this report. (Recommendation No. 30.)
- The Board of Trustees and the Township Supervisor should establish an annual goal-setting workshop with the Fire Chief to develop the sense of common vision necessary to improve the department and the quality of fire and EMS services that Larkin Township receives. (Recommendation No. 31.)
- Working collaboratively, the Larkin Township Board of Trustees, and the members of the LTFD should commence a process for creating fire department-specific mission, vision, and core

values statements. Once complete, these should be prominently posted in the fire station. (Recommendation No. 32.)

- The LTFD Fire Chief should utilize his office in the township building on a regular basis. This should include having consistent weekly office hours. (Recommendation No. 33.)
- The LTFD Fire Chief should attend the monthly Board of Trustees meeting to provide the Board with his report, and to answer any questions members of the board and/or the public may have. (Recommendation No. 34.)

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SECTION 3. INFRASTRUCTURE

LTFD FINANCIAL RESOURCES

The LTFD is a Township General Fund (GF) department. Revenues for this fund come from various taxes including property taxes, state shared revenues, license and permits, fees, grants, cable franchise fees, and transfers from the water district.²⁵ The overall Larkin Township 2020 GF budget was \$1,298,590, increased to \$1,453,296 in 2021, before decreasing to \$1,356,431 in 2022.

The LTFD operating budget is depicted in the following tables, which include the 2020, 2021, 2022, and 2023 general fund budget allocations.²⁶ In 2020 the LTFD budget accounted for **12.9%** of the township budget, decreasing slightly to **12.2%** in 2021, before increasing in 2022 to **14.2%**. Personnel services (payroll expenditures to include salary, pension, wages for fire calls, meeting stipends and maintenance) make up a large portion (**42.2%**) of the GF budget for the LTFD.²⁷ This share is not uncommon, since GF departments and activities are typically service-oriented departments and heavily weighted in staffing and personnel costs.

TABLE 3-1: LTFD Overall Budget, 2020–2023

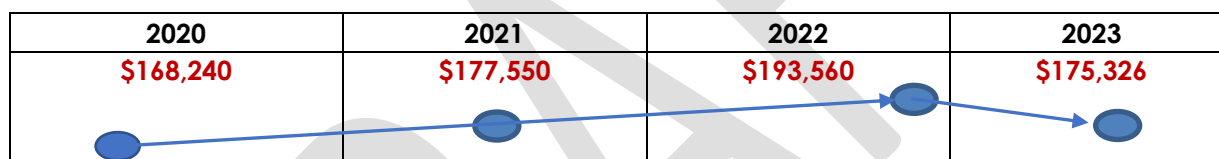


TABLE 3-2: LTFD 2022 Operating Budget Details

336 - Fire Dept					
Account Number	Description	2022 Approved Budget	YTD Actual	Unenc Balance	YTD % Actual
702.000	Salary	\$ 16,700.00	\$ -	\$ 16,700.00	0.00%
702.002	Assistant Fire Chief Salary	\$ 8,350.00	\$ -	\$ 8,350.00	0.00%
704.000	Wages - Maintenance	\$ 5,900.00	\$ -	\$ 5,900.00	0.00%
704.005	Meeting Stipend	\$ 10,800.00	\$ -	\$ 10,800.00	0.00%
709.000	Wages - Fire Runs	\$ 40,000.00	\$ -	\$ 40,000.00	0.00%
709.002	Plan Review Change	\$ 200.00	\$ -	\$ 200.00	0.00%
715.000	Payroll Tax	\$ -	\$ -	\$ -	N/A
716.000	Workers Compensation Insurance	\$ -	\$ -	\$ -	N/A
717.000	Life Insurance	\$ -	\$ -	\$ -	N/A
719.000	Pension	\$ -	\$ -	\$ -	N/A
728.000	Office Supplies	\$ 1,000.00	\$ -	\$ 1,000.00	0.00%
741.000	Operations & Supplies	\$ 17,000.00	\$ -	\$ 17,000.00	0.00%
808.000	Training & Continuing Education	\$ 1,000.00	\$ -	\$ 1,000.00	0.00%
830.000	Fire Dept Physicals	\$ 4,000.00	\$ -	\$ 4,000.00	0.00%
850.000	Communications (phone, cell, etc)	\$ 3,500.00	\$ -	\$ 3,500.00	0.00%
860.000	Mileage	\$ 2,000.00	\$ -	\$ 2,000.00	0.00%
904.000	Testing/Cert/Compliance	\$ 8,500.00	\$ -	\$ 8,500.00	0.00%
912.000	Insurance	\$ 22,110.00	\$ -	\$ 22,110.00	0.00%
920.000	Utilities	\$ -	\$ -	\$ -	N/A
922.000	Fuel Expenses	\$ 5,500.00	\$ -	\$ 5,500.00	0.00%
930.000	Repairs/Maintenance	\$ 39,000.00	\$ -	\$ 39,000.00	0.00%
978.000	Heavy Equip - Fire Dept	\$ 8,000.00	\$ -	\$ 8,000.00	0.00%
Total		\$ 193,560.00	\$ -	\$ 193,560.00	0.00%

Traditionally, and like every other fire department in the nation that compensates its personnel, the LTFD's budget is significantly consumed by personnel costs. This includes salary, pension,

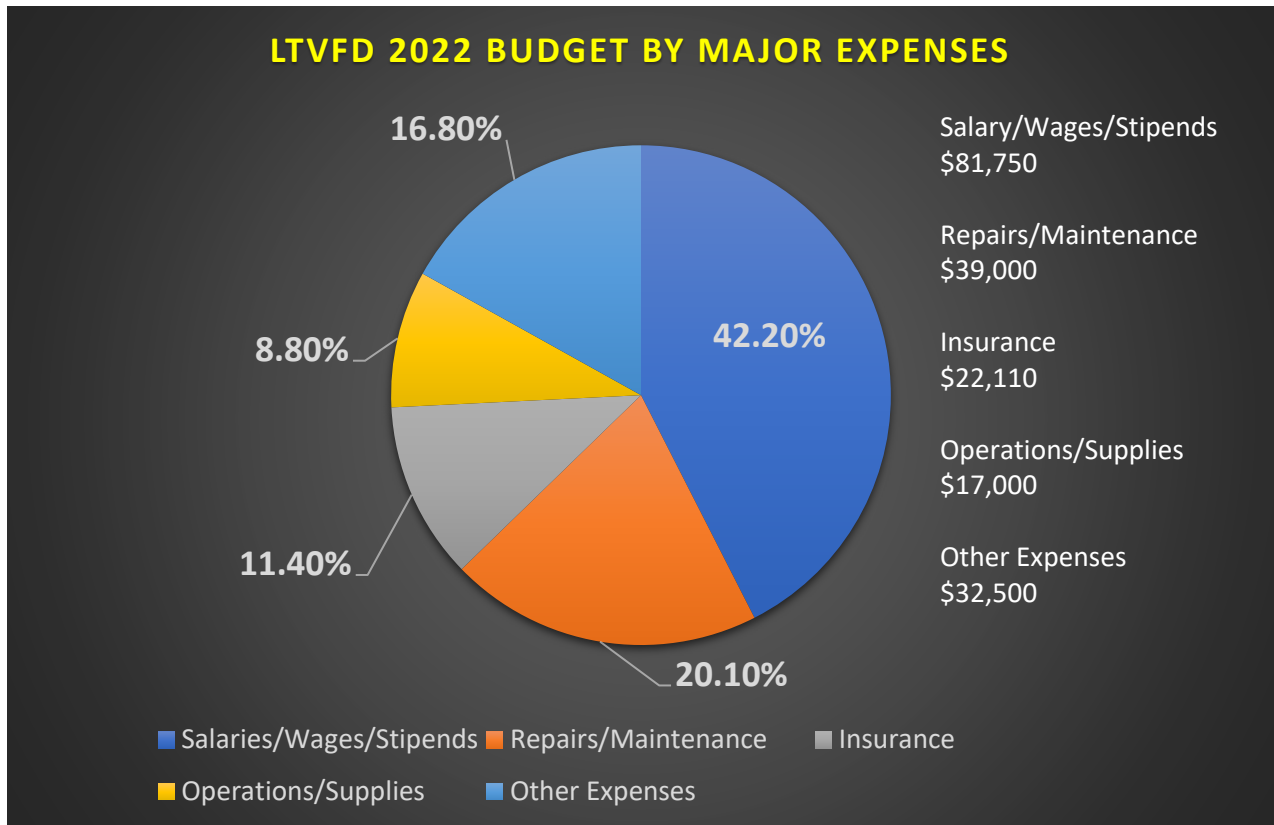
25. Larkin Charter Township 2022 Budget.

26. Ibid.

27. Ibid.

wages, and stipends to name the larger line items in this budget area. That fact notwithstanding, there are limited pension or benefit costs involved, which helps to keep personnel costs lower than utilizing full-time personnel. The LTFD personnel services budget represents approximately **42.2%** of the total 2022 budget. The next largest budget areas are repairs/maintenance rentals which is 20.1 percent with insurance taking 16.8 percent, and operations/supplies at 11.4 percent. The next figure illustrates a breakdown of the LTFD budget.

FIGURE 3-1: LTFD Expense Breakdown²⁸



One major area of fiscal concern that was brought to CPSM's attention was the fact the township does not currently have a formal purchasing policy in place that includes the use of a purchase order system. This can complicate the checks and balances necessary for an effective but transparent system for tracking the expenditure of budgetary funds. While there was no suggestion of impropriety, CPSM was informed that the township is not normally aware of what the fire department is doing regarding the management of its budget and its purchases until it receives a bill for payment.

28. Ibid.

Fiscal Management Recommendations:

- Larkin Township should implement a fiscal management policy/process that includes the use of requisitions and purchase orders for any expenditures that involve municipal/public funds. (Recommendation No. 35.)
 - Prior to any purchases being made a requisition should be completed and submitted for approval. The requisition should include a detailed description of what is being requested and the anticipated cost.
 - Once the requisition has been approved, a purchase order should be prepared and issued.
 - Once the requested product or service has been received the purchase order should be submitted for payment along with an attached bill or invoice and a signature from the chief that the requested product or service has been received.
 - Based upon state law and/or local policy, potential purchases above a certain dollar threshold should require three quotes, which should be attached to the requisition.
 - Based upon state law and/or local policy, potential purchases above a certain dollar threshold should be required to undergo a formal bid process.

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In addition to funding the fire department through the GF, the township has a Capital Improvement Program (CIP) that finances various needs. The definition of a capital project/expense varies from community to community but generally has a cost greater than \$5,000 or \$10,000 and a useful life of three to five years or longer. However, because of the high cost of new fire apparatus this funding is generally not included in the CIP but is funded at the time of need. The same will be true regarding funding for a new fire station. Although it may be too late at this point in the process regarding the pumper that is on order, Larkin Township may want to consider leasing its fire apparatus or entering into lease/purchase agreements to attempt to reduce, or at least stabilize these big-ticket expenditures.

Over the long term, Larkin Township will most likely need to look for additional ways to adequately fund fire and emergency services, particularly if the township decides that it needs to eventually hire a small career firefighter contingent to assist and supplement the on-call force. In addition, the cost of apparatus and equipment continues to increase significantly, with many standard fire pumpers now costing upwards of \$750,000 and more. Even if the township were to decide to enter into a shared services agreement, or straight-out contract for service with the City of Midland, there would be significant costs involved.

CPSM's research found that seven communities in Midland County have adopted fire or emergency services taxes to fund their fire protection needs. While new or increased taxes are rarely popular, funding dedicated to fire protection or emergency services are often among those viewed most favorably. In Midland County the assessed fire millages range from 0.7499 in Warren Township to 1.7275 in Hope Township.

Another potential long-term option for the provision of fire and emergency services in the township is the creation of a Regional Fire Authority (RFA). An RFA is a special purpose district created by the vote of the people residing within the proposed district. Its boundaries are usually coexistent with two or more adjacent fire protection jurisdictions located within "reasonable proximity" to each other. An RFA is a municipal corporation with independent taxing authority. The authority is operated by a Board of Directors appointed by the participating municipalities. This option will be discussed in a later section of this report.

The implications associated with the implementation of a dedicated emergency services tax or the creation of an RFA are discussed and developed more in subsection in Section 6 of this report, *Options for a Sustainable Fire and EMS System*.

FLEET ANALYSIS

The provision of an operationally ready and strategically located fleet of mission-essential fire vehicles is fundamental to the ability of a fire department to deliver reliable and efficient public safety within a community.

Fire department apparatus come in many shapes and sizes and are used for a variety of different applications. Fire apparatus come in five configurations: Engines (pumpers), Trucks (ladder/aerials), Tenders (Tankers), Rescues, and Specialized (airport rescue or a brush truck as an examples). How many, what type, and the depth of fleet vehicles varies by size of community, fire risk, and other community service demands. Generally speaking, most communities have one or more Type 1 Pumpers. These versatile vehicles are often the first on scene because they support firefighting, initial emergency medical service (EMS), and rescues. Type 1 pumpers are purposefully designed to support most day-to-day operations. Next, most fire departments have support vehicles such as water tenders (tankers) which are needed in the fleet to support operations, as an example, in communities with no fire hydrants. Brush trucks are needed in communities prone to brush fires.

The National Fire Protection Association (NFPA) is an organization devoted to eliminating death, injury, property, and economic loss due to fire, electrical, and related hazards. It publishes what are known as NFPA industry standards. NFPA 1901, *Standard for Automotive Fire Apparatus*, is the standard that defines the requirements for new automotive fire apparatus. NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Emergency Vehicles*, is the standard for the inspection, maintenance, testing, and retirement of emergency vehicles; however, it applies primarily to heavy apparatus. CPSM references these standards as best practices when reviewing an agency's fleet.

The LTFD has four heavy apparatus (two engines, a heavy rescue, and a water tender), and two light vehicles. It also has an ATV with a utility trailer. The LTFD emergency vehicle inventory is outlined in the following table, listed oldest to newest.

CPSM noted the LTFD fleet and equipment within are in satisfactory to good condition, showing normal wear and condition for their age. Fleet inspections and general care are done by the firefighters after each use, and more thoroughly, once a month. Records are kept by the Fire Chief. Services and repairs are done by a mobile mechanic who is certified to work on emergency vehicles (certified EVT, Emergency Vehicle Technician). Annual pump and hose testing is also done by a third-party vendor.

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TABLE 3-3: LTFD In-Service Vehicle Inventory

Unit Number	Year	Vehicle Description	Scheduled Replacement
Tender 530	1998 (25 years old)	Water Tender	N/A
Utility 541	2019	Mixed Use ATV w/transport trailer	N/A
Engine 520	2001 (22 years old)	Type 1 Pumper	2021
Medical and Utility 551	2008 (15 years old)	Quick Response Medical (non-transport)	2023
Rescue 550	2009 (14 years old)	Heavy Rescue	2029
Brush 540	2017	Quick Attack Pumper	2032
Engine 521	2014 (9 years old)	Type 1 Pumper	2034

The LTFD's vehicles are in service and deployed as follows:

- **Utility 551** is a light vehicle used primarily as a first-out unit for medical emergencies, public assist calls, motor vehicle accidents, etc. Utility 551 has limited firefighting capabilities (fire extinguishers). No pump/water. This unit made 170 responses during the year analyzed by CPSM.
- **Engine 521** is a Type 1 engine used primarily as a first-out engine for fires but also for medical emergencies, public assist calls, motor vehicle accidents, etc.
- **Engine 520** is a Type 1 engine used primarily as a secondary engine for fires but also for medical emergencies, public assistance calls, motor vehicle accidents, etc.
- **Tender 530** is a water tender used primarily for delivering water during fires in areas with no fire hydrants.
- **Brush 540** is a light vehicle used primarily for wildland firefighting for fires but also for medical emergencies, public assist calls, motor vehicle accidents, etc.
- **Rescue 540** is a heavy rescue vehicle used primarily for rescue operations and serious motor vehicle crashes.

CPSM finds the overall method of deployment of the township's fire apparatus is logical. LTFD uses light vehicles—which are easier to drive for volunteers and thus safer and less expensive to replace—for a significant percentage of its calls, primarily medical calls and other low acuity types of incidents. Utility 551 made the most responses in the year studied with 170. The larger fire apparatus and more specialized vehicles are used as needed. Engine 521 and Rescue 540 each made 47 responses in the study year.

While the fleet is in good condition, Engine 520 and Tender 530 are very near their NFPA-recommended life span as they are approaching 22 and 25 years old, respectively. Rescue 550 is also aged.

The procurement of emergency vehicles is one of the largest expenses incurred in sustaining a community's fire-rescue department. While it is the personnel of the LTFD who provide

emergency services within the community, the department's fleet of response vehicles is essential to operational success. Reliable vehicles are needed to deliver responders and the equipment/materials they employ to the scene of dispatched emergencies within the township. Replacement of fire-rescue response vehicles is a necessary, albeit expensive, element of township budgeting that should reflect careful planning. A well-planned and documented emergency vehicle replacement plan ensures ongoing preservation of a safe, reliable, and operationally capable response fleet. A plan must also include a schedule for future capital outlay in a manner that is affordable to the community.

NFPA 1901 serves as a guide to the manufacturers that build fire apparatus and the fire departments that purchase them. The document is updated every five years using input from the public/stakeholders through a formal review process. The committee membership is made up of representatives from the fire service, manufacturers, consultants, and special interest groups. The committee monitors various issues and problems that occur with fire apparatus and attempts to develop standards that address those issues. A primary interest of the committee over the years has been improving firefighter safety and reducing fire apparatus crashes. The annex material in NFPA 1901 (2016) contains recommendations and worksheets to assist in decision-making in vehicle purchasing. With respect to recommended vehicle service life, the following excerpt is noteworthy:

"It is recommended that apparatus greater than 15 years old that have been properly maintained and that are still in serviceable condition be placed in reserve status and upgraded in accordance with NFPA 1912, Standard for Fire Apparatus Refurbishing (2016), to incorporate as many features as possible of the current fire apparatus standard. This will ensure that, while the apparatus might not totally comply with the current edition of the automotive fire apparatus standards, many improvements and upgrades required by the recent versions of the standards are available to the firefighters who use the apparatus."

The status of LTFD heavy fire apparatus is as follows: Engine 521 is 9 years old, in good condition, and within NFPA standards. Engine 520 is 22 years old, in good condition, but is near its useful life span; it is scheduled to be replaced in 2023/2024 with a new engine that is on order. Tender 530 is 25 years old, in good condition, but is now beyond the NFPA-recommended life span. Rescue 550 is close to 15 years old.

FIGURE 3-2: LTFD Heavy Apparatus (L to R): Tender 530, Engine 521, Rescue 550, and Engine 520



It can be a difficult decision to replace any fleet vehicle, especially if it has low mileage and is in good, overall condition. However, the primary impetus for the NFPA's recommended service-life thresholds is the continual advances in occupant safety. Despite good stewardship and maintenance of emergency vehicles in sound operating condition, there are many advances in occupant safety, such as fully enclosed cabs, enhanced rollover protection and air bags, three-point restraints, antilock brakes, secondary braking systems, higher visibility, cab noise abatement/hearing protection, and a host of other improvements as reflected in each revision of NFPA 1901. Likewise, hidden structural or mechanical issues could lead to an unplanned catastrophic failure. Engine 520, Tender 530, and Rescue 550 lack many of these advances.

When purchasing fire apparatus, agencies should consider the option of group purchasing or piggybacking off another agency as a method to save money and in many cases better the delivery time. (Also known as joint, bridging, cooperative bids, etc.). Group purchasing can be done formally such as by using an established consortium (state-wide bid, as an example, or Houston-Galveston Buy) or less formally (such as teaming up with another local agency during their bid process, as an example). In both cases, the aggregate of two or more similar fire engine purchases often leads to a more economical purchase, including less cost and more rapid delivery.²⁹ Similarly, when piggybacking, there is the advantage of time savings because it can reduce transaction and administrative costs, workload, and processing time as someone else has already done the work of specifying, evaluating, and negotiating the final contract award price. LTFD should consider group purchasing when updating fleet vehicles.

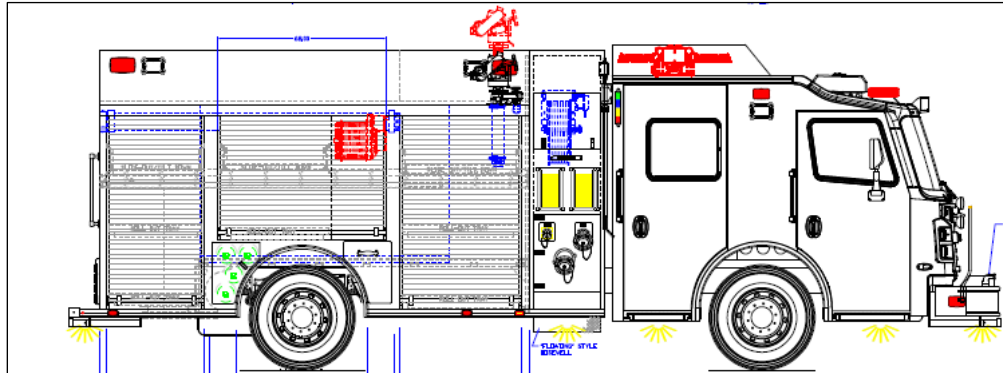
When upgrading a fleet, agencies should consider the opportunity to possibly make adjustments to the fleet (aka: "rightsizing"). Rightsizing a fleet is a management practice that focuses on *ideal* vehicle inventories as opposed to large inventories. Fire agencies are increasingly challenged with finding the right number of vehicles to meet their response needs. The goal is always to have the optimal fleet (number and type) that can safely and efficiently get from point A to point B and carry the right personnel and equipment to the scene. Fleet rightsizing is a management practice that can help vehicle fleet managers build and maintain an ideal vehicle inventory and should be reviewed each time a new vehicle is being considered.

With a new engine in production, the township has the option to combine and right size its fleet and therefore reduce its overall number of vehicles. Looking ahead, the township will have another option to right size its fleet.

In May 2022, the Larkin Township Board of Trustees approved a bid for \$751,000 for procurement of a new 2023 Rosenbauer-America Type I engine from Front Line Services Inc. The new engine will be a Commander 5-passenger Type I engine with a 1500 GPM fire pump, 1000-gallon water tank, 30-gallon Class A foam tank, medical compartments, tilting/rotating scene safety light, front fender attack line, and a significant amount of compartment storage. The Rosenbauer Group is one of the largest manufacturers of fire-service vehicles and firefighting equipment and Front-Line Services Inc. (FLSI) is an authorized Rosenbauer dealer. Delivery date is estimated for December 2023.

29. <https://www.firehouse.com/apparatus/article/21142831/consortium-purchasing>

FIGURE 3-3: Schematic of the LTFD On-Order Engine



CPSM notes that Tender 530 has no scheduled replacement date. A water tender, sometimes known as a water tanker, is a type of firefighting apparatus that specializes in the transport of water from a water source to a fire scene, a practice often known as a water shuttle. Water tenders are capable of drafting water from a stream, lake, or a hydrant. Water tenders are necessary in communities, such as Larkin, that lack fire hydrants or have other limited water sources.

When reviewing the national statistics regarding fire apparatus crashes, it becomes very apparent that a disproportionately high number of rollover crashes involve fire department water tenders (tankers) apparatus. Indeed, these vehicles are very heavy, and weight can transfer and shift during driving. These vehicles require specialized driving skills and frequent training in safe operations. More modern tenders have additional safety features and can be designed to meet the specific needs of the department they represent, carrying more equipment with the ability to also be frontline engines. Replacing the water tender also yields possibilities such as replacing it with an engine-tender apparatus (an apparatus mainly for transporting water but has pumping and compartments similar to a regular engine pumper).

For light emergency vehicles, which are typically smaller and less complex vehicles, procurement is guided by internal department or municipal policy and generally based on miles and/or engine hours but also on capability for current deployments. Brush 540 (shown in the figure below) is in excellent condition. It is equipped with 4-wheel drive, has a slide-in pump, and is capable of off-pavement response. Utility 551 (also shown in the figure) is in satisfactory condition, has 4-wheel drive, and is used as a utility and a quick response vehicle mostly for emergency medical calls. Utility 551 appears to be limited in the amount of equipment it can carry (it's a half-ton truck) and any equipment is somewhat exposed to the elements.

FIGURE 3-4: Brush 540 (L) and Utility 551 (R)



The LTFD also has an off-road UTV with firefighting and EMS transport capability, along with a trailer to transport it in.

FIGURE 3-5: LTFD Off-Road UTV and Transport Trailer



Fleet Recommendations:

Larkin Township should consider the following fleet changes and opportunities to right size its fire apparatus fleet.

- Upon delivery of the new engine, combine the operations of Engine 520 and Rescue 550 on the new engine, thus creating a single rescue-engine configuration. Designate Engine 520 and Rescue 550 as surplus and sell them. With both of these vehicles, particularly Rescue 550, in good condition and with relatively low mileage, they should command a decent resale value. This money should then be placed in the CIP account for future apparatus purchases. (Recommendation No. 36.)
- When fiscally possible, circa 2030, replace Engine 521 and Tender 530 with an engine-tender configuration. (Recommendation No. 37.)



- Consider replacing Utility 551 with a heavier duty (3/4 or one-ton) utility vehicle primarily for medical and service calls such as CO alarms with no report of illness. (Recommendation No. 38.)



Summary of recommended fleet reconfiguration:

Unit No.	Primary and Secondary Purpose	Description
New engine	Structure engine with rescue capabilities	Engine – Rescue
530	Combination engine/water tender	Engine - Tender
540	Vegetation/off road fires (no change)	Brush Engine
551	Quick response vehicle (QRV) medical and service calls (no change)	QRV

- For future fire fleet vehicle purchases, Larkin Township should consider co-purchasing (piggybacking) with other agencies in the region to reduce costs and production time, while increasing uniformity and consistency between neighboring agencies. (Recommendation No. 39.)
 - An alternative is to consider making apparatus purchases through a purchasing consortium much like the Houston-Galveston Area Council (H-GAC) cooperative purchasing program known as HCACBuy.³⁰

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FACILITY ANALYSIS

A fire facility is a critical infrastructure within a community. Fire facilities store emergency vehicles in a state of readiness, provide a place for firefighters to train, work, and respond to (stand-by for) emergencies. Fire facilities need to be in a state of emergency readiness 24 hours a day, all year.

Fire facilities often serve as a de facto “safe haven” during local community emergencies, and also serve as the likely command center for large-scale, campaign emergency incidents. Therefore, design details and construction materials and methods should embrace the goal of having a facility that can perform in an uninterrupted manner despite prevailing climatic conditions, natural disasters, or disruption of utilities. Programmatic details, such as the provision of an emergency generator connected to automatic transfer switching—even going so far as to

30. <https://www.hgacbuy.org/Home>

provide tertiary redundancy of power supply via a “piggyback” roll-up generator with manual transfer (should the primary generator fail)—provide effective safeguards that permit the fire department to function fully during local emergencies when response activity predictably peaks. Fire facilities should conform to all building and fire codes; for example, a fire facility should have a fire sprinkler system.

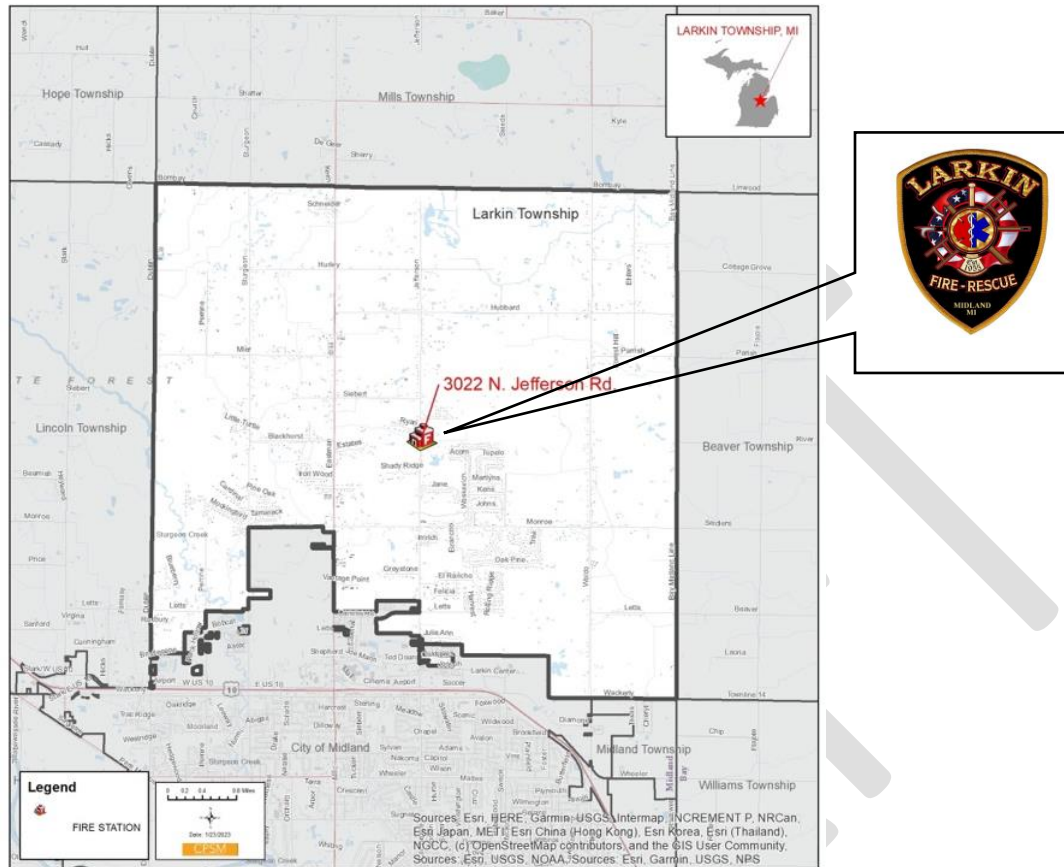
The adequacy, quality, and appearance of fire facilities have a significant impact on the performance of the department as a whole. Well-designed fire and EMS facilities enable staff to perform their duties effectively, efficiently, and safely. As a facility ages, it may no longer meet the needs of an evolving department and/or community, thus negatively affecting morale, efficiency, safety, security, technology, and overall efforts to provide quality fire, rescue, and emergency medical services. It may also hamper the ability of the department to keep pace with increasing and/or expanded requests for, and/or levels of, service. Older and/or obsolete facilities are also expensive to maintain. When these conditions occur, typical remedies include expanding, renovating, and/or replacing the existing facilities.

Typically, fire facilities have an anticipated service life of approximately 50 years. In most cases facilities require replacement because of the size constraints of the buildings, a need to relocate the facility to better serve changing population centers, the absence of needed safety features or service accommodations, and the general age and condition of the facility. The day-to-day cost of operating a fixed capital facility can burden the operating budget. Properly maintaining mechanical and structural components is critical to the longevity of the facility. Deferring routine maintenance creates inefficiencies of mechanical systems and increases costs for replacement and repairs.

The LTFD has one fire station located at 3022 North Jefferson Rd., which is in the center of Larkin Township, as shown in the following figure.

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FIGURE 3-6: Larkin Township Fire Station Location



The LFTD station was built in 1973 as a “fire barn” and at the time had an anticipated life span of about 50 years. It was remodeled in 1985 and again in 1993.³¹ The CPSM team toured the station and met with the some of the volunteers (users). CPSM's tour and review of the station was not intended or implied to be a complete facility assessment (aka: an engineering/ architecture review), but rather an observation of general condition and efficiencies. The following figure is a photograph of the front of the LFTD fire station taken during the CPSM site visit.

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31. Interview with Fire Chief.

FIGURE 3-7: Larkin Township Fire Department Fire Station



Larkin Township Fire Station
3022 North Jefferson Rd.

Year Built: **1973**
Refurbished: **1985, 1993**
Square Footage: **2,800**
Number of Bays: **Four wide, marginally 1.5 deep**
Condition: Needs Replacement

Crews make this facility work and clearly there is great pride of ownership. However, the CPSM team has concerns about the continued operational viability of the station as it has not kept pace with public safety (or business-office) building standards, innovations, or building codes. The LTFD facility—which is highly relied upon by the volunteers and the community—is physically and functionally obsolete and to some degree unsafe. CPSM noted the following deficiencies:

- There is no public entrance or reception area.
- There is limited fire protection, and no fire sprinkler system.
- It appears the station has significant gaps in accessibility (may not meet Americans with Disabilities Act [ADA] requirements).
- Apparatus bays are very small and vehicles are very close together. This exposes firefighters to potential backing accidents.
- Any time there are equipment checks or maintenance required, at least one vehicle must be pulled out of the station. This is also the case when trying to restore vehicles to service after a fire or other significant incident.
- There is no ventilation or drainage in the engine bay.

- There is no source capture vehicle exhaust extraction system. It's likely vehicle exhaust is entering all spaces of the fire station, including living/work areas. **Breathing diesel fumes has known health hazards and has been designated as a likely carcinogen.**
- There is no place for overnight staffing during storms or other times when this may be appropriate.
- The meeting room is very small and cramped.
- The firefighter personal protective equipment (PPE) storage area is not ventilated. PPE is directly exposed to vehicle exhaust, which can impregnate it. PPE is also stowed near the entrance to the living/work areas and adjacent to the kitchen area. The PPE can also be off gassing products of combustion from fire operations.
- The station lacks adequate storage. Storage areas around the station and above the office are all exposed to vehicle exhaust. CPSM noted cooking utensils, uniforms, and PPE are all exposed to vehicle exhaust.
- There is only one very small office for use by all the department's officers and personnel.
- There is no "clean room" (highly sanitized) area for medical storage, SCBA repairs, etc.
- There is no decontamination area for personnel to clean up after fires and medical responses.
- There is only limited security.

The following figures show a sampling of station limitations and hazards.

FIGURE 3-8 Facility Overview

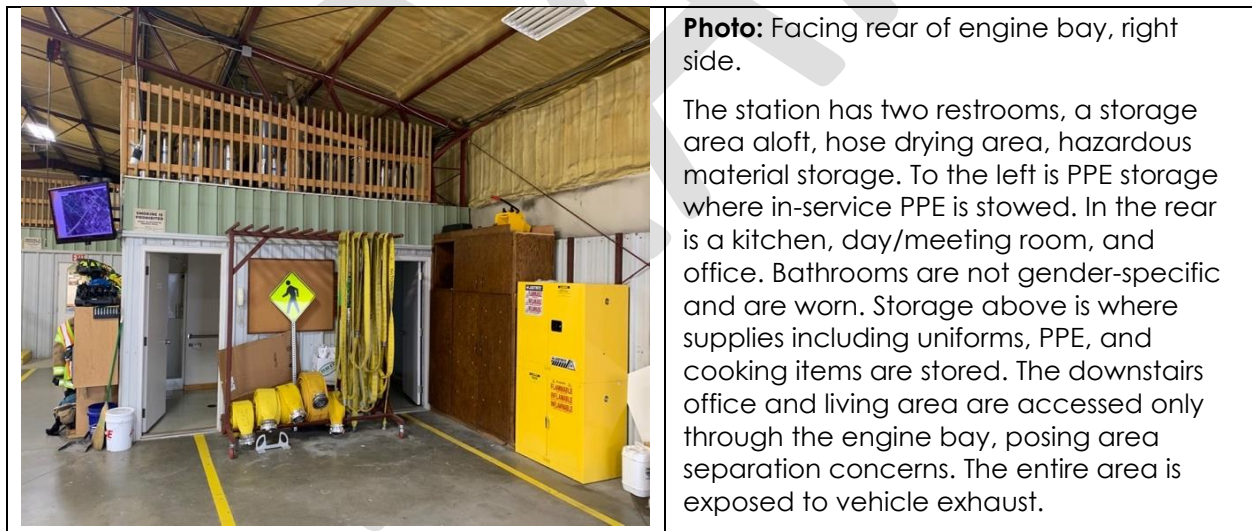




Photo: Rear of engine bay, PPE storage area.

PPE is stored in the engine bay, which is not ventilated. PPE is also exposed to contaminants from fire apparatus. There are no working drains in the station engine bay. Space between apparatus and work area is very tight.



Photo: Left Side of engine bay between Tender 520 and Engine 521

Fire apparatus parking is a very tight fit, which can lead to backing accidents. To keep apparatus out of the elements, the vehicles are parked two deep, requiring moving front vehicle to retrieve vehicles from the back row. There are exposed, unprotected load bearing posts between apparatus. An accidental backing accident could impact building stability.



Photo: Station kitchen area

The station has small, aged, residential style kitchen appliances. There is no fire protection, and the stove is not equipped with shun switch activated upon an alarm. There is no fire extinguisher cabinet. The kitchen is adjacent to engine bay and is very likely exposed to vehicle exhaust.



Photo: Outside rear of station

The station has a generator that is exposed to harsh elements and is unprotected. The heater/HVAC is protected but is aged.

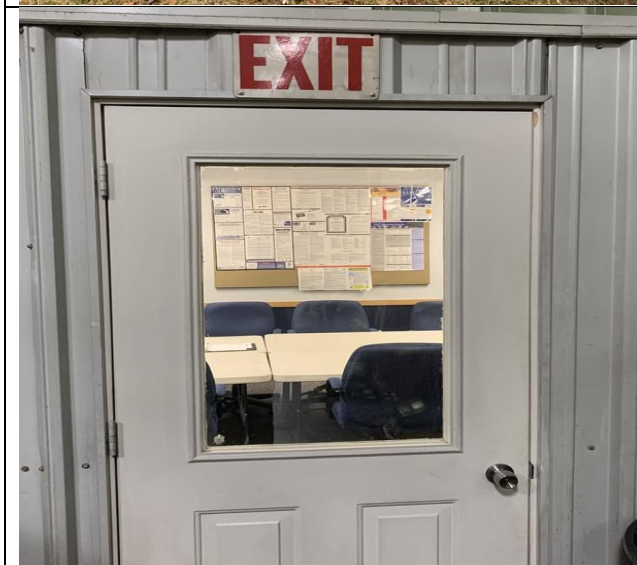


Photo: Entrance to meeting and office area

The entrance to the office from the engine bay is not an exit (non-code) and doesn't appear to be adequate separation for fire and vehicle exhaust (garage to work/living area) possibly allowing contaminants into work, eating, and meeting area. Office is small, conference table is tight, not suitable for meeting or training with the full roster of volunteers. It is not inviting and safe for public meetings.

As mentioned above, the CPSM team finds the current station obsolete and in need of replacement.

Fire facilities must be designed and constructed to accommodate both current and forecast trends in fire service vehicle type and manufactured dimensions. A facility must have sufficiently-sized bay doors, circulation space between garaged vehicles, departure and return aprons of adequate length and turn geometry to ensure safe response, and floor drains and oil separators to satisfy environmental concerns. Station vehicle bay areas should also consider future tactical vehicles that may need to be added to the fleet to address forecast response challenges, even if this consideration merely incorporates civil design that ensures adequate parcel space for additional bays to be constructed in the future.

Personnel-oriented needs in fire facilities must enable performance of daily duties in support of response operations. For personnel, fire facilities must have provisions for vehicle maintenance and repair; storage areas for essential equipment and supplies; space and amenities for administrative work, training, physical fitness, laundering, meal preparation, and personal hygiene/comfort; and—where a fire department is committed to minimize “turnout time”—bunking facilities.

Fire facilities are vital to the community they protect and serve. As mentioned above, fire facilities often serve as a de facto “safe haven” during local community emergencies, and also may even serve as command center for large-scale, campaign emergency incidents. Fire facilities must be designed to resist gravity forces, to minimize fire hazards and to resist, insofar as practical, the forces generated by winds and major earthquakes of the intensity and severity of the strongest anticipated at the building site without catastrophic collapse. It must be designed and constructed to continue to provide essential services to the public after a disaster. Therefore, design details and construction materials and methods should embrace the goal of having a facility that can perform in an uninterrupted manner despite prevailing climatic conditions, natural disasters, or disruption of utilities.

Programmatic details, such as the provision of an emergency generator connected to automatic transfer switching—even going so far as to provide tertiary redundancy of power supply via a “piggyback” roll-up generator with manual transfer (should the primary generator fail)—provide effective safeguards that permit the fire department to function fully during local emergencies when response activity predictably peaks. Fire facilities should conform to all building and fire codes—for example, a fire facility should be equipped with a fire sprinkler system.

Personnel/occupant safety is a key element of effective fire facility design. This begins with small details such as the quality of finish on bay floors and nonslip treads on stairwell steps to decrease tripping/fall hazards, or use of hands-free plumbing fixtures and easily disinfected surfaces/countertops to promote infection control. It continues with installation of specialized equipment such as a source capture exhaust emissions system to capture and remove cancer-causing by-products of diesel fuel exhaust. A design should thoughtfully incorporate best practices for achieving a safe and hygienic work environment.

An ergonomic layout and corresponding space adjacencies in a fire facility should seek to limit the travel distances between occupied crew areas to the apparatus bays. Likewise, facility design should carefully consider complementary adjacencies, such as lavatories/showers in proximity of bunk rooms, desired segregations, and break rooms or fitness areas that are remote from sleeping quarters. Furnishings, fixtures, and equipment selections should be thoughtfully considered in view of the around-the-clock occupancy of fire facilities. Durability is essential, given the accelerated wear and life cycle of systems and goods in facilities that are constantly occupied and operational.

A modern fire station is expected to serve a community for 40 to 50 years or more. For this reason, adequate consideration must be given to predicted future needs requiring fire service leaders and township officials to be visionaries. One very important item to consider; what will be the future needs of the City of Midland as it annexes additional parts of Larkin Township and do those needs create opportunity for the two agencies to coexist and/or share services? The answers to these questions could assist with determining the size and complexity of the Larkin Fire Station. Likewise, the City of Midland needs a fire training facility (as do other agencies in Midland County). This need could also prompt conversations for shared opportunities. Shared opportunities can be in the form of possible shared facility in totality, or shared components of the facility such as a training room or training tower.

With that, the first step in planning for a fire facility is to define the current and future requirements of the occupants—a process called space programming or a spatial needs assessment. Space programming includes identifying needs, then providing the right amount and type of space, equipment, and furniture needed to function efficiently. During the planning stage—or often due to costs—adding or eliminating space to a fire station programming may be necessary. Getting the basics planned first and then expanding is a possibility. Indeed, when

defining the size, features and preliminary budget of a new fire facility, the township should consider the following programming items:

Now or the near future:

- Three double-deep drive-through bays.
- Public entrance and reception area.
- Administrative offices.
- PPE storage room.
- SCBA spare bottle storage, cascade system room.
- Hose drying and storage.
- Maintenance shops (clean shop for EMS and SBCA, regular shop for other repairs).
- Gender separation restrooms with shower and locker facilities.
- Mechanical room (heating and air-conditioning, generators, power, fire riser, etc.)
- Laundry facility with domestic (uniforms, kitchen towels) and extractor (PPE) appliances.
- Kitchen/day room/dining area.
- Supply and equipment storage.
- Computer room.
- Training and meeting space.
- Source capture vehicle exhaust emissions system.
- Complete automatic fire detection and fire suppression systems.
- Emergency generator.

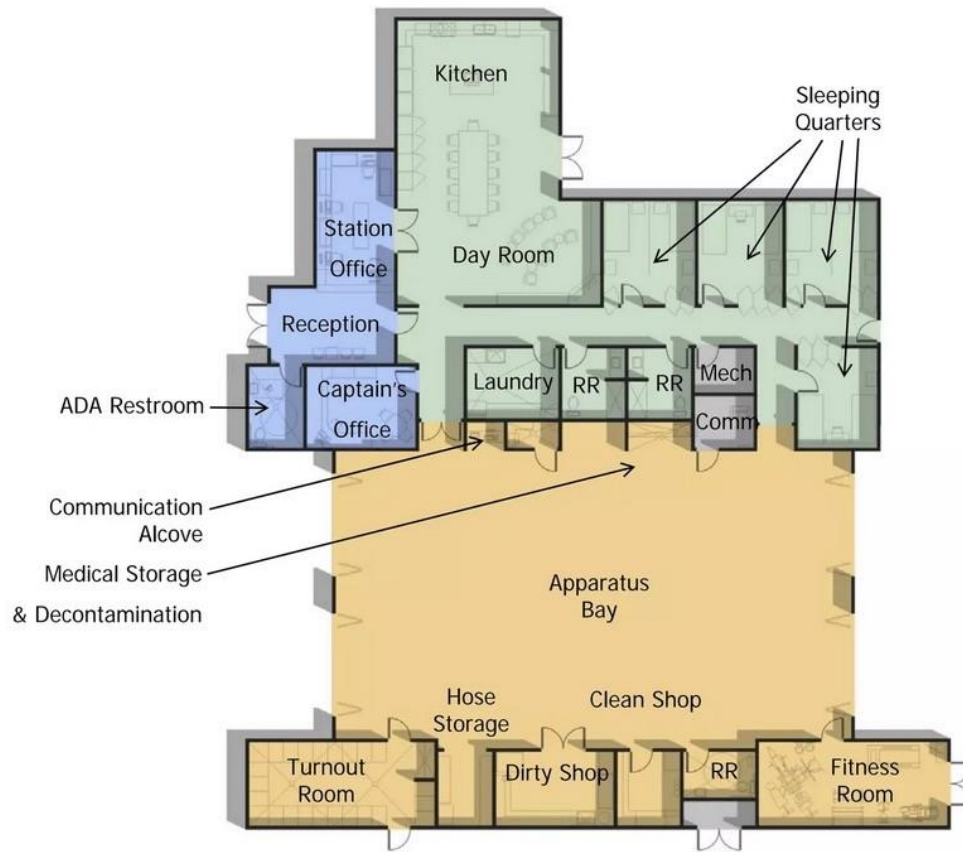
Future expansion considerations:

- Dormitories.
- Fitness areas.
- Additional apparatus bays.

The following figure shows an example of an architectural rendering of a standard substation fire facility; it is comprised of a two-bay, four vehicle drive-through area, day room, kitchen, dorms, office, supervisor office, reception area, repair shops, laundry facility, PPE room, fitness area, mechanical and computer rooms, and storage aloft. (Not shown is a training room and additional storage on a side lot). This facility was designed for volunteer response, which can be noted by the direct access to apparatus from the parking lot via a PPE room.

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FIGURE 3-9: Example of Facility Initial Rendering



The above diagram is just shown as a general example. For any new station in Larkin Township it would need an additional bay and the bays would need to be deeper. The bunk room area in this example could be converted to meeting room space. Other necessary operations spaces can be added.

Ergonomic layouts and corresponding space planning is critical for new fire stations. Internal adjacency design is driven by response times. The location of the crew areas must accommodate quick and clear access to the apparatus room for response. In volunteer agencies, as noted above, easy access to the apparatus bay from the parking lot via a PPE room is an important design consideration.

Fire station site configurations, building orientation, and exterior façade should provide a clear understanding of the location a community member should go to in order to receive help, often the primary entry of the facility. Fire stations shall be accessible and should be welcoming. Parking and walkways to the lobby of the facility and emergency phone should follow ADA requirements to allow all members of the community to be able to approach the station for assistance. Fire facilities should have a marquee or electric sign displaying important community fire and life safety information.

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FIGURE 3-10: Example of Fire Station Orientation and Exterior Design



While the Uniform Building Code denotes area separation requirements by the designations of A- Assembly, B- Business / Office, R- Residential, S- Storage and garage,³² modern fire station planning often uses the Hot Zone design concept that defines Red (hot), Yellow (transitional), and Green (cold) zones incorporated into the new facility. Designated 'dirty,' the red zone requires additional space for decontamination of apparatus, gear, equipment, and personnel. This strategy focuses on controlling the entry and handling of carcinogen-contaminated personnel and equipment in the building. Yellow (transition) zones are for moderate hazards such as a janitor's closet, as an example, and cold zones (green) are for low hazard, such as a living, meeting space, dorm rooms, etc. The following figures show area separation examples based on building code and zone separation methods to reduce fire station hazards.

FIGURE 3-11: Example of Area Separation (Uniform Building Code)

A: Denotes the training room.

B: Denotes the office and work areas, kitchen, and day rooms.

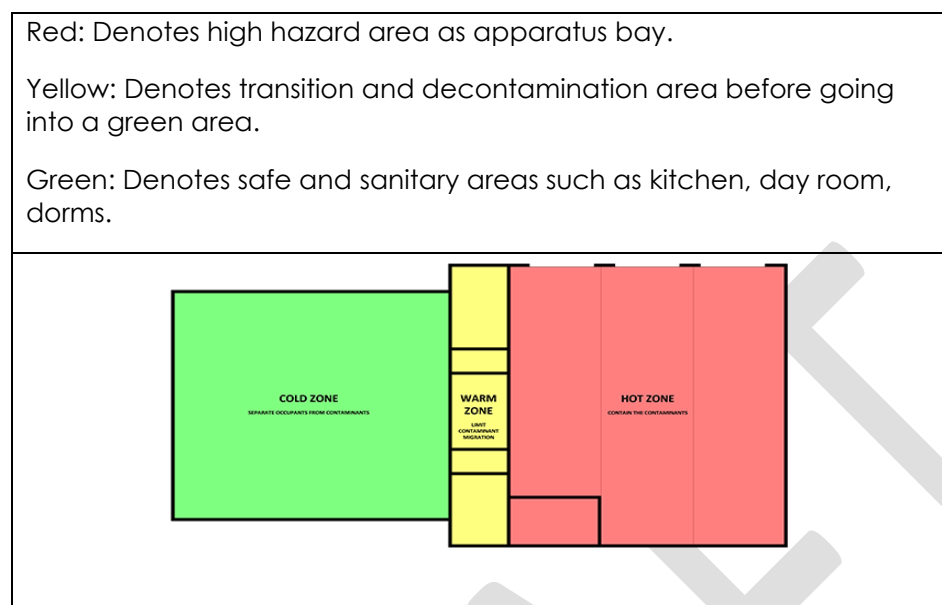
R: Denotes residential area such as dorm rooms, rest area.

S: Denotes storage area, apparatus bays, shops.



32. International Building Code.

FIGURE 3-12: Example of Area Separation (Zone Separation Concept)



In a review of recent fire stations constructed in the United States within the past approximately three years, CPSM noted construction costs that vary from \$152 a square foot (Overman, Texas) to \$913 a square foot (Ketchum, Idaho) with an average cost of \$401 a square foot.³³ CPSM excluded California from this study where the costs to build fire stations in that state hovers around \$834 to \$1,100 a square foot.

Specifically, in the State of Michigan, CPSM found the cost to build a fire facility varies from approximately \$170 a square foot (White Lakes) to \$557 a square foot (Port Huron)³⁴ (bearing in mind the Port Huron facility was constructed to Green/LEED standards, which adds to the cost³⁵).

Labor shortages, particularly in trained construction workers, and supply shortages have also resulted in delays and increased costs over the last three years. Other cost factors include purchasing the land, land preparations, architectural and engineering services, etc. The following table summarizes CPSM's fire facility cost analysis (building only).

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33. https://cdn.firehouse.com/files/base/cygnus/fhc/document/2022/11/SDA_Book_1.6363e95b3fc4a.pdf

34. Internet search

35. LEED / Green Standards: <https://www.usgbc.org>

TABLE 3-4: General Construction Costs (per square foot) for New Fire Facility

United States ³⁶	\$401
Michigan ³⁷	\$170 White Lake \$301 Paw Paw Village \$326 Portage Township \$339 Monitor Township \$350 Cedar Springs Township \$367 Highland Township \$557 *Port Huron
Local ³⁸	\$130 **Burch Run Township \$173 **Jerome Township \$320 Monitor Township

Notes: *Port Huron is a LEED credited building.

**Pre-engineered steel facility.

The following figure provides information regarding costs for stations recently constructed in Michigan.

FIGURE 3-13: Example of Recent Local Fire Station Projects

Jerome Township VFD (2018) 725 W Irish Street Sanford, MI Square Feet: 11,280 Cost: \$1,949,282 (C/O 2%) (\$173 a square foot)	
Monitor Township FD 2483 Midland Road Bay City, MI Square Feet: 15,000 Cost: \$4,800,000 (\$320 a square foot)	

Building an affordable fire station to meet the needs of the township may be a challenge due to cost. Many agencies are taking a less expensive approach such as with prefabricated (modular) or pre-engineered steel buildings (generally known as Butler buildings). In 2017, the

36. https://cdn.firehouse.com/files/base/cygnus/fhc/document/2022/11/SDA_Book_1.6363e95b3fc4a.pdf

37. Internet search – Fire stations built in Michigan last three years.

38. Phone calls with local fire chiefs.

City of Beaverton Fire Department (Mich.) erected a steel structure consisting of apparatus bays and offices. It is 10,000 square feet and cost approximately \$835,000.

The following figure shows examples of pre-engineered fire stations:

FIGURE 3-14: Examples of Pre-Engineered Fire Stations

White Lake VFD 1271 Lake Street White Lake, MI Square Feet: 9,920 Cost: \$1,686,400 (\$170 a square foot)	
Church Hill VFC 316 Main Street Church Hill, MD Square Feet: 12,000 SF Cost: \$2,200,000 (\$183 a square foot)	
Princeton FD 2000 E Princeton Drive Princeton, TX Square Feet: 7,900 Cost, \$2,400,000 (\$303 a square foot)	

CPSM has identified several potential funding sources in the form of grants that could offset some fire station costs for qualifying agencies. Low interest loans may also be available. The following table summarizes several grant and loan sources. While these are not all specific to fire station construction, obtaining a grant for other operations can help offset costs for a fire station.

TABLE 3-5: Potential Grant and Loan Opportunities

Assistance to Firefighters Grant Program (FEMA AFG) ³⁹	This program provides funds for enhancing the health and safety of first responders and improving their abilities to protect the public from fire and fire-related hazards.
Federal Community Development Block Grant CDBG) ⁴⁰	This program provides annual grants on a formula basis to states, cities, and counties to develop viable urban communities by providing decent housing and a suitable living environment, and by expanding economic opportunities for low- and moderate-income persons.
USDA Community Facilities Direct Loan and Grant Programs ⁴¹	This program provides direct loans and/or grants for essential community facilities in rural areas. Priority is given to healthcare, education, and public safety projects. Funds may be used to purchase, construct, enlarge, or improve facilities.
Volunteer Fire Assistance Grants (VFA) ⁴²	This program provides funds to organize, train, and equip fire departments in rural Michigan areas and rural communities to prevent and suppress fires.
Local Contributors ⁴³	Individuals, corporations, and merchants are often interested in providing donations towards construction of a fire station or items for a fire station (office furniture, as an example). Making a fire station project endeavor known to the public often generates this interest.

Facility Recommendations:

- Larkin Township should begin the process of planning for a new fire station as soon as possible. If planning starts in 2023, the new station will probably not be completed and ready for occupancy until 2028/2029. (Recommendation No. 40.)
A potential timeline for this project might be:
 - 2024: Formation of a building committee.
 - 2025/2026: Feasibility study conducted on new station.
 - 2026/2027: Architectural design developed, and funding procured.
 - 2028/2029: Construction and occupancy of new station.
- Larkin Township and the City of Midland should enter discussions and explore potential shared and/or regional fire facility opportunities. This concept is developed later in the report in Section 6, Options for a Sustainable Fire and EMS System. (Recommendation No. 41.)
- In the interim, Larkin Township should periodically conduct third-party air quality testing of its fire station. (Recommendation No. 42.)

39. <https://www.fema.gov/grants/preparedness/firefighters>

40. https://www.hud.gov/program_offices/comm_planning/cdbg

41. <https://www.nal.usda.gov/rural-development-communities/rural-fire-department-resources-local-officials>

42. <https://www.interoperabilitygrants.info/GrantDetails.aspx?gid=39565>

43. Example of local business donations: Sioux Center Businesses Donate toward fire station.

- In the interim, Larkin Township and the LTFD should consider taking steps to address and mitigate some of the station issues identified. (Recommendation No. 43.)

