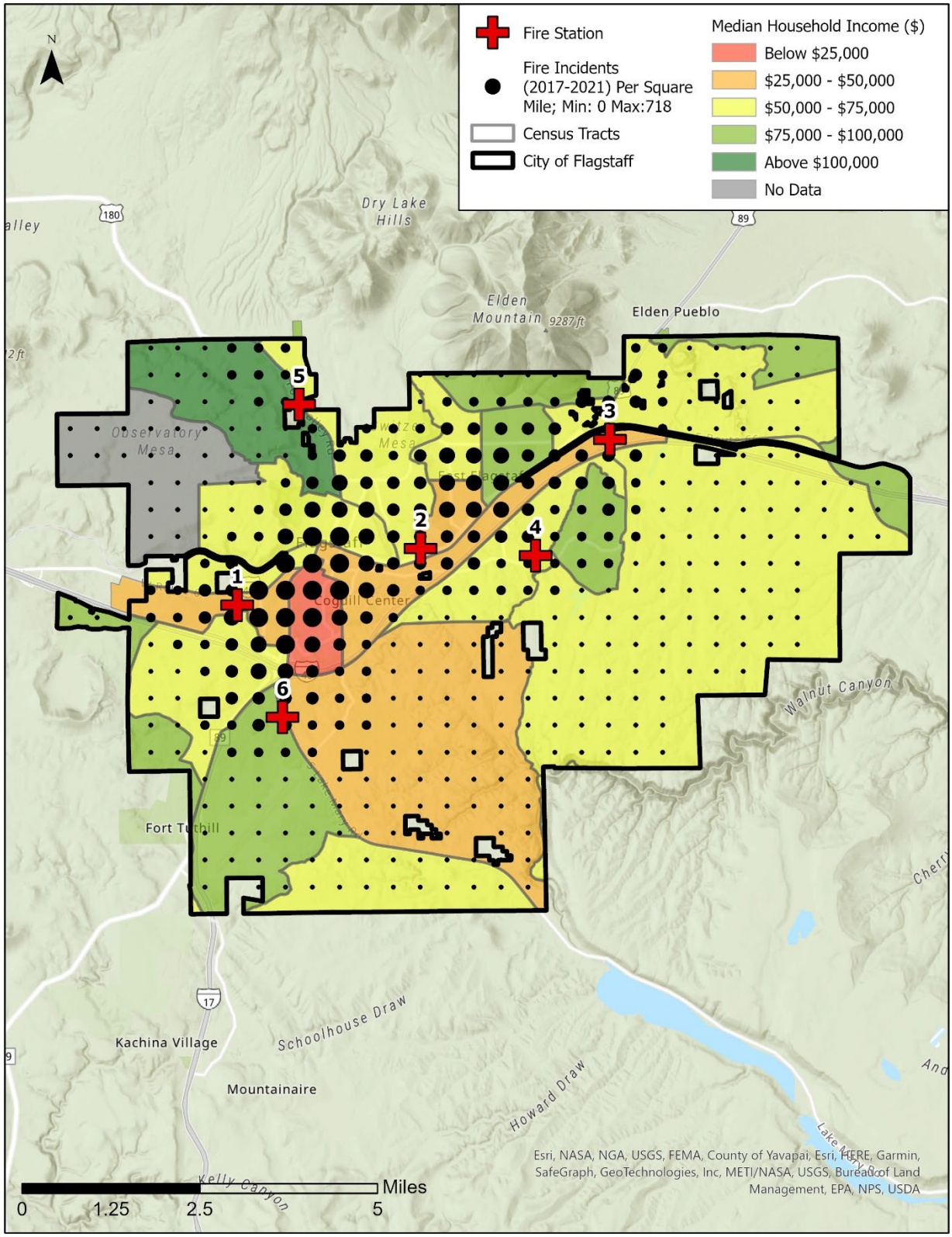
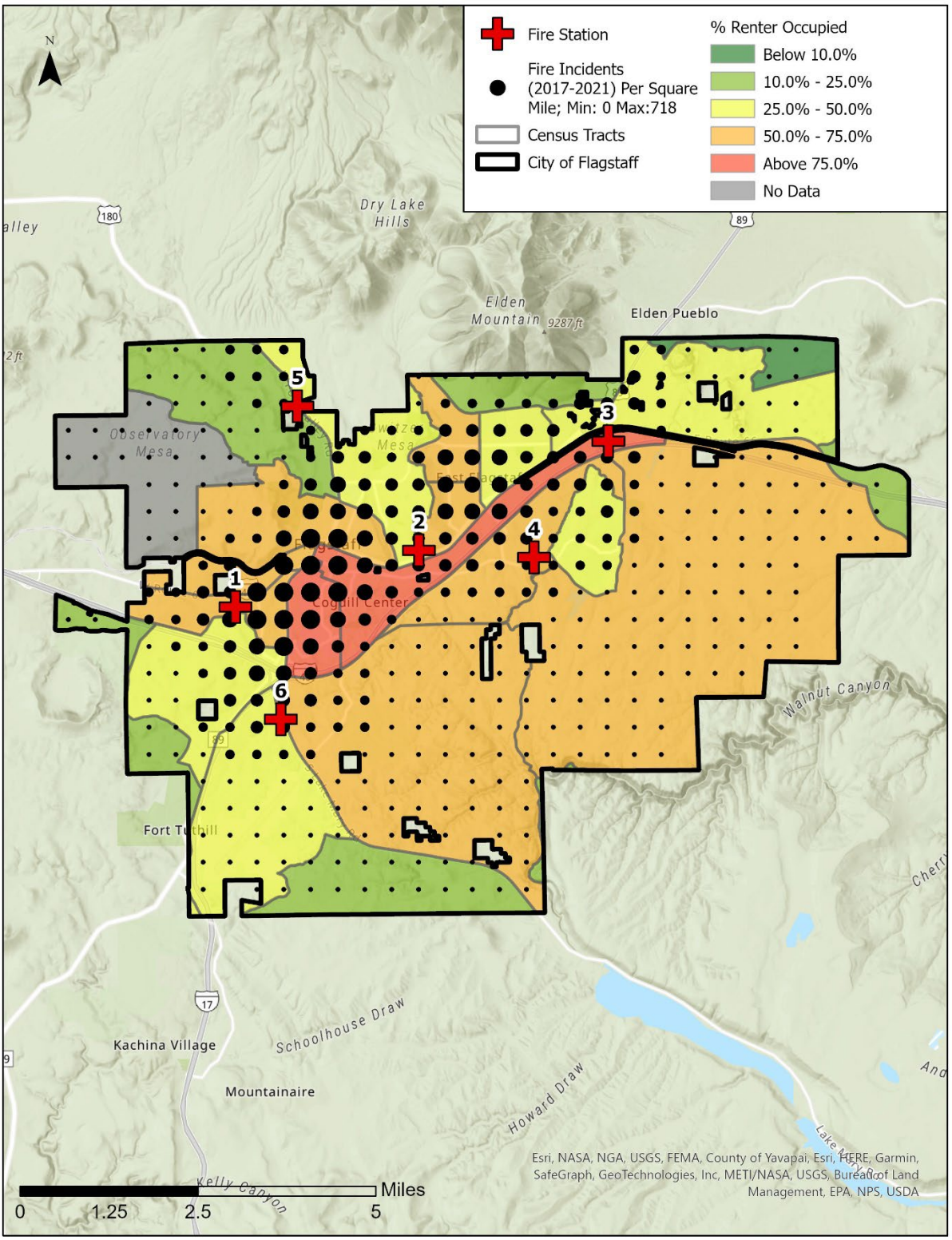
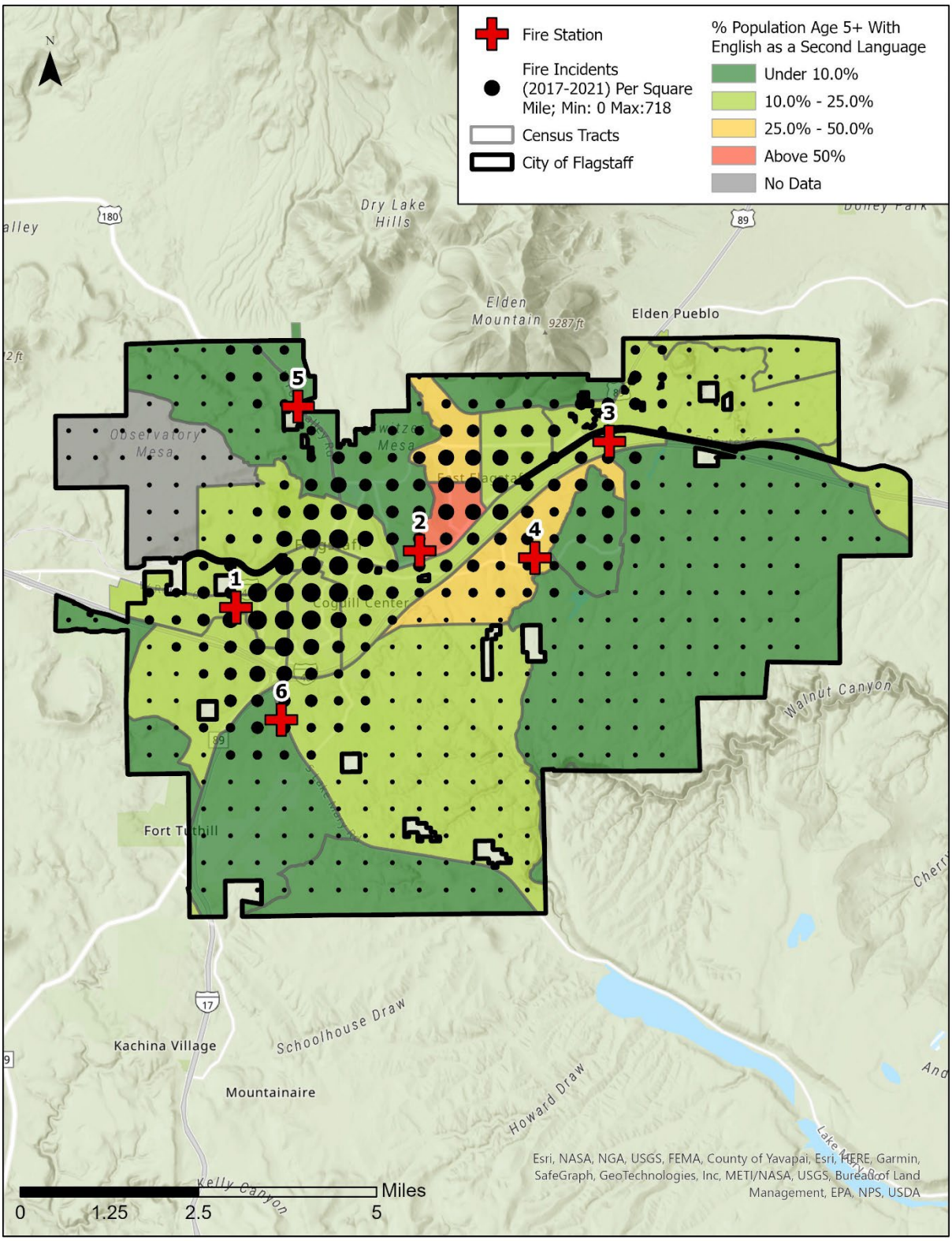


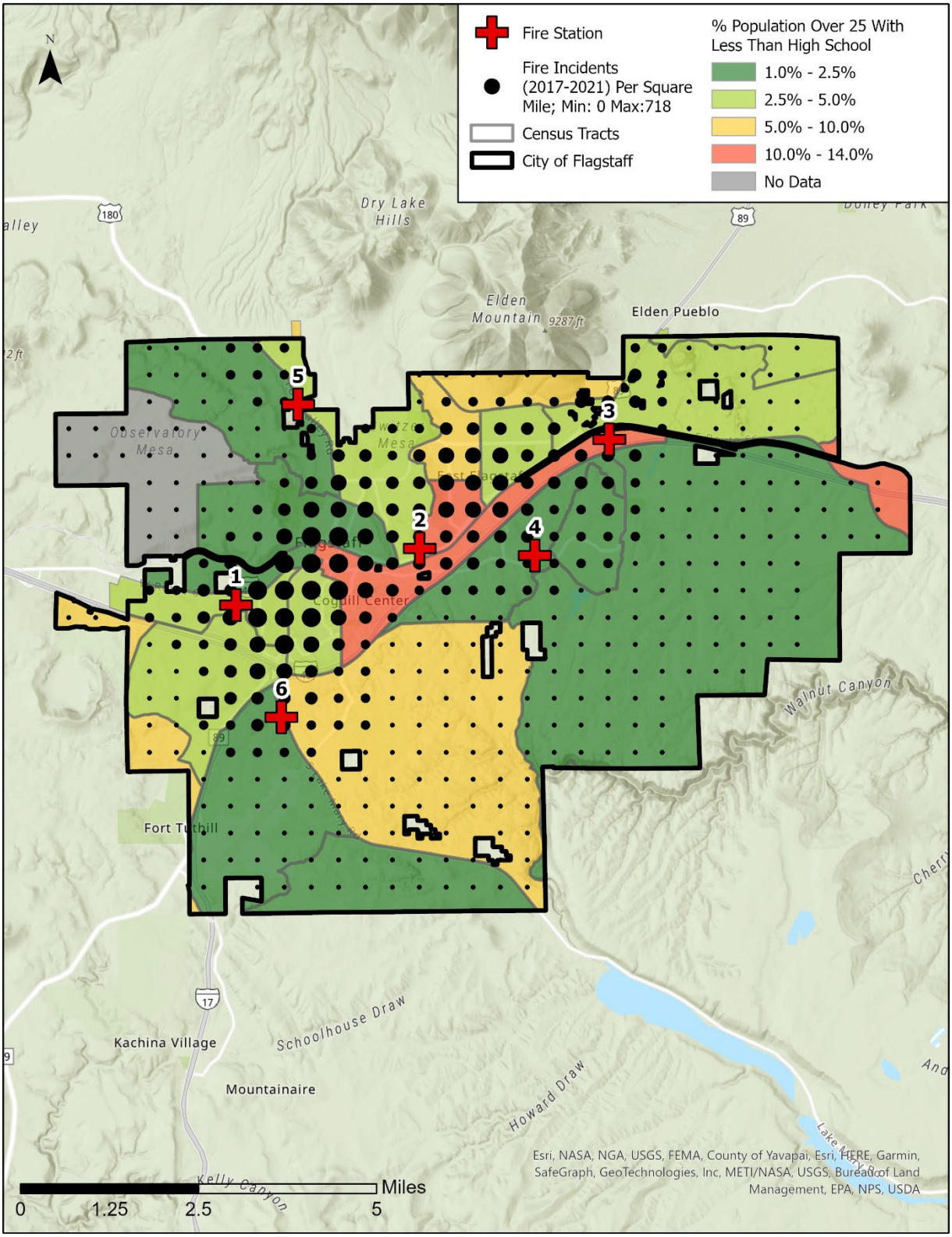
This map displays all fire-related incidents by median household income.



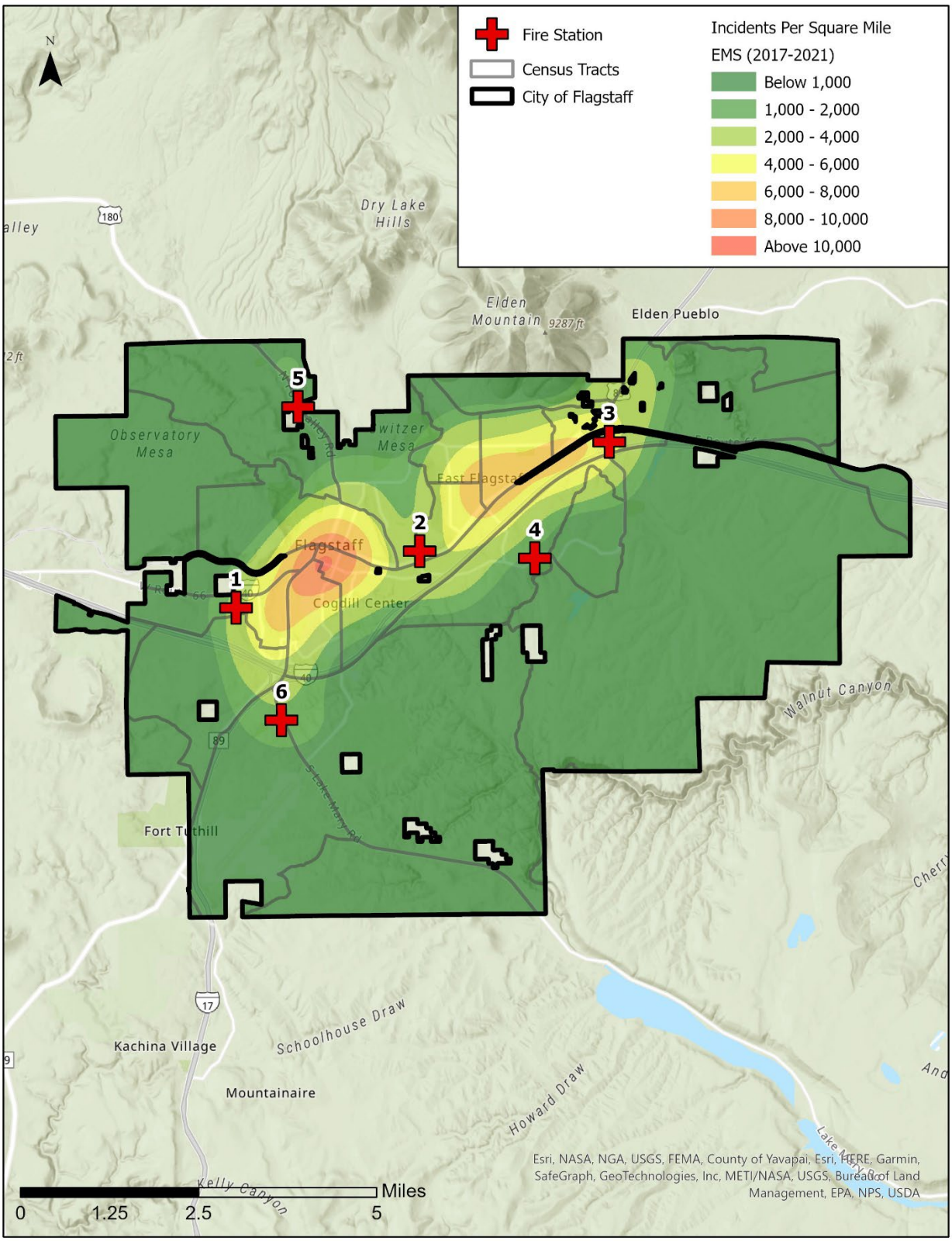
This map displays all fire-related incidents by percent renter-occupied households.



This map displays all fire-related incidents by population >5 years old with English as a Second Language.



This map displays all fire-related incidents by educational attainment City-wide.



This map displays all EMS-related incidents across the City of Flagstaff.

NAH Health Village

Northern Arizona Healthcare (NAH) proposes a mixed-use development anchored by a medical center with office, retail, residential, and commercial buildings totaling approximately 7 million square feet of enclosed space. The development will commence in 2022 with buildout projected over the next 30 years. The NAH Health Village medical center is intended to replace the Flagstaff Medical Center, also operated by NAH, currently located at 1200 North Beaver Street in downtown Flagstaff.

The NAH Health Village site is at the southern end of the City of Flagstaff, bounded by Highway 89A and Interstate 17 on the east and Fort Tuthill County Park on the south. The total land area of the project is approximately 185 acres and the site represents approximately 0.5% of the City's current total land area.

