Optimal Staffing Strategy

Optimally, if the adopted performance objective is a 7-minute travel time for 90% of the incidents, then an 11-unit configuration would be optimal. The engines would be staffed at 3-personnel, with an officer on each apparatus, and the medic units at two personnel (paramedic and EMT).

Recommendation:
Assuming a 7-minute, and 7-station deployment, the department should have a minimum of 11 resources in the system each day to meet both the geographic demand for services and the average hourly demand.

Optimized Relief Multiplier

A Continuous Staffing strategy is utilized when the department hires additional personnel to cover the average leave experienced on shift work. In this manner, the additional personnel are available as "relief" personnel who are utilized to cover vacancies at the straight time rate more frequently and thus reducing the overtime liability.

An optimized staffing analysis was conducted utilizing mathematical formulae to determine the most efficient allocation of personnel to maintain the desired staffing. Data provided by the department included an accounting of all personnel time spent away from regularly scheduled shift work. Analyses found that GFES is optimally staffing personnel with respect to the current minimum staffing.

Optimal staffing is defined as sufficient staffing to cover all scheduled work hours, shift schedules, and the average employee leave experience. Maintaining the minimum daily staffing of (25/31/25), would require a staffing multiplier of 4.04 to optimally staff the department. In other words, it would take 4.04 Full-Time Equivalents (FTEs) for each of the minimum staffed positions for a total of 109 personnel assigned to shift. The current allocation is 98 personnel. This equates to a need for an additional 11 personnel department-wide. The results are presented below.

Observation:
it would take 4.04 Full-Time Equivalents (FTEs) for each of the minimum staffed positions for a total of 109 personnel assigned to shift. The current allocation is 98 personnel. This equates to a need for an additional 11 personnel department-wide.

Table 80: Optimized Staffing Analysis

Current Staffing and Unit Count	Excluding Station 31 All Shifts		Only Station 31 (B-Shift only)		Total
24hr Seats	25		6		25 A and C Shifts 31 on B Shift
Minimum Per Shift	**25**	**4.04 Multiplier**	**6**	**1.35 Multiplier**	**25 A and C Shifts** **31 on B Shift**
Total FTE Required by Multiplier	101		8		109
Shift Assigned FTE Strength	92		6		98
Additional Department Personnel Needed	**9**		**2**		**11**

Finally, it is understood that it is a local policy choice for the City and Department to balance the relationship between the number of FTEs and the associated overtime liability. The 11 additional FTEs suggested would be able to cover the typical employee's average leave experience and thus significantly reduce overtime. In other words, this strategy would maximize staffing and minimize overtime.

Observation:
Optimizing staffing strategies would maximize staffing and minimize overtime.

Resource Allocation Strategies

A total of four assessments and alternatives were developed. These assessments examined variations of responding to incidents that GFES handles.

Baseline Assessment of Current Deployment Capacity

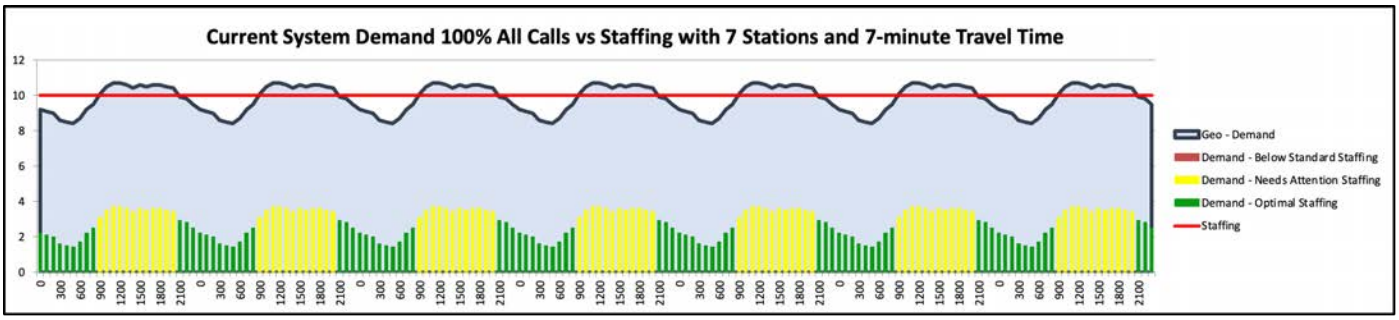
The current deployment included a total of ten 24-hour resources. The following figures illustrate the resource constraint of the current system. When reviewing the figures, the green/yellow/red columns are the hourly demand for services, adjusted for time on task, from Sunday through Saturday. The blue shaded area represents the unit demands to cover the geographic area with a 7-minute travel time. The dark blue line that outlines the shaded area is the required unit deployment required without consideration for the workload. Finally, the red

line is the actual unit deployment. Whenever the redline is at or below the blue line, the system is resource constrained even before considering the impact of the workload on the personnel.

When the system is resource constrained, the units aren't available to respond immediately, which means that there may be longer response times from farther away units and/or mutual and automatic-aid requests. When the units aren't available to respond as designed, the system attempts to mitigate the system failures by sending the closest Engine or Truck to get a resource there quickly.

Within the current system, the combination of the geographic demand to meet a 7-minute response time and the average hourly rate of calls requires a total of 11 deployed units each day. The current system has ten; therefore, the optimal resource allocation for the current risks, desired performance, and system design would require one additional resource. Since the City is not providing patient transportation services, the units could be in any configuration, such as an engine, aerial, or rescue, understanding the differences in personnel required and the fact that EMS may be much of its utilization.

Figure 45: Current System Staffing to Demand 100% of All Calls – 7-Minute Travel Time



Baseline Assessment and Development of EMS Alternatives

Current System with 2-Unit EMS Deployment at 7-Minutes

Understanding that most incidents are EMS in nature, many communities have begun to address EMS as an intentional overlay of the resource deployment strategy rather than utilizing large fire suppression apparatus as the sole provider of EMS. Gresham has already moved in this direction with the Rescue at Station 74 and the collaboration at Station 31 with the City of Portland.

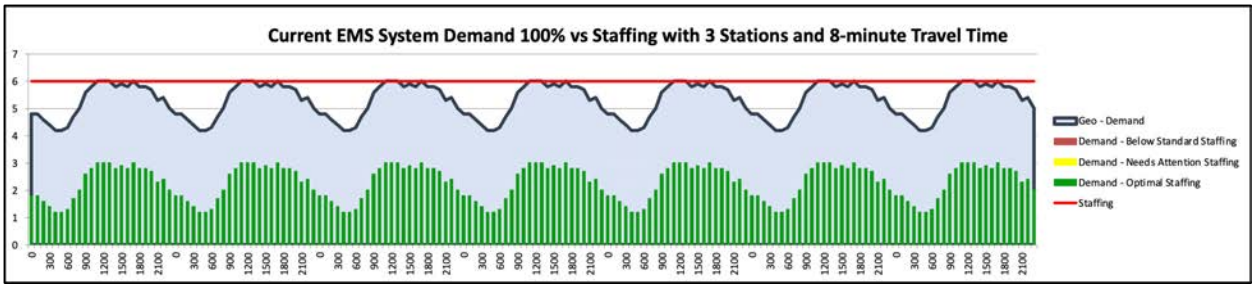
Similar to the previous analysis, utilizing a 7-minute travel time and all seven stations, it is no surprise that a two-unit EMS deployment falls short of meeting expectations at the system level. For example, the units may provide excellent benefit within the first-due response area but have limited impact on the overall system workload for EMS.

Figure 46: Current EMS System Demand – 100% of Incidents – 7-Mintue Travel Time

Current System with 6-Unit EMS Deployment at 8-Minutes – 100% of Calls

If an independent EMS overlay were to be created, the adjustment from 7 minutes to 8-minutes provides greater relaxation of the resource commitment. With an 8-minute travel time, only three stations would need to be staffed (move-up plan) with a total of 6 EMS resources. Under this scenario, nearly 100% of the incidents could be handled by the EMS units, which reduces the workload on the large fire apparatus and reduces operating costs. First-due fire companies would still be utilized during surges in calls and other high-acuity events to ensure response time expectations when time is of the essence. Of course, there are the increased operating costs for the EMS overlay of 4 additional EMS resources.

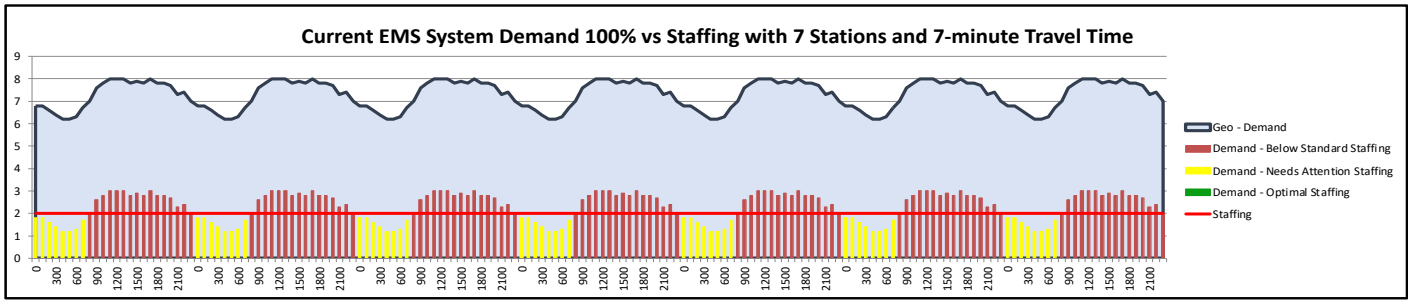
Figure 47: Current EMS System Demand – 100% of Incidents – 8-Minute Travel Time



Current System with 6-Unit EMS Deployment at 8-Minutes – 100% of Calls (5 24-hour and one 12-hour unit)

Within the Gresham jurisdiction, geography is the limiting factor, more so than the workload or UHUs at the systemic level. Therefore, the City could benefit from layering some peak load resources on top of the base 24-hour shift-assigned rescues. This will allow for fiscal and operational efficiencies as the peak load units can work upwards of 50% rather than being capped at 30% (24-hour resources). The peak load resources are a significant return on investment as the City could more strategically deploy resources with a higher capacity to absorb work than a single 24-hour resource for overnight periods where there is little return on investment once staffed appropriately.

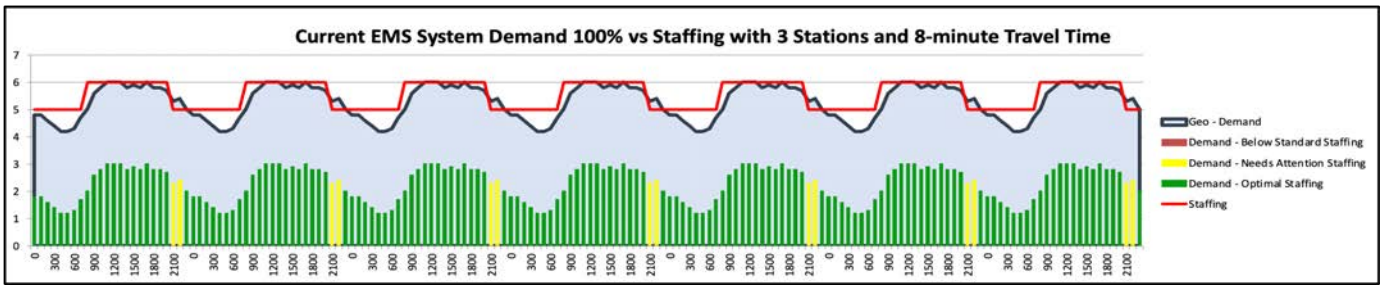
As an alternative to the six 24-hour resources presented above, the City/Department could elect to deploy EMS units during the peak periods of the day. These are typically deployed in 12-hour increments and provide a



fiscal benefit of requiring approximately 2.4 FTEs per seat rather than 4.04. For example, if the same solution were to be delivered with a total of five 24-hour resources (a 3-rescue increase) and one peak unit, then the

same net new (6) EMS units could be accomplished with a total of 29 FTEs, as opposed to 32 FTEs with only 24-hour resources; or three fewer FTEs required.