Some options the township may want to consider include, but are certainly not limited to:

- Lease a temporary, modular-type structure to serve the personnel needs of the fire station (kitchen, office space, rest area, bathroom/shower, training/conference room), etc. It should be equipped for full accessibility. This option could also provide a “clean shop” (a very clean/sanitary area) for the purpose of dedicated SCBA and medical equipment repairs / storage.
- Upgrade the current building with a carbon monoxide source capture vehicle exhaust extractor system. **Note:** Funding for this project would not be wasted as often these systems can be dismantled and installed in a new facility.

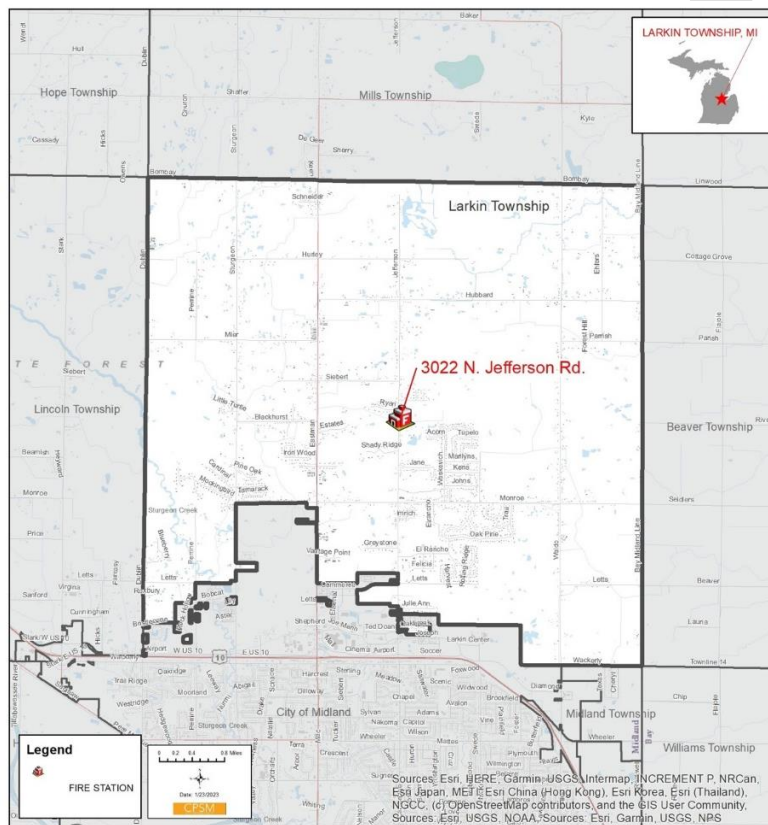
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SECTION 4. COMMUNITY RISK PROFILE

SERVICE AREA

The LTFD is housed at 3022 N. Jefferson and responds to fire and medical emergencies in Larkin Township's municipal boundaries, along with a small portion of Midland Township. It also responds occasionally to surrounding areas on the basis of mutual aid. The township is mostly rural-residential⁴⁴ with small pockets of retail, services, and light industrial; there are large agriculture areas and open space.

FIGURE 4-1: Larkin Township Fire Department Service Area



The LTFD service area is adjacent to the communities of Hope, Lincoln, Mills and Beaver Townships (volunteer and/or paid on-call agencies) and the City of Midland (fully staffed agency to the south). The figure above illustrates the township's municipal boundaries and its fire station location.

The LTFD is a medical first responder agency. MyMichigan Health (MMC-EMS) provides advance life support and ground transport EMS for the Larkin Township service area. This is done through a contract with Midland County to provide EMS transport county-wide. The contract with the county is longstanding, having first been implemented in about 1975 or 1976. EMS operations are funded by a 0.55 mil assessment, which covers operating expenses, and also is used to

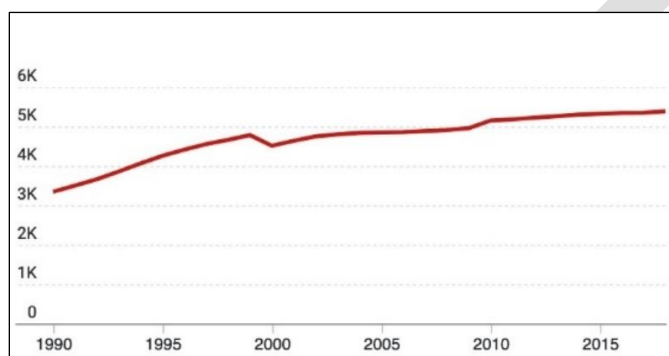
44. Defined in NFPA 1720 -as < 500 people/mi²

underwrite unpaid third-party billing. MMC-EMS uses system status management to redeploy its EMS units as necessary based upon call volume and automatic vehicle location (AVL) to dispatch the nearest available unit. All EMS units are normally staffed with two paramedics.

POPULATION AND COMMUNITY DEMOGRAPHICS

Larkin Charter Township borders the City of Midland in east-central Michigan; it is 20 miles inland from Lake Huron and 130 miles northwest of the City of Detroit. Originally founded in 1879 as a logging town, it was named for John Larkin who was a lumberman, hotel keeper, and entrepreneur. Today, Larkin Township is about 32.16 square miles and has a population of approximately 5,375 people.⁴⁵ The following graph shows the township's population growth since 1990.

FIGURE 4-2: Population in Larkin Township, 1990–2015



In terms of fire and emergency medical services risk, the age and socio-economic profiles of a population can have an impact on the number of requests for fire and EMS services. Evaluation of the number of seniors and children by fire management zone can provide insight into trends in service delivery and quantitate the probability of future service requests.

In a 2021 National Fire Protection Association (NFPA) report on residential fires, the following key findings were identified for the period 2015–2019:⁴⁶

- Males were more likely to be killed or injured in home fires than females and accounted for larger percentages of victims (57 percent of the deaths and 55 percent of the injuries).
- The largest number of deaths (19 percent) in a single age group was among people ages 55 to 65.
- 59 percent of the victims of fatal home fires were between the ages of 39 and 74, and three of every five (62 percent) of the non-fatally injured were between the ages of 25 and 64.
- Slightly over one-third (36 percent) of the fatalities were age 65 or older; only 17 percent of the non-fatally injured were in that age group.

45. <https://www.census.gov/quickfacts/fact/table/larkinchartertownshipmidlandcountymichigan/HCN010217>

46. M. Ahrens, R. Maheshwari "Home Fire Victims by Age and Gender," Quincy, MA: NFPA, 2021.

- Children under the age of 15 accounted for 11 percent of the home fire fatalities and 10 percent of the injuries. Children under the age of 5 accounted for 5 percent of the deaths and 4 percent of the injuries.
- Adults of all ages had higher rates of non-fatal fire injuries than children.
- Smoking materials were the leading cause of home fire deaths overall (23 percent) with cooking ranking a close second (20 percent).
- The highest percentage of fire fatalities occurred while the person was asleep or physically disabled and not in the area of fire origin, which are key factors to vulnerable populations.

Within Larkin Township, the age and socioeconomic factors considered herein when assessing and determining risk for fire and EMS preparedness response include:

- Children under the age of five represent 7.2 percent of the population.
- More than one in five (20.7 percent) of the population is age 65 or older.
- Female persons represented 50.7 percent of the population.
- The medium household income is \$114,318. The medium household income in the United States (including overtime, commission, and tips) for full-time workers in 2022 was about \$54,132 a year.⁴⁷ People in a higher income bracket are unlikely to want to be emergency services volunteers or on-call personnel.
- Persons living in poverty represent just 1.65 percent of the population.
- Population by race includes White alone at 90 percent, Black or African American at zero percent, American Indian or Alaska Native alone at 2.7 percent, Asian alone at 7 percent, and two or more races at 1.3 percent.
- Most people own their home in Larkin Township with about 2.7 people per household.
- There was no indication of homelessness.
- There are no large industries in or planned for the township. The township has a limited number of small businesses, services, and some light industrial occupancies.
- Larkin Township has seen the most growth in the form of residential development, mostly estate homes—some 4,000 to 5,000 square feet—in the southern area of the township (Seibert Woods Estates, Aspen Pointe Estates, and Copper Leaf Condominiums, as examples). Many of these homes have large basements and most have large setbacks from the street.
- It is likely this growth will continue as this is considered a very desirable area to live.⁴⁸ The following two figures display land use per Larkin Township's Master Plan (Ordinance 115, 2012) and the current land use/development percentages.

47. U.S. Bureau of Labor Statistics (BLS).

48. Interviews with staff.

FIGURE 4-3: Larkin Township Land Use Map

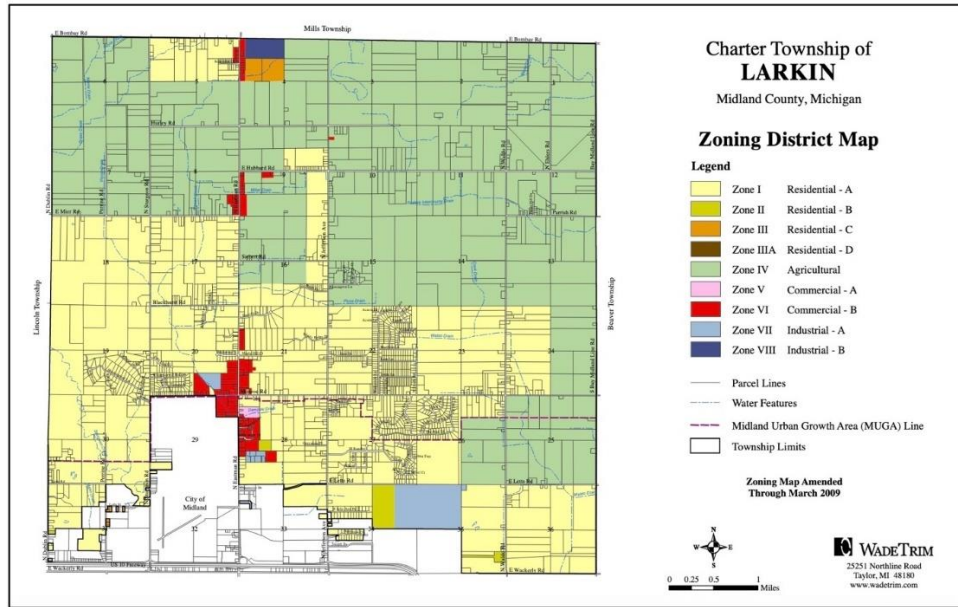


TABLE 4-1: Existing Land Use Areas in Larkin Township⁴⁹

Category	Acres	% of Total
Residential	11,586	57.5
Open Space	7,800	38.7
Industrial	341	1.5
Commercial	215	1.1
Semi-public	110	0.5
Golf Course	53	0.3
Recreation	17	0.1
Total	20,139	100%

The City of Midland Urban Growth Area (MUGA) is a two-mile territorial band that was defined unilaterally beyond the city limits as they existed when MUGA was created. Over the last four decades, the MUGA boundaries have been modified and the city limits have expanded incrementally into the MUGA. Simply put, the MUGA is a band around the city limits that serves as the potential, long-range City of Midland limits. Properties within the MUGA must be annexed by the city if the landowners desire city water and sanitary sewer services for their property.⁵⁰ Within that band the City of Midland's policy of "no annexation, no water" would continue in an effort to promote orderly urban growth.

In the early 1990s, Midland Mall was being developed within the city limits on the city's north boundary. Its location near the Eastman Avenue / US-10 interchange was expected to lure other commercial development in the area immediately north of the mall in Larkin Township.⁵¹ During this process, Larkin Township initiated contact with the city to determine if the city was interested in negotiating a mutually acceptable arrangement involving the area petitioned for

49. Larkin Township Master Plan (2012).

50. <https://cityofmidlandmi.gov/DocumentCenter/View/22485/Full-Master-Plan-?bidId=>

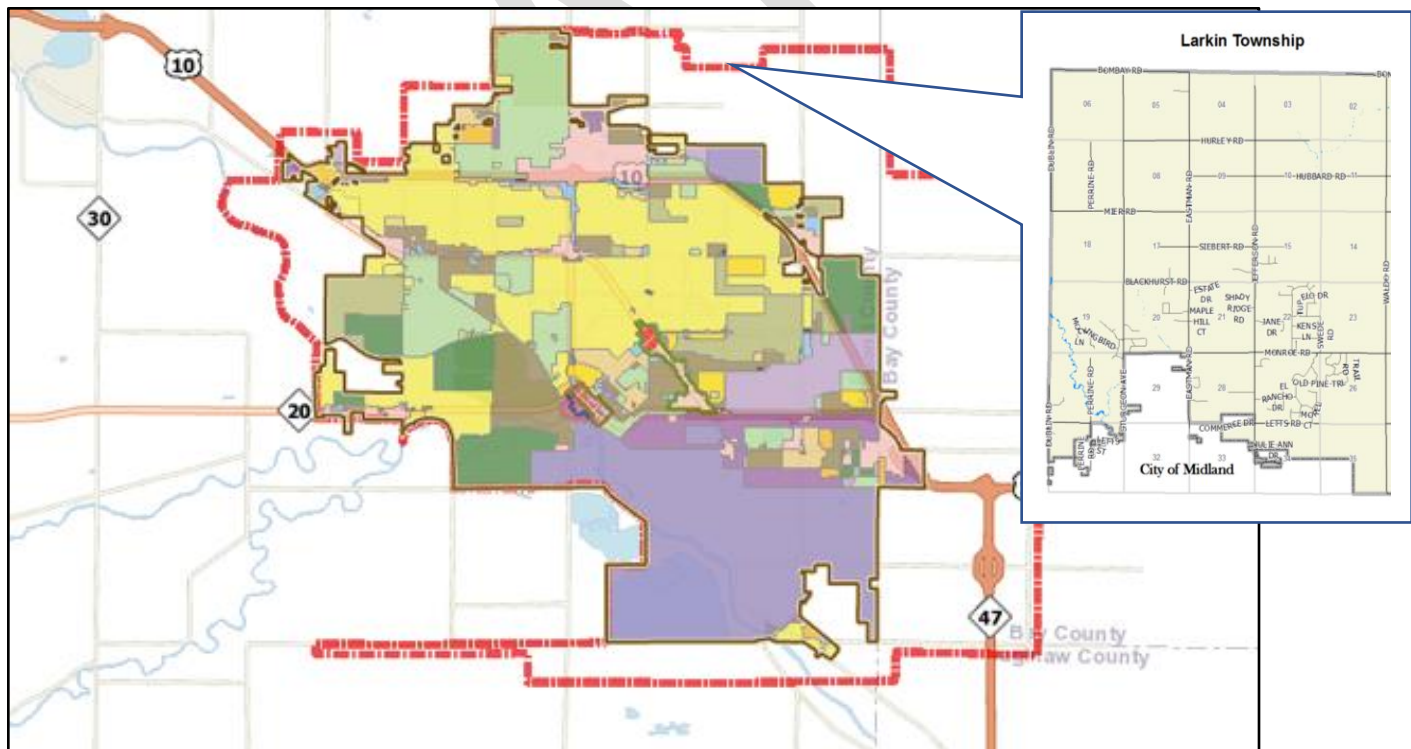
51. <https://cityofmidlandmi.gov/764/Midland-Urban-Growth-Area-MUGA-Policy>

annexation. This resulted in an Urban Cooperation Act Agreement. The MUGA line in Larkin Township was modified and defined by both municipalities; Larkin Township agreed to support annexation within the MUGA through the joint resolution process or the State Boundary Commission process, the city agreed to share revenue generated from the annexed property and the city also agreed to enter into water negotiations with Larkin Township for an area outside the revised MUGA boundary. The following map illustrates the MUGA boundary, with Larkin Township to the north/east of the city.

Many areas within the city Limits are already highly developed with an urban land use pattern and are not proposed to redevelop as part of this plan. The most significant changes proposed are in areas where the existing land use pattern provides the opportunity for new development infill or in areas outside the city Limits where water, sewer, and transportation infrastructure are not currently available.⁵²

Seven townships located in three different counties make up the area known as the MUGA (next figure). Each of these townships has their own future land use and zoning plans in place. The City of Midland Master Plan does not change the designation of any land outside the city limits. However, Michigan law allows the city to plan beyond its borders to help ensure coordinated and compatible development in the future, especially where the land is intended to be added to the city.⁵³

FIGURE 4-4: Midland Urban Growth Area (MUGA)



52. <https://cityofmidlandmi.gov/DocumentCenter/View/22485/Full-Master-Plan-?bidId=>

53. <https://cityofmidlandmi.gov/DocumentCenter/View/22485/Full-Master-Plan-?bidId=>

ENVIRONMENTAL FACTORS

The Larkin Township area is prone to and will continue to be exposed to certain environmental hazards that can impact the community. The most commonly identified environmental hazards in Larkin are occasional flooding, harsh winter weather, severe winds, and tornados. Other hazards include man-made incidents which can include a variety of things such as infrastructure failure, chemical emergencies, and power failures.^{54 55}

Flooding: The Tittabawassee River is the primary river with the Chippewa, Pine, and Salt Rivers as its major tributaries. Other creeks and streams such as the Snake and Sturgeon are also branches of the Tittabawassee. Midland County typically experiences flooding in the spring when the ground is saturated with moisture and rainfall runs off into the river system. Flooding can impact access to communities and slow or cut off emergency services.

Winter Weather: Michigan winters are known for being extremely cold with multiple days of overcast. Hail, blizzards, heavy snow, ice storms, and wind chills are to be expected. The season can last approximately four to six months, usually beginning around November and lasting through April, with the coldest months being December, January, and February.

Michigan has several hailstorms and ice storms annually. When winds near the surface are strong enough, hail can fall at an angle or even nearly sideways, which causes the greatest damage. Wind-driven hail can tear up siding on houses, break windows and blow into houses, damage vehicles, and cause severe injury and/or death. Ice storms are a serious winter hazard. Thin layers of ice on roadways make driving dangerous and greater accumulations of ice on trees and power lines can cause power outages and serious disruptions in daily activities.

Michigan sees an average of about 53 inches of snow annually. Rapidly accumulating snow, high winds, cold temperatures, and low visibility define what can be expected from a Michigan snowstorm and blizzards. Snow causes transportation delays (including emergency vehicles), makes it difficult to locate hydrants, and makes emergency operations more difficult and slower. Blizzards are the most dramatic and perilous of all snowstorms, characterized by low temperatures and strong winds bearing enormous amounts of snow. Blizzards have the potential to result in property damage and loss of life.

Major Wind Events and Tornadoes: Tornadoes develop from severe thunderstorms. The average tornado is on the ground for less than 10 minutes and travels about 5 miles. Tornadoes do their destructive work through the combined action of their strong rotary winds and the impact of wind-caused debris. Lightning and thunderstorms typically occur during the summer months when people are more likely to be spending time outdoors, thereby increasing the risk of injury.

The following table indicates more recent larger weather-related events in the Midland/Larkin area.

⁵⁴ <https://co.midland.mi.us/EmergencyManagement/KnowtheRisks.aspx>

⁵⁵ Midland Hazard Mitigation Plan (page 134)

TABLE 4-2: Weather-Related Emergencies/Destructive Weather History⁵⁶

Year	Event
1997	Major Ice Storm
1998	Major Ice Storm
2000	Snow Emergency / Extreme Cold
2002	Major Ice Storm
2003	Major Ice Storm
2005	Major Ice Storm
2006	Sleet
2009	Extreme Cold
2011	Blizzard
2015	Extreme Cold
2020	Major flooding

Infrastructure Failure: Public and private utility infrastructure provides life-supporting services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of these independent, yet interrelated systems fail due to disaster or other causes—even for a short period of time—it can have devastating consequences. For example, when power is lost during periods of extreme heat or cold, people can literally die in their homes. Inoperable water or wastewater treatment systems in a community can create serious public health problems that must be addressed immediately to prevent outbreaks of disease. When storm drainage systems fail due to damage or an overload of capacity, serious flooding can occur. All of these situations can lead to disastrous public health and safety consequences. Typically, it is the most vulnerable segments of society—the elderly, children, ill or frail individuals—who are most heavily impacted by an infrastructure failure. If the failure involves more than one system, or is large enough in scope and magnitude, whole communities and even regions can be negatively impacted.

Other environmental factors in the Larkin Township area:

Public Health Emergencies: Pandemics are large-scale outbreaks of infectious disease that can greatly increase morbidity and mortality over a wide geographic area and cause significant economic, social, and political disruption. The international community has made progress toward preparing for and mitigating the impacts of pandemics. However, despite these improvements, significant gaps and challenges exist in global pandemic preparedness. Pandemics can cause economic damage through multiple channels, including short-term fiscal shocks and longer-term negative shocks to economic growth.

Wildfires: While less of an overall environmental threat, there are 10,000 to 12,000 wildfires reported each year in the state of Michigan.⁵⁷ Wildland fires are often difficult to put out and require a great deal of resources. The peak time of wildfire season in Michigan is the spring season because it's windier and drier than other times of the year. The most immediate dangers from wildfires are the destruction of homes and timber, wildlife, and injury or loss of life to persons who live in the affected area or who are using recreational facilities in the area.

Gun Violence / Mass Shootings Incidents: There is no specific trend to mass shootings; they accrue in small rural settings, metropolitan cities, movie theaters, schools, and shopping malls.

56. <https://www.co.midland.mi.us/EmergencyManagement>

57. <https://www.michigan.gov/michiganprepares/be-informed/wildfire>

The destructive reach of a mass shooting stretches far beyond those killed and wounded, damaging the well-being of survivors, their families, and communities. Studies of survivors from various mass shootings consistently find that mass shootings harm the mental health of both direct survivors and community members, including psychological symptoms like post-traumatic stress and depression.⁵⁸

National Security Threats/Terrorism: An act of terrorism or act of violence is possible virtually anywhere. While the federal government works to prevent such things from happening, agencies throughout Midland County should plan, train, and equip themselves for responding to terrorism as they do for other events. For example, a major incident at the Dow plant in Midland could have significant impacts on the township.

Earthquakes: The chance of earthquake damage in the Larkin Township area are much lower than the national average. Still, Michigan is not immune from earthquakes and smaller quakes occur annually.⁵⁹

BUILDING AND TARGET HAZARDS

CPSM toured the community and found a scattering of commercial buildings (light industrial, storage facilities etc.), several large residential home developments (some homes well over 4,000 square feet; many with large setbacks), agriculture, and a large church. Overall, Larkin Township is largely rural.



Of the 49 +/- industrial and commercial businesses, the LTFD (mostly the Fire Chief) performs familiarization and advisory walk-throughs.⁶⁰ Likewise, the LTFD approves/denies final occupancy (aka: certification of occupancy). These advisory walk-throughs are beneficial to both the business owner (or resident as applicable) and for the LTFD but do not qualify as a fire inspection as the inspector(s) are not certified and the township has not adopted a fire code. Larkin Township does not issue business licenses or have a business registry, does not issue use permits, and does not have an annual inspection fee. The LTFD does perform limited pre-incident planning as defined by NFPA 1620. While these are reported to be electronic and accessible on tablets, they could not be accessed by any LTFD personnel for CPSM to review. Records of these business safety advisories are managed by the LTFD. The following table and photographs are samplings of business and occupancy types in the township.

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58. Sarah R. Lowe and Sandro Galea, "The Mental Health Consequences of Mass Shootings."

59. <https://earthquake.usgs.gov/earthquakes/map3>

60. Interview and area tour with Fire Chief.

TABLE 4-3: Sampling of Businesses in Larkin Township

Business	Occupancy Type ⁶¹
Stanford Propane	H
Great Lakes Bay Construction	B
Midland Glass Company	B
New Century Engineering	B
Cendant Equipment Rental	B
Roy Kutchey Greenhouse	B
On Eagles Wings Inn	R
Grays Garage Hot Rod and Customs	B
Blessed Virgin Mary Parish	A
Mills Market / Food Center	B
Larkin Food Center	B
Gable Land and Lumber	B
Icon Storage	S

FIGURE 4-5: Typical Larkin Township Businesses



The township has a local ordinance regarding blight and dangerous buildings (ordinances 260 and 323, respectively), enabling it to reduce the fire hazards caused by storage and accumulation of trash, rubbish, junk, junk vehicles, abandoned vehicles, and building materials or portion of a building that has been damaged by fire, wind, flood, or by any other cause such as neglect or age.

Note: the Michigan Fire Inspectors Society is a fire code organization in the State of Michigan. With over 600 members, it represents the wide interests of Michigan's fire Inspectors and could be a valuable resource for the LTFD. The organization utilizes multiple committees to assist its membership and the public safety in Michigan, including resources and training in fire inspections, fire investigations, and public outreach. It also provides updated rules or monitoring of code changes.⁶²

61. Uniform Building Code: H- Hazard, B- Business, R- Residential, A- Assembly.

62. <https://mfis.org/resources-1>

TRANSPORTATION FACTORS

The road network within Larkin Township is typical of other rural mostly residential areas in Michigan. This includes a main route through the community (North Jefferson Road) with arterial streets and street networks which provide road systems to businesses and mostly to rural properties. The Joe Mann Boulevard and US Highway 10 are to the south and are major throughfares; State Highway 30 is to the west and Highway 74 is to the east. Together these roads provide good evacuation routes (egress and ingress). The new and planned residential areas offer wider streets to enable better access for emergency vehicles; the development CPSM toured has two ways in/out. All roads in/out of Larkin Township are impacted by rain and ice during the winter periods and some more rural roads can be affected by trees and other debris during storms. During winter snow, roads in/out of Larkin require snowplowing.

County Connection of Midland Transit is a state and locally sponsored curb-to-curb public transportation service and is available to Larkin Township residents. There is no other transportation service other than private car service/taxi. There are no trains or airports within the township. However, the Jack Barstow Municipal Airport is a general aviation airport located just southwest of Larkin's boundary adjacent to the Midland County Fairgrounds. The airport's airfield covers over 500 acres and serves the needs of locally based pilots, many of whom fly for recreation and business. The southern end of Larkin is in the final approach path for the airport.

CPSM noted traffic, including truck traffic, is very light; it increases as one gets closer to the City of Midland. Still, there is potential and there is history of high-speed to very high-speed motor vehicle accidents in this area. Although not extensive, truck traffic with heavy vehicles can be a source of risk also particularly if they are carrying hazardous materials.

CPSM also noted many long driveways and residential homes—hundreds of feet in length to more than a mile to some properties. These extensive setbacks create some difficulties for first responders (long hose lays, unplowed driveways, for example). As mentioned, snow and ice are factors for travel around the township.

FIRE AND FIRE-RELATED RISK

An indication of the community's fire risk is the type and number of fire-related incidents the fire department responds to. CPSM conducted a data analysis for this project that analyzed LTFD incident responses and workload. The following table details the call types and call type totals for these types of fire-related risks for the 12-month period we analyzed.

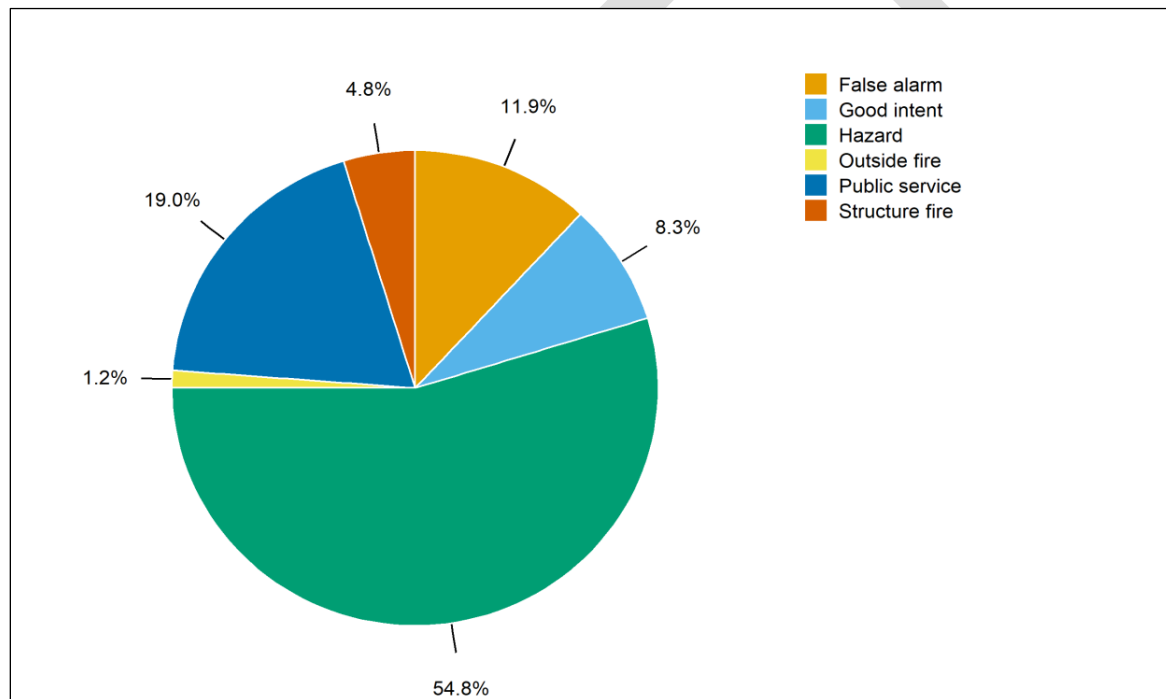
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TABLE 4-4: Calls for Service: Fire Alarm, Good Intent, Hazard, Outside Fire, Public Service, and Structure Fires

Call Type	Total Calls	Calls per Day	Call Percentage
False alarm	10	0.0	3.3
Good intent	7	0.0	2.3
Hazard	46	0.1	15.0
Outside fire	1	0.0	0.3
Public service	16	0.0	5.2
Structure fire	4	0.0	1.3
Fire Total	84	0.2	27.4

Note: *Calls that occurred outside Larkin Township were labeled as aid given. One aid given call was canceled.

FIGURE 4-6: Fire Calls by Type



An analysis of the data in the above table and figure tells us:

- Fire calls for the year totaled 84 (27.4 percent of all calls), an average of 0.23 calls per day, or one call every five days.
- Hazard calls were the largest category of fire calls at 54.8 percent of fire calls, an average of 0.13 calls per day or about one call every 10 days.
- False alarm calls made up 11.9 percent of fire calls, an average of 0.03 calls per day.
- Structure and outside fire calls combined made up six percent of fire calls, an average of 0.01 calls per day, or one call every 73 days.

EMS RISK

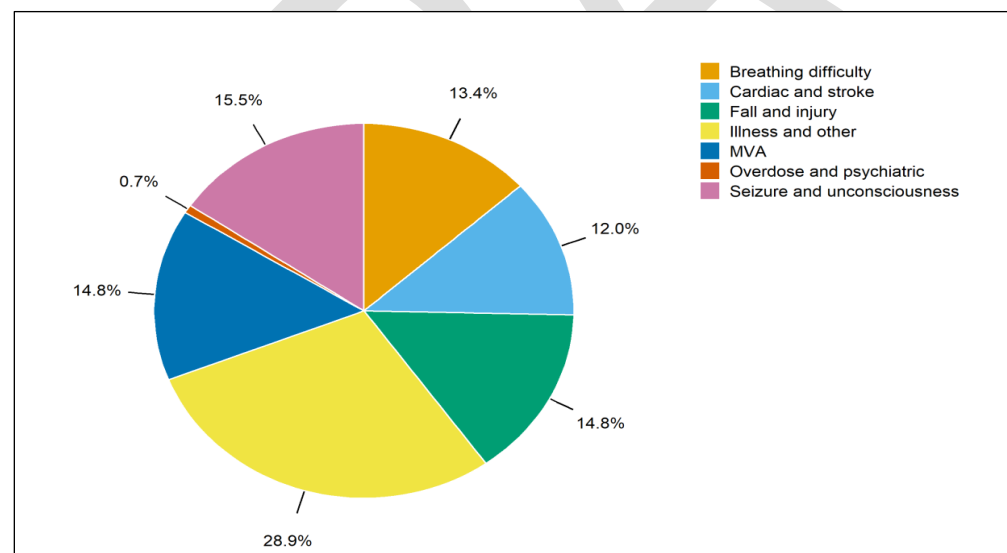
As with fire risks, an indication of the community's pre-hospital emergency medical risk is the type and number of EMS calls to which the fire department responds. The LTFD provides first responder EMS care for all EMS calls that occur in Larkin Township. The majority of LTFD personnel are certified to at least the Medical First Responder (MFR) level.

During the CPSM data analysis study period, September 2, 2021, to August 31, 2022, the LTFD responded to 142 EMS-related calls for service. The following table details the call types and call type totals for these types of EMS risks.

TABLE 4-5: LTFD EMS Calls by Type

Call Type	Total Calls	Calls per Day	Call Percentage
Breathing difficulty	19	0.1	6.2
Cardiac and stroke	17	0.0	5.5
Fall and injury	21	0.1	6.8
Illness and other	41	0.1	13.4
MVA	21	0.1	6.8
Overdose and psychiatric	1	0.0	0.3
Seizure and unconsciousness	22	0.1	7.2
EMS Subtotal	142	0.4	46.3

FIGURE 4-7: LTFD EMS Calls by Type



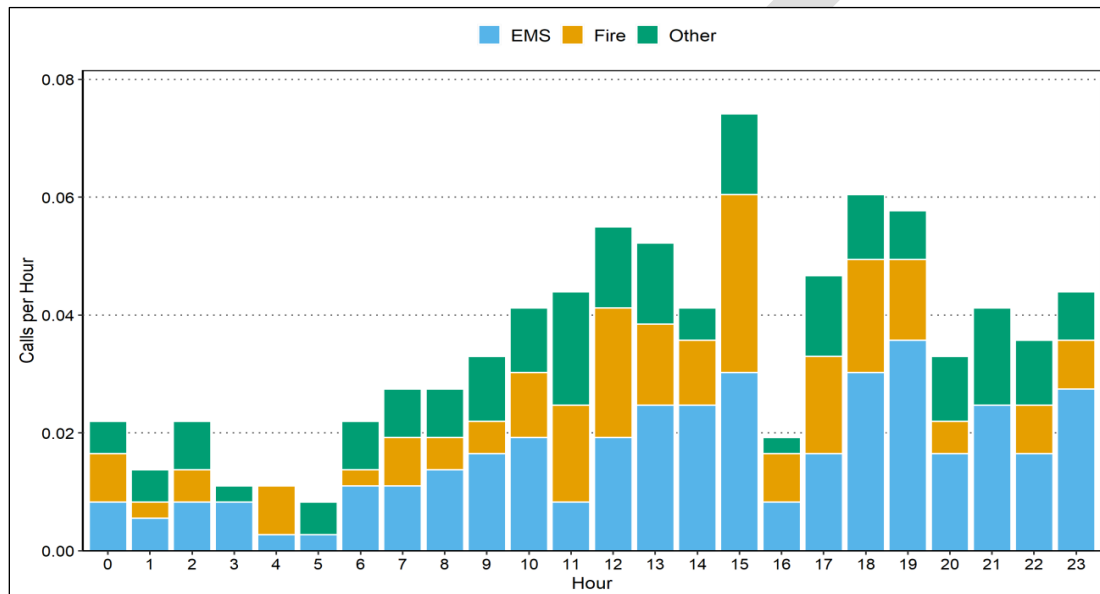
Key takeaways from the data in this table and figure are:

- EMS calls for the year totaled 142 (46.3 percent of all calls), an average of 0.39 calls per day or one call about every three days.
- Illness and other calls were the largest category of EMS calls at 29 percent of EMS calls, an average of 0.11 calls per day.

- Cardiac and stroke calls made up 12 percent of EMS calls, an average of 0.05 calls per day. This equates to one call about every three weeks.
- Cumulatively, the most serious types of EMS calls, those referred to as “Life Threats” or ALS criterion, which includes difficulty breathing, cardiac and strokes, and seizures and unconsciousness, totaled 58 incidents, or one about every 6.3 days.
- Motor vehicle accidents made up 15 percent of EMS calls, an average of 0.06 calls per day.

The following figure shows the average number of calls received each hour of the day over the year.

FIGURE 4-8: LTFD Calls by Hour of Day



Key takeaways from the data in this table are:

- Average EMS calls per hour ranged from 0.003 between 4:00 a.m. and 6:00 a.m. to 0.036 between 7:00 p.m. and 8:00 p.m.
- Average calls per hour overall ranged from 0.008 between 5:00 a.m. and 6:00 a.m. to 0.074 between 3:00 p.m. and 4:00 p.m.

EMS ground transport in Larkin Township is provided by MyMichigan Medical Center EMS (MMC-EMS). Information relevant to EMS ground transport services includes:

- MMC-EMS ambulances for EMS calls in Larkin Township normally respond from their primary station located at 4601 Wellness Drive in Midland. On occasion an ambulance may respond from one of MMC-EMS's other stations located in Homer Township, Sanford, and Coleman.
- The MWMC-EMS units are normally staffed with two paramedics.
- The primary receiving hospital for EMS ground transport originating in Larkin Township is the Mid-Michigan Medical Center located at 4000 Wellness Drive in Midland.

Overall, the LTFD responded to 307 total calls, an average of 0.84 calls per day.

COMMUNITY LOSS AND SAVE INFORMATION

Fire loss is an estimation of the total loss from a fire to the structure and contents in terms of replacement. Fire loss includes contents damaged by fire, smoke, water, and overhaul. Fire loss does not include indirect loss, such as business interruption.

In 2020, a fire department responded to a fire on average every 23 seconds in the United States, according to the National Fire Protection Association. A home fire was reported every 89 seconds, a home fire death occurred every three hours and 24 minutes, and a home fire injury occurred every 46 minutes. There are typically upticks in residential fires during the Thanksgiving to Christmas holiday period. Structure fires were up 1.9 percent from 2019 to 2020. These fires caused \$12.1 billion in property damage in 2020. Hence, CPSM supports installation of residential fire sprinklers in new home construction.

Vehicle fires, outside fires, and fires in the California wildland-urban interface caused another \$9.8 billion in property damage, bringing total property losses from fires to \$21.9 billion. There were a reported 7,410 structure fires in public assemblies (eating and drinking places and other entertainment venues, houses of worship and other places where people congregate). Nightclubs remain the deadliest public occupancy fires historically; residential fires are the most common cause of multi-death fires.

Single-family dwelling fires are the preponderance of fires in Larkin Township and are where people are likely to be injured or killed. Non-working or missing smoke alarms may be a factor in these injuries and deaths. Almost three out of five home fire deaths in the U.S. were caused by fires in properties with no smoke alarms (41 percent) or smoke alarms that failed to operate (16 percent).⁶³

The following two tables provide information on the fire loss in Larkin Township during the study period.

TABLE 4-6: Total Fire Loss Above and Below \$25,000 in Larkin

Call Type	No Loss	Under \$25,000	\$25,000 plus	Total
Outside fire	0	0	1	1
Structure fire	2	0	2	4
Total	2	0	3	5

TABLE 4-7 Content and Property Loss in Larkin Structure and Outside Fires

Call Type	Property Loss		Content Loss	
	Loss Value	Number of Calls	Loss Value	Number of Calls
Outside fire	\$1,700,000	1	\$3,000	1
Structure fire	\$56,000	2	\$20,000	2
Total	\$1,756,000	3	\$23,000	3

Note: The table includes only fire calls with a recorded loss greater than \$0.

63. <https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Detection-and-signaling/ossmokealarms.pdf>

Takeaways from these tables are:

- Two structure fires had no recorded losses.
- One outside fire and two structure fires had \$25,000 or more in recorded losses.
- Structure fires:
 - The highest total loss for a structure fire was \$40,000.
 - The average total loss for all structure fires was \$19,000.
 - Two structure fires recorded content loss, with a combined \$20,000 in losses.
 - Out of four structure fires, two had recorded property loss, with a combined \$56,000 in losses.
- Outside fires:
 - There was one outside fire, which had \$3,000 in content loss and \$1,700,000 in property loss. The total loss was \$1,703,000. This loss resulted from an industrial logging woodchipper that was destroyed in a fire while in use. The equipment involved was located at a remote job site, off-road on a logging trail nearly two miles from the nearest hydrant. The fire was not immediately reported and was fully involved upon crew arrival due the delayed reporting and accessibility issues. This is an unusual loss for this agency.⁶⁴

FIRE AND EMS DEMAND

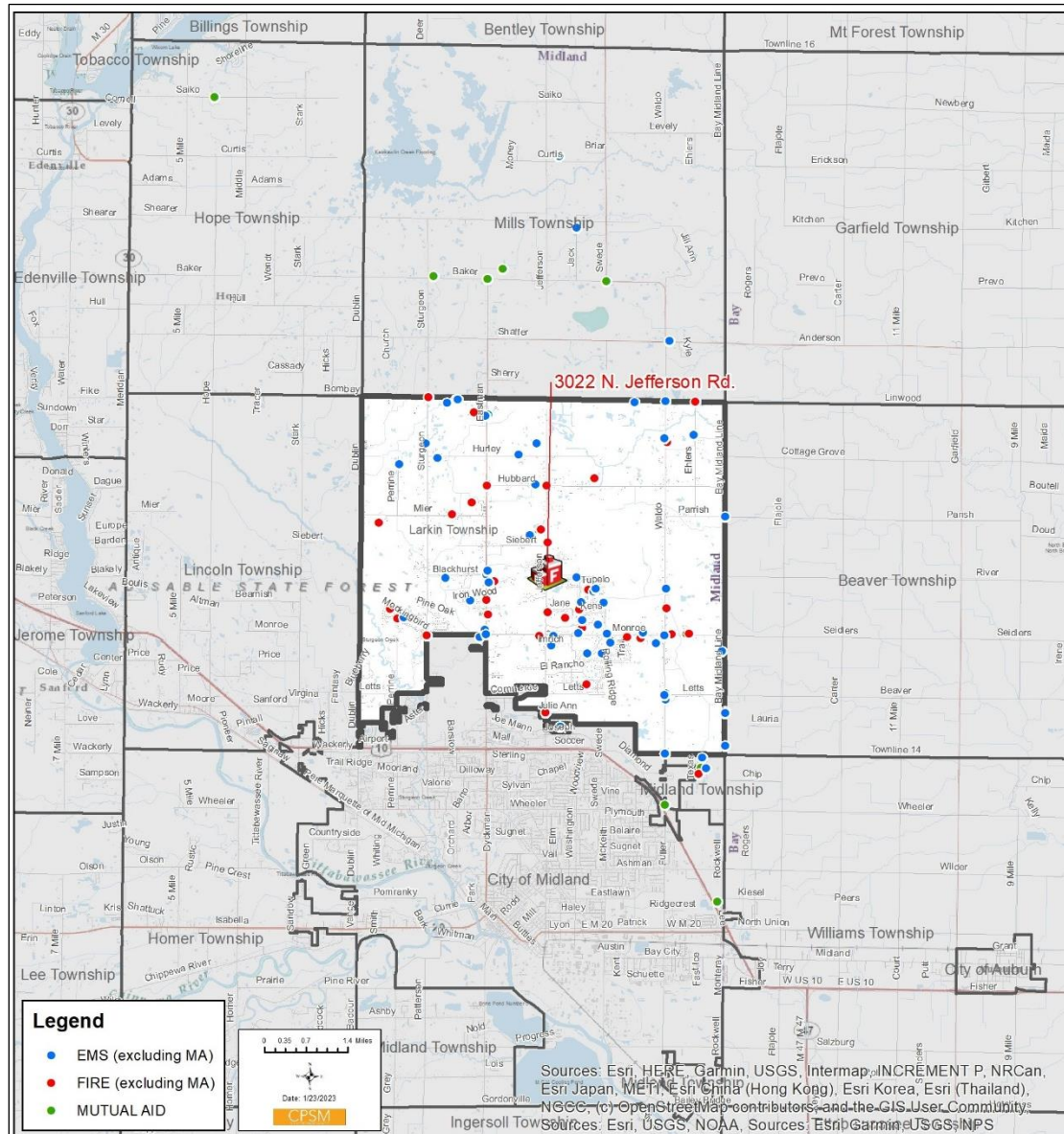
The fire and EMS risk in terms of numbers and types of incidents is important when analyzing a community's risk, as outlined above. Analyzing where the fire and EMS incidents occur, and the demand density of fire and EMS incidents, helps to determine if resource assignment and deployment are in the correct location. This is determined using demand maps. What these maps tell us is that calls for service are scattered about the township with slightly higher demand close to the fire station, with the exception of vehicle accidents, in which there is no concentration.

The following figures illustrate call demand for both fire and EMS calls in the township.

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64. Interview, Fire Chief.

FIGURE 4-9: All Call Demand (Fire and EMS) Including Mutual Aid



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FIGURE 4-10: All Fire Demand

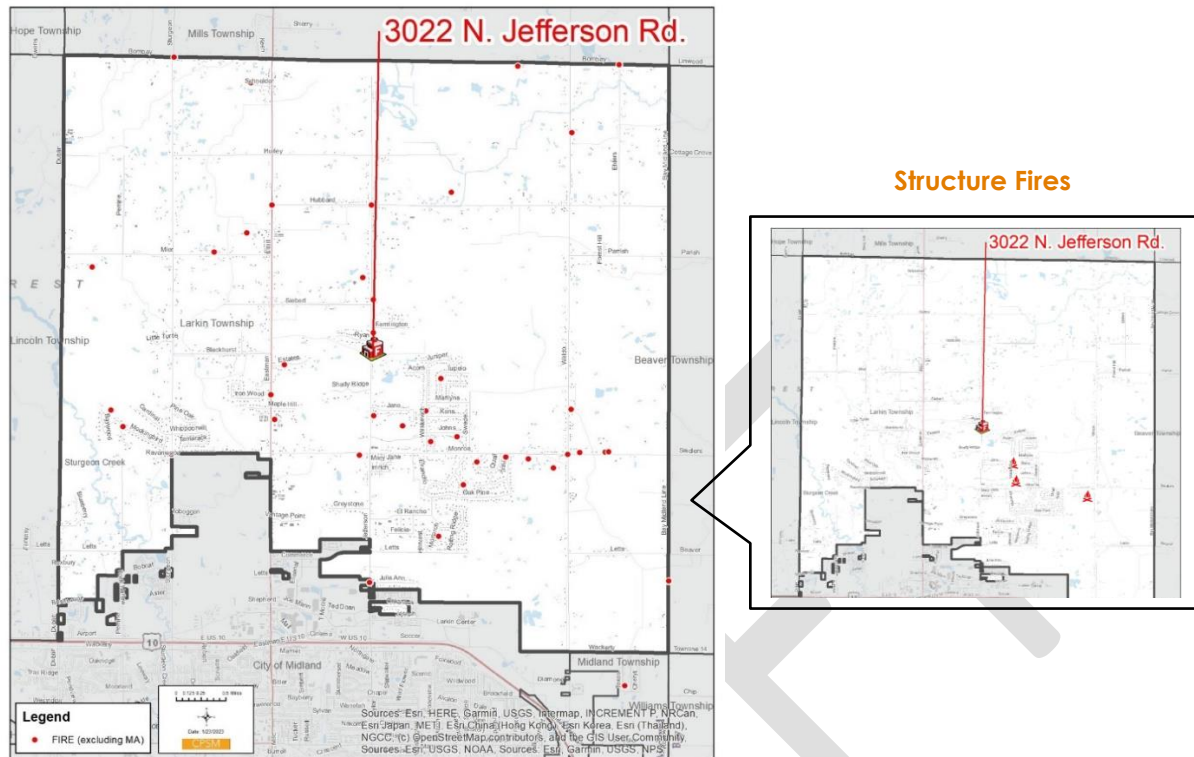
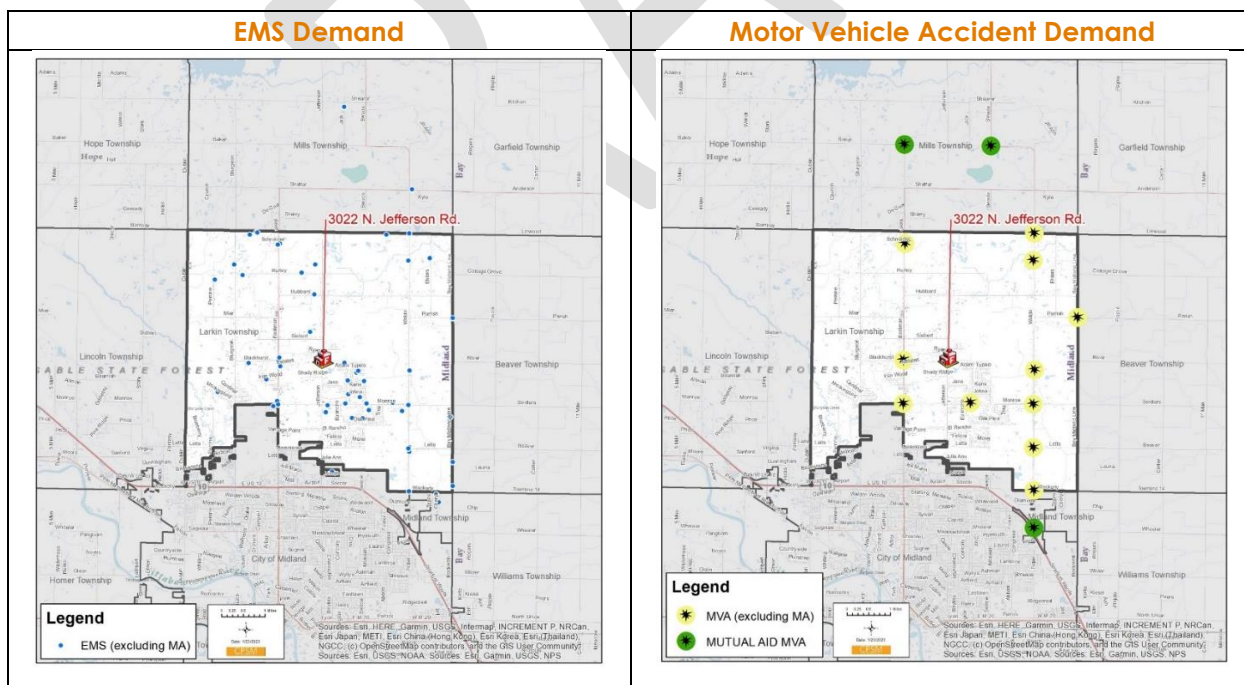


FIGURE 4-11: EMS and Motor Vehicle Accident Demand



What these maps tell us is there is no particular area of the township which generates a preponderance of calls. Fire, EMS, MVA, and other calls are scattered around the township.

However, it is likely that call demand will increase in the areas with new residential developments being built in the township.

ISO-PPC RATING

The ISO is a national, not-for-profit organization that collects and evaluates information from communities across the United States regarding their capabilities to combat building fires. ISO conducts field evaluations to rate communities and their relative ability to provide fire protection and mitigate fire risk. This evaluation allows ISO to determine and publish a Public Protection Classification (PPC) rating of Class 1/1X to Class 9 (Class 10 are areas with no fire protection).

A fire department rated Class 1 (highest classification/lowest numerical score [1/1x]) represents an exemplary community fire suppression program as outlined below. In contrast, a Class 9 score indicates that the community's fire suppression program does not meet ISO's minimum criteria. It is important to understand the PPC is not just a fire department classification, but a compilation of community services that include the fire department, the emergency communications center, and the community's water supply system operator. The lower numerical score makes the community more attractive from an insurance risk perspective, with insurance costs generally reduced for businesses and homeowners. A community's PPC grade depends on:

- **Emergency Communications:** A maximum of 10 points of a community's overall score is based on how well the fire department receives and dispatches fire alarms. ISO field representatives evaluate:
 - Emergency reporting system.
 - Communications center, including the number of telecommunicators.
 - Computer-aided dispatch (CAD) facilities.
 - Dispatch circuits and how the center notifies firefighters about the location of the emergency.
- **Fire Department:** A maximum of 50 points of the overall score is based on the fire department. ISO representatives review the fire companies throughout the area and check that the fire department tests its pumps regularly and inventories each engine and ladder company's equipment according to NFPA 1901. ISO also reviews the fire company records to determine factors such as:
 - Type and extent of training provided to fire company personnel.
 - Number of people who participate in training.
 - Firefighter response to emergencies.
 - Maintenance and testing of the fire department's equipment.
- **Water Supply:** A maximum of 40 points of the overall score is based on the community's water supply. This part of the survey focuses on whether the community has sufficient water supply for fire suppression beyond daily maximum consumption. ISO surveys all components of the water supply system and reviews fire hydrant inspections and frequency of flow testing.
- **Community Risk Reduction:** The Community Risk Reduction section of the Fire Suppression Rating Schedule (FSRS) offers a maximum of 5.5 points, resulting in 105.5 total points available in the FSRS. The inclusion of this section for "extra points" allows recognition for those

communities that employ effective fire prevention practices, without unduly affecting those that have not yet adopted such measures. The addition of Community Risk Reduction gives incentives to those communities who strive proactively to reduce fire severity through a structured program of fire prevention activities.

The LTFD had an ISO-PPC evaluation in 2018 from which the township earned 62.34 out of 105.5 available credits, thus leading to a classification of 4/4Y.⁶⁵ For comparison purposes, the following two figures illustrate where fire departments across the United States and within the State of Michigan are rated.

FIGURE 4-12: ISO-PPC Countrywide

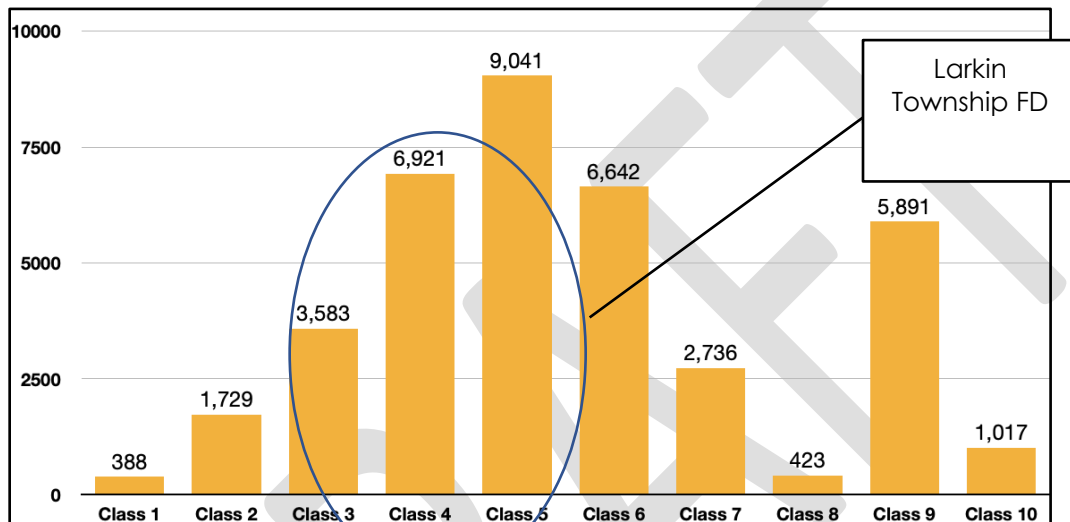
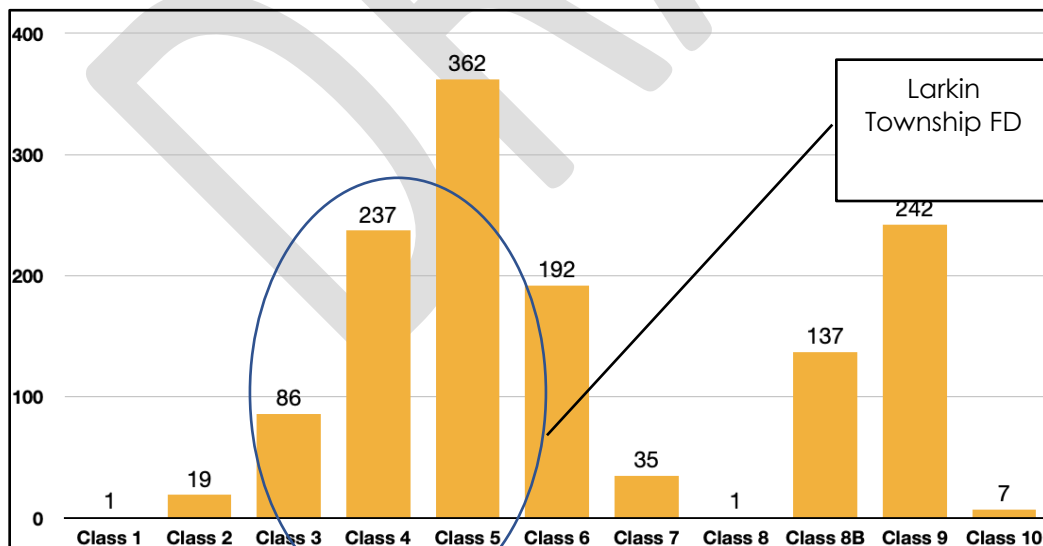


FIGURE 4-13: ISO-PPC State of Michigan



The 2018 review was recently audited, which yielded 62.00 out of 105.5 earned credits (a slight decrease of 0.34). Nonetheless, this maintains the classification of 4/4X.⁶⁶ This is a good rating for

65. ISO Letter and Report October 2018.

66. ISO Letter and Report April 2023.

a mostly rural community protected by an all-call fire department. The following table summarizes the 2018 and 2023 ISO-PPC scores. Highlighted areas in the table are lower scores.

