CITYGATE ASSOCIATES, LLC

FOLSOM (SACRAMENTO), CA MANAGEMENT CONSULTANTS

FIRE SERVICES DEPLOYMENT STUDY

CITY OF SAN BERNARDINO, CA

VOLUME 1 OF 3 – EXECUTIVE SUMMARY

June 11, 2014

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VOLUME 1—EXECUTIVE SUMMARY

The City of San Bernardino (City) retained Citygate Associates, LLC to review four issues about the City's Fire Department, all of which revolve around a comprehensive Standards of Response Cover (SOC) Planning analysis (fire crew deployment study). The primary SOC analysis reviews the adequacy of the existing deployment system from the current fire station locations and the impacts, if any, from the City's mutual aid partners.

In addition, Citygate's work investigates three other related issues, which can only be addressed after the baseline or "as is" deployment workload situation is understood using the SOC study results. These additional issues are:

1. If the current fiscal crisis requires the City to consider closing fire stations to help balance its budget, can any be closed? If so, where, with what impacts?
2. Should the City continue to provide fire department-based paramedics on firefighting units to support the County-managed private ambulance contract?
3. What are the high-level options for the City to consider for contracting out or merging fire services with another agency?
   - While this study is not a fire services Request for Proposal (RFP) or analysis of bids received, the City requested advice based on Citygate's experience on the possible forms of shared fire services and related issues to consider.

To address all of these issues, Citygate's work is presented across three main volumes, including: this Executive Summary (**Volume 1**) that summarizes the most important findings and recommendations; an in-depth Technical Report (**Volume 2**) that first analyzes deployment and then assesses the three related issues above; and a Map Atlas (**Volume 3**) that contains supporting analysis geographic maps.

1.1 POLICY CHOICES FRAMEWORK

As the Mayor and Common Council understand, there are no mandatory federal or state regulations directing the level of fire service response times and outcomes. The body of regulations on the fire service provides that *if fire services are provided at all, they must be done so with the safety of the firefighters and citizens in mind.*

1.2 CITYGATE'S OVERALL OPINIONS ON THE STATE OF THE CITY'S FIRE SERVICES

While historically the City has made significant investments in its fire services, the recession-induced fiscal crisis has already lowered the Department's daily staffing. In addition, several factors have dramatically increased the emergency medical services incident demand on the

Department. Citygate finds that the challenge of providing fire services in San Bernardino is similar to that found in many urban communities: providing an adequate level of fire services within the context of limited fiscal resources, competing needs, changing and aging populations, plus uncertainty surrounding the exact timing of fiscal recovery following the recession.

In brief, Citygate finds the Fire Department is under severe stress. This stress exists as a result of line and headquarters staffing reductions, combined with escalating—and by now, high—firefighting and emergency medical incident workloads. This level of stress cannot continue forever; people and equipment will eventually wear down.

Given the City's high emergency medical incident volume, along with frequent structure fires, any deployment reduction will *seriously* lengthen response times further. At times, this will create undesirable incident outcomes. The City is **not** over-deployed to serve its diverse geography and risks.

Given the high volume of emergency medical incidents, the policy question becomes, "At what cost can the Fire Department respond to every call for assistance as if it is a life and death emergency?" In doing so, the Department is wearing itself and its equipment out. More importantly, while responding to emergency medical incidents, the Fire Department is not available for an appropriate level of fire suppression, given the City's risks, which unfortunately is an all-too-necessary service in San Bernardino.

It would be too easy to suggest that the City stop responding to medical incidents as they are 87% of the service requests. One would think the City could then reduce the number of fire stations. But fire departments are intended to exist at a stand-by capacity, allowing them to suppress fires and stop conflagrations from occurring. In this way, fire departments are similar to property or life insurance; people hope they never have to use it, but when they do, they need it quickly. As stated in the deployment analysis section of this study, fire attack is about the speed (time) and weight (staffing quantity) of deployment, and speed comes from neighborhood-based units.

The policy headache for San Bernardino is how to safely and humanely lower the quantity of Fire Department EMS responses while preserving the first mission of a fire department—keeping the community safe from fire. Other communities have gone through, or are going through, what San Bernardino is currently experiencing as far as the rate of building fires in abandoned or poorly maintained buildings. The results are worse when fire services are reduced to the point where the speed and weight of the suppression effort cannot keep up. More and more serious fires occur, and economic potential and growth stalls because the community is not perceived as being safe from fire.

Such a scenario is playing out today in the City of Detroit.[1] It played out to tragic results in the South Bronx section of New York City in the late seventies.[2] San Bernardino is at a tipping point, in Citygate's opinion. In our analysis of the City's Fire Department paramedic program in Section 6, Citygate recommends the City, County EMS Agency, and ambulance contractor work to *immediately* lower the EMS incident rate on the fire units to include only the more critical incidents. This would stabilize eroded response times and strengthen efforts in fire suppression, fire prevention, and arson investigations in abandoned buildings. The City cannot let a culture grow in which fires are tolerated and believed to be of no harm to the community.

There are significant changes ahead for the provision of EMS care under Federal Health Care Reform. There is new economic pressure to divert patients from unnecessary emergency room visits. Other agencies in California and other states are testing Community Paramedicine alternative delivery programs and new partnerships with ambulance providers and health care centers. Some believe new EMS revenues will emerge and will help pay for field providers to provide pre- and post-discharge care.

In Citygate's opinion, now is not the time to exit the provision of firefighter/paramedic care. Doing so would throw away the sunk cost of the training already provided to paramedics and produce a net savings of only approximately $547,875 per year (after EMS fees are also stopped), which, by itself, will not close the City's budget gap. Citygate believes that the City should take the steps recommended in our paramedic program review section of this study to be agile in leveraging its paramedic investment as new opportunities emerge.

Regarding contract or merger of fire service options, based on Citygate's experience, there are just as many happy as unhappy agencies in California in regional fire service partnerships. We have observed that the fiscal stress caused by the recession, combined with increases in retirement and health costs for employees, has significantly increased the stress and request for separation (divorce) studies. Large agencies have equally complicated policy, labor relations, and cost issues to manage. It can be very difficult for some smaller contracting agencies to afford the cost structure dictated by a large regional fire service provider. However, the regional agencies are also trapped, as they cannot easily, if at all, offer one agency a cost reduction if it is not also offered to others they contract with. Thus, with some agencies having an inability to pay, yet still wanting to receive similar regional services, the dialog between all of the agencies can be very contentious.

Even cities joining fire districts under annexation that only provide property taxes to the regional fire provider complain that, in some cases, based on their local assessed valuation, they pay more

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[1] Guillen, Joe. (2013, June 16). *Fire Department: Response time, IT needs cited in report*. Retrieved from http://www.freep.com/article/20130616/NEWS01/306160069/detroit-financial-crisis-ems-fire-department

[2] Flood, Joe. (2010). *The Fires: How a Computer Formula, Big Ideas, and the Best of Intentions Burned Down New York City—and Determined the Future of Cities.* New York, NY: Riverhead Books, The Penguin Group.

property tax revenue than they receive from the regional fire department in locally-sited fire crews. Thus, they feel they are subsidizing the region's firefighting efforts.

Given these issues, there is not one best fire service partnership approach for the City of San Bernardino to consider. The Mayor and Common Council would be well advised to first consider the coming decades, and ask themselves how much control of fire service they would like, at what level of effort they would like it, and at what quality and cost *after they exit bankruptcy and realize an economic recovery.* Firefighters as employees are not easily shifted between employers due to benefit and labor law issues. While the fiscal crisis is very painful at the moment, what will the City be like in 10, 20, or 30 years?

Throughout this report, Citygate makes observations, key findings, and, where appropriate, specific action item recommendations. Overall, there are 21 key findings and 10 specific action item recommendations. Citygate's findings and recommendations across the four requested key study themes are presented as four challenges in their entirety below:

1.3 Challenge #1 – Base Field Operations Deployment (Fire Stations)

Fire department deployment, simply stated, is about the speed and weight of the attack. Speed calls for first-due, all-risk intervention units (engines, trucks and/or rescue ambulances) strategically located across a department. These units are tasked with controlling moderate emergencies, preventing the incident from escalating to second alarm or greater size. Larger incidents unnecessarily deplete department resources, as do multiple requests for service. Weight is about multiple-unit response for serious emergencies such as a room and contents structure fire, a multiple-patient incident, a vehicle accident with extrication required, or a heavy rescue incident. In these situations, enough firefighters must be assembled within a reasonable time frame to safely control the emergency.

In **Volume 2** of this study, Citygate's analysis of prior response statistics and geographic mapping reveals that most of the City has adequate fire station coverage, except a few hard-to-serve outer edges. The maps provided in **Volume 3** and the corresponding text explanation beginning in **Volume 2** describes in detail the City's current deployment system performance.

For effective outcomes on serious medical emergencies, and to keep serious, but still-emerging fires small, best practices recommend that the first-due fire unit should arrive within 7 minutes of fire dispatch alerting the fire unit, 90% of the time. In the City, given its geography, the current fire station system is challenged to provide this level of service across a variety of population density and risk types. Citygate recommends a 5-minute travel time measure to space out fire stations acknowledging the City's diverse road network, open space areas, and topography. Thus, a complete *total response time goal is comprised of:*

1 minute dispatch processing + 2 minutes crew turnout + 5 minutes driving time = 8 minutes

Citygate recommends the following fire incident outcomes for San Bernardino:

- Provide equitable response times to all similar risk neighborhoods
- Provide for depth of response when multiple incidents occur
- Provide for a concentration of response forces in the core for high-risk areas.

If San Bernardino wants to provide the three outcomes above, the City needs at least twelve fire stations across its geography.

Even with twelve fire stations, the Department struggles to arrive by a preferred total response time of 8 minutes for emergency medical incidents due to the high volume of emergency medical and simultaneous incidents:

Table 1—Call to Arrival Performance – Department Wide for Fire & EMS Incidents

Year	Time to 90%
Overall	09:50
2012	10:07
2013	09:36

The Call to Arrival performance goal is missed in each station area:

Table 2—Call to Arrival Performance – Station Area for 90% of Fire & EMS Incidents

Station	Overall	2012	2013
221	08:59	09:23	08:38
222	08:54	09:07	08:41
223	09:25	09:37	09:18
224	09:16	09:33	09:04
225	09:42	09:28	09:55
226	10:16	10:45	09:52
227	09:28	09:17	09:38
228	10:05	10:34	09:29
229	09:55	09:57	09:55
230	09:46	10:06	09:33
231	10:28	10:45	10:21
232	10:56	10:46	10:58

San Bernardino, in the near term, should adopt performance measure policies from which to set forth service expectations and, on an annual basis, monitor Fire Department performance as part of its annual budget considerations.

Citygate's deployment findings and recommendations are listed below. For reference purposes, the finding and recommendation numbers refer to the sequential numbers as these are presented in the Technical Report volume.

Finding #1: The General Plan, the annual budget, and the response time policy adopted in 2000 by the Mayor and Common Council lack response goals tied to specific outcomes by type of emergency. This is not congruent with best practices for emergency response time tracking. Updated deployment measures are needed that include specialty response measures for all-risk emergency responses that includes the beginning time measure from the point of fire dispatch receiving the 9-1-1 phone call, and a goal statement tied to risks and outcome expectations. The deployment measure should have a second measurement statement to define multiple-unit response coverage for serious emergencies. Making these deployment goal changes will meet the best practice recommendations of the Commission on Fire Accreditation International.

Finding #2: The Department has a standard response dispatching plan that considers the risk of different types of emergencies and pre-plans the response. Each type of call for service receives the combination of engine companies, truck companies, ambulances, and command officers customarily needed to handle that type of incident based on fire department experience.

Finding #3: Apparatus staffing at 3 firefighters per engine and ladder truck is light for a city with San Bernardino's risks and emergency incident volumes. Thus, it is not in alignment with delivering an effective force to keep fires below the greater alarm and/or conflagration point while also providing high levels of emergency medical response.

Finding #4: Using the current twelve fire station locations, not all of the urban density developed areas are within 4 minutes travel time of a fire station. Given actual incident workloads, this is a significant issue in the core of the City between Stations 221, 222, 224, 226 and north of 226.

Finding #5: The coverage of the Effective Response Force (First Alarm) to serious fires is only adequate in the core of the City and, as such, is inadequate in outer City areas with commercial buildings and/or high wildland fire risks.

Finding #6: Improving ladder truck coverage to the outer areas of the City would require the addition of two ladder trucks or the use of Quints (engine and aerial ladder combined apparatus) instead of engines in Stations 225 and 228.

Finding #7: The Fire Department must insist and follow-up on the requirement that all incidents are reported, fully and accurately in the NFIRS 5 reporting system.

Finding #8: The City's time of day, day of week, and month of year calls for service demands are very consistent. This means the City needs to operate a fairly consistent 24/7/365 response system. Peak activity units would only be cost-effective when high call volumes can be reasonably predicted in the core areas.

Finding #9: The review of Unit Hour Utilization (UHU) shows a very high workload on all of the central City area fire stations from early morning to midnight. This level of workload is cause for serious concern, as it not only impacts response time, but crew rest, apparatus costs, and training time.

Finding #10: The high incident demand that exists in the core areas of the City, and the resultant high UHU percentages for a large number of units, are further driven by the effect of many simultaneous incidents in the core station areas.

Finding #11: Compared to the Citygate benchmark of 7 minutes Total Response Time, San Bernardino's actual performance to 90% of the Fire and EMS incidents is 9:36 minutes/seconds to Fire and EMS incidents.

Finding #12: Call processing and crew turnout times are too long to 90% of the Fire and EMS incidents. Management focus is needed to bring them into alignment with best practice goals. Doing so could save up to 1:42 minutes/seconds. This would lower citywide performance from 9:36 to 7:18 minutes/seconds without adding any field resources.

Finding #13: Long travel times for the City's fire units are due to high incident volumes, high simultaneous incident rates, and some fire stations not being well placed to serve the central City area.

Finding #14: Reducing travel times in the short-term during the fiscal crisis, while continuing to respond to all medical incident requests, will require additional funds for peak hour units in the central City area. These additional units would absorb some of the simultaneous incidents and would leave other units available within their assigned areas.

Finding #15: If funds became available, at least two peak-hour (part-time) 2-firefighter EMS squads in Stations 226 and 222 would significantly lower the workload on all of the central City and nearby fire engines.

Finding #16: As the GIS analysis shows, the City has a large center area with high incident volumes in-between some fire stations. Other fire stations are too close together. Once an economic recovery can be realized, the City can study several older fire stations for relocation using the more advanced GIS tools that were used in this study to identify more optimal station locations.

Recommendation #1: **Adopt Updated Deployment Measures:** The City should adopt updated performance measures for the major types of emergencies to direct fire crew planning and to monitor the operation of the Department. The measures should take into account a realistic company turnout time of 2 minutes and be designed to deliver outcomes that will save patients medically salvageable upon arrival, and to keep small, but serious, fires from becoming greater alarm fires. Citygate recommends these measures be:

1.1 Distribution of Fire Stations: To treat medical patients and control small fires, the first-due unit should arrive within 8 minutes, 90% of the time from the receipt of the 9-1-1 call in the fire dispatch center. This equates to 1-minute dispatch time, 2 minutes company turnout time, and 5 minutes drive time in the most populated areas.

1.2 Multiple-Unit Effective Response Force for Serious Emergencies: To confine fires near the room of origin, to stop wildland fires to under three acres when noticed promptly, and to treat up to five medical patients at once, a multiple-unit response of at least 20 personnel should arrive within 11 minutes from the time of 9-1-1 call receipt in fire dispatch, 90% of the time. This equates to 1-minute dispatch time, 2 minutes company turnout time, and 8 minutes drive time spacing for multiple units in the most populated areas.

1.3 Hazardous Materials Response: Provide hazardous materials response designed to protect the community from the hazards associated with uncontrolled release of hazardous and toxic materials. The fundamental mission of the Fire Department response is to minimize or halt the release of a hazardous substance so it has minimal impact on the community. This is done by achieving a travel time in urban to suburban areas for

the first company capable of investigating a HazMat release at the operations level within 5 minutes travel time, or less than 90% of the time. After size-up and scene evaluation is completed, a determination will be made whether to request additional resources from the City's multi-agency hazardous materials response partnership.

1.4 Technical Rescue: Respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue. Achieve a travel time for the first company in urban to suburban areas for size-up of the rescue within 5 minutes travel time or less 90% of the time. Assemble additional resources for technical rescue capable of initiating a rescue within a total response time of 11 minutes, 90% of the time. Safely complete rescue/extrication to ensure delivery of patient to a definitive care facility.

Recommendation #2: The Department needs to conduct a study to determine which fire stations should not be maintained for another 25-50 years. Then, based on the number of stations that require total replacement, the Department needs to adjust replacement fire station spacing such that response time overlap between stations is minimized as much as possible. Further, stations should not be sited close to City edges so that station response times cover areas substantially outside the City.

1.4 Challenge #2 – Reducing Fire Stations Due to Economic Stress

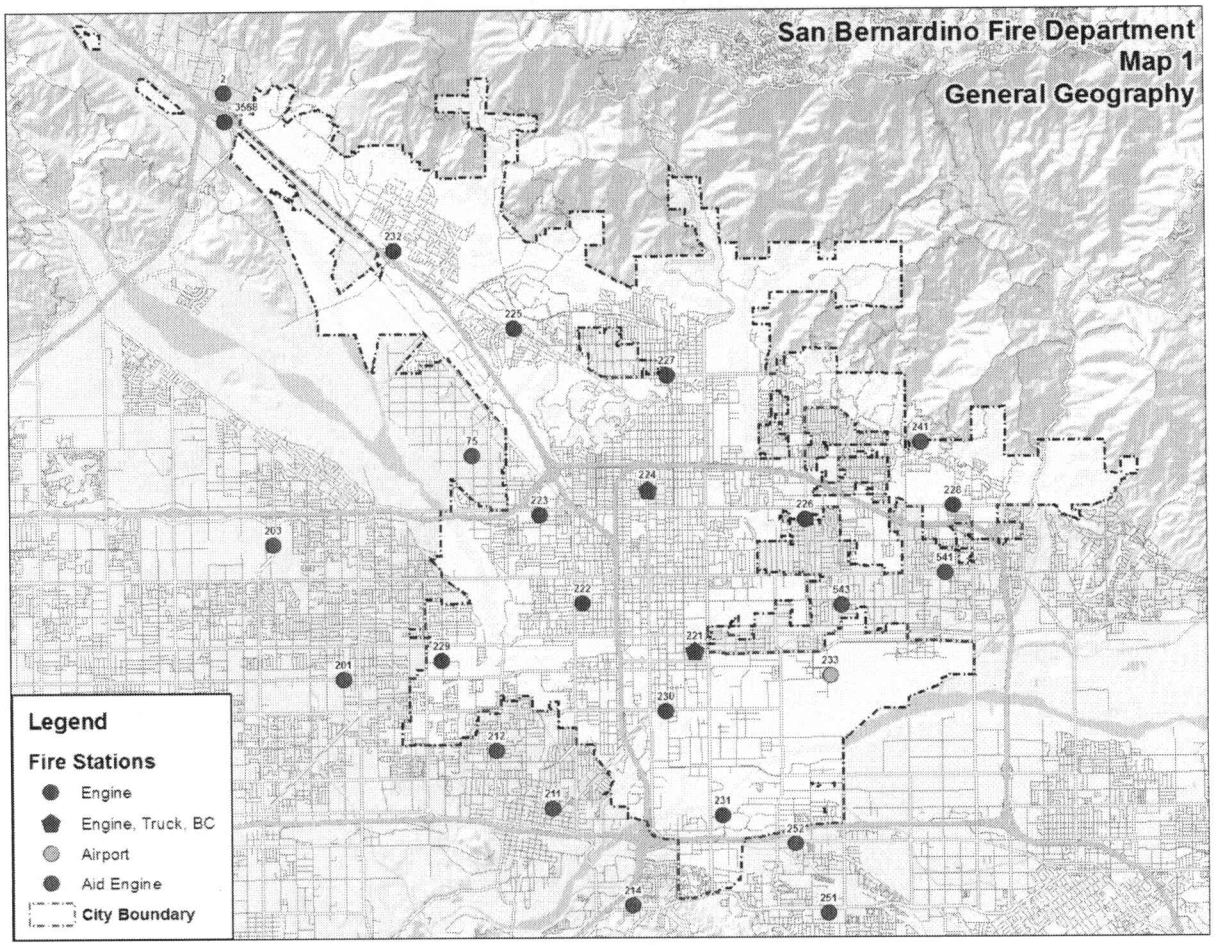
Reducing fire department units will have three types of consequences. First, as fewer units are available there will be longer travel times to incidents. First-due unit arrivals will be delayed in the reduction areas. Second, and equally important, complex incidents requiring multiple units will take longer for all the needed units to arrive to effectively control building and wildland fires. Thus, the ability to mitigate serious incidents to a First Alarm level will be reduced or eliminated. Third, most stations only have one response unit—an engine company (pumper) with a crew of three. Reductions in force thus cannot be done to all stations at once, as only one to three stations can even be considered at all for closure. When a few stations are closed, an inequity of response time capacity is created between neighborhoods where, at the same taxation level, some neighborhoods have better access to a nearby fire unit than do other neighborhoods near the closed stations.

Citygate's analysis has considered multiple factors regarding where the City can make the least painful reductions, should this be necessary due to the current fiscal crisis. However, the City has such a high emergency medical incident volume, along with frequent structure fires, that any

reduction in deployment of the response force will reduce response times and, occasionally, incident outcomes. The City is not over-deployed for fire companies to serve its diverse geography and risks.

If reductions have to occur, Citygate makes the following finding and recommendations. An overview map of the fire station locations is provided below, since the recommendations specifically reference station numbers.

Map #1 – General Geography



Finding #17: The City has such a high emergency medical incident volume, along with frequent structure fires, that any reduction in deployment of the response force will reduce response times and, at times, incident outcomes. The City is not over-deployed for fire companies to serve its diverse geography and risks.

Recommendation #3: The station closures in this analysis should only be implemented in combination with an aggressive re-structuring and lowering of Fire Department responses to non-life-threatening emergency medical

services (EMS) incidents as studied elsewhere in Citygate's overall deployment analysis of the City.

Recommendation #4: Given the fiscal emergency, the City could choose to close Engines 223 and 231 and negotiate the impacts on the surrounding mutual aid partner fire departments.

Recommendation #5: Given that Stations 228 and 232 were not considered for long-term closure, they should be considered for immediate move-up to the core of the City when a high rate of simultaneous medical or sustained on-scene operations at multi-unit firefighting incidents occurs in the central City fire station areas. This move-up would trade coverage for a few hours from low workload areas to the highest workload areas in the City, thus shoring up response times where it is needed the most.

Recommendation #6: Additionally, the two ladder trucks in the core stations of 221 and 224 support the core workload. If fiscal pressures only required the savings of approximately 1.5 stations, and if both Stations 223 and 231 were closed, some of the savings should be used to open a 2-person paramedic squad and place it at Station 226, the busiest in the City.

1.5 Challenge #3 – City Fire Department Paramedic Program Options

As the City continues to evaluate the pressures placed on it by the high occurrence of emergency medical service demands, based on our analysis, Citygate offers these findings and recommendations to guide the City's policy choices:

Finding #18: The quantity of EMS incidents and the practice of immediately sending a fire unit to every 9-1-1 medical call, regardless of severity, are significantly lowering the City's firefighting ability, risking its firefighters unnecessarily and increasing its expenses for personnel and equipment.

Recommendation #7: The City should work with the County and its ambulance contractor, AMR, to re-implement medical priority dispatch and immediately lower the Fire Department EMS response to serious health emergencies, rescue, entrapment, etc.

Recommendation #8: Due to the modest savings and sunk costs in the training of firefighter/paramedics, the City should not consider dropping its paramedic program until all of the effects of Federal Health Care restructuring are well understood in the EMS arena.

Recommendation #9: The City should immediately send a letter to the County EMS Agency as required by California Health and Safety Section 1797.201 requesting changes to the Fire Department's response to non-life threatening medical problems. This request should be to implement medical priority dispatching with 60 days. Further, the letter should state that, absent a new partnership with the County and AMR to divert and absorb the non-emergency medical patients, the City will hold a public hearing per Section 1797.201 and unilaterally consider lowering its paramedic first response program.

1.6 Challenge #4 – Contract or Merger of Fire Service Options

Contracting or merging of fire services is not easy given the regulatory and legal complexities. If it were, there would be hundreds fewer fire departments in the State. Given our analysis of the issues at present in San Bernardino, and our experience with fire department mergers, Citygate offers the following findings and recommendation to assist the City in evaluating the policy choices for the provision of fire services:

Finding #19: Due to the current fiscal crisis and legal proceedings, CAL FIRE will not respond to a contract for service request. Even if it responded, resolving the issues and determining if the cost is beneficial to the City could take upwards of 1-2 years. In effect, this option does not offer any short-term financial savings to the City in the near term.

Finding #20: During the period of this study, Citygate and City Hall staff were not able to identify any other local government partners interested in shared fire services via a JPA. As such, this option will not assist the City in the near term with its costs of fire services.

Finding #21: While the County can offer annexation into its Fire District, the negotiation of costs, revenues and employment impacts, along with the LAFCO approval process, could easily take two years. As such, this option does not provide any immediate cost reduction relief in the current fiscal crisis.

Recommendation #10: Given the issues of contracting for services or annexation into the County of San Bernardino Fire District, the Mayor and Common Council must choose a path for staff to proceed that can answer, at a fine level, the amount of local control and thus costs, that the City wants to manage for fire services as these costs are currently approximately 26% of the City's General Fund budget.

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FIRE SERVICES DEPLOYMENT STUDY

CITY OF SAN BERNARDINO, CA

VOLUME 2 OF 3 – TECHNICAL REPORT

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VOLUME 2—TECHNICAL REPORT

SECTION 1—STANDARDS OF COVERAGE INTRODUCTION AND SAN BERNARDINO OVERVIEW

1.1 OVERVIEW OF STUDY AND ORGANIZATION OF REPORT

Citygate Associates, LLC's detailed work product for the Standards of Response Cover (SOC) planning analysis (fire crew deployment study) for the City of San Bernardino (City) is presented in this volume. Citygate's scope of work and corresponding Work Plan was developed consistent with Citygate's Project Team members' experience in fire administration. Citygate utilizes various National Fire Protection Association (NFPA) publications as best practice guidelines, along with the self-assessment criteria of the Commission on Fire Accreditation International (CFAI) and the Insurance Services Office (ISO).

The baseline or "as is" deployment workload portion of the study consists of ***Sections 1-4*** and reviews the adequacy of the existing deployment system from the current fire station locations and the impacts, if any, from the City's mutual aid partners.

Given the City's fiscal stress, Citygate was also tasked with investigating three other related issues once the baseline deployment assessment was completed. These questions are highlighted below, and addressed in later sections of the report, as indicated:

1. If the current fiscal crisis requires the City to consider closing fire stations to help balance its budget, can any be closed? If so, where, with what impacts? ***(Addressed in Section 5)***

2. Should the City continue to provide fire department-based paramedics on engines to support the County-managed private ambulance contract? ***(Addressed in Section 6)***

3. What are the high-level options for the City to consider for contracting out or merging fire services with another agency? ***(Addressed in Section 7)***

   - While this study is not a fire services Request for Proposal (RFP) or analysis of bids received, the City requested advice based on Citygate's experience on the possible forms of shared fire services and related issues to consider.

1.1.1 Standard of Response Cover Review Components

To address the scope of work for this deployment project, Citygate performed the following:

- Citygate reviewed the existing San Bernardino Fire Department fire crew and fire station deployment plan as of FY 2013/14.
- Citygate modeled the need and effects of the current fire station locations. Although this is not a study of fire departments adjacent to the City, Citygate considered the impacts of the City's existing or potential automatic and mutual aid agreements on the City's needs.
- Citygate proposed performance goals that are consistent with national guidelines from the NFPA, CFAI, and ISO.
- Citygate used a geo-mapping software program for the updated mapping analysis of this project to analyze current fire station locations by driving time.
- Citygate used an incident response time analysis program called StatsFD™ (formerly NFIRS 5 *Alive*) to review the statistics of prior historical performance for the last 5 fiscal years.

1.1.2 SOC Study Processes

The core methodology used by Citygate in the scope of its deployment analysis work is the "Standards of Response Coverage" 5th Edition, which is a systems approach to fire department deployment, as published by the CFAI. This is a systems-based approach using local risk and demographics to determine the level of protection best fitting the City's needs.

The Standards of Response Coverage method evaluates deployment as part of the self-assessment process of a fire agency. This approach uses risk and community expectations on outcomes to assist elected officials in making informed decisions on fire and EMS deployment levels. Citygate has adopted this methodology as a comprehensive tool to evaluate fire station locations. Depending on the needs of the study, the depth of the components may vary.

Such a systems approach to deployment, rather than a one-size-fits-all prescriptive formula, allows for local determination. In this comprehensive approach, each agency can match local needs (risks and expectations) with the costs of various levels of service. In an informed public policy debate, a governing board "purchases" the fire protection and EMS levels the community needs and can afford.

While working with multiple components to conduct a deployment analysis is admittedly more work, it yields a much better result than any singular component can. For instance, if only travel time is considered, and frequency of multiple calls is not considered, the analysis could miss

over-worked companies. If a risk assessment for deployment is not considered, and deployment is based only on travel time, a community could under-deploy to incidents.

The Standard of Response Cover process consists of eight parts:

1. Existing Deployment – each agency has something in place today.
2. Community Outcome Expectations – what is expected of the response agency?
3. Community Risk Assessment – what assets are at risk in the community?
4. Critical Task Analysis and Time Study – what must be done over what timeframe to achieve the stated outcome expectation of the Effective Response Force?
5. Distribution Study – the locating of first-due resources (typically engines).
6. Concentration Study – First Alarm assignment or the Effective Response Force.
7. Reliability and Historical Response Effectiveness Studies – using prior response statistics to determine what percent of compliance the existing system delivers.
8. Overall Evaluation – proposed Standard of Cover statements by risk type.

Fire department deployment, simply stated, is about the speed and weight of the attack. Speed calls for first-due, all-risk intervention units (engines, trucks, and/or rescue ambulances) strategically located across a department. These units are tasked with controlling moderate emergencies without the incident escalating to second alarm or greater size, which unnecessarily depletes department resources as multiple requests for service occur. Weight is about multiple-unit response for serious emergencies such as a room-and-contents structure fire, a multiple-patient incident, a vehicle accident with extrication required, or a heavy rescue incident. In these situations, enough firefighters must be assembled within a reasonable time frame to safely control the emergency, thereby keeping it from escalating to greater alarms.

Thus, small fires and medical emergencies require a single- or two-unit response (engine and specialty unit) with a quick response time. Larger incidents require more crews. In either case, if the crews arrive too late or the total personnel sent to the emergency are too few for the emergency type, they are drawn into a losing and more dangerous battle. The science of fire crew deployment is to spread crews out across a community for quick response to keep emergencies small with positive outcomes, without spreading the crews so far apart that they cannot amass together quickly enough to be effective in major emergencies.

1.2 SOC Study Questions

To deeply analyze San Bernardino's existing Standards of Response Coverage, Citygate reviewed computer data, preformed our own independent response time analysis, and used

geographic mapping to visualize predicted coverage from fire stations. As a result, the SOC portion of this study addresses the following questions:

1. Is the type and quantity of apparatus adequate for the City's deployment to emergencies?

2. What are the recommended deployment strategies for adequate emergency responses in San Bernardino?

1.3 CITY OF SAN BERNARDINO OVERVIEW

The San Bernardino Mayor and Common Council, elected by its constituents, governs the City according to the voter-approved Charter. The Fire Chief oversees the general operations of the Fire Department under the City Manager in accordance with the policy direction prescribed by the Mayor and Common Council.

In FY 2013/14, the Fire Department will employ 165 personnel, in all program areas. The City maintains twelve (12) fire stations strategically located throughout the City and one administrative office. An additional part-time fire station exists at the airport, but is only staffed when there is a pre-planned air cargo carrier need or when the United States Forest Service (USFS) Air Tanker Base is put into operation during wildland fire incidents. When this occurs a standard fire crew of three is used on overtime. The Department staffs fourteen front-line companies, which include twelve fire engines, two ladder trucks, and specialty units for wildland fires, technical rescue, and hazardous materials incidents.

The City operates its own police/fire dispatch center. As such, the San Bernardino Police Department is the City's Public Safety Answering Point (PSAP) for all 9-1-1 emergency calls. A request from a caller for the Fire Department is forwarded to a fire dispatcher for dispatch of the Fire Department's resources.

The City's service area encompasses approximately 60 square miles. Within the boundaries of San Bernardino are expansive wildland areas, single-family homes and multi-family residential complexes, and significant commercial businesses. The City has a regional airport, two hospitals that include emergency rooms, a major events center, a minor league baseball stadium, Cal State San Bernardino, San Bernardino Valley College, over 10 satellite university and college campuses, numerous regional sports complexes, two major railway hubs including a metro-link station, three major freeways (10, 215, and 210), two major highways that lead to the mountain communities (18 and 330), numerous industrial parks throughout the City that include warehouses that are over 1,000,000 square feet in size, numerous businesses that store and manufacture hazardous materials, dozens of convalescent hospitals and retirement homes, numerous specialized health care facilities (dialysis, respiratory care, etc.), numerous high density low-income housing complexes, an aging housing stock, and a wildland fire interface threat throughout the entire north end of the City.

The City recently incorporated well over 1,572 acres of the San Bernardino National Forest into its City boundaries due to the Arrowhead Springs Annexation. The north end of the City limit now stretches many miles into the San Bernardino National Forest boundary including areas along HWY-18 and HWY-330. The City has one of the largest wildland urban interface areas in the state of California.

The total population served by the City in 2013 is estimated by the California Department of Finance to be 211,614. Cal State San Bernardino has an estimated enrollment of 20,000 students. San Bernardino Valley College has 12,000 students. The enrollment of satellite campuses and universities is unknown and could be upwards of several thousand. Employment figures are somewhat dated, but the City appears to have an employment base of approximately 100,000 workers. The San Bernardino City Unified School District has approximately 60,000 students (K-12), which includes six high schools and has approximately 5,000 employees.

1.3.1 Legal Basis for Agency

San Bernardino is a charter city as allowed by the state of California. In 1886, San Bernardino incorporated for the second time. The city government was reorganized and in 1905 San Bernardino became a charter city with an elected mayor.

1.3.2 Fire Department History

The first fire company was organized in San Bernardino in 1865. The first volunteer department began in 1878. In 1889, the first career firefighters were hired to work alongside the volunteers. In 1910, the first motorized fire apparatus was purchased. Given the City's diverse size, geography and commerce, it has suffered tragic fires over its history, as summarized below:

- In November of 1980, the Panorama Fire swept down upon the City, destroying 286 homes and taking 4 lives. At the time, this was the most devastating fire to strike the City of San Bernardino, and it went on for over 3 days. At the same time, the Sycamore Fire was burning at the northeast end of the City.
- On May 12, 1989, a runaway Southern Pacific freight train with 69 hopper cars carrying a product called "Trona" derailed in the Muscoy area. Seven homes were destroyed and 4 others extensively damaged. Of the 5 crewmembers aboard the train, 2 were killed and the other 3 injured. Two residents were killed and 1 seriously injured.
- On May 25, 1989, a California/Nevada gasoline pipeline, located directly beneath the point of impact of the previously derailed train, exploded with a fire column spurting over 1,000 feet in the air. Subsequently, 2 residents were killed, 3 received serious injuries, and 16 received minor injuries. Eleven homes were destroyed and 6 received moderate fire and smoke damage.

- On Sunday, October 25, 2003, a vegetation fire was reported in the area of Old Waterman Canyon Road, north of the City. The Old Fire, as it is called, began to rapidly spread since it was being fanned by north winds gusting to 30 mph, 90-degree temperatures and, 6 percent humidity. The fire burned approximately 91,000 acres of wildland and in the City of San Bernardino itself, 330 homes were destroyed, and property damage was over 126 million dollars.

1.3.3 Funding Sources and Restrictions

In FY 2013/14, the San Bernardino Fire Department has an adopted budget of $30,078,535 for both operating and capital expenses. The proposed Budget includes revenues related to the SAFER grant, which provides funding for six firefighter positions over two years. This grant will expire in FY 2014-15, and at that time, the City will have to address the loss of this funding of $1.6 million per year.

1.3.4 San Bernardino—Overall Description

Topography

The City lies in the San Bernardino foothills and the eastern portion of the San Bernardino Valley, roughly 60 miles (97 km) east of Los Angeles. Some major geographical features of the City include the San Bernardino Mountains and the San Bernardino National Forest. The San Bernardino Mountains are the only east-west running range in the U.S. The housing stock along the foothills is built in direct alignment of any Santa Ana wind event.

Climate

San Bernardino features a somewhat cooler version of a Mediterranean climate with cool to chilly winters (frost is common during this time of the year) and hot, dry summers. Relative to other areas in Southern California, winters are colder, with frost and with chilly to cold morning temperatures common. The seasonal Santa Ana winds are felt particularly strongly in the San Bernardino area as warm and dry air is channeled through nearby Cajon Pass at times during the autumn months. This phenomenon markedly increases the wildfire danger in the foothills, canyon, and mountain communities that the cycle of cold, wet winters and dry summers helps create.

1.4 Previous Studies of the San Bernardino Fire Department

The last independent study of the Fire Department was conducted in 1995. Internal staff studies in 2004 reviewed fire station locations and, in 2006, staff reviewed dispatch operations. While the Department has older Mission, Vision, and Values statements adopted, it does not have a current strategic or master plan driving multi-year decision-making. Other than internally reviewing fire station locations ten years ago, the Department has never completed an in-depth

Standards of Response Cover Assessment, nor do the current departmental data systems support data-driven decision-making.

The Department has spent the recession and bankruptcy years in turmoil going from one cutback to another. The fiscal crisis has resulted in the Department reducing staffing from 4 firefighters to 3 firefighters on all engines and ladder trucks. A 2-person medic squad was eliminated and numerous headquarters positions were eliminated, including prevention and inspection officers, a disaster preparedness coordinator, a fire marshal, a deputy chief, a training chief, a training captain, a dispatch supervisor, a mechanic, an EMS coordinator, and secretarial staff.

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SECTION 2—SAN BERNARDINO DEPLOYMENT RISK ASSESSMENT OUTCOME GOALS AND STAFFING PLAN

2.1 COMMUNITY OUTCOME EXPECTATIONS AND EXISTING RESPONSE PERFORMANCE MEASURES—WHAT IS EXPECTED OF THE FIRE DEPARTMENT?

A review of the City's fire station and crew deployment system begins by understanding what fire department response time policies have been adopted, if any. One policy document to review is the Safety Element of the City's adopted General Plan. In Section 10, the Safety Element sets forth these fire safety policies:

10.11.1 Continue to conduct long-range fire safety planning efforts to minimize urban and wildland fires, including enforcement of stringent building, fire, subdivision and other Municipal Code standards, improved infrastructure, and mutual aid agreements with other public agencies and the private sector.

10.11.2 Work with the U.S. Forest Service and private landowners to ensure that buildings are constructed, sites are developed, and vegetation and natural areas are managed to minimize wildfire risks in the foothill areas of the City.

10.11.3 Require that development in the High Fire Hazard Area, as designated on the Fire Hazards Areas Map (Figure S-9) be subject to the provisions of the Hillside Management Overlay District (HMOD) and the Foothill Fire Zones Overlay.

10.11.4 Study the potential acquisition of private lands for establishment of greenbelt buffers adjacent to existing development, where such buffers cannot be created by new subdivision.

10.11.5 Continue to require that all new construction and the replacement of 50% and greater of the roofs of existing structures use fire retardant materials.

In budget documents, the San Bernardino Fire Department has not identified any response time or outcome-driven policies for its fire services to meet. Due to the paramedic program, the Fire Department strives to meet the County of San Bernardino Emergency Medical Services Agency response time requirement of responding to 90% of the emergency medical incidents within 9:59 minutes/seconds.

In the year 2000, the Mayor and Common Council by resolution, 2000-113 adopted emergency response time standards, contingent upon the availability of funds. This resolution called for:

- Dispatch processing time to be 60 seconds or less, to 90% of the incidents

- Crew turnout time to be 60 seconds or less, to 90% of the incidents
- Travel (drive) time to be less than 5 minutes, to 90% of the incidents.

The lack of response goals tied to specific outcomes by type of emergency in the General Plan, the annual budget, and even the year 2000 response time policy adopted by the Mayor and Common Council, is not congruent with best practices for emergency response time tracking. Nationally recognized standards and best practices call for a time line with several important time measurements.

The City has not identified response goals for emergency medical incidents versus fires, technical rescue, and hazardous material responses; all are required to meet the Standards of Coverage model for the Commission on Fire Accreditation International (CFAI). In this SOC update, Citygate will recommended response time goals to include all risks including fire, EMS, hazardous materials, and technical rescue responses. The goals will be consistent with the CFAI systems approach to response.

The Standards of Response Coverage Process begins by reviewing existing emergency services outcome expectations. This can be restated as follows: for what purpose does the response system exist? Has the governing body adopted any response performance measures? If so, the time measures used need to be understood and good data collected.

Current best practice nationally is to measure percent completion of a goal (e.g., 90% of responses) instead of an average measure. Mathematically this is called a "fractile" measure.[1] This is because the measure of average only identifies the central or middle point of response time performance for all calls for service in the data set. Using an average makes it impossible to know how many incidents had response times that were way over the average or just over. For example, if a department had an average response time of 5 minutes for 5,000 calls for service, it cannot be determined how many calls past the average point of 5 minutes were answered in the 6th minute or way out at 10 minutes. This is a significant issue if hundreds or thousands of calls are answered far beyond the average point. Fractile measures will identify per minute how many incidents are reached up to 100%.

San Bernardino has data from its computer aided dispatch (CAD) system and its Records Management System (RMS) to make these measurements possible. Upon completion of this study, the City should consider adopting the performance goals recommended for its emergency response systems.

More importantly within the Standards of Response Coverage Process, positive outcomes are the goal, and from that crew size and response time can be calculated to allow efficient fire station spacing (distribution and concentrations). Emergency medical incidents have situations with the

[1] A *fractile* is that point below which a stated fraction of the values lie. The fraction is often given in percent; the term percentile may then be used.

most severe time constraint. In a heart attack that stops the heart, a trauma that causes severe blood loss, or in a respiratory emergency, the brain can only live 8 to 10 minutes without oxygen. Not only heart attacks, but also other events, can cause oxygen deprivation to the brain. Heart attacks make up a small percentage; drowning, choking, trauma constrictions, or other similar events have the same effect. In a building fire, a small incipient fire can grow to involve the entire room in an 8- to 10-minute timeframe. If fire service response is to achieve positive outcomes in severe EMS situations and incipient fire situations, ***all*** responding crews must arrive, size-up the situation, and deploy effective measures before brain death occurs or the fire leaves the room of origin.

Thus, from the time of 9-1-1 receiving the call, an effective deployment system is ***beginning*** to manage the problem within seven to eight minutes total response time. This is right at the point that brain death is becoming irreversible and the fire has grown to the point to leave the room of origin and become very serious. Thus, the City needs a first-due response goal that is within the range to give the situation hope for a positive outcome.

It is important to note the fire or medical emergency continues to deteriorate from the time of inception, not the time the fire engine actually starts to drive the response route. Ideally, the emergency is noticed immediately and the 9-1-1 system is activated promptly. This step of awareness—calling 9-1-1 and giving the dispatcher accurate information—takes, in the best of circumstances, one minute. Then crew notification and travel time take additional minutes. Once arrived, the crew must walk to the patient or emergency, size-up the situation, and deploy its skills and tools. Even in easy-to-access situations, this step can take two or more minutes. This time frame may be increased considerably due to long driveways, apartment buildings with limited access, multi-storied apartments or office complexes, or shopping center buildings such as those found in parts of the City.

Unfortunately, there are times that the emergency has become too severe even before the 9-1-1 notification and/or Fire Department response for the responding crew to reverse; however, when an appropriate response time policy is combined with a well-designed system, then only issues like bad weather, poor traffic conditions, or multiple emergencies will slow the response system down. Consequently, a properly designed system will give citizens the hope of a positive outcome for their tax dollar expenditure.

For this report, "total" response time is the sum of the fire dispatch, crew turnout, and road travel time steps. This is consistent with the recommendations of the CFAI.

Finding #1: The General Plan, the annual budget, and the response time policy adopted in 2000 by the Mayor and Common Council lack response goals tied to specific outcomes by type of emergency. This is not congruent with best practices for emergency response time tracking. Updated deployment measures are needed that include specialty response measures for all-risk emergency responses that includes the beginning time measure from the point of fire dispatch receiving the 9-1-1 phone call, and a goal statement tied to risks and outcome expectations. The deployment measure should have a second measurement statement to define multiple-unit response coverage for serious emergencies. Making these deployment goal changes will meet the best practice recommendations of the Commission on Fire Accreditation International.

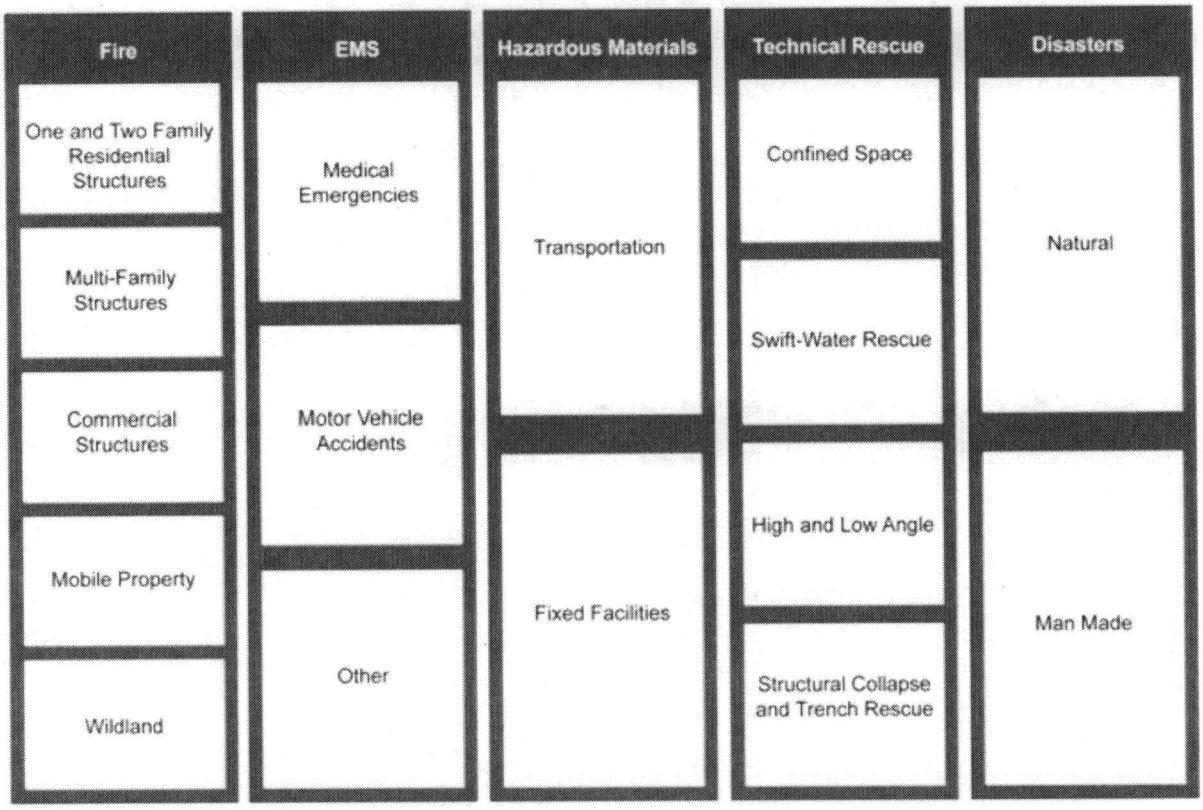
2.2 Community Risk Assessment

Risk assessment is a major component of developing a Standards of Cover (SOC) document. A risk assessment identifies the type of incidents a fire department will respond to and what resources and staffing it will need to mitigate the situation.

To better understand risk it is necessary to define the types and levels of risk a community might encounter. For risk assessment in an SOC study, it is typical to consider low, moderate, high/special, and maximum risk occupancies. Risk also can be classified by probability and consequences. Probability is defined as the likelihood of a fire occurring in an occupancy type. Consequences are defined as the effects of the fire on the property and community. These classifications will be discussed later in this section.

The figure below identifies the risks that Citygate studied to develop this Standards of Cover report. Since San Bernardino is an "All Risk" response agency, each of the types of incidents was studied.

Figure 1—Risk Types Studied



The San Bernardino City Fire Department has several types of demographic data available to understand the risks to be protected and how to deploy emergency response or prevention resources to these risks to lessen or prevent the seriousness of an emergency. The data sets are:

1. Population and socioeconomic data from City planning and U.S. Census Bureau data sets.
2. Wildfire hazard severity zones, as initially identified by CAL FIRE and refined by the San Bernardino City Fire Department.
3. Building fire flow and type of construction data as collected by the Insurance Service Office (ISO).
4. The City's General Plan Safety Element.
5. The history of fire and special hazard incidents in the City.

2.2.1 Fire Assessment

Building Fire Risk

The response area for each fire station is identified as a station district. When a request for service is received through the 9-1-1 system, the Communication Center verifies the call location and uses the computer-aided dispatch (CAD) system to identify the required resources to send. The CAD system takes into consideration the type of occupancy and associated risk. Once the call type has been identified, the correct type of predetermined response is dispatched. This utility allows the dispatcher to dispatch a predetermined fire alarm assignment quickly to the emergency.

The Department has identified risk hazards for each type of occupancy within the City of San Bernardino. All emergency response units carry premise information for risks that pose a high life hazard, high property loss, conflagration hazard, contain hazardous materials, or have frequent fire occurrence. Fire service deployment risks are divided into the following four classifications defined below:

- Maximum-Risk Occupancies
- High/Special-Risk Occupancies
- Moderate-Risk Occupancies
- Low-Risk Occupancies.