Figure 48: Current EMS System Demand – 100% of Incidents – 8-Minute Travel Time



Current System with 5-Unit EMS Deployment at 8-Minutes – 50% of Calls

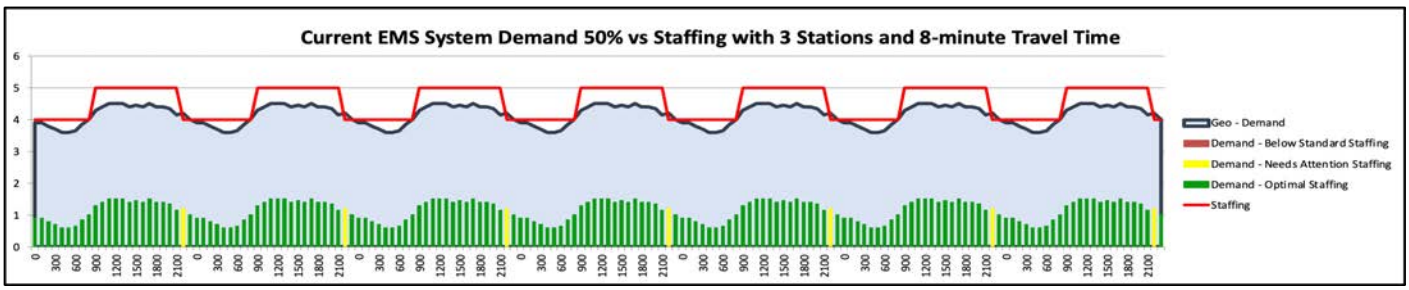
Another strategy is to fine-tune to EMS overlay's responsibility to lower acuity incidents, typically around 50% of the incidents utilizing Medical Priority Dispatch (MPDS). In this scenario, the dedicated EMS units could specifically be sent to lower acuity calls. As previously stated, geography is the limiting factor, so the reduction in workload didn't materially impact the required resource allocation. The utilization of all 24-hour resources drops from six units to five units.

Figure 49: Current EMS System Demand – 50% of Incidents – 8-Minute Travel Time

Current System with 5-Unit EMS Deployment at 8-Minutes – 50% of Calls (4 24-hour and one 12-hour unit)

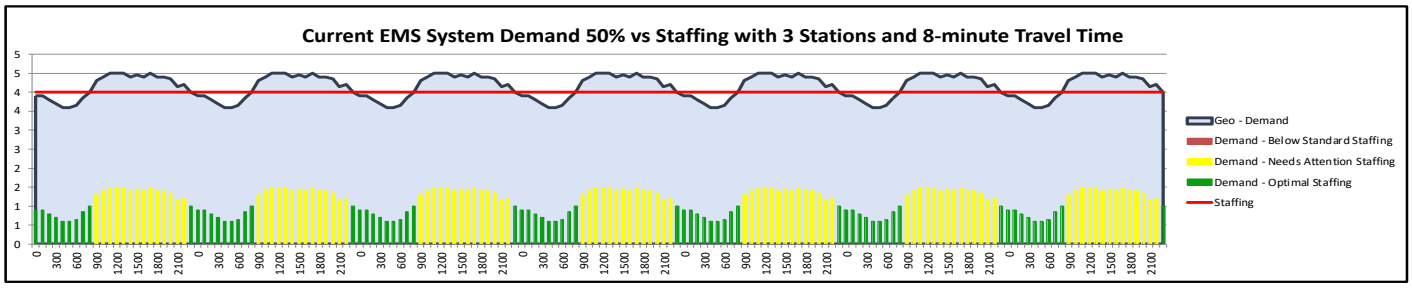
As an alternative to the five 24-hour resources presented above, the City/Department could elect to deploy EMS units during the peak periods of the day. So, for example, if the same solution were to be delivered with a total of four 24-hour resources (a 2-rescue increase) and one peak unit, then the same net new (5) EMS units could be accomplished with a total of 21 FTEs as opposed to 24 FTEs with only 24-hour resources; or three fewer FTEs required.

Figure 50: Current EMS System Demand – 50% of Incidents – 8-Minute Travel Time



As an alternative to the four 24-hour resources presented above, the City/Department could elect to deploy EMS units during the peak periods of the day. So, for example, if the same solution were to be delivered with a total of four 24-hour resources (a 2-rescue increase), then the same net new (2) EMS units could be accomplished with a total of 16 FTEs.

Figure 51: Current EMS System Demand = 50% of Incidents – 8-Minute Travel Time



Consideration for Capital Improvement Needs in Fire Stations

The City and Department are well aware of the capital needs for fire stations. The facilities are dated and not on par with what would be considered best practices in a modern career fire department. The City and Department are encouraged to develop a capital improvement strategy for rebuilding or refurbishing stations.

From an operational perspective, the facilities lack the capacity for changes in operational needs. For example, in accordance with the risk assessment completed during this study, Station 72 is a high-risk station with a 46% call concurrency rate, meaning that only 54% of the time when a call comes in, can the crews mitigate and go back available without missing a second call or more within their response area. The remedy would be a recommendation for a second resource located at Station 72. The second unit is recommended to be a rescue unit, as that will provide the greatest flexibility in system design and return on investment. The current station configuration may require capital intervention before implementing the recommendation.

If the City and Department were desirous of adopting an alternative EMS strategy, the facilities would largely be an impediment to implementation. In all cases, as stations are either rebuilt, relocated, or refurbished, the goal should be to build the facilities with sufficient living, sleeping, and apparatus space to accommodate a changing environment over the 30-to-50-year life of the structure.

Recommendation:
It is recommended that Station 72 is assigned a Rescue unit as a second-staffed resource.

Recommendation:
The City and Department is encouraged to develop a capital improvement strategy for rebuilding or refurbishing stations.

Consideration for New Stations

When contemplating future station locations, two scenarios were analyzed. First is an optimized station location plan that uses a whiteboard approach. In this scenario, the computer models the locations with the best and most efficient capability to capture calls. The second is through the lens of the insurance services and coverage of the developed area. The distinction here is that geography and development is the primary driver of station coverage, irrespective of the actual historical call volume. The positive is it is well aligned with a commensurate risk model, and the negative is that it can be less efficient under certain circumstances.

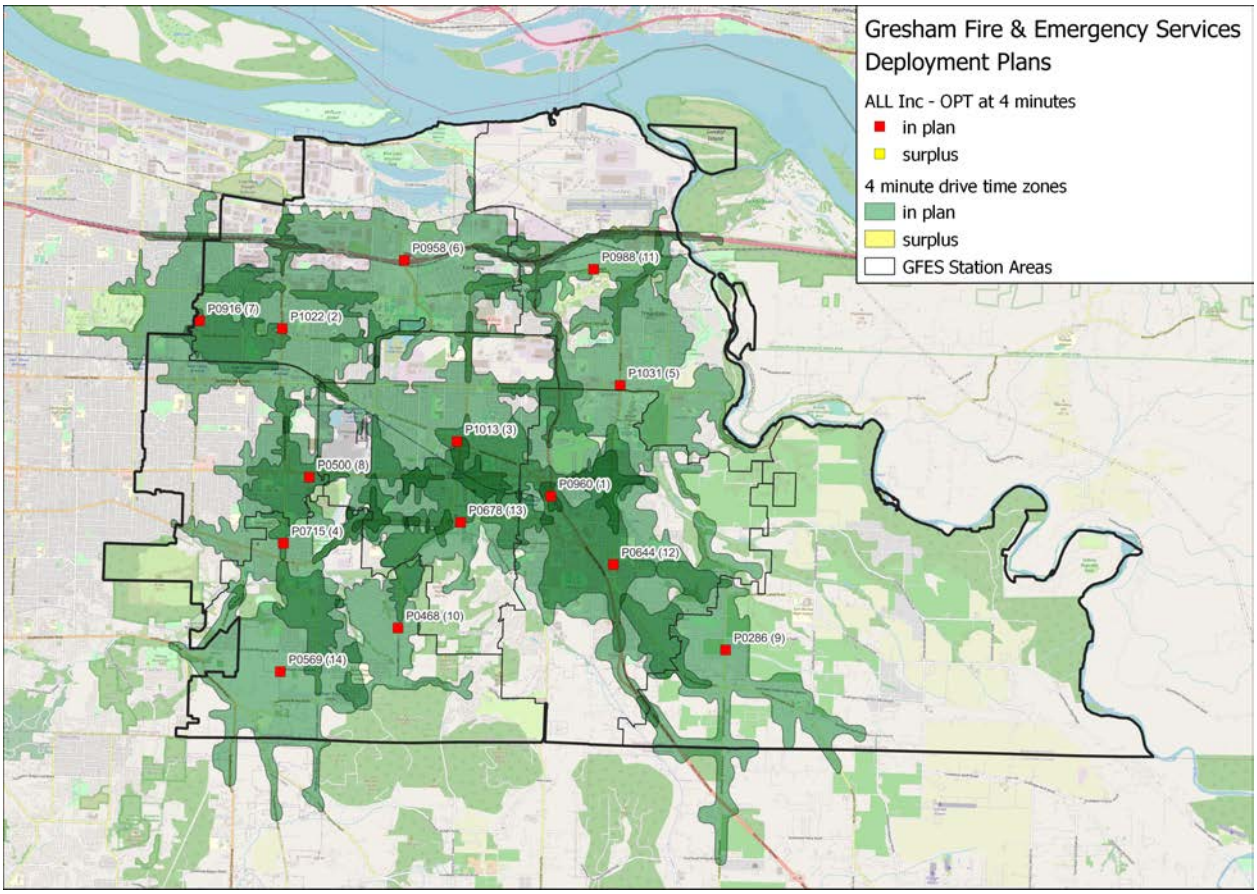
Optimized Station Locations

Optimized location analyses utilize a whiteboard approach, allowing the data to suggest optimal placement. It is understood that it would be difficult to relocate stations in a short period, as well as there may not be land available, or the land may be cost-prohibitive. However, these analyses may prove beneficial in long-range planning considerations.

4-Minute Travel Time – All Calls

Results suggest that it would require 14 fire stations to achieve a 4-minute travel time to 91% of the incidents. The mapping is provided below.