TABLE 4-8: Larkin Township ISO-PPC Earned Credit Overview

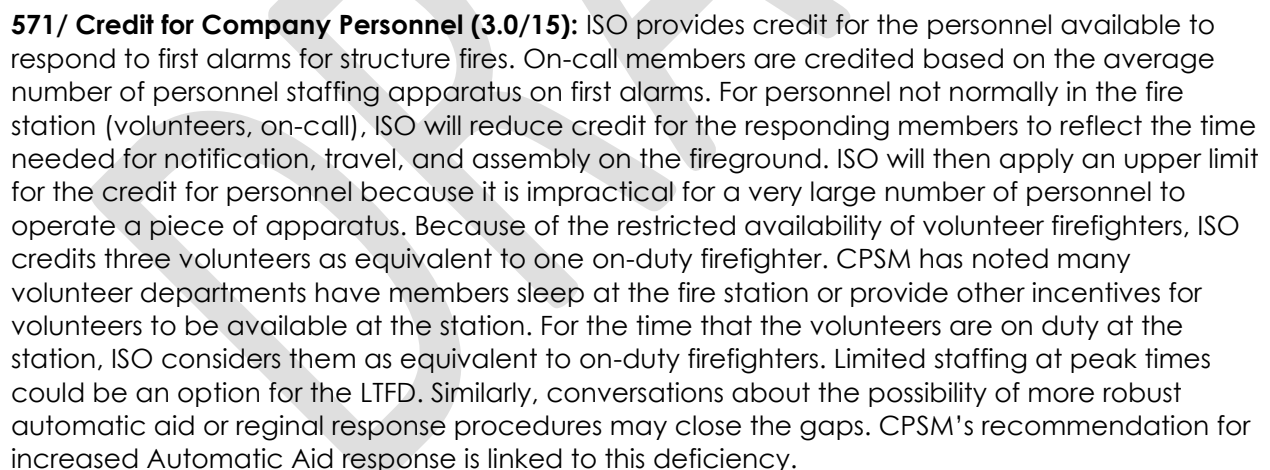
FSRS Component	Township Rating 2018	Township Rating 2023	Credit Available	Change
414. Credit for Emergency Reporting	3	3	3	N/C
422. Credit for Telecommunicators	3.87	4	4	N/C
432. Credit for Dispatch Circuits	2.85	2.85	3	N/C
440. Credit for Emergency Communications	9.72	9.85	10	-0.13
513. Credit for Engine Companies	5.74	5.84	6	+1.10
523. Credit for Reserve Pumpers	0.00	0.00	0.5	NC
532. Credit for Pump Capacity	3.00	3.00	3	NC
549. Credit for Ladder Service	3.37	3.42	4	+0.05
553. Credit for Reserve Ladder and Service Trucks	0.00	0.00	.5	NC
561. Credit for Deployment Analysis	2.38	2.38	10	NC
571. Credit for Company Personnel	3.00	5.84	15	+ 2.84
581. Credit for Training	2.54	2.50	9	-.04
730. Credit for Operational Considerations	2	2	2	NC
590. Credit for Fire Department	22.03	24.98	50	+2.95
616. Credit for Supply System	28.89	23.38	30	-5.51
621. Credit for Fire Hydrants	3	3	3	NC
631. Credit for Inspection and Flow Testing	5.40	2.40	7	-3
640. Credit for Water Supply	37.29	28.78	40	-8.51
*Divergence	-9.83	-4.40	---	
1050. Community Risk Reduction	3.13	2.79	5.50	-.34
Total Credit	62.34	62.00	105.50	- .34

Note: NC denotes no change.

While LTFD's 2023 ISO-PPC classification is good and essentially unchanged (in totality) since 2018, there are areas of the review which could be used to set performance improvement goals.

561. Deployment Analysis (2.38/10.00): ISO provides credits for the percentage of the community within specified response distances of pumpers, which is 1.5 miles (and ladder/service apparatus which is 2.5 miles). As an alternative, a fire protection area may use the results of a systemic performance evaluation; an evaluation analyzing CAD history to demonstrate that, with its current deployment of companies, the fire department meets the time constraints for initial arriving engine and initial full-alarm assignment. These points are difficult to achieve in rural volunteer fire department settings. CPSM doesn't see the need to add another station to reduce these buffers. However, conversations leading to the possibility of more robust

FIGURE 4-14: ISO-PPC 1.5-Mile Response Distance



CPSM®

1050. Community Risk Reduction (3.13/5.50): ISO recognizes a community effort to reduce risks through fire prevention, public fire safety education, and fire investigations. Our recommendations to increase fire prevention and inspection training, increase public education, and increase inspections are linked to this deficiency.

ISO-PPC Recommendation:

- CPSM recommends to the extent possible the LTFD address the deficiencies within the ISO-PPC rating criterion, with a focus on first improving the areas listed in Table 4-9. (Recommendation No. 44.)

TABLE 4-9: Recommended Areas to Focus on Improving in the ISO-PPC Rating Criterion

Criteria	LTFD Credit 2023	Credit Available	CPSM Recommendation
561. Credit for Deployment Analysis	2.38	10	■ LTFD should review mutual aid agreements with neighboring communities to see if increase use of automatic aid could close response gaps (and mutually increase on-scene staffing).
571. Credit for Company Personnel	5.84	15	■ LTFD should consider staffing the station, if possible, during peak times. Many volunteer agencies have members sleep at the station, for example, or provide other incentives for volunteers to be available at the station. A review of automatic aid agreements with neighboring communities may also help close response gaps (and mutually increase on-scene staffing).
581. Credit for Training	2.50	9	■ LTFD should increase routine training at the fire station (aka: increase company standards drills). ■ LTFD should provide specialized training for specialize positions such as company officer (lieutenant) and apparatus operators. ■ LTFD should increase drivers training opportunities (NFPA 1002). ■ LTFD should consider providing an area for training props, increase the of training media as videos, computer-based trainings, and closed-circuit or satellite TV trainings, etc.
1050. Community Risk Reduction	2.79	5.50	■ Larkin Township should consider adoption and enforcement of the Uniform Fire Code. ■ The Township should consider providing training and certification for members of the LTFD interested in providing routine fire and life safety inspections in the community. (Fire Inspector 1 / NFPA 1031, per Michigan State Fire Chiefs Association). The State of

Criteria	LTFD Credit 2023	Credit Available	CPSM Recommendation
			Michigan has many resources to help with Fire Prevention, Fire Investigation, and Public Outreach. ■ Larkin Township should also consider increasing public education such as increased social media presence, electronic fire station sign, etc.

RISK CATEGORIZATION

The risks that the department faces can be natural or man-made and may be affected by the changing demographics of the community served. Risk is often categorized in three ways:

1) the probability the event will occur in the community; 2) consequence of the event on the community; and 3) the impact upon the fire department.

A comprehensive risk assessment is a critical aspect of creating standards of cover and can assist the LTFD in quantifying the risks that it faces. Once those risks are known, the department is better equipped to determine if the current response resources are sufficiently staffed, equipped, trained, and positioned.

In this component, the factors that drive the service needs are examined and then link directly to discussions regarding the assembling of an effective response force (ERF) and when contemplating the response capabilities needed to adequately address the existing risks, which encompasses the component of critical tasking. The risks that the department faces can be natural or manufactured and may be affected by the changing demographics of the community served. Risk is often categorized in three ways:

- The probability the event will occur in the community.
- Consequence of the event on the community.
- The impact on the fire department.

The following tables look at the probability of the event occurring within the township, ranging from unlikely to frequent, insignificant to catastrophic, and the impact to the organization.

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TABLE 4-10: Event Probability

Probability	Chance of Occurrence	Description	Risk Score
Unlikely	2% to 25%	Event may occur only in exceptional circumstances.	2
Possible	26% to 75%	Event could occur at some time and/or recorded incidents.	4
Highly Probable	76% to 90%	Event will probably occur and/or regular recorded incidents and strong anecdotal evidence. Considerable opportunity, means, reason to occur.	8
Frequent	91% to 100%	Event is expected to occur. High level of recorded incidents and/or very strong anecdotal evidence.	10

TABLE 4-11: Impact on the LTFD

Impact	Impact Categories	Description	Risk Score
Insignificant	Personnel and Resources	One apparatus out of service for period not to exceed one hour.	2
Minor	Personnel and Resources	More than one but not more than two apparatus out of service for a period not to exceed one hour.	4
Moderate	Personnel and Resources	More than 50 percent of available resources committed to incident for over 30 minutes.	6
Significant	Personnel and Resources	More than 75 percent of available resources committed to an incident for over 30 minutes.	8
Catastrophic	Personnel, Resources, and Facilities	More than 90 percent of available resources committed to incident for more than two hours or event, which limits the ability of resources to respond.	10

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TABLE 4-12: Consequence to Community Matrix

Impact	Impact Categories	Description	Risk Score
Insignificant	Life Safety	1 or 2 people affected, minor injuries, minor property damage, and no environmental impact.	2
Minor	Life Safety Economic and Infrastructure Environmental	- Small number of people affected, no fatalities, and small number of minor injuries with first aid treatment. Minor displacement of people for <6 hours and minor personal support required. - Minor localized disruption to community services or infrastructure for <6 hours. Minor impact on environment with no lasting effects.	4
Moderate	Life Safety Economic and Infrastructure Environmental	- Limited number of people affected (11 to 25), no fatalities, but some hospitalization and medical treatment required. Localized displacement of small number of people for 6 to 24 hours. Personal support satisfied through local arrangements. Localized damage is rectified by routine arrangements. - Normal community functioning with some inconvenience. Some impact on environment with short-term effects or small impact on environment with long-term effects.	6
Significant	Life Safety Economic and Infrastructure Environmental	- Significant number of people (>25) in affected area impacted with multiple fatalities, multiple serious or extensive injuries, and significant hospitalization. - Large number of people displaced for 6 to 24 hours or possibly beyond. External resources required for personal support. Significant damage that requires external resources. Community only partially functioning, some services unavailable. Significant impact on environment with medium- to long-term effects.	8
Catastrophic	Life Safety Economic and Infrastructure Environmental	- Very large number of people in affected area(s) impacted with significant numbers of fatalities, large number of people requiring hospitalization; serious injuries with long-term effects. General and widespread displacement for prolonged duration; extensive personal support required. Extensive damage to properties in affected area requiring major demolition. - Serious damage to infrastructure. Significant disruption to, or loss of, key services for prolonged period. - Community unable to function without significant support. - Significant long-term impact on environment and/or permanent damage.	10

Larkin Township is responsible for providing three core services: fire response, medical first responder response (BLS), and rescue. The three-axis risk methodology considers the probability of those occurrences, the likely consequence, and the impact to fire department resources. CPSM then looks at the minimum requirements relating to the organization and deployment of fire suppression operations, emergency medical operations, and special operations to the public by volunteer fire departments.⁶⁷

As part of this analysis, information presented and reviewed earlier in this section regarding community risk (All-Hazards Risk Assessment of the Community) in Larkin Township has been considered. Risk is categorized as Low, Moderate, High, or Special.

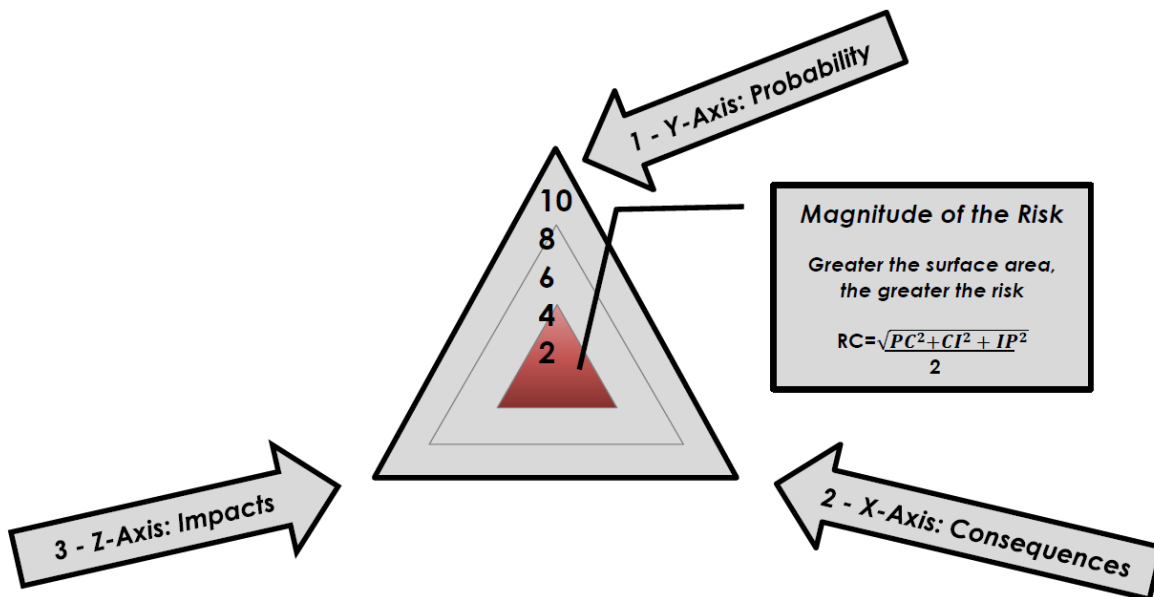
CPSM uses the three-axis risk assessment formula:

P = Probability (Y-Axis): Probability is associated with the frequency of an incident type.

C = Consequences (X-Axis): Consequence is the measure of the outcome of an incident type by identifying and categorizing community hazards. Risk factors then quantify the degree of potential danger the hazard presents.

I = Impact (Z-Axis): Impact describes a fire department's ability to provide ongoing services to the remaining areas of a community and what plan is in place for both the current incident, but also overall high-volume demand areas. It is important to have a plan in place to relocate response resources, use mutual or automatic aid, as an example, to ensure the best coverage possible. The following figure should help illustrate:

FIGURE 4-15: Three-Axis Risk Calculation



67. NFPA 1720

The following factors/hazards were identified and considered:

- **Demographic factors** such as age, socio-economic aspects, vulnerability.
- **Natural hazards** such as major weather events, snow and ice events, wind events.
- **Manufactured hazards** such as rail lines, roads and intersections, target hazards.
- **Structural/building risks.**
- **Fire and EMS incident numbers and density.**

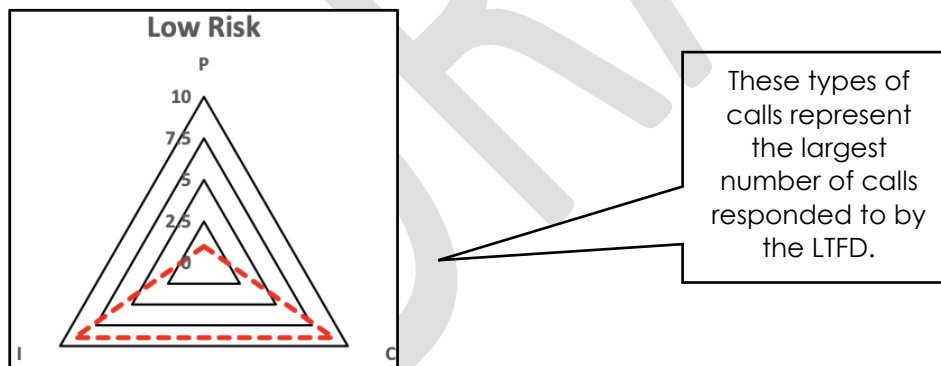
The assessment of each factor and hazard that follow took into consideration the likelihood of the event, the impact on the township itself, and the impact on the fire departments' ability to deliver emergency services. The list is not all inclusive but includes categories most common or that may be presented to the township.

Low Risk

- Automatic fire/false alarm.
- Low acuity-BLS EMS incidents.
- Low-risk environmental event.
- Motor vehicle crash (MVC).
- Good intent/hazard/public service fire incidents with no life-safety exposure.
- Outside fires such as grass, rubbish, dumpster, vehicle with no structural/life-safety exposure.

The probability if these types of calls in the township are high but manageable due to low frequency and low impact.

FIGURE 4-16: Low Risk



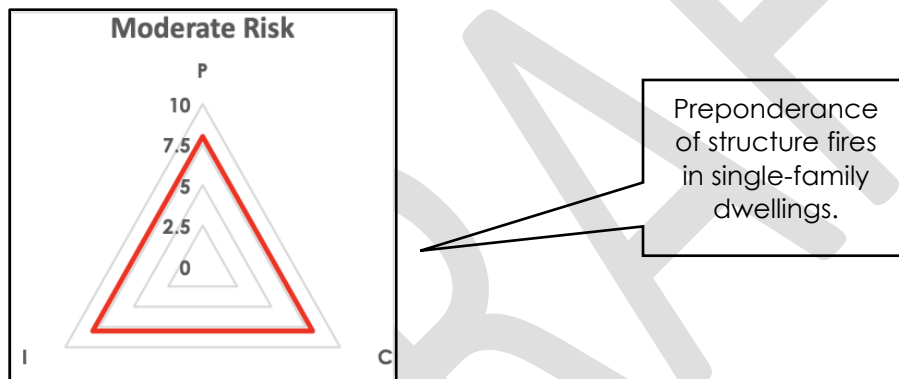
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Moderate Risk

- Fire incident in a single-family dwelling where fire and smoke or smoke is visible, indicating a working fire.
- ALS EMS incident.
- MVC with entrapment of passenger.
- Grass/brush fire with structural endangerment/exposure.
- Low angle rescue involving ropes, rope rescue equipment and resources.
- Surface water rescue.
- Good intent, hazard, public service fire incident with life-safety exposure.

The probability of these types of calls in the township is moderate but manageable. Fire incidents in single-family dwellings are probable as are ALS criterion EMS incidents. MVCs with entrapment are also probable given high-speed accidents in the area. Grass-brush fires are likely as well given the vast amount of wildland and adjacent parks. These calls usually require more personnel and more specialized equipment.

FIGURE 4-17: Moderate Risk

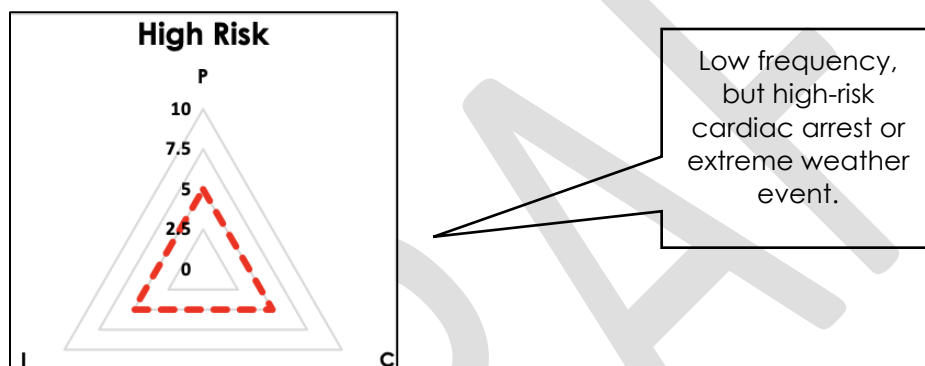


High Risk

- Working fire in target hazard. Larkin Township has almost none of these.
- Cardiac arrest.
- Mass casualty incident of more than 10 patients, but fewer than 25 patients
- Confined space rescue.
- Trench rescue.
- Industrial leak of hazardous material that causes exposures to person or threatens life safety.
- Weather events that cause widespread flooding, tornadoes, heavy winds, building damage, etc.

Except for cardiac arrest calls, the probability of these types of calls in the township is limited and will most likely require the use of widespread mutual aid, particularly from the City of Midland. Weather-related events are highly likely from time to time.

FIGURE 4-18: High Risk



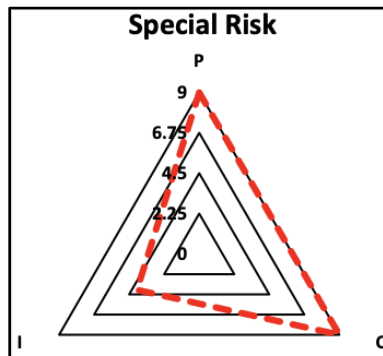
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Special Risk

- Fire at an industrial building or complex with hazardous materials.
- Mass casualty incident of more than 25 patients.
- Massive river/estuary flooding, high impact environmental event, pandemic.
- Fire, explosion, hazardous materials release, complex technical rescue incident or other significant incident.

The likelihood of an event described above is unlikely; however, the impact would be quite high.

FIGURE 4-19: Special Risk



These types of incidents will also quickly exhaust all available LTFD resources and would require not only the use of nearby mutual aid but also probably a regional response of specialized resources.

RESILIENCY

Resiliency as defined by the Center for Public Safety Excellence (CPSE) in its *Fire and Emergency Service Self-Assessment Manual (FESSAM)*, ninth edition, as: "an organization's ability to quickly recover from an incident or events, or to adjust easily to changing needs or requirements." Greater resiliency can be achieved by constant review and analysis of the response system and focuses on three key components:

- **Resistance:** The ability to deploy only the resources necessary to control an incident and bring it to termination, which is achieved through the development and implementation of critical tasking and its application to the establishment of an effective response force for all types of incidents safely and effectively.

Resilience is not an issue due to the low number of complex calls received by the LTFD. Therefore, the agency is generally available at the time of the call, notwithstanding the availability of volunteers.

- **Absorption:** The ability of the agency to quickly add or duplicate resources necessary to maintain service levels during heavy call volume or incidents of high resource demand.

Absorption is not generally an issue due to the low frequency of overlapping events (about 10 overlapping calls a year) and also accomplished by "all call" of volunteers for all calls and use of regional mutual aid.

- **Restoration:** The agency's ability to quickly return to a state of normalcy.

Restoration from larger incidents or multiple calls at once is accomplished through the availability of regional mutual aid resources and/or recall of volunteers.

Regarding resiliency, with less than one call per day (0.84 calls), resiliency should not normally be an issue for the LTFD except **for the overriding factor for all calls, which is having sufficient on-call personnel respond in a timely manner**, to either satisfactorily mitigate the incident, or commence initial operations for more significant incidents while awaiting the arrival of automatic or mutual aid resources.

Information extracted from the data analysis in this report provides the following information regarding LTFD resiliency.

- Among all units, L551—the light rescue/quick response vehicle (QRV) used for EMS responses—made the most runs (170; an average of 0.5 runs per day or one run every other day) and had the second-highest total annual deployed time (45.6 hours, or an average of 7.5 minutes per day).
 - EMS calls accounted for 67 percent of runs and 77 percent of total deployed time.
- Among all units, L501—the Fire Chief—made the second-most runs (100; an average of 0.3 runs per day, or one run every three days) and had the highest total annual deployed time (48.4 hours or an average of 8.0 minutes per day).
 - EMS calls accounted for 45 percent of runs and 49 percent of total deployed time.
 - Structure and outside fire calls accounted for one percent of runs and four percent of total deployed time.

The following tables illustrate the number of times the LTFD had overlapping calls and the instances when there were multiple calls within a short time frame.

TABLE 4-13: Frequency of Overlapping Calls in Larkin Township

Scenario	Number of Calls	Percent of All Calls	Total Hours
No overlapped call	275	95.8	189.2
Overlapped with one call	10	3.5	1.9
Overlapped with two calls	1	0.3	0.4
Overlapped with three calls	1	0.3	0.2

Note: The 27 aid given calls outside Larkin Township are not included.

The total of overlapped hours during the 12 months was 2.5 hours.

TABLE 4-14: Frequency Distribution of the Number of Calls

Calls in an Hour	Frequency	Percentage
0	8,433	96.5
1	296	3.4
2+	7	0.1
Total	8,736*	100.0

Note: *364 days.

TABLE 4-15: Top Five Hours with the Most Calls Received

Hour	Number of Calls	Number of Runs	Deployed Hours
9/7/2021, 3:00 p.m. to 4:00 p.m.	5	7	3.7
9/20/2021, 8:00 p.m. to 9:00 p.m.	3	9	4.0
5/20/2022, 11:00 p.m. to midnight	2	5	2.0
12/24/2021, 3:00 a.m. to 4:00 a.m.	2	5	1.9
12/11/2021, noon to 1:00 p.m.	2	3	0.6

Note: Total deployed hours are a measure of the total time spent responding to calls received in the hour and may extend into the next hour or hours. The number of runs and deployed hours only includes LTFD units.

The above tables also tell us that:

- During seven hours (0.1 percent of all hours), two or more calls occurred; in other words, the LTFD responded to two or more calls in an hour roughly once every 52 days.
- The highest number of calls to occur in an hour was five, which happened once.
 - The hour with the most calls was 3:00 p.m. to 4:00 p.m. on September 7, 2021, when the area was hit by severe thunderstorms. The hour's 5 calls involved 7 individual dispatches resulting in 3.7 hours of deployed time. These 5 calls included four hazard calls and one canceled call.

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SECTION 5. FIRE PROGRAMS, OPERATIONS, DEPLOYMENT, AND PERFORMANCE

Fire, rescue, and emergency medical system (EMS) incidents, and the fire department's ability to respond to, manage, and mitigate them effectively, efficiently, and safely, are mission-critical components of the emergency services delivery system. In fact, fire, rescue, and EMS operations provide the primary, and certainly most important, basis for the very existence of the fire department.

Nationwide, fire departments are responding to more EMS calls and fewer fire calls, particularly fire calls that result in active firefighting operations by responders. This is well documented in both national statistical data, as well as CPSM fire studies. Larkin's experience is mostly consistent with these trends based upon overall numbers.

These trends and improvements in the overall fire protection system notwithstanding, fires still do occur, and the largest percentage of those occur in residential occupancies where they place the civilian population at risk. Although they occur with less frequency than they did several decades ago, when they occur today they grow much quicker and burn more intensely than they did in the past due to building construction features, more flammable interior finishes, and furniture, and in some cases in older buildings with multiple renovations that have led to hidden voids and spaces that act as channels for fire and smoke. **As will be discussed later in this section, it is imperative that the fire department, even a volunteer fire department, is able to assemble an Effective Response Force (ERF) within a reasonable time period in order to successfully mitigate these incidents with the least amount of loss possible and with a focus on life and firefighter safety.** If a department is unable to accomplish this goal it is often limited to performing defensive operations and protecting exposures as opposed to saving the original fire building. This is often the case in rural communities with limited fire suppression capabilities.

Fire and rescue work are task-oriented and labor intensive, performed by personnel wearing heavy, bulky personal protective equipment (PPE). Many critical fireground tasks require the skillful operation and maneuvering of heavy equipment.

CURRENT STAFFING AND DEPLOYMENT OF FIRE RESOURCES

When exploring staffing and deployment of fire department resources it is prudent to design an operational strategy around the actual circumstances that exist in the community and the fire and risk problems that are identified. The strategic and tactical challenges presented by the hazards that a department protects against need to be identified and planned for through a community risk analysis planning and management process as completed in this report. It is ultimately the responsibility of elected officials to decide the level of risk that is acceptable to their community. Once the acceptable level of risk has been decided, then operational service goals can be established. Whether looking at acceptable risk, or level of service goals, it would be imprudent, and probably very costly, to build a deployment strategy that is based solely on response times and emotion.

The staffing of fire and EMS units is a never-ending focus of attention among fire service and governmental leadership. While NFPA 1720 and OSHA provide guidelines (and to some extent the law, specifically OSHA in OSHA states) as to the level of staffing and response of personnel, the adoption of these documents varies from state to state, and department to department.

NFPA 1720 addresses the recommended staffing in terms of specific types of communities. The needed staffing to conduct the critical tasks in each type of community is determined to be the Effective Response Force (ERF).

One of the factors that has helped the fire service in terms of staffing is technology. The fire service continues to benefit from technological advances that help firefighters extinguish fires more effectively. More advanced equipment in terms of nozzles, personal protective gear, thermal imaging systems, advancements in self-contained breathing apparatus, incident command strategies, drones with infrared cameras, and devices used to track personnel air supply are some of the technologies and techniques that help firefighters extinguish fires faster and manage the fireground more effectively and safely. While some of these technologies do not reduce the staffing or workforce needed, they can have an impact on firefighter safety, property loss, and crew fatigue.

Even with the many advances in technology and equipment, the fireground is an unforgiving and dynamic environment where firefighters must complete critical tasks simultaneously. Lightweight wood construction, truss roofs, dwellings and buildings with basements, increased set-backs making accessibility to the building difficult, and estate homes are examples of the challenges that firefighting forces are met with when mitigating structural fires in a community such as Larkin Township.

Larkin Township is currently experiencing a moderate amount of new residential construction; newly constructed homes are larger than much of the older home stock in a community. These new homes tend to incorporate open floor plans, with large spaces that contribute to rapid fire spread. In addition, homes constructed since 1980 most likely incorporate lightweight construction which contributes to rapid fire spread, and the potential for early collapse of the entire structure. The challenge of rapid fire spread is exacerbated by the use of lightweight roof trusses, vinyl siding, and combustible sheathing. The result is that more personnel are required to mitigate the incidents safely and effectively in these structures. Providing adequate staffing through an **Effective Response Force** for these environments depends on many factors.

The operations necessary to successfully extinguish a structure fire, and do so effectively, efficiently, and safely, requires a carefully coordinated and controlled plan of action where certain operations such as venting ahead of the advancing interior hose line(s) must be carried out with a high degree of precision and timing. Multiple operations, frequently where seconds count, such as search and rescue operations and trying to cut off a rapidly advancing fire, must also be conducted simultaneously. If there are not enough personnel on the incident initially to perform all the critical tasks, some will, out of necessity, be delayed. This can result in an increased risk of serious injury, or death, to building occupants and firefighters, and increased property damage.

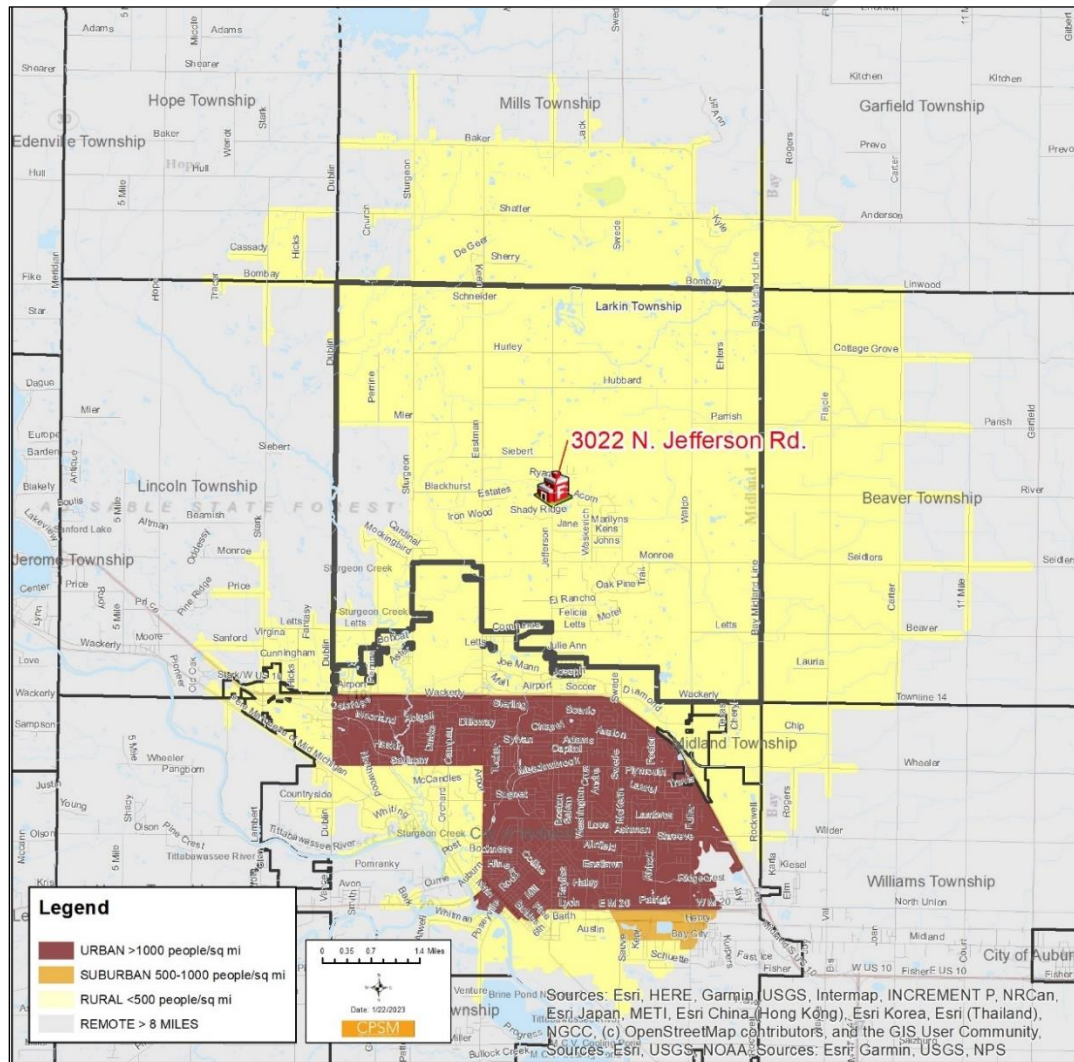
The LTFD operates out of a single fire station located at 3022 N. Jefferson Road. The department staff of 16 personnel currently operates two engines, one water tender, one rescue truck, one brush truck, and one utility truck that is used for primary first response to medical emergencies. At the time of this assessment the department was awaiting the delivery of a new pumper, which will replace a 2001 unit. The chief is considering consolidating two units into one and removing the rescue truck from service also.

Deciding how many emergency vehicles to deploy is not an exact science. There are no perfect deployment models. The ultimate decision is based on a combination of risk analysis, professional judgment, and the jurisdiction's willingness to accept more or less risk. Fire agencies are increasingly challenged with finding the right vehicles to meet their response needs. The goal is always to have a fleet of vehicles that can safely and efficiently get to/from calls with just

about everything the crews need to mitigate and stop an emergency. As mentioned above, fire apparatus comes in many types and sizes. Fire agencies are increasingly challenged with finding the right vehicles (number, type, design, size, etc.) to meet their response needs (aka: fleet right-sizing). Over the years fire apparatus has become much more diverse, but specialty vehicles will always need to be in the fire fleet (water tankers/tenders in rural areas as example). In some cases, an agency can “do without” if a neighboring agency has the vehicle/equipment it needs on an automatic aid matrix (as in Midland providing a ladder for all structure fires). Having the correct number of pumpers (pump capacity) also impacts a community's ISO rating.

The following figure illustrates the location of the LTFD fire station.

FIGURE 5-1: LTFD Fire Station Location



This map also illustrates that all of Larkin Township is considered rural by the U.S. Census Bureau based on having a population density of less than 500 people per square mile. The significance of this is discussed later in this section in conjunction with NFPA 1720.

NFPA 1720

Emergency events occur at all hours, on all days, and under all conditions. Emergencies are like lightning strikes—they can occur anytime, anywhere. The fire and EMS service's response to these unpredictable conditions has been to develop a methodology for being prepared to respond and deploy adequate resources in a timely fashion when they occur.

The rapid and effective performance of highly coordinated assigned tasks is the hallmark of a successful emergency response force whether it be fire or EMS or combined. Time and on-scene performance expectations are the target indicators established for measuring the operational elements (individuals, crews, and work units) that comprise response-ready resources.

- Critical tasks are those activities that must be conducted on time and preferably simultaneously by responders at emergency incidents to control the situation and minimize/stop loss (property and life-safety).
- Critical tasking for fire operations involves the minimum number of personnel needed to perform the tasks needed to effectively control and mitigate a fire or other emergency.
- Critical tasking for EMS operations is comprised of those activities (clinical and operational) that must be conducted, some in succession, and some simultaneously to rapidly assesses the patient, determine the level of intervention needed, if any, and connect the patient with the appropriate level of pre-hospital clinical care.

To be effective, critical tasking must assign enough personnel so that all identified functions can be performed as described above. However, it is important to note that initial response personnel may manage secondary support functions once they have completed their primary assignment. Thus, while an incident may end up requiring a greater commitment of resources or a specialized response, a properly executed critical tasking assignment will provide adequate resources to immediately begin bringing the incident under control.

The specific number of people required to perform all the critical tasks associated with an identified risk or incident type (fire, EMS, and fire/EMS) is referred to as an **Effective Response Force (ERF)**. The goal is to deliver an ERF within a prescribed period. NFPA 1720 provides the benchmarks for effective response forces for fire companies. There are no established critical tasks for all EMS incidents *per se*; however, a Standards of Cover will provide critical tasking for incidents that EMS units typically respond to.

NFPA 1720, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Volunteer Fire Departments*, 2020 edition (National Fire Protection Association, Quincy, Mass.), outlines organization and deployment of operations by volunteer and combination (a fire department having emergency service personnel comprising less than 85 percent majority of either volunteer or career membership) fire and rescue organizations.⁶⁸ It serves as a benchmark to measure staffing and deployment of resources to certain fire incidents and emergencies.

According to NFPA 1720, fire departments should base their specific role on a formal community risk management plan, as discussed earlier in this analysis, and taking into consideration:

68. NFPA 1720 is a nationally recognized standard, but it has not been adopted as a mandatory regulation by the federal government or the State of Michigan. It is a valuable resource for establishing and measuring performance objectives for Larkin Township but should not be the only determining factor when making local decisions about the township's fire services.

- Life hazard to the population protected. The number and type of units assigned to respond to a reported incident shall be determined by risk analysis and/or pre-fire planning.
- Fire suppression operations shall be organized to ensure that the fire department's fire suppression capability includes personnel, equipment, and other resources to deploy fire suppression resources in such a manner that the needs of the organization are met.
- The Authority Having Jurisdiction (AHJ) shall promulgate the fire department's organizational, operational, and deployment procedures by issuing written administrative regulations, standard operating procedures, and departmental orders.
- The number of members that are available to operate on an incident is sufficient and able to meet the needs of the department.
- Provisions for safe and effective firefighting performance conditions for the firefighters.
- Personnel responding to fires and other emergencies shall be organized into company units or response teams and have the required apparatus and equipment to respond.
- Initial firefighting operations shall be organized to ensure that at least four members are assembled before interior fire suppression operations are initiated in a hazardous area.
- The capability to sustain operations shall include the personnel, equipment, and resources to conduct incident-specific operations.

It is understood that volunteers typically respond to incidents from home or work, so for a minimum-level Effective Response Force to begin fire suppression efforts, NFPA 1720 establishes the minimum response staffing for an all-volunteer department for low to moderate hazard structural firefighting incidents (to include out buildings and up to a 2,000 square-foot, one- to two-story, single-family dwelling without a basement and no exposures) for specific demand zones. Since responding personnel normally drive to their station to obtain the apparatus necessary to handle the emergency, which takes time and obviously increases with distance, responses by volunteer emergency services providers inherently tend to be longer.

Each NFPA 1720 demand zone takes into consideration certain risk elements such as population density, exposed occupied buildings (more predominant in urban and suburban demand zones), water supply, and proximity to responding apparatus and members (incident and fire station).

TABLE 5-1: NFPA 1720 Staffing for an ERF, Residential Structure, by Demand Zone

Demand Zone	Demographics	Minimum Staff to Respond	Response Time (minutes)	Meets Objective (% of time)
Special Risks	AHJ	AHJ	AHJ	90 %
Urban	>1000 people/ sq. mi.	15	9	90 %
Suburban	500-1000 people/ sq. mi.	10	10	80 %
Rural	< 500 people/sq. mi.	6	14	80 %
Remote*	Travel dist. > 8 mi.	4	Dependent upon travel distance	90 %

Note: *Minimum staff responding includes automatic and mutual aid. Minimum staff responding to scene by apparatus and personal owned vehicle.

- Paragraph 4.3.4 on *Staffing and Deployment* states that upon assembling the necessary resources at the emergency scene, the fire department should have the capability to safely commence an initial attack within 2 minutes, 90 percent of the time.
- Paragraph 4.6.1 *Initial Firefighting Operations* states that initial firefighting operations shall be organized to ensure that at least four members are assembled before interior fire suppression operations are initiated in a hazardous area.
- Paragraph 4.7.1 *Sustained Firefighting Operations* states that the fire department shall have the capability for sustained operations, including fire suppression; engagement in search and rescue, forcible entry, ventilation, and preservation of property; accountability of personnel; the deployment of a dedicated rapid intervention crew (RIC); and the provision of support activities for those situations which are beyond the capabilities of the initial attack.
- Paragraph 4.7.2 *Sustained Firefighting Operations* also states that the capability to sustain operations shall include sufficient personnel, equipment, and resources to effectively, efficiently, and safely conduct the appropriate operations.

Note: While the NFPA standards are nationally recognized consensus standards, it is still the responsibility of the local jurisdiction to determine the acceptable level of risk and corresponding fire protection/EMS services. When applying any standard, including the NFPA standards, it is important to apply the document in its entirety. One should not selectively extract requirements to the exclusion of others or take a requirement out of context. For example, while NFPA 1710 and 1720 establish requirements for the minimum number of on-scene personnel, they also require fire departments and firefighters to comply with NFPA 1500, *Standard on Firefighter Occupational Health and Safety Program*. Among other requirements, NFPA 1500 requires personnel to be medically evaluated and to be evaluated annually for their physical performance capabilities.

Figure 5-1 illustrated that Larkin Township is entirely a rural demand zone, for which NFPA recommends a total of six personnel on the scene within 14 minutes. It is important to remember that this level of minimal staffing will limit the tactical options and may relegate the responding personnel to defensive operations or just protecting exposures.

NFPA 1720 calls attention to additional staffing/response requirements worth noting here:

- The fire department shall identify minimum staffing requirements to ensure that the number of members that are available to operate are able to meet the needs of the department.
 - For the volunteer component this can include scheduled staffing at predetermined stations or pre-determined staff responding to stations to assemble response apparatus.
- Upon assembling the necessary resources at the emergency scene, the fire department shall have the capability to safely commence an initial attack within 2 minutes, 90 percent of the time.
 - This should be announced by the incident commander over the radio and measured through the computer-aided dispatch (CAD) system after the arrival of the initial arriving members, companies, and response teams.
- Personnel responding to fires and other emergencies shall be organized into company units or response teams and have the required apparatus and equipment.
 - This avoids freelancing by personnel before and after the arrival of the fire suppression units; enables the incident commander to size-up available on-scene resources, ensures fireground accountability, and ensures a coordinated assignment of critical tasks.

CODE OF FEDERAL REGULATIONS, NFPA 1500, TWO-IN/TWO-OUT

Another consideration, and one that links to critical tasking and assembling an Effective Response Force, is that of two-in/two-out regulations. Essentially, prior to starting any fire attack in an immediately dangerous to life and health (IDLH) environment [with no confirmed rescue in progress], the initial two-person entry team shall ensure that there are sufficient resources on-scene to establish a two-person initial rapid intervention team (IRIT) located outside of the building.

There is no Michigan state or federal requirement that specifies staffing levels on fire apparatus. This critical tasking model has its genesis with the Occupational Safety and Health Administration, specifically 29 CFR 1910.134(g)(4). MIOSHA establishes regulations for firefighters in Michigan including the adoption of OSHA regulations and NFPA standards. Federal OSHA covers the issues not specifically covered by the Michigan regulations. As such, the federal rule (29 CFR 1910.134(g)(4)) applies to the LTFD.

As is common with many volunteer/on call/combination fire departments, LTFD does not respond to structural fires with a pre-determined staffing regimen or a guaranteed command officer on the initial alarm dispatch. Midland Fire Department also responds automatically with a ladder truck staffed with three personnel and a Battalion Chief. At times the MFD rescue also responds with two additional personnel. Under this response model, LTFD may or may not have the minimum number of firefighters on the initial response in order to comply with CFR 1910.134(g)(4), regarding two-in/two-out rules and initial rapid intervention team (IRIT) until the MFD also arrives on the scene. Responding members must be mindful of who and what apparatus is on scene and the two-in/two-out concept.

CFR 1910.134: *Procedures for interior structural firefighting.* The employer shall ensure that:

- (i) At least two employees enter the IDLH atmosphere and remain in visual or voice contact with one another at all times;
- (ii) At least two employees are located outside the IDLH atmosphere; and
- (iii) All employees engaged in interior structural firefighting use SCBAs.⁶⁹

According to the standard, one of the two individuals located outside the IDLH atmosphere may be assigned to an additional role, such as incident commander in charge of the emergency or safety officer, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident.

NFPA 1500, *Standard on Fire Department Occupational Health, Safety, and Wellness*, 2018 Edition, has similar language as CFR 1910.134(g)(4) to address the issue of two-in/two-out, stating “the initial stages of the incident where only one crew is operating in the hazardous area of a working structural fire, a minimum of four individuals shall be required consisting of two members working as a crew in the hazardous area and two standby members present outside this hazard area available for assistance or rescue at emergency operations where entry into the danger area is required.”⁷⁰

NFPA 1500 also speaks to the utilization of the two-out personnel in the context of the health and safety of the firefighters working at the incident. “The assignment of any personnel including the

69. CFR 1910.134 (g) 4

70. NFPA 1500, 2018, 8.8.2.

incident commander, the safety officer, or operations of fire apparatus, shall not be permitted as standby personnel if by abandoning their critical task(s) to assist, or if necessary, perform rescue, this clearly jeopardizes the safety and health of any firefighter working at the incident."⁷¹

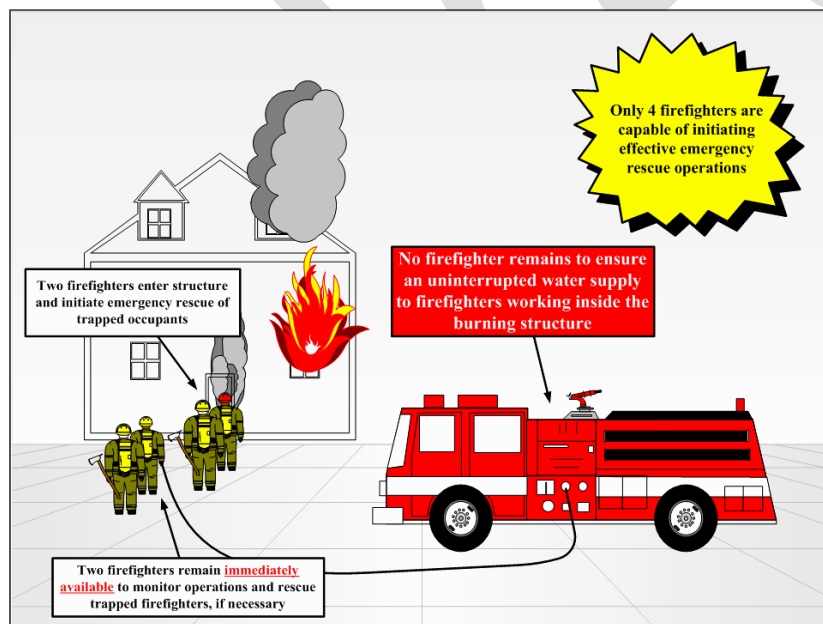
In order to meet CFR 1910.134(g)(4) and NFPA 1500, the LTFD must utilize two personnel to commit to interior fire attack while two firefighters remain out of the hazardous area or immediately dangerous to life and health (IDLH) area to form the IRIT, while attack lines are charged, and a continuous water supply is established. It is CPSM's opinion that in almost all cases this will require a minimum of two companies to commence operations.

However, NFPA 1500 allows for fewer than four personnel under specific circumstances. It states, "Initial attack operations shall be organized to ensure that if on arrival at the emergency scene, initial attack personnel find an imminent life-threatening situation where immediate action could prevent the loss of life or serious injury, such action shall be permitted with fewer than four personnel."⁷²

CFR 1910.134(g)(4) also states that nothing in section (g) is meant to preclude firefighters from performing emergency rescue activities before an entire team has assembled.⁷³

It is also important to note that the OSHA standard (and NFPA 1720) specifically references "interior firefighting." Firefighting activities that are performed from the exterior of the building are not regulated by this portion of the OSHA standard. However, in the end, the ability to assemble adequate personnel, along with appropriate apparatus, on the scene of a structure fire, is critical to operational success and firefighter safety. NFPA 1720 addresses this through the minimum staff to respond matrix this standard promulgates.

FIGURE 5-2: Two-In/Two-Out Interior Firefighting Model*



71. NFPA 1500, 2018, 8.8.2.5.

72. NFPA 1500, 2018 8.8.2.10.

73. CFR 190.134, (g).

The OSHA requirement has two key provisions that allow considerable flexibility regarding staffing:

- One provision specifies that the four personnel who engage in interior firefighting are required at the incident (assembled) and are not a staffing requirement for the individual responding unit(s).
- The second provision is that an exception is provided when crews are performing rescue operations where there is the **potential** for serious injury or death of the occupants. In this case the standard allows the entry of two personnel to conduct the rescue activity without two firefighters outside immediately available to monitor operations and rescue trapped firefighters, if necessary.

LTFD FIRE/EMS OPERATIONS, EFFECTIVE RESPONSE FORCE, AND CRITICAL TASKING

With a population density estimated to be approximately 167 people per square mile Larkin Township is considered a rural community by the Census Bureau. Like most rural communities this creates challenges for the fire department in the form of long travel distances to emergencies, which translates into extended response times and lack of a complete municipal water supply system. The township is primarily residential with an assortment of older and newer construction with a limited number of primarily smaller commercial occupancies scattered throughout. The newer construction is primarily located in areas near the Midland border where there is municipal water available. However, newer, large estate type home homes are scattered throughout the township.

Regarding residential construction, if a fire grows to an area in excess of 2,000 square feet, or extends beyond the building of origin, it is most probable that additional personnel and equipment will be needed, as initial response personnel will be taxed beyond their available resources. From this perspective it is critical that LTFD units respond quickly and initiate extinguishment efforts as rapidly as possible after notification of an incident. It is, however, difficult to determine in every case the effectiveness of the initial response in limiting the fire spread and fire damage. Many variables will impact these outcomes, including:

- The time of detection, notification, and ultimately response of fire units.
- The age and type of construction of the structure. Being primarily a community where much of the development has occurred over the past several decades, many of the new homes in Larkin Township will be of lightweight construction, which is prone to early collapse in a fire situation.
- The presence of any built-in protection (automatic fire sprinklers) or fire detection systems. CPSM was informed that there are no buildings equipped with automatic fire suppression systems in Larkin Township.
- The contents stored in the structure and its flammability.
- The presence of any flammable liquids, explosives, or compressed gas canisters.
- Weather conditions and the availability of water for extinguishment.

Subsequently, in those situations in which there are extended delays in the extinguishment effort, or the fire has progressed sufficiently upon arrival of fire units, there is actually very little that can be done to limit the extent of damage to the entire structure and its contents. This is particularly

true with the limited initial staffing that the LTFD will normally be able to muster. In these situations, suppression efforts may need to focus on the protection of nearby or adjacent structures (exterior exposures) with the goal being to limit the spread of the fire beyond the building of origin, and sometimes the exposed building. This is often termed **protecting exposures**. When the scope of damage is extensive, and the building becomes unstable, firefighting tactics typically move to what is called a **defensive attack**, or one in which hose lines and more importantly personnel are on the outside of the structure and their focus is to merely discharge large volumes of water until the fire goes out. In these situations, the ability to enter the building is very limited and if victims are trapped in the structure, there are very few safe options for making entry.

Today's fire service is actively debating the options of interior firefighting vs. exterior firefighting. These terms are self-descriptive in that an **interior fire attack** is one in which firefighters enter a burning building in an attempt to find the seat of the fire and from this interior position extinguish the fire with limited amounts of water. An **exterior fire attack**, also sometimes referred to as a **transitional attack**, is a tactic in which firefighters initially discharge water from the exterior of the building, either through a window or door, and knock down the fire before entry in the building is made. The concept is to introduce larger volumes of water initially from the outside of the building, cool the interior temperatures, and reduce the intensity of the fire before firefighters enter the building. A transitional attack is most applicable in smaller structures, typically single family, one-story detached units which are smaller than approximately 2,500 square feet in total floor area. For fires in larger structures, the defensive type, exterior attacks generally involve the use of master streams capable of delivering large volumes of water for an extended period of time.

When using an exterior attack, the requirement of having the four persons assembled on-scene, prior to making entry, as discussed in other sections of this report, would not apply. Recent studies by UL have evaluated the effectiveness of interior vs. exterior attacks in certain simulated fire environments. These studies have found the exterior attack to be equally effective in these simulations.⁷⁴ This debate is deep-seated in the fire service and traditional tactical measures have always proposed an interior fire attack, specifically when there is a possibility that victims may be present in the burning structure. The long-held belief in opposition to an exterior attack is that this approach may actually push the fire into areas that are not burning or where victims may be located. The counterpoint supporting the exterior attack centers on firefighter safety.

The exterior attack limits the firefighter from making entry into those super-heated structures that may be susceptible to collapse. From CPSM's perspective, there is at least some likelihood that a single understaffed LTFD crew of two or three personnel will encounter a significant and rapidly developing fire situation. This situation can occur anywhere in the township due to extended response times, particularly in outer areas of the township. It is prudent, therefore, that the LTFD build at least a component of its training and operating procedures around the tactical concept of the exterior fire attack when the situation warrants such an approach.

Fire Operations Recommendation:

- The LTFD should build at least a portion of its training regimens and tactical strategies around the exterior or transitional attack for when the fire scenario and the number of available units/responding personnel warrants this approach. (Recommendation No. 45.)

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74. "Innovating Fire Attack Tactics," U.L.COM/News Science, Summer 2013.

The following table and figures show the fire call totals for the one-year period between September 2, 2021, and August 31, 2022, including number of calls by type, average calls per day, and the percentage of total calls that fall into each call type category. During this time period, LTFD responded to 320 calls, of which 307 calls were included in the analysis. This equates to an average of 0.88 calls per day. Of these, 46.3 percent were-EMS related.

During the period evaluated, the department responded to 142 EMS incidents, an average of 0.4 per day. Illness and other related emergencies made up the largest number of calls with 41 which was 13.4 percent of all calls and 28.9 percent of EMS-related incidents. Breathing difficulty, cardiac and stroke, and seizure and unconsciousness calls account for 18.9 percent of all calls and 40.8 percent of EMS incidents. The department averaged 1.1 of these calls each week.

Of the total number of incidents the department responded to, 84 were fire calls; four of those were structure fire calls and one was an outside fire call. Fire call types were 27.4 percent of the total calls for service, about average for what we normally see in departments that that are heavily involved in the provision of EMS services in their community where fire calls range in the 20% to 30% range. Actual fire calls (structural and outside) were just 1.6 percent of the overall calls for service (approximately one actual fire-type incident every 10.4 weeks). The five actual fires represent 5.9 percent of the fire-related incidents. False alarms, hazardous conditions, and public service calls represent the largest percentage of fire-type calls for service. This experience is typical in CPSM data and workload analyses of other fire departments.