Given the obvious wildfire and WUI exposure of this planned development, NAH commissioned a comprehensive wildfire risk and mitigation study in 2021. It is vital for the safety of future residents, business, and visitors to this area that the ongoing mitigation efforts recommended in that assessment are accomplished/maintained throughout the lifecycle of this development. Even with the most effective mitigation, however, it is still possible for fires to occur and this fact should be considered in terms of FFD resource deployment.

It is likely that every square foot of this development will be protected by automatic fire sprinklers. While not a panacea, when paired with proper building construction, sprinklers are the most effective protection from the loss of life and property from fire.

The International Fire Code (IFC) and the International Wildland Urban Interface Code (IWUI) should provide the necessary safety requirements to assure the safe development of this project, including the special hazards and requirements of the medical center. The requirements of the IFC should also assure the safety of the high-rise portion of the project.

The medical center and some of its supporting operations may include the use and storage of hazardous materials such as liquified oxygen and other flammable medical gases. The installation of these systems will be required to comply with IFC and NFPA requirements to minimize risk.

The FFD may require site safety planning and provisions during construction, as provided in the IFC, to reduce risk during construction.

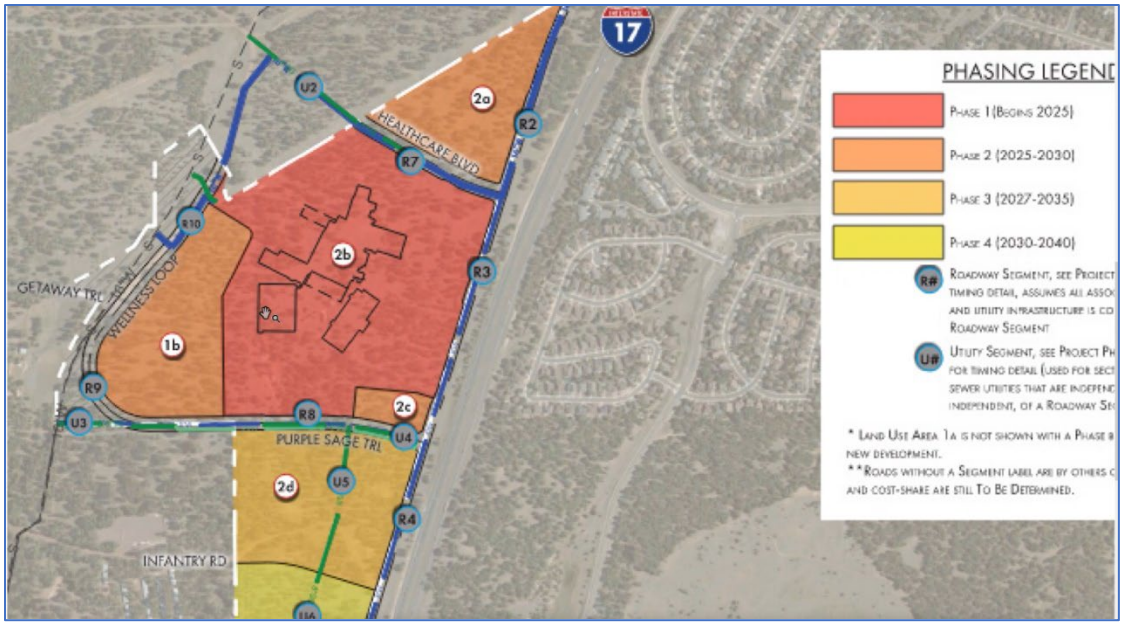
Even with the benefits of contemporary codes/standards and high-quality engineering/construction, the NAH Health Village will, when occupied with people, create additional risk and fire-EMS service demand in a relatively remote corner of Flagstaff.

By its very nature, a hospital is a high-risk building from a fire and EMS perspective. Even with state-of-the-art fixed fire protection systems installed, the presence of numerous non-ambulatory patients, special hazards including flammable liquids/gases, multiple elevators, and the challenges posed by all high-rise buildings will demand a commensurate response from the FFD.

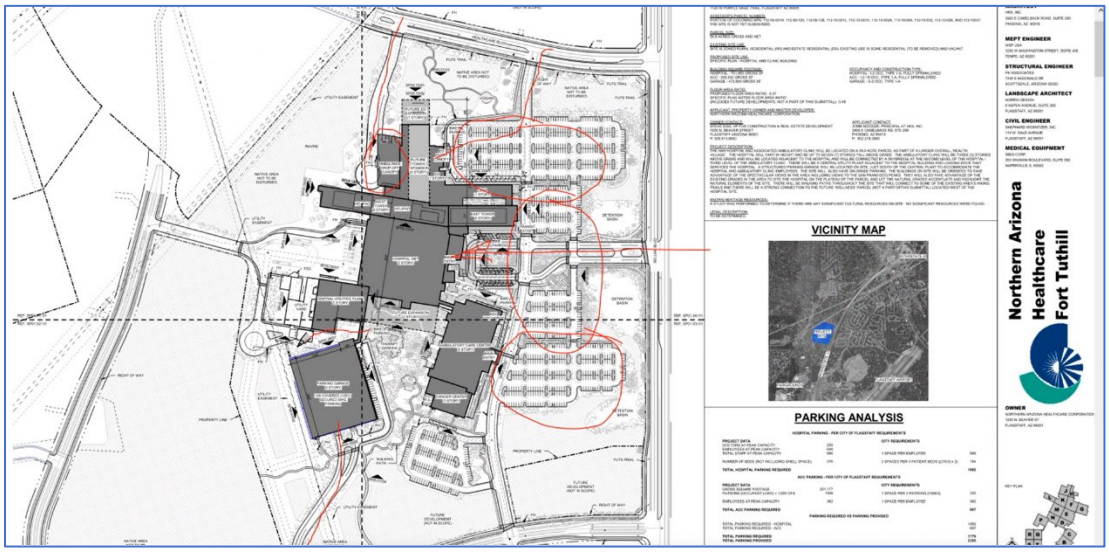
The need for a robust, high-hazard FFD response to the NAH Health Village starts on “day one” of medical center construction. While a typical fire alarm activation for a single-family residence might be handled by one fire engine, the potential for harm in a complicated medical building(s), high-rise or not, demands a larger initial response. Further, buildings under construction pose additional risk, since fire protection systems are incomplete and other site hazards are present throughout construction.

As additional development wraps around the medical center complex, increasing fire-EMS demand will depend on the pace of construction/occupancy and the ultimate risk profile of the local area. The planned 315 residential units, in multifamily occupancies, represent an approximately 2% increase in the City’s total number of dwelling units.

While it is impossible to precisely forecast risk and demand 30 years ahead of time, it seems likely that the NAH Health Village will perform in a similar way to other medium-density, mixed-use areas of the City.

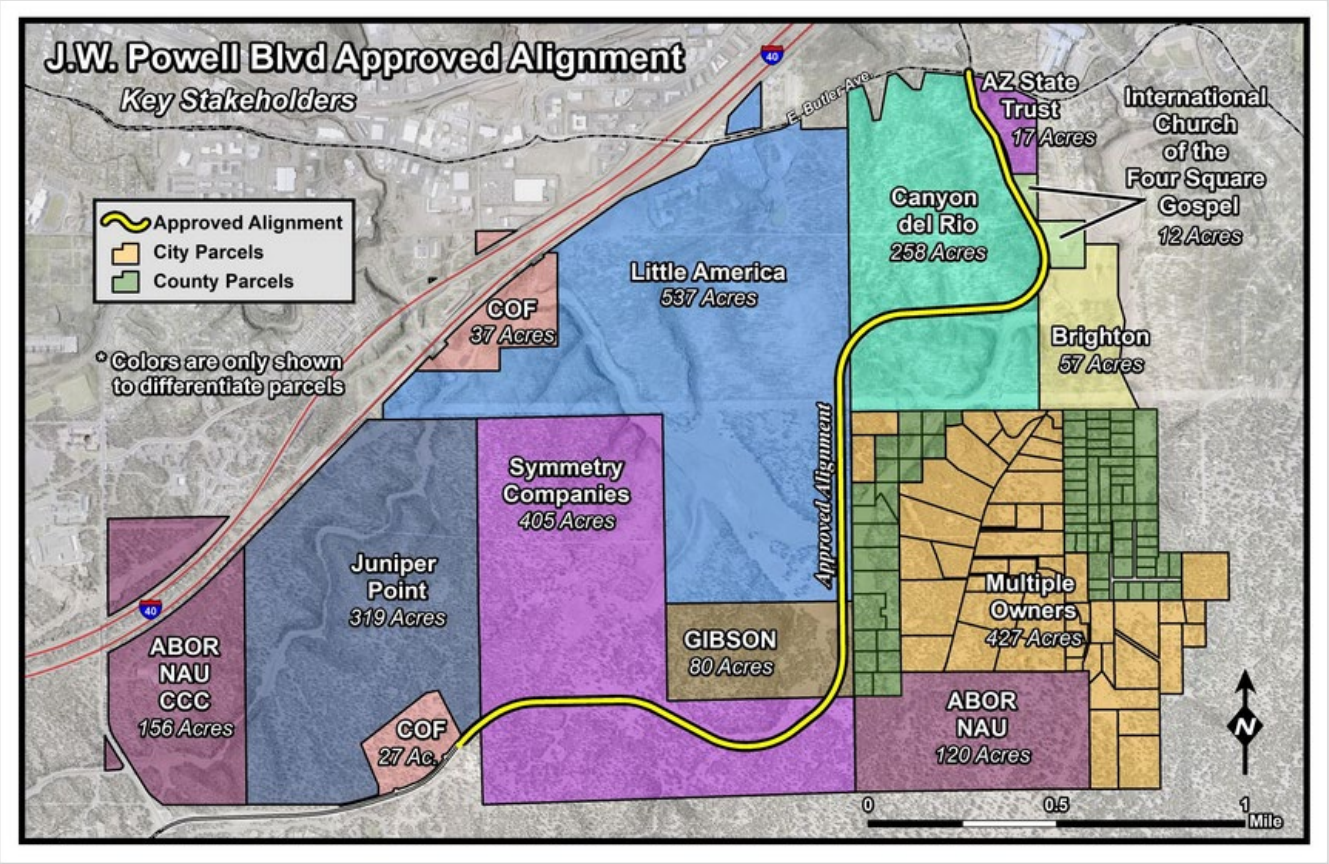


Ensuring full fire department access in/around the development is an important aspect of response planning; interconnected streets and multiple access/egress points are particularly important in WUI areas.



John Wesley Powell (JWP) Corridor

The JWP Corridor is already showing signs of significant development activity.



The JWP Corridor represents almost 6% of Flagstaff's total land area and the planned 3,000-4,000 residential units will add almost 20% to the City's total supply of residential dwellings.

WUI is a major concern throughout the JWP.

The ultimate character of development along the JWP Corridor is not completely defined. For this study, FACETS modeled a development profile and street network using representative areas of the city that currently exist, based on discussions with City of Flagstaff personnel from multiple departments.

STANDARDS OF COVER ANALYSIS

The Standards of Cover (SOC) Analysis is used to describe the FFD's ability to provide the current/expected level of fire protection and EMS coverage across the City's land area.

As previously identified by FACETS in a 2021 analysis performed for Northern Arizona Healthcare, the FFD does not currently meet the NFPA 1710 standard for delivering all-hazards fire and emergency services to the City of Flagstaff.

Providing all-hazards fire protection and EMS in local communities can be described as a complex "system of systems," with changes to individual nodes often cascading throughout the entire system with sometimes unanticipated effects.

Fire-EMS coverage must be considered in terms of both breadth and depth (or "distribution" and "concentration") of coverage.

Breadth or distribution of coverage is typically measured in terms of the ability for a single first-arriving fire-EMS unit to respond and arrive onscene at an emergency incident within approximately 5 minutes from the time of dispatch. A single fire-EMS unit, however, is rarely capable of safely and effectively performing the range of simultaneous functions required to handle a structural/WUI fire, vehicle crash, hazardous materials emergency, or even a severe medical crisis (i.e., sudden cardiac arrest).

Evaluating coverage depth or concentration recognizes that many fire-EMS incident types require multiple response units to properly address, along with the fact that response units in busy areas cannot respond to simultaneous incidents; in the latter case, fire-EMS coverage is maintained by relying on available units in adjacent fire stations coming into the original unit's first-due area while that unit is working their original incident.

Even beyond the number of available response units, the number of firefighters (including firefighter/paramedics and firefighter/EMTs) assigned to each response unit (i.e., "minimum staffing") defines its level of capability. For instance, a fire engine with a single firefighter is incapable of safely performing any function beyond establishing an initial water supply from a hydrant; federal regulations and national standards require at least three additional firefighters onscene before interior structural firefighting operations can be started.

Similarly, not all "fire trucks" are the same. Fire engines and ladder trucks are both required to safely and effectively handle structural fires. The national standard for deployment to fire incidents typically requires 3-4 fire engines (with 4-5 firefighters each), 1-2 ladder trucks (with 4-5 firefighters each), 1-2 command units (with 1-2 firefighters each), an ambulance with 2 EMS providers, and often a special services/operations unit (heavy rescue or squad company) with 4-5 firefighters aboard. (Or some combination thereof.)

Fireground Task	Unit	NFPA 1710	City of Flagstaff
Rescue occupants	1st Ladder*	4-5 firefighters	3 firefighters
Exposure protection	3rd Engine	4-5 firefighters	3 firefighters
Confine fire	1st Engine	4-5 firefighters	3 firefighters
Extinguish fire	2nd Engine	4-5 firefighters	3 firefighters
Overhaul	4th Engine	4-5 firefighters	3 firefighters
Ventilation	2nd Ladder*	4-5 firefighters	3 firefighters
Salvage (property conservation)	When available		

Together, these units comprise an "Effective Firefighting Force" (EFF) for low- to medium-risk incidents. Incidents in higher-risk properties, such as fires in high-rise buildings, require even more resources to safely/effectively address.

Resource Deployment

The FFD's current resource deployment is just adequate to handle existing demand for all-hazards fire-EMS across its coverage area. (For the purposes of this analysis, the Summit Fire & Medical District is considered a reliable, albeit limited, automatic mutual-aid partner.)

The Flagstaff Fire Department is a career (full-time) fire department that provides fire protection, emergency medical, special operations, and hazardous materials response services to the City of Flagstaff. The department operates six fire stations with a fleet of response vehicles.

Flagstaff has automatic aid agreements with surrounding fire departments, including the SFMD to the north and the Highlands Fire District to the south. Automatic mutual-aid (automatic aid) agreements provide that the firefighters closest to an emergency respond, regardless of jurisdictional lines. Assistance with a major emergency beyond the capability of the Flagstaff automatic aid system is remote; gathering and deploying a significant firefighting force from outside Flagstaff would take hours.

At this time, Flagstaff has a total of 27 firefighters assigned to each shift and a minimum on-duty staffing of 21 firefighters per day. Each Flagstaff fire station is provided with a structural fire engine (pumper) and a wildland fire engine. Each station also houses other emergency vehicles that are utilized as needed. The on-duty captain in the station determines which vehicle is utilized based on the type of emergency and fire department procedures.

The national standard that dictates requirements for fire department deployment is *NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*. The most recent version of NFPA 1710 is the 2020 edition.

The most significant requirements of the standard include requirements for fire department engine and ladder company unit staffing, emergency response times, and times for the assembly of an effective firefighting force (EFF) by occupancy type.

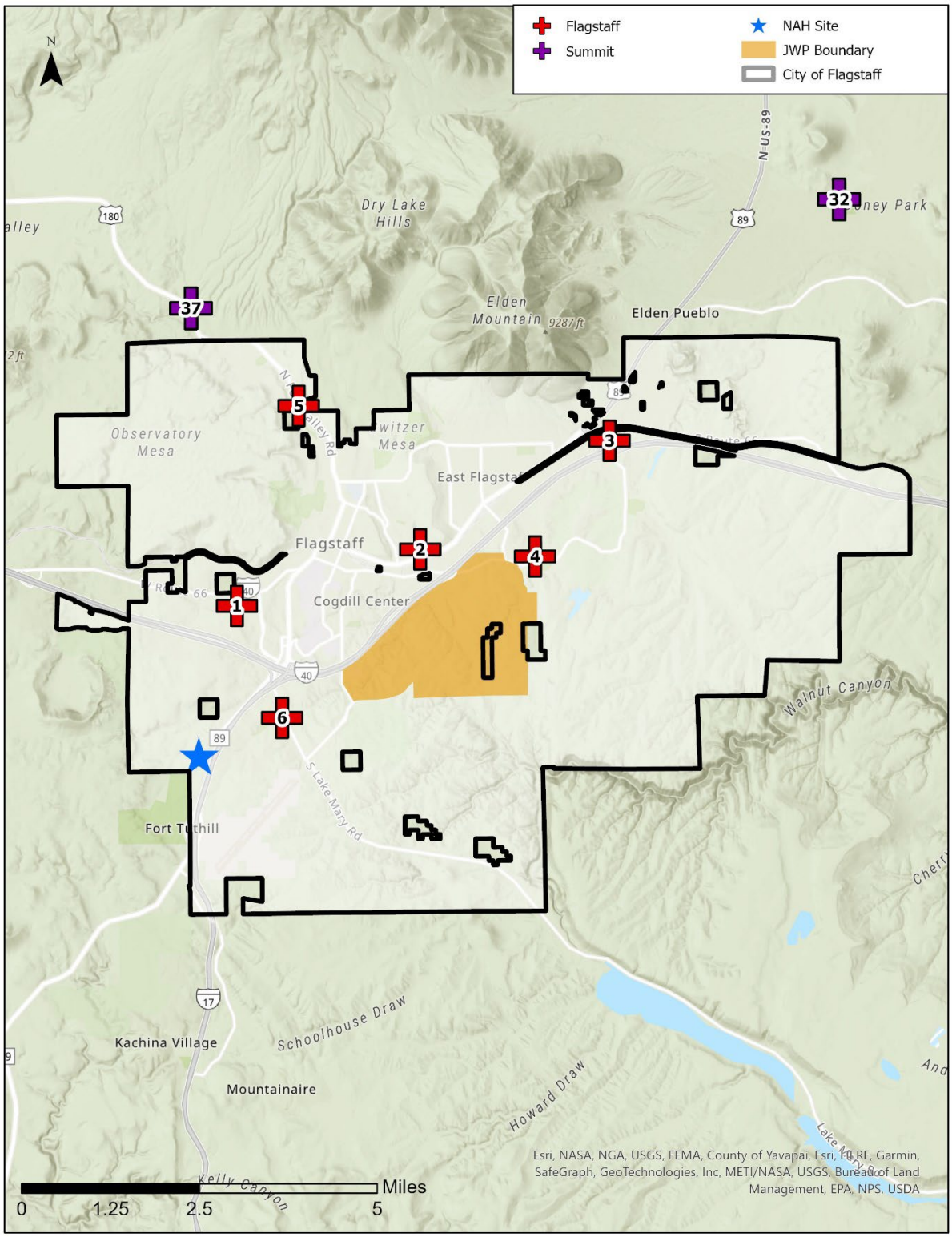
Station Number	Street Address	On-Duty Staffing	Apparatus Assigned
1	**1972 South Thompson Street**	1 Captain 1 Engineer 1 Firefighter	Type1 Engine Quint Type III Engine
2	**1701 East Ponderosa Parkway**	1 Battalion Chief 2 Captains 1 Engineer 2 Firefighters	Type 1 Engine Rescue Special OPS Squad Reserve Type 1 Type VI Engine Mini Squad (TRT) BC1 Reserve BC
3	**4500 East Nestlé Purina Avenue**	2 Captains 1 Engineer 2 Firefighters	Type I Engine Quint Rescue Reserve Type I Type III Engine Support Rig P/U Crew Cab P/U with ATV and trailer
4	**4040 East Butler Avenue**	1 Captain 1 Engineer 1 Firefighter	Type I Engine Type 1 Tender Type VI Engine
5	**2525 North Fort Valley Road**	1 Captain 1 Engineer 1 Firefighter	Type I Engine Type III Engine Haz-Mat Truck
6	**3877 Lake Mary Road**	1 Captain 1 Engineer 1 Firefighter	Type I Engine Type I Tender Type VI Engine Support Truck

Current on-duty unit staffing for the Flagstaff Fire Department does not comply with the staffing requirements of NFPA 1710. This national standard requires a minimum of four on-duty firefighters for each engine and ladder company.