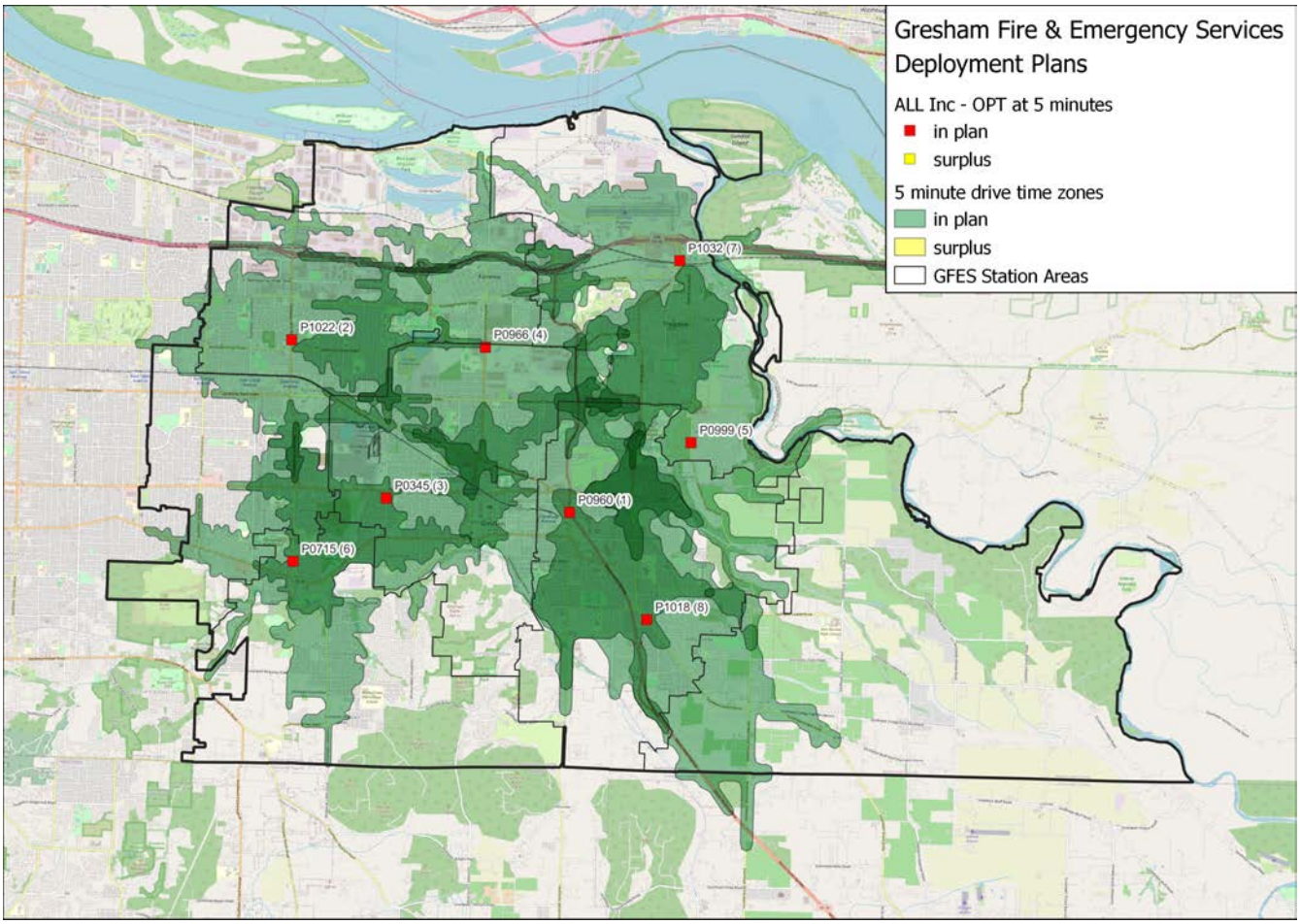
Figure 52: Optimized Station Locations for a 4-Minute Travel Time



5-Minute Travel Time – All Calls

Results suggest that it would require eight fire stations to achieve a 5-minute travel time to 92% of the incidents. Since this analysis focuses on the concentration and distribution of calls, Station 76 would still need to be included for a total of nine stations. The mapping is provided below.

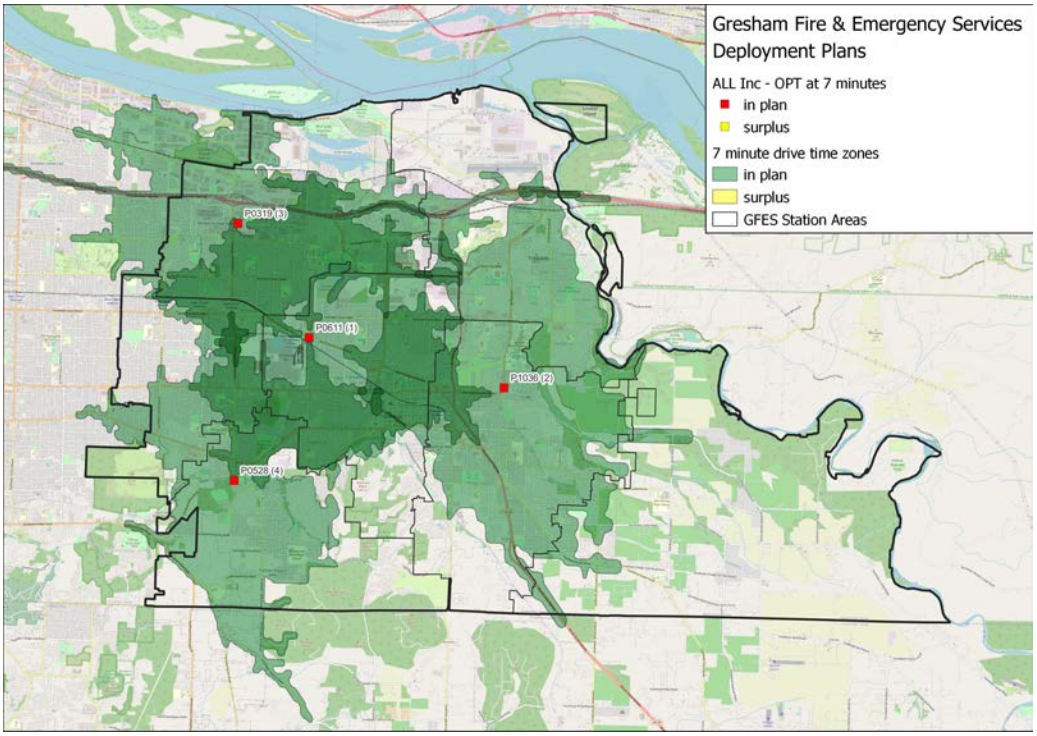
Figure 53: Optimized Station Locations for a 5-Minute Travel Time



7-Minute Travel Time – All Calls

Results suggest that it would require four fire stations to achieve a 7-minute travel time to 93% of the incidents. The mapping is provided below.

Figure 54: Optimized Station Locations for a 7-Minute Travel Time



Geographic Coverage without Consideration for Call Distribution

While there are multiple deployment strategies that may be adopted, two clear policy positions emerge in communities. First, position stations that are best prepared to meet the community's historical distribution of calls or demand for services. The advantage of this approach is that it is a more efficient model to address meeting 90% of the risk within the desired performance. This is a very stable outlook for established communities and growing in density or in-fill rather than through significant annexations or urban growth.

A second strategy is to provide station response coverage purely on a geographic lens without any consideration for how calls are distributed throughout the community. The following analyses utilized distance without consideration of the relative impedance and/or the robustness of the road network. For example, when time is the unit of measure, a station's units could travel a farther distance on a highway than through a school zone, but this approach caps the coverage area at 1.5 miles (i.e., for engines) regardless of available travel speeds. This strategy more closely follows the recommendations of insurance rating services. Therefore, these analyses examined current coverage areas by utilizing a 1.5-mile engine polygon and 2.5-mile station locations. Analyses confirmed that all stations are within a 5-miles contiguous road system.

Engine Coverage

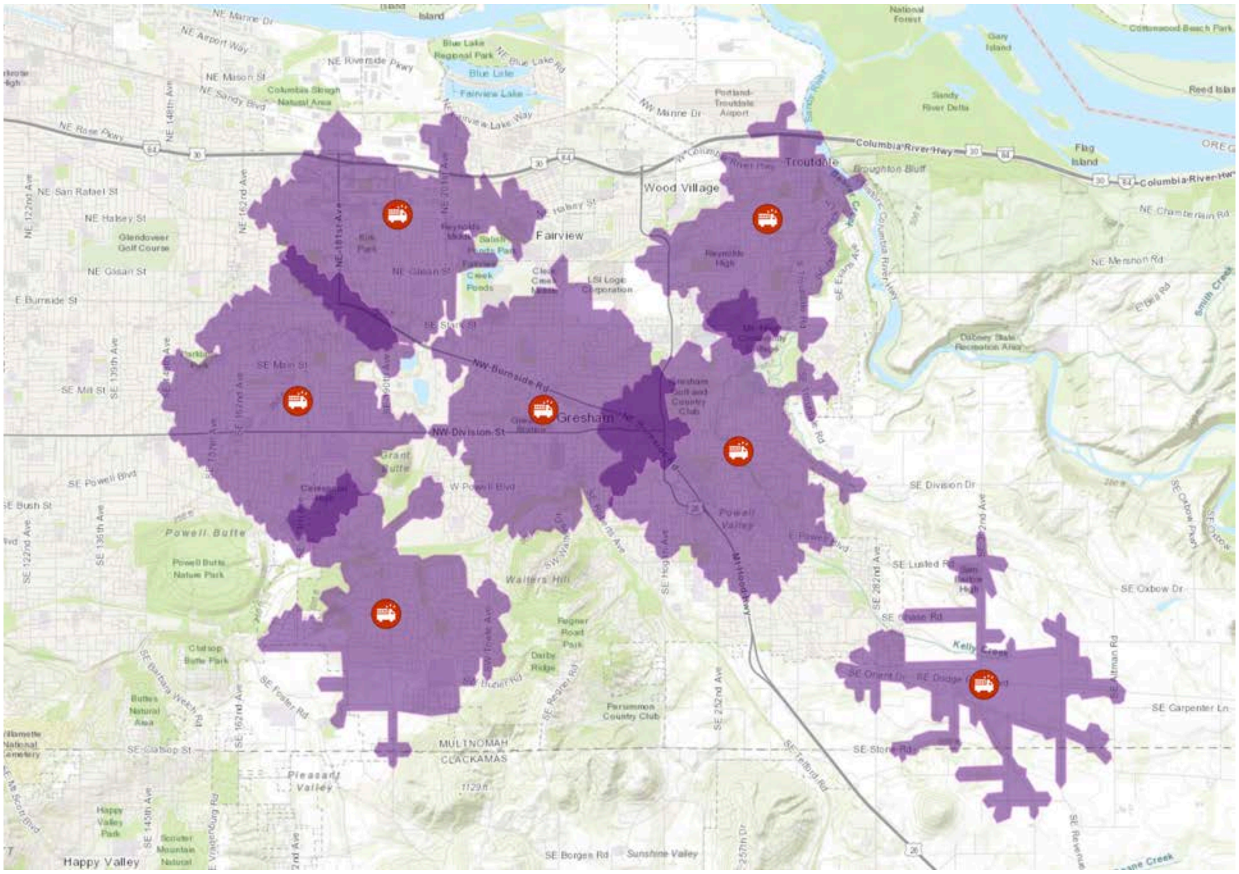


Figure 55: 1.5-Mile Engine Polygons – All Stations

The utilization of Station 71 as the only truck company station provided limited coverage for the community. Therefore, two configurations were developed for the department's consideration. First, following the risk assessment process, the three high-risk stations would be 71, 72, and 74. Second, since there is some duplication in that configuration, a leaner option would be to provide ladder coverage at Stations 72 and 74.

