Appendix M

Wildfire Risk Assessment

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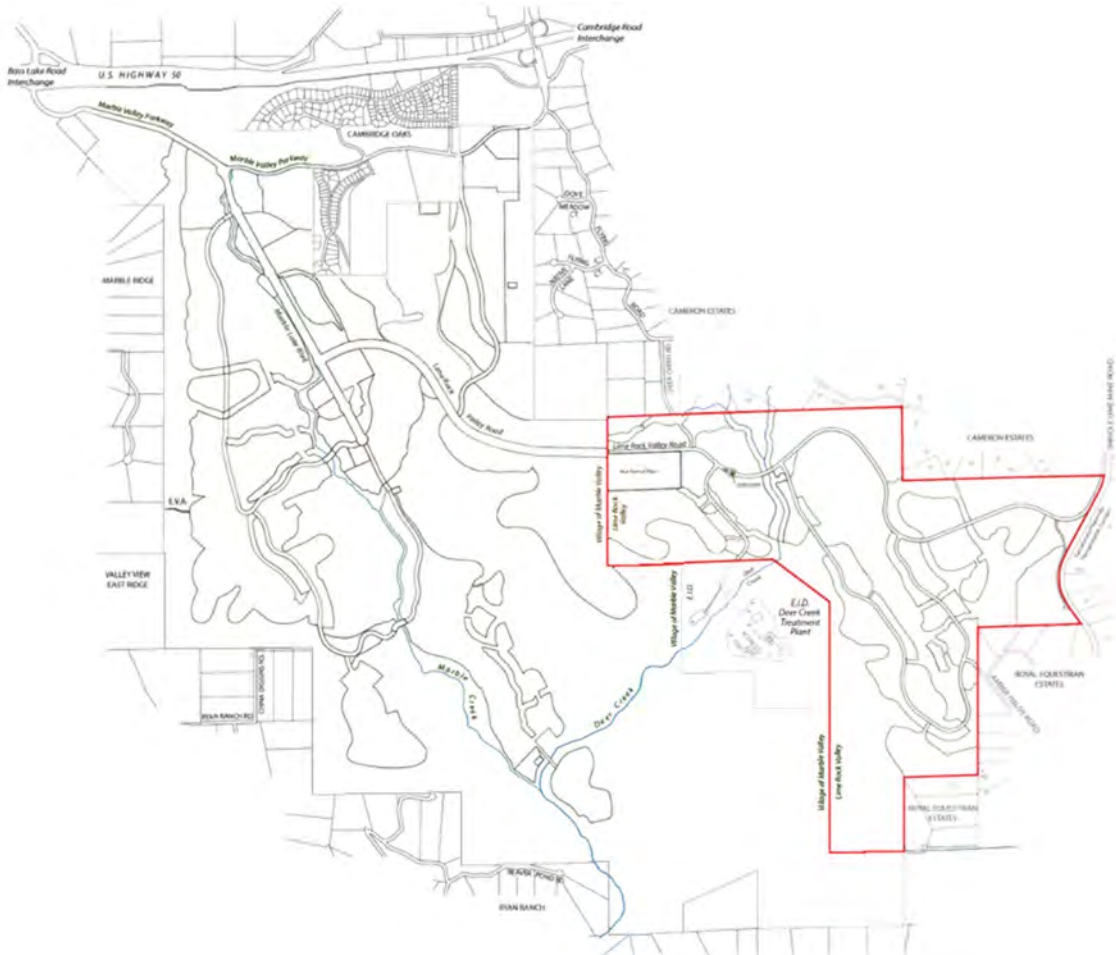
Wildland Fire Evacuation Risk Report
Fire Behavior
Lime Rock Project



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firesafe ::PLANNING SOLUTIONS

11/01/23

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Executive Summary

A review of the expected fire behavior in the interface of the Lime Rock development indicates that the fire behavior could produce extreme fire behavior, and as such, risk reduction measures will be necessary. Many of these risk reduction measures are required by the State and Local fire/building regulations, fire department standards, and guidelines, and by risk reduction measures already considered and applied by the development review process. Fire behavior modeling predicts that there will be varied timeframes for evacuation of the Project Site under fire scenarios where the fire is burning into the community from an adjacent area. Each scenario has its own set of parameters. Where fires are initialized within the Project Site or near its boundary, the fire incident command and control may have to determine if the population will be moved or "sheltered in place."

The proposed community with its increased built-in fire protection features (defensible space, fuel modification, hardening of the structures and required maintenance), placement of the structures on the topography, overall orientation to the fuels, wind, and slope and nested (safe center) configuration would be a candidate for a "shelter in place" decision. While "shelter in place" is never a first option, history shows us that moving populations, once the fire has arrived, has increased risk, and should not be attempted when safe alternatives exist.

The configuration of the Project Site, the placement of the structures and features on the topography and the nature of the wildland fuels surrounding the project create conditions where the fire will travel at great speeds when wind, slope and fuel align but all of the access points are not impacted by fire at the same time.

The fire behavior static modeling in this report with flame lengths of up to 55' under the worst-case scenario would be protected by compliance with the Fire Department fuel modification/defensible space standards. Fuel modification/defensible space is designed to reduce and change the fuel types as the combustible vegetation gets closer to the structure. As a " rule of thumb," two times the maximum flame length is adequate protection from radiant heat in a hardened structure. These distances also protect from direct flame contact (a distance greater than the flame length by a factor of two) and convected heat (less impactful than the radiant heat distance as discussed previously). The structure hardening (including ember intrusion projection) protects from embers and brands which may travel long distances under worst-case conditions.

The configuration of the Project Site development areas, the increased number of evacuation alternatives and the enhance protection features within the building construction and defensible space of the Project Site creates the conditions necessary to allow the resident to have viable options for all fire scenarios in the event that the community is impacted by a wildland fire. This report will be used as the basis for fire behavior assumptions in the evacuation modeling for the Project Site.

Introduction

The proposed project site is in unincorporated El Dorado County, California, south of U.S. Highway (US) 50, approximately 32 miles northeast of downtown Sacramento and 11 miles west of Placerville. The site comprises a series of sloping hills surrounding the main valley (Lime Rock Valley) and a minor valley associated with the corridor of Deer Creek, a perennial stream that flows from north to south through the property. The elevation of the site ranges from 1,280 feet above mean sea level (MSL) at the northeast corner to 880 feet above MSL where Deer Creek flows out of the property near the El Dorado Irrigation District (EID) Deer Creek Wastewater Treatment Plant (WWTP). The LRVSP provides for a mix of low-density and medium-density residential lots, a village park and open space (including 124 acres of natural open space land for use as a passive, day-use park).

Purpose and Scope of Report

Firesafe Planning Solutions performed an assessment of risks related to wildfires in order to assess the intensity of a wildfire approaching the Project Site. This report provides the results of that assessment and objective hazard and risk assessments which can be used to establish the community risk reduction measures (hazard less reduction measures = risk) that are equal to or greater than the hazards which would be encountered in a worst-case scenario.

The study takes into consideration existing/future vegetative interface fuels, topography, fire , and weather conditions during extreme fire conditions. The report provides results of computer calculations that measured the fire intensity, flame lengths, rate of spread, and fire travel distance (arrival times) from worst-case scenario wildfires in both the extreme (Diablo wind) and the predominant (Onshore wind) wind conditions.

The Fire Hazard Planning Technical Advisory General Plan Technical Advice Series, 2022 Update Finalized – August 2022, Figure 7, Page 31, from the Governor's Office of Planning and Research, provided a visualization of risk vs hazard for wildfires as shown in Figure 1. This report will use this guidance and terminology.

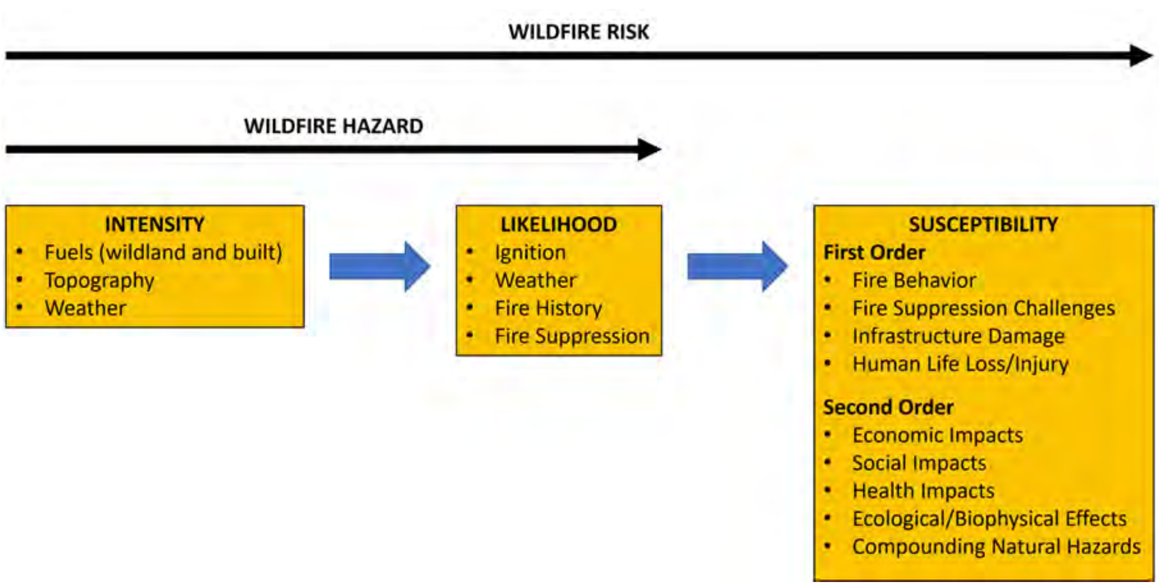

Figure 1 - Visualization of risk vs. hazard for wildfires-

The results of fire behavior calculations have been incorporated into the analysis of the interfaces of the project with adjacent wildlands and the potential ingress/egress routes used by the Project Site on a daily basis and under emergency conditions where evacuation might be possible.

Scope

This document will address the following tasks as outlined in the California Attorney General's "*Best Practices for Analyzing and Mitigating Wildfire Impacts of Development Projects Under the California Environmental Quality Act*" (AG Guidelines):

1. Determination if project impact will substantially impair an adopted emergency response plan or emergency evacuation plan.
2. Determine the project-specific Wildland Fire Hazard and Wildland Fire Risk to quantify issues that may exacerbate wildfire risks and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire;
3. Determine if the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment;
4. Determine if people or structures will be exposed to significant risks due to the completion of the project; and
5. Consider whether a project will "expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires."

CEQA Appendix G,

Section XX. WILDFIRE. If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:

a. Substantially impair an adopted emergency response plan or emergency evacuation plan.

b. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

c. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment.

The AG guidelines encompass the CEQA Appendix G, Section XX, subsection a, b, and c requirements, and as this report addresses the AG guidelines, it addresses the Appendix G issues in the same effort. This report will not speak to the Appendix G requirements directly except as it applies to evacuation.

Project Description

The proposed project would be a comprehensive planned residential community totaling approximately 740 acres with a variety of lot sizes and housing types, designed to ensure the preservation of significant historical sites and prominent natural features, including oak woodlands, steep slopes, streams, and wetlands. The proposed project would be a mix of low-density residential and open space uses. Specifically, the project would consist of up to 800 single-family residential units on 358 acres, an 8-acre neighborhood park with recreational amenities, and about 335 acres of public and private open space. The balance of the project area would consist of roads and rights-of-way.

Other features of the proposed project would include a network of pedestrian trails and pathways that would connect and enhance existing and proposed trails in the area, including the El Dorado Trail. The proposed project would require annexation of the LRVSP area into the EID service area for water and wastewater services. The proposed project would also require an amendment to the El Dorado Hills Community Services District (CSD) sphere of influence to include the LRVSP area and annexation of the LRVSP area into the El Dorado Hills CSD service area for parks and recreation.

The LRVSP would rely upon roadway and water infrastructure associated with the Marble Valley Master Plan, which was approved in 1998 (TM95-1298, PD95-0004, DA97-001) and has since expired. The expired Marble Valley Master Plan and tentative map included proposed Lime Rock Valley Road which would have provided access to the project area through the Marble Valley Master Plan area.

As noted previously, there is a new proposed specific plan for the Marble Valley Master Plan area (the VMVSP), which includes the same infrastructure on which the LRVSP would rely. Therefore, Lime Rock Valley Road and water infrastructure would be approved regardless of whether the VMVSP is approved, and these improvements would be in place if the VMVSP or the Marble Valley Master Plan is constructed prior to LRVSP construction. However, the roadway and associated water line are not currently constructed and if the LRVSP is constructed before the VMVSP property, the LRVSP will have to construct these improvements to provide roadway connectivity and water to the LRVSP development.

The proposed project site is in unincorporated El Dorado County, California, south of U.S. Highway (US) 50, approximately 32 miles northeast of downtown Sacramento and 11 miles west of Placerville. The site comprises a series of sloping hills surrounding the main valley (Lime Rock Valley) and a minor valley associated with the corridor of Deer Creek, a perennial stream that flows from north to south through the property.

The elevation of the site ranges from 1,280 feet above mean sea level (MSL) at the northeast corner to 880 feet above MSL where Deer Creek flows out of the property near the El Dorado Irrigation District (EID) Deer Creek Wastewater Treatment Plant (WWTP). The LRVSP provides for a mix of low-density and medium-density residential lots, a village park and open space (including 124 acres of natural open space land for use as a passive, day-use park).

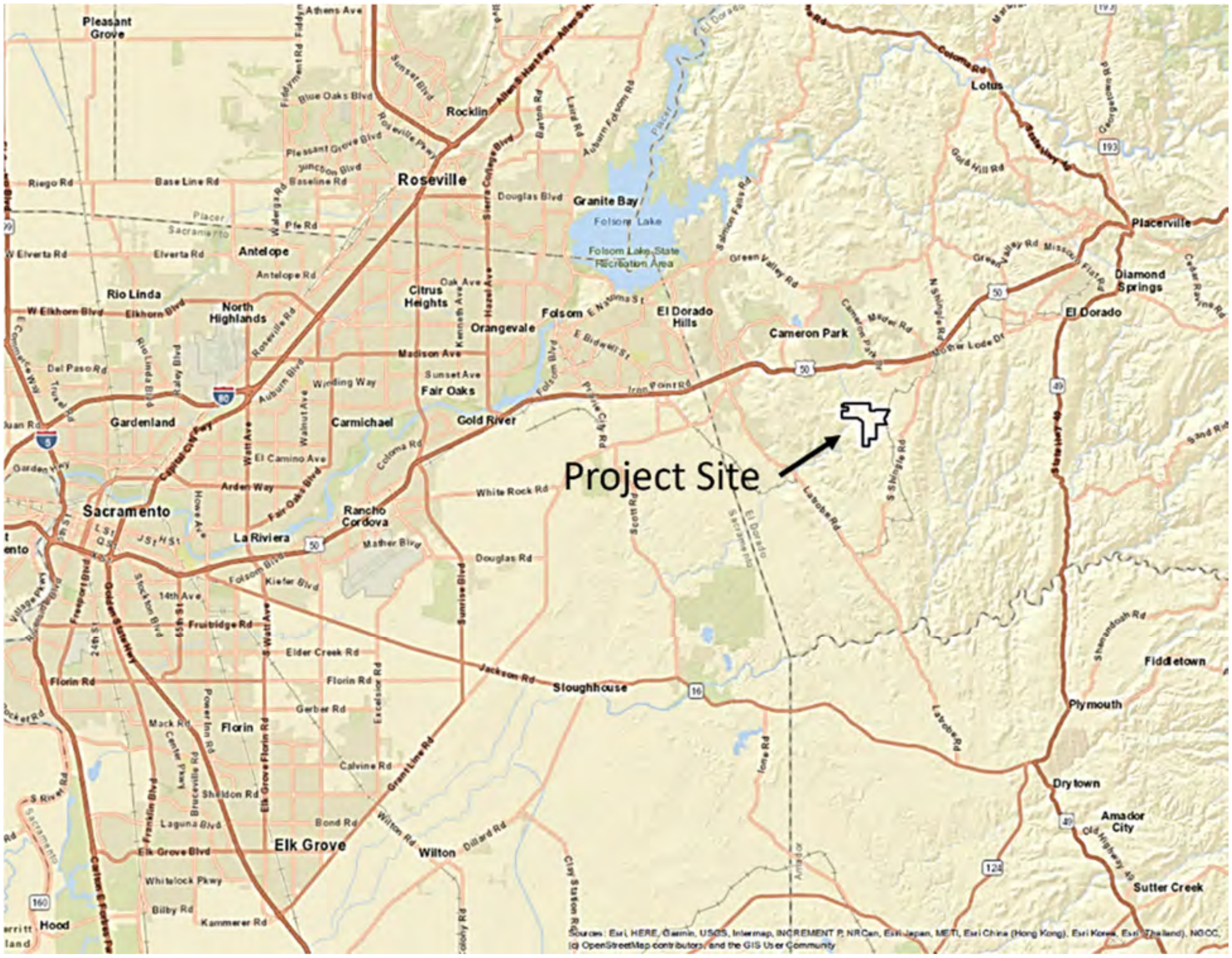

Figure 2 – Regional Location Map

The Project Site has two configurations under review for this analysis. The first is the project on its own; the second, is a configuration with an adjoining project (Marble Valley) to the west which will share some infrastructure (roads and evacuation points) with the Project Site (Figure 3).

The proposed project is designed in a manner that concentrates a majority of the development (clustered development) along the existing topographic features and preserves, enhances, and highlights the historic character of the site derived from the historical use of the property for limestone mining.

Current Environmental Conditions

General Location of Site and Adjacent Wildland

The Project Site will have undeveloped natural areas on all sides of the majority of the development area rather than directly abutting existing development (Internally and to the West/South). The site was designed with the "clustered development" concept, where density is concentrated in the development area to maximize the amount of open space on the balance of the site. This concept is illustrated in Figure 4.

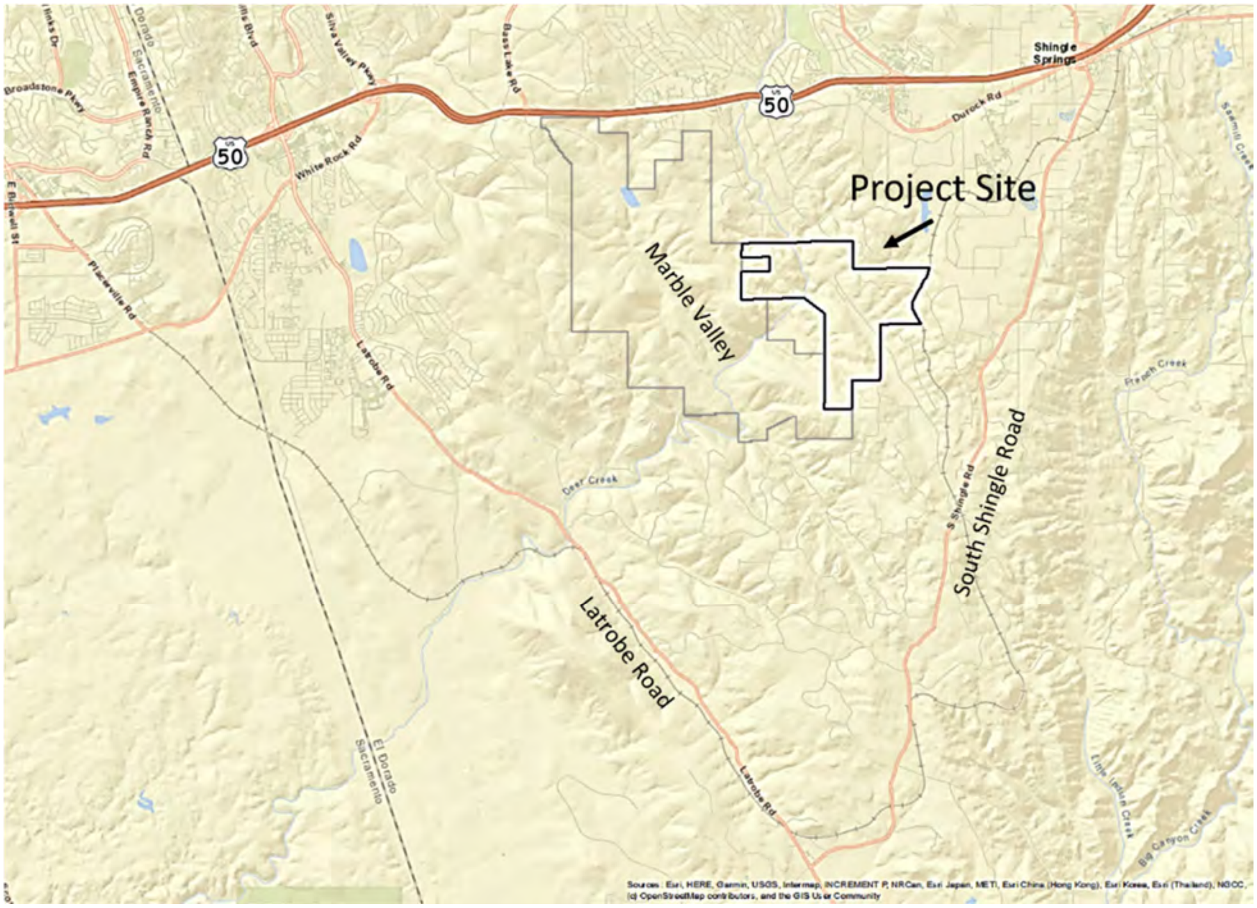

Figure 3 – Vicinity Map

In Figure 5, the majority of the unclassified (no dominate lifeform – light red) is in the existing development areas. The grasses are indicated in light yellow, the shrubs in dark brown, and the green and light blue areas are trees. The dark blue (non-vegetated) areas are water bodies or quarries for the most part.

Landfire data is provided in 30-meter grids with the predominate value in the grid representing the entire grid. This is true for all of the data sourced from the Landfire site (elevation, slope, aspect, wildland fuels, existing vegetation type, canopy coverage, etc.). It is necessary to review the data to ensure that processing errors have not occurred, which has been done at a macro level. The wildland interface is a mixture of Herbaceous (grasses) and Shrublands (chaparral/brush) and conifer/oak woodlands. Much of this open space will be native species with the exception of the fuel modification/defensible space zones. Fire behavior modeling was completed using the data from the Landfire data site (https://www.landfire.gov) which provided the source for the fuels types, vegetation type, slope, aspect, and elevation for this report and for the models used in this report. Figure 5 provides an illustration of the various wildland fuel types (grasslands, shrublands, tree covered/canopy (open or sparse), sparsely vegetated, no dominant vegetation) in general categories. For the most part, this illustration is simply grass, shrub, trees, little vegetation, or areas where the diversity of vegetation does not allow for classification under this category.

Figure 4 – Land Use Map

When the development area is added (Figure 6), it is possible to see the interface that will be created with this project. Figure 7, provides the development area for the alternative development configuration (Marble Valley Project) to illustrate the west interface if that development occurs as currently envisioned. A large amount of the shrub interface is eliminated or modified, reducing the wildland threat in that area.

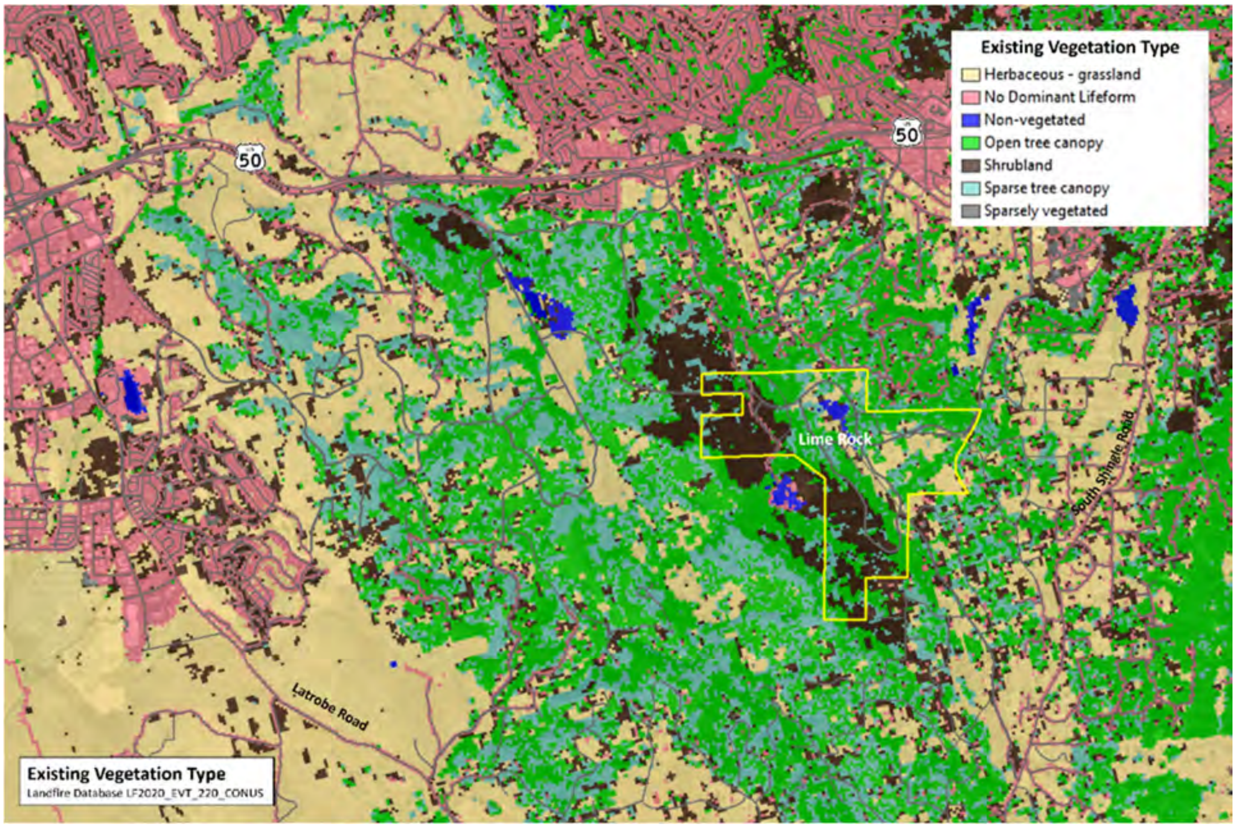

Figure 5 – Vegetation Type Map

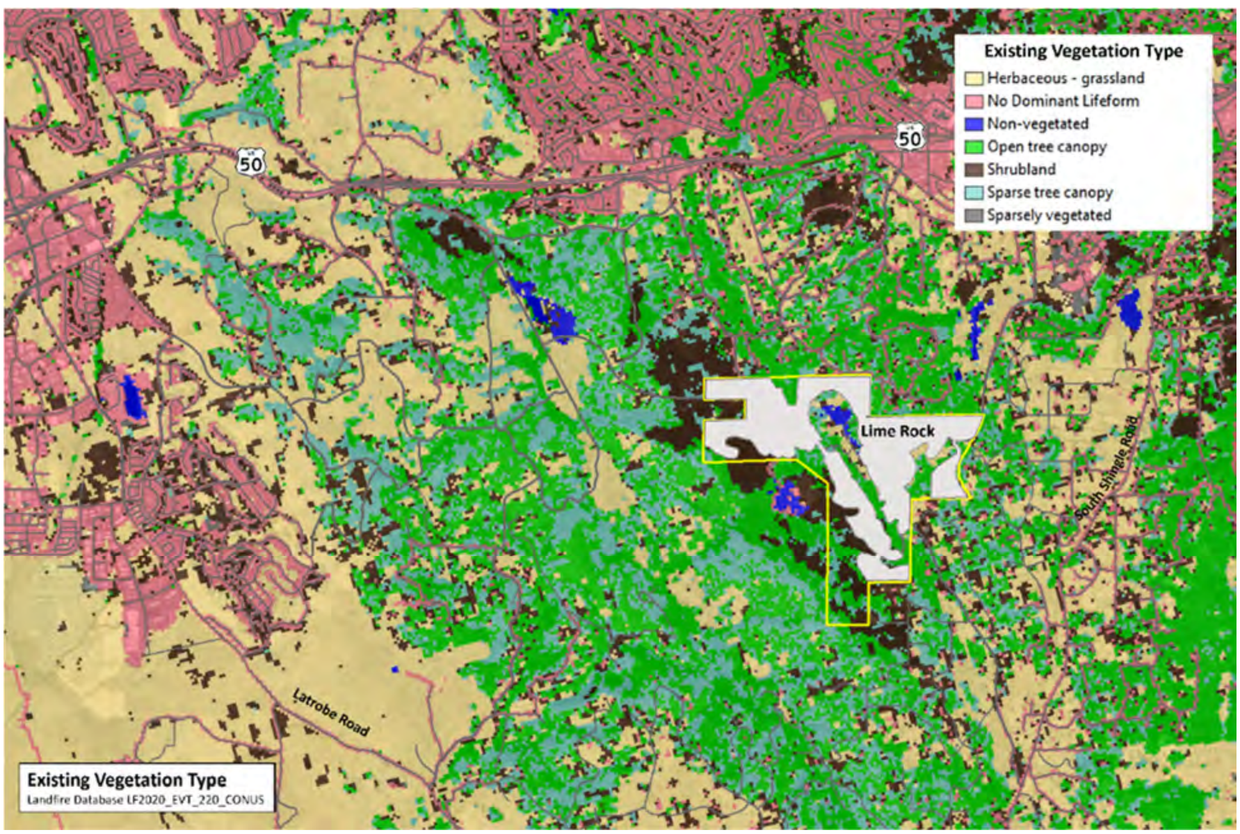

Figure 6 – Vegetation Type Map with Development Area for Lime Rock

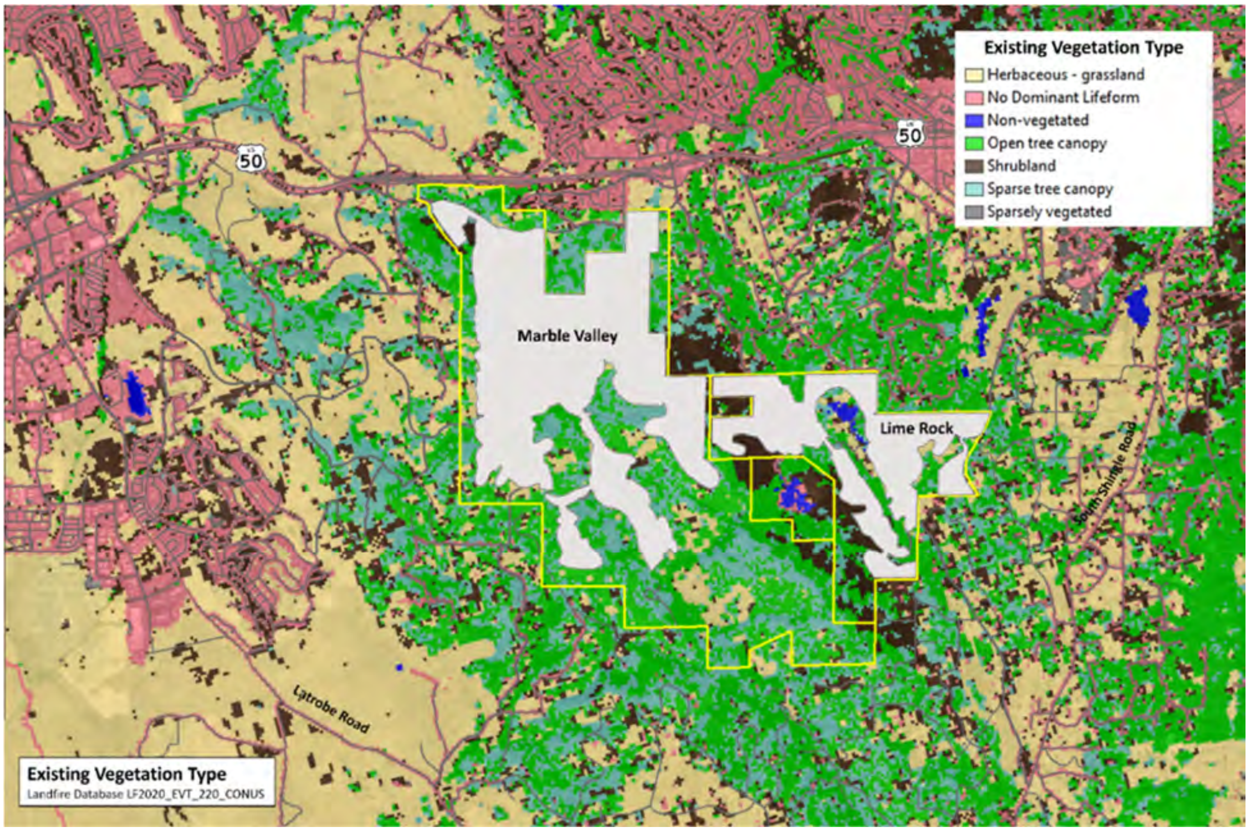

Figure 7 – Vegetation Type Map with Lime Rock and Marble Valley Development Areas

Agency responsible for fire protection

Fire protection services in El Dorado County are provided by 13 separate fire districts, one city fire department, the California Department of Forestry and Fire Protection (CAL FIRE), and the U.S. Forest Service (USFS). The project site is within the El Dorado County Fire Protection District, with backup protection provided by CAL FIRE (G3 Enterprises 2020). The final map boundary line must follow the existing fire boundary line to insure no residential or commercial lot is split between two fire districts.

The El Dorado County Fire Protection District serves 281 square miles and population of 75,000 with 14 stations (El Dorado County Fire 2020). The department consists of 74 total personnel (Alvarado pers comm.). Station 28 would serve the eastern portion of the project site. This fire station is located approximately 4 miles northeast of the project site and the average response to the project site would be 12.5 minutes (Alvarado, pers. comm.). Project Site as shown in Figure 8.

The Cameron Park Fire Department sits within the unincorporated community of Cameron Park. It serves the community, its citizens, visitors, and neighboring areas under the direction and governing Board of the Cameron Park Community Services District (CSD). Station 89 lies approximately 2 miles from the proposed project. Average response times for the Cameron Park Fire Department to calls in this area range between approximately 4 to 7 minutes (Winger 2016 pers. comm.).

It is likely that once the development is approved and started the LAFCO will examine the current boundaries and adjust them to provide for the "natural service provider" based on each agency's ability to provide the services to the new areas. The adjacent Marble Valley Project Site includes a fire station site which may be a relocation of Fire Station 92 (Ryan Ranch) which is currently unstaffed.

As shown in Figure 9, the entire Project Site is in SRA. All, or nearly all, of the SRA lands, are in one of the three Fire Hazard Severity Zones classifications. (Very High, High, or Moderate).

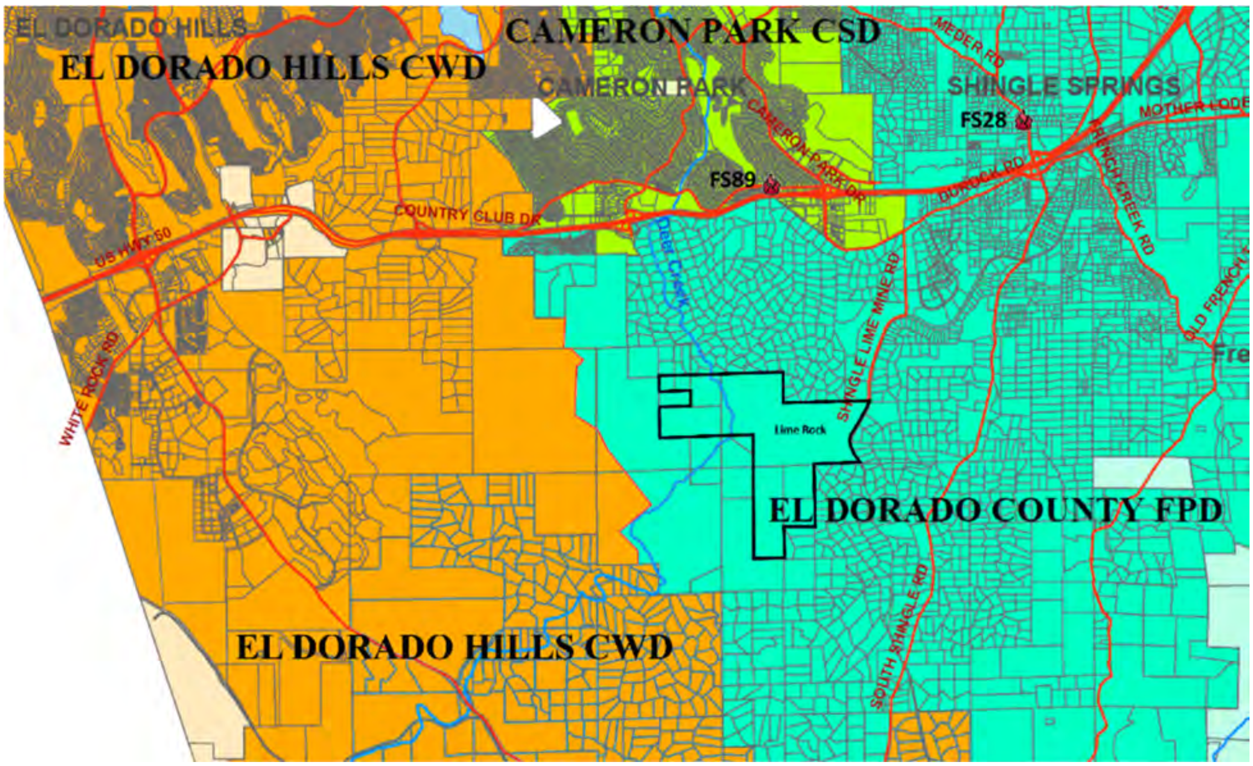

Figure 8 – Fire Protection Area Boundaries

Fire Severity Zones and proximity

Fire Hazard Severity Zones are currently based on potential fuels, fire weather conditions, and terrain and represent potential fire hazard exposure to structures and other human infrastructure assets. FHSZ areas are adopted as a Title 14 regulation, fulfill the obligations laid out in Public Resources Code (PRC) Sections 4201-04, and are essential in various fire safety regulations, building construction standards, and real estate hazard disclosure requirements. These zones were determined in November 2007 for SRA and September 2008 for LRA and are currently in the process of being revised by CalFire (CalFire Website). The review process for the updated SRA areas is completed and is being implemented. The 2007 Fire Severity Zone Map is provided in the Reference section of this report. New "draft" maps are out for review for the SRA areas for the entire state. In Figure 10, are the proposed classification for the Protect Site and adjoining lands. These new maps will be adopted within the next few months. Comment periods are completed for the Project Site.

SRA/LRA/FRA

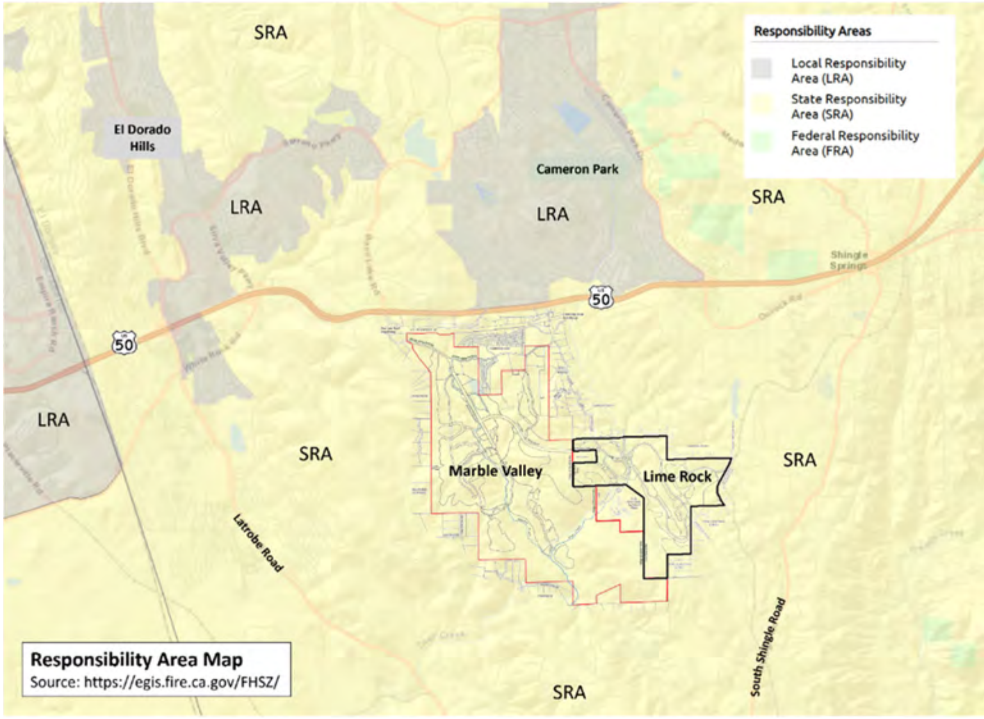

Figure 9 – Map Responsabilty Areas (SRA/LRA/FRA)

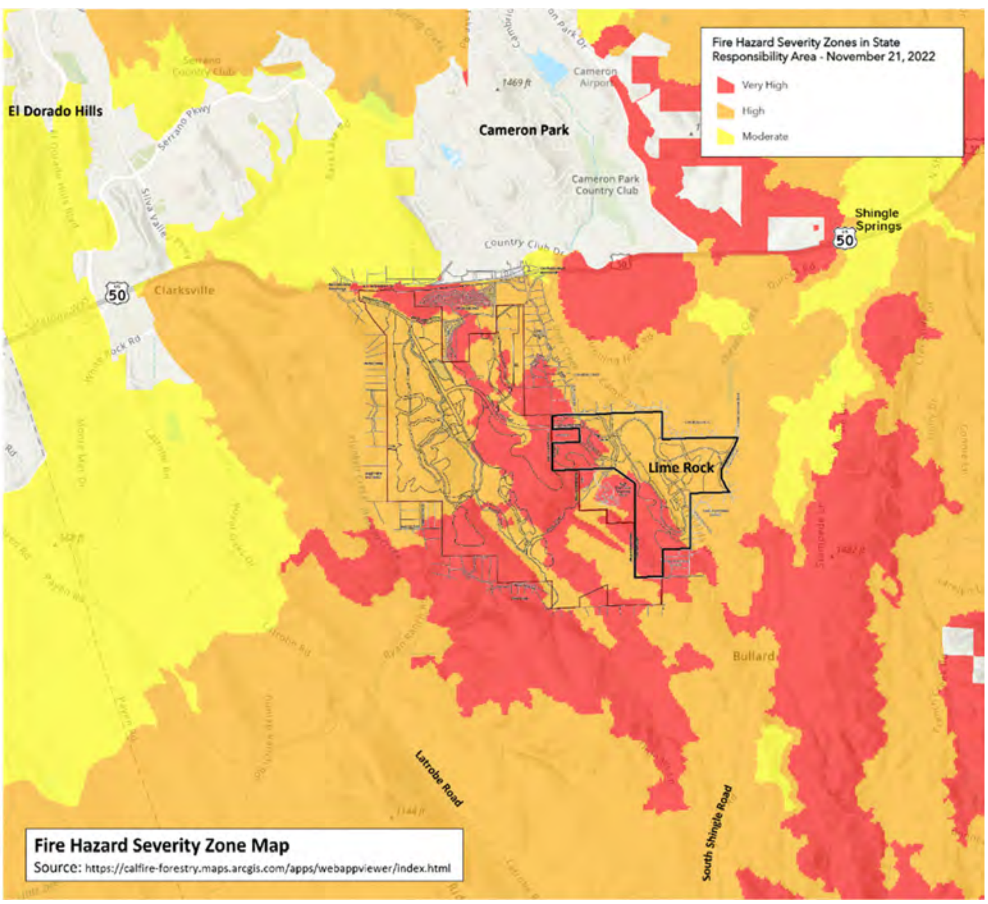

Figure 10 – Fire Hazard Severity Zones (2022)

Wildland Interface/Intermix

The wildland-urban interface (WUI) is defined by the U.S. Forest Service as any area where "humans and their development meet or intermix with wildland fuel." This area includes communities that are within a half-mile of this interface. The WUI is classified into two categories:

1. Interface WUI — where structures are adjacent to the wildland vegetation. A clear line of delineation is provided.

2. Intermix WUI — where structures intermingle with wildland vegetation. Each structure or group of structures has its own interface.

Figure 11 – Interface vs. Intermix

Source: "Fire FAQs-Are Structures Fuel? The Wildland Urban Interface and the 'Built' Environment", Daniel Leavell, Stephen A. Fitzgerald, Carrie Berger, Gavin Horn, EM 9291 Published August 2020

The Project Site will utilize a WUI Interface for each of the planning areas. Some native areas will remain between planning areas, but most of the development will create areas where the only interface with native fuels will be on the perimeter. Figure 4, previously, illustrates the project WUI interface. This is discussed in more detail in the analysis of the fire behavior.

Codes, guidelines, and standards

The Project Site will be required to provide protection measures as required by a number of Laws, Codes, Ordinances, Regulations, Guidelines, and Standards (collectively, Regulations). Most of the Regulations apply to all areas of the Project Site. Below are the major Regulations that will impact the Project Site:

- PRC Sections 4290 through 4299.
- PRC Sections 4201 through 4204 for State Responsibility.
- Title 14 of the California Code of Regulations (14 CCR), Division 1.5, Chapter 7, Subchapter 2, Articles 1-5, "State Minimum Fire Safe Regulations."
- California Code of Regulations, Title 24, Part 9, California Fire Code, Chapter 49.

- California Code of Regulations, Title 24, Part 2 (Volumes 1 and 2), California Building Code, Chapter 7A.
- California Code of Regulations, Title 24, Part 2.5, California Residential Code, Section R337.
- Fire Code of the El Dorado County Fire Protection District (California State Fire Code as amended and adopted)
    - Section 4906 – Vegetation Management
    - Section 4907 – Defensible Space
- El Dorado County Vegetation Management and Defensible Space Ordinance #5101,
- El Dorado County Regional Fire Protection Standards apply to the entire site

The Project Site will have wildland-specific requirements before, during and after construction.
Prior to Construction

Areas within the EDCFPD will also be a part of the Fire Safe Plan per the Specific Plan Polices. A Fire Safe Plan is based on a site-specific wildfire risk assessment that includes considerations of the location, topography, aspect, flammable vegetation, climatic conditions, and fire history. The plan addresses water supply, emergency vehicle access, building ignition and fire- resistance factors, fire protection systems equipment, defensible space, fuel breaks, buffer zones and vegetation management to reduce hazard severity and risk. The Fire Safe Plan summarizes all fire related recommendations for the project, the timing in which the recommendations are to be implemented, and who the responsible party is to complete these recommendations.

As further described below, the Project Site Specific Plan requires the development process to abide by a number of policy decisions, some of which are provided below for this project:

C.17 **Public Services** (Fire Protection)

Policy 7.25
The local fire protection district shall review and approve all discretionary applications for tentative subdivision maps, parcel maps, and planned development permits prior to County approval to ensure the adequacy of emergency water supply, storage, conveyance facilities, and access for fire protection. Recommendations may be incorporated as conditions of approval.

Policy 7.26
After the adoption of the Specific Plan and prior to the submittal of the first small lot tentative subdivision map, the Project Proponent will prepare a Wildfire Safety Plan (WSP). The California Department of Forestry and Fire Protection and the applicable local fire protection district (El Dorado Hills County Water District or the County Fire

Protection District) will review and approve the WSP prior to the approval of the first small lot tentative subdivision map.

Policy 7.27
Pay all applicable fire impact fees at building permit issuance and/or participate in any applicable Mello Roos districts required to fund public facilities as specified in the PFFP.

As indicated, the Wildfire Safety Plan (Fire Safe Plan) will be completed for review prior to the first small lot tentative subdivision map submittal and must be approved by CalFire and the applicable local fire district prior to the approval of that first small lot tentative subdivision map.

- The plan evaluates whether the project will substantially impair an adopted emergency response plan or emergency evacuation plan.

- The plan identifies potential mitigation measures that can be adequately employed to reduce the impacts caused to the existing response or evacuation plan.

- The plan evaluates whether the project exacerbates the wildfire risk due to slope, prevailing winds and other factors.

- The plan identifies potential mitigation measures that can be adequately employed to reduce the overall wildfire risk due to the factors identified.

- The plan identifies the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or on-going impacts to the environment.

- The plan identifies potential mitigation measures for vegetation reduction around emergency access, evacuation routes and associated infrastructure that can be implemented to ensure that this infrastructure is installed and maintained by the project and successor parties.

- The plan identifies whether the project will expose people or structures to significant risks, including downslope or downstream flooding or landscape, as a result of runoff, post-fire slope instability, or drainage changes.

- The plan evaluates the local fire protection capabilities; and fire suppression water supply capabilities to necessary to adequately serve the project and makes recommendations to improve or mitigate deficiencies identified during the analysis of the project.

- The plan evaluates community wildfire evacuation routes required for the project for their capacity, safety, and viability under a range of scenarios and to ensure consistency with CAL FIRE, CAL OES and AHJ requirements.

- The plan provides legally binding statements regarding community responsibility for the maintenance of fuel modification zones. The legally binding statement is required to be incorporated into the project covenants, conditions, and restriction regarding property owner responsibilities for vegetation maintenance.

<u>Protection During Construction</u>
EDCFPD has adopted Chapter 33 of the California State Fire Code entitled Fire Safety During Construction and Demolition with amendments. This section of the Fire Code provides requirements for “Precautions Against Fire”, Combustible and Flammable Liquids, Flammable Gases and Explosive. Additionally, it requires readily accessible means of reporting emergencies, access roadways and fire department water supply to all areas where combustible construction is occurring.

This section (CFC Chapter 330 requires the development, implementation, and maintenance of an approved, written Site Safety Plan establishing a fire prevention program at the Project Site applicable throughout all phases of the construction, repair, alteration, or demolition work. This plan addresses the requirements of the Fire Code, the duties of staff, and staff training requirements. The Site Safety Plan must be submitted and approved before the issuance of a building permit. Any changes to the plan must be submitted and approved by the fire department.

Prior to the approval of a certificate of occupancy for a building, the project shall demonstrate to the satisfaction of the AHJ (Authority Having Jurisdiction) and CAL FIRE that the project complies with all applicable provisions found in the Fire Safe Plan.

<u>Protection After Construction</u>
The Project Site is within a Fire Hazard Severity Zone, which requires the enforcement of Fire Chapter 49. This chapter provides for increased wildfire building construction protection (maintenance, additions, and remodels must be in compliance with wildland standards), vegetation management, defensible space, and compliance with an Approved Fire Protection Plan. These requirements provide for the implementation and maintenance of California Building Code Chapter 7A, California Residential Code Section R337, and Californian Reference Standards Code Chapter 12-7A.

It further requires that buildings and structures be maintained in accordance with California Public Resources Code Section 4291, California Code of Regulations, Title 14, Division 1.5, Chapter 7, Subchapter 3, Article 3, Section 1299.03; California Government Code Section 51182 and California Code of Regulation, Title 19, Division 1, Chapter 7, Subchapter 1, Section 3.07. The Project Site is also within the SRA, which requires it to comply with the SRA Fire Safe Development Regulation as specified in Title 14, Division 1.5, Chapter 7, Subchapter 2. The Project Site will need to be maintained to the same standards and Regulations that were applicable at the time of construction on an ongoing basis.

Additionally Standard W-002 requires that prior to June 1st of each year the property owner or their representative shall demonstrate to the satisfaction of the AHJ and CAL FIRE that the project:

[1] complies with all relevant provisions of the Fire Safe Plan; and

[2] that all fire hazards in the development have been mitigated.

This standard further requires that the Fire Safe Plan be reviewed and updated by the property owner (Homeowners Association or HOA for common areas) no less than once every five calendar years after its original approval to ensure that the project complies with all current regulations and requirements for existing developments. The AHJ is responsible for routine inspections of all of the installed fire protection features (including fuel modification and defensible space). The AHJ and CAL FIRE shall review and approve this plan update prior to its use.

Public Information and Resident Education

All of the requirements for the fuel modification/defensible space zones, defensible space requirements, limitations on remodels/additions on the interface lots, and community planting restrictions will be cover included in the disclosure documents provided to the owners during the escrow process. Additionally, these requirements will be fully detailed in the Project Site CCR’s (Covenants, Conditions, and Restrictions) legal documents that are filed with the county recorder's office and made a part of the official real estate records that run with the land that is part of the community.

The HOA will have the responsibility to inform the residents of the requirements, review and approve changes to the property and provide a process to ensure compliance with the community standards where applicable. The CCR’s will be reviewed and approved by various governmental agencies (El Dorado County Fire, CalFire and the County of El Dorado) in the development process.

Project Analysis - Wildfire Hazard and Risk

The analysis of Wildland Fire Risk starts with the review of the hazards, the likelihood of an event, and the intensity of that event which is then examined against the vulnerability (exposure and susceptibility) to provide a "level of risk."

Wildfire Hazard

Likelihood

Wildfire likelihood is the probability of a wildfire burning in a specific location. At the community level, wildfire likelihood is assessed in the area where development is present. The likelihood is the probability that any specific location will experience a wildfire in any given year. Fire history is the main data source for this analysis along with potential ignition sources and weather conditions that lead to extreme fire behavior.

Fire History

The Project Site is not within/adjacent to a historic fire corridor. When the fire history is viewed in total (all records available) this is evident (Figure 12). Most fire travels SW/NE as evident by the elongated fire perimeter. The Scott Fire in 1996 appears to have originated under NW wind which changes to SW wind as it progresses (shape implies this). It also shows a few fires running S to N, such as the Joerger Fire 1964 (small cones pattern getting larger as it goes N). The largest fire shown is the Quarry Fire in 1976 (20,869 acres.

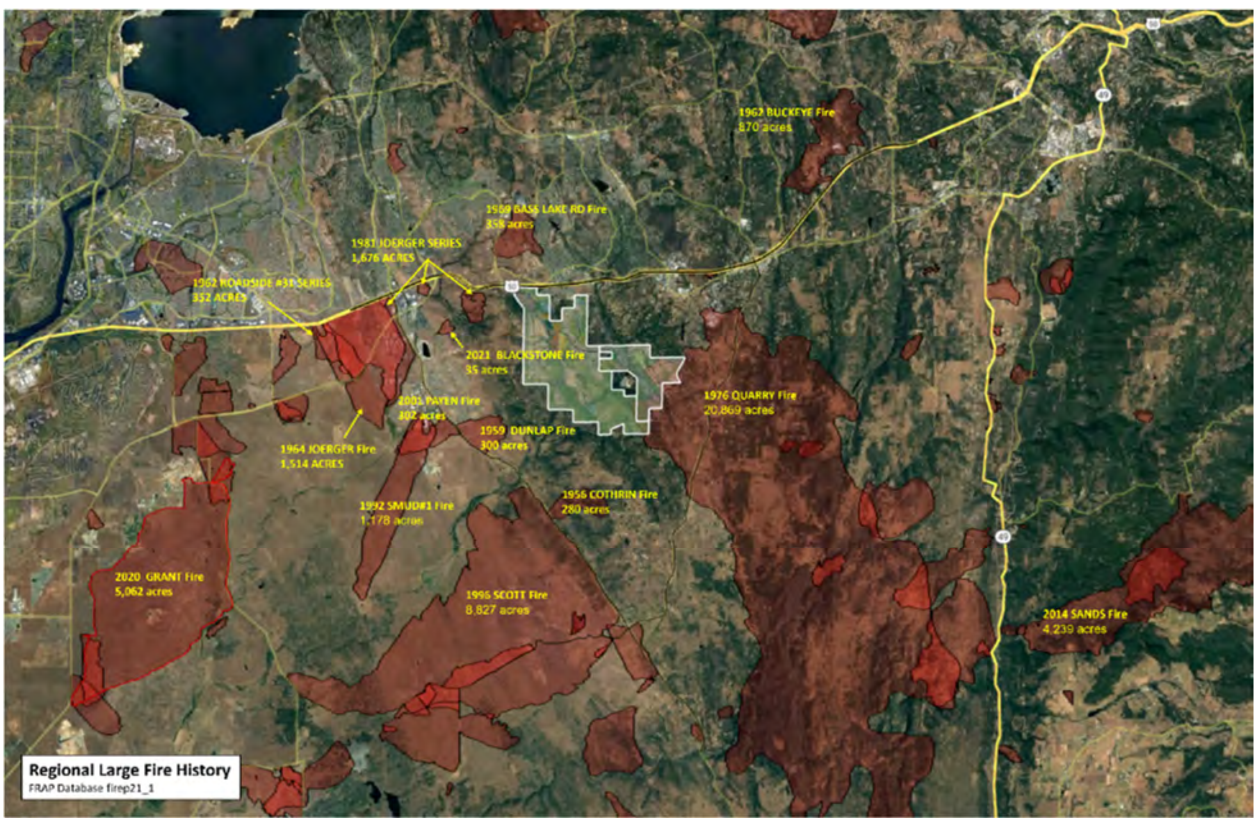

Figure 12 – Fire History for the regional area (all fires/all years)

Large fires in the area are due to several issues. Access and topography are part of it. Roads in the lands to the east, west, and south of the Project Site have limited access to the areas where these fires can burn. The topography can be steep, and most of it is well-vegetated. The general area does not have a large number of fire stations which can arrive quickly in the early stages, and fires that occur are generally related to the transportation and infrastructure (powerlines and roads) in the area that provide the ignition sources in many cases. This area sometimes experiences thunderstorms/lightning which produce strong winds and ignitions without the rainfall necessary to put out the spot fires. All of these factors are covered in more detail later in this report.

Weather

The weather has a significant impact on the ability of a small fire to become a large fire. Within the weather category, wind, relative humidity, temperature, and interaction with the topography are especially impactful.

High temperature, low humidity, and wind combine to create "Fire Weather". In the general area of the Project Site, the regional weather has a strong history of extreme Fire Weather. Conditions like these are common to the point where the National Weather Service has a specific system used to identify when extreme conditions are being achieved, and additional action should be taken. On its website, CalFire describes as follows:

> *The National Weather Service issues Red Flag Warnings & Fire Weather Watches to alert fire departments of the onset, or possible onset, of critical weather and dry conditions that could lead to rapid or dramatic increases in wildfire activity.*
>
> *A Red Flag Warning is issued for weather events which may result in extreme fire behavior that will occur within 24 hours. A Fire Weather Watch is issued when weather conditions could exist in the next 12-72 hours. A Red Flag Warning is the highest alert. During these times extreme caution is urged by all residents because a simple spark can cause a major wildfire. A Fire Weather Watch is one level below a warning, but fire danger is still high.* Red Flag Warnings & Fire Weather Watches (ca.gov)

Extreme Fire Behavior is a term used by the National Wildfire Coordinating Group (NWCG) for conditions which imply a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, and strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

Temperature

The temperature in and of itself does not have a large impact on fire behavior but the effects of temperature on other factors such as Relative Humidity make temperature important to the fire behavior discussion. More direct sunlight increases fuel temperatures and decreases the amount of heat needed to raise the fuel to its ignition temperature, but since most wildland fuels must be raised to over 400^{o}F to sustain combustion, the difference of 10 or 20 degrees in the atmospheric temperature has limited direct effect.

Relative Humidity

Relative humidity (RH) indicates how much moisture is in the air. Expressed as a percentage, it provides an objective measurement of the amount of water vapor that is in the air compared to the amount needed to be saturated (100% RH). When RH is low, moisture can be removed from the vegetation at a high rate creating drier vegetation conditions that burn easily and at a faster rate. Fuels (wildland) are categorized by the amount of time (time lag) it takes them to adjust the plant moisture level to the atmospheric level (63% of the difference) in one-hour, ten-hour, hundred-hour, and thousand-hour fuels. One- and ten-hour fuels have the most impact on the flaming front (active burning) of wildland fires in grass/brush fuels. For example, a grass fuel (one-hour) could be at a very high level of fuel moisture (90%) due to overnight fog. When the sun comes up, and the fog burns off or a dry air mass moves into the area, if the RH where to drop to 20, then in the first hour, the fuel moisture would move from 90% to 45% (63% of the difference between 90% moisture in the fuel and 20% moisture in the air) in the first hour and down to 30% by the end of the second hour and 24% by the end of the third hour. Each time moving 63% of the difference between the fuel moisture and the air moisture.

Humidity varies with temperature (generally, when temperature increases, humidity decreases, and vice versa). Humidity is important because it affects fuel moisture content and therefore, the fuel's combustibility. This is the reason that hot, dry Diablo wind conditions tend to create Fire Weather and increase the level of risk as they continue to impact the fuels for serval days, weeks, or months in the dry season for southern California. Hot, dry, and windy are a bad combination.

Wind

The wind is the most obvious factor in creating Extreme Fire Behavior. While Extreme Fire Behavior is possible without extreme wind, such as fuel- driven, plume-dominated wildfire, they are often found together. The Station Fire in southern California in 2009, was a prime example of fuel and low relative humidity-driven fire, with much of the fire growth occurring in the absence of significant winds (The Station Fire: An Example of a Large Wildfire in the Absence of Significant Winds (weather.gov)). This was not what is normally seen in the recent history of fires in California, but prolonged drought, bug kill and other factors which are increasing the amount of dead fuels in the wildlands are making these types of fires more common than they were in recent history. The wind is normally one of the prime factors. The reason for this is that, in fine fuels like grasses, wind can accelerate the fire to the maximum flame length and Rate of Spread (ROS) with little wind compared to the wind speeds that are possible under fire weather conditions.

One method of illustrating this fact is to show grass wildland fuels (dry climate) at various wind speeds and look for the point at which the fire from a specific fuel reaches its maximum energy output (all fuel consumed; no additional fuel to burn). Using the BehavePlus software from the U.S. Forest Service to complete the comparison, an extreme moisture scenario was used (3% for one-hour fuels, 4% for ten-hour fuels, 5% for 100-hour fuels, 30% for live herbaceous fuels and 50% for live woody fuels) for the fuel moisture levels in the time lag dead and live fuels. Three dry climate grass fuels were used (GR1, GR2, GR4), which are the fuels normally found in most of California for grasses. The results (Figure 13) indicate that the GR1 fuel reaches the maximum flame length and ROS at 5 mph (midflame wind speed), while the GR2 fuel reaches maximums at 13 mph and the GR4 at 25 mph. For this example, the 20-foot winds are two times the midflame wind speed. 20-foot winds are defined as sustained winds averaged over a 10-minute period and measured 20 feet above the average height of nearby vegetation. (This is the standard reported by the Remote Automated Weather Stations (RAWS) owned by land management agencies and used in the National Fire Danger Rating System (NFDRS)). Using the 20-foot winds at two times the midflame wind speed allows for the perspective of how little wind is needed on a flat plain. When the slope is added, the GR1 is at maximum without wind, the GR2 drops to 9 mph and the GR4 drops to 22 mph. Figure 13 provides the output from the Behave modeling for this example.

Max ROS
Head Fire
Surface Fire Flame Length (ft)

Midflame Wind Speed mi/h	Fuel Model gr1	gr2	gr4
0	0.6	1.4	2.7
5	2.6	6.3	11.8
10	2.6	9.9	18.6
11	2.6	10.6	19.8
12	2.6	11.2	21.0
13	2.6	11.6	22.1
14	2.6	11.6	23.2
15	2.6	11.6	24.3
16	2.6	11.6	25.4
17	2.6	11.6	26.4
18	2.6	11.6	27.4
19	2.6	11.6	28.5
20	2.6	11.6	29.4
21	2.6	11.6	30.4
22	2.6	11.6	31.4
23	2.6	11.6	32.3
24	2.6	11.6	33.2
25	2.6	11.6	33.7
26	2.6	11.6	33.7

Max ROS with 100% slope
Head Fire
Surface Fire Flame Length (ft)

Midflame Wind Speed mi/h	Fuel Model gr1	gr2	gr4
0	2.6	7.6	14.3
4	2.6	9.1	17.0
5	2.6	9.6	17.9
6	2.6	10.1	18.9
7	2.6	10.6	19.8
8	2.6	11.1	20.8
9	2.6	11.6	21.8
10	2.6	11.6	22.7
11	2.6	11.6	23.7
12	2.6	11.6	24.7
13	2.6	11.6	25.6
14	2.6	11.6	26.6
15	2.6	11.6	27.5
16	2.6	11.6	28.4
17	2.6	11.6	29.3
18	2.6	11.6	30.2
19	2.6	11.6	31.1
20	2.6	11.6	32.0
21	2.6	11.6	32.9
22	2.6	11.6	33.7
23	2.6	11.6	33.7
24	2.6	11.6	33.7
25	2.6	11.6	33.7
[illegible]	[illegible]	[illegible]	[illegible]

Figure 13 - BehavePlus Outputs for Rate of Spread in dry climate grass fuels

The regional area around the Project Site has one Remote Access Weather Station or RAWS (BENC1) which is monitored/ maintained by a governmental agency to measure, record, and transmit Fire Weather data on a routine basis over extended periods of time. Most of these RAWS sites have been in place for many years, if not decades. These sites are good for establishing the long-term wind (speed, direction, and gusts), temperature, and RH.