TABLE 5-2: LTFD Calls by Type and Number, and Percent of All Calls

Call Type	Total Calls	Calls per Day	Call Percentage
Breathing difficulty	19	0.1	6.2
Cardiac and stroke	17	0.0	5.5
Fall and injury	21	0.1	6.8
Illness and other	41	0.1	13.4
MVA	21	0.1	6.8
Overdose and psychiatric	1	0.0	0.3
Seizure and unconsciousness	22	0.1	7.2
EMS Subtotal	142	0.4	46.3
False alarm	10	0.0	3.3
Good intent	7	0.0	2.3
Hazard	46	0.1	15.0
Outside fire	1	0.0	0.3
Public service	16	0.0	5.2
Structure fire	4	0.0	1.3
Fire Subtotal	84	0.2	27.4
Aid given*	27	0.1	8.8
Canceled	54	0.1	17.6
Total	307	0.8	100.0

Note: *Calls that occurred outside Larkin Township were labeled as aid given. One aid given call was canceled.

FIGURE 5-3: EMS Calls by Type

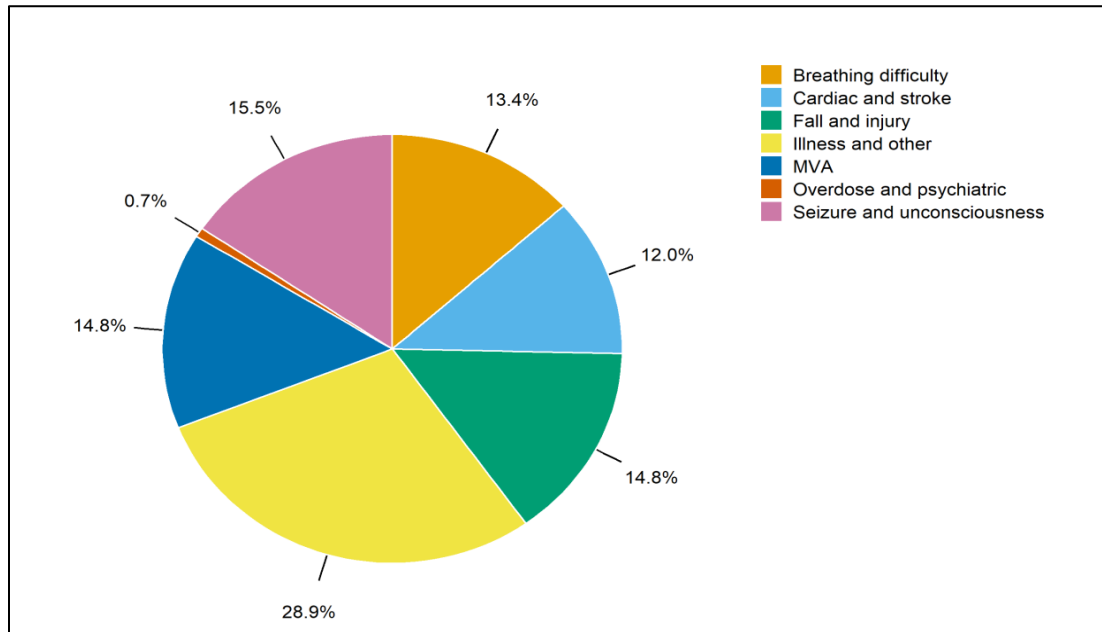
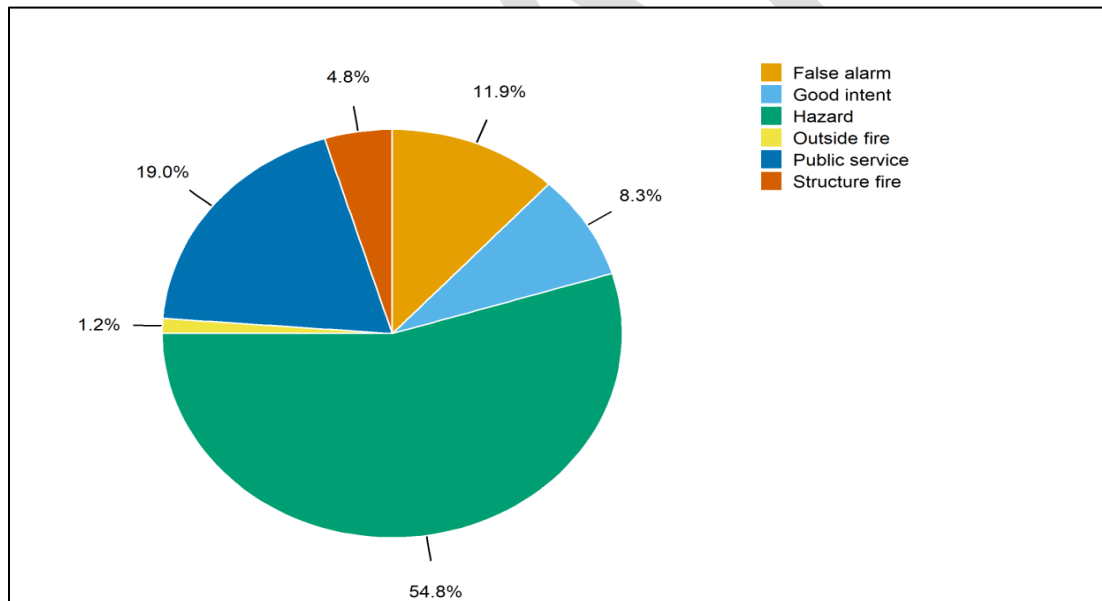


FIGURE 5-4: Fire Calls by Type



The data in this table and figures tells us that:

EMS

- EMS calls for the year totaled 142 (46.3 percent of all calls), an average of 0.4 calls per day.
- Illness and other calls were the largest category of EMS calls at 28.9 percent of EMS calls and 13.4 percent of all calls, an average of one call every 8.9 days.
- Cardiac and stroke calls made up 5.5 percent of EMS calls, an average of one call every 21.5 days.

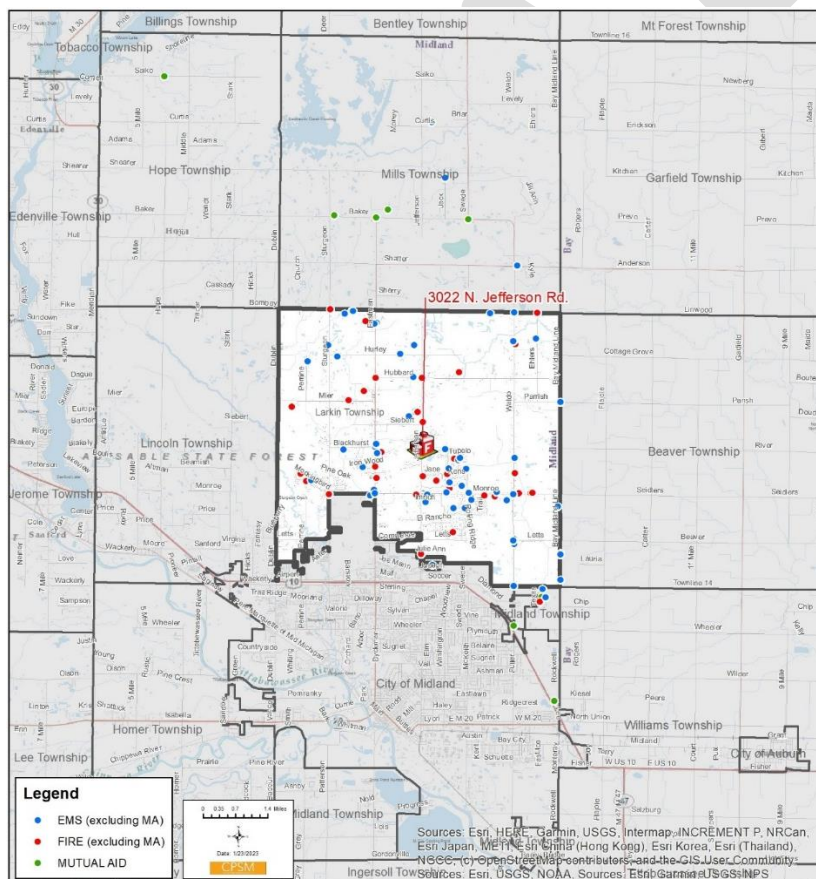
- Motor vehicle accidents made up 6.8 percent of EMS calls, an average one call every 17.4 days.

Fire

- Fire calls for the year totaled 84 (27.4 percent of all calls), an average of one call every 4.4 days.
- Structure and outside fire calls combined made up 5.9 percent of fire calls, an average of one actual fire type incident every 10.4 weeks.
- A total of four structure fire calls accounted for 4.8 percent of the fire calls.
- A single outside fire call accounted for 1.2 percent of the fire calls.
- Hazardous condition calls were the largest category of fire calls at 54.8 percent of fire calls, an average of 0.88 calls per week.
- Public service calls were the second largest fire call category, with 19.0 percent of the fire calls, an average of one every 3.2 weeks.

The next figure illustrates the locations of fire and EMS calls in Larkin Township during the study period.

FIGURE 5-5: Fire and EMS Demand Map



The next table summarizes the annual workload of LTFD units including officers and firefighters who have radios and can respond directly to calls. Because multiple units—and in this case

individual personnel—respond to some calls, there are more runs (604) than calls (307) and the average deployed time per run varies from the total duration of calls.

TABLE 5-3: Annual Workload by Unit

Unit	Unit Type	Minutes per Run	Total Hours	Total Percent	Minutes per Day	Total Runs	Runs per Day
L501	Chief	29.1	48.4	17.6	8.0	100	0.3
L502	Asst. chief	142.9	11.9	4.3	2.0	5	0.0
L507	Officer	49.4	9.1	3.3	1.5	11	0.0
L509	Officer	21.6	6.9	2.5	1.1	19	0.1
L510	Officer	14.1	1.4	0.5	0.2	6	0.0
L520	Engine	39.5	29.0	10.5	4.8	44	0.1
L521	Engine	33.9	26.6	9.7	4.4	47	0.1
L530	Tender	103.6	10.4	3.8	1.7	6	0.0
L540	Brush	75.9	11.4	4.1	1.9	9	0.0
L550	Rescue	30.4	23.8	8.7	3.9	47	0.1
L551	Rescue	16.1	45.6	16.6	7.5	170	0.5
L573	Firefighter	20.2	0.3	0.1	0.1	1	0.0
L577	Firefighter	26.8	28.6	10.4	4.7	64	0.2
L581	Firefighter	16.5	6.6	2.4	1.1	24	0.1
L585	Firefighter	10.9	1.1	0.4	0.2	6	0.0
L591	Firefighter	18.6	12.1	4.4	2.0	39	0.1
L593	Firefighter	19.2	0.3	0.1	0.1	1	0.0
L595	Firefighter	16.5	1.4	0.5	0.2	5	0.0
Total		27.3	274.7	100.0	45.3	604	1.7

Note: The units in bold and highlighted above are the LTFD's emergency response vehicles. The remainder of those listed are department officers and firefighters with portable radios.

- Among all units, L551 (Light rescue/EMS quick response vehicle) made the most runs (170 or an average of 0.5 runs per day, or one run every other day) and had the second-highest total annual deployed time (45.6 hours or an average of 7.5 minutes per day).
 - EMS calls accounted for 67 percent of runs and 77 percent of total deployed time.
 - L551 did not respond to any outside or structure fires.
- Among all units, L501 (Fire Chief) made the second-most runs (100 or an average of 0.3 runs per day, or one run every 3.65 days) and had the highest total annual deployed time (48.4 hours or an average of 8.0 minutes per day).
 - EMS calls accounted for 45 percent of runs and 49 percent of total deployed time.
 - Structure and outside fire calls accounted for one percent of runs and four percent of total deployed time.

To effectively respond to and mitigate requests for emergency services, an agency must have a thorough understanding of its community's risk factors, both fire and EMS. Once identified and understood, each category or level of risk is associated with the necessary resources and actions required to mitigate it. This is accomplished through a critical task analysis. The exercise of matching operational asset deployments to risk, or critical tasking, considers multiple factors

including national standards, achievement of benchmark performance measures, and the safety of responders.

Critical tasks are those activities that must be conducted in a timely manner by responders at emergency incidents to control the situation as quickly as possible and stop loss. Critical tasking for fire operations is the minimum number of personnel needed to perform the tasks required to effectively control a fire. The same is true for EMS as there are specific patient care tasks that must be completed in succession and often together to support positive prehospital care. The specific number of people required to perform all the critical tasks associated with an identified risk is referred to as an **Effective Response Force (ERF)**. The goal is to deliver an ERF within a prescribed time frame. NFPA 1720, as a nationally recognized consensus standard on staffing and deployment for volunteer fire departments, provides a benchmark for ERF.⁷⁵

During fire incidents, to be effective, critical tasking must assign enough personnel so that all identified functions can be performed simultaneously. However, it is important to note that secondary support functions may be handled by initial response personnel once they have completed their primary assignment. Thus, while an incident may end up requiring a greater commitment of resources or a specialized response, a properly executed critical task analysis will provide adequate resources to immediately begin bringing the incident under control.

The NFPA *Fire Protection Handbook*⁷⁶ classifies buildings and occupancies by their relative risk and provides recommendations on the minimum ERF that will be needed to handle fire incidents in them. These include:

High-hazard Occupancies: Schools, hospitals, nursing homes, high-rise buildings, and other high life safety-hazard or large fire-potential occupancies. Larkin Township does not have any of these types of occupancies.

Medium-hazard Occupancies: Apartments, offices, and mercantile (strip malls) and industrial occupancies, not normally requiring extensive rescue by firefighting forces. Larkin Township has only a few of this type of occupancy.

Low-hazard Occupancies: One-, two-, or three-family dwellings and scattered small business and industrial occupancies. Larkin Township is almost entirely comprised of this type of occupancy.

Regarding the implementation of an ERF and its aggregate effect on fireground operations, there has been much research done by a number of fire departments on the effects of various staffing levels. These studies have consistently confirmed that company efficiency and effectiveness decrease substantially, and injuries increase when company staffing falls below four personnel. A comprehensive yet scientifically conducted, verified, and validated study titled *Multiphase Study on Firefighter Safety and the Deployment of Resources* was performed by the National Institute of Standards and Technology (NIST) and Worcester Polytechnic Institute (WPI), in conjunction with the International Association of Fire Chiefs, the International Association of Fire Fighters, and the Center for Public Safety Excellence. For the first time, quantitative evidence has been produced regarding the impact of crew size on accomplishing critical tasks. Additionally, continual research from UL has provided tactical insights that shed

75. It is important to note that compliance with NFPA 1720 has not been mandated in the State of Michigan or by the federal government. It is considered a "best practice" that fire departments strive to achieve.

76. Cote, Grant, Hall & Solomon, eds., *Fire Protection Handbook* (Quincy, MA: NFPA 2008), 12-3

further light on the needs related to crew size and firefighter safety. This body of research includes:

- An April 2010 report on *Residential Fireground Field Experiments* from the National Institute of Standards and Technology (NIST).
- An April 2013 report on *High-Rise Fireground Field Experiments* from the National Institute of Standards and Technology (NIST-HR).
- A December 2010 report on the *Impact of Ventilation on Fire Behavior in Legacy and Contemporary Residential Construction* (UL).
- Additional collaborative efforts such as the Governor's Island and Spartanburg Burns continue to expand upon and reinforce the findings of NIST and UL.

As stated, some of these studies' findings have a direct impact on the exercise of critical tasking. For example, as UL studied the impact of ventilation on fire behavior, it was able to obtain empirical data about the effect of water application on fire spread and occupant tenability.

The research clearly indicates that the external application of a fire stream, especially a straight stream, does not "push fire" or decrease tenability in any adjacent rooms. Therefore, during the deployment of resources for the critical task of fire attack, consideration must be given to the option of applying water to the fire from the exterior when able. This approach enables a fire attack that can begin prior to the establishment of an Initial Rapid Intervention Team (IRIT) as well as decreases the time to getting water on the fire, which has the greatest impact on occupant survivability.

The NIST studies examined the impact of crew size and stagger on the timing of fireground task initiation, duration, and completion. Although each study showed crew size as having an impact on time-to-task, consideration must be given to what tasks were affected and to what extent. For example, four-person crews operating at a low-hazard structure fire completed all fireground tasks (on average) 5.1 minutes or 25 percent faster than three-person crews.

- Four-person firefighting crews were able to complete 22 essential firefighting and rescue tasks in a typical residential structure 30 percent faster than two-person crews and 25 percent faster than three-person crews.
- The four-person crews were able to deliver water to a similar sized fire 15 percent faster than the two-person crews and 6 percent faster than three-person crews, steps that help to reduce property damage and reduce danger/risks to firefighters. The latter time represents a 34-second difference.
- Four-person crews were able to complete critical search and rescue operations 30 percent faster than two-person crews and 6 percent faster than three-person crews. The latter time represents a 23-second difference. The "rescue time" difference from a four-person to a three-person crew is seven seconds.

When considering critical tasking for the deployment of an ERF for fire suppression operations, as currently staffed, the LTFD has virtually no chance of handling even fires in single-family dwellings that are limited in size and intensity without the extensive use of automatic and mutual aid. In addition, the department will rarely be able to initiate an interior attack on a fire unless there are potential rescues, until additional automatic or mutual aid resources arrive on scene. Likewise, the ability of the volunteer fire companies that would be responding on automatic/mutual aid would likely face the same challenges depending upon the time of day, and how quickly these automatic and mutual aid partners can arrive on scene to assist.

To be clear, there is no Michigan or federal requirement that specifies staffing levels on fire apparatus, or for that matter, the entire initial response. The closest thing that approaches a requirement for staffing levels is the OSHA 29 CFR 1910.134 standard that was previously discussed.

CPSM advocates structural fire tactics and strategies that are both safe and effective, but sometimes staffing levels can make that dual goal difficult to achieve. Initiating offensive operations with fewer than four firefighters will place firefighters at a high level of risk; delaying operations until additional staffing arrives places occupants in greater danger and can increase property damage.

Ultimately, overall fire department staffing is a local government decision. It is also important to note again that the OSHA standard (and NFPA's 1500/1710/1720) specifically references "interior firefighting." Firefighting activities that are performed from the exterior of the building are not regulated by this portion of the OSHA standard. However, **in the end, the ability to assemble adequate personnel, along with appropriate apparatus to the scene of a structure fire, is critical to operational success and firefighter safety.** How and where personnel and resources are located, and how quickly they can arrive on scene, play major roles also.

All of these factors must be taken into consideration as Larkin Township reaches consensus on the acceptable community fire safety risk level, affordable levels of expenditure for fire protection, and appropriate levels of operational capability. The township will need to consider the cost-benefit of various deployment strategies, such as continuing the current staffing and deployment model, or adopting a modified one based upon options presented within this report.

For the LTFD, emergency responses are based on caller information provided to dispatchers at the Midland County 9-1-1 Center; responses depend on the nature and type of call for service. LTFD details out its response procedures through a response procedure in the dispatch center. This response plan covers a variety of incidents that range from low to high risk. Structure fire responses represent the type of high-risk/low-to-moderate frequency incidents that present the greatest challenges to an organization.

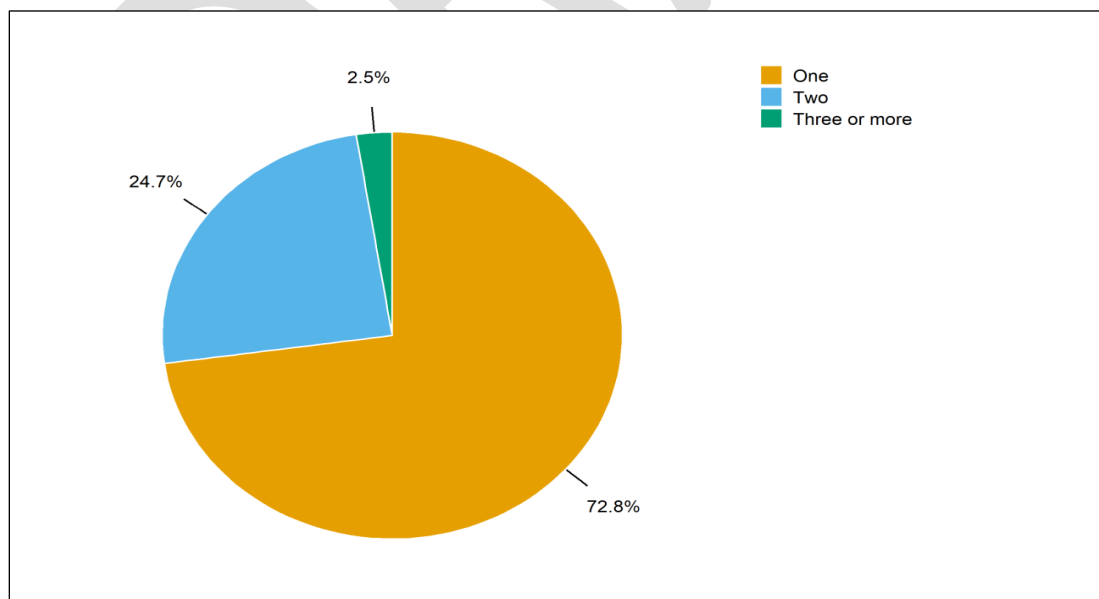
The following table shows the workload of fire responses by number of units arriving to these incident types during the year studied. This table only includes calls where a unit from the LTFD arrived. For this reason, there are fewer calls in this table than in the previous one.

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TABLE 5-4: Calls by Call Type and Number of Arriving Units

Call Type	Number of Units			Total Calls
	One	Two	Three or more	
Breathing difficulty	14	4	0	18
Cardiac and stroke	9	6	0	15
Fall and injury	13	6	0	19
Illness and other	32	4	0	36
MVA	10	8	3	21
Seizure and unconsciousness	18	3	0	21
EMS Subtotal	96	31	3	130
False alarm	4	4	1	9
Good intent	6	0	0	6
Hazard	27	11	1	39
Outside fire	0	1	0	1
Public service	14	1	0	15
Structure fire	1	2	1	4
Fire Subtotal	52	19	3	74
Aid given	18	8	0	26
Canceled	8	1	0	9
Total	174	59	6	239
Percentage	72.8	24.7	2.5	100.0

Note: Only calls with arriving LTFD units were considered. There were 68 calls where an LTFD unit recorded an en route time, but no unit recorded an arrival time. This included 45 canceled calls, 12 EMS calls, 10 fire calls, and one mutual aid call.

FIGURE 5-6: Calls by Number of Arriving Units

A more in-depth analysis of the data in the above table and figure tells us:

- On average, 1.3 LTFD units arrived at all calls; for 72.8 percent of calls, only one unit arrived.
- Overall, three or more LTFD units arrived at 2.5 percent of calls.
- On average, 1.3 units arrived per EMS call.
 - For EMS calls, one unit arrived 74 percent of the time and two or more units arrived 26 percent of the time.
- On average, 1.3 units arrived per fire call.
 - For fire calls, one unit arrived 70 percent of the time, two units arrived 26 percent of the time, and three or more units arrived four percent of the time.
 - For the single outside fire call, two LTFD units arrived.
 - For structure fire calls, three or more units arrived 25 percent of the time.

For any given emergency to which the LTFD responds, there are critical tasks that must be completed. These tasks can range from the immediate rescue of trapped occupants within a burning structure to vehicle or water rescue when needed. A set of critical tasks have been developed in an effort to identify what resources are needed for each incident type. LTFD has developed response matrixes detailing the initial levels of response for varying incident types. Most of these involve an initial response of just the LTFD. The following critical task analysis was performed independent of these policies.

The intent of the risk management process is for the department to develop a standard level of safety while strategically aligning its resources with requests for service. Thus, the critical tasking presented herein will consider the EFR in relation to a low-risk classification.

LTFD utilizes a standard assignment for reported structure fire responses that includes the initial dispatch of the LTFD along with Midland for a ladder truck and battalion chief, which provides four additional personnel. At times the Midland rescue also responds, which provides two additional personnel. The total number of personnel who are responding will be contingent upon how many LTFD personnel are initially available to respond and whether additional mutual aid resources are requested to respond.

LTFD utilizes Active911, a software app that links responding apparatus and responding volunteers to the CAD system, which alerts responding members, apparatus, and command officers who and what personnel and/or apparatus are responding to an incident or the station to respond with apparatus. The features of this software include:

- Members can receive call notifications through the communications system (CAD) to their smartphone.
- When a member utilizes the response functions, the member can alert command officers and apparatus driver/operators they are responding to the scene or the station. Active911 is linked to the apparatus mobile data computer.
- The Active911 App provides a map display of the incident location, directions to the scene, and the live location of responding members and apparatus (as long as members and apparatus are using the system). Through this system, command officers have an initial accountability of responding members and where they are responding to (scene or station).
- When members are responding to the station their live locations are displayed, which alerts command officers and apparatus driver/operators where they are, assisting driver/operators in determining whether to wait on a member prior to rolling apparatus.

The variables of how and where personnel and companies are located, and how quickly they can arrive on scene, play major roles in controlling and mitigating emergencies. **The reality is that LTFD relies on volunteer response from home or work to make up the teams and crews of the Effective Response Force.** LTFD's volunteer availability at any time of the day may have an impact on assembling enough personnel and resources on the scene. This factor has to be considered at all times by those responding to the scene, those responding to the station to pick up apparatus, and command officers responding who must manage and coordinate available responding and on-scene resources.

The following discussion and tables will outline how critical tasking and assembling an effective response force is first measured in NFPA 1720 for a rural demand zone, and then how the companion NFPA 1710 is benchmarked against this standard for single-family dwellings, which constitute the overwhelming majority of structures in Larkin Township.

TABLE 5-5: Minimum Personnel Response in a Rural Demand Zone, Single-Family Dwelling, Low/Moderate Risk

Critical Task	Number of Personnel Assigned to Task
■ Attack Line/Search and Rescue (two-In/two-out)	2
■ Outside crew for: initial engine pump operator (sets pump then assists with outside tasks), ventilation, utility control, hose management, potential exposure line, or additional fire suppression line. ■ One member may take on incident command function coordinating with interior crew(s) until additional crew members/command officers arrive on scene.	2
■ Backup/Second Line	2
Total Minimum Response for Rural Demand Zone	6

As has been mentioned previously, when the fire department only needs to assemble this number of personnel on scene—and within 14 minutes—the incident commander's tactical options are going to be limited and primarily confined to defensive operations, or even just protecting exposures.

In the rural (and suburban) demand zones critical tasks are combined and often delayed, creating circumstances where these critical tasks are completed in sequence, rather than simultaneously. The rural and remote demand zone minimum staffing can place one attack line in service, and then combine two-person crews (two for rural; one for remote) to handle one or two other critical tasks until additional crew members arrive on scene. Achieving completion of the basic fireground critical tasks is far less than optimal in the rural and remote demand zones.

By comparison, the following table illustrates the suggested staffing in NFPA 1710 for the same fire in a community that is protected by a career fire department (the urban demand zone in NFPA 1720 recommends a slightly smaller ERF of 15 personnel) which recommends a significantly higher minimum; however, critical tasks are completed simultaneously.

The initial full alarm assignment (ERF) to a structural fire in a typical 2,000 square-foot, two-story, single-family dwelling without a basement and with no exposures must provide for a minimum of 16 members (17 if an aerial device is used). The following table outlines the critical task matrix illustrates this, and the subsequent figure illustrates it.

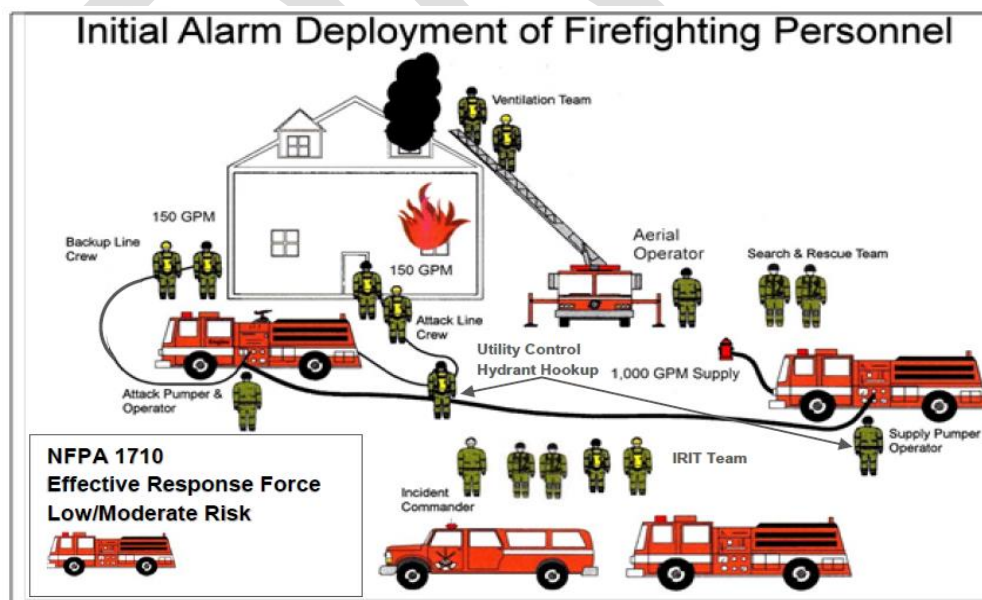
TABLE 5-6: NFPA 1710 Structure Fire, Single Family Dwelling – Low/Moderate Risk

Critical Task	Needed Personnel
Incident Command	1
Continuous Water Supply/Pump Operator	1
Fire Attack via Two Handlines	4
Hydrant Hook-Up, Forcible Entry, Utilities	2
Primary Search and Rescue	2
Ground Ladders and Ventilation	2
Aerial Operator (if Aerial is Used)	1
Establishment of an IRIT (Initial Rapid Intervention Team)	2
Effective Response Force	16/17

These tasks meet the minimum requirements of NFPA 1710 for the initial full alarm assignment to a typical low-risk, 2,000 square-foot, two-story residential structure. These are the proverbial “bread and butter” structural fire incidents that fire departments respond to, and which are, by far, the most common type of structure fire.

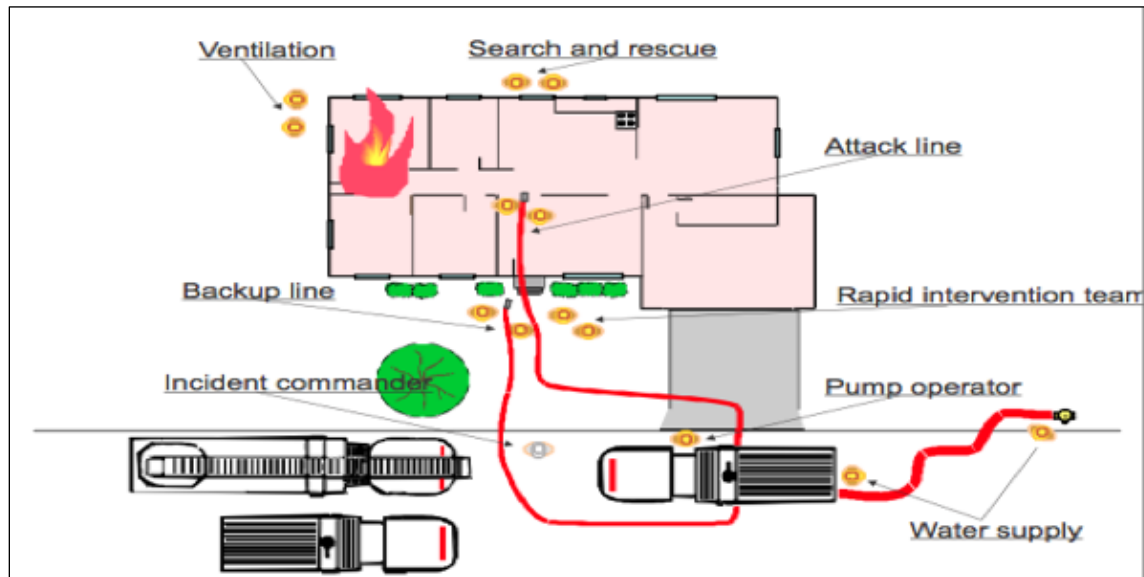
This table and the next figure serve as a good benchmark for critical tasking that needs to be accomplished to mitigate the most common type of structural fire incident, which is the single-family dwelling. The next figure illustrates how a properly staffed Effective Response Force integrates simultaneously to accomplish these fireground goals.

FIGURE 5-7: NFPA 1710 Initial Deployment of Firefighting Personnel/ERF Recommendation– 7 Personnel: Low/Moderate Risk, Single-family Dwelling



The next figure illustrates a slightly smaller ERF for a single-family dwelling utilizing **14 personnel** instead of the **17** shown in the previous figure.

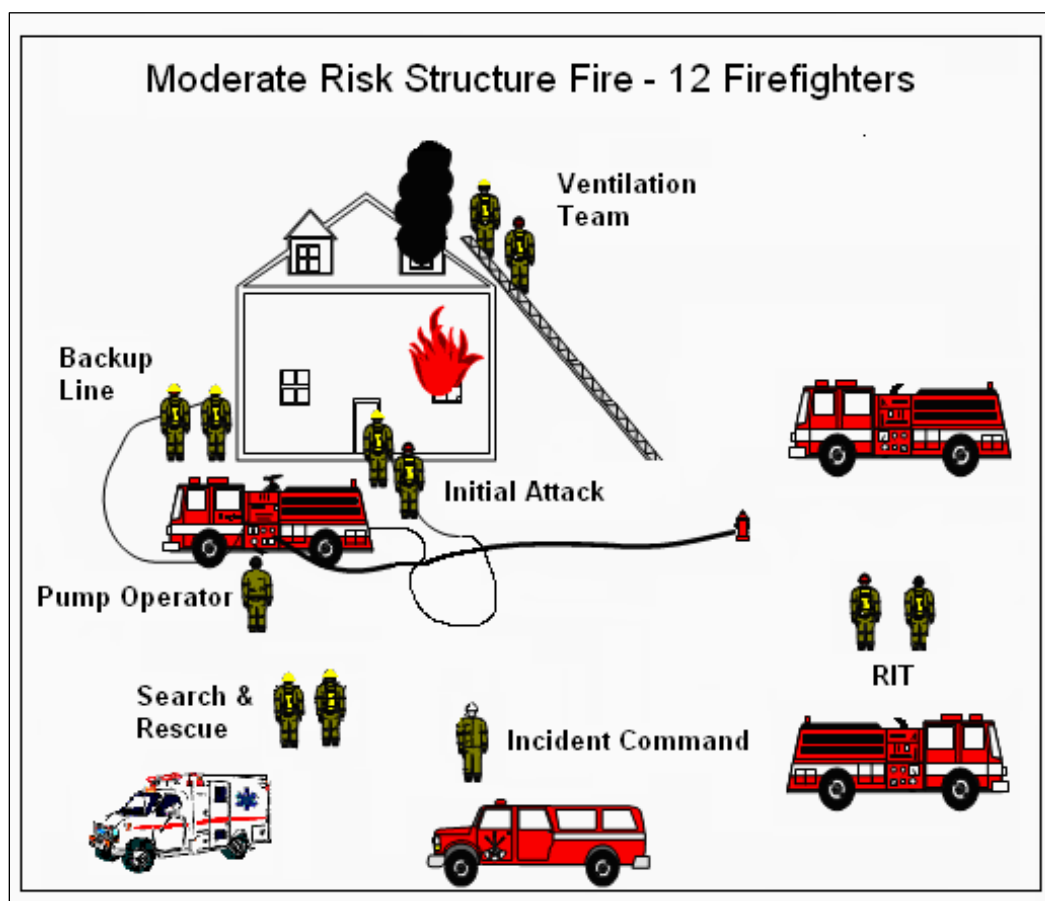
FIGURE 5-8: Initial Deployment of Firefighting Personnel–14 Personnel: Low/Moderate Risk, Single-family Dwelling



The last figure in this sequence illustrates a fire attack with a true barebones personnel complement of just **12 personnel**. At this point critical tasks are probably being delayed and are taking longer to complete. However, depending upon circumstances, an effective interior attack with support functions being performed may be mounted.

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**FIGURE 5-9: Initial Deployment of Firefighting Personnel–12 Personnel:
Low/Moderate Risk, Single-family Dwelling**



Although risk management processes and appropriate call screening are important parts of determining the appropriate number of resources that should be initially dispatched to various types of emergency incidents, it is also important that enough personnel and resources be initially available to handle all critical tasks in a timely manner should they need to be performed. For this reason, it is the widespread practice in the fire service to send multiple resources to incidents that ultimately end up not being utilized if the incident turns out to be a minor one that is easily mitigated. Even today, within reason, this remains a prudent approach. It is in support of this concept that CPSM recommends modifications to the LTFD's initial dispatch of resources to various incidents.

It is important to remember that the effective response force personnel needs contained in NFPA 1710 are still the minimum number of personnel that are needed to be able to accomplish the critical tasking identified. They are not all-inclusive as to personnel needs. For instance, this tasking provides for two initial attack lines, not three, which are often needed for multistory dwellings. It also includes just two personnel on each line, which requires the officer to either be on the nozzle, or advancing the line as a back-up rather than monitoring conditions, supervising the application of the water, and coordinating other activities.

They may also include other clarifying factors. For instance, the low-hazard structure fire is based on a fire in a typical 2,000 square-foot, two-story, single-family dwelling without a basement and with no exposures. It does not consider factors such as lightweight construction, and the fact

that in many parts of the country homes have basements, and often have multiple exposures close by. In addition, many of the new homes being constructed today are much larger than 2,000 square feet. Housing types such as townhouses and condominiums are also gaining popularity as “single family” dwellings. All of these factors contribute to the knowledge that many experienced chief officers possess that the actual personnel needs are often higher depending upon the severity of the incident.

Overall, there were just four structure fires in Larkin Township between September 2, 2021, and August 31, 2022. The next table presents these structure fires and the number of units and personnel that arrived at these calls.

TABLE 5-7: Structure Fires by Number of Response Runs and Arriving Personnel

CFS Number	Date	Address	Larkin Twp FD		Midland City FD	
			Units	Personnel	Units	Personnel
M101821-144	10/18/2021	2723 Waskevich Ln.	2	3	3	6
M110621-005	11/6/2021	2573 N. Arbutus Ct.	3	3	3	6
M022522-076	2/25/2022	4424 E. Monroe Rd.	2	5	3	6
M042922-115	4/29/2022	N. Eastman Rd. & E. Hubbard Rd.	1	2	5	8

Note: We included the arriving units of both Larkin Twp. FD and Midland City FD.

According to the data provided, for three of the four structure fires the LTFD was able to only field three or fewer personnel. The most that responded was five personnel. **This should be an area of great concern to the township and the LTFD leadership.** Generally, reported structure fires elicit the largest turnout of volunteer/on-call personnel of any type of incident. **If this is the normal structure fire response by the LTFD to these types of incidents, concern for the long-term viability of the organization is certainly reasonable.** In addition, the department may be portraying a false sense of security to the community. Fortunately, the MFD was able to provide six personnel for three of the four fires and eight for the fourth one. These responses on automatic/mutual aid allowed there to be a larger response force assembled than is suggested for rural communities. This undoubtedly improved operations on the fire ground.

It is important to note again that Larkin Township does not have very many structure fires. A small deviation in the number of fires in a given year can significantly skew these statistics. While not covered by the NFPA 1720 recommendations, other types of incidents (vehicles fires, brush fires, motor vehicle accidents) may still require six or more personnel to mitigate. For all fire-related (non-EMS) incidents the statistics are not significantly better than those for structure fires. The average number of personnel who respond to various types of incidents also illustrates the staffing challenges facing the township.

The next table shows the average, 80th percentile, and 90th percentile travel times for the first arriving unit. For this section, NFPA defines travel time as beginning from when the first unit goes en route—even if it is not the same unit that arrived first. Thus, this travel time corresponds to the travel time of an entire call. Here, only arriving units were included.

TABLE 5-8: Average, 80th Percentile, and 90th Percentile Travel Times

Response Type	Minutes			Calls
	Average	80th Percentile	90th Percentile	
First Arriving LTFD Unit	11.9	14.4	16.3	4
First Arriving Midland City FD Unit	9.0	10.2	10.8	4
First Arriving Unit Overall	8.9	10.2	10.8	4

It is important to note on the above table that the MFD response times for all three response time criterion are significantly less than those of the LTFD. While the MFD is a career department with staffed stations, if it is consistently arriving on scene first that is also cause for considerable concern. It was reported to CPSM by the Midland FD that it is often first on location of structure fires in Larkin Township and in some cases with minor fires have it knocked down prior to the arrival of the LTFD.

When an incident is dispatched, if it is any type of fire-related incident, all personnel are supposed to respond to the station to ensure that the apparatus is able to respond. For motor vehicle crashes, firefighters respond to the station, officers may respond directly to the scene. For EMS incidents, while personnel are supposed to respond to the station, they are permitted to go to the scene if they will pass it en route to the station. However, they must also be trained and have proper equipment.

The LTFD does have somewhat of a minimum staffing requirement for its apparatus in that there should be a minimum of two personnel on the first unit responding to an incident. Other units can respond with just one personnel rather than a much more desirable minimum of three or the recommended four. It was reported to CPSM that the number of apparatus on an emergency incident sometimes almost matches the total number of personnel, particularly during the day. This situation is neither effective, efficient, nor safe from an operational perspective. It is our opinion that without a significant increase in the active membership resources the LTFD will rarely be able to get both sufficient properly staffed apparatus and personnel to the scene of significant incidents without turning to its neighboring departments for assistance.

Another viable solution to the staffing challenges, one that has been successful in many other on call/volunteer fire departments, is the implementation of a **duty crew system**. Under the duty crew system, the department could be divided into multiple duty crews. The duty crew would have their own separate alert tone and would function on some type of rotational system with the other crews, perhaps one week on and one or two/three weeks off, or one night per week. Only the "duty crew" would be dispatched initially to minor incidents often referred to as "still" alarms. These crews would handle most incidents, thus relieving the remainder of the membership from the need to be available to respond to them.

The advantage of the duty crew system is two-fold. It preserves the active, primary response role of a volunteer force while simultaneously reducing the constant need for personnel to respond to all incidents. Statistical analysis of incident response data and trends, once the program is operational, would provide guidance on what adjustments to the program may be required to optimize its effectiveness.

Looking ahead, there are several methods a volunteer fire department can consider and implement to ensure safe and effective response while maintaining efficient service to the citizens. Examples of different volunteer staffing models include:

- Apparatus-only response (minimally staffed apparatus with no or limited personal vehicles to scene response). This is the system that the LTFD currently utilizes for response to fire-type incidents. For EMS incidents qualified medical personnel may respond directly to the scene if they would pass it (or are significantly closer) on the way to the station.
 - Initial response of members to station, assemble a crew of at least three personnel (Driver/Operator, Officer or designated crew leader, firefighter); apparatus responds. Under this model many volunteer departments establish individual companies by the apparatus they deploy (engines – ladders - rescues), assign members and officers who then maintain and staff the apparatus, and then train together to increase their effectiveness on the emergency scene.
- Hybrid response (minimally staffed apparatus with personnel maintaining duty crews).
 - For nights and weekends when volunteer members are typically more readily available, assign a minimum crew of three (four preferable) to duty who respond from home to the station to assemble and respond the first apparatus for all calls. Other members respond to the station based upon the type of incident such as an actual (structure) fire or serious motor vehicle crash. Typical crew assignment commitment times are 6:00 p.m. to 6:00 a.m.
- Daytime response.
 - Members should register through Active9-1-1 that they are available and if qualified, that they will respond to the station and deploy the apparatus. This ensures accountability to the overall system of available responding members and how an effective response force can be assembled during those hours when volunteer members are not as readily available.

It is critically important to stress that, in the context of staffing requirements for fire and emergency response operations, certain minimum standards of training and certification must be met. Just because an individual has been on the fire department rolls for many years, has a set of personal protective equipment (PPE), and responds to calls does not necessarily make them a “qualified” firefighter by modern-day standards and best practices. For a member to be qualified for the purposes of staffing considerations, they should, at a minimum, be:

- Firefighter I and II certified.
- SCBA qualified with up-to-date fit test and proficiency evaluation.
- Medically qualified (required by OSHA for SCBA certification) and physically capable.
- Hazardous materials operations certified.
- Completed Incident Management System I-100, I-200, I-700, and I-800 training.
- Completed all mandatory annual training requirements.
- Participate in the required number of minimum hours of training per year.
- Be CPR and First Responder certified.

Paragraph 4.7.3 of NFPA 1720 states, the fire department shall be allowed to use established automatic aid or mutual aid agreements to comply with the requirements of Section 4.7, *Sustained Firefighting Operations*. Paragraph 4.3.5, Staffing and Deployment, states, “*standard response assignments and procedures, including mutual aid response and mutual aid agreements predetermined by the location and nature of the reported incident, shall regulate the dispatch of companies, response groups, and command officers to fires and other emergency incidents.*”

The lack of adequate on-scene staffing is a frequent finding in National Institute for Occupational Safety and Health (NIOSH) firefighter fatality investigation reports. For example, the final NIOSH report on the death of a firefighter in Sedgewick County Kansas, in the early 1990s cited a number of "preventable events" that contributed to the firefighter's death, not the least of which was an inadequate number of personnel on the initial response. The report went on to say, "A two-firefighter engine is, at minimum, 50 percent under-staffed and increases the work effort of the two firefighters by a factor of 3." Almost every NIOSH line-of-duty death report recommends that fire departments "provide adequate firefighter staffing to ensure safe operating conditions."

Fire/EMS Operations Recommendations:

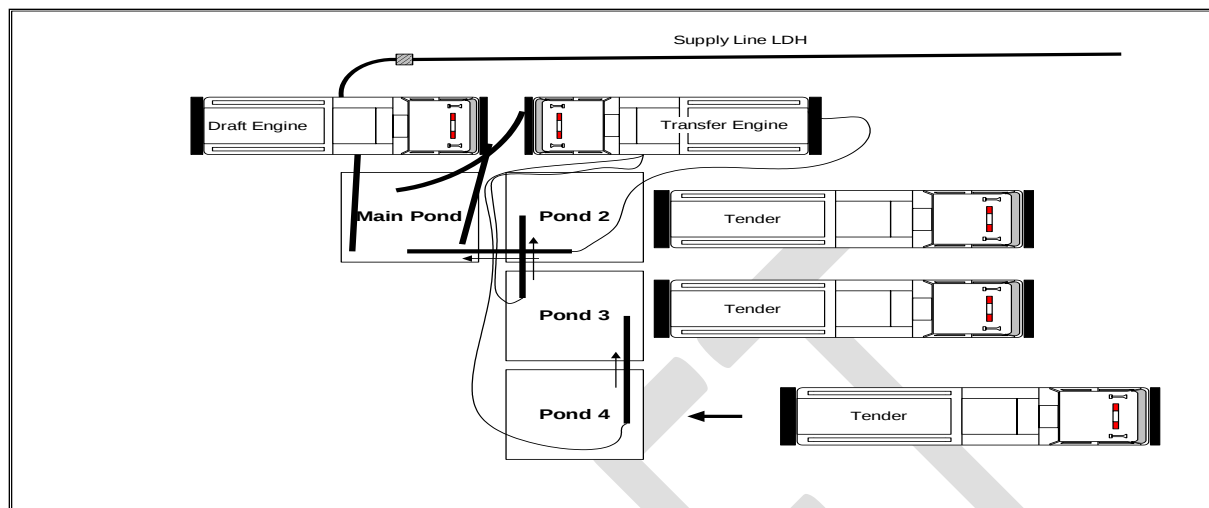
- The LTFD should revise and enhance its initial dispatch and response protocols to include the immediate and automatic dispatch of additional firefighting resources from surrounding communities for any reported structure fire to attempt to provide for the quicker establishment of a larger ERF of 15 to 17 personnel to these types of emergencies. (Recommendation No. 46.)
- The LTFD should implement a policy that the first apparatus responds with a minimum of three personnel, namely, a qualified driver/operator, an officer, and a minimum of one (two is preferable) qualified/certified firefighter. (Recommendation No. 47.)
- The LTFD should implement a policy that ALL apparatus responding to emergency incidents beyond the first apparatus should be staffed with a minimum of two personnel. For an apparatus that has additional seating capacity, three personnel is even more desirable and should be mandated. (Recommendation No. 48.)
- The LTFD should discontinue the practice of allowing apparatus to respond with just one firefighter unless specifically authorized by a chief officer. (Recommendation No. 49.)
- The LTFD should consider the adoption of a duty crew program on nights and weekends to ensure the response of a minimum number of personnel while simultaneously easing the burden on the remainder of the personnel to respond to minor incidents. (Recommendation No. 50.)
- The LTFD should develop a guideline that outlines the use of the Active9-1-1 wireless phone platform and make this system mandatory for all responders who have access to a wireless phone to ensure accountability of all responders and also provide an update status of member availability. (Recommendation No. 51.)

Water Supply

The ability to quickly develop an adequate and sustainable water supply is key to successful mitigation of almost every fire incident. Larkin has a good municipal water supply system in some parts of the township for fire department use. The bulk of the township does not have a water system, which requires the fire department to establish, and then maintain, an adequate supply of water to fight a fire. The establishment of a rural water supply operation requires significant resources, both personnel and equipment, in addition to a closely coordinated effort. Portable tanks are set up near the fire scene to supply engines operating to attack the fire. Water tenders transport water from water supply sources located throughout the town to the dump tanks near the incident. The larger the fire, and the distance from the fire to the closest source(s) of water, will both directly impact the size and complexity of this type of operation. At an absolute minimum, three rated Class A pumpers are required to maintain a rural water supply operation, along with an adequate number of tenders/tankers. If a water supply is being established

through the use of large diameter hose, an additional pumper will be required at no more than each interval of 1,000 feet.

FIGURE 5-10: Typical Set-up for a Water Tender Supply Operation for a Rural Fire



The LTFD utilizes its water tender to initially supply water for fire suppression operations until the arrival of additional water supply units.

Fire Operations Recommendation:

- The LTFD should revise and enhance its initial dispatch and response protocols to include the immediate and automatic dispatch of at least two water tenders from surrounding communities for any reported structure fire in the areas of the township where there are no fire hydrants. Additional tenders can be dispatched, if necessary, after the arrival of a chief officer on the scene, and the completion of an initial size-up. (Recommendation No. 52.)

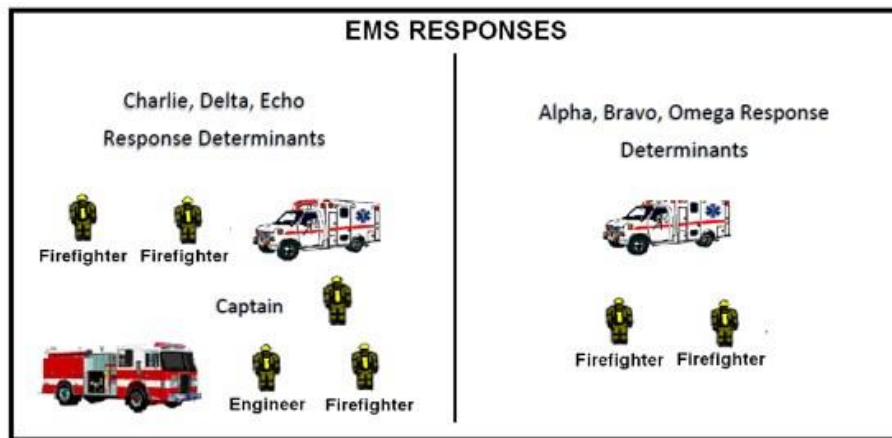
EMS Critical Tasking

Establishing an ERF for medical emergencies is significantly less labor intensive than it is for fire incidents. NFPA 1720 is silent on this topic. The companion standard NFPA 1710 provides guidance regarding staffing levels for units responding to EMS incidents; however, the provision does not specify a minimum staffing level for EMS response units. Instead, section 5.3.32 of the standard states: “EMS staffing requirements shall be based on the minimum levels needed to provide patient care and member safety.” It further recommends that resources should be deployed to provide “for the arrival of a first responder with AED within a 240-second travel time to 90 percent of the incidents,” and, “when provided, the fire department’s EMS for providing ALS shall be deployed to provide for the arrival of an ALS unit within a 480-second travel time to 90 percent of the incidents provided a first responder with AED or BLS unit arrived in 240 seconds or less travel time.”

EMS calls are typically managed with fewer personnel, and the majority of EMS calls can be handled with a single ambulance staffed with two personnel. In the call-screening process, those calls that require additional personnel are typically identified at the dispatch level and additional personnel can be assigned when needed. These types of incidents could include cardiac and respiratory arrest, unconscious persons, and other incidents where the initial call seems to indicate a severe and imminent threat to life. NFPA 1710 suggests for these types of emergencies that “personnel deployed to ALS emergency responses shall include a minimum of

two members trained at the emergency medical technician–paramedic level and two members trained at the emergency medical technician–basic level arriving on scene within the established travel time." However, these types of emergencies constitute a small percentage of overall EMS incidents as identified herein.

FIGURE 5-11: Typical EMS ERF



Critical tasks by specific call type for fire response to EMS incidents are not always as well-defined as those critical tasks in the fire discipline. That notwithstanding, critical tasking in EMS is typical of that in the fire service in that there are certain critical tasks that need to be completed either in succession or simultaneously. EMS on-scene service delivery is based primarily on a focused scene assessment, a patient assessment, and then followed by the appropriate basic and advanced clinical care through established medical protocols.

EMS incidents comprise nearly half of the LTFD's call volume. Because the ambulances for these calls in Larkin Township are responding from other municipalities there will be an inherently increased timeframe for units to arrive on scene. As a result, the LTFD is dispatched to all EMS calls that occur in the township. The normal fire department response to these incidents is with a utility/quick response vehicle. This is a prudent use of resources. Personnel who would need to pass the scene to get to the station are permitted to stop and render assistance, particularly for life-threatening type of emergencies, provided they are properly trained.

Safety Officer, Accountability System

A critical component of the incident command system is the establishment of the role of safety officer to monitor conditions at fires and emergency incident scenes to ensure that appropriate safety procedures are being followed. The incident safety officer is an important member of the incident command team. The safety officer works directly under and with the incident commander to help recognize and manage the risks that personnel take at emergencies. The LTFD does have a designated safety officer who currently holds the rank of Lieutenant. However, when he is not available to respond, and often with very limited staffing, particularly during the day, the critical role of safety officer often goes unfilled. This can create a trickle-down effect by causing other critical tasks like personnel accountability to be delayed or neglected.

A companion component of incident scene safety is the use of an emergency scene accountability system utilizing tracking mechanisms that account for individual members by name and where they are operating (interior, exterior, roof, extrication, hose line, hazard control etc.) and who they are operating with (interior crew, extrication crew, attack hose line crew, search and rescue crew, ventilation crew etc.).

A component of the accountability system is the incident scene Personnel Accountability Report or PAR, which occurs at various intervals of an emergency incident, or at critical incident junctures such as a building collapse, flashover, equipment failure, or hose line or fire pump issues. A PAR check is made with crews or groups that have radio contact with Incident Command. Matching names with crews and groups is a critical link to account for every member on the emergency scene at all times.

The 2021 edition of NFPA 1500 standard on *Fire Department Occupational Safety, Health, and Wellness Program* is clear on this critical emergency scene function. Additionally, the 2020 edition of NFPA 1561, *Emergency Services Incident Management System and Command Safety*, more specifically addresses emergency scene accountability. These standards include the following language as outlined in the following table.