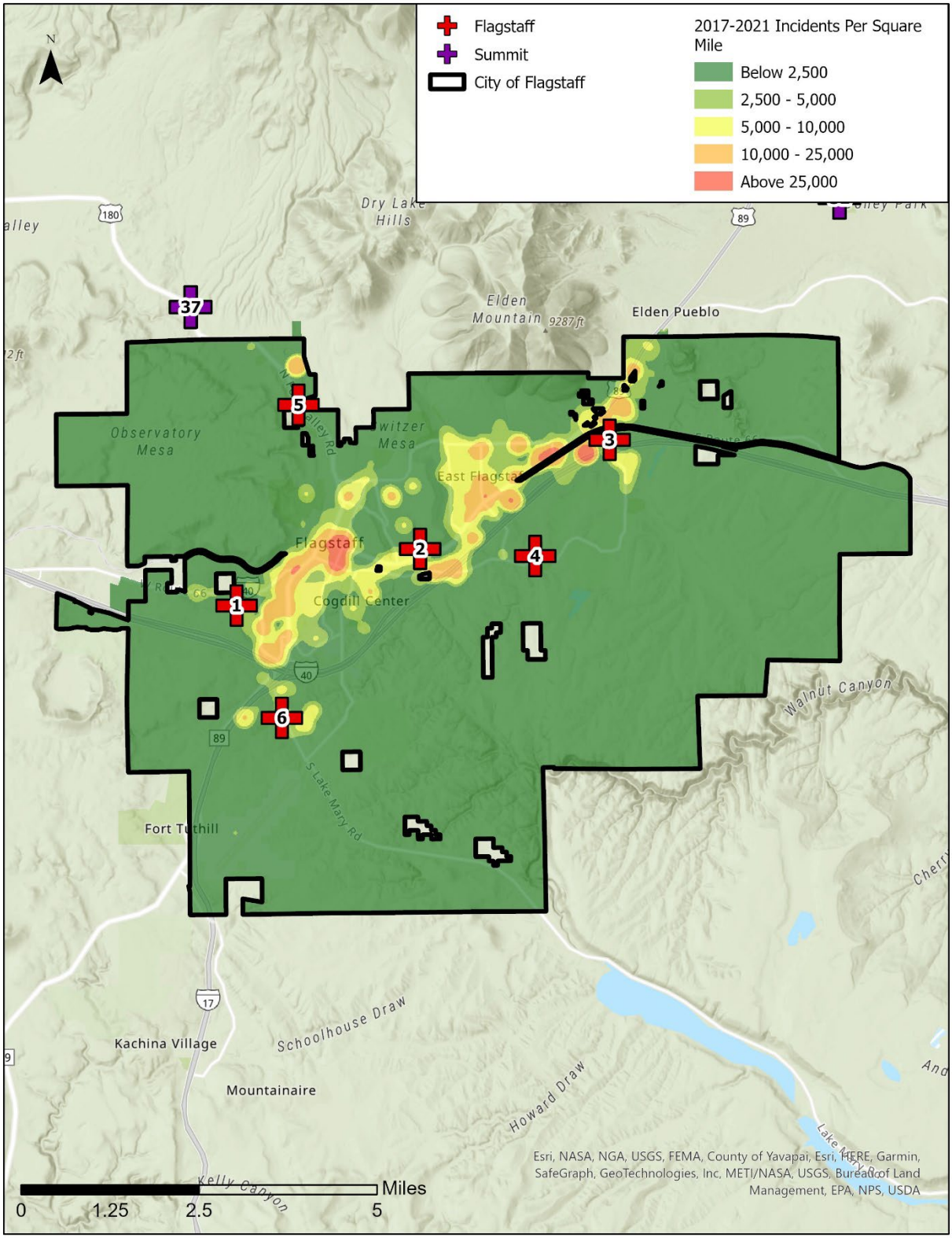
In addition, the FFD does not operate a full-time staffed ladder truck. Fire Station 1 and Fire Station 3 house ladder trucks that are cross-staffed when needed. When a ladder truck is needed for an incident response, the on-duty crew of three firefighters responds in the ladder truck (leaving the unstaffed fire engines behind).

The lack of a staffed ladder company is unusual for a city of Flagstaff's size. According to data from the most recent *United States Fire Department Profile–2020*, published by the National Fire Protection Association, a typical city in Flagstaff's population range operates at least two staffed ladder companies and six engine companies. In fact, 63 percent of cities in Flagstaff's population range operate one or more full-time staffed ladder companies.

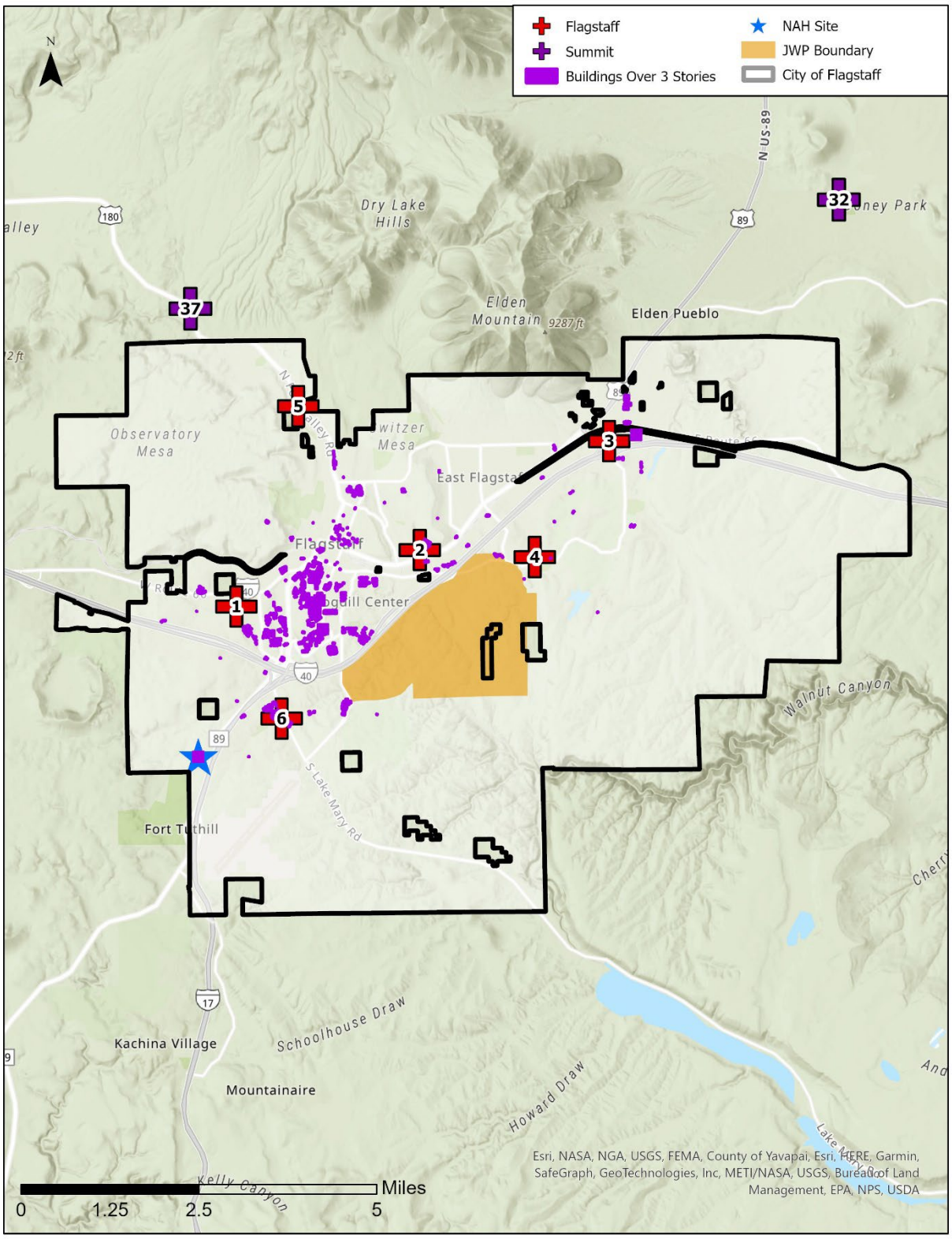
NFPA 1710 also requires that ALS (paramedic) units be staffed by two paramedics with the balance of the crew certified as EMTs. Currently, the Flagstaff Fire Department staffs ALS units with one paramedic.



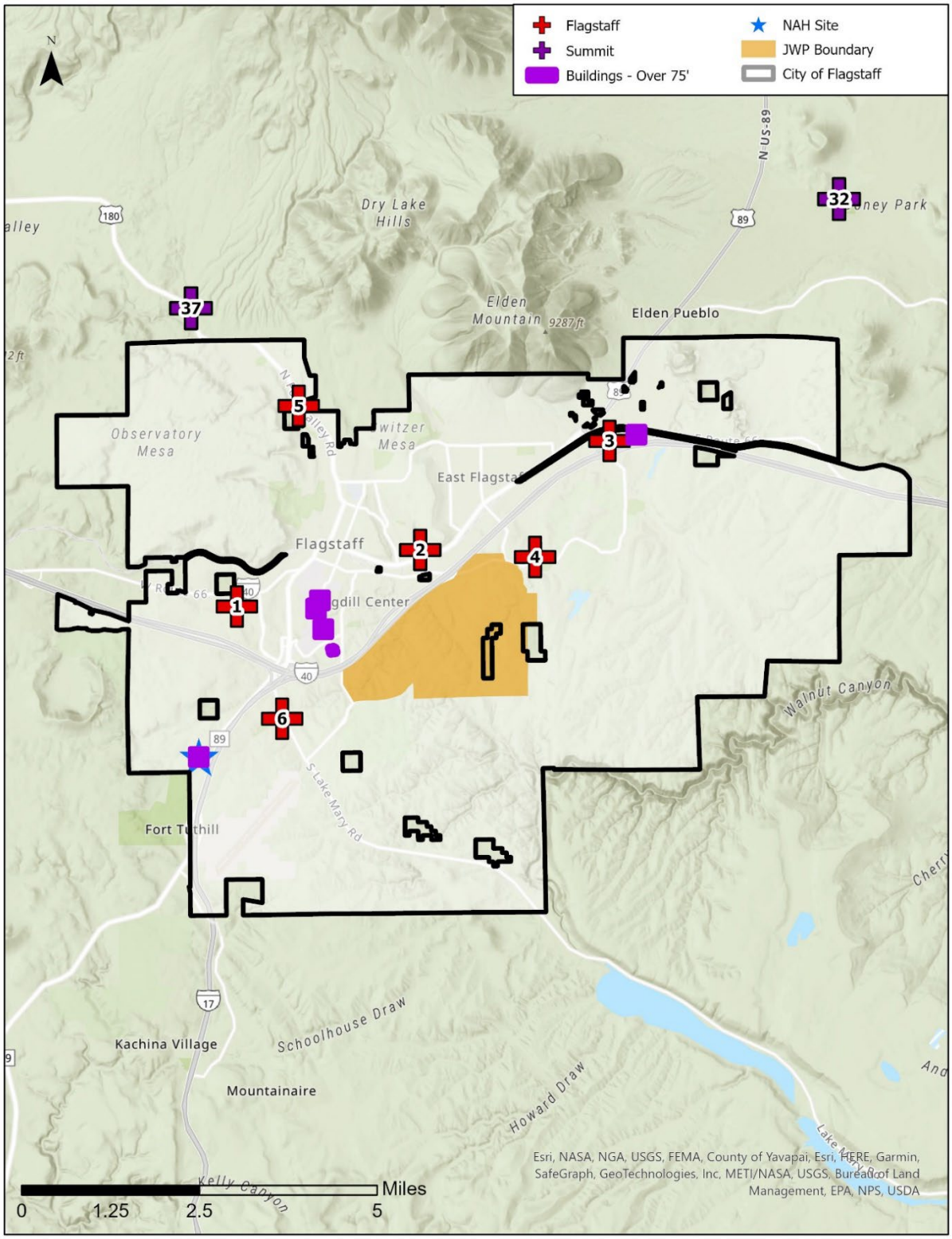
This map displays FFD and relevant SFMD station/resource locations. Highlands Fire District stations/resources are not considered in this analysis.



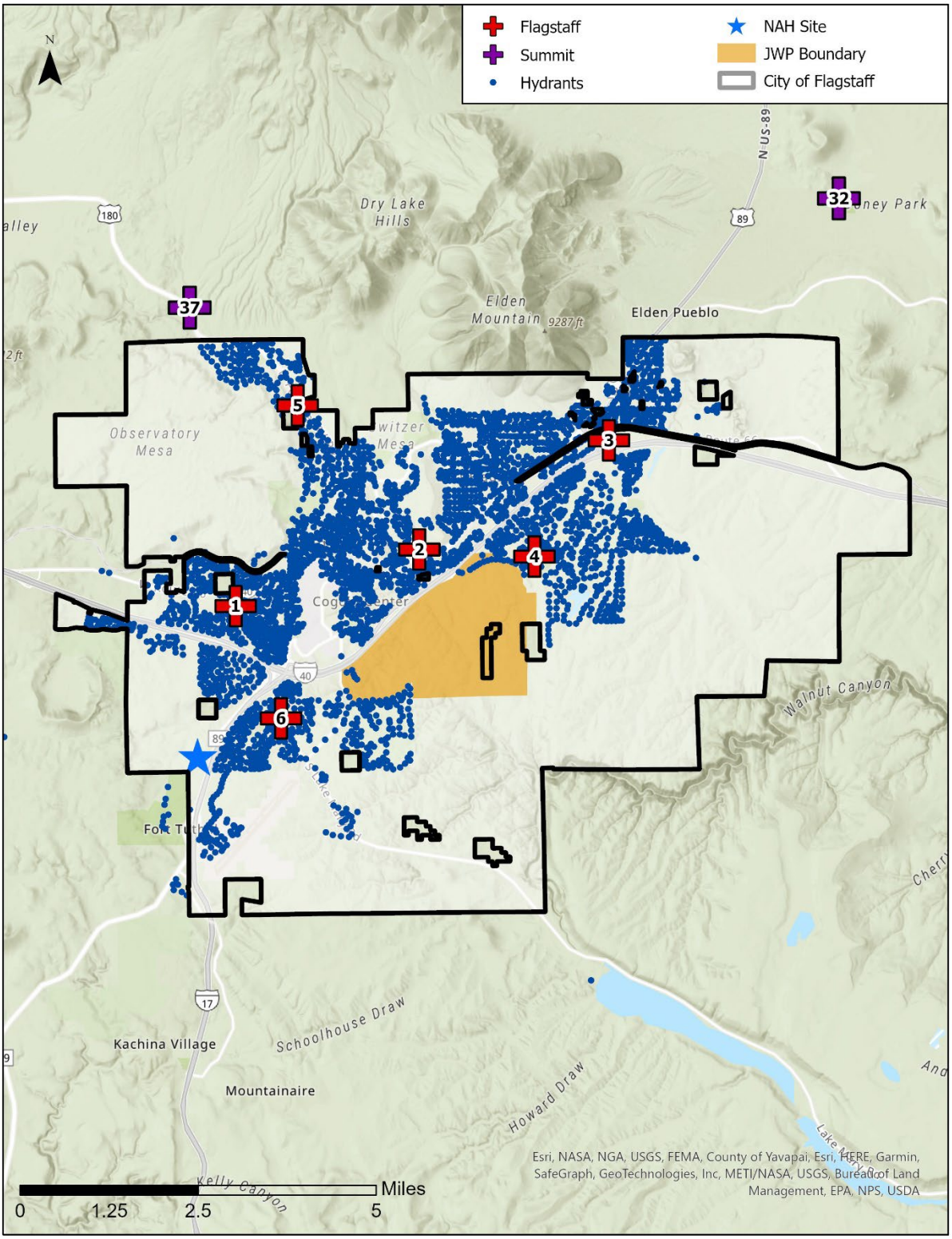
This map displays FFD incidents of all types (Fire, EMS, and other) from 2017-2021.



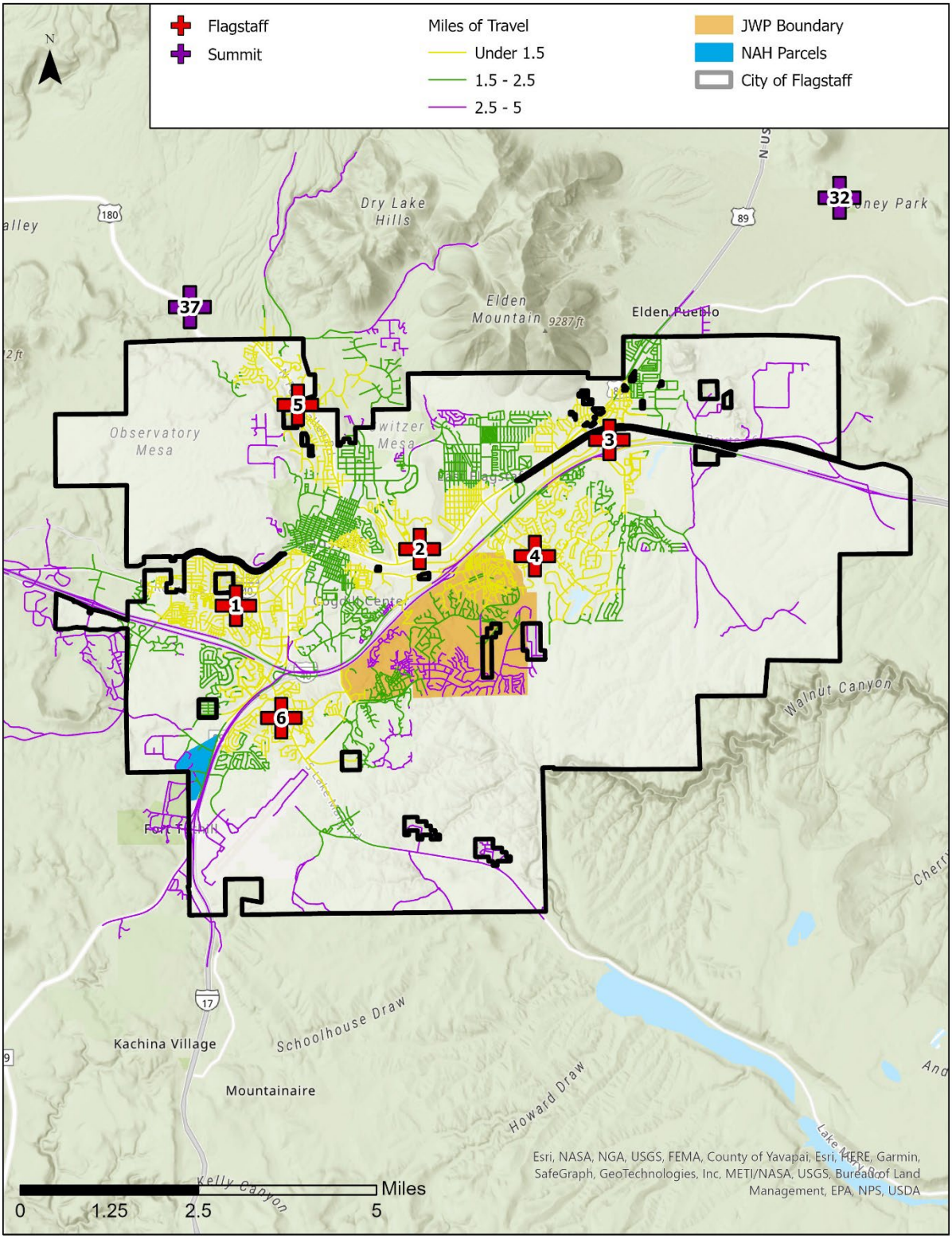
This map displays FFD/SFMD stations and building heights >3 stories across the City of Flagstaff, including the proposed NAH Health Village.