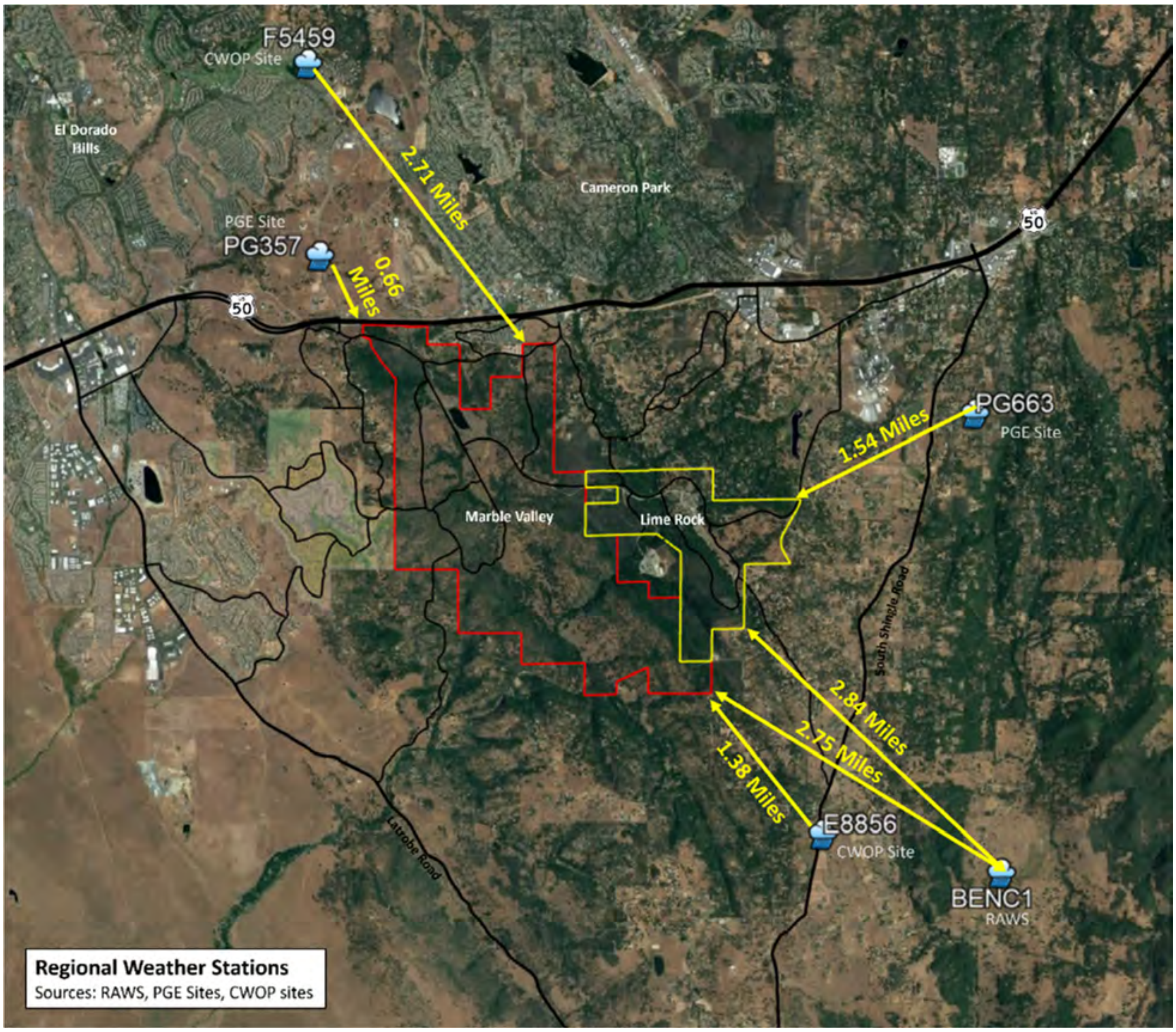

Figure 14 – Location map for location weather collection sites

The Ben Bolt RAWS is located to the southeast of the Project Site. The RAWS is approximately 2.84 miles to the SE from the southern boundary of the Project Site. The location for Ben Bolt is provided in Figure 14, as well as four additional weather data locations around the Project Site, two of which are weather stations maintained and monitored by Pacific Gas and Electric (PGE) as part of the company's Wildland Fire Safety program and two private weather stations which are part of the Citizen Weather Observing Program (CWOP) sponsored by the National Weather Service. The company (PGE) uses data to make decisions on Public Safety Power Shutoff (PSPS) actions. The data is available to safety personnel and the general public in nearly "real-time." Most of these PGE sites are mounted on utility poles owned by the company.

The RAWS site data has over 20 years of recent data, while the PGE sites have all come online within the past 4 years, and some in the area have been installed in the past year (those have not been used here). The data from the RAWS sites shows a consistent pattern of winds from the south to west and from the north to northeast, with the stronger winds originating from the S/SW (Figure 15). The data tables for the RAWS site are in Figure 16.

The data summaries in Figure 16 are derived from over 179,000 data points over 20+ years, with maximum/minimum summaries encapsulating the data for recordation by the hour. The green highlighted areas of the summary show the flow toward the mountains, and the light red the flow from the mountains into the central valley. The two highest wind measurements occurred from the S and SE, but the predominant flow is from the N to NE (34.5% of the time) and S to WSW (34.9% of the time). It should be noted that only 182 hourly reports out of 179,528 (0.101%) have wind gust speed that exceeds 40 mph. Wind gusts exceeding 30 mph do not amount to 1% of the wind data observations. The 99th percentile for wind gusts in this data base is 27 mph.

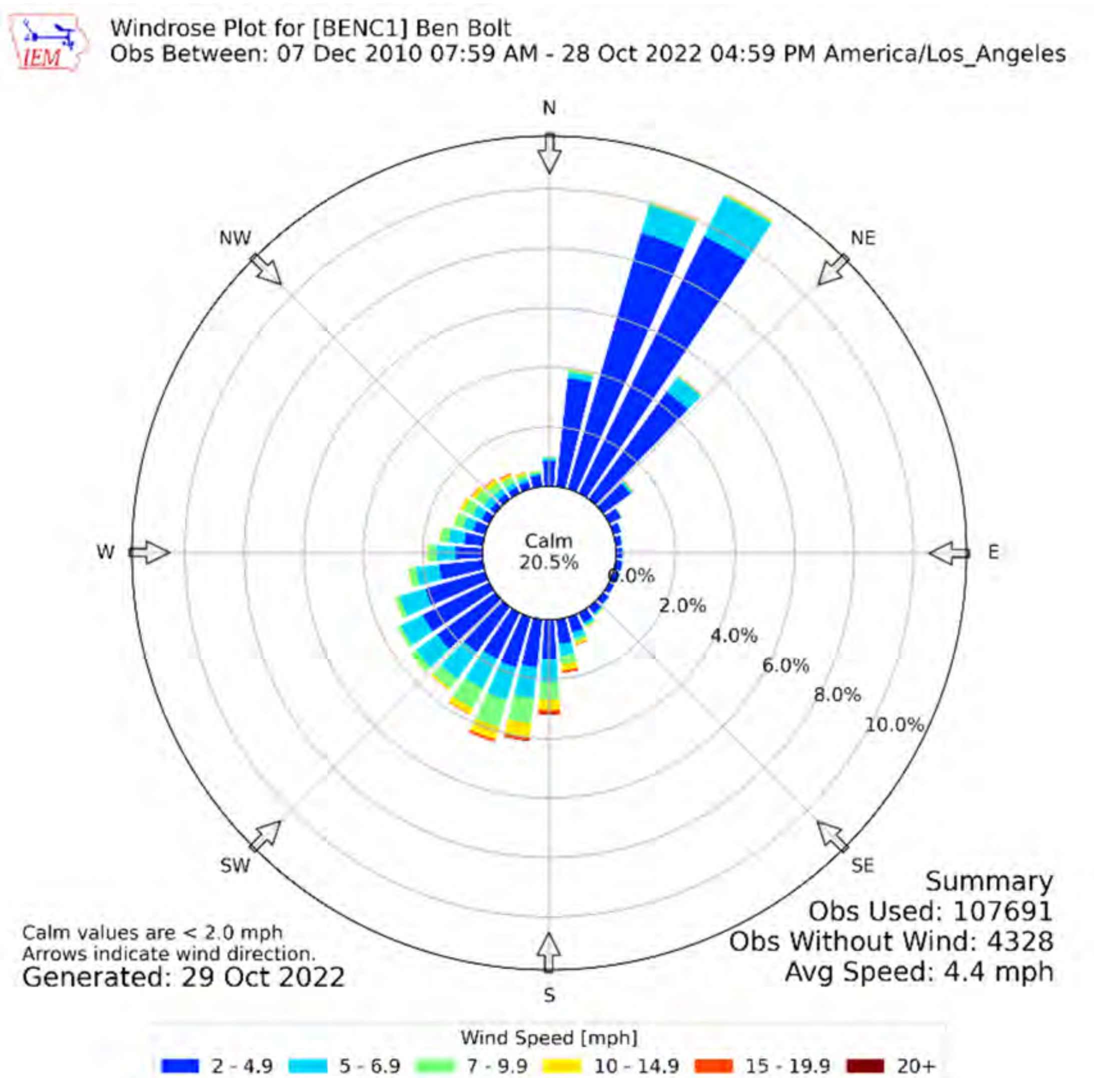

Figure 15 - Output data/graphics for RAWS locations (Ben Bolt)

Ben Bolt RAWS 2002 to 2022

BENC1			Wind Gust (mph)						
	Count	Cardinal	<20	>20	>30	>40	>50	>60	>70
7.2%	12,992	N	12,801	191	16	-	-	-	-
21.0%	37,774	NNE	37,624	150	34	5	-	-	-
6.2%	11,172	NE	11,073	99	36	8	-	-	-
1.3%	2,301	ENE	2,272	29	4	1	-	-	-
1.2%	2,119	E	2,094	25	2	1	-	-	-
1.2%	2,146	ESE	2,102	44	13	3	-	-	-
2.0%	3,541	SE	3,295	246	75	26	2	1	-
3.9%	7,053	SSE	6,203	850	214	44	3	-	-
9.0%	16,224	S	14,570	1,654	367	70	9	1	-
9.5%	17,117	SSW	15,942	1,175	152	18	1	-	-
9.0%	16,224	SW	15,722	502	53	6	-	-	-
7.3%	13,069	WSW	12,864	205	24	-	-	-	-
5.1%	9,086	W	8,893	193	11	-	-	-	-
3.2%	5,732	WNW	5,442	290	20	-	-	-	-
3.7%	6,659	NW	5,999	660	93	-	-	-	-
7.1%	12,779	NNW	12,236	543	82	-	-	-	-
2.0%	3,540	Null	-	-	-	-	-	-	-
100.0%	179,528		169,132	6,856	1,196	182	15	2	-
			94.2%	3.8%	0.7%	0.1%	0.0%	0.0%	0.0%

Wind Direction

N	12,992	7.2%
NNE	37,774	21.0%
NE	11,172	6.2%
ENE	2,301	1.3%
E	2,119	1.2%
ESE	2,146	1.2%
SE	3,541	2.0%
SSE	7,053	3.9%
S	16,224	9.0%
SSW	17,117	9.5%
SW	16,224	9.0%
WSW	13,069	7.3%
W	9,086	5.1%
WNW	5,732	3.2%
NW	6,659	3.7%
NNW	12,779	7.1%
0	-	0.0%
Blank	3,540	2.0%
	179,528	100.0%

Greater than	Wind		Gust	
60			2	0.001%
50	-	0.000%	15	0.008%
45	1	0.001%	50	0.028%
40	1	0.001%	182	0.101%
30	8	0.004%	1,196	0.666%
20	304	0.169%	6,856	3.819%
10	8,237	4.588%	63,806	35.541%
0	179,528		179,528	

10/29/2022 Begin
1/1/2002 End
7606 days
20.8 years

179,528.0 Data points

	Temp	RH	Wind	Gust
Min	22.0	3.0	0.0	0.0
Max	117	100	50.0	64.0
Avg	60.9	61.1	4.3	9.0
3rd	36	16.0	3.0	0.0
99th	101.0	100	27.0	27.0

Figure 16 – Ben Bolt RAWS Data Summary

Four additional weather data collection points have been used around the Project Site. The two PGE sites (PG663 and PG357) have databases for the past 2.5+ years, with both going into service in the spring of 2020. Each has about 130,000 data points. These sites have direct readings every six minutes (10 times per hour), whereas the RAWS had hourly summaries. The lowest/highest values are not any different, but the depth of the data is greater with respect to the wind direction and duration of a particular data value.

PGE monitors the weather sites 24/7 in an effort to provide data for planning and protecting communities from wildfires and assist in the prediction of fire-prone weather and assist in the prevention of wildfires where possible. One method they use is the Public Safety Power Shutoff (PSPS) forecast and implementation program. This is designed to reduce or eliminate possible wildfire sources from the electric grid during times of high risk.

Access to PGE's interactive weather and fire-detection satellite maps allows local fire officials and the general public the ability to review the weather in the local area so that they can be better prepared. This same data provides a historical view of past fire-prone weather which is very useful to the assessment of future risk. Data from the two sites is provided in Figure 17.

PG663

	Temp	RH	Wind	Direction	Gusts
Min	27.8	6.7	0.0	0.0	0.0
Max	111.5	99.6	16.5	360.0	39.2
Average	65.4	48.0	2.5		5.5
3rd	41.0	15.0	0.0		0.0
97th	93.5	96.5	5.61		12.78
>0	132,632	132,631	126,468		126,821
	Temp 100+	HR < 10	Wind > 10		Gust >25
	917	237	252		103
	0.69%	0.18%	0.20%		0.08%

4/17/2020 Begin
10/29/2022 End
925 days
2.5 Years

132,632 Data points

Greater than	Wind		Gust	
70	-		-	
60	-		-	
50	-		-	
45	-		-	
40	-		-	
30	-		29	0.02%
20	-		473	0.36%
10	252	0.2%	14,064	10.60%
0	132,523	100%	132,632	100%

PG663	Count	Cardinal	Wind Gust (mph) <20	>=20	>30	>40	>50
7.3%	9,733	N	9,721	12	-	-	-
7.7%	10,195	NNE	10,180	15	-	-	-
2.5%	3,300	NE	3,287	13	-	-	-
1.9%	2,512	ENE	2,469	43	3	-	-
1.5%	2,040	E	2,033	7	-	-	-
2.4%	3,234	ESE	3,232	2	-	-	-
5.1%	6,767	SE	6,745	22	2	-	-
8.4%	11,188	SSE	10,967	221	19	-	-
7.7%	10,204	S	10,105	99	5	-	-
6.9%	9,107	SSW	9,087	20	-	-	-
8.4%	11,080	SW	11,071	9	-	-	-
9.9%	13,171	WSW	13,167	4	-	-	-
8.4%	11,096	W	11,096	-	-	-	-
6.8%	8,966	WNW	8,966	-	-	-	-
5.2%	6,912	NW	6,910	2	-	-	-
5.3%	7,068	NNW	7,064	4	-	-	-
4.6%	6,059	Null	6,059				
100.0%	132,632		132,159	473	29	-	-
			99.6%	0.4%	0.0%	0.0%	0.0%

PG357

	Temp	RH	Wind	Gust
Min	28.9	6.6	0	0
Max	109.8	99.9	28.2	48
Avg	64.8	52.0	4.9	8.2
3rd	41	18	0	2
97th	93	99	11	18
>0	130,454	130,452	129,931	130,092
	Temp 100+	HR < 15	Wind > 15	Gust >25
	698	1,627	887	746
	0.54%	1.25%	0.68%	0.57%

5/4/2022 Begin
10/29/2020 End
908 days
2.5 years

130,454 Data points

Greater than	Wind		Gust	
70	-		-	
60	-		-	
50	-		-	
45	-	0.000%	5	0.01%
40	-	0.00%	20	0.02%
30	-	0.0%	227	0.18%
20	103	0.1%	2,486	1.91%
10	7,288	5.6%	39,938	30.60%
0	130,454	100%	130,452	100%

PG357	Count	Cardinal	Wind Gust (mph) <20	>=20	>30	>40	>50
3.9%	5,053	N	4,989	54	3	-	-
3.4%	4,463	NNE	4,419	44	2	-	-
5.0%	6,584	NE	6,555	29	4	-	-
4.6%	5,988	ENE	5,981	7	-	-	-
8.1%	10,614	E	10,607	7	-	-	-
15.1%	19,744	ESE	19,641	103	9	-	-
9.5%	12,454	SE	11,845	609	147	15	-
5.0%	6,470	SSE	6,218	252	41	5	-
6.1%	7,996	S	7,811	185	2	-	-
9.1%	11,858	SSW	11,718	140	-	-	-
8.6%	11,258	SW	11,238	20	2	-	-
6.5%	8,475	WSW	8,468	5	-	-	-
2.8%	3,599	W	3,583	16	-	-	-
5.1%	6,695	WNW	6,404	291	2	-	-
4.3%	5,561	NW	4,947	614	9	-	-
2.5%	3,234	NNW	3,134	100	6	-	-
0.3%	408	Null	408				
100.0%	130,454		127,966	2,486	227	20	-
			98.1%	1.9%	0.2%	0.02%	0.0%

Figure 17 – PGE Sites Weather Data

Data from the PGE sites is more localized and provides a view at a more micro level than the RAWS site. The wind directions, wind speeds, relative humidity, and temperatures are similar and within the overall parameters of the RAWS dataset extremes.

The last two sites are private weather stations that are a part of the CWOP. CWOP runs data checking and analysis on its site to increase the quality of the data. These sites (E8856 and F5459) are located 2.71 miles to the NNW (F5459) and 1.38 miles to the SSE (E8856) of the Project Site boundary. The data from these sites are within the expected values but it should be noted that in these datasets, over 40% of the values are "null" (missing or blank).

These databases, used as a primary source, would be suspect due to the null values, but as an accessory source, utilized to find data outside of the primary site data, they have value. Both sites have data beyond the PGE data windows. F5459 has 175,791 data points over a 3.42-year period (5/19 to 10/22). E8856 has 675,262 datapoints over a 6.6-year period (3/16 to 10/22). Even with the null values, the amount of data present is significant. The data summaries are provided in Figure 18.

F5459

	Temp	RH	Wind	Direction	Gust
Min	29	9	0	0	0
Max	113	100	17	338	42
Average	64	56	1	193	4
3rd	40	23	-	67	
97th	94	95	5	338	
>0	175,690	175,690	101,599	101,055	151,779
	temp 100+	HR < 15	Wind > 10		Gust >25
	1,265	274	300		117
	0.72%	0.16%	0.30%		0.08%

5/28/2019 Begin
10/28/2022 End
1,249.00 Days
3.42 Years

175791 Data points

Greater than	Wind		Gust	
60	-		-	
50	-		-	
45	-		-	
40	-		1	0.0007%
30	-		22	0.014%
20	-	0.00%	441	0.29%
10	300	0.3%	6,284	4.14%
0	101,599	100%	151,779	100%

F5459

	Count	Cardinal	Wind Gust (mph) <20	>=20	>30	>40	>50
0.3%	544	N	544		-	-	-
0.1%	126	NNE	126	-	-	-	-
0.8%	1,371	NE	1,371	-	-	-	-
3.7%	6,485	ENE	6,484	1	-	-	-
4.6%	8,171	E	8,171	-	-	-	-
1.1%	1,925	ESE	1,922	3	-	-	-
3.1%	5,454	SE	5,362	102	4	1	-
10.0%	17,598	SSE	17,230	368	17	-	-
7.0%	12,314	S	12,266	48	1	-	-
2.1%	3,633	SSW	3,628	5	-	-	-
9.2%	16,155	SW	16,150	5	-	-	-
4.4%	7,749	WSW	7,749	-	-	-	-
2.6%	4,633	W	4,632	-	-	-	-
3.0%	5,322	WNW	5,322	-	-	-	-
2.5%	4,435	NW	4,433	2	-	-	-
3.2%	5,674	NNW	5,650	24	-	-	-
42.2%	74,192	Null	74,192	-	-	-	-
100.0%	175,791		175,232	558	22	1	-
			99.7%	0.3%	0.0%	0.0%	0.0%

E8856

	Temp	RH	Wind	Direction	Gust
Min	28	7	0	1	0
Max	115	100	29	359	49
Average	63.1	57.3	2	177	5
3rd	40	19	0	40	0
97th	94	96	8	327	15
>0	675,262	675,262	398,687	94,668	460,038
	Temp 100+	HR < 15	Wind > 10		Gust >25
	5,917	4,478	9,537		2,892
	0.88%	0.66%	2.39%		0.63%

3/7/16Begin
10/28/22End
2426days
6.6years

675,262 Data points

Greater than	Wind		Gust	
60			-	
50	-		-	
45	-		2	0.0003%
40	-		39	0.01%
30	-		963	0.1%
20	335	0.05%	7,143	1.1%
10	9,537	1.4%	79,358	11.8%
0	675,262	100%	675,266	100%

E8856

	Count	Cardinal	Wind Gust (mph) <20	>=20	>30	>40	>50
1.1%	7,108	N	7,016	92	-	-	-
0.8%	5,326	NNE	5,209	117	4	-	-
0.8%	5,342	NE	5,298	44	-	-	-
2.9%	19,751	ENE	19,733	18	4	-	-
3.8%	25,894	E	25,889	5	-	-	-
3.1%	21,269	ESE	20,584	685	104	12	-
5.6%	37,592	SE	33,558	4,034	687	23	-
4.8%	32,304	SSE	29,992	2,312	148	4	-
4.5%	30,207	S	29,763	444	11	-	-
4.5%	30,188	SSW	30,076	112	3	-	-
6.0%	40,398	SW	40,317	81	2	-	-
8.1%	54,597	WSW	54,525	72	-	-	-
5.9%	39,618	W	39,558	60	-	-	-
3.3%	22,364	WNW	21,992	372	-	-	-
2.8%	19,125	NW	18,829	296	-	-	-
1.1%	7,604	NNW	7,581	23	-	-	-
41.0%	276,575	Null	276,575	-	-	-	-
100.0%	675,262		666,495	8,767	963	39	-
			98.7%	1.3%	0.1%	0.0%	0.0%

Figure 18 – CWOP Sites weather data

From a fire modeling perspective, wind (speed and direction), relative humidity, and temperature, (to a lesser degree) are important elements. These output factors are combined for all the weather sites in Figure 19. The maximum values (minimum for RH) are provided along with the values for the 3rd and 99th percentile of the dataset. The RAWS site has the max/min values for all of the datasets. Modeling assumptions have been derived from this data. The maximum wind value is a 64-mph wind gust, the highest temperature was 117 degrees F., the lowest RH was 3%, and the predominant direction is from the N to NE (34.5% of the time) and S to WSW (34.9% of the time).

For this report, the minimum fuel moisture for 1-hr fuels will be 3% based on the RH values shown in Figure 19, as found at the referenced site. Wind assumptions, based on the values in Figure 19, will be modeled at sixteen locations with one or more wind directions from:

SW at 65/50/40/30	ENE at 50
SSW at 65/50	NE at 50
S at 50	N at 50
SSE at 50	WNW at 50
ESE at 50	WSW at 50
E at 50	W at 50

[illegible]	Temp	RH	Wind	Gust		
	22	3	0	0	20.8 years	
Max	117	100	50	64	179,528	Data points
Avg	60.9	61.1	4.3	9	1/1/2002	Begin
3rd	36	16	3	0	10/29/2022	End
99th	101	100	27	27		

[illegible]	Temp	RH	Wind	Gust		
Min	29	9	0	0	3.4 years	
Max	113	100	17	42	175,791	Data points
Average	64	56	1	4	5/28/2019	Begin
3rd	40	23	-		10/28/2022	End
97th	94	95	5			

E8856	Temp	RH	Wind	Gust		
Min	28	7	0	0	6.6 years	
Max	115	100	29	49	675,262	Data points
Average	63.1	57.3	2	5	3/7/2016	Begin
3rd	40	19	0	0	10/28/2022	End
97th	94	96	8	15		

[illegible]	Temp	RH	Wind	Gust		
Min	28.9	6.6	0	0	2.5 years	
Max	109.8	99.9	28.2	48	130,454	Data points
Avg	64.8	52	4.9	8.2	5/4/2020	Begin
3rd	41	18	0	2	10/29/2022	End
97th	93	99	11	18		

[illegible]	Temp	RH	Wind	Gusts		
Min	27.8	6.7	0	0	2.5 years	
Max	111.5	99.6	16.5	39.2	132,632	Data points
Average	65.4	48	2.5	5.5	4/17/2020	Begin
3rd	41	16	0	0	10/29/2022	End
97th	93.5	96.5	5.61	12.78		

Figure 19 -Weather Data Summaries for All locations

Intensity

The intensity of a wildfire is measured in the energy release expected from the flaming front of the fire (active burning). Intensity is greatly affected by topography, weather, and the amount of fuel available to burn. For example, a brush fire in heavy chaparral in a steep canyon can produce a greater wildfire intensity than short grass fuels on flat ground. Wildfire intensity is measured in units of heat transfer per length of the fire edge within the fire modeling community but is more often expressed in terms of flame length for easier understanding in training and discussion with those who fire fight fires and those who must live with the potential of wildland fires.

Fire intensity is the primary wildfire characteristic related to potential fire effects. Typically, the greater the intensity, the greater the loss, but this is not always the case. (USDA Forest Service Gen. Tech. Rep. RMRS-GTR-315. 2013, page 5)

> The factors affecting wildfire intensity include the elements of the fire behavior triangle (fuel, weather, and topography) as well as spread direction (heading, flanking, backing, etc.). At a basic level, wildfire intensity can be assessed for a point, stand, or landscape without consideration of fire spread by assuming that a fire occurs at the given location(s) under specific weather, fuel moisture, and fire spread parameters (heading, flanking, or backing). Typically, this is assessed as

> the near-maximum potential (for example, heading fire under 97th percentile fuel moisture and wind conditions).
>
> There may be a very low probability of a wildfire occurring under these conditions in any particular area, but nevertheless, this level of assessment provides useful information about the potential wildfire behavior that different areas of a landscape are capable of producing. At the landscape scale, this type of wildfire hazard assessment may also be used to identify where on a landscape there is the potential to meet or exceed specific wildfire behavior thresholds, thus aiding the identification and prioritization of management opportunities. (USDA Forest Service Gen. Tech. Rep. RMRS-GTR-315. 2013, pages 7-8)

In order to assess potential intensity, it is necessary to examine the fuels, topography, and configuration in order to accurately assess both the hazard and the risk to the adjacent areas. The topography includes elevation, slope, aspect, and features, such as canyons, valleys, or rivers.

Fuels (wildland and built)

Wildland fuels on and near the Project Site consist mainly of grass, shrubs, and open canopy treed vegetation cover as indicated in Figure 5, on page 11. Figure 20 provides an illustration of the wildland fuels on and near the Project Site. The fuels are classified by number in categories as listed in the legend.

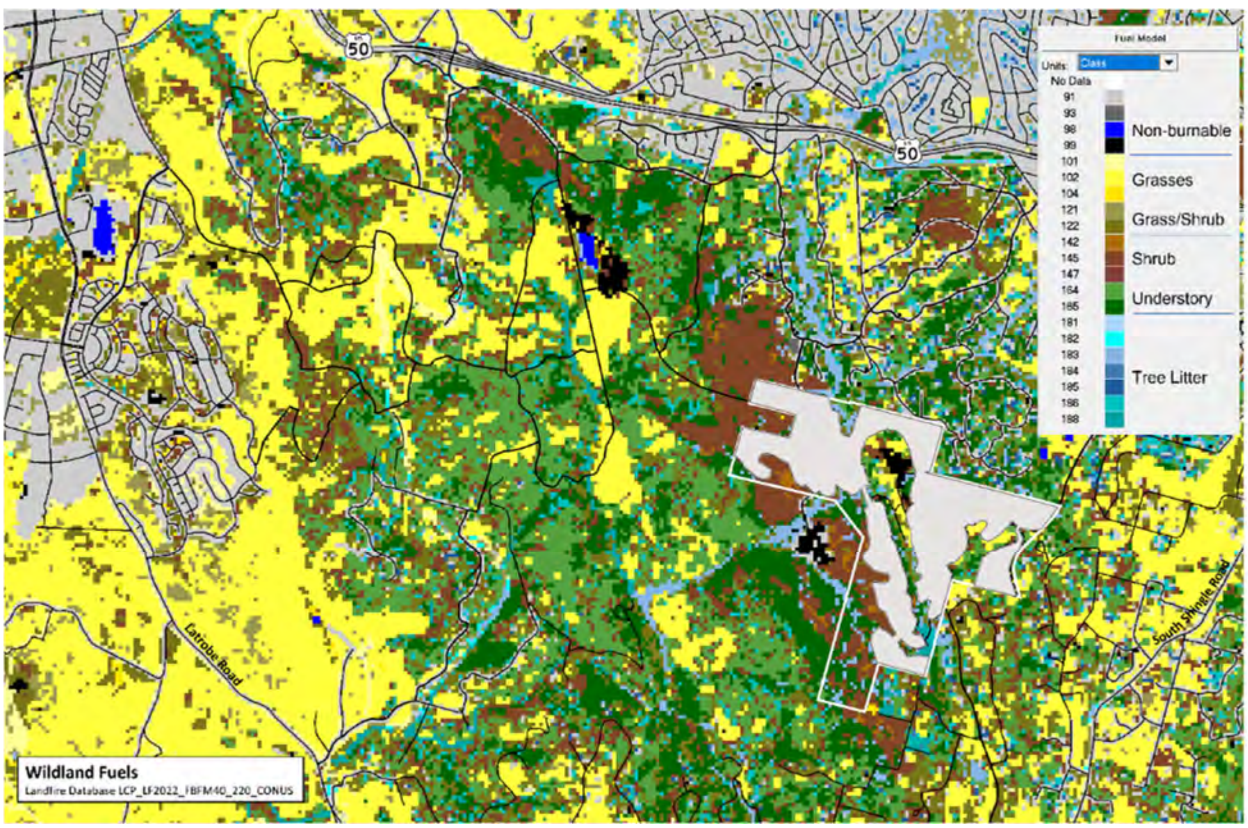

Figure 20 – Wildland Fuels Map

In each category, the amount of fuel is generally greater as the number increases. Grass fuel 101 has less combustible fuel available than grass fuel 102. The 100's are grasses, the 120's are grass/shrub mixtures, the 140's are shrub fuels, the 160's are understory fuels, and the 180's are tree litter fuels. These all apply to surface fuels (within 6' of the ground), as canopy fuels are dealt with separately in other modeling modules. The Project Site (shown here with the Lime Rock development area shaded) is mostly grass and grass/shrub fuels with some areas of shrub-only fuel. Canopy fuels are not predominant. Fuels are assessed in 30-meter grids, with the predominant fuel type within the grid representing the entire grid.

The Lime Rock Project Site consists of a valley approximately one half miles wide (east to west) by one mile long (north to south). Elevations on-site range from approximately 850 to 1,280 feet above mean sea level. Deer Creek flows from north to south through the Project Site and joins Marble Creek southwest of the Lime Rock development area. Vegetation on the site is primarily comprised of five plant communities: annual grassland, oak woodland, white leaf manzanita chaparral, riparian woodland, and ruderal.

Per the Bio Resources report for the Project Site, annual grassland occurs mainly in the eastern half of the Project Site and as understory to the blue oak woodland. The oak woodland community on the site consists of mixed stands of blue oak and canyon live oak, with scattered valley oak and black oaks. The total area of oak canopy on the site is 246.6 acres. The majority of the blue oak woodland is located on the slopes of the eastern half of the property. Here, the canopy density of blue oak varies such that it ranges from closed canopy with a mixed species assemblage in the understory to a savanna like setting where oaks are scattered throughout the annual grassland.

White leaf manzanita chaparral on the site forms a mosaic across most of the west side of the property. This mosaic is composed of an assemblage, mostly comprised of native species, with characteristic shrubs including chamise, white leaf manzanita, coyote brush (*Baccharis pilularis*), buck brush, deerbrush, golden fleece (*Ericameria arborescens*), yerba santa (*Eriodyction californicum*), coffeeberry *(Frangula californica),* toyon (*Heteromeles arbutifolia*), chaparral pea (*Pickeringia montana),* scrub oak (*Quercus berberidifolia),* red bud *(Rhamnus crocea),* and poison oak. Although trees are not a major component of the chaparral they are obvious features of the landscape emerging above the chaparral brush. Canyon live oak occurs frequently throughout this habitat whereas foothill pine only occurs in a few locations. Grasses, forbs, and sub-shrubs are minor components of chaparral habitats and are typically found in openings within the chaparral following fires or formed by road cuts or other disturbances. (Biological Resources Report, Lime Rock Valley Specific Plan, El Dorado County, California, LSA Associates, Inc., Pt. Richmond, California , Project No. GGG1202)

These findings from the biologist report are in concurrence with wildland fuels found in the Landfire database used for the fire modeling in this report. The majority of the future wildland interface will be woodlands with the exception of the remaining chaparral areas to the west of the Project Site in an undeveloped parcel (within the Lime Rock development area). The bio report validates the Landfire data at a macro level.

Photos of site wildland fuels are provided on the following pages in Photo 1 through Photo 4. In Appendix A, site photos for all areas are provided.

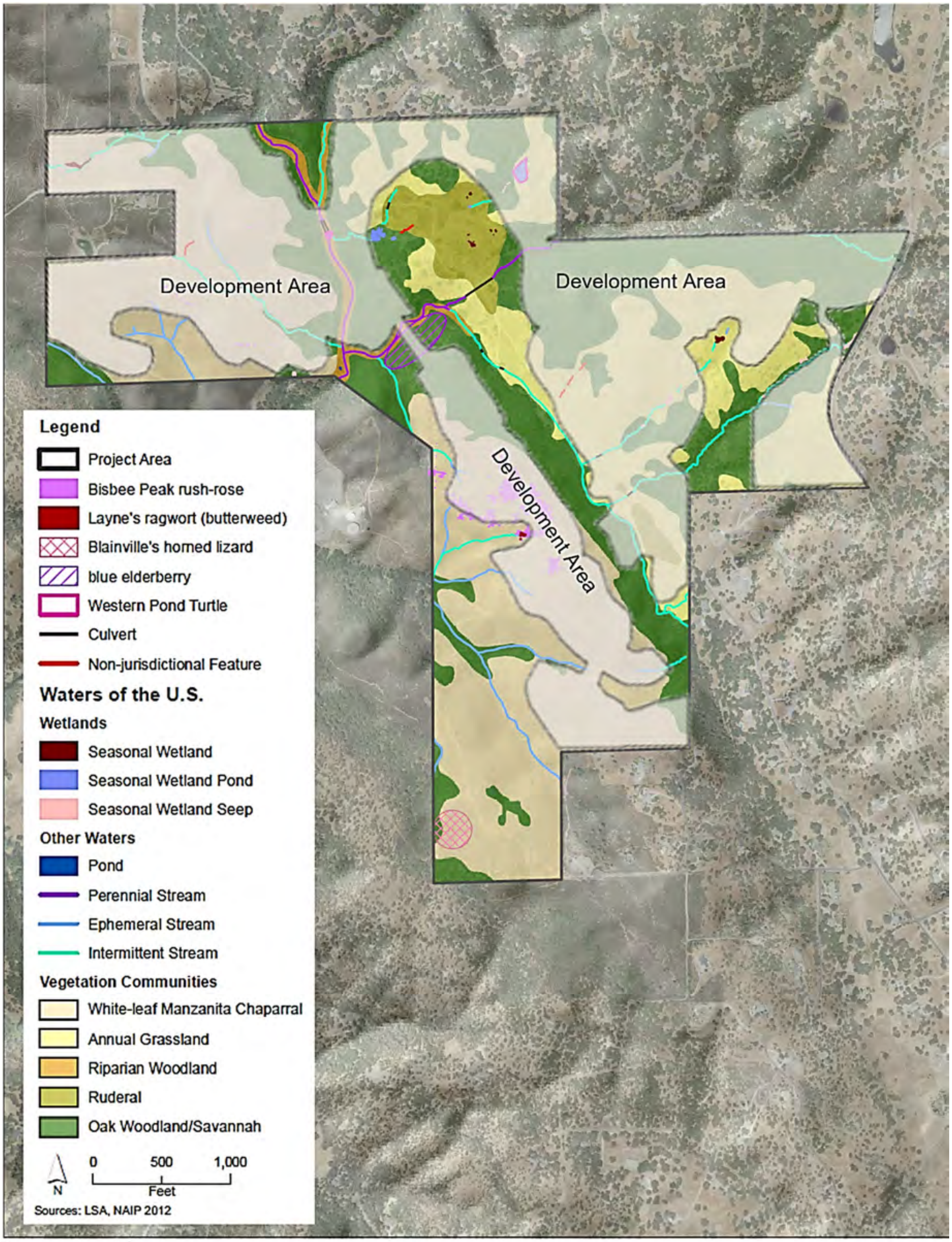

Figure 21 – Vegetation Communities with Development Overlay

Photo 1 -Chaparral Fuels

Photo 2 – Open Canopy Understory Fuels

Photo 3 – Grassland Fuels

Photo 4 – Wildland Tree Litter Fuels

Slope

Slope can influence how a fire will move up or down hills. A fire that ignites at the bottom of a steep slope will spread much more quickly upwards because it can pre-heat the upcoming fuels with rising hot air. The upward drafts are more likely to create spot-fire conditions. In the absence of winds, fires usually move faster uphill than downhill, so the steeper the slope, the faster a fire moves. Wind can overpower the slope factor, but generally, steeper slopes result in more extreme fire behavior. If the slope is below a site, it will have a more significant impact on the site than if the slope is moving up and away from the site.

Slope can be measured in degrees or percentages. A 45-degree angle is a 100% slope because it rises one foot for each linear foot of the slope. Figure 22 provides an illustration of the slopes around the Project Site prior to grading. The slope percentages shown in the graphic are averaged for the 30-meter grid that is displayed for that area. In the graphic one of the possible configurations is provided for reference. The slopes within the development area will be changed during the grading process and, for the most part, will be reduced in steepness or averaged over a larger area. For the purposes of this report, the portions of land in the native interfaces where the wildland fires could be burning are the "area of interest" as they will not be modified and will retain the native fuels.

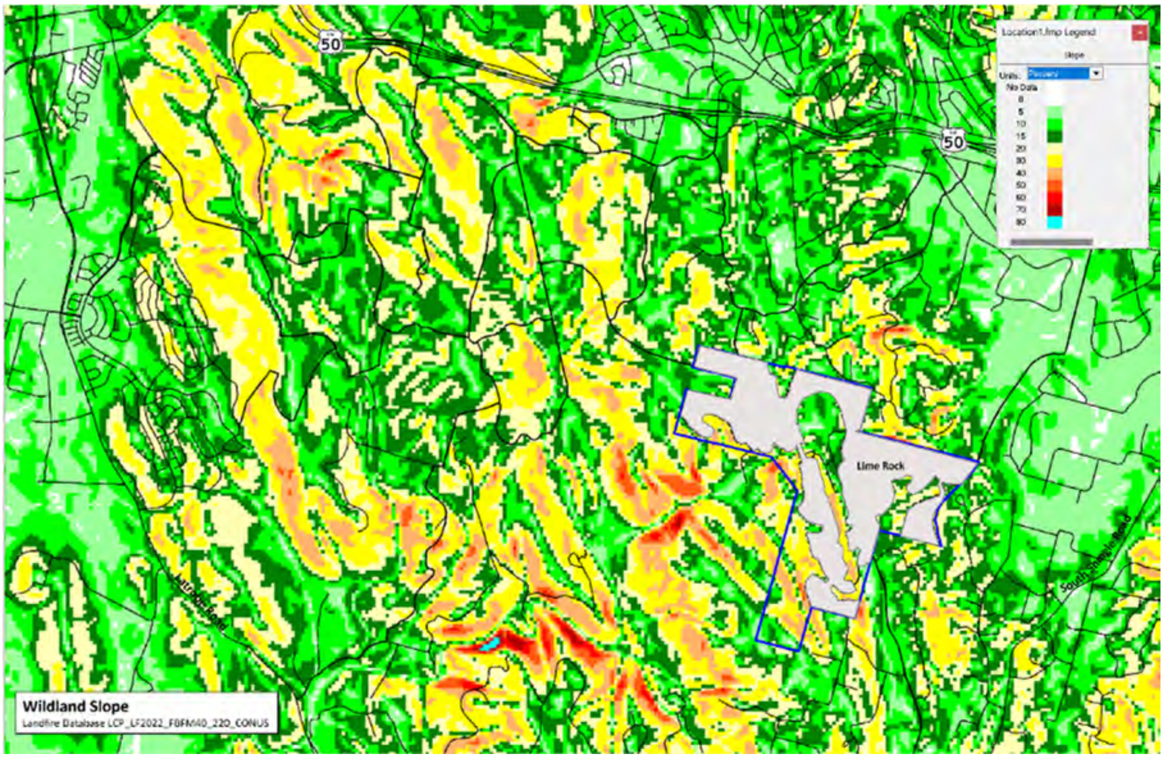

Figure 22 – Slope Map

When averaged over the 30-meter grids, there are no areas with slopes over 50 percent in the interface areas of the Project Site. Manufactured slopes within the development area may be 50 percent or greater in some cases, but they would be in the "managed area" of the development and not in the native areas at the interface. All slopes within the development area which are within 100 feet of a structure will be maintained in accordance with the applicable defensible space standards as required by the California Public Resources Code 4291 by the AHJ.

Aspect and Elevation

Aspect is the compass direction the slope faces. Elevation and aspect can determine how hot and dry a given area will be. Aspect, in particular, often dictates the amount of direct sunlight that wildland fuels will receive in areas where slopes are steep enough to cast shadows. South aspects tend to get more sun than any other aspect, and north aspects, if the slope is significant enough, can be sheltered from the sun's heat and drying effects. This is why, under the right conditions, fuel loading on the northern aspects of some drainages tend to have more fuel. An example from the Project Site is provided in Figure 23.

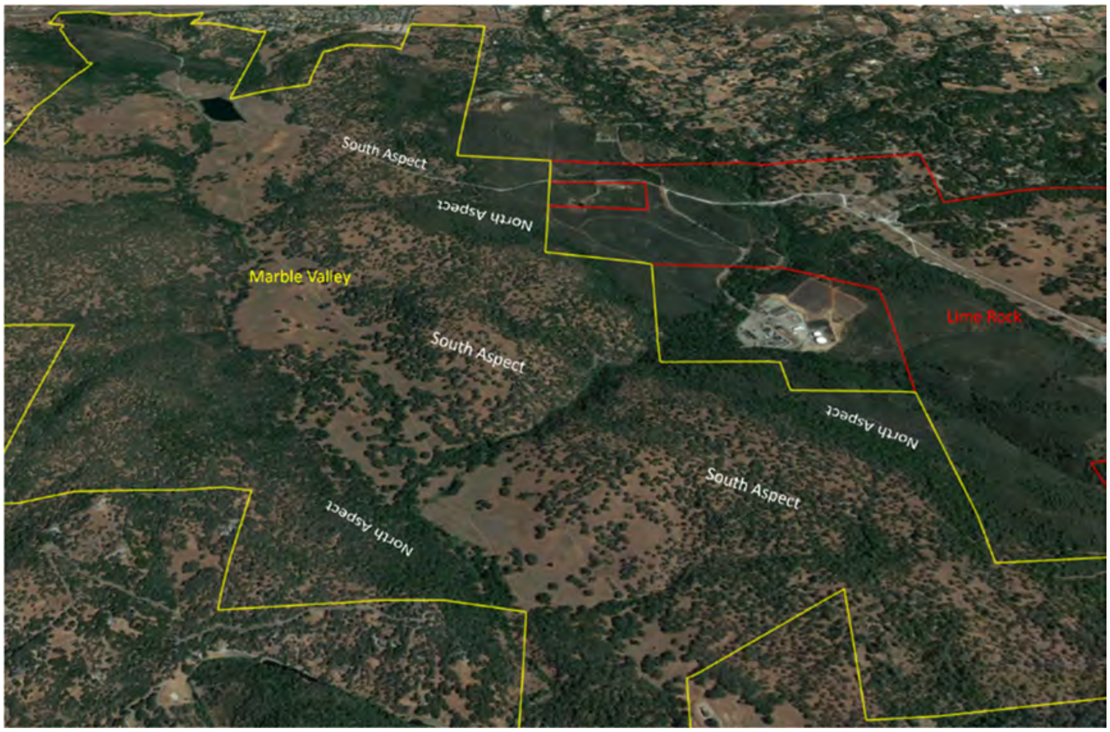

Figure 23 – Aspect Example

The National Wildfire Coordinating Group (NWCG) speaks to the issue of south-facing slopes in the S190 (Introduction to Wildland Fire Behavior) training materials. It states, "In the Northern Hemisphere, the slopes facing south receive direct sun rays and become hotter than the slopes facing any other direction. The higher temperature on the southern exposures results in lower humidity, rapid loss of fuel and soil moisture, and drier, lighter, flashy fuels such as grass. All of these things add together to make southern slopes more susceptible to fires than northern slopes." This statement about northern/southern slopes does not apply to wind-driven fires, only slope and fuel-driven fires. When winds are from the N or NE and align with the heavier fuels on the north slopes, the possibility of extreme wildland fire behavior is increased exponentially. (*S190 - Introduction to Wildland Fire Behavior, Module 2: Principles of Wildland Fire Behavior, Topic 2: Topography, Aspect, p3,* https://training.nwcg.gov/classes/S190/508Files/071231_s190_m2_508.pdf)

The Aspect Map (Figure 24) provides an illustration of how the topography will interact with the Project Site. The Project Site development area is provided in gray for reference. With the Marble Valley running from north-northwest to south-southeast, the interface aspect is varied and complex. The Elevation Map (Figure 25) indicates how the site rises to the north/east.

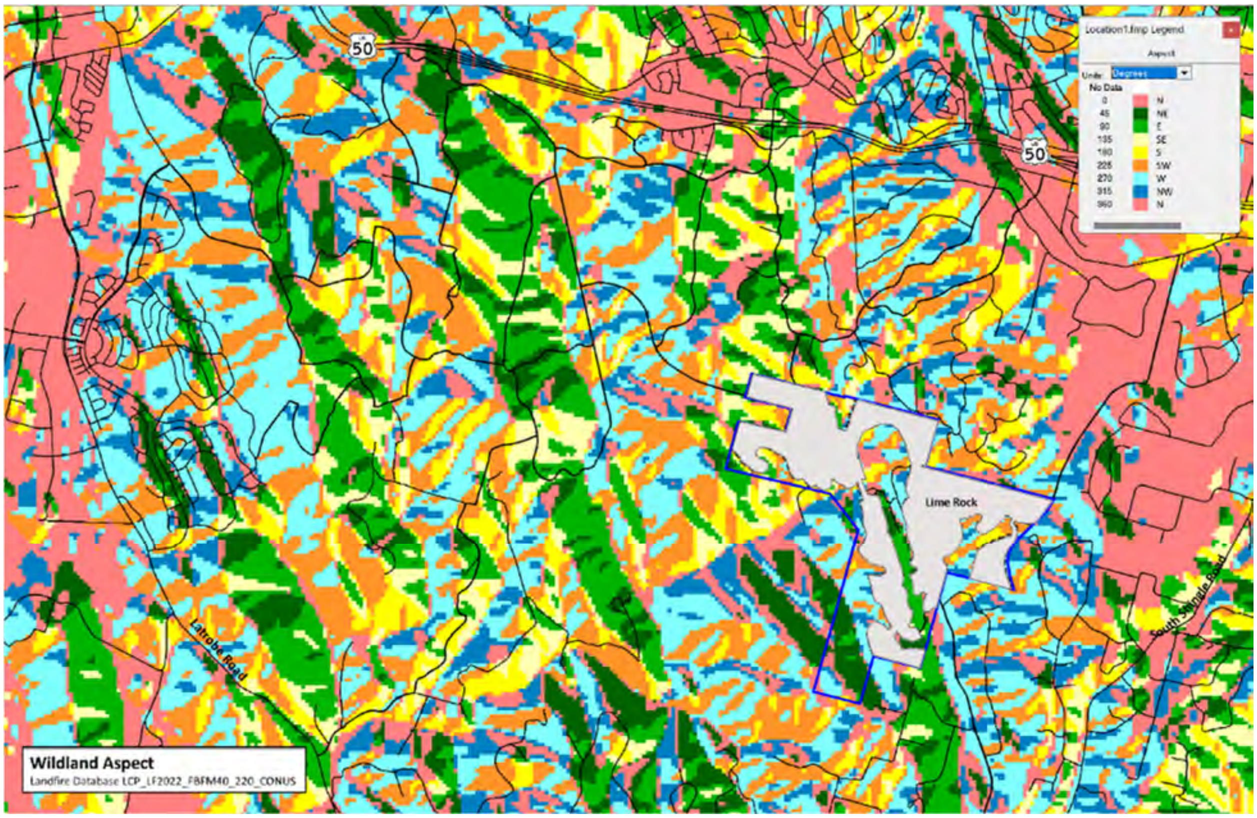

Figure 24 – Aspect Map

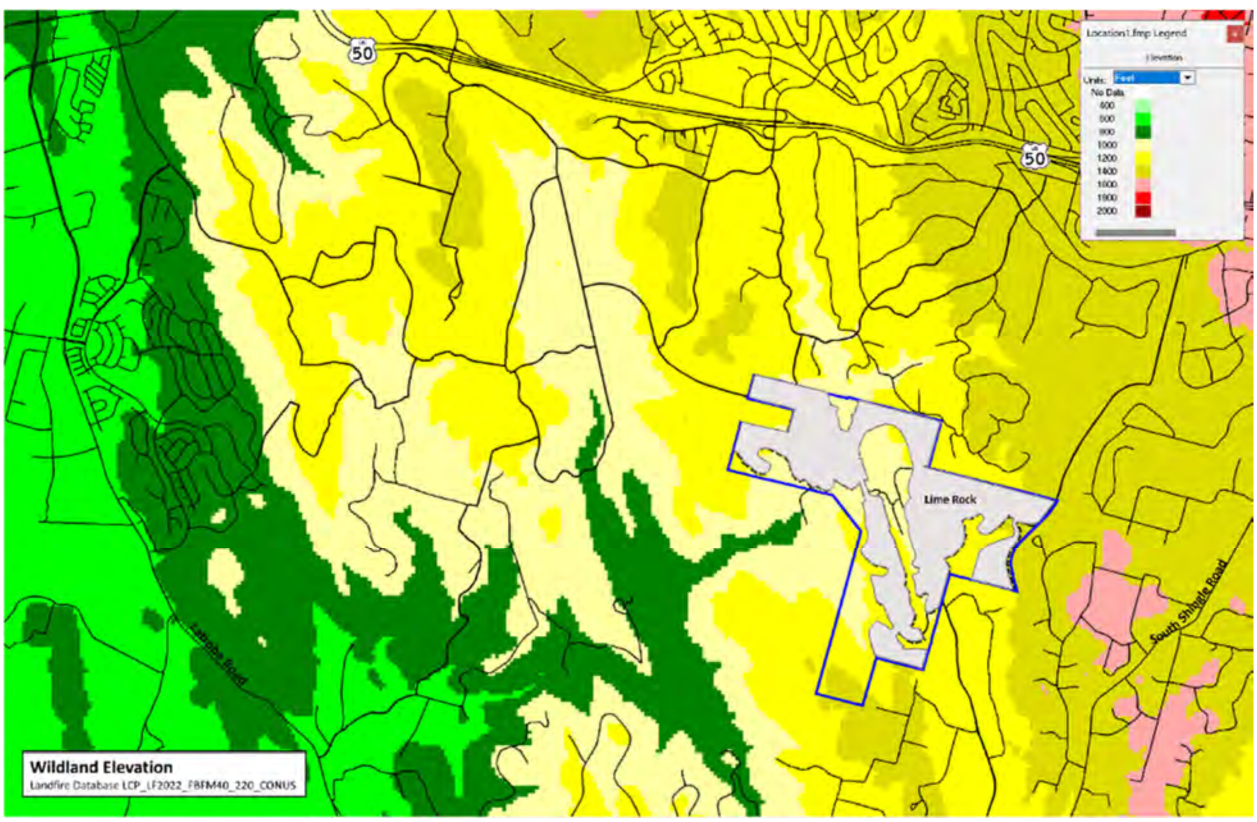

Figure 25 – Elevation Map

Weather

The data from the previously discussed data sites provide the needed assumptions for fire modeling. In addition to the what (data), it is important to understand the why. For the Project Site, the wind has the largest impact on the amount of risk that can be expected from wildland fires. The topography, fuels, and configurations of the interface between the Project Site and the remaining native vegetation are relatively stable (changes are mostly over longer timeframes), whereas weather changes rapidly and often throughout the day, week, months, and seasons.

In the Project Site area, the wind tends to have a large impact on the temperature, relative humidity, fuel moisture, and direction of fire travel. When it comes to wildland fire behavior impacts, winds for the Project Site are driven primarily by two conditions, diurnal flow, and high-pressure areas.

Air moves from high-pressure areas to low-pressure areas. The bigger the difference between the pressures, the faster the air will move from the high to the low pressure. That rush of air is wind. Diurnal flow is created when the land mass heats up (mountains and deserts particularly), creating a low-pressure area (rising air). Cooler air from over the ocean or in the valleys flows to fill these low-pressure areas. To some degree, this occurs every day. Solar heating causes daytime slope/valley winds, and when the night comes, the flow reverses once the air over the ocean/valley is warmer than the air over the mountains. This is depicted in Figure 26 and Figure 27.

Winds caused by high-pressure areas can be extreme, depending on the pressure difference and the topography through which the air flows. Weather fronts and large high-pressure domes can override normal air flow. These winds have various names at different locations around California (as shown in Figure 28). One such event is a high-pressure area to the north/east of the Project Site (often called a high-pressure dome) which sets up air flow from the interior moving toward a low pressure over the ocean. This creates the Diablo and Mono wind events that occur regularly in the central part of California but more often in the fall. Figure 29, on page 38, illustrates how the flow might occur when the high pressure is east and north of the Project Site.

Figure 26 – Valley Winds Flow

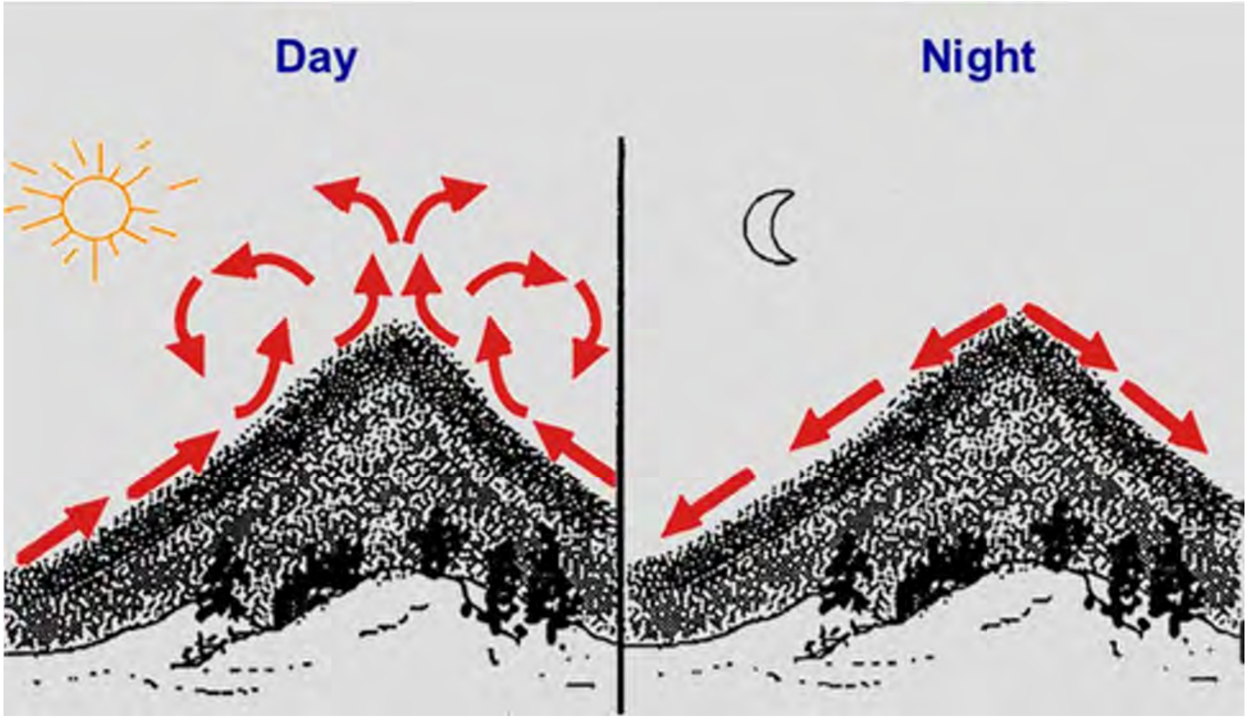

Figure 27 – Slope Winds

Very often, the high pressure moves down the east side of the Sierra Nevada Mountain range. While moving from the north to the south across the high desert area it creates a pressure difference between the sinking dry/cold air in the high-pressure area and the warm rising air over the ocean. The intensity of the wind event is driven by the pressure difference between the high- and low-pressure areas.

Diablo winds tend to warm as they travel across the dry areas to the east (sometimes hot areas). The moisture in the air (RH) can be further reduced by this arid region. The winds are channeled by the topography, and in some cases, the wind speeds are significantly increased by this process. This results in high winds which are hot, dry, and sustained.

At the Project Site, Diablo winds will normally come from the N, NNE, or NE due to the way the air flows through the mountain passes to the north and east of the Project Site.

Most extreme fire behavior in the area around the Project Site occurs during a Diablo wind event. These events dissipate when the high-pressure area moves off to the east or south.

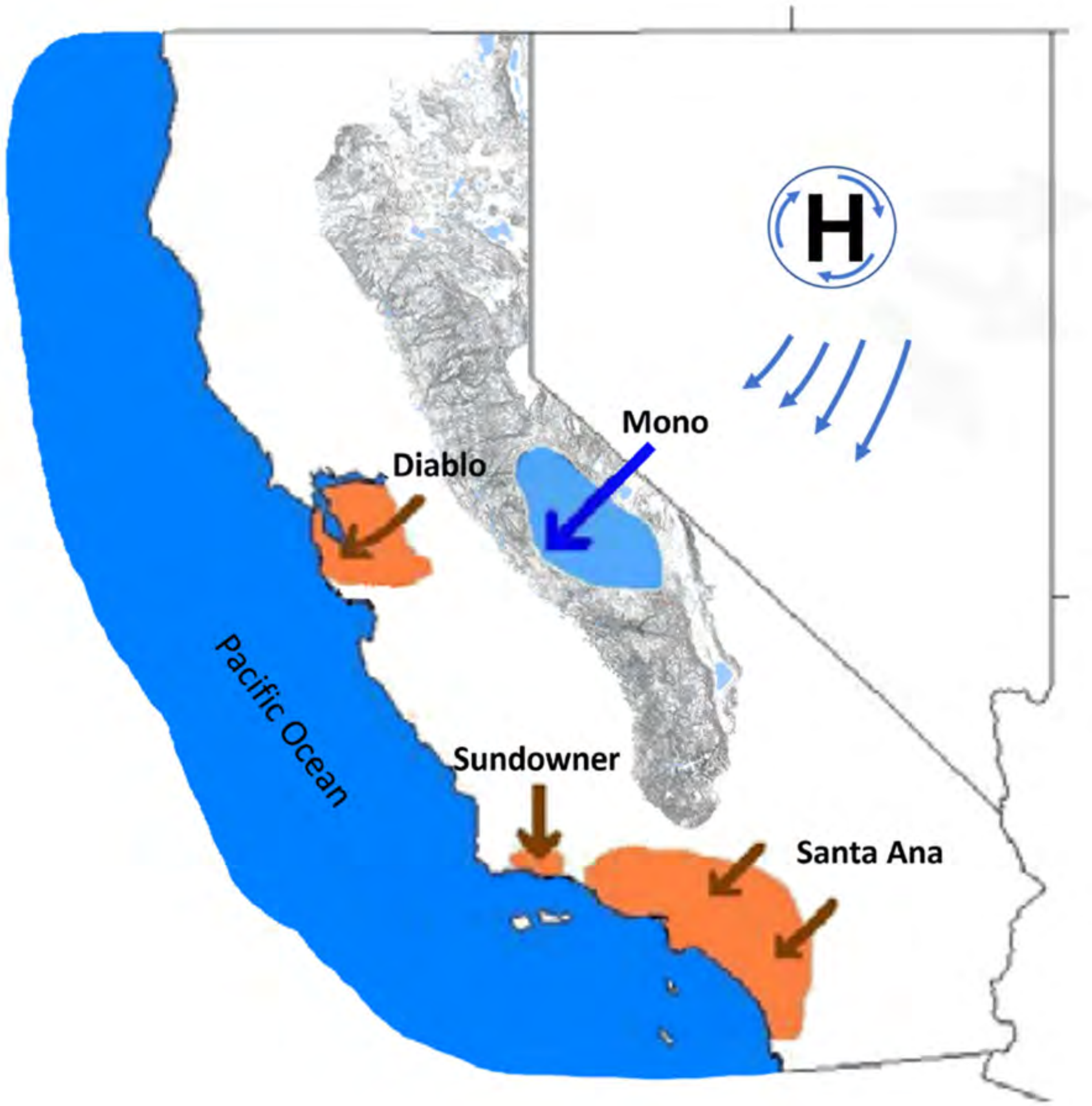

Figure 28 – Foehn Winds in California

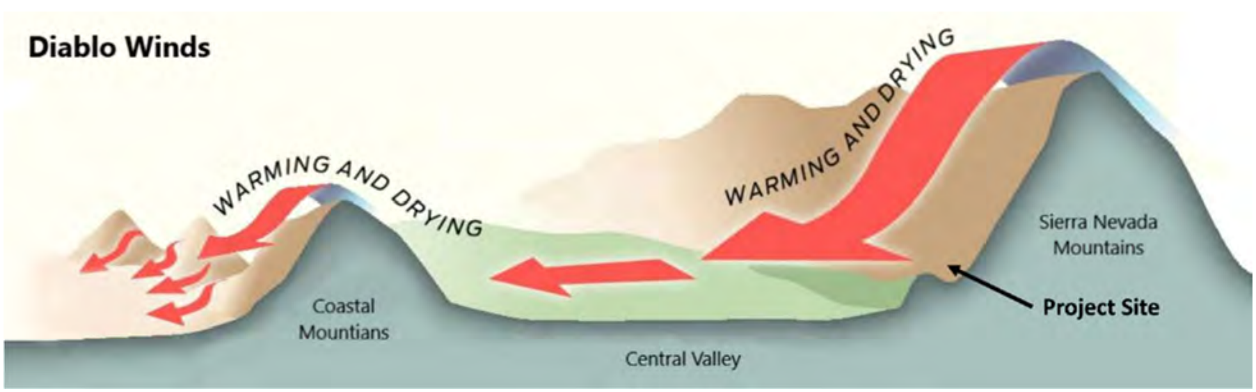

Figure 29 – Diablo Wind Event

Historical

California has a history of extreme fire conditions which are often accompanied by winds from the north and east. These winds are the main cause of large fires developing resulting in the loss of structures and lives in California.

In a research paper published in 2018, entitled “A Surface Observation Based Climatology of Diablo-Like Winds in California’s Wine Country and Western Sierra Nevada” the researchers found that Diablo winds occurs not only in the San Francisco Bay area but also in the western Sierra Nevada mountains.

> *During the October 2017 Northern California Firestorm, Diablo winds were thrust to the forefront of the public consciousness and the broader wildfire meteorology community as a meteorological phenomenon, about which little is known. Our analysis showed that conditions similar to Diablo winds tend to occur at night or in the early morning and are most common during the cool season (late fall through spring). However, our analysis is somewhat constrained by the binary nature of our criteria, and we did not consider the eastern San Francisco Bay Area nor the San Francisco Peninsula. Further research is required to address many issues posed by the sparse RAWS network used in this study, including the production and analysis of a long-term, high resolution downscaled numerical climatology. Of the total number of Diablo-like wind conditions, identified on a daily basis per area, 35% occurred north of the San Francisco Bay area only, 41% occurred in the western Sierra Nevada only, and 23% occurred in both areas. Thus, conditions similar to Diablo winds appear to be just as common in the Sierra Nevada as they are in the area north of the San Francisco Bay Area.*
>
> *This implies that they are a regional wind system of Northern California and not a local phenomenon of the San Francisco Bay Area. This indicates that wildfire fighting resources may be required throughout Northern California, including the western Sierra Nevada, when conditions similar to Diablo winds are forecast. Since historical usage of the term Diablo winds was initially confined to the Oakland Hills, it might be more appropriate to refer to Diablo-like wind conditions in the Sierra Nevada as “Diablos del Sierra” or “Bruja” winds. Associated numerical weather simulations (not shown) strongly suggest the downstream linking of mountain wave breaking over the Sierra Nevada to Diablo wind conditions north of the San Francisco Bay Area.* ***We hypothesize that this mechanism drives Diablo-like wind conditions in both areas and that vertical profiles of wind speed and stability, east of the Sierra Nevada, play a primary role in determining the altitude at which the Sierra downslope jet is lofted off the surface and control of the characteristics of Diablo winds in the San Francisco Bay Area.*** (Smith C, Hatchett BJ, Kaplan M. A Surface Observation Based Climatology of Diablo-Like Winds in California’s Wine Country and Western Sierra Nevada. Fire. 2018; 1(2):25. https://doi.org/10.3390/fire1020025)

The weather data around the Project Site does not show significant wind events but it does show pronounced N to NE flow which is likely in these events.

Expected Fire Activity Based on History

Based on the location of the Project Site adjacent to the State Route 50 freeway (source of many fire ignitions) and the proximity of the historic fire corridor to the south and west, coupled with the probability of wind events in the area during times of low moisture (fuel and air), it must be assumed that some fire behavior is going to occur near the Project Site in the near future and continue.

A review of the fire history within 10 miles of the Project Site reveals limited large wildland fire activity in the immediate area around the Project Site. (Figure 30). There is no record of a fire greater than 50 acres on the Project Site within the past 22 years. The nearest fire, over 50 acres, is on the west side of Latrobe Road, approximately 1.5 miles to the west of the project boundary. The increase in fire resources over the past 22 years, coupled with fuels management by CalFire has reduced the frequency of large fires in the general area of the Project Site. Fires can and will continue to occur in the general area due to the nature of the native fuels, but, at least in the past two decades, efforts to minimize these fires have been successful in this area.