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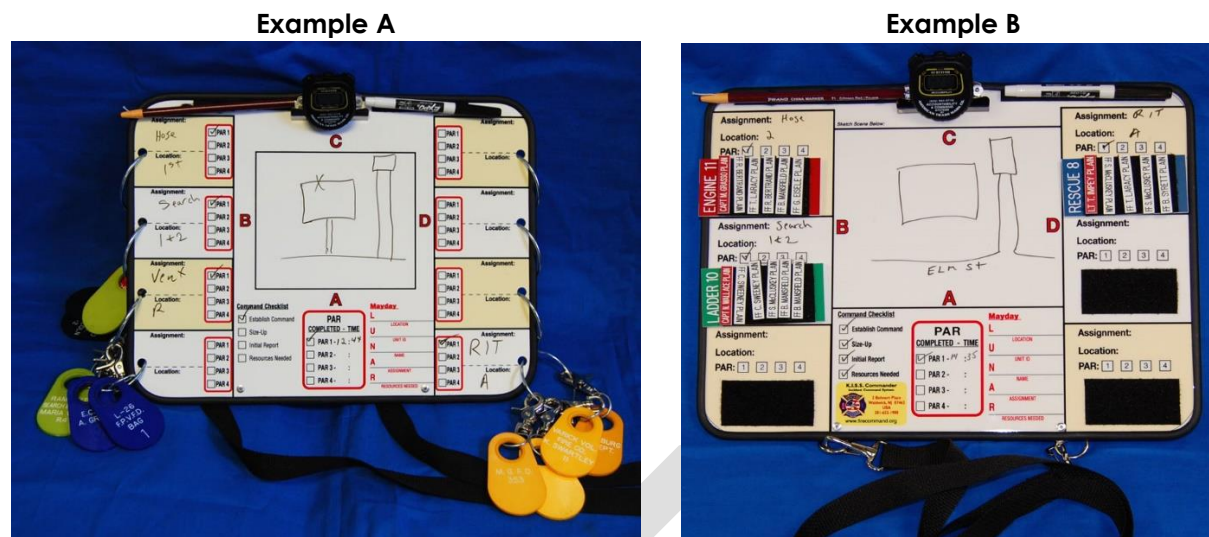
TABLE 5-9: Emergency Scene Accountability: NFPA 1500 and NFPA 1561

NFPA 1500	NFPA 1561
8.5.1: The fire department shall establish written standard operating procedures for a personnel accountability system; this is in accordance with NFPA 1561.	4.6.1: The ESO shall develop and routinely use a system to maintain accountability for all resources assigned to the incident with special emphasis on the accountability of personnel.
8.5.3: It shall be the responsibility of all members operating at the emergency incident to actively participate in the personnel accountability system.	4.6.2: The system shall maintain accountability for the location and status condition of each organizational element at the scene of the incident.
8.5.4: The incident commander shall maintain an awareness of the location and function of all companies or crews at the scene of the incident.	4.6.3: The system shall include a specific means to identify and keep track of responders entering and leaving hazardous areas, especially where special protective equipment is required.
8.5.8: Members shall be responsible for following personnel accountability system procedures.	4.6.5: Responder accountability shall be maintained and communicated within the incident management system when responders in any configuration are relocated at an incident.
8.5.9: The personnel accountability system shall be used at all incidents.	4.6.6: Supervisors shall maintain accountability of resources assigned within the supervisor's geographical or functional area of responsibility.
8.5.10: The fire department shall develop, implement, and utilize the system components required to make the personnel accountability system effective.	4.6.10: Responders who arrive at an incident in or on marked apparatus shall be identified by a system that provides an accurate accounting of the responders on each apparatus.
	4.6.11: Responders who arrive at the scene of an incident by other means other than emergency response vehicles shall be identified by a system that accounts for their presence and their assignment at the incident scene.
	4.6.14: The system shall also provide a process for the rapid accounting of all responders at the emergency scene.

Accountability systems include tracking systems where responding apparatus crews or individuals deliver accountability tags to Incident Command for use when command assigns members and companies, and forms crews and groups (interior, roof, hazard control etc.). The Incident Commander places the accountability tags on a board or other tracking instrument that he/she can constantly visualize, move when crews are reassigned, and maintain accountability awareness.

The next figure illustrates accountability boards used by fire department incident commanders.

FIGURE 5-12: Accountability Boards



Example A shows a simple system of tags clipped to an accountability board by assignment of task and crew. In this system individual members are issued tags that they clip to their turnout coat. When they are riding on the engine or ladder, they clip an individual tag to the engine or ladder tag. If they respond in their POV, on arrival they would report to command and provide the Incident Commander with their tag. The Incident Commander will then clip either the apparatus tag with individual tags of firefighters arriving on the engine or ladder or of the firefighter arriving via POV in the appropriate assignment area/crew once the engine or ladder crew and individual firefighter is assigned.

Example B is the same system using engraved tags that have Velcro backs. In this system, firefighters are issued accountability tags with their name engraved. They then attach these tags to the underside of their helmets. They place/distribute the tags in the same manner as described in Example A. The firefighter attaches the individual tag to the main apparatus tag or provides it to the Incident Commander when arriving on the scene in their POV. When developing guidelines for an incident accountability tag system, the LTFD should script how tags are collected prior to the arrival of a command officer, specifically for initial arriving firefighters in POVs prior to apparatus.

Safety Officer, Accountability System Recommendations:

- The LTFD should ensure that the critical role of Safety Officer is filled on every significant incident regardless of whether the department's designated Safety Officer is on the scene or not. (Recommendation No. 53.)
- The LTFD should ensure the use of an on-scene accountability function on every incident and which incorporates individual and apparatus accountability tags as well as accountability boards in all apparatus and response vehicles. The personnel accountability guideline should incorporate language from NFPA standards 1720, 1500, and 1561. (Recommendation No. 54.)

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FIRE PREPLANNING

An important part of risk management in the fire service is pre-fire planning inspections by fire companies of large, high-hazard, and complex buildings in each fire response zone. Conducting pre-fire surveys by fire companies can have significant impact on both potentially reducing structural fire loss and on reducing firefighter injuries. By improving firefighters' understanding of complex building layouts, standpipe locations, etc. as well as by identifying any structural changes and possible code violations, fireground suppression activities can be improved and potential firefighter injuries avoided.

The process of identifying target hazards and pre-incident planning are basic preparedness efforts that have been key functions in the fire service for many years. In this process, critical structures are identified based on the risk they pose. Then, tactical considerations are established for fires or other emergencies in these structures.

NFPA's 1620, *Recommended Practice for Pre-Incident Planning*, identifies the need to utilize both written narrative and diagrams to depict the physical features of a building, its contents, and any built-in fire protection systems. Information collected for pre-fire/incident plans includes, but is certainly not limited to, data such as:

- The occupancy type.
- Floor plans/layouts.
- Building construction type and features.
- Fire protection systems (sprinkler system, standpipe systems, etc.).
- Utility locations.
- Hazards to firefighters and/or firefighting operations.
- Special conditions in the building.
- Apparatus placement plan.
- Fire flow requirements and/or water supply plan

The information contained in pre-incident fire plans allows firefighters and officers to have a familiarity with the building/facility, its features, characteristics, operations, and hazards, thus enabling them to conduct firefighting and other emergency operations more effectively, efficiently, and safely. Pre-incident fire plans should be reviewed regularly and tested by periodic table-top exercises and on-site drills for the most critical occupancies.

The members of the LTFD reported to CPSM that they have a pre-fire/incident planning program that includes all 49 commercial occupancies in the township. These are updated during the annual safety walk-throughs. The plans are reported to be all maintained in a cloud-based application called *Site Docs*. The plans are reported to be accessible via iPads; however, despite multiple attempts during CPSM's field visit we were unable to view any of the pre-plans.

An increasingly important part of fire department risk identification, assessment, and management is the identification of unsafe structures in the township that could pose an increased, and often unnecessary, risk to firefighters during a fire situation. Once these buildings have been identified they should be marked as being unsafe. In the event of a fire, unless the fire is still a small, incipient fire, which can be extinguished quickly and safely, operations at these structures should be limited to exterior, defensive operations.

Fire Preplanning Recommendations:

- The LTFD should continue to make pre-fire/incident plan development a high priority and ensure they remain accessible via computers/tablets and the CAD system so they will be more readily available to personnel on the incident scene. (Recommendation No. 55.)
- The LTFD should compile an inventory of the locations of any vacant and unsafe structures throughout the Township and mark them accordingly regarding offensive or defensive only fire suppression operations. (Recommendation No. 56.)

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LARKIN TOWNSHIP FIRE DEPARTMENT STAFFING MODEL

The LTFD's membership is currently comprised of approximately 16 personnel, a net reduction of four from 2022. This consists of a Fire Chief, one Assistant Fire Chief, two Lieutenants, and one Safety Officer/Lieutenant. Information provided to CPSM on 2022 membership participation listed a total of 22 personnel on the rolls. A roster of current personnel provided to CPSM by the LTFD in early 2023 listed a total of 18 personnel. A list later provided by the township showed that three personnel had resigned from the department already in 2023, two to relocate out of the area and one to pursue a career opportunity, while only one new member joined the department. This has resulted in a net loss of four personnel, which in a department with approximately 20 members is a 20 percent decrease in less than a year. This type of attrition is not sustainable.

In addition, in almost any call/volunteer emergency services organization there is going to be a percentage of members whose names still appear on the "active" roster, yet they no longer truly are, or are minimally so, for a variety of reasons. This is the case in Larkin Township where only nine personnel are "active" and that uses the relatively low benchmarking standard of participating in 20 percent of responses. The most frequent responder, the Fire Chief, responded to 56 percent of the department's incidents. Factor in that most members of the department have a primary job, other than the fire department, and which probably limits their availability to respond during normal business hours, and the current membership picture becomes even more of a concern. It was reported to the CPSM study team from several of those interviewed that although the department has not "scratched" or failed to respond at all to a call in six years, there are a number of incidents each year the fire department is dispatched to that generates a response of just one member.

It is often difficult to get a good handle on the actual staffing numbers in many volunteer fire service organizations. The number of available personnel from the same station often varies at different times during the day, different days of the week, and sometimes even from incident to incident depending upon what the nature is (CO detector versus structure fire). Personnel are also often counted in the number of personnel who responded even if they arrived very late in the incident, or may have stood by at the station rather than actually responding to the incident. These long-held practices for awarding credit can often skew the actual number of personnel and make staffing for the volunteer companies appear better than it really is.

In addition, volunteer emergency services personnel are aging. In a study conducted several years ago, the average age for a volunteer firefighter in Pennsylvania was 48. In Larkin Township it is slightly lower at 42.9 years old. However, 6 (37.5 percent) of the department's members are over the age of 50.

It should also be noted that the LTFD is not a true volunteer fire department but rather a paid on-call organization where personnel are currently compensated \$21.00 per hour for emergency incident response if they possess at least an MFR certification. Personnel who are not MFR certified receive \$20.00 per hour. Personnel receive a \$15.00 stipend for meetings, training, truck/equipment checks, and special projects.

With the limited number of active members of the LTFD and the extended travel distances and thus travel times to certain areas of the township, along with extended travel distances and times for mutual aid and automatic response, LTFD's ability to properly manage anything greater than a small structural fire, an outbuilding, garage, vehicle fire, or porch fire is very limited.

Documents provided to CPSM by the LTFD provide a synopsis of the staffing challenges that the department is facing.

- For 2022, out of 20 members listed on the department roster:
 - One member responded to zero calls and one member responded to just one call.
 - Just eight personnel responded to at least 25 percent of incidents with one additional responding to 24 percent. This illustrates that just over 50 percent of the department responds to at least one in four incidents.
 - Just three members (15 percent) responded to more than 35 percent of the calls with only the chief responding to more than 50 percent (56 percent) of the calls.
- A different spreadsheet provided by the department that tracked 167 calls showed that the number of personnel responding to calls ranged from 1 (6 percent) to 16 (84 percent). The former (only 1 member responding) occurred four times while the latter just once.
 - The next highest number of personnel who responded was 11 (55 percent), which occurred three times.
 - Conversely, 30 times (18 percent of the incidents reported) just two personnel responded.

On-Call Firefighter Recruitment and Retention

It does not appear that there is a formal membership recruitment program in place in the LTFD. Recruitment into the department is primarily through social media, station open houses, and part of a county-wide effort. Beyond that, efforts to recruit and retain new members have been sporadic, not well coordinated, and not a high priority for the department. CPSM was informed that the department *"has exhausted the candidate pool even as the township grows."* The township does not have prominent information on how to become a fire department volunteer on its website. There is no prominent banner on either the main township or fire department home pages, although the fire department page does contain a fire department application.

In any on call/volunteer organization, the recruitment of new personnel is only one component of the challenge that is faced. In many cases, the more daunting challenge is the retention of volunteer staff and retaining these valuable human resources once they become members of the organization. According to the National Volunteer Fire Council (NVFC) 2017 statistics:⁷⁷

77. <http://www.nvfc.org/hot-topics/key-fire-service-facts>

- There are 814,850 volunteer firefighters in the U.S., comprising 70 percent of the nation's fire service (NFPA, *U.S. Fire Department Profile Through 2015*).
- The majority of fire departments in the United States are volunteer.
- Of the total 29,727 fire departments in the country, 19,762 are all volunteer; 5,421 are mostly volunteer; 1,893 are mostly career; and 2,651 are all career (NFPA, *U.S. Fire Department Profile Through 2015*).
- Donated time from volunteer firefighters saves localities across the country an estimated \$139.8 billion per year (NFPA, *The Total Cost of Fire in the United States, 2014*).
- Small and mid-sized communities rely heavily on volunteer firefighters. Small communities (populations under 10,000) across the U.S. are typically protected by all-volunteer departments. In some cases, however, these communities have hired a few paid firefighters to assist.
- The number of volunteer firefighters in the U.S. has declined significantly over the past four decades. Pennsylvania, which has one of the strongest volunteer fire service traditions in the United States and boasts more volunteer fire companies than any other state, estimates that the number of volunteer firefighters in the state has declined from around 300,000 in 1976 to about 38,000 by 2018.

In March 2004, the International Association of Fire Chiefs (IAFC) issued a report by the Volunteer and Combination Officers Section (VCOS), entitled *A Call for Action: Preserving and Improving the Future of the Volunteer Fire Service* (Appendix B). Among other things, the report highlighted the fact that the ranks of volunteer/call firefighters nationwide are declining due, at least in part, to an increasing demand for services. There are also various other factors that are prevalent in the reduction in the number of volunteer and on-call firefighters in communities such as Larkin Township. Among them is that the demographics of many communities today do not include a sufficient number of people attracted to the fire service, that is, someone with time to dedicate to public service or a young person who wants to make a career of it.

Major factors contributing to the decline in volunteerism are included in the following table.

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TABLE 5-10: Volunteer Retention and Recruitment: Root Causes⁷⁸

Sources Of Challenge	Contributing Factors
Time Demands	• the two-income family and working multiple jobs • increased training time demands • higher emergency call volume • additional demands within department (fundraising, administrative)
Training Requirements	• higher training standards and new federal requirements • more time demands • greater public expectation of fire department's response capabilities (broader range of services such as EMS, Hazmat, technical rescue, etc.) • additional training demands to provide broader range of services • recertification demands
Increasing Call Volume	• fire department assuming wider response roles (EMS, Hazmat, technical rescue) • increasing emergency medical call volume • increase in number of automatic fire alarms
Changes In The "Nature Of The Business"	• abuse of emergency services by the public • less of an emphasis on social aspects of volunteering
Changes In Sociological Conditions (In Urban And Suburban Areas)	• transience • loss of community feeling • less community pride • less of an interest or time for volunteering • two-income family and time demands • "me" generation
Changes In Sociological Conditions (In Rural Areas)	• employers less willing to let employees off to run calls • time demand • "me" generation
Leadership Problems	• poor leadership and lack of coordination • authoritative management style • failure to manage change
Federal Legislation And Regulations	• Fair Labor Standards Act interpretation • "2 in, 2 out" ruling requiring four firefighters on scene before entering hazardous environment • Environmental Protection Agency (EPA) live-fire burn limitations
Increasing Use Of Combination Departments	• disagreements among chiefs or other department leaders • friction between volunteer and career members
Higher Cost Of Housing (In Affluent Communities)	• volunteers cannot afford to live in the community they serve
Aging Communities	• greater number of older people today • lack of economic growth and jobs in some towns
Internal Conflict	• disagreements among departmental leaders • friction between volunteer and career members

- While the number of volunteer firefighters is declining, the age of volunteer firefighters is increasing. As noted above the average age of Larkin firefighters is 42.9 years old and 37.5 percent of the department is over age 50.
- Fire department call volume has nearly tripled in the last 25 years, mainly due to a sharp increase in the number of EMS calls and false alarms (NFPA, *Fire Loss in the United States* 2012). This includes a 29.2 percent increase from 22,406,000 to 31,644,500 in the ten-year period between 2003 and 2013 (NVFC).

78. *Retention & Recruitment for the Volunteer Emergency Services: Challenges & Solutions*. National Volunteer Fire Council and United States Fire Administration (FA-310), May 2007.

In November 2005, the IAFC VCOS released a second report, called *Lighting the Path of Evolution: Leading the Transition in Volunteer and Combination Fire Departments* (Appendix C). This report further expanded on issues and strategies for maintaining high service levels to the community, and safety for emergency response personnel while simultaneously keeping costs down. One prominent question asked in the report was "How can fire departments ensure the delivery of services are reliable?" The answer was the development of a list of "indicators for change," where fire department managers and local government leaders need to be cognizant of warning signs pointing to potential problems and "prepare for change before it is forced on them by external circumstances." These "indicators" of change include:

- **Community Growth** – Generally speaking, the larger the community, the larger the call volume and higher level of service people expect.
- **Community Aging** – Maintaining an appropriate level of service depends on the fire department's ability to recruit new and younger members.
- **Missed Calls** – A critical issue because 1) it is a failure that is highly visible to the public, and 2) there is an overreliance on mutual aid for coverage.
- **Extended response times** – A reliability problem as the public is not provided with the appropriate service.
- **Reduced staffing** – A serious problem as citizens' and responders' safety is at greater risk.

Some of these issues appear to have some applicability to Larkin Township. These warning indicators are not an indictment of anything wrong in Larkin; the same problems are facing call and volunteer fire department across the country.

Increasing the active membership in the LTFD will require significantly expanded efforts. Over the next five years, sustained effort will need to be made regarding the recruitment and retention of volunteer personnel. Although Larkin Township is not alone in dealing with a reduction in volunteer staff, it is essential that addressing this situation becomes a primary focus of the fire department with support and assistance from the township. In fact, to attain success will require the development of new strategies and a monetary investment to retain a viable on-call component of the department. It should also be adopted as a shared mission of the entire department.

Once an individual becomes interested in becoming a volunteer firefighter, they must achieve a level of ever-increasing specialized skill that is quite time-consuming to achieve. Often, exit interviews reveal that the training commitment alone is daunting and one of the primary reasons that volunteer personnel resign. To become a certified firefighter takes several hundred hours and add to that over 200 hours to become a state-certified emergency medical technician. Then there are the dozens of hours training annually spent maintaining firefighter and EMT skills and certifications.

In addition, in 2023, the average citizen does not want to spend a great deal of personal time dedicated to the fire service, especially when family commitments take priority.

It is easy to believe that increasing the number of volunteer firefighters can cure staffing problems. Unfortunately, in 2023, this is a difficult solution to achieve, and many organizations are finding they must look to per diem or career staffing to ensure that the service level expected by the community is delivered.

It is important to note that volunteer recruitment and retention activities can, in and of themselves, be very time-consuming and labor intensive.

Larkin Township should recognize that the only way to develop a more active and better staffed fire department is to determine what would motivate potential responders (including current ones) and craft a program of investment that meets these extrinsic and intrinsic needs. The federal government has a version of the Staffing for Fire and Emergency Response (SAFER) grant program that pertains strictly to volunteer and on-call firefighters. It provides competitively awarded funds to municipalities to retain and recruit on-call and volunteer firefighters. The grants fund expenses such as recruitment campaigns, and can provide money for tuition for college curriculums in fire science, for EMT and paramedic training, health insurance for call members, physical fitness programs, uniforms, and various tax incentives offered to attract new candidates to join the fire department and stay for an extended period of time. Consideration could also be given to the implementation of a Length of Service Awards Program (LOSAP), which is basically a pension program for call/volunteer personnel.

The first step Larkin Township should take is to apply for a SAFER grant to recruit and retain volunteer/ on-call members. The goal of the SAFER grants is to enhance the fire departments' ability to comply with staffing, response, and operational standards established by NFPA and OSHA (NFPA 1720 and OSHA 1910.134). Specifically, SAFER funds assist the fire department to increase its staffing and deployment capabilities in order to respond to emergencies whenever they may occur. (SAFER grants are awarded to departments for both hiring of career personnel, and recruitment and retention of volunteer/call personnel.)

The township's grant application should note the current staffing challenges and lack of full response that currently exists and indicate that the grant would be an attempt to meet the NFPA 1720 fire response standard. The demographic and societal changes driving the reduction in volunteer participation need to be reversed through utilizing innovation and best practices.

A 2003 report prepared by Maine Fire Training and Education noted that most call and volunteer fire departments serving small to medium-sized communities throughout Maine anticipate that about one percent of their year-round population will be members of the fire department. This would equate to about 53 members in Larkin Township. We believe this figure is overly optimistic, given the 20 years that have elapsed since its release. However, if we cut it in half and said one half of one percent, the department could still anticipate a membership of 26 to 27 residents of the township, ten or eleven more than the current call contingent. CPSM believes that the township should endeavor to increase volunteer membership to 25 to 30 active, qualified interior structural firefighters.

Many communities have come to the conclusion that investing in volunteer personnel is the best practice, and to that end, they have pursued some of the following strategies, most of which could be undertaken in Larkin:

- Creating a marketing program to recruit new personnel into the department.
- Placing a prominent banner with a link on the home page of the Larkin Township and Larkin Township Fire Department websites.
- Conducting a recruitment mailing to all residential properties in the township with information about the fire department and recruiting new members. One fire department in a city in New Jersey had fire personnel knock on every door in the city to recruit new members.
- Placing signs at the entrances to the township to recruit volunteer members.
- Placement of a temporary signboard at various locations in the community.
- Working with local businesses in an attempt to form partnerships that would allow employees to leave work to respond to emergency incidents when needed.

- Hire a volunteer firefighter "Recruitment and Retention Coordinator" to develop, implement, and coordinate these activities. This could possibly be undertaken by a number of communities as a regional endeavor.
- Implementation of a Length of Service Awards Program (LOSAP) for volunteer personnel who achieve certain training and response levels.
- Provide a reduction in property taxes, or a tax abatement incentive, for volunteer service.
- Provide volunteer firefighters with community-based benefits.
- Implement an incentive for members that attain a level of more than 25 percent response. An example would be to provide gift certificates for local restaurants, concerts, or other entertainment as a reward for attaining a high level of response.

FIGURE 5-13: Volunteer Recruitment Posters*



Note: *Left: Recruit NY Volunteer Recruitment Program; Right: Plympton, Mass. Fire Department.

Some other recruitment and retention programs that have been implemented elsewhere and might be considered include:

- Connecticut has a property tax relief program in the form of a \$1,000 per year abatement on property taxes for volunteer emergency services personnel.
- North Carolina provides free hunting licenses to volunteer firefighters, a benefit that may have appeal in Michigan.

It is imperative that the LTFD more aggressively recruit and retain combat (ability to engage in interior firefighting) on-call firefighters and develop programs that increase the retention of these members so that any future need to introduce career staff can be transitioned over a planned and measured period and kept to a minimum number of personnel. The NVFC has guides and resources to assist in this endeavor, as does the Federal Emergency Management Agency, among others.

There may be community members who can only volunteer on the weekends or during the day, which currently is a challenge for the LTFD as there is not a large turnout of volunteer members

during some of these time frames. Flexibility in recruitment and retention should be a goal, with a focus on balancing the needs of the organizational staffing.

The National Volunteer Fire Council has excellent resources on the recruitment of new volunteer personnel. They can be found at <https://www.nvfc.org/make-me-a-firefighter-six-steps-to-recruitment-success-2/>. The International Association of Firefighter also has resources that can be found at <https://www.iafc.org/topics-and-tools/resources/resource/guide-to-best-practices-in-volunteer-firefighter-recruitment-and-retention>.

Some of the critical steps to ensuring engagement with potential members during the recruitment process include:

- Keeping prospective members engaged throughout the entire recruitment process with emails and phone calls.
- Clearly articulating expectations.
- Providing recruits with a clear point of contact if they have any questions, concerns, or issues that may arise during the recruitment process, or if they just want additional information or to stay in the loop.
- Inviting recruits to department events, meetings, training sessions, work details, or even just to ride along (if permitted by department policy and insurance regulations).

Once the recruit is accepted into full—or at least probationary—membership of the fire department the focus should now shift to ensuring *their* success:

- Consider pairing them with a mentor, an experienced (and positive) member who can help guide them through their fire experience in the fire/EMS service and start to teach them how to do the “job.”
- Implement a tracking program to follow the member’s progress through their probationary period. Are they engaged and showing interest? Are they hitting the right marks? Where do they need help? Any number of programs can also help keep track of key certifications, schedule duty shifts, hold emergency contact information, and more.
- Create a “New Member Guide” with various checklists, progression information, copies of primary response maps, key forms, and other critical details they’ll need to know as a member of the fire department. Solicit the “what” goes into that document from both long-standing members (what do they wish new members knew sooner?) and newer members (what do they wish they had known faster when they first joined?)

The new member making a connection with, and feeling welcomed into, the department is going to be a major driver in their success and level of involvement with the fire department. If they are successful, then the department will also be as it will gain another important asset. Changing the long-standing culture of many volunteer fire departments in acknowledgement of the diversification of society will be critical to the long-term survival of the volunteer fire service.

Staffing, Recruitment, and Retention Recommendations:

- The LTFD should make the recruitment and retention of additional personnel one of its highest priorities. A key component of this priority should be to apply for a federal SAFER grant for on-call recruitment and retention, citing in the application an attempt to meet the provisions of NFPA 1720. This grant should be utilized to develop a comprehensive marketing program to

attract new members, and provide incentives for the retention of those personnel. (Recommendation No. 57.)

- The Larkin Township Fire Department should make it a priority to develop an active on-call recruitment program led by a ranking officer. (Recommendation No. 58.)

At a minimum this program should consist of:

- Developing a recruitment brochure and mailing it to all residents.
- Holding periodic open houses at the fire station.
- Performing public outreach and advertising through the local media.
- Contacting community and service groups.
- Developing an eye-catching banner on the township and fire company websites.
- Placing signs to recruit volunteers at key, well-traveled locations in the township.
- Placing a temporary signboard at various rotating locations within the community.
- Placing signs in the township building and local businesses, particularly high-volume locations.
- Placing lawn signs recruiting on-call personnel at locations throughout the community.
 - The proposed SAFER grant could be utilized to cover many of these expenses.
- In collaboration with surrounding communities Larkin Township should give consideration to hiring a call/volunteer "Recruitment and Retention Coordinator" to develop, implement, and coordinate recruitment and retention efforts and programs for the cooperating communities. (Recommendation No. 59.)
- The LTFD should take steps to aggressively recruit, train, and utilize on-call firefighters to increase daily fire suppression staffing and establish realistic recruitment, retention, and volunteer member utilization goals. (Recommendation No. 59.)
- The LTFD should work to foster a recruitment and retention program that focuses on: membership flexibility; marketing the on-call program to millennials; and continuous retention efforts focused on increasing the retention rate of on-call members through recognition of efforts, a friendly and diverse work environment, mentoring for advancement in the organization, sustaining current incentives, and researching and implementing new incentives as funds are made available. (Recommendation No. 61.)
- The LTFD should set a realistic goal of recruiting at least 10 to 12 new members over the next three years, and simultaneously set a goal of increasing the overall call member force to between 25 and 30 active, qualified personnel. (Recommendation No. 62.)
- Larkin Township should explore various additional financial incentives for on-call firefighters including exploring the feasibility of providing incentives such as implementing a Length of Service Awards Program (LOSAP) program for personnel who meet certain training and response criterion. (Recommendation No. 63.)

- The hiring of all new on-call firefighters should be done through Larkin Township in coordination with the fire department leadership. All prospective members should be subject to: (Recommendation No. 64.)
 - Interview.
 - State and federal background investigations including fingerprinting.
 - Child abuse check.
 - Driving record check.
 - Credit check.
 - Social media check.
 - Medical screening.
 - Reference check.
- The LTFD should develop a "Welcome Wagon" program that can be used to welcome new residents to the area and to provide information on, and recruiting information for, the on-call fire protection delivery system. (Recommendation No. 65.)

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RESPONSE TIME ANALYSIS

Response times are typically the primary measurement for evaluating fire and EMS services. Response times can be used as a benchmark to determine how well a fire department is currently performing, to help identify response trends, and to predict future operational needs. Achieving the quickest and safest response times possible should be a fundamental goal of every fire department.

However, the actual impact of a speedy response time is limited to very few incidents. For example, in a full cardiac arrest, analysis shows that successful outcomes are rarely achieved if basic life support (CPR) is not initiated within four to six minutes of the onset. However, cardiac arrests occur very infrequently; on average they are 1 percent to 1.5 percent of all EMS incidents.⁷⁹ There are also other EMS incidents that are truly life-threatening, and the time of response can clearly impact the outcome. These involve cardiac and respiratory emergencies, full drownings, obstetrical emergencies, allergic reactions, electrocutions, and severe trauma (often caused by gunshot wounds, stabbings, and severe motor vehicle accidents, etc.). Again, the frequency of these types of calls is limited.

An important factor in the whole response time question is what we term "**detection time**." This is the time it takes to detect a fire or a medical situation and notify 9-1-1 to initiate the response. In many instances, particularly at night or when automatic detection systems (fire sprinklers and smoke detectors) are not present or inoperable, the detection process can be extended. Fires that go undetected and are allowed to expand in size become more destructive and are difficult to extinguish.

79. Myers, Slovis, Eckstein, Goodloe et al. (2007). "Evidence-based Performance Measures for Emergency Medical Services System: A Model for Expanded EMS Benchmarking." *Pre-hospital Emergency Care*.

For the purpose of this analysis, **response time** is a product of three components: **dispatch time**, **turnout time**, and **travel time**.

- **Dispatch time** is the time interval that begins when the alarm is received at the initial public safety answering point (PSAP) or communications center and ends when the response information begins to be transmitted via voice and/or electronic means to the emergency response facility or emergency response units or personnel in the field.
 - **Alarm processing time:** According to NFPA 1710, event processing times shall be completed in 64 seconds 90 percent of the time and not more than 106 seconds 95 percent of the time.
 - Alarm processing time for the following call types shall be completed within 90 seconds 90 percent of the time and within 120 seconds 99 percent of the time:
 - Calls requiring Emergency Medical Dispatch.
 - Calls requiring language translation.
 - Calls requiring TTY/TTD receipt of events.
 - Calls of criminal activity that require information vital to emergency responder safety prior to dispatching units.
 - Haz-Mat incidents.
 - Technical rescue incidents.
 - Incomplete location.
 - Calls received by text message to the communications center.
- **Turnout time** is the time interval that begins when the notification process to emergency response facilities and emergency response personnel and units begins by an audible alarm and/or visual announcement and ends at the beginning point of travel time. Because each community is different and in many cases volunteer fire stations are not staffed continually, NFPA 1720 is silent on turnout time. **The fire department has the greatest control over these segments of the total response time.**
 - When the LTFD is dispatched to a call, if there is no response within three minutes, the call is toned out again. If there is no response in another two minutes, the call is toned again and mutual aid is sent.
- **Travel time** is the time interval that initiates when the emergency response unit is actually moving in response to the incident and ends when the unit arrives at the scene. NFPA 1720 is silent on travel times for the first due unit for either fire or EMS units. The only reference that it makes is that for structure fires a community that is classified as rural, such as Larkin, the department should be able to assemble six personnel on scene within 14 minutes.

Response time, also known as **total response time**, is the time interval that begins when the call is received by the primary dispatch center and ends when the dispatched unit(s) arrives on the scene of the incident to initiate action.

For this study, and unless otherwise indicated, response times and travel times measure the first arriving unit only.

The following figures provide: 1) an overview of response time performance and identifies responsibility of the key components of the emergency communications center and the fire department, and 2) provides an overview of the fire department incident cascade of events.

FIGURE 5-14: Response Time Performance Measures

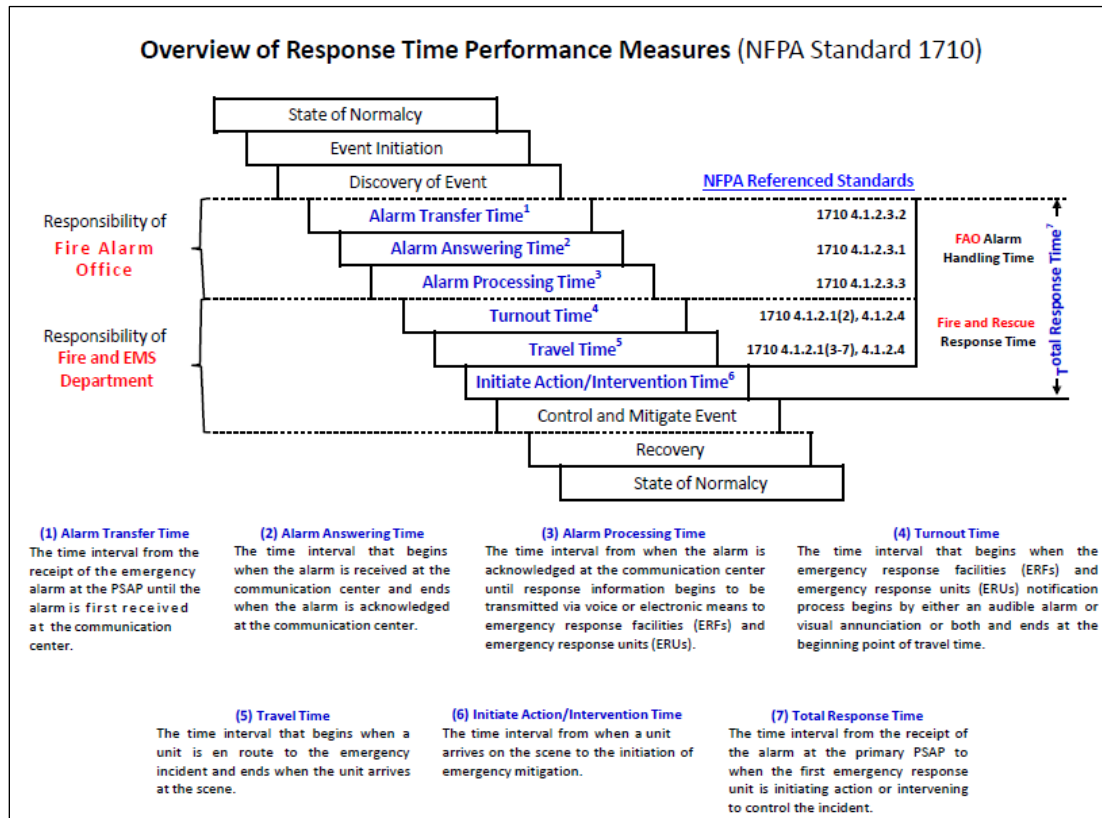
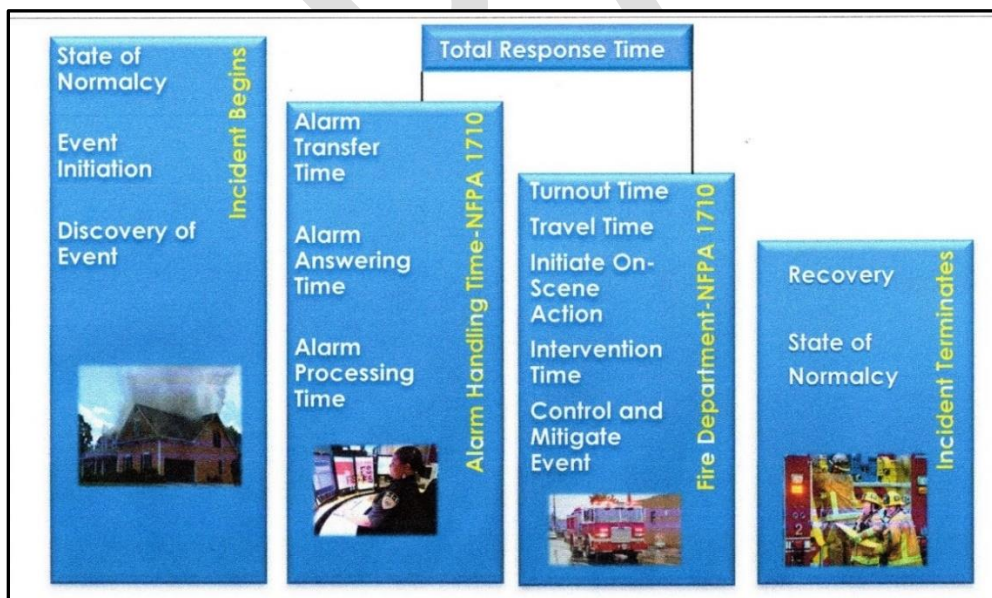


FIGURE 5-15: Incident Cascade of Events



Regarding response times for fire incidents, the criterion is linked to the concept of “**flashover**.” This is the state at which super-heated gases from a fire are released rapidly, causing the fire to burn freely and become so volatile that the fire reaches an explosive state (simultaneous ignition

of all the combustible materials in a room). In this situation, usually after an extended period (often eight to twelve minutes after ignition but at times as quickly as five to seven minutes), and a combination of the right conditions (fuel and oxygen), the fire expands rapidly and is much more difficult to contain. When the fire does reach this extremely hazardous state, initial firefighting forces are often overwhelmed, larger and more destructive fire occurs, the fire escapes the room and possibly even the building of origin, and significantly more resources are required to affect fire control and extinguishment.

Flashover occurs more quickly and more frequently today and is caused at least in part by the introduction of significant quantities of plastic- and foam-based products into homes and businesses (e.g., furnishings, mattresses, bedding, plumbing and electrical components, home and business electronics, decorative materials, insulation, and structural components). These materials ignite and burn quickly and produce extreme heat and toxic smoke.

NFPA 1720 outlines recommended organization and deployment of operations by volunteer, and primarily volunteer fire and rescue organizations.⁸⁰ It is the benchmark standard that the U.S. Department of Homeland Security utilizes when evaluating applications for staffing grants under the Staffing for Adequate Fire and Emergency Response (SAFER) grant program.

As a benchmark, Table 4.3.2 of NFPA 1720 recommends a minimum of six personnel to respond within 14 minutes, 80 percent of the time.

It is also important to keep in mind that once units arrive on scene, they will need to get set up to commence operations. NFPA 1720 recommends that units be able to commence an initial attack within two minutes of arrival, 90 percent of the time.

Although trying to reach the NFPA benchmark for travel time may be laudable, the question is, at what cost? What is the evidence that supports such recommendations? NFPA travel times are established for two primary reasons: (1) the fire propagation curve); and (2) sudden cardiac arrest, where brain damage and permanent brain death occurs in four to six minutes.

The following figure shows the fire propagation curve relative to fire being confined to the room of origin or spreading beyond it and the percentage of destruction of property by the fire.

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80. NFPA 1720 is a nationally recognized standard, but it has not been adopted as a mandatory regulation by the federal government or the State of Michigan. It is a valuable resource for establishing and measuring performance objectives for Larkin Township but should not be the sole determining factor when making local decisions about the township's fire and EMS services.

Fire Propagation Curve

THE LINE REPRESENTS A RATE OF FIRE PROPAGATION WHICH COMBINES TEMPERATURE RISE AND TIME. IT ROUGHLY CORRESPONDS TO THE PERCENTAGE OF PROPERTY DESTRUCTION. AT APPROXIMATELY TEN MINUTES INTO THE FIRE SEQUENCE, THE HYPOTHETICAL ROOM OF ORIGIN FLASHES OVER. EXTENSION OUTSIDE THE ROOM BEGINS AT THIS POINT.

Minutes

% OF PROPERTY DESTRUCTION

Room of Origin

Beyond Room of Origin

Minutes	% of Property Destruction
0	0
2	5
4	10
6	15
8	20
10	25
12	50
14	75
16	85
18	90
20	95
22	98
24	100

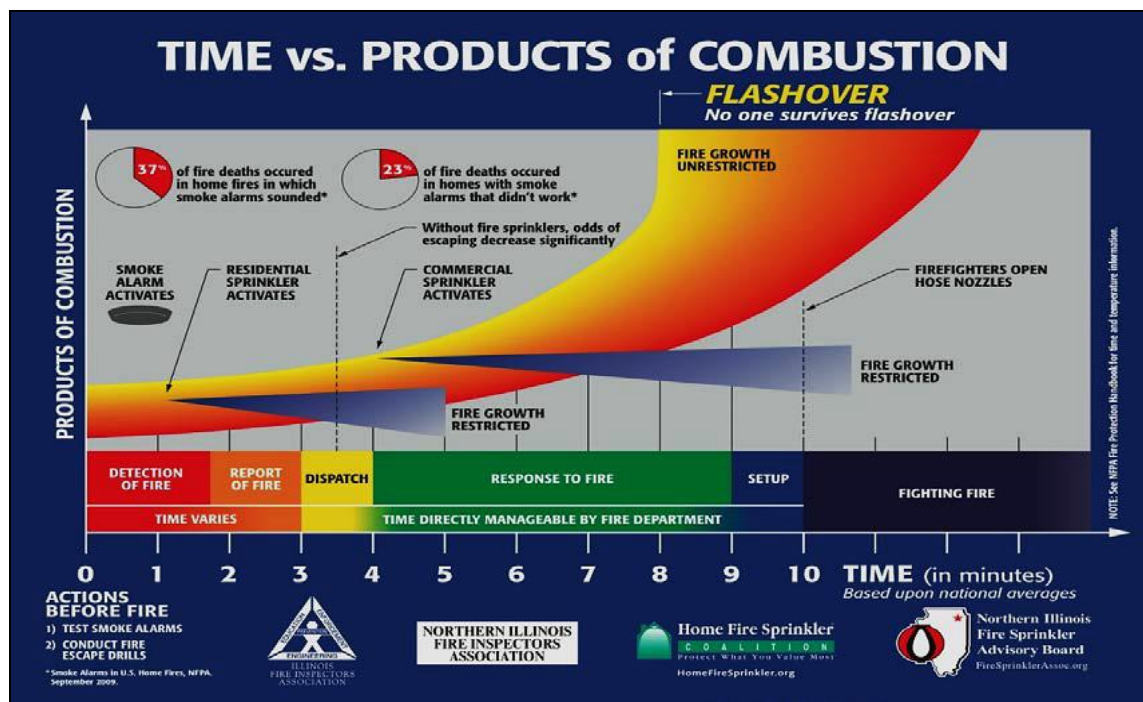
According to fire service educator Clinton Smoke, the fire propagation curve establishes that temperature rise and time within in a room on fire corresponds with property destruction and potential loss of life if present.⁸¹ At approximately the eight- to ten-minute mark of fire progression, the fire flashes over (due to superheating of room contents and other combustibles) and extends beyond the room of origin, thus increasing proportionately the destruction to property and potential endangerment of life. The ability to quickly deploy adequate fire staff prior to flashover thus limits the fire's extension beyond the room or area of origin.

Clearly, an early aggressive and offensive initial interior attack on a working structural fire results in greatly reduced loss of life and property damage. Consequently, given that the progression of a structural fire to the point of "flashover" (the very rapid spreading of the fire due to super-heating of room contents and other combustibles) generally occurs in less than 10 minutes, two of the most important elements in limiting fire spread are the quick arrival of sufficient numbers of personnel and equipment to attack and extinguish the fire as close to the point of its origin as possible.⁸²

82. *Safe Fire Fighter Staffing: Critical Considerations*, 2nd ed. (Washington, DC: International Association of Fire Fighters), 5.

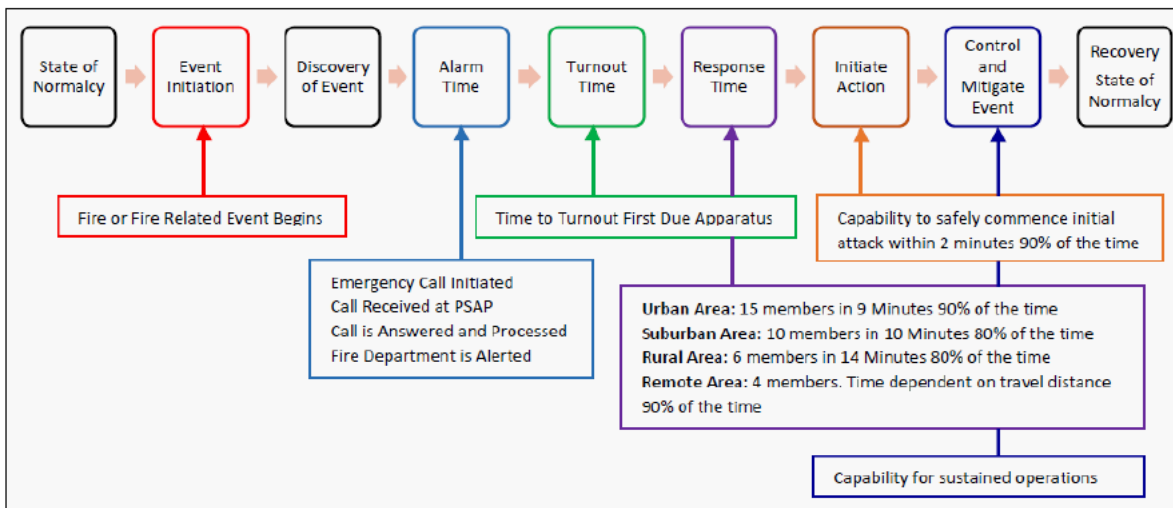
department's response time to the fire is one of the only aspects of the timeline that the fire department can exert direct control over.

FIGURE 5-17: Fire Growth from Inception to Flashover⁸³



The next figure illustrates the overview of response time performance for fire response under NFPA 1720.

FIGURE 5-18: NFPA 1720 Response Time Performance Elements



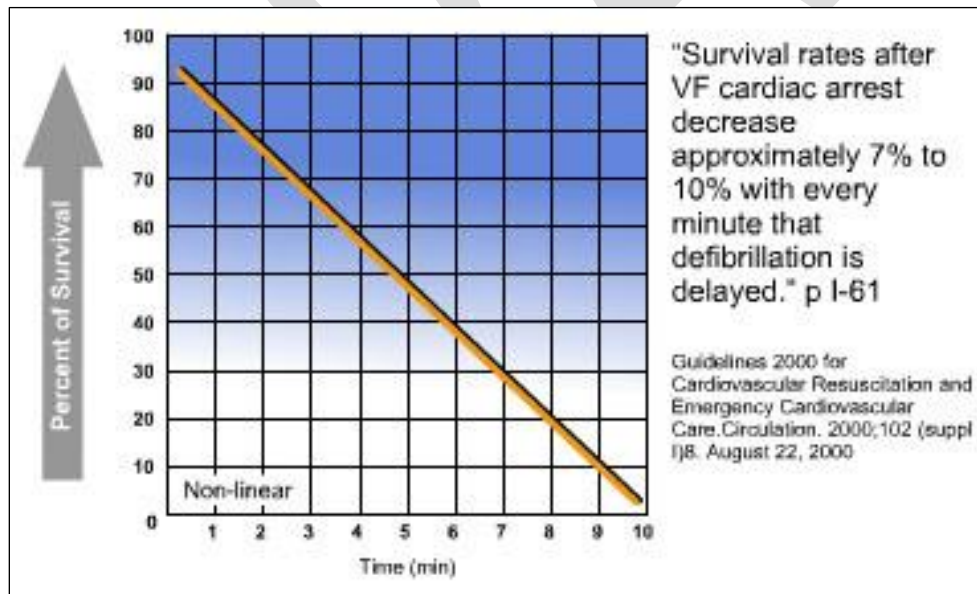
83. Source: Northern Illinois Fire Sprinkler Advisory Board.

EMS response times are measured differently than fire service response times. Where the fire service uses NFPA 1710 and 1720 as response time benchmarking documents, **the focus by EMS focus is and should be directed to the evidence-based research relationship between clinical outcomes and response times.** Much of the current research suggests response times have little impact on clinical outcomes outside of a small segment of call types. These include cerebrovascular accidents (stroke), injury or illness compromising the respiratory system, injury or illness compromising the cardiovascular system to include S-T segment elevation emergencies, and certain obstetrical emergencies. Each requires rapid response times, rapid on-scene treatment and packaging for transport, and rapid transport to the hospital.

As with fire incidents, NFPA 1720 is silent on travel and first unit response times for EMS incidents. For comparison, Paragraph 4.1.2.1(7) of NFPA 1710 recommends that for EMS incidents a fire unit with first responder or higher-level trained personnel and equipped with an AED should arrive on scene within four minutes of travel time (time after call is processed, dispatched, and the unit turns out). An advanced life support (ALS) unit should arrive on scene within eight minutes travel time, provided the fire department responded first with first responder or higher-level trained personnel and equipped with an AED. According to the NFPA 1710, *"This requirement is based on experience, expert consensus, and science. Many studies note the role of time and the delivery of early defibrillation in patient survival due to heart attacks and cardiac arrest, which are the most time-critical, resource-intensive medical emergency events to which fire departments respond."*

The next figure illustrates the chance of survival from the onset of cardiac arrest, largely due to ventricular fibrillation in terms of minutes without emergency defibrillation delivered by the public or emergency responders. The chance of survival has not changed over time since this graphic was published by the American Heart Association in 2000.

FIGURE 5-19: Cardiac Arrest Survival Probability by Minute

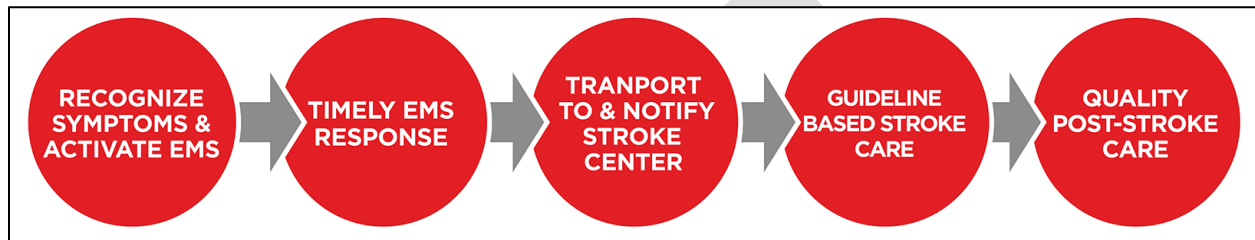


Typically, a low percentage of 9-1-1 patients have time-sensitive and advanced life support (ALS) needs. But, for those patients that do, time can be a critical issue of morbidity and mortality. For the remainder of those calling 9-1-1 for a medical emergency, though they may not have a medical necessity, they still expect rapid customer service. Response times for patients and their families are often the most important measurement of the EMS department.

Regardless of the service delivery model, appropriate response times are more than a clinical issue; they are also a customer service issue and should not be ignored.

In addition, **a true emergency is when an illness or injury places a person's health or life in serious jeopardy and treatment cannot be delayed.** Examples include severe trauma with cardiovascular system compromise, difficulty breathing, chest pain with S-T segment elevation (STEMI), a head injury, or ingestion of a toxic substance.⁸⁴ The next figure illustrates the out-of-hospital chain of survival for a stroke emergency, which is a series of actions that, when put in motion, reduce the mortality of a stroke emergency.

FIGURE 5-20: Cerebrovascular Emergency (Stroke) Chain of Survival



Source: <https://nhcps.com/lesson/acls-acute-stroke-care/>

If a person is experiencing severe pain, that is also an indicator of an emergency. Again, the frequencies of these types of calls are limited as compared to the routine, low-priority EMS incident responses. In some cases, these emergencies often make up no more than 5 percent of all EMS calls.⁸⁵

Cardiac arrest is one emergency for which EMS response times were initially built around. The science tells us that the brain begins to die without oxygenated blood flow at the four- to six-minute mark. Without immediate cardiopulmonary resuscitation (CPR) and rapid defibrillation, the chances of survival diminish rapidly at the cessation of breathing and heart pumping activity. For every minute without CPR and/or defibrillation, chances of survival decrease 7 to 10 percent. Further, only 10 percent of victims who suffer cardiac arrest outside of the hospital survive.⁸⁶

The following figure illustrates the out-of-hospital chain of survival, which is a series of actions that, when put in motion, reduce the mortality of sudden cardiac arrest. Adequate EMS response times coupled with community and public access defibrillator programs potentially can impact the survival rate of sudden cardiac arrest victims by deploying early CPR, early defibrillation, and early advanced life support care provided in the prehospital setting.

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84. Mills-Peninsula Health Blog, Bruce Wapen, MD.

85. www.firehouse.com/apparatus/article/10545016/operations-back-to-basics-true-emergency-and-due-regard

86. American Heart Association. *A Race Against the Clock*, Out of Hospital Cardiac Arrest. 2014

FIGURE 5-21: Sudden Cardiac Arrest Chain of Survival



From: "Out of Hospital Chain of Survival,"

http://cpr.heart.org/AHA/ECC/CPRAndECC/AboutCPRFirstAid/CPRFactsAndStats/UCM_475731_Out-of-hospital-Chain-of-Survival.jsp

The primary focus of the following part of this section is the dispatch and response time of the first arriving units for calls responded to with lights and sirens (Code 3).

In this analysis, which covers the one-year time period from September 2, 2021, thru August 31, 2022, CPSM included all calls responded to by both the LTFD and other EMS and fire agencies to which at least one unit arrived while excluding canceled and aid given calls. However, calls with a total response time exceeding 30 minutes were excluded. In addition, CPSM focused on units that had complete time stamps, that is, units with all components recorded, so that we could calculate each segment of response time. Since most calls were responded to with lights and sirens, we identified all calls as emergency calls.

Based on the methodology above, for 314 calls, we excluded 56 canceled calls, 27 aid-given calls, 11 calls where no units recorded a valid arrival time, and 11 calls where one or more segments of the first arriving unit's response time could not be calculated due to missing or faulty data. As a result, in this section, a total of 209 calls are included in the analysis.

The following tables break down the average, 80th percentile, and 90th percentile response times by call type for all calls in Larkin Township. LTFD follows the NFPA 1720 standard that benchmarks both 80th and 90th percentile response times. The 80th and 90th percentiles means that 80 percent and 90 percent of calls had response times at or below the corresponding numbers. For example, Table 5-12 shows an overall 80th percentile response time of 16.9 minutes, which means that 80 percent of the time, a call had a response time of no more than 16.9 minutes.