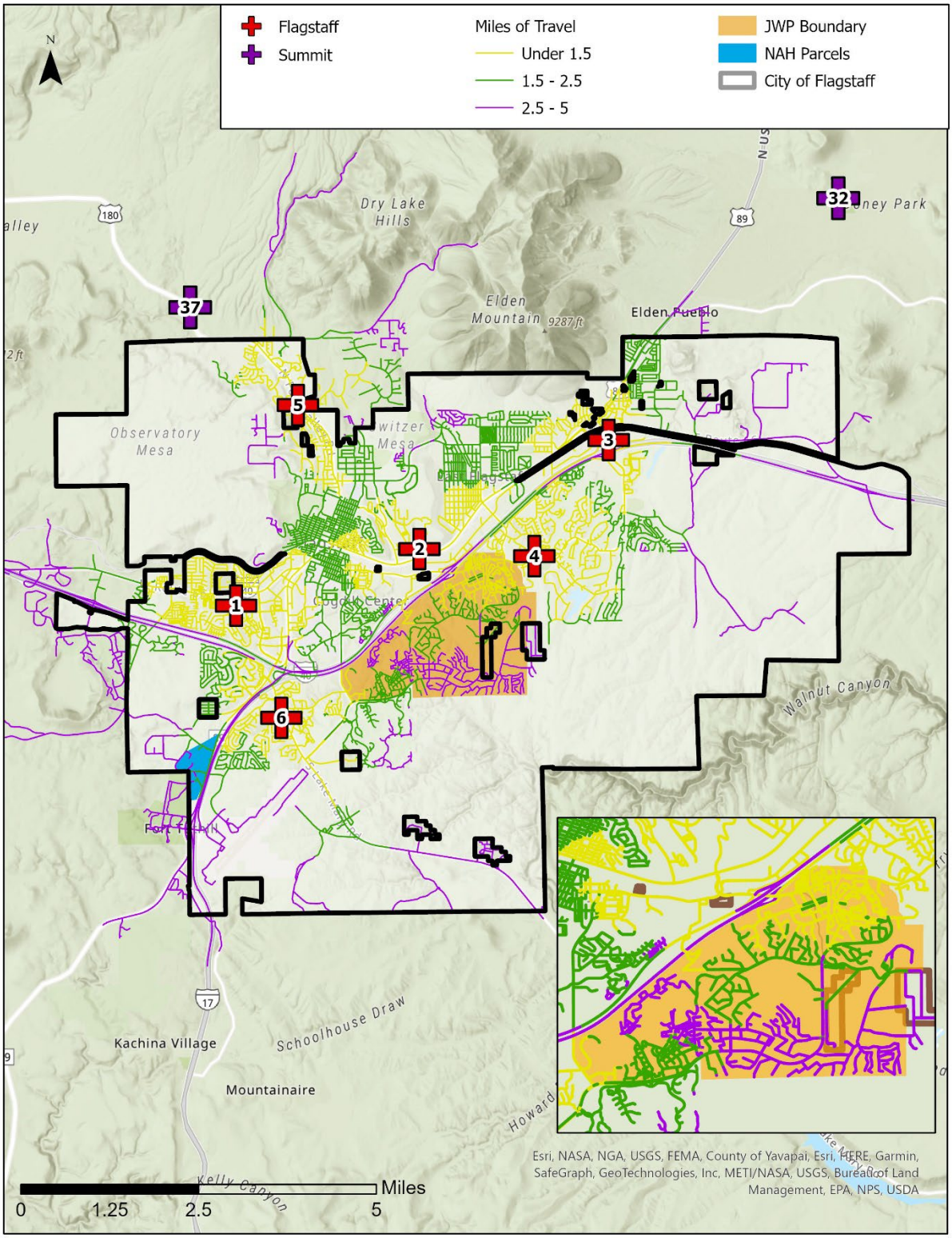
This map displays FFD/SFMD stations and building heights >75' (high-rise) across Flagstaff, including the proposed NAH Health Village hospital tower.



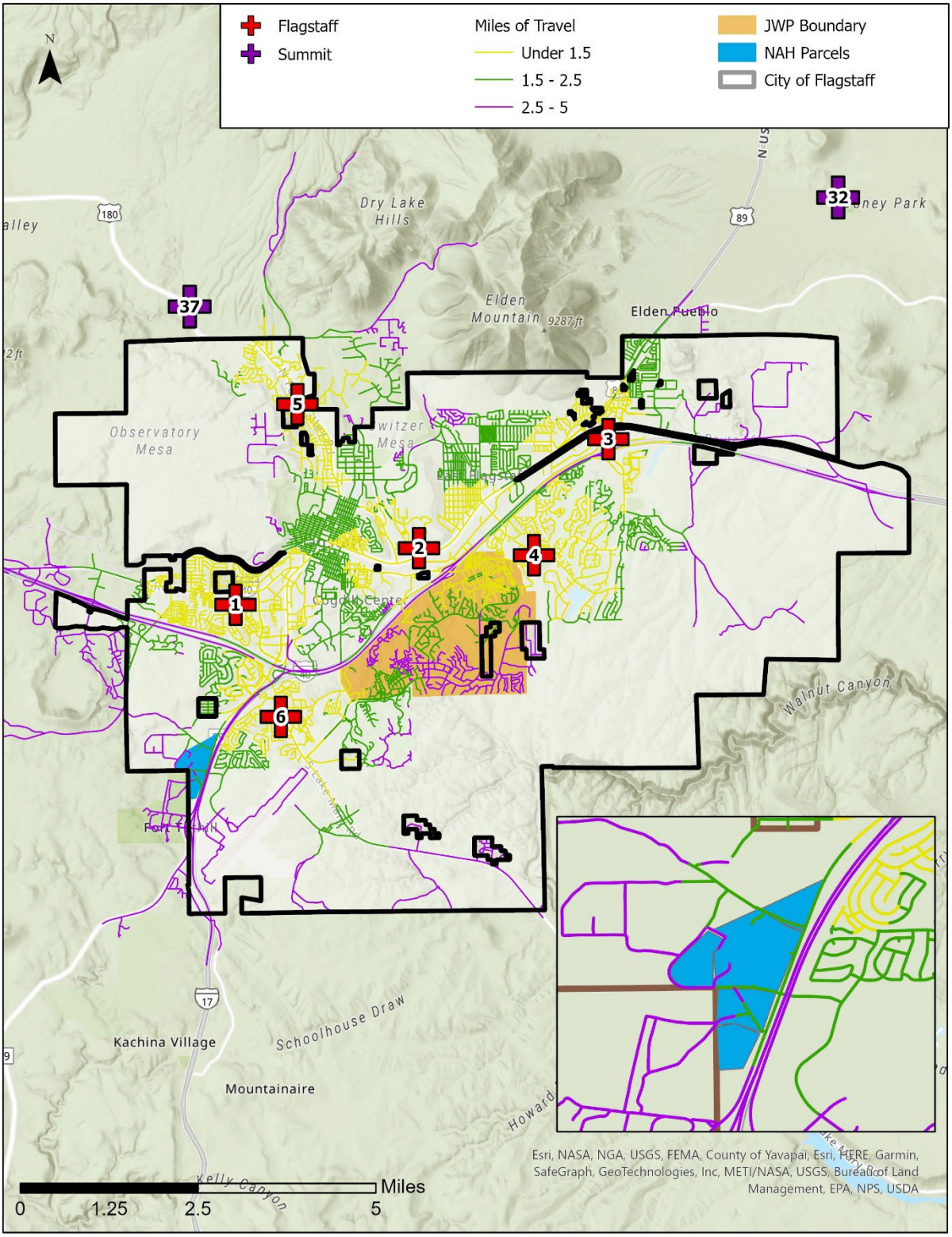
This map displays existing fire hydrant locations across the City of Flagstaff.



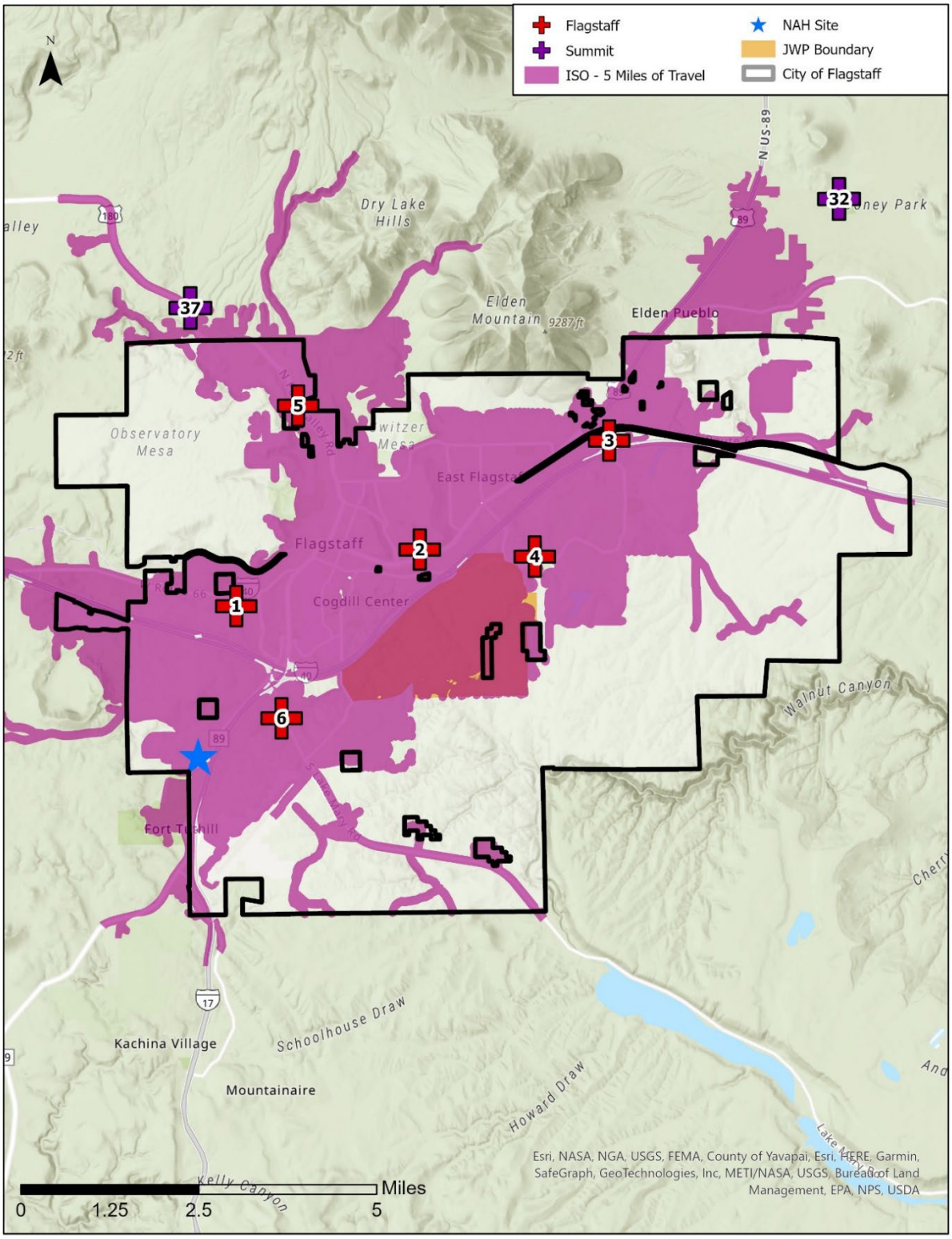
This map displays travel distance for an(y) existing first-due FFD/SFMD response unit(s); the JWP area is modeled with a representative street network.



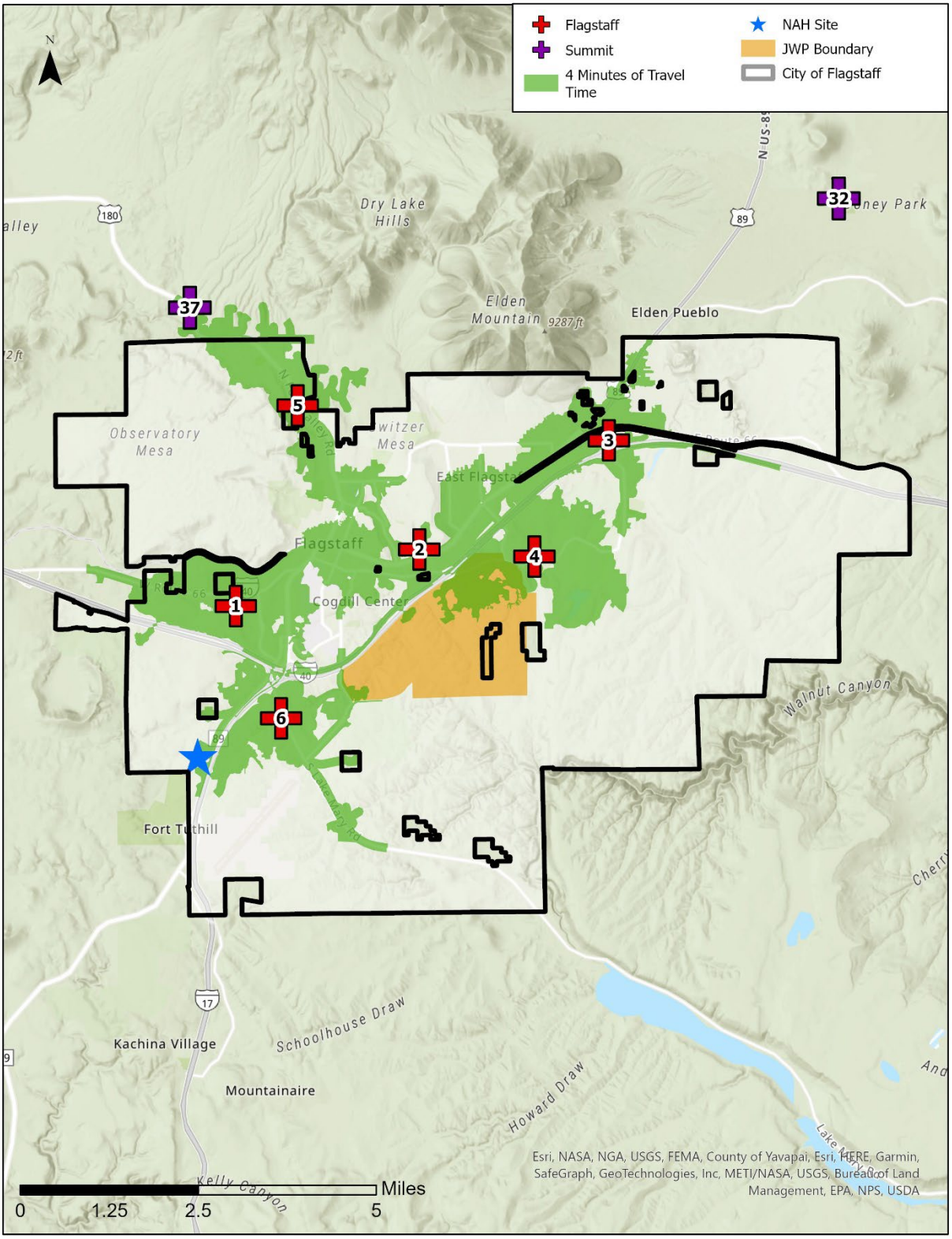
This map displays travel distance for an(y) existing first-due FFD/SFMD response unit(s), with a focus on the JWP area (modeled with a representative street network).



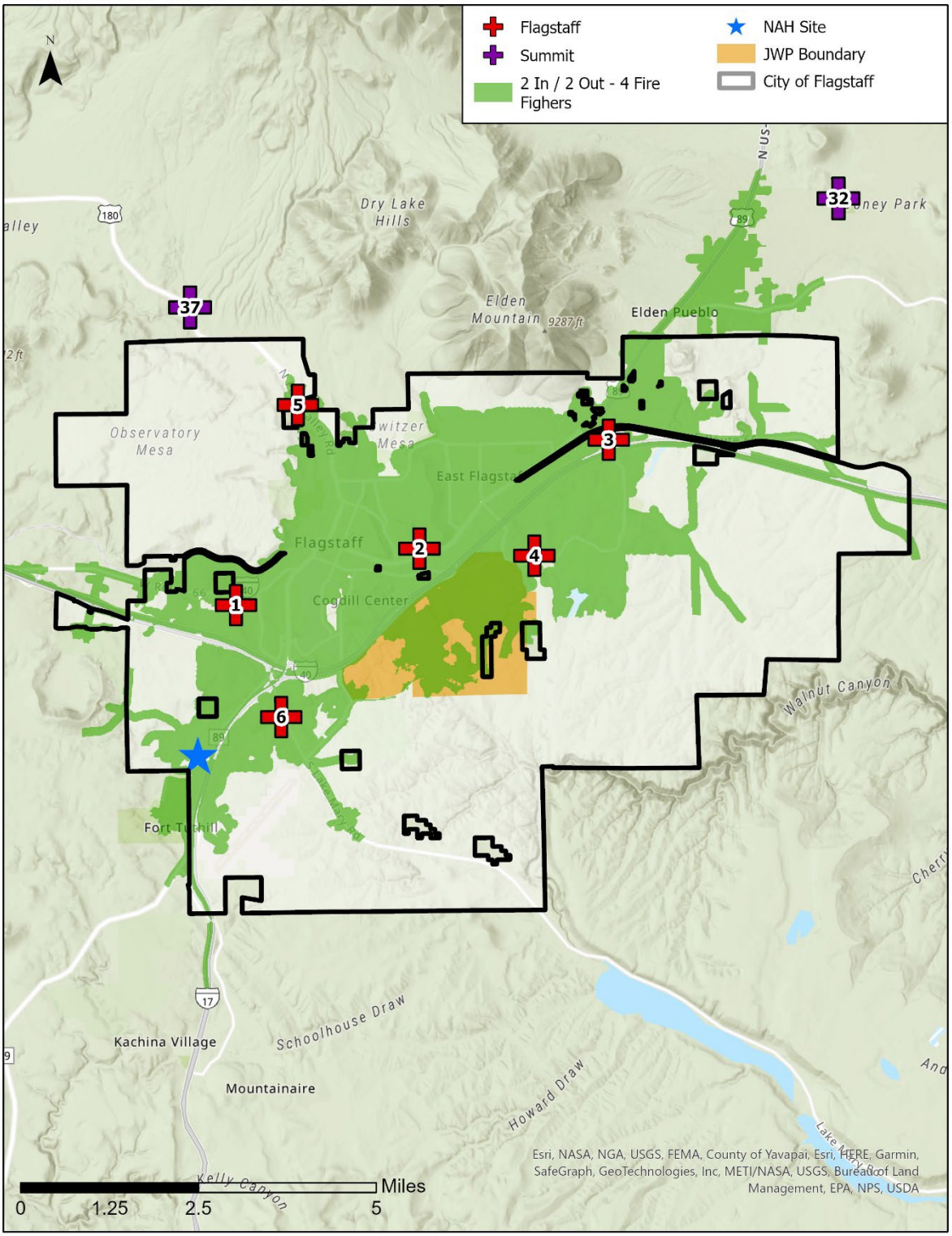
This map displays travel distance for an(y) existing first-due FFD/SFMD response unit(s), with a focus on the proposed NAH Health Village.