To the east of the Project Site (approximately 17 miles) is the location of the Caldor Fire 2021, which started on August 14th and contained on Oct 21st consuming over 220,000 acres or 347 square miles. This fire destroyed 1,003 structures and damaged 81 more. The Caldor Fire started at an elevation of approximately 3,200 feet and burned up to and over the Sierra Nevada divide on down into the Tahoe Basin (Figure 31). This fire was driven by wind, topography and fuel all being in alignment for more of the large runs that the fire made. The conditions that created this level of extreme fire behavior simply do not exist on or near the Project Site. The Project Site is mostly Oak Woodland, whereas the area consumed in the Caldor Fire is mostly Conifer Woodlands. Fire behavior in these two types of woodland is significantly different. The 2021 Caldor Fire (CA-ENF-023040) Burned Area Emergency Response (BAER), Assessment Report Summary, by the Eldorado National Forest and Lake Tahoe Basin Mgt Unit, Pacific Southwest Region, USDA Forest Service, dated October 2021, states:

> *These dominant vegetation communities are found within the fire perimeter areas: alpine dwarf-shrub, annual non-native grassland, blue-oak/foothill pine, chamise/redshank chaparral, Jeffery pine, lodgepole pine, mixed chaparral, montane chaparral, montane hardwood/ conifer, perennial grassland, ponderosa pine, red fir, Sierran mixed conifer, subalpine conifer, wet meadow, and white fir.*

The Project Site interface has chaparral fuel areas and once ignited, these fuels will likely burn with great intensity and be difficult to stop. Without historic fire frequency, this chaparral is highly dense and will have a significant dead component as there has been no fire to reduce this load in the recorded large fire database history. Oak Woodlands, on the other hand, do not tend to have the same level of buildup (dead component) resulting in less intense fire behavior. The grass understory of the oaks would have approximately one ton of total fuel load per acre where the chaparral fuels would range from 8 to 15 tons per acre. Large areas of understory shrubs have not been found on the Project Site or surrounding areas nor evidence that it has occurred in the past (dead and downed materials).

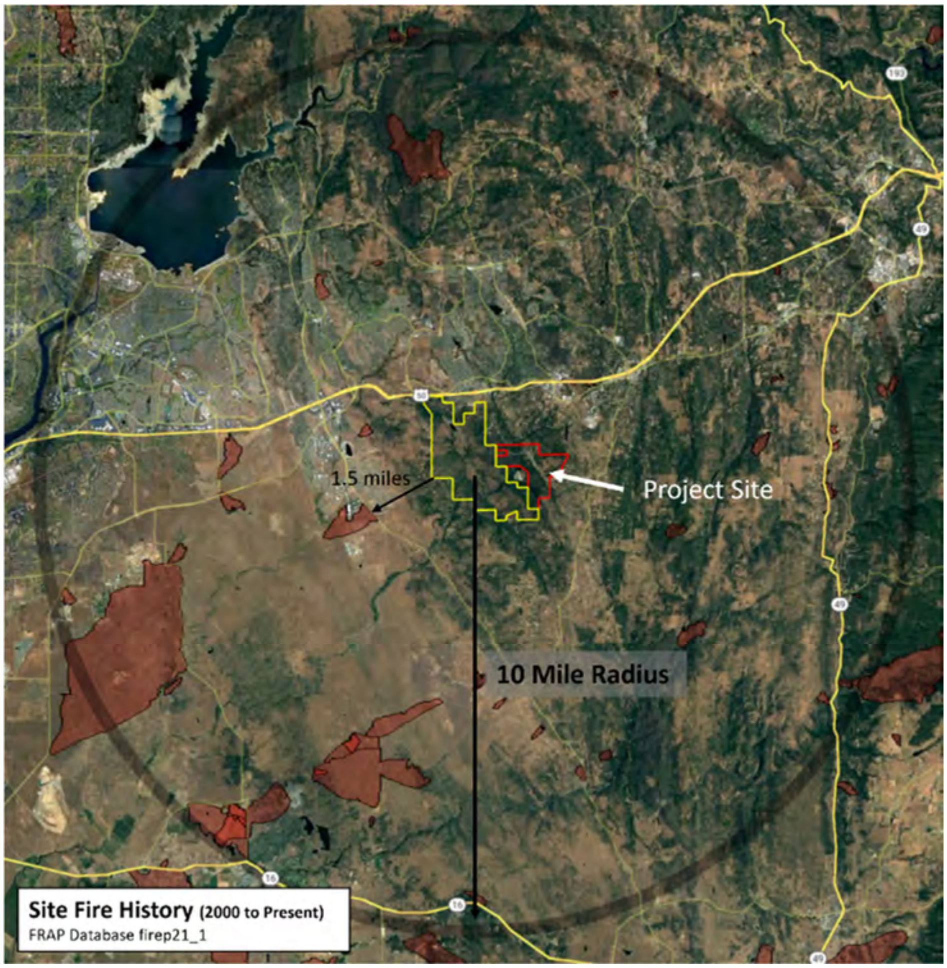

Figure 30 – Recent Fire History

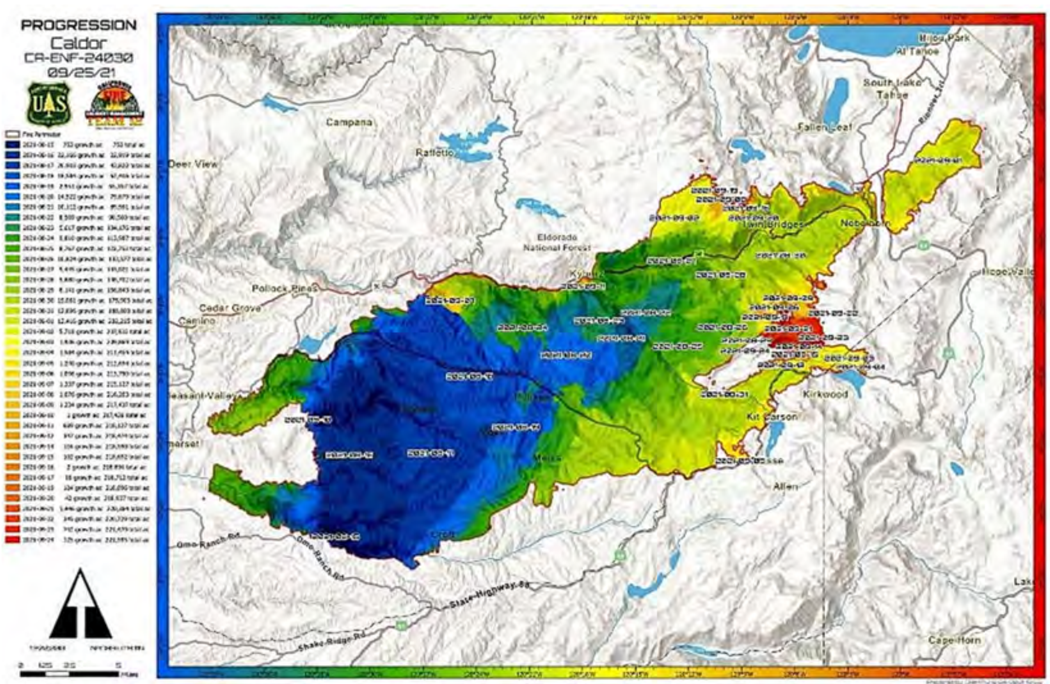

Figure 31 – Caldor Fire Progression Map

Wildfire Risk

The assessment of Wildfire Risk is to examine the hazards in terms of the vulnerability of the assets at risk, the amount of exposure those assets have, and the susceptibility of the assets to wildfire.

Vulnerability

Vulnerability must be examined at multiple levels (Regional, Landscape, Community, and Parcel). At the end of the day, it all comes down to time, distance, and shielding. The amount of time that the fire will impact the area, the distance between the fire and the structures/residents, and the ability of the Project Site to shield its structures/residents from the harmful effects of the fire.

In terms of regional vulnerability, state-wide studies such as the Caltrans Climate Change Vulnerability Assessment Statewide Summary Report 2021 provide a good overview of how different regions of the state of California are expected to be impacted by various climate change issues.

> CalTrans completed a statewide Caltrans Climate Change Vulnerability Assessment for the entire State Highway System in 2019. This study involved applying climate data to refine the agency's understanding of potential climate impacts to the State Highway System, and Caltrans coordinated with various state and federal agencies and academic institutions to obtain the best available climate data for California. Discussions with professionals from various engineering disciplines helped identify how changing climate hazards may affect highways, including their design. The assessment allowed Caltrans to begin to understand how climate change may affect the highway and identified a subset of State Highway System assets on which to focus future efforts. (https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/office-of-smart-mobility-and-climate-change/caltrans-climate-change-vulnerability-assessment-statewide-summary-feb2021-a11y.pdf)

Table 1 (Figure 32 in this report) summarizes the lengths of the State Highway System that passes through the medium to very-high wildfire exposure areas. The Project Site is located in District 3 which is expected to see a 0% increase (none) in the number of State Highway System miles that pass through the medium to very high wildfire exposure areas.

At the Parcel level, the issue of vulnerability is more specific to the actual structure, the amount of defensible space, and the degree of "hardening" of the structure. The current building code standards for structures in the Fire Hazard Severity Zones create the ability for the structure to be more survivable during a fire in the interface. This issue has been studied, and the findings support this view.

The CalFire DSpace (Defensible Space) and DINS (Damage Inspection) Program Analysis program completed an assessment to analyze the effectiveness of Chapter 7A building codes, where they performed a spatial analysis that compared the location of damaged/destroyed commercial and residential structures for the seven largest fires that occurred in 2017 and 2018 (Atlas, Camp, Carr, Nuns, Thomas, Tubbs, and Woolsey) to a 2018 statewide parcel layer. Parcel data, maintained by counties primarily for location and tax purposes, is the most authoritative dataset for information regarding the value and year built of structures in each area.

Table 1: Centerline Miles of Highway Exposed by Year

District	Year 2025	2055	2085	
1	585	702	784	34.0%
2	1519	1534	1544	1.6%
3	743	743	743	0.0%
4	377	546	631	67.4%
5	761	837	875	15.0%
6	638	630	638	0.0%
7	442	451	461	4.3%
8	483	556	655	35.6%
9	296	333	349	17.9%
10	781	786	786	0.6%
11	371	378	423	14.0%
12	71	72	72	1.4%
Total	**7068**	**7567**	**7961**	12.6%

CALTRANS CLIMATE CHANGE VULNERABILITY ASSESSMENT STATEWIDE SUMMARY REPORT 2021

Figure 32 – CalTrans Climate Change Vulnerability Assessment Wildfire 2021

This research demonstrates the power of geospatial information to inform research-based decisions. The study demonstrated that structures built to pre-Chapter 7A building codes were more likely to be destroyed in the seven largest fires on record between 2017 and 2018 (Atlas, Camp, Carr, Nuns, Thomas, Tubbs, and Woolsey). The results also demonstrate that residential structures built in High and Very High Fire Hazard Severity Zones (FHSZ) were less likely to be destroyed by wildfire than those built in Low FHSZ and Urban classifications.

Using over 1,000 pre-fire home inspections, we were able to use real-world data to analyze what factors were most strongly associated with residential structure loss in the Camp Fire. Our findings indicate that wooden roofs, single-pane windows, wooden decks/patios, combustible exterior siding, and a combustible fence attached to a structure are the attributes that are most likely to increase the odds of loss for a residential structure. Structures with double pane windows and patio/carport covers, decks, and exterior siding made of non-combustible materials had a significantly lower chance of structure loss. (CAL FIRE Defensible Space and Damage Inspection Program Data Analysis, August 27, 2019, Steven R. Hawks, William L. Brewer) Compliance with fire resistance construction standards is enforced through defensible space inspections and AB38 inspections.

Between the Regional level and Parcel level are the Landscape and Community levels. The Landscape level is about the vegetation surrounding the development. The U.S. Fire Administration defines this level as:

> *Wildland landscapes are the dense natural areas that surround the community. These large natural areas can be made up of thousands or even millions of acres. They contain diverse natural fuel types, have undergone various levels of*

> *development or management, and are under the oversight of state, federal, tribes, cities or other agencies and organizations.*
>
> *These landscapes require the highest level of collaborative management and partnership. Local fire resources can actively work with the larger land management partners in establishing forest management discussions, project prioritization, strategic planning and implementation efforts.* (U.S. *Fire Administration, Wildfire, Healthy Landscapes, https://www.usfa.fema.gov/wui/healthy-landscapes/)*

At the Community level are the issues of placement on the topography, fuel modification/ defensible space zones, roadside clearance, allowable plant palette, and infrastructure (roads, water, design).

Vulnerability is further divided into Exposure and Susceptibility for the purpose of analysis in the case of wildland fires.

Exposure

Exposure is the result of Likelihood and Intensity combining or occurring simultaneously. A community or structure can be directly exposed to wildfire from adjacent wildland vegetation (direct flame contact, radiated heat exposure, or convected heat exposure), or indirectly exposed to wildfire from embers and home-to-home ignition.

The Project Site will have structures that are constructed in accordance with the current codes (at the time of construction) with respect to wildland fire safety. This means that they will be "hardened", they will have defensible space designed into the configuration, they will be protected with automatic fire sprinklers per NFPA standards, and the entire Project Site will have fuel modification/defensible space zones in accordance with the development requirement of the Fire Department (up to 100' minimum distance). Direct exposure to a wildland fire is extremely unlikely, given the requirements applied to this development. Indirect (embers and brands) are likely to occur during a fire in the adjacent wildland. Requirements in the California Building Code Chapter 7A and in the California Residential Code Section R337 provide for ember protection through requirements on vents, gutters, roof valleys, decks, exterior siding, eave protection and several other areas where fire embers might be an issue if they were to land or collect. Leaf guards on gutter is one example of such protection requirements.

The issue of home-to-home ignition is addressed by several risk reduction measures which include: the automatic fire sprinkler systems which are designed to hold the fire to the room of origin, the increased fire resistance nature of the exterior of the structures, the use of double-pane windows with one pane being required to be tempered glass and requirement of Chapter 49 of the Fire Code, and the Public Resources Code Section 4291 which provides for the requirements of the "home ignition zone" to reduce the possibility of structure ignition or fire movement between structures.

The CalFire DSpace and DINS Program Analysis program concluded that "… *a higher proportion of parcels built pre-Chapter 7A contained a destroyed structure and a greater proportion of parcels with no damaged or destroyed contained a structure built post 2009*". It also concluded that, "… *results also demonstrate that residential structures built in High and Very High Fire Hazard Severity Zones (FHSZ) were less likely to be destroyed by wildfire than those built in Low*

FHSZ and Urban classifications" which provides some data on the improved outcomes in the zones where construction features are required to be increased for direct and indirect wildland fire impacts.

Susceptibility

The Lime Rock project has been designed in a manner that provides efficient protection from wildfires. Perimeter structures must be protected from radiant heat, direct flame contact, and convected heat to a higher degree than the structures which are in the interior of the development envelope. This protection is achieved through distance, shielding, and limiting the amount of fuel near the structures. This shielding of interior structures equates to decreased risk potential.

While the current project configuration is not an Intermix condition (as described on page 15), the convoluted interface will increase the complexity of the fire behavior closer to the development area but using a "system's approach" by having fuel modification/defensible space zones interconnected and designed as a whole provide for a significant barrier to fire encroachment into the development areas. The use of defensible space, structure hardening, wildland fuel elimination and modification and placement of the structure on the topography to avoid problematic conditions such as saddles, chimneys, ridgeline wind acceleration, and problematic wildland fuels, creates an overall protection system that is multifaceted and provided for synergistic protections as well as some level of extra protection. These factors are examined in the Fire Safe Plan and addressed in the plan review process for the tract/parcel map. For example, keeping the flaming front of the fire at a distance that will reduce radiant heat issues, but still providing tempered glass in the double-paned windows creates this type of extra protection.

Climatic Conditions

Increasing Temperatures: While temperature increases are likely, according to most of the published materials on climate change in California, the Project Site is not likely to be impacted by this change in terms of wildland fire behavior. The USGS report cited earlier stated, "*Higher temperatures during or in the months prior to Santa Ana Wind events were generally not associated with the area burned.*" The same is thought to be true for Diablo Winds. Higher temperatures may well increase the curing rate (rate at which the seasonal growth loses moisture and becomes a dead fuel) of seasonal grasses and increase the decline in fuel moisture during the dry periods, but the wildland fuels which are adjacent to and within the Project Site are relatively drought tolerant. Where they not, they would have already succumbed to the current drought cycles in the region. The temperature is certainly important on an incident-level analysis, but this assessment is considering the worst-case scenario and has already assumed that this has occurred. (https://www.usgs.gov/news/research-spotlight-ignitions-and-wind-speed-are-strongest-drivers-area-burned-santa-ana-wind).

Shifting Wind Patterns: The Diablo/Mono winds will continue to shape wildfire activity across the impacted areas in California. While Fire Weather and Fire Behavior Modelers continue working to determine how these wind events will be impacted by climate change, this analysis has already taken the worst-case wind into account from the current data available.

Precipitation: The amount of rainfall and when it occurs have an extreme impact on fire conditions every year. Drought-impacted fuels are also more susceptible to wildfire. Grasslands in particular have a "boom/bust" growth cycle. Low growth in the dry years and high growth in the wet years.

The Project Site will be resilient to wildfire even in the high grassland fuel level years. Wildland fuels in this analysis have assumed an extremely low level of moisture in both the dead and live fuels to account for this aspect of climate change. Changing patterns of rainfall will impact plant growth, thereby altering the amount of fuel for fires.

Changes in Wildland Fuels: After a fire, the lack of precipitation will have an effect on the vegetation that returns. Invasive plants may overtake the native species after a fire. *Most evidence indicates that the strongest impacts of invasive plants on fire regimes in California occur in grasslands and riparian areas*. During this interval where invasives are present, fires may have faster rates of spread but will have lower fireline intensity as they generally have less fuel loading.

> When one thinks of fire in California, one immediately thinks of the massive conflagrations that occur in central and southern California chaparral and sage-scrub ecosystems, particularly because of their close proximity to dense population centers. These closed-canopy shrublands—particularly intact chaparral—are in fact, relatively resistant to invasion by non-native species. However, non-native plants are increasingly closely tied to fire dynamics and to ecosystem responses to fire in some regions.
>
> Under natural conditions, chaparral communities retain most fuels in the canopy layer and have relatively long fire intervals (greater than 20 years). Contrary to common perception, foliar tissue does not easily ignite except under super-heated conditions or when leaf tissue moisture is low. However, several weedy forbs and grasses tend to thrive at the disturbed edges of these shrublands along roads, power lines, and fuel breaks where shrubs are removed. The invasive, annual grasses that often colonize these areas dry out much earlier in the spring than the native shrubs, and with their high surface area to volume ratio, they are more prone to ignition than the native vegetation. Mediterranean grasses such as Bromus species and slender oats (Avena barbata) are particularly implicated since they act as wicks, spreading fast-moving fire into the canopies of larger shrub vegetation.
> (Invasive Species and Fire in California Ecosystems, Adam M. Lambert, Carla M. D'Antonio, and Tom L. Dudley, 2010).

The Project Site has both shrub and grass fuels at the perimeter/interface in addition to the treed interfaces. The modeling will show fire activity in the shrub, grass/shrub mixtures, and grass fuels as well as the canopied fuels. All four of these are accounted for in the analysis. This report does not suggest that the Project Site would use prescribed fire for control purposes, but this may be an option to the regional fire agencies.

Shifting Insect Habitat: Insect infestations are rising in response to the changing climate, increasing tree mortality—particularly in the Sierra Nevada regions —and reducing carbon storage according to the Best Practices for Analyzing and Mitigating Wildfire Impacts of Development Projects Under the California Environmental Quality Act published by the California Attorney General in October of 2022. The Project Site has many trees of various species. Insect infestations are not expected to impact the Project Site in any meaningful way. The biological report on the Project Site has addressed this issue.

The management of Oak Woodlands is complex but overall, fire, used correctly, can be a benefit, especially when done under controlled conditions that do not damage the oaks while reducing the overall risk to adjacent areas.

> *For thousands of years, natural and anthropogenic fire have played an important role in oak woodlands of California. Frequent burning by Native Americans before European settlement resulted in low-intensity fires that maintained open stands of large oaks with little shrub cover, creating a fine-grained mosaic of vegetation patches. Following European American settlement in the mid-1800s, ranchers also conducted burns. Fire history studies indicate that average fire return intervals in oak woodlands in the late nineteenth to early twentieth centuries were from 8 to 15 years, at least in some areas. Fire suppression, begun in the 1940s and 1950s, increased surface and crown fuels, invasion of woody vegetation in the understory, and tree density. The effects of past fires are important to consider when making recommendations for wildlife species. Because these conditions existed for such a long time, they represent conditions under which species evolved and to which they are adapted.*
>
> *Prescribed fire can be used to reintroduce fire into the ecosystem and co mimic historic fire regimes. Current land ownership patterns complicate prescribed burning plans in many areas, particularly those in urban-wildland interface areas. With careful planning and attention, however, low-intensity prescribed fires can be safely implemented and can achieve the desired results. Moderate- co low-intensity fires rarely kill mature oaks because their thick bark protects them from damage. However, even a low-intensity fire often kills the tops of seedlings, saplings, and small trees, though most will resprout from their base. Most scientific evidence indicates that typical oak woodland understory fires do not adversely affect the majority of terrestrial vertebrate populations. In an experimental fire that burned over approximately 50 percent of 500 acres (200 ha) of mixed blue oak-coast live oak woodland in central coastal California, there was no appreciable loss of canopy cover, shrubbery, or snags (Vreeland and Tietje 2002). Although grass cover was reduced by 70 percent and downed wood and woodrat houses by 30 percent, there were no substantial or long-term negative impacts to over 150 species of birds, small mammals amphibians, and reptiles monitored 2 years before and 4 years after the fire.* (A Planner's Guide for Oak Woodlands, Second Edition, University of California, Agriculture and Natural Resources, Publication 3491, pages 26-27)

Hazard and Risk Summary

The Project Site is embedded in an area that is adjacent to native wildland fuels on most of the Project Site wildland interface; it will have a wildland interface along the project perimeter. The Project Site is located, for the most part, within the Marble Valley drainage, where most fuels will be oak woodlands with some areas of grassland and chaparral. According to the CalFire database, fires have historically occurred with regular frequency in the regional area around the Project Site but none have burned over the Project Site that is contained within the CalFire database. Current scientific studies (cited previously in this report) indicate that large fire activity will involve winds pushing the fire to achieve extreme fire behavior. This does not mean that every time the wind blows on a hot day a large fire will occur or that extreme fire behavior is guaranteed based on weather alone. The Highway 50 corridor is a potential source of many fires within the area but also serves as a barrier to some fires (fire perimeter stops at the freeway) where fire conditions (ember cast) do not allow the fire to cross over the freeway and continue to burn. Extreme fire behavior is possible and should be modeled in any scenario in which fire behavior outputs are to be used in this report. This is the basis for the analysis that follows.

The Project Site will need to mitigate against direct fire impingement, radiant heat impingement, convected heat impacts, and ember/brand intrusion, which are all required by the current Regulations. Additionally, modeling will need to demonstrate that the Project Site can be evacuated in a timely manner or that if evacuation is not possible because of the location of the incipient fire, the community will be able to provide "areas of refuge" until it is safe to evacuate, or the fire is suppressed. This analysis is done in a separate document.

Project Impacts Related to Wildland Fires

Ingress/Egress

The Project Site configuration has two access points that will be used on a daily basis for ingress and egress (Marble Valley Road to the Bass Lake Road Interchange (NW Access) and Deer Creek Road/Flying C Road to the Cambridge Road Interchange (N Access)). Five EVA (Emergency Vehicle Access) points are identified, with two serving the Marble Valley site primarily and three serving the Lime Rock site primarily, but all of which could be used by either project is completed. The location of each is shown in Figure 33.

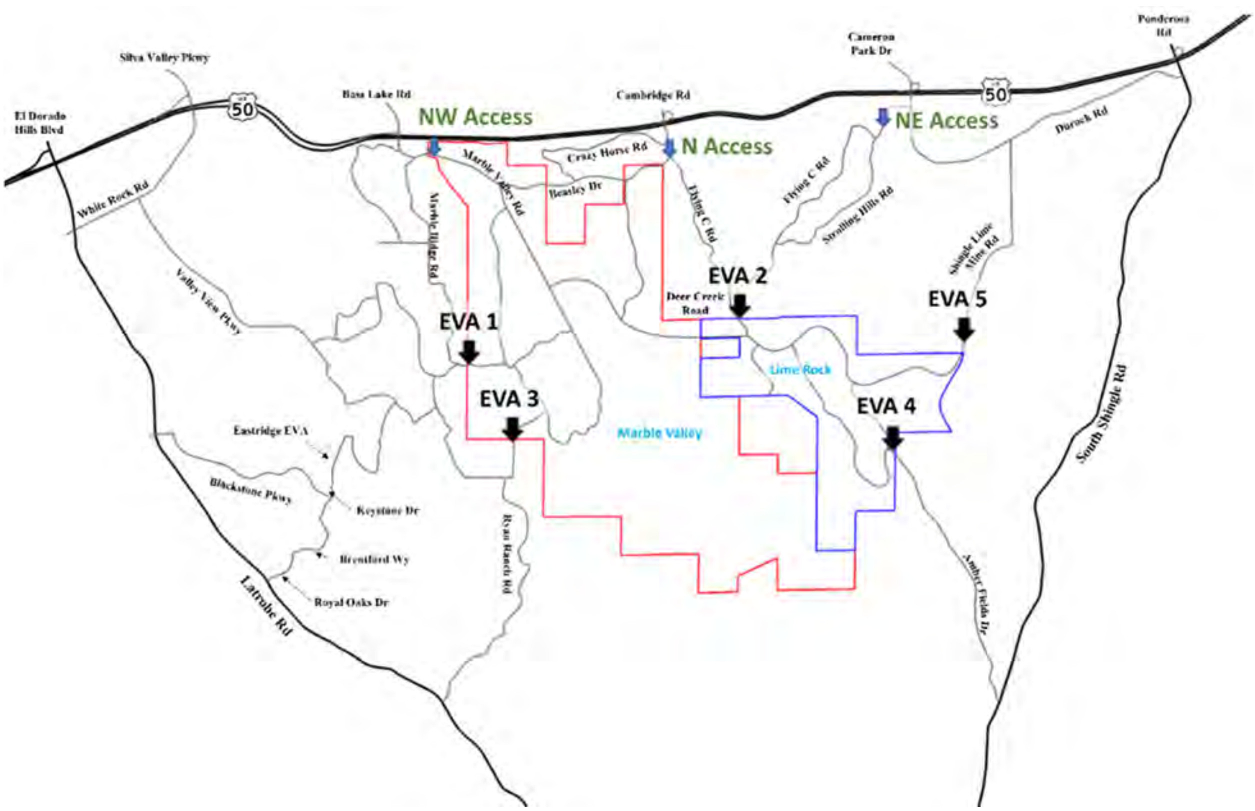

Figure 33 – Evac (Evacuation) Points

These locations will be analyzed in the Evacuation Modeling by the Traffic Engineer using the fire behavior information to determine when each site would no longer be viable for use under fire conditions.

Fire Modeling

Fire modeling will provide a number of outputs that can be used to examine the need and appropriateness of project design features and risk reduction measures. Static modeling is for a given location or condition which does not account for variables over the landscape. The BehavePlus modeling software will be used for this purpose. *"The BehavePlus, Fire Behavior Prediction, and Fuel Modeling System is the most popular and accurate method for predicting wildland fire behavior in pre-fire defense planning. The BehavePlus fire behavior computer modeling system is utilized by wildland fire experts nationwide. Because the model was designed to predict the spread of a fire, the fire model describes the fire behavior only within the flaming front. The primary driving force in the fire behavior calculations is the dead fuel less than ¼" in diameter; these are the fine fuels that carry the fire. Fuels larger than ¼" in diameter contribute to fire intensity, but not necessarily to fire spread. The BehavePlus fire model describes a wildfire spreading through surface fuels, which are burnable materials within 6' of the ground and contiguous to the ground. This type of modeling demonstrates the potential of wind, or a slope-driven fire that could potentially enter the fuel modification zones from the adjacent wildland areas."* (Andrews, Patricia L. 2014 (published online 2013). Current status and future needs of the BehavePlus Fire Modeling System. International Journal of Wildland Fire 23(1):21-33.)

The Regional modeling in this report will be accomplished using FlamMap, which can simulate potential fire behavior characteristics (spread rate, flame length, fireline intensity, etc.), fire growth and spread, and conditional burn probabilities under constant environmental conditions (weather and fuel moisture). The version used in this report (Version 6.1) includes a FARSITE module (previously a separate application) which allows for outputs on wildfire growth and behavior for longer time periods under heterogeneous conditions of terrain, fuels, fuel moistures, and weather.

Because environmental conditions remain constant when using FlamMap, MTT (Minimum Travel Time), Burn Probability, and TOM (Treatment Optimization Modeling), it will not simulate temporal variations in fire behavior caused by weather and diurnal fluctuations as FARSITE does. Nor will it display spatial variations caused by backing or flanking fire behavior. These limitations need to be considered when viewing FlamMap output using these models in an absolute rather than relative sense. However, these outputs are well-suited for Landscape-level comparisons of fuel treatment effectiveness because fuel is the only variable that changes. Outputs and comparisons can be used to identify combinations of hazardous fuel and topography, aiding in prioritizing fuel treatments.

The FlamMap software creates a variety of vector and raster maps of potential fire behavior characteristics (for example, spread rate, flame length, crown fire activity) and environmental conditions (dead fuel moistures, mid-flame wind speeds, and solar irradiance) over an entire landscape or for specific modeling applications these same outputs are limited to the simulation footprint (MTT and FARSITE). For practical purposes, the most important result of the FARSITE tests to date has been that **spread rates for all fuel models tended to be over-predicted** by the

Rothermel spread equation (Rothermel 1972). (https://firelab.org/project/flammap). The overall result produces a conservative/worst-case analysis.

Static modeling (BehavePlus)

For the Static modeling, a worst-case fire scenario based on current and expected conditions was used. The modeling input assumptions are:

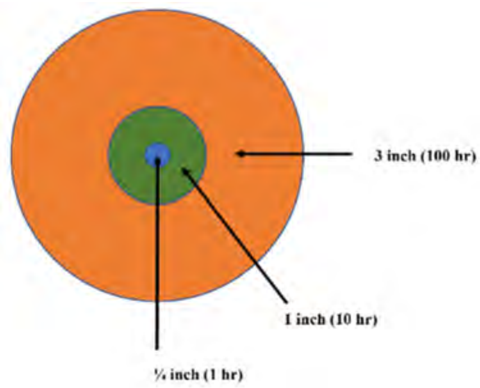

Figure 34 - Dead Fuel Moisture Sizes

1-hr Dead Fuel Moisture	3%
10-hr Dead Fuel Moisture	4%
100-hr Dead Fuel Moisture	5%
Live Herbaceous Fuel Moisture	30%
Live Woody Fuel Moisture	50%

Wind Speeds at 0, 30, 40, 50, and 65 mph with an adjustment factor of 0.5 (unprotected) were used for all to attain the midflame wind speeds. Winds are assumed to upslope in full alignment with the fuel and slope. Outputs are for the head of the fire (leading edge) in the direction of maximum spread. Inputs for the modeling are shown in Figure 35.

Inputs: SURFACE

Description		Lime Rock Fuel Comparison
Fuel/Vegetation, Surface/Understory		
Fuel Model		gr1, gr2, gr4, gs1, gs2, sh2, sh5, s
Fuel Moisture		
1-h Fuel Moisture	%	3
10-h Fuel Moisture	%	4
100-h Fuel Moisture	%	5
Live Herbaceous Fuel Moisture	%	30
Live Woody Fuel Moisture	%	50
Weather		
20-ft Wind Speed (upslope)	mi/h	0, 30, 40, 50, 65
Wind Adjustment Factor		0.5
Terrain		
Slope Steepness	%	50

Figure 35 – BehavePlus Inputs for Worst-case Scenario

The outputs are provided in Appendix B (Modeling Outputs) of this report. In Figure 36 the Flame length outputs for each of the select fuel models are provided with some additional information for perspective. The outputs are highlighted, green for the grasslands, yellow for the chaparral, and blue for the oak shrub understory (healthy oak will have a grass understory if the canopies are closed enough). Flame lengths are provided for the various wind speeds from calm (0 mph) to 65 mph. Statistically, the top end of the wind speed would be around 40 mph from the weather history (only two times over 60 mph in 22 years). This modeling is also assuming it is running upslope (50% slope) in alignment with the wind in a continuous fuelbed.

At 40 mph wind speed, the gr2 produces a 11.6-foot flame length and in the gr4, it is 33.7 feet. Within the chaparral, if the sh5/sh7 models are used, the flame lengths are 42.5 and 39.9 respectively. If the SCAL chaparral fuel models are used for manzanita (SCAL14), the 40-mph flame length is 28.1 feet ,and the Chamise models are less. Using the worst-case scenario, this report will assume the sh5 fuel model as the worst-case. California-specific fuel models labeled SCAL are Fuel models designed to be used with the BehavePlus software for fuel in southern California. They will likely overestimate fire behavior in the El Dorado region. The SCAL fuel models are species specific (manzanita, chamise, ceanothus) and provide a solid measurement of the fuels ability to burn under specific conditions. They are used here to illustrate the similarities and differences between the fuel specific models and the overall shrub models (sh2, sh5, sh7).

Lime Rock Fuel Comparison

Head Fire

Surface Fire Flame Length (ft)

Fuel Model	20-ft Wind Speed (upslope) mi/h 0	30	40	50	65
gr1	1.8	2.6	2.6	2.6	2.6
gr2	4.2	11.6	11.6	11.6	11.6
gr4	7.8	25.1	30.1	33.7	33.7
gs1	3.5	11.1	11.7	11.7	11.7
gs2	5.1	16.1	19.2	22.2	23.4
sh2	4.8	13.5	16.0	18.2	21.4
sh5	12.2	36.8	42.5	47.7	54.7
sh7	12.0	34.6	39.9	44.7	51.2
tu4	5.5	17.3	21.1	24.7	29.8
tu5	7.3	18.2	20.8	23.2	26.5
tl1	0.6	0.8	0.8	0.8	0.8
tl2	0.8	1.4	1.4	1.4	1.4
tl3	1.0	1.9	1.9	1.9	1.9
tl4	1.3	2.8	2.8	2.8	2.8
tl5	1.9	5.4	6.0	6.0	6.0
tl6	2.5	7.2	8.6	10.0	10.5
tl8	3.1	8.5	10.1	11.5	13.6
SCAL14	9.8	25.2	28.1	30.6	34.0
SCAL15	7.3	20.1	22.9	25.3	28.6
SCAL16	9.6	27.3	31.1	34.5	39.0
SCAL17	6.5	20.2	23.9	27.3	32.1

Fuel Model	Label	Description
101	gr1	Short, sparse, dry climate grass (D)
102	gr2	Low load, dry climate grass (D)
104	gr4	Moderate load, dry climate grass (D)
121	gs1	Low load, dry climate grass-shrub (D)
122	gs2	Moderate load, dry climate grass-shrub (D)
142	sh2	Moderate load, dry climate shrub (S)
145	sh5	High load, dry climate shrub (S)
147	sh7	Very high load, dry climate shrub (S)
164	tu4	Dwarf conifer understory (S)
165	tu5	Very high load, dry climate timber-shrub (S)
181	tl1	Low load, compact conifer litter (S)
182	tl2	Low load broadleaf litter (S)
183	tl3	Moderate load conifer litter (S)
184	tl4	Small downed logs (S)
185	tl5	High load conifer litter (S)
186	tl6	High load broadleaf litter (S)
188	tl8	Long-needle litter (S)
14	SCAL14	Manzanita
15	SCAL15	Chamise 1
16	SCAL16	North Slope Ceanothus
17	SCAL17	Chamise 2

Figure 36 – BehavePlus Output for Flame Length (all fuels)

* Appendix B, provides fuel model descriptions

At zero wind/zero slope, the maximum flame length is only 12.2’ (yellow highlight). Adding a 30-mph wind to the slope nearly triples the flame length to 36.8’. Adding an additional ten mph of wind speed increases the flame length by just over 6 feet at the 40-mph mark and another 5 feet at the 50-mph mark. All three of the grass models (gr1, gr2 and gr4) ran out of fuel. The gr1 fuel is maximized by 30 mph. The gr2 by 40 mph and the gr4 are maximized by the 50-mph wind level and do not increase the flame lengths after that point regardless of the wind increase.

The fuel parameters (the variables for each of the fuel models) for each of the dry climate fuels near the Project Site are provided in Figure 37. These standardized fuel models account for the amount of fuel available for combustion (Fuel Load), the size of the fuel in relationship to the area (SAV ratio or Surface Area to Volume ratio), the fuel bed depth, the level of moisture at which the fuel will no longer combust (moisture of extinction), the amount of live fuel that can be transferred to combustible fuel (Transfer rate), the amount of energy that the particular fuel model can be expected to release (Heat Content) and the amount of dead vs live fuel (live fuel must have the moisture driven off before it can combust).

Fuel model parameters | **Dead Component Calculation**

Fuel Model Code	Fuel Model Number	Climate	Fuel load (t/ac) 1-hr	10-hr	100-hr	Live herb	Live woody	Fuel model type[a]	SAV ratio (1/ft)[b] Dead 1-hr	Live herb	Live woody	Fuel bed depth (ft)	Dead fuel extinction moisture (percent)	Heat content BTU/lb)[c]	Fuel Model Code	100% Transfer Dead	Herb	Dead load
SCAL14	N/A	N/A	3.00	4.50	1.05	1.45	5.00	static	350	1500	250	3.0	15	9211	SCAL14	8.55	no transfer	8.55
SCAL15	N/A	N/A	2.00	3.00	1.00	0.50	2.00	static	640	220	640	3.0	13	10000	SCAL15	6.00	no transfer	6.00
SCAL16	N/A	N/A	2.25	4.80	1.80	3.00	2.85	static	500	1500	500	6.0	15	8000	SCAL16	8.85	no transfer	8.85
SCAL17	N/A	N/A	1.30	1.00	1.00	2.00	2.00	static	640	2200	640	4.0	20	8000	SCAL17	3.30	no transfer	3.30
GR1	101	Dry	0.10	0.00	0.00	0.30	0.00	dynamic	2200	2000	9999	0.4	15	8000	GR1	0.10	0.30	0.19
GR2	102	Dry	0.10	0.00	0.00	1.00	0.00	dynamic	2000	1800	9999	1.0	15	8000	GR2	0.10	1.00	1.10
GR4	104	Dry	0.25	0.00	0.00	1.90	0.00	dynamic	2000	1800	9999	2.0	15	8000	GR4	0.25	1.90	2.15
GS1	121	Dry	0.20	0.00	0.00	0.50	0.65	dynamic	2000	1800	1800	0.9	15	8000	GS1	0.20	0.50	0.45
GS2	122	Dry	0.50	0.50	0.00	0.60	1.00	dynamic	2000	1800	1800	1.5	15	8000	GS2	1.00	0.60	1.36
SH1	141	Dry	0.25	0.25	0.00	0.15	1.30	dynamic	2000	1800	1600	1.0	15	8000	SH1	0.50	0.15	0.52
SH2	142	Dry	1.35	2.40	0.75	0.00	3.85	static	2000	9999	1600	1.0	15	8000	SH2	4.50	no transfer	4.50
SH5	145	Dry	3.60	2.10	0.00	0.00	2.90	static	750	9999	1600	6.0	15	8000	SH5	5.70	no transfer	5.70
SH7	147	Dry	3.50	5.30	2.20	0.00	3.40	static	750	9999	1600	6.0	15	8000	SH7	11.00	no transfer	11.00
TU1	161	Dry	0.20	0.90	1.50	0.20	0.90	dynamic	2000	1800	1600	0.6	20	8000	TU1	2.60	0.20	2.64
TU4	164	Dry	4.50	0.00	0.00	0.00	2.00	static	2300	9999	2000	0.5	12	8000	TU4	4.50	no transfer	4.50
TU5	165	Dry	4.00	4.00	3.00	0.00	3.00	static	1500	9999	750	1.0	25	8000	TU5	11.00	no transfer	11.00
TL1	181	N/A	1.00	2.20	3.60	0.00	0.00	static	2000	9999	9999	0.2	30	8000	TL1	6.80	no transfer	6.80
TL2	182	N/A	1.40	2.30	2.20	0.00	0.00	static	2000	9999	9999	0.2	25	8000	TL2	5.90	no transfer	5.90
TL3	183	N/A	0.50	2.20	2.80	0.00	0.00	static	2000	9999	9999	0.3	20	8000	TL3	5.50	no transfer	5.50
TL4	184	N/A	0.50	1.50	4.20	0.00	0.00	static	2000	9999	9999	0.4	25	8000	TL4	6.20	no transfer	6.20
TL5	185	N/A	1.15	2.50	4.40	0.00	0.00	static	2000	9999	1600	0.6	25	8000	TL5	8.05	no transfer	8.05
TL6	186	N/A	2.40	1.20	1.20	0.00	0.00	static	2000	9999	9999	0.3	25	8000	TL6	4.80	no transfer	4.80
TL8	188	N/A	5.80	1.40	1.10	0.00	0.00	static	1800	9999	9999	0.3	35	8000	TL8	8.30	no transfer	8.30

Figure 37 – Wildland Fuel Model Parameters(a larger version is provided in Appendix B)
The red highlighted is to distinguish the six-foot fuel beds.

Also of note is the Rate of Spread for each of the fuels under different wind speeds, as shown in Figure 38. Under these extreme conditions, the gr4 fuel is traveling at 16 mph in a 50-mph wind, and the sh5 fuel is traveling at 12 mph in the 66-mph wind. This is extreme fire behavior.

Static modeling has shown that flame lengths of 54.7 feet could be expected if the fire was running upslope, in alignment with the wind, in a continuous fuelbed in a sh5 fuel. BehavePlus 6.0.0 has a chaparral module for refining these calculations.

If this module is run in the same scenario parameters and the maximum value for fuelbed depth is input at 8 feet, and the Dead Load Fraction is set to the maximum value in the model of 43%, and the total fuel load is set to 31tons per acre, the maximum flame length is 53.9 feet, as shown in Figure 40.

Increasing the dead load actually slows the ROS (see appendix Behave runs).

Lime Rock Fuel Comparison

Head Fire

Surface Fire Rate of Spread (ch/h)

Fuel Model	20-ft Wind Speed (upslope) mi/h				
	0	30	40	50	65
gr1	12.4	27.3	27.3	27.3	27.3
gr2	26.7	244.3	244.3	244.3	244.3
gr4	53.6	679.4	1005.4	1287.8	1287.8
gs1	13.3	164.3	184.8	184.8	184.8
gs2	18.6	225.7	333.7	454.9	513.8
sh2	6.2	59.8	86.1	115.1	163.1
sh5	37.2	406.2	556.7	714.5	962.4
sh7	26.5	263.8	359.6	459.8	616.9
tu4	9.7	116.8	180.3	254.5	383.9
tu5	7.7	55.5	74.7	94.8	126.3
tl1	0.7	1.4	1.4	1.4	1.4
tl2	1.0	3.7	3.7	3.7	3.7
tl3	1.3	5.2	5.2	5.2	5.2
tl4	1.8	10.0	10.0	10.0	10.0
tl5	3.1	28.9	36.9	36.9	36.9
tl6	4.2	42.2	62.8	86.2	95.5
tl8	4.5	38.7	56.1	75.6	108.1
SCAL14	11.6	89.7	113.8	137.5	172.4
SCAL15	13.3	122.0	160.9	200.4	260.7
SCAL16	19.7	188.5	250.5	313.9	411.0
SCAL17	21.0	242.5	350.8	470.3	667.1

66 feet to the chain/80 chains to the mile

gr4 is traveling 16 mph in a 50 mph wind
sh5 is traveling 12 mph in a 65 mph wind

Figure 38 – BehavePlus Output for Rate of Spread (all fuels)

Based on the worst-case modeling calculations, a maximum flame length of approximately 55 feet could be expected under extreme conditions which are not present on the Project Site currently or in the recent past.

Inputs: SURFACE

Description		Chaparral Fuel Scenario Worst Case
Fuel/Vegetation, Surface/Understory		
Chaparral Fuel Bed Depth	ft	8
Chaparral Dead Load Fraction	%	32, 33, 34, 35, 36, 40, 41, 42, 43,
Chaparral Total Fuel Load	ton/ac	25, 28, 29, 31
Fuel Moisture		
1-h Fuel Moisture	%	3
10-h Fuel Moisture	%	4
100-h Fuel Moisture	%	5
Live Herbaceous Fuel Moisture	%	30
Live Woody Fuel Moisture	%	50
Weather		
20-ft Wind Speed	mi/h	65
Wind Adjustment Factor		0.5
Wind Direction (from north)	deg	45
Terrain		
Slope Steepness	%	50
Site Aspect	deg	45

Chaparral Fuel Scenario Worst Case

Head Fire

Surface Fire Flame Length (ft)

Chaparral Fuel Dead Load Fraction %	Chaparral Total Fuel Load ton/ac 25	28	29	31
32	46.1	49.0	49.9	51.7
33	46.4	49.3	50.3	52.0
34	46.7	49.6	50.6	52.4
35	46.9	49.9	50.9	52.7
36	47.2	50.2	51.1	52.9
40	47.7	50.8	51.8	53.7
41	47.8	50.9	51.9	53.8
42	47.8	50.9	51.9	53.8
43	47.8	50.9	51.9	53.9
44	47.7	50.9	51.9	53.9
45	47.7	50.9	51.9	53.8
46	47.5	50.8	51.8	53.8
47	47.4	50.6	51.7	53.7
48	47.2	50.5	51.5	53.5
49	47.0	50.3	51.3	53.3
50	46.7	50.0	51.1	53.1

Figure 39 – BehavePlus Inputs/Outputs for Chaparral Fuels Comparision

Regional Modeling (FlamMap/MTT)

Using the FlamMap software, it is possible to track the expected path of the fire across the landscape (wildland) and provide rough timeframes for the arrival of the fire front. Specifically, the Minimum Travel Time (MTT) module provides both the path of the fire (major and minor paths) and the excepted arrival interval from the starting point of the scenario. In this section, this function will be used to estimate the amount of time that would be available for evacuation at each of the Evacuation Points discussed earlier. Each scenario will be completed for all four configurations (No project, Marble Valley development, Lime Rock development and both developments). The information generated here will be used in the traffic analysis for evacuation timeframes.

The inputs to the FlamMap software are as follows:

- Winds are scenario specific based on the weather history for the area. 99th percentile value was under 40 mph.
- Foliar Moisture Content is set to 100%.
- Crown Fire Calculation Method set to Finney (2004) as this is the method used in the FarSite modeling software, and it the most appropriate for the model as it is being used (minimum travel time).
- Winds are calculated using Generated Gridded Wind (Wind Ninja) rather than generating them in Wind Ninja and importing the results.
- Fuel Moisture settings were fixed using a 3,4,5,30,50 moisture scenario as discussed previously.
- Fuel Moisture Conditions were not used as the moisture scenario is worst-case. Since the lowest recorded moisture is being used, conditioning the fuels will not lower them.
- Maximum Simulation Time was set to 480 minutes as the evacuations would be completed prior to this point.
- Spot Probability was set to 100% to maximize the worst-case conditions.
- Spotting Delay was set to zero to maximize the worst-case conditions.
- Ignition and barrier files are scenario specific but identical for each configuration alternative.

Scenarios have been completed for sixteen locations with various site-specific wind speeds and directions (as indicated in the matrix). Each of these fires corresponds to historic wind data from the weather site discussed previously and summarized in Figures 27 and 31 above. Each scenario has been accomplished for each of the development configurations. Outputs are provided in the appendixes. The outcomes are summarized in the matrix beginning on the next page. The matrix specifies the amount of time that the Evacuation Point would remain viable during the specific scenario.

Matrix 1 – Outputs from FlamMap Modeling

Scenario #	Location	NW	N	NE	EVA 1	EVA 2	EVA 3	EVA 4	EVA 5
1-A 1-B 1-C	Latrobe Rd North of Ryan Ranch Rd SW 65 No Development	A-360+ B-300+ C-240+	A-60 B-60 C-90	A-360+ B-None C-None	A-90+ B-90 C-90	A-300+ B-240+ C-240+	A-30-N/A B-30-N/A C-30-N/A	A-None B-None C-None	A-None B-None C-None
1-D	Latrobe Rd North of Ryan Ranch Rd SW 65 Marble	400+	360+	None	100	270+	40 – N/A	None	None
1-E	Latrobe Rd North of Ryan Ranch Rd SW 65 Lime	N/A (360+)	N/A (55)	None	N/A (60)	360	N/A (30)	None	None
1-F	Latrobe Rd North of Ryan Ranch Rd SW 65 Both	400+	360+	None	100	270+	N/A (40)	None	None
1-G	Latrobe Rd North of Ryan Ranch Rd SW 50 No Development	300+	60+	360+	90	240+	N/A (40)	None	None
1-H	Latrobe Rd North of Ryan Ranch Rd SW 50 Marble	270+	None	None	90	400+	N/A (45)	None	None
1-I	Latrobe Rd North of Ryan Ranch Rd SW 50 Lime	N/A**(300+)	N/A (60)	None	N/A (90)	360	N/A (45)	None	None
1-J	Latrobe Rd North of Ryan Ranch Rd SW 50 Both	270+	None	None	100+	None	N/A (45)	None	None
1-K	Latrobe Rd North of Ryan Ranch Rd SW 40 No Development	240+	90+	None	90+	300+	N/A (45)	None	None
1-L	Latrobe Rd North of Ryan Ranch Rd SW 40 Marble	240+	None	None	85	400+	N/A (45)	None	None
1-M	Latrobe Rd North of Ryan Ranch Rd SW 40 Lime	N/A**(240+)	90	None	N/A (90)	210	N/A (45)	None	None
1-N	Latrobe Rd North of Ryan Ranch Rd SW 40 Both	270+	None	None	90	None	N/A (55)	None	None
1-O	Latrobe Rd North of Ryan Ranch Rd SW 30 No Development	240+	120+	None	90+	240+	N/A (65)	None	None
1-P	Latrobe Rd North of Ryan Ranch Rd SW 30 Marble	270	None	None	110	None	N/A (65)	None	None
1-Q	Latrobe Rd North of Ryan Ranch Rd SW 30 Lime	N/A** (300+)	120	None	N/A (90)	230	N/A (65)	None	None
1-R	Latrobe Rd North of Ryan Ranch Rd SW 30 Both	270	None	None	110	None	N/A (65)	None	None

Scenario #	Location	NW	N	NE	EVA 1	EVA 2	EVA 3	EVA 4	EVA 5
1-S	Latrobe Rd North of Ryan Ranch Rd WSW 65 No Development	None	360+	None	300+	200+	N/A** (240+)	360+	300+
1-T	Latrobe Rd North of Ryan Ranch Rd WSW 65 Marble	None	None	None	None	200	N/A** (240+)	360+	360+
1-U	Latrobe Rd North of Ryan Ranch Rd WSW 65 Lime	N/A** (None)	220**	None	N/A** (360+)	220	N/A** (240+)	None	None
1-V	Latrobe Rd North of Ryan Ranch Rd WSE 65 Both	None	None	None	360+	None	N/A** (240+)	None	None
2-A	Ryan Ranch Rd to Beaver Pond Rd SW 65 No Development	None	N/A (20)	150+	360+	N/A (20)	N/A (0)	None	None
2-B	Ryan Ranch Rd to Beaver Pond Rd SW 65 Marble	None	145	N/A (120)	360+	N/A (50)	N/A (115)	N/A** (None)	N/A** (None)
2-C	Ryan Ranch Rd to Beaver Pond Rd SW 65 Lime	N/A (None)	N/A (20)	N/A (160)	N/A (0)	N/A (20)	N/A (110)	None	None
2-D	Ryan Ranch Rd to Beaver Pond Rd SW 65 Both	None	None	N/A** (300+)	435	N/A (75)	N/A (110)	None	None
2-E	Ryan Ranch Rd to Beaver Pond Rd SSW 65 No Development	150+	N/A (50)	None	N/A (120)	240+	N/A (0)	None	None
2-F	Ryan Ranch Rd to Beaver Pond Rd SSW 65 Marble	250	None	None	175	None	N/A (0)	None	None
2-G	Ryan Ranch Rd to Beaver Pond Rd SSW 65 Lime	N/A** (180+)	N/A (50)	None	N/A (120)	225	N/A (0)	None	None
2-H	Ryan Ranch Rd to Beaver Pond Rd SSW 65 Both	250	300+	None	175	None	N/A (0)	None	None
3-A	End of Beaver Pond Rd SW 65 No Development	None	150+	N/A (60)	None	N/A (0)	None	360+	300+
3-B	End of Beaver Pond Rd SW 65 Marble	None	290	N/A (60)	None	N/A (0)	None	N/A** (360+)	N/A** (300+)
3-C	End of Beaver Pond Rd SW 65 Lime	N/A** (None)	N/A** (150)	N/A** (200+)	N/A** (None)	N/A (0)	N/A** (None)	None	None
3-D	End of Beaver Pond Rd SW 65 Both	None	None	None	None	None	None	None	None

N/A is not accessable. None is no time restriction. Numbers are in minutes (time to egress point no longer viable)
* Only applies if infrastructure (roads) from adjacent project is provided (even if balance of the project is not completed)
** - Based on travel route impacts not Evac Point
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Scenario #	Location	NW	N	NE	EVA 1	EVA 2	EVA 3	EVA 4	EVA 5
3-E	End of Beaver Pond Rd SSW 65 No Development	360+	N/A (0)	360+	None	N/A (0)	360+	None	None
3-F	End of Beaver Pond Rd SSW 65 Marble	None	90	N/A** (None)	None	N/A (0)	360+	N/A** (None)	N/A** (None)
3-G	End of Beaver Pond Rd SSW 65 Lime	N/A** (360+)	N/A (0)	None	N/A** (None)	300+	N/A (0)	None	None
3-H	End of Beaver Pond Rd SSW 65 Both	None	300+	None	None	N/A (0)	360+	None	None
4-A	End of Summer Creek Ct SW 65 No Development	None	360+	N/A (60)	None	90+	None	N/A (30)	N/A (30)
4-B	End of Summer Creek Ct SW 65 Marble	None	None	N/A (90)	None	N/A (150)	None	N/A** (50)	N/A** (50)
4-C	End of Summer Creek Ct SW 65 Lime	210**	230*	120+	N/A** (None)	230	N/A** (None)	90	120
4-D	End of Summer Creek Ct SW 65 Both	None*-	None*	120+	None	None	None	90	120
5-A	Venture Valley Rd at Ranch Gate Rd SW 65 No Development	None	150+	N/A (50)	None	N/A (0)	300+	240+	120+
5-B	Venture Valley Rd at Ranch Gate Rd SW 65 Marble	None	240	N/A (60)	None	N/A (30)	N/A** (240+)	N/A**(210)	N/A** (200+)
5-C	Venture Valley Rd at Ranch Gate Rd SW 65 Lime	N/A** (None)	N/A** (120+)	N/A** (240+)	N/A** (None)	N/A** (120)	N/A** (360+)	300+	300+
5-D	Venture Valley Rd at Ranch Gate Rd SW 65 Both	None	240	N/A (240+)	None	N/A** (120)	N/A **(200+)	300+	300+
5-E	Venture Valley Rd at Ranch Gate Rd SSW 50 No Development	180+	N/A (30)	None	180+	120+	N/A (20)	None	None
5-F	Venture Valley Rd at Ranch Gate Rd SSW 50 Marble	300+	240+	N/A** (None)	250+	N/A** (120)	N/A (20)	N/A** (None)	N/A** (None)
5-G	Venture Valley Rd at Ranch Gate Rd SSW 50 Lime	N/A** (240+)	N/A (40)_	None	N/A** (200+)	N/A** (180+)	N/A (60)	None	None
5-H	Venture Valley Rd at Ranch Gate Rd SSW 50 Both	200+	N/A** (300+)	None	160	120	N/A (20)	None	None

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** - Based on travel route impacts not Evac Point
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Scenario #	Location	NW	N	NE	EVA 1	EVA 2	EVA 3	EVA 4	EVA 5
6-A	Cothrin Ranch Rd at Thunder Ln SW 50 No Development	None	None	None	None	300+	None	N/A (0)**	N/A (40)
6-B	Cothrin Ranch Rd at Thunder Ln SW 50 Marble	None	None	200	None	300+	None	N/A (0)**	N/A (40)
6-C	Cothrin Ranch Rd at Thunder Ln SW 50 Lime	None*	None	300+	None*	300+	None*	N/A (0)**	N/A (90)
6-D	Cothrin Ranch Rd at Thunder Ln SW 50 Both	None	None	None	None	None	None	N/A (0)**	N/A (90)
6-E	Cothrin Ranch Rd at Thunder Ln SSW 50 No Development	None	180+	None	None	N/A** (60)	None	120+	240+
6-F	Cothrin Ranch Rd at Thunder Ln SSW 50 Marble	None	120	N/A** (120)	None	N/A** (60)	None	N/A** (120)	N/A** (300+)
6-G	Cothrin Ranch Rd at Thunder Ln SSW 50 Lime	N/A** (None)	N/A** (150)	N/A** (300+)	N/A** (None)	N/A** (300+)	N/A** (None)	90	210
6-H	Cothrin Ranch Rd at Thunder Ln SSW 50 Both	None	None	N/A** (240+)	None	None	None	90	120
7-A	Bullard Dr west of Amber Fields Dr S 50 No Development	None	180+	180+	None	150+	None	N/A (0)	120+
7-B	Bullard Dr west of Amber Fields Dr S 50 Marble	None	90	N/A** (300+)	None	N/A** (150)	None	N/A** (0)**	N/A** (120)
7-C	Bullard Dr west of Amber Fields Dr S 50 Lime	None*	240+	N/A** (300+)	None*	240+	None*	N/A** (0)**	N/A** (120)
7-D	Bullard Dr west of Amber Fields Dr S 50 Both	None	300+	N/A** (300+)	None	300+	None	N/A** (0)**	N/A** (120)
7-E	Bullard Dr west of Amber Fields Dr SSE 50 No Development	100+	N/A (90)	None	360+	N/A (30)	None	N/A (0)**	360+
7-F	Bullard Dr west of Amber Fields Dr SSE 50 Marble	None	N/A (90)	N/A** (None)	None	N/A (30)	None	N/A (0)**	N/A** (300+)
7-G	Bullard Dr west of Amber Fields Dr SSE 50 Lime	N/A** (120)	N/A (150**)	None	N/A** (360+)	N/A** (120)	N/A** (None)	N/A (0)**	300+
7-H	Bullard Dr west of Amber Fields Dr SSE 50 Both	None	N/A** (150)	None	None	N/A** (120)	None	N/A (0)**	300+

N/A is not accessable. None is no time restriction. Numbers are in minutes (time to egress point no longer viable)
* Only applies if infrastructure (roads) from adjacent project is provided (even if balance of the project is not completed)
** - Based on travel route impacts not Evac Point
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Scenario #	Location	NW	N	NE	EVA 1	EVA 2	EVA 3	EVA 4	EVA 5
8-A	S. Shingle Rd north of Barnett Ranch Rd E 50 No Development	None	None	None	360+	None	N/A (210+)**	150+	None
8-B	S. Shingle Rd north of Barnett Ranch Rd E 50 Marble	None	None	None	None	300+	300+	N/A (0)**	300+**
8-C	S. Shingle Rd north of Barnett Ranch Rd E 50 Lime	None*	None	None	N/A** (360+)	None	N/A** (240+)	N/A** (0)**	None
8-D	S. Shingle Rd north of Barnett Ranch Rd E 50 Both	None	None	None	None	None	N/A** (300+)	N/A (0)**	None
8-E	S. Shingle Rd north of Barnett Ranch Rd ESE 50 No Development	360+	None	None	N/A (50)**	180+	N/A (30)	N/A (0)**	None
8-F	S. Shingle Rd north of Barnett Ranch Rd ESE 50 Marble	None	None	None	N/A (90)**	200+	N/A (90)	N/A (0)**	N/A (None)
8-G	S. Shingle Rd north of Barnett Ranch Rd ESE 50 Lime	None*	None	None	N/A (90)**	300+	N/A (60)_	N/A (0)**	None
8-H	S. Shingle Rd north of Barnett Ranch Rd ESE 50 Both	None	None	None	N/A	None	N/A (90)	N/A (0)**	None
9-A	S. Shingle Rd north of Big Ranch Rd E 50 No Development	None	None	None	180+	240+	N/A (0)**	N/A (60)	180+
9-B	S. Shingle Rd north of Big Ranch Rd E 50 Marble	None	None	None	300+	180+	N/A (90)**	N/A (60)	N/A** (150)
9-C	S. Shingle Rd north of Big Ranch Rd E 50 Lime	None*	None	None	300+*	300+	N/A (150)**	N/A (60)	N/A** (150)
9-D	S. Shingle Rd north of Big Ranch Rd E 50 Both	None	None	None	None	300+	300+	N/A** (120)	N/A** (150)
10-A	Shingle Lime Mine Rd south of Dividend Dr @ RR tracks NE 50 No Development	None	None	None	None	None	None	N/A (0)	N/A (0)
10-B	Shingle Lime Mine Rd south of Dividend Dr @ RR tracks NE 50 Mable	None	None	None	None	None	None	N/A (0)	N/A (0)
10-C	Shingle Lime Mine Rd south of Dividend Dr @ RR tracks NE 50 Lime	None	None	None	None	None	None	N/A (30)**	N/A (0)

N/A is not accessable. None is no time restriction. Numbers are in minutes (time to egress point no longer viable)
* Only applies if infrastructure (roads) from adjacent project is provided (even if balance of the project is not completed)
** - Based on travel route impacts not Evac Point
DRAFT

Scenario #	Location	NW	N	NE	EVA 1	EVA 2	EVA 3	EVA 4	EVA 5
10-D	Shingle Lime Mine Rd south of Dividend Dr @ RR tracks NE 50 Both	None	None	None	None	None	None	N/A (30)**	N/A (0)
10-E	Shingle Lime Mine Rd south of Dividend Dr @ RR tracks ENE 50 No Development	None	None	None	None	360+	300+	180+	N/A** (100+)
10-F	Shingle Lime Mine Rd south of Dividend Dr @ RR tracks ENE 50 Marble	None	None	None	None	300+	N/A (90)**	N/A** (180)	N/A** (100+)
10-G	Shingle Lime Mine Rd south of Dividend Dr @ R R tracks ENE 50 Lime	None	None	None	None	None	N/A** (100+)	240+	N/A **(100+)
10-H	Shingle Lime Mine Rd south of Dividend Dr @ RR tracks ENE 50 Both	None	None	None	None	300+	N/A** (100+)	240+	N/A** (100+)
11-A	Lariat Rd at McNeil Rd NE 50 No Development	None	None	None	None	N/A** (100+)	N/A (60)**	360+	None
11-B	Lariat Rd at McNeil Rd NE 50 Marble	None	None	N/A	None	N/A** (100+)	N/A (60)**	N/A** (360+)	N/A** (360+)
11-C	Lariat Rd at McNeil Rd NE 50 Lime	N/A** (None)	N/A** (None)	N/A** (None)	N/A** (None)	N/A** (120)**	N/A** (240+)	None	None
11-D	Lariat Rd at McNeil Rd NE 50 Both	None	None	N/A** (None)	None	N/A** (120)**	None	None	None
12-A	Fallen Leaf Rd at Flying C Rd N 50 No Development	None	None	None	None	None	None	N/A (30)	360+
12-B	Fallen Leaf Rd at Flying C Rd N 50 Marble	None	None	N/A** (None)	None	300+	None	N/A (30)	N/A** (360+)
12-C	Fallen Leaf Rd at Flying C Rd N 50 Lime	None*	None	None	None*	None	None*	N/A** (150)	300+
12-D	Fallen Leaf Rd at Flying C Rd N 50 Both	None	None	None	None	None	None	N/A** (150)	300+
12-E	Fallen Leaf Rd at Flying C Rd NE 50 No Development	None	None	None	360+	N/A (0)**	N/A (30)_**	None	None
12-F	Fallen Leaf Rd at Flying C Rd NE 50 Marble	None	None	None	None	N/A (0)**	None	N/A** (None)	N/A **(None)

N/A is not accessable. None is no time restriction. Numbers are in minutes (time to egress point no longer viable)
* Only applies if infrastructure (roads) from adjacent project is provided (even if balance of the project is not completed)
** - Based on travel route impacts not Evac Point
DRAFT

Scenario #	Location	NW	N	NE	EVA 1	EVA 2	EVA 3	EVA 4	EVA 5
12-G	Fallen Leaf Rd at Flying C Rd NE 50 Lime	N/A** (None)	N/A** (None)	None	N/A** (360+)	N/A (0)**	N/A (30)**	None	None
12-H	Fallen Leaf Rd at Flying C Rd NE 50 Both	None	None	None	None	N/A (0)**	None	None	None
12-I	Fallen Leaf Rd at Flying C Rd ENE 50 No Development	None	None	None	90+	360+	N/A (70)	None	None
12-J	Fallen Leaf Rd at Flying C Rd ENE 50 Marble	None	None	N/A** (None)	None	N/A** (180)**	N/A** (90)	N/A** (None)	N/A** (None)
12-K	Fallen Leaf Rd at Flying C Rd ENE 50 Lime	N/A** (None)	N/A** (None)	None	N/A (60)**	180+	N/A (60)	None	None
12-L	Fallen Leaf Rd at Flying C Rd ENS 50 Both	None	None	None	None	180+	N/A (120)	None	None
13-A	Crazy Horse Rd at Flying C Rd N 50No Development	None	N/A (0)	None	None	N/A (60)	300+	None	None
13-B	Crazy Horse Rd at Flying C Rd N 50 Marble	None	N/A (0)	N/A (None)	None	N/A (60)	None	N/A (360+)	N/A** (None)
13-C	Crazy Horse Rd at Flying C Rd N 50 Lime	N/A** (None)	N/A (0)	None	N/A** (None)	N/A (60)	N/A (80)**	None	None
13-D	Crazy Horse Rd at Flying C Rd N 50 Both	None	N/A (0)	None	None	N/A (60)	None	None	None
13-E	Crazy Horse Rd at Flying C Rd NE 50 No Development	None	N/A (30)	None	N/A (30)	None	N/A (40)	None	None
13-F	Crazy Horse Rd at Flying C Rd NE 50 Marble	None	N/A (30)	None	None	300+	None	N/A** (None)	N/A** (None)
13-G	Crazy Horse Rd at Flying C Rd NE 50 Lime	N/A** (None)	N/A (30)	None	N/A (30)	None	N/A (40)	None	None
13-H	Crazy Horse Rd at Flying C Rd NE 50 Both	None	N/A (30)	None	None	None	None	None	None
14-A	White Rock Rd north of Valley View Pkwy W 50 No Development	N/A** (150)	150+	None	360+	360+	None	None	None
14-B	White Rock Rd north of Valley View Pkwy W 50 Marble	N/A** (150)	120+	None	300+	None	None	None*	None*

N/A is not accessable. None is no time restriction. Numbers are in minutes (time to egress point no longer viable)
* Only applies if infrastructure (roads) from adjacent project is provided (even if balance of the project is not completed)
** - Based on travel route impacts not Evac Point
DRAFT

Scenario #	Location	NW	N	NE	EVA 1	EVA 2	EVA 3	EVA 4	EVA 5
14-C	White Rock Rd north of Valley View Pkwy W 50 Lime	N/A **(150)_	N/A** (150+)	None	N/A** (360+)	300+	N/A** (None)	None	None
14-D	White Rock Rd north of Valley View Pkwy W 50 Both	N/A** (150)	120+	None	300+	None	None	None	None
14-E	White Rock Rd north of Valley View Pkwy WNW 50 No Development	None	None	None	N/A** (150)	N/A (90)	N/A** (240+)	N/A** (210+)	N/A (90+)
14-F	White Rock Rd north of Valley View Pkwy WNW 50 Marble	None	None	None	N/A** (150)	None	None	N/A** (300+)	N/A** (None)
14-G	White Rock Rd north of Valley View Pkwy WNW 50 Lime	N/A** (None)	N/A** (300+)	N/A** (None)	N/A** (180+)	N/A** (90)	N/A** (240+)	300+	N/A** (90)
14-H	White Rock Rd north of Valley View Pkwy WNW 50 Both	None	None	None	N/A (150)	None	240+	None	None
15-A	Valley View Pkwy at Blackstone Pkwy W 50 No Development	120+**	90+**	360+	N/A** (240+)	N/A** (240+)	N/A** (360+)	N/A— (None)	360+
15-B	Valley View Pkwy at Blackstone Pkwy W 50 Marble	240+	120+	None	210+	None	300+	N/A** (None)	N/A** (None)
15-C	Valley View Pkwy at Blackstone Pkwy W 50 Lime	N/A** (200+)	N/A** (90)	300+	N/A** (240+)	120+	N/A** (360+)	None	None
15-D	Valley View Pkwy at Blackstone Pkwy W 50 Both	240+	300+	None	210+	None	300+	None	None
15-E	Valley View Pkwy at Blackstone Pkwy WNW 50 No Development	None	None	None	N/A** (0**)	N/A (40)	N/A** (180)	N/A (** (90)	90+
15-F	Valley View Pkwy at Blackstone Pkwy WNW 50 Marble	None	None	None	N/A **(0)	None	N/A** (180)	N/A* (180+)	N/A* (None)
15-G	Valley View Pkwy at Blackstone Pkwy WNW 50 Lime	N/A** (None)	N/A** (None)	180+	N/A (0)	N/A** (60)	N/A** (100+)	90+	180+
15-H	Valley View Pkwy at Blackstone Pkwy WNW 50 Both	None	None	None	N/A (0)	None	N/A** (100+)	210+	None
16-A	East of Aspen Meadows Dr and Cornerstone Dr W 50 No Development	None	150+	240+	N/A (0)	N/A (50)	N/A** (100)	N/A	N/A

N/A is not accessable. None is no time restriction. Numbers are in minutes (time to egress point no longer viable)
* Only applies if infrastructure (roads) from adjacent project is provided (even if balance of the project is not completed)
** - Based on travel route impacts not Evac Point
DRAFT

Scenario #	Location	NW	N	NE	EVA 1	EVA 2	EVA 3	EVA 4	EVA 5
16-B	East of Aspen Meadows Dr and Cornerstone Dr W 50 Marble	None	300+	None	N/A (0)	120+	N/A** (100)	N/A** (240+)	N/A** (120)
16-C	East of Aspen Meadows Dr and Cornerstone Dr W 50 Lime	N/A** (None)	N/A** (180+)	N/A** (300=)	N/A (0)	N/A (50)	N/A** (100)	300+	90+
16-D	East of Aspen Meadows Dr and Cornerstone Dr W 50 Both	None	300+	None	N/A (0)	None	N/A** (100)	None	None
16-E	East of Aspen Meadows Dr and Cornerstone Dr SW 50 No Development	N/A (0)	300+	None	N/A** (100+)	None	N/A** (None)	None	None
16-F	East of Aspen Meadows Dr and Cornerstone Dr SW 50 Marble	N/A (0)	None	None	N/A** (0)**	None	None	None	None
16-G	East of Aspen Meadows Dr and Cornerstone Dr SW 50 Lime	N/A (0)	300+	None	N/A** (0)**	None	N/A** (None)	None	None
16-H	East of Aspen Meadows Dr and Cornerstone Dr SW 50 Both	N/A (0)	None	None	N/A** (0)**	None	None	None	None

As indicated in the footer, N/A means that the evacuation point was not used for that scenario. This point could be used for local residents to evacuate but is not used for the Project Site modeling. The single * indicates that the time shown is valid only if the infrastructure from the adjacent project was constructed and available. The double ** indicates that the time value (number in the cell of the matrix may be based on the travel route rather than the actual evacuation point. This applies when the route would be back into the fire path in a timeframe that would make this route unsafe.