Figure 56: 2.5-Mile Station Ladder Truck Configuration – Current Station 71

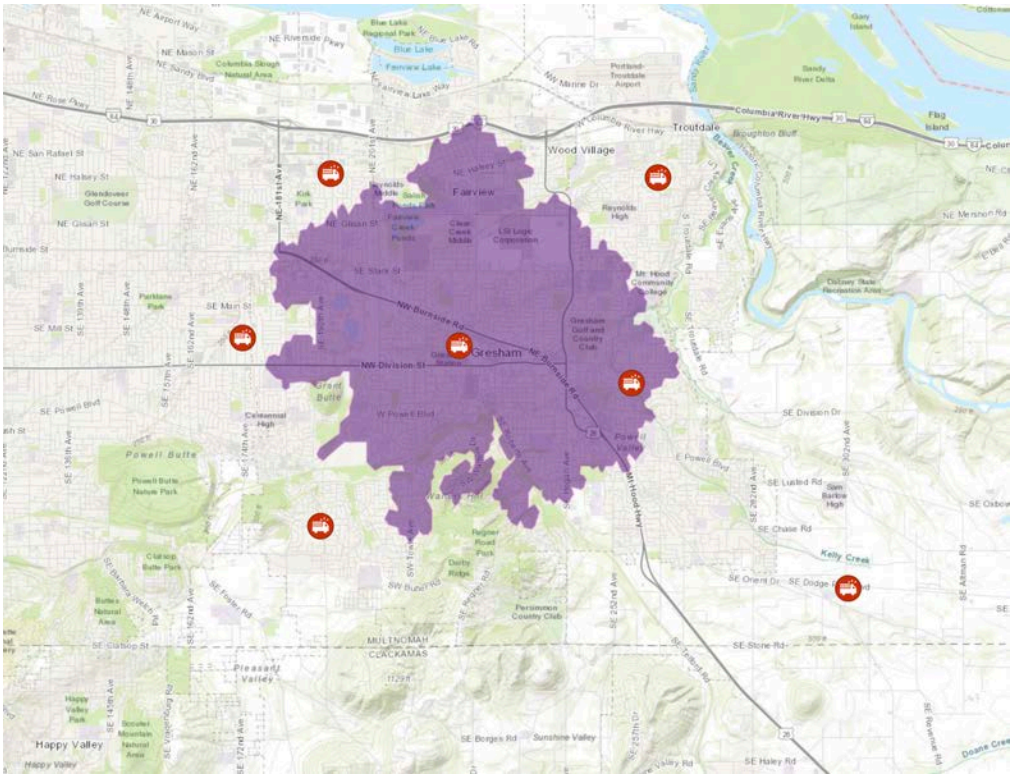


Figure 57: 2.5-Mile Station Ladder Truck Configuration – High-Risk Stations 71, 72, and 74

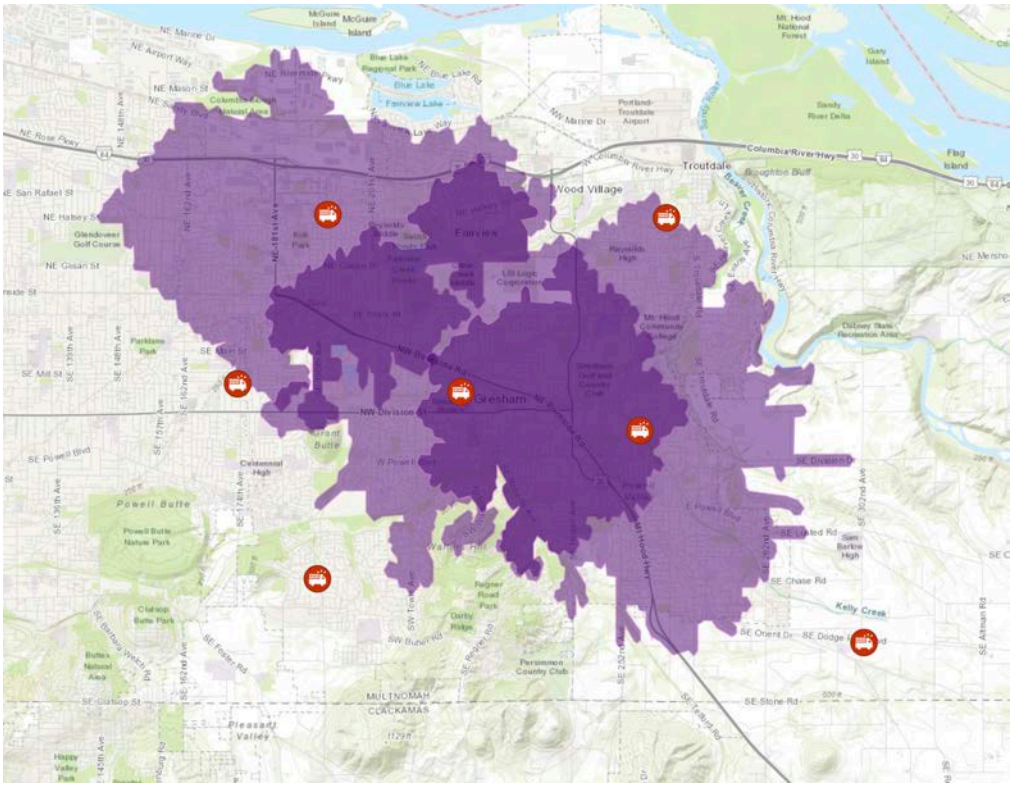
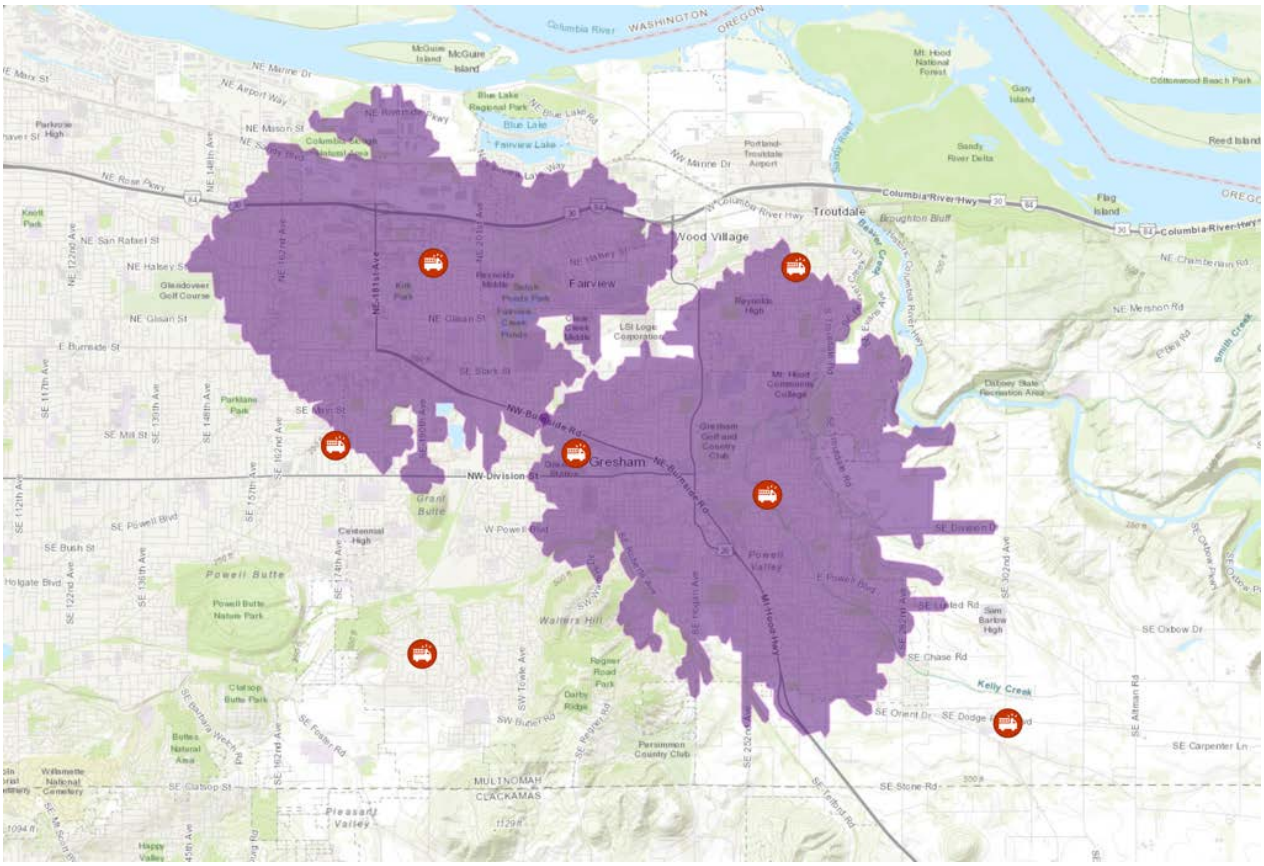


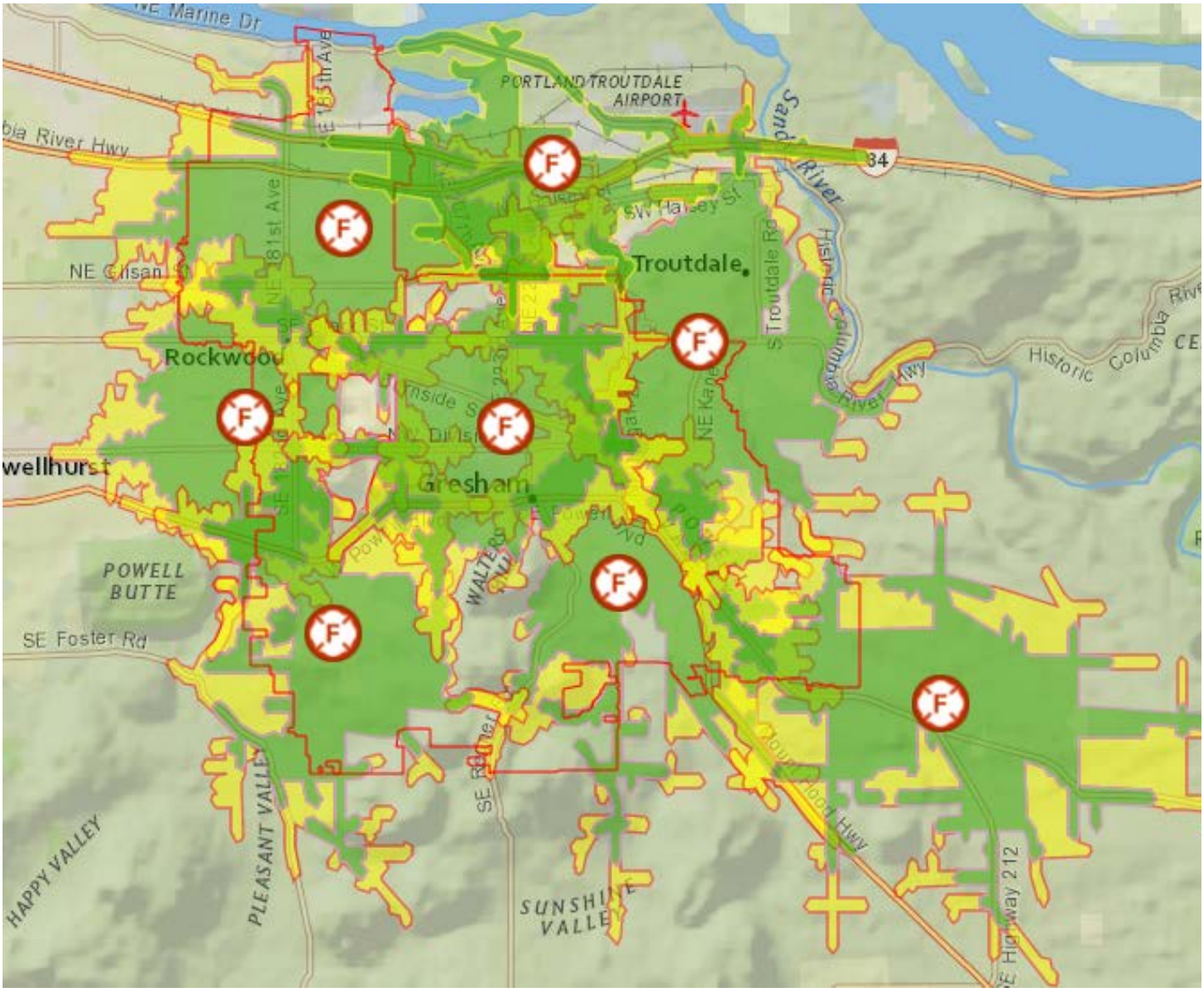
Figure 58: 2.5-Mile Station Ladder Truck Configuration – High-Risk Stations 72 and 74



Recommendation:
The City and Department are encouraged to explore a two or three-station configuration for aerial/ladder apparatus.

Finally, the fire department's internal efforts produced a more geographically accommodating strategy that also describes an eight-station configuration to improve response time to five minutes for the majority of the coverage area. This configuration highlights the need for some commonsense modifications to the computer modeling to provide coverage in geographic areas with very few incidents. While this may cover the majority of the community within five minutes, the optimized model provided previously will ensure that 90% of the incidents would be responded to within 5-minutes or less. Therefore, covering the larger geography in District 10 (Station 76 area) would require a 9th station.