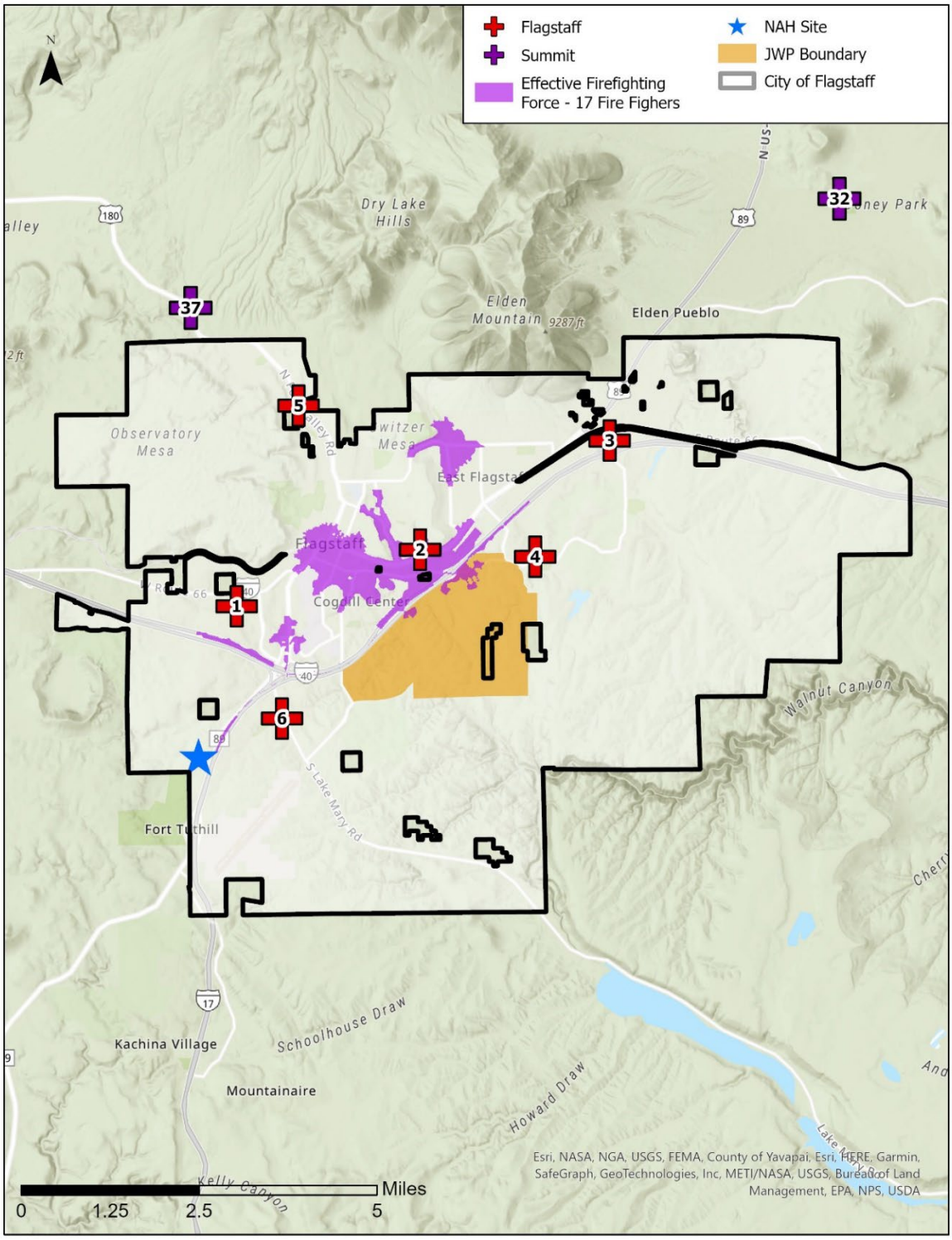
This map displays travel distance under 5 miles for an(y) existing first-due FFD/SFMD response unit; the JWP area is modeled with a representative street network.



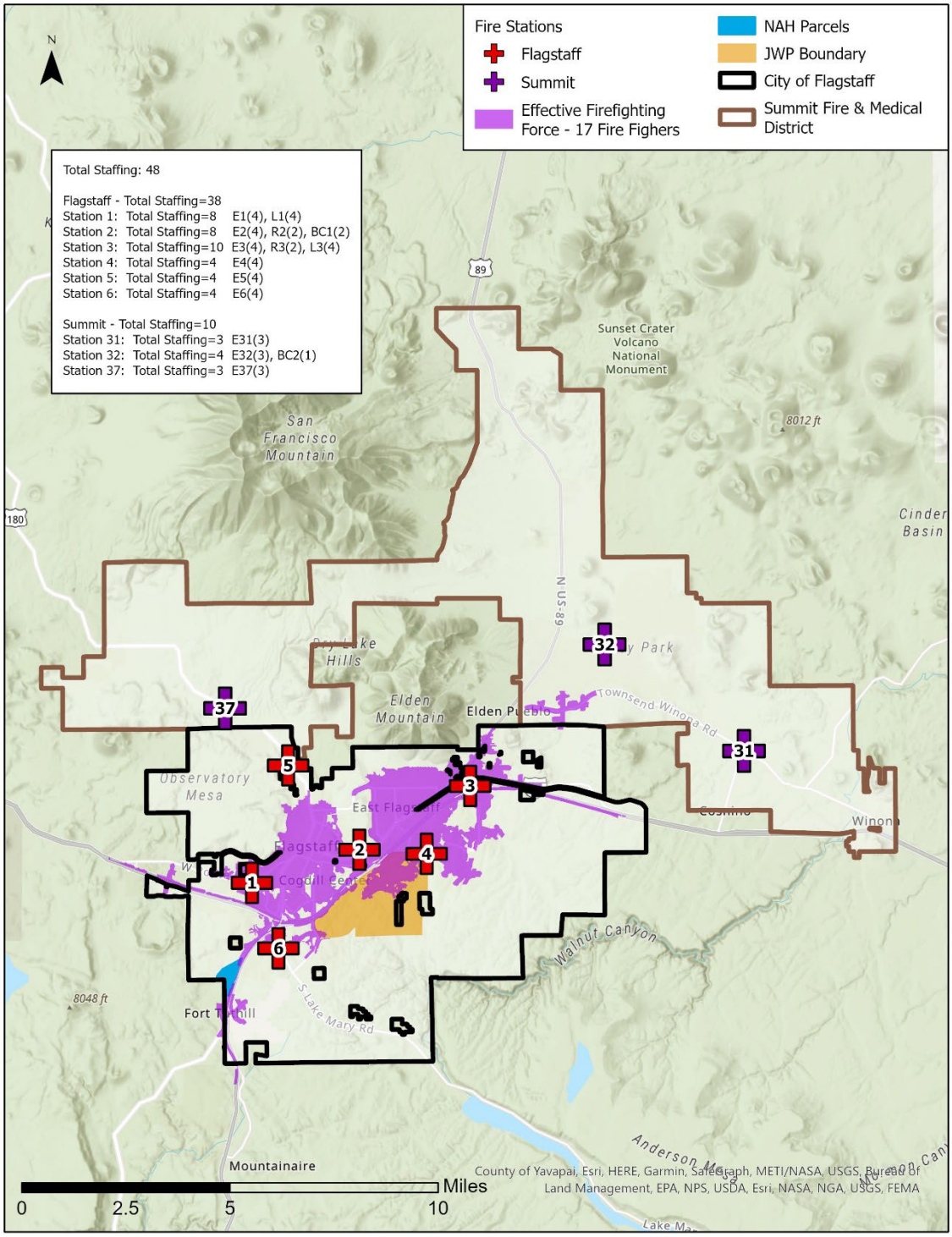
This map displays travel time under 4 minutes for an(y) existing FFD/SFMD response unit(s); the JWP area was modeled with a representative street network.



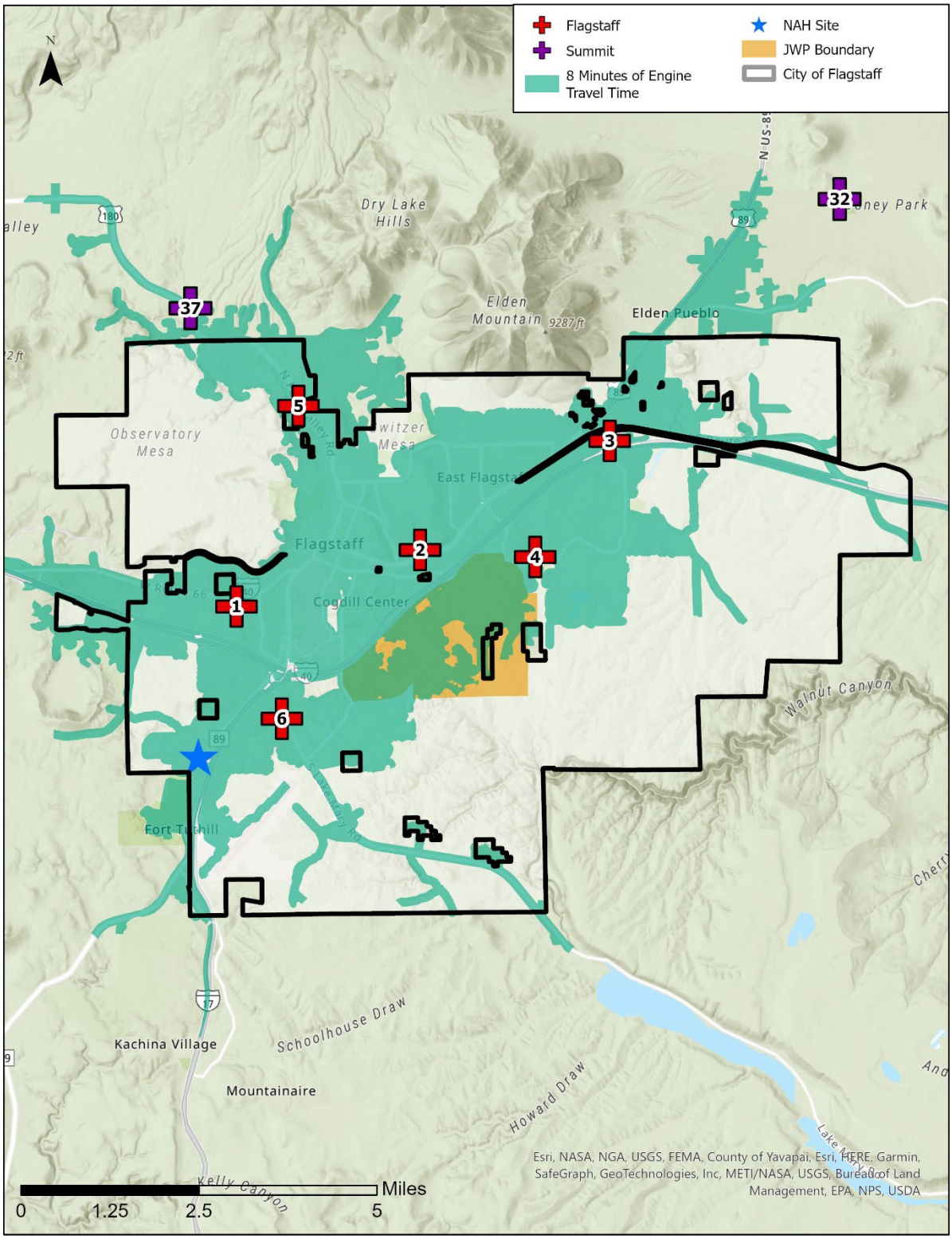
This map displays travel time under 8 minutes for any combination of existing FFD/SFMD response unit(s) to assemble the minimum 4 firefighters onscene for interior firefighting operations; the JWP area was modeled with a representative street network.



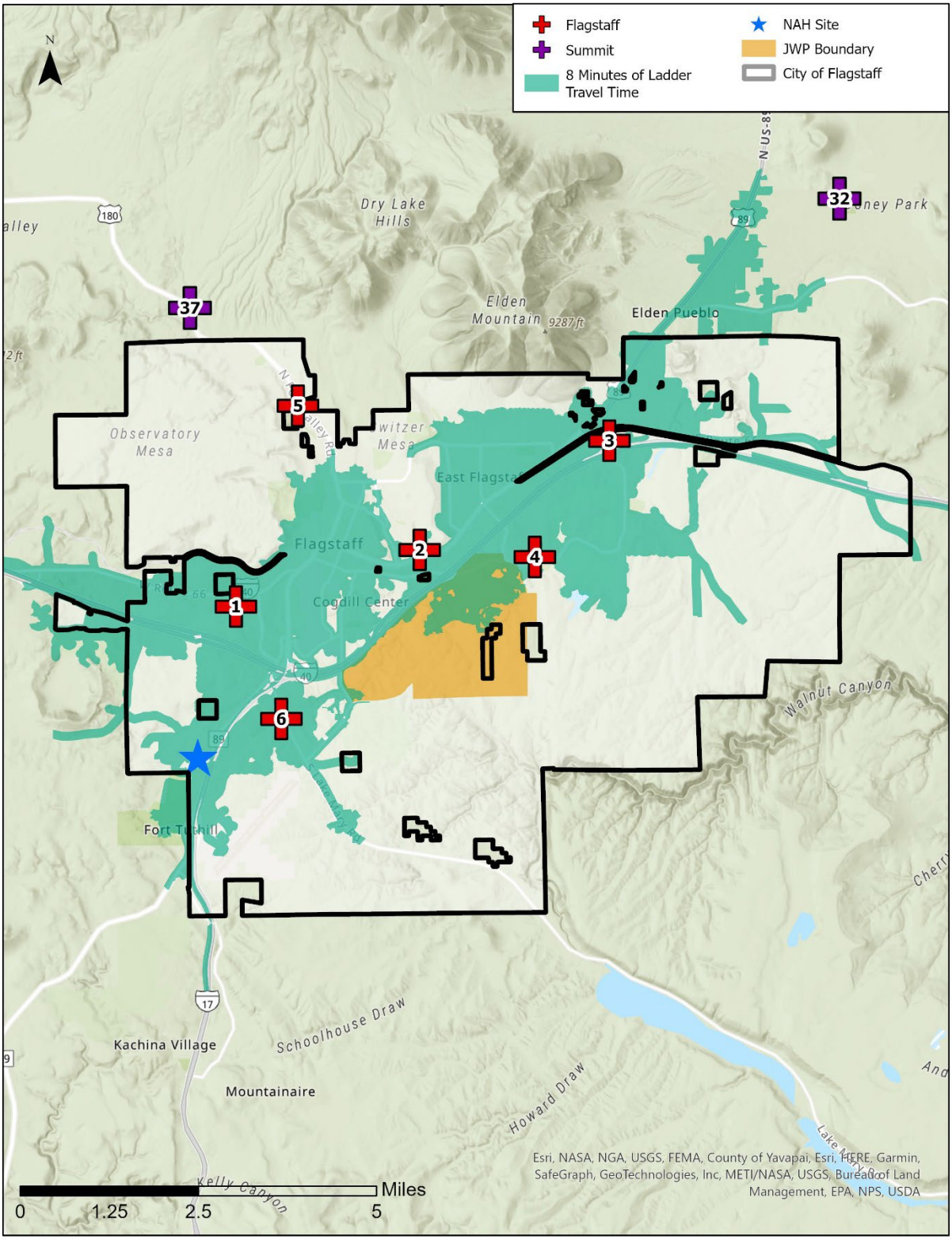
This map displays travel time under 8 minutes for any combination of existing FFD/SFMD response units to assemble an EFF of 17 firefighters; the JWP area was modeled with a representative street network.



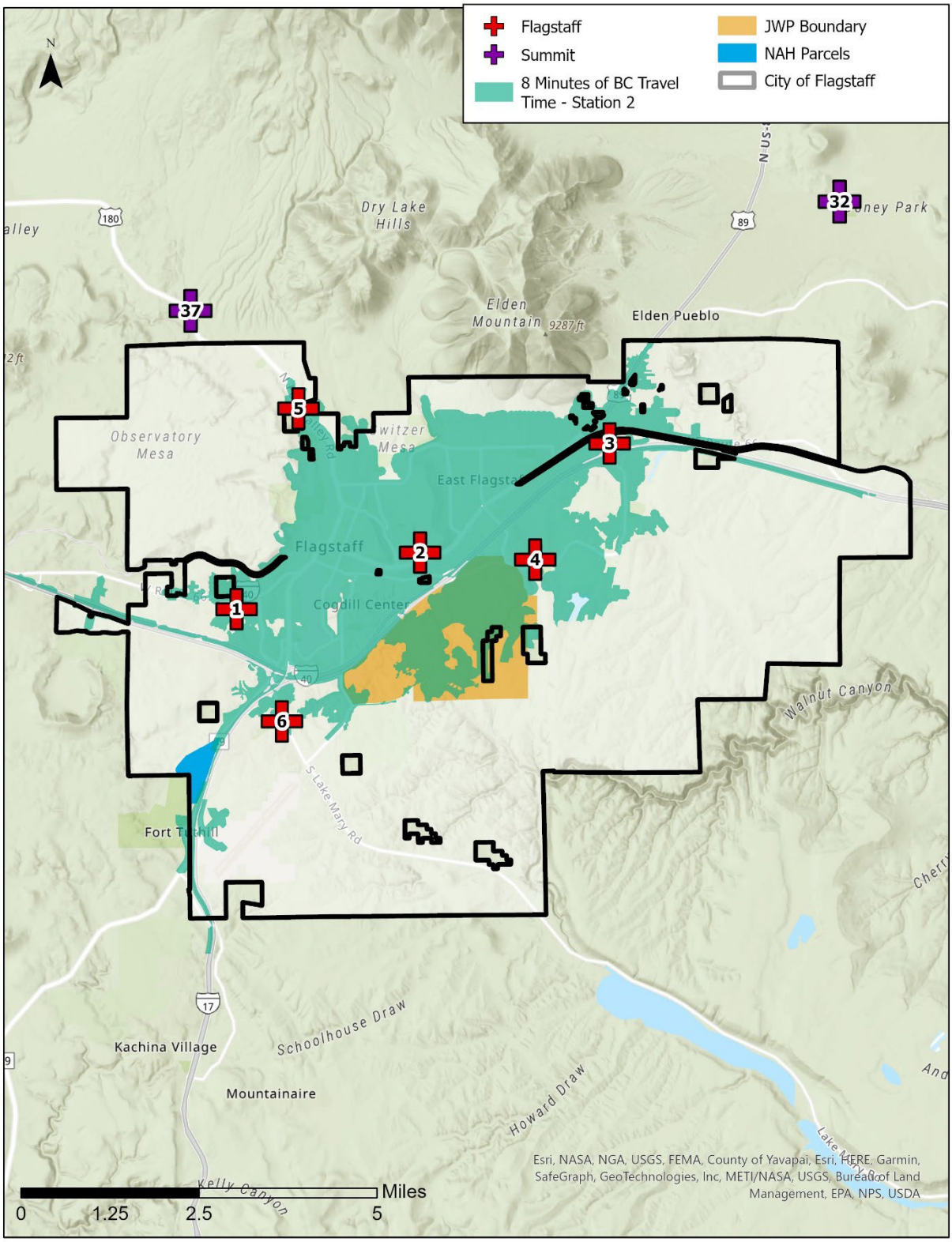
This map depicts a notional combination of existing/future FFD/SFMD response units, staffed/deployed according to NFPA 1710, to assemble an effective firefighting force (EFF) of 17 firefighters within 8 minutes; the JWP area was modeled with a representative street network.