Modeling Summary

In a worst-case scenario for the static fire modeling, flame lengths of 55'+/- may be possible when the fire is running upslope, in a continuous fuel bed (chaparral fuel), in line with the wind, on a very dry hot day. This is based on six-foot chaparral fuel beds (Sh5 fuel) and eight-foot beds in the Chaparral specific model run.

Using the Minimum Travel Time feature of FlamMap, it is possible to project the time it might take for a given fire scenario to travel the distance from the origin to each of the evacuation points within the Project Site and when they might impact the Evacuation Points. These results are provided for each scenario in the appendix and summarized in the matrix.

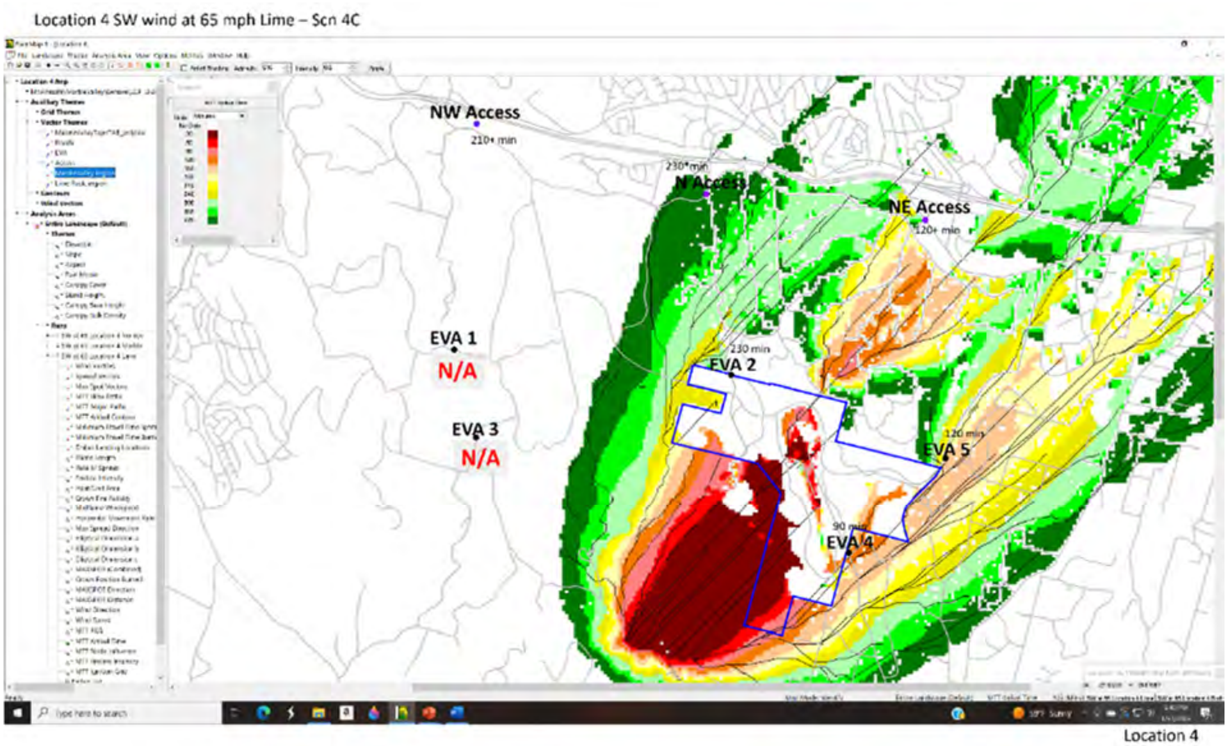

Figure 40 – Example Scenario Modeling Output

In all scenarios, burn-through of the community is not modeled or expected given the fuel modification/defensible space zones, hardened structures and restrictions on vegetation which will be in place by the Regulation and standards required by the Fire Department for new development within the Very High Fire Hazard Severity Zones. This does not preclude structure ignition or damage on the perimeter of the community in this modeling, only that the fire will not continue through the community.

In a recent study (2019) researcher found that housing density plays a role in the number of structures which are damaged in wildland fire:

> *Looking at fire ignitions, large fires, and structures burned, we explored the importance of climatic and human variables for explaining fire and structure loss patterns across three diverse California landscapes, under current and future*

> *climate (hot-dry or warm-wet) and land use (rural or urban residential growth) scenarios. Across regions, we found that housing and human infrastructure were more responsible for explaining fire ignitions and structure loss probability. Large fires were better explained by climate, topography, and fuel variables. The differing strengths of these relationships interacted with the climate and land use scenarios, resulting in variability across regions in the relative importance of climate and housing patterns on fire and structures burnt. Focusing only on empirical housing density and structures burnt, we found that most structure loss occurred in areas with low housing density (from 0.08 to 2.01 units/ha), and as such, expansion of rural residential land use generally increased projected structure loss probability in the future. Both the historical results and the future projections highlight that future changes are likely to be complex and will result from a range of interacting factors. Climate change will be important to consider for managers and policy makers in some, but not all regions. In all areas, land use change merits increased attention, as local policy decisions can influence future patterns of development and exposure of structures to risk of loss in large wildfires.*
> Syphard, A. D., Rustigian-Romsos, H., Mann, M., Conlisk, E., Moritz, M. A., & Ackerly, D. (2019). The relative influence of climate and housing development on current and projected future fire patterns and structure loss across three California landscapes. Global Environmental Change, 56, 41–55. https://doi.org/10.1016/J.GLOENVCHA.2019.03.007

The findings of this research make sense in that denser developments will have a defined interface (rather than an intermix condition), overall vegetation within the community is generally less and is managed within 100 feet of the structures. These management areas tend to overlap in denser communities, forming a homogenous area within the wildland where conditions for continue burning are greatly reduced or eliminated. Add to this, structures which are hardened to radiant and convected heat, have ember protects and are set far enough from the native fuels to not have direct flame contact from the wildland makes the ignition less likely. In the event that a structure was to ignite, all of the residential units and support structures of any real size are protected by automatic fire sprinklers which have a history of holding fires to the room or area of origin in most cases, make the likelihood of a conflagration or community burn-through unlikely.

The size, location and configuration of the Project Site make it unlikely that a fire will impact the entire Project Site at a single time, but rather the fire will impact sections of the project interface over a period of time which will allow for resources to be redistributed and for evacuation opportunities after the fire front has passed a specific location. Travel within the Project Site should be viable at all times, given the distance from the wildland fuels and the protection features which will be provided. The fire scenarios which have been modeled are extreme and the results indicate the fire will be traveling at a rate faster than fire suppression activity will allow for control lines. The fire department would be expending efforts to keep evacuation routes open, protect structures where it was safe to do so and to work on indirect actions in an effort to have a positive effect on the fire path and the assets at risk. Interior area of the community not shown in the areas burned (colored areas in Figure 40 and in the appendixes) will be capable of use as "areas of refuge" when not in the direct line of travel for the fire.

Water Supply and Infrastructure

No water delivery facilities are present on the Project Site. El Dorado Irrigation District (EID) provides potable water to over 100,000 people in El Dorado County through two primary interconnected water systems in its service area—the El Dorado Hills system and the Western/Eastern system. The El Dorado Hills water system obtains its primary supplies under rights and entitlements from Folsom Reservoir, while the Western/Eastern system derives its supplies from sources under rights from the South Fork American River and Cosumnes River watersheds. The Project Site lies within EID's El Dorado Hills supply area.

El Dorado County Fire Protection District

TABLE B105.1(1)
REQUIRED FIRE FLOW FOR ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

FIRE-FLOW CALCULATION AREA (square feet)	AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE FLOW (gallons per minute)	FLOW DURATION (hours)
0–3,600	No automatic sprinkler system	1,000	1
3,601 and greater	No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2) at the required fire-flow rate
0–3,600	Section 903.3.1.3 of the *California Fire Code* or Section 313.3 of the *California Residential Code*	1,000	1
3,601 and greater	Section 903.3.1.3 of the *California Fire Code* or Section 313.3 of the *California Residential Code*	½ Value in Table B105.1(2) (min 1,000 gpm)	2
MAJOR SUBDIVISIONS (5 Parcel or Greater)			
0–3,600	Section 903.3.1.3 of the *California Fire Code* or Section 313.3 of the *California Residential Code*	1,000	1
3,601 and greater	Section 903.3.1.3 of the *California Fire Code* or Section 313.3 of the *California Residential Code*	½ Value in Table B105.1(2) (min 1,000 gpm)	2
OTHER RESIDENTIAL DEVELOPMENT			
0–3,600	Section 903.3.1.3 of the *California Fire Code* or Section 313.3 of the *California Residential Code*	500	1
3,601 and greater	Section 903.3.1.3 of the *California Fire Code* or Section 313.3 of the *California Residential Code*	½ Value in Table B105.1(2) (min 750 gpm)	1

TABLE B105.2
REQUIRED FIRE FLOW FOR BUILDINGS OTHER THAN ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE FLOW (gallons per minute)	FLOW DURATION (hours)
No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2)
Section 903.3.1.2 of the *California Fire Code*	25% of the value in Table B105.1(2)[b]	Duration in Table B105.1(2) at the reduced flow rate

b. The reduced fire flow shall be not less than 1,500 gallons per minute.

Figure 41 - Amended Fire Flow Requirements for EDCFPD Area

The El Dorado Irrigation District 2019 Water Supply and Demand Report and 2020 Urban Water Management Plan detail water supply and the timing and need for various improvements throughout the district.

Based on reviews of these recent reports and the revalidation memorandum, the data and supply availability conclusions in the WSA relating to water supply and consumption remain valid, and water is available for the Project Site for residential use, irrigation, and fire flow. The specifics of the water supply are well documented in the Project Site EIR.

In accordance with the adopted Fire Code (2020) fire flow requirements for the Project are shown in Figure 41, to the left.

The water system will be designed and constructed in accordance with the adopted fire code, NFPA Standards and local requirements as stated in the fire department adopted and published requirements. For El Dorado Regional Fire Protection Standard #D-003 Water Supplies for

Suburban and Rural Fire Fighting -3/23/2022. Where any portion of the water system is not gravity fed, emergency power will be provided for the duration required by the code.

According to EID's 2022 Water Supply and Demand Report (El Dorado Irrigation District, 2022), the district has available water supply in the Western/Eastern supply area of approximately 30,580 AF (acre feet). EID's adopted Integrated Water Resources Master Plan (HDR, 2013) describes new water supply and transmission infrastructure necessary to increase the availability of water supply for the Western/Eastern Supply area.

An overall potable water system is in place for the El Dorado Hills and the Cameron Park communities, including off-site transmission mains, storage tanks, and booster stations. Development of the Plan Area requires the construction and extension of transmission and distribution water mains that will be constructed in phases. (Refer to Figure 42.)

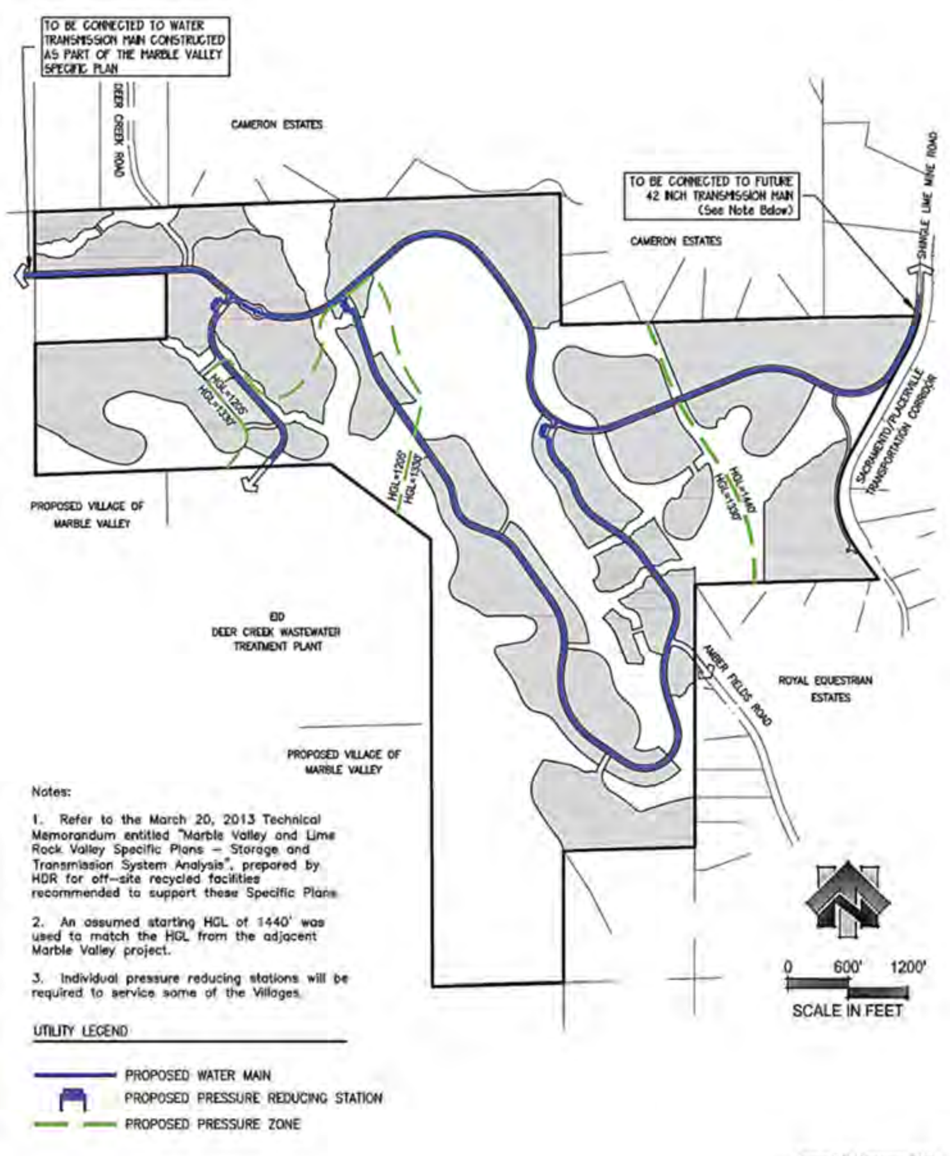

Figure 42 – Lime Rock Specific Plan Master Water Plan Map

Components of the overall water system include off-site transmission mains, on-site and/or off-site storage tanks, booster stations, distribution mains, and laterals. The installation of water improvements will be performed in a multi-phased approach. The initial water plan includes the construction of necessary backbone infrastructure to ultimately serve the entire assumed maximum needs of the Plan Area. The off-site infrastructure required to convey water to the Plan Area would be constructed to meet Plan Area needs. This includes the transmission mains and any other components needed to physically transport water to the Plan Area from the EID Western/Eastern water supply region.

Electric Power Lines

While by electrical lines are the cause of fires all over the state, utilities in the state of California are taking steps to increase the safety of all power lines by:

1. Undergrounding distribution lines
2. Improving safety on transmission lines through the replacement of equipment before it fails
3. Increased routine inspections.
4. The use of "covered conductors" rather than "bare wire" as has been used in the past.
5. Expanded line clearance, increased hazard-tree assessments and removals, ensuring adequate cleared brush at the base of poles/towers.
6. Public Safety Power Shut Offs during high-risk weather events.
7. Installing and monitoring of over 2,000 Remote Automated Weather Stations, expanded use of Artificial Intelligence/Machine Learning capabilities (AI/ML) for improved forecasting and the installation of High-Definition Cameras for real-time monitoring of high-risk areas during extreme weather events.
8. Installation of Sectionalizing Devices and Fast Acting Fuses to decrease the risk of fire inducting events.

The above measures are regional actions which should result in a decrease in the fires caused by the overall electrical grid. Many of the fires caused by the electrical distribution system occur during extreme fire weather conditions. Any reduction in these types of fires within the region increases the overall protection to the Project Site by lowering the probability of a large fire.

Fire Protection Resources

Impacts During Construction

Prior to combustible construction on site the Fire Department requires that "all-weather" fire department access roadways, fire hydrants (or approved water source alternative), and initial fuel modification/defensible space zones (bare earth is acceptable at this point) are installed and approved prior to the "framing stage". Prior to C of O (certificate of occupancy), the Fire Department requires that all fire department life safety systems (fire sprinklers, standpipes if applicable), fire lanes, street signs, addressing, wayfinding if appropriate, defensible space requirements and structure hardening as required by the various laws, codes, ordinance and standards enforced by the fire department and building/planning agencies be in place, tested, inspected and approved.

Impacts Over the Life of the Project

Maintenance requirements for each of the safety systems or devices are assigned to specific entities (homeowners, Homeowner's Associations (HOA), Local government). Repair/replacement and maintenance of these systems will be established in the CC&R's for the homeowners and HOA(s), while the local governmental agency is responsible for the public improvements in the Right of Way (ROW). In some cases, a Zone of Benefit (ZOB) may be established to provide for different levels of service, or to raise additional revenue within specific areas of a county service area.

The responsibilities and funding source for the common areas (not in the ROW) are to be set in CC&R's. Unless otherwise provided in the CC&Rs, homeowners are responsible to maintain improvements to their fee-title properties while HOA's maintain common areas and other improvements either owned by the HOA or controlled by the HOA if established by the CCR&s.

EVA's (Emergency Vehicle Access) will be maintained in perpetuity by the appropriate entity or entities which are benefited by the improvement. In the case of public streets or ROW's this will be the governmental agency which owns the underlying property. For improvements on private property, the HOA(s) or other legal entity (such as a private property owner or ZOB) is responsible for the common area(s) on which the improvements (EVA) have been made.

The responsibilities and funding source for the common areas (not in the ROW) are set in the CCR's. Homeowners are responsible in the single-family communities and HOA's in the structures where community ownership of the underlying property or areas of the structure(s) exist.

Fuel modification/defensible space zones, installed automatic fire sprinklers (except the NFPA13D system in one and two-family dwellings) and defensible space are inspected by the fire department on a routine basis (annually or bi-annually in most cases) and in the case of fire sprinklers (NFPA 13 and 13R), they are inspected and certified by third-party venders on a five year interval.

Fire Suppression Resources

The Fire Department resources and capabilities have been discussed in various documents over the development of the Project Site. The following is a summary of those overall resource and capabilities:

> *Fire protection services in El Dorado County are provided by 13 separate fire districts, one city fire department, the California Department of Forestry and Fire Protection, and the U.S. Forest Service. Two fire protection districts serve the proposed project site: the El Dorado Hills County Water District (which includes the EDHFD) serves the western portion of the project site, and the El Dorado County Fire Protection District (also referred to as the El Dorado County Fire District or El Dorado County Fire) serves the eastern portion. The final map boundary line must follow the existing fire boundary line to insure no residential or commercial lot is split between two fire districts.*
>
> *<u>El Dorado County Fire Protection District</u>*
> *The El Dorado County Fire Protection District serves 281 square miles and has a population of 75,000 with 14 stations (El Dorado County Fire 2020). The department consists of 74 total personnel (Alvarado pers. comm.). Station 28*

would serve the eastern portion of the project site. This fire station is located approximately 4 miles northeast of the project site, and the average response to the project site would be approximately 12.5 minutes (Alvarado, pers. comm.)

The El Dorado County Fire Protection District Five Year Plan 2011–2016 serves as a set of guidelines to address identified needs over a 5-year period. The district's vision and guiding principles, history, organization, and sources of revenue are outlined, and the district's facilities, apparatus, and response to incidents are described. The plan uses this information to identify personnel and equipment needs as well as methods to address those needs.

The plan indicates that the El Dorado County Fire Protection District—also referred to as the El Dorado County Fire District or El Dorado County Fire—responds to 4.6 times more calls than the average number of responses of all 14 other fire agencies in El Dorado County (El Dorado County Fire Protection District 2011). The plan includes bar charts that show a 15.7 percent increase in call volume over the previous 8 years, and a 19 percent reduction in average response time since 2002, with an average response time of 9 minutes and 19 seconds (El Dorado County Fire Protection District 2011).

The plan also describes existing and future department revenues and their sources, including property taxes and development fees. Property taxes constitute the district's primary source of funding; the district receives 13 percent of the 1 percent Ad Valorem Tax collected by the County within the district's boundaries (El Dorado County Fire Protection District 2011). The plan notes a decrease in property tax revenues beginning in the 1992–1993 fiscal year, associated with the transfer of 10 percent of each special district's property tax revenue to school funding through the Educational Revenue Augmentation Fund, and indicates that the annual loss to the district exceeds $1.1 million dollars (El Dorado County Fire Protection District 2011). In addition to the Ad Valorem Tax funding, the district receives funding from voter-approved special taxes in some areas of the district; this funding provides approximately $510,000 of additional annual revenue (El Dorado County Fire Protection District 2011).

Fire Station 28, located approximately 4 miles from the project site on Ponderosa Road in Shingle Springs, is the closest El Dorado County Fire Protection District fire station to the project area. It serves Red Hawk Casino and the communities of Shingle Springs, South Cameron Estates, and Crazy Horse. The average response time for the El Dorado County Fire Protection District from 2002 to 2010 was approximately 9 minutes, and approximately 8:43 minutes in 2010 (El Dorado County Fire Protection District 2011:18). Response times have been reduced by 19 percent since 2002. Although this is slightly over the 8-minute minimum response time, several factors would address this deficit. Because the project area would be served by the EDHFD and the El Dorado County Fire Protection District, the proximity of the project site to the nearest fire stations, and the inclusion of a future fire station on the Marble Valley project site, it is anticipated that the County

> *General Plan requirements would be met. No new fire protection facilities beyond those planned within the project or alterations to existing facilities would be needed.*

Utilizing the "boundary drop" agreement, which is in place between the local fire departments, the closest resource responses to an emergency regardless of jurisdiction, E89 from Cameron Park (3200 Country Club Drive, Cameron Park) could be the closest fire department resource, if available.

El Dorado County Fire Protection District also owns a vacant parcel APN 119-295-002 located in the area of Crazy Horse Rd and Hemmingway Ct. on the western side of the district and immediately north of the Project Site. Potential future development of this parcel would add to the resources available in the event of an emergency.

Operational Considerations

How to complete the evacuation, when to evacuate, how long it will take to get the last person out of harm's way, and to where are they evacuating, are all factors that need to be considered when making tactical decisions on wildfires. Normally the majority of the effort is put towards fire suppression on the active fire line if conditions warrant it; indirect attack if not. When people are in "harm's way," the situation shifts dramatically. The protection of the egress pathways, the structures themselves, and the area where refuge can be found become the priority.

The decision to "Shelter in Place" is never the first choice and is not a first choice for the Project Site. Getting people "out of harm's way" is always the preferred option. Not every scenario can be anticipated, there will be scenarios that would require the incident commander(s) or field officer of the fire and law enforcement agencies to decide on how to protect the citizens when emergent conditions arise. Figure 43 provides a simple decision tree for evacuation vs. protecting people in place.

Evacuation is always the preferred option but sometimes, circumstances may generate conditions where moving an "at risk" population will place them in more danger. It should be noted that most evacuation scenarios are generated by large fires burning into communities. These fires would have already been burning for a period of time and would, no doubt, have been discovered. Emergency personnel would be working on the decisions below to determine where evacuation is warranted. The modeling shows that if the fire reaches certain points, evacuation is not a likely choice. If there is not enough time to safely move the population at risk to an uninvolved/safe area, consideration of where to best protect them is the next action on the decision tree.

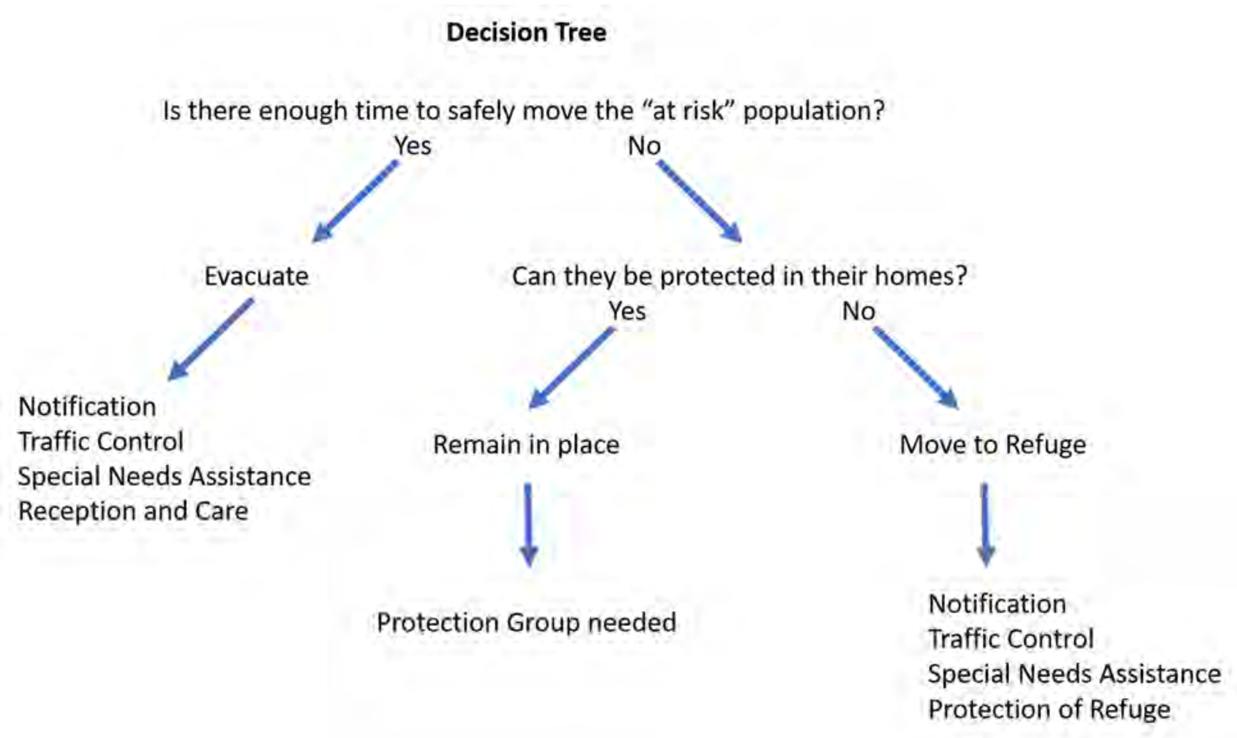

Figure 43 – Evacuation Decision Tree

In planned communities, a legal entity (normally an HOA) is responsible for common areas and the maintenance of community resources. This often includes lighting, landscape, parks, pools and in some communities' roads, bridges, and open spaces, and when the housing products include, joint land ownership, and even property insurance. Where the community has been designed and developed with wildland fire defenses such as fuel modification/defensible space zones, greenbelts, roadside clearance for evacuation routes and/or special maintenance areas within the community, it is the HOA or other legal entity that is responsible for maintaining these common features. As such, there is a high probability that this ongoing maintenance will occur as required and as stated in the organizational documents which were put in place when the community was established. It also makes a single entity accountable and simplifies the inspection process as well as streamlines the communications process (notices, code and standards updates, compliance, verification of maintenance).

The building and fire codes and some county and state wildland fire regulations are based on requirements for the land or building owner. As such, there is not necessarily an equal level of compliance at each and every structure, even if they were constructed at the same time, under the same requirements. In wildland fire safety, when structures are not separated by a large distance (30 feet or more), the risk to one structure can be caused by the risk to the adjacent structure even when the first owner has done everything right in terms of wildland fire protection. In planned communities, this is not the case. Common areas are managed as one entity, and the HOA has the power to make each homeowner comply with the regulations adopted by the local fire authority as an obligation of its fiduciary function to keep the entire community safe. This is why planned communities are significantly different in the ability to keep the community safe from wildland fires. This is why a "systems approach" is possible.

This "systems approach" begins with the community design. Larger, planned communities generally tend to use a defined interface rather than an intermix with respect to the wildland perimeter of the development.

Cluster development (higher density with more open space) with defined perimeter protection provides for a "protective bubble" around the development. By controlling the interior (vegetation, configuration and defensible space) and providing an adequate distance (fuel modification/defensible space, greenbelts, selected agriculture crops (vineyards, certain types of orchards, row crops), fuel breaks and fire breaks) the combination of these elements creates a system for the protection of the community.

The current codes and standards coupled with the design of the current fuel modification/defensible space zone requirements provides for a community in which fire is unlikely to burn through the community (burn through) when all portions of the system are in place and functioning as designed.

Provisions are in place to allow for approved maintenance in the fuel modification/defensible space areas so that the safety margin can be maintained.

> *2.1.2 Fire Safe Activities Exemption Actions taken pursuant to an approved Fire Safe Plan for existing structures or in accordance with defensible space maintenance requirements for existing structures as identified in California Public Resources Code (PRC) Section 4291 are exempted from the mitigation requirements included in this ORMP. Oak resources impacts for initial defensible space establishment for new development are not exempt from the mitigation requirements included in this ORMP. After establishment of defensible space for new development, maintenance of that defensible space thereafter is exempt from the mitigation requirements included in this ORMP. In addition, fuel modification activities outside of defensible space areas that are associated with fuel breaks, corridors, or easements intended to slow or stop wildfire spread, ensure the safety of emergency fire equipment and personnel, allow evacuation of civilians, provide a point of attack or defense for firefighters during a wildland fire, and/or prevent the movement of a wildfire from a structure to the vegetated landscape, where no grading permit or building permit is applicable, are exempted from the mitigation requirements included in this ORMP.* (El Dorado County Oak Resources Management Plan, September 2017, Page 6)

Risk Reduction Measures

Risk Reduction measures which are required by codes, ordinances and standards include:

a) All dwelling units and most large commercial buildings will be protected with automatic fire sprinklers. (Fire department plan check and inspection ensure compliance)

b) The Project Site has increasing housing density and used a consolidated design to reduce or eliminate, where possible, wildland fuels within the interior of the Project Site and keep the edge of the Project Site as an identifiable interface with appropriate fuel breaks, fire breaks and fuel modification/defensible space zones. (Fire department plan check and inspection ensure compliance)

c) The Project Site has been designed to avoid and minimize low-density urban development patterns or leapfrog-type developments (i.e., those with undeveloped wildland between developed areas). (Fire department plan check and inspection ensure compliance)

d) Decreasing the extent and amount of "edge," or interface area, where development is adjacent to undeveloped wildlands. (Fire department plan check and inspection ensure compliance)

e) The Project Site has/will create buffer zones and defensible space within and adjacent to the development, with particular attention to ensuring that vegetation will not touch structures or overhang roofs. The Project will establish the legal obligations within the CCR's to ensure that defensible space measures are retained over time. (Implementation of the Fire Safe Plan, Fire department plan check and inspection ensure compliance)

f) Undergrounding of power lines will be accomplished in the entire Project Site. (Fire department plan check and inspection ensure compliance)

g) The Project Site design attempts to limit development along steep slopes and amidst rugged terrain, so as to decrease exposure to rapid fire spread and increase accessibility for firefighting. Sites which have wildland fuels below (lower than the project structures) will have additional protections provided with radiant heat walls, increased built-in fire protection features and/or placement of the structure so that the impacts of "underslung fuels" are reduced to a level of acceptable risk. (Implementation of the Fire Safe Plan, Fire department plan check and inspection ensure compliance)

h) Fire hardening structures and homes in accordance with Chapter 7A of the Building Code, Section R337 of the Residential Code, and the specific requirements of the fire department during the development review process for the site-specific locations.

i) Siting structures and features to maximize the role of low-flammability landscape features and roadways that may buffer the development from fire spread. (Implementation of the Fire Safe Plan, Fire department plan check and inspection ensure compliance)

j) The Project will expand existing fire resources funding in the region (new revenue generated by the development). (Developer Agreement with Fire Department participation in fire district ensure compliance)

k) Placement of development within the existing or planned ingress/egress and designated evacuation routes to efficiently evacuate the project population and the existing community population, consistent with evacuation plans, while simultaneously allowing emergency access. (Implementation of the Fire Safe Plan, Fire department plan check and inspection ensure compliance)

Additional Regional Benefits

In addition to the project specific risk reduction measures, the project, in and off itself, provides for some additional protection to existing communities where it provides a buffer of non-wildland fuels between some of the fire scenarios and the existing communities. Using the modeling results to illustrate this point, in Figure 44, the graphic provides a comparison of the fire behavior for a

"No Development" scenario with a scenario where the Lime Rock project has been completed. Significant additional time is provided to the existing communities to the north of the Project Site.

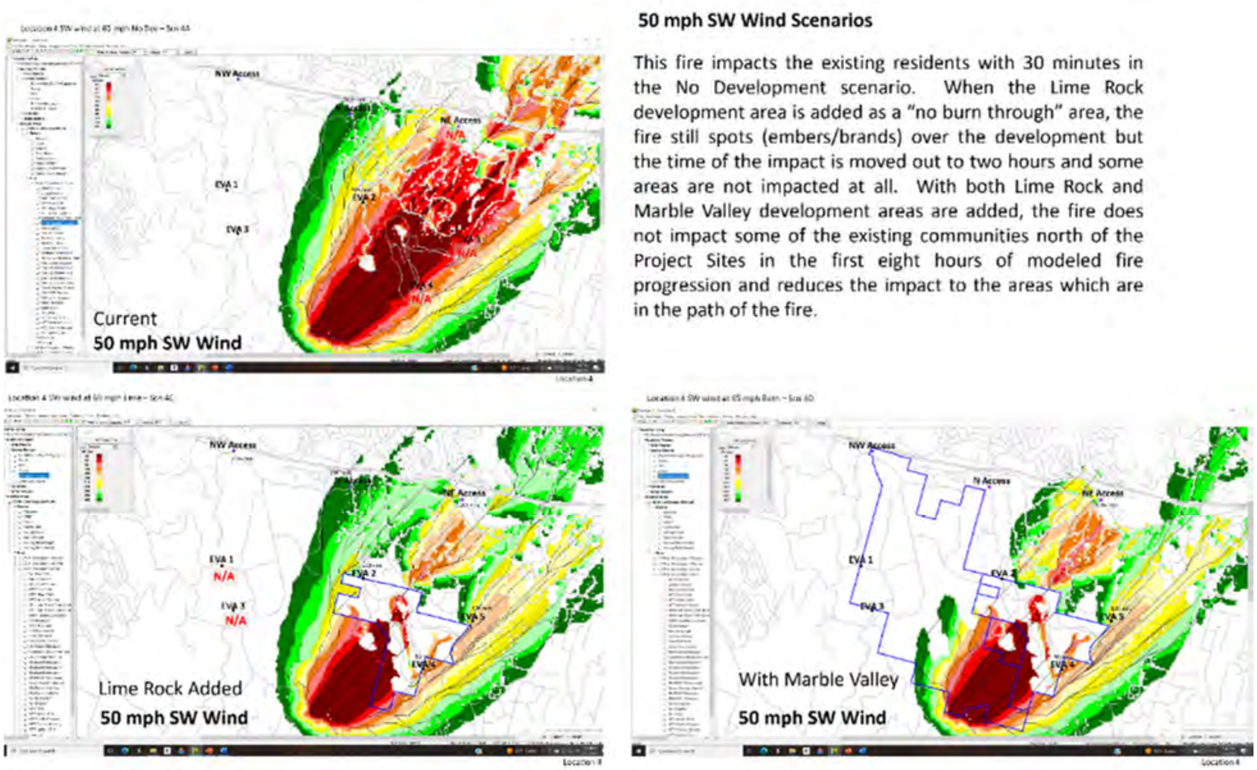

Figure 44 - Example of Regional Benefits (Wildfire)

The comparison then provides the impact with the adjoining Marble Valley project added. Each scenario has its own impacts and benefits but, in most cases, where the new development is between the origin of the fire and the existing community, there is a benefit in terms of additional time to evacuate or the fire simply not getting the existing community at all in some areas.

With respect to the tasks as outlined in the California Attorney General's "*Best Practices for Analyzing and Mitigating Wildfire Impacts of Development Projects Under the California Environmental Quality Act*" the report has the following conclusions:

1. **Determination of project impact will substantially impair an adopted emergency response plan or emergency evacuation plan;**

   The Project Site's general area does not have an adopted emergency evacuation plan. The emergency response capabilities will be enhanced with the addition of a new fire service funding from the project site's inclusion in the fire district and improvements to the public roadways. The evacuation analysis for this project will be the first formal process that can be found in searches of the available records. (see Fehr and Peers Evacuation Analysis for details).

   From a wildland fire behavior perspective, the Project Site will not substantially impair an adopted emergency response plan or emergency evacuation plan. Project Site specific plans will be completed as an integral part of Resident Information and Community Communications efforts by the Project Site sponsors, builders, and the ultimate HOA's who will have the ongoing responsibility for this information.

2. **Determine the project-specific Wildland Fire Hazard and Wildland Fire Risk to quantify issues that may exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire;**

This report has examined the project-specific Wildland Fire Hazards and the resulting Risks after the risk reduction measures are in place and found that the level of Risk that results is no greater than similar communities in the area and generally better than projects constructed prior to the current Regulations. The Project Site has two primary egress points, and up to five EVA's which are available for evacuation efforts should law enforcement deem it necessary. Additionally, the combination of fuel modification/defensible space, hardened structures, and the placement of the structures and features on the topography relative to the wildland fuels creates a community that is capable of "sheltering in place" if necessary. While never a first choice by emergency service providers, if moving the population is a greater risk, this community, as designed and as it will be constructed, is capable of a sheltering operation without undue risk to the residents.

All fire scenarios that have been modeled have multiple Evac Points which are viable for specific periods of time. It should be noted that by the time the reaches the downwind evacuation point, the earlier evacuation points may become available for use by traveling through the center of the development area. All of the fire scenarios are run under extreme conditions which have not been recorded in previous fires or which are not likely to occur in the future; they are worst-case scenarios.

Evacuation reduces exposure to pollutant concentrations generated by wildfire. The combined effects of the fuel modification/defensible space, roadside clearance, wildland fire building code requirements, and the design/placement of the structures on the topography work together to protect the community from wildfire. The Project Site will, in fact, provide a buffer to some of the existing communities by removing or modifying the wildland fuels which are upwind from them. With the fuel modification/defensible space and roadside clearance in place, the probability of a fire originating from the Project Site is lower than in the adjacent communities without this level of protection. In order to access the wildlands, it will be necessary to traverse either the 100' fuel modification/defensible space zone or the roadside clearance zone. Ignitions from the normal sources associated with development will be much less likely to occur.

As proposed, the Project Site will have a less than significant impact on wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire as in most cases, they will be able to evacuate.

3. **Determine if the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) may exacerbate fire risk, or that may result in temporary or ongoing impacts to the environment;**

   All of the improvements for the Project Site have been identified and analyzed for their impact on the environment in the CEQA process. None of the Project Site infrastructure will exacerbate the fire risk for the Project Site. In fact, the improved water supply for the general area, the placement of fuel modification/defensible space zones and the establishment of a community that has the option to "shelter in place" if needed provides an alternative to the existing residents where this level of protection does not exist. If evacuation is not possible from the region, nearby communities would be safer traveling to the Project Site development areas than they would be in some of the current neighborhoods due to the added protections provided in the Project Site.

   As proposed, the Project Site will have a less than significant impact on ongoing impacts to or exacerbation of the environment as a result of **i**nstallation or maintenance of associated infrastructure related to wildland fire risk.

4. **Determine if people or structures will be exposed to significant risks due to the completion of the project; and**

   The required wildland fire protection features, and the additional protection measured identified in this report, will keep the residents and the structure of the Project Site protected from significant risk by the required Regulations and the manner in which the Project Site will be developed (clustered development with a definable interface vs an intermix community). The risk from wildland fires for the Project Site will be less than the surrounding communities as the Regulations under which the project will be developed have significantly increased the level of protection required as a baseline for development projects. Coupled with the additional protection measures listed in this report, the Project Site has mitigated the hazards in the adjacent native vegetation to an acceptable level of risk under current Regulations.

   As proposed, the Project Site will have a less than significant impact on increasing or creating new risk associated with completion of the project. A strong case can be made that the Project Site reduces risk to the existing communities by providing a buffer between the fire and the existing communities which is constructed to current standards and is not expected to allow fire to move into the existing communities which are downwind with the same level of intensity and rate of spread.

5. **Consider whether a project will "expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires."**

   As proposed, the Project Site will not expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death due to a wildland fire in the native areas adjacent to the Project Site due to the use of Fuel modification/defensible space, Defensible Space, Fire Sprinklers, placement of the structure on the Landscape/Topography, the width of the streets, the amount of fire protection water available and the placement of the fire hydrants are specified intervals, the hardening of the structures to comply with the current wildland interface Regulations and availability of firefighter resources within the Project Site and the regional assets available to combat a wildland fire by the Fire Department and the other associated agencies (CalFire, USFS, mutual aid fire resources, Call when needed fire resources) who routinely assist in the suppression of wildland fire in the region.

As proposed, the Project Site will have a less than significant impact on creating or increasing the expose of people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires. The Project Site will be significantly more protected than the existing communities which were not constructed to the current standards and do not have the same protections afforded the Project Site through its system's approach to wildland fire defense.

Conclusions and Recommendations

A review of the expected fire behavior in the interface of the Lime Rock development indicates that the fire behavior could produce extreme fire behavior, and as such, risk reduction measures will be necessary. Many of these risk reduction measures are required by the State and Local fire/building regulations, fire department standards, and guidelines, and by risk reduction measures already considered and applied by the development review process. Fire behavior modeling predicts that there will be varied timeframes for evacuation of the Project Site under fire scenarios where the fire is burning into the community from an adjacent area. Each scenario has its own set of parameters. Where fires are initialized within the Project Site or near its boundary, the fire incident command and control may have to determine if the population will be moved or "sheltered in place."

The proposed community with its increased built-in fire protection features (defensible space, fuel modification, hardening of the structures and required maintenance), placement of the structures on the topography, overall orientation to the fuels, wind, and slope and nested (safe center) configuration would be a candidate for a "shelter in place" decision. While "shelter in place" is never a first option, history shows us that moving populations, once the fire has arrived, has increased risk, and <u>should not be attempted</u> when safe alternatives exist.

The configuration of the Project Site, the placement of the structures and features on the topography and the nature of the wildland fuels surrounding the project create conditions where the fire will travel at great speeds when wind, slope and fuel align but all of the access points are not impacted by fire at the same time.

The fire behavior static modeling in this report with flame lengths of up to 55' under the worst-case scenario would be protected by compliance with the Fire Department fuel modification/defensible space standards. Fuel modification/defensible space is designed to reduce and change the fuel types as the combustible vegetation gets closer to the structure. As a "rule of thumb," two times the maximum flame length is adequate protection from radiant heat in a hardened structure. These distances also protect from direct flame contact (a distance greater than the flame length by a factor of two) and convected heat (less impactful than the radiant heat distance as discussed previously). The structure hardening (including ember intrusion projection) protects from embers and brands which may travel long distances under worst-case conditions.

With respect to the defensible space distance for the perimeter structures, the Fire Department requires distances of 100 feet of fuel modification/defensible space based on the adjacent fire potential as measured by the slope, aspect, fuel characteristics, fire history, and weather data (wind, temperature, and relative humidity). While the distance required in the thinning zones may be allowed to be reduced based on the level of hazard present, the zones nearest the structures are rarely reduced.

Additionally, the implementation of Zone 0 (the first five feet from the structure) will only enhance the already robust level of protection for the Project Site.

It has been determined that, with the implementation of the risk reduction measures set forth in this report, the proposed development areas set forth as project configurations will have a less than significant impact from the wildland fire-related issues raised under the AG Guidelines, as well as under CEQA Guidelines Appendix G, Section XX Wildfire.

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CEQA (Public Resources Code 21000–21189)

CEQA, Guidelines (California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000–15387) CEQA Appendix G, Section XX. WILDFIRE

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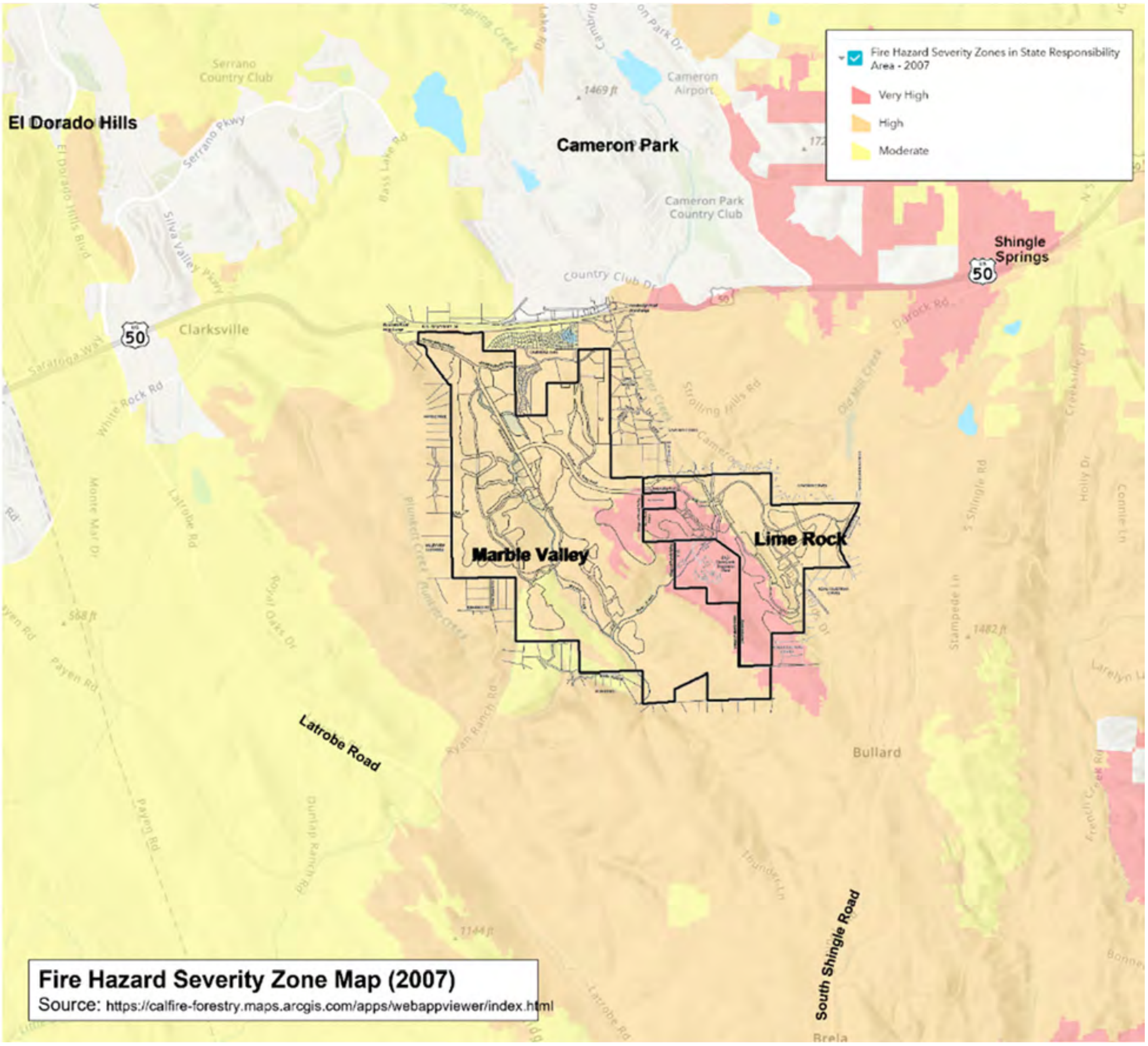


Appendix A
Site Photos Locations

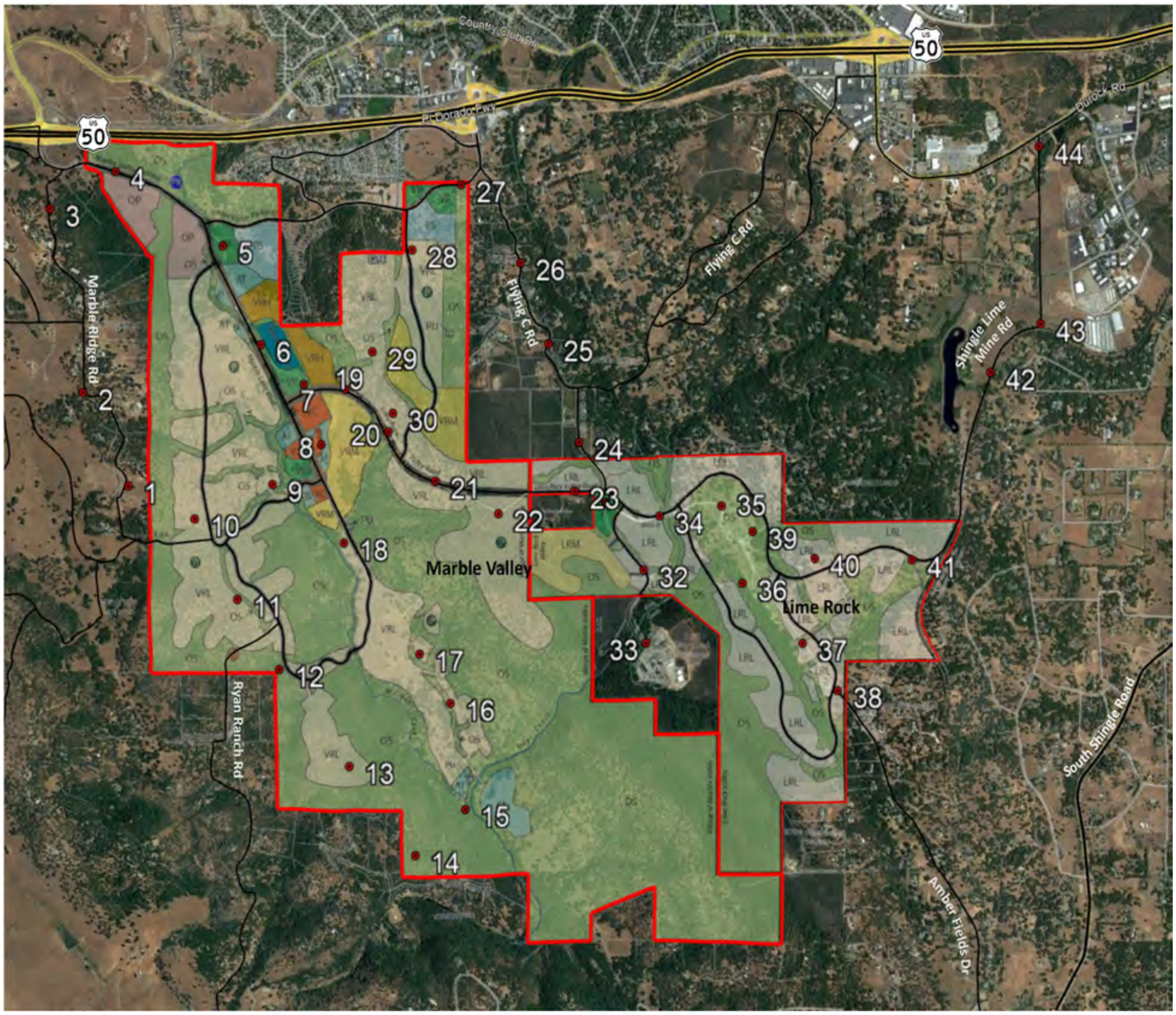


Photo locations are shown on the map above as reference points. Several photos were taken from each general location and are within a few feet of each other. For simplicity, these photo site have been grouped in the locations are shown above.