Maximum Risk Occupancies: These types of occupancies are usually found in the nation's largest cities and require significant responses, personnel, and resources. The maximum risks in the City of San Bernardino are the wildfire zone with a history of devastating fires, and the railroad and pipelines that transport hazardous materials.

High/Special-Risk Occupancies: Schools, apartments, hospitals, nursing homes, low-rise buildings, commercial structures, dwellings in water-deficient areas, and other high life hazard or large fire potential occupancies. The City has numerous examples of these types of risks.

Moderate-Risk Occupancies: One-, two-, or three-family dwellings and small commercial and industrial occupancies. Approximately 70% of the occupancies within the City of San Bernardino, typical of most suburban cities with low-rise housing, fall into the moderate-risk category including the single-family residences.

The most common risk in any community like San Bernardino is fire. San Bernardino has a mix of occupancy uses, which help to determine risk level. For example, the City of San Bernardino has over 6,500 occupancies classified as residential occupancies. Typically these buildings are lower risks. However, the vacancy rate of homes in the City is unusually high, creating a higher fire risk than most communities.

Low-Risk Occupancies: Small non-commercial structures that are remote from other buildings, such as detached residential garages and out buildings.

Unique Risks to be Protected

In addition to the overview of land and structure fire risks discussed in Section 1.3 of this report, other examples of unique risks to be protected in San Bernardino are:

- The City is the County Seat and has many government buildings such as the County Courthouse, County Civic Center, Public Health Offices, IRS regional headquarters, and numerous state buildings.
- The City has numerous critical large-capacity fuel delivery lines (gasoline, Jet-A, diesel) that run through the central and southern portions of the City along various rail-corridors. These fuel lines serve the state of California, Nevada, and Arizona and are operational 24 hours a day.
- The City's north end is home to a large-scale hydroelectric generating plant that feeds electricity to a large portion of Southern California. The Counties of San Bernardino, Riverside, and Los Angeles receive a majority of their water from the Devil's Canyon water pipeline system that is located in the north end of the City.
- The City is situated directly above the San Andreas Fault Line, which is one of the most active earthquake faults in the world. Seismologists are predicting that this fault line is well overdue for a 7.0 earthquake or larger. Emergency management experts have shown that when a major earthquake hits the City of San Bernardino the City will be on its own for at least 2-4 weeks without outside emergency assistance. This is in part due to the City's aging infrastructure, such as bridges, railroads, freeways, and major thoroughfares.
- Most of the City is in the path of major flood plain that history has shown to flood numerous times. The south section of the City is prone to liquefaction due to the water table being as low as four to five feet below grade.
- The City also sits at the base of the Cajon Pass, which is one of the windiest passes in California. The City experiences Santa Ana wind events that average 50-60 mph and gust up to 100 mph. The Santa Ana winds, coupled with the geographical layout of the City, have equated to some of the largest wildfire conflagrations in the state's history.
- The City is home to a minor league baseball team and has events other than baseball games planned at the stadium. The National Orange Show fairgrounds host similar concert events and an annual fair. There are two large soccer complexes hosting tournaments and games weekly. The Little League World Series is played in San Bernardino. All events range in attendance from the

thousands to a few hundred thousand. The San Manuel Indian Casino is located in the northeast end of the City and is a destination alternative for many gamblers in the immediate area and many more are bussed in via tours.

Risk Probability and Consequences

The table below illustrates the probability and consequences for each of the four fire risk types. As indicated earlier, probability is defined as the likelihood of fire occurring in an occupancy type; consequences are defined as the effects that the fire will have on the property and community. Both probability and consequences are reviewed by the fire department to assure proper distribution (location) of fire stations and concentration (the number of units needed to suppress the fire and limit the consequences).

Table 1—Probability and Consequence Matrix

	Low Consequence	High Consequence
High Probability	**Moderate Risk** (High Probability) (Low Consequence)	**Maximum Risk** (High Probability) (High Consequence)
Low Probability	**Low Isolated Risk** (Low Probability) (Low Consequence)	**High/Special Risk** (Low Probability) (High Consequence)

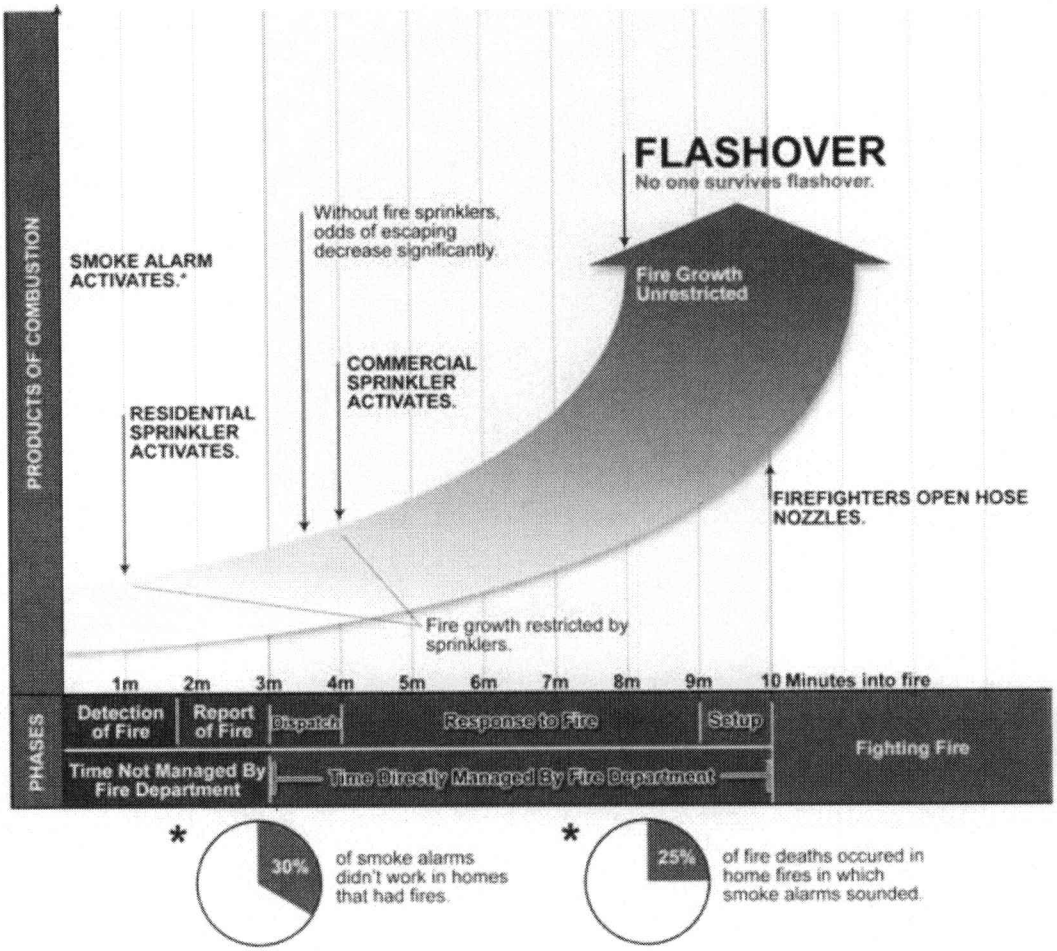
For building fire risk, to determine the appropriate response mix of fire units and staffing, the Department uses an extensive data file from the ISO of local properties the ISO reviewed on-site for underwriting purposes. In total, there were 2,600 buildings listed in the file. One of the measures the ISO collects is called "fire flow," which is the amount of water that would need to be applied if the building were seriously involved in fire. The measure of fire flow is expressed in gallons per minute (gpm). Of the buildings in the ISO data set, 315 buildings have required fire flows of 2,500 gpm or higher. There are a total of 109 buildings with fire flows in excess of 4,000 gpm, and ten buildings at 7,000 gpm to 8,000 gpm.

Fire flows above 3,000 is a significant amount of firefighting water to deploy, and a major fire at any one of these buildings would require the entire on-duty City firefighting force and mutual aid units. Using the generally accepted figure of 50 gallons per minute per firefighter on large building fires, a fire in a building requiring 2,500 gallons per minute would require 50 firefighters. Minimum daily staff for the City is 44 personnel including the two Battalion Chiefs.

Deployment resources and response time are two critical components necessary for a good outcome. As indicated in the chart below, a total response time of 7 minutes from answering the

9-1-1 call is typically needed to stop the fire before flashover. Flashover is the point at which the entire room erupts into fire after all objects in that room have reached their ignition temperature. If a person is in a room at flashover, survivability becomes all but impossible.

Figure 2—Products of Combustion per Minute



Source: http://www.firesprinklerassoc.org

Wildland Fire Risk

The City of San Bernardino has a severe wildland urban interface; one of, if not the worst in California due to the east-west mountain alignment and proximity of development. Wildland fires due to the steep terrain and highly flammable chaparral vegetation of the foothills of the San Bernardino Mountains easily occur in high wind periods that correspond with seasonal dry periods. The direction of the mountain range exacerbates the Santa Ana winds; increasing their severity. The convergence of topography, vegetation fuel, wind and dry Mediterranean climate conditions create a high probability that large uncontrollable fires on a recurring basis are

inevitable. Major fires have endangered the City on numerous occasions and, in several instances, have spread into the City causing extensive damage, as noted previously in this report.

The number of structures and encroachment of new development in the hillside areas increase the danger from wildland fires in foothill locations. The City has annexed large areas in the San Bernardino National Forest. Specific concerns include the density of development, spacing of structures, brush clearance, building materials, access to buildings by fire equipment, adequacy of evacuation routes, property maintenance, and water availability.

The U.S. Department of Forestry has records of wildland fires dating back to the beginning of the 20th century. The data indicates that fires occur on a regular basis almost every year and that very large fires occur approximately every ten years. According to the Department of Forestry, the large fires correspond to the age of the vegetation, and if older vegetation is not burned or thinned regularly, it begins to accumulate dead material that is more easily ignited and spreads fire faster than newer growth.

Consequently, a decade can pass with few fires followed by a decade with several large fires. The occurrence of the largest fires also corresponds to periods of extremely high wind conditions. This was seen in the 2003 Old Waterman Canyon fire, and the Panorama fire in 1980, which destroyed 345 structures and killed four people. Many of the areas burned during the Panorama fire were again burned in 2003.

These large fires were spread by winds periodically approaching and the California Department of Forestry and U.S. Forest Service consider fires in winds exceeding 90 to 100 miles per hour as uncontrollable. Other areas in southern California are being burned off periodically by way of controlled burns to remove older vegetation. The controlled burn process is used very carefully in the San Bernardino Mountains because of the unpredictability and force of the winds in the area that could make controlled burns a potential hazard.

Citygate obtained and mapped the wildfire threat zones as identified by CAL FIRE. These areas, based on fuel type, density, and percent of slope, range from moderate to high to very high. Many of these areas abut buildings. As such, the City's response plan is designed to deliver the right mix of structural and wildland fire apparatus to each area.

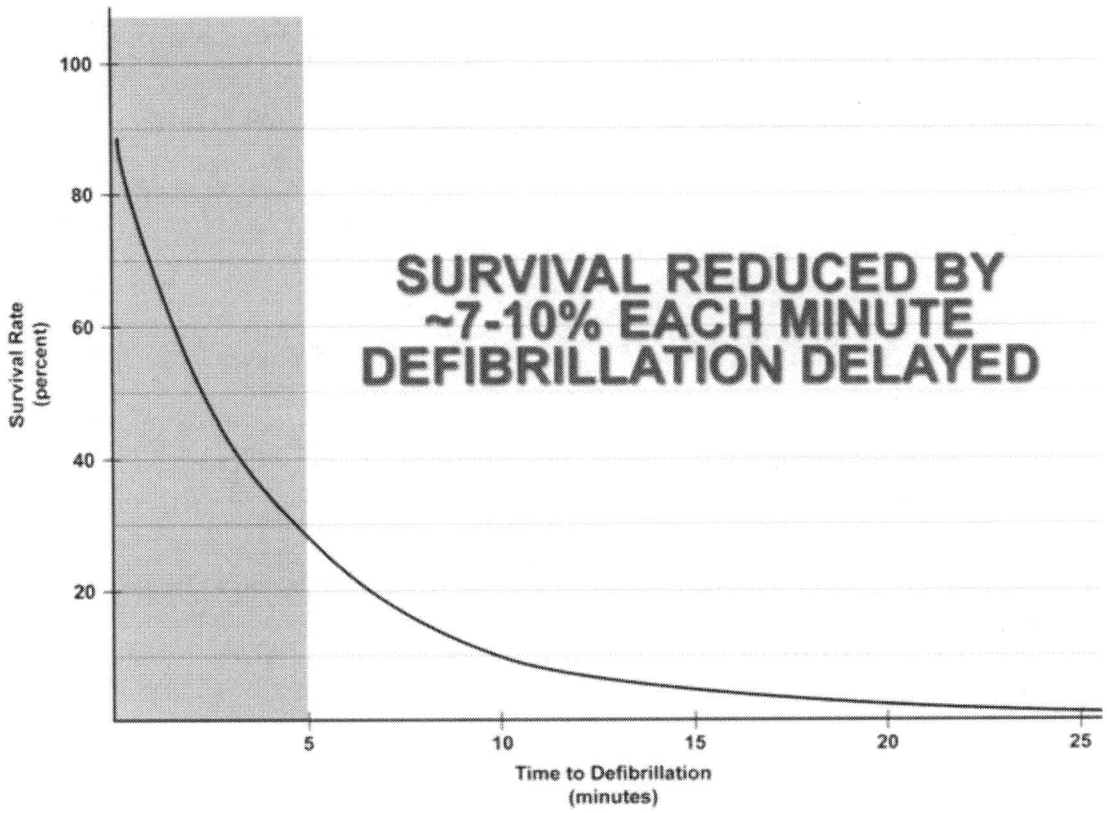
2.2.2 Emergency Medical Services System Assessment

The emergency medical system provided by the Department consists of 12 engine and two truck companies staffed with one Advanced Life Support Paramedic (EMT-P) and two EMTs. These units are equipped to meet the standards set forth by the San Bernardino County Department of Health Services, Local Emergency Medical Services Agency. The Department's EMS system provides a 24-hour "first response" emergency paramedic via the engine or truck company for treatment of ill and injured patients in San Bernardino.

In the City of San Bernardino, a 9-1-1 call for medical assistance receives a paramedic fire engine or truck, whichever is closest. This level of response provides a minimum of one paramedic and two EMTs to every call for service. Along with the Fire Department, the County's private ambulance contractor, AMR, also dispatches an ambulance.

The most serious medical emergency would likely be a heart attack or some other emergency where there was an interruption or blockage of oxygen to the body. The figure below indicates survivability rate of a heart attack victim. There are other factors that can influence survivability as well, such as early CPR, early defibrillation, and early ALS intervention.

Figure 3—Survival Rate vs. Time of Defibrillation



Source: www.suddencardiacarrest.org

2.2.3 Hazardous Materials Risk Assessment

Hazardous materials risk assessment is for fixed facilities that store, use, and produce hazardous chemicals. Additionally, with the road transportation infrastructure in San Bernardino, and the rail transportation and pipeline transport network traversing the City, the risk assessment also includes those threats and hazards.

The state of California EPA and the California Building, Fire and Environmental Codes regulate hazardous materials storage and use. The City has chosen to have the County manage and inspect facilities under the Certified Unified Program Agency (CUPA) for the City.

The City has several pipelines transporting fuel (diesel, gasoline, and Jet-A) through the City to the states of California and Nevada. The historic data from the 1989 train incident previously mentioned illustrates the susceptibility for damage to the pipelines and increased risk to the community.

2.2.4 Technical Rescue Risk Assessment

It is difficult to predict and locate where technical rescue requests for service will occur in an urban city. The potential types of technical rescues that might occur in San Bernardino range from trench collapses due to water pipe installations, high angle rescue of window washers, structural collapse after an earthquake, confined space rescues from tanks and underground vaults, and swift water rescues from flooded urban streams. Technical rescues can also come from industry. Personnel trapped in machinery, transportation accidents, aircraft crashes, and motor vehicle accidents account for many technical rescues.

San Bernardino has prepared and trained for these events and has established a response matrix with the Communications Center to send the appropriate number of personnel and equipment to mitigate the situation. If additional resources are required, the County Fire Mutual Aid System will be implemented.

2.2.5 Natural and Man-made Disasters

A city's fire department is also expected to respond to natural disasters. Some of these can cause fires or disrupt the water supply needed to fight fires. Other disasters can place a burden on the fire department for medical and technical rescue incidents.

The City's General Plan's Safety Element describes several risks associated with public safety. Specific hazards of concern to San Bernardino include earthquakes, landslides and mudflows, dam or reservoir failure, and contamination of soil and groundwater resources by hazardous materials associated with some of the research, commercial, and industrial facilities present in the City. These hazards can impact the City's residents, workers, and visitors, and can cause the disruption of critical facilities (hospital, schools, fire stations) and essential facilities (water, gas, sewage, electricity, communications). The Fire Department and City need to be prepared to respond to these emergencies; this risk assessment will help them identify the hazards, locations, and impact in the event of a natural emergency.

Earthquakes and Seismic Hazards

Earthquake-induced ground shaking is what causes the damage to structures and infrastructure like roads and bridges. San Bernardino has some very old building stock, which is very susceptible to damage from an earthquake.

San Bernardino is crisscrossed by numerous earthquake faults. San Bernardino is located between several active fault zones including: the San Andreas Fault, the San Jacinto Fault, the Glen Helen Fault, and the Loma Linda Fault. Each of these faults is classified as an Alquist-Priolo Special Study Zone under the Alquist-Priolo Earthquake Fault Zoning Act. These areas of significance extend parallel to or extend from approximately 200 to 500 feet from designated faults.

Consequently, the potential for fault rupture, strong ground shaking, landslides, and liquefaction is high. These geologic and seismic hazards can affect the structural integrity of buildings and utilities, and, in turn, cause severe property damage and potential loss of life. The City's policies and programs for geologic/seismic hazards are intended to reduce death, injuries, damage to property, and economic and social dislocation due to seismic events, as well as to enhance our preparedness to survive, respond to, and recover from a major earthquake or geologic disaster. Effective implementation of seismic policies requires a continuing awareness of the seismic hazards affecting the City; strong, enforceable seismic standards for the siting, design, and review of proposed development; and citywide programs for disaster preparedness and recovery planning.

Geologic Hazards

Site-specific investigation of geologic and soils conditions are the City's primary means of hazard evaluation and an important basis for developing effective mitigation of individual development projects through planning and design. Standardized reporting procedures are necessary to assure consistency of hazard evaluation in the planning area. Data collected for an individual development site does not necessarily provide a complete picture of the regional geologic hazards affecting the site. A broader database of geologic and soils information, derived from a variety of research, development, and excavation projects, would provide a broader perspective and significant insights on potential development hazards that can be utilized on a regional scale for risk assessment.

Hills and mountains surround the City of San Bernardino. Slope failure does not need to be initiated by an earthquake. Intense rainstorms can penetrate the underlying soils and make them slip or slide off the slope, causing catastrophic consequences at the bottom of the hill. Slopes exposed to heavy rain, especially after a wildland fire, will usually result in a mudslide causing a great deal of damage at the bottom of the hill.

Subsidence

Subsidence can be caused by natural geologic processes or by human activity such as subsurface mining or pumping of groundwater or oil. The City's historic subsidence area was located within the thick, poorly-consolidated alluvial and marsh deposits of the old artesian area north of Loma Linda. Potential subsidence within this area may be as great as five to eight feet if groundwater is depleted and not replenished from the Bunker Hill-San Timoteo Basin. Since 1972, the San Bernardino Municipal Water District has maintained groundwater levels from recharge to percolation basins that, in turn, filter back into the alluvial deposits. Problems with ground subsidence have so far been mitigated since the groundwater recharge program began.

Landslides

General slope stability is determined by a number of factors including slope, vegetative cover, wildfire, bedrock, soil, precipitation, and human alteration. Slopes may be in temporary equilibrium until one of the above factors is modified resulting in an unstable condition and potential failure. Slope stability studies of the San Bernardino planning area were conducted by Morton (1974) and Miller (1979) and include general descriptions of slope areas along with accompanying maps. Generalized slopes are subdivided into areas of low relief, areas of moderate relief, and areas of high relief. Generalized landslide susceptibility in the City is considered low to moderate. A combination of the generalized slope categories and the generalized landslide susceptibility areas results in two potentially hazardous zones:

- Areas of low relief with low to moderate susceptibility that may contain small-scale surficial soil slips, debris flow, and mudflows on steep slopes.
- Areas of moderate and high relief with low to moderate susceptibility that may contain small to large rotational slides, debris slide, and combinations of surficial slide and flows. These areas contain individual landslides that have been included on the regional slope stability and landslides map. Potential slope failures in the above areas could be hazardous to buildings, reservoirs, roads, and utilities. Seismic shaking may also include slope failure.

Flood Hazards

Flooding represents a potential hazard in San Bernardino, especially at the base of the mountains and foothills. This section addresses the risks of flooding due to the natural topography, rainfall, and runoff of the City. The 100-year floodplain within the City is currently defined by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate maps. FEMA periodically updates these maps. The 100-year floodplain is confined to storm channels, debris basins, and between levees with a few minor exceptions. A few areas are identified as low areas within the 100-year floodplain, such as the Base Line Street and Sterling Avenue area, Mountain View Avenue and Electric Avenue area, south of Redlands Boulevard, and east of Hunts Lane.

Storm drains and flood control facilities within the City include: channels, storm drains, street waterways, natural drainage courses, dams, basins, and levees. Some streets in the City of San Bernardino are specifically designed to accommodate storm flow. Flows carried within the street right-of-way may cause localized flooding during storms, possibly making some roads impassable during the storm event. Storms are not the only cause of flooding within the City. Basements and underground utility vaults may also experience flooding in areas between the Santa Ana River and downtown due to the City's existing high groundwater table.

Dam Inundation

Flood inundation resulting from the failure of the Seven Oaks Dam is a potential hazard for the City of San Bernardino. The Seven Oaks Dam is located in unincorporated San Bernardino County northeast of the City of Highland. The Seven Oaks Dam is a feature of the Santa Ana River Mainstream Project. A study showed that storage of dam floodwater would provide a minimum average of about 10,000 acre-feet of water per year. The dam was designed to resist an earthquake measuring 8.0 on the Richter scale, with any point able to sustain a displacement of four feet without causing any overall structural damage.

Wind Hazards

The City is subject to extremely high winds, which have resulted in significant property damage. For example, portions of roofs and block walls have been broken and blown away and public utility structures, such as power lines and traffic signals, have been damaged. The most significant wind problems occur at the canyon mouths and valleys extending downslope from the San Bernardino Mountains. The highest velocities are associated with downslope canyon and Santa Ana winds (90-100 mph). The Santa Ana wind conditions are a reversal of the prevailing southwesterly winds and usually occur on a region-wide basis during late summer and early fall. Santa Ana's are dry, warm winds that flow from the higher desert elevations in the north through the mountain passes and canyons. As they converge through the canyons, their velocities increase. Consequently, peak velocities are highest at the mouths of the canyons and dissipate as they spread across the valley floor. High winds exacerbate brush fire conditions.

Of the major fires in the San Bernardino Mountains, all have occurred during periods of high winds. New development in the foothill areas and valleys will expose buildings and population to significant wind hazards. The high wind velocity and property damage potential have resulted in the northern half of the City adjacent to the mountains being classified by the City as a "High Wind Area." In this area of the City, stringent conditions for the construction of buildings and public facilities are applied. Due to various topographic conditions, wind velocities vary throughout the City; however, building standards remain constant.

2.3 Risk Assessment Impact

Upon review of the risk assessment data, the City has:

- Urban and suburban population densities in many areas
- Significant building stock ranging from single-family detached homes to large businesses
- Unique commercial and institutional uses such as colleges, hospitals, and research facilities
- Many residential areas that are bordered by steep slopes containing high quantities of wildland fire fuel types mixed in with significant housing
- Transportation risks from its airport, railway, and pressurized fuel and natural gas lines.

Based on the these factors, the City has staffed and designed its response system to field an "Effective Response Force" to reported serious fires in buildings and wildland areas, and operates paramedics for emergency medical responses.

The City has an enhanced fire sprinkler ordinance in place requiring buildings in excess of 5,000 square feet that are replaced or remodeled to have automatic fire sprinklers. For the foreseeable future, San Bernardino will need both first-due firefighting unit and Effective Response Force (First Alarm) coverage in all parts of the City, consistent with national best practices. There are just not enough fire-sprinklered buildings or properties that can be defended against wildfire without a strong fire department response.

The Department's multi-unit force (First Alarm) is designed to stop the escalation of the emergency and keep it from spreading to greater alarms. This "informal" goal will be the foundation of updated deployment measures as part of this Standard of Response Cover process.

2.4 Existing City Deployment Staffing and Unit Count

2.4.1 Existing Deployment Situation—What the City Has in Place Currently

For this study, given that the Common Council has not adopted a response time policy, the response time benchmarks used by Citygate are those recommended by the National Fire Protection Association (NFPA) and the Commission for Fire Accreditation International (CFAI). Citygate is proposing that these benchmarks be used as the City's performance benchmarks for deployment. The performance marks are more consistent with actual data and achievable results.

The proposed benchmarks for San Bernardino are that an all-risk initial intervention unit (engine company or ladder truck company) will arrive at the scene of a critical emergency in 7 minutes

or less from the time of call receipt in the City's 9-1-1 dispatch center, 90% of the time. All the companies that make up the Effective Response Force should arrive at critical emergencies within 11 minutes, again from call receipt. In these two measures, the travel time is 4 minutes for the first unit and 8 minutes for the Effective Response Force (First Alarm) units. Benchmarks are defined as what the community would like to see as an optimal response time.

Critical emergencies are those immediately threatening to life or likely to cause severe property damage from fire. Crew turnout time is longer in critical emergencies because more protective clothing must be donned before the fire apparatus can respond. Thus, the CFAI-recommended total response time includes:

1. Sixty (60) seconds or less dispatcher processing time, when pre-arrival medical directions are not given to the caller
2. Sixty (60) seconds or less fire crew turnout time to medical incidents; 80 seconds for fire incidents
3. A travel (driving) time of 4 minutes for the first-due unit and 8 minutes for multiple units to severe emergencies.

The Department's current daily staffing plan is:

Table 2—2014 Daily Minimum Staffing per Unit for the City

Per Unit	Minimum		Extended Minimum
12 Engines @	3	Firefighters/day	36
2 Truck Companies @	3	Firefighters/day	6
Subtotal firefighters:			***42***
Battalion Chief	2	Per day for command	2
		Total:	**44**

This daily staffing is adequate for the immediate response fire risk needs presented in the more built-up urban areas of the City. However, for this staffing statement to be accurate for a building fire, the assumption is that the closest crews are available and not already operating on another emergency medical call or fire, which happens far too frequently as the incident statistics section of this study will show (Section 4). For example, if one engine and is committed to an EMS call, then an adjacent engine company or truck company must respond.

The Department has solid automatic and mutual aid partnerships with the surrounding fire departments that will send their closest units into San Bernardino if the City's units are committed to other emergencies.

2.4.2 City Services Provided

The San Bernardino Fire Department is an "all-risk" fire department providing the people it protects with services that include structure fire, paramedic first response, technical rescue, and first-responder hazardous materials response as well as other services.

Given these risks, the Department uses a tiered approach of dispatching different types of apparatus to each incident category. The dispatch center's computer-aided-dispatch (CAD) system, which selects the closest and most appropriate resource types, handles this function. In all, the dispatching system uses multiple unique resource-dispatching groups. As an example, here are the resources dispatched to common risk types:

Table 3—Resources Sent to Common Risk Types

Risk Type	Type of Resources Sent	Total Firefighters Sent
1-Patient EMS	1 Engine or Truck and 1 Private Ambulance	3 FF + 2 on Ambulance
Auto Fire	1 Engine	3 FF
Building Fire	5 Engines, 1 Ladder Truck, 2 Battalion Chiefs	20 FF
Wildland Fire	4 Engines, 2 Battalion Chiefs	14 FF
Technical Rescue	2 Engines, 1 Ladder Truck, 1 Heavy Rescue (USAR), 1 Battalion Chief	13 FF

Other Specialty Responses

The Department, via its own resources and mutual aid agreements, has access to these specialty units for unique incident types:

1. Urban Search & Rescue unit(s)
2. Hazardous Materials unit(s)
3. Air/Light Utility unit(s)
4. Water Tender unit(s)
5. Type III Brush Engines
6. A Crash or Aircraft Rescue & Firefighting apparatus (ARFF).

Finding #2: The Department has a standard response dispatching plan that considers the risk of different types of emergencies and pre-plans the response. Each type of call for service receives the combination of engine companies, truck companies, ambulances, and command officers customarily needed to handle that type of incident based on fire department experience.

2.5 Critical Time Task Measures—What Must be Done Over What Time Frame to Achieve the Stated Outcome Expectation?

In order to understand the time it takes to complete all of the needed tasks on a moderate residential fire and a modest emergency medical rescue, Citygate references national best practices and time-task information using standard operating procedures.

Given the high emergency incident workload in San Bernardino, this study did not require the Department to take personnel off-line to conduct their own critical task time trials. Therefore the following time-task evolutions are based on aggregate Citygate client data for similar California fire departments to demonstrate how much time the operations take. The following tables start with the time of fire dispatch notification and finish with the outcome achieved. There are several important themes contained in these tables:

1. The evolution results were obtained under best conditions, in that the day was sunny and moderate in temperature. The structure fire response times are from actual events, showing how units arrive at staggered intervals.

2. It is noticeable how much time it takes after arrival or after the event is ordered by command to actually accomplish key tasks to arrive at the actual outcome. This is because it requires firefighters to carry out the ordered tasks. The fewer the firefighters, the longer some task completion times will be. *Critical steps* are highlighted in ***grey*** in the table.

3. The time for task completion is usually a function of how many personnel are ***simultaneously*** available so that firefighters can complete some tasks simultaneously.

4. Some tasks have to be assigned to a minimum of two firefighters to comply with safety regulations. An example is that two firefighters would be required for searching a smoke-filled room for a victim.

The following tables of unit and individual duties are required at a First Alarm fire scene for a typical single-family dwelling fire. This set of duties is taken from standard operational procedures, which is entirely consistent with the usual and customary findings of other agencies

using the Standards of Response Cover process. No conditions existed to override the OSHA 2-in/2-out safety policy.

Shown below are the critical task times for a typical San Bernardino response to structure fires in built-up suburban areas with five engines, one ladder truck, and two battalion chiefs for a total of **20** personnel.

Scenario: *This was a simulated one-story residential structure fire with no rescue situation. Responding companies received dispatch information as typical for witnessed fire. Upon arrival they were told approximately 1,000 square feet of the home was involved in fire.*

Table 4—First Alarm Structure Fire – 20 Firefighters

Task Description	Task Clock Time	Elapsed Time from 9-1-1
Time of call	00:00	00:00
Dispatch	02:31	
Crew turnout	02:11	
Travel to scene	06:18	11:00
First-due engine on scene		11:00
Forcible entry	01:14	
Attack team entry pre-connect	01:40	
2nd engine on scene / water supply	01:45	
First unit walk around size-up	01:46	
3rd engine on scene / primary search	02:21	13:21
4th engine on scene	02:55	
Battalion Chief on scene / command	03:20	
Attack line advanced to interior	03:23	14:23
Ladder truck on scene / ventilation	04:43	
5th engine on scene rapid intervention crew	04:55	
2nd BC on Scene Safety Officer	05:00	
Water Supply to attack pumper	05:04	
Back-up fire attack line	06:12	
Ladder to roof	07:46	
Positive pressure ventilation set-up	08:04	
Primary search completed, no victims	09:26	20:26
Secure utilities	11:03	
Vertical ventilation complete in roof	12:20	
Fire under control	12:25	
Total Time to Control:	***12:25***	**23:25**
Total Personnel:	20	

The above duties grouped together to form an *Effective Response Force or First Alarm assignment*. Remember that the above discrete tasks must be performed simultaneously and effectively to achieve the desired outcome; arriving on-scene does not stop the escalation of the emergency. While firefighters accomplish the above tasks, the clock keeps running, and has been since the emergency first started.

Fire spread in a structure can double in size during its free burn period. Many studies have shown that a small fire can spread to engulf the entire room in less than four to five minutes after free burning has started. Once the room is completely superheated and involved in fire (known as flashover), the fire will spread quickly throughout the structure and into the attic and walls. For this reason, it is imperative that fire attack and search commence before the flashover point occurs, if the outcome goal is to keep the fire damage in or near the room of origin. In addition, flashover presents a serious danger to both firefighters and any occupants of the building.

For comparison purposes, the critical task table below reviews the tasks needed on a typical automobile accident rescue.

Scenario: *This was a simulated two-vehicle accident, with two patients, one of whom was trapped. Extrication required total removal of the driver's door. A standard response of one engine, one ladder truck, one ambulance, and one battalion chief responded with a total of 9 personnel.*

Table 5—Multi-Casualty Traffic Collision – 9 Personnel

Task Description	Task Clock Time	Elapsed Time from 9-1-1
Pre-arrival response time		11:00
First-due engine on scene	00:00	
Size up, 360 degree survey	00:54	
Patient #1 contact	01:15	12:15
1st Truck on scene	01:39	
Protection hose line in place	01:56	
Battalion Chief on scene / command	02:12	
Patient #2 contact	02:21	13:21
Patient(s) stabilization	03:39	
Patient #2 removal	03:39	14:39
Heavy rescue on scene / extrication of trapped patient	03:47	
Extrication need determined and assigned to ladder truck	02:30	
Vehicle stabilized	04:16	
Patient care assigned to ambulance crew	05:29	
Extrication team with tools ready to begin	05:24	
Door removed	07:38	
Patient #1 removed and in full c-spine	09:13	
Total Time to Begin Transport:	***09:13***	**20:13**
Total Personnel:	9	

2.5.1 Critical Task Analysis and Effective Response Force Size

What does a deployment study derive from a response time and company task time analysis? The total task completion times (shown above) to stop the escalation of the emergency have to be compared to outcomes. We know from nationally-published fire service "time vs. temperature" tables that after about four to five minutes of free burning, a room fire will grow to the point of flashover. At this point, the entire room is engulfed, the structure becomes threatened and human survival near or in the fire room becomes impossible. Additionally, we know that brain death begins to occur within four to six minutes of the heart having stopped. Thus, the Effective Response Force must arrive in time to stop these catastrophic events from worsening.

The response and task completion times discussed above show that the residents of San Bernardino are able to expect positive outcomes and have a chance of survival in a *serious* fire or medical emergency—if enough units are available to immediately respond.

The point of the tables above is that mitigating an emergency event is a team effort once the units have arrived. This refers back to the "weight" of response analogy. If too few personnel arrive

too slowly, then the emergency will worsen instead of improve. Control of the structure fire incident still took 12:25 minutes after the time of the first unit's arrival, or 23:25 minutes from fire dispatch notification.

In the City, the quantity of staffing and the time frame it arrives in can be critical in a serious fire. Fires in older and/or multi-story buildings could well require the initial firefighters to rescue trapped or immobile occupants. If a lightly-staffed force arrives, it cannot simultaneously conduct rescue and firefighting operations.

Fires and complex medical incidents require that the other needed units arrive in time to complete an effective intervention. Time is one factor that comes from ***proper station placement***. Good performance also comes from ***adequate staffing*** and training. However, major fires and medical emergencies where the closest unit is not available to respond still challenge the City's response system to deliver good outcomes. This factor **must** be taken into account when fire station locations are considered.

Previous critical task studies conducted by Citygate, the Standard of Response Cover documents reviewed from accredited fire departments, and NFPA 1710 recommendations all arrive at the need for 15+ firefighters arriving within 11 minutes (from the time of call) at a room and contents common house fire to be able to ***simultaneously and effectively*** perform the tasks of rescue, fire attack, and ventilation. Given that the Department sends 20 personnel to an incident involving a working First Alarm building fire, the City and its leaders understand that firefighting crews arriving closely together are needed to deliver a positive outcome that protects lives and property by stopping the escalation of the emergency as found by the arriving force.

It begs the question, "If fewer firefighters arrive, *what* from the list of tasks mentioned would not be done?" Most likely, the search team would be delayed, as would ventilation. The attack lines would only have two firefighters, which does not allow for rapid movement above the first-floor deployment. Rescue is done with only two-person teams per Cal/OSHA safety regulations; thus, when rescue is essential, other tasks are not done in a simultaneous, timely manner. Remember what this report stated in the beginning: effective deployment is about the **speed** *(travel time)* and the **weight** *(firefighters)* of the attack.

The City struggles to meet the staffing challenge by staffing each unit with 3 personnel, which is not consistent with the NFPA 1710 recommended staffing, as well as being compliant at the first unit arrival with the OSHA 2-in/2-out requirement. In April 2010, the National Institute of Standards and Technology (NIST) published a fire crew staffing study titled "Report on Residential Fireground Field Experiments."

The first-of-its-kind NIST study used multiple standardized actual fire scenarios to measure the effectiveness of different fire crew per apparatus sizes. The NIST study found in summary:

> *"The four-person crews operating on a low-hazard structure fire completed all the tasks on the fireground (on average) seven minutes faster—nearly 30%—than the*

two-person crews. The four-person crews completed the same number of fireground tasks (on average) 5.1 minutes faster—nearly 25%—than the three-person crews."

Twenty initial firefighters (5 engines, 1 ladder truck, and 1 battalion chief) can handle a serious risk house fire; however, even an Effective Response Force of 20 will be seriously slowed if the fire is above the first floor, in a low-rise apartment building, or commercial/industrial building. A severe wildfire also requires an immediate and heavy staffing response to control the fire to the first few acres. This is also where the capability to add alarms (more staffing) to the standard response becomes important.

The current City First Alarm (Effective Response Force) of 20 personnel to a building fire reflects the City's goal to confine serious building fires to or near the room of origin and to prevent the spread of fire to adjoining buildings. This is a typical desired outcome in built-out areas and requires more firefighters, more quickly, than the typical rural outcome of keeping the fire to the building, not room, of origin.

Given the Department's current response to building fires, it is in effect the City's de-facto deployment measure to built-up urban areas. Thus, this becomes the baseline policy for the deployment of firefighters.

2.5.2 San Bernardino Emergency Unit Staffing

The twelve engine companies and two ladder trucks are staffed on a daily basis with a minimum staffing of three firefighters. The two ladder trucks have the same staffing requirements as the engine companies. The daily minimum shift staffing count is 42 firefighters plus two battalion chiefs for incident command and safety officer functions. Per NFPA 1710, a minimum of 15 firefighters plus a command chief are required for a typical room and contents fire in a home in a suburban area. For a single-patient EMS event, one fire company plus an ambulance is needed. Given that, the daily staffing depth of the Department is adequate to handle two simultaneous modest house fires and a medical emergency before relying on mutual aid.

However, when the City staffed the fire apparatus with four personnel each, it only needed to send three, not five, engines to a house fire. Stated this way, to gain enough personnel to *safely* confine serious fires, with engines staffed with three, not four, any one serious fire consumes more resources. This would not be as much of an issue in a suburban area with infrequent fires and a modest frequency of medical emergencies. However, San Bernardino is an urban area and due to its risks, population density, and socioeconomics, it experiences a very high volume of fires and, at peak hours of the day, simultaneous medical incidents. As such, during periods of every day, the Department only has one effective multi-unit fire response force available as the other units are on medical incidents.

Large, busy fire departments—such as San Diego, Los Angeles, Oakland, San Jose, and San Francisco to name a few—staff apparatus with four personnel each. The staffing of units with 4-firefighters each in San Bernardino was entirely the correct thing to do—*when the City could afford it.*

When the fiscal crisis hit, the City *also made the correct* reduction in force decision to drop to three firefighters per unit, as a way to keep every neighborhood fire station open as a first responder. But as the economy worsened and more people became unemployed or under-employed without health insurance, the emergency medical demand significantly rose, as the incident statistics section of this study will explain.

As Citygate will explain after our geographic and incident demand analysis sections, the City has to "restore" some fighting capacity and, short of adding more personnel it cannot afford, it has to reduce the emergency medical incident response burden to free up firefighting, hazardous materials, and technical rescue response resources.

Finding #3: Apparatus staffing at 3 firefighters per engine and ladder truck is light for a city with San Bernardino's risks and emergency incident volumes. Thus, it is not in alignment with delivering an effective force to keep fires below the greater alarm and/or conflagration point while also providing high levels of emergency medical response.

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SECTION 3—GEO-MAPPING ANALYSIS

3.1 DISTRIBUTION AND CONCENTRATION STUDIES—HOW THE LOCATION OF FIRST-DUE AND FIRST ALARM RESOURCES AFFECTS THE OUTCOME

The City of San Bernardino is served today by twelve fire stations. As part of this deployment study, it is appropriate to understand what the existing stations do and do not cover, if there are any coverage gaps needing one or more stations, and what, if anything, to do about them. Given the City's fiscal crisis and the age of some of its oldest fire stations with resultant repair needs, it is critical for San Bernardino to consider how many fire stations are needed and where they should be located, given the 50-year investment cycle when fire stations are replaced.

In brief, there are two geographic perspectives to fire station deployment:

1. **Distribution** – the spreading out or spacing of first-due fire units to stop routine emergencies.

2. **Concentration** – the clustering of fire stations close enough together so that building fires can receive sufficient resources from multiple fire stations quickly. This is known as the **Effective Response Force**, or, more commonly, the "First Alarm Assignment"—the collection of a sufficient number of firefighter's on-scene delivered within the concentration time goal to stop the escalation of the problem.

To analyze first-due fire unit travel time coverage for this study, Citygate used a geographic mapping tool called *FireView*^{TM} that can measure theoretical travel time over the street network. For this next portion of the study, Citygate used the base map and street travel speeds calibrated to actual fire company travel times from previous responses to simulate real world coverage. Using these tools, Citygate ran several deployment tests and measured their impact on various parts of the City. The travel time measure used was 4 and 5 minutes over the road network, which is consistent with the "benchmark" recommendations and desirable outcomes in critical emergencies. When a minute is added for dispatch time and 2 minutes for crew turnout times, then the maps effectively show the area covered within 7 minutes for first-due and 11 minutes for a First Alarm assignment.

3.1.1 Community Deployment Baselines

Map #1 – General Geography and Station Locations

This view shows the existing City fire station locations within the City boundaries. This is a reference map view for the other map displays that follow. Also displayed are nearby fire stations in other communities that are part of the Department's automatic aid response system.

Map #2 – Risk Assessment – Wildfire Hazards, ISO Surveyed Buildings and Population

Risk assessment is an effort by the Fire Department to classify properties by potential impact on service demand levels. In this study, commercial building fire risk was examined by understanding the locations of the higher fire flow buildings as calculated by the Insurance Service Office (ISO) as a measure of how zoning locates the educational, commercial, and industrial uses in the City. These higher fire flow sites (≥2,000 gpm) are the buildings that must receive a timely and effective First Alarm force to serious fires, thus requiring more firefighters in fewer minutes should a serious fire emerge. Most of these higher fire flow buildings are along the major road corridors and central core of the City.

Also displayed is the wildland fire high hazard along the entire northern edge of the City, as well as an open space pocket south of Stations 225 and 227.

The multi-color under layer displays population density in thousands per square mile using census data. The darker the color, the higher the population density. For emergency medical incidents, population drives calls for service. When this map is compared to a later map on medical incident locations, it will be obvious why Stations 221, 224, and 226 are the busiest in the City.

The Commission on Fire Accreditation International defines these population densities:

Table 6—Population Density Definitions

Area	Population Density
Metropolitan	≥ 3,000 people per square mile, or overall city population >200,000
Urban	≥ 2,000 people per square mile
Suburban	≥ 1,000 to 2,000 people per square mile

Based on these definitions, most of the City's built-up areas contain much more than 1,000 people per square mile and there are three areas with the range of 15,000 to 20,000 per square mile. Based on the areas exceeding 3,000 per square mile and the City's resident population of 211,614, San Bernardino is a metropolitan area in terms of fire protection risks.

In Citygate's experience, the only place where densities exceed 20,000 people per square mile is where there are residential high-rise buildings. The census population counts *do not* include the "mobile" populations the Fire Department must protect such as the employment base, travelers on the freeway or railroads, and visitors to open space recreation areas.

Map #3 – First-Due Unit Distribution 4-Minute Engine Travel

This map shows, in green colored street segments, the *distribution* or first-due response time for each station per a best-practice-recommended response goal of 4 minutes *travel* time which is the NFPA #1710 best practice recommendation for career fire departments in urban areas. Therefore, the limit of color per station area is the time an engine could reach within this time, ***assuming*** it is in-station and encounters no unusual traffic delays. In addition, the computer uses mean fire company speed limits per roadway type. Thus, the projection is optimal or "perfect-world."

Real dispatch data to be discussed in the next section *shows* response times to be a slower in most all areas. This is due to the effects of simultaneous incidents, the non-grid street design layout, and the upslope hilly areas. The purpose of computer response mapping is to determine and balance station locations. This geo-mapping design is then checked in the study against actual dispatch time data, which reflects the real world. There also should be some overlap between station areas so that a second-due unit can have a chance of an adequate response time when it covers a call in another fire company's first-due area.

It is not possible to serve every road segment out to the edge of the City's urban/suburban areas in 4 travel minutes.

Finding #4: Using the current twelve fire station locations, not all of the urban density developed areas are within 4 minutes travel time of a fire station. Given actual incident workloads, this is a significant issue in the core of the City between Stations 221, 222, 224, 226 and north of 226.

Map #3a – First-Due Unit Distribution 5-Minute Engine Travel

Citygate finds that determining station placement at 4 minutes travel is very difficult in all but dense, urban core, high-rise building areas on a grid type street design. With non-grid streets, and challenging topography, a station placement at 5 minutes is more cost-effective to achieve. Thus, absent adopted City policy on response times, this map measures the coverage from the existing stations at 5 minutes travel time.

With just one more minute of travel time, all of the interior area and much of the edge areas are within 5 minutes of an existing fire station.

Map #3b – First-Due Unit Distribution 5-Minute Engine Travel With Overlap

The dark color shows where two or more stations overlap at 5 minutes. This is necessary for both multi-unit response to serious fires, as well as back-up unit response when simultaneous incidents occur in one station area. The overlap at 5 minutes is very good in the core of the City and occurs with less frequency in some of the outer areas.

Map #3c – First-Due Unit Distribution 6-Minute Engine Travel With Overlap

Finally this map measures coverage at 6 minutes travel. While 6 minutes is too long for effective outcomes in the most serious emergencies, this measure shows that most of the higher population density areas could receive coverage overlap coverage within 6 minutes from two or more stations, which again is very effective and necessary overlap of units.

Map #4 – ISO Coverage Areas

This map exhibit displays the ISO requirement that stations cover a 1.5-mile travel distance. This makes it easier to see what the traditional 1.5-mile measure covers. Depending on the road network in a department, the 1.5-mile measure usually equates to a 3.5- to 4-minute travel time. However, a 1.5-mile measure is a reasonable indicator of station spacing and overlap. As can be seen, the ISO coverage is similar but less forgiving than the 4-minute travel time measure. This is due to the fact that a "distance" based measure cannot account for higher speeds on freeways and primary arterial streets that feed out into the neighborhoods.

Viewed from this measurement, the City core is not completely covered north of Station 221 and southwest of Station 226.

Maps #5 – Concentration (First Alarm) With One Ladder Truck and One Battalion Chief

This map exhibit shows the *concentration* or massing of fire crews for serious fire or rescue calls. Building fires, in particular, require 15+ firefighters (per NFPA 1710) arriving within a reasonable time frame to work together and effectively to stop the escalation of the emergency. Otherwise, if too few firefighters arrive, or arrive too late in the fire's progress, the result is a greater alarm fire, which is more dangerous to the public and the firefighters.

The concentration map exhibits look at the City's ability to deploy five of its engine companies, one truck company, and two chief officers to building fires within 8 minutes travel time (11 minutes total Fire Department response time from 9-1-1 answer). This measure ensures that a minimum of 20 firefighters (three firefighters per engine, three firefighters per ladder truck, and two chiefs for incident command) can arrive on-scene to work ***simultaneously*** and effectively to stop the spread of a modest fire.

The colors in this map show the area in **green** where the City's current fire deployment system should deliver the initial Effective Response Force.

As can be seen, only the core of the City is within 8 minutes of the entire Effective Response Force. This is due to both station spacing and the need to send five engines initially (to have sufficient staffing) on each working building or wildland fire.

Finding #5: The coverage of the Effective Response Force (First Alarm) to serious fires is only adequate in the core of the City and, as such, is inadequate in outer City areas with commercial buildings and/or high wildland fire risks.

The next series of maps will "take apart" the First Alarm unit coverage by apparatus type to see what unit locations do or do not limit the full First Alarm coverage.

Map #6 – Engines Only at 8-Minute Travel

This map shows a different view of concentration by only showing the 8-minute coverage of 5 engine companies. Here, the green color shows the areas receiving five engines in 8 minutes travel time. This coverage is not much better than in Map #5 because, even with the battalion chiefs and one ladder truck removed, and there is only so much of the City given its layout that five engines can reach in 8 minutes travel.

Map #7 – Battalion Chief Travel at 8-Minutes

This map displays the battalion chief coverage from Stations 221 and 224. At 8 minutes travel time, it is not possible to cover the outer areas of the City. However, as other maps will show, the core of the City experiences a high incidence of building fires and these events are time-sensitive for the arrival of the Incident Commander and Safety Officer.

Map #8 – Single Ladder Truck Coverage

This map displays the 8-minute travel time coverage from either of the two ladder trucks located at Stations 221 and 224. It shows that all but the less-built-up northwest and northeast corners of the City are within reach of one ladder truck at 8 minutes travel.

Finding #6: Improving ladder truck coverage to the outer areas of the City would require the addition of two ladder trucks or the use of Quints (engine and aerial ladder combined apparatus) instead of engines in Stations 225 and 228.