Figure 59: 5-Minute Travel Time - GFES Internal Work Product



Consideration for ALS and BLS Tiered Service Delivery Models

Since its inception, the standard of care for EMS systems has continued to migrate toward ALS. However, the prevailing belief that ALS systems represent a gold standard by facilitating improved patient care and outcomes is being challenged in the current literature. One of the largest and most expansive studies is the Ontario Prehospital Advanced Life Support (OPALS) study which involved more than 25,000 patients over an 8-year period. OPALS examined the influence of ALS on patient outcomes over three major EMS categories: (1) major trauma, (2) cardiac arrest, and (3) respiratory distress. [1] [2]

For major trauma, the OPALS study's primary outcome measure was survival to hospital discharge for adults who had suffered major trauma. The study controlled for age, injury type, severity, and Glasgow Coma Scale (GCS). The study found that survival rates did not differ overall between patients receiving ALS care or BLS care. In fact, among patients with a GCS <9, survival was lower among the ALS group. The study showed that, for major trauma patients, a system-wide implementation of full ALS did not decrease mortality or morbidity.[3]

For out-of-hospital cardiac arrest, OPALS focused on the rate of survival to hospital discharge. Their study found no improvement in the rate of survival with the use of ALS in any subgroup. In other words, ALS did not improve the rate of survival for out-of-hospital cardiac arrest in systems that had already optimized rapid defibrillation.[4] The study highlighted the life-saving value of bystander CPR and rapid-defibrillation, which can be easily delivered by Automated External Defibrillators (AEDs).

For respiratory distress, the primary outcome measure was mortality, defined as the rate of death before hospital discharge, regardless of the duration of admission. Additional outcome measures considered emergency department intubation rates, aspiration, hospitalization, length of stay, and functional status after discharge. The study included patients whose primary symptom was shortness of breath related to respiratory illness. The study did show that specific ALS interventions had a positive impact on the rate of death--a change from 14.3% for BLS and 12.4% for ALS. However, endotracheal intubation was only performed in 1.4% of patients, and intravenous drugs were administered to 15% of patients. The use of medications for symptom relief increased from 15.7 % at the BLS level to 59.4% at the ALS level.[5] Thus, ALS interventions were rarely used. Other research seems to indicate that adding CPAP to the BLS scope of practice can reduce the need for an ALS level of care in patients facing acute respiratory failure.[6]

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[1] Stiell, I.G., et al. (1998) The Ontario Prehospital Advanced Life Support (OPALS) Study: Rationale and methodology for cardiac arrest patients. Annals of Emergency Medicine. 32(2), 180-90. doi: 10.1016/s0196-0644(98)70135-0.

[2] Stiell, I.G., et al. (1999) The Ontario Prehospital Advanced Life Support (OPALS) study Part II: Rationale and methodology for trauma and respiratory distress patients. OPALS Study Group. Annals of Emergency Medicine. 34(2), 256-62. doi: 10.1016/s0196-0644(99)70241-6.

[3] Stiell, I.G., et al. (2008) The OPALS major trauma study: Impact of advanced life-support on survival and morbidity. OPALS Study Group. Canadian Medical Association Journal. 178(9), 1141-1152. doi: 10.1503/cmaj.071154

[4] Stiell, I.G., et al. (2004) Advanced cardiac life support for in out-of-hospital cardiac arrest. OPALS Study Group. New England Journal of Medicine. 351(7), 647-56. doi: 10.1056/NEJMoa040325.

[5] Stiell, I.G., at al. (2007) Advanced life support for out-of-hospital respiratory distress. The New England Journal of Medicine. 356(21), 2156-64. doi: http://dx.doi.org.libproxy.troy.edu/10.1056/NEJMoa060334

[6] Williams, T. A., Finn, J., Perkins, G. D., & Jacobs, I. G. (2013). Prehospital continuous positive airway pressure for acute respiratory failure: A systematic review and meta-analysis. Prehospital Emergency Care, 17(2), 261-273. doi: 10.3109/10903127.2012.749967

Conclusion and Recommendations

The OPALS project, the largest to date at its time, provided valuable insight into the efficacy of ALS in EMS. However, the OPALS research does not stand alone. For example, another study of patients suffering out-of-hospital cardiac arrest showed that those who received BLS care had a higher survival rate at hospital discharge than those who received ALS. These patients were also less likely to experience poor neurological functioning.[7]

The research indicates that ALS-level care in the EMS environment has a very limited positive impact on clinical outcomes. While some incidents may benefit from a measure of ALS care, the vast majority of EMS responses can be effectively answered with a highly functioning and proficient BLS level of care, potentially improving patient outcomes.

When evaluating the clinical differences between ALS and BLS models, we also consider the levels of paramedic staffing within ALS models. Research has consistently suggested clinical improvement with fewer paramedics per capita. Several studies show better survival rates for SCA with fewer paramedics per capita. Other research has shown that the successful execution of advanced procedures, such as endotracheal intubation, is directly correlated with the first-hand experience level of the clinician. [8] Advanced ALS-level skills are inherently rare, as the research shows. Thus, the limited opportunities to perform these skills and remain proficient with them are directly influenced by the concentration of paramedics within the system. Simply put, the limited opportunities to perform ALS skills are diluted with each paramedic added to the system. Therefore, the research firmly supports the ALS staffing strategy of one paramedic and one EMT per ALS unit.

The research indicates that EMS systems can overstaff paramedic-level providers, negatively impacting patient outcomes. The research firmly supports the ALS staffing strategy of one paramedic and one EMT per ALS unit.

While there is no question regarding the clinical efficacy of a tiered ALS-BLS system, there are considerations for the efficiency and effectiveness of the model. Several policy considerations must be addressed.

At this time, it is recommended that the department continues with a single tier all ALS system as the highest level of care and the most fiscally efficient model. It is understood that other considerations, such as challenges in recruitment and retention for paramedics, could influence the ultimate policy decisions.

Recommendation:
It is recommended that the department continues with a single tier all ALS system as the highest level of care and the most fiscally efficient model.

[7] Sanghavi, P., et al. (November 2014). Outcomes after out-of-hospital cardiac arrest treated by basic vs. advanced life support. JAMA Internal Medicine, E1-E9. Available at http://www.jamainternalmedicine.com

[8] Wang, H.E., Balasubramani, G.K., et al. (2010). Out-of-hospital endotracheal intubation experience and patient outcomes. Annals of Emergency Medicine, 52(3): 256-262.

Optimizing Resource Allocation with Call Triaging

Innovative strategies, such as considering tiered-response models and other opportunities to best align resource allocation decisions to risk, require an elegant call prioritization or triage system at the 911-dispatch center. The more sophisticated the pre-incident call stratification, the greater flexibility the department has to best assign resources.

The following is provided as an example of a protocolized call triage system, Medical Priority Dispatch System (MPDS), which the county currently utilizes for the purposes of explaining the downstream potentialities for the department. First, the distribution of BLS versus ALS incidents is provided from a national research study of millions of records.

Distribution of ALS and BLS Incidents at Time of Dispatch

Data from a study of systems using the Medical Priority Dispatch System (MPDS) would suggest that the relationship is approximately 47% BLS (Alpha, Bravo, Omega) and 53.1% ALS (Charlie, Delta, Echo).

Figure 60: Distribution of Cases by Agency and Priority Threat[9]

Agency	N	Dispatch priority levels: n (%)					
		OMEGA	ALPHA	BRAVO	CHARLIE	DELTA	ECHO
ATCEMS	354,929	3,992 (1.1)	65,822 (18.6)	77,801 (21.9)	62,724 (17.7)	128,676 (36.3)	15,914 (4.5)
EMSA	1,514,033	78,041 (5.2)	236,153 (15.6)	446,747 (29.5)	310,374 (20.5)	418,080 (27.6)	24,638 (1.6)
LMEMS	472,343	24,061 (5.1)	85,092 (18.0)	81,855 (17.3)	115,739 (24.5)	160,519 (34.0)	5,076 (1.1)
MEDIC	156,063	2,101 (1.4)	23,748 (15.2)	28,959 (18.6)	40,911 (26.2)	57,624 (36.9)	2,720 (1.7)
MedStar	617,396	12,603 (2.0)	135,111 (21.9)	161,815 (26.2)	153,777 (24.9)	146,043 (23.7)	8,047 (1.3)
SLCFD	47,526	530 (1.1)	9,881 (20.8)	8,809 (18.5)	8,628 (18.2)	18,623 (39.2)	1,051 (2.2)
Overall	3,162,290	121,328 (3.8)	555,807 (17.6)	805,986 (25.5)	692,153 (21.9)	929,565 (29.4)	57,446 (1.8)

ATCEMS = Austin-Travis County EMS, Austin, Texas, USA. *EMSA* = Emergency Medical Services Authority, Tulsa, Oklahoma, USA. *LMEMS* = Louisville Metro EMS, Louisville, Kentucky, USA. *MEDIC* = Mecklenburg EMS Agency, Charlotte, North Carolina, USA. *MedStar* = MedStar-Mobile Healthcare, Ft. Worth, Texas, USA. *SLCFD*

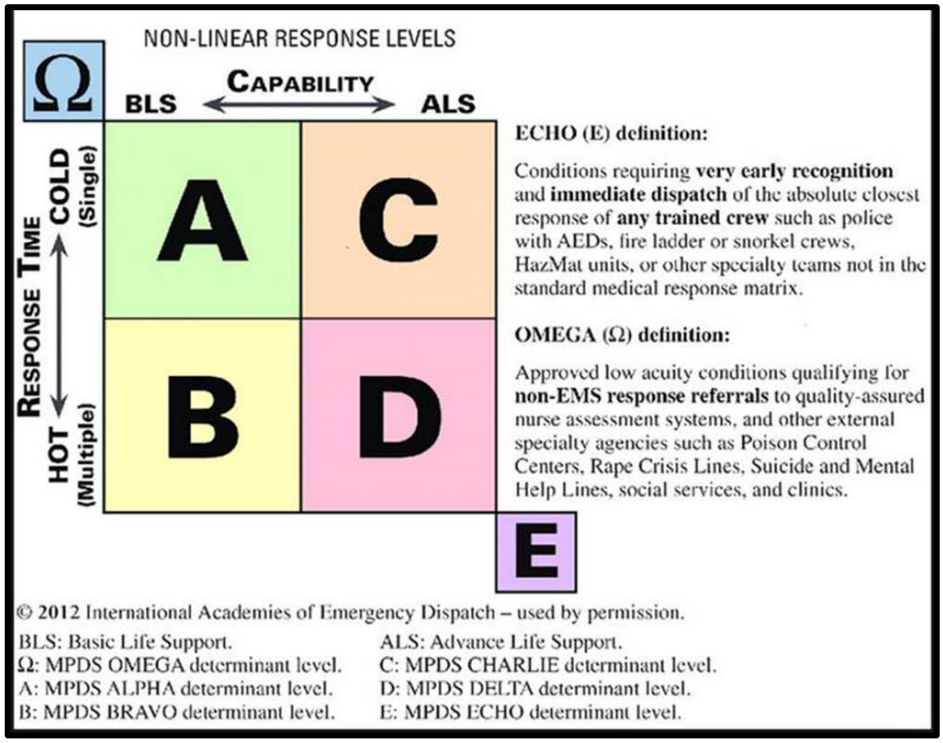
Resource Allocation on EMS Incidents

Once again, utilizing the MPDS model as an example, a single EMS resource can respond to Alpha (BLS) and Charlie (ALS) incidents. This would equate to 17.6% of the incidents at the Alpha (BLS) level and 21.9% at the Charlie (ALS) level, for a total of 39.5% of the incidents. Therefore, a GFES EMS unit could respond with the AMR resource without the large fire apparatus. A strategy similar to this would primarily reduce the workload on the large fire apparatus accompanying ambulances to risk levels that don't require multi-unit

[9] Scott, G., Et. Al. (2016). Characteristics of call prioritization time in a Medical Priority Dispatch System. *Annals of Emergency Dispatch & Response.* 2016; 4(1): pp.27-33.

responses. This would reintroduce capacity back into the system for other activities and higher priority incidents.