Photo Site 1 – Looking Southeast

Looking East

Photo Site 2 – Looking Southeast

Looking East

Photo Site 3 – Looking South

Looking East

Photo Site 4 – Looking North

Looking Southeast

Photo Site 5 – Looking West

Looking Southeast

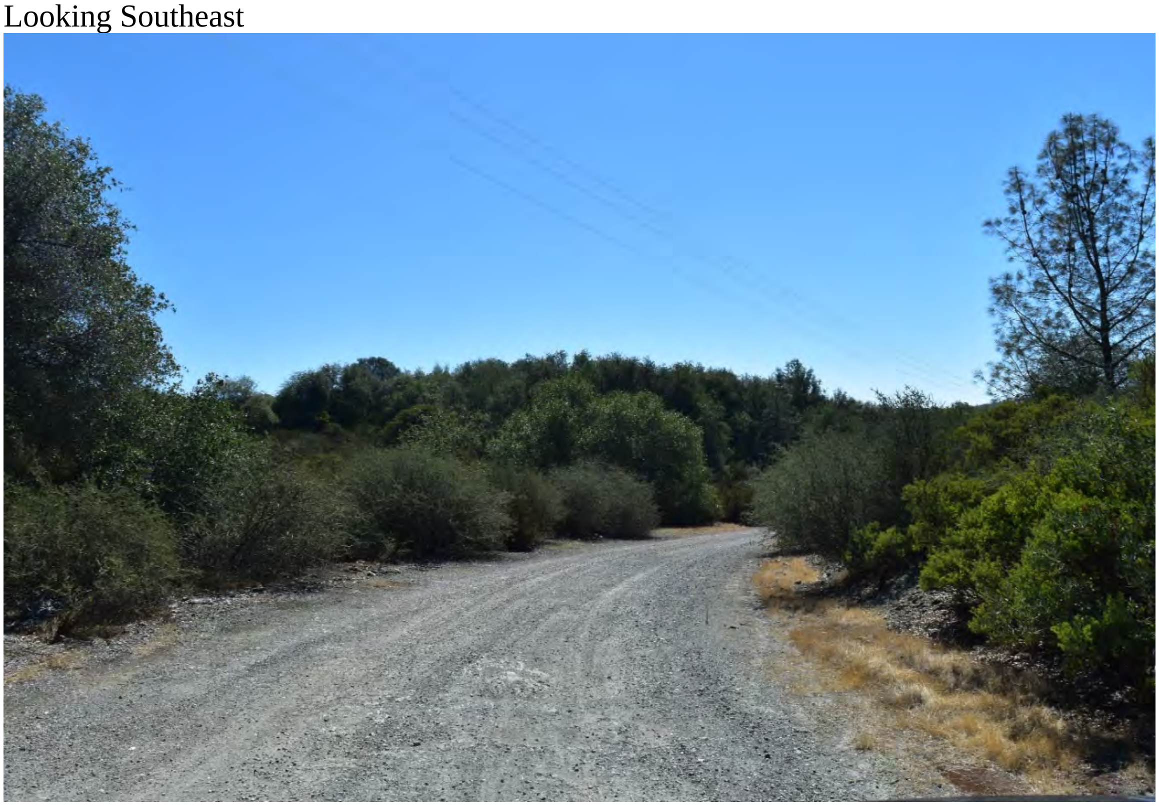


Photo Site 6 – Looking East West

Looking Southeast

Photo Site 7 – Looking East

Looking South

Photo Site 8 –Looking North

Looking South Southeast

Photo Site 9 – Looking Southwest

Looking North

Photo Site 10 – Looking South

Looking Northwest

Photo Site 11 – Looking East

Looking Southeast

Photo Site 12 –Looking West

Looking East

Photo Site 13 – Looking Southeast

Looking Southwest

Photo Site 14 – Looking West

Looking Southwest

Photo Site 15– Looking East

Looking North Northeast

Photo Site 16 –Looking Northwest

Looking North

Photo Site 17 – Looking West

Looking Northwest

Photo Site 18 – Looking North Northwest

Looking East

Photo Site 19 – Looking South

Looking Southeast

Photo Site 20 –Looking Southeast

Looking West Southwest

Photo Site 21 – Looking East

Looking Southeast

Photo Site 22 – Looking North

Looking South

Photo Site 23 – Looking South

Looking South Southwest

Photo Site 24 –Looking West Northwest

Looking North

Photo Site 25 – Looking West

Looking North

Photo Site 26 – Looking North Northwest

Looking South

Photo Site 27 – Looking South Southeast

Looking West

Photo Site 28 –Looking North Northwest

Looking Northeast

Photo Site 29 – Looking Northeast

Looking South

Photo Site 30 – Looking Southeast

Looking South

Photo Site 31 – Looking North

Looking Northwest

Photo Site 32 – Looking Southeast

Looking Southwest

Photo Site 33 – Looking Northeast

Looking North Northwest

Photo Site 34 –Looking North

Looking West

Photo Site 35 – Looking North

Looking Northeast

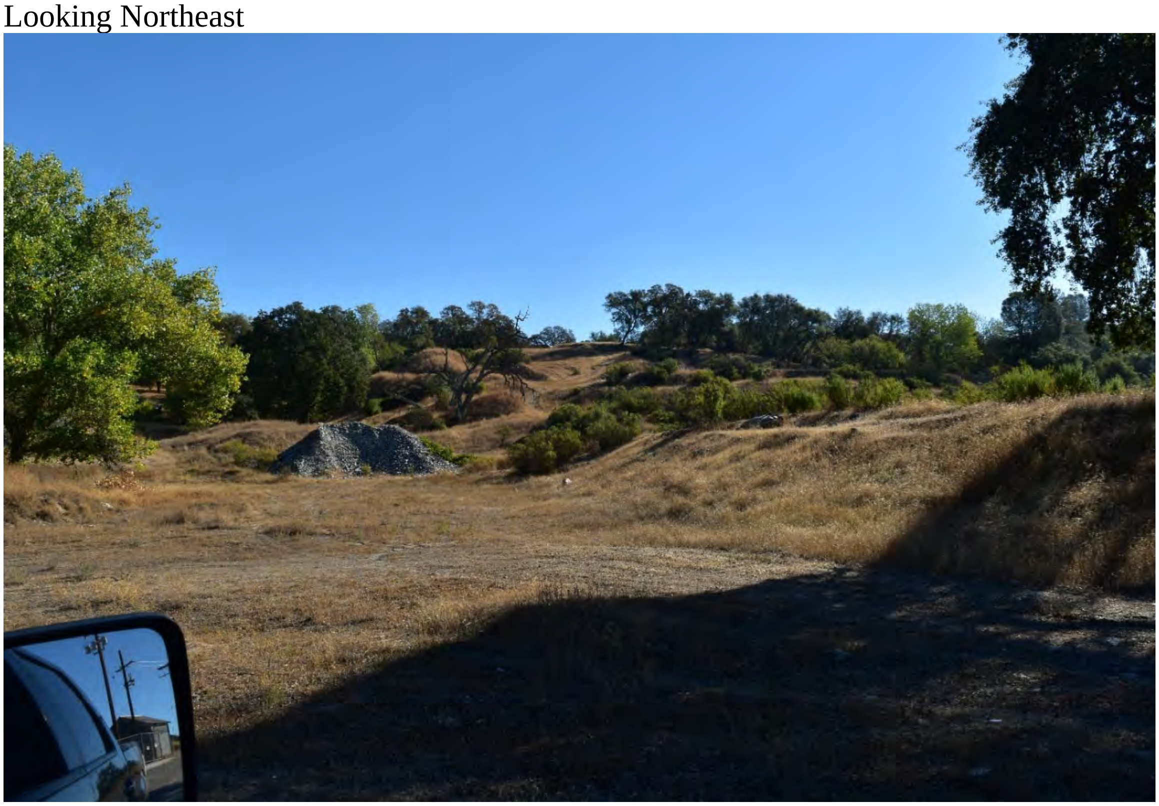


Photo Site 36 – Looking Northeast

Looking Northwest

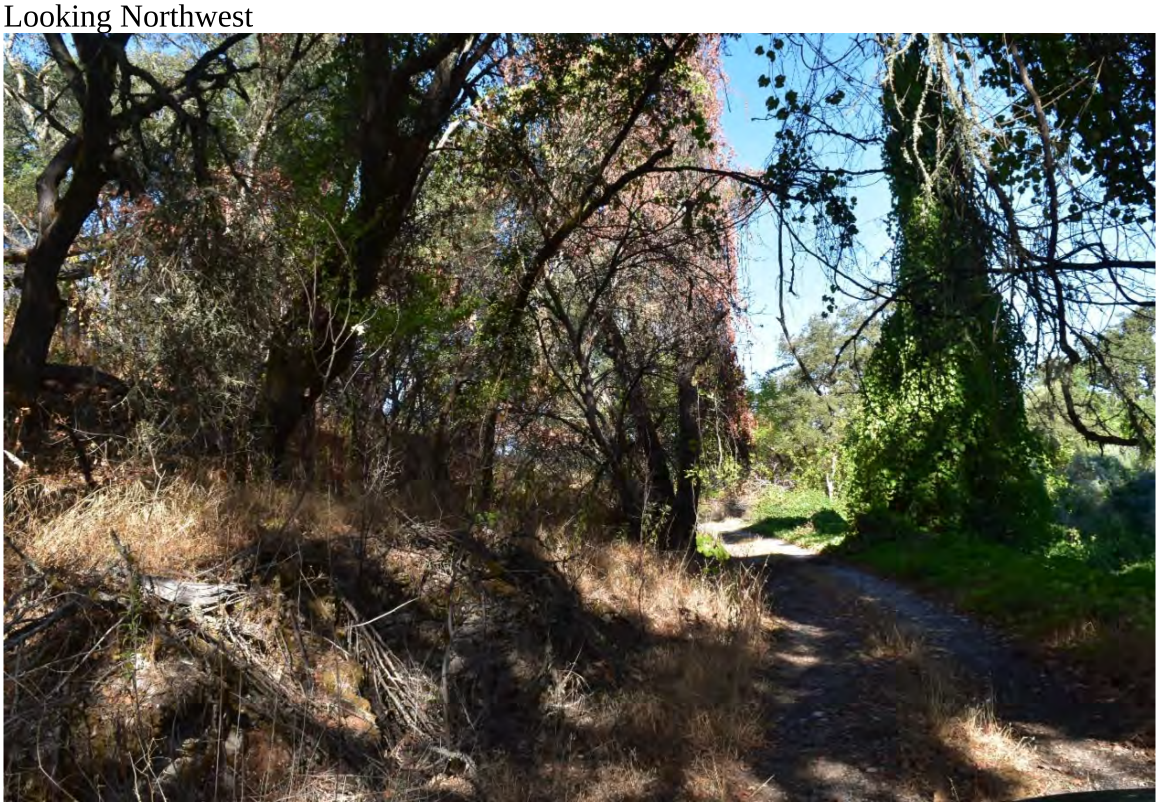


Photo Site 37 – Looking East

Looking North

Photo Site 38 – Looking Southwest

Looking West Northwest

Photo Site 39 – Looking South

Looking North

Photo Site 40 –Looking South

Looking West

Photo Site 41 – Looking South

Looking North

Photo Site 42 – Looking North

Looking South

Photo Site 43 – Looking West

Looking Northwest

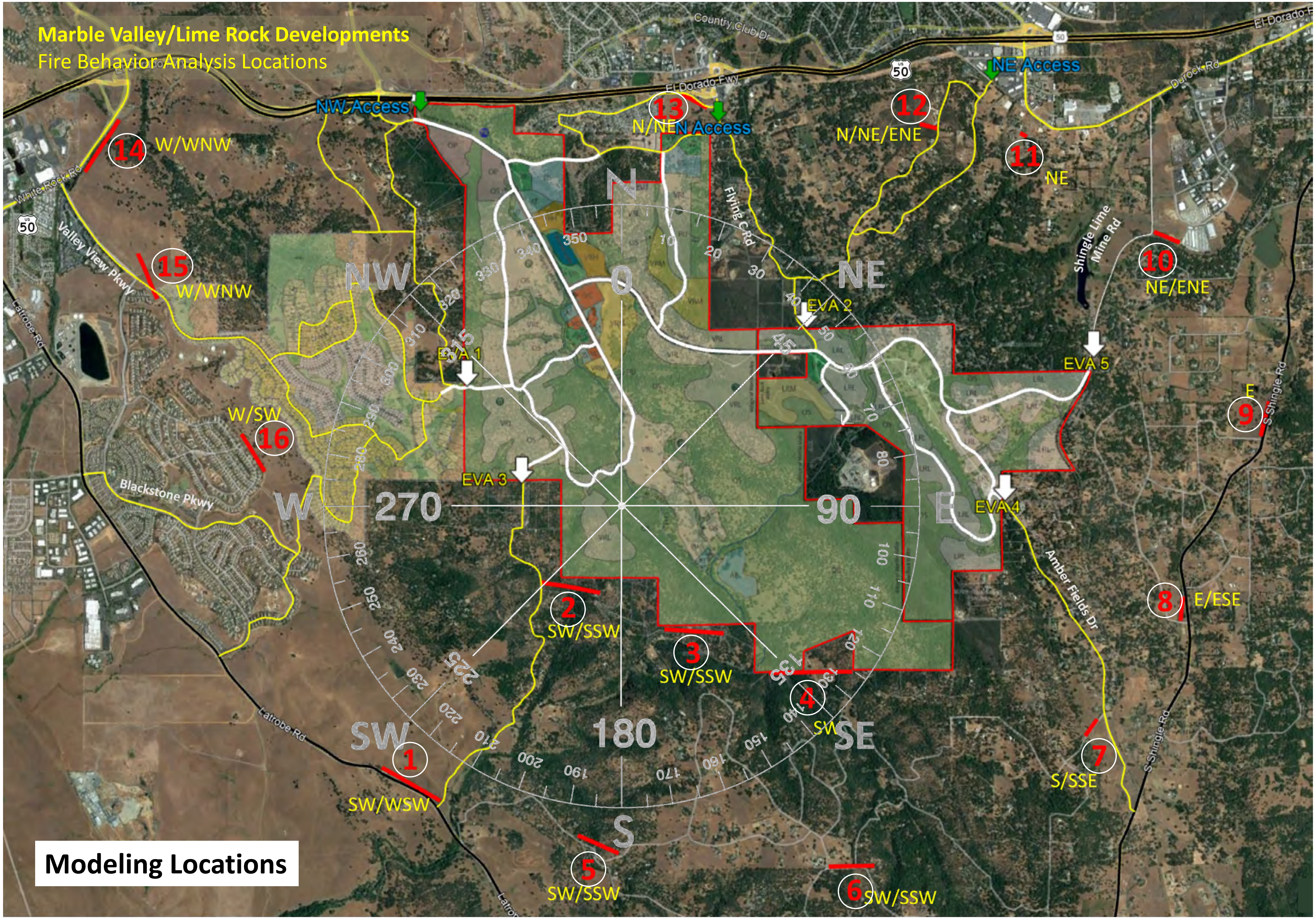
Photo Site 44 – Looking South

Appendix B – Modeling Outputs

B-2 – Scenario Locations/Wind Directions (Access and Evac Points Provided)

B-3 to B-137 – FlamMap/Minimum Travel Time Outputs

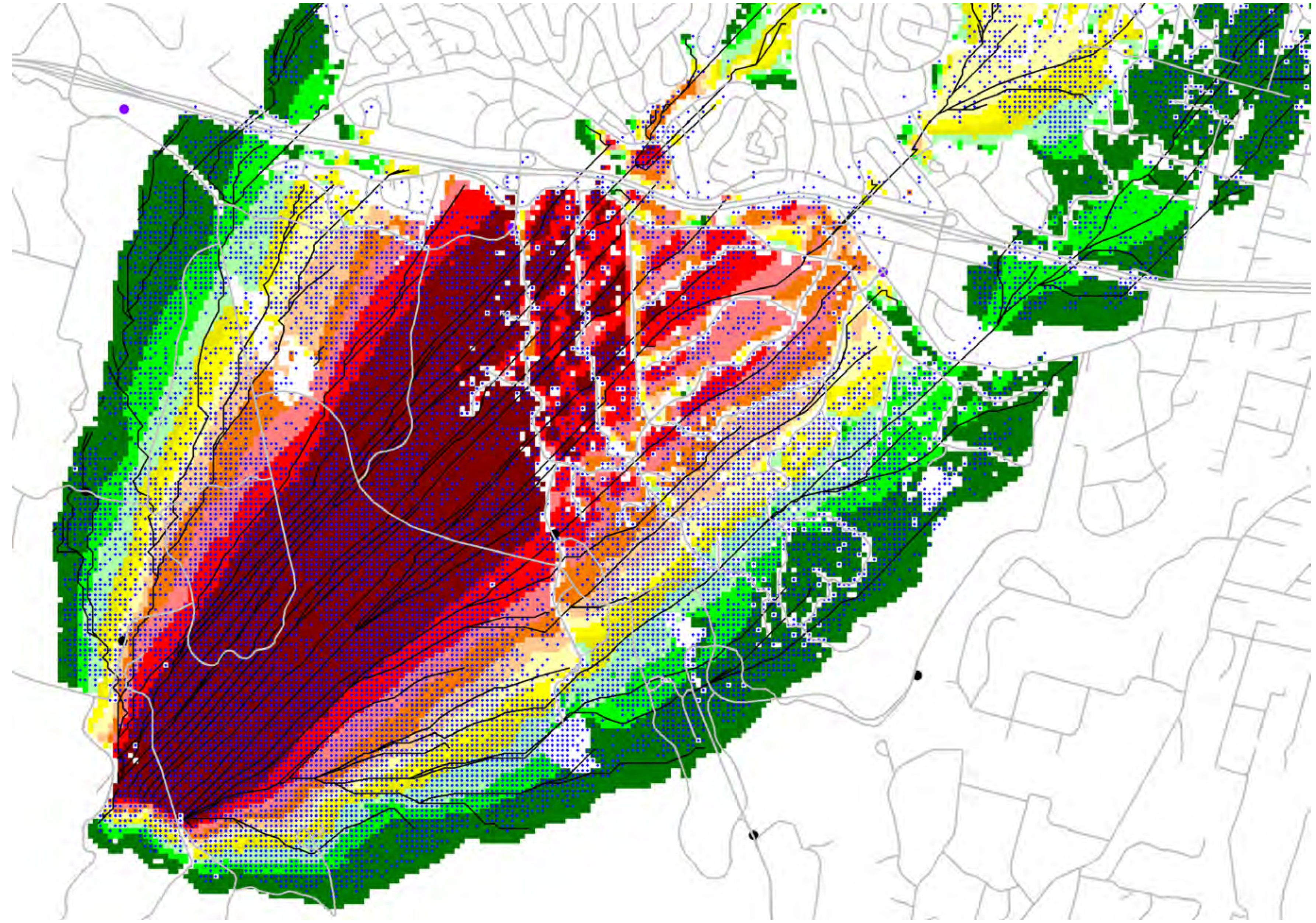
B-134 to B-138 – BehavePlus Outputs



Marble Valley/Lime Rock Developments
Fire Behavior Analysis Locations
NW Access
N Access
NE Access
1
SW/WSW
2
SW/SSW
3
SW/SSW
4
SW
5
SW/SSW
6
SW/SSW
7
S/SSE
8
E/ESE
9
E
10
NE/ENE
11
NE
12
N/NE/ENE
13
N/NE
14
W/WNW
15
W/WNW
16
W/SW
EVA 1
EVA 2
EVA 3
EVA 4
EVA 5
N
NE
E
SE
S
SW
W
NW
0
90
180
270
Country Club Dr
El Dorado Fwy
Durock Rd
Flying C Rd
Shingle Lime Mine Rd
S Shingle Rd
Amber Fields Dr
White Rock Rd
Valley View Pkwy
Latrobe Rd
Blackstone Pkwy
Modeling Locations

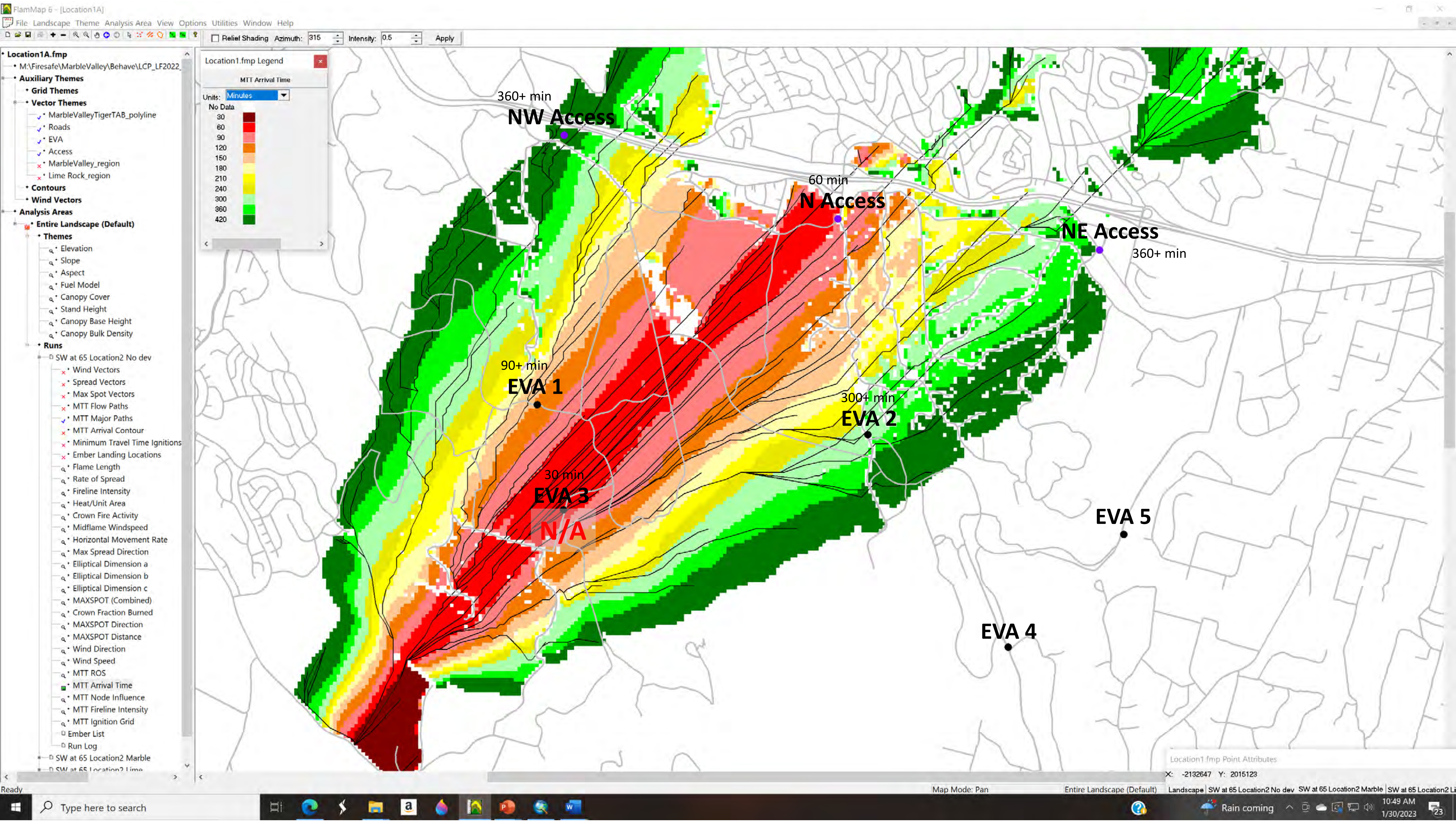
Modeling Assumptions:

1. Moisture Scenario will be 3, 4, 5, 30, 50 (extreme)
2. Wind will be assumed to be from:
   a. N, NNE, NE at 45 mph
   b. SE, SSE, S, SSW, SW at 65 mph
3. Fuel models to be used
   a. LCP_LF2022_FBFM40_220_CONUS
   b. No modifications have been done to any layers
4. Development area are used as fire barriers due to fuel modification and defensible space protection. Community burn through is not expected.
5. Fire scenario will be with sustained winds (no diurnal effect)
6. No fuel conditioning is used with worst-case moisture scenario
7. Arrival Times are shown to eight hours, but fire scenario is unlimited
8. Foliar Moistures are assumed to be 100
9. Crown Fire Calculation Method is set to Finney (2004)
10. Spotting Probability is set to 0.99
11. Spotting Delay is set to 0
12. Fuels have not been adjusted to any disease or drought impacts
13. Slopes and Aspects have not been adjusted in the development area (barrier file adjusts this to some degree)

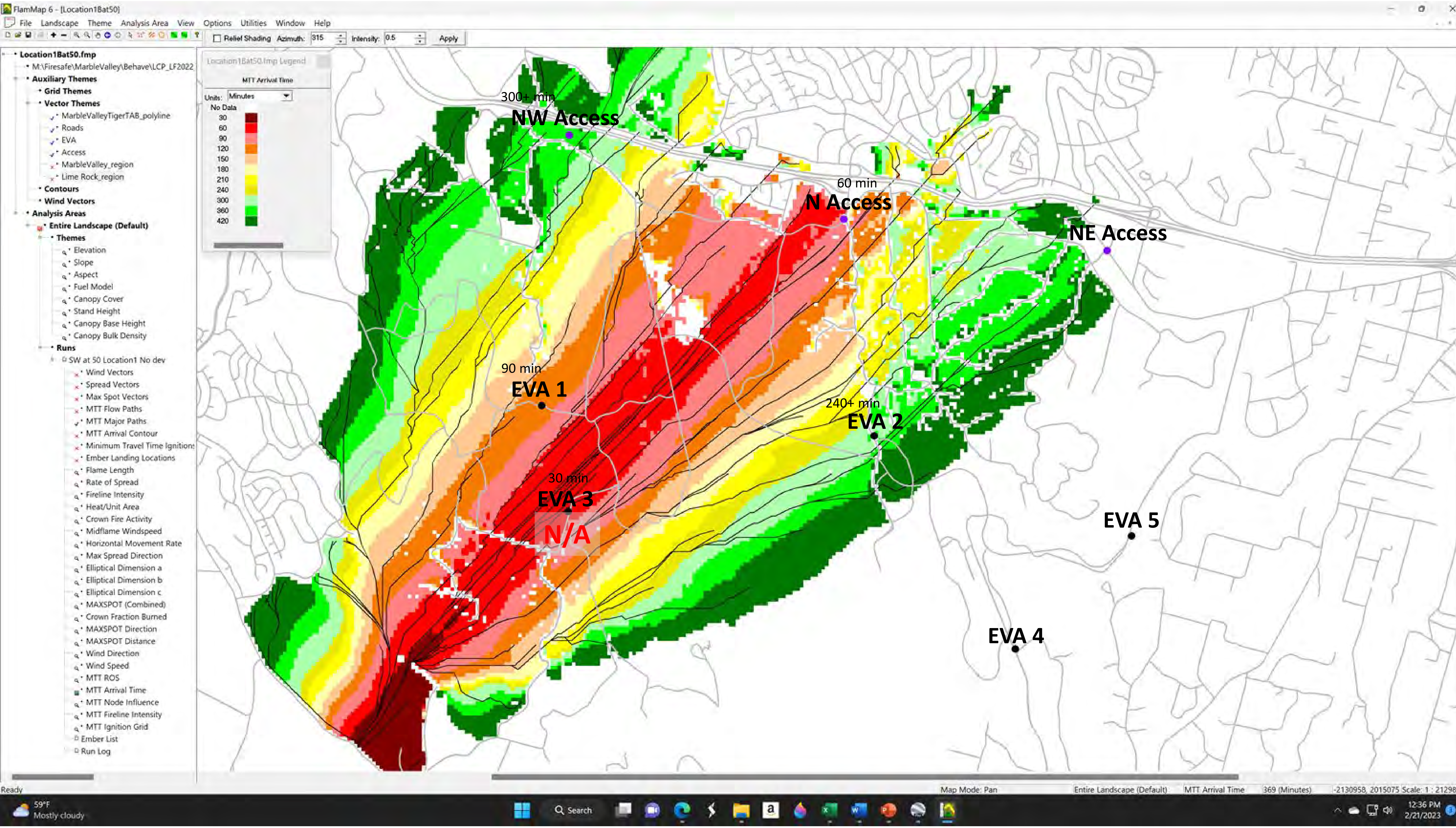


Modeling Note: Each of the blue dots on the graphic above is an ember landing location. Since the spotting probability is set to 99%, each of the downwind locations is available. The software will select the spotting locations randomly. Since the this will be different on each run of the scenario, minor differences will occur if the same scenario is run multiple times.

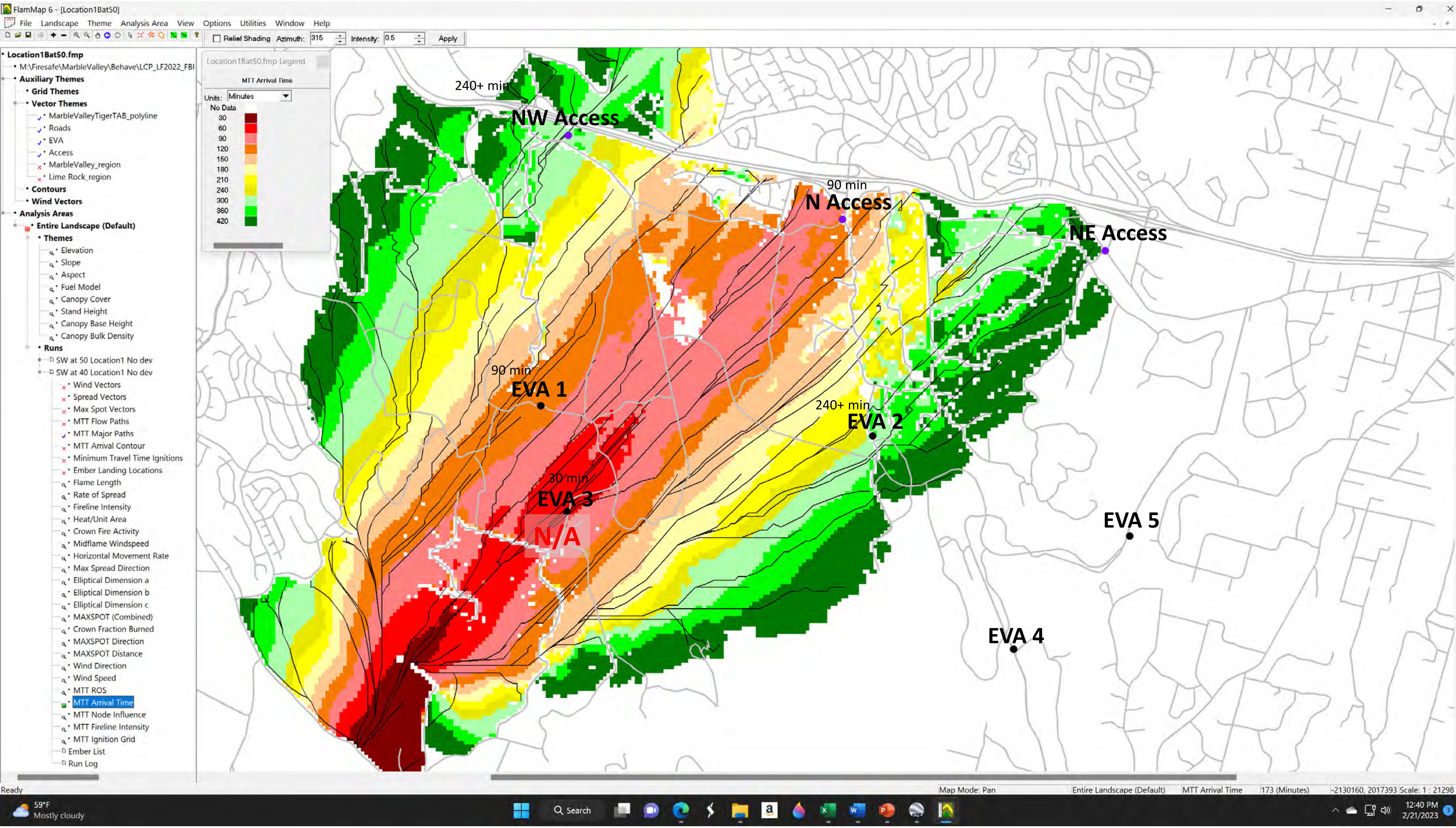
Location 1 SW wind at 65 mph No Dev – Scn 1A



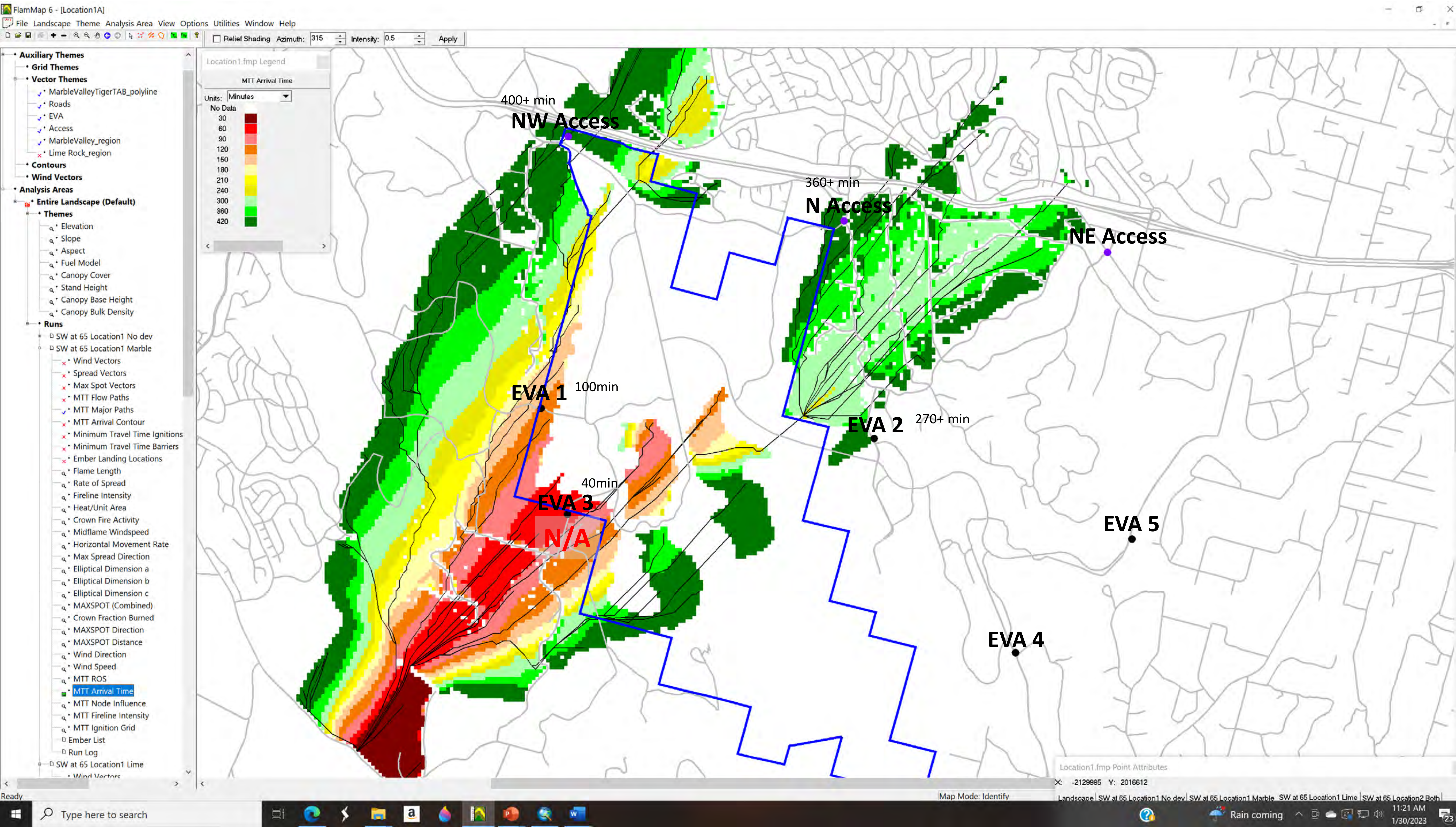
Location 1 SW wind at 50 mph No Dev – Scn 1B



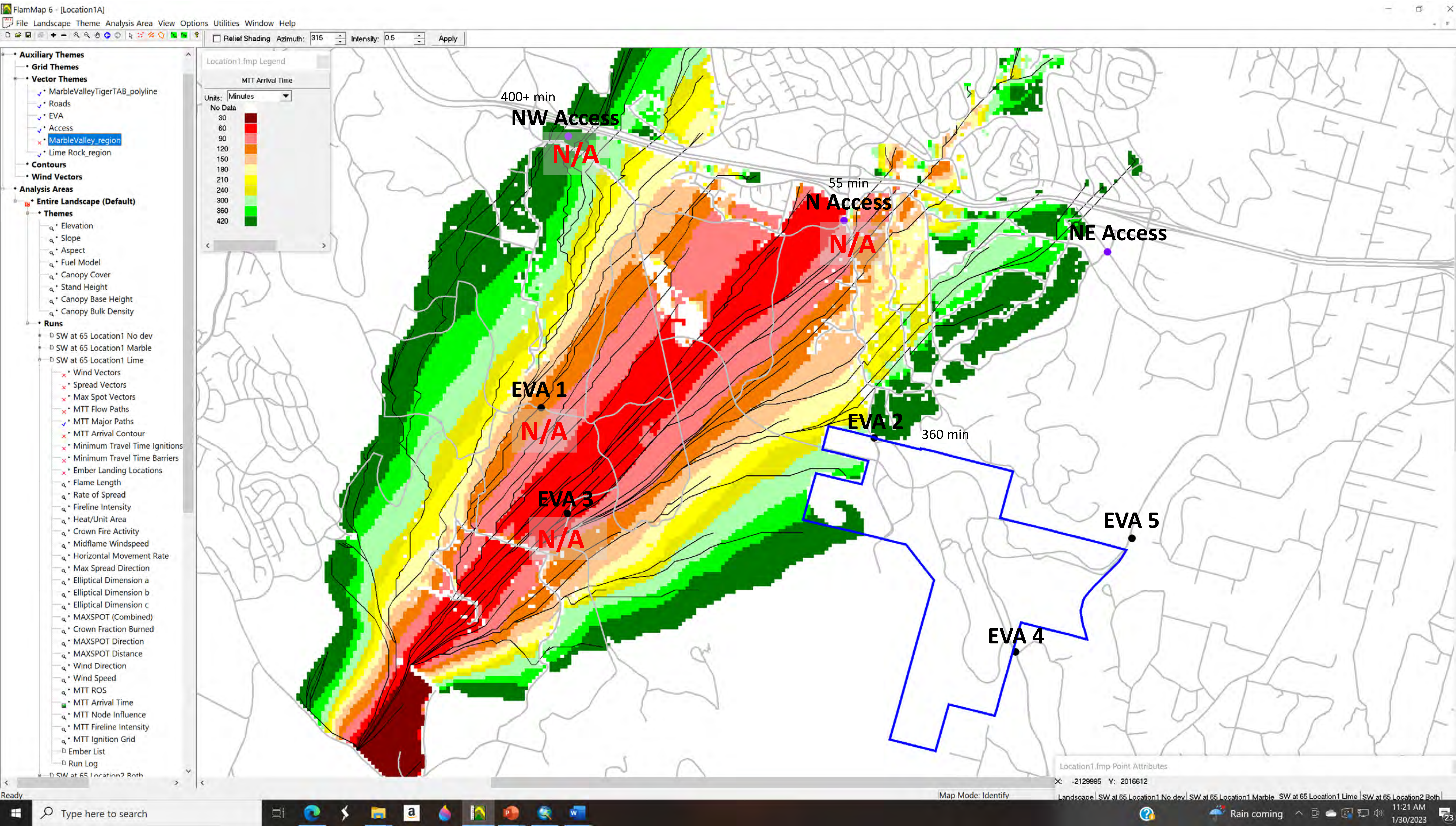
Location 1 SW wind at 40 mph No Dev – Scn 1C



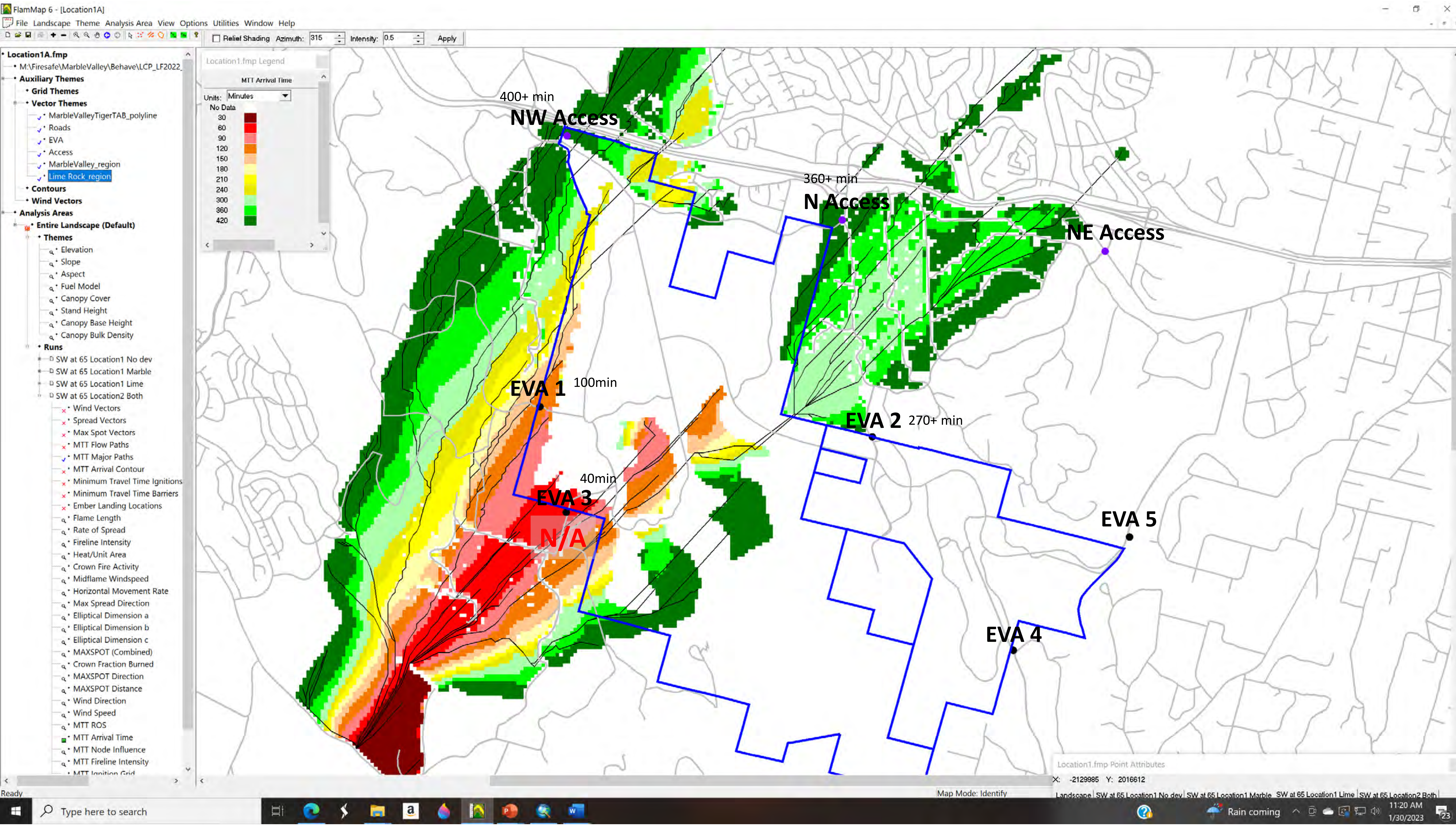
Location 1 SW wind at 65 mph Marble – Scn 1D



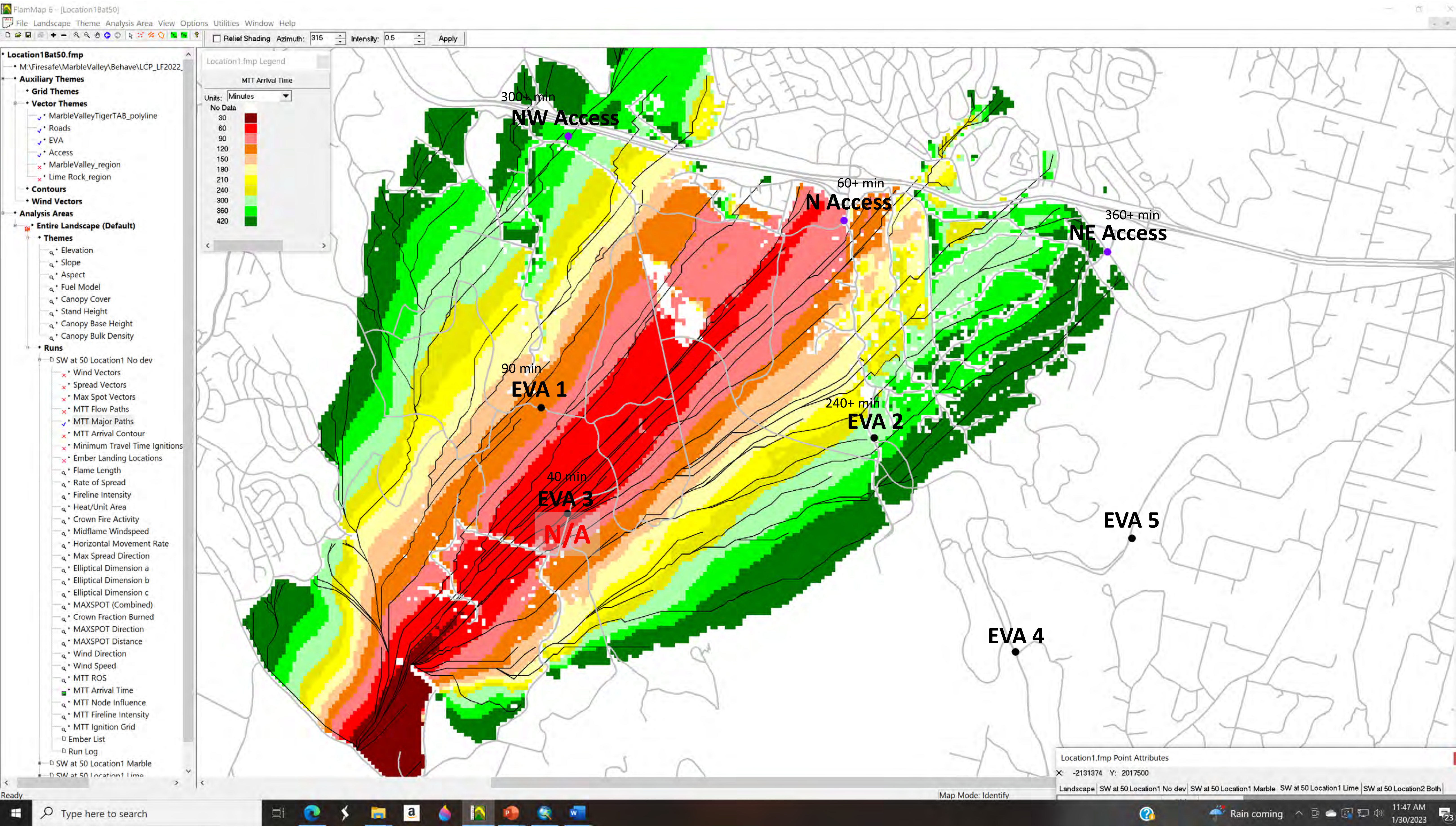
Location 1 SW wind at 65 mph Lime – Scn 1E



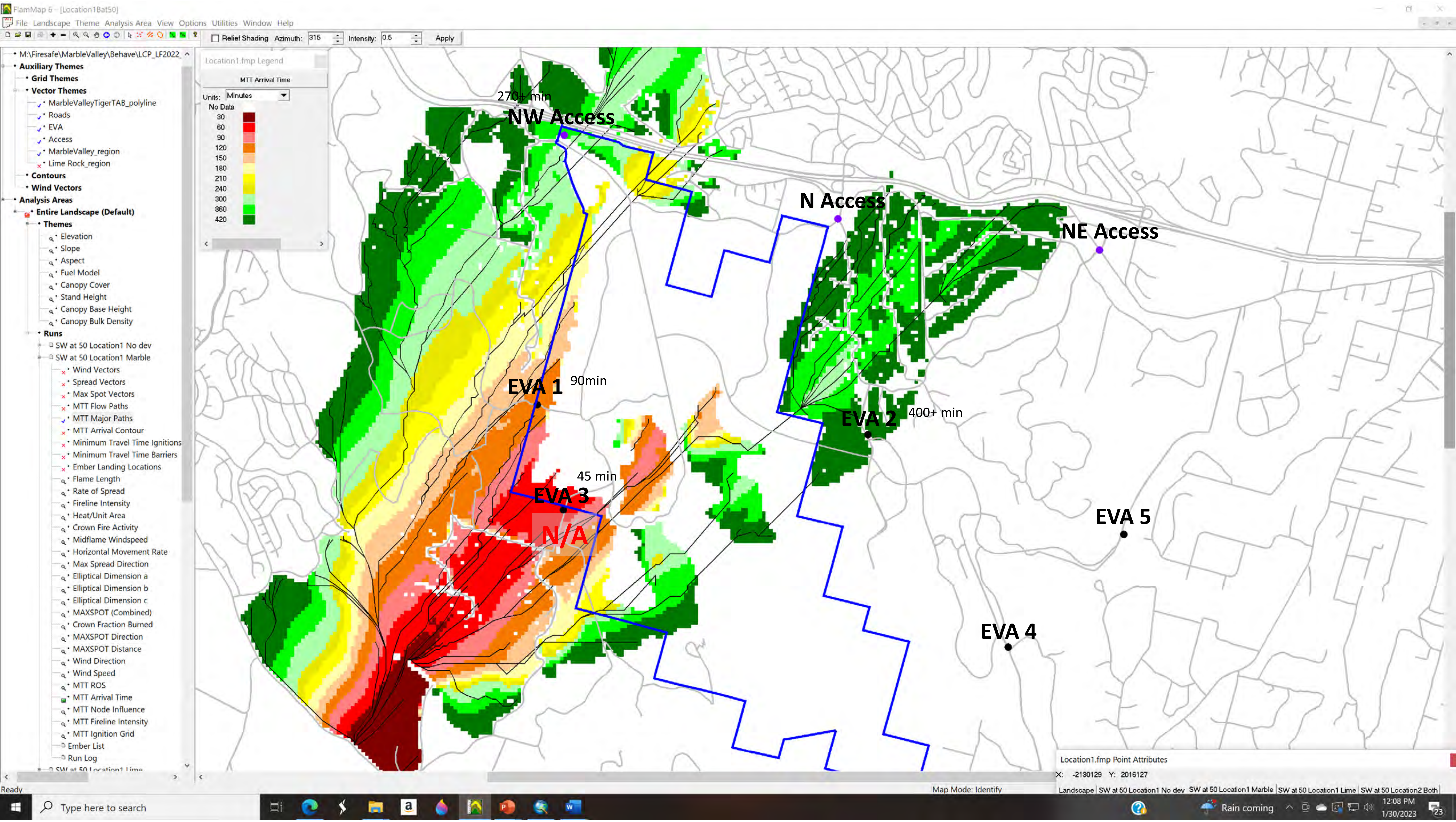
Location 1 SW wind at65 mph Both – Scn 1F



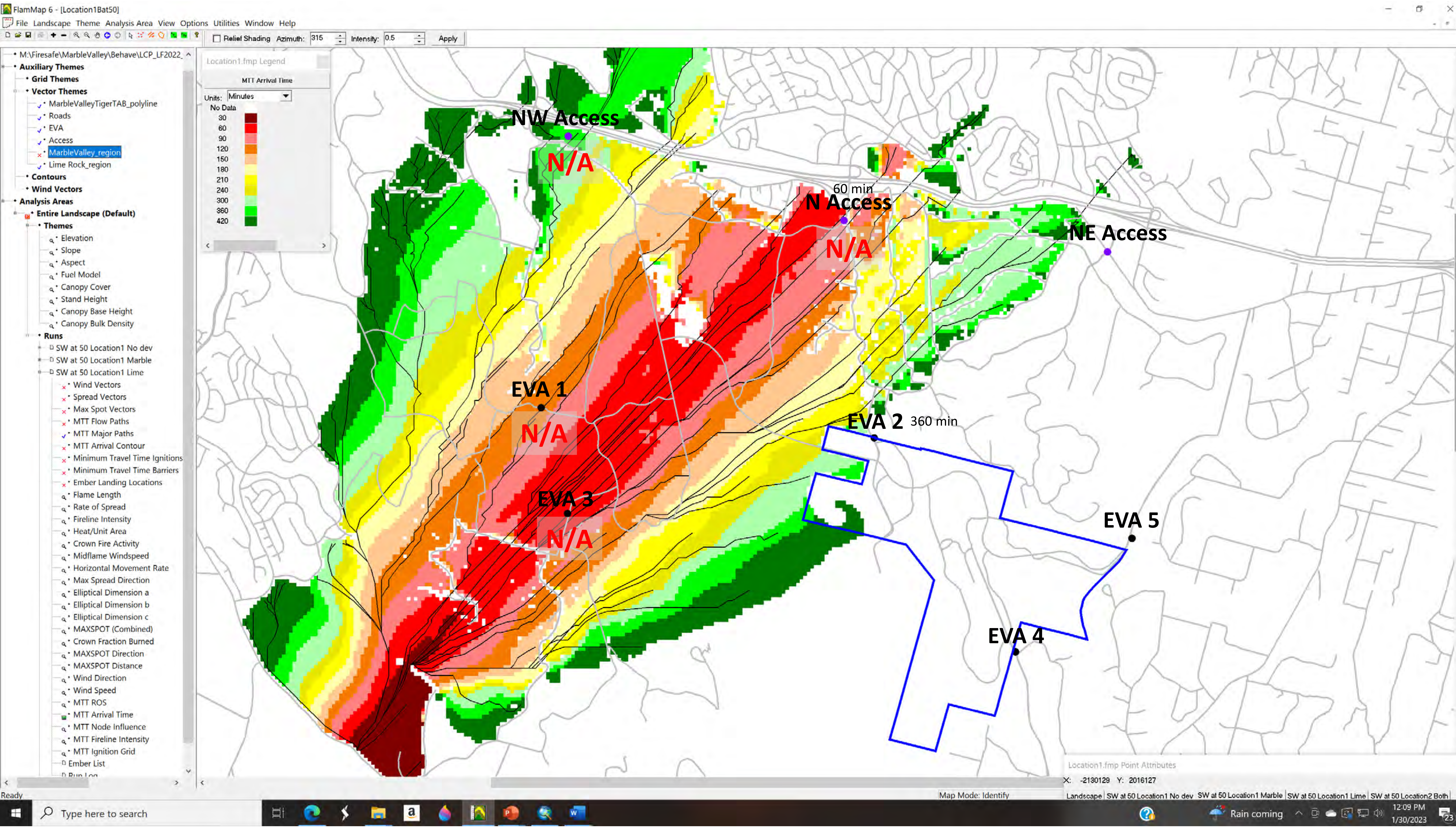
Location 1 SW wind at 50 mph No Dev Scn 1G



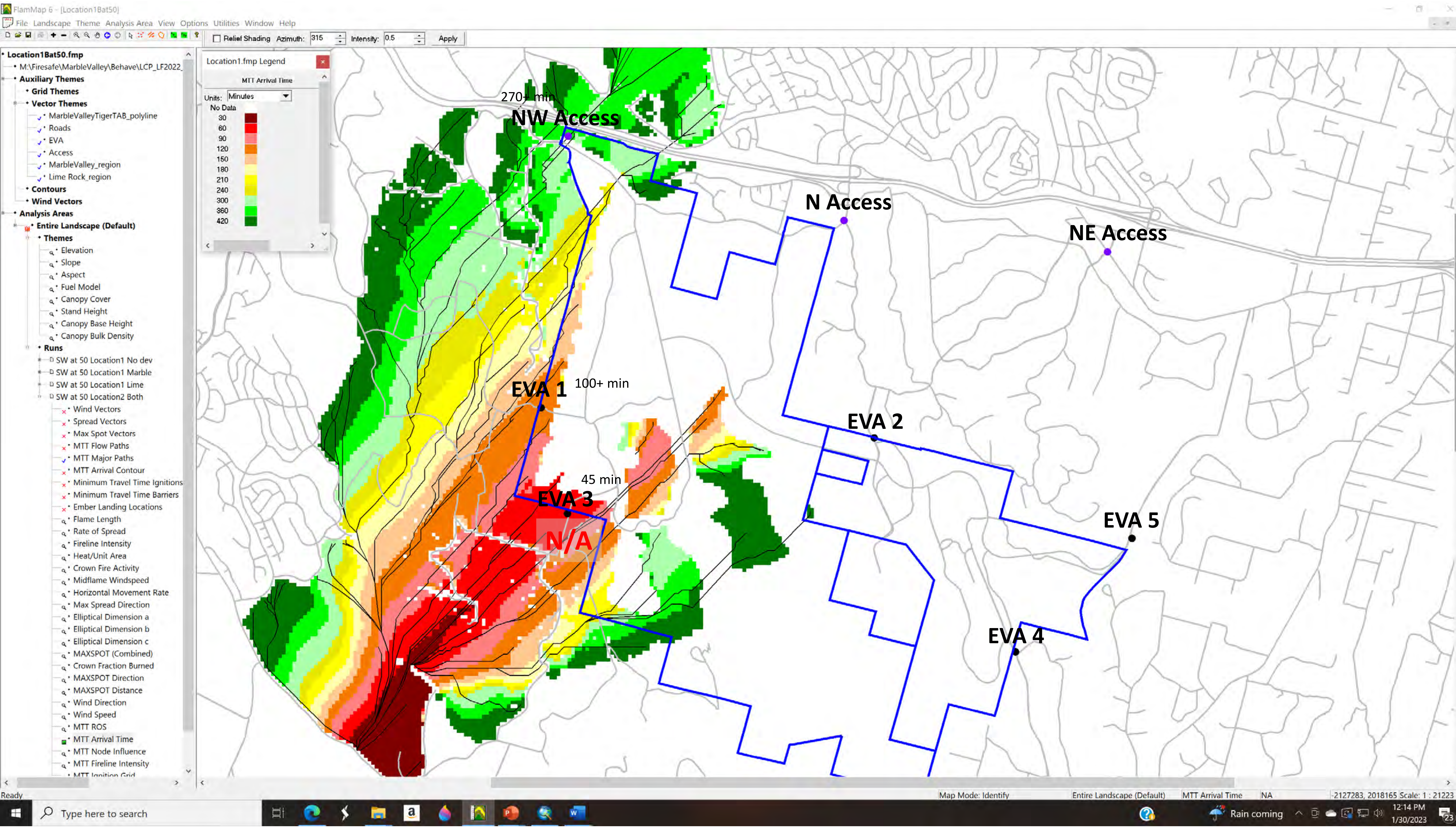
Location 1 SW wind at 50 mph Marble – Scn 1H



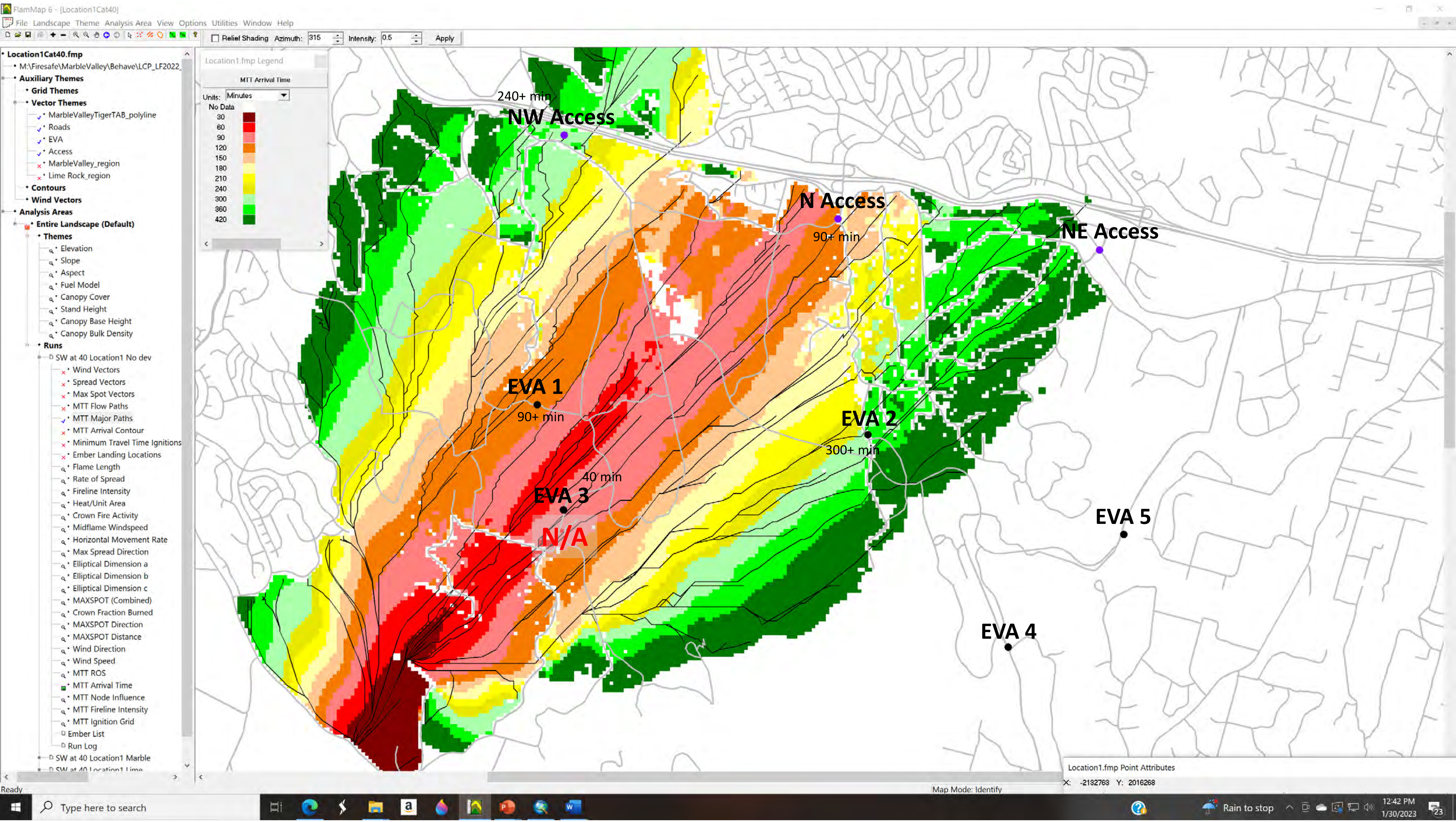
Location 1 SW wind at 50 mph Lime – Scn 1I



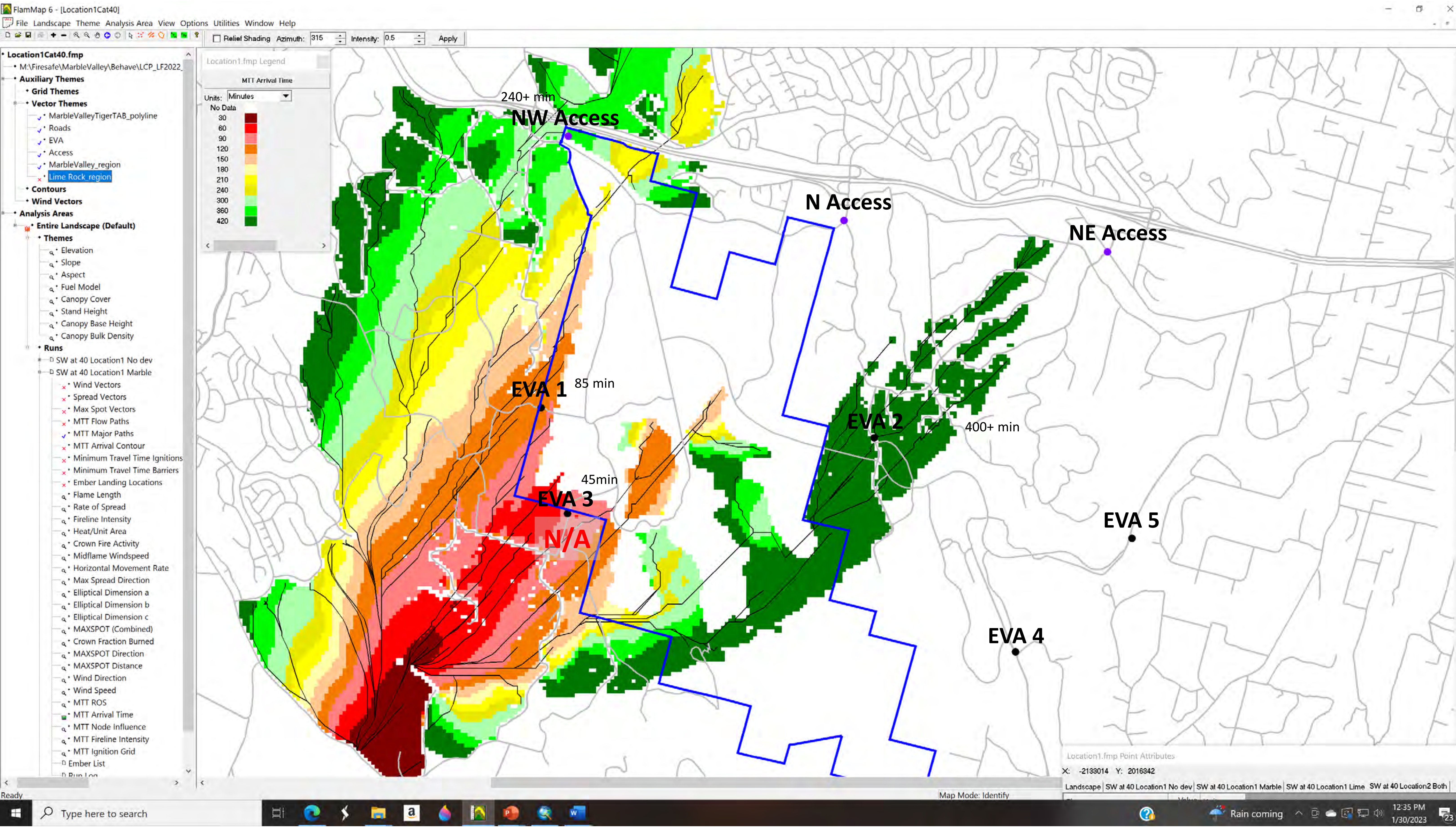
Location 1 SW wind at 50 mph Both – Scn 1J



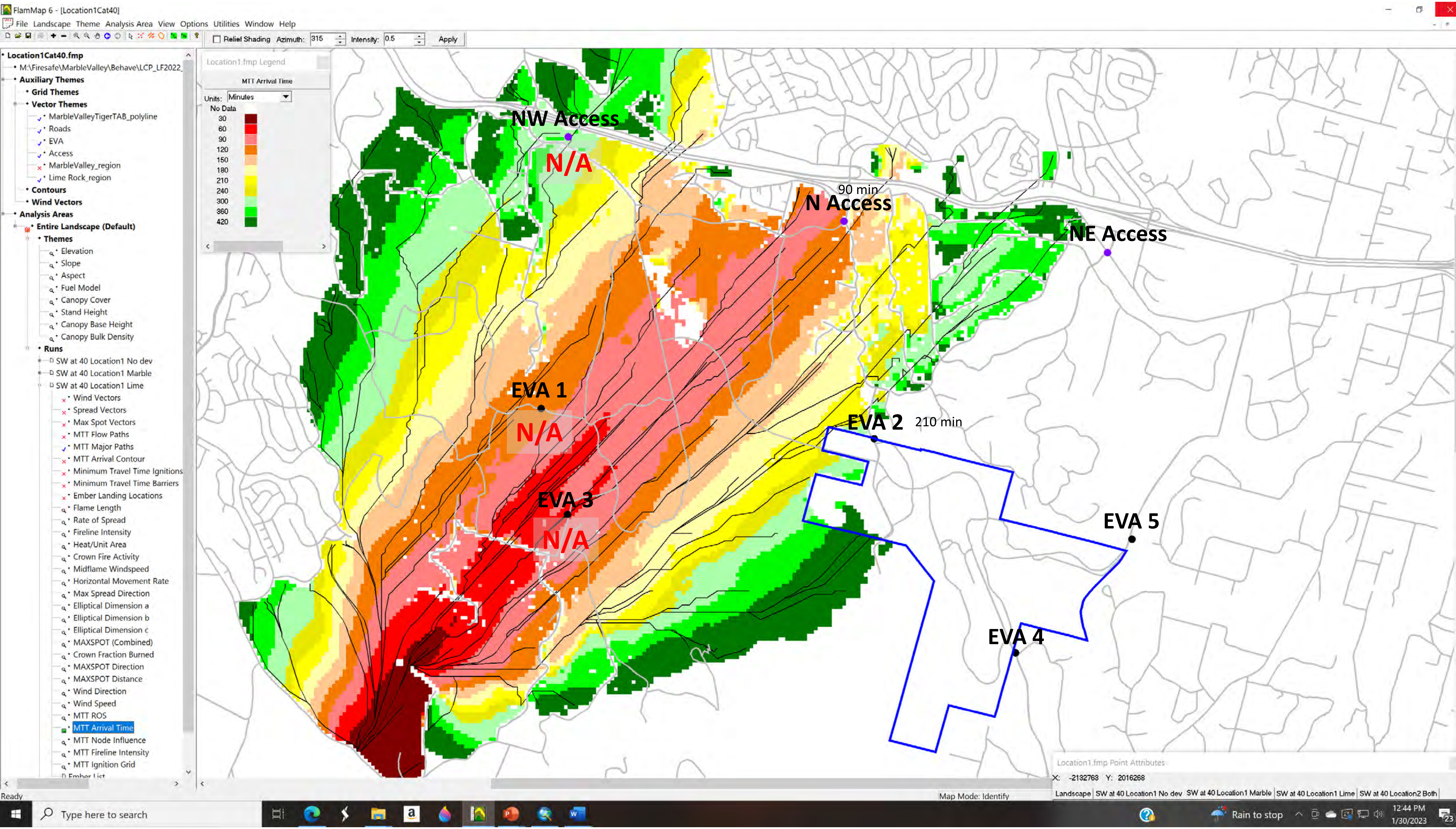
Location 1 SW wind at 40 mph No Dev Scn 1K