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TABLE 5-11: Average Response Time of First Arriving Unit, by Call Type

Call Type	Minutes				Call Count
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	4.5	0.8	7.4	12.7	17
Cardiac and stroke	4.0	1.0	7.5	12.5	16
Fall and injury	6.4	1.2	6.9	14.4	22
Illness and other	4.7	1.1	7.1	12.9	43
MVA	5.7	0.6	6.1	12.4	19
Overdose and psychiatric	3.3	1.1	8.5	12.9	1
Seizure and unconsciousness	4.0	0.8	7.7	12.5	21
EMS Subtotal	4.9	1.0	7.1	13.0	139
False alarm	7.6	1.3	10.3	19.3	9
Good intent	10.1	1.8	5.1	16.9	6
Hazard	7.3	1.5	6.2	15.0	37
Outside fire	3.0	14.9	6.4	24.4	1
Public service	8.2	0.7	3.5	12.4	13
Structure fire	1.8	2.3	7.2	11.4	4
Fire Subtotal	7.3	1.6	6.2	15.1	70
Total	5.7	1.2	6.8	13.7	209

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TABLE 5-12: 80th and 90th Percentile Response Times of First Arriving Unit, by Call Type

Call Type	80th Percentile Response Time, Minutes				90th Percentile Response Time, Minutes				Call Count
	Dispatch	Turnout	Travel	Total	Dispatch	Turnout	Travel	Total	
Breathing difficulty	9.4	1.8	10.7	15.0	10.2	2.2	11.3	15.2	17
Cardiac and stroke	7.1	2.2	10.0	14.8	7.6	2.7	10.6	15.4	16
Fall and injury	8.5	1.5	9.4	17.3	12.0	2.4	12.4	17.4	22
Illness and other	8.6	1.7	10.3	15.4	10.9	2.4	10.9	16.9	43
MVA	6.3	1.1	9.0	13.3	11.3	1.5	10.4	17.2	19
OD*	3.3	1.1	8.5	12.9	3.3	1.1	8.5	12.9	1
Seizure and UNC**	7.3	1.9	10.0	14.2	8.4	2.6	11.6	15.6	21
EMS Subtotal	7.7	1.8	10.0	15.0	10.3	2.4	11.7	16.9	139
False alarm	11.9	0.6	13.8	21.6	12.5	2.8	16.1	22.9	9
Good intent	14.9	1.7	6.6	19.6	15.4	5.2	7.3	20.2	6
Hazard	13.1	0.2	8.2	20.0	14.1	4.7	12.2	24.6	37
Outside fire	3.0	14.9	6.4	24.4	3.0	14.9	6.4	24.4	1
Public service	11.9	0.4	4.3	16.2	13.6	0.9	5.5	17.7	13
Structure fire	2.7	3.5	9.0	13.1	3.9	4.7	10.1	13.5	4
Fire Subtotal	13.2	1.5	8.4	20.5	14.2	6.0	12.6	22.8	70
Total	9.4	1.8	9.8	16.9	12.3	2.6	12.0	19.6	209

Note: *OD= Overdose and psychiatric; **UNC=Unconsciousness. Because there is only one outside fire and one overdose call, the average, 80th percentile, and 90th percentile values are the same.

The next two figures illustrate the components of the average response time for EMS and fire calls, respectively.

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FIGURE 5-22: Average Response Time of First Arriving Unit, by Call Type, EMS

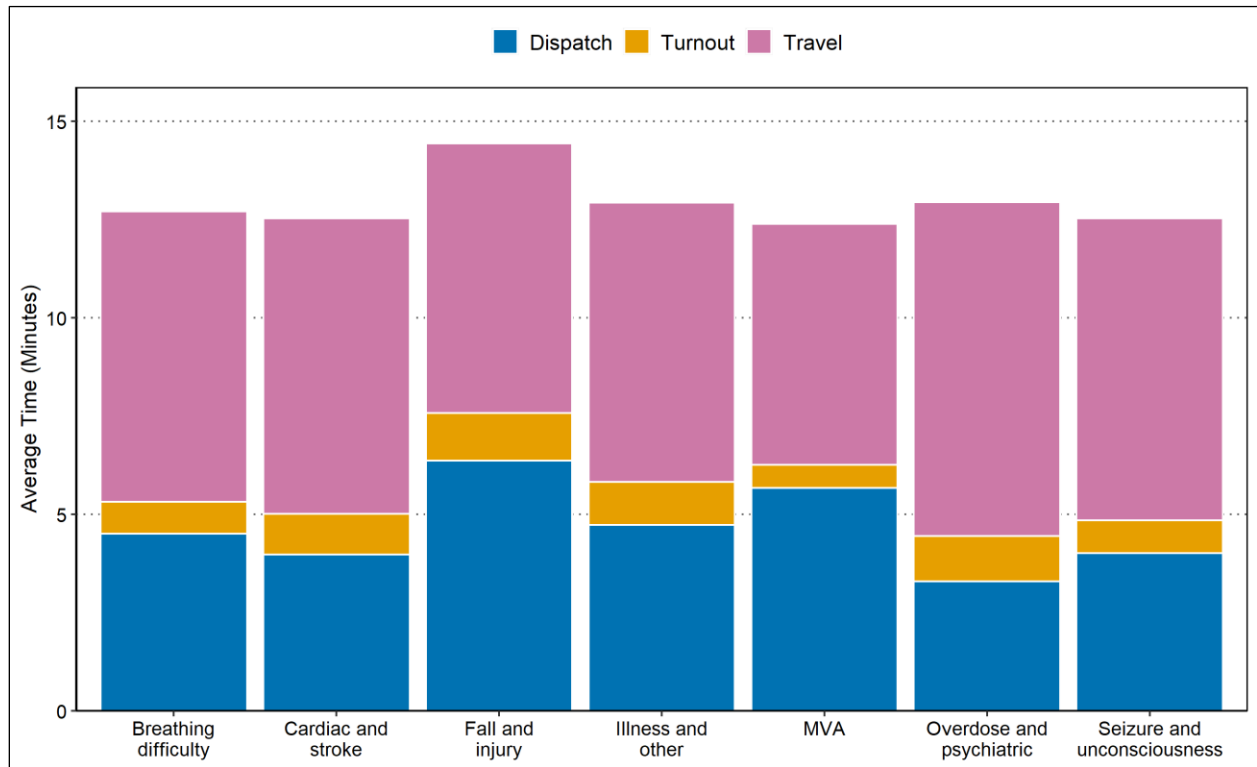
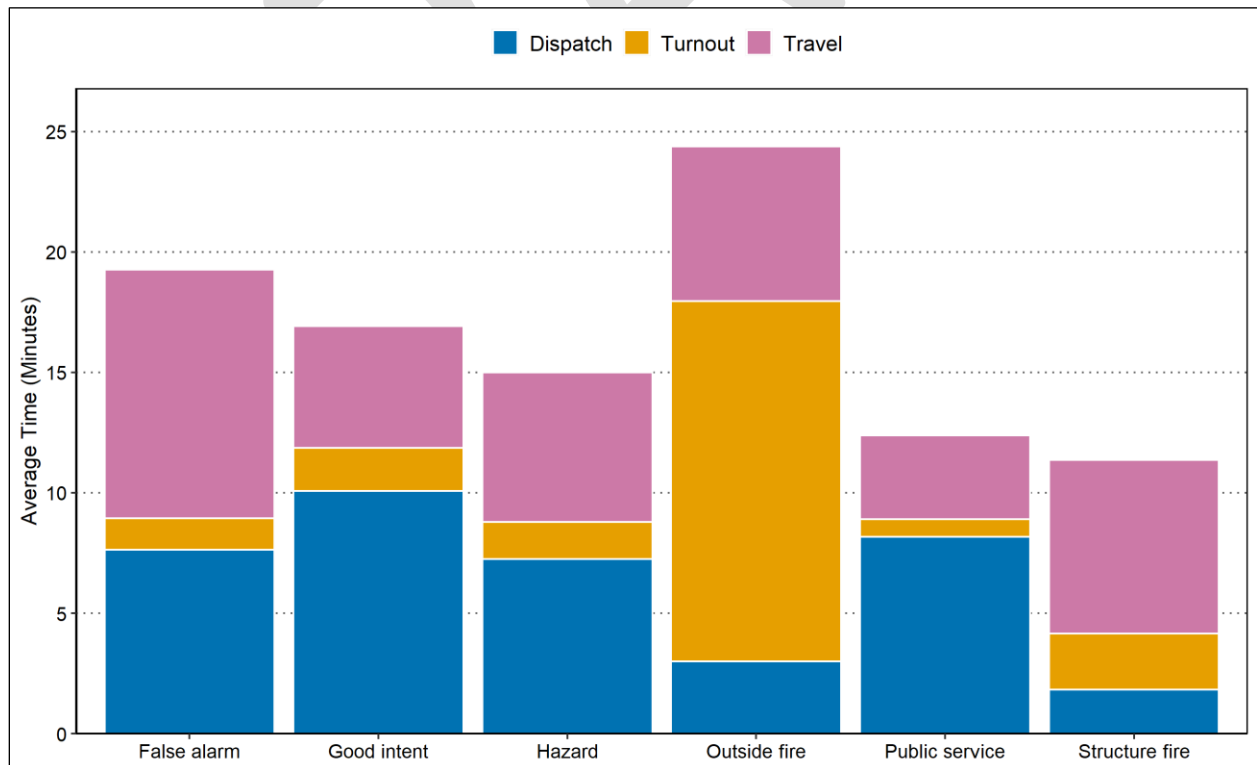


FIGURE 5-23: Average Response Time of First Arriving Unit, by Call Type, Fire



Observations and analysis of the previous tables and figures tell us:

- The average dispatch time for all calls was 5.7 minutes.
- The average turnout time for all calls was 1.2 minutes. However, it should be noted that this time merely indicates that an officer or other member with a portable radio has acknowledged receipt of the call, **not necessarily that necessary emergency units are responding**, so it can be a deceiving statistic.
- The average travel time for all calls was 6.8 minutes. However, it should be noted that this time merely indicates that an officer or other member with a portable radio has arrived on the scene of the call, **not necessarily that necessary emergency units have arrived**.
- The average total response time for all calls was 13.7 minutes.
- The average total response time was 13.0 minutes for EMS and 15.1 minutes for fire calls.
- The average total response time was 24.4 minutes for outside fires and 11.4 minutes for structure fires.
- The table shows an overall 90th percentile response time of 19.6 minutes, which means that 90 percent of the time a call had a total response time of no more than 19.6 minutes.
- Overall 80th percentile dispatch time was 9.4 minutes and the 90th percentile time was 12.3 minutes. This situation is totally inadequate and needs to be addressed. However, this part of the response time equation is out of the control of the LTFD.
- Overall, the 80th percentile turnout time was 1.8 minutes and 90th percentile time was 2.6 minutes. Remember, this is the one aspect of total response time the fire department has the most direct impact on, but these times may not reflect actual response by fire apparatus.
- Aggregate fire and EMS 80th percentile travel time was 9.8 minutes, while the 90th percentile time was 12.0 minutes. Travel times are dictated by the road network and accessibility to local streets, time of day, weather, and station location with respect to the incident. Again, these times reflect the first person who arrived on the scene with a radio, not necessarily an emergency response vehicle.
- Aggregate 80th percentile total response time was 16.9 minutes. For fire calls it was 20.5 minutes, while for EMS calls it was 15.0 minutes.
 - The 80th percentile total response time was 24.4 minutes for outside fires and 13.1 minutes for structure fires.
- The aggregate 90th percentile total response time was 19.6 minutes. For fire calls it was 22.8 minutes, while for EMS calls it was 16.9 minutes.
 - The 90th percentile response time was 24.4 minutes for outside fires and 13.1 minutes for structure fires.

The next three tables illustrate the average, 80th percentile, and 90th percentile response times of the first arriving units by the time of day (in four-hour intervals).

TABLE 5-13: Average Response Time of First Arriving Unit, by Time of Day

Time of Day	Minutes				Number of Calls
	Dispatch	Turnout	Travel	Total	
0:00 - 3:59	4.6	2.1	8.9	15.6	16
4:00 - 7:59	6.0	1.2	7.8	15.0	17
8:00 - 11:59	5.2	1.9	6.9	14.0	30
12:00 - 15:59	6.6	1.0	6.0	13.7	60
16:00 - 19:59	5.5	0.7	6.2	12.4	49
20:00 - 23:59	5.3	1.0	7.5	13.7	37
Total	5.7	1.2	6.8	13.7	209

TABLE 5-14: 80th Percentile Response Time of First Arriving Unit, by Time of Day

Time of Day	Minutes				Number of Calls
	Dispatch	Turnout	Travel	Total	
0:00 - 3:59	6.4	2.5	10.9	16.8	16
4:00 - 7:59	9.5	2.2	9.6	16.4	17
8:00 - 11:59	7.7	1.9	9.8	17.7	30
12:00 - 15:59	10.1	1.5	9.2	16.9	60
16:00 - 19:59	9.5	1.0	8.8	15.4	49
20:00 - 23:59	7.5	1.5	10.1	16.2	37
Total	9.4	1.8	9.8	16.9	209

TABLE 5-15: 90th Percentile Response Time of First Arriving Unit, by Time of Day

Time of Day	Minutes				Number of Calls
	Dispatch	Turnout	Travel	Total	
0:00 - 3:59	7.7	2.7	11.9	22.4	16
4:00 - 7:59	12.8	2.4	11.1	21.4	17
8:00 - 11:59	12.4	5.1	10.6	20.9	30
12:00 - 15:59	12.3	3.0	11.8	17.9	60
16:00 - 19:59	11.6	1.8	12.6	17.6	49
20:00 - 23:59	12.8	2.4	12.0	19.7	37
Total	12.3	2.6	12.0	19.6	209

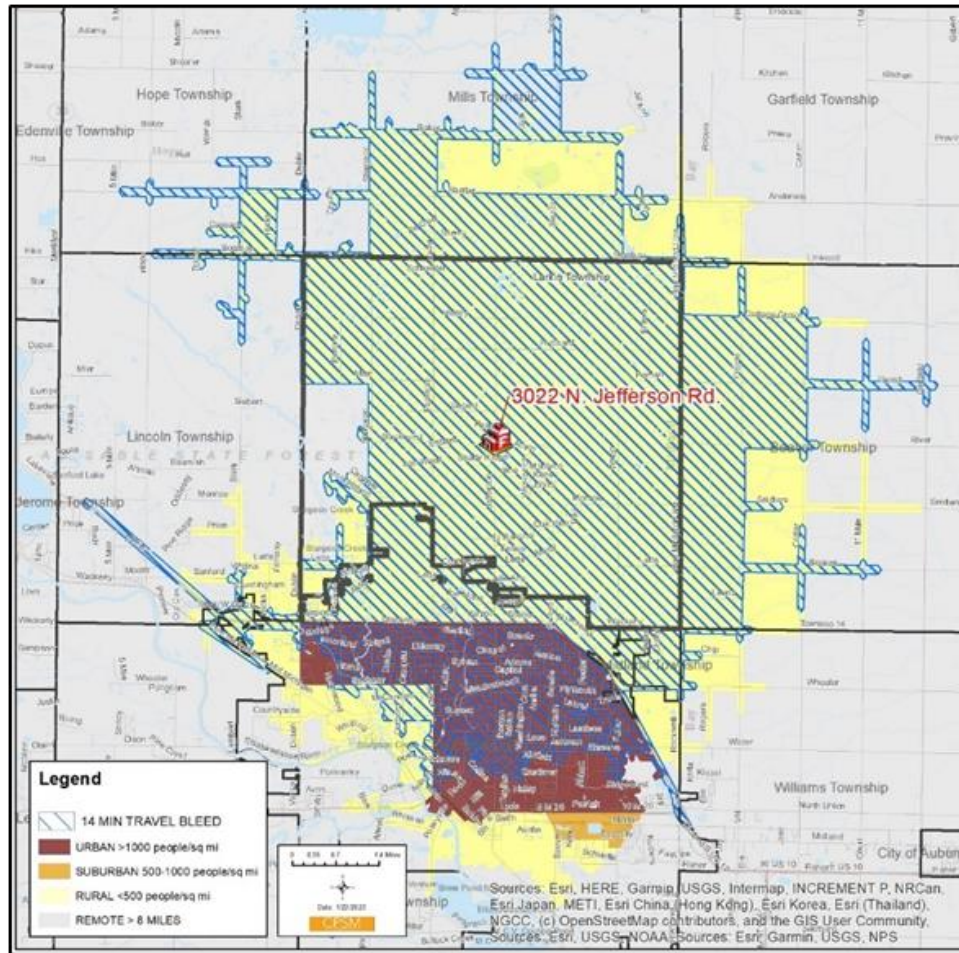
The next table presents a more detailed look at how response times to calls are distributed. The cumulative distributions of total response time for the first arriving unit to EMS calls and outside and structure fire calls are shown. In the table, the EMS cumulative percentage of 7.2, for example, means that just 7.2 percent of EMS calls had a response time under 8 minutes. The 80th percentile for EMS calls was approximately 15 minutes while the 90th percentile was 17 minutes. For actual fires the 80th percentile was 14 minutes.

TABLE 5-16: Cumulative Distribution of Response Time – First Arriving Unit

Response Time (Minute)	EMS		Outside Fire and Structure Fire	
	Frequency	Cumulative Percentage	Frequency	Cumulative Percentage
1	0	0.0	0	0.0
2	0	0.0	0	0.0
3	0	0.0	0	0.0
4	0	0.0	0	0.0
5	0	0.0	0	0.0
6	3	2.2	0	0.0
7	3	4.3	0	0.0
8	4	7.2	0	0.0
9	10	14.4	0	0.0
10	8	20.1	2	40.0
11	16	31.7	0	40.0
12	19	45.3	0	40.0
13	18	58.3	1	60.0
14	14	68.3	1	80.0
15	17	80.6	0	80.0
16	7	85.6	0	80.0
17	7	90.6	0	80.0
18	5	94.2	0	80.0
19	3	96.4	0	80.0
20	0	96.4	0	80.0
21	1	97.1	0	80.0
22	2	98.6	0	80.0
23	0	98.6	0	80.0
24	0	98.6	0	80.0
25+	2	100.0	1	100.0

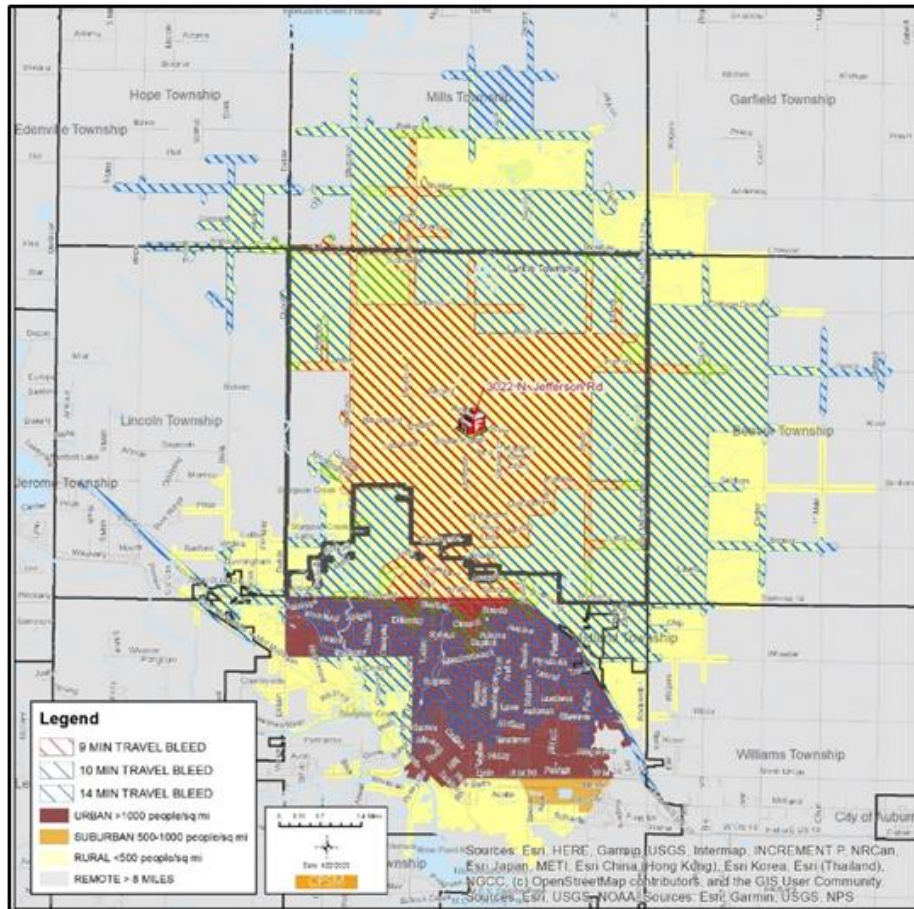
The next set of figures are bleed maps that illustrate the nine-, ten-, and fourteen-minute travel times in Larkin Township from the fire station as identified in NFPA 1720. Keep in mind the important one is the fourteen-minute time for a rural community, which is what Larkin is classified as. Based upon the existing road network, it appears that the entire township is within fourteen minutes of travel time from the station. The nine- and ten-minute benchmarks are just for comparison based upon NFPA recommendations for volunteer organizations serving urban and suburban communities, respectively.

FIGURE 5-24: Fourteen-Minute Drive Time from LTFD Station



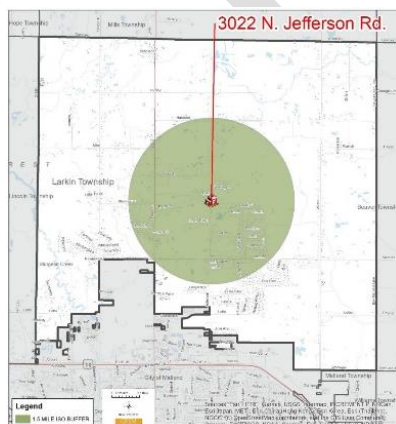
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FIGURE 5-25: Nine, Ten-, and Fourteen-Minute Drive Times from LTFD Station



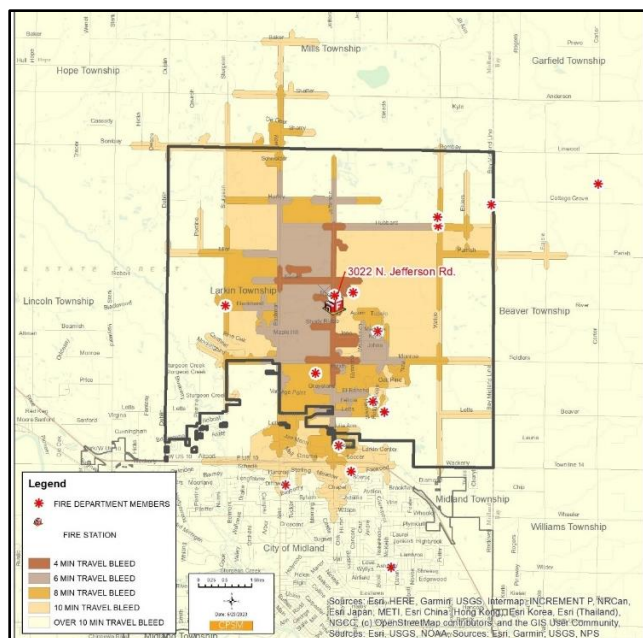
As noted in a previous section of this report, ISO uses a different benchmark for determining adequacy of fire protection response. Their standard calls for the nearest engine company to be within a travel distance of 1.5 miles of an emergency. The next map shows the 1.5-mile distance from the Lark fire station. While much of the township is beyond that travel distance, this situation is common in rural communities.

FIGURE 5-26: ISO-FSRS 1.5-Mile Response Circle for Engine Companies



Another factor that must be considered with volunteer and on-call fire departments that do not staff their stations on a regular basis is the locations where their members live and/or work and normally respond to the station from. The farther away from the station these personnel are, the longer it will take for them to respond to the station to staff the apparatus. This can add significant time onto the turnout component of the response time matrix. The next figure illustrates the location of the LTFD members' address of record in relation to the fire station. The map also illustrates four-, six-, eight-, ten-, and more than ten-minute response times to get to the station from these locations. It should be noted that four members of the department (25 percent) do not live in Larkin Township, while a fifth lives right on the border of Larkin and Beaver Townships.

FIGURE 5-27: LTFD Member Locations with Travel Time Bleeds



While an extended response time just to get to the station is better than no response at all, and is not uncommon in rural communities, our concern is that ten minutes for an emergency response unit to just to begin to make its response, particularly if it is the first unit responding, is not an acceptable response time.

EXTERNAL AGENCY COLLABORATION / REGIONAL ANALYSIS

Mutual aid (MA) is an essential component of almost every fire department's operation. Except for the largest cities, no municipal fire department can, or should, be expected to have adequate resources to respond to and safely, effectively, and efficiently mitigate large-scale and complex incidents. This is particularly true of smaller rural fire departments such as Larkin Township's, which may need mutual aid even for many routine incidents. Mutual aid is shared between communities when their day-to-day operational fire, rescue, and EMS capabilities have been exceeded, and this ensures that the citizens of the communities are protected even when local resources are overwhelmed.

Automatic aid (AA) is an extension of mutual aid, where the resources from adjacent communities are dispatched to respond at the same time as the units from the jurisdiction where

the incident is occurring. There are two basic principles for automatic aid, the first being that all jurisdictional boundaries are essentially erased, which allows for the closest, most-appropriate unit to respond to an incident, regardless of which jurisdiction it belongs to. The second is to provide, immediately and at the time of initial dispatch, additional personnel or resources that may be needed to mitigate the reported incident.

Automatic and mutual aid are generally provided without charge among the participants. Over the years, automatic and mutual aid programs have been developed and refined and are now widely used in the U.S. fire service to augment services and reduce response times.

Locally, the LTFD participates in automatic and mutual aid with its surrounding departments.

The LTFD is a signatory of the Midland County Fire Mutual Aid agreement with all the other departments in the county. However, the MA agreement that CPSM was provided was from 1981, so it is more than 40 years old. This agreement should be updated, then reviewed for accuracy every one to three years.

The LTFD is not currently a participant in the Michigan Mutual Aid Box Alarm System (MABAS) for mutual aid.

All of the MA agreements specify that the resources needed are called for by the incident commander at the time of the request. There are no standardized requests such as a second alarm bringing four engines and two ladders. For Larkin Township, the MFD does respond on automatic aid with a ladder truck and battalion chief to any reported structure fire. At times the MFD rescue will also respond. Otherwise, the township utilizes mutual aid from surrounding communities, which are called upon by the responding LTFD officers when needed and based upon incident conditions.

Larkin Township received aid from the MFD six times during the year studied. Conversely, the LTFD provided MA to surrounding communities 27 times during the year analyzed including 24 times to other locations in Midland County, two times to the City of Midland, and once to Hope. On most of these incidents more than one unit responded from the township although it is unclear if this included chiefs or other officers.

The next table breaks down the workload of LTFD by the location of calls. The following table provides further detail on the workload associated with structure and outside fire calls, also broken down by location.

TABLE 5-17: LTFD Mutual Aid Workload by Call Location

Location	Calls	Percent Calls	Runs	Runs Per Day	Minutes Per Run	Work Hours	Percent Work	Minutes Per Day
Midland (County)	24	7.8	49	0.1	60.5	49.4	18.0	8.1
Midland City	2	0.7	5	0.0	23.6	2.0	0.7	0.3
Hope	1	0.3	2	0.0	55.2	1.8	0.7	0.3

TABLE 5-18: Mutual Aid Runs for Structure and Outside Fires by Call Location

Location	Structure Fires		Outside Fires		Combined	
	Runs	Minutes per Run	Runs	Minutes per Run	Annual Hours	Percent Work
Midland (County)	8	212.2	7	31.5	31.96	56.1
Midland City	3	29.5	0	NA	1.47	2.6
Hope	2	55.2	0	NA	1.84	3.2

The information in the above tables tells us that:

- There were 27 mutual aid calls or nine percent of the total calls.
- There were 56 runs, including two runs dispatched for canceled calls.
- The total deployed time for mutual aid for the year was 53.2 hours, or 19 percent of the total annual workload.

The following table details the information on 27 aid given calls, including the number of runs and deployed minutes for each call.

TABLE 5-19: Mutual Aid Given Runs and Deployed Minutes

CFS Number	Date	Address	Incident Description	Runs	Deployed Minutes
M091521-085	9/15/2021	1305 Rumbaugh Ln	Alarm - Fire	2	29.9
M092221-073	9/22/2021	5600 N Poulos Ln	Falls	1	33.7
M100421-087	10/4/2021	5600 N Poulos Ln	Falls	2	49.4
M101721-007	10/17/2021	2545 E Baker Rd	House Fire	3	85.9
M120721-025	12/7/2021	E Baker Rd & N Eastman Rd	Injury Accident	2	62.7
M122021-019	12/20/2021	E Baker Rd & N Swede Rd	Injury Accident	3	167.4
M011622-105	1/16/2022	2325 Rockwell Dr	Heart Problem	2	29.5
M012222-013	1/22/2022	3551 E Saiko Rd	Chimney Fire	2	110.3
M013122-016	1/31/2022	E Wheeler Rd & N Waldo Rd	Fatal	3	159.9
M022222-144	2/22/2022	1377 Rumbaugh Ln	Wire Down Fire	2	52.8
M031322-090	3/13/2022	1372 Cheryl-Lynne Ln	Fire Public Assist	2	41.6
M033122-012	3/31/2022	3051 W Curtis Rd	Commercial Fire	2	1,015.5
M033122-130	3/31/2022	2922 E Baker Rd	Alarm Burglar	2	70.4
M041122-048	4/11/2022	E Baker Rd & N Waldo Rd	Suicide If Ems Needed	2	159.3
M042422-059	4/24/2022	977 E Price Rd	House Fire	3	595.9
M042922-177	4/29/2022	101 Hunters Ridge	House Fire	3	88.5
M051322-053	5/13/2022	N Waldo Rd & E Wheeler Rd	Grass Fire	2	33.1
M051922-058	5/19/2022	W Us10 & Waldo Rd	Wire Down Or Sparking	2	43.8
M052922-058	5/29/2022	W Us10 & Waldo Rd	Car Fire Not Near	2	89.0
M060422-185	6/4/2022	4780 E Wackerly Rd	Uncons/Fainting	2	34.5
M060922-043	6/9/2022	1424 Rumbaugh Ln	Chest Pain	2	13.9

CFS Number	Date	Address	Incident Description	Runs	Deployed Minutes
M061622-236	6/16/2022	1424 Rumbaugh Ln	Breathing	1	14.1
M061822-060	6/18/2022	4309 E Shaffer Rd	Car Fire Not Near	3	98.4
M070322-120	7/3/2022	1424 Rumbaugh Ln	Chest Pain	1	15.9
M072922-017	7/29/2022	W Us10 & Waldo Rd	Injury Accident	1	16.5
M082522-218	8/25/2022	1332 Cheryl-Lynne Ln	Falls	2	42.5
M082922-077	8/29/2022	4520 E Wheeler Rd	Breathing	2	39.2
Total				56	3,193.5

Note: M012222-013 was in Hope; M011622-105 and M042922-177 were in Midland City; The rest of the calls were in Midland County's unincorporated zones.

As has been noted previously in this report, LTFD does not train routinely with any MA partners.

While no formal studies have been completed, early evidence suggests that the COVID-19 pandemic has hastened the decline of an increasing number of volunteer and on-call emergency services organizations. Whether this is the case in the Larkin Township is unknown. However, the department has experienced a net loss of four members—20 percent—in the past year. Even in career fire departments recruiting highly qualified new recruits has become much more challenging. This situation may open new opportunities for regional collaborations or shared services agreements related to the provision of emergency services. The concurrent study that CPSM is conducting for the City of Midland can potentially provide one such opportunity.

The idea of giving up total local control is always a proposition that gives elected officials and their constituents pause and has been one of the obstacles to true regionalization or consolidation, particularly where small community pride and the time-honored concept of home rule are deeply ingrained in the culture. However, the constantly escalating costs of attempting to provide the same level of service is becoming a more and more difficult task. Scarce tax dollars are being stretched to the limit. Smaller communities that have far fewer resources and options than their larger neighbors will find it especially difficult to cope within the limitations imposed by the new financial reality. The continuing trend of declining volunteerism will create simultaneous challenges that will stretch the provision of emergency services in many communities even farther.

As noted previously, Larkin Township is not a member of Michigan Mutual Aid Box Alarm System (MABAS),⁸⁷ which coordinates intrastate and interstate mobilization and deployment of fire, emergency medical services, and special operations mutual aid resources. MABAS is designed to streamline the requesting and providing of emergency and fire services resources across Michigan for day-to-day mutual aid and for large-scale events such as major fires, train derailments, tornadoes, wildfires, domestic or foreign terrorism, and other events that may overwhelm local resources.

For automatic and mutual aid to be successful, participating agencies must train frequently together and at times, help each other with training shortfalls, and specialized or specific training specific to the community. Likewise, successful MA and AA programs are recognized by the ISO in terms of weight of response (staffing and equipment) and water supplies (fire flow).

87. <https://www.mabasmi.org/index.php/about-us/about-mabas>

The issue of which companies should respond to certain areas on mutual or automatic aid is often the subject of debate within the emergency services. While the simple answer is to say the closest should always be called, the reality is not that clear cut. A significant issue that is closely related to automatic and mutual aid is the training of departments and personnel who are participating. In large part due to the lack of mandatory firefighter training requirements (in many cases even basic Firefighter I training is not mandatory) the training of personnel from fire company to fire company can vary widely. This is particularly true in the volunteer fire service. It also creates a major dilemma for fire chiefs of well-trained organizations and can create serious operational and safety issues on the emergency scene. In short, personnel who are not adequately trained can be a serious detriment on the emergency scene and present liabilities to the municipality in which the incident is taking place. Ultimately, the incident commander is responsible for the safety and conduct of everyone on the scene regardless of their organizational affiliation.

It is certainly not unreasonable for the LTFD, and in a larger context the township as a whole, to expect that companies coming into the township on automatic and/or mutual aid be required to meet certain minimum training requirements as long as they are valid and reasonable. These minimum training requirements should be spelled out in the formal, signed automatic/mutual aid agreements that should exist between various communities and/or fire departments.

Agency Collaboration Recommendations:

- Larkin Township and the LTFD should explore and be open to opportunities for more regional and/or shared services collaborations that would provide for a more robust emergency services delivery system. (Recommendation No. 66.)
- Larkin Township and the LTFD should consider joining the MABAS system to assist with streamlining the calling for and response of necessary resources to significant incidents. (Recommendation No. 67.)
- Larkin Township and the LTFD should require that personnel who staff fire and rescue organizations that respond into the township on mutual aid possess the same minimum levels of training (Firefighter I and II) that Larkin Township personnel are required to maintain. The mutual aid agreements with surrounding fire departments should stipulate the minimum required training standards for personnel who may respond into the township to assist. (Recommendation No. 68.)

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SPECIALIZED FIRE-TECHNICAL RESPONSE CAPABILITIES

Specialized response capabilities include hazardous materials (Haz-Mat), high angle rope rescue, trench collapse, building collapse, complicated heavy auto extrication, elevated rescue with an aerial platform, and confined space rescue. There is no requirement in NFPA 1710, 1720, ISO-FSRS, or other national benchmarks that mandates that a fire department deliver all of these services. What is required in the NFPA standard is *an organizational statement that sets forth the criteria for the various types of special operations response and mitigation activities to which the fire department is required to respond.*

In many communities, such as Larkin Township, engine companies or a light/medium rescue truck carry auto extrication equipment for light to medium extrication incidents and are trained in certain aspects of Haz-Mat and technical rescue incidents, more as supportive assets in large-

scale incidents. Larkin Township personnel are trained to the hazardous materials operational level. With the township having areas that are becoming more suburban in nature, the department has training in wildland–urban interface firefighting operations. There is also a contingent of personnel who are trained in swift water operations. The department has an all-terrain utility unit and trailer to support these operations.

Larkin Township is fortunate to be adjacent to the City of Midland, where the MFD has become a hub for regional special operations response training and activities. The MFD is host to the Michigan Region 3 Regional Response Team (RRT), which provides Technical Rescue and Hazardous Materials response to a 14-county region area stretching from Genesee County to Alpena County.

The special operations teams represent a group of firefighter personnel that in addition to their firefighting duties and training have elected to diversify and train to meet the challenges and dangers of specific operations environments. Members of the RRT come from a three-county area with the MFD providing 15 of the 45 members. The MFD also houses the RRT response truck and trailer (see next figure).

FIGURE 5-28: Region 3 Special Operations Regional Response Team Truck and Trailer Deployed at MFD



In the technical rescue disciplines the RRT has personnel who are trained and certified to the Technician level in the following specialties:

- Confined Space Rescue.
- High Angle Rope Rescue (including tree-based rescue).
- Trench Rescue.
- Agriculture Rescue.
- Machine Rescue.
- Structural Collapse Rescue.

EMS GROUND TRANSPORT

MyMichigan Health (MMC-EMS) provides ground transport EMS for Larkin Township. This is done through a contract with Midland County to provide EMS transport county-wide. The contract with the county is long-standing, having first been implemented in about 1975 or 1976. EMS operations are funded by a 0.55 mil assessment, which covers operating expenses and is also used to underwrite unpaid third-party billing.

MMC-EMS operates from four stations located throughout Midland County. The main facility is located at 4601 Wellness Rd. in the MyMichigan Health System campus in Midland. The other stations are located in Homer Township, Sanford, and Coleman. MMC-EMS averages seven EMS units on duty in the county, with three of those normally stationed in the city. It uses system status management to redeploy units as necessary based upon call volume and automatic vehicle location (AVL) to dispatch the nearest available unit. All EMS units are normally staffed with two paramedics. It is their belief that the system as currently configured operates very efficiently.

MMC-EMS informed CPSM that it has a good relationship with the LTFD and that communication both ways, although limited with the low call volume, is generally good.

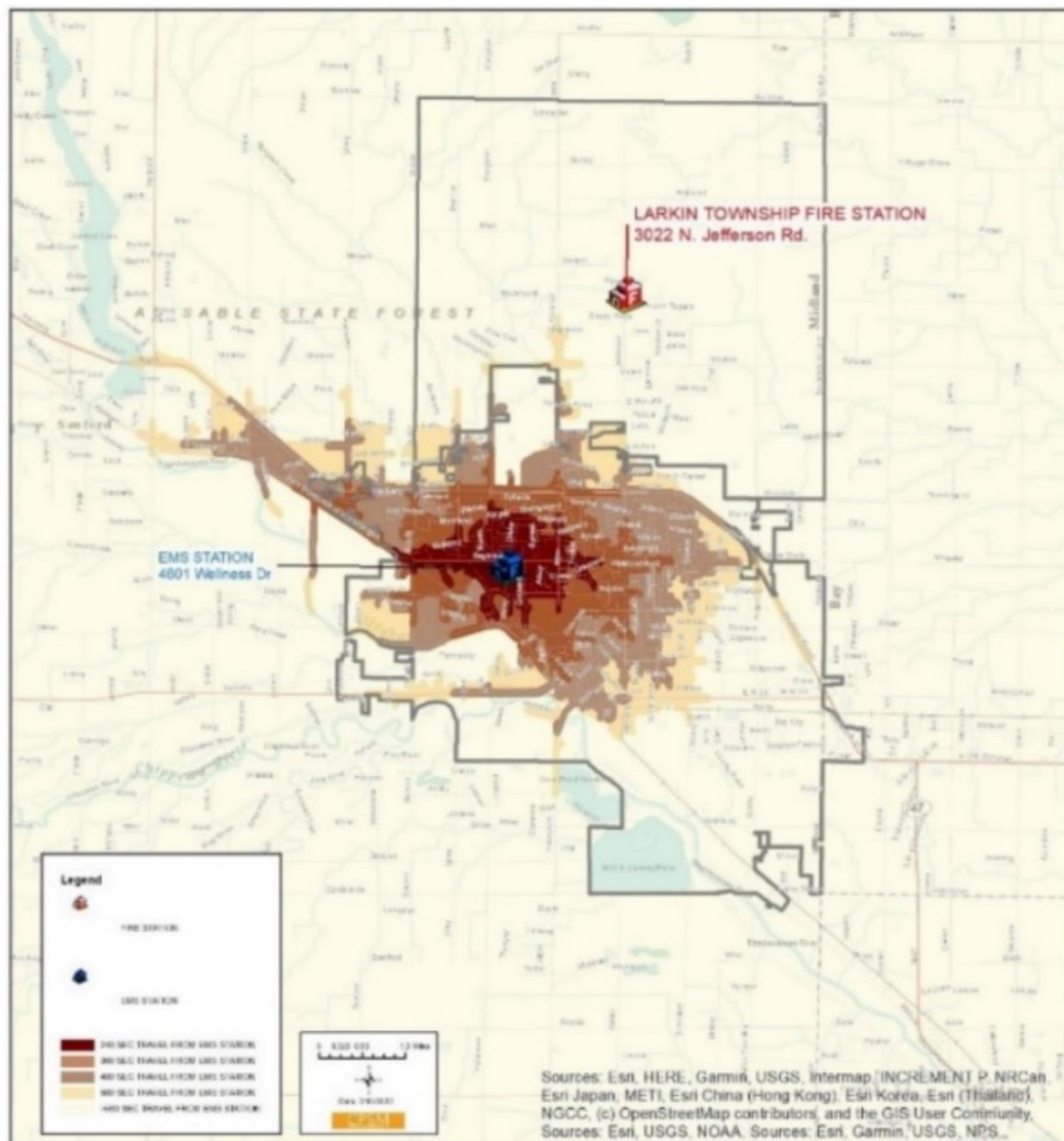
Between September 2, 2021, and August 31, 2022, MyMichigan Medical Center EMS (MMC-EMS) responded to 195 calls (arrived at 185 of them) in Larkin Township, of which 74 percent were EMS calls. The following table shows the number of calls by call type, the average calls per day, and the percentage of calls that fall into each call type category for the study period.

TABLE 5-20: Calls Responded to in Larkin Township by MMC-EMS, by Type

Call Type	Total Calls	Calls per Day	Call Percentage
Breathing difficulty	19	0.1	9.7
Cardiac and stroke	17	0.0	8.7
Fall and injury	23	0.1	11.8
Illness and other	42	0.1	21.5
MVA	19	0.1	9.7
Overdose and psychiatric	2	0.0	1.0
Seizure and unconsciousness	22	0.1	11.3
EMS Subtotal	144	0.4	73.8
Good intent	1	0.0	0.5
Public service	2	0.0	1.0
Structure fire	3	0.0	1.5
Fire Subtotal	6	0.0	3.1
Canceled	45	0.1	23.1
Total	195	0.5	100.0

The following map shows the location of the Midland MyMichigan EMS station in relation to Larkin Township, along with response time bleeds. Almost the entire area of Larkin Township is more than a 10-minute travel time (light yellow color) from the Midland station. This fact makes it imperative that the LTFD respond quickly to EMS incidents, particularly those that are potentially life-threatening, to provide emergency first responder care and basic life support.

FIGURE 5-29: MyMichigan EMS travel Time Bleed to Larkin Township



One of the main factors to consider when analyzing EMS service operations is the transport component of that service. Factors like the percentage of incidents that result in either a transport or a refusal, travel time to the nearest medical facility or facilities, and turnaround time (the time from when the ambulance arrives at the hospital until they transfer care to hospital staff and can be available for another emergency) at the medical facility all play roles in the number of resources that are needed, and how well they can meet established benchmarks. The latter factor (turnaround time) is a growing problem in many areas of the country with overused and understaffed emergency departments.

The following table shows transport calls by call type by MMC-EMS from Larkin Township. Transport calls were identified by requiring that at least one responding medical unit had

recorded both a “beginning to transport” time and an “arriving at the hospital” time. Based on these criteria, we note that 26 non-EMS (fire & other) calls that resulted in a transport are included in this analysis.

TABLE 5-21: Transport Calls by Call Type

Call Type	Number of Calls			Conversion Rate
	Non-transport	Transport	Total	
Breathing difficulty	2	17	19	89.5
Cardiac and stroke	3	14	17	82.4
Fall and injury	3	20	23	87.0
Illness and other	16	27	43	62.8
MVA	15	6	21	28.6
Overdose and psychiatric	2	0	2	0.0
Seizure and unconsciousness	6	16	22	72.7
EMS Subtotal	47	100	147	68.0
Fire & Other Subtotal	114	26	140	18.6
Total	161	126	287	43.9

The data in this table tells us that:

- 68 percent of EMS calls involved transporting one or more patients.
- On average, 0.3 EMS calls per day involved transporting one or more patients. In other terms, this means that there was one patient transported to the hospital from Larkin Township about once every three days.

The next table shows the average duration of transport and non-transport EMS calls by call type. The duration of a call is defined as the longest deployed time of any of the units responding to the same call.

TABLE 5-22: Call Duration by Call Type and Transport

Call Type	Non-transport		Transport	
	Average Duration (Minutes)	Number of Calls	Average Duration (Minutes)	Number of Calls
Breathing difficulty	34.7	2	52.0	17
Cardiac and stroke	67.0	3	55.4	14
Fall and injury	34.4	3	53.4	20
Illness and other	37.8	16	53.7	27
MVA	34.3	15	88.5	6
Overdose and psychiatric	15.8	2	NA	0
Seizure and unconsciousness	22.6	6	49.2	16
EMS Subtotal	35.3	47	54.9	100
Fire & Other Subtotal	29.7	114	44.8	26
Total	31.3	161	52.8	126

The data in this table tells us that:

- The average duration was 35.3 minutes for non-transport EMS calls.
- The average duration was 54.9 minutes for EMS calls where one or more patients were transported to a hospital.

The next table gives the average deployed time for an EMS unit on a transport call, along with a breakdown of the three major components of the deployed time: **on-scene time**, **travel to hospital time**, and **at-hospital time**. For the purposes of this analysis:

- **On-scene time** is the interval from the unit arriving on-scene time through the time the unit departs the scene for the hospital.
- **Travel to hospital time** is the interval from the time the unit departs the scene to travel to the hospital through the time the unit arrives at the hospital.
- **At-hospital time** is the time it takes for patient turnover at the hospital.

This table analyzes times by runs. Remember, normally, the number of runs will exceed the number of calls as a call may have multiple runs. In addition, average times may differ slightly from similar averages measured per call. In addition, average unit deployed time per run is lower than the average call duration for some call types because call duration is based on the longest deployed time of any of the units responding to the same call, which may include an LTFD engine, rescue, or other personnel in a private vehicle. Finally, total deployed time is greater than the combination of on-scene, transport, and hospital wait times as it includes turnout, initial travel, and hospital return times.

TABLE 5-23: Time Component Analysis for Transport Runs by Call Type

Call Type	Average Time Spent per Run (Minutes)				Number of Runs
	On Scene	Traveling to Hospital	At Hospital	Deployed	
Breathing difficulty	9.5	11.9	19.3	51.9	17
Cardiac and stroke	13.9	11.1	17.6	54.4	14
Fall and injury	14.5	12.4	13.9	53.4	20
Illness and other	13.7	13.4	14.9	53.0	27
MVA	11.5	9.7	16.3	45.3	6
Seizure and unconsciousness	14.4	12.9	10.4	48.9	16
EMS Subtotal	13.1	12.3	15.2	52.0	100
Fire & Other Subtotal	7.0	13.5	13.5	44.7	26
Total	11.9	12.6	14.9	50.5	126

Analysis of the data in this table tells us that:

- The average time spent on-scene for a transport EMS call was 13.1 minutes.
- The average travel time from the scene of the EMS call to the hospital was 12.3 minutes.
- The average deployed time spent on transport EMS calls was 52.0 minutes.
- The average deployed time at the hospital was 15.2 minutes, which accounts for approximately 29 percent of the average total deployed time for a transport EMS call.

OVERALL OPERATIONAL ASSESSMENT AND CURRENT STATE OF THE FIRE AND EMS DELIVERY SYSTEM

As analyzed and observed by CPSM, the current state of the fire and EMS delivery system in Larkin Township, from the operational perspective of the LTFD, which includes external factors such as available staffing, on-call personnel recruitment and retention, risk, future township growth, available funding, and demand for service, is as follows:

- During this study, CPSM observed what appears to be a volunteer fire organization that strives to provide a high level of service to the community but is struggling with membership participation.
- The LTFD appears to be an organization that attempts to provide the best service possible to the township within the constraints of a rural community with limited staffing and resources. Members of the department appear to work as a team to produce a level of service that is commensurate with that found in many other rural communities.
- From all accounts, once they arrive on the scene of an emergency, LTFD personnel perform their duties in a competent manner. They are to be commended for their efforts and given the support they need to continue to try to be more successful.
- The above opinions of the CPSM team notwithstanding, the LTFD is confronted by many of the challenges that are facing fire service organizations across America. As the fire service has entered an all-hazards environment, the public has come to expect increased knowledge, skills, and abilities from their firefighters, as well as a higher level of service and responsiveness. This is often difficult to achieve in volunteer and on-call departments that have limited resources, including adequate hours to devote to training.
- Like many volunteer and on-call emergency services organizations the LTFD is struggling with a declining (and aging) membership group and has not had good success at recruiting and retaining new members.
- The LTFD has seen a 20 percent decline in membership in approximately the past year. This type of staffing decline will not sustain the department over the long term.
- Of the current LTFD membership, 25 percent do not live in Larkin Township. This situation creates extended response times for these personnel, which minimizes their ability to be part of the critical initial response.
- Just eight personnel responded to at least 25 percent of incidents, with one additional responding to 24 percent. This illustrates that just over 50 percent of the department responds to at least one in four incidents.
- Just three members (15 percent) responded to more than 35 percent of the calls with only the Chief responding to more than 50 percent (56 percent) of the calls.
- Based on data provided by the LTFD for 167 responses, an average of just 4.3 personnel responded to each incident. Of those 167 responses, on 34 of them (20.6 percent) just one or two members responded.
- When responding to any incident with the potential for personnel to encounter an IDLH, units with staffing of less than four personnel have fewer tactical fire options until the arrival of additional personnel and resources.
- Of four structure fires in Larkin Township during the study period, the number of LTFD members who responded ranged from two to five.

- On all four structure fires the Midland Fire Department arrived on scene prior to the LTFD.
- Like many on-call and volunteer organizations, the membership is aging; 37.5 percent of the LTFD roster is over the age of 50.
- Based on the LTFD's current deployment model, nearly the entire township is within 14 minutes of travel time for the first responding unit, a time that is recommended for a rural community in NFPA 1720.
- The township averages about 0.84 emergency calls per day. On average, one EMS call occurs about every three days and a fire call about once every five days. An actual structure or outside fire occurs about once every 52 days.
- Being a primarily rural community with limited commercial occupancies, other than fires in single-family dwellings, the township's fire risk is relatively low.
- Except for the City of Midland, the township is bordered by townships that are also protected by primarily volunteer fire departments, thus, the LTFD may have limited reliable mutual aid options.
- 27.9 percent of the population of the township falls into higher risk categories of 65 years old or older (20.7 percent) and under age 5 (7.2 percent).
- Just under two percent (1.65 percent) of Larkin residents live below the poverty line.
- The township's fire station is at best in fair condition and has outlived its usefulness as an emergency response facility. If it decides to maintain its own independent fire department, the township will need to make a major investment in fire department capital infrastructure over the next several years for the construction of a new facility.
- The LTFD has limited community risk reduction (CRR) and training capabilities due to its small size. Both capabilities should be enhanced moving forward.
- Larkin Township expects to continue to experience moderate growth, primarily residential in nature. The pace of growth may accelerate if the township secures additional water hookups from Midland.

Our analysis of the LTFD contains illustrative and descriptive material, specific operational and administrative findings, and recommendations regarding the delivery of fire protection and initial EMS services in the Township. Included in this analysis are several components that create the foundation of effective fire protection and EMS service delivery to include training and education, fleet rightsizing, community risk reduction, personnel recruitment and retention, improved procurement, health and safety of volunteer members, and emergency response and fire department performance and benchmarking against national standards.

CPSM found the LTFD members to be open and we believe transparent about their operations. Officers and members with whom the project team interacted were passionate about their volunteer service to the community. In fact, CPSM did not encounter a single member who was not passionate about what they do within their department and for the community. All on-call fire department members are to be commended for their service and their commitment to the citizens of their community.

Although there are findings of this analysis that may be viewed as something other than positive, they should not be considered as such. Rather, they should be viewed as opportunities to make the LTFD stronger, more efficient, and more effective in how it provides emergency services in the township. In the short term, and ongoing, the most important task that the LTFD leadership,

with support from the township, should undertake is an aggressive campaign for recruitment and retention of members. This campaign should be accompanied by careful monitoring of the department's ongoing ability to turn out a sufficient response force in a timely manner as outlined in the performance objectives found in this report.

There is no "right" amount of fire protection and EMS delivery for a community. It is a dynamic model based on such things as the expressed needs of the community, community risk, population growth, and ability/willingness of the community to fund the desired level of service. Providing the right amount of fire protection and EMS service, and by extension the number and status of personnel for a fire department, is based on several factors. First, the community must decide how to manage its level of risk based upon what resources it can afford to commit, and thereby avoid making the community vulnerable to an undesirable event. Fire departments also calculate risk levels for the community and their personnel in the form of a Community Risk Reduction Analysis and Standards of Coverage (SOC).

In looking at response times it is prudent to design a deployment strategy around the actual circumstances that exist in the community and the fire problem that is identified to exist. The strategic and tactical challenges presented by the widely varied hazards that the department protects against need to be identified and planned for through a community risk analysis planning and management process as identified in this report. It is ultimately the responsibility of elected officials to determine the level of risk that is acceptable to their community. Once the acceptable level of risk has been determined, then operational service objectives can be established. Whether looking at acceptable risk, or level of service objectives, it would be imprudent, and probably very costly, to build a deployment strategy that is based solely upon response times. It is also the responsibility of those elected officials to translate community needs into reality through direction, oversight, and the budgetary process. It is their unenviable task to maximize fire and emergency medical services within the reality of the community's ability and willingness to pay, particularly in today's economic environment.

In formulating our recommendations CPSM has relied on several widely accepted references for benchmarks and standards, industry best practices, as well as experience drawn from projects across the United States. These references include:

- The ninth edition of the *Fire and Emergency Service Self-Assessment Manual (FESSAM)*, 2015, Center for Public Safety Excellence, Inc., of Chantilly, Va.
- *Managing Fire and Emergency Services*, 2012, International City-County Management Association, 777 N. Capitol Street NE, Washington, DC.
- National Fire Protection Association standards for deployment, EMS, safety, etc.

SECTION 6. OPTIONS FOR A SUSTAINABLE FIRE AND EMS DELIVERY SYSTEM

Larkin Township has several options that the township's leadership can and should consider as they work to determine the best model for the future delivery of fire and EMS services to the township. In addition, it is possible a hybrid version combining aspects of several options might provide the best path forward. Regardless of what option is selected initially, there will need to be an ongoing evaluation process involved to determine if that option or model is working as anticipated. If it is not, then modifications and/or a change in direction may be warranted.

Before we present several options for the township's consideration, there are several points that we should make that will most likely be consistent through any of the models selected.

- The first is that for any option (except for one) to be viable and successful in the long term, the LTFD and township will need to make recruitment—and perhaps more importantly retention—of new on-call personnel a high priority. In addition to increasing the compensation for on-call personnel, the township will need to develop additional incentives to keep personnel active, such as considering offering at least a percentage of healthcare benefits.
- The second point is the need to implement a township fire millage fee to assist with funding the necessary operations of the fire department in the future. Even with a fully volunteer or on-call department there are significant costs to providing fire protection. New basic pumpers cost upward of \$750,000, a set of firefighter PPE can cost up to \$4,000, and training and equipment costs are increasing exponentially.
 - CPSM's research found that seven communities in Midland County have adopted fire or emergency services taxes to fund their fire protection needs. While new or increased taxes are rarely popular, funding dedicated to fire protection or emergency services are often among those viewed most favorably. In Midland County the assessed fire millages range from 0.7499 in Warren Township to 1.7275 in Hope Township.
 - The assessment of a one (1) mil fire or emergency services tax for Larkin Township would generate approximately \$295,000 in revenue that could be utilized for the delivery of fire and EMS services in the Township.
- Finally, under most, but not all of the options presented, Larkin Township will need to construct a new fire station. The current station is not in good condition and has outlived its usefulness as a fire station. If the township continues to provide fire protection and initial EMS response and hopes to recruit and retain new personnel to bolster the fire department's ranks, these personnel must have an adequate facility from which to conduct operations. This is particularly important if there is a desire to encourage personnel to staff the station on a more regular basis.

While the CPSM team are not construction professionals, due to supply chain shortages and rapidly escalating costs for both materials and labor, it is our belief that a new, basic fire station for Larkin Township could cost up to (plus or minus) \$2 million. Some options for obtaining at least part of the necessary funding were presented earlier in this report.

With these thoughts in mind, following are options that Larkin Township can consider for the continued and future provision of fire and EMS first responder services to the township.