Figure 61: Example of Non-Linear Response Levels for MPDS



The department's current strategy is that the Rescues respond to the Alpha and Bravo calls, and the Engines respond to the Charlie, Delta, and Echo calls. Following the structure of the MPDS system, the department could expand that to the Charlie level events.

Finally, the current practice and utilization of the Rescues are primarily for within their first-due response area. The EMS overlay concept would extend that to a system-wide solution rather than two out of the seven stations.

Observation:
Following the structure of the MPDS system, the department could expand the Rescue program to the Charlie level events.

Recommendation:
It is recommended that the department consider an EMS overlay concept that would extend that to a system-wide solution rather than a smaller number of select station areas.

Fiscal Considerations for Long-term Sustainability

The review of the FY 2022-23 Proposed Budget suggests that after some positive revenue growth and other cost control mechanisms coupled with one-time monies, the budget may be structurally challenged in beyond 2023. Of course, it is understood that in this highly dynamic economy, projections have a limited horizon with a positive jobs market, high consumer spending, low unemployment, and higher inflation.

With that said, there are a few observations concerning the increasing costs of the GFES budget that can be illuminated. First, fire has had a net increase of approximately 9% growth in expenditures year over year for the last three years. This increase has been predominately within the personnel costs, which is to be expected. The likely contributing factors are the reduction in the workweek by the introduction of another Kelly Day to 10 per year for all employees and general wage increases.

Second, the department is understaffed by 11 employees, which may have been exacerbated by the enhanced Kelly Day benefit. The net effect is that a greater proportion of vacancies will be required to be filled on overtime and, thus, a greater proportion on premium pay at 1.5 rates after the FLSA threshold is met.

Third, the department's personnel costs of $24,801,242 are calculated at 77.6% of the total budget of $31,971,544. Our national experience with full-time fire departments is that personnel costs are 90% to 92% of the overall department budget. After required materials and services, most career departments have 1% to 3% discretionary spending.

Fourth, in providing context to the recommended staffing in this report based on risk and desired performance, the National Fire Protection Association (NFPA) publishes a *Survey of Fire Departments for US Fire Experience*. The 2020 version provided insight into the median and high experience for the number of career firefighters per 1,000 population protected. The median was 1.2, and the high was 2.74. This equates to a range between 139 and 318 firefighters for a community of 116,000. Therefore, the optimized staffing at 109 (for current deployment only) is lean compared to the average national experience. Neither NFPA nor *FITCH* recommend a rate per 1,000 population or define a fire protection standard; rather, it is a context for what similar policy groups have exercised from peer agencies across the nation.

Finally, there is limited information to validate or suggest that the fire department has aberrant spending or escalating costs that couldn't be explained by negotiated benefits such as work schedules, general wages, and constrained human resource allocation. The budget review would suggest that the department would benefit from the additional investment as described throughout this report. In other words, the GFES may be in a current period of expenditure growth (percentage) that is exceeding City revenue growth (percentage), but that may be misleading as to the appropriateness of the expenditures. With that said, it is understood that public safety occupies a large percentage of the general fund expenditures.

According to the FY 2022-23 Proposed Budget, Fire has several specific key challenges and work plan items for the budget period. This report addresses potential solutions for each of the key challenges. These key challenges are replicated below verbatim:

- Increasing costs with limited resources, recognizing that some of the cost increases are outside of Gresham's control.

- Support Gresham's Strategic Planning Process. While the SAFER (Sustainable Affordable Funding for Emergency Services) Council has been paused, GFES will continue efforts to advance the department's strategic plan through collaboration with the larger citywide strategic planning process to establish long-term financial stability for fire and emergency services.
- Facilities – Multiple fire stations are in immediate need of improvement. Fire and Emergency Services will continue its multi-year process to study the condition and location of the City's fire stations.

Unit-Level Staffing Considerations

While it is understood that per-unit staffing is largely a local policy decision, NFPA 1710 recommends 4-person staffing on fire apparatus such as engines and ladder trucks; however, most agencies in the country struggle to comply with 4-person staffing. Currently, GFES deploys 3-person apparatus on all units except the ladder truck (4) and Engine 31 (4). There are agencies that have an ISO 1 rating that are also internationally accredited with 3-person staffing.

The National Institute of Standards and Technology (NIST) conducted a study years ago that suggested that the 4-person crews were the most efficient on the fire ground and then later replicated and posited the same conclusion on EMS events. This aligned well with the pre-existing standards suggested in NFPA 1710. Notwithstanding, in actual practice, it is difficult to find empirical evidence that 4-person staffing is more effective in outcomes, safety, work injuries, etc., that can't also be mediated through multi-unit responses, early arrival, training, passive mitigation systems, and well-aligned standard operating guidelines. In other words, if desired, the agency has the flexibility to evaluate the totality of workload, risks, costs, and return on investment when making staffing decisions. Therefore, the data doesn't identify a deficiency that would drive increased staffing from three to four on a unit, nor would it have a strong foundation to decrease staffing from four to three: it is a local policy choice.

Per unit staffing policy consideration is a matter of priority. For example, this report suggests a need for 11 additional FTEs to appropriately staff the current deployment model, the need for an additional response unit each day, and the opportunity to address EMS differently, which will provide long-term cost avoidance. The City and Department would have to establish the order of priorities and which reinvestment strategy provides the greatest return on investment. Given the potential future fiscal constraints, investment in deployment that enhances availability, response time, and system resiliency would provide a greater system benefit than adding additional costs to existing resources.

Observation:
While it is understood that per-unit staffing is largely a local policy decision, NFPA 1710 recommends 4-person staffing on fire apparatus such as engines and ladder trucks; however, most agencies in the country struggle to comply with 4-person staffing.

Observation:
There are agencies that have an ISO 1 rating that are also internationally accredited with 3-person staffing.

Observation:
The data doesn't identify a deficiency that would drive increased staffing from three to four on a unit, nor would it have a strong foundation to decrease staffing from four to three: it is a local policy choice.

Recommendation:
Given the potential future fiscal constraints, it is recommended that the department invests in deployment that enhances availability, response time, and system resiliency which would provide a greater system benefit than adding additional costs to existing resources.

Evaluation of Performance – A Shift Towards Outcomes

Evaluation of system performance occurs through various mechanisms of iterative planning and analysis but commonly includes an examination of a system's processes, outputs, and impact. Processes (or activities) are the services or interventions provided by the system to fulfill its mission or goals; outputs are the direct products or results from the system's processes, some of which may also be referred to as process measures; and impact refers to the ultimate benefits that result from the system's activities and output, including positive effects related to short-term, intermediate, and long-term goals, and may also be referred to as outcome measures.

In systems that offer fire and EMS services:

- Processes may include training personnel; acquiring, maintaining, and inspecting vehicles and equipment; establishing community relationships; and developing communication and data management connections with a 911 center;
- Outputs or process measures may include the number of calls received and number of responses made by a department, station, or unit; unit dispatch, turnout, travel, on-scene, and response times; percentage of patient transports; percentage of post-seizure patients receiving a blood glucose check;[10] percentage of STEMI patients transported to a designated cardiac receiving center;[11] and number of community outreach or education events; and

[10] Washington State Department of Health. (2017, January 18). EMS System Key Performance Indicators / Clinical Measures. State of Washington: Author, KPI 4.1. (Available: http://ncecc.net/wp-content/uploads/2012/03/WA-State-EMS-KPI-Spreadsheet-Update-20170126.pdf).
[11] Ibid, KPI 5.6.

- Impact or outcome measures may include reduced financial loss with structure fires; reduced number of forest or wildland fires originating from people; improved patient outcomes; and increased survival rates.

In addition to setting goals or benchmarks related to impact or outcome measures, systems typically set goals or benchmarks related to outputs or process measures due to the presumed or evidence-based relationship between the two measures. For example, research indicates that the transport of Step 1 and Step 2 trauma patients to a designated trauma center (process measure) can reduce mortality (outcome measure).[12] The Washington State Department of Health created the "System of Key Performance Indicators and Clinical Measures" that provides a framework for clinical performance and outcomes.[13]As such, the Washington State Department of Health has set a process-related goal that ≥ 90% of Step 1 and Step 2 trauma patients be transported by EMS to a designated trauma center.

Outputs or process measures are typically more easily evaluated, as the system exerts direct influence over its outputs and processes and can oversee related data collection and management. Impact or outcome measures become more difficult to evaluate when data collection and management are outside the system's purview, and data interpretation must account for other intervening factors.

Nevertheless, systems are encouraged to move beyond goal setting or benchmarking and evaluation related to outputs or process measures and consider ways that impact or outcome measures can be evaluated. Establishing effective partnerships with medical facilities to access data related to patient outcomes is essential for EMS-related outcomes. Internally, the department may benefit from refined training and quality assurance/quality improvement efforts on fire reporting, estimating fire spread, and estimating fire losses.

Outcome Measures for Consideration[14]

In the context of fire suppression-related outcomes, several potential outcome measures are posited for the Department's consideration. A brief description and discussion of these outcomes are provided:

Fire Spread – Degree of Confinement – All Building Fires with Fire Spread

Analyses of fire spread could not be completed with the available data provided. Future internal analyses would provide reasonable data to adopt benchmark performance outcome measures to contain all building fires to the building of origin at X%, X% of all building fires to the floor of origin, and X% of all building fires to the room of origin or less.

This capability to measure and report on fire spread is currently available to the department through state and national fire reporting formats. However, it is recommended that a focused quality assurance and quality

[12] Ibid, KPI 1.2.

[13] Washington State Department of Health. (2017, January 18). EMS System Key Performance Indicators / Clinical Measures. State of Washington: Author. (Available: http://ncecc.net/wp-content/uploads/2012/03/WA-State-EMS-KPI-Spreadsheet-Update-20170126.pdf).

[14] Friedman, M. (2011). Adapted from *Fire department performance measures.* Santa Fe, New Mexico: Fiscal Policy Studies Institute (FPSI).

improvement process be adopted that ensures consistency in reporting and defines key reporting elements. For example, when is a cooking fire in a building a building fire or a cooking fire?

Fire Spread – Degree of Confinement – Residential Structure Fires

The differentiation by occupancy type can be accomplished through accurate fire reporting. The department is encouraged to begin to measure the degree of confinement by residential fires and commercial occupancies separately and as the aggregate data described previously.

Fire Controlled by Fire Suppression Systems

This measure is available in the Department's fire reporting systems. The Department is encouraged to view this outcome measure from at least two lenses. First, it may be beneficial to measure the percentage of fires controlled by fire suppression systems where a fire suppression system is present. A second lens may be to establish a long-term goal of the number of overall fires that were extinguished by suppression systems to measure the saturation of sprinkler systems in the community's building stock. While both measures are valuable, the department has other mechanisms available to capture long-term sprinkler saturation. Therefore, it is recommended that the department focuses on ensuring the present sprinkler systems are delivering the desired outcomes at a high level while continuing to further the policy discussion on required sprinkler system saturation.

Preventable Fire Incidents

Fire prevention and community risk reduction efforts generally focus on reducing preventable fire incidents through engineering, enforcement, economic incentives, and education.[15] The last line of defense is the emergency response. Therefore, it is recommended that the department begin to track and measure the number of preventable and unpreventable incidents of fire. The available fields for the cause of fires are provided below.