Map #9 – All Incident Locations

This map is an overlay of the exact location for all incident types using a 2-year data set. It is apparent that there is a need for Fire Department services on almost every street segment of the City. The greatest concentration of calls is also where the greatest concentration of Fire Department resources is available. Given the Department's mutual and automatic aid partnerships, also shown are the locations outside the City where San Bernardino units responded.

Map #10 – EMS and Rescue Incident Locations

This map further breaks out only the emergency medical and rescue call locations. Again, with the majority of the calls for service being emergency medical, virtually all areas of the City need emergency medical services, with the greatest need being where population densities are the highest.

Map #11 – All Fire Type Locations

This map identifies the location of all fires in the City over the previous 2 years. All fires include any type of fire call, from auto to dumpster to building. There are obviously fewer fires than medical or rescue calls. Even given this, it is evident that all first-due engine districts experience fires; the fires are more concentrated where the Fire Department resources are more concentrated.

Map #12 – Structure Fire Locations

This map is similar to the previous map, but only displays structure fires for the 2-year data set. While the structure fire count is a smaller subset of the total fire count, there are two meaningful findings from this map. There are still structure fires in every first-due fire company district. The location of many of the building fires parallels the higher risk buildings in commercial areas, along with the higher density housing sections of the City. These areas and buildings are of significant fire and life loss risk to the City. Fires in the more complicated building types must be controlled quickly or the losses will be very large. Fortunately, concentration (First Alarm) coverage is adequate in most of these areas of the City.

Map #13 – Hot Spots for All Incident Locations

Using the 2-year data set, this map examines by mathematical density where clusters of incident activity occurred. In this set, the darker density color plots represent the highest concentration of all incidents. This type of map makes the location of frequent workload more meaningful than just mapping the dots of all locations as done in Map #9.

This perspective is important for understanding the overlap of units and ensuring the delivery of a good concentration for the Effective Response Force. When this type of map is compared with the concentration of units shown on Map #5, the best concentration should be where the greatest density of calls for service occurs. For the City, this occurs primarily where development density is the greatest—in the core—but also in separate areas north of Station 226, east of Station 227, and around Station 228.

Map #14 – EMS and Rescue Incident Location Densities

This map is similar to Map #14, but only the medical and rescue hot spots of activity are plotted. The clusters of activity look very similar to the all-incident set in Map #13 because medical calls are such a large part of the total.

Map #15 – All Fire Location Densities

This map shows the hot spot activity for all fires. In this case, the call for service density is slightly more scattered, reflecting small fires, such as auto fires in areas where the population density is the highest. Of note in this measure are the density spots north of Station 226 and 227, which also have very high emergency medical incident demands.

Map #16 – Structure Fire Densities

This map shows only the building fire workload by density. The density is less scattered than the EMS density that follows the highest population per square mile. These building fire densities indicate a structure fire workload primarily in the core of the City and north of Station 226.

Maps #17 – 19 – Mutual Aid and Special Issues Analysis

This next series of maps will be used in Section 5 where an analysis is conducted on the possibilities to close one or more fire stations due to the City's economic crisis.

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SECTION 4—STATISTICAL ANALYSIS AND OVERALL DEPLOYMENT RECOMMENDATION

4.1 HISTORICAL EFFECTIVENESS AND RELIABILITY OF RESPONSE—WHAT STATISTICS SAY ABOUT EXISTING SYSTEM PERFORMANCE

The map sets described in Section 3 show the ideal situation for response times and how responses might look under perfect conditions with no competing calls, light traffic conditions, units all in place, and no simultaneous calls for service. Examination of the actual response time data in this section will provide a picture of how response times are in the "real" world of simultaneous calls, rush hour traffic conditions, units out of position, and delayed travel time for hazards such as those caused by severe weather.

4.1.1 Data Set Identification

The San Bernardino Fire Department provided incomplete National Fire Incident Reporting System (NFIRS version 5) incident data, and more comprehensive computer-aided-dispatch (CAD) apparatus response data, for the time period 1/1/2012 – 12/31/2013. The NFIRS 5 data was loaded for the two years and resulted in only 6,515 incidents being matched to dispatch incident records, which is very unusual in Citygate's experience over the last decade.

Atypically, San Bernardino Fire Department policy dictates that "Medical Call" incidents need not be entered into the NFIRS 5 state and federal systems. Also, it appears that many other CAD incident classes frequently fail to generate a matching NFIRS 5 incident record. Missing records were found in incident classes including "Fire Alarm," "Structure Fire," "Fire-Other," "Vegetation Fire," "Investigate Smoke," "Other Call," "Rescue Incident," "Transportation Vehicle Incident," and "Trash Fire."

When the CAD data was combined with incidents, San Bernardino logged 55,473 distinct incidents for the 2-year period. Under the present system, only 11.74% of incidents are being documented with NFIRS 5 data.

It is likely that many unreported CAD incident classes were false alarms, good intent (accidental alarms), or "cancelled en route" responses. It appears from the data that many non-EMS incidents are not being reported, being reported after long delays, or being reported inconsistently with missing data.

Best practice is to consistently report every incident, regardless of incident type, in NFIRS 5 data. NFIRS 5 data has long been recognized as the primary legal and operational record of fire department activity. It should be considered essential for official documentation, legal system requests, local recordkeeping, and operational analysis. Even for EMS events, the NFIRS system captures data such as the type of property classification and other factors about the causation of

the incident that the County EMS Patient Care reporting system does not and was never intended to capture. Simply requiring fire crews to use the County patient care report (ePCR) on EMS events is insufficient and not done in the majority of fire departments. Fire Chief Avery has already noticed this situation and has started policy change and oversight steps to correct it. However, it will take time, command team oversight, and good electronic data systems to change the culture to recognize record keeping as a high priority.

Finding #7:	The Fire Department must insist and follow-up on the requirement that all incidents are reported fully and accurately in the NFIRS 5 reporting system.

4.1.2 Analysis Period

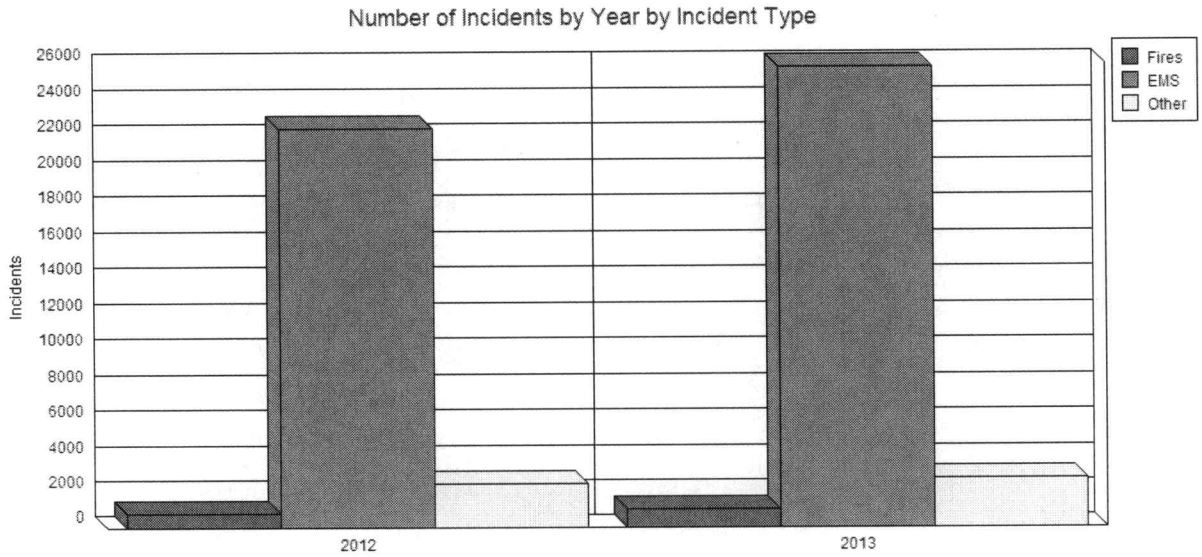
The data examined is for calendar years 2012 and 2013. Demand trends were tracked for this 2-year period. Unless otherwise noted, *response time performance* measurements were based on the latest 2013 data. In early 2012, the City implemented a new computer aided dispatch (CAD) system from a vendor called New World. It is possible that some of the dispatch and crew turnout times right after the conversion as reported below could be partially flawed, in that some dispatch time is actually listed as turnout time and vice versa. However, given the large number of incidents per year, any small variance early in the two years would not significantly affect the overall response time trends used for policy analysis in this study.

Service Demand

Service demands are broken down into specific incident types. Due to the lack of NFIRS records, types of properties and other classifications about incidents are not available for this study.

In 2013, the San Bernardino Fire Department responded to 29,680 incidents, or an average of 81.31 incidents per day (or 3.9 per hour). The majority of responses (87.27%) were to EMS incidents; the rest were to fires and other specialty responses. The number of EMS incidents rose significantly from 2012 to 2013 as seen in the graph below:

Figure 4—EMS Incidents by Year



Next is a breakdown of dispatch call types by year. Notice the very heavy representation of EMS incidents. It must be also noted that "as dispatched" call types can vary somewhat from how the incident actually turned out or "closed." For example, units can be dispatched to a building fire that turns out to be BBQ smoke, a dumpster fire not close to the building, or a car fire in a parking lot. This is another reason that is critical that the Department complete the NFIRS reports, which capture "closed" incident types.

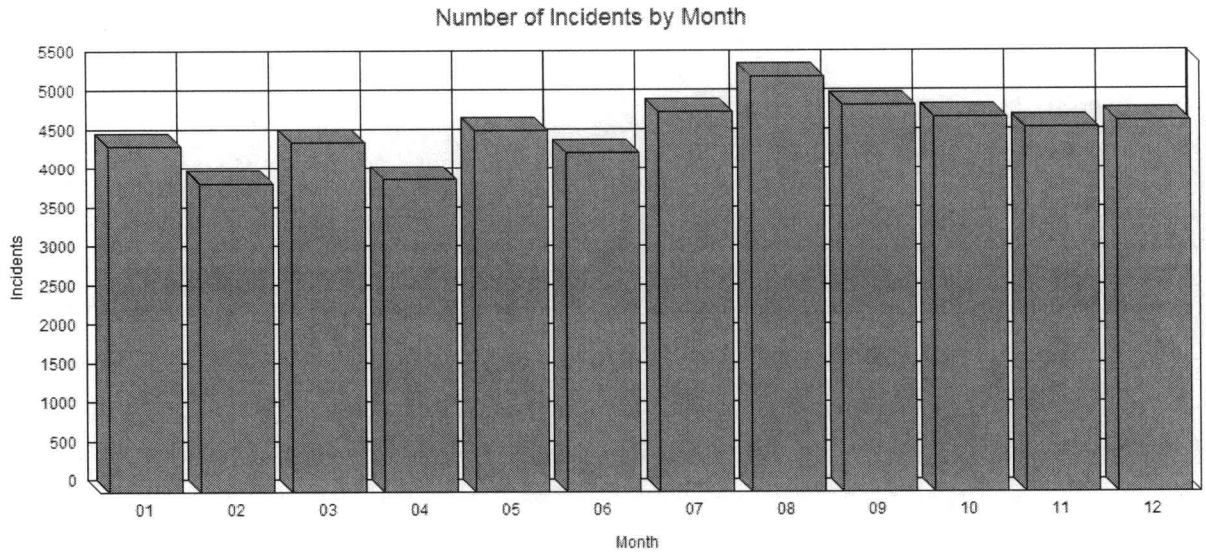
Table 7—Incidents: Count – Year by CAD Call Type

CAD Call Type	2012	2013	Totals
Medical Call	22,486	25,904	48,390
Fire Alarm	1,046	1,251	2,297
Investigate Smoke	496	509	1,005
Fire--Other	367	352	719
Vegetation Fire	288	400	688
Other Call	311	365	676
Structure Fire	286	317	603
Transportation Vehicle Incident	248	261	509
Trash Fire	168	188	356
Hazardous Materials Incident	45	54	99
Rescue Incident	37	47	84
-Blank-	15	32	47
Totals	25,793	29,680	55,473

4.1.3 Breakdown of Incident Demand Over Time

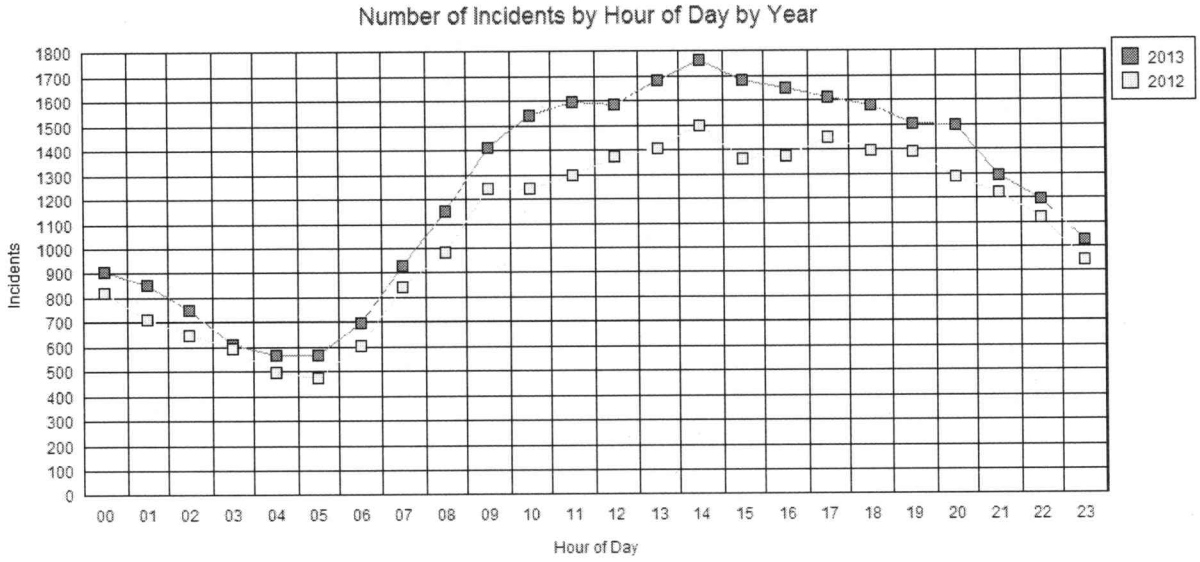
The chart below illustrates the number of incidents by month. The graph illustrates the trending for each month is fairly consistent.

Figure 5—Number of Incidents by Month



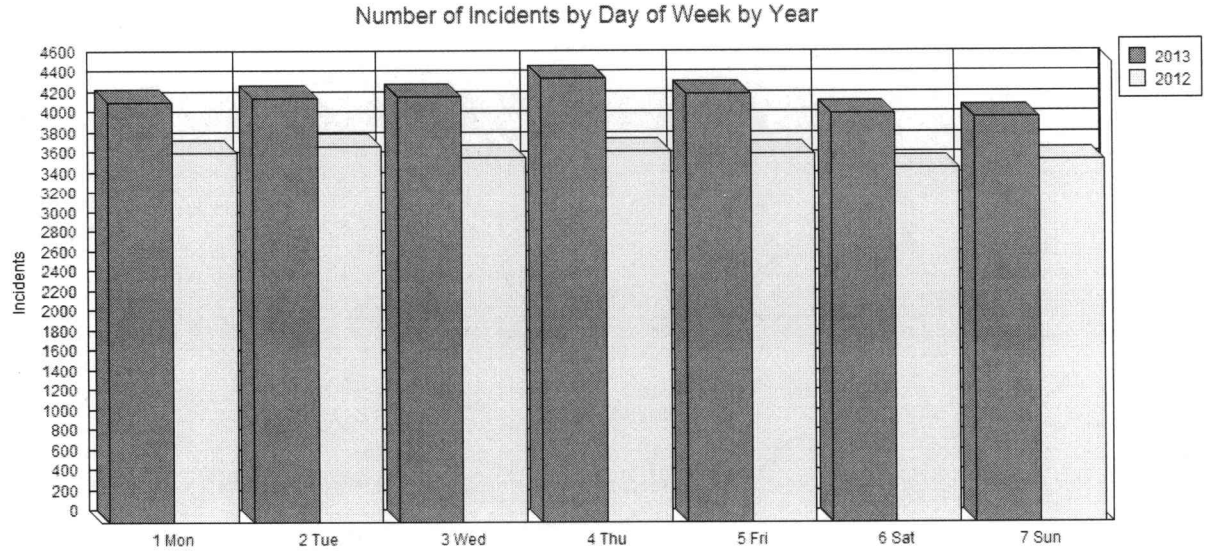
The next graph compares incident activity by hour of day. The graph follows traditional fire department activity hours, but in San Bernardino's case the off-peak hours after midnight are still higher in volume than all but the busiest metropolitan fire departments in their core population areas.

Figure 6—Number of Incidents by Hour of Day by Year



Incident activity by day of week remains fairly consistent with a slight decline on the weekend:

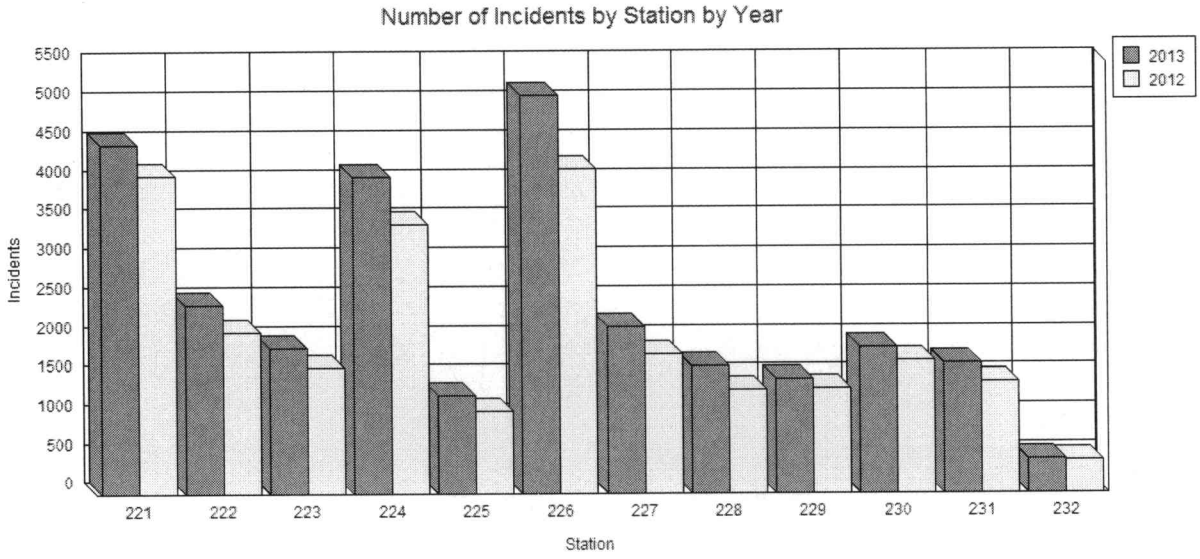
Figure 7—Number of Incidents by Day of Week by Year



4.1.4 Breakdown of Incident Demand by Station Area

For total incident type demand, Stations 221, 224, and 226, are the most active. The following graph illustrates the 2-year trend by breaking down station activity by year. It appears that the greatest increase in year-to-year activity focused on those stations with the most activity. Station 226 saw the largest jump in activity.

Figure 8—Number of Incidents by Station by Year



Finding #8: The City's time of day, day of week, and month of year calls for service demands are very consistent. This means the City needs to operate a fairly consistent 24/7/365 response system. Peak activity units would only be cost-effective when high call volumes can be reasonably predicted in the core areas.

Station Demand Percentage

The following is a summary of overall activity percentage by station for all incidents in 2013. The percentage listed is the percentage likelihood a particular station is involved in an incident at any given time. This number considers not only the number of incidents, but also the length of incidents. The busiest stations are listed first.

Notice Station 226 is active more than 20% of the time. With only a single company, Station 226 must rely on a disproportionate number of resources from surrounding fire station areas:

Table 8—Incident Activity per Station

Station	Overall	Incidents
226	21.41%	5,101
221	18.52%	4,475
224	16.80%	4,063
222	10.08%	2,435
227	9.51%	2,138
228	7.95%	1,641
230	7.90%	1,868
223	7.81%	1,881
231	7.11%	1,666
229	7.04%	1,472
225	5.79%	1,265
232	2.30%	453

Unit Hour Utilization

Here is a unit hour utilization summary for engines and ladders in 2013. Unit hour utilization is a measure of how much, per hour and per shift, units are assigned and thus out of service on incidents. Units cannot move from incident to incident forever in a 24-hour shift. Crews also need meal break times and have to maintain the apparatus, refuel, resupply, and conduct training.

There are no firm published guidelines for UHU levels for fire units; however, as Citygate has observed, and as some studies have noted, engine or ladder truck UHUs above 15% become very problematic for meeting response time goals. UHU's above 10% can occasionally impact response times. As for ambulances, some published studies submit that a UHU between 35-46% is economically efficient. Citygate and others have observed that if a resource's UHU is greater than 45%, the unit is often not available and response times suffer. However, these measures are very sensitive to each community's road network, severity of incidents, the number of hospitals, and the turnaround time at hospitals to transfer patient care. In San Bernardino, the following

table illustrates how high incident demand is generating punishing UHU rates on more than one unit:

Table 9—Unit Hour Utilization of Apparatus

Vehicle	Overall	Responses
ME226	**19.73%**	4,594
ME221	**18.52%**	4,342
ME224	**18.13%**	4,296
ME222	**13.77%**	3,112
ME223	**10.64%**	2,464
ME230	**10.57%**	2,225
ME228	**10.26%**	2,354
ME227	**10.00%**	2,268
ME231	9.25%	1,942
ME229	8.95%	1,737
ME225	7.82%	1,750
MT221	7.15%	1,513
ME232	6.58%	761
MT224	6.32%	1,497
ME241	5.21%	1,331
MT241	1.16%	272

The next table is a picture of a large MS-Excel UHU table by hour for the City's fire units. A more readable full size table is attached as Appendix 1. The takeaway from the image below is the color and depth of units with very high UHUs over a long period of the daylight hours. As the color goes from green (low) usage to red (high) usage it can be seen that during mid-afternoon, all but three fire units have UHUs above 15% and 8 are above 30% with three of those above 40%. Second, in most departments, the high UHUs are more typically from late morning to just after evening rush hour. In San Bernardino they are from 7 am to after midnight for the core stations.

Stated this way, the band of orange to red should be less wide and not nearly so deep to allow more units to be available mid-day. This level of so many units, so busy, in contiguous station areas is very unusual in Citygate's experience for a city or even core city area of San Bernardino's size.

Table 10—Unit Hour Utilization by Hour

Unit/Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Overall
ME226	17%	16%	15%	13%	11%	15%	16%	14%	18%	21%	22%	26%	22%	25%	26%	22%	25%	19%	24%	25%	24%	20%	19%	16%	20%
ME221	13%	15%	12%	10%	7%	8%	13%	15%	19%	18%	20%	22%	26%	23%	41%	23%	27%	20%	21%	23%	18%	18%	17%	17%	19%
ME224	12%	15%	10%	13%	8%	8%	12%	13%	14%	17%	17%	20%	21%	22%	44%	23%	26%	22%	23%	21%	19%	21%	18%	13%	18%
ME222	8%	10%	9%	6%	7%	7%	8%	11%	11%	16%	15%	17%	14%	16%	33%	20%	20%	17%	18%	16%	16%	13%	10%	13%	14%
ME223	7%	7%	8%	8%	4%	5%	6%	7%	10%	10%	10%	13%	13%	11%	28%	13%	14%	14%	14%	13%	13%	9%	10%	8%	11%
ME230	4%	7%	7%	5%	3%	4%	7%	6%	8%	9%	12%	12%	14%	16%	41%	13%	15%	13%	13%	11%	9%	11%	8%	6%	11%
ME228	9%	6%	5%	7%	6%	4%	6%	7%	9%	9%	11%	14%	9%	12%	31%	12%	14%	12%	13%	10%	15%	10%	9%	7%	10%
ME227	7%	8%	7%	6%	5%	5%	6%	9%	10%	12%	13%	15%	14%	14%	11%	11%	13%	12%	11%	12%	11%	11%	8%	7%	10%
ME231	6%	8%	4%	4%	3%	4%	7%	6%	9%	10%	10%	12%	8%	15%	30%	15%	11%	10%	12%	10%	9%	7%	6%	7%	9%
ME229	6%	7%	5%	4%	5%	3%	5%	6%	8%	8%	8%	12%	8%	10%	31%	13%	12%	9%	12%	11%	8%	8%	6%	9%	9%
ME225	7%	4%	5%	3%	5%	4%	4%	5%	9%	9%	10%	12%	11%	9%	11%	9%	12%	10%	9%	7%	10%	10%	7%	5%	8%
MT221	3%	3%	6%	3%	2%	1%	6%	3%	6%	7%	9%	10%	11%	12%	26%	9%	11%	8%	8%	7%	6%	6%	3%	4%	7%
ME232	7%	4%	2%	10%	2%	2%	5%	3%	5%	4%	7%	6%	10%	7%	33%	5%	12%	6%	5%	5%	4%	5%	5%	3%	7%
MT224	4%	5%	4%	5%	3%	1%	3%	3%	5%	8%	7%	10%	10%	10%	10%	10%	13%	8%	9%	6%	8%	5%	5%	2%	6%
ME241	3%	2%	1%	1%	1%	1%	3%	2%	4%	4%	6%	8%	4%	4%	25%	10%	12%	7%	6%	5%	5%	4%	3%	2%	5%

As simultaneous incidents occur in the core of the City, more outer City area units are drawn into help. After a certain point, units are going from call to call anywhere in the City and, as will be shown in the next section, response times suffer accordingly. This next table shows the counts when a fire unit responds to any of the station areas. As can be seen, many of the units are drawn into other areas to assist the busiest core areas:

Table 11—Unit Arrival Count by Station Area

Vehicle ID	221	222	223	224	225	226	227	228	229	230	231	232
ME226	57	17	11	83	7	3,712	34	191	2	8	8	2
ME221	3,144	155	13	118	4	218	8	17	13	169	66	
ME224	196	75	114	2,915	9	274	125	76	4	21	9	6
ME222	220	1,898	146	88	5	28	7	3	123	211	22	3
ME223	28	181	1,511	132	19	32	13	10	46	29	6	11
ME228	14	3	4	12	3	674	2	1,323	3	15	5	1
ME227	10	7	8	89	85	194	1,504	22	1	3	3	6
ME230	160	28	8	15	3	12	2	3	87	1,282	205	
ME231	57	11	4	10	6	13	2	4	10	116	1,270	2
ME225	6	20	49	23	1,010	20	243	3	1	6	3	63
ME229	22	123	21	6	3	19	1	5	1,204	64	26	1
MT221	936	73	3	52	2	76	4	5	18	92	39	
MT224	74	38	69	794	28	129	65	32	3	8	4	5
ME241	9	4	3	6	1	740	6	404	2	13	4	2
ME232	8	19	22	15	111	14	27	4	4	19	8	307

This chart indicates that ME228, ME241, ME224, ME221, and ME227 all have a significant number of out-of-home-station-area responses into Station 226's territory.

Finding #9: The review of Unit Hour Utilization (UHU) shows a very high workload on all of the central city area fire stations from early morning to midnight. This level of workload is cause for serious concern, as it not only impacts response time, but crew rest, apparatus costs, and training time.

4.1.5 Simultaneous Analysis

For this analysis, a simultaneous incident is an incident that occurs while another incident is in progress. In San Bernardino City during 2013, 70.37% of incidents occurred while one or more

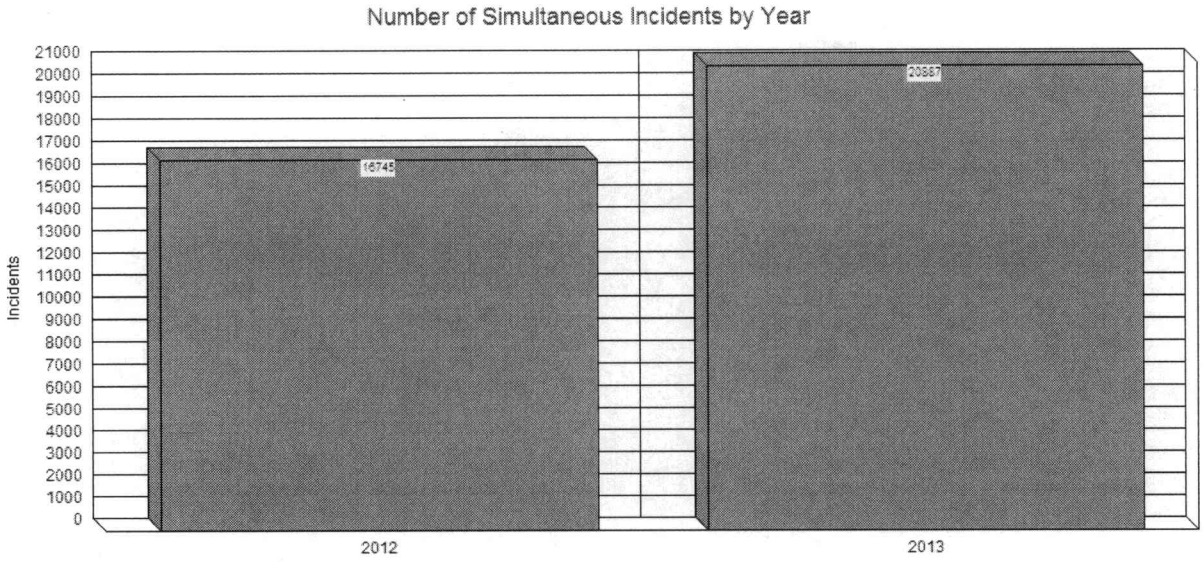
other incidents were underway. The following table shows the percentage of incidents that occurred while one or more incidents were already in progress.

Table 12—Simultaneous Analysis – Incidents Broken-Down

# of Simultaneous Incidents	Percentage
1 or more	70.37%
2 or more	39.69%
3 or more	17.71%
4 or more	06.68%
5 or more	02.14%
6 or more	00.60%

The following graph shows the number of simultaneous incidents by year. In 2013, the number of incidents increased by 13%. During the same time period, the number of department-wide simultaneous incidents increased by more than 19%.

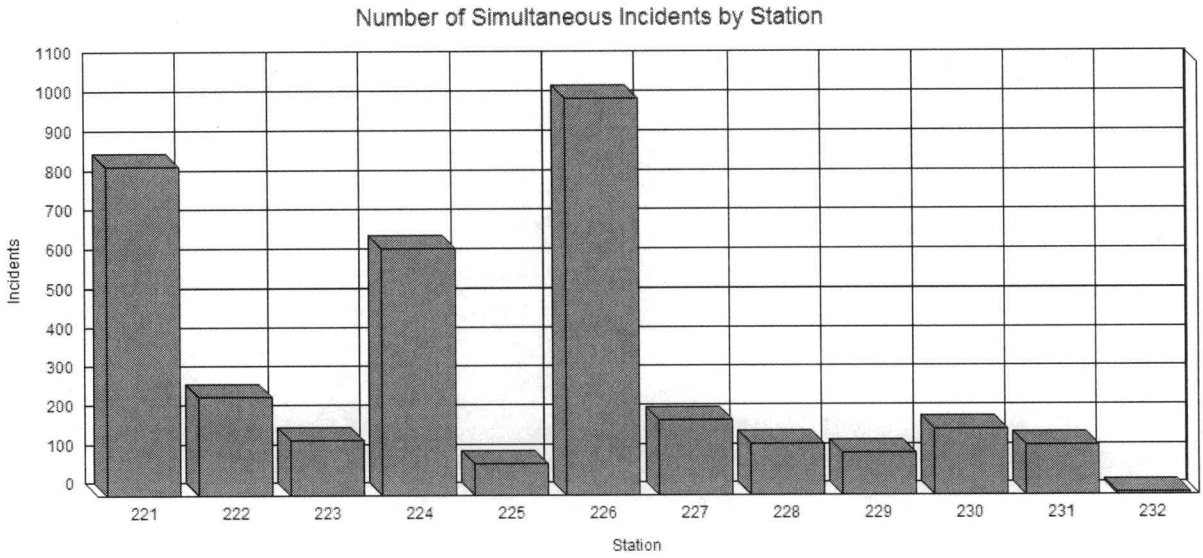
Figure 10—Number of Simultaneous Incidents by Year



Simultaneous incidents in different station areas have very little operational consequence if dispersed across a city. However, when simultaneous incidents occur within a single station area, there can be significant delays in response times.

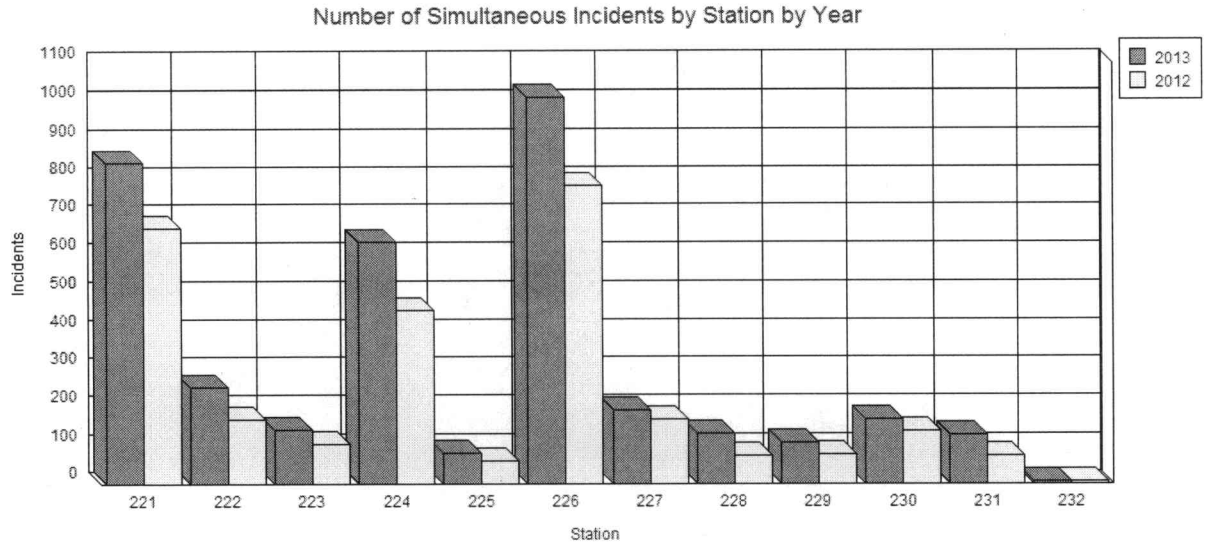
The following graph illustrates the number of single-station simultaneous incidents by station area in 2013. Stations 226, 221, and 224 are, by far, the most likely to have simultaneous incidents within their operational territory. *The problem of simultaneous incidents is most acute in Station 226's area.*

Figure 11—Number of Simultaneous Incidents by Station



The following graph displays simultaneous incident trends by station by year. The greatest increase in simultaneous incidents occurred in the busiest station areas. *Station 226 leads the way with the greatest increase in simultaneous incidents.*

Figure 12—Number of Simultaneous Incidents by Year



Finding #10: The high incident demand that exists in the core areas of the City, and the resultant high UHU percentages for a large number of units, are further driven by the effect of many simultaneous incidents in the core station areas.

4.1.6 Dollar Loss Incidents

The following table illustrates total dollar loss by station by year. Dollar loss tends to be a very volatile measurement. These are fire crew estimates, not insurance industry payouts. Also, this data is reported back to the dispatch center and, given that not all fire incidents even generate an NFIRS record, there is no way to determine if the data below represents all of the loss incidents. As part of the on-going issue with the Department's record keeping, notice the highest dollar loss occurred where the station area was not identified on the CAD record.

Table 13—Incidents: Count – Year by Station

Station	2012	2013	Total
-Blank-	860,900	1,261,587	2,122,487
221	329,720	519,238	848,958
222	712,375	681,970	1,394,345
223	503,020	693,230	1,196,250
224	637,095	935,380	1,572,475
225	46,700	125,275	171,975
226	733,593	422,240	1,155,833
227	85,665	360,525	446,190
228	573,091	35,225	608,316
229	102,950	79,900	182,850
230	1,750,331	300,085	2,050,416
231	209,550	378,320	587,870
232	9,835	16,600	26,435
Total	6,554,825	5,809,575	12,364,400

4.2 Response Time Analysis

Once the types of incidents and locations are quantified, incident analysis shifts to the time required to respond to those incidents. Fractile breakdowns track the percentage (and count the number) of incidents meeting defined criteria, such as the first apparatus to reach the scene within progressive time segments.

As a reminder, there is no current City of San Bernardino Fire Department response time goal. As such, Citygate will benchmark the existing response time performance to the best practice expectations of NFPA #1710 for career fire departments in urban areas, as well as those of the Commission on Fire Accreditation International.

Fire department response time should be measured as the amount of time it takes to reach 90% compliance with three component tasks: (1) Call Handling; (2) Turnout; and (3) Travel. These three components can be combined into a "Call to Arrival" measurement. The total response time does not include the "dismount" time to leave the engine or ambulance and walk to the patient, which, in a large complex or multi-story building, can take more than a minute.

Call Handling Time (or Call Processing Time) measures the time from the initial request for assistance until the apparatus is "toned-out" (or dispatched). National standards recommend 60 seconds as the goal for accomplishing Call Handling for 90% of emergency incidents.

Turnout Time measures the performance of a company from the time the company is notified of the emergency until the company begins "wheels-turning" to the scene. Again, national standards generally establish a 60- to 80-second goal for 90% of turnouts to emergency incidents. Practically, however, fire departments adopt goals from 60 seconds to 120 seconds for this component task as crews must don mandated protective clothing and many older station designs do not allow fast turnout times.

Travel Time measures the performance of a company from the time it begins to move toward the incident until the company arrives on the scene of the incident. National recommendations favor a 4-minute (240-second) first company arrival to 90% of emergency incidents in urban and suburban settings.

Note: 90% compliance is not the same as an average. It is possible to have an average of 90 seconds for a particular task while it may be well over 3 minutes for the task to be accomplished for 90% of emergency incidents. What causes a divergence between average and 90% compliance is consistency. For example:

If 1,000 incidents have a Call Handling Time between 85 and 90 seconds the Call Handling operation can be characterized as "consistent." In this case the Call Handling average and 90% compliance can be similar. However, if Call Handling Time varies from 25 seconds to 240 seconds then the average may still be near 90 seconds while 90% compliance takes over 180 seconds (3 minutes). Consistency is a key element of contemporary performance measurements.

All measurements in the sections to follow have been based on fire and EMS responses as far as possible, to eliminate non-emergency incidents.

For this study, based on its experience and national recommendations, will benchmark the response time segments as follows:

Total Response Time (Call to Arrival) is 7 minutes (or 420 seconds). This is made up of three component parts:

Call Processing: 1 minute

Turnout Time: 2 minutes (Most agencies can meet this, based on Citygate's experience)

Travel Time: 4 minutes (240 seconds)

4.2.1 Call Handling Time – Department Wide

Call Handling Time performance in San Bernardino is weaker than the 60- to 80-second national recommendations, but there is evidence that performance is improving:

Table 14—Call Handling Time

Year	Time
Overall	02:42
2012	02:53
2013	02:31

Further improvement in Call Handling time can shorten Call to Arrival response times, providing needed help to emergencies faster.

4.2.2 Turnout Time

Turnout performance in San Bernardino is slower than a very achievable 2-minute turnout time measure for 90% of the fire and EMS incidents. However, there was better performance in 2013 than in 2012.

Table 15—Turnout Time

Year	Time
Overall	02:15
2012	02:20
2013	02:11

Turnout times miss the mark in each fire station, except 231 and 229.

Table 16—Turnout Time by Station

Station	Overall	2012	2013
221	02:13	02:18	02:10
222	02:14	02:16	02:12
223	02:17	02:18	02:16
224	02:20	02:24	02:16
225	02:14	02:16	02:11
226	02:18	02:27	02:10
227	02:12	02:11	02:13
228	02:23	02:35	02:12
229	02:02	02:04	02:00
230	02:20	02:17	02:07
231	01:59	02:00	01:59
232	02:32	02:37	02:20

4.2.3 Travel Time

Travel time performance in San Bernardino is also below the 4-minute recommendation for an urban fire department. This performance problem is true for all fire stations, but is predictably worse for stations in less-densely-populated areas.

Table 17—Travel Time – Department Wide

Year	Time
Overall	06:15
2012	06:13
2013	06:18

The travel time trend is below the 90% 4-minute standard for any responding unit within each station area:

Table 18—Travel Time by Station Area

Station	Overall	2012	2013
221	05:25	05:28	05:23
222	05:22	05:19	05:24
223	05:52	05:43	05:59
224	05:46	05:44	05:49
225	06:19	05:59	06:27
226	06:34	06:32	06:36
227	06:05	05:34	06:26
228	06:23	06:39	06:07
229	06:32	06:23	06:42
230	06:26	06:26	06:26
231	07:16	07:05	07:18
232	07:22	07:01	07:44

The following are the same travel times, color coded to reveal differences between years and stations:

Table 19—Travel Time – Differences Between Years and Stations

Station	Overall	2012	2013
221	5:25	5:28	5:23
222	5:22	5:19	5:24
223	5:52	5:43	5:59
224	5:46	5:44	5:49
225	6:19	5:59	6:27
226	6:34	6:32	6:36
227	6:05	5:34	6:26
228	6:23	6:39	6:07
229	6:32	6:23	6:42
230	6:26	6:26	6:26
231	7:16	7:05	7:18
232	7:22	7:01	7:44

4.2.4 Call to Arrival Performance

A Call to Arrival performance of 90% compliance in 7 minutes is considered adequate. Additional time is expected when a fire department serves more rural and remote areas. In San Bernardino, Call to Arrival performance is below expectations, but improving.

Table 20—Call to Arrival Performance – Department Wide for Fire & EMS Incidents

Year	Time
Overall	09:50
2012	10:07
2013	09:36

The Call to Arrival performance goals are missed in each station area:

Table 21—Call to Arrival Performance – Station Area for 90% of Fire & EMS Incidents

Station	Overall	2012	2013
221	08:59	09:23	08:38
222	08:54	09:07	08:41
223	09:25	09:37	09:18
224	09:16	09:33	09:04
225	09:42	09:28	09:55
226	10:16	10:45	09:52
227	09:28	09:17	09:38
228	10:05	10:34	09:29
229	09:55	09:57	09:55
230	09:46	10:06	09:33
231	10:28	10:45	10:21
232	10:56	10:46	10:58

The following are the same Call to Arrival times, color coded to reveal differences between years and stations:

Table 22—Call to Arrival Performance – Colored

Station	Overall	2012	2013
221	8:59	9:23	8:38
222	8:54	9:07	8:41
223	9:25	9:37	9:18
224	9:16	9:33	9:04
225	9:42	9:28	9:55
226	10:16	10:45	9:52
227	9:28	9:17	9:38
228	10:05	10:34	9:29
229	9:55	9:57	9:55
230	9:46	10:06	9:33
231	10:28	10:45	10:21
232	10:56	10:46	10:58

4.2.5 Effective Response Force (First Alarm)

An Effective Response Force (ERF) is defined as a multi-unit team of engines, ladders, and chief officers for incident command arriving at the scene of a building or wildland fire. The number of firefighting personnel arriving at the scene can also define it. This measure should also be used for any other type of technical rescue or hazardous materials team emergency requiring multiple units in a timely manner. The end time for this measure is when either the last vehicle, or the last firefighter, arrives on the scene to complete the defined ERF team.

In San Bernardino, the ERF for building fires is 5 engines and 1 truck company. This is a very heavy response involving up to 18 firefighters (5 engines of 3 firefighters and 1 truck of 3 firefighters).

In 2012 and 2013, there were 70 incidents where 5 engines and 1 truck company arrived on scene. Of those incidents, 53 involved serious building fires.

In 2012, there were 28 ERF building fires with an ERF last-in unit travel time of 13:50. In 2013, there were 25 ERF building fires with a 90% travel time compliance of 17:45. The diversity of this measure indicates a small sample size and that in 2013 there were more ERF responses in the other City areas, where the GIS maps showed the lack of ERF coverage at 8 minutes travel.

Finding #11: Compared to the Citygate benchmark of 7 minutes Total Response Time, San Bernardino's actual performance to 90% of the Fire and EMS incidents is 9:36 minutes/seconds to Fire and EMS incidents.

Finding #12: Call processing and crew turnout times are too long to 90% of the Fire and EMS incidents. Management focus is needed to bring them into alignment with best practice goals. Doing so could save up to 1:42 minutes/seconds. This would lower citywide performance from 9:36 to 7:18 minutes/seconds without adding any field resources.

Finding #13: Long travel times for the City's fire units are due to high incident volumes, high simultaneous incident rates, and some fire stations not being well placed to serve the central City area.

Finding #14: Reducing travel times in the short-term during the fiscal crisis, while continuing to respond to all medical incident requests, will require additional funds for peak hour units in the central City area. These additional units would absorb some of the simultaneous incidents and would leave other units available within their assigned areas.

Finding #15: If funds became available, at least two peak-hour (part-time) 2-firefighter EMS squads in Stations 226 and 222 would significantly lower the workload on all of the central City and nearby fire engines.

Finding #16: As the GIS analysis shows, the City has a large center area with high incident volumes in-between some fire stations. Other fire stations are too close together. Once an economic recovery can be realized, the City can study several older fire stations for relocation using the more advanced GIS tools that were used in this study to identify more optimal station locations.

4.3 Overall Deployment Evaluation

The San Bernardino Fire Department serves a very diverse population, set of risks, and land use pattern in a geographically challenging area. Population drives emergency service demand and development brings more risks to be protected against fire. Most of the outer City areas with slower response times also have the lowest population densities.

For the foreseeable future, to suppress fires when they occur, San Bernardino will need both first-due firefighting unit and Effective Response Force (First Alarm) coverage in all parts of the City, consistent with current best practices.

The stations in the core of the City experience much higher workload than just ten years ago, but some are currently significantly overworked many hours of every day. The City needs fire stations across its geography to:

- Provide equitable response times to all similar risk neighborhoods
- Provide for depth of response when multiple incidents occur
- Provide for a concentration of response forces in the core for high-risk venues.

But as the EMS incident statistics portion of this study has identified, the volume of EMS incidents is decaying the Department's response time to all incidents and lowering its ready response capability for firefighting.

In the immediate future during the fiscal crisis, hopefully the City can maintain the current number of fire companies. Then, starting as soon as possible, the City must triage its firefighting resources to respond only to the most serious EMS emergencies, thus stabilizing response times for all incidents and the availability for firefighting. This will be discussed further in the paramedic analysis section (Section 6) of this report to follow.

Once the City's economic capacity is regained, the City can consider rebuilding aging fire stations and spreading out some stations that are too close together. But, given the geography of the City to protect, the actual number of fire stations will always be about twelve, if the Mayor and Common Council choose to provide the same level of first responder service equally to all neighborhoods.

Based on our deployment analysis above, Citygate offers these near-term recommendations:

4.3.1 Recommended Response Time Benchmark Goals

Recommendation #1:	**Adopt Updated Deployment Measures:** The City should adopt updated performance measures for the major types of emergencies to direct fire crew planning and to monitor the operation of the Department. The measures should take into account a realistic company turnout time of 2 minutes and be designed to deliver outcomes that will save patients medically salvageable upon arrival, and to keep small, but serious, fires from becoming greater alarm fires. Citygate recommends these measures be:

1.1 Distribution of Fire Stations: To treat medical patients and control small fires, the first-due unit should arrive within 8 minutes, 90% of the time from the receipt of the 9-1-1 call in the fire dispatch center. This equates to 1-minute dispatch time, 2 minutes company turnout time, and 5 minutes drive time in the most populated areas.

1.2 Multiple-Unit Effective Response Force for Serious Emergencies: To confine fires near the room of origin, to stop wildland fires to under three acres when noticed promptly, and to treat up to five medical patients at once, a multiple-unit response of at least 20 personnel should arrive within 11 minutes from the time of 9-1-1 call receipt in fire dispatch, 90% of the time. This equates to 1-minute dispatch time, 2 minutes company turnout time, and 8 minutes drive time spacing for multiple units in the most populated areas.

1.3 Hazardous Materials Response: Provide hazardous materials response designed to protect the community from the hazards associated with uncontrolled release of hazardous and toxic materials. The fundamental mission of the Fire Department response is to minimize or halt the release of a hazardous substance so it has minimal impact on the community. This is done by achieving a travel time in urban to suburban areas for the first company capable of investigating a HazMat release at the operations level within 5 minutes travel time, or less than 90% of the time. After size-up and scene evaluation is completed, a determination will be made whether to request additional resources from the City's multi-agency hazardous materials response partnership.

1.4	Technical Rescue: Respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue. Achieve a travel time for the first company in urban to suburban areas for size-up of the rescue within 5 minutes travel time or less 90% of the time. Assemble additional resources for technical rescue capable of initiating a rescue within a total response time of 11 minutes, 90% of the time. Safely complete rescue/extrication to ensure delivery of patient to a definitive care facility.
Recommendation #2:	The Department needs to conduct a study to determine which fire stations should not be maintained for another 25-50 years. Then, based on the number of stations that require total replacement, the Department needs to adjust replacement fire station spacing such that response time overlap between stations is minimized as much as possible. Further, stations should not be sited close to City edges so that station response times cover areas substantially outside the City.

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SECTION 5—DEPLOYMENT REDUCTION ANALYSIS

5.1 STATION CLOSURE INTRODUCTION AND OVERALL OPINION

As part of our deployment analysis, Citygate was asked to determine if the City could close any fire stations to help in balancing its budget. If so, Citygate was asked to determine which stations could be closed and to identify the impacts.