MAINTAIN THE STATUS QUO

In a more perfect world, the present fire protection model of utilizing volunteer firefighters and the current fire department would be sufficient and would obviously be the most cost-effective model for the township. CPSM bases this option on the limited workload and demand data as presented in this report. However, the turnout of personnel, and to a lesser extent, overall response times are less than desirable. Compliance with recommended standards of response are, at best, sporadic. These issues will only become more pronounced as additional development progresses and the annual requests for service gradually increase. Although the township could implement many of the recommendations contained in this report while still opting to stay the course with this option, we do not believe that this course of action would be in the best interests of the township, its residents and visitors, or the other emergency services stakeholders as it would ignore the most significant challenges facing its fire department.

This option is probably the easiest and least expensive for Larkin Township to consider. However, it is also the least desirable considering the challenges the LTFD is facing, particularly with regard to an aging and shrinking on-call firefighting force.

Advantages of this alternative include:

- Since Larkin Township has less than one emergency call per day, the governing body can decide to accept a higher level of risk knowing that calls may not receive a timely response by enough personnel.
- Larkin Township maintains full control over the delivery of fire and first responder EMS and maintains the traditional service delivery that residents are accustomed to seeing.
- Lowest cost to the township as the status quo is maintained. However, this does not mean that costs will not increase in other areas such as equipment, station maintenance and construction, etc.

Disadvantages of this alternative include:

- The LTFD is staffed by an aging and diminishing on-call force. The department ranks declined by 20 percent in the past year and more than one in three members are over the age of 50.
- More than one in five (20.6 percent) of calls resulted in a response from just one or two LTFD members.
- On all four structure fires that occurred in the Township, the Midland Fire Department was on the scene prior to the LTFD.
- Volunteer and on-call recruitment is a difficult and time-consuming endeavor that no longer produces high results. These challenges will only increase in the future.

Model cost (assumptions):

- Same as existing model of fire/EMS service delivery except for the significant costs for equipment and apparatus.

CPSM does not recommend this option.

HIRE A PART-TIME FIRE CHIEF OR FIRE ADMINISTRATOR

Managing and monitoring all components of a modern-day emergency services provider, with the variables found in a growing community, requires a well-versed and experienced manager and leader. The role includes program oversight such as budget development, implementation, and management; on-call department liaison with the Township Supervisor and Board; developing SOPs/SOGs; ensuring the training and education of members; monitoring department turnout and emergency response force and consulting with those personnel who have response issues; apparatus maintenance and replacement; fire station maintenance; understanding the ISO report and devising a plan to correct deficiencies; personnel guidance to include recruitment and retention of the on-call membership; community risk reduction; logistical support; and other functions. In addition, if a new fire station is approved for construction, this person would need to oversee the construction of this important community asset.

The role of today's fire chief is complex and multifaceted. It is no longer simply about organizing and commanding a reactionary force to suppress fires. Today's Fire Chief must fill these many roles:

- **Community Ambassador.** Community ambassadors work with their community. They begin by getting to know the community and the community knowing them. They represent fire and emergency services to the community, serve as spokespersons, share information, and are the symbolic leader to represent the department in the community.
- **Futurist.** Futurists have their eyes on the horizon. They anticipate policy and political issues and keep abreast of industry innovations, NFPA standards, and industry best practices in the fire service. They anticipate change and plan for it.
- **Strategist.** Strategists work with appointed and elected officials and community leaders. They move the department to a strategic deployment and operation level rather than a reactionary service. Strategists can articulate the needs of the department based on facts and not emotion.
- **Negotiator.** The contemporary chief negotiates and represents the department with other agencies, within the jurisdictional entities, and with members. Negotiators must be willing and able to be a part of a negotiating team, articulate and argue a point of view, seek a middle ground, and sell agreement to others, particularly their members. Negotiators are not everyone's friends but rather they are their leader.
- **Lobbyist.** A contemporary chief must be a lobbyist with their local government, state, and various other entities that affect the department. Examples may be the through state Chief's Associations, International Association of Fire Chiefs, National Fire Protection Agency, the National Volunteer Fire Council, accrediting bodies, and funding organizations such as the Federal Emergency Management Agency.
- **Navigator.** Navigators first help others focus on the end results and desired outcomes and then guide the organization through obstacles at the department level, community level, chief administrative officer level, and the elected body level. Navigators get out ahead of issues and develop plans in advance rather than at the last minute.
- **Champion.** Champions are boosters of the fire and emergency services. They look at ways to get others to believe in the department and inspire others to act in support of its mission. They make the department desirable for new membership and the retention of current members.

The position that CPSM is suggesting for consideration is an enhancement of the current part-time Fire Chief position. We are suggesting that the role of Fire Chief or Fire Administrator be to oversee all the department's administrative functions (and operations if holding the title of Fire Chief) and who reports directly to the Township Supervisor. The person would be required to work a regular schedule of about 25 to 30 hours per week.

Since Larkin Township really has no community risk reduction program at this time, it may be prudent to consider designating this person as a Fire Protection or Emergency Services Chief. This position would have the responsibility of oversight of the township's fire protective services along with implementation of a Community Risk Reduction program (fire prevention, fire investigation, public fire education). In addition, the duties of fire/emergency service chief/administration could include the duties of Emergency Manager (OEM). This person would also be a "working" chief who responds to all fire and EMS emergencies when working.

Advantages of this alternative include:

- Emergency services issues receive higher priority with a professional chief/administrator working two or three days per week.
- More professional management and leadership of the fire department.
- Important tasks such as training, community risk reduction, and SOP/SOG development are addressed in a timely and ongoing basis.
- Opportunity for new vision and direction for the LTFD.
- More responsiveness to Larkin Township governing body.

Disadvantages of this alternative include:

- Potential lack of acceptance by other members of the LTFD.
- Difficulty in finding a qualified candidate who is a good fit for Larkin Township.
- Starts LTFD on what can be a slippery slope as a more truly combination fire department.
- Opposition from the community.
- Political interference.
- Cost.

Model cost (assumptions):

- \$70,000/year. Part time Fire Chief or Administrator works 25 hours per week at \$50.00 per hour.
 - $\$50.00/\text{hour} \times 25 \text{ hours/week} \times 52 \text{ weeks/year} = \$65,000$
 - Other expenses such as uniforms, supplies, etc. = \$5,000

CPSM does not recommend this option as a primary one.

However, if the township decides to continue to provide fire protection services and first responder EMS as a stand-alone entity, then this option should be considered.

SHARED ADMINISTRATIVE AND/OR SUPPORT SERVICES (SASS)

Integration of administrative shared services between Midland and Larkin Township could provide a unique opportunity to apply the theory of shared service in a real word application between agencies. The Shared Administrative/Support Service Model allows for a streamlined administrative staff to oversee operations of the Larkin Township Fire Department. The model would strive to eliminate duplication, build efficiencies, fiscal prudence, future vision, and sustainability of the Larkin Township Fire Department and in a larger context the fire service delivery model in the greater Midland area.

Some benefits that could be gained from this type of arrangement include, but are certainly not limited to:

- Single administration
- Standardized (and joint) training, qualifications
- Standardized equipment
- Streamlined operational and administrative policies
- Reduce duplication of effort
- Joint purchasing
- Identity potential fiscal efficiencies
- Explore technology to enhance operations and response
- Safety & accountability
- Documentation
- Data collection
- Increase prevention & life safety programs

HIRE PART-TIME PER DIEM PERSONNEL

There is no real statistical evidence that quantifies when a community's fire department needs to transition from a fully volunteer or on-call organization into one that employs either part-time or full-time personnel. Such a transition is based on call volume, number of available personnel, budget resources, and other factors specific to that community. Anecdotal evidence suggests that in many cases the tipping point is often when annual responses reach about 450 to 500 per year. While the LTFD is not near that response volume, the declining number of on-call members, and the number of incidents that only one or two members respond to—both of which will likely continue to deteriorate—indicates that the time to make this initial transition may be arriving in Larkin Township.

It should be noted that during our interviews with members of the LTFD, that while they do not believe that the time has arrived just yet, many members believe that the need for a couple of compensated personnel to staff the station during the day is not far away. With the ongoing difficulty in recruiting new personnel into volunteer and on-call organizations nationwide, CPSM concurs with that assessment. However, we also believe that although staffing the station will be necessary, trying to initially do it with part-time per diem personnel is a less expensive option than hiring full-time career personnel.

While effective, efficient, and safe emergency scene operations, particularly initial fire attack operations, is the overriding reason for considering the addition of career staffing, that is not the sole justification. There are numerous other duties and responsibilities that compensated personnel could undertake when not responding to fire and rescue emergencies. Some of the other benefits of having the per diem personnel in place, particularly during the day when most of the call force are at their primary jobs, include, but would certainly not be limited to:

- Quicker and guaranteed compliance with the OSHA two-in/two-out requirement for initial fire attack.
- Guaranteed, and usually immediate, EMS response to get lifesaving help to the 9-1-1 caller quicker.
- Performing fire prevention inspections (possible future duty) and other fire prevention activities.
- Developing/updating pre-fire/incident plans.
- Performing fire apparatus, tool, and equipment inspections, testing, and maintenance.
- Performing basic station maintenance.
- Performing fire hydrant testing, maintenance, and flow testing.
- Assisting the Fire Chief with various day-to-day administrative duties and/or special projects.

It is our belief that initially, the township could initially staff the station with two personnel (one of whom would be the chief when he/she is working) who would provide a guaranteed, timely, and qualified, response to daytime emergency incidents.

Advantages of this alternative include:

- Guaranteed, timely, and qualified response to daytime emergency incidents.
- Improvement of the department's operational preparedness/readiness.
- Lightening the workload for the call personnel so they can concentrate on training and emergency response.

Disadvantages of this alternative include:

- Potential friction between personnel.
- Decline in on-call staff if career staff are introduced.
- Cost to township.
- Time commitment to schedule personnel to fill shifts.
- Potential need to eventually hire full-time personnel.

Model cost (assumptions):

- \$195,000/year. This assumes two personnel working 10 hours per day, Monday to Friday from 9:00 a.m. to 7:00 p.m., which are the busiest hours.
 - 50 hours per week of coverage x 2 personnel = 100 staff hours/week.
 - 100 staff hours/week minus 25 hours per week when chief is working = 75 staff hours/ week.
 - 75 staff hours/week x \$25.00/hour x 52 weeks/year = \$195,000.
- Other potential costs may include personal protective equipment, uniforms, and training.

CPSM does not recommend this option as a primary one.

However, if the township decides to continue to provide fire protection services and first responder EMS as a stand-alone entity, then this option should be seriously considered.

CONTRACT WITH CITY OF MIDLAND FOR CAREER STAFF

When the time arrives for Larkin Township to consider the addition of compensated staffing in their fire station, particularly during the day, the Township may want to consider contracting with the City of Midland to provide that staffing. In this case, with Midland units staffed with three personnel, for consistency and safety considerations, that would be the recommended staffing. These personnel would most likely be assigned to work Monday – Friday for 10 or 11 hours per day sometime between the hours of 6:00 AM and 6:00 PM.

Model cost (assumptions):

- Dependent on level of service/expectations from both stakeholders.

IMPLEMENTATION OF DUTY CREWS

The LTFD does not really discuss on its website the expectations of being an on-call firefighter. As has been noted previously, leading recruitment and retention issues center on time demands of the person who seeks to serve as an on-call firefighter. The LTFD could seek to minimize this demand by arranging for duty groups that respond, when needed, to handle more minor incidents. In many programs of this type this means that personnel must commit to one duty night every week. The goal of this program is to ensure that a minimum of three personnel are available to respond (or better yet, posted at the station) during certain hours, typically between the hours of about 6:00 p.m. and 6:00 a.m. There would be additional opportunities for personnel as well, predominantly in the area of training.

Maintaining a successful once-every-seven-nights volunteer duty crew of three members would require a minimum of 21 on-call members. Realistically, however, each shift should be upstaffed by one additional member to maintain the minimum three-person duty crew, as there should be allowance for scheduled absences. Thus, to maintain the minimum staffing of three volunteer members per night over seven duty crews, the LTFD should strive to maintain 28 on-call members trained and released to engage in interior firefighting operations. This is consistent with our previous recommendations of a target of 25 to 30 personnel.

If the township were to provide each member on the duty crew a stipend for each night of \$75.00, the annual cost to provide this additional staffing would be approximately \$110,000. Other costs include personal protective equipment, uniforms, and training.

Advantages of this alternative include:

- Guaranteed and qualified response to all emergency incidents.
- More timely response if personnel are staffing the station.
- Improvement of the department's operational preparedness/readiness.
- Lightening the workload for the majority of call personnel by not having to respond to minor incidents.

Disadvantages of this alternative include:

- Decline in on-call staff if they do not feel they are being utilized enough.
- Cost to township.
- Time commitment to schedule personnel to fill duty crews.
- Resistance of members to participate.
- Long-term viability is always a challenge.
- Lack of accommodations in current station to motivate personnel to staff the station.

Model cost (assumptions):

- \$93,800/year. This assumes four personnel on each duty crew with a \$50.00 per shift duty crew/standby stipend in addition to their normal compensation.
 - \$50.00 per shift stipend x 4 personnel per night = \$200.00/night
 - \$200.00/night x 365 nights/year = \$73,000/year
 - \$50.00 per shift stipend x 4 personnel per weekend day = \$200.00/day
 - \$200.00/weekend day x 104 days = \$20,800/year
 - \$73,000 + \$20,800 = \$93,800.
- Other potential costs may include personal protective equipment, uniforms, and training.

CPSM recommends that Larkin Township consider this option.

Regardless of which direction Larkin Township decides to go with regard to the long-term delivery of fire and EMS services, in the interim this is an option that could be implemented along with an aggressive recruitment and retention program to attempt to increase staffing. The success of these two related endeavors could also help to determine the best future direction for the township.

ENTER INTO SHARED SERVICE AGREEMENT WITH THE CITY OF MIDLAND

*"Fire and EMS **are** in a crisis – right now. Simply put, EMS is woefully lacking in funding – and the number of volunteer firefighters has fallen dramatically over the decades."*

Those words comprise the first two sentences of the SR 6 *Final Report* on the status of the fire and EMS delivery systems throughout Pennsylvania. The report then states that "*this is not new*" and notes that many of the same issues have been highlighted in multiple other reports over the past four decades. This crisis is not in any way limited to the state of Pennsylvania. It is being experienced in every state in the country. Michigan—and Larkin Township—are no exception.

The multitude of reports that have been completed all say the same thing about the need to act. Yet definitive action—moving ideas that may make a difference from concept to reality—has been slow to happen. While the need to be deliberative in this process is important, the continued wearing down of the emergency services towards potential systemic failure continues unabated.

While no formal studies have been completed, early evidence suggests that the COVID-19 pandemic has hastened the decline of an increasing number of volunteer and on-call

emergency services organizations. Whether this is the case in the Larkin Township is unknown. However, what is known is the following:

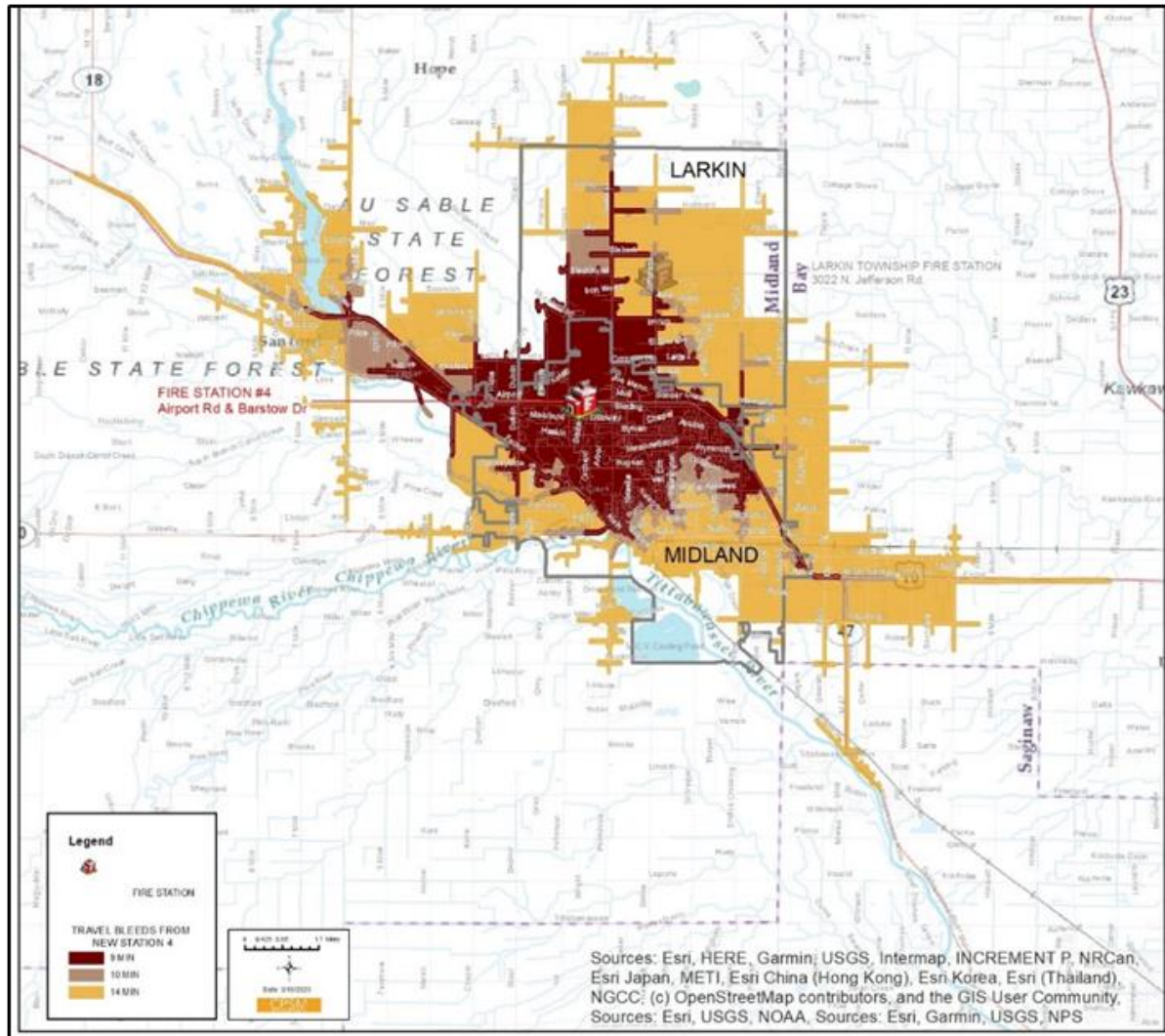
- The department lost 20 percent of its membership in the past year. Five personnel left the department while only one new member joined.
- More than one-third of the department is over age 50.
- Fielding sufficient personnel for calls is a growing challenge. Only 50 percent of the current department membership responded to at least 25 percent of calls.
- One in five calls had only one or two personnel respond.
- The type of resident moving into Larkin Township is unlikely to want to become an on-call firefighter. This will complicate the already daunting task of recruiting and retaining new members.
- Larkin Township sees a limited number of emergency calls, less than one per day.
- On all four structure fires in Larkin Township during the study period, the Midland Fire Department arrived on scene first.
- Response times for all types of calls in Larkin Township exceed recommended benchmarks.

In most forms of municipal government the residents of the community, that is, the voters/stakeholders/taxpayers, choose the elected officials who will represent their interests and serve as the governing body. A key question that should be asked is: "If taxpayers could choose their public services, would they choose the services they receive today?"

The idea of giving up total local control is always a proposition that gives elected officials and their constituents pause and has been one of the obstacles to true regionalization or consolidation particularly where small community pride and the time honored concept of home rule are deeply ingrained in the culture. However, the constantly escalating costs of attempting to provide the same level service is becoming a more and more difficult task. Scarce tax dollars are being stretched to the limit. Smaller communities that have far fewer resources and options than their larger neighbors will find it especially difficult to cope within the limitations imposed by the new financial reality. The continuing trend of declining volunteerism will create a simultaneous challenge that will stretch the provision of emergency services in many communities even farther. This situation may open new opportunities for regional collaborations or shared services agreements related to the provision of emergency services.

The City of Midland is concurrently having a study performed on their fire protection and EMS delivery system. One of the challenges that is facing Midland is the potential need for a fourth fire station in the northern section of the city in order to provide proper coverage for the existing and planned development in that area. This includes the area primarily in the areas of the city north of Route 10, areas that were annexed into the city from Larkin Township as part of the MUGA process. One of the potential locations for a new fire station in Midland is on the grounds of Jack Barstow Airport in the vicinity of Airport Road and Barstow Drive. The following figure illustrates response times into Larkin Township from a station at this location.

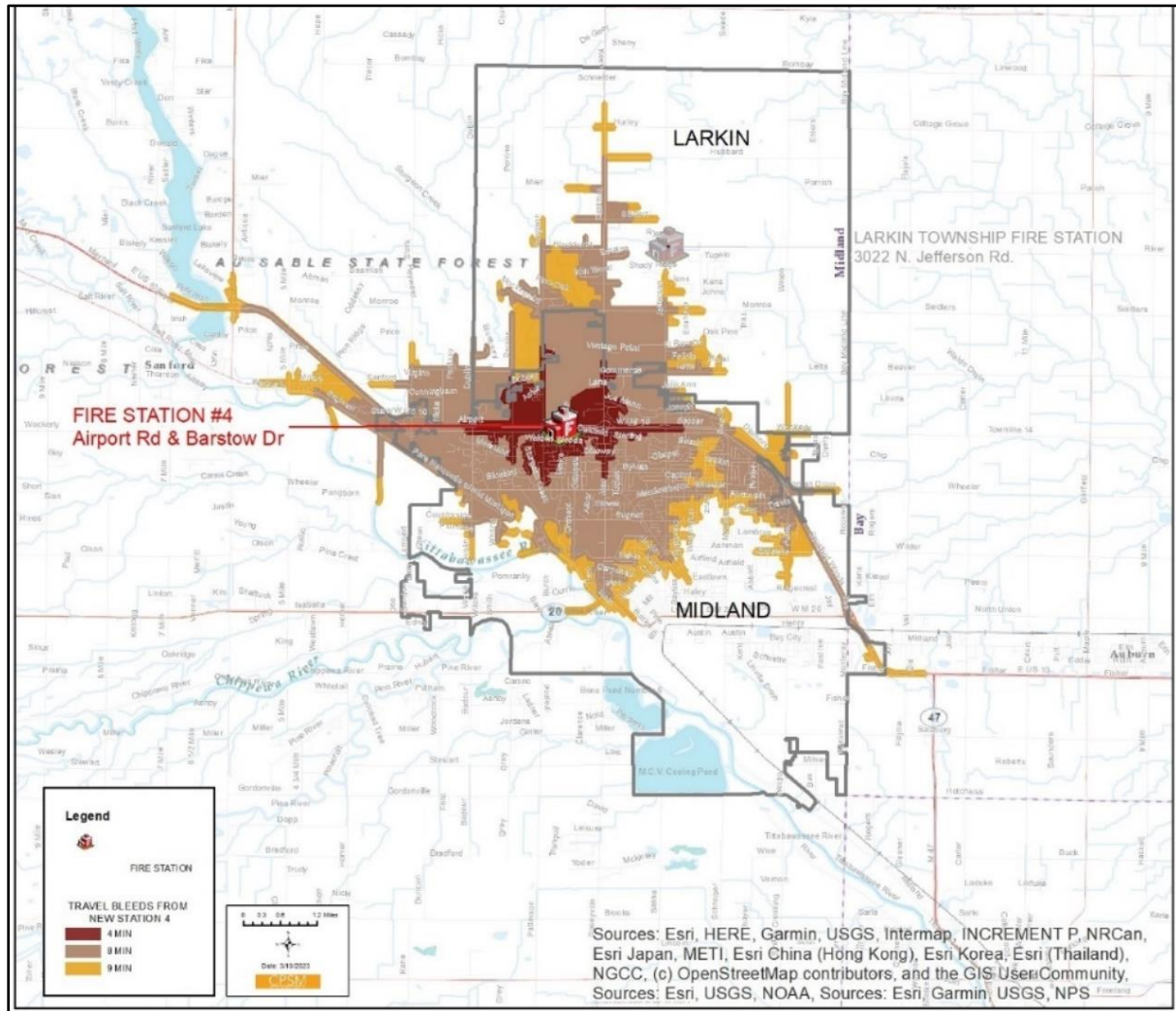
FIGURE 6-1: Fire Bleeds into Larkin Township from Potential New MFD Station 4



As can be seen on the map, from this location virtually all of Larkin Township is within 14 minutes travel distance from this station, allowing the 14-minute benchmark response times in NFPA 1720 to still be met. In addition, as illustrated, much of the township, particularly the areas with the most development, are within nine or ten minutes of travel time. With the immediate guaranteed response of a unit staffed with career personnel it is likely that overall response times would be improved with responses coming from this station.

One of the recommendations that CPSM makes regarding this station is that an effort be made to have MMC-EMS deploy an ambulance from it to better distribute its deployment and improve EMS response within the township and city. The next figure illustrates what the travel times would be into Larkin Township for an ambulance responding from that location.

FIGURE 6-2: EMS Bleeds into Larkin Township from New MFD Station 4



As can be seen, much of the township is within an eight-minute (NFPA 1710) or nine-minute (CAAS) travel time from this station. This is a significant improvement over current ambulance response times. It would also have the potential to reduce the number of calls (low acuity type calls) that the fire department needs to respond to.

Advantages of this alternative include:

- Guaranteed, timely, and qualified response to all emergency incidents.
- Possible reduction in ambulance response times into Larkin Township.
- May provide Larkin Township with access to more resources.
- Assures the township continued, high-quality emergency services even as it continues to grow.
- Relieves the township of the full cost of building a new station and purchasing new apparatus. Part of any agreement may include Larkin Township contributing to the construction of the new MFD station.

Disadvantages of this alternative include:

- Loss of direct control and oversight by Larkin Township since the township would most likely be a contractual customer.
- Opposition from township residents and LTFD membership.
- Would most likely result in the demise of the Larkin Township Fire Department.
- Potential lack of accountability and transparency from the city.
- Performance data may not be readily accessible.
- Follow-up on complaints and inquiries may be inconsistent.

Model cost (assumptions):

- Dependent on level of service/expectations from both stakeholders.

CPSM recommends that Larkin Township strongly consider this option and approach the City of Midland to determine its level of interest in participating in some level of shared or contract service delivery system.

OPERATIONAL FIRE DEPARTMENT CONSOLIDATION

One alternative under this scenario would be to align both departments more closely to function as a single unit through the vehicle of an intergovernmental agreement which will provide both flexibility and a workable termination plan should joint services prove unwieldy. Under this plan a common command would be established to respond to the new combined service area to meet the overall obligations.. The key elements of a functional consolidation approach to service delivery for Midland and Larkin Township includes (but is certainly not limited to):

- Organize the two departments by forming an amalgamation for joint services and authorize such an arrangement through an Intergovernmental Agreement. Such an Amalgamation would structure one department with two divisions, Midland or City Division, and Larkin or Township Division.
- Establish a central management command and management authority. Midland would serve as the lead contractor agency.
- Maintain a senior command structure for each division with the "lead" division – City of Midland - serving as Chief and Assistant Chief. Larkin Township's senior officer would be equivalent to an MFD battalion chief.
- Consider the expansion of daytime career staffing into Larkin Township. The Larkin or Township Division would also be permitted to maintain paid on call staff, however, they would be required to meet training and participation requirements.
- Each division would be responsible for their own liabilities including debt. Future liabilities would be apportioned based on the level of benefit achieved with the goal of mutual benefits for all new acquisitions.
- Within the Intergovernmental Agreement provide for the termination of joint operations with the return of separate operations should service levels deteriorate, costs rise, or either participant feels the arrangement is no longer in their best interest.

While there are significant risks with such a combined operational plan there are also opportunities for improved services. However, the majority of those benefits would be derived by Larkin Township.

Model cost (assumptions):

- Dependent on level of service/expectations from both stakeholders.

FORM A REGIONAL FIRE AUTHORITY

A regional fire authority (abbreviated to RFA) is a special purpose district created by the vote of the people residing in the proposed district. Its boundaries are usually—but not always—coextensive with two or more adjacent fire protection jurisdictions. It is considered a municipal corporation, an independent taxing authority, and a taxing district.

In simple terms it is a cooperative agreement between government entities or municipalities to provide fire and emergency services. The authority is operated by a Board of Directors appointed by the participating governments.

Once established, the RFA governing board is established and consists of elected officials of the participating municipalities. These governing board members generally consist of:

- Current elected officials from the participating jurisdictions, such as city councilmembers or township trustees; and/or,
- Regional fire commissioners who are elected by the voters of the regional fire authority.
- A combination of the above may be permitted.

During the course of this study, CPSM was informed that one of the city's primary concerns is that they believe that it may be paying more than its share of the operational costs of SFD 7. While the data does not support that concern (Mill Creek has 18.9 percent of the SFD 7 population, 11.2 percent of its incidents, and pays 10.9 percent of the total budget) it may be driven by percept. As with many issues of this type, the perception, while not supported factually, can become the reality. It is the opinion of CPSM that the creation of an RFA could alleviate many of these concerns for Marysville and provide it an ownership stake in the provision of fire and EMS services to the community, as well as some level of direct representation which it does not currently have.

Advantages of this alternative include:

- Larkin Township maintains an ownership stake and direct representation on the RFA board through the provision of a representative governing board.
- Provides stable and sustainable funding.
- Understand revenue sources and options to provide for current and future fire operation needs.
- Allows for future expansion to better regionalize the delivery of fire and EMS services in the greater Midland area.

Disadvantages of this alternative include:

- Larkin Township will likely have a minority ownership share and vote in the RFA.

CPSM does not recommend this as a primary option.

This is the case particularly if the City of Midland has interest in a shared services or contractual agreement as discussed above, unless Midland is interested in also being a participant in an RFA. However, if those discussions do not end up being productive, the RFA concept could be explored with the option of multiple townships participating.

CONCLUSION

Whether volunteer or career, fire protective and community risk reduction services operate under national standards, local government ordinances, and state statutes. It is imperative that department leadership understand and stay abreast of these standards and act accordingly to implement processes, guidelines, funding plans, training, and education of their members, and deploy overall organizational management of contemporary fire services concepts. Firefighter injuries and deaths are devastating to families, fellow responders, local governments, and the community. The National Institute for Occupational Safety and Health (NIOSH) has sought to identify the root causes of firefighter fatalities, and has determined there are key factors, which are commonly referred to as the NIOSH 5:

- Lack of fireground firefighter accountability.
- Lack of fireground communication methods.
- Lack of standard operating procedures related to response and fireground operations.
- Lack of incident management/command.
- Lack of appropriate risk assessment of the incident as whole, the building, the emergency scene, and basic fireground knowledge to understand the risk.

These five fireground factors should be etched in every firefighter's brain. A fire department training regimen, equipment, guidelines, and culture should center on these five factors. A lack of understanding of these five factors leads to sloppy, ineffective, and unsafe fireground operations. They should be taken seriously.

To the credit of the current Township Supervisor and Board of Trustees, this body wanted to understand more about how contemporary fire departments operate, and what was needed to ensure the LTFD was operating efficiently and effectively, has the right equipment and infrastructure to provide services to the township, and understand more about what was needed to position the LTFD to provide contemporary fire services.

The principal findings of the study that have the most profound effect on fire protective and community risk reduction services, and that include significant recommendations herein are focused on:

- The declining and aging membership of the LTFD.
- Lack of an effective and ongoing recruitment and retention program for on-call members.
- A need for the LTFD to strengthen administrative, operational, training, and program related guidelines.
- The LTFD facility, which is aging and no longer useful as a modern-day fire station. Replacement will require a major capital investment.
- The need to right size the LTFD fleet.

- The lack of a formal fire code enforcement system in the township.
- How the department assembles an Effective Response Force to perform critical tasks on the fireground as benchmarked against a national standard.
- Extended response times and limited personnel responding to reported structure fires. Of the four structure fires in Larkin Township during the study period, the MFD arrived on scene first all four times. The number of LTFD personnel who responded ranged from two to five.
- The lack of formal, policy-driven, emergency scene safety and accountability systems through a coordinated effort led by the Incident Commander and in accordance with national standards.

To move forward, CPSM recommends Larkin Township and the LTFD strongly consider the recommendations presented in this analysis, remembering the LTFD's strength comes from its on-call membership and their continuous commitment to serve their community. The ability to function on the emergency scene at a consistent elevated level, recruitment, retention, training, and adequate facilities and equipment are essential elements to keeping the citizenry and community safe. They are also critical to the significant decision the township will need to make moving forward regarding whether to maintain its own independent fire department. How well the LTFD and its personnel respond to the gaps identified herein and implement the recommendations made, particularly regarding the recruitment and retention of a significant number of new personnel, will likely be a major factor in the ultimate outcome.

This analysis focuses on the big picture of fire protection, community risk reduction, and EMS first responder services in the township. Using this analysis, the township and the LTFD need to implement succinct discussion and planning strategies to determine the path forward. Once these have been determined, then budget objectives can be established to move forward more clearly. We believe that Larkin Township has multiple, viable options for the long-term delivery of emergency services. It is the unenviable task of the Board of Trustees to determine—from their perspective, and on behalf of the residents of the township—which is the best, most cost effective option for the township. Regardless of which option is chosen, the township should anticipate the need to provide additional funding for the delivery of emergency services.

CPSM prepares these analyses for cities, towns, and counties with the goal that they offer substantive information and recommendations for the client and remain viable for continuous organizational improvement. This analysis, along with its recommendations, is also meant to be a roadmap to assist the LTFD with continuing to provide continuous, efficient, and effective services. However, it also provides the township with alternative options if the LTFD is unable to continue to provide adequate service.

In closing, CPSM would like to thank the members of the LTFD for their input, discussion, and transparency. CPSM also extends a thank-you to the Township Supervisor and the Board of Trustees, and especially the Township Clerk, for assisting the project team in the gathering of information from so many sources in and around the township. This helped make the project a success.

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SECTION 7. DATA ANALYSIS

This data analysis was prepared as a key component of the study of the Larkin Township Volunteer Fire Department (LTFD), which was conducted by the Center for Public Safety Management, LLC (CPSM). This analysis examines all calls for service between September 2, 2021, and August 31, 2022, as recorded in Midland County Central Dispatch's computer-aided dispatch (CAD) system and the LTFD's National Fire Incident Reporting System (NFIRS) records.

This analysis is made up of four parts. The first part focuses on call types and dispatches. The second part explores the time spent and the workload of individual units. The third part presents an analysis of the busiest hours in the year studied. The fourth and final part provides a response time analysis of LTFD units.

The Larkin Township Fire Department serves a population of about 5,340 people covering an area of over 32 square miles. As a volunteer fire department, LTFD provides service and protection for fire and medical emergencies, hazardous material responses, vehicle accidents, and other incidents where life and property are threatened. The LTFD staffs a complement of 18 personnel, including a Fire Chief and an Assistant Chief. It operates out of one fire station. The frontline units include two engines, a brush unit, a heavy rescue unit, a light rescue unit, and a tender.

Between September 2, 2021, and August 31, 2022, the Larkin Township Fire Department responded to 307 calls, of which 47 percent were EMS calls. The total combined workload (deployed time) for LTFD units was 274.7 hours. The average dispatch time was 5.7 minutes, and the average total response time was 13.7 minutes. The 80th percentile dispatch time was 9.4 minutes and the 80th percentile total response time was 16.9 minutes. The 90th percentile dispatch time was 12.3 minutes and the 90th percentile total response time was 19.6 minutes.

Methodology

In this report, CPSM analyzes calls and runs. A call is an emergency service request or incident. A run is a dispatch of a unit (a unit responding to a call). Thus, a call may include multiple runs.

We received CAD data and NFIRS data for the LTFD. We first matched the NFIRS and CAD data based on the incident numbers provided. Then, we classified the calls into a series of steps. We first used the NFIRS incident type to identify canceled calls and to assign emergency medical service (EMS), motor vehicle accident (MVA), and fire category call types. EMS calls were then assigned detailed categories based on their incident codes and descriptions. The method to categorize incident types is shown in Attachment VI.

We received records for 320 total calls that were made between September 2, 2021, and August 31, 2022. We removed two calls lacking a responding LTFD unit and four calls to which a unit was dispatched but did not go en route or arrive on scene.

SUMMARY OF CALLS AND WORKLOAD

In this report, we separate the workload of the LTFD and other agencies that provided mutual aid to Larkin, including MyMichigan Medical Center EMS, DNR FD, Lincoln FD, Midland FD, Midland Township FD, and Mills Township FD. The following two tables summarize the number of calls and the corresponding workload, broken out by responding agencies and grand call type.

The main analysis includes the 307 calls responded to by LTFD units. The workload of MyMichigan Medical Center EMS is presented in Attachment III. An analysis of EMS medical unit transports is given in Attachment IV.

TABLE 7-1: Calls by Responding Agency and Call Type

Response Agency	Number of Calls				
	EMS	Fire	Cancel	Aid Given	Total
LTFD	142	84	54	27	307
MMC-EMS	144	6	45	NA*	195
External FD	0	6	2	NA*	2
Total	147	84	56	27	314

Note: LTFD=Larkin Township Fire Department; MMC-EMS = MyMichigan Medical Center EMS; External FD includes DNR FD, Lincoln FD, Midland FD, Midland Township FD, and Mills Township FD. *For 27 calls that occurred outside Larkin Township, we labeled them as aid given. For these calls, we included only LTFD response units. There were 287 calls inside Larkin Township, of which 90 calls (31 percent) were responded to by only LTFD, 190 calls (66 percent) were jointly responded to by LTFD and other agencies, and seven calls (two percent) were independently responded to by MyMichigan Medical Center EMS.

TABLE 7-2: Runs by Responding Agency and Call Type

Response Agency	Number of Runs					Work Hours				
	EMS	Fire	Cancel	Aid Given	Total	EMS	Fire	Cancel	Aid Given	Total
LTFD	295	158	95	56	604	125.6	83.8	12.0	53.2	274.7
MMC-EMS	161	6	46	NA*	213	114.9	3.5	25.9	NA*	144.3
External FD	0	23	8	NA*	31	0.0	21.3	1.5	NA*	22.8
Total	456	187	149	56	848	240.5	108.7	39.3	53.2	441.8

Note: LTFD=Larkin Township Fire Department; MMC-EMS = MyMichigan Medical Center EMS; External FD includes DNR FD (two runs), Lincoln FD (two runs), Midland FD (22 runs), Midland Township FD (three runs), and Mills Township FD (two runs).

* For mutual aid calls, we included only LTFD's work.

Observations:

- Larkin Township FD made 604 runs (71 percent of total runs).
- MyMichigan Medical Center EMS made 213 runs (25 percent of total runs).
- Other external fire departments made 31 runs (four percent of total runs).

AGGREGATE CALL TOTALS

Between September 2, 2021, and August 31, 2022, LTFD responded to 307 calls, of which 4 were structure fire calls and one was an outside fire call.

Calls by Type

The following table and two figures show the number of calls by call type, average calls per day, and the percentage of calls that fall into each call type category for the 12 months studied.

TABLE 7-3: Call Types

Call Type	Total Calls	Calls per Day	Call Percentage
Breathing difficulty	19	0.1	6.2
Cardiac and stroke	17	0.0	5.5
Fall and injury	21	0.1	6.8
Illness and other	41	0.1	13.4
MVA	21	0.1	6.8
Overdose and psychiatric	1	0.0	0.3
Seizure and unconsciousness	22	0.1	7.2
EMS Subtotal	142	0.4	46.3
False alarm	10	0.0	3.3
Good intent	7	0.0	2.3
Hazard	46	0.1	15.0
Outside fire	1	0.0	0.3
Public service	16	0.0	5.2
Structure fire	4	0.0	1.3
Fire Subtotal	84	0.2	27.4
Aid given*	27	0.1	8.8
Canceled	54	0.1	17.6
Total	307	0.8	100.0

Note: *Calls that occurred outside Larkin Township were labeled as aid given. One aid given call was canceled.

FIGURE 7-1: EMS Calls by Type

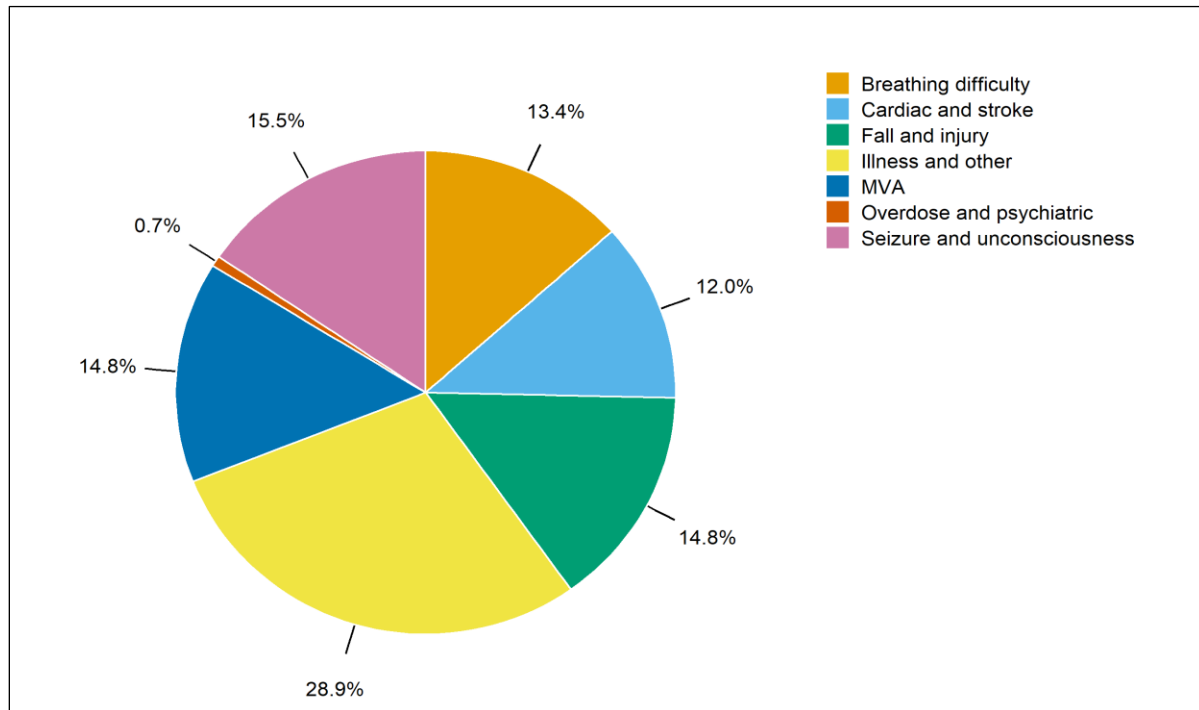
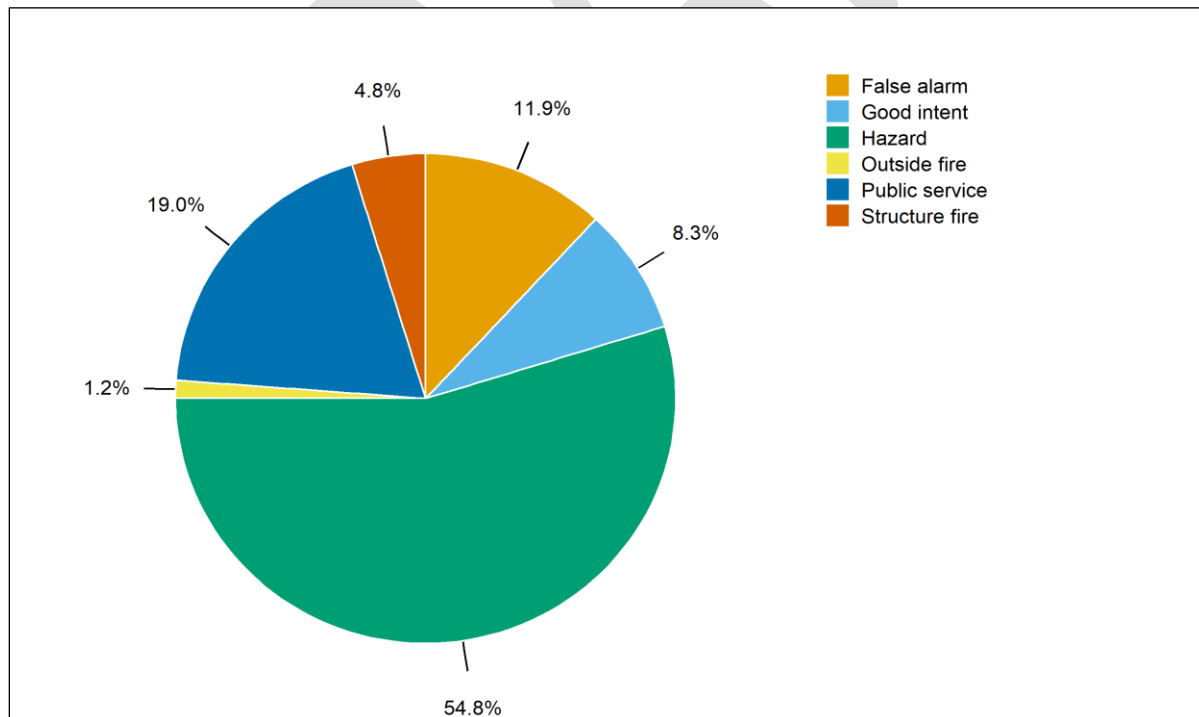


FIGURE 7-2: Fire Calls by Type



Observations:

Overall

- The department received an average of 0.84 calls, including 0.15 canceled and 0.07 aid given calls, per day.

EMS

- EMS calls for the year totaled 142 (46 percent of all calls), an average of 0.39 calls per day.
- Illness and other calls were the largest category of EMS calls at 29 percent of EMS calls, an average of 0.11 calls per day.
- Cardiac and stroke calls made up 12 percent of EMS calls, an average of 0.05 calls per day.
- Motor vehicle accidents made up 15 percent of EMS calls, an average of 0.06 calls per day.

Fire

- Fire calls for the year totaled 84 (27 percent of all calls), an average of 0.23 calls per day.
- Hazard calls were the largest category of fire calls at 55 percent of fire calls, an average of 0.13 calls per day.
- False alarm calls made up 12 percent of fire calls, an average of 0.03 calls per day.
- Structure and outside fire calls combined made up six percent of fire calls, an average of 0.01 calls per day, or one call every 73 days.

Calls by Type and Duration

The following table shows the duration of calls by type using four duration categories: less than 30 minutes, 30 minutes to one hour, one to two hours, and more than two hours.

TABLE 7-4: Calls by Type and Duration

Call Type	Less than 30 Minutes	30 Minutes to One Hour	One to Two Hours	Two or More Hours	Total
Breathing difficulty	17	2	0	0	19
Cardiac and stroke	12	4	1	0	17
Fall and injury	20	1	0	0	21
Illness and other	38	2	1	0	41
MVA	8	10	1	2	21
Overdose and psychiatric	1	0	0	0	1
Seizure and unconsciousness	21	1	0	0	22
EMS Subtotal	117	20	3	2	142
False alarm	7	3	0	0	10
Good intent	7	0	0	0	7
Hazard	26	10	8	2	46
Outside fire	0	0	0	1	1
Public service	14	2	0	0	16
Structure fire	1	1	1	1	4
Fire Subtotal	55	16	9	4	84
Aid given	14	9	2	2	27
Canceled	54	0	0	0	54
Total	240	45	14	8	307

Observations:

EMS

- On average, there were 0.01 EMS calls per day that lasted more than one hour.
- A total of 137 EMS calls (96 percent) lasted less than one hour, three EMS calls (two percent) lasted one to two hours, and two EMS calls (one percent) lasted two or more hours.

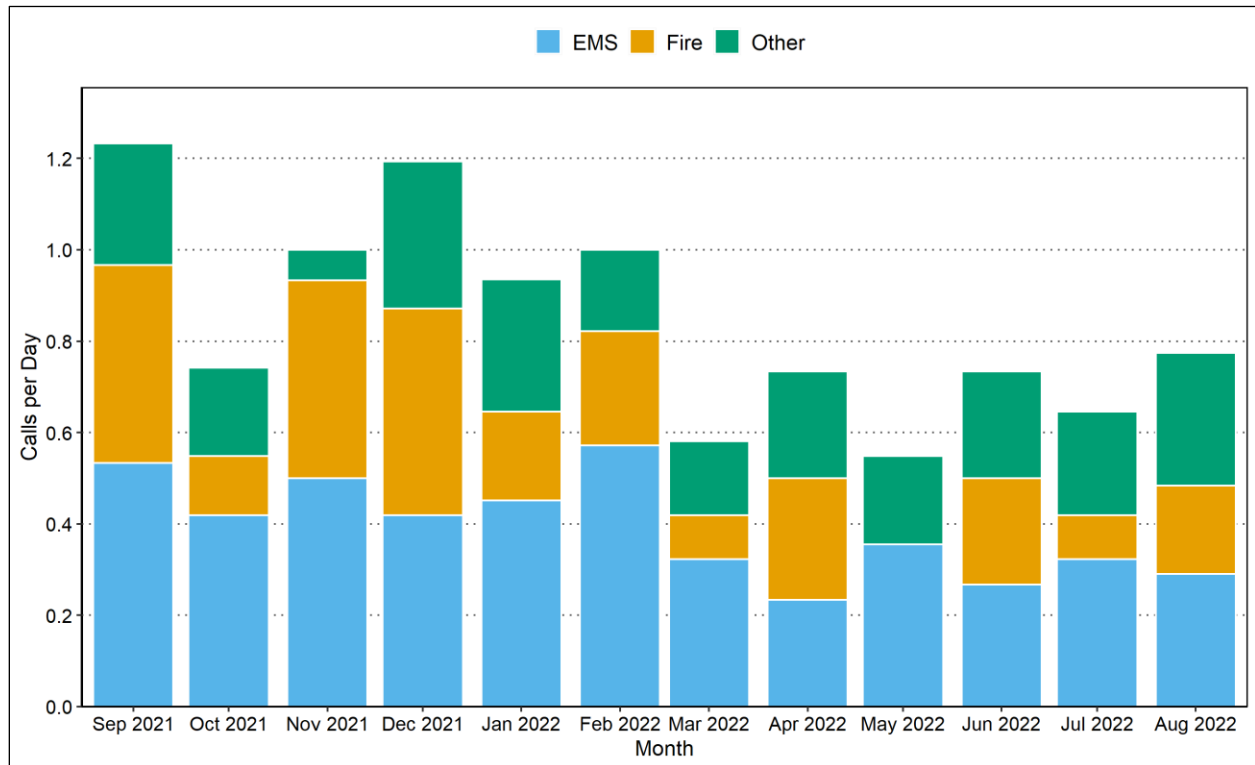
Fire

- On average, there were 0.04 fire calls per day that lasted more than one hour.
- A total of 71 fire calls (85 percent) lasted less than one hour, nine fire calls (11 percent) lasted one to two hours, and four fire calls (five percent) lasted two or more hours.
- There was one outside fire call. It lasted more than two hours.
- A total of two structure fire calls (50 percent) lasted less than one hour, one structure fire call (25 percent) lasted one to two hours, and one structure fire call (25 percent) lasted two or more hours.

Calls by Month and Hour of Day

Figure 7-3 shows the monthly variation in the average daily number of calls handled by the LTFD from September 2, 2021, to August 31, 2022. Similarly, Figure 7-4 illustrates the average number of calls received per hour by the time of day.

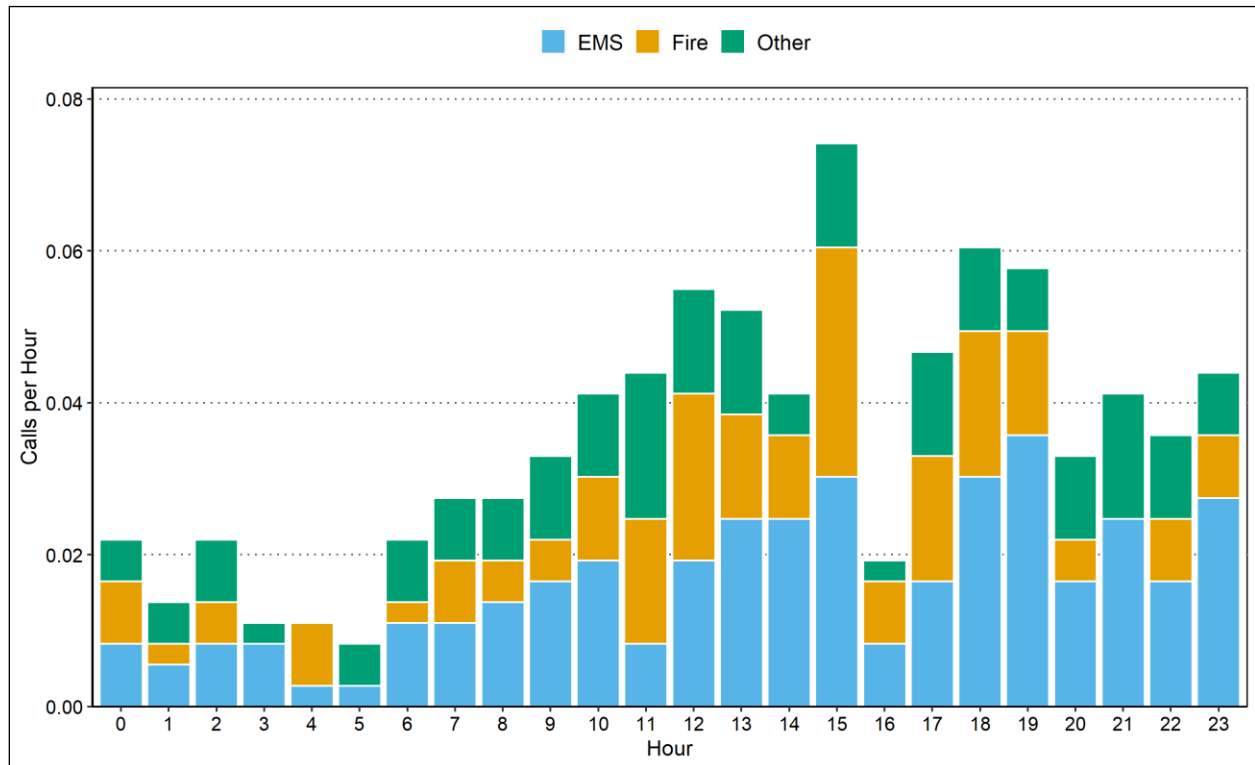
FIGURE 7-3: Calls by Month



Observations:

- Average EMS calls per day ranged from 0.23 in April 2022 to 0.57 in February 2022.
- Average fire calls per day ranged from 0.10 in both March and July 2022 to 0.45 in December 2021.
- Average calls per day overall ranged from 0.55 in May 2022 to 1.23 in September 2021.

FIGURE 7-4: Calls by Hour of Day



Observations:

- Average EMS calls per hour ranged from 0.003 between 4:00 a.m. and 6:00 a.m. to 0.036 between 7:00 p.m. and 8:00 p.m.
- Average fire calls per hour ranged from 0.000 between 3:00 a.m. and 4:00 a.m., between 5:00 a.m. and 6:00 a.m., and between 9:00 p.m. and 10:00 p.m. to 0.030 between 3:00 p.m. and 4:00 p.m.
- Average calls per hour overall ranged from 0.008 between 5:00 a.m. and 6:00 a.m. to 0.074 between 3:00 p.m. and 4:00 p.m.