Count of Incident Number	
Row Labels	**Total**
Act of nature	
Cause under investigation	
Cause undetermined after investigation	
Cause, other (Only used for additional exposures)	
Failure of equipment or heat source	
Intentional	
Unintentional	
Grand Total	

[15] National Fire Protection Agency. (2016). *Community risk reduction doing more with more.* Quincy, MA: NFPA Urban Fire and Life Safety Task Force.

Therefore, the department is encouraged to utilize and/or create a data point that provides insight into preventable and unpreventable fires. For example, it would be reasonable to suggest that a large percentage of "Unintentional Fires" would be preventable. This category typically accounts for large percentage of building fires. Similarly, a smaller portion of "Failure of Equipment or Heat Source" may be associated with behavioral influences that serve as proximal or inception events.

Finally, what percentage of the fires were logged with an undetermined cause? The Department is encouraged to ensure that as longer duration investigations are completed, the original fire reporting is updated and captured for analysis, where applicable. Conversely, in fires where a cause may not be readily available, the department may evaluate the process for an appropriate return on investment for a more detailed investigation.

Building Fires in Commercial Occupancies

The differentiation by occupancy type can be accomplished in fire reporting. The Department is encouraged to begin to measure the degree of confinement by residential fires and commercial occupancies separately and as the aggregate data described previously. In addition, this section of outcomes contemplates capturing fire loss as a percentage of the total property value both with and without fire protection systems.

Property Saved in Buildings with Fires

One desired outcome of fire suppression efforts is focusing not just on fire losses but also on the value and proportion of property saved. However, estimates for the property saved must be completed with a high degree of transparency, consistency, and fidelity. In other words, the Department must guard against inflating value that erodes trust in the reported outcomes.

Therefore, it is recommended that a structured system be developed internally that incorporates strategies for estimating fire losses, defining and capturing original value, and legitimately estimating the portion of the building that would have burned without intervention.

First, estimating fire losses has been a difficult proposition for most fire agencies. There is often a lack of structured methodology to estimate the actual loss experienced by insurers may be three-fold the local fire officer's estimates. The fire department may estimate the damage to the room of origin but underappreciate the value to the remainder of the house and contents. Therefore, a system should be developed, and the personnel should be educated in the system, accompanied by a quality assurance/quality improvement process.

Second, it will be important to define the source material for the value of the property. For example, is it market value or assessed value? It is recommended to use assessed value for consistency. Some agencies have incorporated the tax collector's office link to the address so that completion of the fire report, personnel can have ready access to the building's value.

Third, the estimate of property saved has to be moderated by the realistic probability of further damage. In other words, it would not be appropriate for the fire department to put out a small trash can fire in a bathroom of a mall and assume the entire mall would have been a loss without the intervention. In this example, if the bathroom were non-combustible or sprinklered, then the opportunity for fire spread would be greatly reduced. Therefore, it is recommended that a process is adopted that appropriately suggests the impact if there were no intervention similar to the following:

The probability or likelihood of loss to the remaining structure is:

- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- 80%
- 90%
- 100%

If the building is sprinklered, then the probability may be reduced to less than 10%.

The property value can be multiplied by the percentage of estimated fire spread to determine the amount of property saved. Since the number of incidents is relatively low, each post-fire report should be reviewed for accuracy and justification. When specifically contemplating fire loss as a percentage of total protected property value, the department can measure this annually.

Finally, understanding that the number of fires is relatively low in frequency, there may be merit in having a few department members or less conduct investigations and/or cost estimates to ensure a high degree of consistency and accuracy in reporting.

Cardiac Arrest Patient Management

When contemplating EMS services, there are few better outcome measures than that of understanding the number and percentage of patients that survived cardiac arrest through hospital discharge. The Washington State Department of Health created the "System of Key Performance Indicators and Clinical Measures," which provides a framework for clinical performance and outcomes.[16]

The Washington Key Performance Indicators (KPI) suggest that greater than or equal to 50% of the patients that present in cardiac arrest prior to EMS arrival, with a witnessed collapse, and found in a shockable rhythm will survive to hospital discharge. Similarly, with none of the previous restrictions, it is suggested that greater than or equal to 10% of all cardiac arrest patients will survive to discharge from the hospital.

The recommended outcome measures are provided below for the Department's consideration. Benchmark performances are only a recommendation, and items left blank will need to be developed and adopted internally. It is fully expected that the Department will continue to refine the outcome measures as well as add new measures in the future.

Recommendation:
It is recommended that the department consider adopting outcome measures to complement the system of measures to guide performance management.

[16] Washington State Department of Health. (2017, January 18). EMS System Key Performance Indicators / Clinical Measures. State of Washington: Author. (Available: http://ncecc.net/wp-content/uploads/2012/03/WA-State-EMS-KPI-Spreadsheet-Update-20170126.pdf).

Table 81: Recommended Fire Suppression and EMS Outcome Measures

Fire Suppression		
Measure	**Benchmark Performance**	**Current Performance**
Fire Spread – Degree of Confinement – All Building Fires with Fire Spread		
Fire Confined to Building of Origin	95%	%
Fire Confined to Floor of Origin	75%	%
Fire Confined to Room of Origin	50%	%
Time to Fire Confined (from FD arrival)	10:00	mm:ss
Fire Spread – Degree of Confinement – Residential Structures with Fire Spread		
Fire Confined to Room of Origin		
Fires Controlled by Fire Suppression Systems		
Percentage of Fires Extinguished by Fire Suppression Systems in Protected Buildings	90%	%
Preventable Fire Incidents		
Percentage of Fires Unpreventable	%	%
Building Fires in Commercial Occupancies		
Confined to Room of Origin	%	%
Fire Loss as a Percentage of Total Protected Property Value with Fire Protection System	%	%
Fire Loss as a Percentage of Total Protected Property Value without Fire Protection System	%	%
Property Saved in Buildings with Fires		
Value of Property Saved in Dollars	$	$

Fire Loss as a Percentage of Total Protected Property Value	0.05%	%
Emergency Medical Services		
7. Cardiac Arrest Patient Management		
7.3 Percent of patients (in cardiac arrest before EMS arrival) with a witnessed collapse and found in an initially "shockable" rhythm, with survival to discharge from the acute care hospital	≥ 50%	%
7.4 Percent of overall cardiac arrest patients with survival to discharge from hospital	≥ 10%	%

Recommended Process (Activity) Measures

While the outcomes are the ultimate goals of the system design and performance, there are process objectives that have an assumed surrogate relationship to accomplishing and/or maintaining the ultimate outcomes. Therefore, a system of process measures is recommended for the department to create (if not readily available), adopt, measure, and manage the building blocks toward desired outcomes.

Several process measures were identified and are provided here for consideration and/or adoption. These are presented in the Table below. As with the previous presentation for Outcome Measures, any benchmark performance elements that are provided are a suggestion and are not intended to be restrictive for the agency.

Table 82: Recommended Process Measures

Process Measure	Benchmark Performance	Current Performance
Performance and Other Objectives to Accomplish Outcomes		
Percentage of Commercial Properties with Operating Fire Protection Systems	%	%
Total Number of Buildings Protected		#
Dollar Value of Buildings Protected		$
Number of Responses to Fire Alarms	#	#
Percentage of Fire Alarms that are Unwanted Alarms	10%	%
Number of Community Outreach, Training, and Education Events	#	#
Distribution of Fires by Type and Cause	%	%
Percentage of Inspections on Schedule	90%	%

Additionally, a more traditional performance-based system of baseline service measures is provided in the Table below. However, the intended benefit to the City and Department of migrating towards well-defined outcome measures is that the Department can be less sensitive to incremental changes in performance as long as the outcome measures continue to be met. In other words, if the department continues to meet greater than 50% survivability on sudden cardiac arrests, then the sensitivity to a 30-second increase in response time may receive a measured response, if at all.

Regarding EMS, the Washington State Department of Health's KPIs clearly articulate process measures that are desirable. While it wasn't evident that the State of Oregon has a comparable set of KPIs to use as a reference, the Multnomah County contract with AMR does include outcome-related language that proves useful as well. A condensed version of the Washington KPIs is provided here for the Department's consideration. It is understood that some of the data points may not currently exist and are either in process development or may have to be fully developed.

Conclusion and Recommendations

At a high level, the Medical Director is supportive of migration toward outcome measures and consideration of the sample KPI platform. The KPIs are categorized into eight broad patient management categories:

1. Critical Trauma
2. Heart Failure
3. Asthma
4. Seizures
5. Acute Coronary Syndrome/Chest Pain
6. Stroke/TIA
7. Cardiac Arrest
8. Advanced Airways

Again, it is understood that some of the measures may need to be modified or adjusted based on local medical direction. In all cases, the process measures presented in this section will require administrative oversight and capacity and should be accompanied by a robust quality assurance/quality improvement effort. A condensed version of the process measures and the benchmark performances are provided below.

Table 83: Washington State Department of Health KPIs (condensed)

Process Measure	Benchmark Performance	Current Performance
1. Critical Trauma Patient Management		
Percent of Step 1 and Step 2 trauma patients		
1.1 . . . with EMS scene time < 10 minutes (arrival-to-departure of ambulance)	≥ 90%	
1.2 . . . transported to designated trauma center	≥ 90%	
2. Heart Failure Patient Management		
Percent of suspected heart failure patients who received		
2.1 . . . CPAP or had CPAP protocol documented	≥ 90%	
2.2 . . . nitroglycerine (NTG) or had NTG protocol documented	≥ 90%	
3. Asthma Patient Management		
Percent of bronchospasm patients with respiratory distress, indicative of wheezing or known history of asthma or reactive airways disease,		
3.1 . . . who received a beta-agonist or had the beta-agonist administration protocol documented by the first EMS crew able to provide such treatment	≥ 90%	
4. Seizure Patient Management		
Percent of still seizing (upon EMS arrival)		
4.1 . . . and post-seizure patients who received a blood glucose (BG) check	≥ 90%	
4.2 . . . or recurrent seizure patients treated with benzodiazepines by EMS	≥ 90%	
5. Acute Coronary Syndrome/Chest Pain Patient Management		
Percent of patients ≥ 35 years old with suspected cardiac chest pain, discomfort, or other ACS symptoms		
5.1 . . . who received aspirin (ASA) from EMS or had the aspirin protocol documented	≥ 90%	
5.2 . . . with 12-Lead ECG acquired by EMS	≥ 90%	

Process Measure	Benchmark Performance	Current Performance
5.3 . . . who received a 12-Lead ECG < 10 minutes from time of arrival on scene by first 12-Lead ECG-equipped EMS unit	≥ 90%	
5.4 . . . with an EMS scene time (arrival-to-departure of ambulance) < 20 minutes	≥ 90%	
5.5 Percent of suspected STEMI patients in which a Code STEMI alert is activated prior to hospital arrival	≥ 90%	
5.6 Percent of patients identified as STEMI by EMS who are taken to a designated cardiac receiving center	≥ 90%	
6. Stroke/TIA Patient Management		
Percent of suspected CVA/TIA patients		
6.1 . . . who have a FAST exam (i.e., neuro screening) completed and documented or documentation of why an exam could not be completed	≥ 90%	
6.2 . . . receiving a BG check	≥ 90%	
6.3 . . . with an EMS scene time (arrival-to-departure of ambulance) < 20 minutes	≥ 90%	
6.4 . . . with Time Last Normal < 6 hours to hospital arrival, in which a Code Stroke alert is activated prior to hospital arrival	≥ 90%	
6.5 . . . taken to a designated stroke center	100%	
6.6 . . . who have a FAST exam score who have a LAMS Stroke Scale Assessment completed and documented or documentation of why an assessment could not be completed	100%	
7. Cardiac Arrest Patient Management		
7.1 Percent of non-traumatic cardiac arrest patients who received bystander CPR	≥ 50%	
7.2 Percent of patients (in cardiac arrest before EMS arrives) in an initially “shockable” rhythm who received first defibrillation in < 8 minutes from time 911 call was received at Fire/EMS dispatch	≥ 90%	
8. Advanced Airway Management		
Percent of patients		

Process Measure	Benchmark Performance	Current Performance
8.1 . . . intubated with “first pass” success	≥ 80%	
8.2 . . . who are successfully intubated with an ET tube	≥ 90%	
8.3 . . . with successful placement of a supraglottic (SGA) airway	≥ 90%	
8.4 . . . who are successfully intubated or who have an SGA successfully placed	≥ 90%	
8.5 . . . and patients with SGAs with documentation of continuous waveform ETCO2	≥ 90%	

Considerations for Social Impacts on Health

Social Determinants of Health (SDOH)

Social determinants of health, including economic stability, education, health, access to health care, and the social and community context in which people live, have an impact on health, development, and morbidity. Poverty, coupled with adverse childhood experiences (ACEs), can have a lasting, negative effect on physical and emotional well-being.