One point needs to be emphasized by Citygate at the beginning of this analysis: San Bernardino City does not have excess fire department resources. The City has very high levels of demand for (1) emergency medical incidents and (2) building fires. The number of building fires has increased since January 1, 2014 demonstrating a real and credible risk of major building fire scenarios. Other cities with high foreclosures and abandoned buildings also are seeing this trend. Going forward, any reduction of resources will seriously degrade the City's first responder capacity for emergency medical, firefighting, and rescue incidents. The purpose of this analysis is to prioritize cuts so the extent of the degradation to response times is progressive, from least serious to most serious.

5.1.1 Consequences of Service Reductions

Reducing fire department units will have three types of consequences. First, as fewer units are available there will be longer travel times to incidents. First-due unit arrivals will be delayed in the reduction areas. Second, and equally important, complex incidents requiring multiple units will take longer for all the needed units to arrive to effectively control building and wildland fires. Thus, the ability to mitigate serious incidents to a First Alarm level will be reduced or eliminated. Third, most stations only have one response unit—an engine company (pumper) with a crew of three. Reductions in force thus cannot be done to all stations at once, as only one to three stations can even be considered at all for closure. When a few stations are closed, an inequity of response time capacity is created between neighborhoods where, at the same taxation level, some neighborhoods have better access to a nearby fire unit than do other neighborhoods near the closed stations.

5.2 BACKGROUND

5.2.1 Levels of Apparatus Resources

The most difficult component of fire response is bridging the travel distance from the location of resources to the location of emergency incidents. Ideally a neighborhood-based fire apparatus arrives first at incidents within its assigned station area. In practice, however, in San Bernardino and other busy metropolitan areas, apparatus frequently travel outside their assigned station area to arrive first at incidents when the local apparatus are unavailable due to an emergency in that area.

Given the highest call volume is at the City's center core area fire stations, logic would indicate that they should have the shortest travel distance and response times. However, simultaneous incidents in the core frequently make "local" apparatus unavailable requiring the responses of apparatus from other fire stations.

The City of San Bernardino has three levels of fire apparatus resource demand identified by these location labels:

- Core
- Peripheral-Core
- Peripheral.

Core resources are those in the center of the action—near the center of the City. Core resources exist because of higher population densities and call for service volumes. Peripheral-core resources frequently respond into the core station areas and also serve their areas adjacent to the core. Peripheral or edges of the City apparatus are those serving outlying areas. Peripheral resources exist because of geography. Peripheral stations seldom arrive first in the core, but do provide the core with needed resources for major incidents such as building fires.

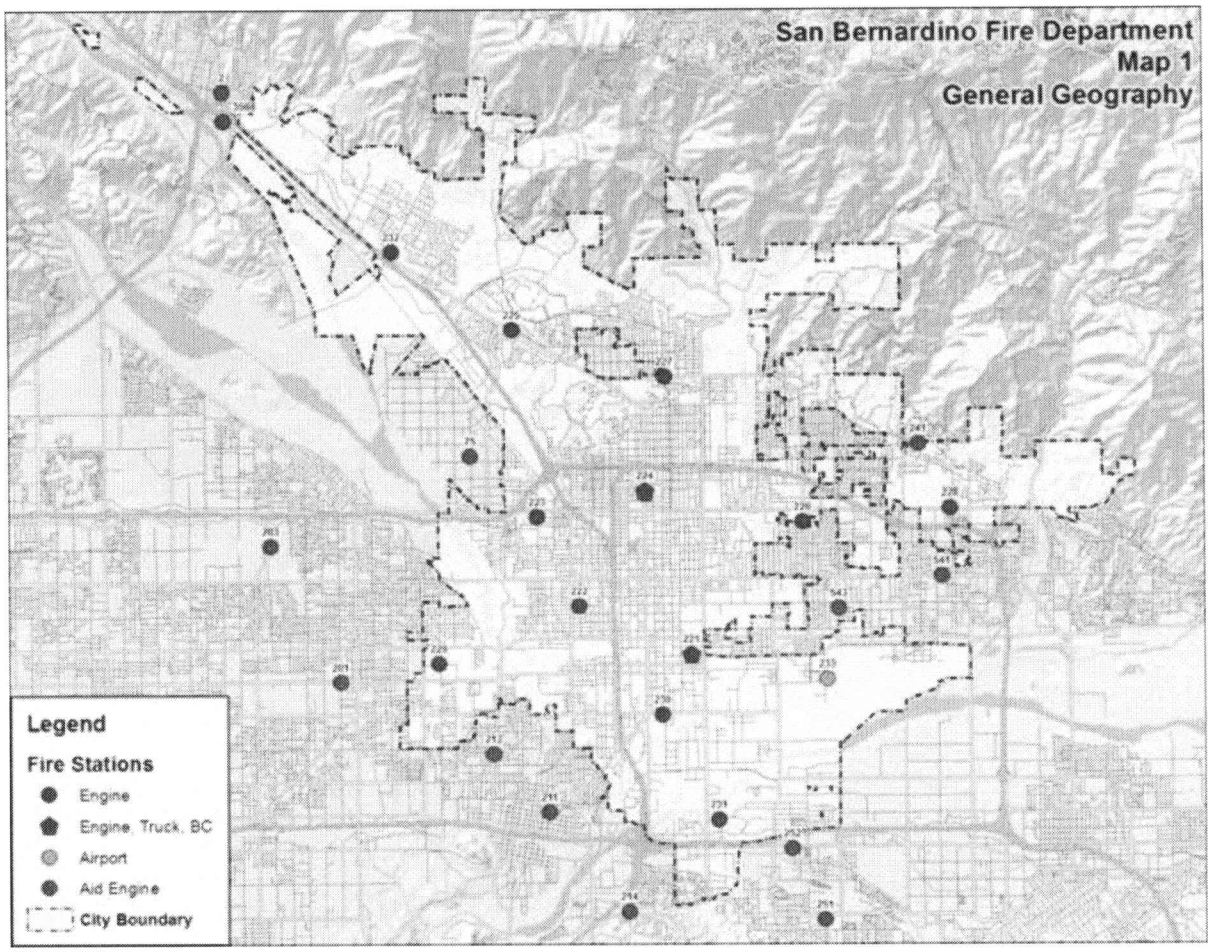
The core fire stations in San Bernardino are 221, 224, and 226. These are high volume fire stations located near high demand areas. Two of these stations have two apparatus, an engine and ladder truck, while the busiest station, 226, has only one engine company. In 2013, these three core stations accounted for 13,638 emergency incidents or 46 percent of total incidents citywide.

The next "ring" of peripheral-core fire stations frequently arrives first in the core and provides backup resources for the more remotely located peripheral fire stations. Peripheral-core stations exist both for call volume and for geography. Peripheral-core stations include 222, 223, 227, and 230. In 2013 these four stations accounted for 8,321 emergency incidents or 28 percent of total incidents citywide.

The peripheral fire stations are 225, 228, 229, 231, and 232. These stations have lower population density and emergency incident demand. Travel distances and travel times are the greatest for peripheral fire stations. While simultaneous incidents are less frequent in these edge areas, when simultaneous incidents do occur, they often result in protracted travel time from more distant fire stations. These five peripheral stations accounted for 6,487, or 22 percent, of total incidents in 2013. The remaining 4 percent of incidents in 2013 were either in other jurisdictions or had a blank station area reference in the dispatch data set.

The map below illustrates station locations:

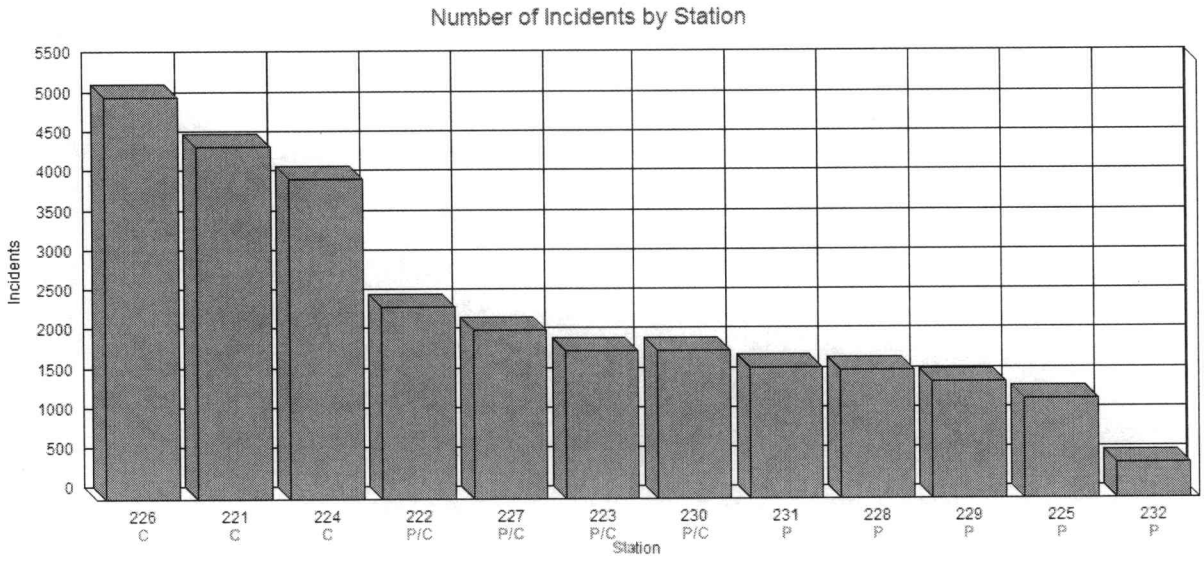
Figure 9—Map #1 – General Geography



5.2.2 Demand – Volume of Incidents

The graph below illustrates the number of incidents by station in calendar year 2013. The three "core" stations area listed first, followed by the four "peripheral-core" stations and finally the remaining five "peripheral" stations.

Figure 10—Number of Incidents by Station

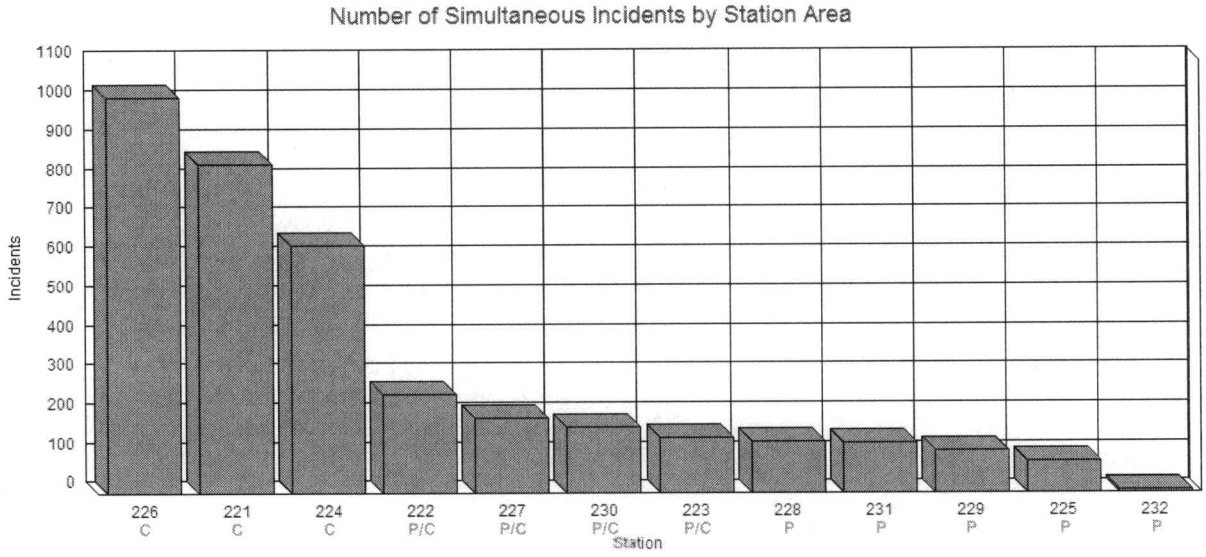


5.2.3 Demand – Simultaneous Incidents

Simultaneous incidents place stress on response times. When multiple incidents occur in a single station area, outside resources must respond. The graph below illustrates the number of simultaneous incidents occurring within each station area in 2013.

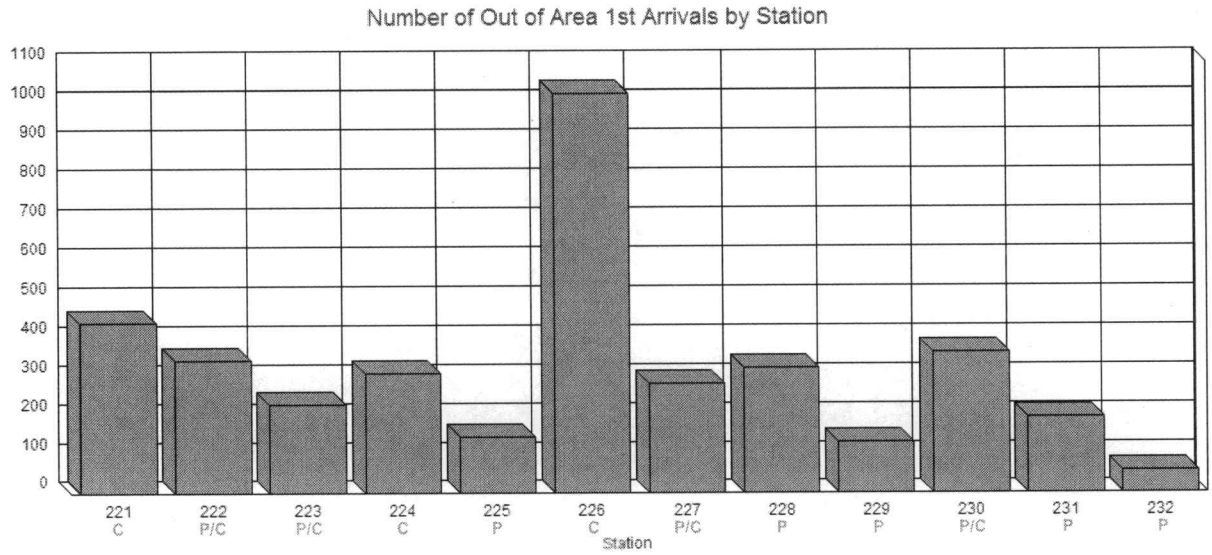
Notice the three core stations have the largest number of simultaneous incidents. Simultaneous incident activity drops off quickly for peripheral-core stations.

Figure 11—Number of Simultaneous Incidents by Station Area



The effect of simultaneous incidents on deployment availability has to be understood. The graph below shows the number of times each station has outside resources arrived first rather than the "local" resources arriving first. Here we see Station 226 is under the most stress with the highest number of outside resources arriving first on the scene of emergencies.

Figure 12—Number of Out-of-Area 1st Arrivals by Station

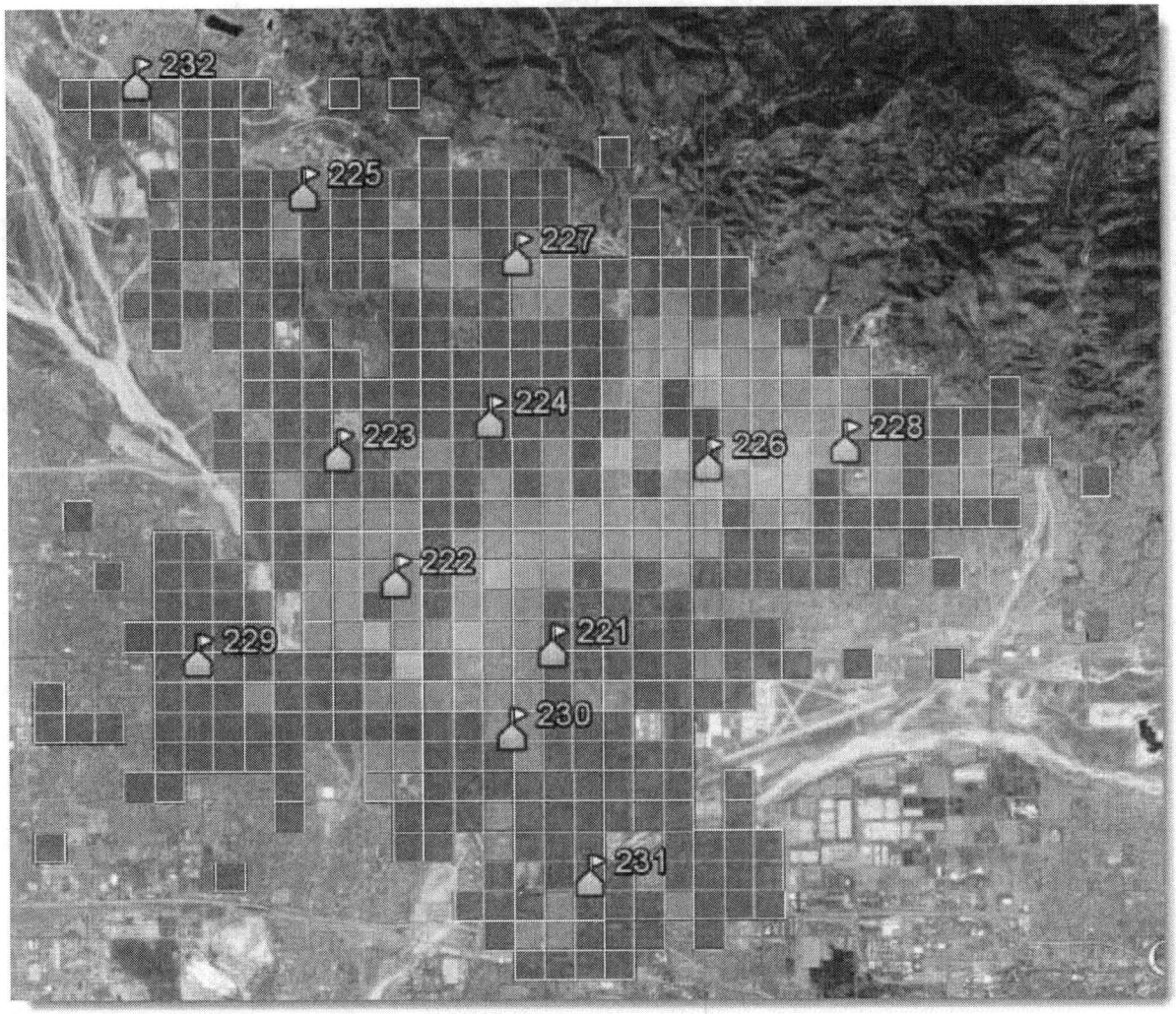


Station 226 has the highest call volume, yet unlike the other core stations, Station 226 has only one engine company. There is no second apparatus to handle the high volume of simultaneous alarms in this area.

The map below shows the concentration of areas where non-local apparatus arrive first on fire and EMS incidents. Notice the concentration of these outside first arrivals is right in the vicinity of Station 226 and to the southwest.

Figure 13—Non-Local Unit 1st Arrivals

(Green Low Volume | Yellow Medium Volume | Red High Volume)



One measure helps to emphasize the simultaneous demand issue. In 2013, Station 226 had more than twice the number (1,015) of simultaneous incidents within its station area than Station 232 had (453) in its station area. However, both stations have the same assigned response unit capability.

The out-of-area first arrivers by quantity for Station 226 emergency incidents in 2013 were:

Table 23—Out-of-Area 1st Arrivers by Quantity for Station 226

First Arriver	Number of Responses
ME228	324
ME241	230
ME224	120
ME221	116
ME227	103

Simultaneous incidents do not occur randomly. Below is a temporal heat map that identifies the occurrence of simultaneous incident by hour of the day and day of the week. Notice this pattern is worse from about 10:00 am – 6:00 pm, Monday through Friday.

Table 24—Simultaneous Incidents by Hour of Day and Day of Week

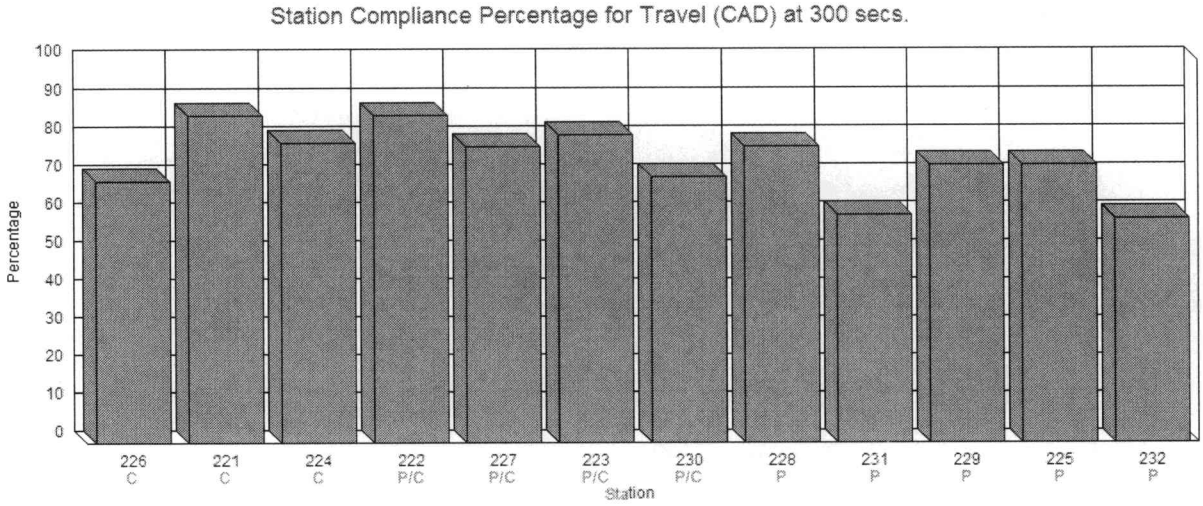
	1 Mon	2 Tue	3 Wed	4 Thu	5 Fri	6 Sat	7 Sun	Total
00:00-00:59	32	31	27	18	34	28	38	208
01:00-01:59	25	23	11	16	28	25	39	167
02:00-02:59	20	25	27	18	20	31	48	189
03:00-03:59	18	9	17	20	23	17	24	128
04:00-04:59	15	16	9	14	14	21	18	107
05:00-05:59	18	17	11	16	13	12	15	102
06:00-06:59	26	15	20	22	25	15	20	143
07:00-07:59	36	29	31	21	38	31	20	206
08:00-08:59	44	52	51	50	55	36	23	311
09:00-09:59	68	84	71	76	81	46	55	481
10:00-10:59	105	106	70	107	81	56	50	575
11:00-11:59	81	118	100	106	79	57	71	612
12:00-12:59	95	85	88	71	86	57	49	531
13:00-13:59	83	93	97	91	90	73	62	589
14:00-14:59	117	103	92	115	99	65	60	651
15:00-15:59	118	104	91	81	108	90	69	661
16:00-16:59	99	90	90	99	80	77	67	602
17:00-17:59	81	84	91	74	71	67	56	524
18:00-18:59	59	81	54	80	72	64	48	458
19:00-19:59	63	61	60	57	67	63	80	451
20:00-20:59	53	54	52	49	64	55	62	389
21:00-21:59	50	49	56	58	45	59	52	369
22:00-22:59	45	39	52	56	66	50	44	352
23:00-23:59	35	26	27	42	41	40	26	237
Total	**1,386**	**1,394**	**1,295**	**1,357**	**1,380**	**1,135**	**1,096**	**9,043**

5.2.4 Performance – Travel Time

As the highest volume station with many nearby incidents, Station 226 should have the fastest travel times. However, Station 226 lags behind the other two core stations by approximately 10%.

The following graph illustrates 2013 *travel* time compliance to a 5-minute goal for fire and EMS incidents. Stations are ordered from busiest to least busy:

Figure 14—Station Compliance Percentage for Travel (CAD) at 300 Seconds



The table below shows the *travel* time performance data to 90% of the fire and EMS incidents in 2013 by station area comparing local (assigned unit) and out-of-area first arrivers:

Table 25—*Travel* Time Performance to 90% of Fire and EMS Incidents in 2013 by Station

Station	Local	Out-of-Area
	Minute/Second (Quantity)	
Core-221	05:05 (3,286)	06:16 (439)
222	04:39 (1,711)	06:27 (343)
223	05:23 (1,334)	07:42 (229)
Core-224	05:36 (3,107)	06:54 (309)
225	05:58 (923)	08:21 (144)
Core-226	05:56 (3,268)	07:25 (1,025)
227	05:21 (1,394)	08:07 (283)
228	05:50 (1,106)	06:40 (322)
229	05:34 (1,112)	09:34 (133)
230	06:19 (1,122)	06:39 (364)
231	06:43 (1,149)	08:36 (197)
232	06:44 (269)	09:28 (61)

The next table shows the difference between local and out-of-area performance ranked by longest second arriver time to fastest. Notice the large difference that exists for Station 229 between local and out of station arrivals at 4:00 minutes/seconds, while Station 230 has the least difference at only 20 seconds:

Table 26—Difference Between Local and Out-of-Area Performance

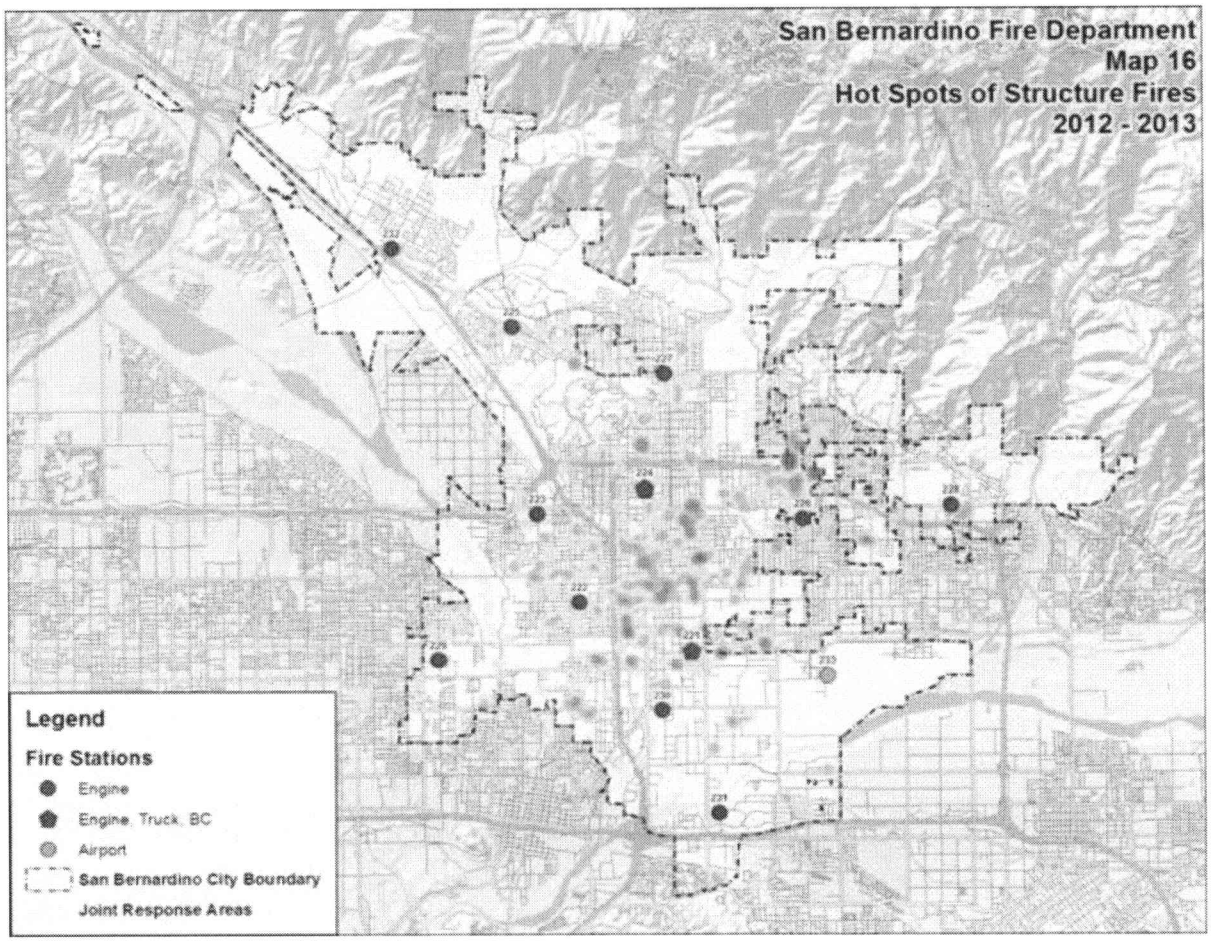
Rank	Station	Difference
1st	229	4:00
2nd	227	2:46
3rd	232	2:44
4th	225	2:23
5th	223	2:19
6th	231	1:53
7th	222	1:48
8th	**Core**-226	1:29
9th	**Core**-224	1:18
10th	**Core**-221	1:11
11th	228	0:50
12th	230	0:20

The above table tells three stories. First, overall City response times are propped up in the high simultaneous incident volume core areas due to stations being somewhat closer together. Second, two of the core stations (221 and 224) have ladder trucks to take simultaneous calls. Third, the outer peripheral edge stations, if they are considered for closure due to lower incident volumes, do not have nearby *City* fire station travel time support.

5.2.5 Locations of Serious and Greater Alarm Structure Fires

The following map shows the citywide "clustering" or hot spots of all structure fire locations for 2012 and 2013:

Figure 15—Map #16 – Hot Spots of Structure Fires 2012-13

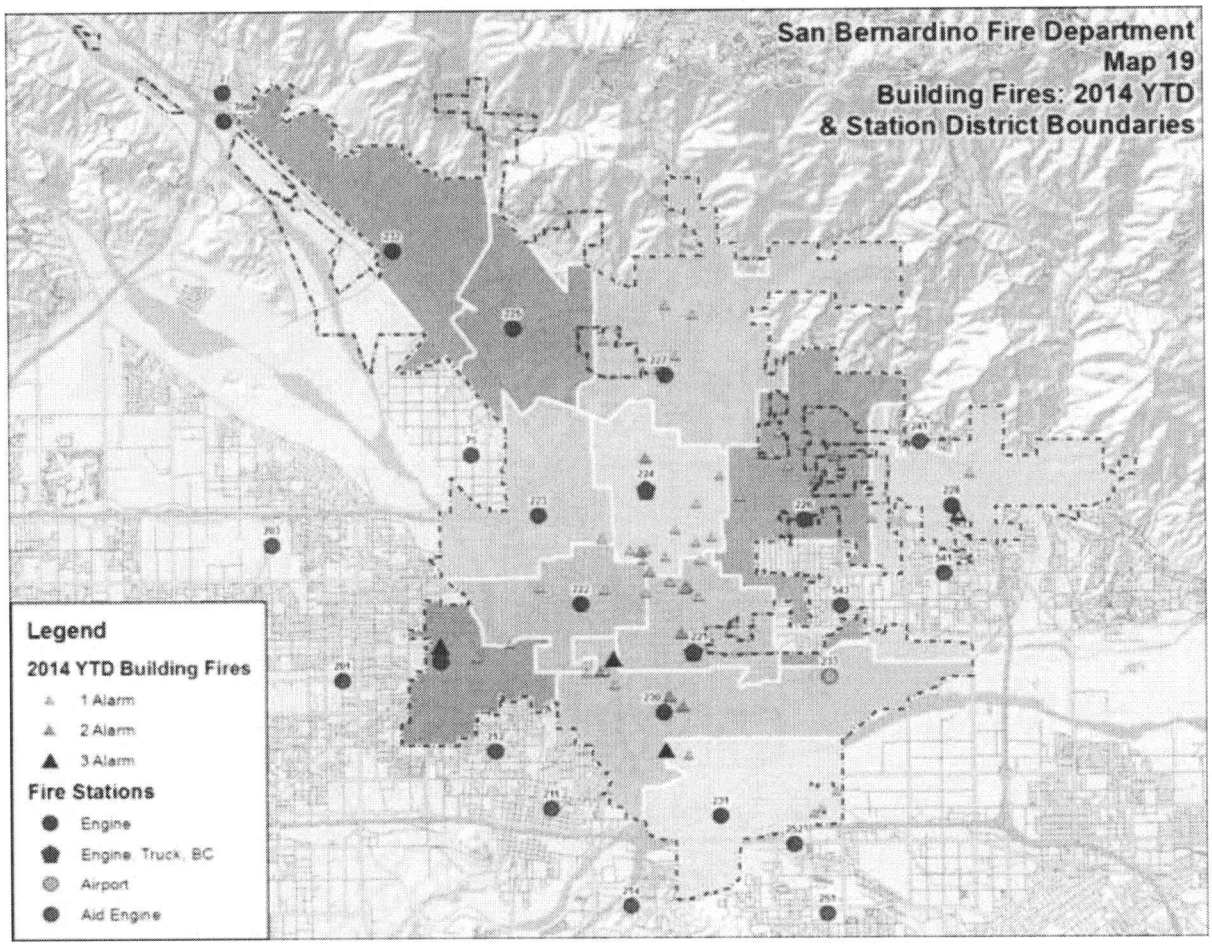


It is apparent due to several demographic factors that the bulk of the fires occur in a triangle area between Stations 222, 224 and 221, along with an area north of Station 226. By total incident demand, these are the four busiest fire station areas in San Bernardino.

Since January 1, 2014, the City has experienced an upswing in serious structure fires, including multiple major alarm fires, commercial building fires, and one fire death building fire. As of early May 2014 there have been 56 building fires, of which 11 (or 20%) were 2nd Alarms and 4 (or 7%) were 3rd Alarms.

The next map displays the locations of these serious building fires:

Figure 16—Map #19 – Building Fires: 2014 YTD and Station District Boundaries



As was found with the plot of all types of building fires for two years, the early 2014 serious building fires were in the same core triangle area as well as north of Station 226. While the quantity of serious fires was highest in these areas, some of the outer peripheral station areas also had serious building fires. However, it is notable that station areas 223, 225, and 232 had none.

Next, as these background factors are combined into an analysis of the units that can be considered for closure, the above core areas for serious building fires are eliminated from consideration.

5.3.1 Core Stations – 221, 224, and 226

Resources in all three of these core stations have to be preserved due to high incident workloads. In fact, consideration should be given to adding a unit in Station 226 during peak simultaneous incident demand hours. The goal would be to stabilize the core so rather than Station 226 being a consumer of resources—drawing units into the core—it can be more resource-neutral, thus keeping other station resources closer to their station areas.

5.3.2 Peripheral-Core Stations – 222, 223, 227, and 230

The lowest out-of-area travel time in peripheral-core stations is for Station 222 (06:27) and 230 (06:39). Station 230 has a lower call volume and there is only a 20-second difference between local and out-of-area travel time in Station 230's territory. Station areas 222 and 230 share station boundaries. Both stations cannot be closed at the same time. Given Station 230's out-of-area travel time and its location further from the core activity area, *it is a candidate* for closure.

Station 223 serves and edge area with mutual aid support, is 50% overlapped by City Stations 222 and 224 and County Station 75 along with it having a lower total incident, simultaneous incident, and structure fire demand. Thus, *it is a candidate* for closure.

Station 227 serves a large edge area, and provides back-up to the core area. As such, it is **not** considered to be a candidate for closure analysis.

5.3.3 Peripheral Stations – 225, 228, 229, 231, and 232

Station 225 has the next lowest call volume. It has a 02:23 minute difference between local and out-of-area travel times. This is rather high, but the station's low call volume makes it a *possible candidate* for closure.

Station 228 has only a 50-second difference between local and out-of-area travel times. This station *is a candidate* for closure.

Station 229 is isolated and has a 04:00 minute travel time difference between local and out-of-area travel times. However, mutual aid from the west could be a mitigating factor. This station is a *possible candidate* for closure.

Station 231 has the highest peripheral station call volume. It is located in the south and has a 01:53 time difference between local and out-of-area travel times. It is a *possible candidate* if Station 230 needs to remains active and mutual aid units can assist.

Station 232 has the lowest call volume station in the City. Based purely on the lack of call volume, Station 232 is the most expendable. It was built to serve the hard-to-cover northwest

finger of the City and has partial revenue offset for its operating cost from an assessment district. Due to its isolated location and partial dedicated funding, it may **not** be a candidate for closure.

5.4 Detailed Station Closure Analysis and Impact on Mutual/Automatic Aid

The next questions that should be considered as a factor in closing a City response unit are, "Can a neighboring city's fire units assist with San Bernardino's incidents?" And, if so, "What will the impact be to both agencies, based on estimated travel times?"

Since there is not historical response time data for mutual aid units into the City due to different record systems and infrequent use, this portion of the study uses a geographic mapping system tool to estimate travel time from one station area to another. In addition to visual travel time estimates, the GIS system provides powerful measures of how much of a city's street network is covered within a travel time measure, along with a second measure of how much overlap at a given travel time there is between adjoining fire station areas. Overlap is important between station areas for both second-unit response times into another station area, as well as multi-unit First Alarm response times. Some overlap is desirable to keep the non-home unit response times reasonable.

There are two issues to resolve if mutual aid resources are to be considered in a closure plan. The first issue is dispatch lag, as the other agency's 9-1-1 center must be asked by San Bernardino for assistance, and their closest unit might not even be available. These issues can be overcome with dispatch-to-dispatch computer system links, but these are costly and take time to implement.

The second and less clear issue to resolve is total workload impact to the neighboring agency. When a fire station is closed, the incident demand workload is not turned off; it is transferred to adjoining fire units. Most mutual and automatic (closest unit) aid agreements operate on the concept of approximate equity in that the send and receive quantities stay in close balance, thus each agency benefits. However, given San Bernardino's high core area incident volumes, if a peripheral edge station is closed, more of that area's workload could be transferred to the mutual aid partner, as core stations are not available all of the time to take some of the closed unit's workload.

If this were proven true going forward, then the mutual aid sender might request a payment or not want to respond at all if the workload to San Bernardino was so high as to impact their local area's response time. Thus, San Bernardino might have to spend some of the savings from a closure to a mutual aid partner contract. Such arrangements take time and may have to be fiscally adjusted after a year of operation.

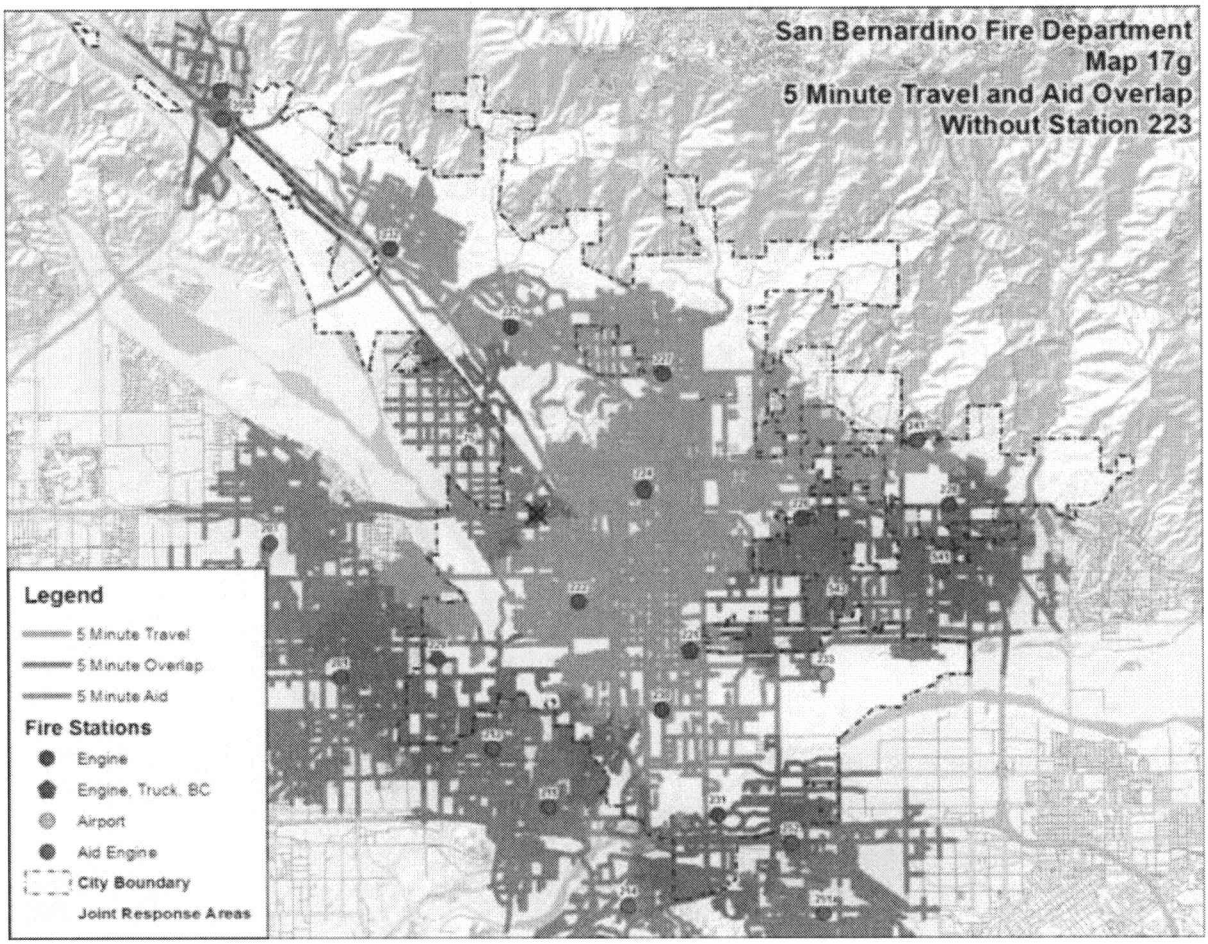
However, this analysis can determine if and where outside help might be available so further multi-agency discussions can take place.

5.4.1 Peripheral-Core Stations

Peripheral-Core Stations – Candidate for Closing – Station 223

The map below displays 5-minute *travel* time if Station 223 is closed:

Figure 17—Map #17g – 5 Minute Travel and Aid Overlap Without Station 223



Before the closure of Station 223, the City of San Bernardino, *including mutual aid partner fire stations*, has 88.56% of its road network within a 5-minute travel time of a fire station. Over half of the road network (55.66%) has 2 or more fire stations within a 5-minute travel time.

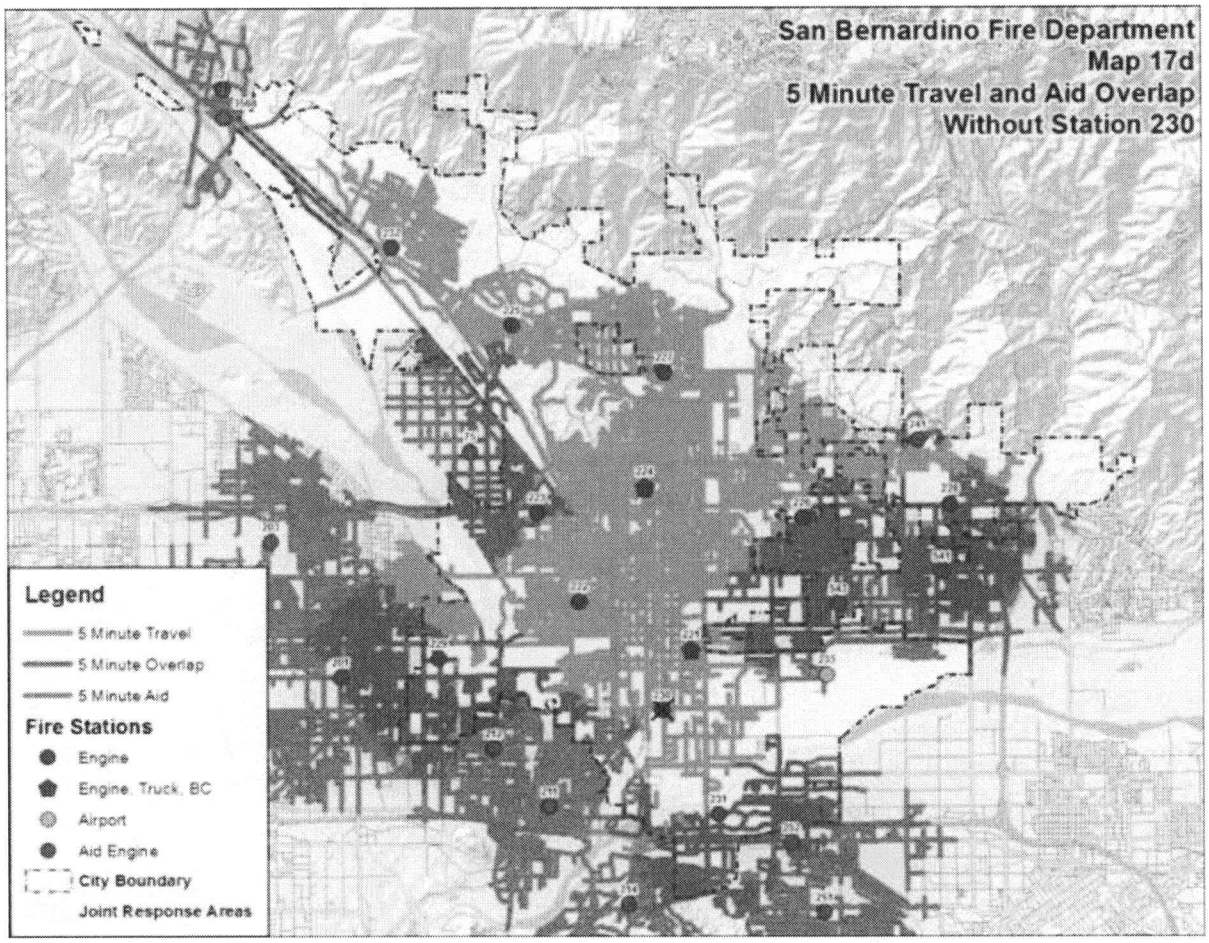
If Station 223 is closed, the percent of road miles within 5 minutes drops only by 0.51% to 88.05%. The overlapping travel percentage drops significantly by 10.1% to 45.51%. These two results show how much Station 223 is completely overlapped at 5 minutes travel time by County Station 75 and City stations. The second-due unit time from another City station is 2:19 minutes/seconds longer than the home unit.

Therefore, Station 223 remains a candidate for closure as all of the area's road segments remain within 5 minutes travel time of a fire station.

Peripheral-Core Stations – Candidate for Closing – Station 230

The map below displays 5-minute *travel* time if Station 230 is closed:

Figure 18—Map #17d – 5 Minute Travel and Aid Overlap Without Station 230



If Station 230 is closed, the percent of road miles within 5 minutes (88.56%) drops just over 1% to 87.38%. However, the overlapping travel percentage (55.66%) drops by more than 5% to 50.19%. The second-due unit time from another City station is only 20 seconds longer than the home unit.

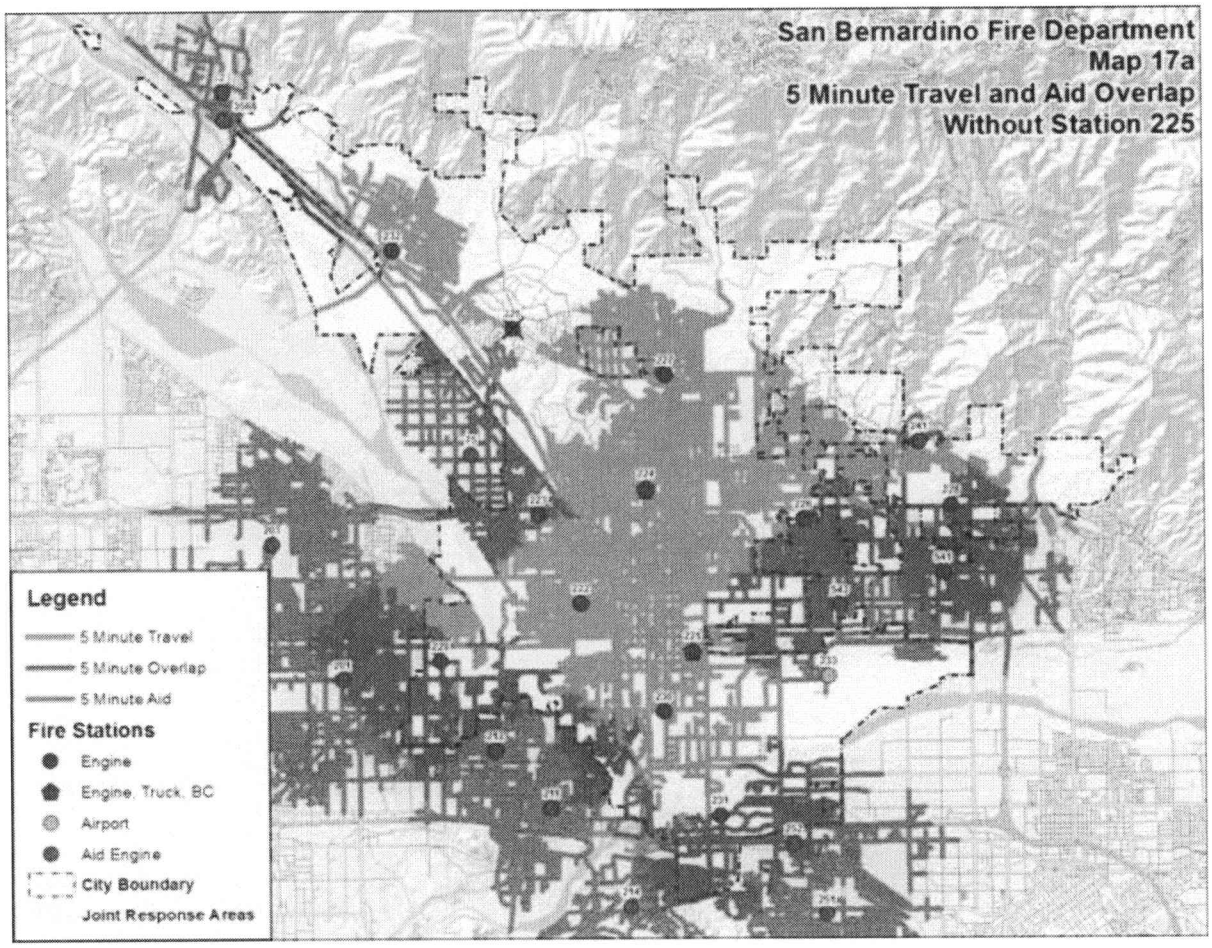
However, Station 230 remains a candidate for closure as all of the area's road segments remain within 5 minutes travel time of a fire station.