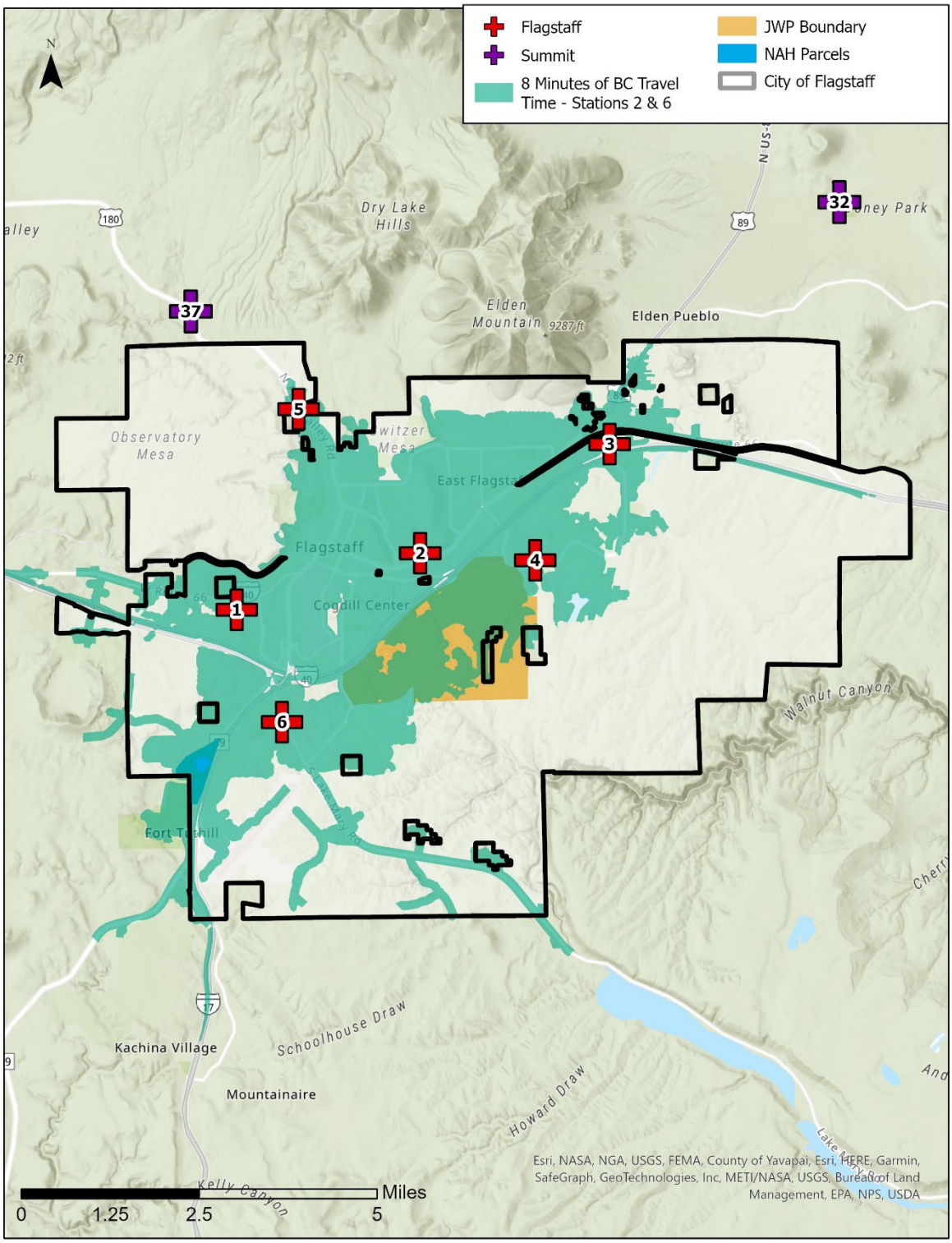
This map displays travel time under 8 minutes for all existing FFD/SFMD engines; the JWP area was modeled with a representative street network.



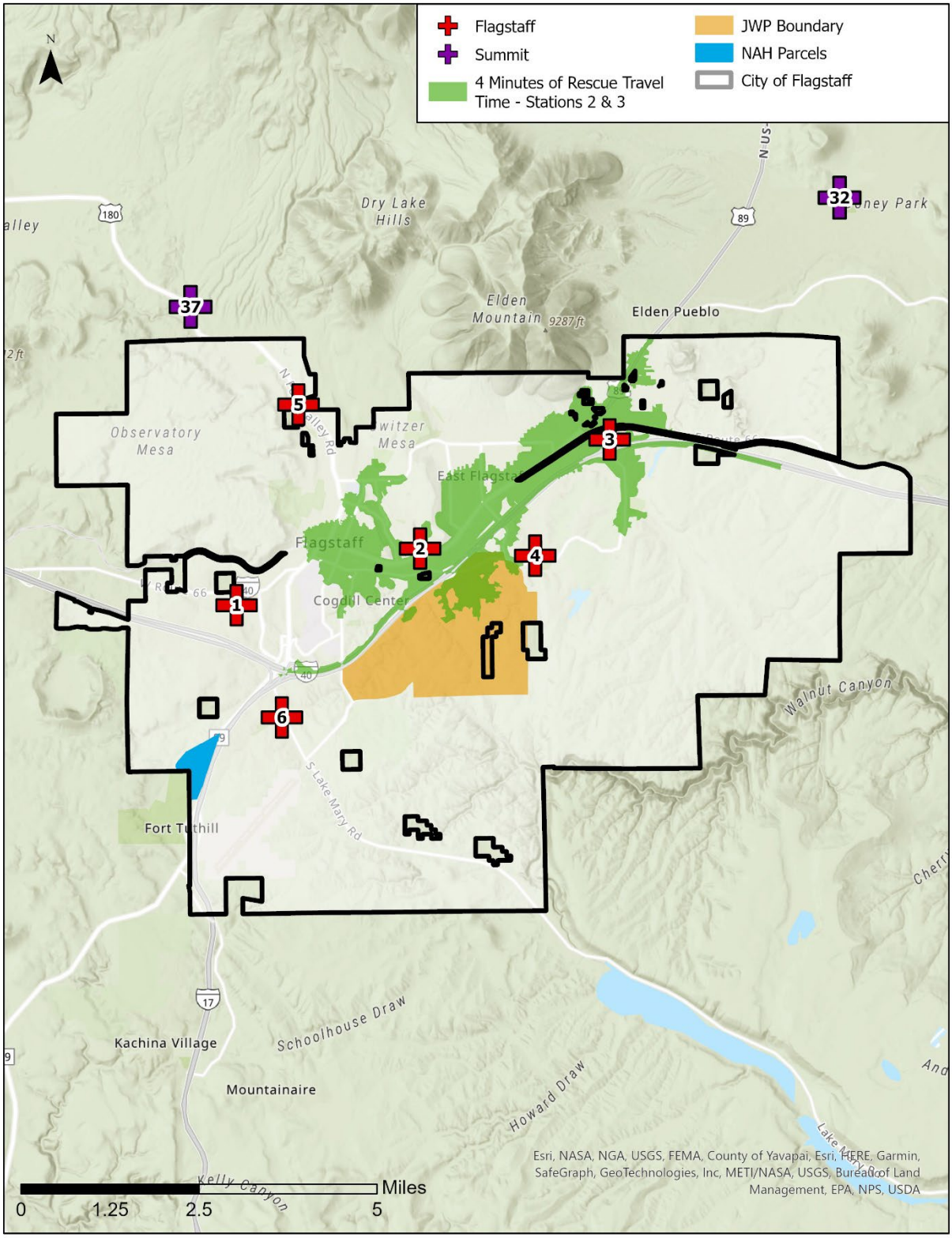
This map displays travel time under 8 minutes for all existing FFD/SFMD ladders*. (*No FFD/SFMD ladders are currently staffed full-time.) The JWP area was modeled with a representative street network.



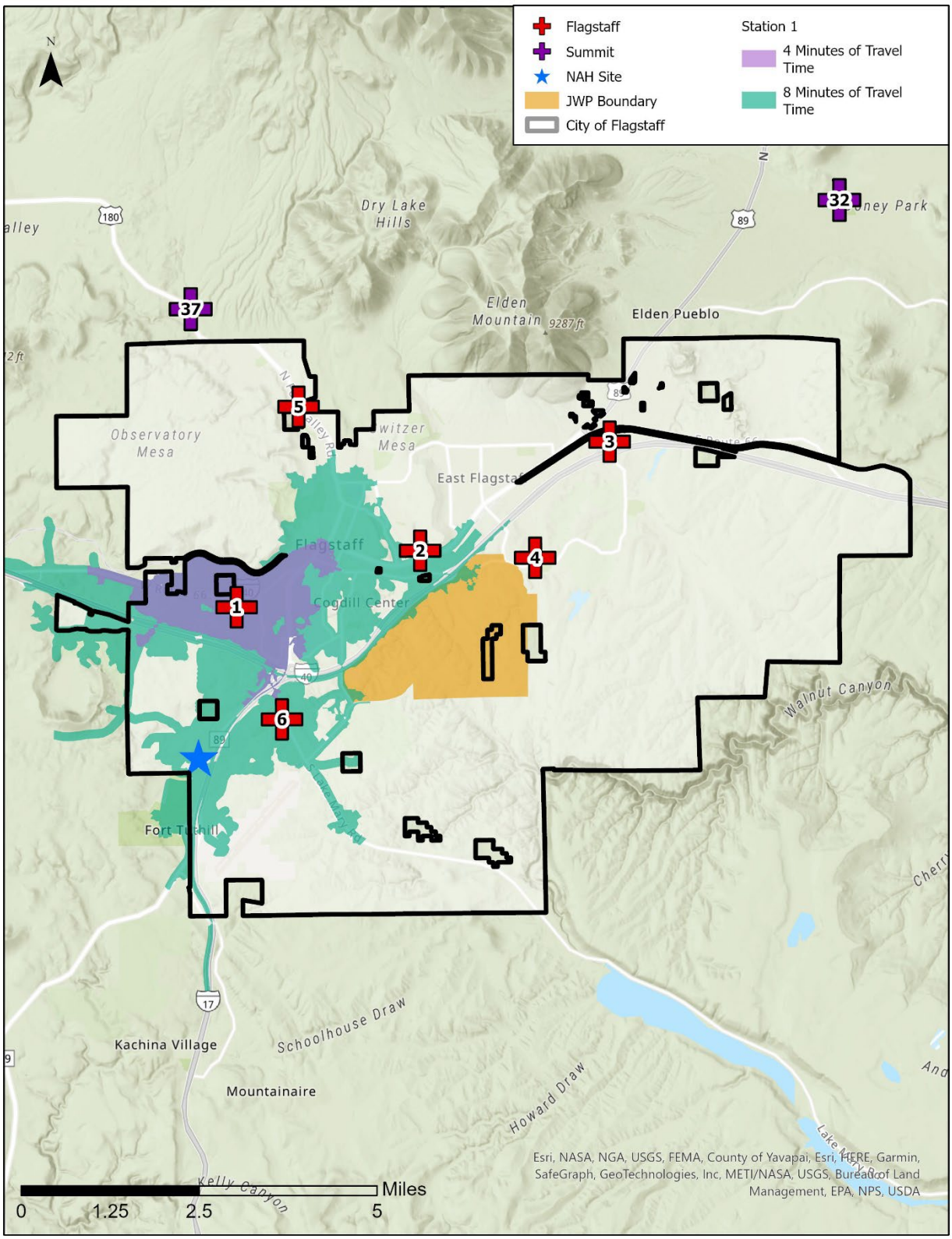
This map displays travel time under 8 minutes for the existing FFD battalion chief at Station 2; the JWP area was modeled with a representative street network.



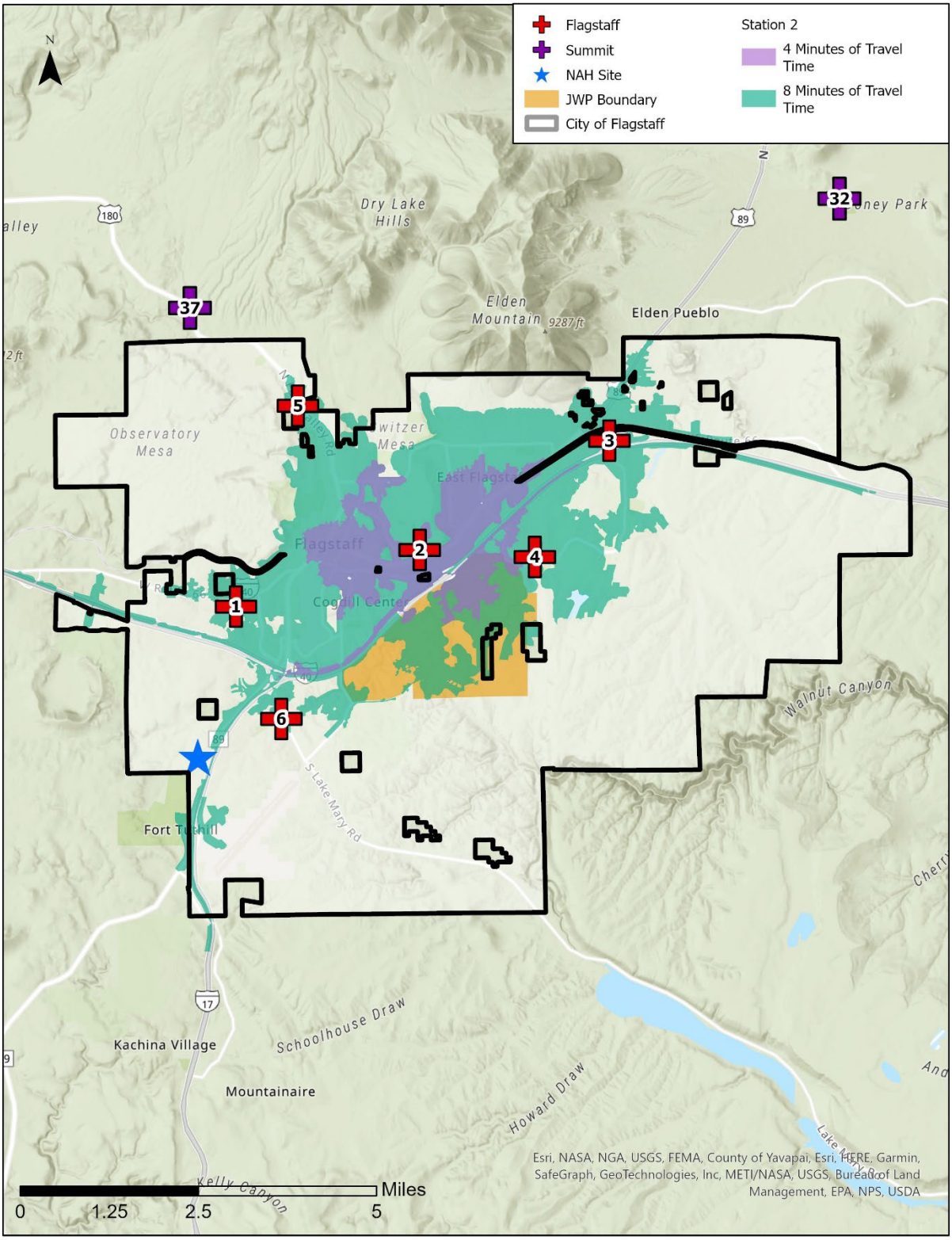
This map displays travel time under 8 minutes for the existing FFD battalion chief (BC) at Station 2 plus a notional additional FFD BC at Station 6; the JWP area was modeled with a representative street network.



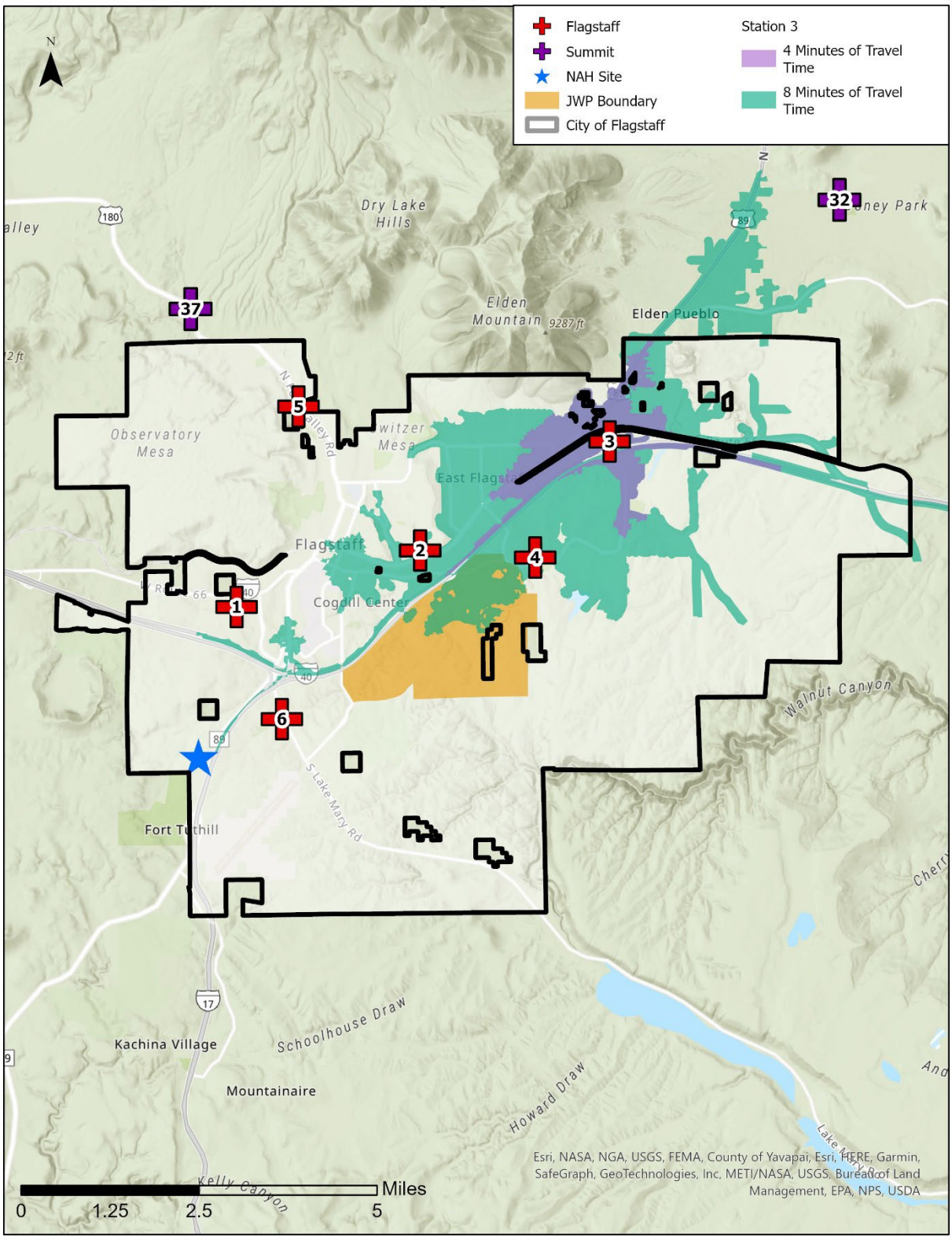
This map displays travel time under 4 minutes for the existing FFD rescue units.