Data-Driven Strategies

Commitment to data-driven strategies of leading homeless services providers (such as Open Door) to end homelessness; and high-level elected officials' interest in providing needed investments to make significant change all provide ample opportunity for the systematic improvement of care.

The Open-Door strategy of using HMIS (Homeless Management Information System) to identify, assess, and direct people experiencing homelessness to appropriate interventions within a shared local system, including VetStar, The Salvation Army, and other providers.

Additional strategies include working with the local EMS transport, and 911, providers on data sharing. There is typically limited information on how many mental health calls to 911 result in a dispatch of law enforcement and EMS, as well as how often 911 calls result in transport for patients experiencing mental health emergencies. Working with the local EMS agency and receiving facilities to obtain these data elements is essential in defining opportunities to improve SDOH locally.

Additionally, data collected regarding veteran mental health is inconsistent and impedes understanding of barriers and needs within the community to provide appropriate care to veterans. Working with local veterans' health facilities to obtain this data is also beneficial.

In our experience, stakeholders often identify the Health Insurance Portability and Accountability Act (HIPAA) as a perceived barrier to data integration, although neither HIPAA nor state law creates barriers to data sharing that support continuity of care. Feedback from interviews typically reveals a consensus that sharing data across systems can improve care for people with chronic needs who cycle between emergency departments, jail, and hospital services.

Effective integrated-behavioral health programs utilize evidence-based treatment interventions to achieve better outcomes and more cost-effective care. They track primary health and behavioral health outcomes and use health information technology to manage population outcomes in order to use interventions that ensure quality care.

Detection

A crisis is still the primary point of detection for people with serious mental and behavioral health disorders. In most communities, there is inadequate primary care capacity to detect needs early and inadequate broader outpatient capacity to buffer against hospitalization, jail, and emergency department utilization as the first choices for care and sustaining people in community settings after discharge. There are also inadequate step-

down services. These shortfalls have an impact on community discussions and beliefs regarding the number of inpatient psychiatric beds that every community requires. There are certain services (Assertive Community Treatment and Forensic Assertive Community Treatment) that have demonstrated value in reducing reliance on hospitals (ACT) and jails (FACT).

The response of any one party to a crisis needs to be viewed within the larger frame of multiple crisis providers, whose efforts are currently not integrated. There are significant nationwide issues in the crisis response system, primarily because multiple parallel initiatives are in place to respond to crises rather than a coordinated system of responses.

Funding Challenges

Admittedly, there are gaps in resources and concerns regarding sustained financing of care for people with serious mental illnesses. In many cases, mental health facilities are bound by state eligibility and funding rules, and commercial insurance plans often provide limited coverage for mental health care.

EMS Integration

Although there are several social determinants of health that may be associated with higher rates of mental illness and serious emotional disorders, EMS is very well positioned to significantly improve care and shift mental health care over time to an integrated model in which mental health care is provided as often as possible within a general health framework.

EMS' mobility allows communities to take advantage of existing EMS and emergency communications infrastructure to provide highly reliable, clinically sophisticated, and medically integrated patient assessments, treatments, and interventions for a range of conditions. The opportunities provided by EMS give the potential to reduce EC visits, decrease Left Without Being Seen, and increase patient flow by allowing for new referral and treatment pathways. Additionally, safe and appropriate care for patients with low acuity medical conditions while aiding health systems in achieving the three goals of the Institute for Healthcare Improvement's Triple Aim and improving patient experience.

Coordinated efforts with a focus on the integration of care, especially crisis services, and the creation or expansion of service capacity to help eliminate the use of jails and emergency departments as the first response to mental illness is essential. The Denver STAR Program is one such example. The Support Team Assisted Response (STAR) Program deploys Emergency Response Teams that include Emergency Medical Technicians and Behavioral Health Clinicians to engage individuals experiencing distress related to mental health issues, poverty, homelessness, and substance abuse.

STAR specializes in responding to low-level behavioral health crises and issues that arise from public health needs and poverty. STAR is dispatched through Denver 9-1-1 Communications and responds to low-acuity calls where individuals are not in imminent risk. Some examples are trespass calls, welfare checks, intoxicated

parties, and mental health distress. The team provides medical assessment/triage, crisis intervention, de-escalation, transportation, and resource connection for community members in need.

Other Resources

There are hundreds of evidence-based practices available for mental health (MH) and substance use disorder (SUD) treatment, and the most definitive listing of these practices is provided by the federal Substance Abuse and Mental Health Services Administration (SAMHSA) through the National Registry for Evidence-based Programs and Practices (NREPP).

The NREPP includes MH and SUD treatment approaches ranging from prevention through treatment. While the NREPP is, in its description, "not exhaustive," it is the most complete source on evidence-based practices available. The NREPP refers to all practices in the registry as "evidence-based," using the following definition: "Approaches to prevention or treatment that are based in theory and have undergone scientific evaluation." The NREPP then rates each program and practice on a multi-point scale across multiple domains to characterize the quality of the evidence underlying the intervention.

The successful best-practice promotion also requires understanding the real-world limitations of each specific best practice, so that the understandable stakeholder concerns that emerge can be anticipated and incorporated into the best-practice promotion effort. This process is sometimes called "using practice-based evidence" to inform implementation and is a core feature of continuous quality improvement. The reasons for stakeholder concerns at the "front line" implementation level are well-documented and significant.

One of the biggest concerns about best practices involves the application of practices to individuals and families from diverse cultural and linguistic backgrounds. There are inherent limitations in the research base regarding diversity that often lead providers, people receiving services, and other stakeholders to question the extent to which the research evidence supporting best practices applies to their communities and the situations they encounter daily. Further, there is wide consensus in the literature that too little research has been carried out to document the differential efficacy of best practices across cultures.

Given that few best practices have documented their results in sufficient detail to determine their effectiveness cross-culturally, it's logical that best practices be implemented within the context of ongoing evaluation and quality improvement efforts to assess their effectiveness. Therefore, they can be adapted to be maximally effective for the local culturally diverse populations being served. The California Institute for Mental Health has compiled an analysis regarding the cross-cultural applications of major best practices. There is also increasing recognition of best practices for refugee and immigrant communities.

EMS-Related Activities Undertaken to Address Frequent Mental Health Patients

- Conduct home visits with patients Monday through Friday.
- Provide follow-up care to program enrollees recently discharged from the hospital.
- Specifically, vitals/wellness checks and wound evaluation, if applicable.
- Provide support via education for enrollees with diabetes, asthma, CHF, and other chronic medical

conditions that lead to EC visits.

- Educate and teach enrollees on the proper use of 911 services and the emergency center as well as how to determine emergent needs versus urgent needs.
- Educate and teach enrollees on the proper use of glucometers, home blood pressure monitors, and oxygen saturation monitors.
- Support Health Promotion and Prevention Programs by identifying the need and referring enrollees to the various community resources available.
- Participate in disease management, prevention, and wellness teaching alongside as it relates to emergency medical services.

Recommendation:
It is recommended that the department consider the implementation of a Mobile Integrated Health (MIH) program for the citizens and visitors within the jurisdiction.

In concert with the common activities undertaken to address MIH, is the inclusion of other health and prevention programs available within the community. The City of Portland, which dispatches Gresham resources, utilizes a patient diversion program to better address low-acuity incidents. This is titled the "Community Health Assess & Treat," or CHAT[17], program. The program accomplishes the following three elements:

- Provide individuals who call 911 for non-emergent health issues the care they need at the moment and connect them to the right resources to get them on the path to health improvement.
- Provide education to community members regarding how to access appropriate healthcare in the future, so they use 911 as a last resort instead of their first option.
- Help reduce the number of individuals going to the emergency department for non-emergent issues.

Recommendation:
It is recommended that the department consider fully integrating the MIH program in concert with the CHAT resources to reduce 911-related responses and provide better-aligned healthcare options.

[17] Community Health Assess and Treat (CHAT) Program. https://www.portland.gov/fire/community-health/chat.

High-Level Summary of Recommendations

Improving Dispatch and Turnout Times

- It is recommended that the Department work with the dispatch center to maximize any potential incremental improvements in call processing times.
- It is recommended that the Department improve turnout times that better align with national recommendations and best practices.

Optimal Deployment Strategies

- Understanding that there is a fairly uniform risk level across the community, as defined by the urban/rural call density analysis, it is recommended that the city continue staffing all 7-stations.
- It is recommended that one additional unit is added for the deployment model to operate optimally within a 7-minute travel time and 7-station configuration, a total of 11 units.
- Following the risk assessment model, it is recommended that Station 72 receive a second resource due to the high-risk rating and 46% call concurrency rate.
- A rescue resource would provide the greatest return on investment.
- It is recommended that the City and Department consider EMS Alternatives by expanding the Rescue program to provide a systemwide benefit.
- It is recommended to continue to deploy a single-tier ALS EMS delivery model.
- It is recommended that the department adopt a formalized move-up policy.

Optimized Staffing Strategies

- It is recommended that the City fund and staff an additional 11 FTEs for the department for relief personnel under the current deployment strategy, maximizing staffing and minimizing overtime.
- If the department is desirous of adding a resource to Station 72, this would require an additional eight personnel for a Rescue and 12 personnel for an engine company.
- Alternative EMS strategies would increase staffing by eight personnel per rescue unit.
- It is recommended to prioritize investments toward improving response capacity and delivery before considering increasing per-unit staffing.

Invest in Capital Facilities

- It is recommended that the City and Department develop and execute a capital improvement plan for the fire station facilities.
- Currently, the stations are dated and not well-aligned with modern fire departments.
- Station capacity is challenged to accommodate system design changes, such as adding or relocating resources and personnel.
- Alternative configurations of the number and locations of stations were provided, but there would be little impact on recurring costs specifically associated with station locations.

Fiscal Sustainability

- All of the analyses within this study validate, at a minimum, that the current number of stations and deployment is appropriate to maintain current services and identify needs for further investment.
- The relative distance between stations solidifies the need for the current deployment. In other words, there is no systematic duplication of efforts.
- The relative increases in the fire department personnel costs, and total budget, may have been contributed to by negotiated benefits such as a migration from 15 Kelly Days to ten between 2017 and 2022. Additional benefits, such as negotiated general wage increases, would also serve to increase costs without enhanced services.
- If desired, leaner models for the numbers and locations of stations could be deployed. However, these solutions may be challenging to implement due to contractual relationships with the Three-cities and District 10. Since the call volume is more concentrated within the City of Gresham, the most efficient models tend to adjust deployment in the rural areas with lower call volumes.
- The net impact may be to continue to provide stations located in the contracted area that eroded some or all of the theoretical efficiencies.

Consider Introducing Outcome Measures to Performance Management

- It is recommended that the Department consider introducing outcome measures into the performance management profile.

Consider Adoption and Implementation of Mobile Integration Health (MIH)

- It is recommended that the department consider the implementation of a Mobile Integrated Health (MIH) program for the citizens and visitors within the jurisdiction.
- It is recommended that the department consider fully integrating the MIH program in concert with the CHAT resources to reduce 911-related responses and provide a better-aligned healthcare option.