Location 1 SW wind at 40 mph Marble – Scn 1L

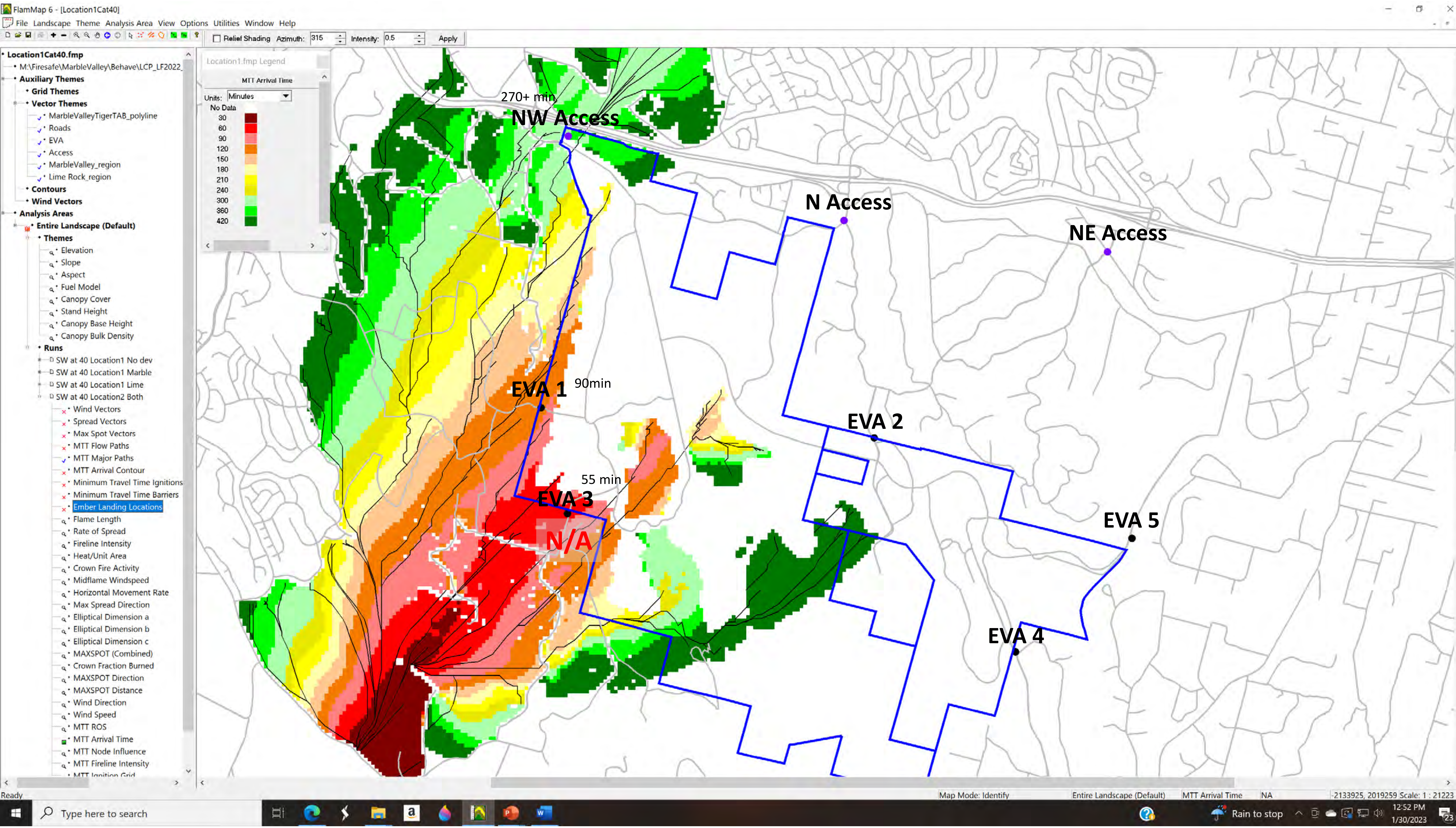


Location 1 SW wind at 40 mph Lime – Scn 1M

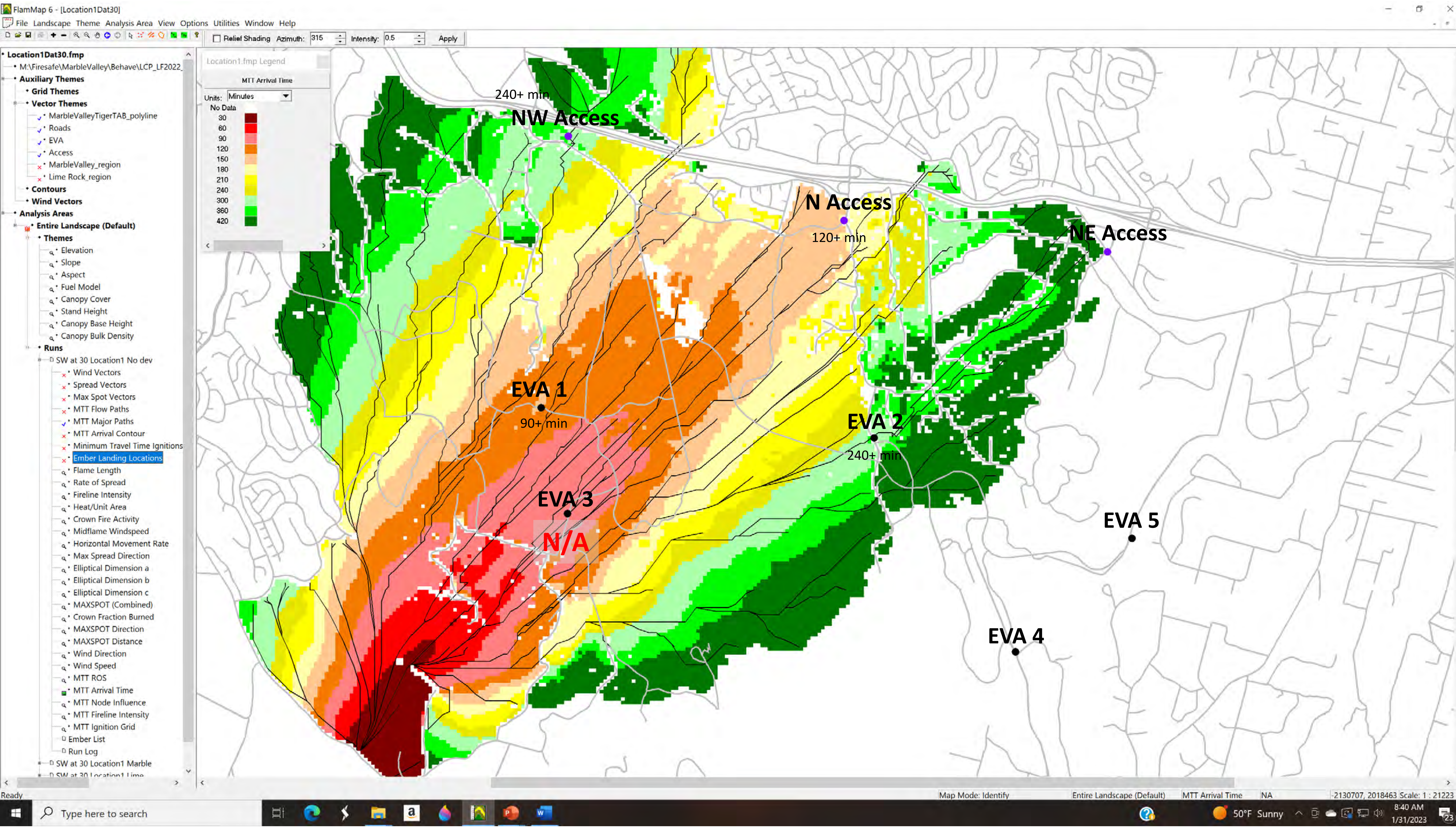


Location 1

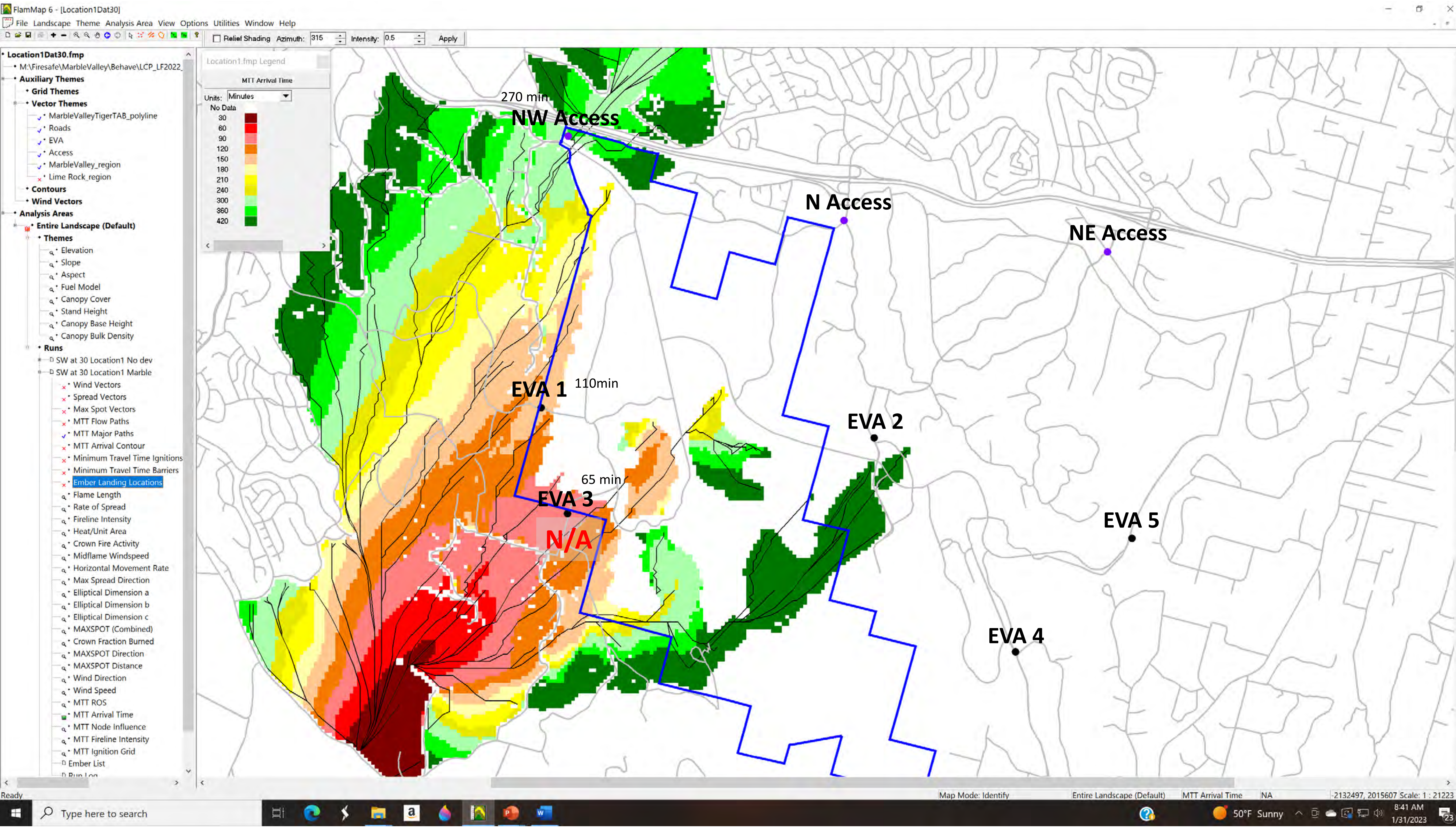
Location 1 SW wind at 40 mph Both – Scn 1N



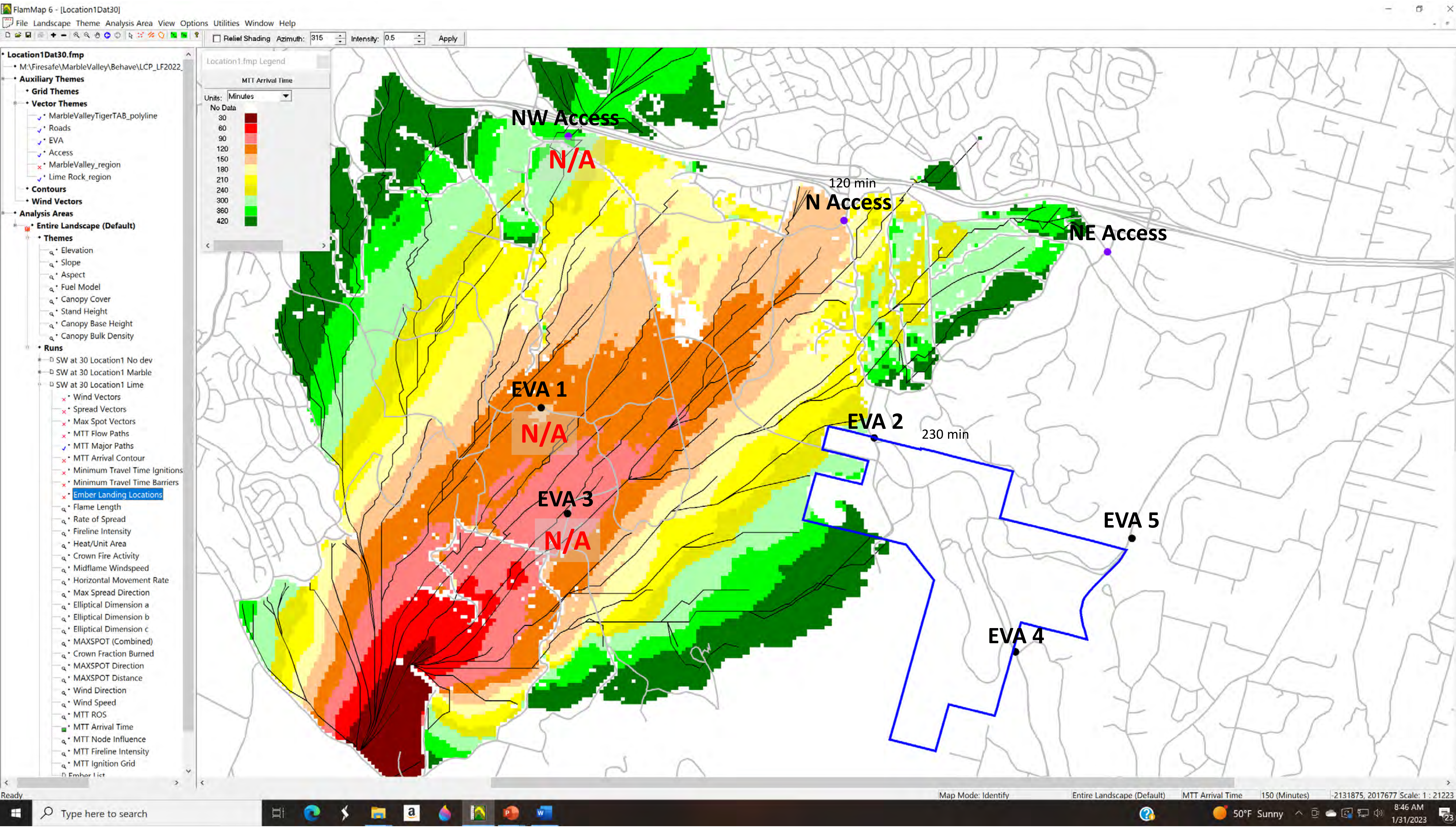
Location 1 SW wind at 30 mph No Dev Scn 1O



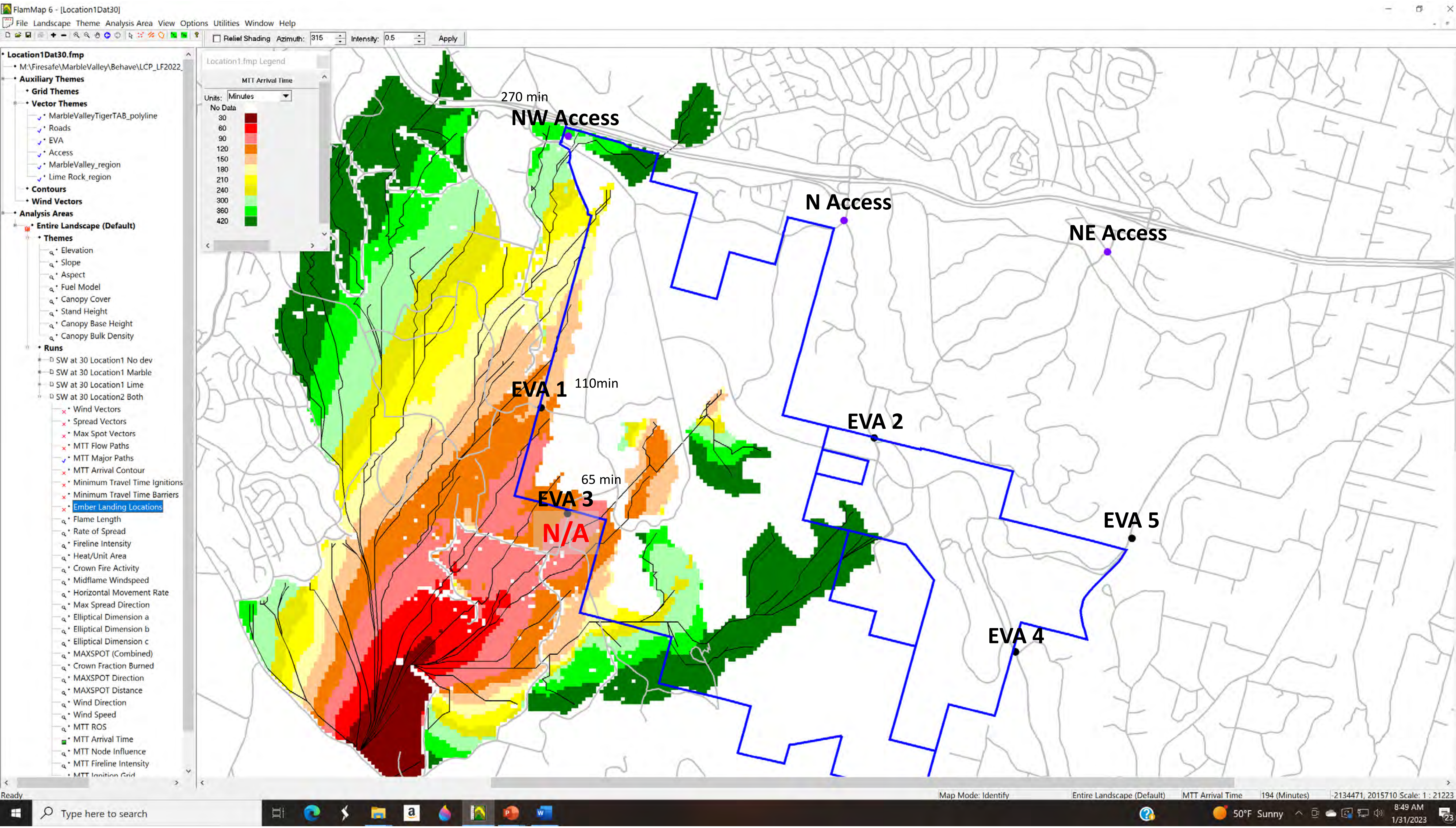
Location 1 SW wind at 30 mph Marble – Scn 1P



Location 1 SW wind at 30 mph Lime – Scn 1Q

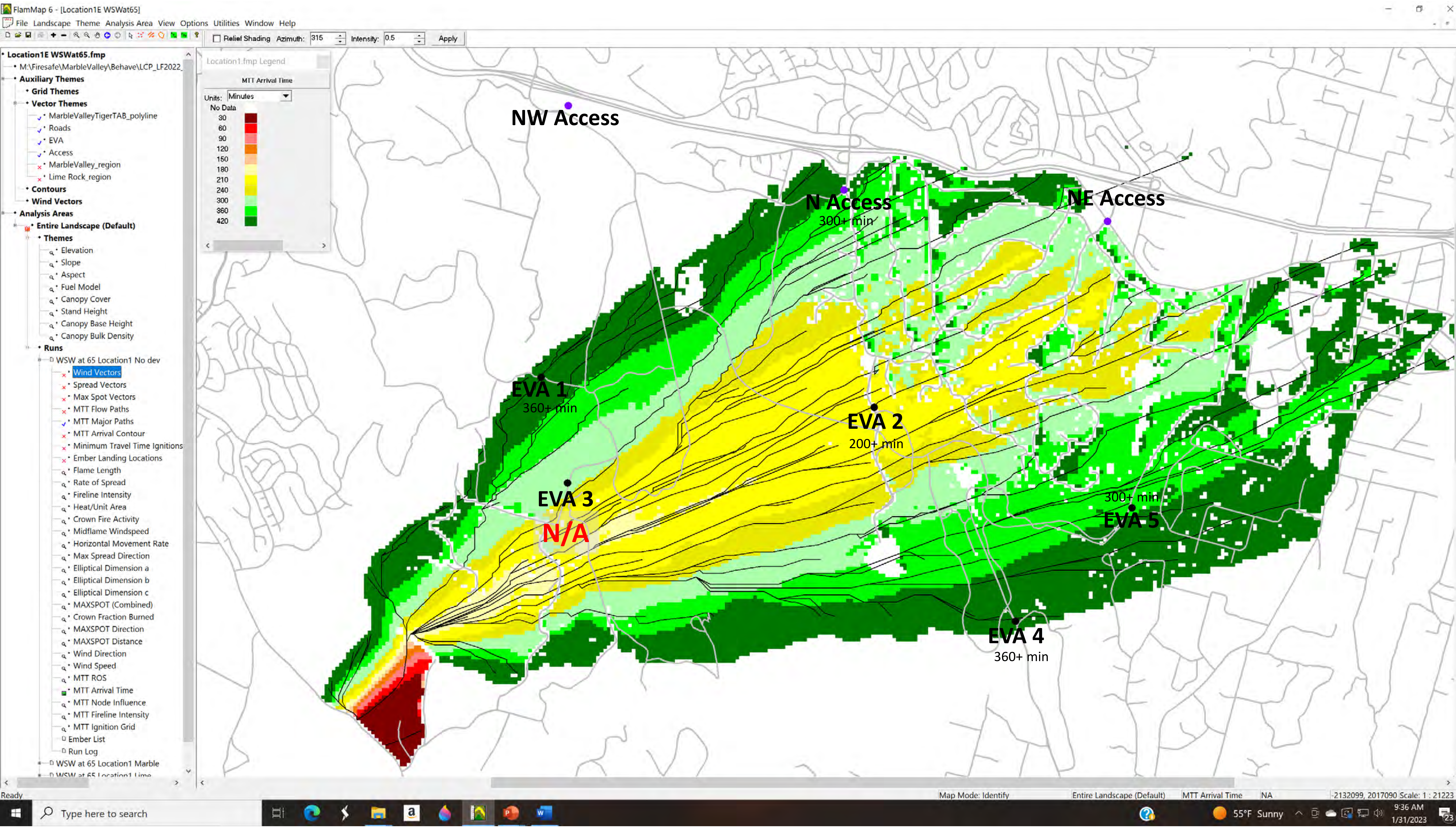


Location 1 SW wind at 30 mph Both – Scn 1R

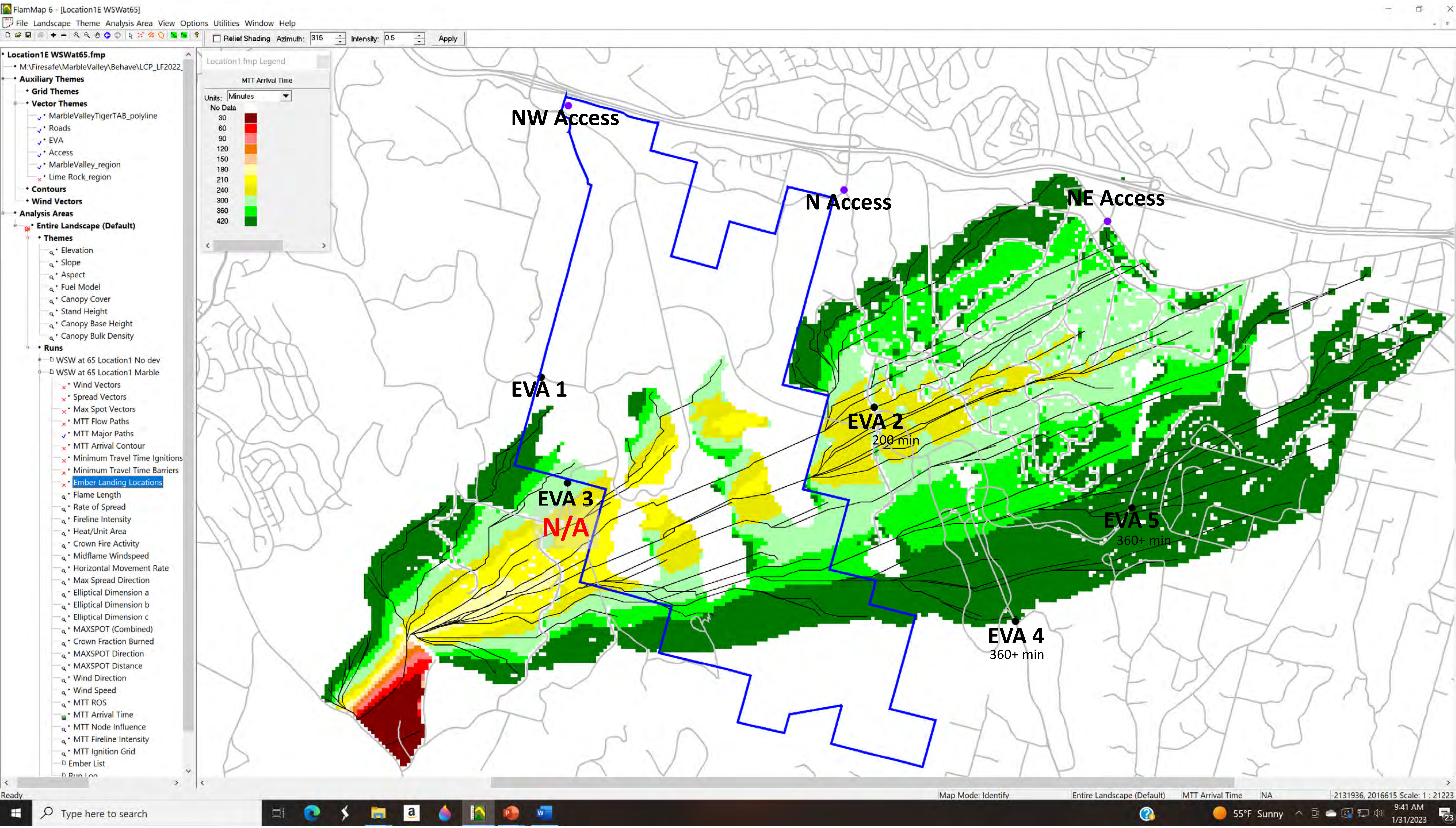


Location 1

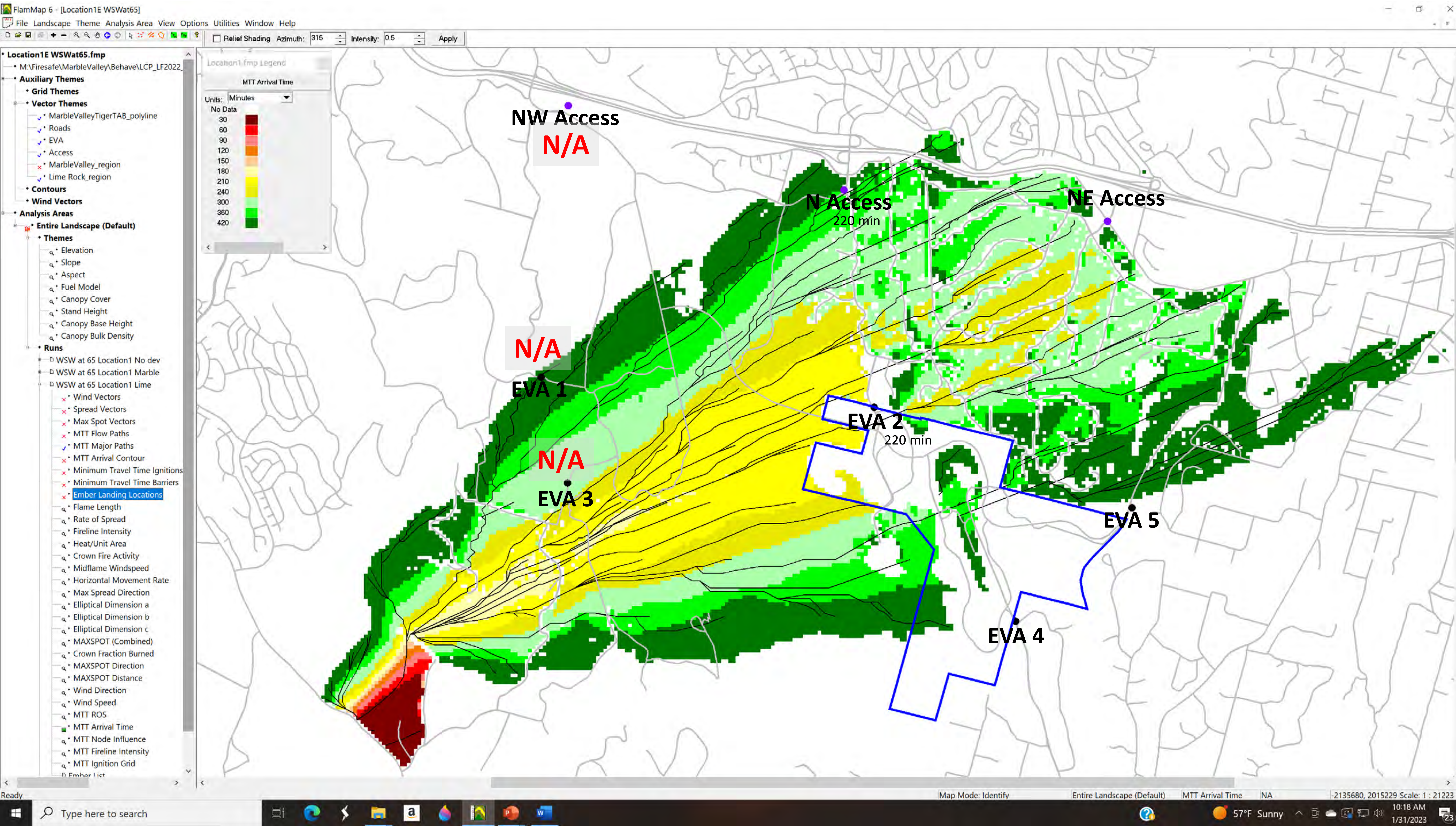
Location 1 WSW wind at 65 mph No Dev – Scn 1-S



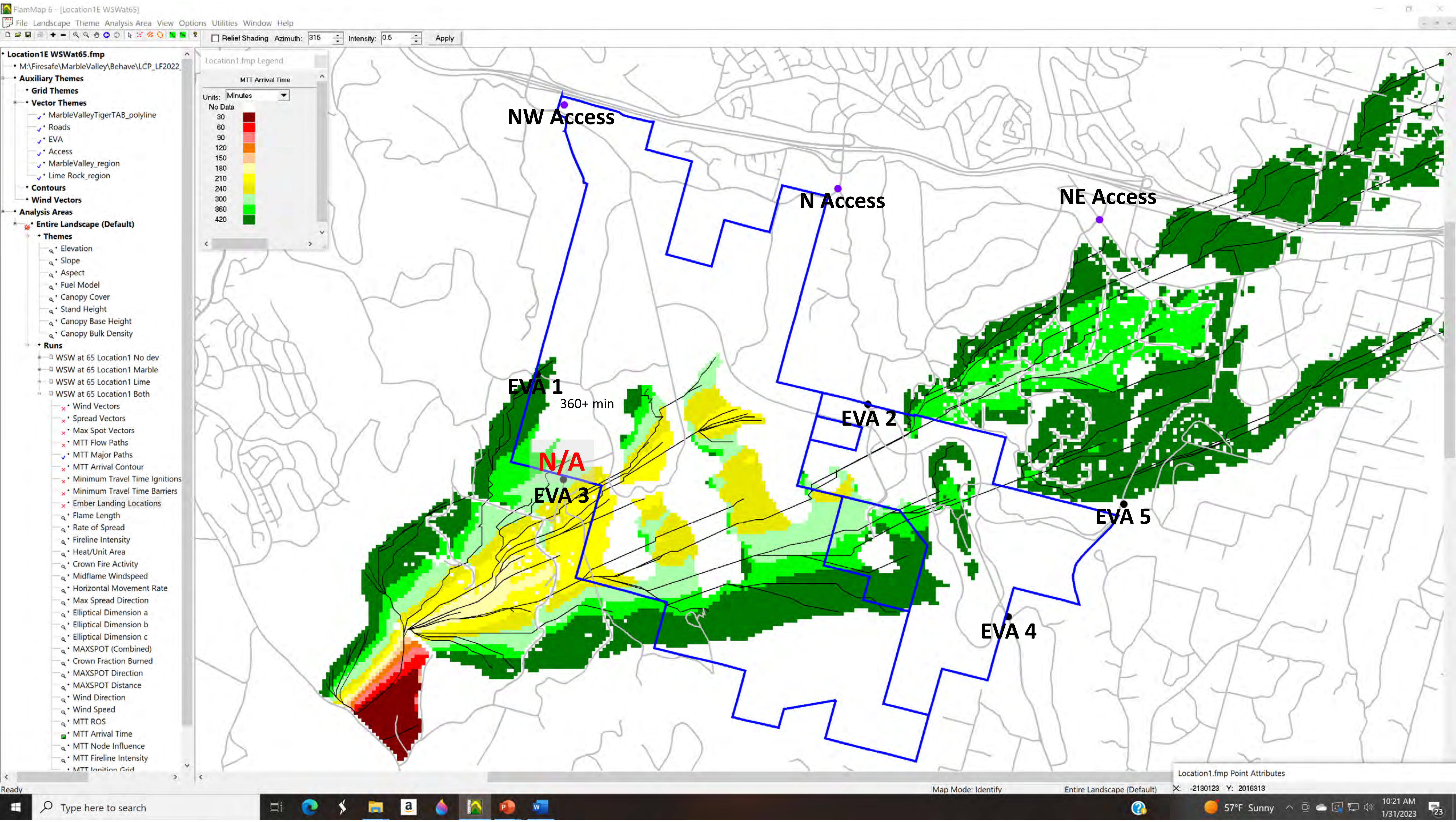
Location 1 WSW wind at 65 mph Marble – Scn 1T



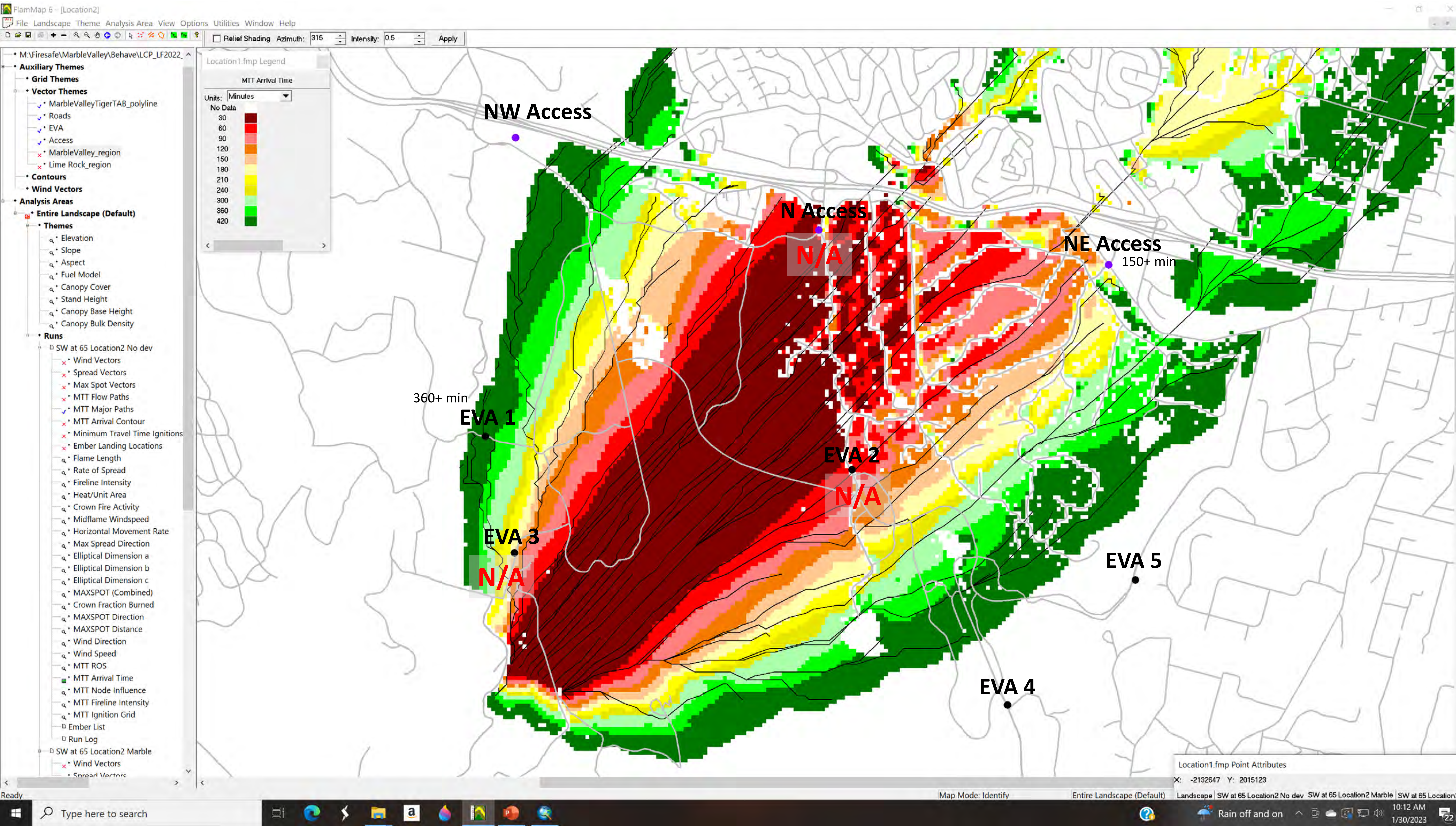
Location 1 WSW wind at 65 mph Lime – Scn 1U



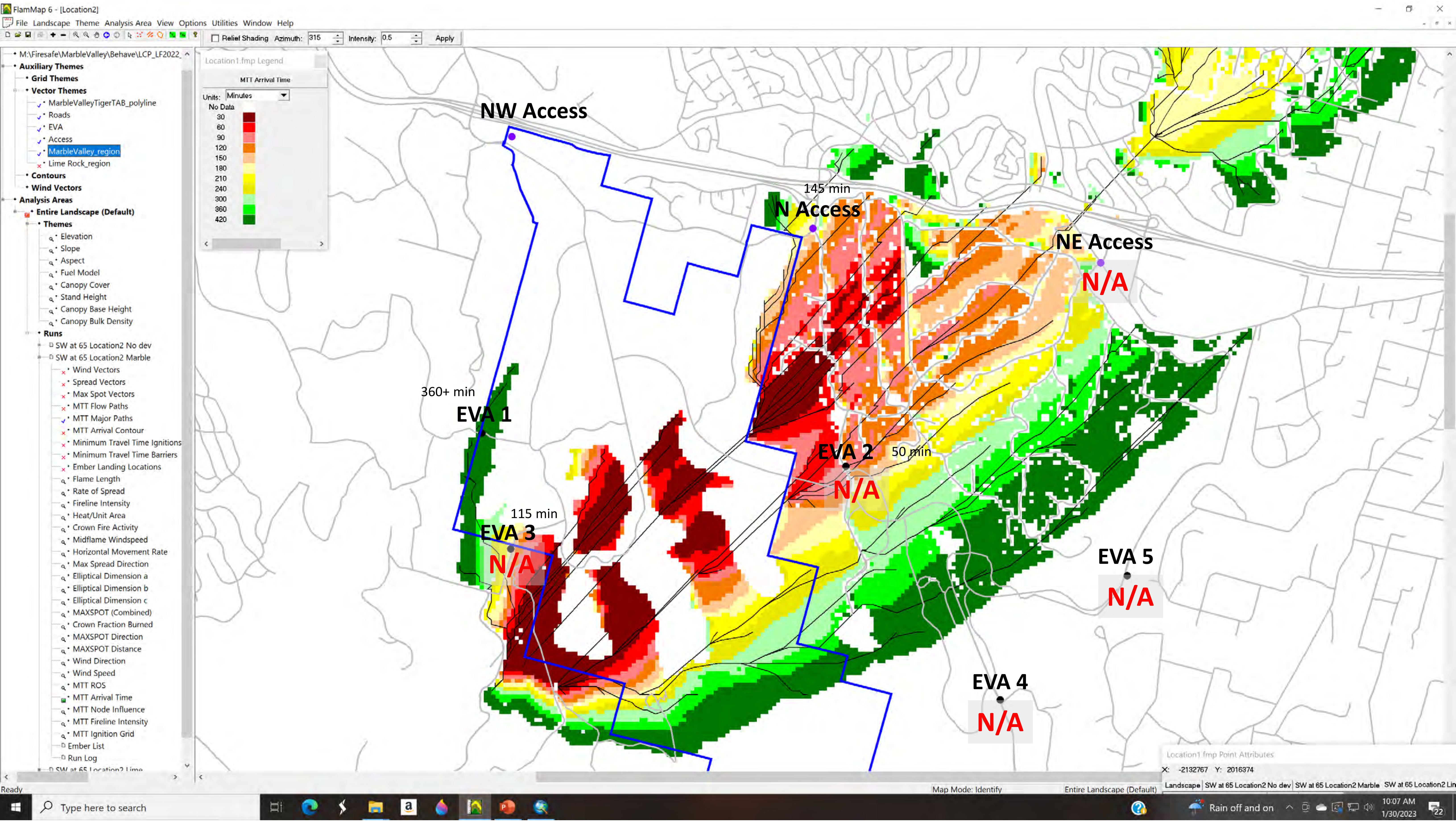
Location 1 WSW wind at 65 mph Both – Scn 1V



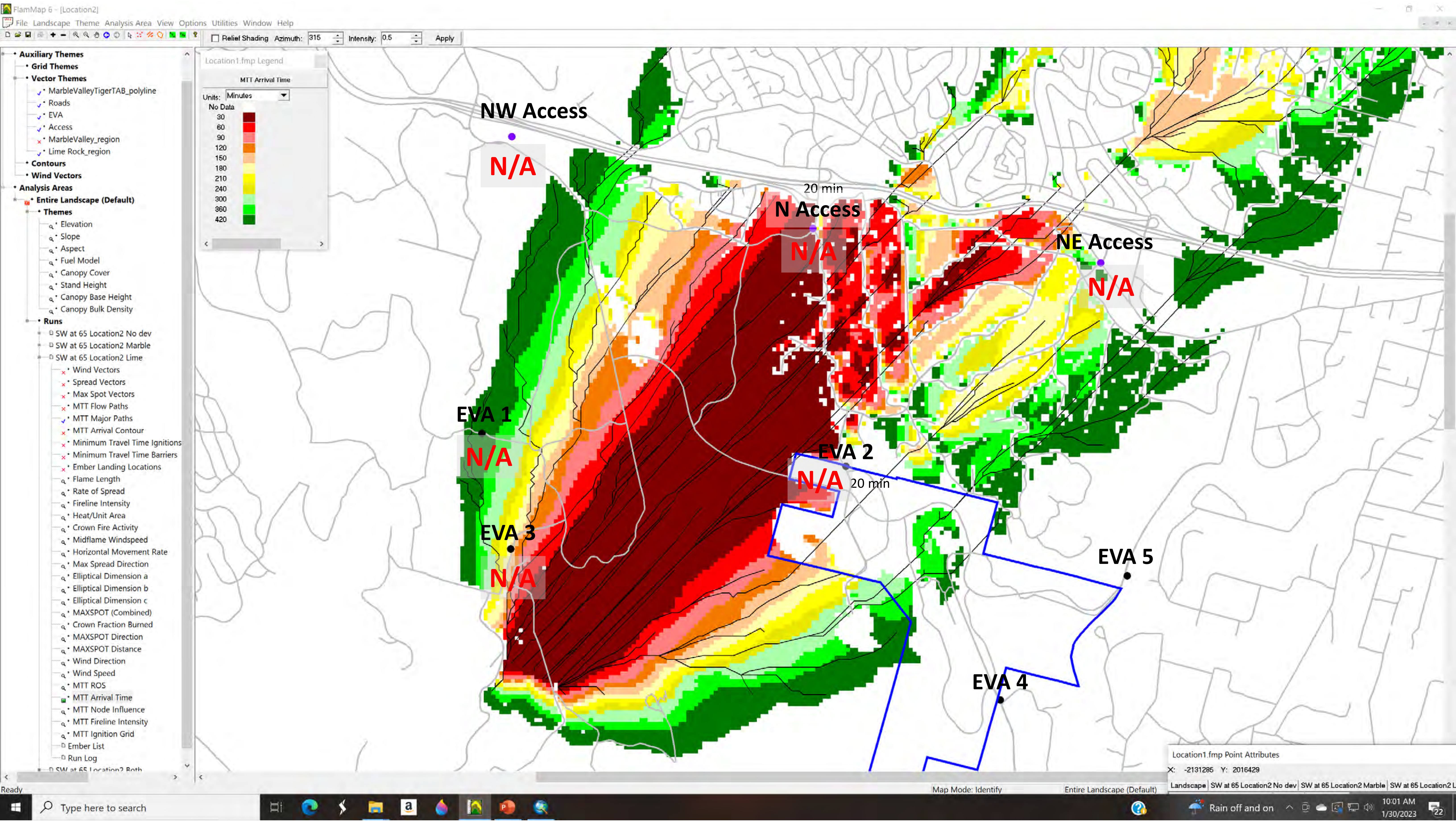
Location 2 SW wind at 65 mph No Dev – Scn 2A



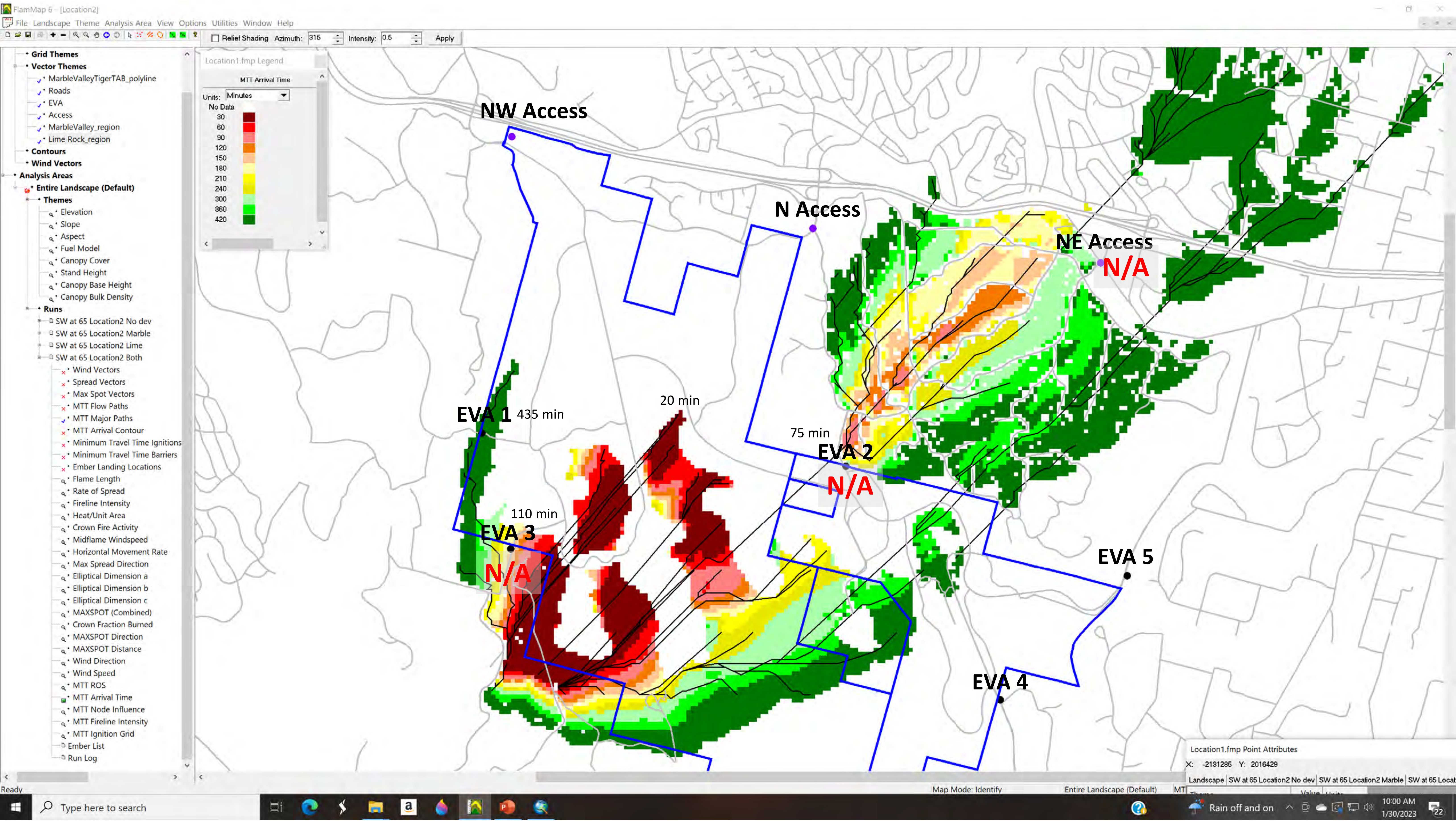
Location 2 SW wind at 65 mph Marble – Scn 2B



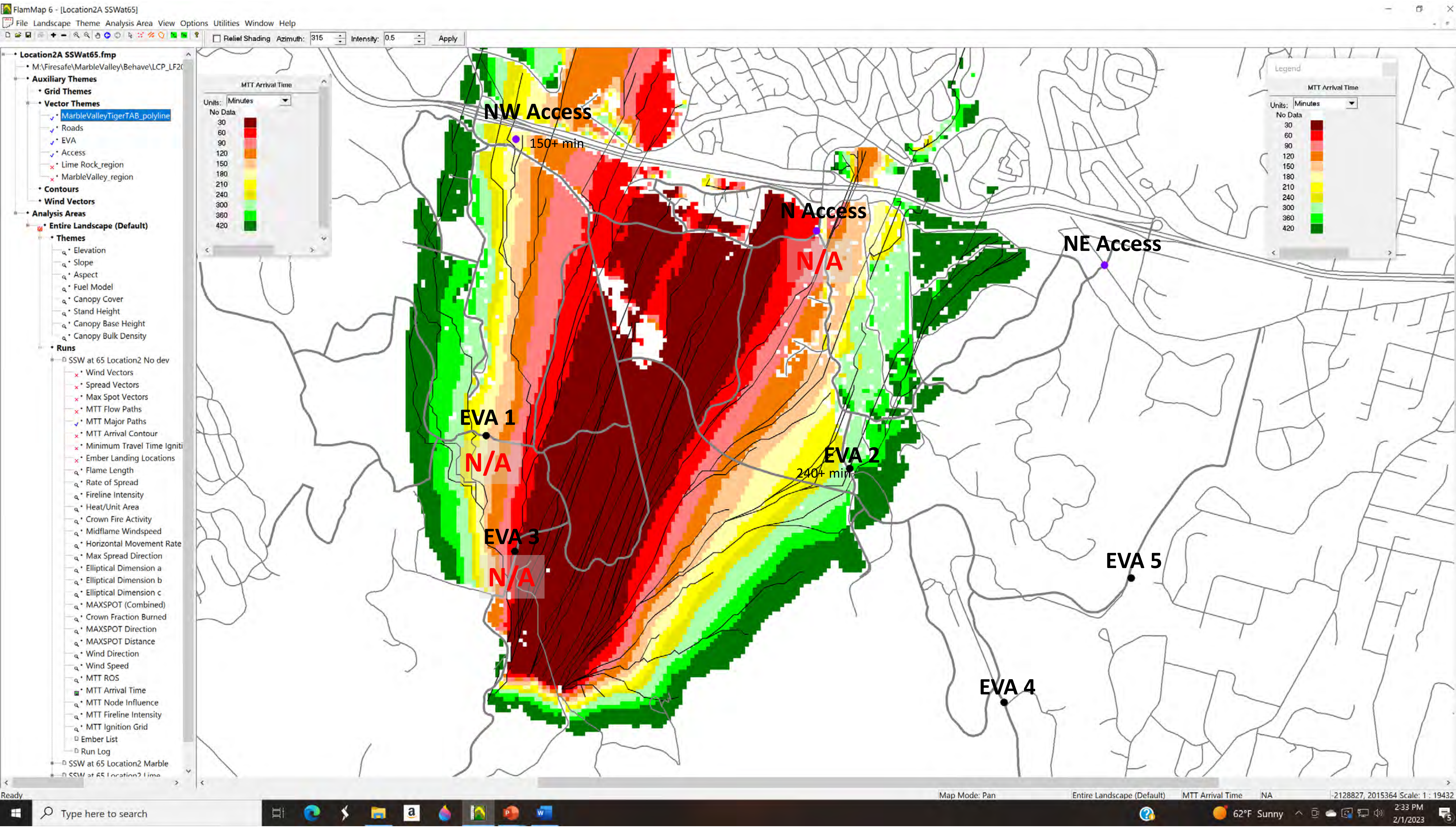
Location 2 SW wind at 65 mph Lime – Scn 2C



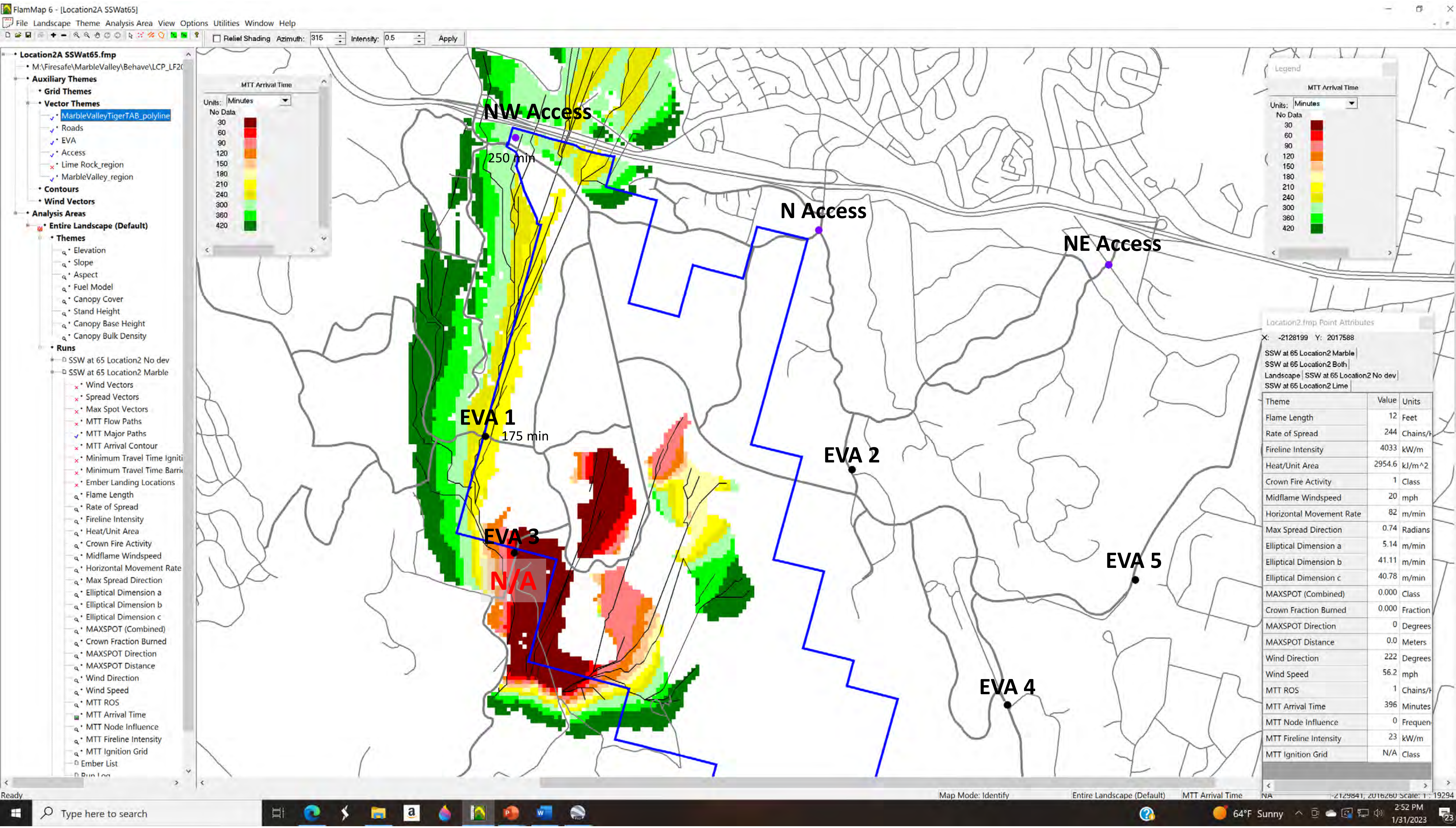
Location 2 SW wind at 65 mph Both – Scn 2D



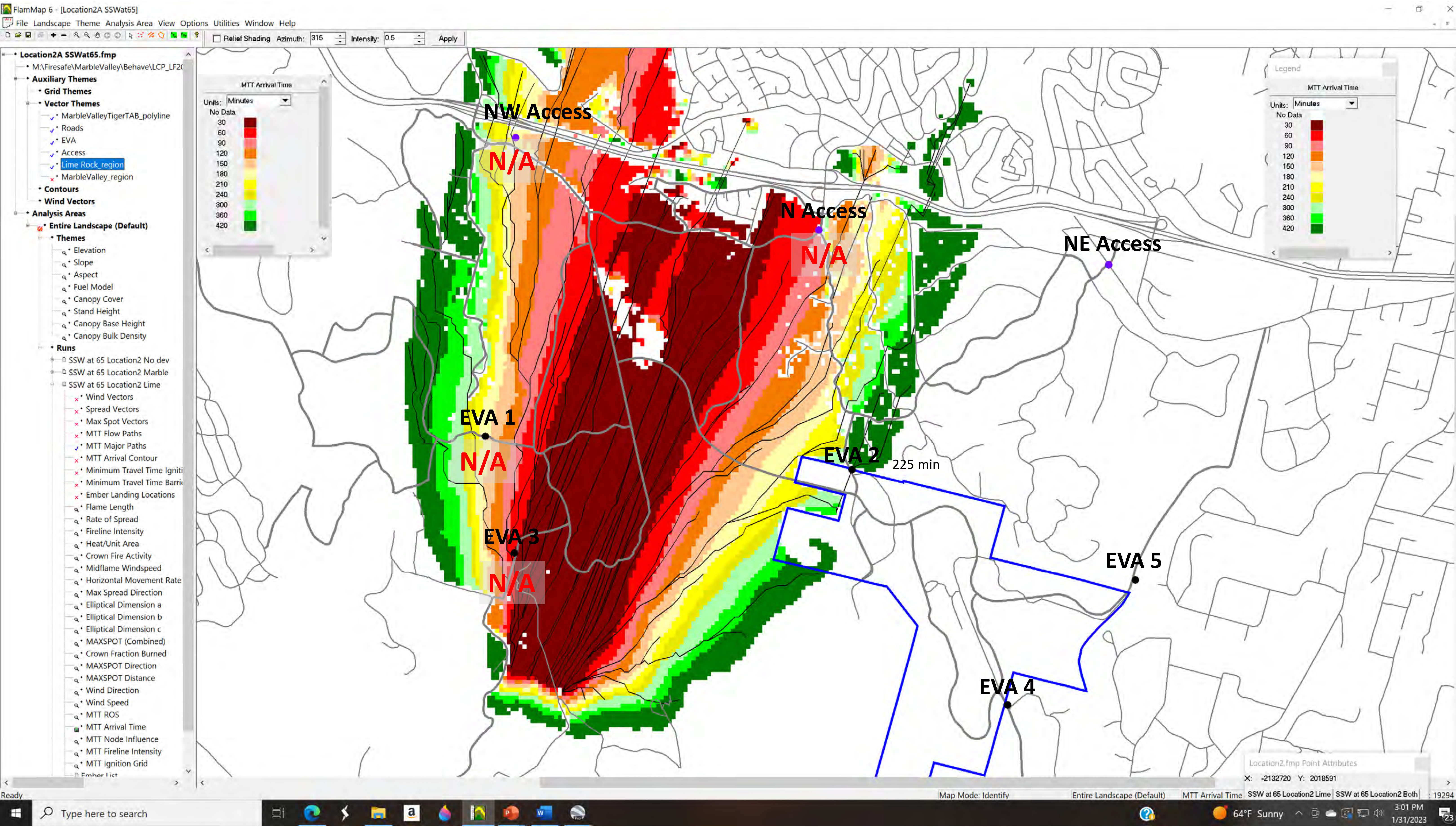
Location 2 SSW wind at 65 mph No Dev Scn 2E



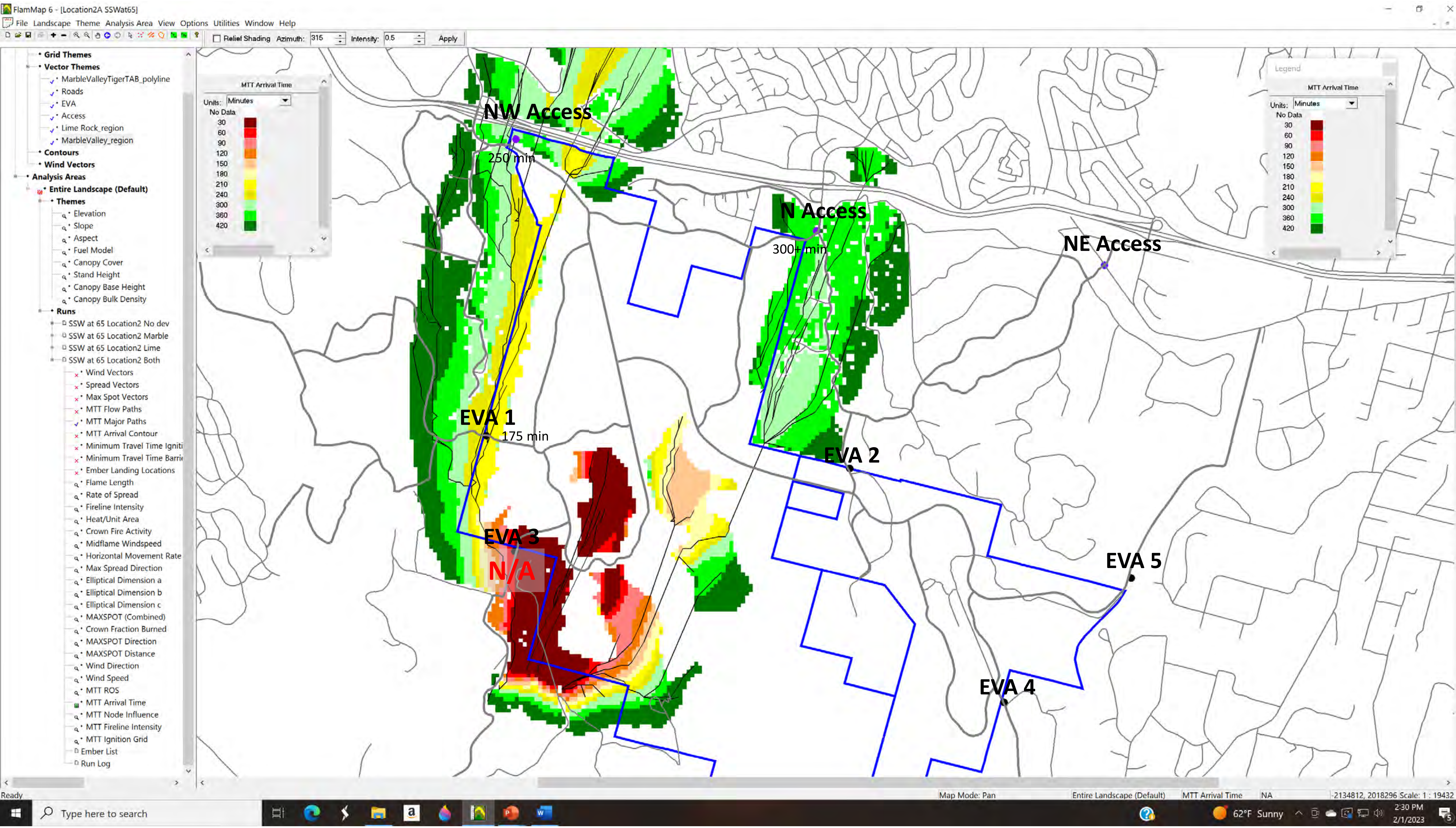
Location 2 SSW wind at 65 mph Marble – Scn 2F



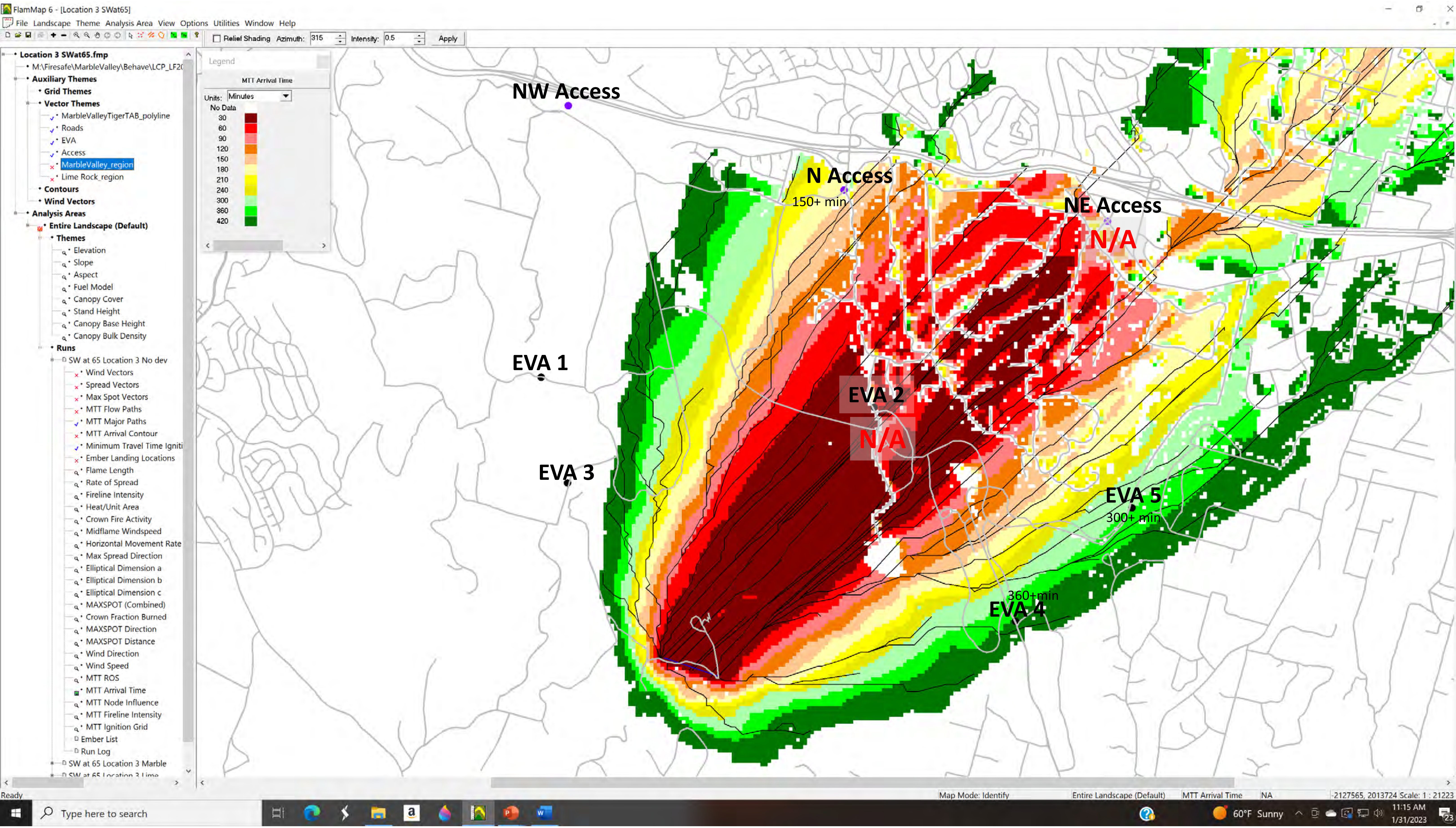
Location 2 SSW wind at 65 mph Lime – Scn 2G



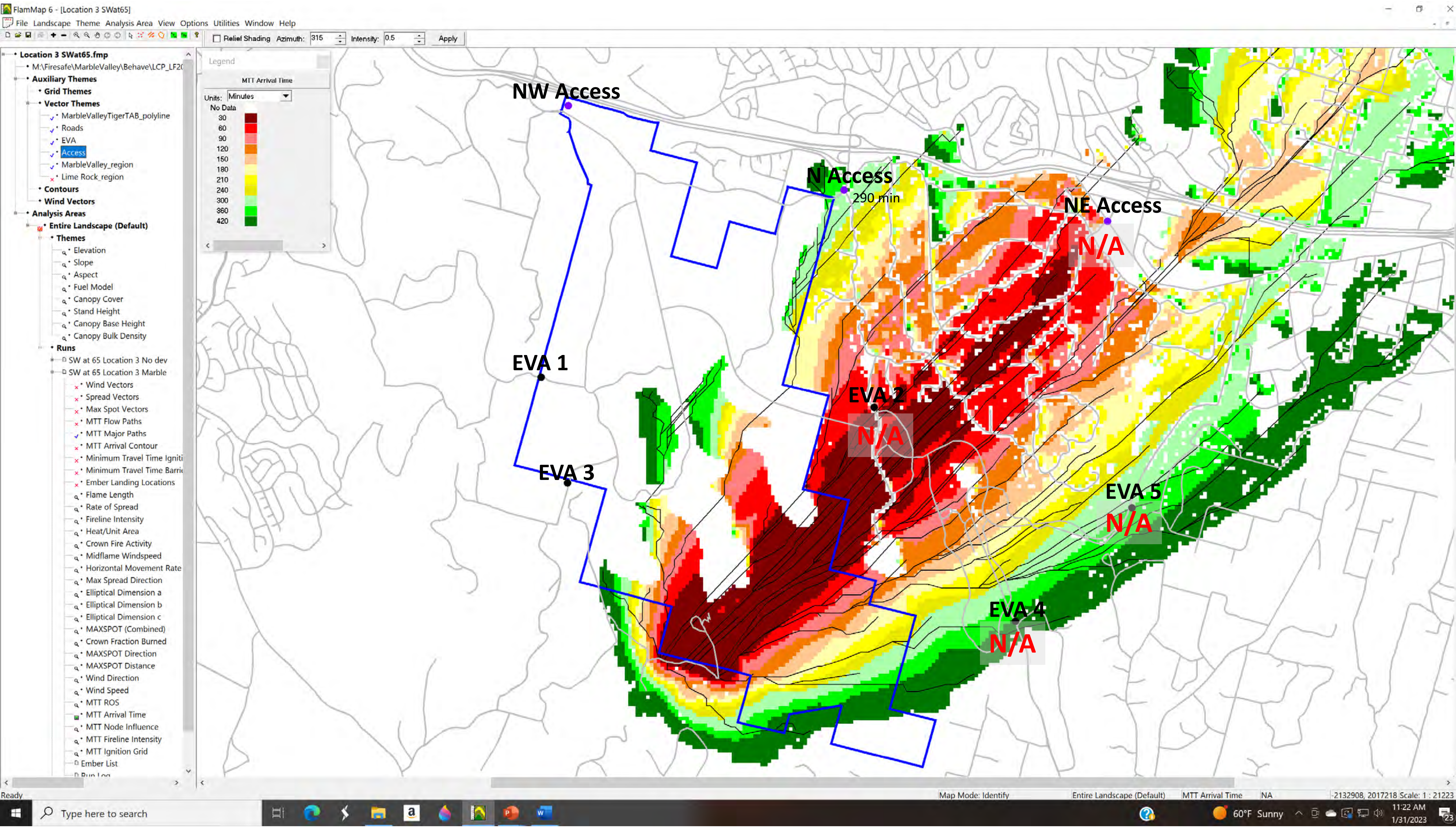
Location 2 SSW wind at 65 mph Both – Scn 2H