5.4.2 Peripheral Stations

Peripheral Stations – Candidate for Closing – Station 225

The map below displays 5-minute travel time if Station 225 is closed:

Figure 19—Map #17a – 5 Minute Travel and Aid Overlap Without Station 225



If Station 225 is closed the percentage of road miles within 5 minutes (88.56%) drops just over 4% to 84.37%. The overlapping travel percentage (55.66%) drops less than 4% to 51.73%.

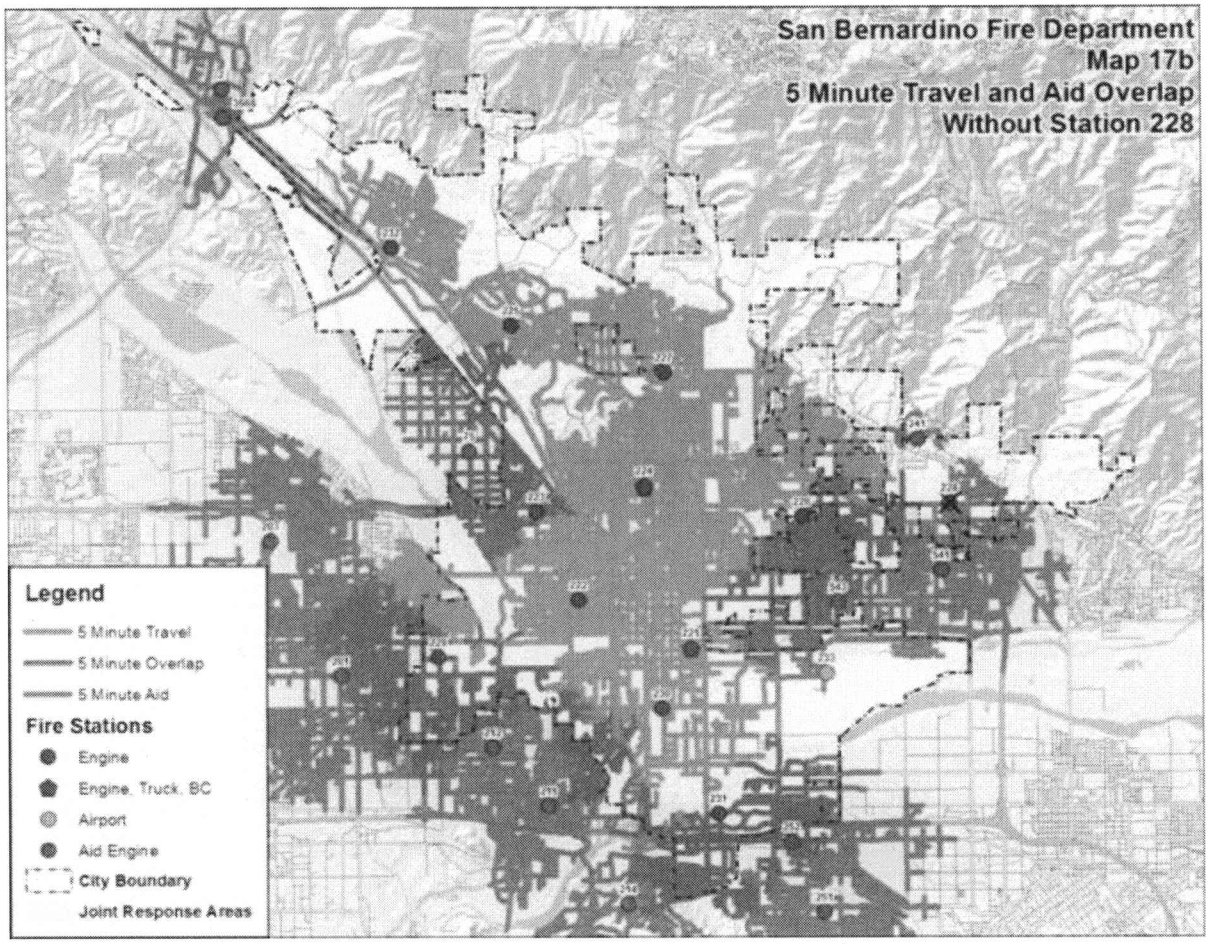
However, a closure of Station 225 means that there are many street segments in the area beyond a 5-minute travel time. With the station located against the upslope area of the City, other unit assistance can only come from three directions, not four. The next nearest station is 227 and it is the 5th busiest in the City and is frequently called into the busy core area. Thus, if it were not available, response times could be long from Station 232 or County Station 75.

Given these measures, Station 225 does **not** remain a candidate for closure.

Peripheral Stations – Candidate for Closing – Station 228

The map below displays 5-minute travel time if Station 228 is closed:

Figure 20—Map #17b – 5 Minute Travel and Aid Overlap Without Station 228



If Station 228 is closed the percentage of road miles within 5 minutes (88.56%) drops more than 7% to 81.25%. The overlapping travel percentage (55.66%) drops by more than 2% to 53.11%. The second-due unit time from another City station is only 50 seconds longer than the home unit.

However, a closure of Station 228 means that there will be an increase in street segments in the area beyond a 5-minute travel time. Currently, even Station 228 cannot cover all of its assigned area at 5 minutes travel time due to street layout and topography.

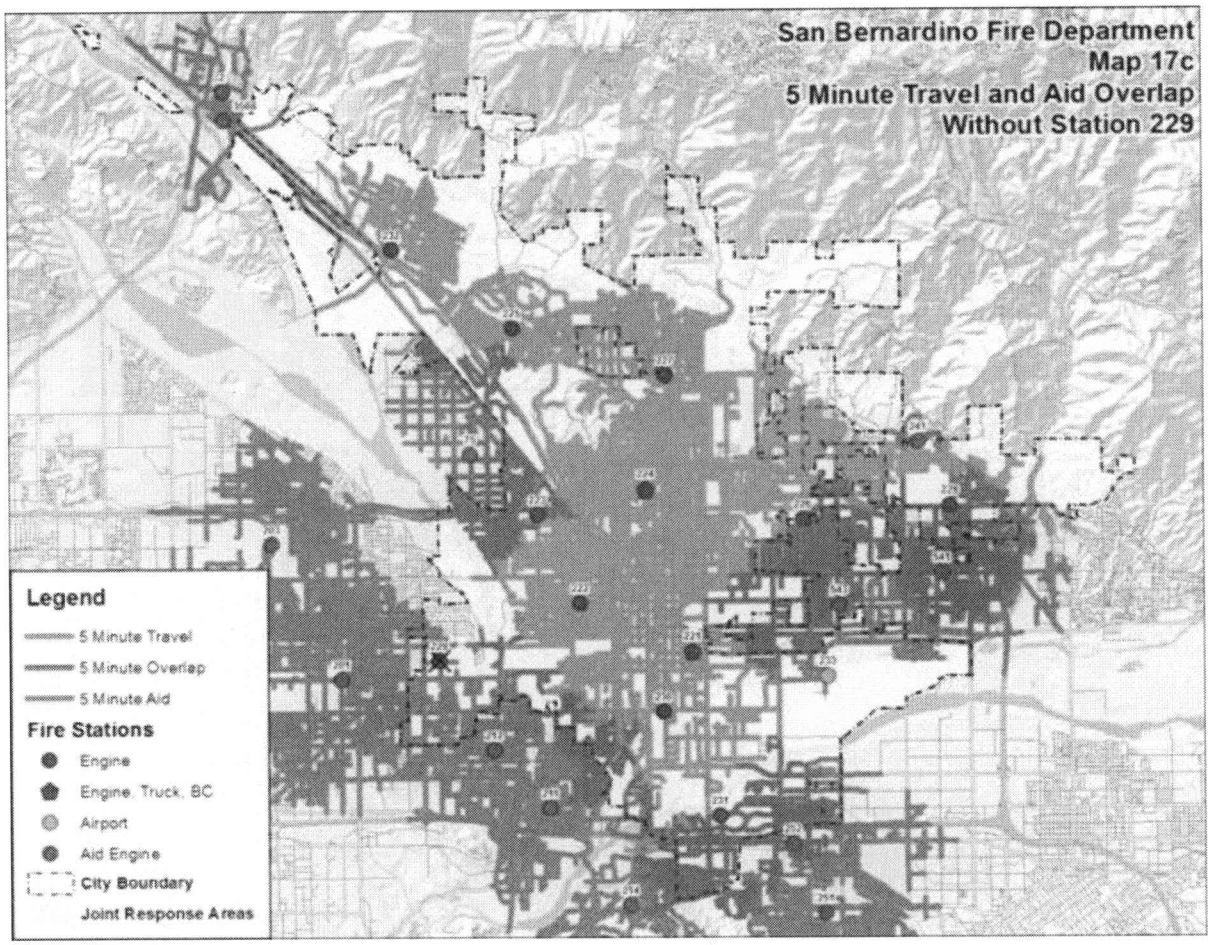
With the station located against the upslope area of the City, other unit assistance can only come from three directions, not four. The next nearest City station is 226 and it is *the busiest* in the City and is also frequently called into the busy core area. Thus, if it were not available, response times could be long from San Manuel Station 241 or CAL FIRE Station 541. However, Station 228 is the 9th busiest in the City and does not have a severe simultaneous incident demand rate.

Given these measures, even with the under-served street segments at 5 minutes travel time, Station 228 is a candidate for closure.

Peripheral Stations – Candidate for Closing – Station 229

The map below displays 5-minute travel time if Station 229 is closed:

Figure 21—Map #17c – 5 Minute Travel and Aid Overlap Without Station 229



If Station 229 is closed, the percentage of road miles within 5 minutes (88.56%) drops 1.7% to 86.85%. The overlapping travel percentage (55.66%) drops 3.43% to 52.23%. However, a closure of Station 229 means that there will be an increase in street segments in the area beyond a 5-minute travel time in the northwest area of this station.

The next nearest City station is 222 and it is the 4th busiest in the City and is also frequently called into the busy core area. This is why the response time for the closest City station is 4:00 minutes longer than if Station 229 is available. Thus, if it were not available, response times

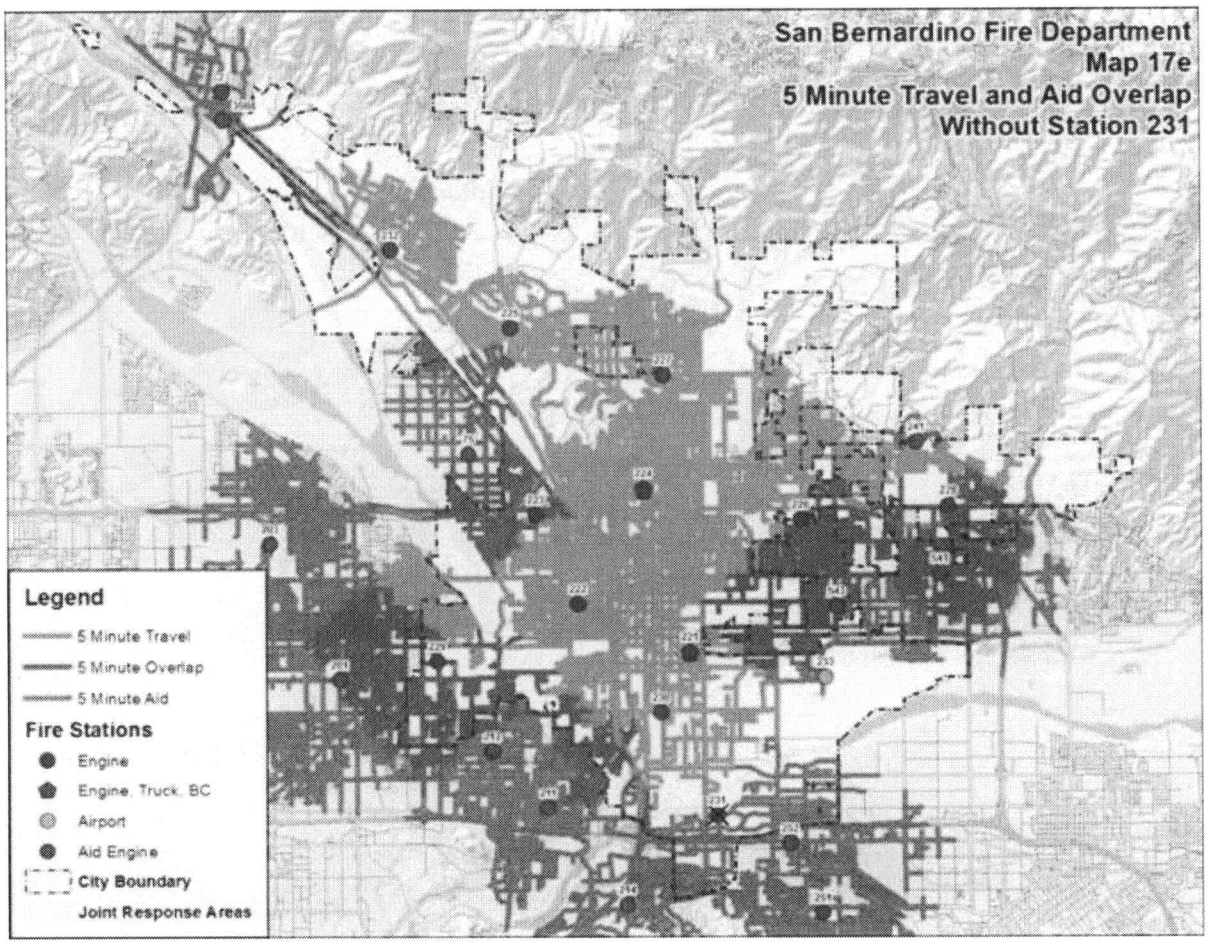
could be lengthy to the streets beyond 5 minutes travel time from Rialto Station 201 or Colton Station 212.

Given these measures, even with the under-served street segments at 5 minutes travel time, Station 229 is a candidate for closure.

Peripheral Stations – Candidate for Closing – Station 231

The map below displays 5-minute travel time if Station 231 is closed:

Figure 22—Map #17e – 5 Minute Travel and Aid Overlap Without Station 231



If Station 231 is closed, the percentage of road miles within 5 minutes (88.56%) drops 0.3% to 88.22%. The overlapping travel percentage (55.66%) drops 4.5% to 51.14%. Due to mutual aid, all of the street segments would still be within 5 minutes travel of a fire station.

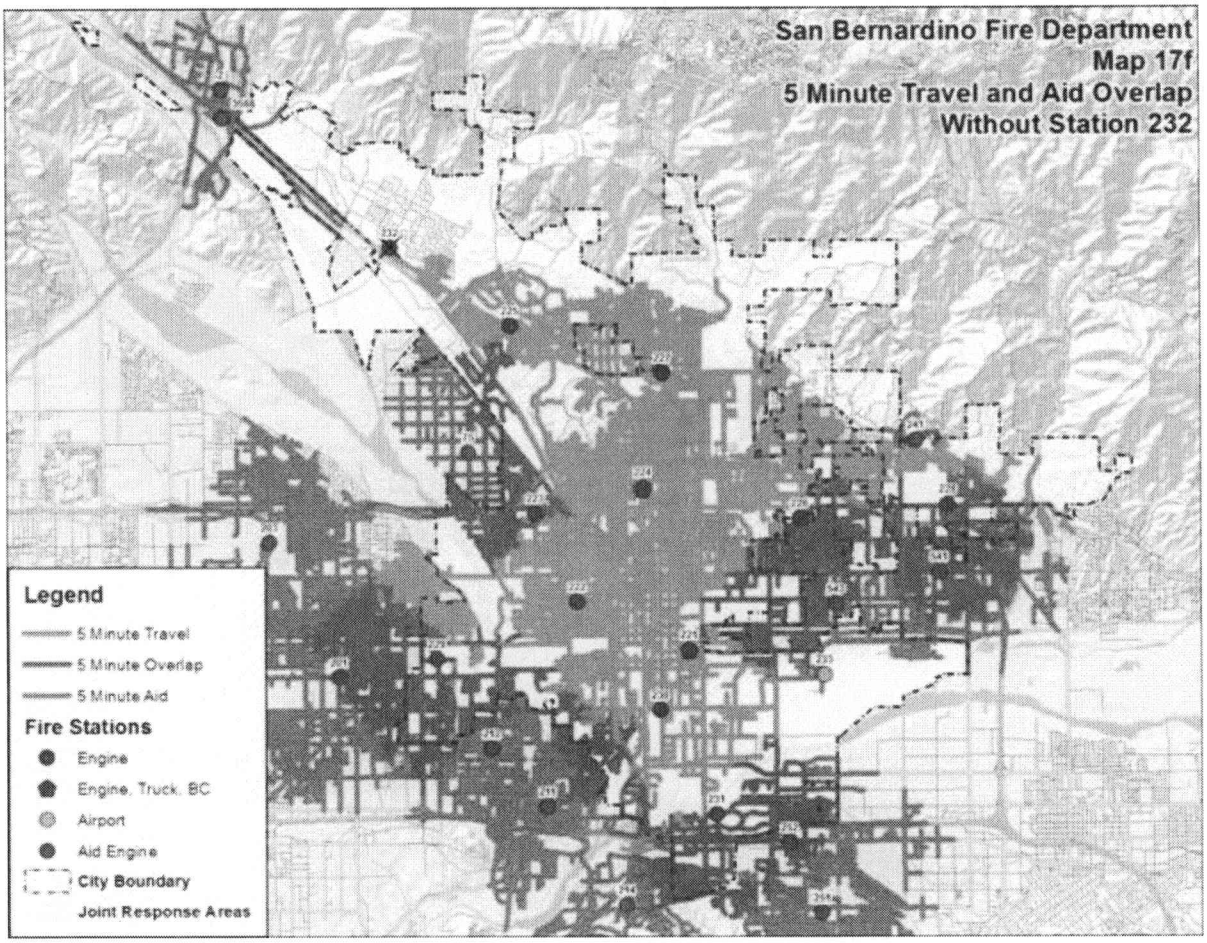
The next nearest City station is 230 and it is the 7th busiest in the City and has a moderate simultaneous incident demand rate. This is why the response time for the closest City station is 1:53 minutes/seconds longer than if Station 231 is available.

Given these measures, Station 231 is a candidate for closure.

Peripheral Stations – Candidate for Closing – Station 232

The map below displays 5-minute travel time if Station 232 is closed:

Figure 23—Map #17f – 5 Minute Travel and Aid Overlap Without Station 232



If Station 232 is closed, the percentage of road miles within 5 minutes (88.56%) drops 5.4% to 83.20%. The overlapping travel percentage (55.66%) drops 1.6% to 54.02%. Even with mutual aid, almost all of the station's street segments would be *beyond* 5 minutes travel of a fire station and, as the overlap measure shows, almost none of this area is overlapped by another City station.

The next nearest City station is 225 and it is the second slowest in the City and has small simultaneous incident demand rate. However, Station 225 is 2:24 minutes/seconds slower to this area than if Station 232 were available.

Given these measures, Station 232 is **not** a candidate for closure.

5.5 Overall Reduction Analysis

A primary goal in a reduction analysis is to identify stations with lower workloads that can be shared by more than one station. Another goal is not to open up street segments to travel times longer than a modest 5 minutes. In San Bernardino, due to geography on the northern side, these goals are difficult due to the mountains and the current year-round threat of wildfire.

5.5.1 Summary of Remaining Station Closure Candidates

Given the above analysis of seven (7) fire stations that might be considered for closure, next is a comparative issues list of the remaining five (5) possible candidates:

5.5.2 Peripheral-Core Stations

- Station 223 remains a candidate for closure as:
  - A high overlap exists at 5 minutes travel time by other fire stations
  - A low number of building fires occur in the early months of 2014
  - Support is available from three other stations to share the transferred workload.
- Station 230 is should be **dropped** as a candidate for closure as Station 231 is a better-fit choice.

5.5.3 Peripheral Stations

- Station 228 should be **dropped** as a candidate for closure as:
  - It backs up the City's busiest Station 226
  - A 5-minute gap is opened that mutual aid cannot cover
  - It is first-due to a large wildland area.
- Station 229 should be **dropped** as a candidate for closure as:
  - It is not completely overlapped by other stations
  - Removing it opens up a coverage gap beyond 5 minutes
  - City backup coverage is an additional 4 minutes away.
- Station 231 remains a candidate for closure as:
  - A high overlap exists at 5 minutes travel time by other fire stations
  - It only reduces 5 minute coverage slightly
  - A low number of building fires occur in the early months of 2014

- Three mutual aid stations plus City Station 230 can share the transferred workload.

The table below summarizes the key measures per station and then Citygate offers our final recommendation:

Table 27—Remaining Station Candidates Summary

Station ID	Citywide 5-Min Coverage Reduction	Overlap Coverage Reduction	2nd Due City Unit Travel Increase Min/Sec	Opens Up Coverage Gap at 5 Minutes	Considered for Closure
223	.51%	10.1%	2:19	None	**Yes**
230	1%	5%	0:20	None	No, 231 is better
228	7%	2%	0:50	Yes	No
229	1.7%	3.43%	4:00	Yes	No
231	0.3%	4.5%	1:53	None	**Yes**

5.6 *Deployment Reduction Findings and Recommendations*

Citygate's analysis has considered multiple factors regarding where the City can make the least painful reductions, should this be necessary due to the current fiscal crisis.

Finding #17: The City has such a high emergency medical incident volume, along with frequent structure fires, that any reduction in deployment of the response force will reduce response times and, at times, incident outcomes. The City is not over-deployed for fire companies to serve its diverse geography and risks.

If the City of San Bernardino is forced to consider the closing of fire stations due to the current fiscal crisis, Citygate makes the following recommendations:

Recommendation #3:	The station closures in this analysis should only be implemented in combination with an aggressive re-structuring and lowering of Fire Department responses to non-life-threatening emergency medical services (EMS) incidents as studied elsewhere in Citygate's overall deployment analysis of the City.
Recommendation #4:	Given the fiscal emergency, the City could choose to close Engines 223 and 231 and negotiate the impacts on the surrounding mutual aid partner fire departments.

Since core stations protect call volume, and peripheral fire stations protect geography, one option is to move peripheral-core or peripheral resources into the core during peak simultaneous hours and move them back into position during off-peak hours to protect geography. This can be done especially when wildland fire weather is the least severe and immediate response to the northern areas is slightly less of a concern for a few hours. Therefore, Citygate additionally recommends:

Recommendation #5:	Given that Stations 228 and 232 were not considered for long-term closure, they should be considered for immediate move-up to the core of the City when a high rate of simultaneous medical or sustained on-scene operations at multi-unit firefighting incidents occurs in the core fire station areas. This move-up would trade coverage for a few hours from low workload areas to the highest workload areas in the City, thus shoring up response times where it is needed the most.
Recommendation #6:	Additionally, the two ladder trucks in the core stations of 221 and 224 support the core workload. If fiscal pressures only required the savings of approximately 1.5 stations, and if both Stations 223 and 231 were closed, some of the savings should be used to open a 2-person paramedic squad and place it at Station 226, the busiest in the City.

SECTION 6—CITY FIRE DEPARTMENT PARAMEDIC PROGRAM OPTIONS

6.1 PARAMEDIC PROGRAM ANALYSIS INTRODUCTION

As part of our deployment analysis, Citygate was asked to determine the costs and benefits of stopping the fire department-based Advanced Life Support (ALS or paramedic) level of response to emergency medical incidents by firefighters on engines and ladder trucks, given the ever-escalating incident volumes and the City's fiscal crisis. This section gives an abbreviated overview of the provision and costs of the current fire paramedic program. While the provision of EMS in the state can be highly complicated and, at times, disputed between cities, fire districts, and counties, this overview is sufficient to help the City make an informed decision about whether to proceed further with this conversion issue.

6.2 BACKGROUND ON CITY PARAMEDICS

The San Bernardino Fire Department implemented firefighter/paramedics in 1976 following the lead of the Los Angeles County Fire Department and others in Southern California in the early 1970s. The original program used 23 paramedics on three squads to provide ALS care alongside a private ambulance company that had historically provided transport services.

In the 1990s the Department shifted to placing firefighter/paramedics on five fire engines to provide better ALS response to more neighborhoods. Over time, this effort has grown to place a firefighter/paramedic on every engine and ladder truck to provide every neighborhood equitably with a quicker ALS response. Over these years, across several companies, a private provider has always provided transport services.

In 2001, the City began a contract with American Medical Response (AMR) where the City received partial savings that AMR realized by not having to field as many ambulances in the City due to firefighter/paramedics arriving first to begin ALS measures. The amount of funds the City received was approximately $395,000 per year, but it had to be "earned" by the Fire Department arriving to EMS incidents within 7:59 minutes/seconds, 90% of the time.

As the ability for residents to obtain health care declined given changes in American health insurance costs, as well as a diminished ability to find a job with health insurance, the incidence of EMS calls to 9-1-1 began to rise throughout the country. By the time the recent recession hit San Bernardino, the EMS call for service rate started to explode, a trend that has continued to this day.

As EMS calls for service increased, the Fire Department could not maintain response times and slipped past 8 minutes to the point that fines for late response were consuming much of the revenue and AMR was feeling pressured to add resources of its own. By October 2012, AMR

notified the City it was stopping the fire first responder program payments, which it was permitted to do given its unilateral right under the 2001 contract.

During this partnership era with AMR, the City also invested in training and equipping its fire dispatchers to perform what is called Medical Priority Dispatching. This process is where, via a dispatcher listening to what a 9-1-1 caller needs, and then using their training and expert decision support software, determines when fire paramedics are immediately needed or just a paramedic or even EMT ambulance with a longer response time.

However, when the AMR contract was stopped in the fall of 2012, to protect residents as effectively as it thought possible, the Fire Department reverted six months later to also stopping medical priority dispatching and commencing sending a fire unit with a paramedic to every 9-1-1 call for assistance.

6.3 REGULATORY ARENA

In the late 1970s the state of California increasingly legislated the power to regulate both medical care standards and the provision of ambulance services via franchises in exclusive operating areas, to the State's counties. Emergency medical services in California began with the passage of the Wedworth-Townsend Pilot Paramedic act in 1970. The Emergency Medical Services System and the Prehospital Emergency Medical Care Personnel Act (EMS Act) was passed in 1980 to institutionalize the provision of emergency medical services. The Act created a State EMS Authority and, in turn, tasked all the counties to create Local Emergency Medical Service Agencies (LEMSAs) to manage the clinical quality and the provision of transport services on a large area called an Exclusive Operating Area (EOA) using franchise powers.

Therefore, today, a county's LEMSA regulates the applicable state and county standards.

Sensing the need to allow time for pre-existing paramedic systems to transition to county control, the EMS Act created Section 1797.201 in the Health and Safety Code to allow agencies to continue operation "as is" until they entered into agreements with their county LEMSA. The Section reads:

> *1797.201. Upon the request of a city or fire district that contracted for or provided, as of June 1, 1980, prehospital emergency medical services, a county shall enter into a written agreement with the city or fire district regarding the provision of prehospital emergency medical services for that city or fire district. Until such time that an agreement is reached, prehospital emergency medical services shall be continued at not less than the existing level, and the administration of prehospital EMS by cities and fire districts presently providing such services shall be retained by those cities and fire districts, except the level of prehospital EMS may be reduced where the city council, or the governing body of a fire district, pursuant to a public hearing, determines that the reduction is necessary.*

In the late 1980s San Bernardino City and other local governments in the State litigated unsuccessfully several aspects of the EMS Act to the California Supreme Court. Since that time, the City has operated the same type of fire department paramedic program under its "201" rights per the citation above. The City has never entered into a formal agreement with the County over the provision of EMS, even while the County changed private ambulance operators over the years.

The State EMS Authority in EMS Document 310-01 dated April 2010, stated, "*The city or fire district's 'obligation' under 1797.201 is fairly limited. A city or fire district must maintain the level of service that was in place as of June 1, 1980, until an agreement for service is reached with the county. Alternatively, the services may be decreased after a public hearing.*"

The grey shading in the 1797.201 citation above highlights the City's ability to change its provision of paramedics by requesting, via a written agreement to the County of San Bernardino LEMSA, a revised paramedic program, and/or if determined necessary, reducing the level of City provided paramedics. Simply stated, the regulation of EMS is the responsibility of the County and its ambulance contractor. There is no state law mandating a city or fire district to provide a paramedic level of care at its continuing expense. If the City were to cease providing paramedics, the County and its ambulance contractor, AMR, would have to provide the level of care and response times the County desires.

6.4 Costs of Current City Program

The current Fire Department paramedic program expense is mainly comprised of two components: (1) personnel expenses, and (2) supplies and equipment. It is essential to understand the Department operates a "dual role" firefighter/paramedic system where one of the three fire personnel on each fire truck is certified at the higher paramedic level of care. As such, there are no dedicated paramedic personnel or response apparatus to expense. There is a paramedic "certification pay" differential above that of the firefighter rank to compensate for the additional duties. Then there are the State licensure and continuing-education requirements bi-annually for the paramedics.

As for equipment, the Department has to provide a much more expensive EKG/Defibrillator unit, rather than the simple, automated external defibrillator units that Emergency Medical Technician (EMT) level firefighters and trained police officers use. Additionally, there are other paramedic-level tools and drugs that are carried.

It is important to understand that reducing the level of care from paramedic to EMT will not reduce positions or apparatus. In a macro sense, the costs to continue the paramedic program over the option of switching to a three-firefighter/EMT engine program can be broken down as:

Table 28—Paramedic Program Cost and Savings Summary

Category	Amount
Expenses Reduced	
Maintenance and Operations (M&O)	$113,245
Personnel – 39 paramedics	$730,630
Subtotal	**$843,875**
Revenues Lost	
EMS User Fee	$290,000
EMS Membership	$6,000
Subtotal	**$296,000**
Net Savings After Revenue Loss	***$547,875***
1st Year EKG Units Change Capital Costs	$122,497
Net 1st Year Savings	**$425,378**

Theoretically, the City could stop providing a paramedic level of care and save approximately $547,875 in year two and beyond at current costs. In the first year when reducing service the Department would have to trade in its paramedic EKG units and purchase new automatic-only units that EMT's use.

What is not seen in the table above are the significant costs that have already been spent to train and keep the current 39 firefighter/paramedics certified for many years. Paramedic training requires over 1,230 hours, compared to slightly over 144 for an EMT. This sunk training cost is in addition to the costs the City incurred to also staff the trainees' positions on fire units while trainees were away at training.

Last, but not least, is the possible cost impact on the City's contract to be a fire first responder to the County islands inside the City limits where the City is closer to respond than a County fire station. Currently, the County pays the City $487,000 annually for this service and the County Fire Department level of care is at the firefighter/paramedic level. It is unknown what the County response would be if the City stopped providing paramedic level care. The County could choose to ignore the change or consider lowering the payment for the lesser service received especially if it had to expense another form of paramedic first responder cost. Thus, if the County were to stop its contract for City Fire Department paramedic responders, the net savings to the City from stopping the paramedic program would disappear and actually cost the City $61,622 in lost revenue over the program savings.

6.5 PARAMEDIC PROGRAM FINDINGS AND RECOMMENDATIONS

Before offering an opinion on what the City's options are for paramedic service, Citygate looked into the patient care reports filed by the firefighter/paramedics along with using nationally published trends to determine which incidents required paramedic level care. In the City, patient care electronic data is captured on tablets carried by the fire and ambulance crews and collected by the County LEMSA. When an agency is considering a change away from the provision of fire department paramedics, the question is, "How many 9-1-1 EMS incidents actually are acute emergencies requiring advanced care in very short timeframes?" Other studies in various parts of the country typically place the actual ALS rate at less than 30% on the high side.

In the City of San Bernardino, over the most recent 12-month period, we reviewed 24,300 patient contacts and found that approximately 6,015 (or 24.75%) required ALS care. The patient initial chief complaints were:

Table 29—ALS Patient Chief Complaints

ALS Type of Chief Complaint	Quantity
Altered Level of Consciousness	1,593
Asthma	259
Cardiac Arrest	295
Dysrhythmia	85
Chest Pain	1182
Allergic Reaction	110
Congestive Heart Failure	65
Chronic Obstructive Pulmonary Disease (COPD)	111
Dehydration	27
Hypoglycemia	174
Hyperglycemia	70
Headache	229
Hypotension	20
Hypertension	74
Respiratory Distress	812
Seizure	561
Cerebrovascular accident (CVA)	126
Syncope	222
Total	**6,015**

Within these categories, while some level of advanced care may have been necessary to alleviate suffering, lessen the severity of the injury, or reduce the hospital stay, not all of the above patients were in immediate danger. This observation of Citygate's about the patients reflects other studies that have the opinion that only 15-20% of all EMS patients are actually in very acute status.

6.5.1 Policy Questions and Citygate's Opinions

The policy question becomes, "At what cost can the Fire Department respond to every call for assistance as if it is a life and death emergency?" In doing so, the Department is wearing itself and its equipment out. More importantly, while responding to emergency medical incidents, the Fire Department is not available for an appropriate level of fire suppression, given the City's risks, which unfortunately is an all-too-necessary service in San Bernardino

It would be too easy to suggest that the City stop responding to medical incidents since they are 87% of the service requests. One would think the City could then reduce the number of fire stations. But fire departments are intended to exist as a stand-by capacity, allowing them to suppress fires and stop conflagrations from occurring. In this way, fire departments are similar to property or life insurance; people hope they never have to use it, but when they do, they need it quickly. As stated in the deployment analysis section of this study, fire attack is about the speed (time) and weight (staffing quantity) of deployment, and speed comes from neighborhood-based units.

The policy choice for San Bernardino is how to safely and humanely lower the quantity of Fire Department EMS responses while preserving the first mission of a fire department—keeping the community safe from fire. Other communities have gone through, or are going through, what San Bernardino is experiencing in terms of the rate of building fires in abandoned or poorly maintained buildings. The pattern is worse when fire services are reduced to the point where the speed and weight of the suppression effort cannot keep up. Then more and more serious fires occur. Economic potential and growth stalls, as the community is not perceived as safe from fire.

Such a scenario is playing out today in the City of Detroit.[2] It played out to tragic results in the South Bronx section of New York City in the late seventies.[3] San Bernardino is at a tipping point, in Citygate's opinion. It has to lower the EMS incident rate on the fire units to the more critical incidents to strengthen its efforts on fire suppression, fire prevention in abandoned buildings, and in arson investigations. The City cannot let a culture grow in which fires are tolerated and believed to be of no harm to the community.

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[2] Guillen, Joe. (2013, June 16). *Fire Department: Response time, IT needs cited in report*. Retrieved from http://www.freep.com/article/20130616/NEWS01/306160069/detroit-financial-crisis-ems-fire-department

[3] Flood, Joe. (2010). *The Fires: How a Computer Formula, Big Ideas, and the Best of Intentions Burned Down New York City—and Determined the Future of Cities.* New York, NY: Riverhead Books, The Penguin Group.

There are significant changes ahead for the provision of EMS care under Federal Health Care Reform. There is new economic pressure to divert patients from unnecessary emergency room visits. Other agencies in California and other states are testing Community Paramedicine alternative delivery programs and new partnerships with ambulance providers and health care centers. Some believe new EMS revenues will emerge and will help pay for field providers to provide pre- and post-discharge care.

In Citygate's opinion, now is not the time to exit the provision of firefighter/paramedic care. Doing so would throw away the sunk cost of the training already provided to paramedics and produce a net savings of only approximately $547,875 per year (after EMS fees are also stopped), which, by itself, will not close the City's budget gap. Citygate believes that the City should follow our recommendations below to be agile in leveraging its paramedic investment as new opportunities emerge. Thus, we find and recommend:

Finding #18: The quantity of EMS incidents and the practice of immediately sending a fire unit to every 9-1-1 medical call, regardless of severity, are significantly lowering the City's firefighting ability, risking its firefighters unnecessarily and increasing its expenses for personnel and equipment.

Recommendation #7: The City has to work with the County and its ambulance contractor, AMR, to re-implement medical priority dispatch and immediately lower the Fire Department EMS response to serious health emergencies, rescue, entrapment, etc.

Recommendation #8: Due to the modest savings and sunk costs in the training of firefighter/paramedics, the City should not consider dropping its paramedic program until all of the effects of Federal Health Care restructuring are well understood in the EMS arena.

Recommendation #9:	The City should immediately send a letter to the County EMS Agency as required by California Health and Safety Section 1797.201 requesting changes to the Fire Department's response to non-life threatening medical problems. This request should be to implement medical priority dispatching with 60 days. Further, the letter should state that, absent a new partnership with the County and AMR to divert and absorb the non-emergency medical patients, the City will hold a public hearing per Section 1797.201 and unilaterally consider lowering its paramedic first response program.

SECTION 7—CONTRACT OR MERGER OF FIRE SERVICE OPTIONS

7.1 OVERVIEW OF FIRE SERVICES PROVISION OPTIONS

As part of our deployment analysis, Citygate was asked to provide a very high level assessment of options regarding contracting or merging fire services with another agency. The following is Citygate's advice for the City based on Citygate's experience and the context of our findings in this report.

There are several technical methods for accomplishing a merger of fire services for a city. Under any method, both parties must have a framework within which they can have on-going conversations and mutually make decisions regarding the level and costs of their fire services. These methods are commonly called the governance structure to separate it from a formula-driven cost-sharing model.

Larger and regional contract-for-service, Joint Powers Authority (JPA), or special district fire departments can spread headquarters and logistical overhead costs across many firefighters, and thus have quality dedicated staff for headquarters support programs. They can train future command staff leaders more easily because they can rotate candidates through different bureau assignments to gain experience for eventual upper executive positions. They do not have to worry as much about an injury leave or disability retirement crippling a critical command staff position.

But the larger and regional contract-for-service fire departments are inflexible when it comes to costs. They use the common tools to set labor costs, but once set, they must be passed onto the contracting cities and counties. However, Citygate notes that after this recession, government employers of all sizes are re-setting their pension, medical, and salary costs to the new economic reality. This should moderate contract cost increases, at least in the long term.

There are other benefits to cities like San Bernardino that contract for service. For example, the City does need to utilize internal City Hall service time and cost expenses for fire department workers' compensation, general liability, payroll, personnel, legal, and labor negotiations. The City Hall overhead is a serious issue for fire and police services. Even if a fire contract did not mean San Bernardino could reduce its already smaller City Hall staff, the staff would gain more time for other under-met City needs.

Consolidation of fire service can take three basic forms:

1. Full
2. Functional (partial services for one or more headquarters functions)
3. Contract.

These forms are described below.

7.1.1 Full Consolidation

In a full consolidation, two or more fire agencies combine completely to create a single fire department. The department then has a single budget, all personnel are employees of the one fire agency functioning under a single labor agreement, and operating with a single payroll, finance, personnel, and purchasing support system.

7.1.2 Functional Consolidation

In a functional consolidation, two or more agencies share functions such as having a combined training officer and/or a fire marshal function, or even combining all headquarters functions, sharing all administrative functions, and reporting to a single fire chief.

7.1.3 Contract for Services

Under contract for services, one agency contracts with another for full fire services. Instead of shared governance and the ability for each agency to set local internal policies and costs, the agency pays for service levels via contract terms.

A merger of a city fire department into a fire district, or the creation of a Joint Powers Authority, usually executes full consolidation. Functional consolidation is more often undertaken with some form of Joint Powers Authority or contractual relationship in which one agency, for example, may provide a function for the entire fire service while the other agency provides the joint training officer function.

Governance is often the most critical issue when merging fire services. Preserving autonomy and the ability to choose levels of service is important to communities. Actual consolidation is not that difficult if the issues of local fiscal and policy control can be resolved by selecting an appropriate governance model.

7.2 Shared Service Models

There are several models for the governance and operation of shared or consolidated fire services. Each has its strengths and shortcomings. The principal models are:

7.2.1 An Independent Fire District

Establishment of a new independent fire district to serve the entire city would require LAFCO agreement and two-thirds local voter approval for a new tax rate to support the district, which will require independent funding. An independent district will require a larger administrative structure because it will have a separate and independent board, be responsible for its own personnel, finance, and purchasing functions, plus it would not be accountable to the city elected officials. Its advantage, if approved by the voters with an adequate revenue base, is that it has as

its principle focus the provision of fire service that is appropriately funded without using current city general fund revenues that might be devoted to other purposes, such as police services.

7.2.2 Dependent Fire Districts

A county board of supervisors serving as the board of directors usually operates a dependent fire district. While dependent districts have most of the same advantages and disadvantages of independent districts, uniquely, the governing board is not composed of people wholly elected from within the area served by the district. The only direct representation is the supervisor or supervisors whose district(s) cover the city area.

7.2.3 Joint Powers Authorities

When several cities or other local government agencies seek to provide consolidated services, and yet want to retain a greater measure of fiscal and operational oversight than either an independent or dependent district would allow, they usually turn to the creation of a Joint Powers Authority. California law allows an almost infinite variety of shared services between governmental agencies and permits the partners to create almost any governing structure that meets the local needs for fiscal and operational control. For example, a JPA with a board composed of elected officials from each of the partner agencies is the most common form. Funding for the combined service can similarly be provided to the JPA by each partner agency according to whatever formula the parties may find agreeable.

7.2.4 Contract for Services

Frequently, the shared fire service may be best provided by having one agency take the lead and act as the service provider while the other agency pays a "fair share" under contract arrangements. It is not uncommon for one city to provide fire service to a portion of or all of a neighboring city at an agreed contractual cost. All of the savings and operational efficiencies that might be found in consolidation under a JPA can be realized in a contractual arrangement. However, the disadvantage is that day-to-day policy control rests with the elected officials of the agency providing the service. Unless there is a close and common vision regarding how to operate the service, conflict can arise between the partners, with the city "buying" the fire service from their neighbor feeling they "pay" but have little control over the nature and quality of the service.

7.3 Contract for Service Issues

It is fairly common for one fire service agency to contract for services from another in order to obtain economies of scale. Training, Hazardous Materials response capacity, specialty rescue services, and first responder services in areas of an agency that may not be well served by its own fire stations are just a few examples of contracted services. Contracting for headquarters

services is more often seen as an interim step to a full contract where one agency provides "all" of the services to the other agency.

The core piece of any contract for service arrangement is the formula that the parties agree is an equitable measure of how to allocate costs between the contracting agencies.

7.3.1 Typical Contract for Service Formulas

Contract for service formulas typically focus on five measures: assessed value being protected, population being served, calls for service, number of line staff assigned to stations daily within each agency, and the number of fire stations located within each agency's boundaries. The measure or combination of measures chosen to determine the contract amount to be paid to the provider agency is typically a formula that "all parties consider to be fair" in their particular environment. Regularly the measures each tend to result in nearly the same "cost split" percentage.

7.3.2 Contract Issues

A full contract for services results in all employees and resources being under the direct management of one employer. The interest of the city is then the level and cost of the service, while all matters necessary to meet the level of service obligation are the responsibility of the contractor. Agencies that contract are interested in the level and content of the service that it provided at a quality level acceptable to them, and at a price that they can afford.

While the governance portion of a contract agreement provides the oversight on level, quality and cost of service, the city then has the freedom of choice regarding where and how it comes up with the revenue to pay for the service. The city can use its current revenue sources or choose to levy a special tax.

The following is a partial list of all of the issues that have to be addressed under a full contract for service model:

- Ownership of the equipment and fire stations
- How to handle depreciation on current city-owned equipment if the contractor takes ownership of the equipment
- Post-retirement medical unfunded liability
- Coordination of emergency response
- Fire prevention and inspection services: Who is to provide and fund plan checking of new construction?

7.3.3 Summary of Benefits

Benefits of a contract include some additional considerations. The extent to which any party sees the following as benefits is always a matter of judgment and local elected official determination.

- Management of employees is simplified under a single MOU and set of personnel rules
- A single accounting system is maintained by the contractor, avoiding duplication
- The city no longer will need to negotiate with fire employees
- The city and contractor can adopt performance measures to gauge the delivery of services
- The city no longer is fiscally responsible for fire services as regulations and needs change.

7.4 CAL FIRE Contract Option

CAL FIRE provides local government the option for "cooperative agreements" to provide fire services in addition to its responsibility for forestry and fire protection for state lands. It is important to note that they are not in the business of contracting for the sake of contracting or expansion. They contract where asked and based on a significant list of criteria. Would the contract benefit the state in a mutual relationship?

The principal difference between CAL FIRE and smaller fire departments is the "bench strength" that CAL FIRE provides. In each region, it has the capacity to guarantee a staffing level regardless of how vacations, injuries, illnesses, or retirements may affect staffing at any single fire station. Smaller fire departments often have to either decrease their daily staffing or resort to extraordinary amounts of overtime when unexpected events result in a reduced number of firefighters available to the department.

In each CAL FIRE region there is a well-trained investigation team that has the training and experience to conduct comprehensive investigations when arson is suspected, as opposed to smaller departments where arson investigation is only a collateral duty with much less opportunity to exercise the skills.

A CAL FIRE prevention program and support staff is available to be used by each part of the CAL FIRE region. While communities that contract for CAL FIRE service continue to provide fire prevention programs out of the local stations, CAL FIRE can bring in the training and materials for more specialized prevention programs.

With CAL FIRE, training is a very high priority, and each CAL FIRE region has portable and permanent training props along with a very structured training and continuing certification program. Smaller agencies may not have the training props. As a result, they must borrow them

or go to other neighboring agencies to obtain specialized training, such as confined space rescue, extrication, and multi-story emergency event training.

CAL FIRE uses a centralized fire dispatch in which the supervisors and dispatchers conduct only fire and related emergency dispatch of fire agencies. Some communities in California are either large enough to provide police/fire dispatch, or have banded together to create regional dispatch centers. However, many still rely upon police dispatchers to also serve as fire dispatchers, which can create conflict when there are multiple fire and police overlapping calls. Many such combination centers do not provide the focused fire dispatch training (reducing dispatch time is critical in reducing the response time to an emergency scene), and they often suffer from a shortage of dispatchers if the agency is not large enough to have backup dispatchers available.

7.4.1 Limitations of CAL FIRE Contracts

CAL FIRE contracts are essentially intended to provide daily staffing at fire stations, dispatch, management, incident command, training, fire cause investigation and fire prevention activities. They do not cover the daily costs of repairing the fire stations, specialized clothing and equipment for the staff, specialized equipment, vehicles, or equipment maintenance. In other words, an agency that contracts with CAL FIRE is expected to provide most of the materials, supplies and equipment for each station, the fire apparatus, and apparatus maintenance. Although CAL FIRE does have an outstanding vehicle apparatus maintenance program and capability, most local agencies find it less expensive to continue maintaining fire engines, etc. under separate contract and through their own public works vehicle maintenance shop.

While CAL FIRE contracts guarantee that existing employees will be transitioned into CAL FIRE employment with all of the associated benefits, if there are specialized benefits (usually credit for retiree medical benefits that have been earned by present employees), the cost remains with the local agency. Of course, this does not so much represent an added cost with or without a CAL FIRE contract, because it is a cost that the City would incur anyway. It is just that this continuing cost needs to be recognized by the City.

When comparing the cost of a CAL FIRE contract for services with the cost of a City continuing with its own fire department, care must be taken to recognize which currently City budgeted costs that will remain if the City contracts with CAL FIRE. This permits a full comparison of the cost of fire services provided by the City in comparison to CAL FIRE.

7.4.2 CAL FIRE's Position on the City of San Bernardino

As this report was being prepared, the City and consultant had conversations and exchanged letters of inquiry. At this time, CAL FIRE regional and state leadership have determined they will <u>not</u> respond to a request for a contract for service with pricing, due to the many uncertainties contained in the bankruptcy situation. Not the least of these is the City's CalPERS benefit obligations.

It is all but impossible to compare another agency's CAL FIRE contract costs to a city the size of San Bernardino. While the labor cost per fire crew may be different, in a contract, CAL FIRE and the City have to reach agreement regarding the level of headquarters and dispatch positions to be included, what CAL FIRE will charge for those, and which costs, such as for fire stations and unfunded pension and/or health liabilities, remain with the City.

Based on Citygate's experience, almost every conceptual contract estimate based in the cost of labor per fire crew is wrong. Most agencies do not understand their full fire service costs, and what a contractor must provide for overhead. In addition, there are these issues to be negotiated:

- Submit for transfer verification by CAL FIRE all City fire employee records to determine who can be transferred, and at what rank and pay
- Resolve City firefighter return rights to the City, if the contract is stopped
- Resolve disposition of earned leave credit
- Resolve City employee continuity of medical coverage during the transition
- Resolve post-retirement retiree medical costs
- Understand the retirement formula applicable to City employees who transfer to CAL FIRE
- Identify retirement reciprocity
- Identify the number and cost of City employees on disability (City expense) on the effective date of a contract
- Finalize ownership and maintenance of front-line and reserve apparatus and equipment.

Given that a contract for service change of employment for the City's firefighters is a major issue, it falls within the City's requirement to meet and confer on wages, hours, and working conditions. Thus, only after negotiations with both CAL FIRE and City firefighters are concluded to determine the final, hard, one-time conversion and on-going costs for at least three fiscal years, can the Common Council be asked to approve final contract documents and a conversion date with both the County and City Firefighters Union.

All of the above can easily take one year *with the cooperation of all parties.* If there is a labor dispute and an agreement cannot be reached, more time is required for the City to follow its options.

Finding #19: Due to the current fiscal crisis and legal proceedings, CAL FIRE will not respond to a contract for service request. Even if it responded, resolving the issues and determining if the cost is beneficial to the City could take upwards of 1-2 years. In effect, this option does not offer any short-term financial savings to the City in the near term.

7.4.3 Joint Powers Authorities

While there are a variety of forms that a JPA might take, one example would be to form a JPA with a board composed of elected official members from each agency. The board could have the responsibility to review the budget and operational policy, but only the power to then recommend approval by the full city councils and/or district boards. Thus, the JPA board of directors would be the fire "sub-committee" of the parties.