Units Arriving at Calls

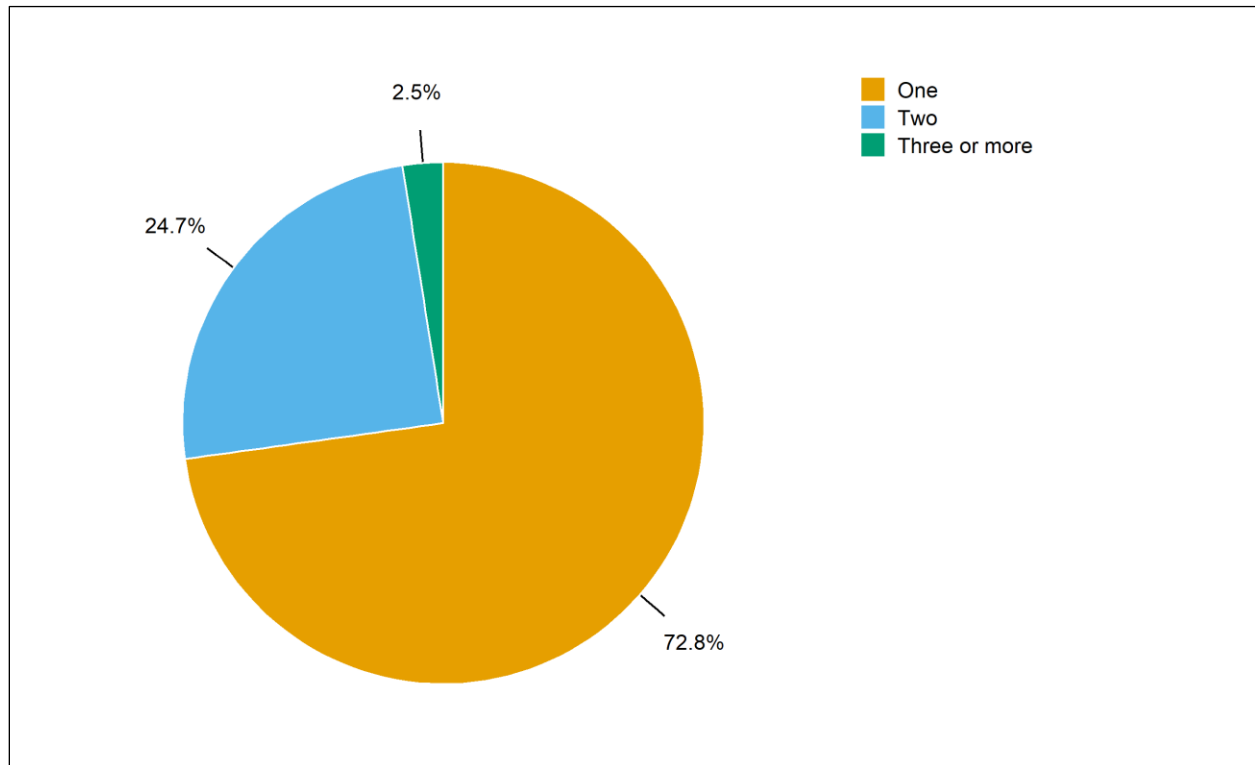
The next table and figure detail the number of calls with one, two, and three or more units arriving at a call, broken down by call type. In this section, we limit ourselves to calls where an LTFD unit arrives.

TABLE 7-5: Calls by Call Type and Number of Arriving Units

Call Type	Number of Units			Total Calls
	One	Two	Three or more	
Breathing difficulty	14	4	0	18
Cardiac and stroke	9	6	0	15
Fall and injury	13	6	0	19
Illness and other	32	4	0	36
MVA	10	8	3	21
Seizure and unconsciousness	18	3	0	21
EMS Subtotal	96	31	3	130
False alarm	4	4	1	9
Good intent	6	0	0	6
Hazard	27	11	1	39
Outside fire	0	1	0	1
Public service	14	1	0	15
Structure fire	1	2	1	4
Fire Subtotal	52	19	3	74
Aid given	18	8	0	26
Canceled	8	1	0	9
Total	174	59	6	239
Percentage	72.8	24.7	2.5	100.0

Note: Only calls with arriving LTFD units were considered. There were 68 calls where an LTFD unit recorded an en route time but no unit recorded an arrival time. This included 45 canceled calls, 12 EMS calls, 10 fire calls, and one mutual aid call.

FIGURE 7-5: Calls by Number of Arriving Units



Observations:

Overall

- On average, 1.3 LTFD units arrived at all calls; for 73 percent of calls, only one unit arrived.
- Overall, three or more LTFD units arrived at three percent of calls.

EMS

- On average, 1.3 units arrived per EMS call.
- For EMS calls, one unit arrived 74 percent of the time, two units arrived 24 percent of the time, and three or more units arrived two percent of the time.

Fire

- On average, 1.3 units arrived per fire call.
- For fire calls, one unit arrived 70 percent of the time, two units arrived 26 percent of the time, and three or more units arrived four percent of the time.
- There was one outside fire call; two LTFD units arrived at this call.
- For structure fire calls, three or more units arrived 25 percent of the time.

WORKLOAD: RUNS AND TOTAL TIME SPENT

The workload of each LTFD unit is measured in two ways: runs and deployed time. The deployed time of a run is measured from the time a unit is dispatched through the time the unit is cleared. Because multiple units respond to some calls, there are more runs (604) than calls (307) and the average deployed time per run varies from the total duration of calls.

Runs and Deployed Time – All Units

Deployed time, also referred to as deployed hours, is the total deployment time of all units deployed on all runs. Table 7-6 shows the total deployed time, both overall and broken down by type of run, for LTFD units between September 2, 2021, and August 31, 2022. Table 7-7 and Figure 7-6 present the average deployed minutes by hour of day.

TABLE 7-6: Annual Runs and Deployed Time by Run Type

Run Type	Minutes per Run	Annual Hours	Percent of Hours	Minutes per Day	Annual Runs	Runs per Day
Breathing difficulty	19.4	12.6	4.6	2.1	39	0.1
Cardiac and stroke	23.7	14.2	5.2	2.3	36	0.1
Fall and injury	19.0	12.0	4.4	2.0	38	0.1
Illness and other	18.9	24.9	9.1	4.1	79	0.2
MVA	52.2	49.6	18.0	8.2	57	0.2
Overdose and psychiatric	9.4	0.3	0.1	0.1	2	0.0
Seizure and unconsciousness	16.4	12.0	4.4	2.0	44	0.1
EMS Subtotal	25.6	125.6	45.7	20.7	295	0.8
False alarm	22.7	7.2	2.6	1.2	19	0.1
Good intent	14.0	3.5	1.3	0.6	15	0.0
Hazard	33.6	44.3	16.1	7.3	79	0.2
Outside fire	130.8	8.7	3.2	1.4	4	0.0
Public service	14.8	7.1	2.6	1.2	29	0.1
Structure fire	65.0	13.0	4.7	2.1	12	0.0
Fire Subtotal	31.8	83.8	30.5	13.8	158	0.4
Aid given	57.0	53.2	19.4	8.8	56	0.2
Canceled	7.6	12.0	4.4	2.0	95	0.3
Other Subtotal	25.9	65.2	23.7	10.7	151	0.4
Total	27.3	274.7	100.0	45.3	604	1.7

Observations:

Overall

- The total deployed time for the year was 274.7 hours. The daily average was 45.3 minutes for all units combined.
- There were 604 runs, including 95 runs dispatched for canceled calls and 56 runs dispatched for mutual aid calls. The daily average was 1.7 runs.

EMS

- EMS runs accounted for 46 percent of the total workload.
- The average deployed time for EMS runs was 25.6 minutes. The deployed time for all EMS runs averaged 20.7 minutes per day.

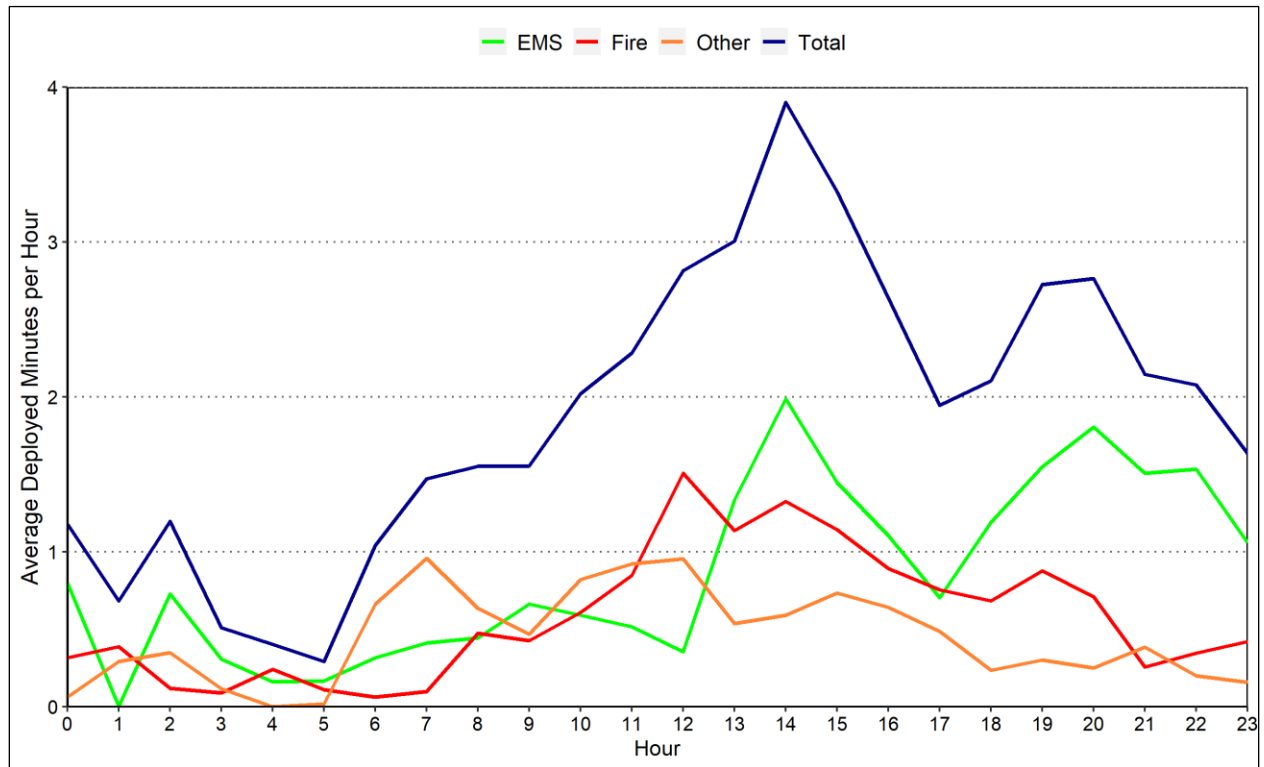
Fire

- Fire runs accounted for 31 percent of the total workload.
- The average deployed time for fire runs was 31.8 minutes. The deployed time for all fire runs averaged 13.8 minutes per day.
- There were 16 runs for structure and outside fire calls combined, with a total workload of 21.7 hours. This accounted for eight percent of the total workload.
- The average deployed time for outside fire runs was 130.8 minutes per run, and the average deployed time for structure fire runs was 65.0 minutes per run.

TABLE 7-7: Average Deployed Minutes by Hour of Day

Hour	EMS	Fire	Other	Total
0	0.8	0.3	0.1	1.2
1	0.0	0.4	0.3	0.7
2	0.7	0.1	0.3	1.2
3	0.3	0.1	0.1	0.5
4	0.2	0.2	0.0	0.4
5	0.2	0.1	0.0	0.3
6	0.3	0.1	0.7	1.0
7	0.4	0.1	1.0	1.5
8	0.4	0.5	0.6	1.6
9	0.7	0.4	0.5	1.6
10	0.6	0.6	0.8	2.0
11	0.5	0.8	0.9	2.3
12	0.4	1.5	1.0	2.8
13	1.3	1.1	0.5	3.0
14	2.0	1.3	0.6	3.9
15	1.4	1.1	0.7	3.3
16	1.1	0.9	0.6	2.6
17	0.7	0.8	0.5	1.9
18	1.2	0.7	0.2	2.1
19	1.5	0.9	0.3	2.7
20	1.8	0.7	0.2	2.8
21	1.5	0.3	0.4	2.1
22	1.5	0.3	0.2	2.1
23	1.1	0.4	0.2	1.6
Daily Avg.	20.7	13.8	10.7	45.3

FIGURE 7-6: Average Deployed Minutes by Hour of Day



Observations:

- Hourly deployed time was highest during the day from 10:00 a.m. to 11:00 p.m., averaging from 1.9 to 3.9 minutes.
- Average deployed time peaked between 2:00 p.m. and 3:00 p.m., averaging 3.9 minutes.
- Average deployed time was the lowest between 5:00 a.m. and 6:00 a.m., averaging 0.3 minutes.

Workload by Unit

Table 7-8 summarizes the annual workload of LTFD units. Tables 7-9 and 7-10 provide a more detailed view of the workload for each unit, showing each unit's runs (Table 7-9) and the resulting daily average deployed time (Table 7-10) by run type.

TABLE 7-8: Annual Workload by Unit

Unit	Unit Type	Minutes per Run	Total Hours	Total Percent	Minutes per Day	Total Runs	Runs per Day
L501	Chief	29.1	48.4	17.6	8.0	100	0.3
L502	Asst chief	142.9	11.9	4.3	2.0	5	0.0
L507	Officer	49.4	9.1	3.3	1.5	11	0.0
L509	Officer	21.6	6.9	2.5	1.1	19	0.1
L510	Officer	14.1	1.4	0.5	0.2	6	0.0
L520	Engine	39.5	29.0	10.5	4.8	44	0.1
L521	Engine	33.9	26.6	9.7	4.4	47	0.1
L530	Tender	103.6	10.4	3.8	1.7	6	0.0
L540	Brush	75.9	11.4	4.1	1.9	9	0.0
L550	Rescue	30.4	23.8	8.7	3.9	47	0.1
L551	Rescue	16.1	45.6	16.6	7.5	170	0.5
L573	Firefighter	20.2	0.3	0.1	0.1	1	0.0
L577	Firefighter	26.8	28.6	10.4	4.7	64	0.2
L581	Firefighter	16.5	6.6	2.4	1.1	24	0.1
L585	Firefighter	10.9	1.1	0.4	0.2	6	0.0
L591	Firefighter	18.6	12.1	4.4	2.0	39	0.1
L593	Firefighter	19.2	0.3	0.1	0.1	1	0.0
L595	Firefighter	16.5	1.4	0.5	0.2	5	0.0
Total		27.3	274.7	100.0	45.3	604	1.7

TABLE 7-9: Annual Runs by Run Type and Unit

Unit	Unit Type	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Aid Given	Cancel	Total
L501	Chief	45	3	3	18	0	2	1	10	18	100
L502	Asst chief	2	0	0	1	0	0	0	2	0	5
L507	Officer	2	0	2	4	1	0	1	1	0	11
L509	Officer	13	0	0	1	0	1	0	0	4	19
L510	Officer	2	0	0	0	0	1	0	1	2	6
L520	Engine	4	2	1	23	1	1	3	6	3	44
L521	Engine	12	5	4	16	0	0	1	4	5	47
L530	Tender	0	1	1	0	0	0	1	3	0	6
L540	Brush	2	0	1	0	1	0	1	4	0	9
L550	Rescue	29	2	0	2	0	1	2	4	7	47
L551	Rescue	114	0	1	3	0	13	0	10	29	170
L573	Firefighter	0	0	0	0	0	0	0	1	0	1
L577	Firefighter	28	3	1	10	1	5	1	5	10	64
L581	Firefighter	13	1	0	0	0	2	0	3	5	24
L585	Firefighter	2	0	0	0	0	0	0	0	4	6
L591	Firefighter	23	2	1	1	0	1	1	2	8	39
L593	Firefighter	1	0	0	0	0	0	0	0	0	1
L595	Firefighter	3	0	0	0	0	2	0	0	0	5
Total		295	19	15	79	4	29	12	56	95	604

TABLE 7-10: Deployed Minutes per Day by Run Type and Unit

Unit	Unit Type	EMS	False Alarm	Good Intent	Hazard	Outside Fire	Public Service	Structure Fire	Aid Given	Cancel	Total
L501	Chief	3.9	0.1	0.1	1.4	0.0	0.1	0.3	1.6	0.5	8.0
L502	Asst chief	0.1	0.0	0.0	0.3	0.0	0.0	0.0	1.5	0.0	2.0
L507	Officer	0.4	0.0	0.1	0.5	0.4	0.0	0.1	0.1	0.0	1.5
L509	Officer	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.1
L510	Officer	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
L520	Engine	0.6	0.1	0.1	2.2	0.4	0.0	0.7	0.5	0.1	4.8
L521	Engine	1.6	0.3	0.1	1.4	0.0	0.0	0.1	0.8	0.1	4.4
L530	Tender	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.6	0.0	1.7
L540	Brush	0.5	0.0	0.0	0.0	0.3	0.0	0.3	0.8	0.0	1.9
L550	Rescue	2.7	0.1	0.0	0.2	0.0	0.0	0.3	0.6	0.1	3.9
L551	Rescue	5.8	0.0	0.0	0.2	0.0	0.6	0.0	0.5	0.4	7.5
L573	Firefighter	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
L577	Firefighter	1.8	0.2	0.1	1.0	0.4	0.2	0.3	0.5	0.2	4.7
L581	Firefighter	0.7	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.1	1.1
L585	Firefighter	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
L591	Firefighter	1.2	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.2	2.0
L593	Firefighter	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
L595	Firefighter	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2
Total		20.7	1.2	0.6	7.3	1.4	1.2	2.1	8.8	2.0	45.3

Observations:

- Among all units, L551 made the most runs (170 or an average of 0.5 runs per day) and had the second-highest total annual deployed time (45.6 hours, or an average of 7.5 minutes per day).
 - EMS calls accounted for 67 percent of runs and 77 percent of total deployed time.
 - L551 did not respond to outside and structure fires.
- Among all units, L501 made the second-most runs (100 or an average of 0.3 runs per day) and had the highest total annual deployed time (48.4 hours, or an average of 8.0 minutes per day).
 - EMS calls accounted for 45 percent of runs and 49 percent of total deployed time.
 - Structure and outside fire calls accounted for one percent of runs and four percent of total deployed time.

Workload by Location

Table 7-11 breaks down the workload of LTFD by the location of calls. Table 7-12 provides further detail on the workload associated with structure and outside fire calls, also broken down by location.

TABLE 7-11: Annual Workload by Call Location

Location	Calls	Percent Calls	Runs	Runs Per Day	Minutes Per Run	Work Hours	Percent Work	Minutes Per Day
Larkin Township	280	91.2	548	1.5	24.2	221.4	80.6	36.4
Midland (County)	24	7.8	49	0.1	60.5	49.4	18.0	8.1
Midland City	2	0.7	5	0.0	23.6	2.0	0.7	0.3
Hope	1	0.3	2	0.0	55.2	1.8	0.7	0.3
Total	307	100.0	604	1.7	27.3	274.7	100.0	45.2

TABLE 7-12: Runs for Structure and Outside Fires by Call Location

Location	Structure Fires		Outside Fires		Combined	
	Runs	Minutes per Run	Runs	Minutes per Run	Annual Hours	Percent Work
Larkin Township	12	65.0	4	130.8	21.73	38.1
Midland (County)	8	212.2	7	31.5	31.96	56.1
Midland City	3	29.5	0	NA	1.47	2.6
Hope	2	55.2	0	NA	1.84	3.2
Total	25	107.1	11	67.6	57.0	100.0

Observations:

Larkin Township

- There were 280 calls or 91 percent of the total calls.
- There were 548 runs, including 95 runs dispatched for canceled calls. The daily average was 1.5 runs.
- The total deployed time for the year was 221.4 hours or 81 percent of the total annual workload. The daily average was 36.4 minutes for all units combined.

Outside Larkin Township

- There were 27 calls or nine percent of the total calls.
- There were 56 runs, including two runs dispatched for canceled calls. The daily average was 0.2 runs.
- The total deployed time for the year was 53.2 hours or 19 percent of the total annual workload. The daily average was 8.7 minutes for all units combined.

Aid Given Workload

The following table details the information on 27 aid given calls, including the number of runs and deployed minutes for each call.

TABLE 7-13: Aid Given Runs and Deployed Minutes

CFS Number	Date	Address	Incident Description	Runs	Deployed Minutes
M091521-085	9/15/2021	1305 Rumbaugh Ln	Alarm - Fire	2	29.9
M092221-073	9/22/2021	5600 N Poulos Ln	Falls	1	33.7
M100421-087	10/4/2021	5600 N Poulos Ln	Falls	2	49.4
M101721-007	10/17/2021	2545 E Baker Rd	House Fire	3	85.9
M120721-025	12/7/2021	E Baker Rd & N Eastman Rd	Injury Accident	2	62.7
M122021-019	12/20/2021	E Baker Rd & N Swede Rd	Injury Accident	3	167.4
M011622-105	1/16/2022	2325 Rockwell Dr	Heart Problem	2	29.5
M012222-013	1/22/2022	3551 E Saiko Rd	Chimney Fire	2	110.3
M013122-016	1/31/2022	E Wheeler Rd & N Waldo Rd	Fatal	3	159.9
M022222-144	2/22/2022	1377 Rumbaugh Ln	Wire Down Fire	2	52.8
M031322-090	3/13/2022	1372 Cheryl-Lynne Ln	Fire Public Assist	2	41.6
M033122-012	3/31/2022	3051 W Curtis Rd	Commercial Fire	2	1,015.5
M033122-130	3/31/2022	2922 E Baker Rd	Alarm Burglar	2	70.4
M041122-048	4/11/2022	E Baker Rd & N Waldo Rd	Suicide If Ems Needed	2	159.3
M042422-059	4/24/2022	977 E Price Rd	House Fire	3	595.9
M042922-177	4/29/2022	101 Hunters Ridge	House Fire	3	88.5
M051322-053	5/13/2022	N Waldo Rd & E Wheeler Rd	Grass Fire	2	33.1
M051922-058	5/19/2022	W Us10 & Waldo Rd	Wire Down Or Sparking	2	43.8
M052922-058	5/29/2022	W Us10 & Waldo Rd	Car Fire Not Near	2	89.0
M060422-185	6/4/2022	4780 E Wackerly Rd	Uncons/Fainting	2	34.5
M060922-043	6/9/2022	1424 Rumbaugh Ln	Chest Pain	2	13.9
M061622-236	6/16/2022	1424 Rumbaugh Ln	Breathing	1	14.1
M061822-060	6/18/2022	4309 E Shaffer Rd	Car Fire Not Near	3	98.4
M070322-120	7/3/2022	1424 Rumbaugh Ln	Chest Pain	1	15.9
M072922-017	7/29/2022	W Us10 & Waldo Rd	Injury Accident	1	16.5
M082522-218	8/25/2022	1332 Cheryl-Lynne Ln	Falls	2	42.5
M082922-077	8/29/2022	4520 E Wheeler Rd	Breathing	2	39.2
Total				56	3,193.5

Note: M012222-013 was in Hope; M011622-105 and M042922-177 were in Midland City; The rest of the calls were in Midland County's unincorporated zones.

ANALYSIS OF BUSIEST HOURS

There is significant variability in the number of calls from hour to hour. One special concern relates to the resources available for hours with the heaviest workload. We tabulated the data for each of the 8,736 hours between September 2, 2021, and August 31, 2022. Table 7-14 shows the number of hours in the year in which there were zero to two or more calls during the hour. Table 7-15 shows the five one-hour intervals which had the most calls during the year. Table 7-16 examines the number of times a call within Larkin Township overlapped with another call within the same area. We included all 314 calls (Table 7-1) in this analysis.

TABLE 7-14: Frequency Distribution of the Number of Calls

Calls in an Hour	Frequency	Percentage
0	8,433	96.5
1	296	3.4
2+	7	0.1
Total	8,736	100.0

TABLE 7-15: Top Five Hours with the Most Calls Received

Hour	Number of Calls	Number of Runs	Deployed Hours
9/7/2021, 3:00 p.m. to 4:00 p.m.	5	7	3.7
9/20/2021, 8:00 p.m. to 9:00 p.m.	3	9	4.0
5/20/2022, 11:00 p.m. to midnight	2	5	2.0
12/24/2021, 3:00 a.m. to 4:00 a.m.	2	5	1.9
12/11/2021, noon to 1:00 p.m.	2	3	0.6

Note: Total deployed hours is a measure of the total time spent responding to calls received in the hour and may extend into the next hour or hours. The number of runs and deployed hours only includes LTFD units.

TABLE 7-16: Frequency of Overlapping Calls in Larkin Township

Scenario	Number of Calls	Percent of All Calls	Total Hours
No overlapped call	275	95.8	189.2
Overlapped with one call	10	3.5	1.9
Overlapped with two calls	1	0.3	0.4
Overlapped with three calls	1	0.3	0.2

Note: The 27 aid given calls outside Larkin Township were not included.

Observations:

- During seven hours (0.1 percent of all hours), two or more calls occurred; in other words, the LTFD responded to two or more calls in an hour roughly once every 52 days.
- The highest number of calls to occur in an hour was five, which happened once.
- The hour with the most calls was 3:00 p.m. to 4:00 p.m. on September 7, 2021, when the area was hit by severe thunderstorms. The hour's 5 calls involved 7 individual dispatches resulting in 3.7 hours of deployed time. These 5 calls included four hazard calls and one canceled call.
- The total overlapped hours during the 12 months were 2.5 hours.

RESPONSE TIME

In this part of the analysis, we present response time statistics for different call types. We separate response time into its identifiable components. *Dispatch time* is the difference between the time a call is received and the time a unit is dispatched. Dispatch time includes call processing time, which is the time required to determine the nature of the emergency and the types of resources to dispatch. *Turnout time* is the difference between dispatch time and the time a unit is en route to a call's location. *Travel time* is the difference between the time en route and arrival on scene. *Response time* is the total time elapsed between receiving a call to arriving on scene.

In this analysis, we included all calls responded to by both Larkin Township Fire Department and other EMS and fire agencies to which at least one unit arrived while excluding canceled and aid given calls. Finally, we focused on units that had complete time stamps, that is, units with all components recorded, so that we could calculate each segment of response time. Since most calls were responded to with lights and sirens, we identified all calls as emergency calls.

Based on the methodology above, for 314 calls (Table 7-1), we excluded 56 canceled calls, 27 aid-given calls, 11 calls where no units recorded a valid arrival time, and 11 calls where one or more segments of the first arriving unit's response time could not be calculated due to missing or faulty data. As a result, in this section, a total of 209 calls are included in the analysis.

Response Time by Type of Call

Tables 7-17 and 7-18 break down the average, 80th percentile, and 90th percentile response times by call type for all calls in Larkin Township. LTFD follows the NFPA 1720 standard that benchmarks both 80th and 90th percentile response times. The 80th and 90th percentiles mean that 80 percent and 90 percent of calls had response times at or below the corresponding numbers. For example, Table 7-18 shows an overall 80th percentile response time of 16.9 minutes, which means that 80 percent of the time, a call had a response time of no more than 16.9 minutes. Figures 7-7 and 7-8 illustrate the components of the average response time for EMS and fire calls, respectively.

TABLE 7-17: Average Response Time of First Arriving Unit, by Call Type

Call Type	Minutes				Call Count
	Dispatch	Turnout	Travel	Total	
Breathing difficulty	4.5	0.8	7.4	12.7	17
Cardiac and stroke	4.0	1.0	7.5	12.5	16
Fall and injury	6.4	1.2	6.9	14.4	22
Illness and other	4.7	1.1	7.1	12.9	43
MVA	5.7	0.6	6.1	12.4	19
Overdose and psychiatric	3.3	1.1	8.5	12.9	1
Seizure and unconsciousness	4.0	0.8	7.7	12.5	21
EMS Subtotal	4.9	1.0	7.1	13.0	139
False alarm	7.6	1.3	10.3	19.3	9
Good intent	10.1	1.8	5.1	16.9	6
Hazard	7.3	1.5	6.2	15.0	37
Outside fire	3.0	14.9	6.4	24.4	1
Public service	8.2	0.7	3.5	12.4	13
Structure fire	1.8	2.3	7.2	11.4	4
Fire Subtotal	7.3	1.6	6.2	15.1	70
Total	5.7	1.2	6.8	13.7	209

TABLE 7-18: 80th and 90th Percentile Response Times of First Arriving Unit, by Call Type

Call Type	80th Percentile Response Time, Minutes				90th Percentile Response Time, Minutes				Call Count
	Dispatch	Turnout	Travel	Total	Dispatch	Turnout	Travel	Total	
Breathing difficulty	9.4	1.8	10.7	15.0	10.2	2.2	11.3	15.2	17
Cardiac and stroke	7.1	2.2	10.0	14.8	7.6	2.7	10.6	15.4	16
Fall and injury	8.5	1.5	9.4	17.3	12.0	2.4	12.4	17.4	22
Illness and other	8.6	1.7	10.3	15.4	10.9	2.4	10.9	16.9	43
MVA	6.3	1.1	9.0	13.3	11.3	1.5	10.4	17.2	19
OD*	3.3	1.1	8.5	12.9	3.3	1.1	8.5	12.9	1
Seizure and UNC**	7.3	1.9	10.0	14.2	8.4	2.6	11.6	15.6	21
EMS Subtotal	7.7	1.8	10.0	15.0	10.3	2.4	11.7	16.9	139
False alarm	11.9	0.6	13.8	21.6	12.5	2.8	16.1	22.9	9
Good intent	14.9	1.7	6.6	19.6	15.4	5.2	7.3	20.2	6
Hazard	13.1	0.2	8.2	20.0	14.1	4.7	12.2	24.6	37
Outside fire	3.0	14.9	6.4	24.4	3.0	14.9	6.4	24.4	1
Public service	11.9	0.4	4.3	16.2	13.6	0.9	5.5	17.7	13
Structure fire	2.7	3.5	9.0	13.1	3.9	4.7	10.1	13.5	4
Fire Subtotal	13.2	1.5	8.4	20.5	14.2	6.0	12.6	22.8	70
Total	9.4	1.8	9.8	16.9	12.3	2.6	12.0	19.6	209

Notes: *OD= Overdose and psychiatric; **UNC=Unconsciousness. Because there is only one outside fire and one overdose call, the average, 80th percentile, and 90th percentile values are the same.

FIGURE 7-7: Average Response Time of First Arriving Unit, by Call Type, EMS

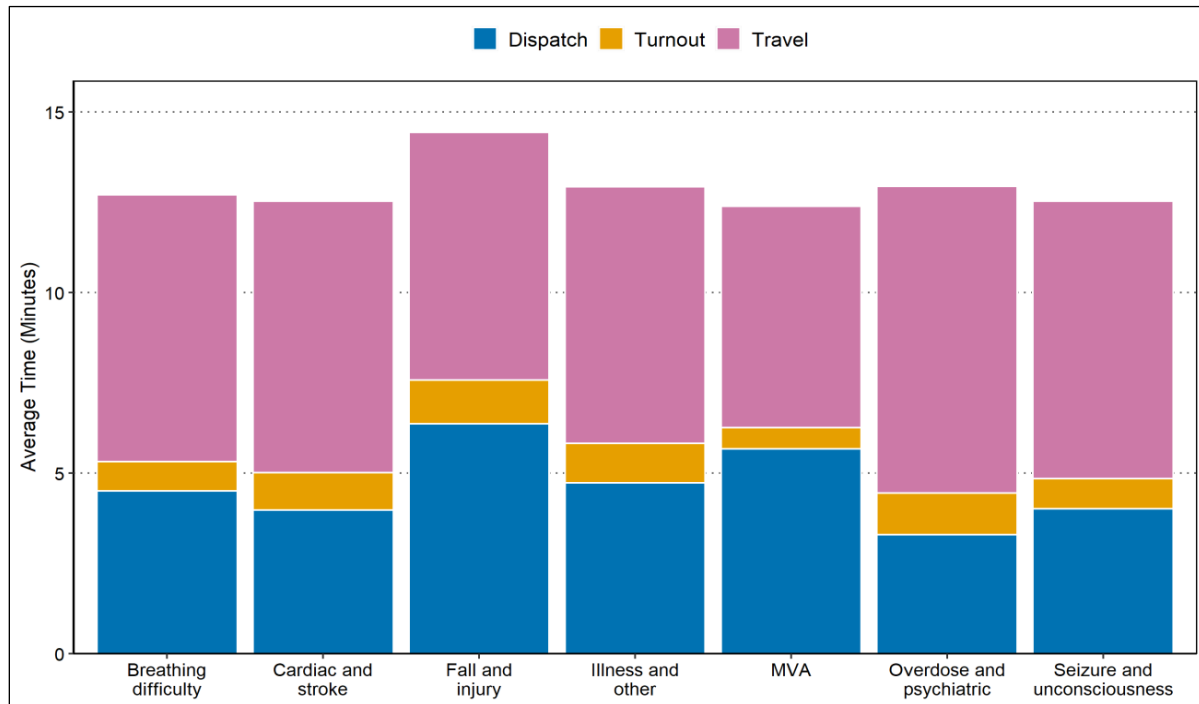
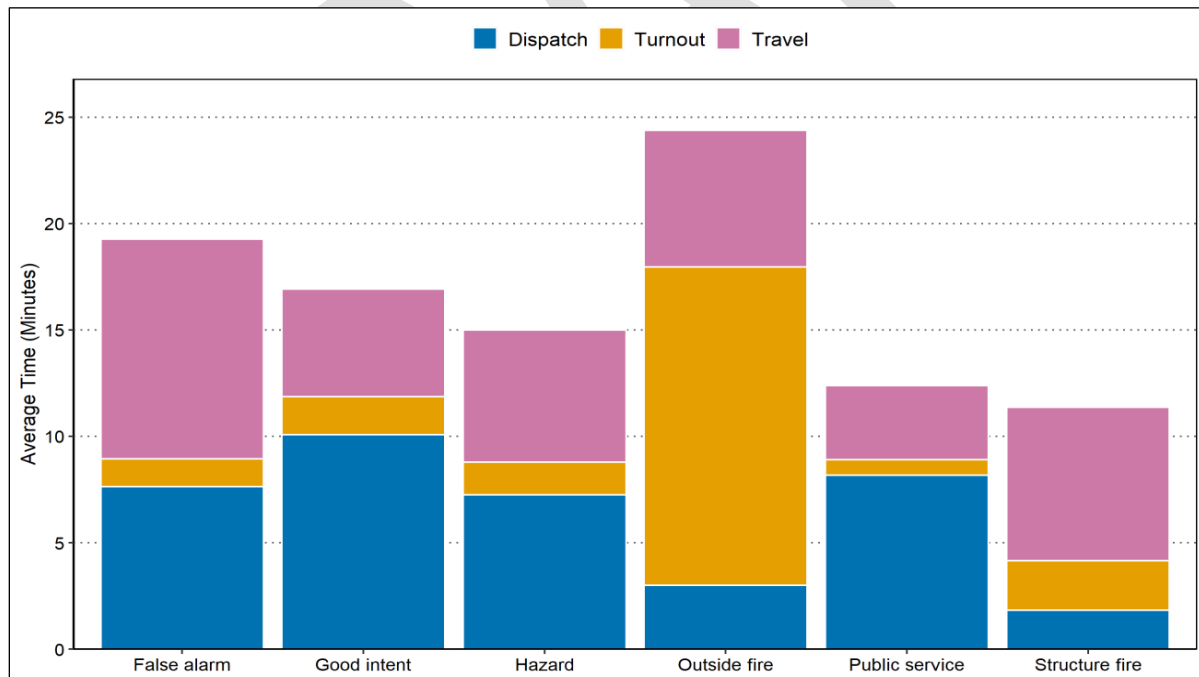


FIGURE 7-8: Average Response Time of First Arriving Unit, by Call Type, Fire



Observations:

- The average dispatch time was 5.7 minutes.
- The average turnout time was 1.2 minutes.
- The average travel time was 6.8 minutes.
- The average total response time was 13.7 minutes.
- The average response time was 13.0 minutes for EMS calls and 15.1 minutes for fire calls.
- The average response time was 24.4 minutes for the outside fire and 11.4 minutes for structure fires.
- The 80th percentile dispatch time was 9.4 minutes.
- The 80th percentile turnout time was 1.8 minutes.
- The 80th percentile travel time was 9.8 minutes.
- The 80th percentile total response time was 16.9 minutes.
- The 80th percentile response time was 15.0 minutes for EMS calls and 20.5 minutes for fire calls.
- The 80th percentile response time was 24.4 minutes for the outside fire and 13.1 minutes for structure fires.
- The 90th percentile dispatch time was 12.3 minutes.
- The 90th percentile turnout time was 2.6 minutes.
- The 90th percentile travel time was 12.0 minutes.
- The 90th percentile total response time was 19.6 minutes.
- The 90th percentile response time was 16.9 minutes for EMS calls and 22.8 minutes for fire calls.
- The 90th percentile response time was 24.4 minutes for the outside fire and 13.5 minutes for structure fires. (This is the same for the outside fire as the 80th percentile as noted.)

Response Time by Hour

Tables 7-19, 7-20, and 7-21 examine the average, 80th, and 90th response times of the first arriving units by the time of day (in four-hour intervals).

TABLE 7-19: Average Response Time of First Arriving Unit, by Time of Day

Time of Day	Minutes				Number of Calls
	Dispatch	Turnout	Travel	Total	
0:00 - 3:59	4.6	2.1	8.9	15.6	16
4:00 - 7:59	6.0	1.2	7.8	15.0	17
8:00 - 11:59	5.2	1.9	6.9	14.0	30
12:00 - 15:59	6.6	1.0	6.0	13.7	60
16:00 - 19:59	5.5	0.7	6.2	12.4	49
20:00 - 23:59	5.3	1.0	7.5	13.7	37
Total	5.7	1.2	6.8	13.7	209

TABLE 7-20: 80th Percentile Response Time of First Arriving Unit, by Time of Day

Time of Day	Minutes				Number of Calls
	Dispatch	Turnout	Travel	Total	
0:00 - 3:59	6.4	2.5	10.9	16.8	16
4:00 - 7:59	9.5	2.2	9.6	16.4	17
8:00 - 11:59	7.7	1.9	9.8	17.7	30
12:00 - 15:59	10.1	1.5	9.2	16.9	60
16:00 - 19:59	9.5	1.0	8.8	15.4	49
20:00 - 23:59	7.5	1.5	10.1	16.2	37
Total	9.4	1.8	9.8	16.9	209

TABLE 7-21: 90th Percentile Response Time of First Arriving Unit, by Time of Day

Time of Day	Minutes				Number of Calls
	Dispatch	Turnout	Travel	Total	
0:00 - 3:59	7.7	2.7	11.9	22.4	16
4:00 - 7:59	12.8	2.4	11.1	21.4	17
8:00 - 11:59	12.4	5.1	10.6	20.9	30
12:00 - 15:59	12.3	3.0	11.8	17.9	60
16:00 - 19:59	11.6	1.8	12.6	17.6	49
20:00 - 23:59	12.8	2.4	12.0	19.7	37
Total	12.3	2.6	12.0	19.6	209

Response Time Distribution

Here, we present a more detailed look at how response times to calls are distributed. The cumulative distributions of total response time for the first arriving unit to EMS calls and outside and structure fire calls are shown in Table 7-22. In the table, the EMS cumulative percentage of 7.2, for example, means that 7.2 percent of EMS calls had a response time under 8 minutes.

TABLE 7-22: Cumulative Distribution of Response Time – First Arriving Unit

Response Time (minute)	EMS		Outside Fire and Structure Fire	
	Frequency	Cumulative Percentage	Frequency	Cumulative Percentage
1	0	0.0	0	0.0
2	0	0.0	0	0.0
3	0	0.0	0	0.0
4	0	0.0	0	0.0
5	0	0.0	0	0.0
6	3	2.2	0	0.0
7	3	4.3	0	0.0
8	4	7.2	0	0.0
9	10	14.4	0	0.0
10	8	20.1	2	40.0
11	16	31.7	0	40.0
12	19	45.3	0	40.0
13	18	58.3	1	60.0
14	14	68.3	1	80.0
15	17	80.6	0	80.0
16	7	85.6	0	80.0
17	7	90.6	0	80.0
18	5	94.2	0	80.0
19	3	96.4	0	80.0
20	0	96.4	0	80.0
21	1	97.1	0	80.0
22	2	98.6	0	80.0
23	0	98.6	0	80.0
24	0	98.6	0	80.0
25+	2	100.0	1	100.0

ATTACHMENT I: ACTIONS TAKEN

TABLE 7-23: Actions Taken Analysis for Structure and Outside Fire Calls

Action Taken	Number of Calls	
	Outside Fire	Structure Fire
Extinguishment by fire service personnel	1	2
Incident command	0	2
Investigate	1	1
Investigate fire out on arrival	0	1
Refer to proper authority	0	2
Salvage & overhaul	1	2
Ventilate	0	1

Note: Totals are higher than the total number of structure and outside fire calls because some calls recorded multiple actions taken.

Observations:

- The single outside fire was extinguished by fire service personnel.
- Out of four structure fires, two were extinguished by fire service personnel, which accounted for 50 percent of structure fires.

ATTACHMENT II: FIRE LOSS

TABLE 7-24: Total Fire Loss Above and Below \$25,000

Call Type	No Loss	Under \$25,000	\$25,000 plus	Total
Outside fire	0	0	1	1
Structure fire	2	0	2	4
Total	2	0	3	5

TABLE 7-25: Content and Property Loss – Structure and Outside Fires

Call Type	Property Loss		Content Loss	
	Loss Value	Number of Calls	Loss Value	Number of Calls
Outside fire	\$1,700,000	1	\$3,000	1
Structure fire	\$56,000	2	\$20,000	2
Total	\$1,756,000	3	\$23,000	3

Note: The table includes only fire calls with a recorded loss greater than \$0.

Observations:

- Two structure fires had no recorded losses.
- One outside fire and two structure fires had \$25,000 or more in recorded losses.
- Structure fires:
 - The highest total loss for a structure fire was \$40,000.
 - The average total loss for all structure fires was \$19,000.
 - Two structure fires recorded content losses with a combined \$20,000 in losses.
 - Out of four structure fires, two had recorded property losses, with a combined \$56,000 in losses.
- Outside fires:
 - There was one outside fire with a \$3,000 content loss and a \$1,700,000 property loss. The total loss was \$1,703,000.

ATTACHMENT III: MYMICHIGAN MEDICAL CENTER EMS RESPONSE AND WORKLOAD

Between September 2, 2021, and August 31, 2022, MyMichigan Medical Center EMS (MMC-EMS) responded to 195 calls (arrived at 185 of them) in Larkin Township, of which 74 percent were EMS calls.

MyMichigan Medical Center EMS Response Calls by Type

The following table shows the number of calls by call type, the average calls per day, and the percentage of calls that fall into each call type category for the study period.

TABLE 7-26: Calls Responded to by MMC-EMS, by Type

Call Type	Total Calls	Calls per Day	Call Percentage
Breathing difficulty	19	0.1	9.7
Cardiac and stroke	17	0.0	8.7
Fall and injury	23	0.1	11.8
Illness and other	42	0.1	21.5
MVA	19	0.1	9.7
Overdose and psychiatric	2	0.0	1.0
Seizure and unconsciousness	22	0.1	11.3
EMS Subtotal	144	0.4	73.8
Good intent	1	0.0	0.5
Public service	2	0.0	1.0
Structure fire	3	0.0	1.5
Fire Subtotal	6	0.0	3.1
Canceled	45	0.1	23.1
Total	195	0.5	100.0

MyMichigan Medical Center EMS Runs and Deployed Time

Table 7-27 shows the total deployed time of MMC-EMS, both overall and broken down by type of run. Table 7-28 details the workload of the responding MMC-EMS ambulances.

TABLE 7-27: MMC-EMS Runs and Deployed Time by Run Type

Run Type	Minutes per Run	Annual Hours	Percent of Hours	Minutes per Day	Annual Runs	Runs per Day
Breathing difficulty	46.7	17.1	11.9	2.8	22	0.1
Cardiac and stroke	55.9	16.8	11.6	2.8	18	0.0
Fall and injury	50.5	21.1	14.6	3.5	25	0.1
Illness and other	44.2	33.1	23.0	5.5	45	0.1
MVA	24.5	10.6	7.4	1.7	26	0.1
Overdose and psychiatric	15.8	0.5	0.4	0.1	2	0.0
Seizure and unconsciousness	40.9	15.7	10.9	2.6	23	0.1
EMS Subtotal	42.8	114.9	79.6	18.9	161	0.4
Good intent	13.2	0.2	0.2	0.0	1	0.0
Public service	18.5	0.6	0.4	0.1	2	0.0
Structure fire	54.2	2.7	1.9	0.4	3	0.0
Fire Subtotal	35.5	3.5	2.5	0.6	6	0.0
Canceled	33.7	25.9	17.9	4.3	46	0.1
Total	40.7	144.3	100.0	23.8	213	0.6

TABLE 7-28: Total Annual Workload by MMC-EMS Ambulances

Unit	Minutes per Run	Annual Hours	Percent of Hours	Minutes per Day	Annual Runs	Runs per Day
600	51.7	3.4	2.4	0.6	4	0.0
601	44.5	62.3	43.2	10.3	84	0.2
602	38.6	32.8	22.7	5.4	51	0.1
603	41.4	6.2	4.3	1.0	9	0.0
604	39.8	25.9	17.9	4.3	39	0.1
605	28.3	5.2	3.6	0.9	11	0.0
606	39.4	2.6	1.8	0.4	4	0.0
607	26.3	3.5	2.4	0.6	8	0.0
608	46.7	2.3	1.6	0.4	3	0.0
Total	40.7	144.3	100.0	23.8	213	0.6

Observations:

- MMC-EMS units responded to 195 calls (arrived at 185 calls) and made 213 total runs and 144.3 total deployed hours.
- The busiest MMC-EMS ambulance was 601, which accounted for 39 percent of total MMC-EMS runs and 43 percent of total MMC-EMS work hours.
- The second busiest MMC-EMS ambulance was 602, which accounted for 24 percent of total MMC-EMS runs and 23 percent of total MMC-EMS work hours.

ATTACHMENT IV: TRANSPORT CALL ANALYSIS

The medical transport service in Larkin Township is provided by MyMichigan Medical Center EMS (MMC-EMS). In this section, we present an analysis of the medical units' activity that involved transporting patients, the variations by hour of day, and the average time for each stage of transport service in Larkin Township. There were 314 calls in Larkin Township (Table 7-1). We identified transport calls by requiring that at least one responding medical unit had recorded both a "beginning to transport" time and an "arriving at the hospital" time. Based on these criteria, we note that 26 non-EMS (fire & other) calls that resulted in transports are included in this analysis.

Transport Calls by Type

Table 7-29 shows the number of calls by call type broken out by transport and non-transport calls.

TABLE 7-29: Transport Calls by Call Type

Call Type	Number of Calls			Conversion Rate
	Non-transport	Transport	Total	
Breathing difficulty	2	17	19	89.5
Cardiac and stroke	3	14	17	82.4
Fall and injury	3	20	23	87.0
Illness and other	16	27	43	62.8
MVA	15	6	21	28.6
Overdose and psychiatric	2	0	2	0.0
Seizure and unconsciousness	6	16	22	72.7
EMS Subtotal	47	100	147	68.0
Fire & Other Subtotal	114	26	140	18.6
Total	161	126	287	43.9

Observations:

- 68 percent of EMS calls involved transporting one or more patients.
- On average, 0.3 EMS calls per day involved transporting one or more patients.

Transport Calls per Hour

Table 7-30 shows the average number of EMS calls received each hour of the day (in four-hour intervals). In Table 7-30, the conversion rate measures the percent of EMS calls that transported one or more patients.

TABLE 7-30: EMS Transport Calls per Hour, by Time of Day

Time of Day	EMS Calls	Transports	Conversion Rate
0:00 - 3:59	11	8	72.7
4:00 - 7:59	10	6	60.0
8:00 - 11:59	22	18	81.8
12:00 - 15:59	38	25	65.8
16:00 - 19:59	33	23	69.7
20:00 - 23:59	33	20	60.6
Total	147	100	68.0

Note: The conversion rate is measured by dividing the number of EMS transports by the number of EMS calls. For example, between midnight and 4:00 a.m., there were eight EMS transports out of 11 EMS calls. This gives a conversion rate of $8 / 11 = 0.727$ or 72.7 percent.

Calls by Transport, Type, and Duration

Table 7-31 shows the average duration of transport and non-transport calls by call type.

TABLE 7-31: Call Duration by Call Type and Transport

Call Type	Non-transport		Transport	
	Average Duration, Minutes	Number of Calls	Average Duration, Minutes	Number of Calls
Breathing difficulty	34.7	2	52.0	17
Cardiac and stroke	67.0	3	55.4	14
Fall and injury	34.4	3	53.4	20
Illness and other	37.8	16	53.7	27
MVA	34.3	15	88.5	6
Overdose and psychiatric	15.8	2	NA	0
Seizure and unconsciousness	22.6	6	49.2	16
EMS Subtotal	35.3	47	54.9	100
Fire & Other Subtotal	29.7	114	44.8	26
Total	31.3	161	52.8	126

Note: The duration of a call is defined as the longest deployed time of any of the units responding to the same call.

Observations:

- The average duration was 35.3 minutes for non-transport EMS calls.
- The average duration was 54.9 minutes for EMS calls where one or more patients were transported to a hospital.

Transport Time Components

Table 7-32 gives the average deployed time for a rescue unit on a transport call, along with three major components of the deployed time: on-scene time, travel to hospital time, and at-hospital time.

The on-scene time is the interval from the unit arriving on-scene time through the time the unit departs the scene for the hospital. Travel to hospital time is the interval from the time the unit departs the scene to travel to the hospital through the time the unit arrives at the hospital. At-hospital time is the time it takes for patient turnover at the hospital.

TABLE 7-32: Time Component Analysis for Transport Runs by Call Type

Call Type	Average Minutes Spent per Run				Number of Runs
	On Scene	Traveling to Hospital	At Hospital	Deployed	
Breathing difficulty	9.5	11.9	19.3	51.9	17
Cardiac and stroke	13.9	11.1	17.6	54.4	14
Fall and injury	14.5	12.4	13.9	53.4	20
Illness and other	13.7	13.4	14.9	53.0	27
MVA	11.5	9.7	16.3	45.3	6
Seizure and unconsciousness	14.4	12.9	10.4	48.9	16
EMS Subtotal	13.1	12.3	15.2	52.0	100
Fire & Other Subtotal	7.0	13.5	13.5	44.7	26
Total	11.9	12.6	14.9	50.5	126

Note: Average unit deployed time per run is lower than the average call duration for some call types because call duration is based on the longest deployed time of any of the units responding to the same call, which may include an engine or ladder. Total deployed time is greater than the combination of on-scene, transport, and hospital wait times as it includes turnout, initial travel, and hospital return times.

Observations:

- The average time spent on-scene for a transport EMS call was 13.1 minutes.
- The average travel time from the scene of the EMS call to the hospital was 12.3 minutes.
- The average deployed time spent on transport EMS calls was 52.0 minutes.
- The average deployed time at the hospital was 15.2 minutes, which accounts for approximately 29 percent of the average total deployed time for a transport EMS call.

ATTACHMENT V: NFPA 1720 ANALYSIS

In this section, we further examine structure fires using the guidelines established in the National Fire Protection Association's standard 1720 (NFPA 1720). Included in these guidelines is a set of standards for the travel time of units responding to a structure fire, where travel time is defined as beginning when the first unit goes en route. Table 7-33 shows the NFPA 1720 minimum staff required to respond to a structure fire within a given time and percentile for the urban, suburban, rural, and remote areas of a response district.

TABLE 7-33: NFPA 1720 Minimum Staff and Response Time Standards

Demand Zone	Demographics	Minimum Staff to Respond to Scene	Response Time Standard
Urban Area	>1000 people/mi ²	15	Within 9 minutes, 90 percent of the time.
Suburban Area	500-1000 people/mi ²	10	Within 10 minutes, 80 percent of the time.
Rural Area	< 500 people/mi ²	6	Within 14 minutes, 80 percent of the time.
Remote Area	Travel Distance > 8 miles	4	Directly dependent on travel distance, determined by AHJ, 90 percent of the time.

There were four structure fires in Larkin Township between September 2, 2021, and August 31, 2022. Table 7-34 presents these structure fires and the number of units and personnel arriving at calls. Table 7-35 shows the average, 80th percentile, and 90th percentile travel times for the first arriving unit. In this section, travel time is calculated differently than in Tables 7-17 and 7-18. In those tables, an individual unit's en route and arrival timestamps were used to calculate the travel time for that unit, yielding a unit-level travel time. Here, in contrast, NFPA defines travel time as beginning from when the first unit goes en route, even if it is not the same unit that arrived first. Thus, this travel time corresponds to the travel time of an entire call. Here, only arriving units were included.

TABLE 7-34: Structure Fires by Number of Response Runs and Arriving Personnel

CFS Number	Date	Address	Larkin Twp FD		Midland City FD	
			Units	Personnel	Units	Personnel
M101821-144	10/18/2021	2723 Waskevich Ln	2	3	3	6
M110621-005	11/6/2021	2573 N Arbutus Ct	3	3	3	6
M022522-076	2/25/2022	4424 E Monroe Rd	2	5	3	6
M042922-115	4/29/2022	N Eastman Rd & E Hubbard Rd	1	2	5	8

Note: We included the arriving units of both Larkin Twp FD and Midland City FD.

TABLE 7-35: Average, 80th Percentile, and 90th Percentile Travel Times

Response Type	Average	80th Percentile	90th Percentile	Calls
First Arriving Larkin TWP FD Unit	11.9	14.4	16.3	4
First Arriving Midland City FD Unit	9.0	10.2	10.8	4
First Arriving Unit Overall	8.9	10.2	10.8	4

ATTACHMENT VI: CALL TYPE IDENTIFICATION

When available, NFIRS data serves as our primary source for assigning call categories. For 161 of the 287 calls inside Larkin Township, NFIRS incident type codes were used to assign call types for canceled, fire, and motor vehicle accident (MVA) calls (Table 7-36). For 287 EMS calls that have NFIRS incident types 320 or 321, or do not have NFIRS incident types, we instead used their CAD incident codes and descriptions to assign call categories (Table 7-37). Aid-given calls were not included.

TABLE 7-36: Call Type by NFIRS Incident Type Code and Description

Call Type	Code	Description	Count
Canceled	611	Dispatched and canceled en route	52
	622	No incident found on arrival	4
False Alarm	736	CO detector activation due to malfunction	2
	745	Alarm system activation (no fire) - unintentional	4
	746	Carbon monoxide detector activation (no CO)	4
Good Intent	600	Good intent call, other	1
	631	Authorized controlled burning	5
	651	Smoke scare, odor of smoke, not steam	1
Hazard	400	Hazardous condition (no fire), other	11
	412	Gas leak (natural gas or LPG)	3
	444	Power line down	28
	463	Vehicle accident, general cleanup	4
MVA	322	Motor vehicle accident with injuries	12
	324	Motor vehicle accident with no injuries	9
Outside Fire	162	Outside equipment fire	1
Public Service	511	Lock-out	1
	550	Public service assistance, other	1
	554	Assist invalid	13
	813	Wind storm	1
Structure Fire	111	Building fire	2
	114	Chimney or flue fire	1
	116	Fuel burner/boiler fire	1
Total			161

Note: MVA=Motor Vehicle Accident.

TABLE 7-37: Call Type by CAD Incident Code and Description

Call Type	Code	Description	Calls
Breathing Difficulty	06	Breathing Difficulty	19
Cardiac and Stroke	09	Cardiac Arrest	3
	10	Chest Pain	10
	28	Stroke	4
Fall and Injury	17	Falls	15
	21	Hemorrhage	4
	27	Stab/Gunshot/Penetrating Trauma	1
	30	Traumatic Injury	2
	NA	Domestic Assault*	1
Illness and Other	01	Abdominal Pain	3
	02	Allergic Reaction	1
	13	Diabetic Problems	3
	18	Headache	2
	26	Sick Call	19
	32	Medical Nature Unknown	12
	NA	Assist Ems*	1
		Carbon Monoxide*	1
		Fire Public Assist*	1
Overdose and Psychiatric	23	Overdose	1
	NA	Suicide If EMS Needed	1
Seizure And Unconsciousness	12	Seizures	6
	31	Subject Unconscious	16
Total			126

Note: *NFIRS incident type code 321.

- END -