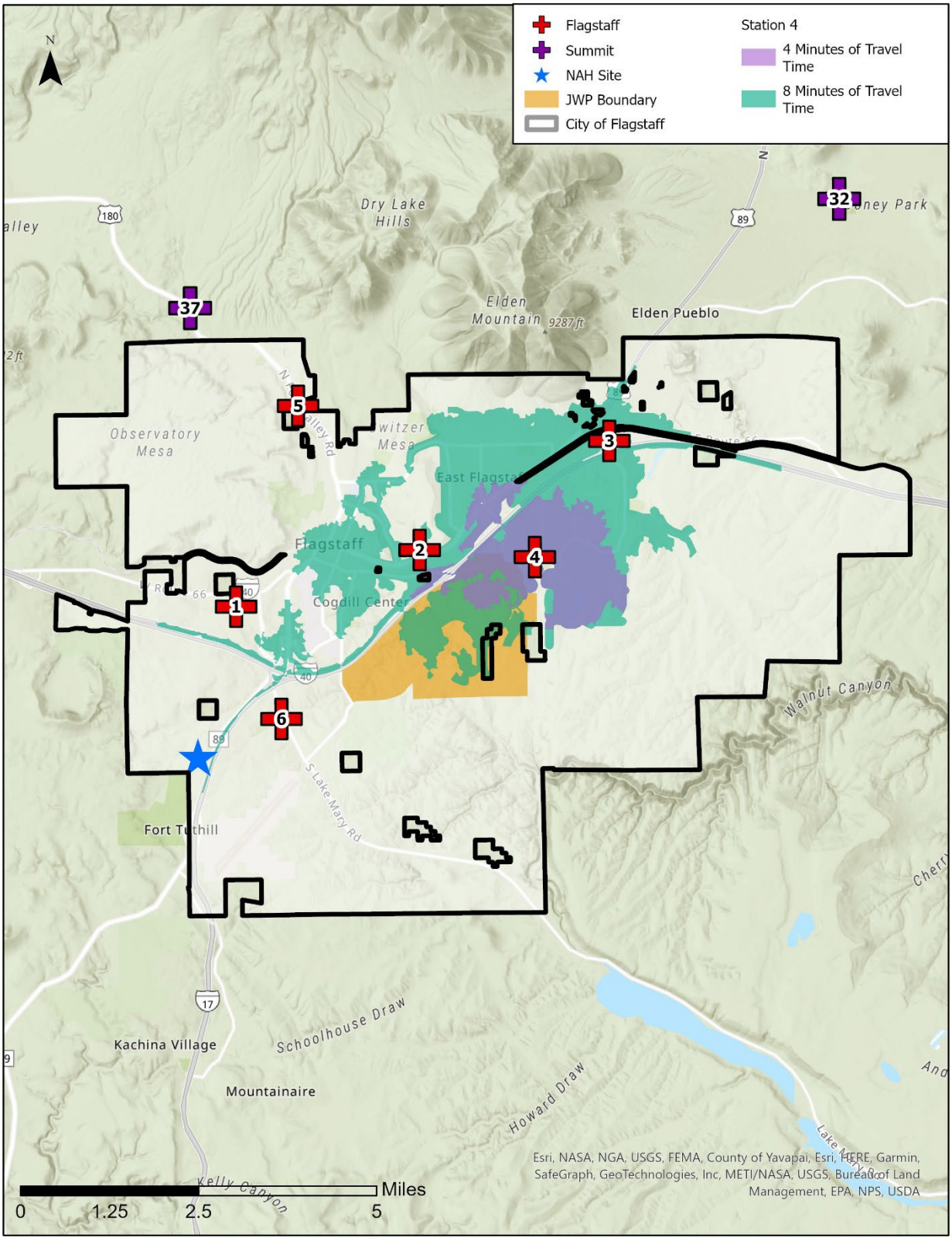
This map depicts travel times for any FFD unit(s) responding from Station 1.



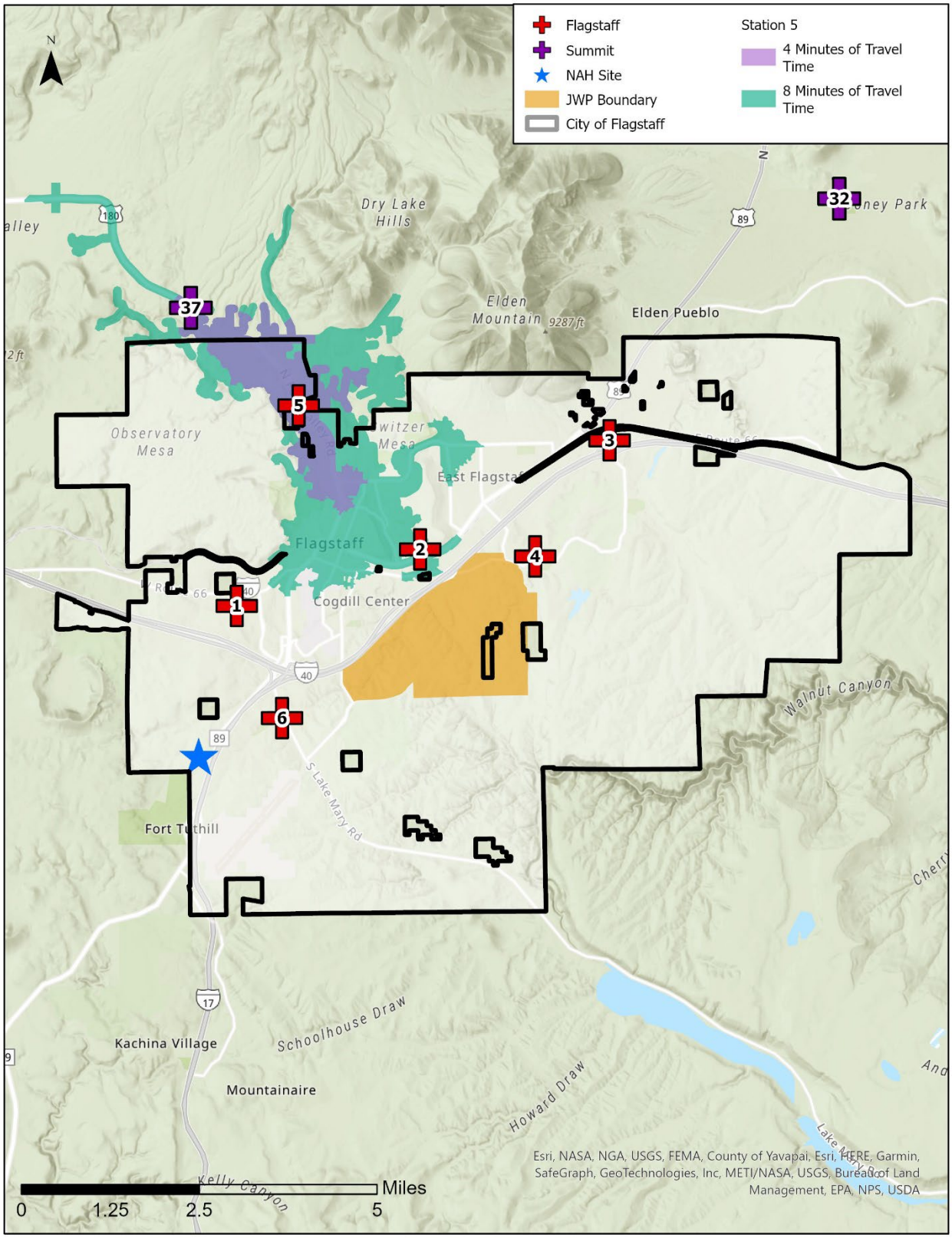
This map depicts travel times for any FFD unit(s) responding from Station 2.



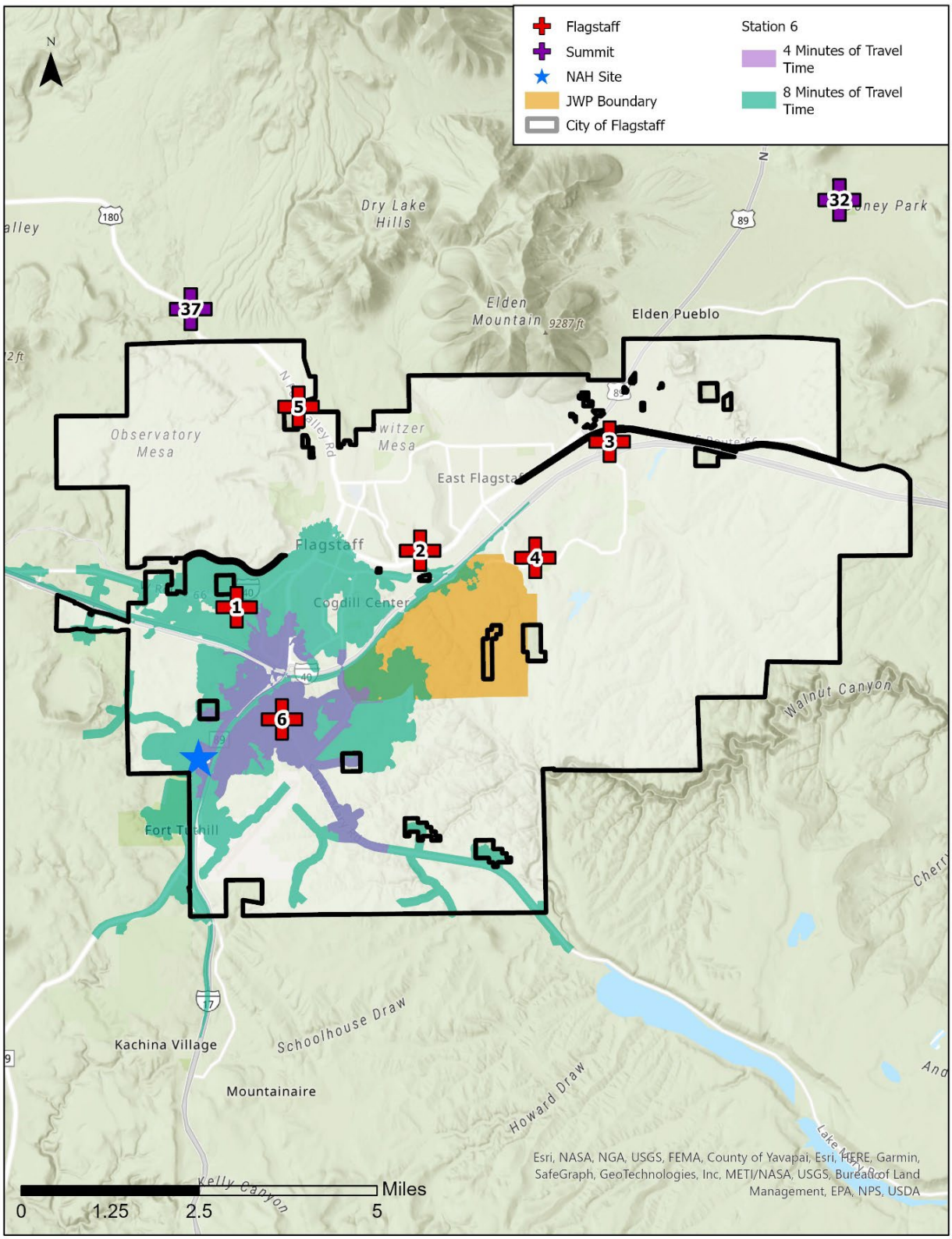
This map depicts travel times for any FFD unit(s) responding from Station 3.



This map depicts travel times for any FFD unit(s) responding from Station 4.



This map depicts travel times for any FFD unit(s) responding from Station 5.



This map depicts travel times for any FFD unit(s) responding from Station 6.

NAH Health Village

The need to provide a safe and effective response to the high-rise tower of the proposed NAH facility demands additional response units beyond what would be required for a lower-risk occupancy. The NAH site can be reached from several existing FFD stations as part of assembling the NFPA 1710-required EFF of personnel and apparatus for a high-risk, high-rise healthcare occupancy.

The City of Flagstaff does have other high-rise structures: an industrial facility in the eastern part of the City and several buildings on the NAU campus. The existing staffing of the FFD does not provide an NFPA 1710-compliant response to any of these structures.

Regardless, the FFD's inability to provide a fully-staffed ladder company 24x7x365, without sacrificing an engine(s), represents a resource insufficiency across the City; this deficiency will be even more salient with the vertical character and location of the NAH development relative to the rest of the City's existing built environment.

Without additional resources proximal to the NAH Health Village and/or additional staffing on FFD units City-wide, assembling an EFF will require the response of additional engines from FFD's current resource deployment. This will essentially strip the city of FFD presence with any incident in the hospital tower, for the duration of that incident.

Moreover, the location of the NAH facility will necessarily draw those units into the far SW corner of the city, causing them to be unavailable from their first-due response areas for a longer time, even once becoming available, than they are from a similar incident in a more central area(s) of the City. It will take longer for units in the SW corner of the City to move and/or respond back into their primary coverage areas from an incident at the new hospital.

Given the vulnerability of hospitalized patients, regardless of the required fire protection systems and other safety features, even seemingly "routine" incidents will need a "high risk" response from the FFD, until the severity and type of incident is confirmed by FFD personnel on the scene.

The development of a commercial and institutional occupancy on the periphery of the City places additional demands on the Flagstaff Fire Department and accentuates the need for a fully-staffed ladder company for the City of Flagstaff.

In the longer term, development at the south end of the City may encourage other activity in the area. Commercial areas east of I-17 at the Pullium Airport and the intersection of John Wesley Powell Boulevard/South Pullium Drive may see follow-on development as a result of this project.

NFPA 1710 requires the arrival of the first engine company with a travel time of 240 seconds (4 minutes) or less. Fire Station 6, located at 3877 Lake Mary Road, is within a 4-minute travel time capability to the NAH site. For high-rise occupancies such as the proposed hospital tower at the NAH Health Village, NFPA 1710 requires the assembly of at least 42 firefighters and fire officers at the scene of the incident within 610 seconds travel time. The Flagstaff Fire Department, even with all the resources of its automatic aid system, cannot comply with this requirement today.

As stated earlier, the closest Flagstaff fire station to the proposed NAH development is Station 6. This station currently houses: Engine 6, a three-person Type I engine; a Type VI (wildland) engine that is cross-staffed with Engine 6; and a water tender (water tanker) that is also cross-staffed with Engine 6.

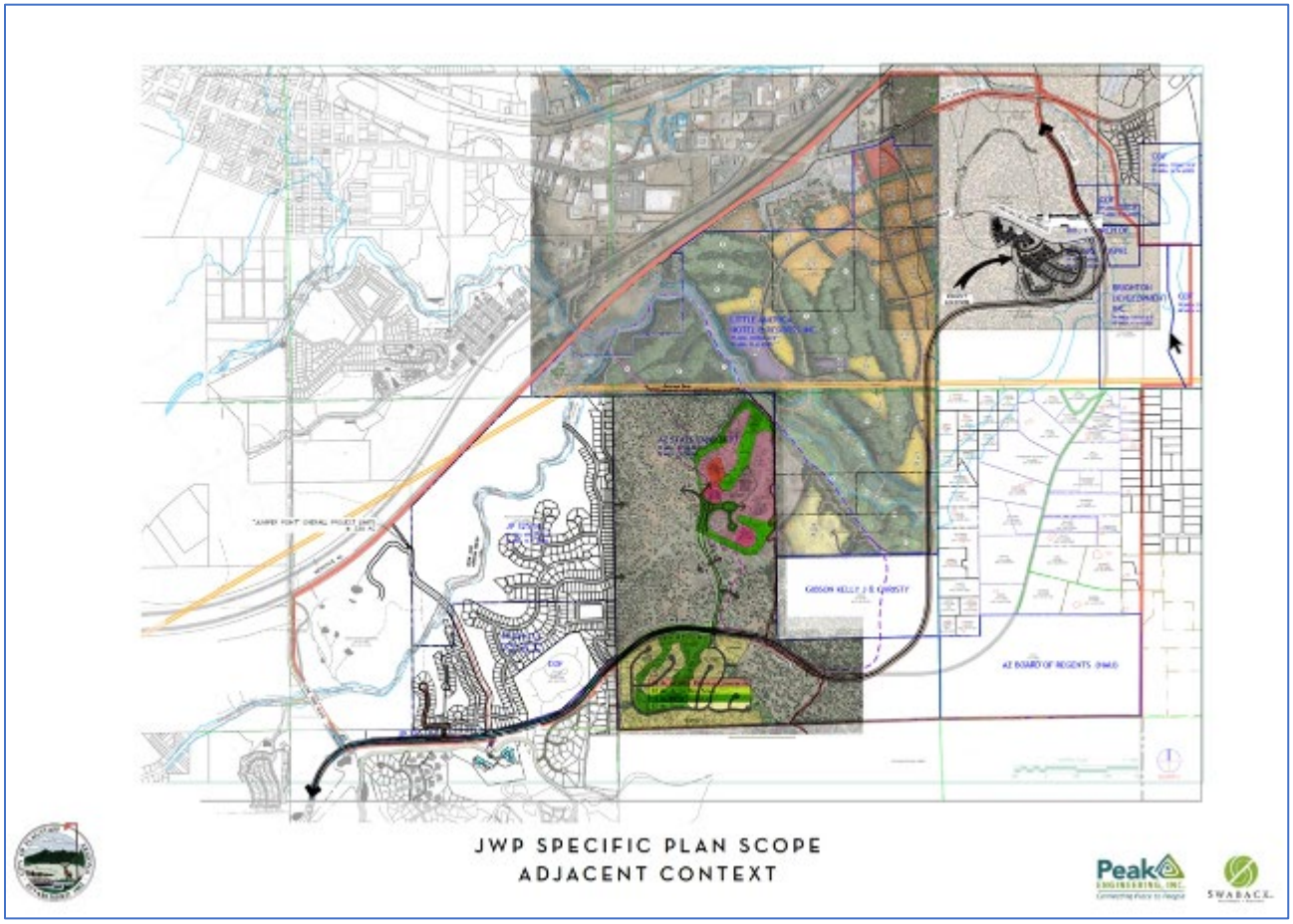
The three personnel assigned to Fire Station 6 are insufficient to provide a reasonable level of initial response to the NAH Health Village. Ideally, a second emergency response unit, staffed to national standards, should be provided at Station 6. This would readily deliver an initial response of 7-8 firefighters to an incident at the NAH site and its environs, providing immediate firefighting capability and limiting the impact on the rest of the FFD's deployment system.

Independent of the NAH development, the FFD needs a fully-staffed ladder company to assure the immediate availability of that service City-wide. If this unit was deployed from Fire Station 6, with proximity to both I-40 and the I-17/Milton, the firefighters assigned to it could provide significant additional depth to the NAH response while providing ladder company coverage to the City as a whole.

In its present configuration and location, Fire Station 6 may not be suitable for an additional emergency response unit(s): the station itself may be too small to accommodate additional apparatus/personnel; the wildland engine and water tender at the station are needed in that location; and the lot may be impractical for a larger fire station. If Station 6 is found incapable of housing an additional response unit(s), then a new fire station—as close as possible to the current location—will be needed. This station should have access to I-40 and I-17/Milton and be large enough to accommodate two fully-staffed emergency response units, plus their support apparatus/equipment, to provide all-hazards fire-EMS coverage to southern Flagstaff without negatively affecting the balance of the City, under normal service demand conditions.

John Wesley Powell (JWP) Corridor

The JWP Corridor is already showing signs of significant development.



With respect to FFD resource deployment, there are two aspects of the JWP area that primarily impact FFD's ability to provide service: road network access and density. All other things set equal, the road network affects FFD's ability to meet first-arriving unit response time goals for all types of incidents, and equally important—the cumulative time it takes to assemble an effective firefighting force from multiple stations to a more severe incident along the JWP Corridor.

Regardless of the ultimate primary/secondary road network throughout the JWP area, the FFD will need at least one additional fire station and fully-staffed engine company (plus wildland and tender apparatus) to provide the City's current level of all-hazards fire and emergency response service across the JWP area.