Example JPA policies are:

- The JPA board would jointly appoint the fire chief and exercise direct oversight on major fiscal and personnel issues for the shared services.
- The JPA would have two choices for the employment of the firefighters—they could become JPA personnel, or one existing agency could employ them, providing payroll and personnel services, reimbursed by the other partners. This decision is one driven by either partner's ability to host fire department personnel services, as well as the State Retirement System requirements. The only way to know the exact costs would be to perform a retirement system actuarial analysis to see which of these two options is less expensive: starting a new retirement contract with the JPA, or having one existing city or district retirement contract absorb the firefighters.
- The fire chief and JPA would set the annual budget and objectives. The JPA board would consider it and recommend co-ratification by each of the partner agencies.
- Budget expenses could be shared based on one of the formulas discussed in the fiscal section of this report. Each agency could continue to separately own, fund, repair and replace its capital assets like fire stations and fire apparatus, under the fire department's common specifications.

This is only one example of how a JPA might be arranged. The specific details and authority would need to be worked out through discussion by the partners to reach a "best fit."

The only advantage to using a JPA would be to create a new governance model that removed full operational authority from the current elected officials and place that authority in a JPA Board consisting of representatives from all of the participating agencies.

> **Finding #20:** During the period of this study, Citygate and City Hall staff were not able to identify any other local government partners interested in shared fire services via a JPA. As such, this option will not assist the City in the near term with its costs of fire services.

7.4.4 Annexation of the City into the County Fire District

Currently the County of San Bernardino has a County Fire Department which is a dependent district, managed by the County Board of Supervisors. Historically, the District, under state laws, has offered both contracts to smaller cities in the County, as well as the option to annex into the Fire District.

During the preparation of this report, the County Fire District was already examining its service options going forward and has indicated that it will no longer offer a contract for service approach. Under contracts, given their long-term uncertainty, it is too difficult to manage employees over a very long time, which is actuarially the most cost efficient for pension and health costs. However, they have indicated that they would offer San Bernardino and other cities if interested, the annexation into the District option.

In annexation the District boundaries will be expanded to encompass the City. There would be one fire service provider and the governing body would be the Board of Supervisors elected by the voters across the entire District, including the City. The District's sources of revenue would be set at the time of merger, to include transfer of part of the City's property tax allocation that is spent on fire services. Future fiscal and operational issues would be for the District to resolve. The Mayor and Common Council would cede all control over the level of fire services to the County, forever.

If the City annexes into the Fire District, it would be required to transfer sufficient revenue to the District to support City Fire Department expenses assumed by the District to continue the present level of service. State law requires the County to negotiate on behalf of the District in determining the amount of property tax to be transferred to the District to ensure that the District will have adequate revenue to continue the present level of service for the foreseeable future. The revenue source must be stable enough to ensure the fiscal stability of the District to provide the projected service level after annexation of the City territory.

Under the Fire Protection Law of 1987, a fire protection district may include incorporated territory (Health and Safety Code section 13810). The advantage is that the annexed territory shall be subject to any previously authorized taxes, benefit assessments, fees or other charges of

the district (LAFCO law section 56330). This means that the any existing District special taxes or benefit assessments would carry over and apply to property within the City.

The objective of the tax sharing discussions would be to ensure that the district has sufficient tax revenue to provide the services within the expanded district boundaries. As a practical matter, the Board of Supervisors may also consider other City tax sources as it negotiates on behalf of the District. More realistically, if the Board and the City reach a tax sharing arrangement themselves, it will most likely be accepted by LAFCO.

Issues such as how the City and District agree to handle major maintenance on the City owned fire stations and accumulated depreciation on the older City fire apparatus might also affect the amount of property tax that needs to be reallocated to the District.

As with a contract with CAL FIRE, there is also in annexation the City's responsibility to meet and confer with its firefighters over the impacts to wages, hours and working conditions. As such all of these and the other City indirect costs for fire service have to be determined.

7.4.5 Process of Annexation

The executive officer notices a public hearing before LAFCO. The commission may approve, modify or deny the proposal. If approved, the commission may adopt terms and conditions for the annexation.

At the end of the hearing, the commission adopts a resolution making determinations. There is a 30-day period in which a written request for reconsideration may be made.

After approval, the proposal is scheduled for a conducting authority hearing unless the proposal has the consent of 100% of the landowners and LAFCO waves the hearing. LAFCO is the conducting authority for the protest hearing. The commission or the executive officer conducts the protest hearing.

Sufficient protest may force the matter to an election or terminate the proceedings. Because there will be over 12 registered voters, we will only discuss the inhabited territory proceedings for registered voter districts.

If at the close of the protest hearing there remain written protests representing 50% or more of the voters residing in the territory, the proceedings are terminated (LAFCO law section 57078).

The proposal goes to an election if, at the close of the protest hearing, there remains protest representing either of the following:

At least 25%, but less than 50%, of the registered voters residing within the district; or at least 25% of the number of landowners who own at least 25% of the assessed value of land within the territory.

If there is insufficient protest, LAFCO orders the annexation without an election (LAFCO law 57075).

> **Finding #21:** While the County can offer annexation into its Fire District, the negotiation of costs, revenues and employment impacts, along with the LAFCO approval process, could easily take two years. As such, this option does not provide any immediate cost reduction relief in the current fiscal crisis.

7.5 Concluding Observations

Based on Citygate's experience, there are just as many happy as unhappy agencies in California in regional fire service partnerships. We have observed that the fiscal stress caused by the recession, combined with increases in retirement and health costs for employees, has significantly increased the stress and request for separation (divorce) studies. Large agencies have equally complicated policy, labor relations, and cost issues to manage. It can be very difficult for some smaller contracting agencies to afford the cost structure dictated by a large regional fire service provider. However, the regional agencies are also trapped, as they cannot easily, if at all, offer one agency a cost reduction if it is not also offered to others they contract with. Thus, with some agencies having an inability to pay, yet still wanting to receive similar regional services, the dialog between all of the agencies can be very contentious.

Even cities joining fire districts under annexation that only provide property taxes to the regional fire provider complain that, in some cases, based on their local assessed valuation, they pay more property tax revenue than they receive from the regional fire department in locally-sited fire crews. Thus, they feel they are subsidizing the region's firefighting efforts.

Given these issues, there is not one best fire service partnership approach for the City of San Bernardino to consider. The Mayor and Common Council would be well advised to first consider the coming decades, and ask themselves how much control of fire service they would like, at what level of effort they would like it, and at what quality and cost *after they exit bankruptcy and realize an economic recovery.* Firefighters as employees are not easily shifted between employers due to benefit and labor law issues. While the fiscal crisis is very painful at the moment, what will the City be like in 10, 20, or 30 years?

Recommendation #10: Given the issues of contracting for services or annexation into the County of San Bernardino Fire District, the Mayor and Common Council must choose a path for staff to proceed that can answer, at a fine level, the amount of local control and thus costs, that the City wants to manage for fire services as these costs are currently approximately 26% of the City's General Fund budget.

APPENDIX 1

UNIT HOUR UTILIZATION OF SAN BERNARDINO FIRE UNITS

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Unit Hour Utilization of San Bernardino Fire Units

Unit/Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Overall
ME226	17%	16%	15%	13%	11%	15%	16%	14%	18%	21%	22%	26%	22%	25%	26%	22%	25%	19%	24%	25%	24%	20%	19%	18%	20%
ME221	13%	15%	12%	10%	7%	8%	13%	15%	19%	18%	20%	22%	26%	23%	41%	23%	27%	20%	21%	23%	18%	18%	17%	17%	19%
ME224	12%	15%	10%	13%	8%	8%	12%	13%	14%	17%	17%	20%	21%	22%	44%	23%	26%	22%	23%	21%	19%	21%	18%	13%	18%
ME222	8%	10%	9%	6%	7%	7%	8%	11%	11%	16%	15%	17%	14%	16%	33%	20%	20%	17%	18%	16%	16%	13%	10%	13%	14%
ME223	7%	7%	8%	8%	4%	5%	6%	7%	10%	10%	10%	13%	13%	11%	28%	13%	14%	14%	14%	13%	13%	9%	10%	8%	11%
ME230	4%	7%	7%	5%	3%	4%	7%	6%	8%	9%	12%	12%	14%	16%	41%	13%	15%	13%	13%	11%	9%	11%	8%	6%	11%
ME228	9%	6%	5%	7%	6%	4%	6%	7%	9%	9%	11%	14%	9%	12%	31%	12%	14%	12%	13%	10%	15%	10%	9%	7%	10%
ME227	7%	8%	7%	6%	5%	5%	6%	9%	10%	12%	13%	15%	14%	14%	11%	11%	13%	12%	11%	12%	11%	11%	8%	7%	10%
ME231	6%	8%	4%	4%	3%	4%	7%	6%	9%	10%	10%	12%	8%	15%	30%	15%	11%	10%	12%	10%	9%	7%	6%	7%	9%
ME229	6%	7%	5%	4%	5%	3%	5%	6%	8%	8%	8%	12%	8%	10%	31%	13%	12%	9%	12%	11%	8%	8%	6%	9%	9%
ME225	7%	4%	5%	3%	5%	4%	4%	5%	9%	9%	10%	12%	11%	9%	11%	9%	12%	10%	9%	7%	10%	10%	7%	5%	8%
MT221	3%	3%	6%	3%	2%	1%	6%	3%	6%	7%	9%	10%	11%	12%	26%	9%	11%	8%	8%	7%	6%	6%	3%	4%	7%
ME232	7%	4%	2%	10%	2%	2%	5%	3%	5%	4%	7%	6%	10%	7%	33%	5%	12%	6%	5%	5%	4%	5%	5%	3%	7%
MT224	4%	5%	4%	5%	3%	1%	3%	3%	5%	8%	7%	10%	10%	10%	10%	10%	13%	8%	9%	6%	8%	5%	5%	2%	6%
ME241	3%	2%	1%	1%	1%	1%	3%	2%	4%	4%	6%	8%	4%	4%	25%	10%	12%	7%	6%	5%	5%	4%	3%	2%	5%

CITYGATE ASSOCIATES, LLC

FOLSOM (SACRAMENTO), CA — MANAGEMENT CONSULTANTS

FIRE SERVICES DEPLOYMENT STUDY

CITY OF SAN BERNARDINO, CA

VOLUME 3 OF 3 – MAP ATLAS

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2250 East Bidwell St., Ste #100 ■ Folsom, CA 95630
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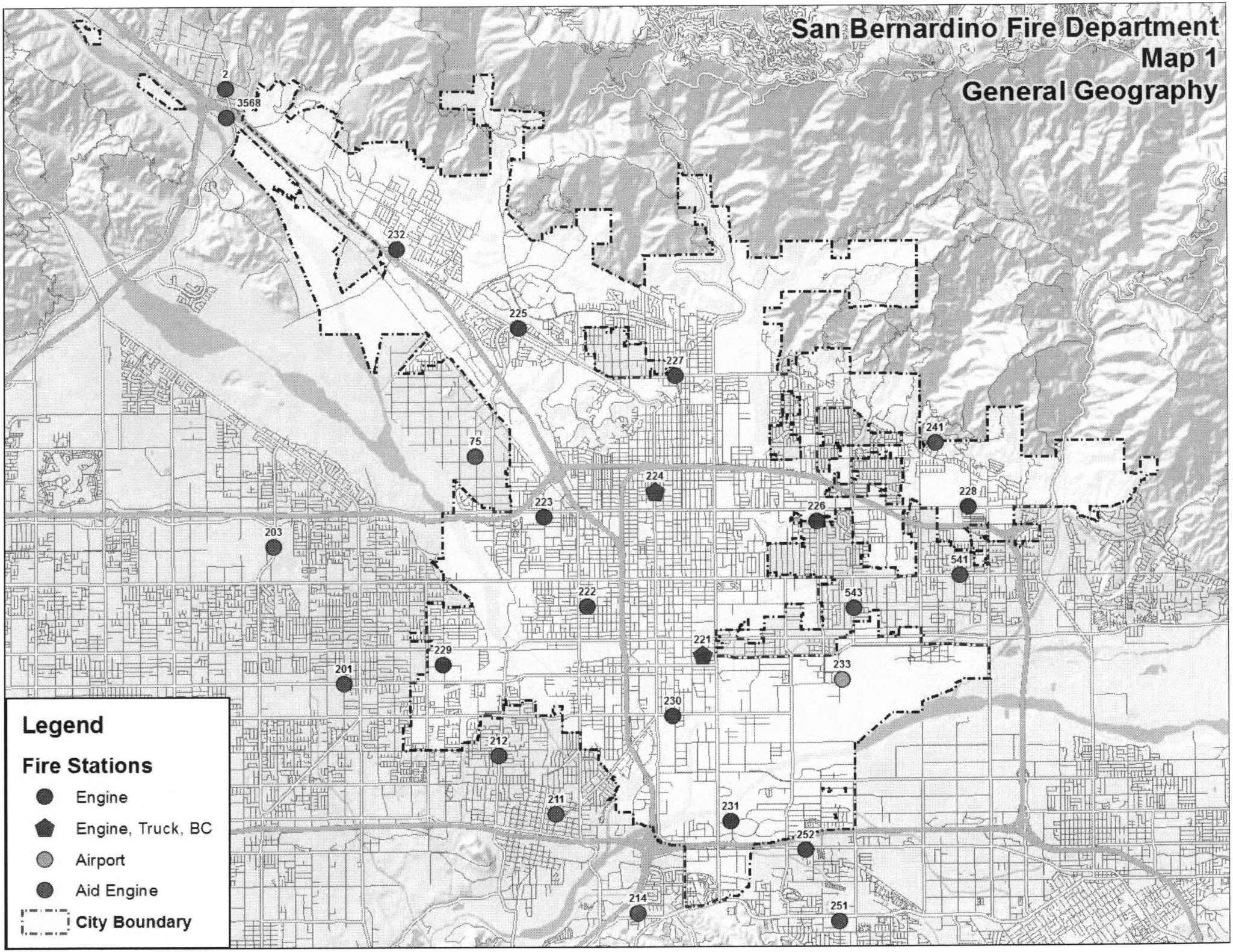
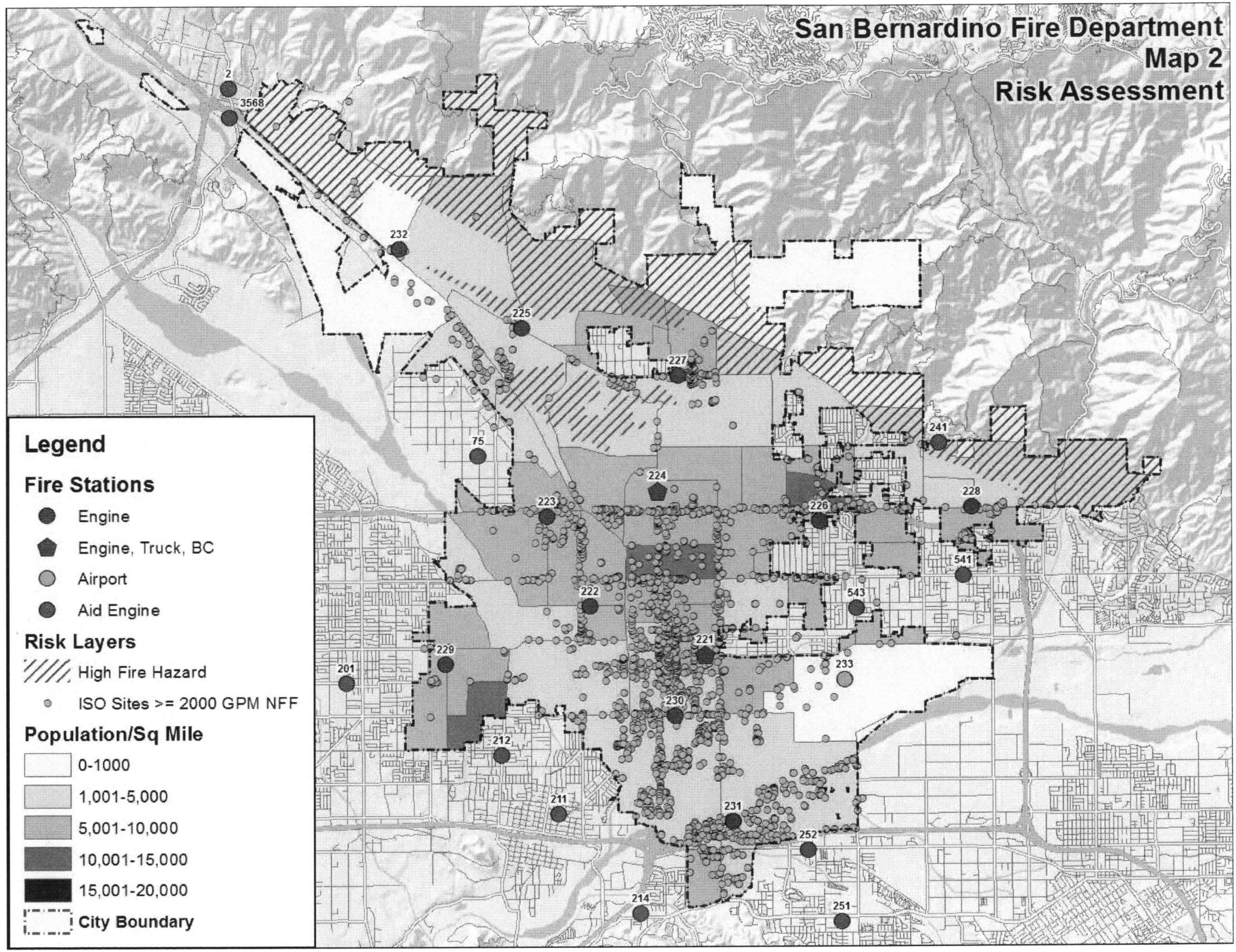
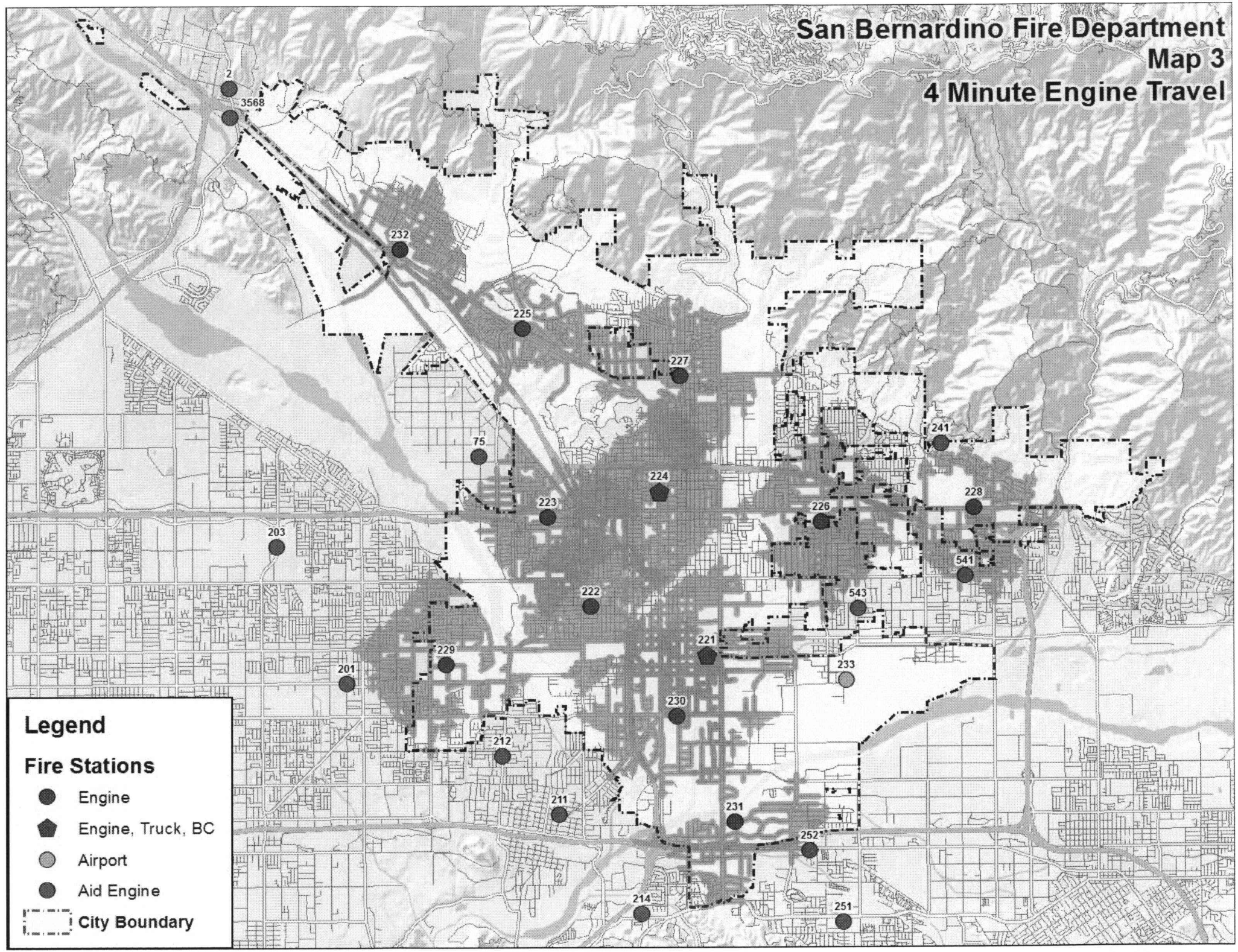
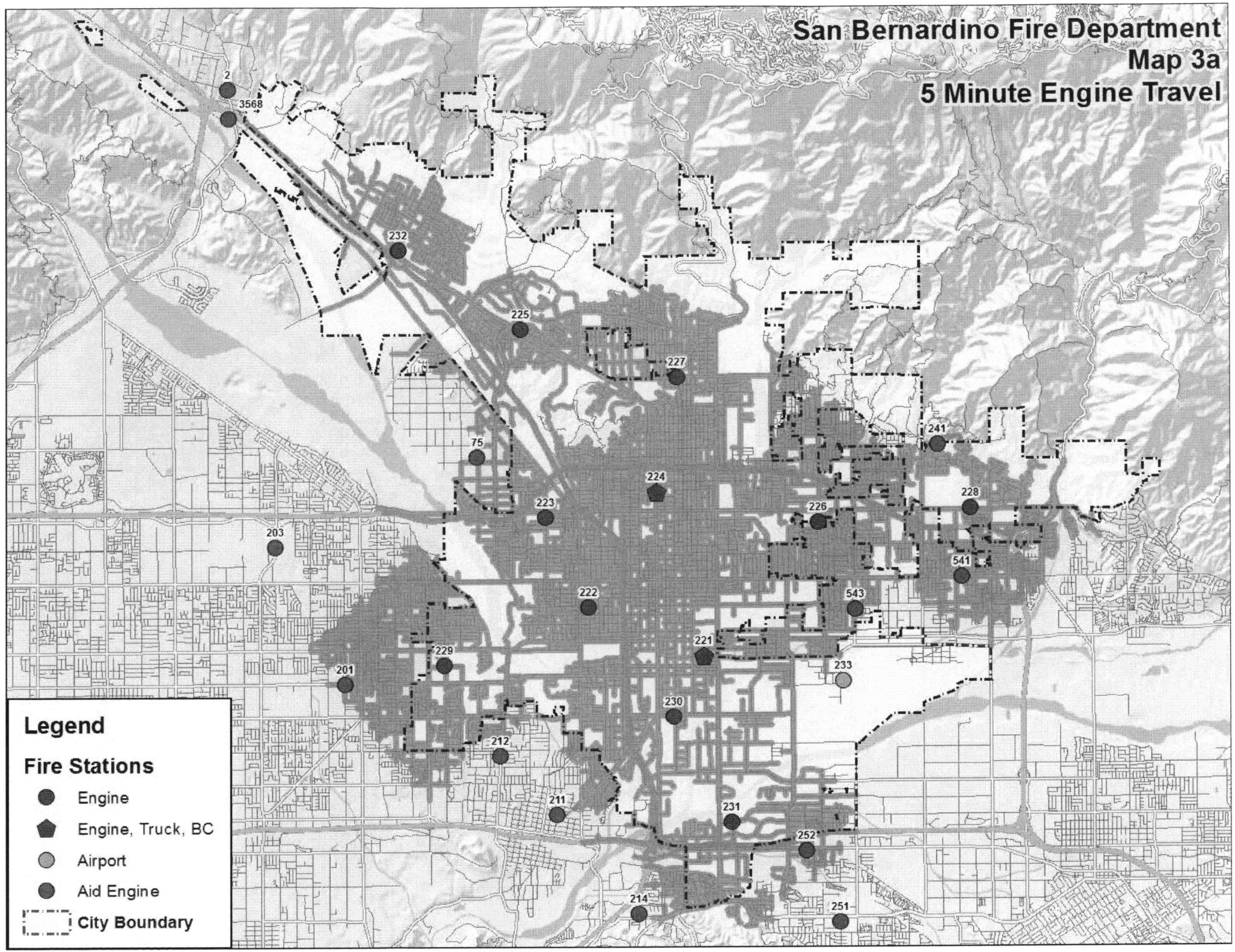
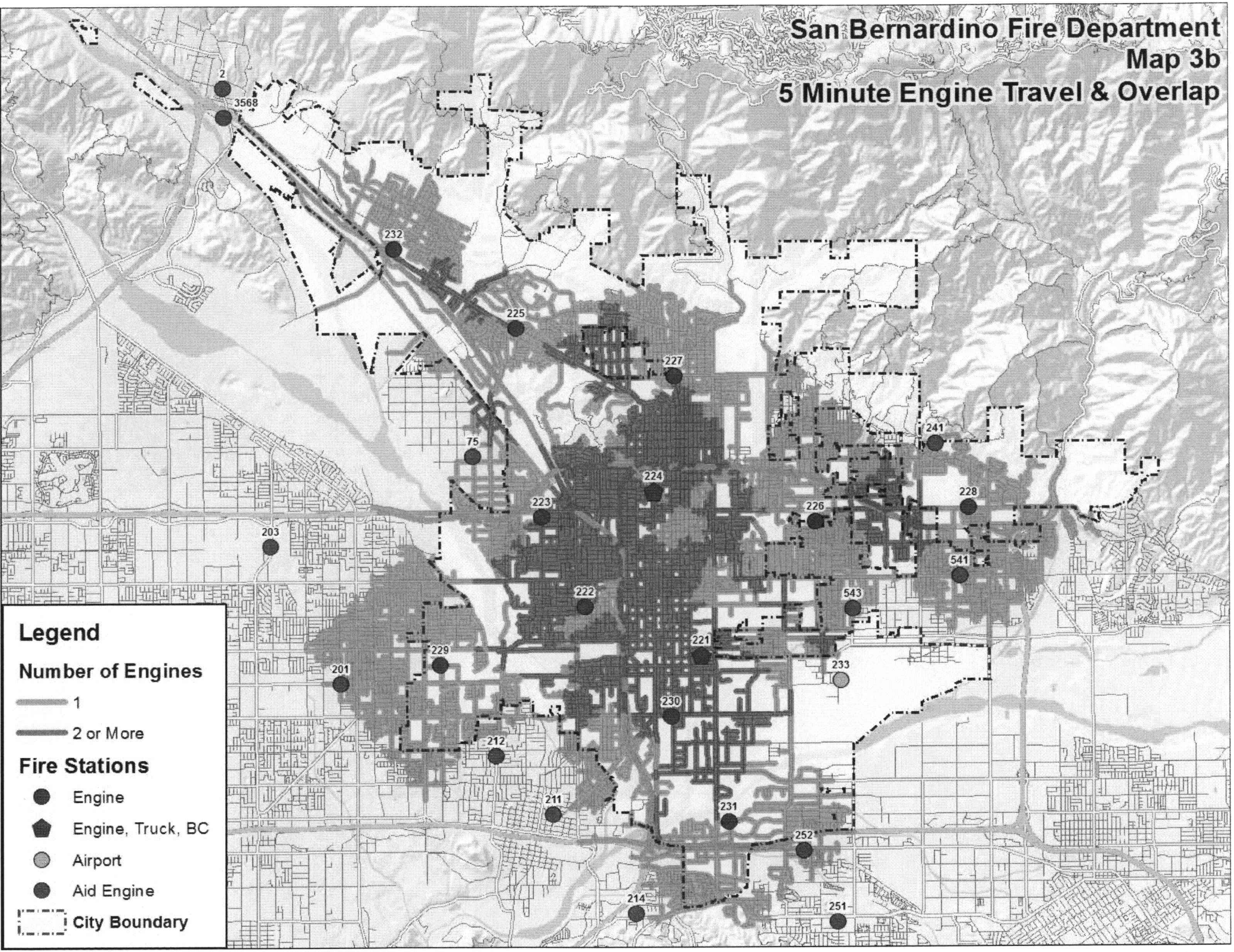
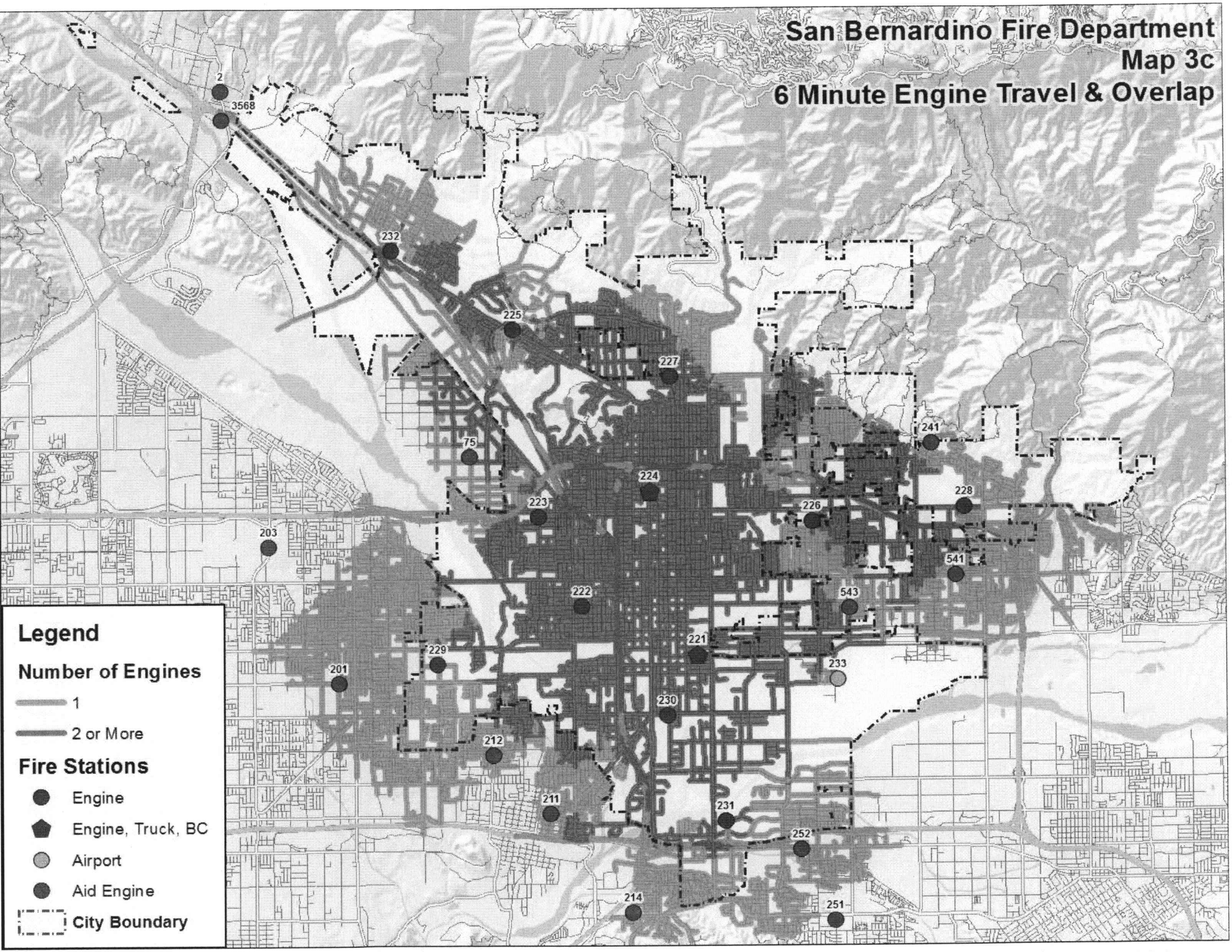

San Bernardino Fire Department
Map 1
General Geography
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary

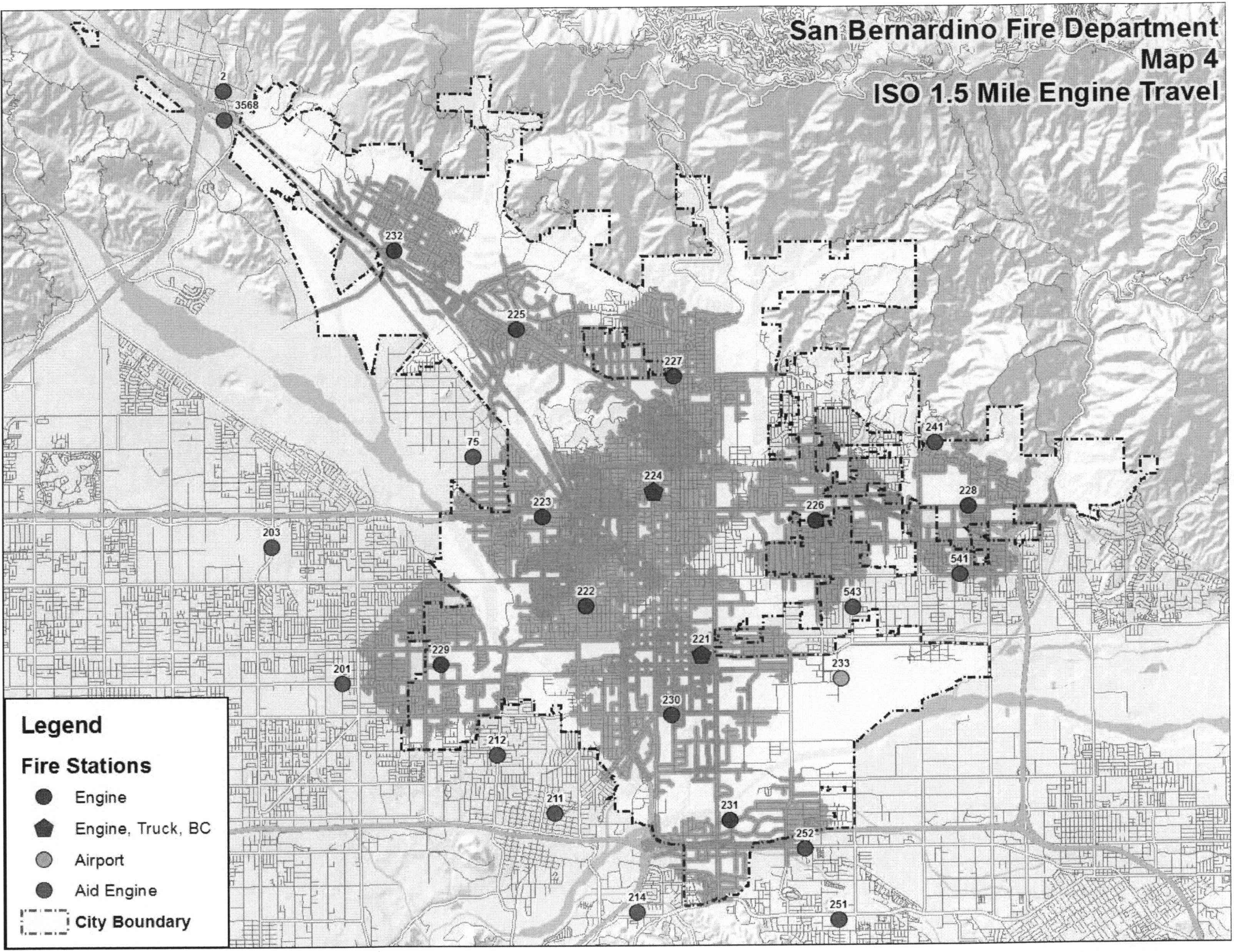

San Bernardino Fire Department
Map 2
Risk Assessment
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
Risk Layers
High Fire Hazard
ISO Sites >= 2000 GPM NFF
Population/Sq Mile
0-1000
1,001-5,000
5,001-10,000
10,001-15,000
15,001-20,000
City Boundary
2
3568
232
225
227
75
241
224
223
226
228
541
222
543
221
229
201
233
230
212
211
231
252
214
251

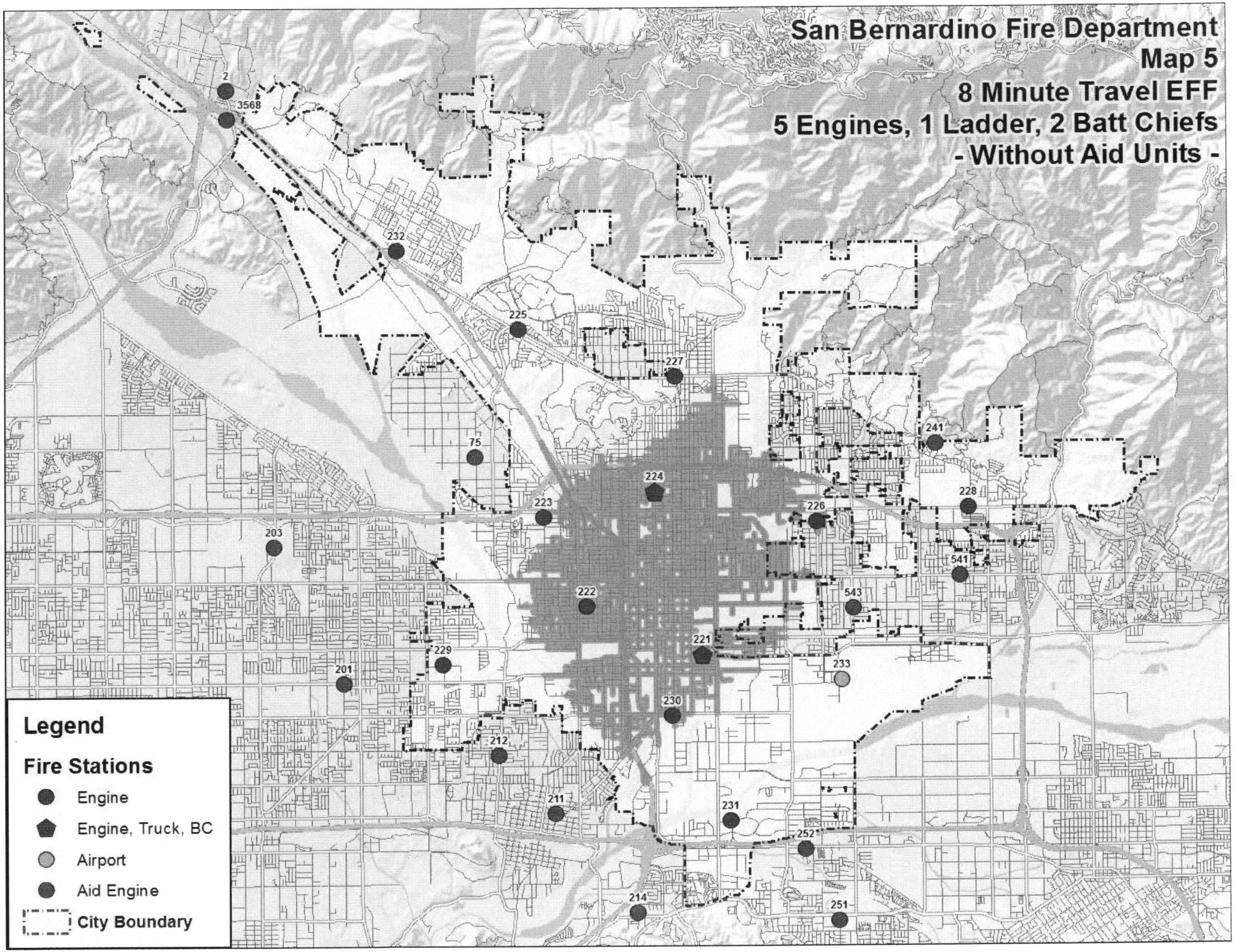

San Bernardino Fire Department
Map 3
4 Minute Engine Travel
2
3568
232
225
227
75
241
224
223
228
226
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary

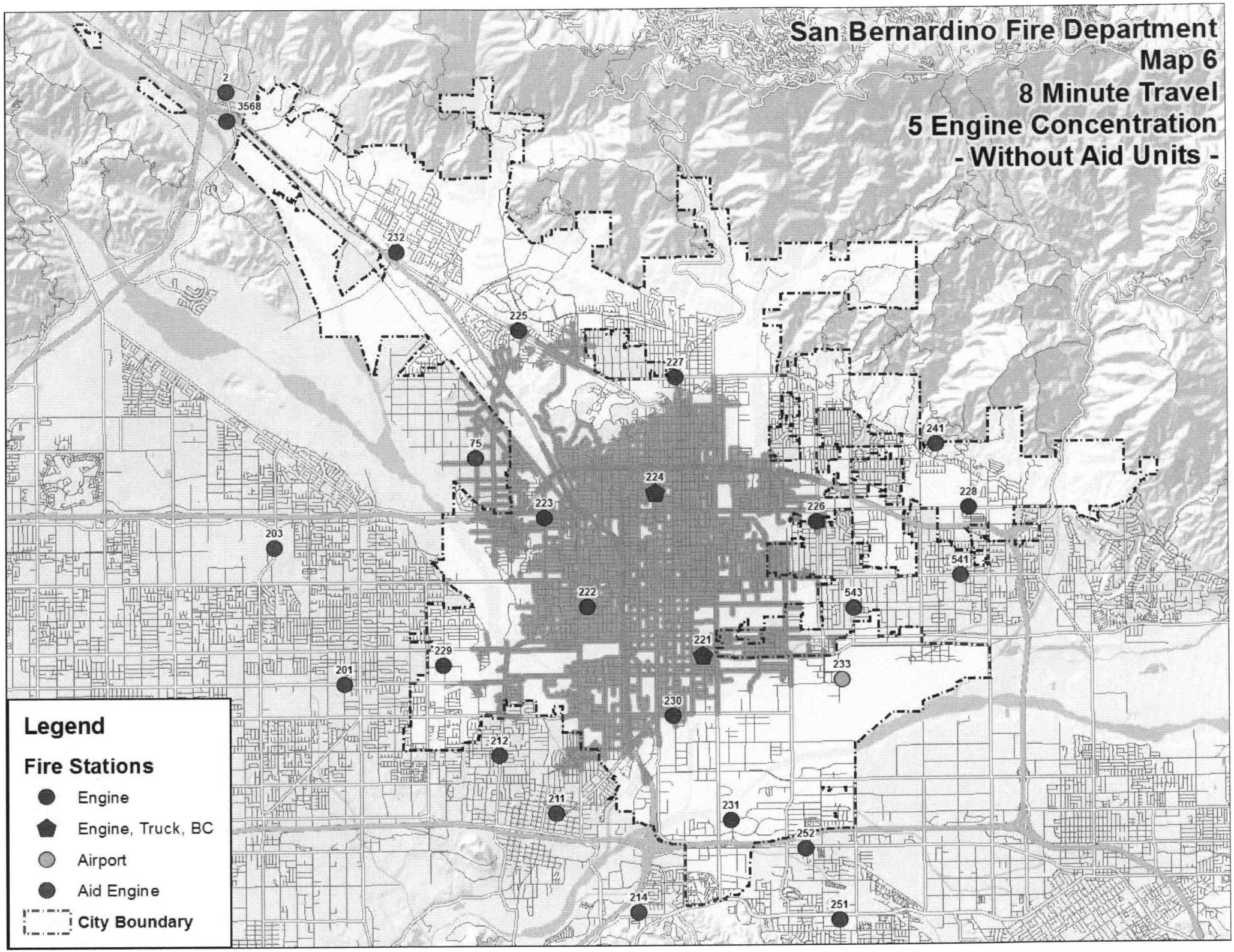

San Bernardino Fire Department
Map 3a
5 Minute Engine Travel
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary

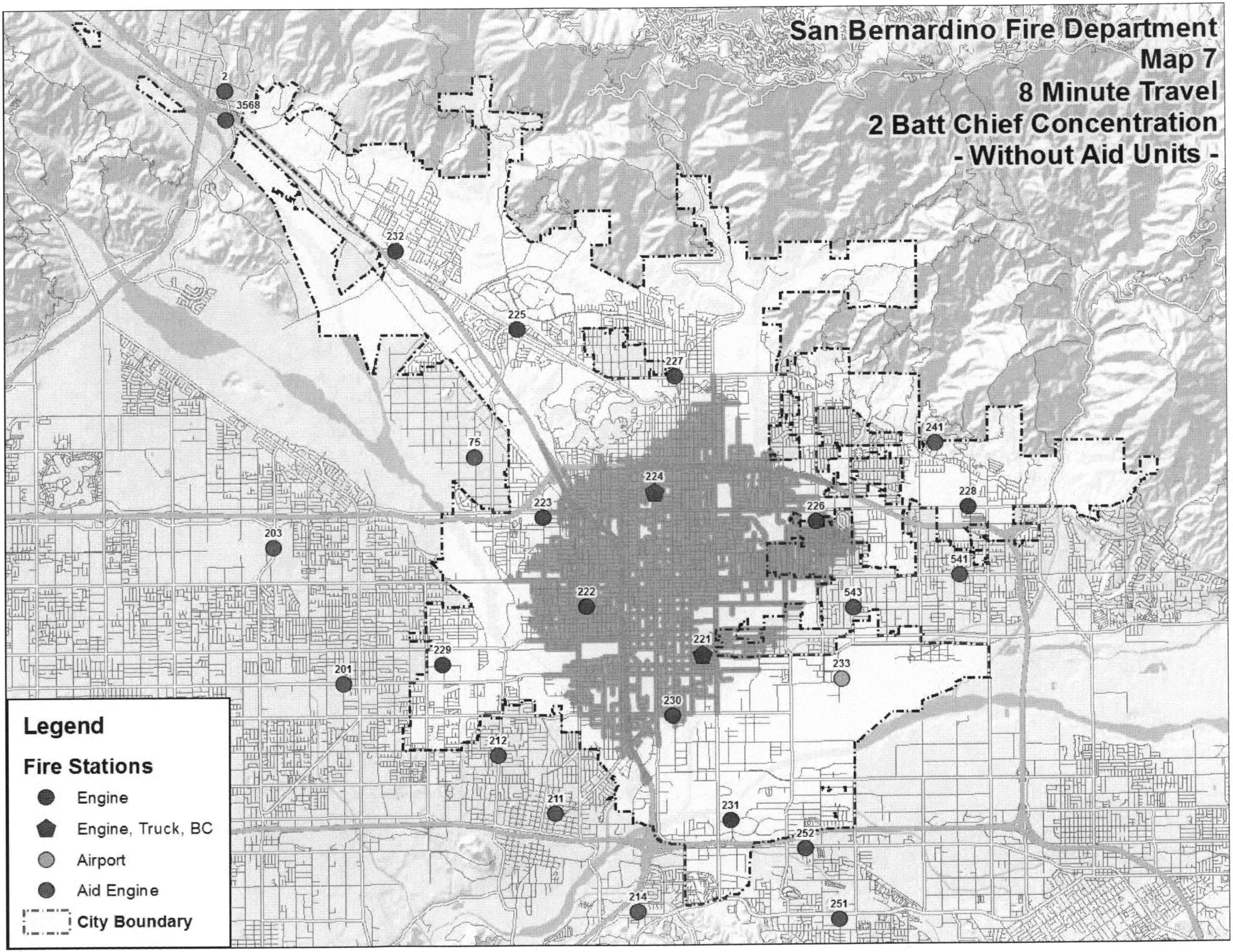

San Bernardino Fire Department
Map 3b
5 Minute Engine Travel & Overlap
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251
Legend
Number of Engines
1
2 or More
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary

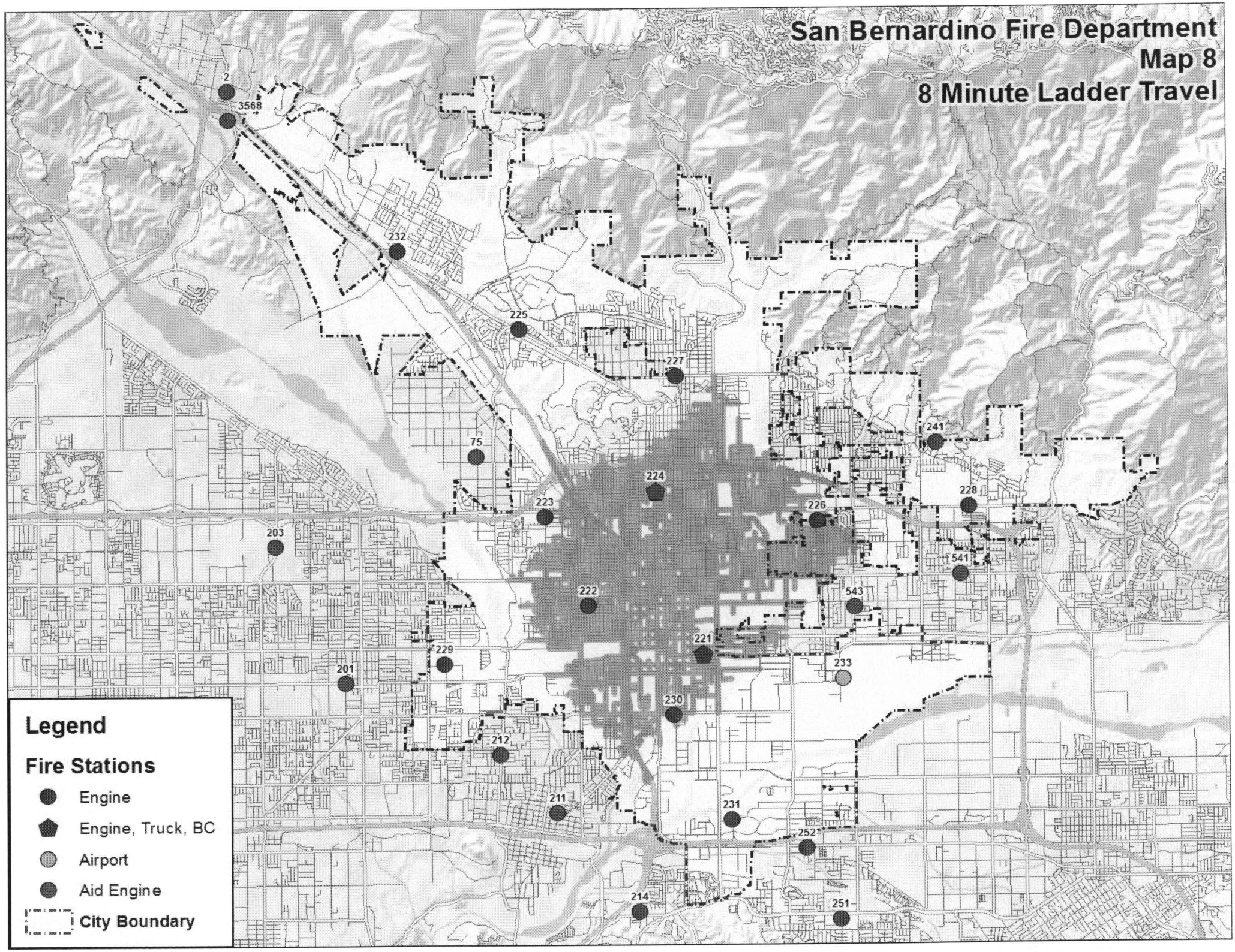

San Bernardino Fire Department
Map 3c
6 Minute Engine Travel & Overlap
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251
Legend
Number of Engines
1
2 or More
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary