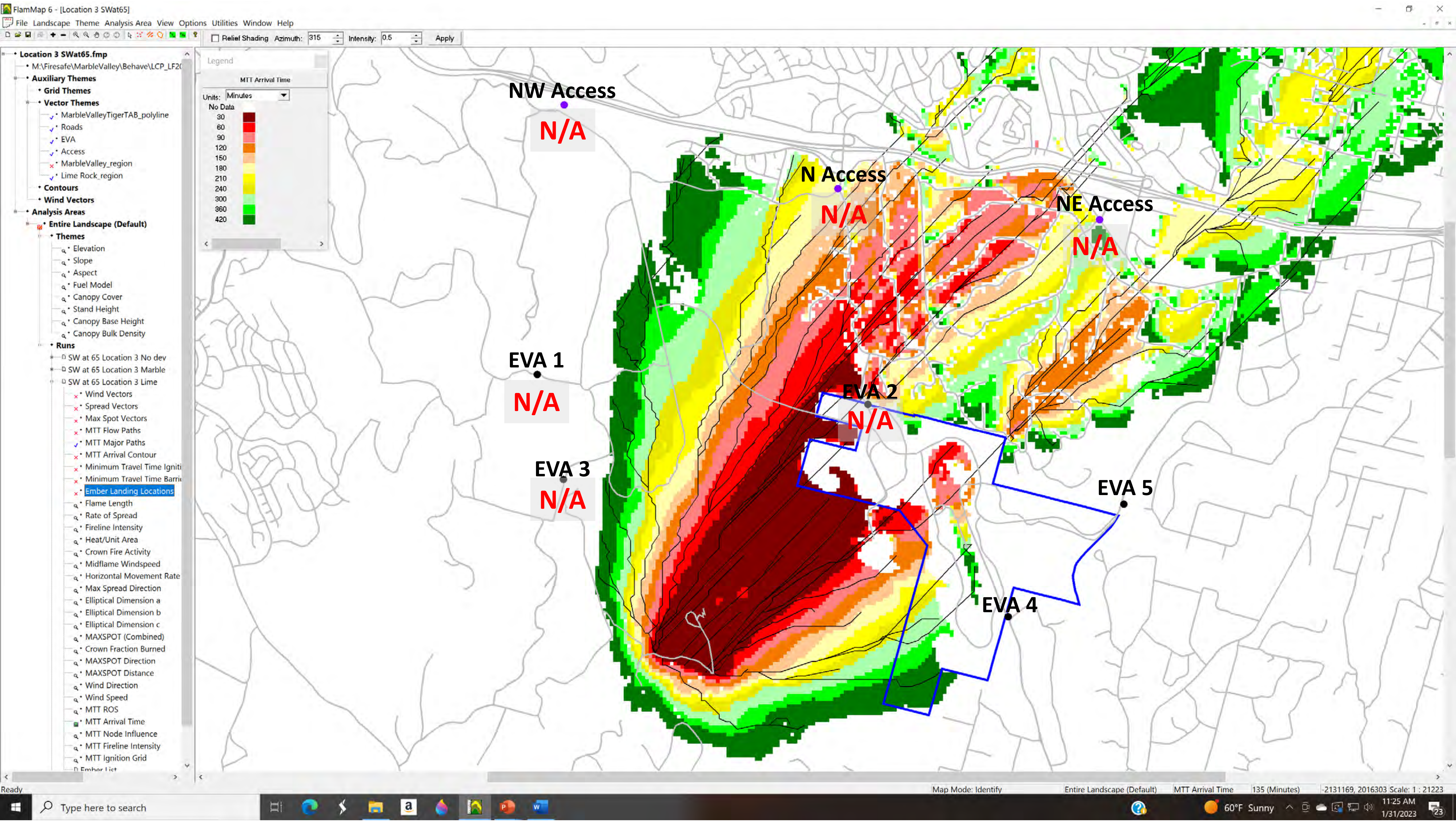
Location 3 SW wind at 65 mph No Dev – Scn 3A



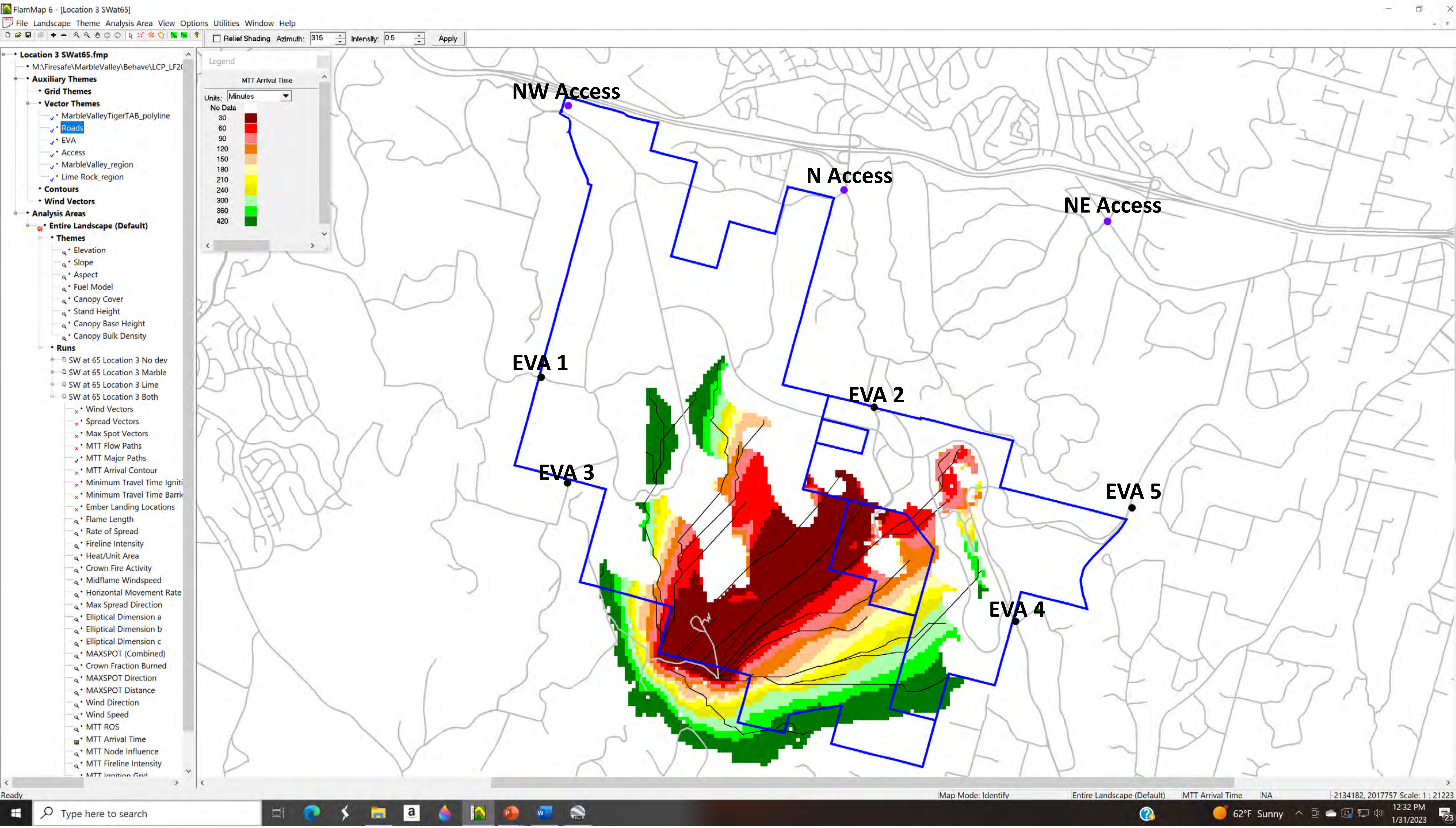
Location 3 SW wind at 65 mph Marble – Scn 3B



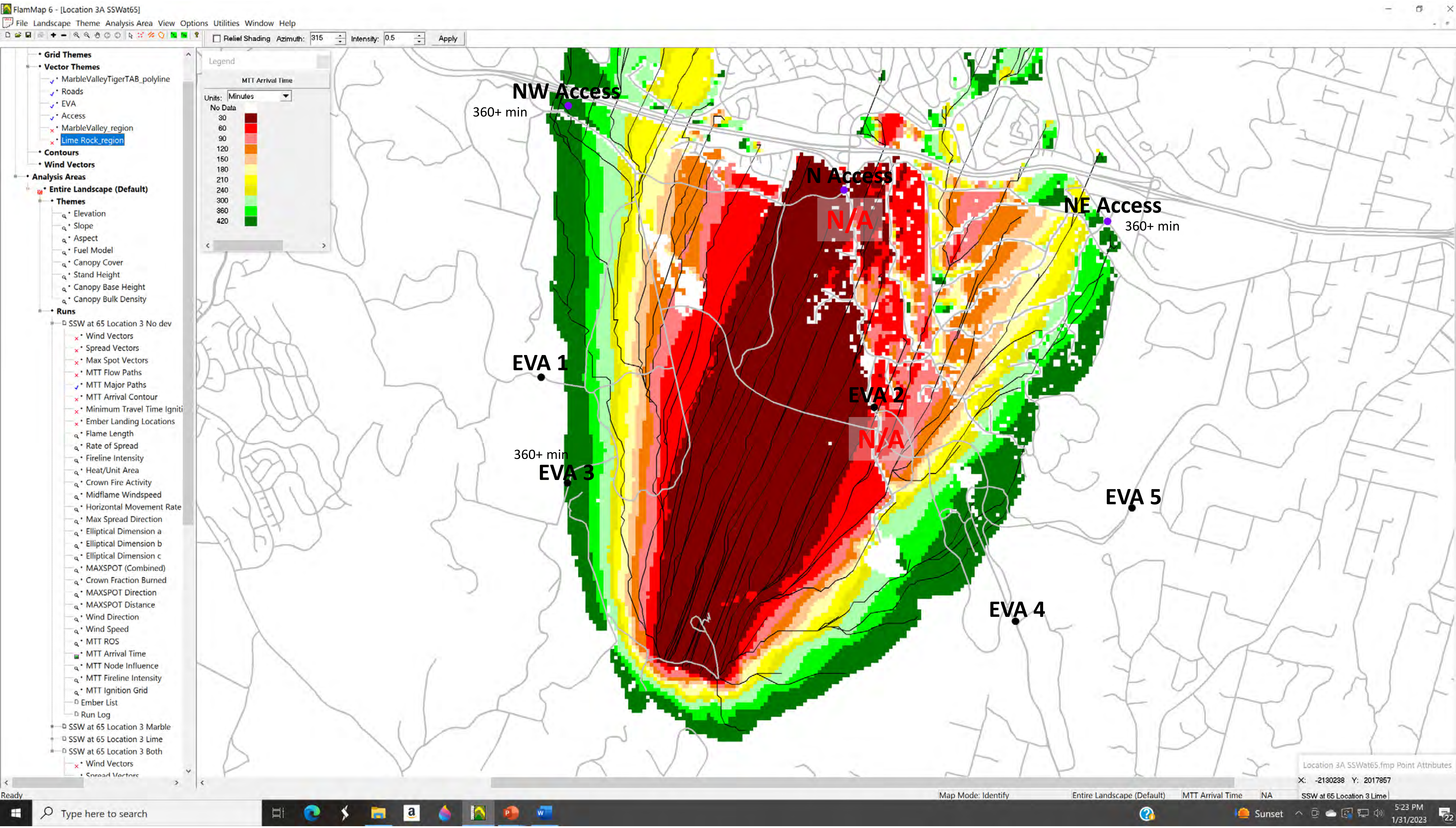
Location 3 SW wind at 65 mph Lime – Scn 3C



Location 3 SW wind at 65 mph Both – Scn 3D

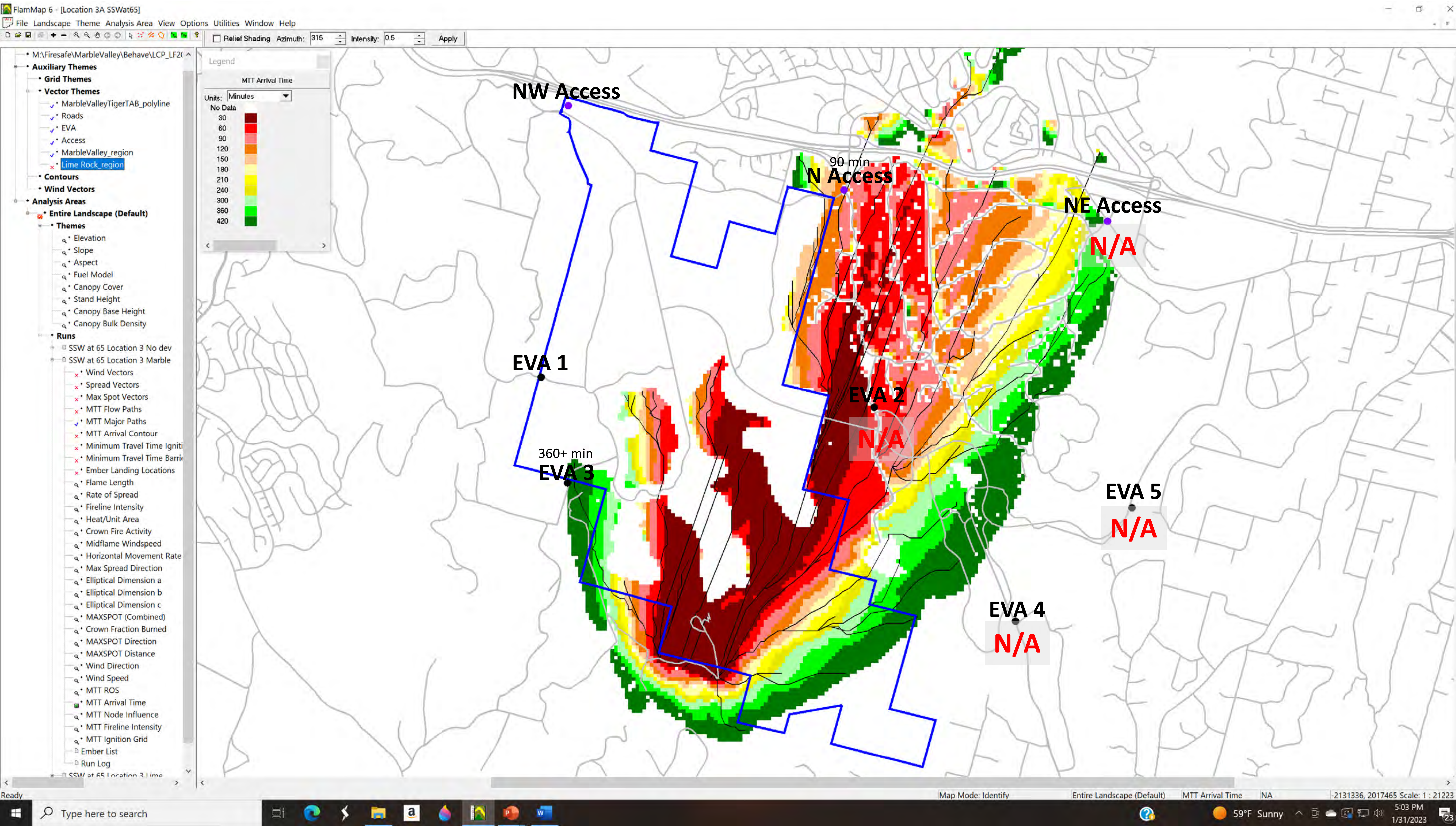


Location 3 SSW wind at 65 mph No Dev Scn 3E

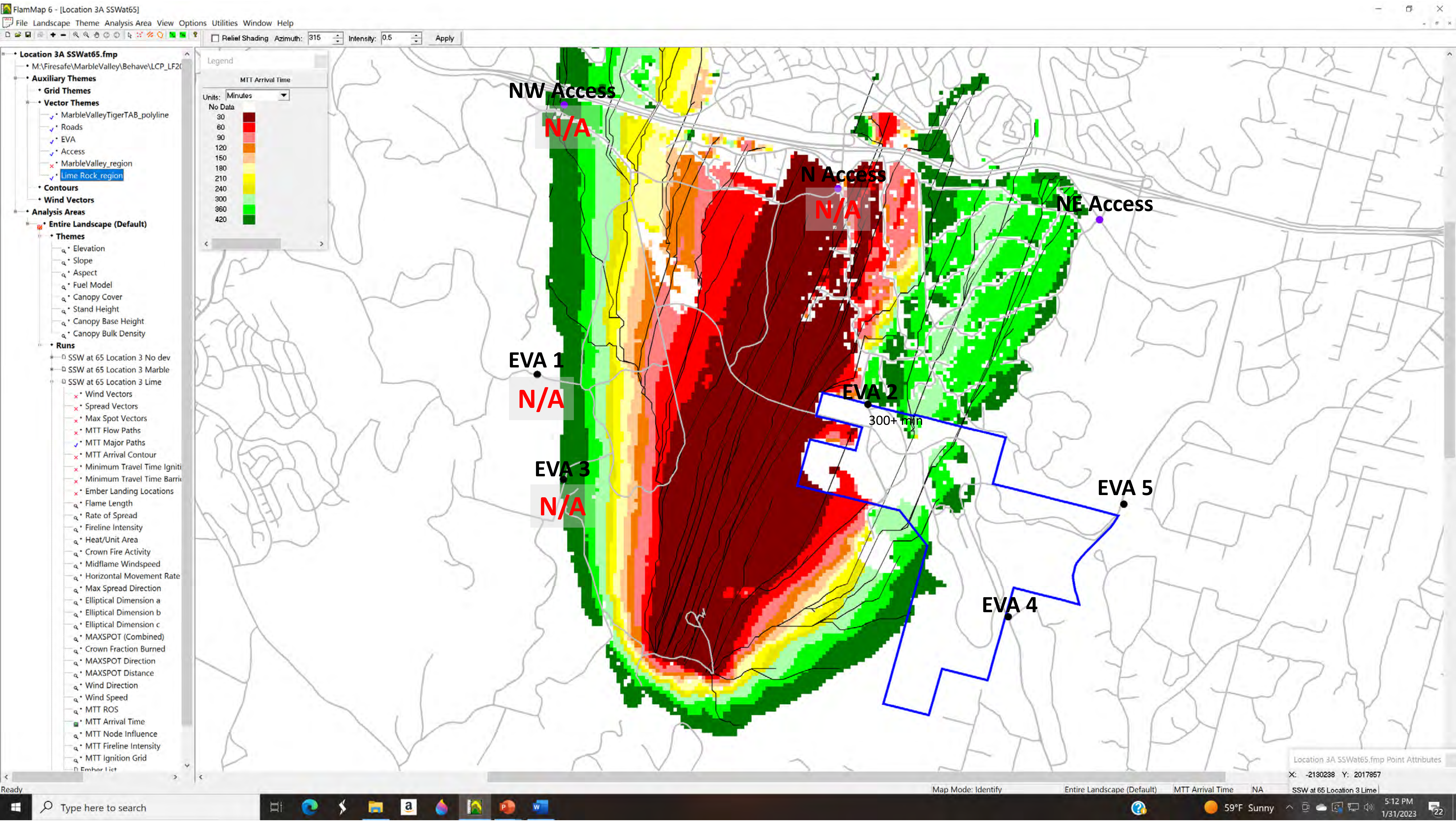


Location 3

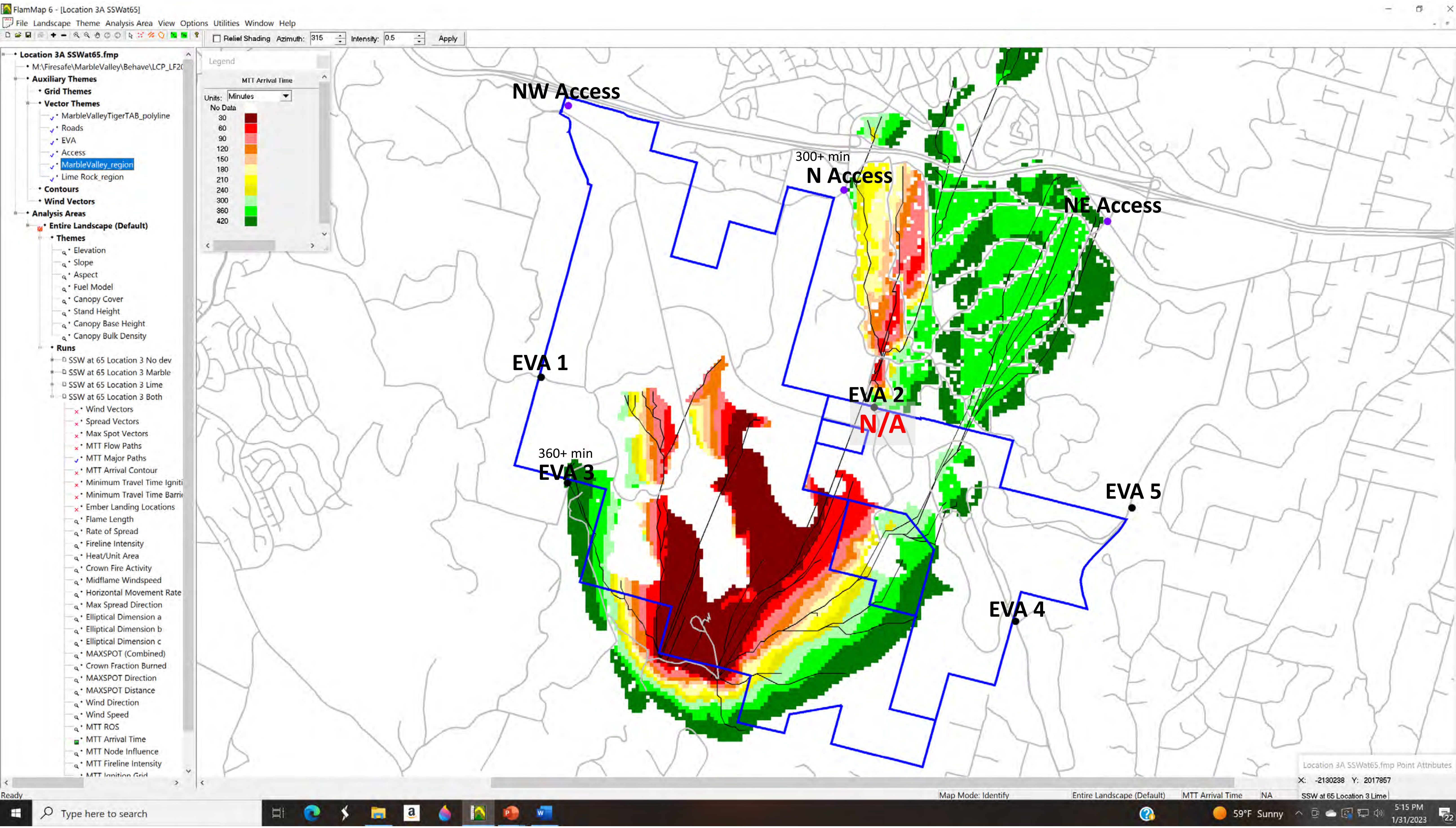
Location 3 SSW wind at 65 mph Marble – Scn 3F



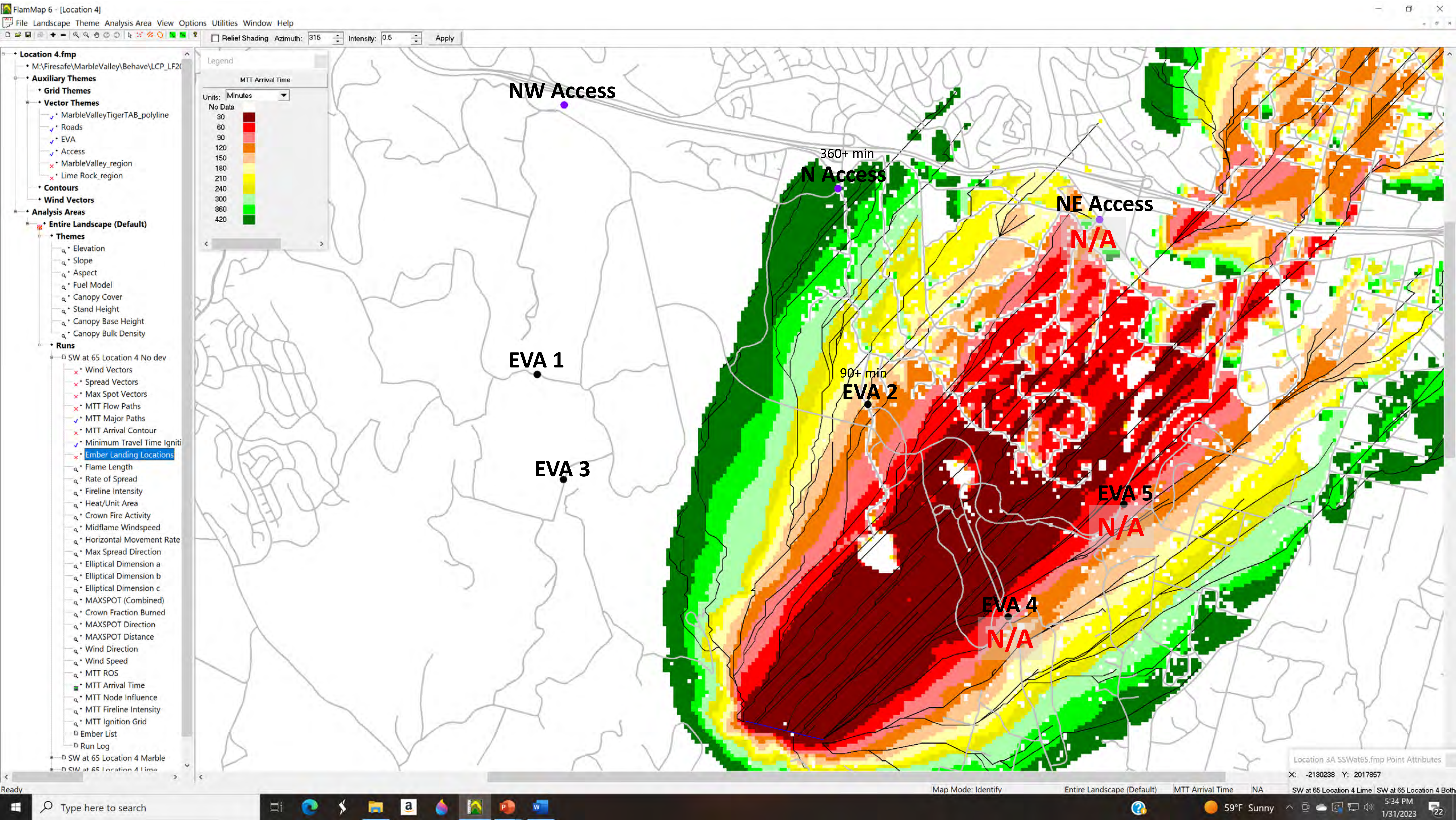
Location 3 SSW wind at 65 mph Lime – Scn 3G



Location 3 SSW wind at 65 mph Both – Scn 3H

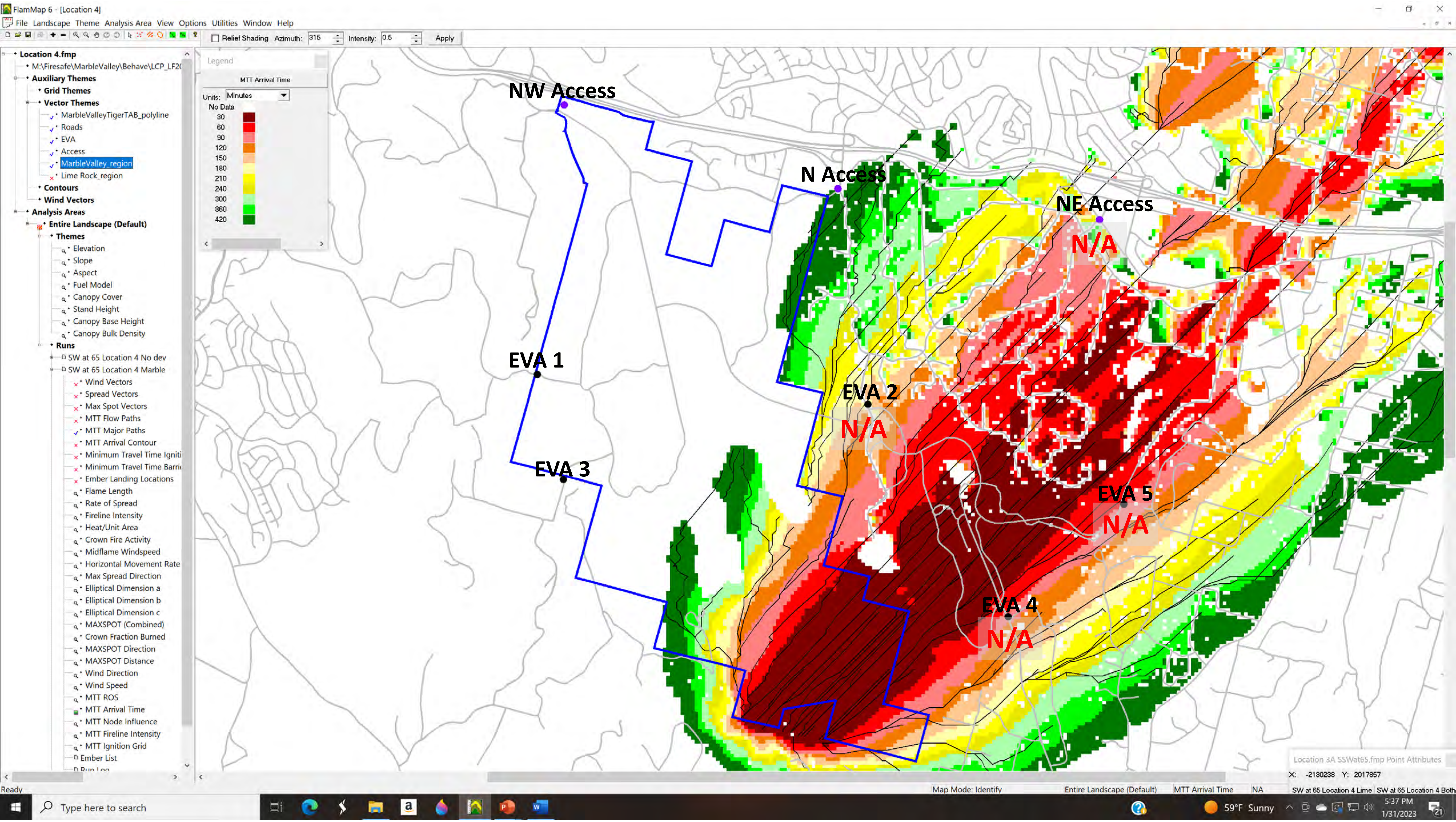


Location 4 SW wind at 65 mph No Dev – Scn 4A

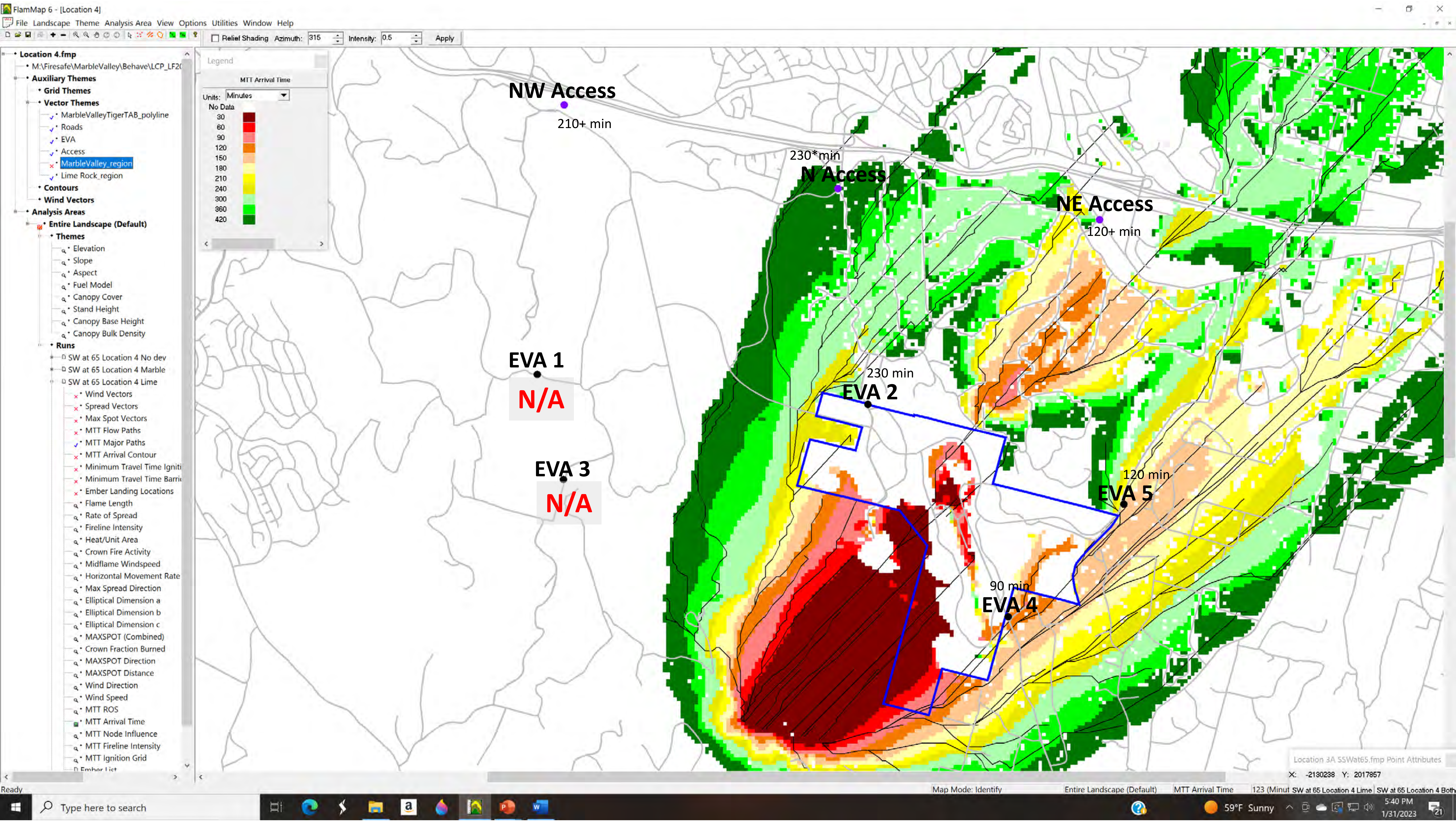


Location 4

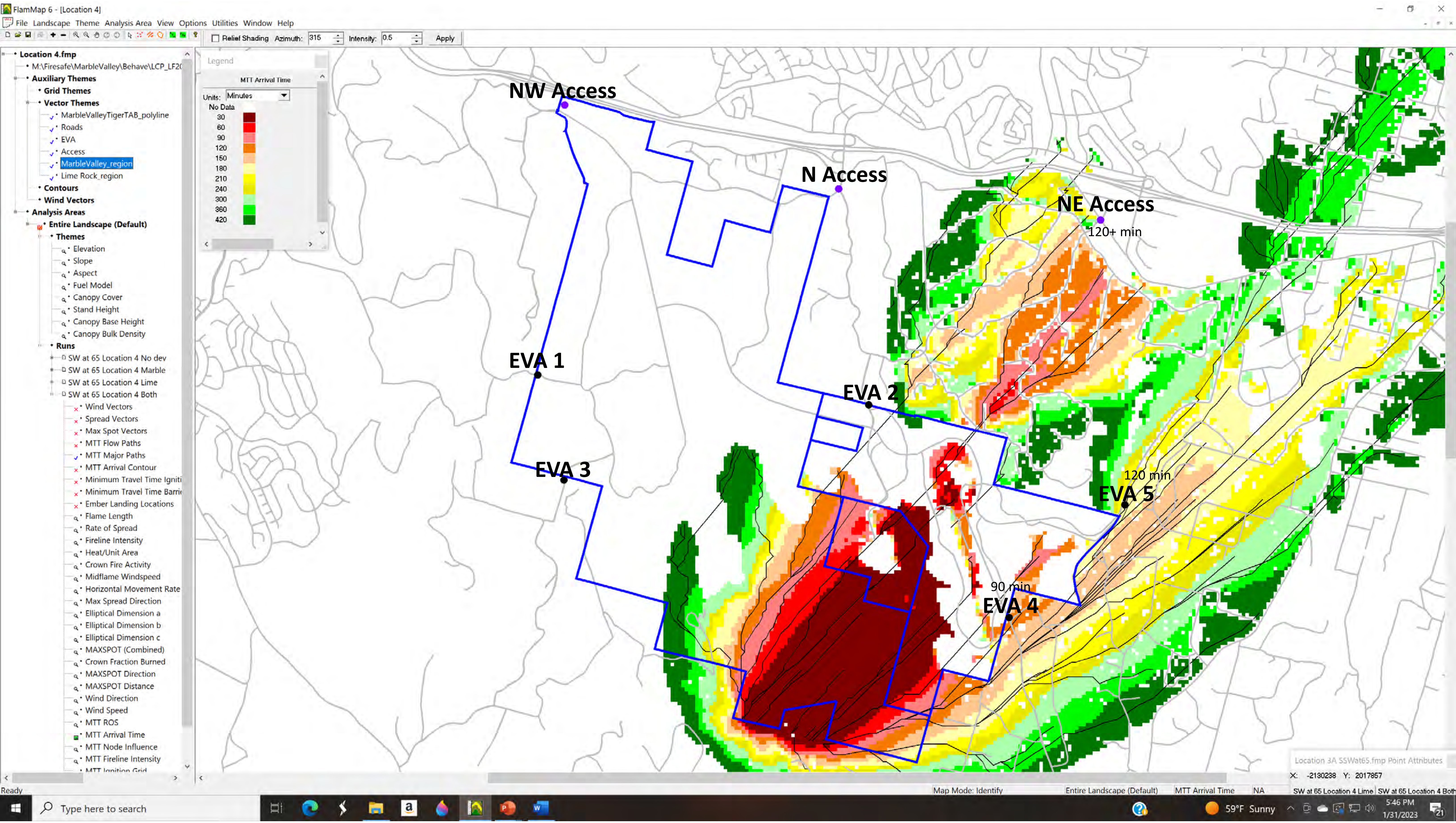
Location 4 SW wind at 65 mph Marble – Scn 4B



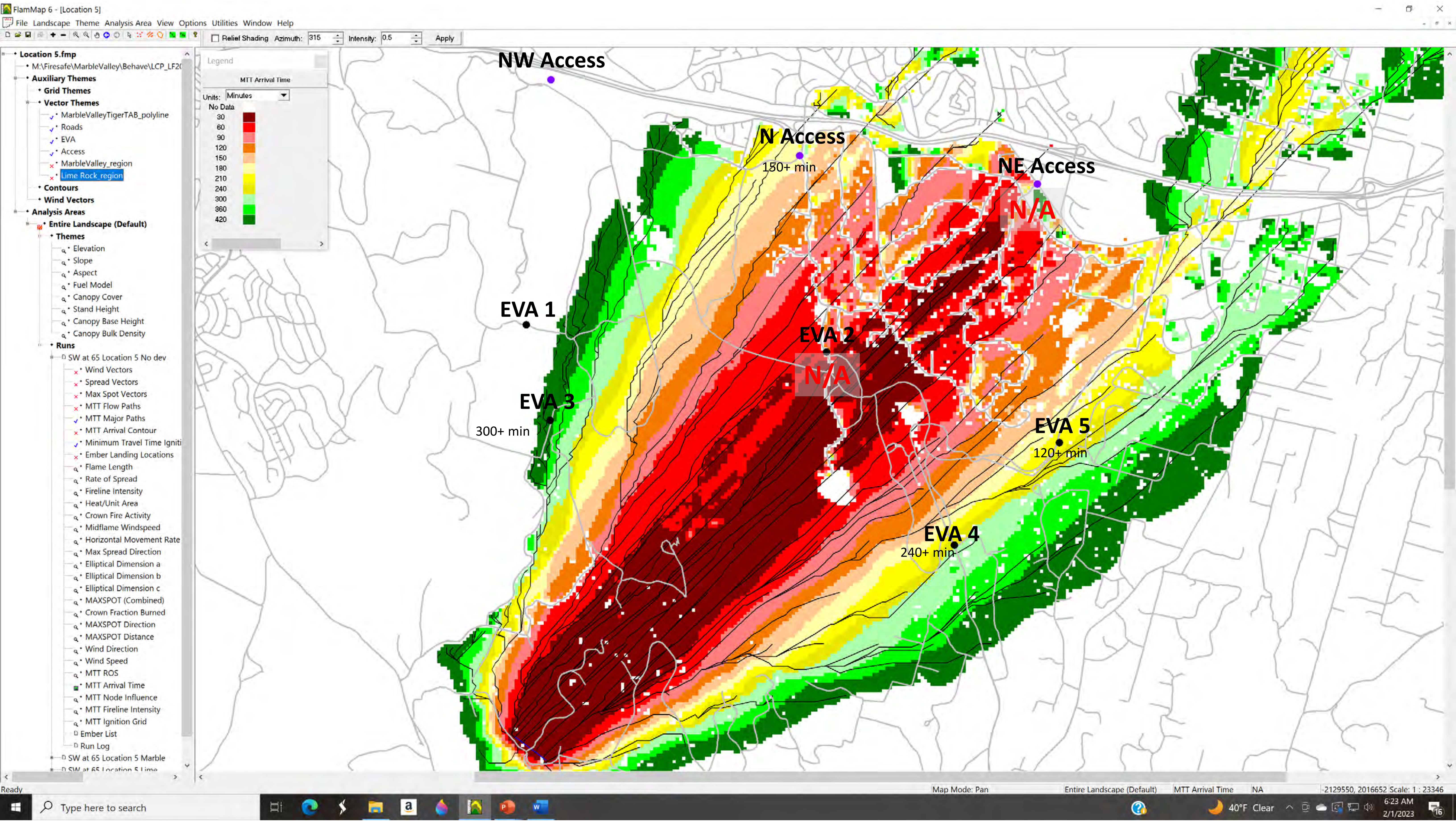
Location 4 SW wind at 65 mph Lime – Scn 4C



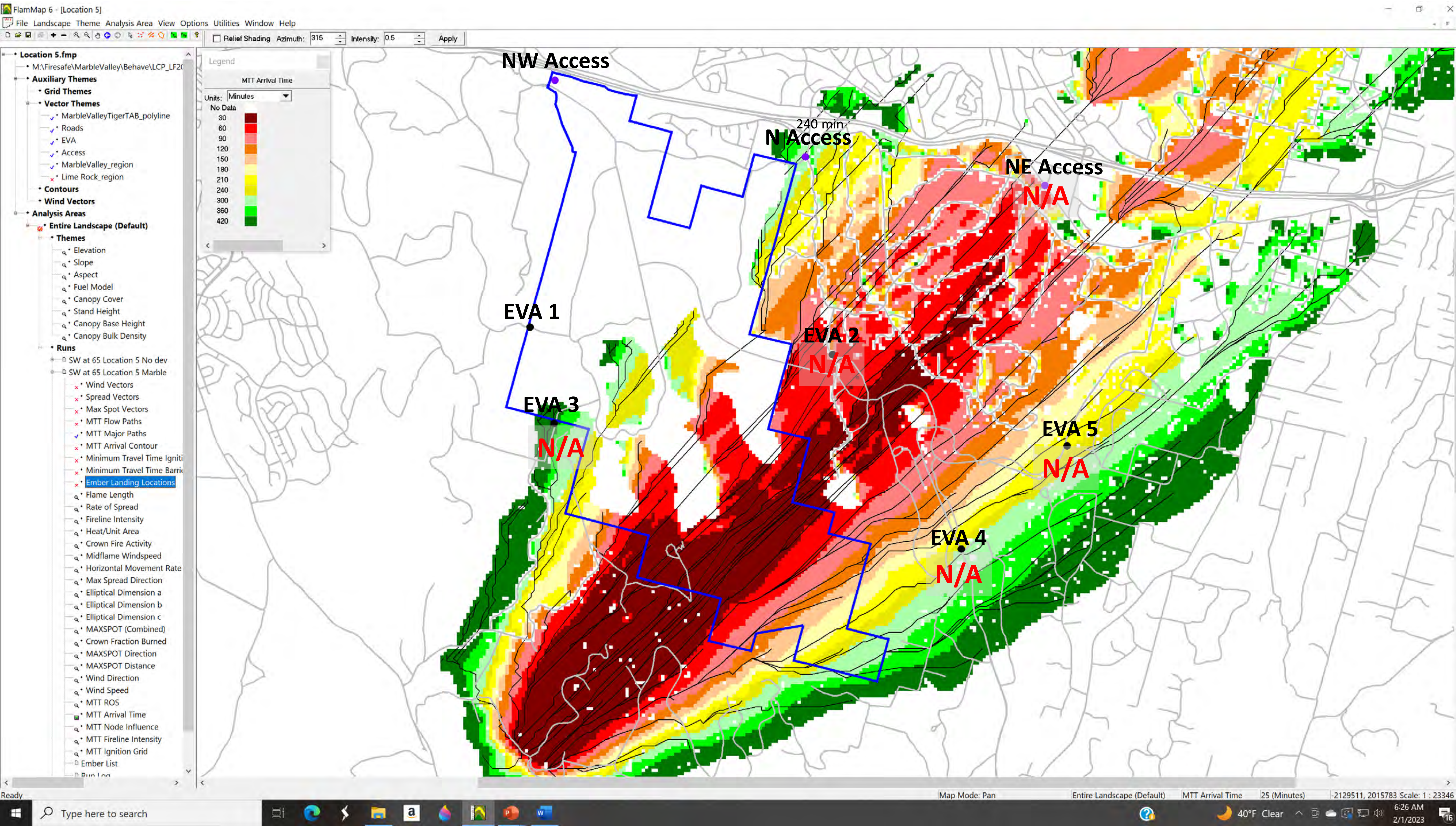
Location 4 SW wind at 65 mph Both – Scn 4D



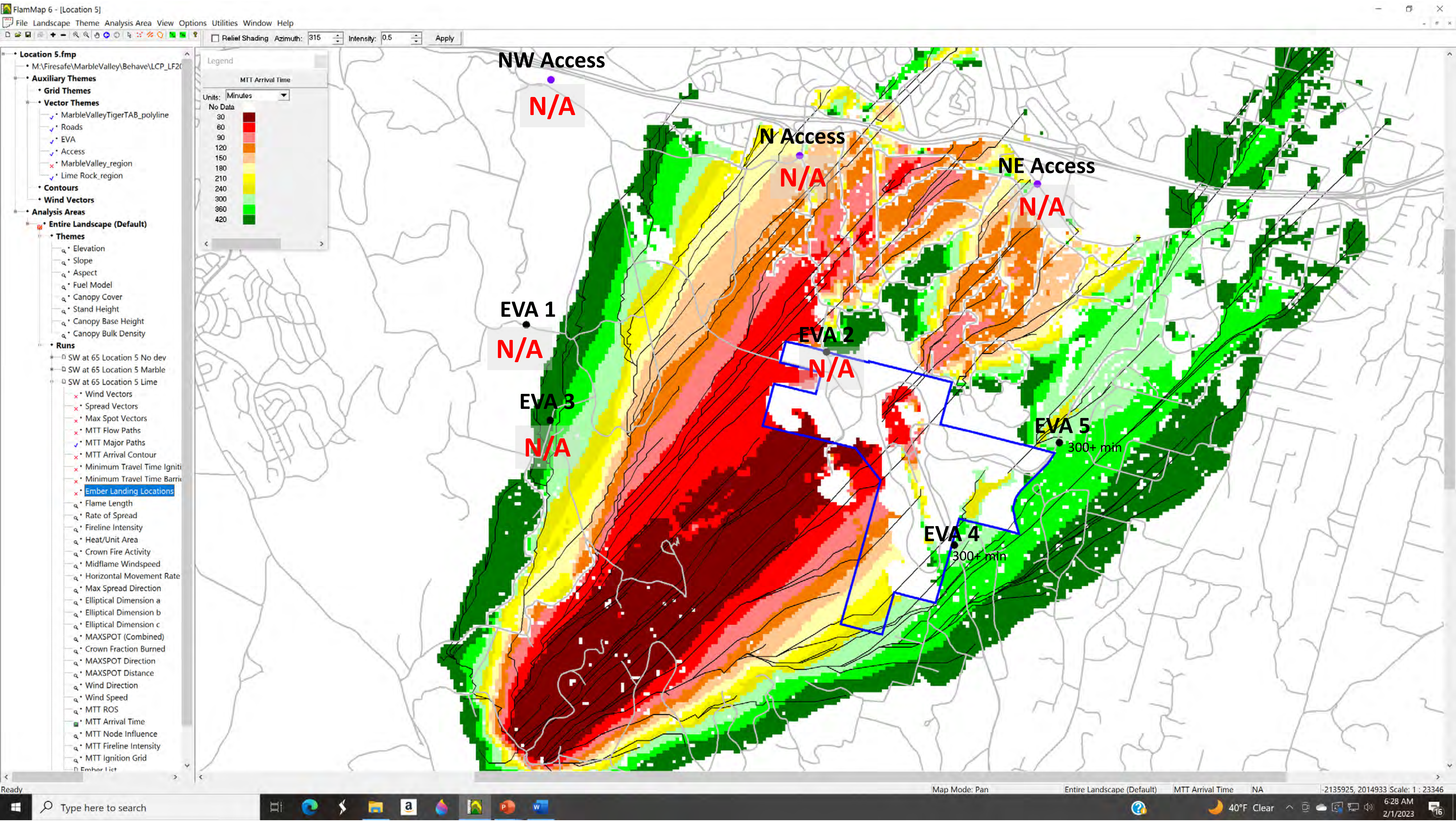
Location 5 SW wind at 65 mph No Dev – Scn 5A



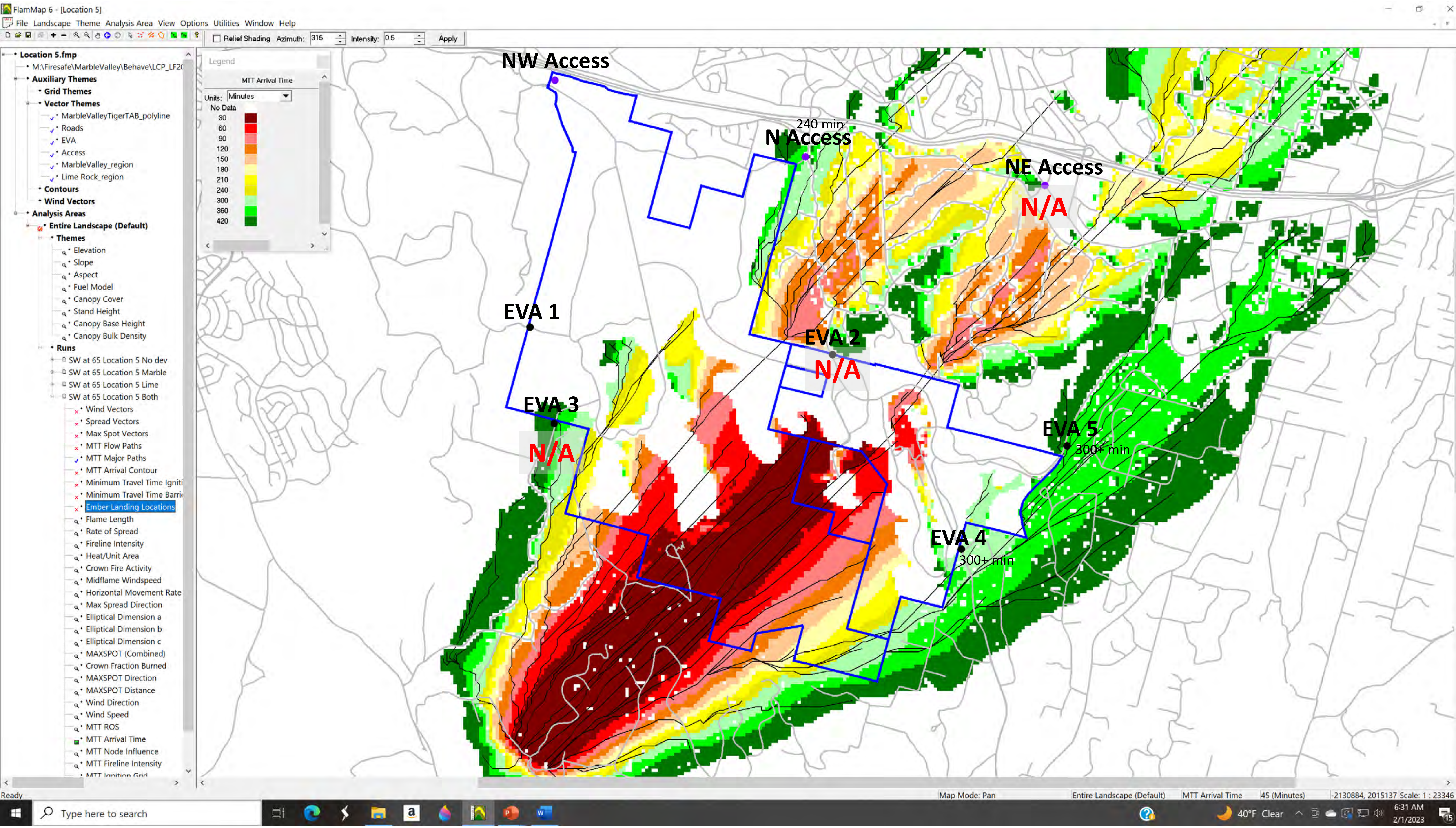
Location 5 SW wind at 65 mph Marble – Scn 5B



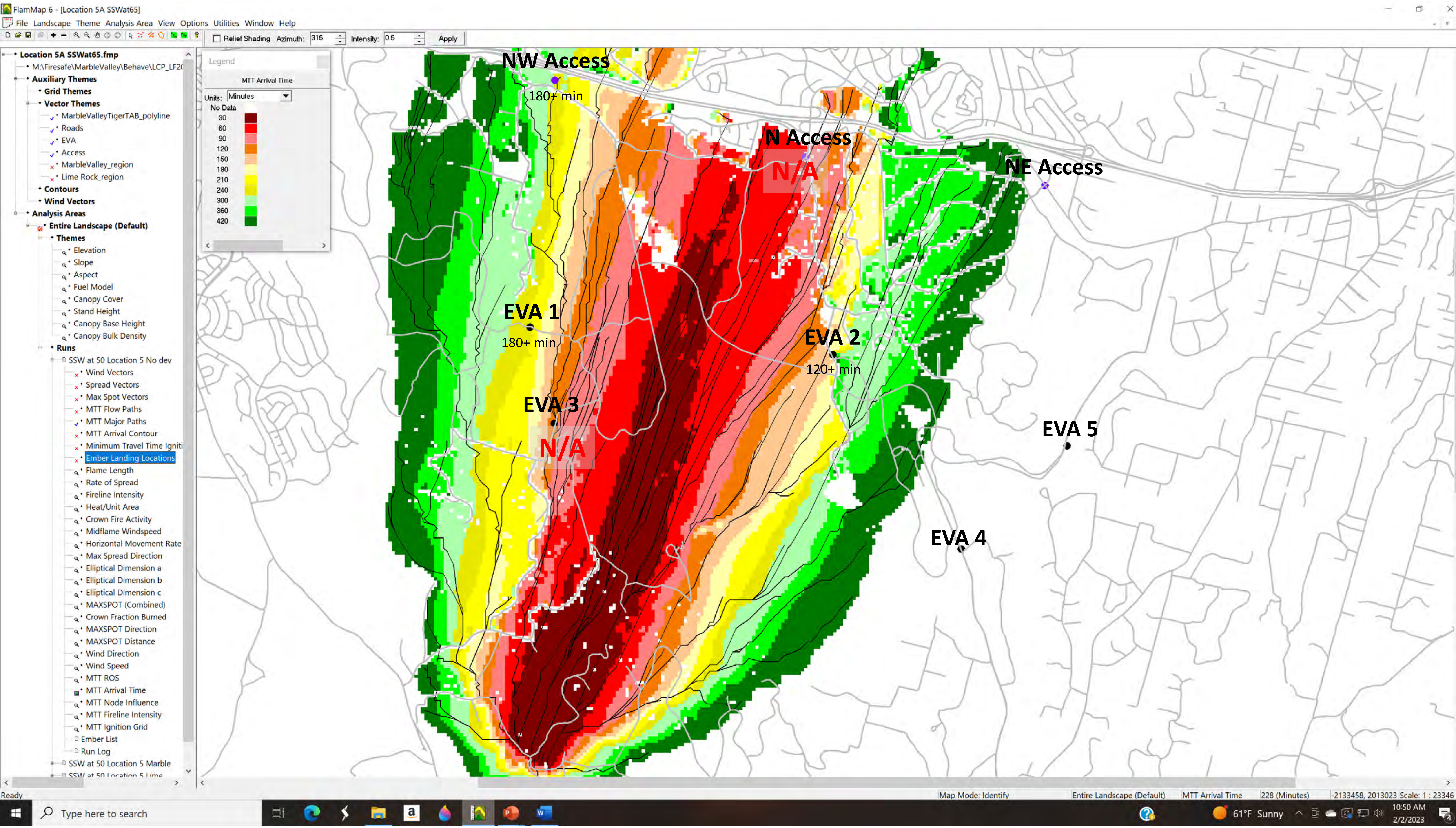
Location 5 SW wind at 65 mph Lime – Scn 5C



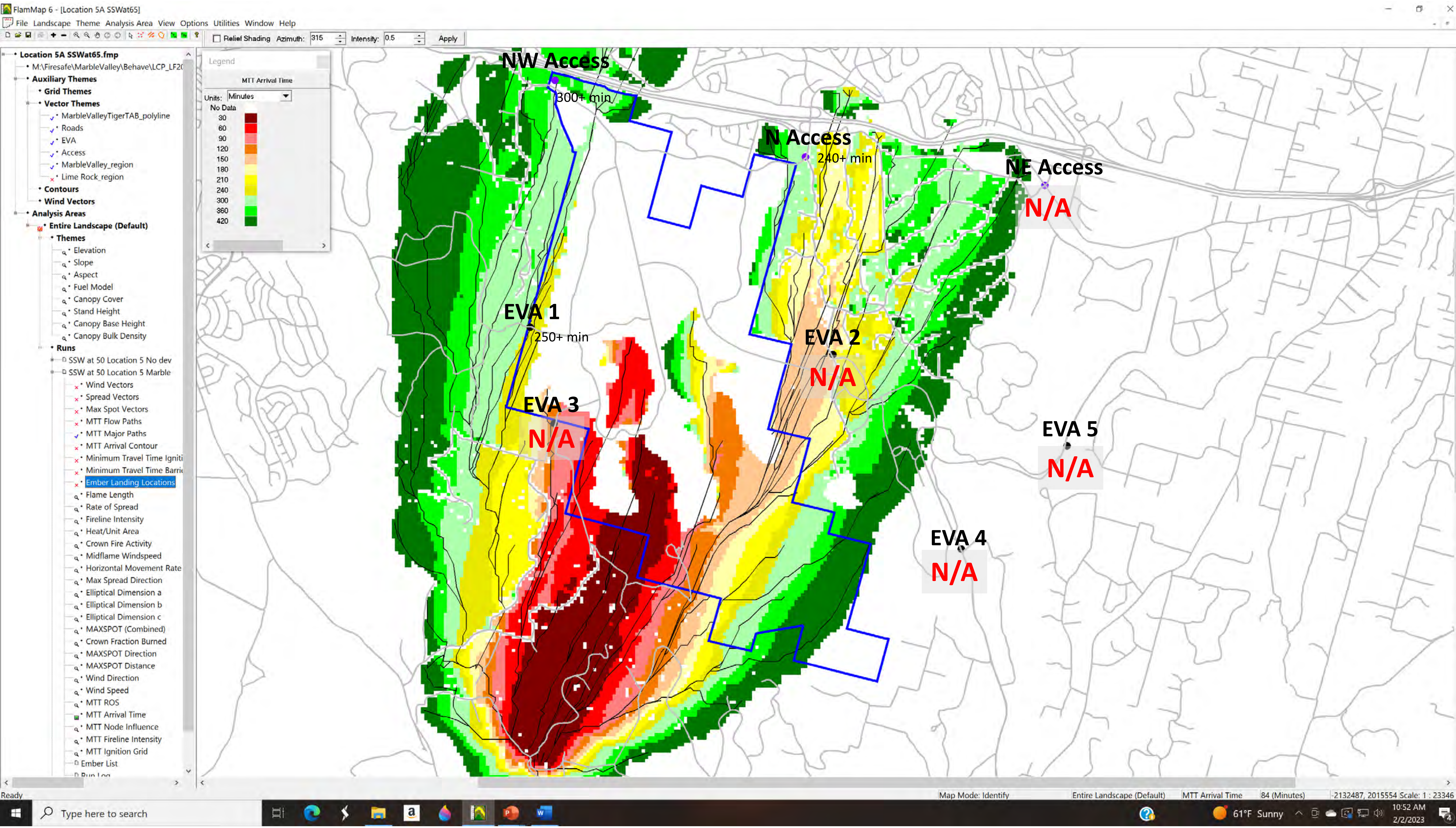
Location 5 SW wind at 65 mph Both – Scn 5D



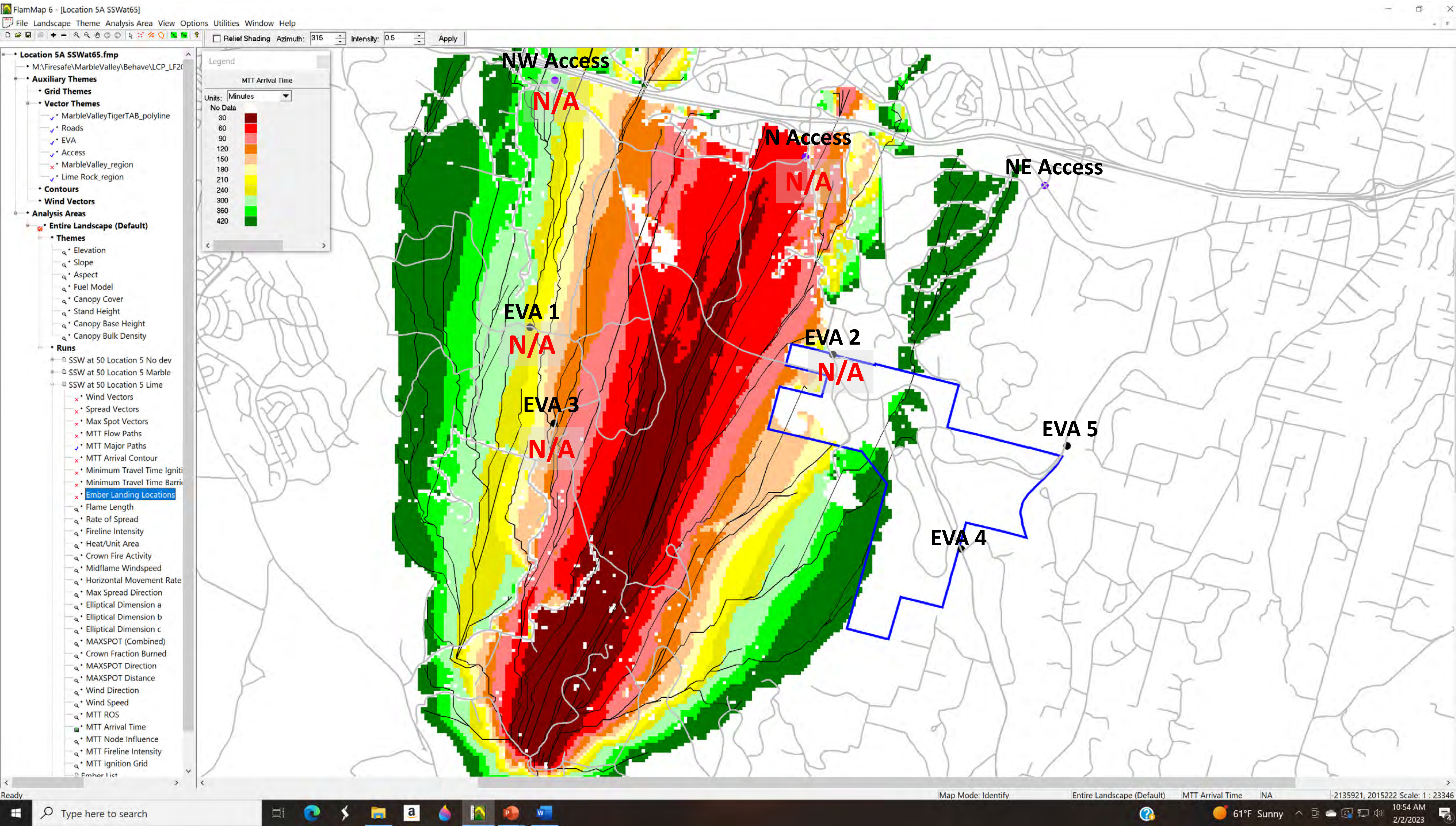
Location 5 SSW wind at 50 mph No Dev – Scn 5E