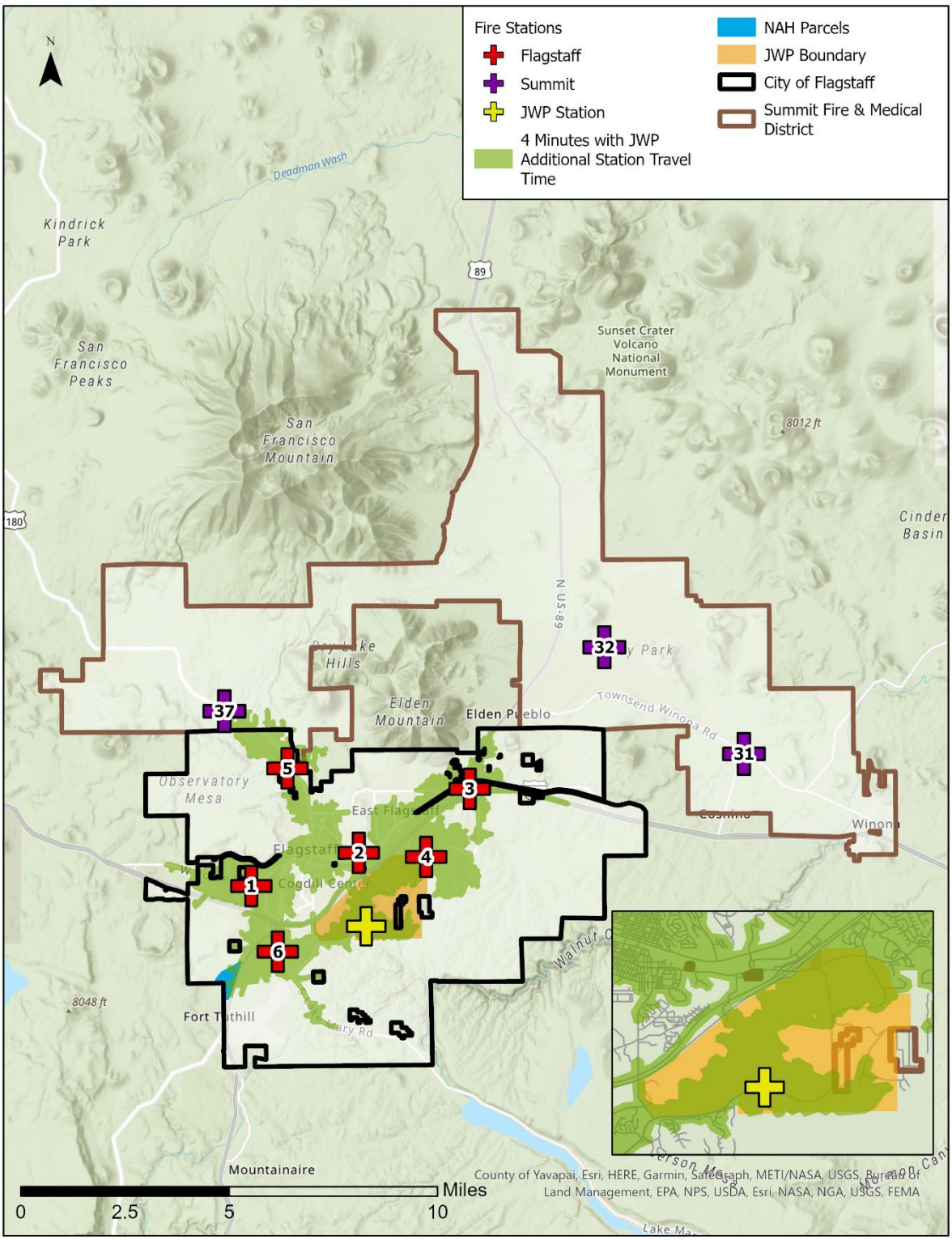
The precise location and resource deployment of this new station will depend on the ultimate configuration of the street network, water infrastructure, and density/character of development. Additionally, since the overall FFD system of fire stations affects response and EFF assembly

times into the JWP area, any changes to the existing network of fire stations and assigned units could also affect coverage in the JWP Corridor, and vice versa.

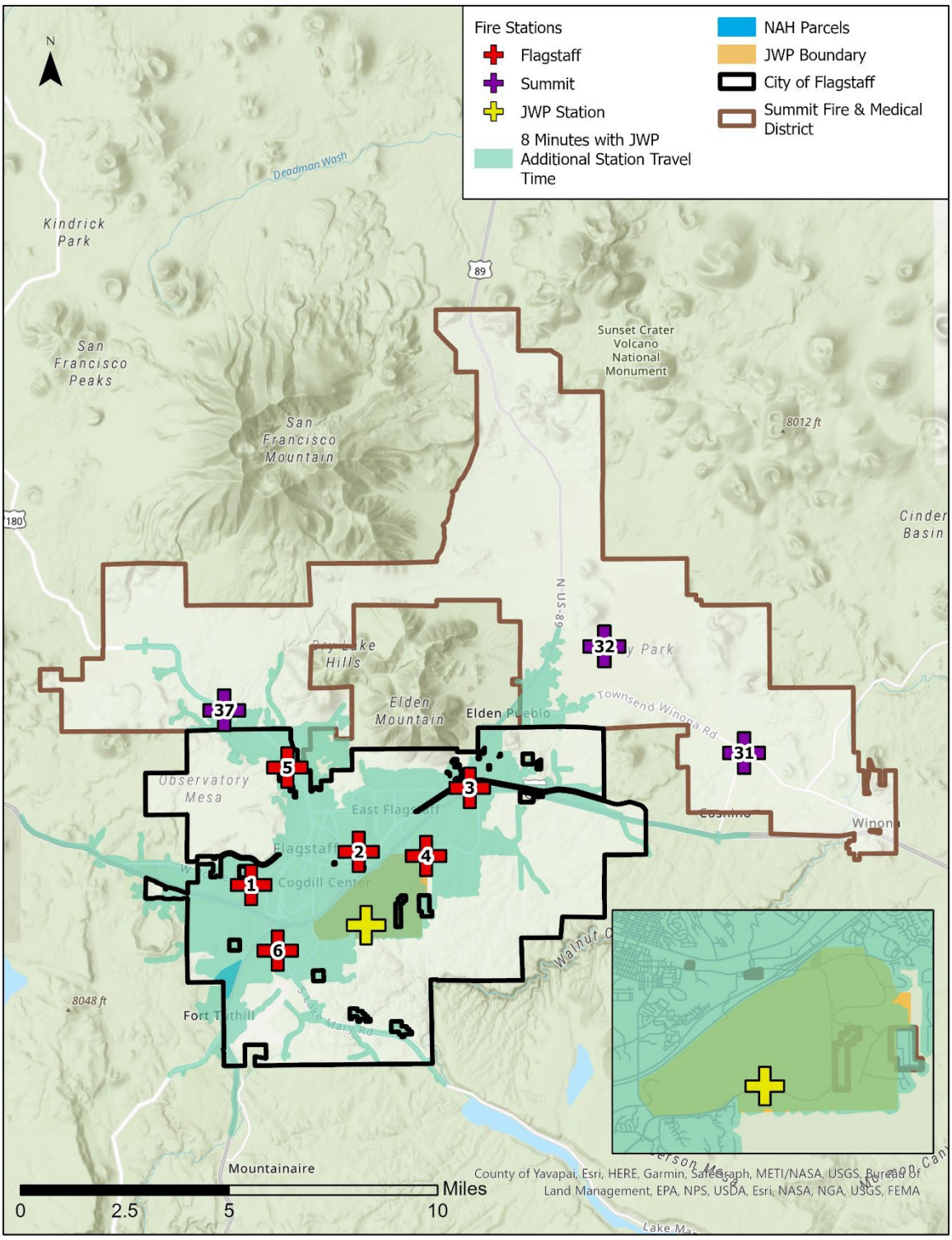
Additional density beyond what is presently anticipated for JWP-adjacent parcels could require additional response units and/or fire stations, depending on the location(s), height, and area of multi-family dwellings, commercial/retail occupancies, and any high(er)-hazard or industrial uses.

While the ultimate configuration and impact of the JWP development is difficult to forecast, given the dynamic nature of current planning efforts, it seems apparent that growth in this area will cause a significant increase in fire-EMS service demand over today's baseline.

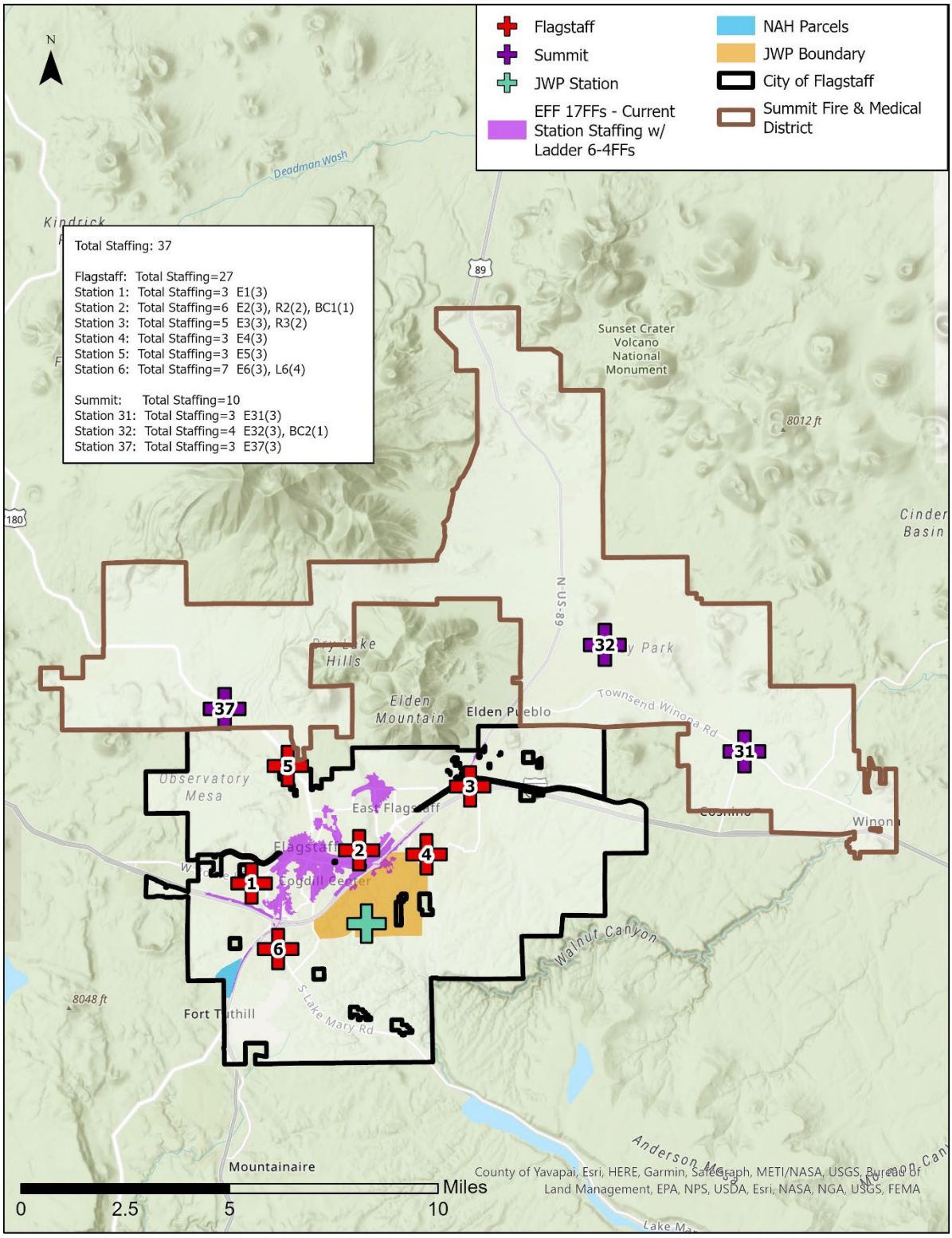
Given the present uncertainty, but using currently available information to create a representative road network and density projection, FACETS has modeled several different scenarios for siting/staffing a new FFD station serving the JWP area, and the entire City of Flagstaff.



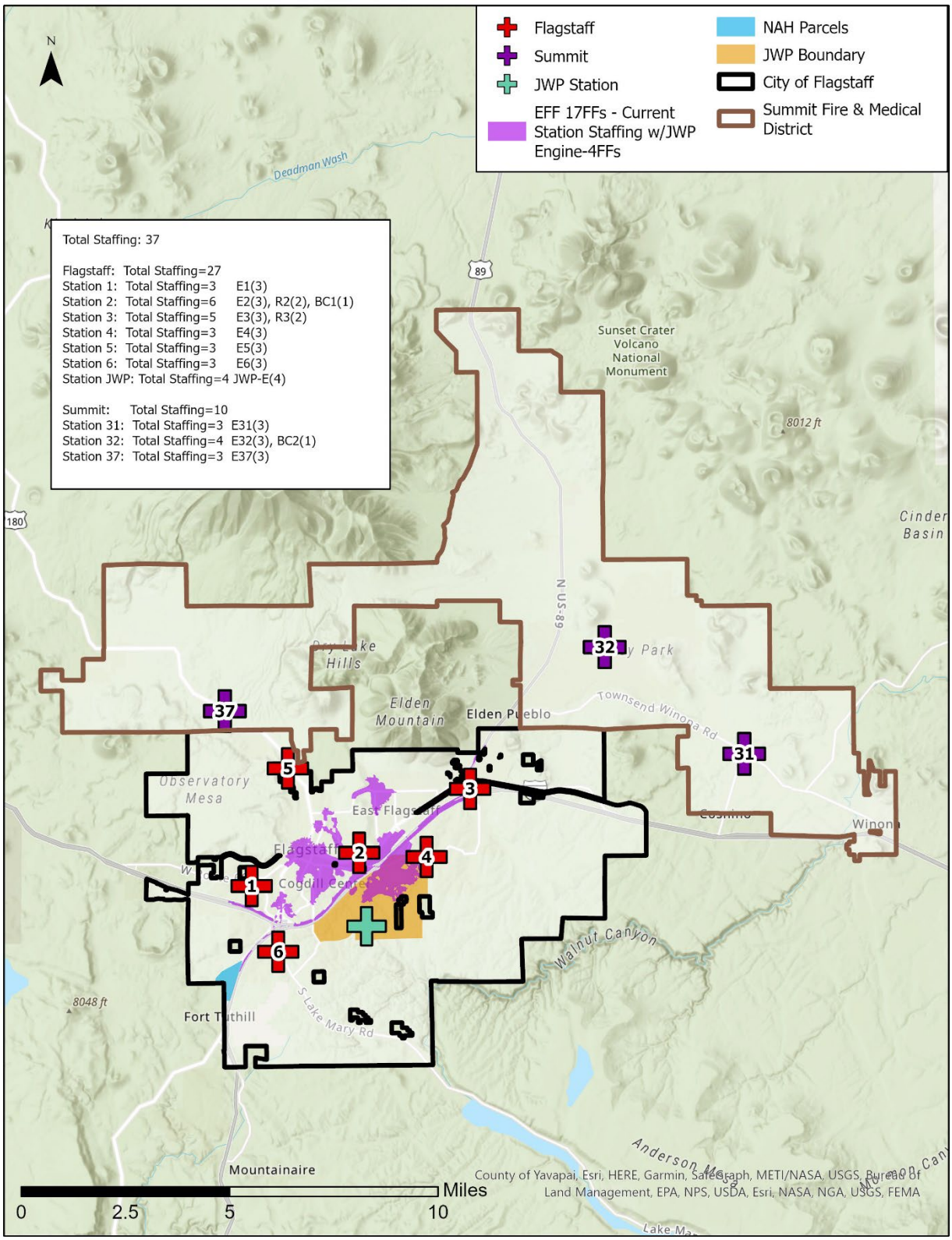
This map depicts the 4-minute travel time(s) for an(y) FFD unit(s) responding from the existing 6 Flagstaff fire stations and a notional new station primarily serving the JWP area.



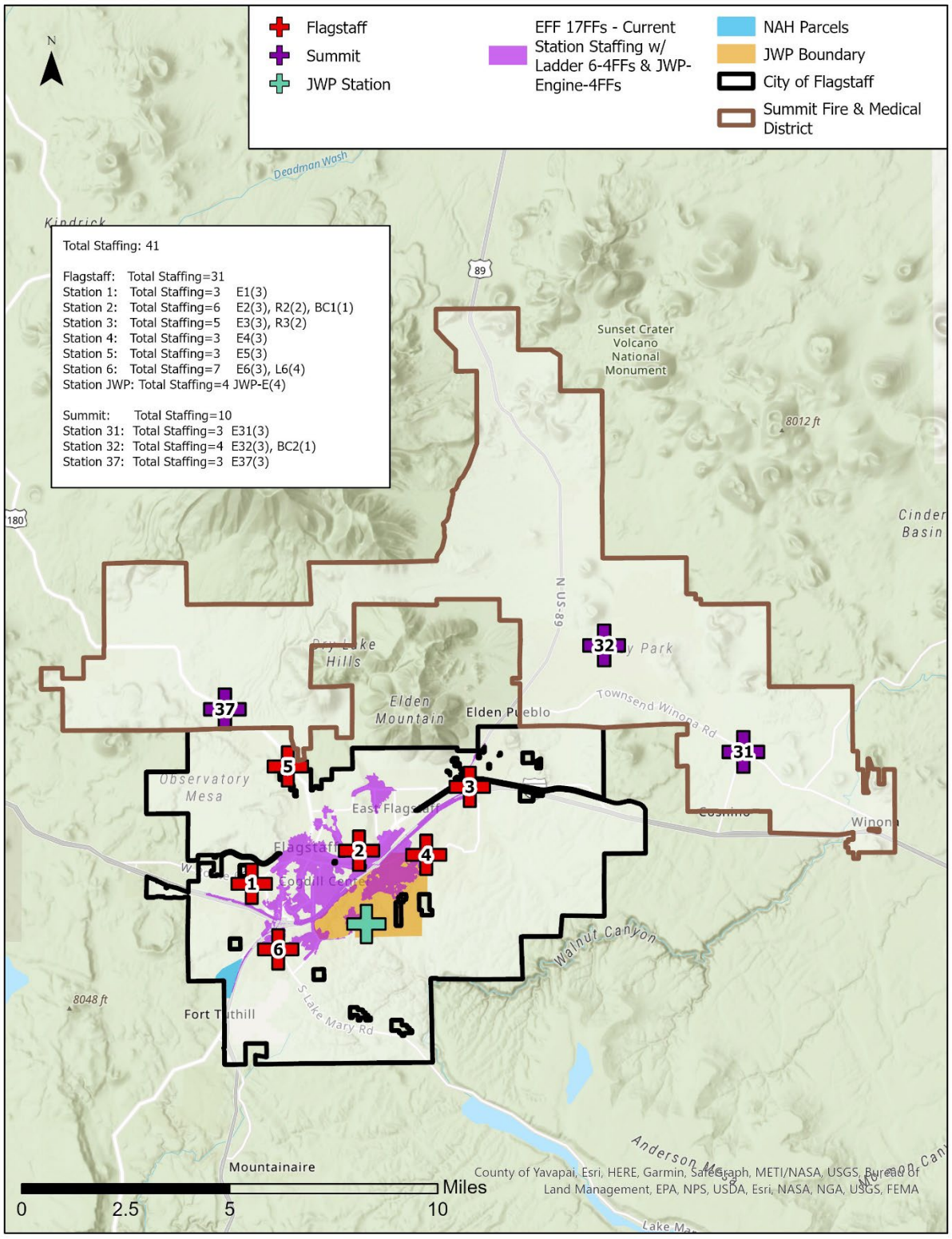
This map depicts the 8-minute travel time(s) for an(y) FFD unit(s) responding from the existing 6 Flagstaff fire stations and a notional new station primarily serving the JWP area.



This map depicts the notional 8-minute EFF response time City-wide with a staffed 4-person ladder company at Station 6 and a new, unstaffed fire station in the JWP area.



This map depicts the notional 8-minute EFF response time City-wide with a staffed 4-person engine company at a new fire station in the JWP area.



This map depicts the notional 8-minute EFF response time City-wide with a staffed 4-person ladder company at Station 6 and a 4-person engine company at a new fire station in the JWP area.