San Bernardino Fire Department
Map 4
ISO 1.5 Mile Engine Travel
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary


San Bernardino Fire Department
Map 5
8 Minute Travel EFF
5 Engines, 1 Ladder, 2 Batt Chiefs
- Without Aid Units -
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary


San Bernardino Fire Department
Map 6
8 Minute Travel
5 Engine Concentration
- Without Aid Units -
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary


San Bernardino Fire Department
Map 7
8 Minute Travel
2 Batt Chief Concentration
- Without Aid Units -
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary


San Bernardino Fire Department
Map 8
8 Minute Ladder Travel
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
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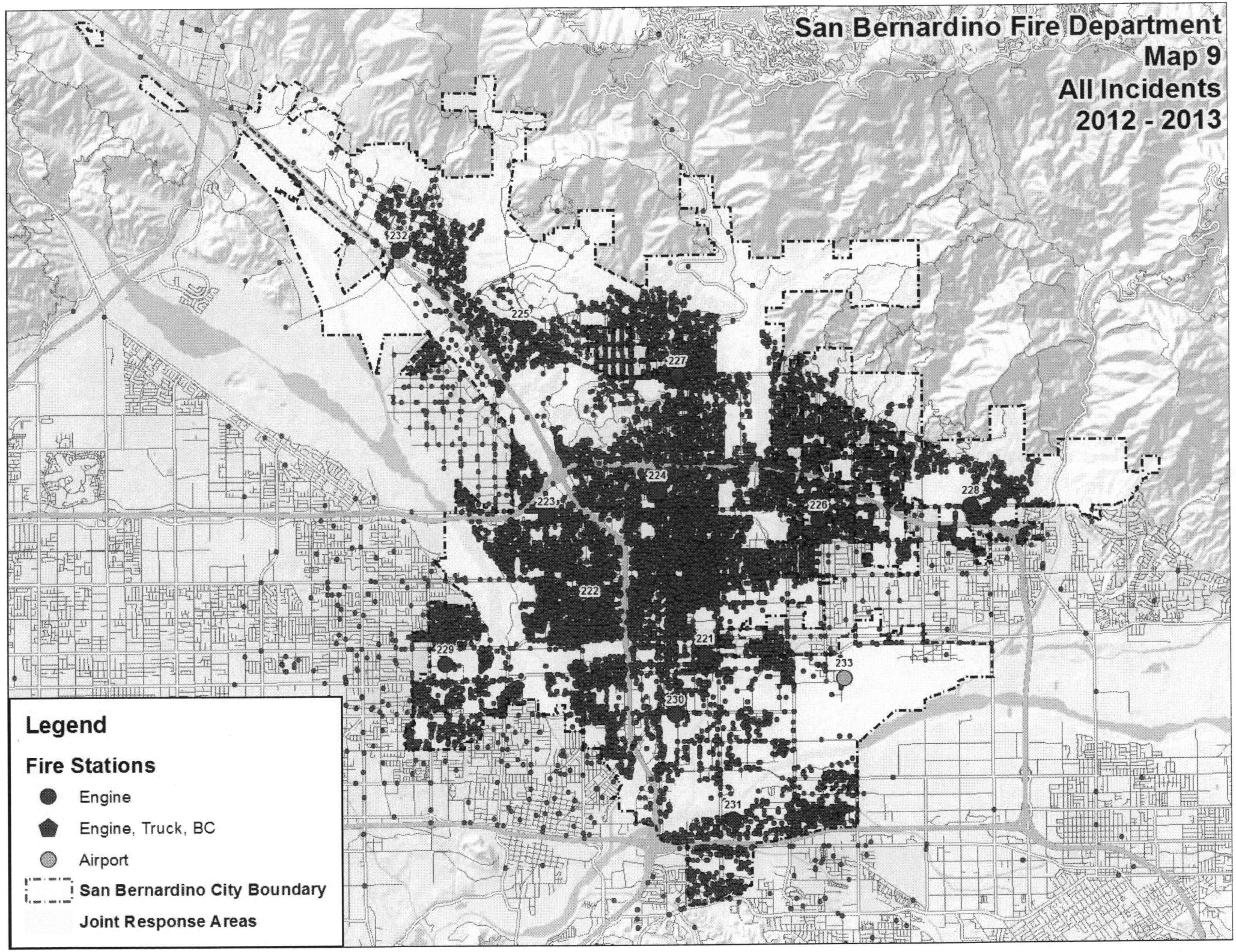
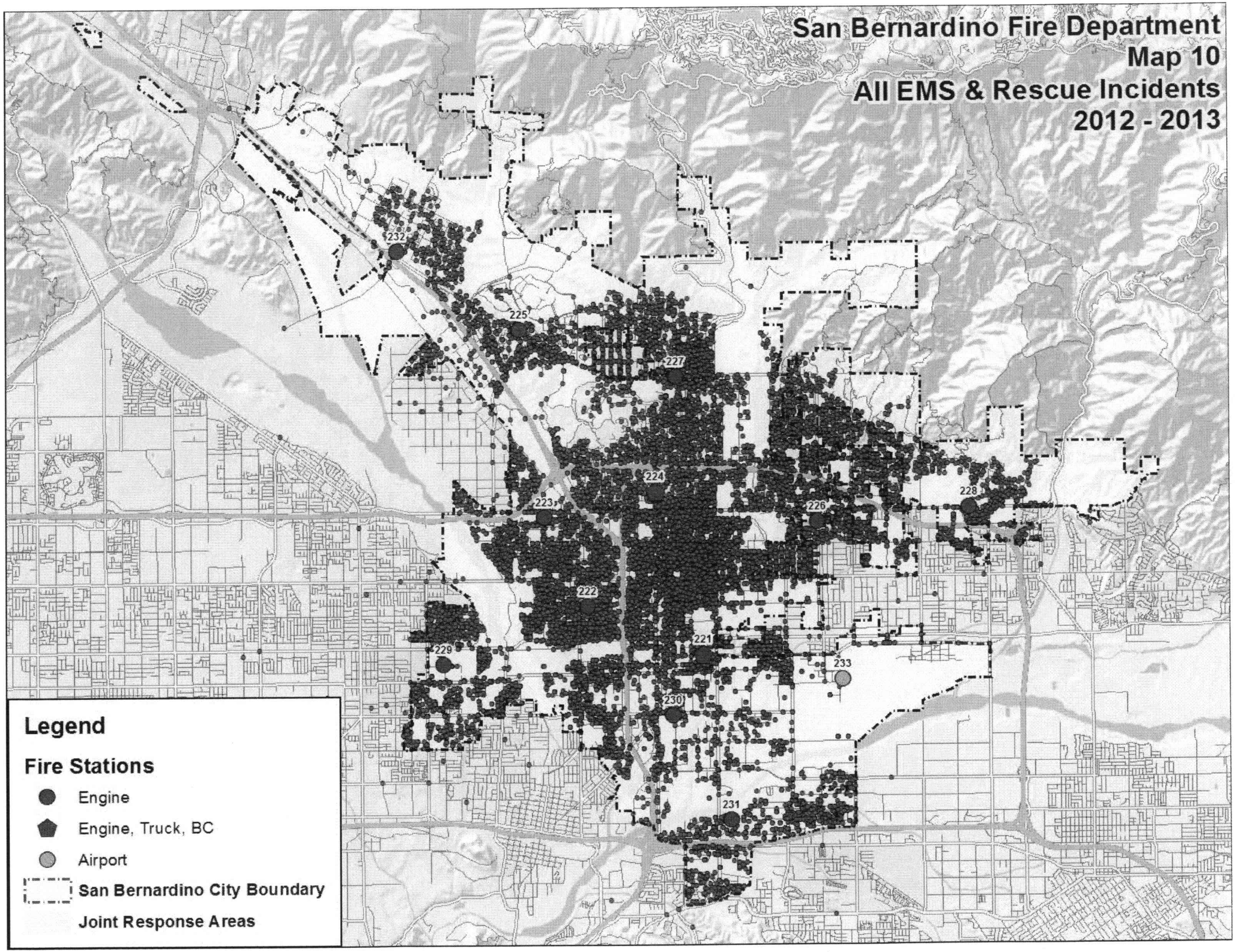
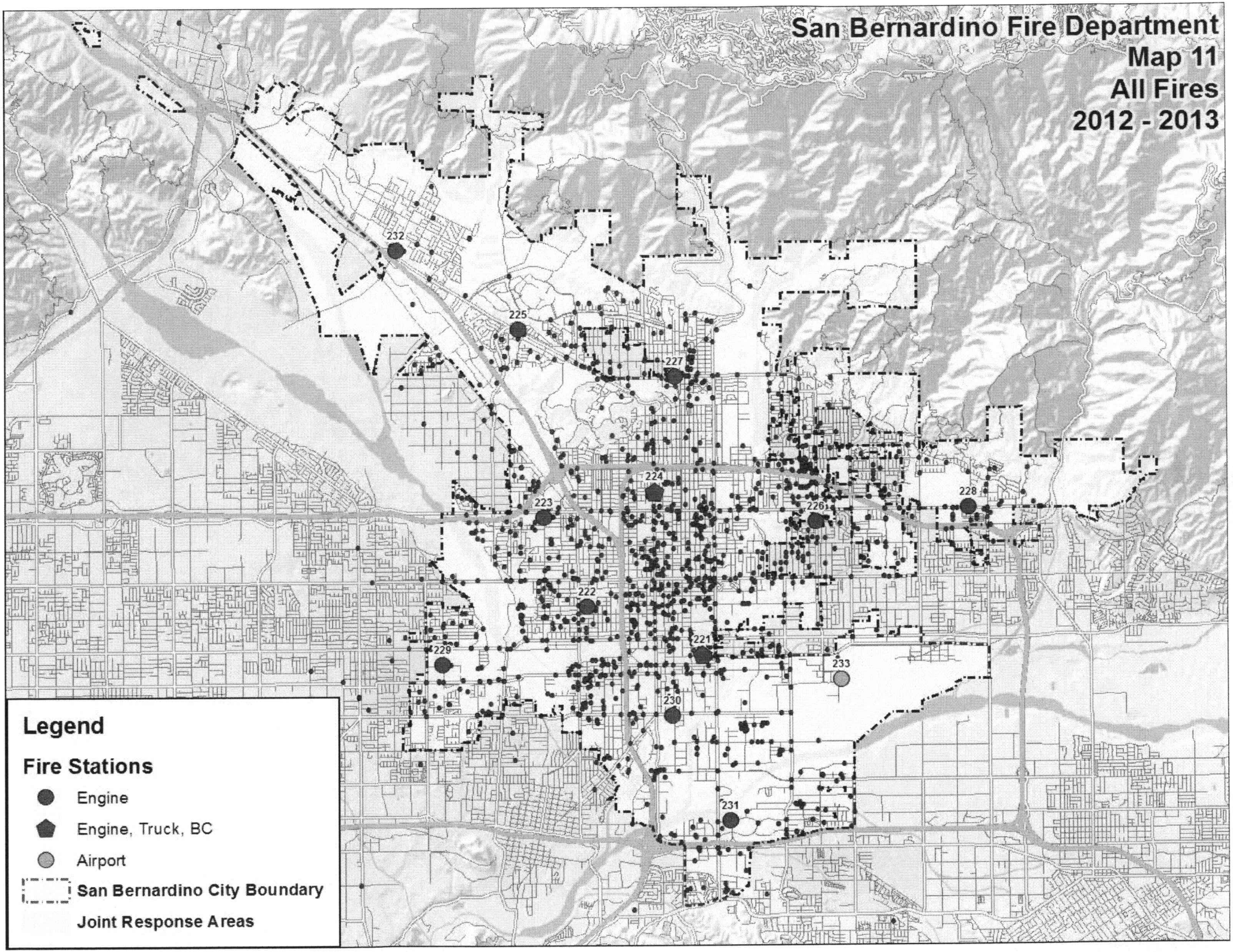
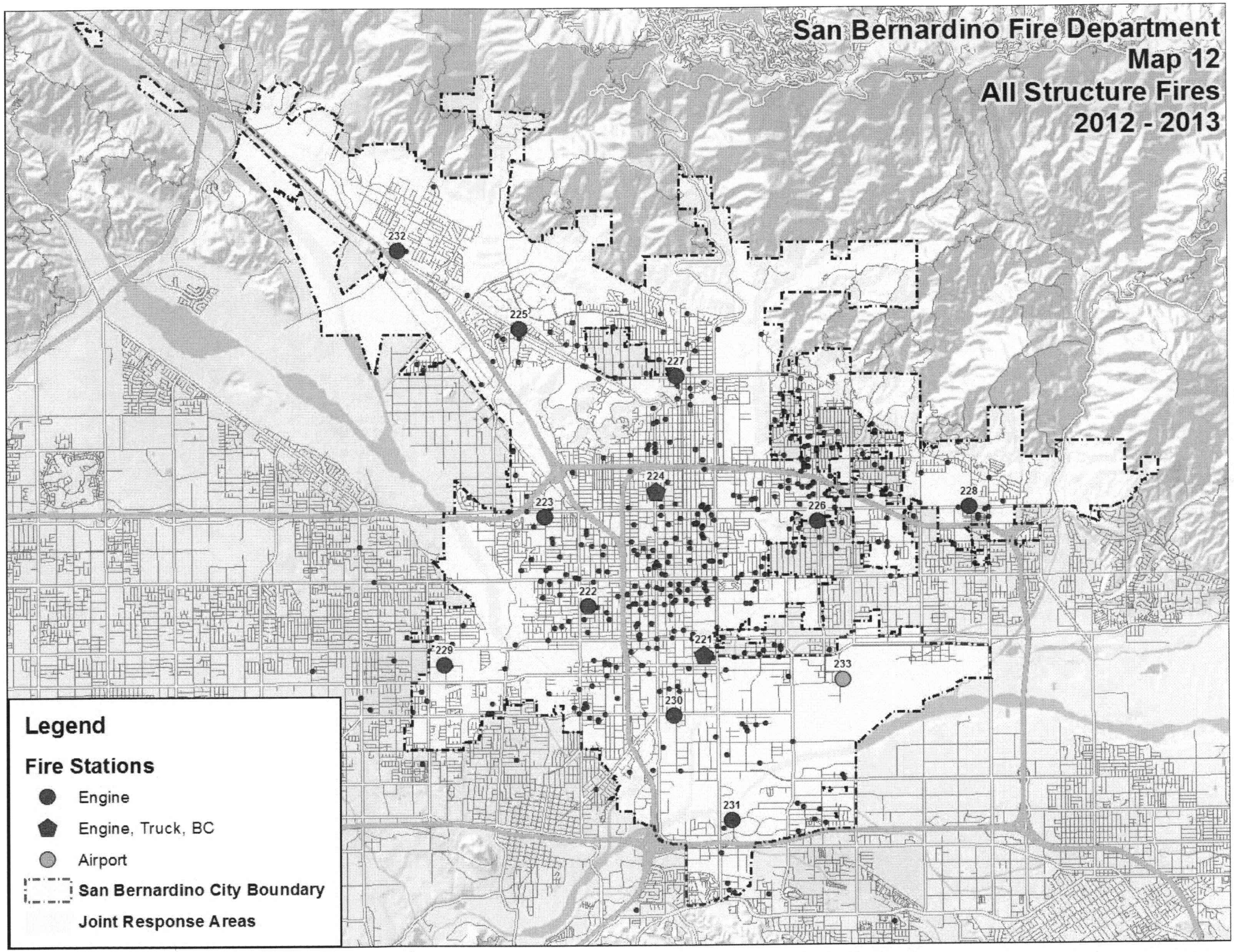
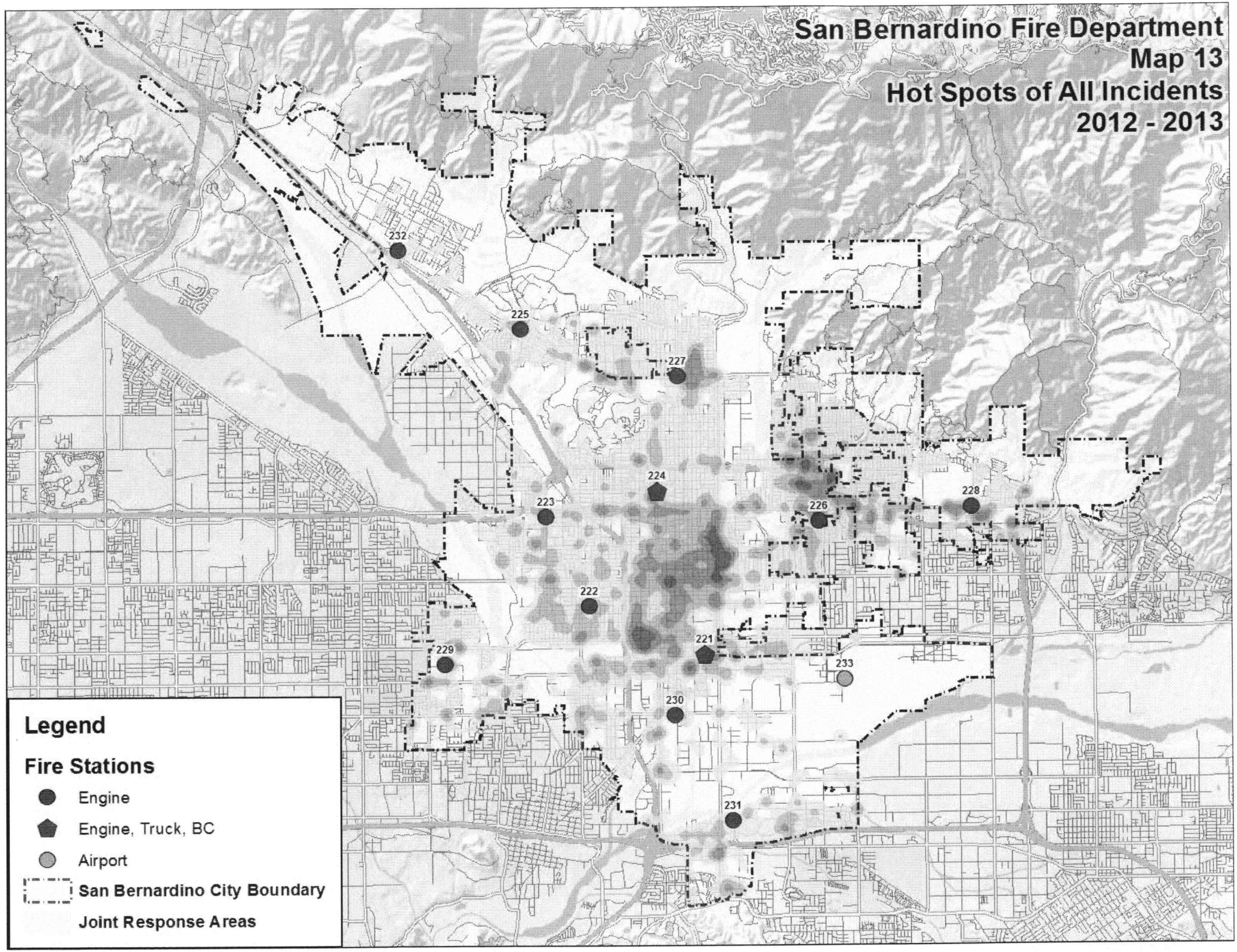
212
211
231
252
214
251
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary

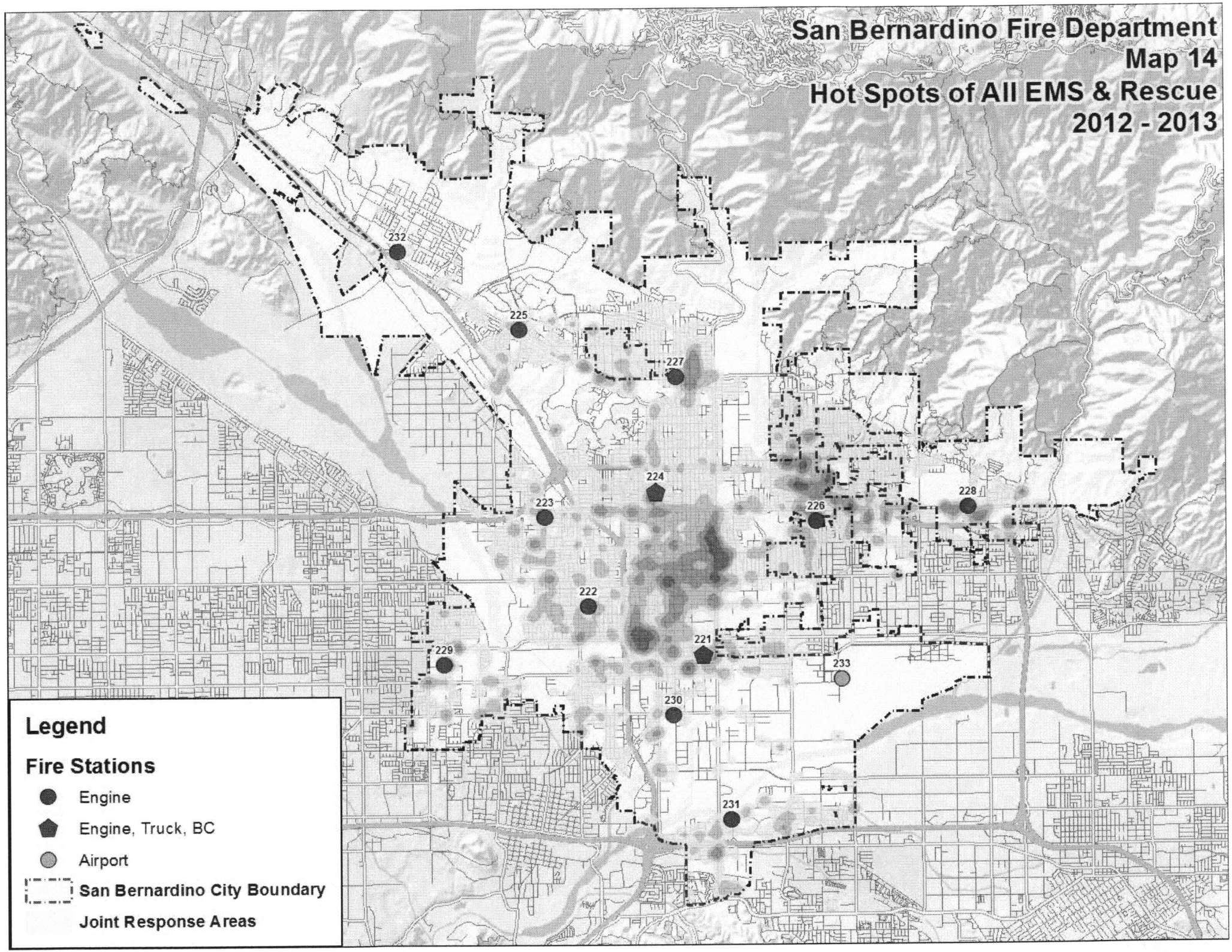

San Bernardino Fire Department
Map 9
All Incidents
2012 - 2013
232
225
227
224
223
226
228
222
221
229
233
230
231
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
San Bernardino City Boundary
Joint Response Areas

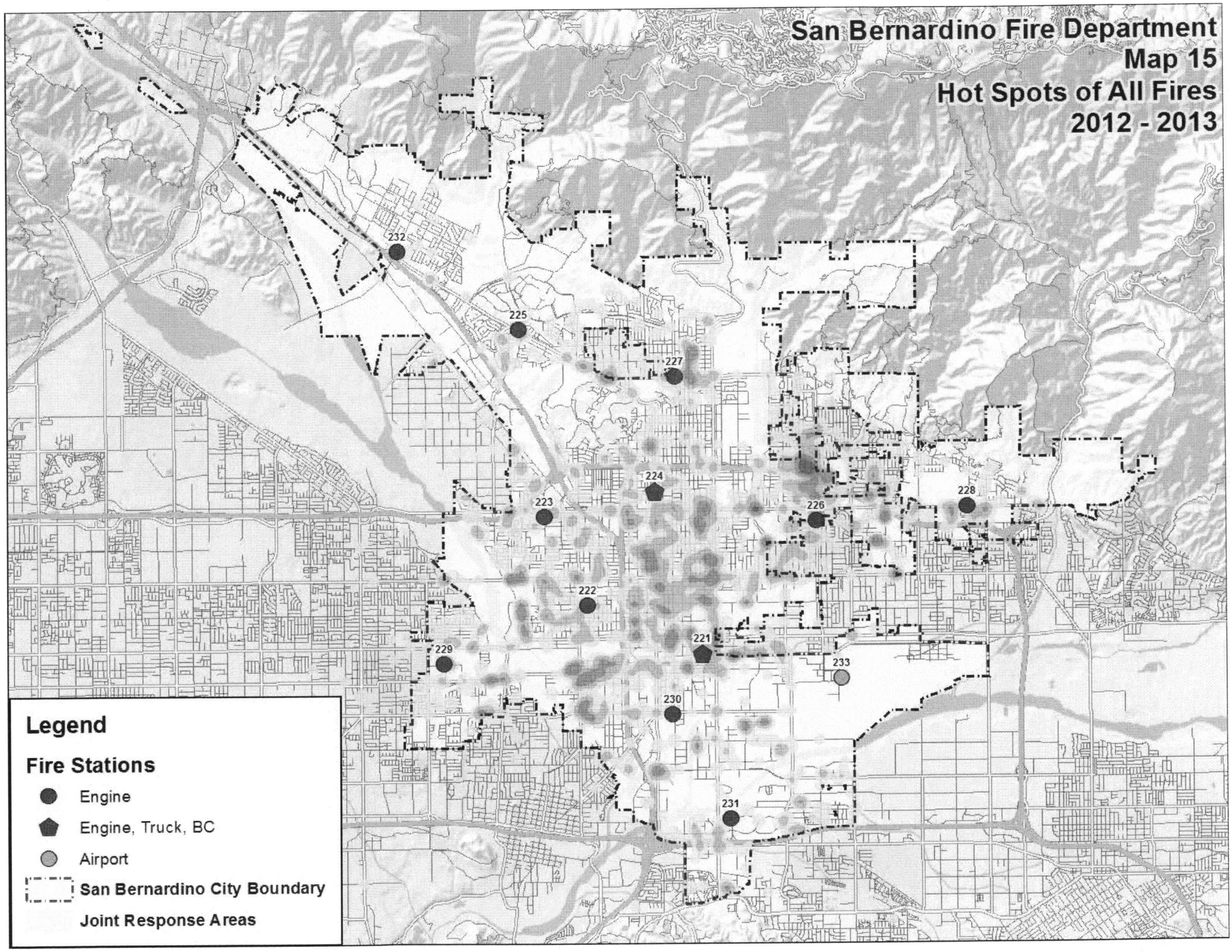

San Bernardino Fire Department
Map 10
All EMS & Rescue Incidents
2012 - 2013
232
225
227
224
223
226
228
222
221
229
233
230
231
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
San Bernardino City Boundary
Joint Response Areas

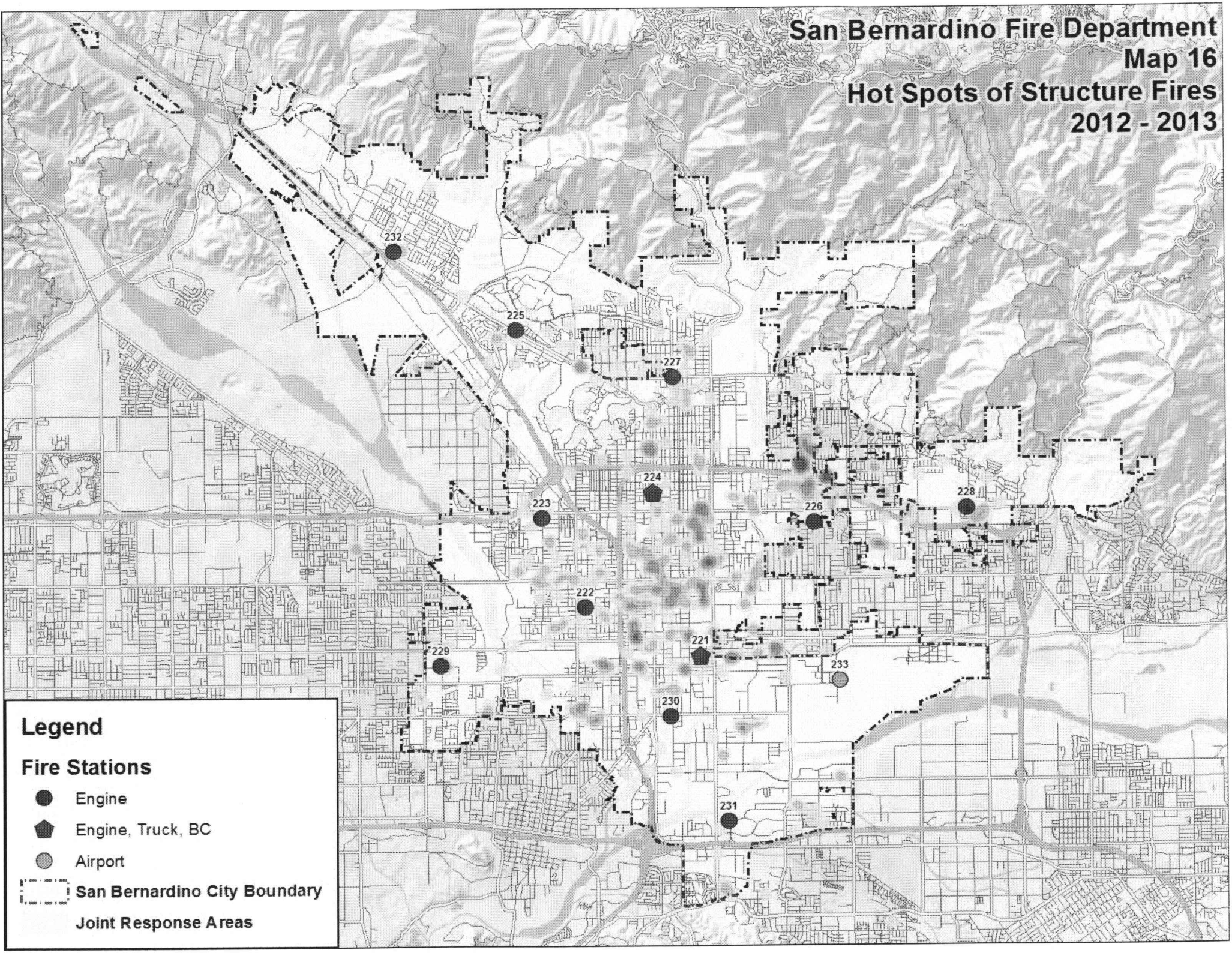

San Bernardino Fire Department
Map 11
All Fires
2012 - 2013
232
225
227
224
223
226
228
222
221
229
233
230
231
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
San Bernardino City Boundary
Joint Response Areas

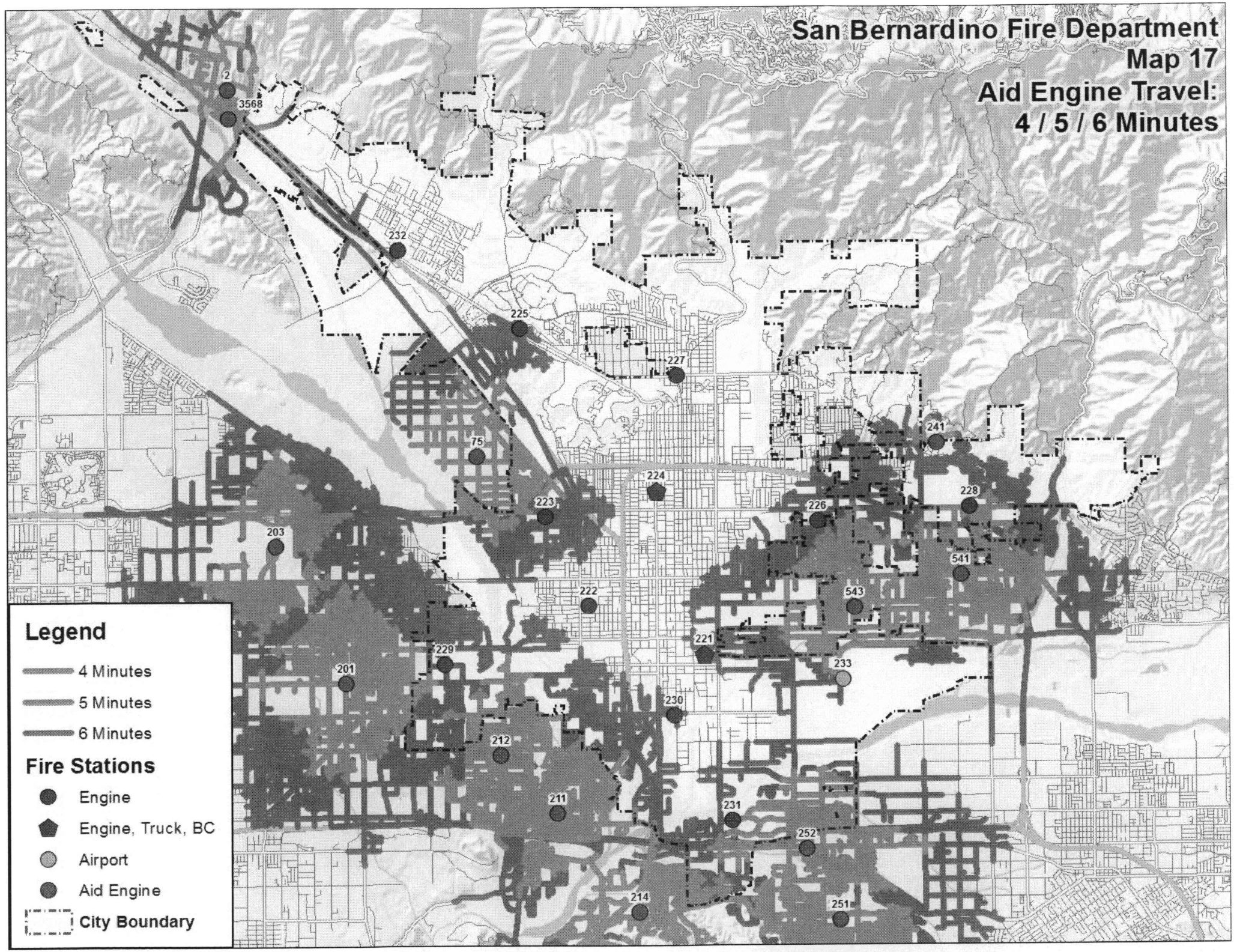

San Bernardino Fire Department
Map 12
All Structure Fires
2012 - 2013
232
225
227
224
223
226
228
222
221
229
233
230
231
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
San Bernardino City Boundary
Joint Response Areas

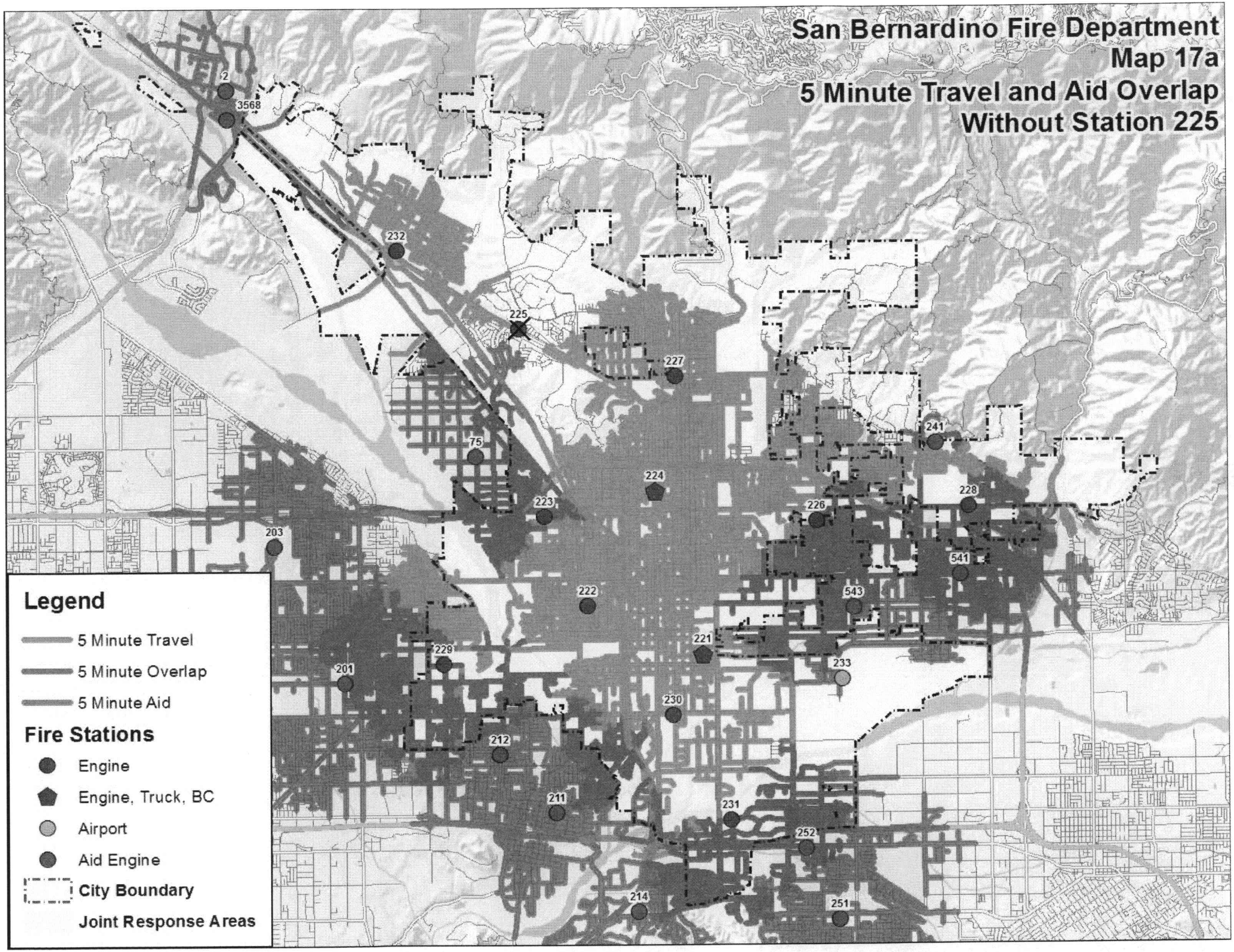

San Bernardino Fire Department
Map 13
Hot Spots of All Incidents
2012 - 2013
232
225
227
224
223
226
228
222
221
229
233
230
231
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
San Bernardino City Boundary
Joint Response Areas

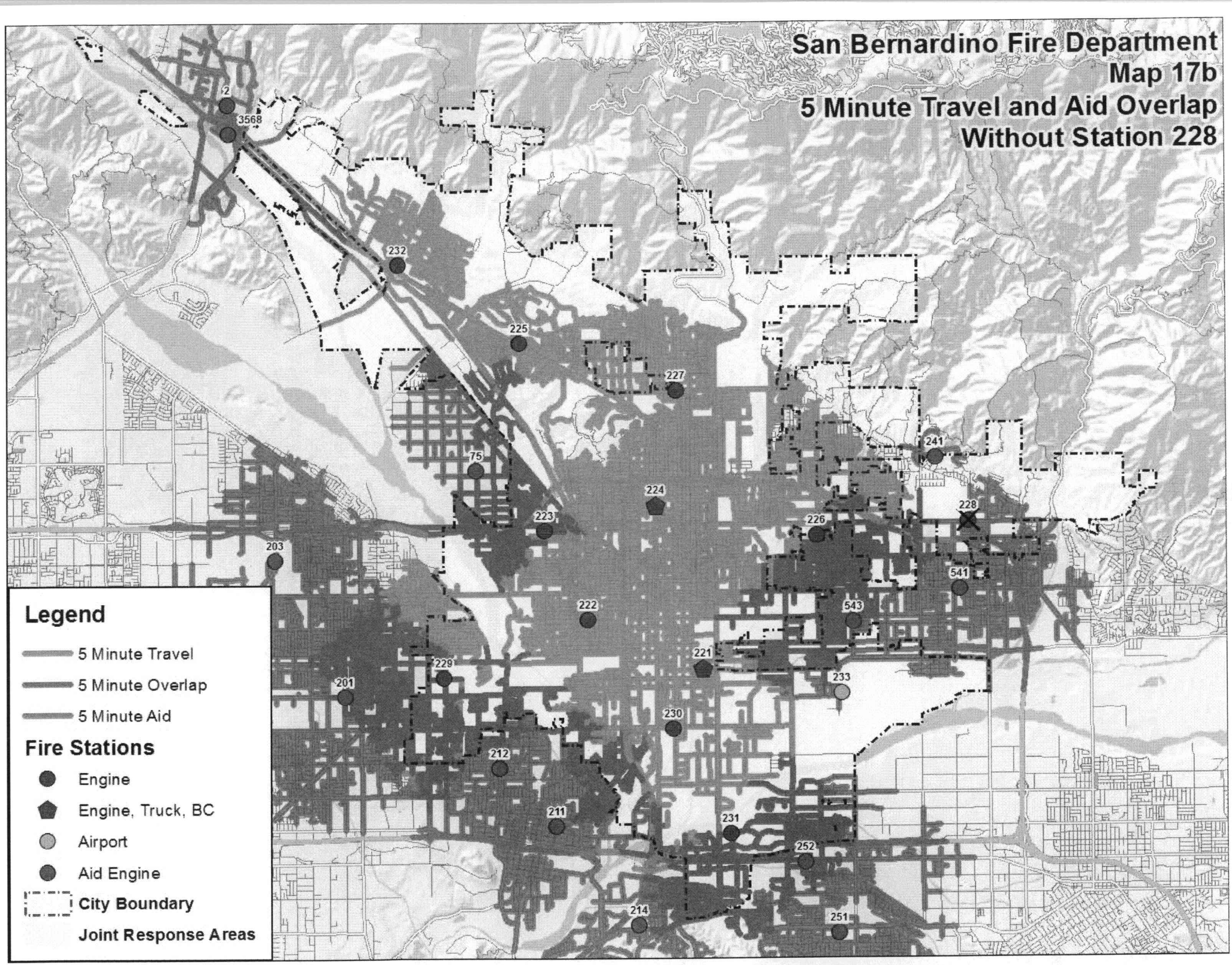

San Bernardino Fire Department
Map 14
Hot Spots of All EMS & Rescue
2012 - 2013
232
225
227
224
223
228
226
222
221
229
233
230
231
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
San Bernardino City Boundary
Joint Response Areas

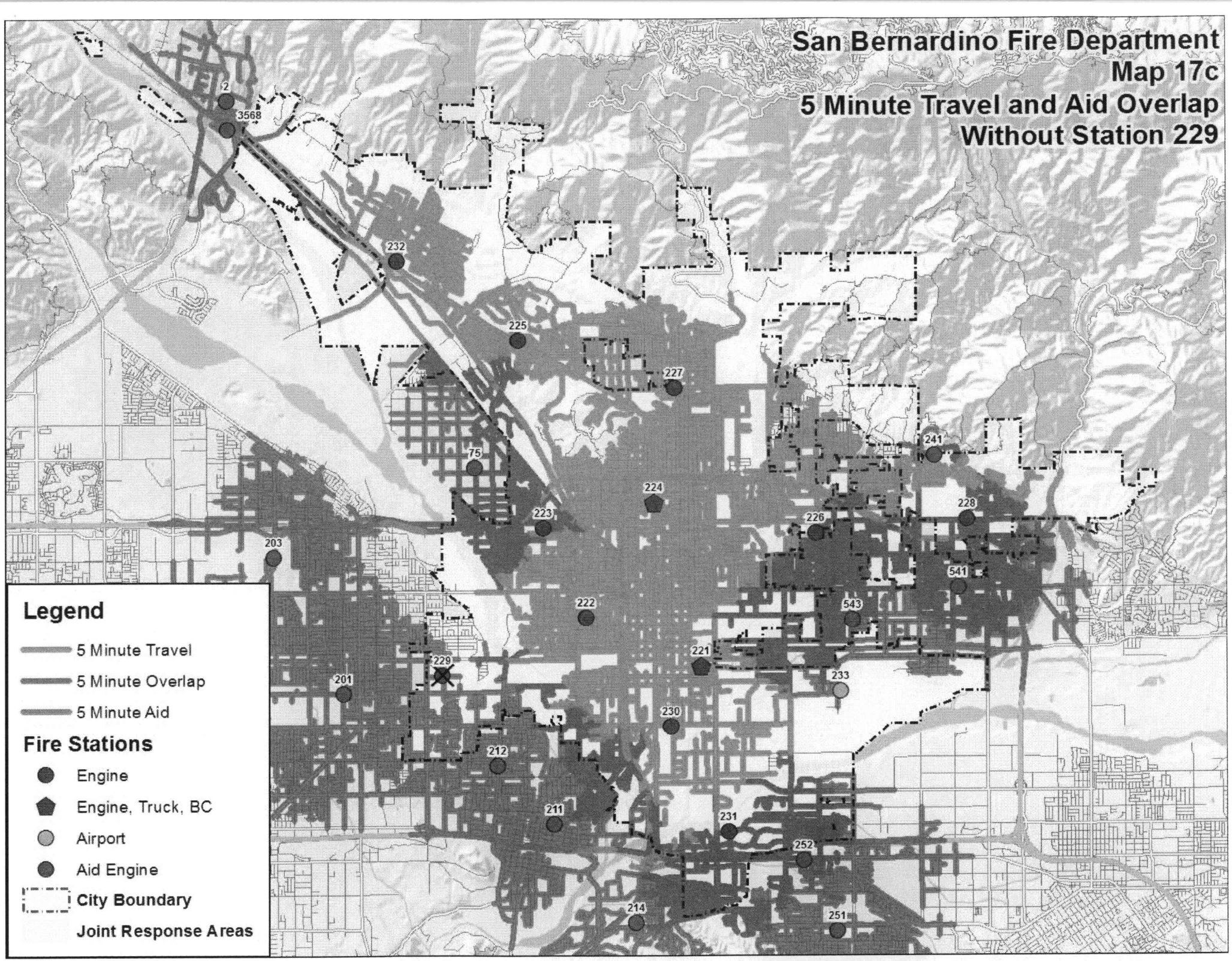

San Bernardino Fire Department
Map 15
Hot Spots of All Fires
2012 - 2013
232
225
227
224
223
226
228
222
221
229
233
230
231
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
San Bernardino City Boundary
Joint Response Areas

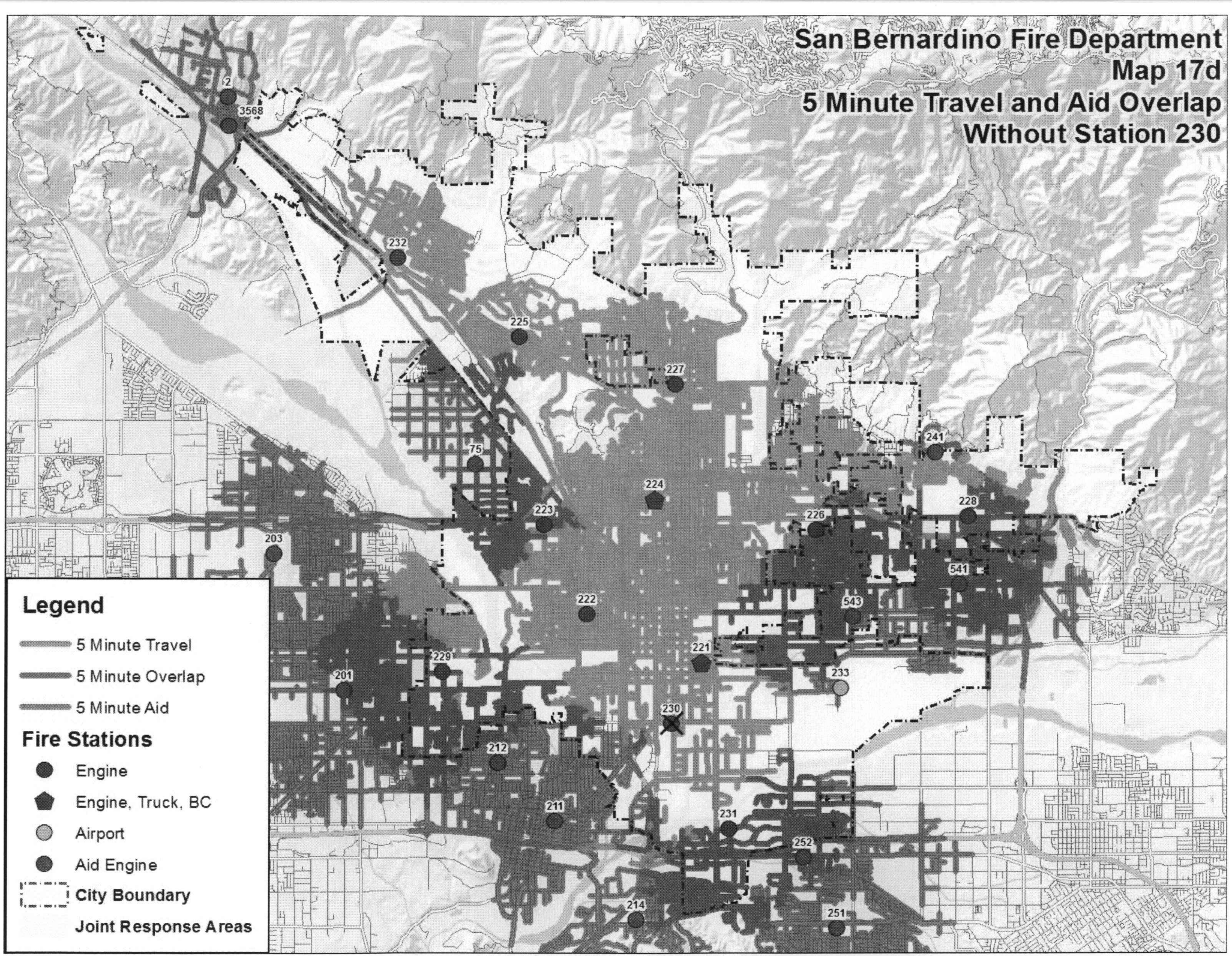

San Bernardino Fire Department
Map 16
Hot Spots of Structure Fires
2012 - 2013
232
225
227
224
223
226
228
222
221
229
233
230
231
Legend
Fire Stations
Engine
Engine, Truck, BC
Airport
San Bernardino City Boundary
Joint Response Areas


San Bernardino Fire Department
Map 17
Aid Engine Travel:
4 / 5 / 6 Minutes
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251
Legend
4 Minutes
5 Minutes
6 Minutes
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary


San Bernardino Fire Department
Map 17a
5 Minute Travel and Aid Overlap
Without Station 225
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
Joint Response Areas
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251


San Bernardino Fire Department
Map 17b
5 Minute Travel and Aid Overlap
Without Station 228
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
Joint Response Areas
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251


San Bernardino Fire Department
Map 17c
5 Minute Travel and Aid Overlap
Without Station 229
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
Joint Response Areas
2
3568
232
225
227
75
241
224
223
226
228
203
541
543
222
221
229
233
201
230
212
211
231
252
214
251


San Bernardino Fire Department
Map 17d
5 Minute Travel and Aid Overlap
Without Station 230
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
Joint Response Areas
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
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201
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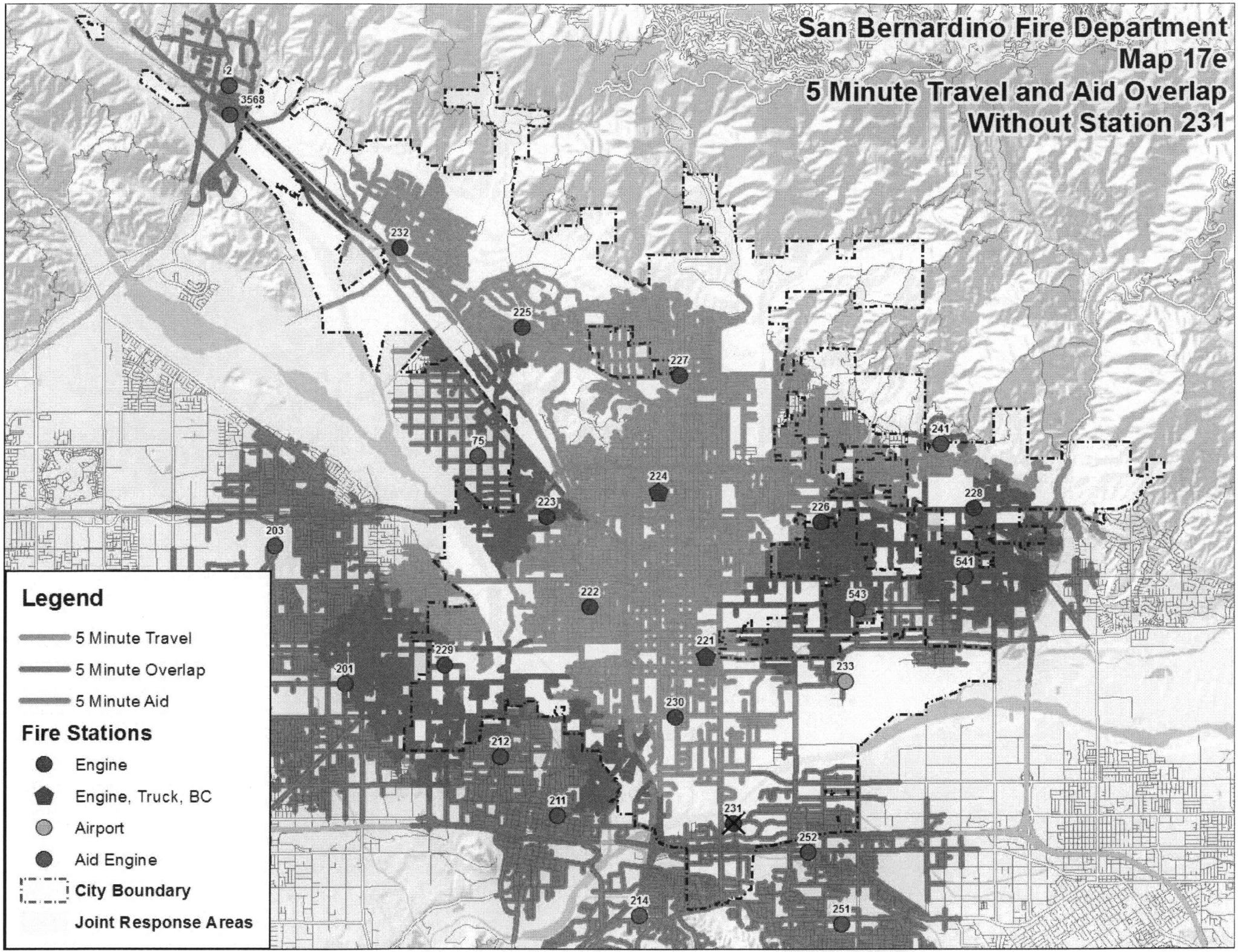
214
251


San Bernardino Fire Department
Map 17e
5 Minute Travel and Aid Overlap
Without Station 231
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
Joint Response Areas
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
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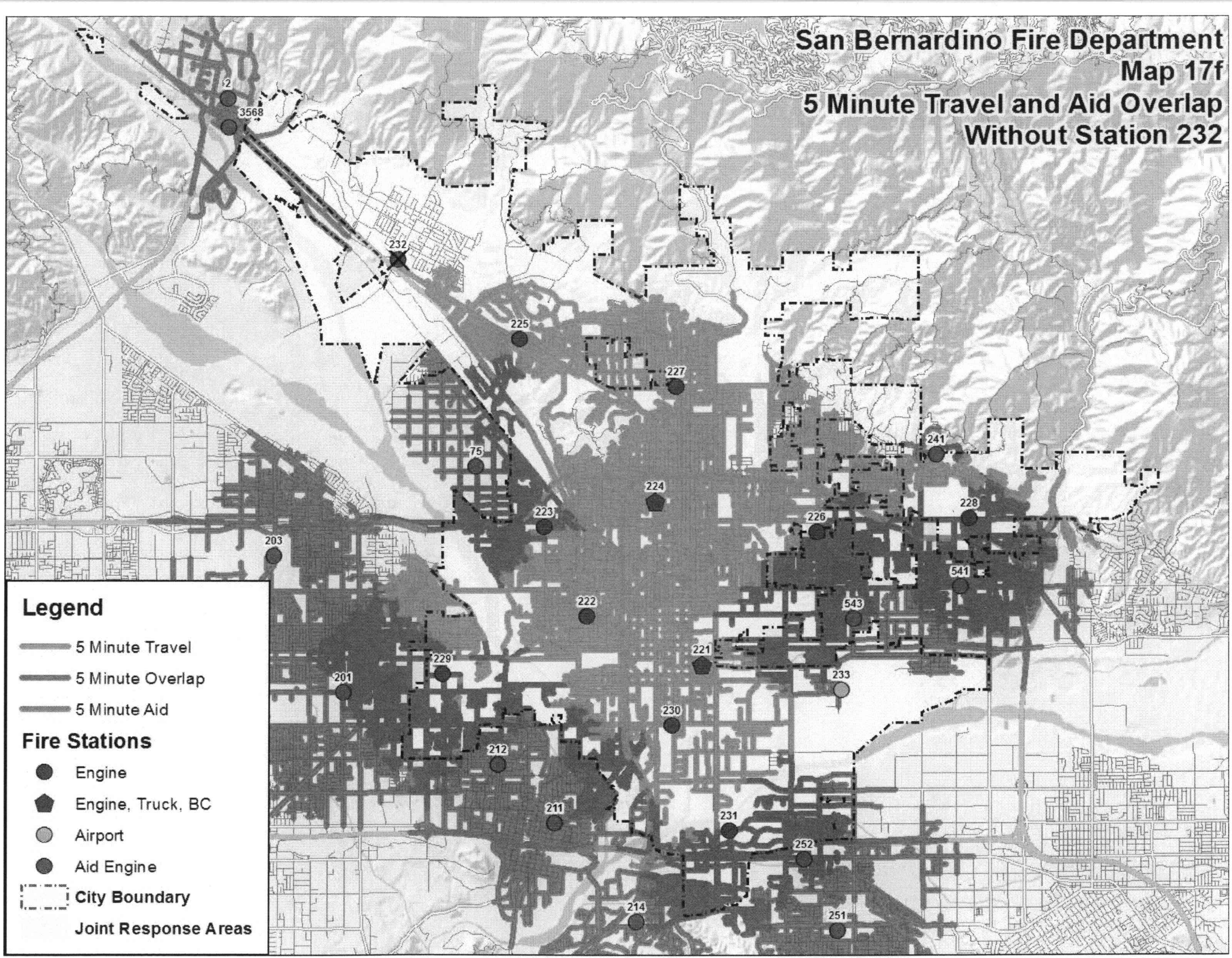
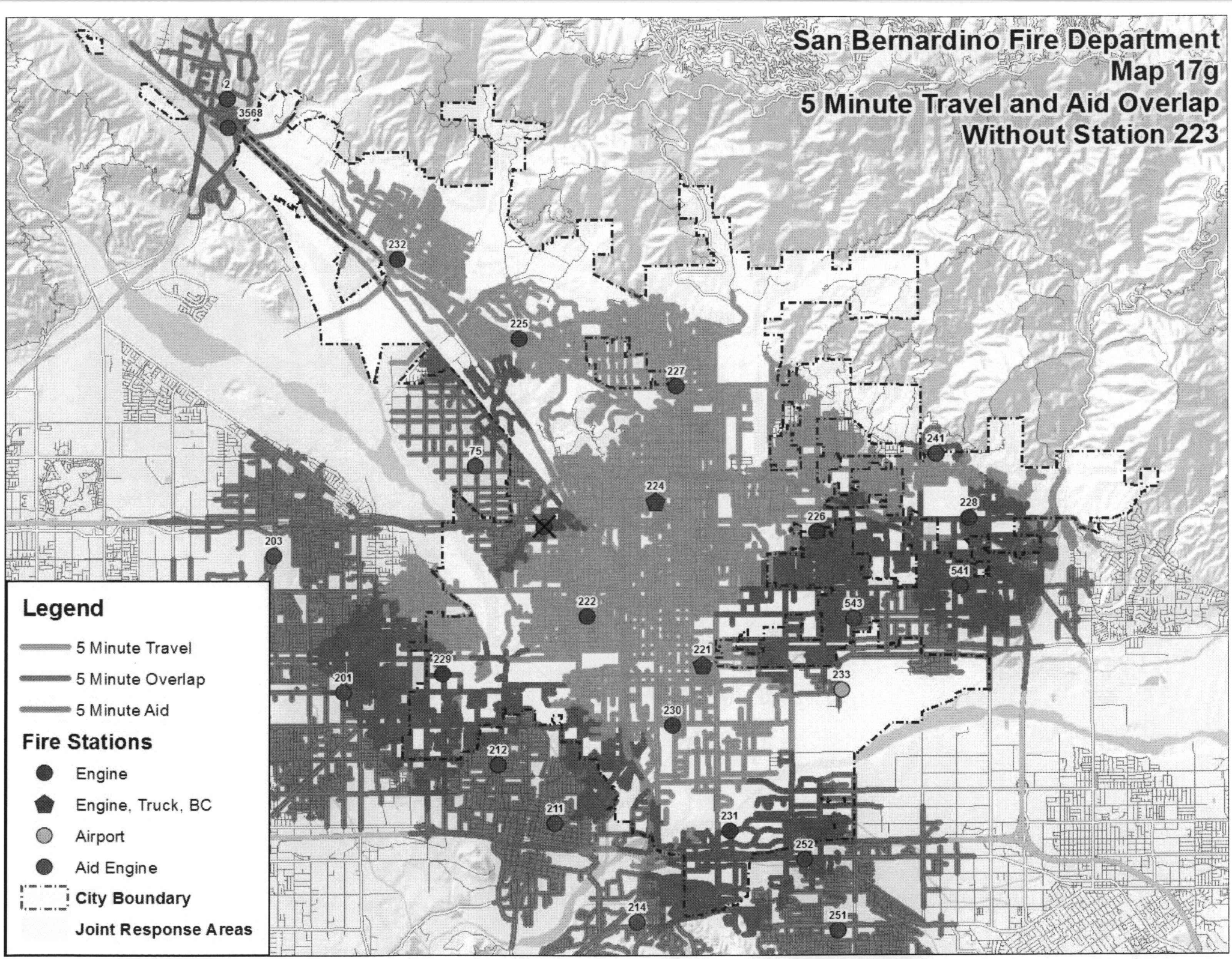
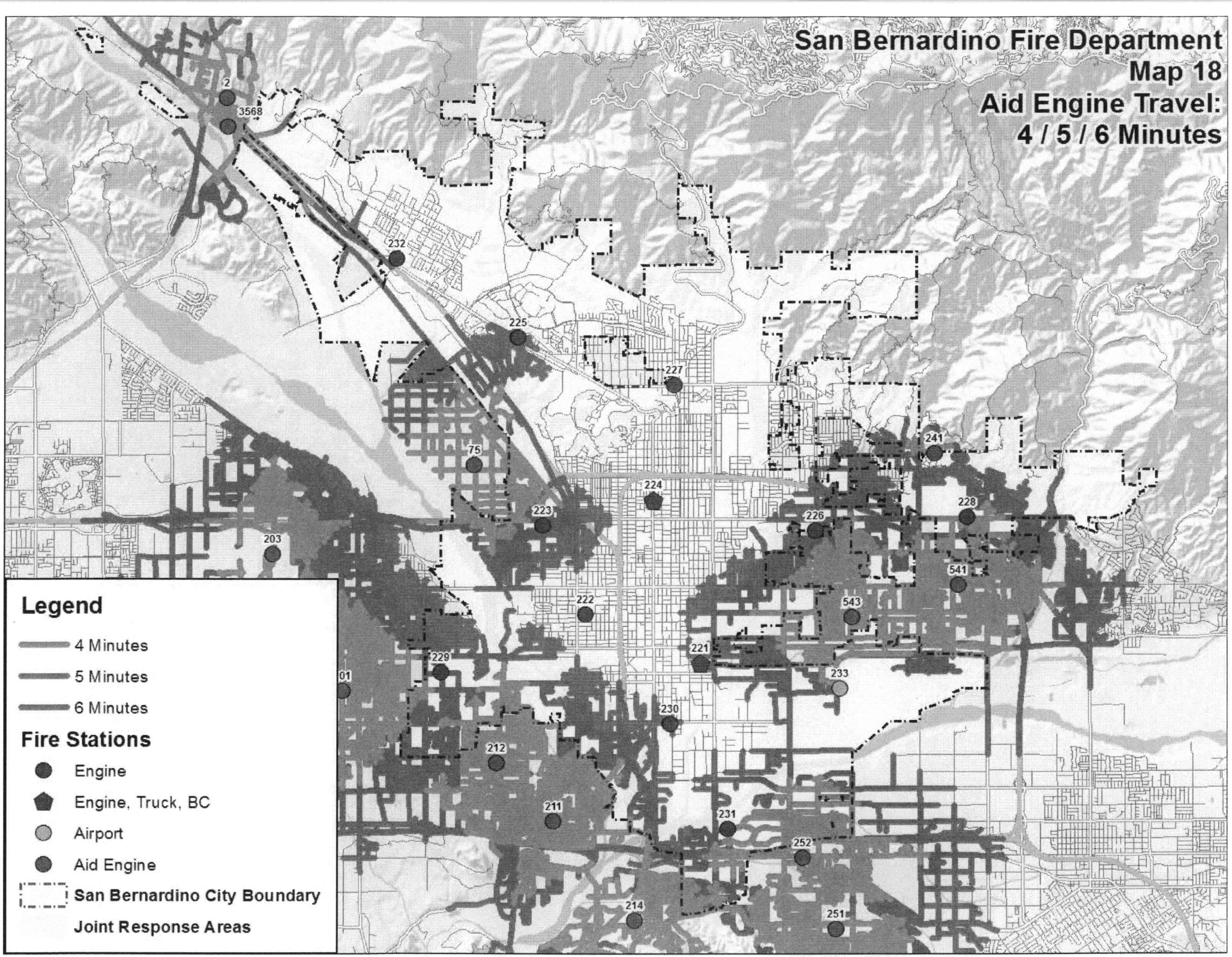
212
211
231
252
214
251


San Bernardino Fire Department
Map 17f
5 Minute Travel and Aid Overlap
Without Station 232
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
Joint Response Areas
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251


San Bernardino Fire Department
Map 17g
5 Minute Travel and Aid Overlap
Without Station 223
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
Joint Response Areas
2
3568
232
225
227
75
241
224
228
226
203
541
543
222
221
229
233
201
230
212
211
231
252
214
251


San Bernardino Fire Department
Map 18
Aid Engine Travel:
4 / 5 / 6 Minutes
Legend
4 Minutes
5 Minutes
6 Minutes
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
San Bernardino City Boundary
Joint Response Areas
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
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233
230
212
211
231
252
214
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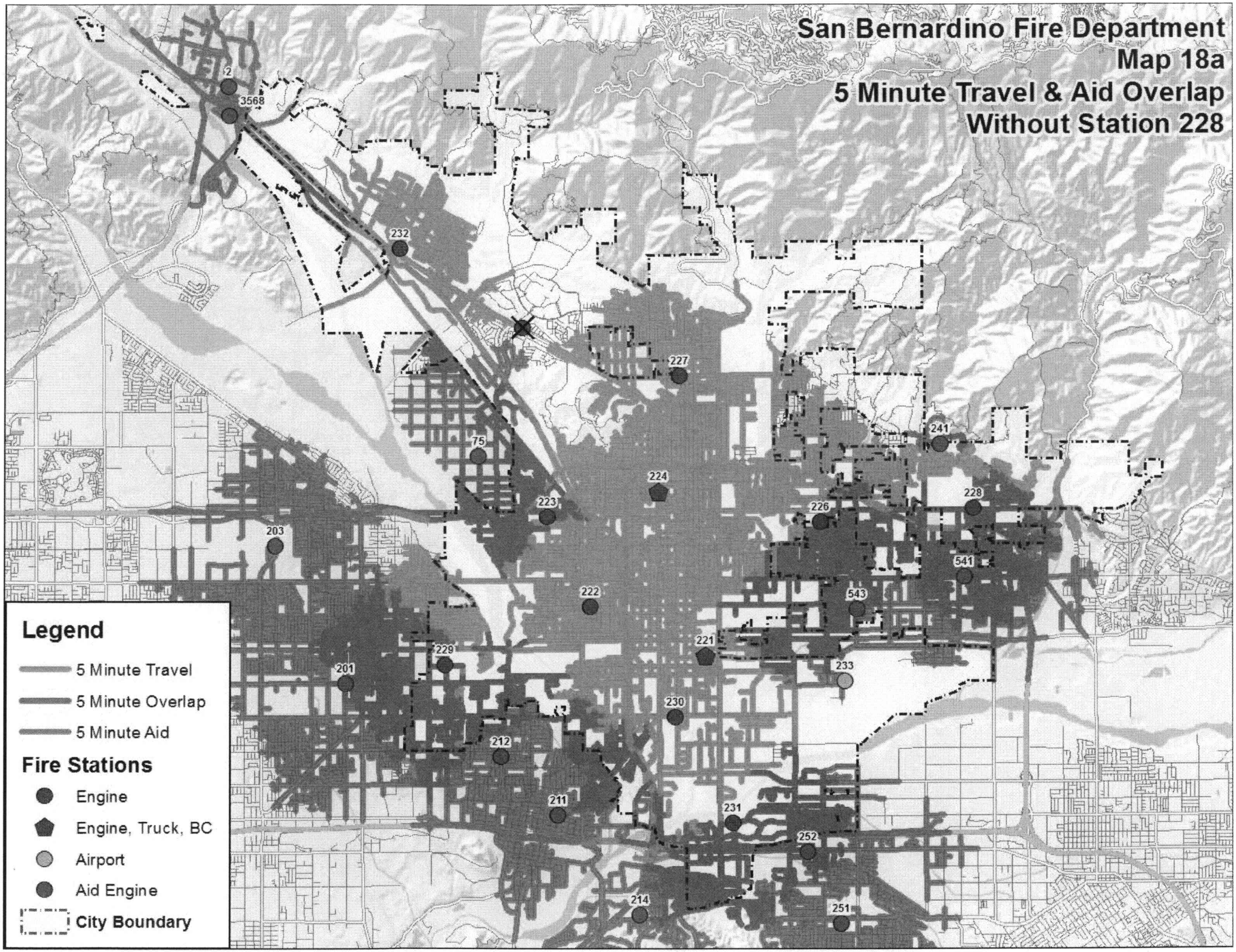
San Bernardino Fire Department
Map 18a
5 Minute Travel & Aid Overlap
Without Station 228
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
2
3568
232
227
75
241
224
223
226
228
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541
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543
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212
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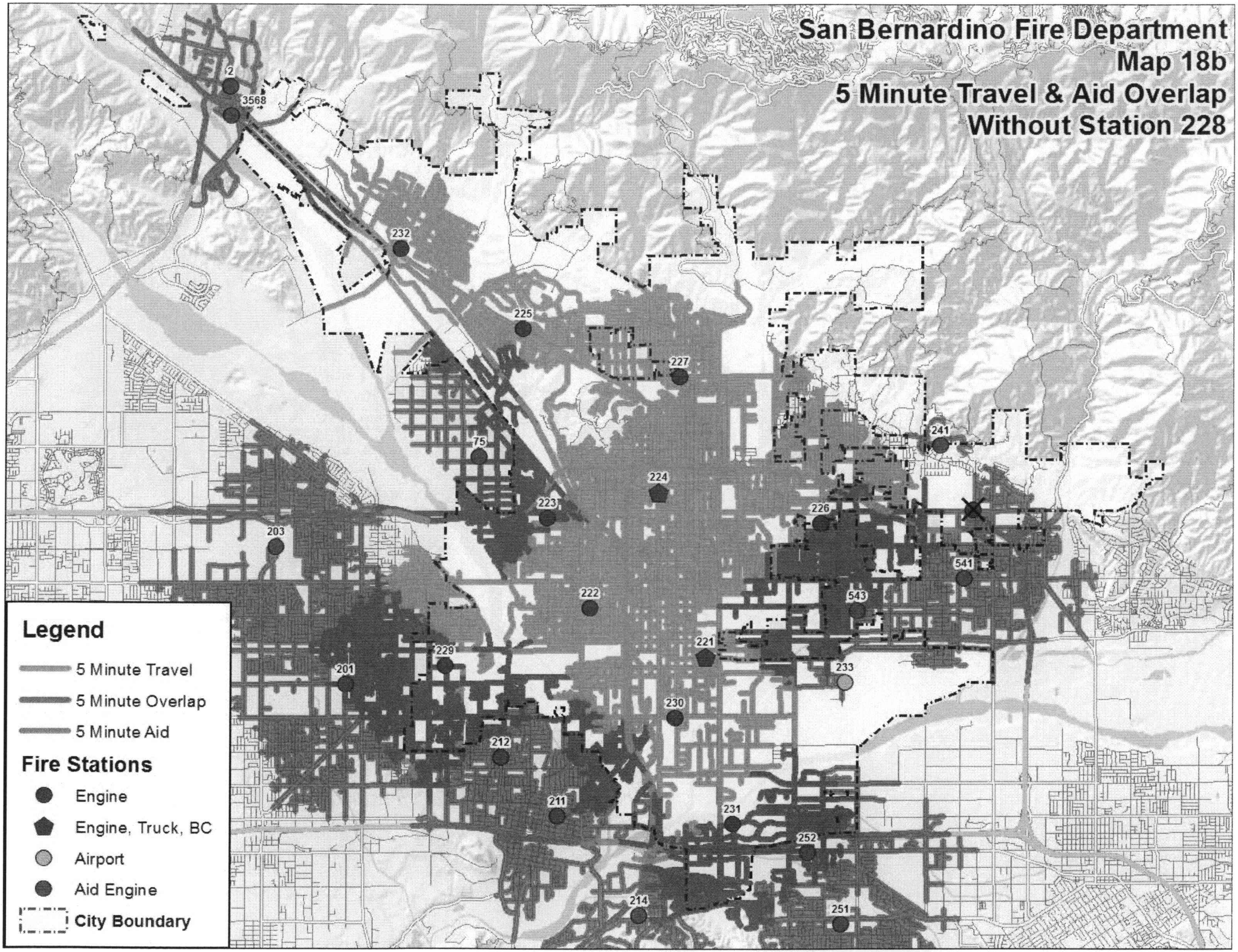
252
214
251


San Bernardino Fire Department
Map 18b
5 Minute Travel & Aid Overlap
Without Station 228
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
2
3568
232
225
227
75
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541
222
543
221
229
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212
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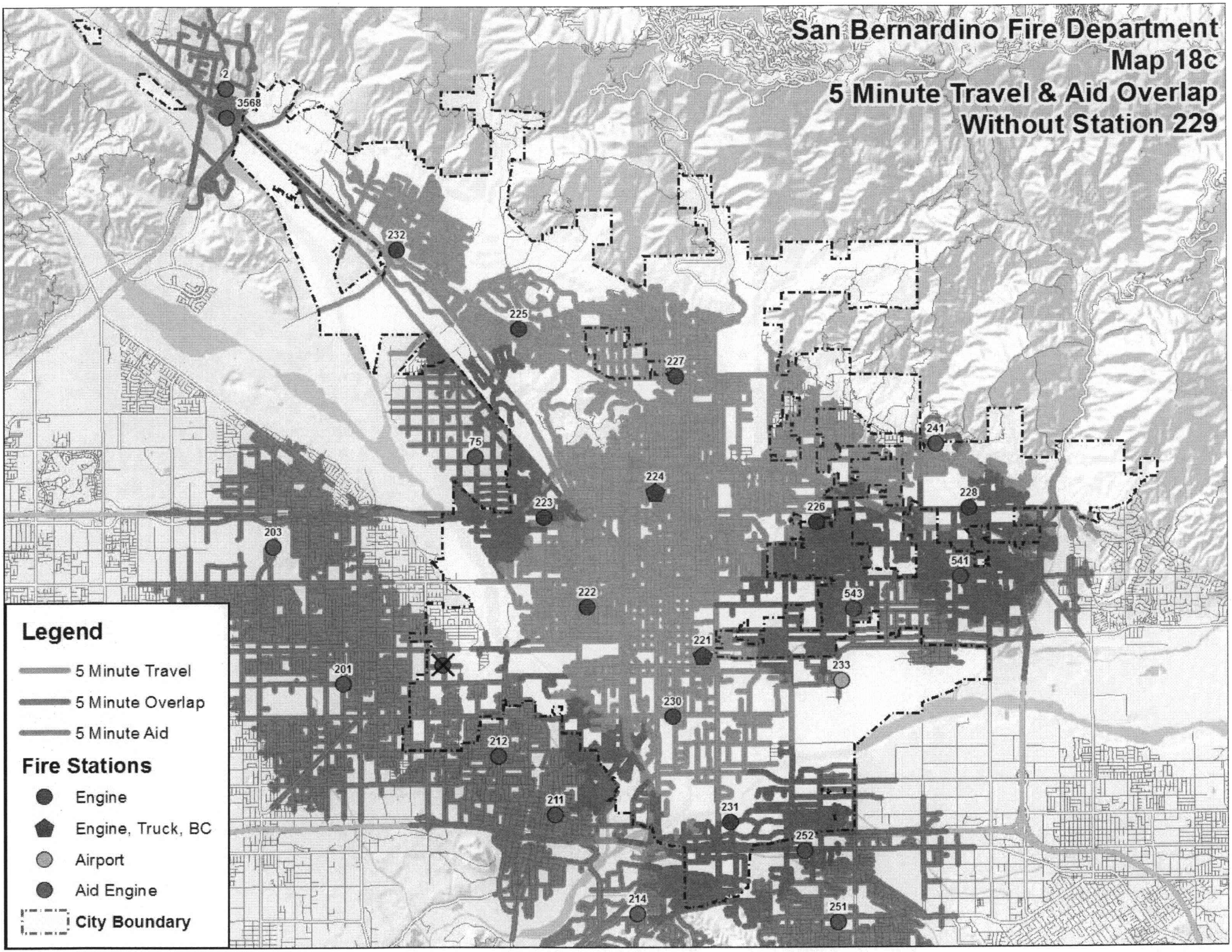
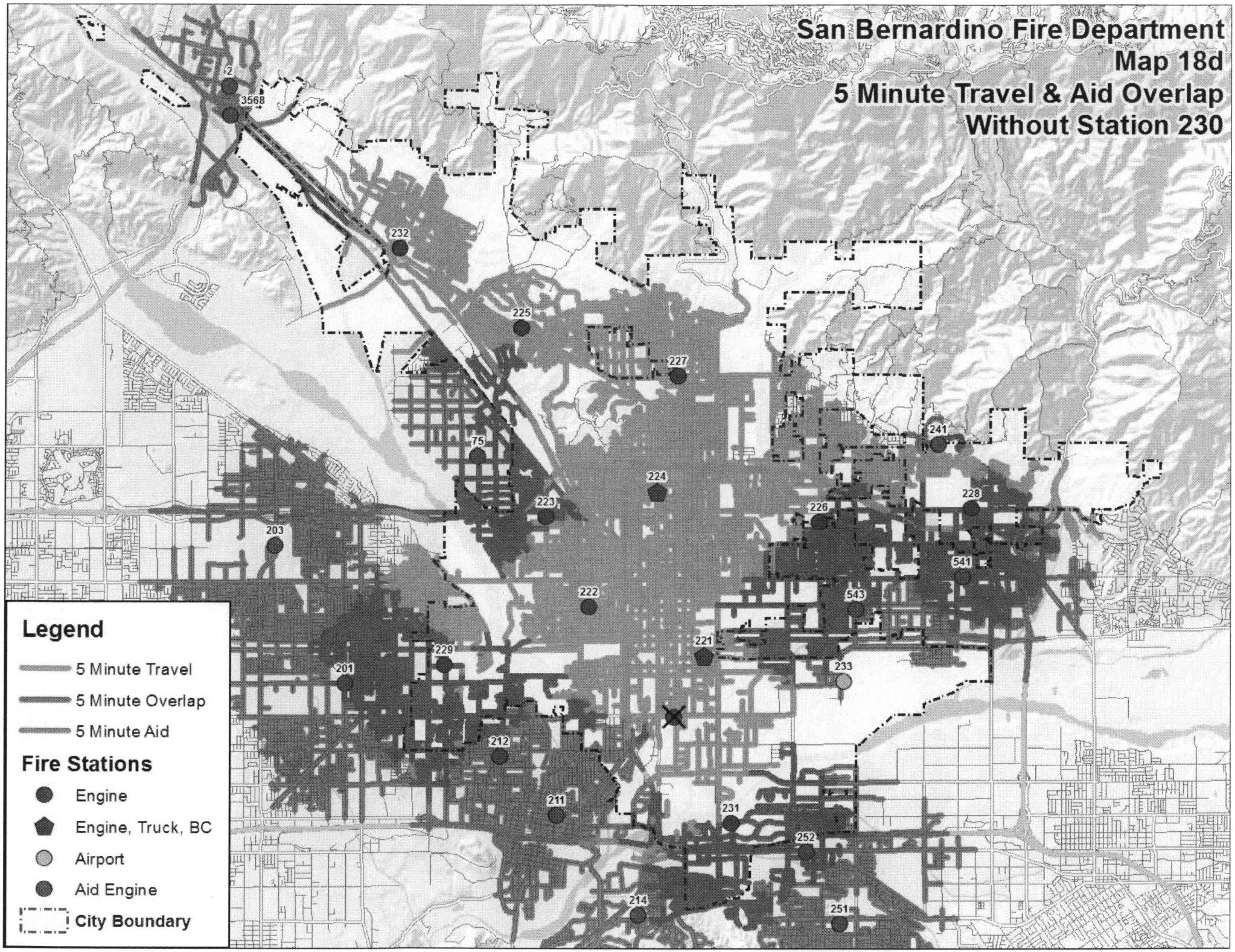
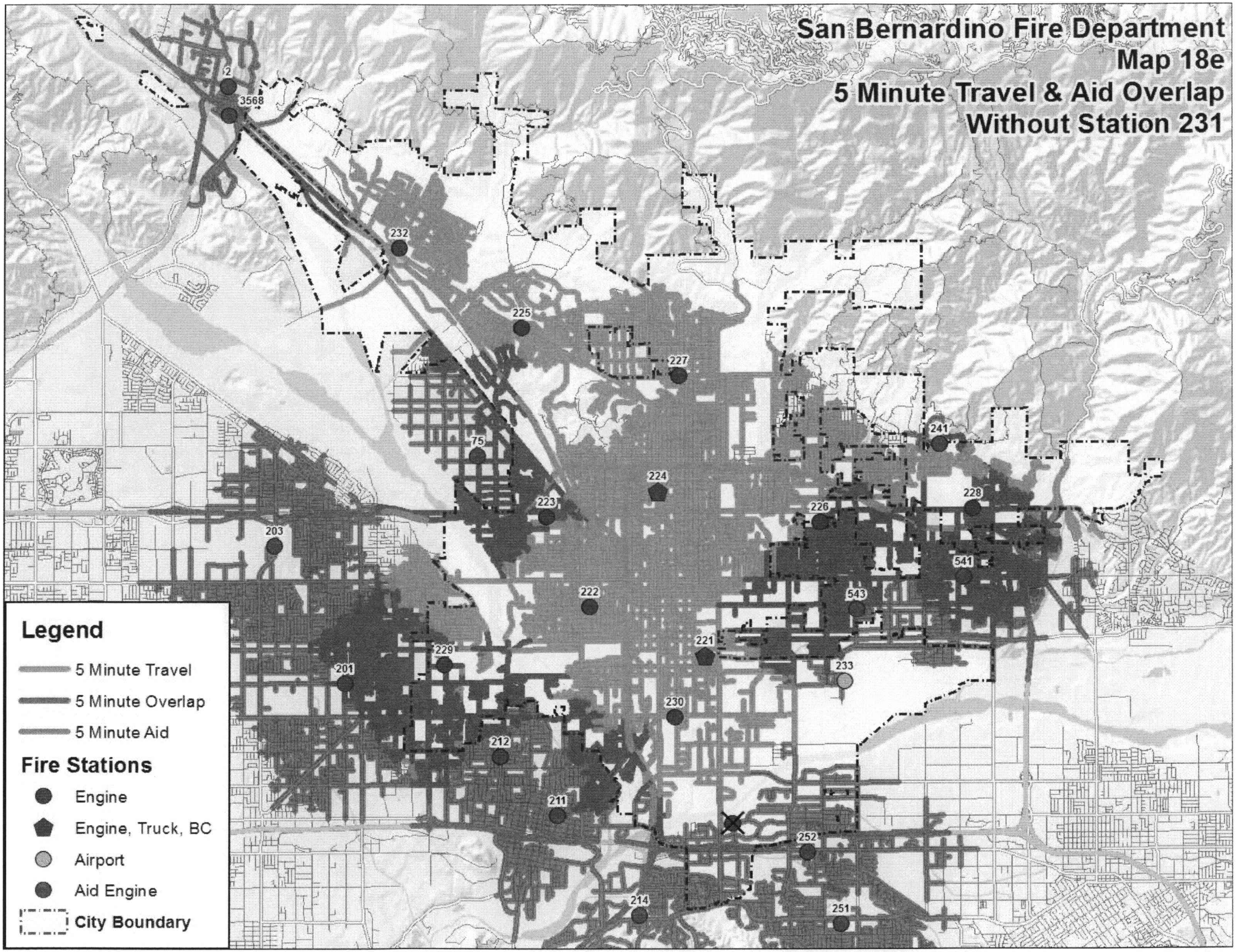
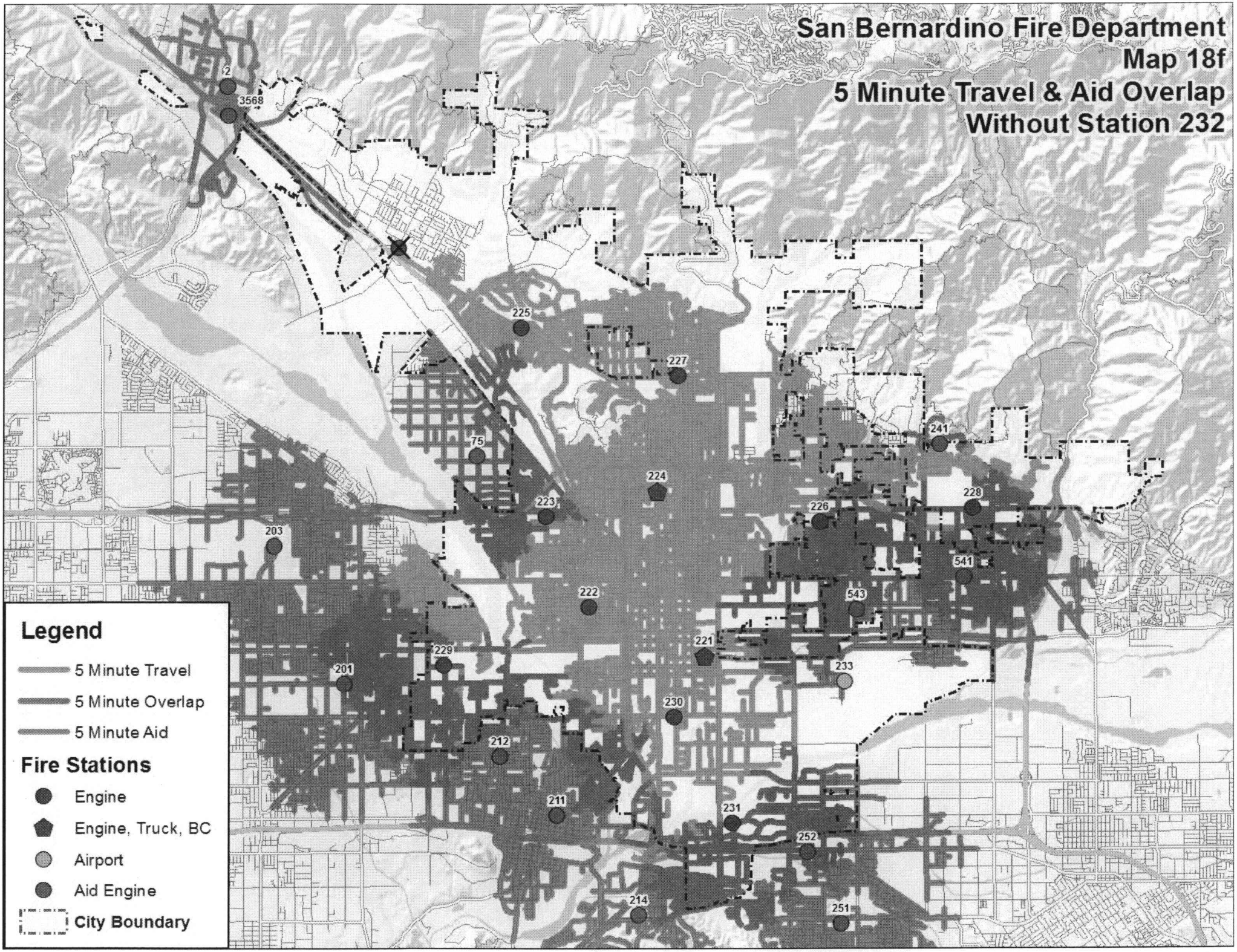
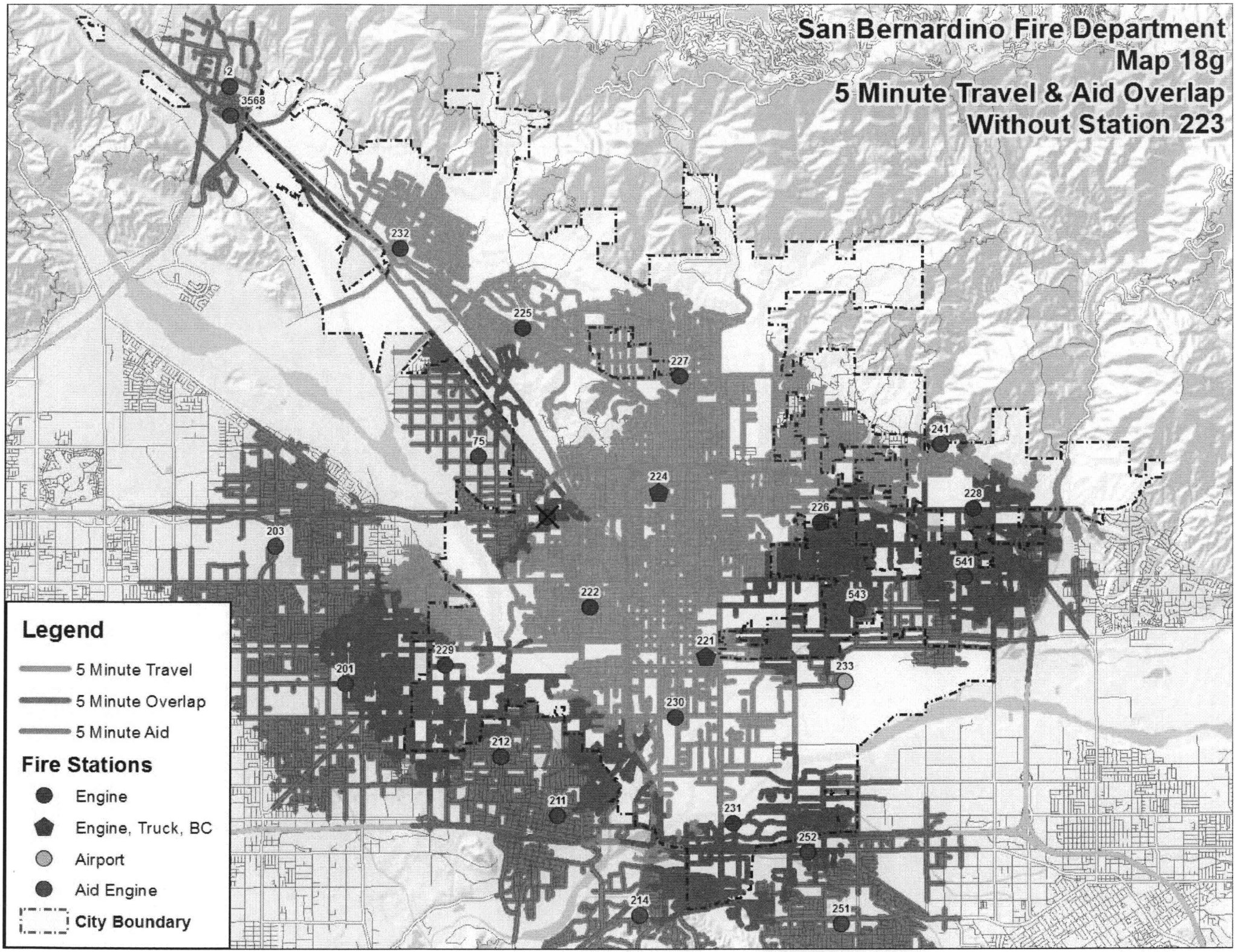
231
252
214
251

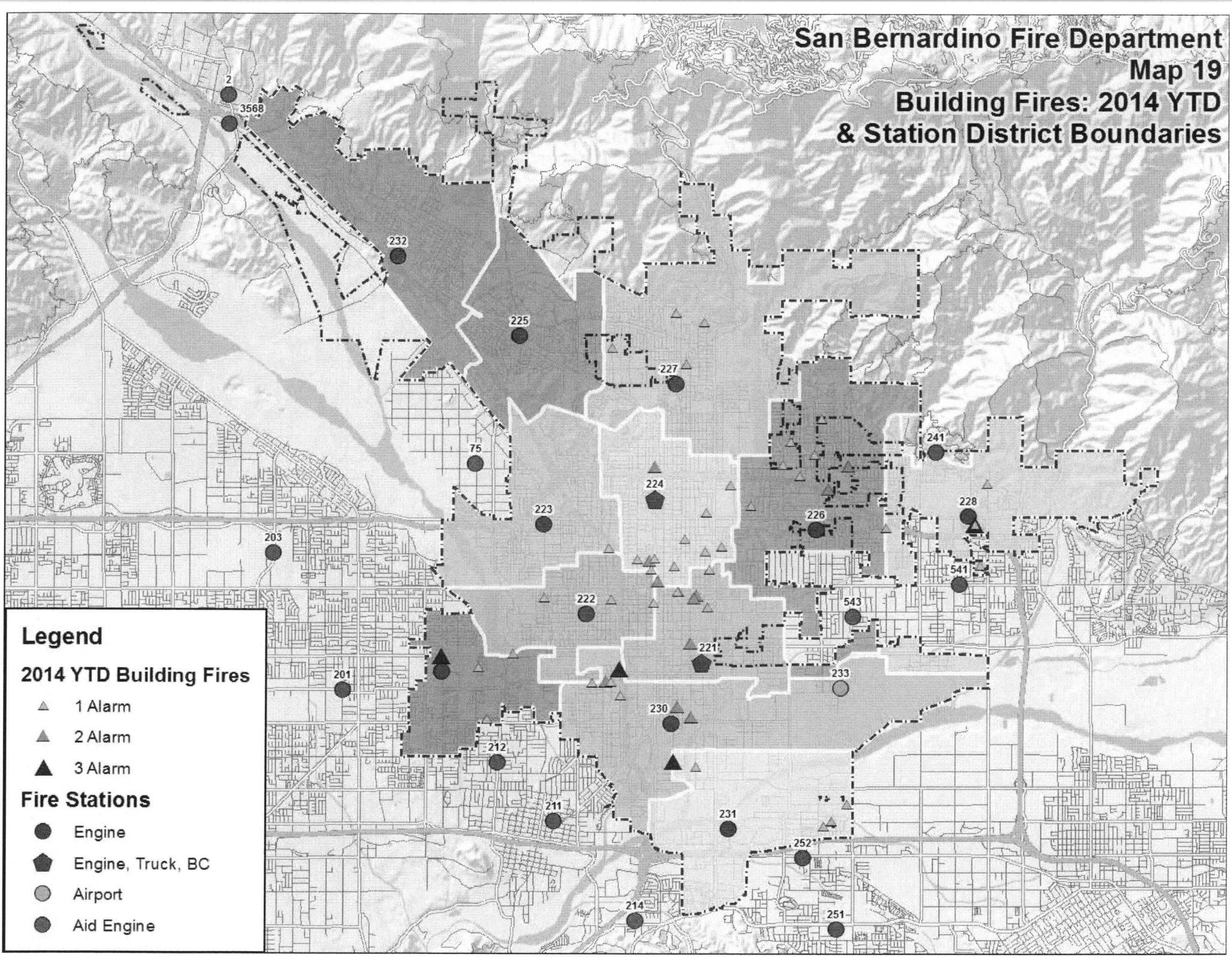

San Bernardino Fire Department
Map 18c
5 Minute Travel & Aid Overlap
Without Station 229
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
233
201
230
212
211
231
252
214
251


San Bernardino Fire Department
Map 18d
5 Minute Travel & Aid Overlap
Without Station 230
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
212
211
231
252
214
251


San Bernardino Fire Department
Map 18e
5 Minute Travel & Aid Overlap
Without Station 231
2
3568
232
225
227
75
241
224
223
226
228
203
541
543
222
221
229
233
201
230
212
211
252
214
251
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary


San Bernardino Fire Department
Map 18f
5 Minute Travel & Aid Overlap
Without Station 232
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
2
3568
225
227
75
241
224
223
226
228
203
541
222
543
221
229
233
201
230
212
211
231
252
214
251


San Bernardino Fire Department
Map 18g
5 Minute Travel & Aid Overlap
Without Station 223
Legend
5 Minute Travel
5 Minute Overlap
5 Minute Aid
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
City Boundary
2
3568
232
225
227
75
241
224
228
226
203
541
543
222
221
229
233
201
230
212
211
231
252
214
251


San Bernardino Fire Department
Map 19
Building Fires: 2014 YTD
& Station District Boundaries
Legend
2014 YTD Building Fires
1 Alarm
2 Alarm
3 Alarm
Fire Stations
Engine
Engine, Truck, BC
Airport
Aid Engine
2
3568
232
225
227
75
241
224
223
226
228
203
541
222
543
221
233
201
230
212
211
231
252
214
251