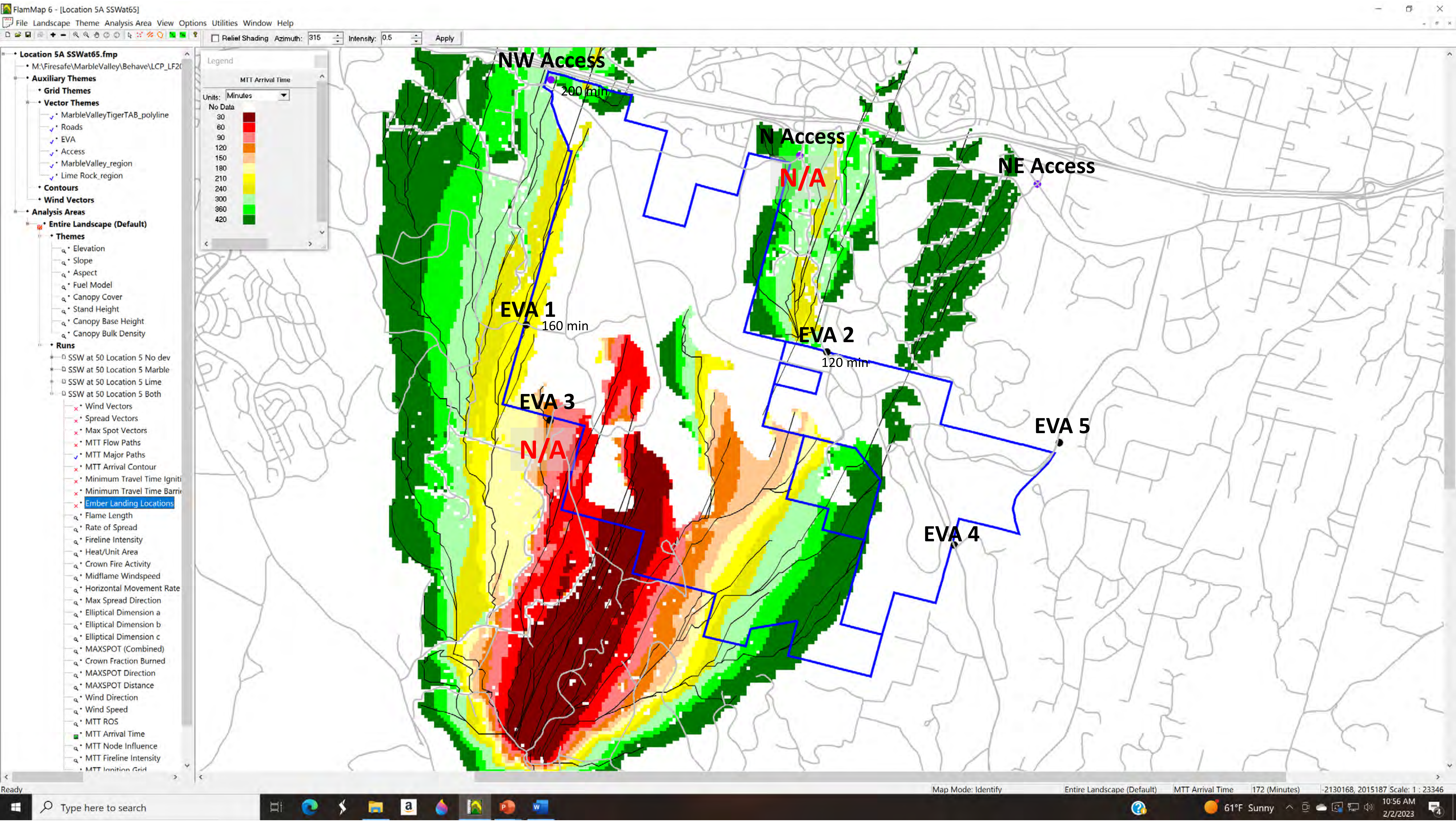
Location 5 SSW wind at 50 mph Marble – Scn 5F



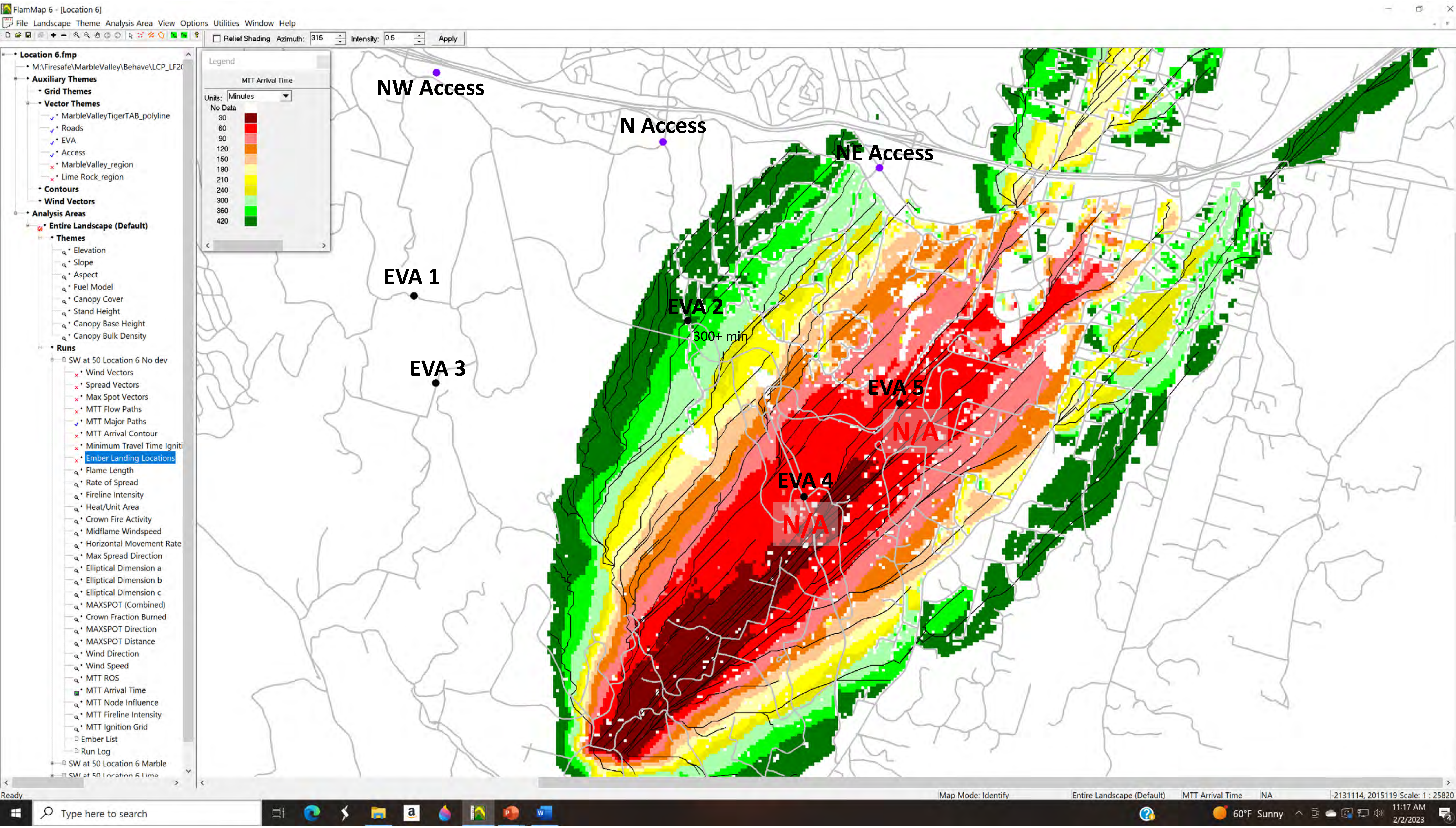
Location 5 SSW wind at 50 mph Lime – Scn 5G



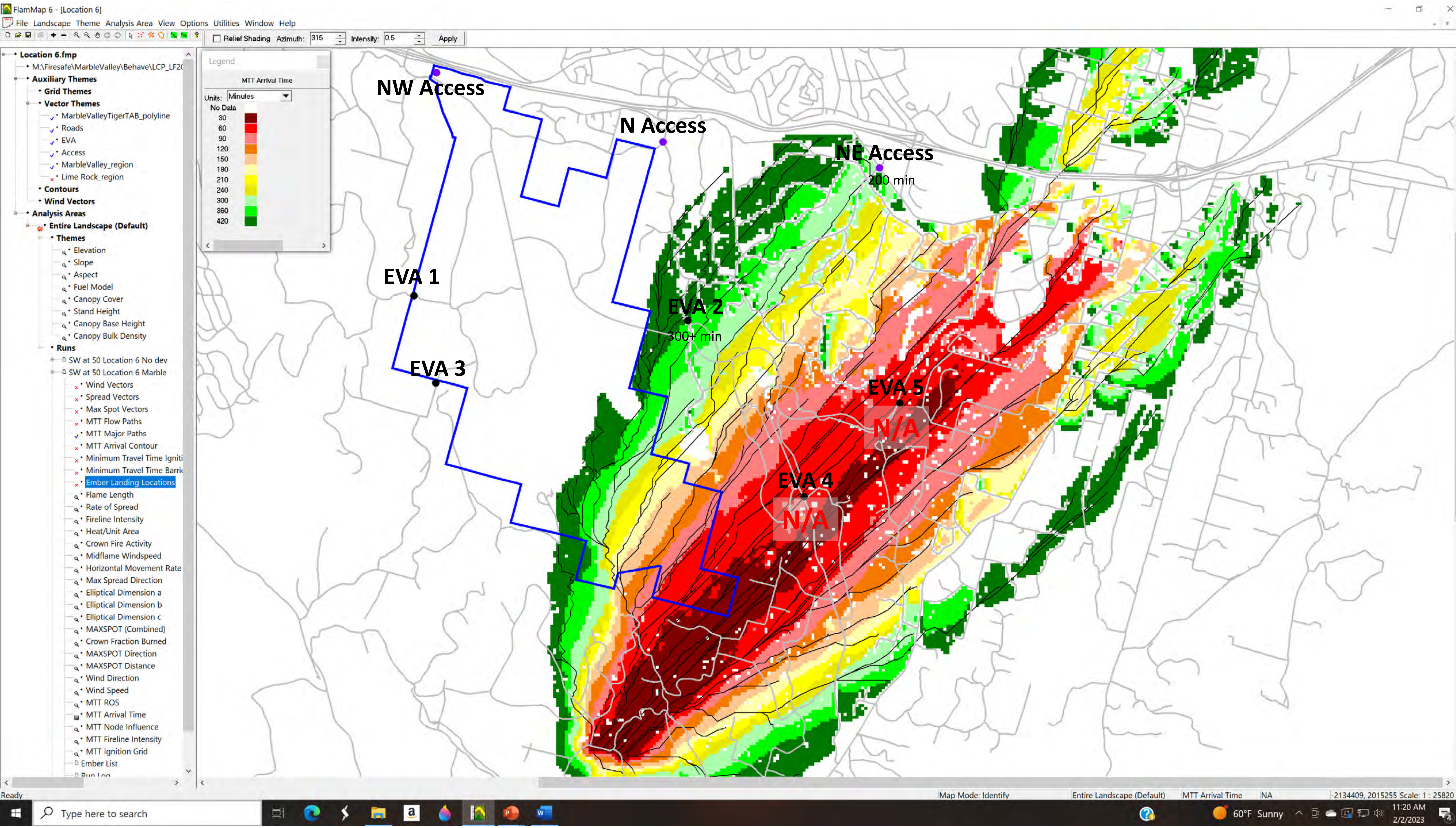
Location 5 SSW wind at 50 mph Both – Scn 5H



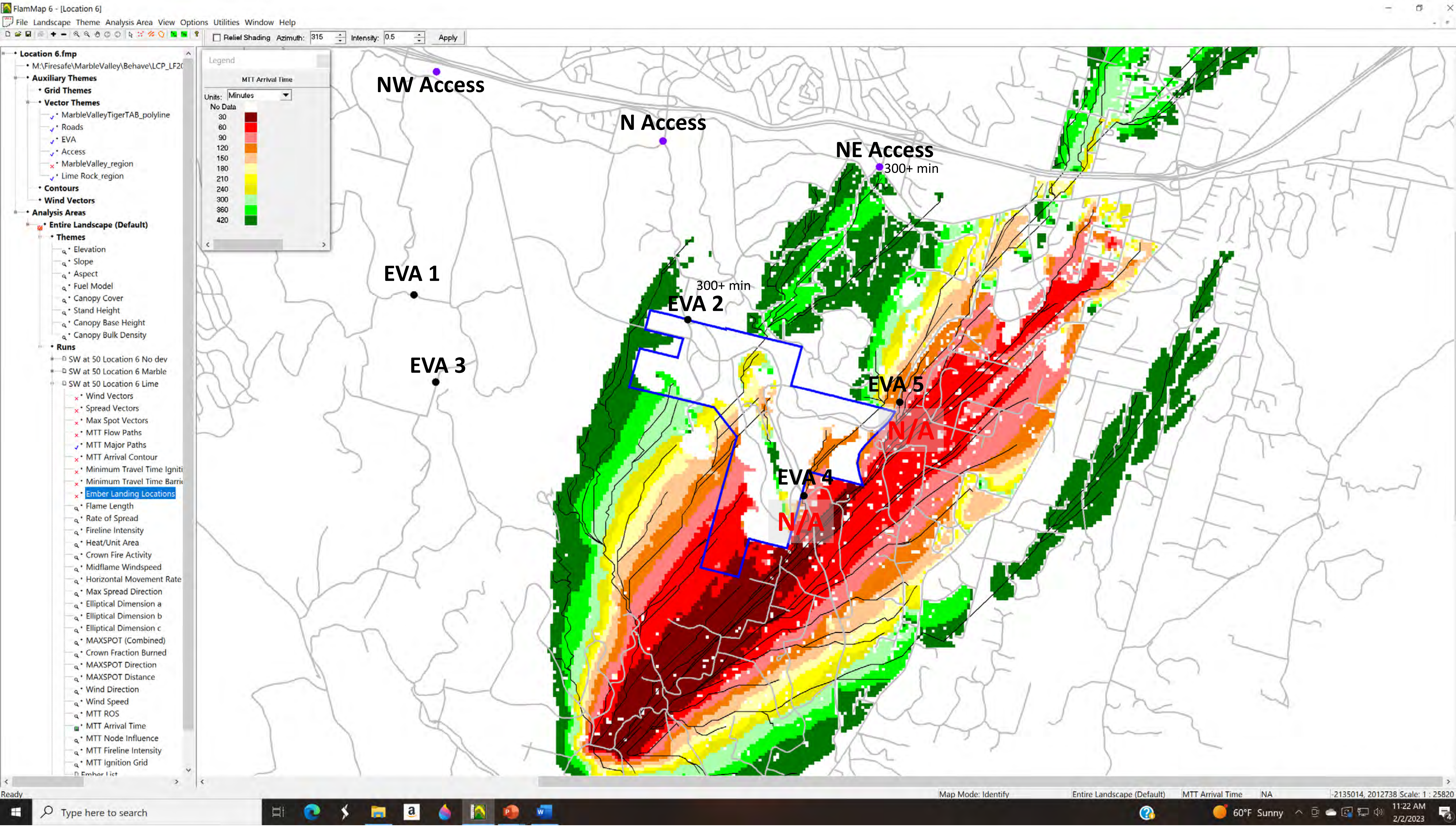
Location 6 SW wind at 50 mph No Dev – Scn 6A



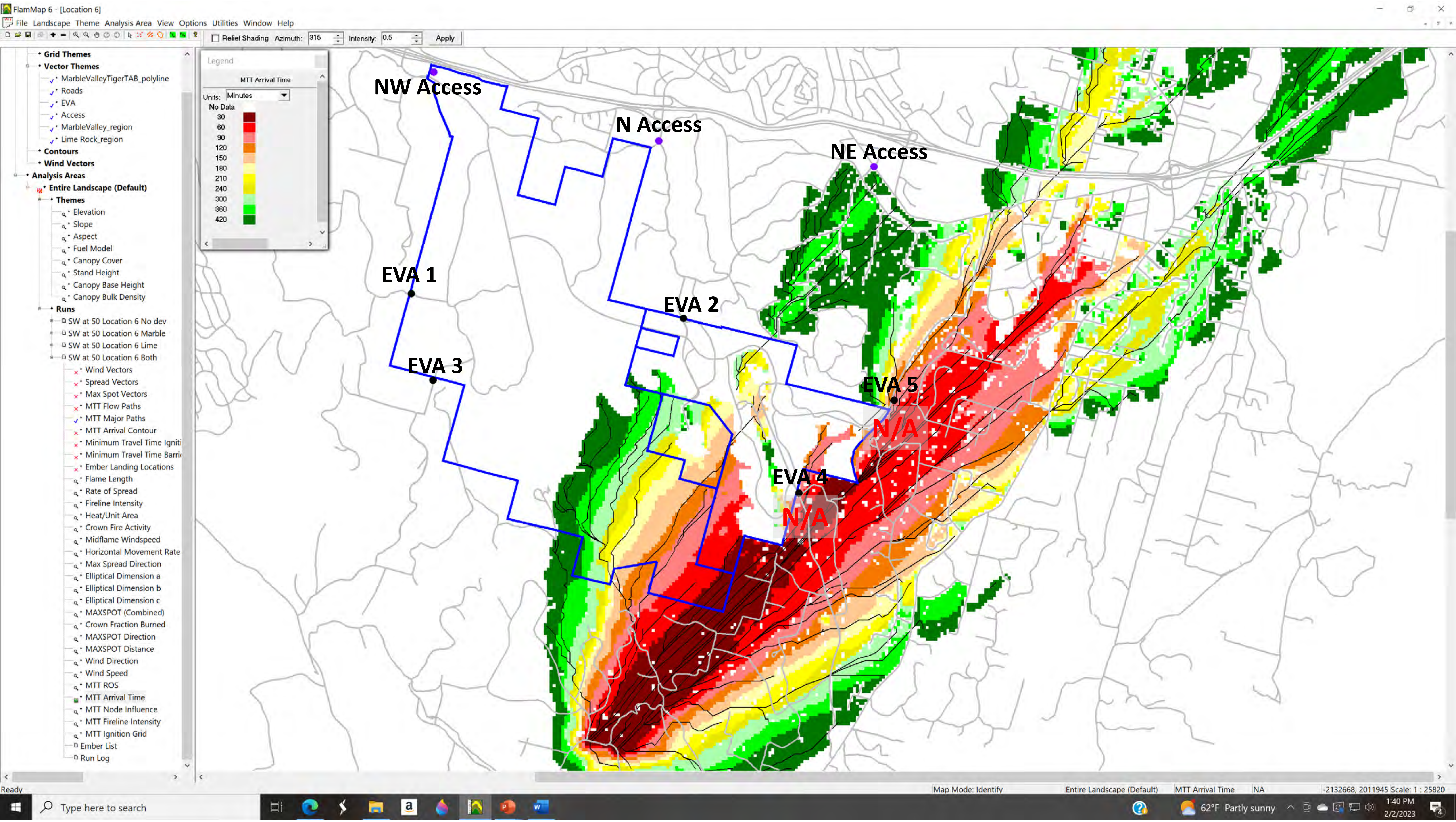
Location 6 SW wind at 50 mph Marble – Scn 6B



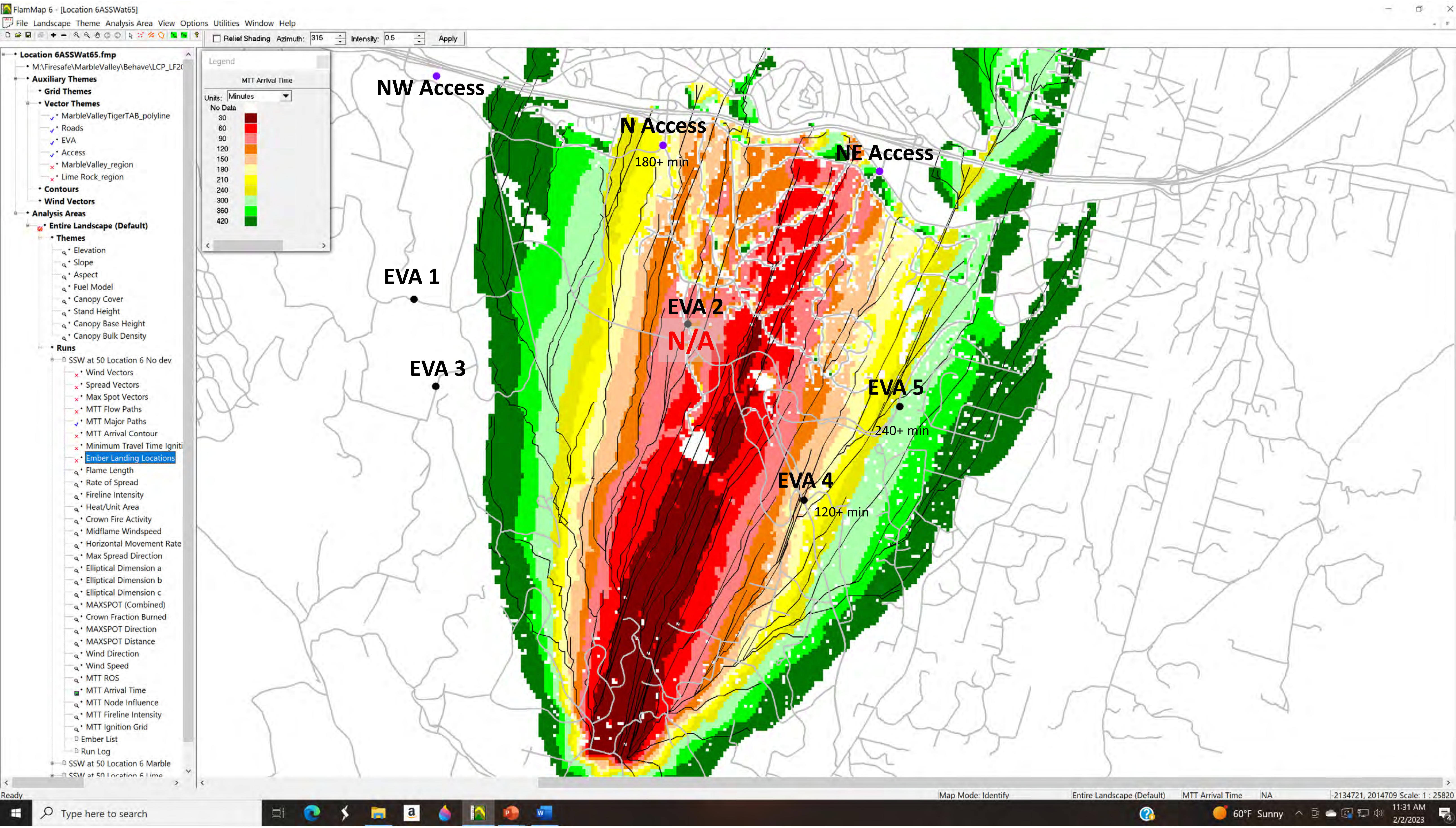
Location 6 SW wind at 50 mph Lime – Scn 6C



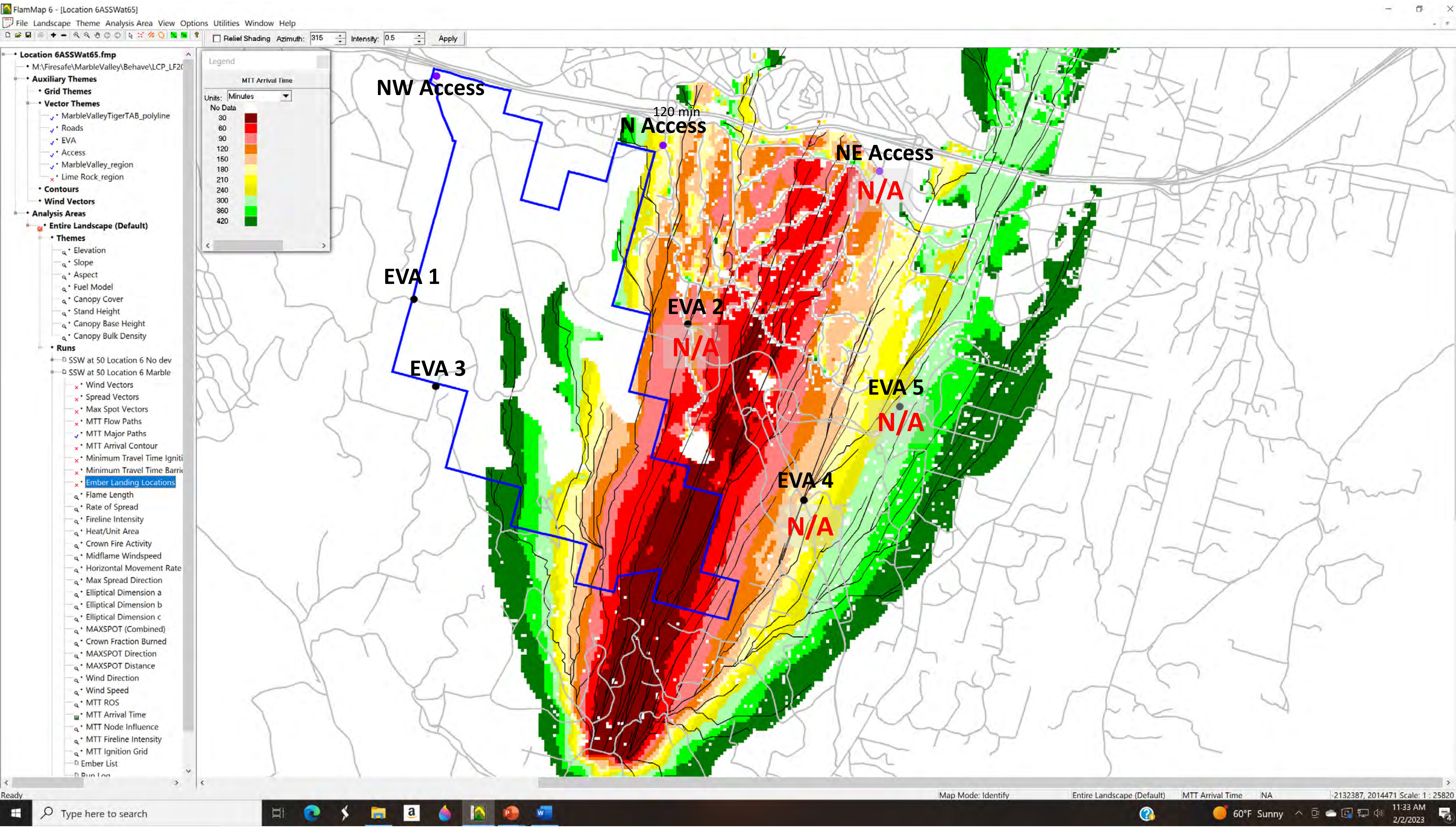
Location 6 SW wind at 50 mph Both – Scn 6D



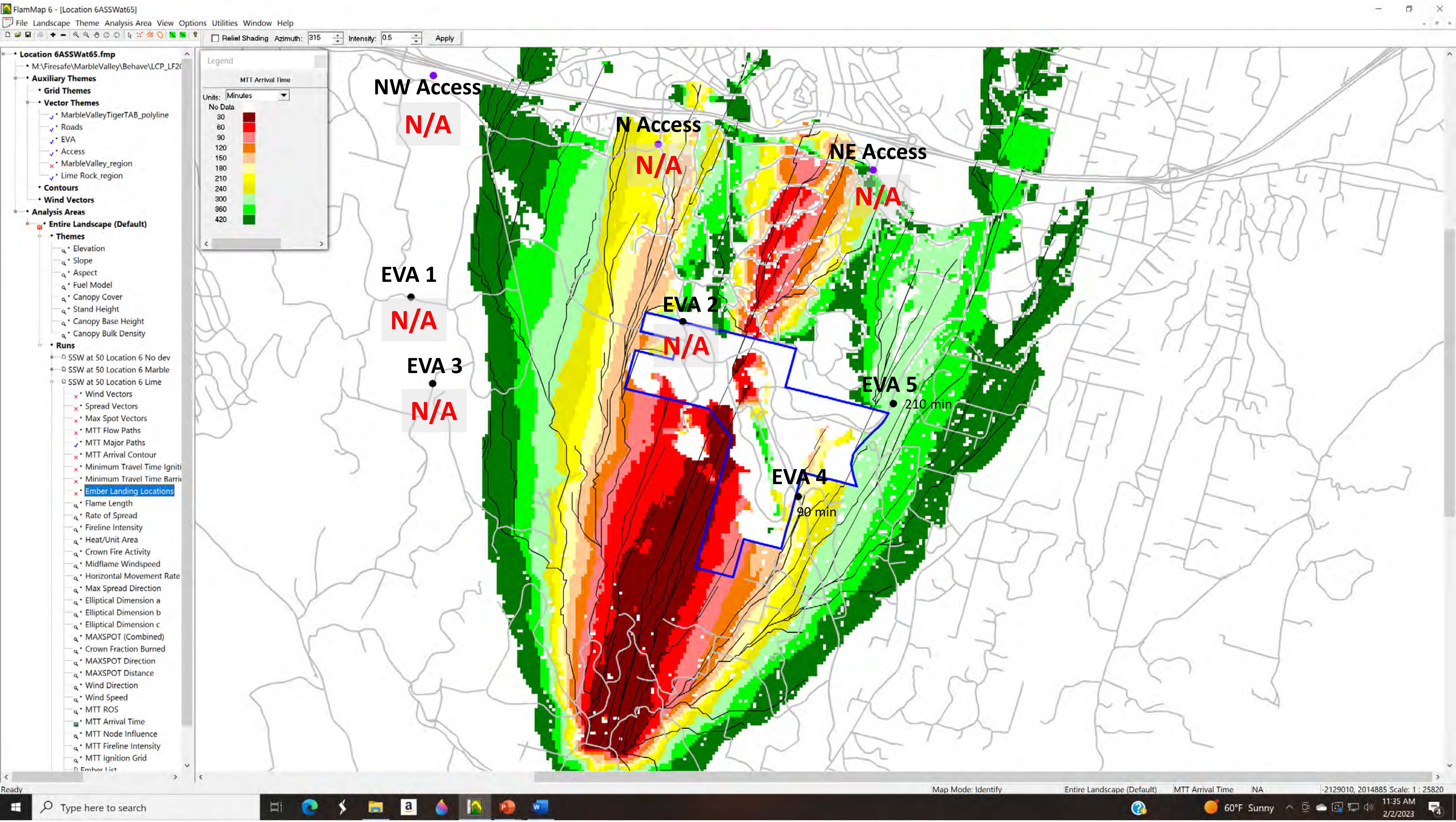
Location 6 SSW wind at 50 mph No Dev – Scn 6E



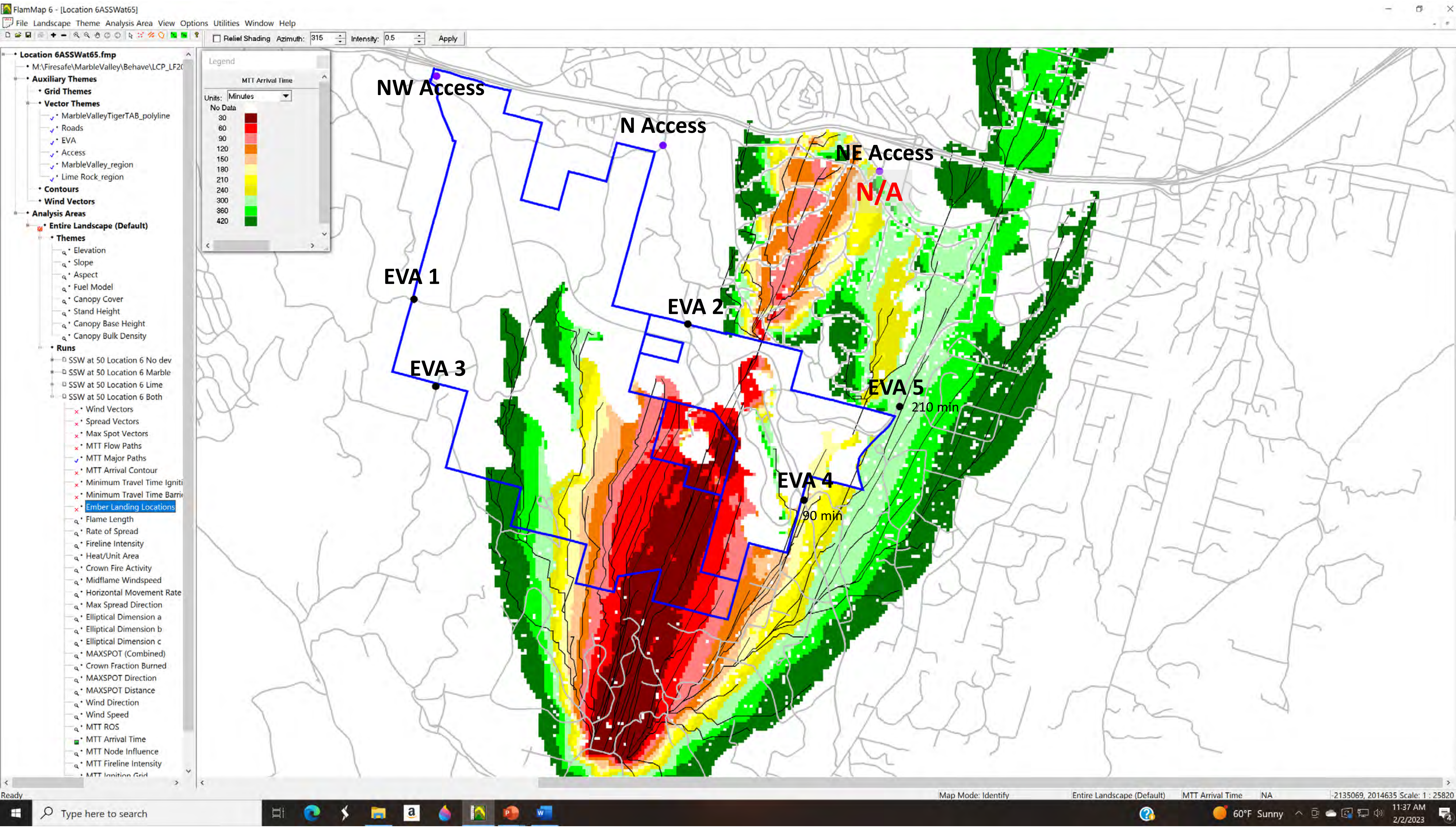
Location 6 SSW wind at 50 mph Marble – Scn 6F



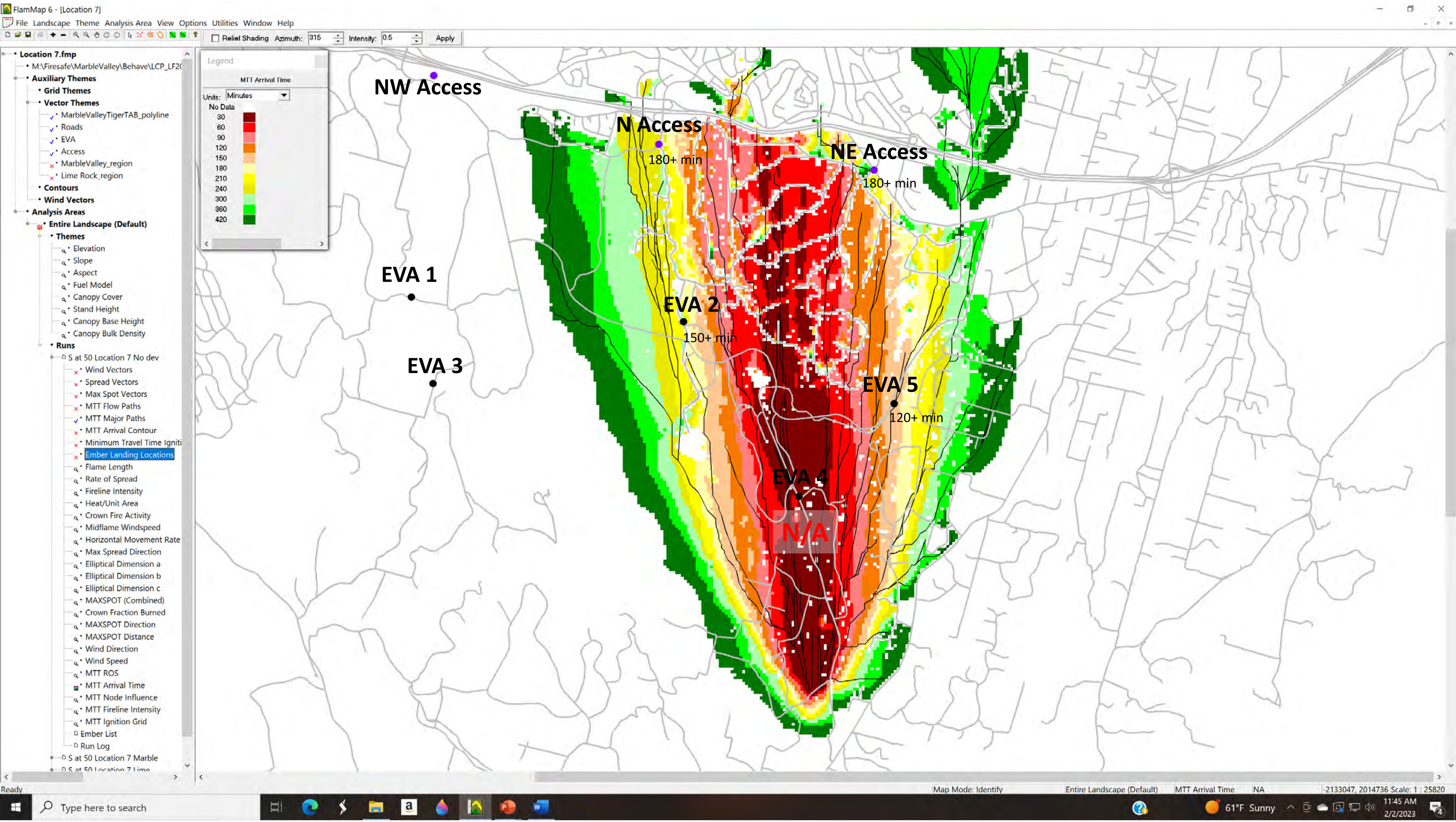
Location 6 SSW wind at 50 mph Lime – Scn 6G



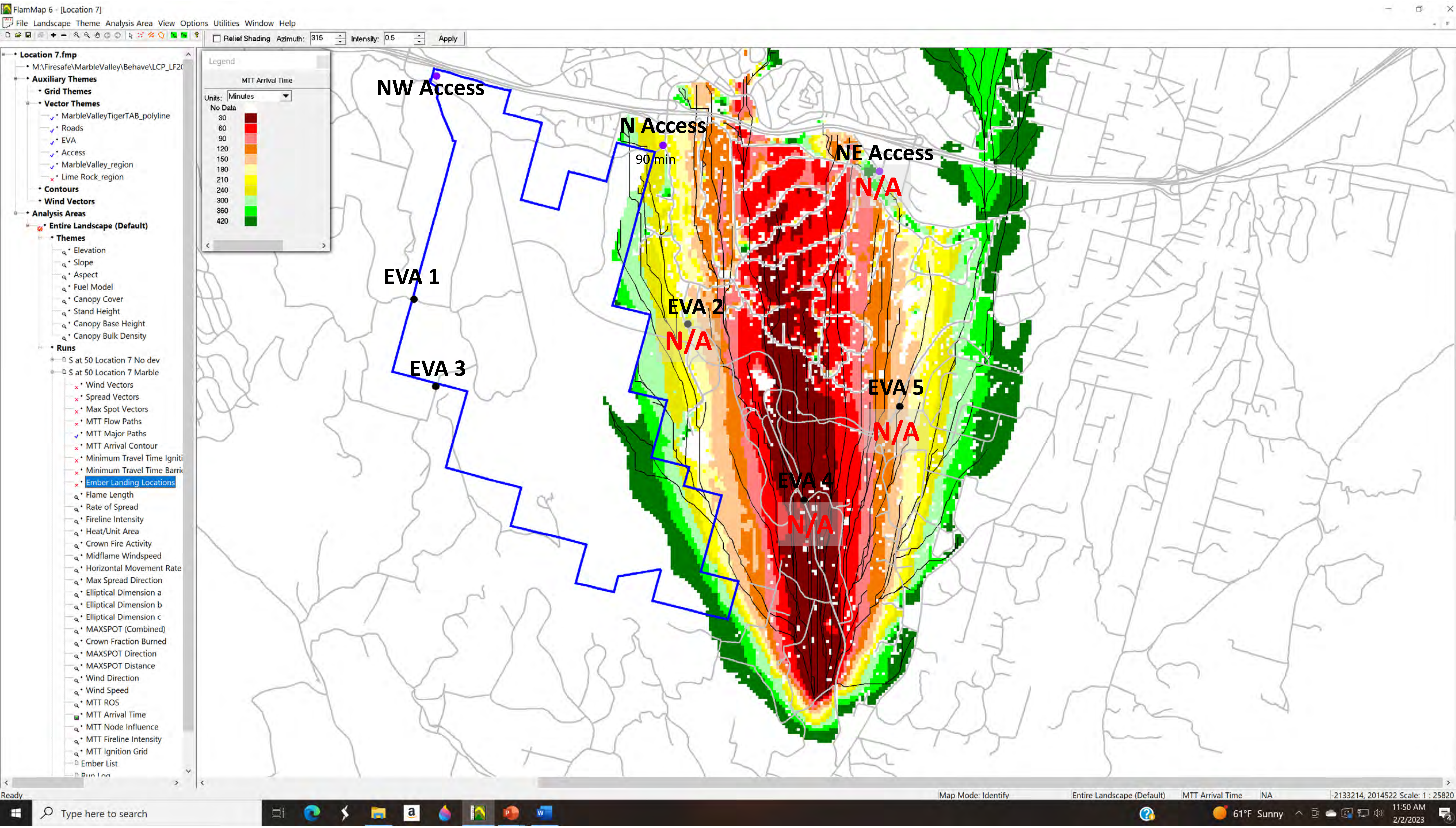
Location 6 SSW wind at 65 mph Both – Scn 6H



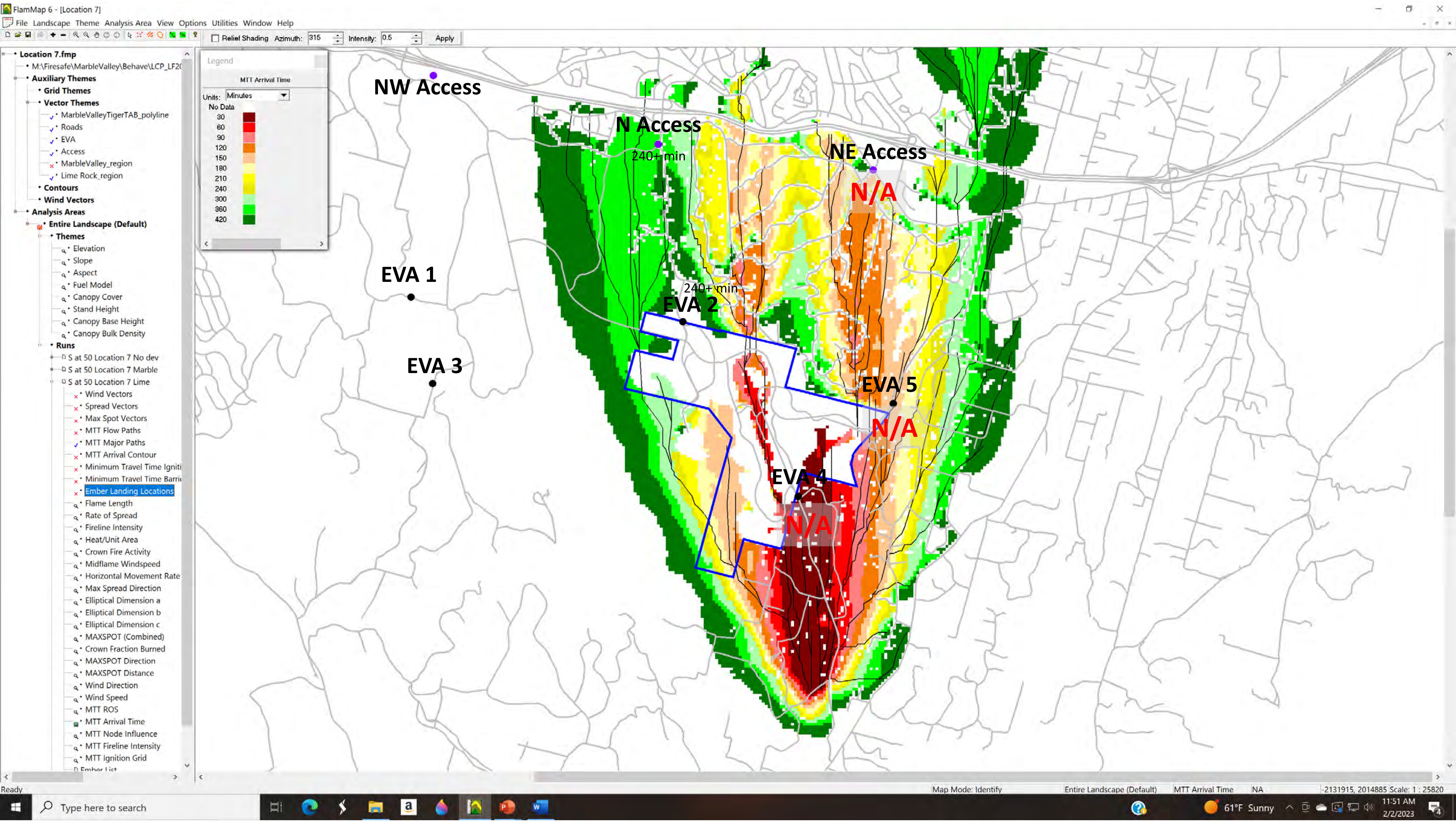
Location 7 S wind at 50 mph No Dev – Scn 7A



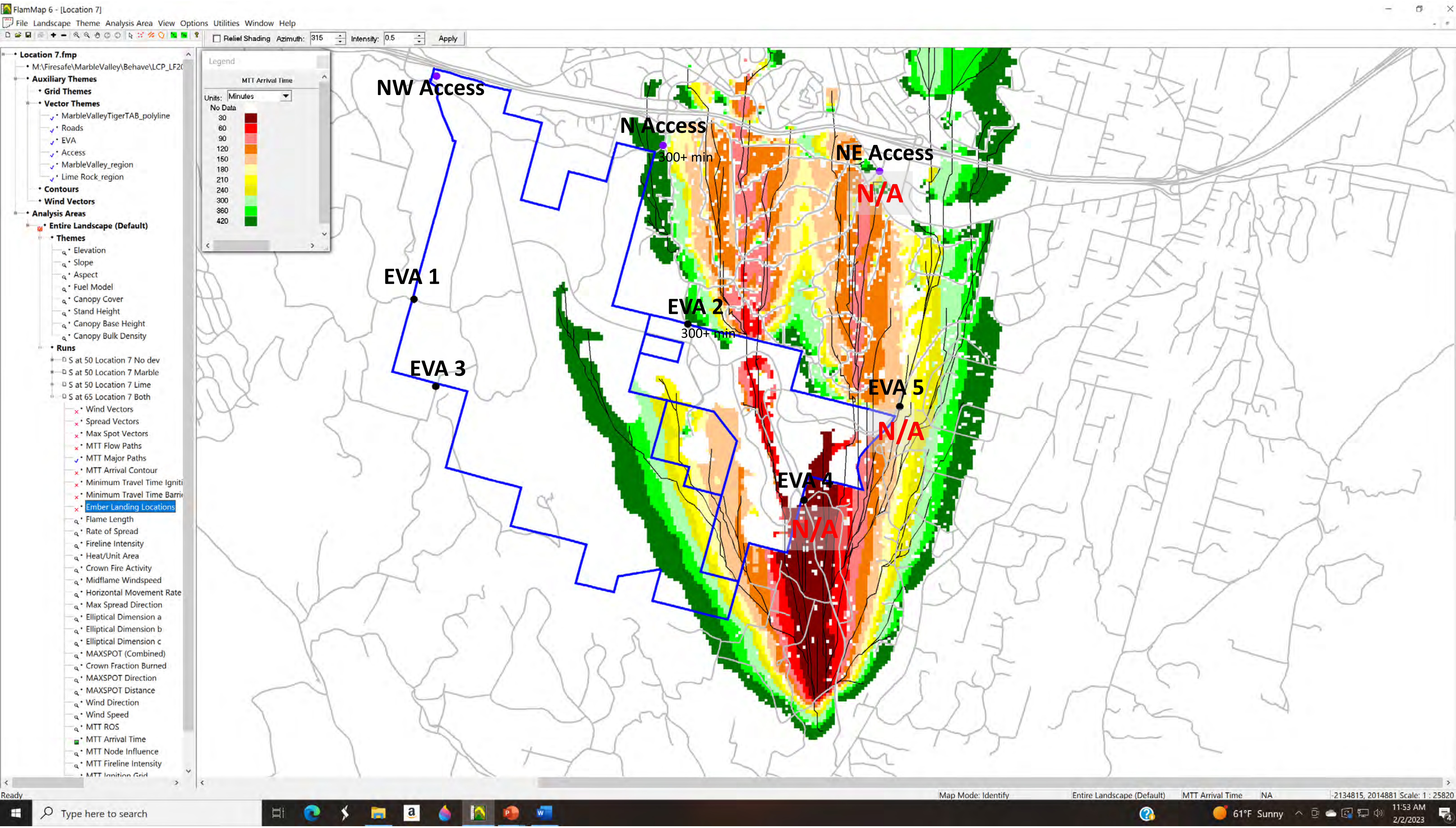
Location 7 S wind at 50 mph Marble – Scn 7B



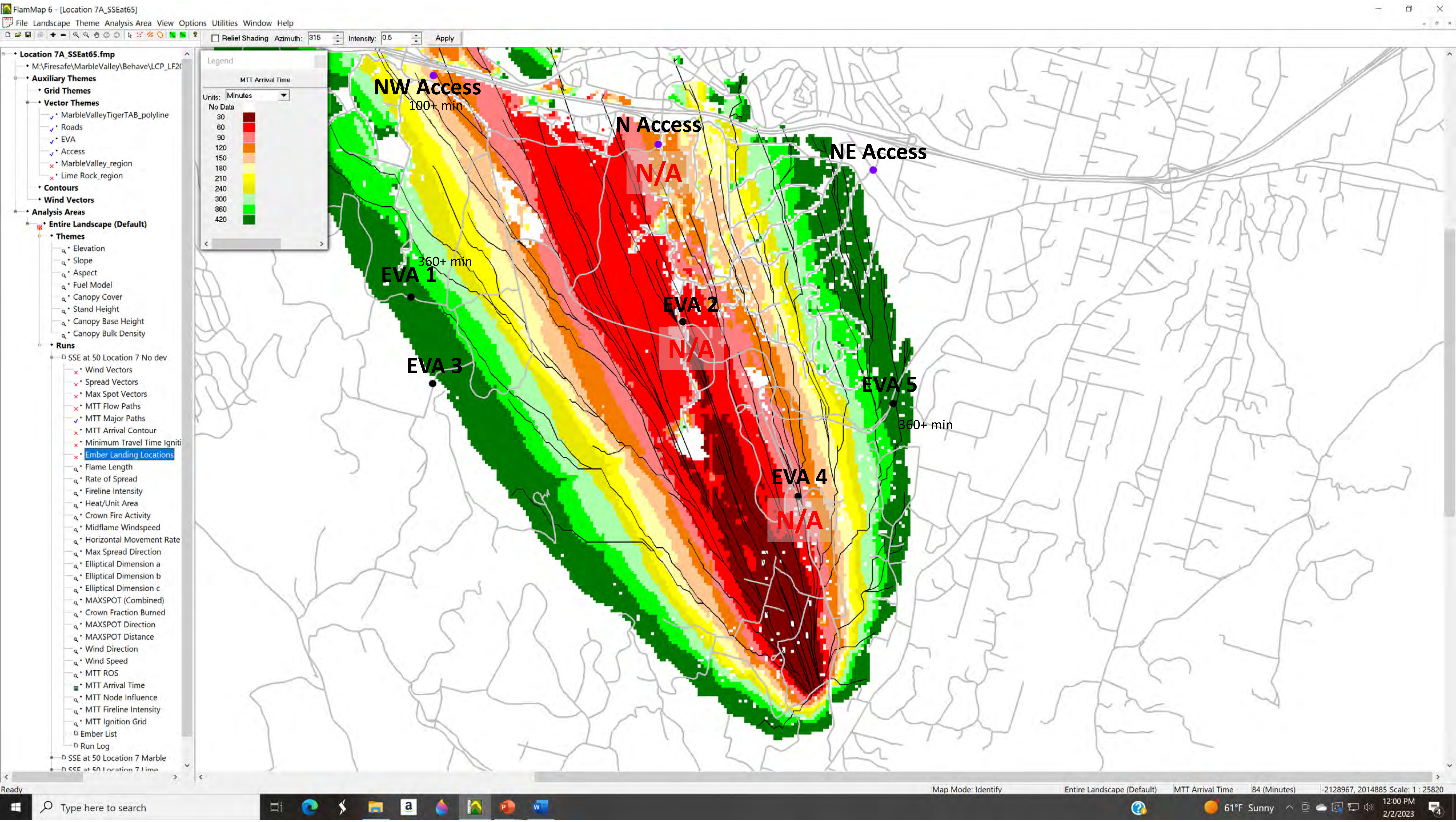
Location 7 S wind at 50 mph Lime – Scn 7C



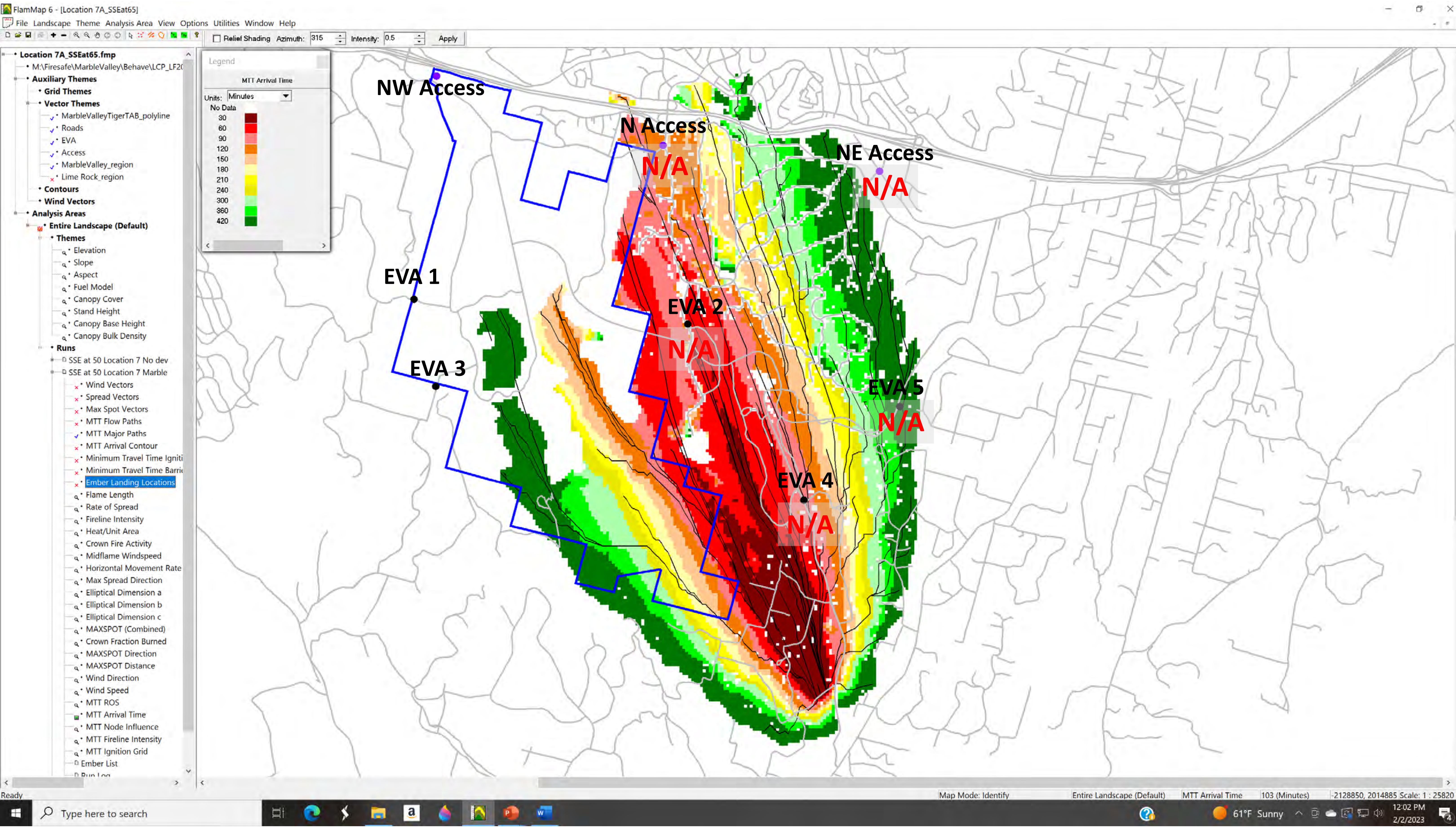
Location 7 S wind at 50 mph Both – Scn 7D



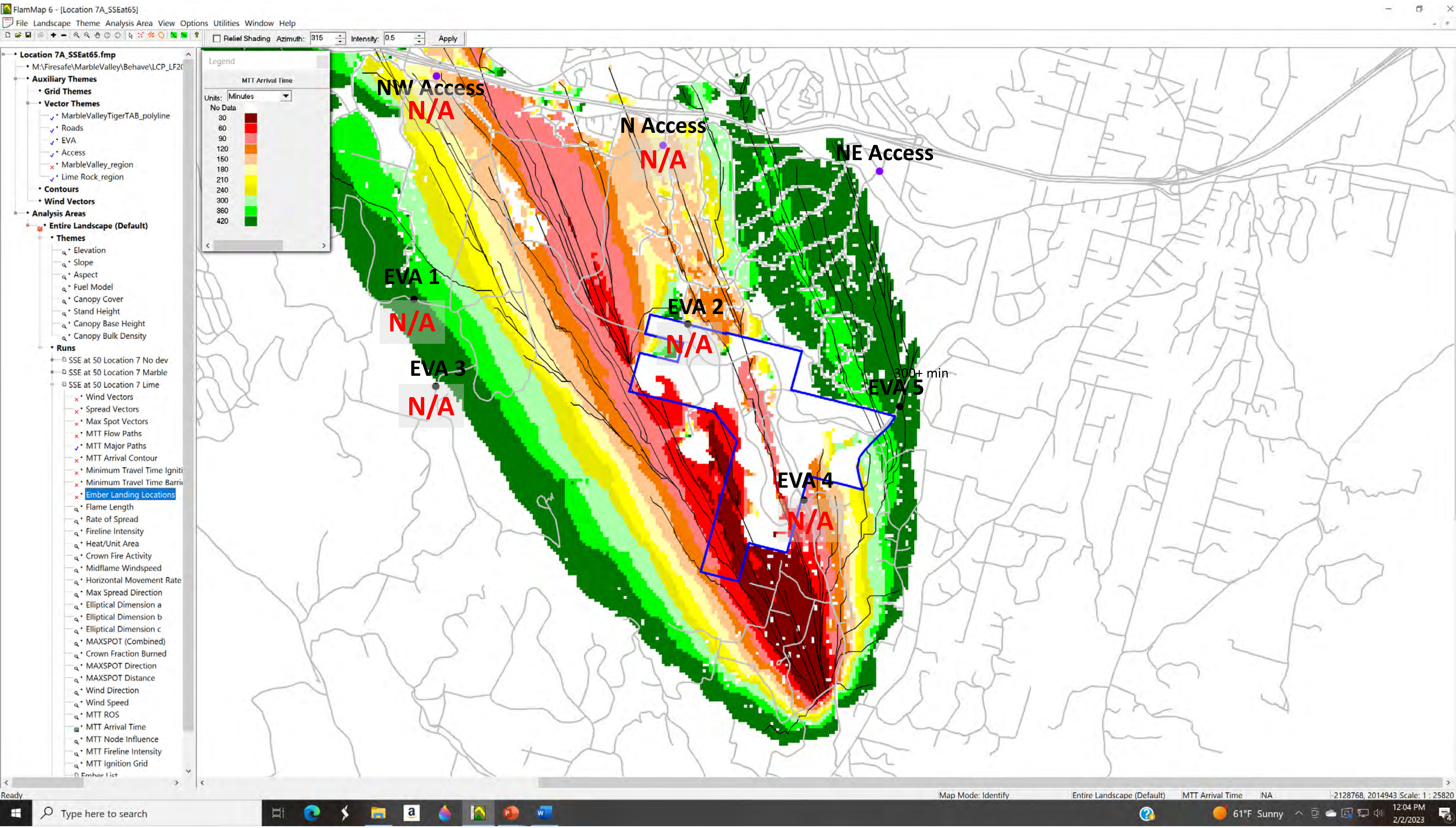
ELocation 7 SSE wind at 50 mph No Dev – Scn 7E



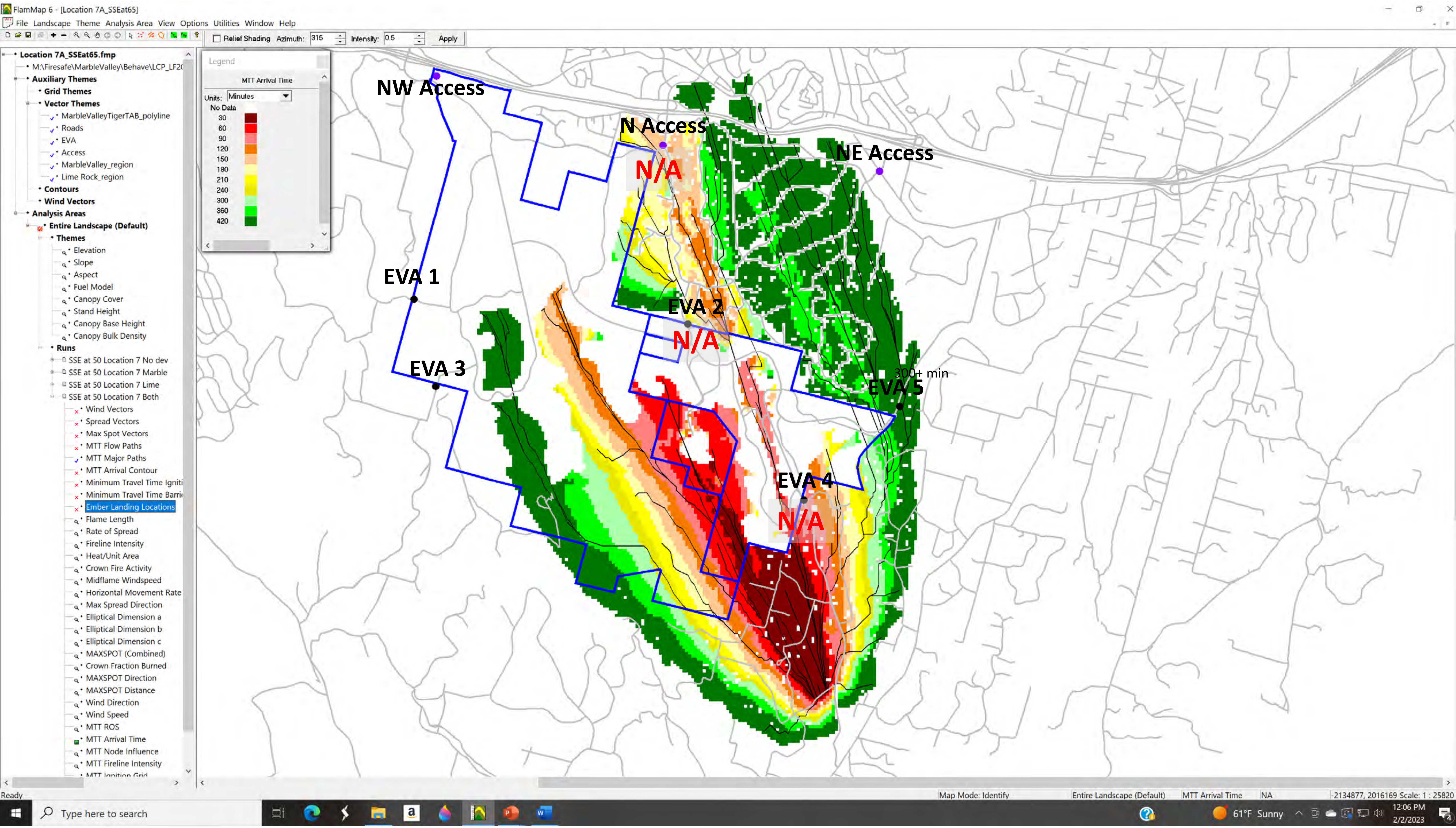
Location 7 SSE wind at 50 mph Marble – Scn 7F



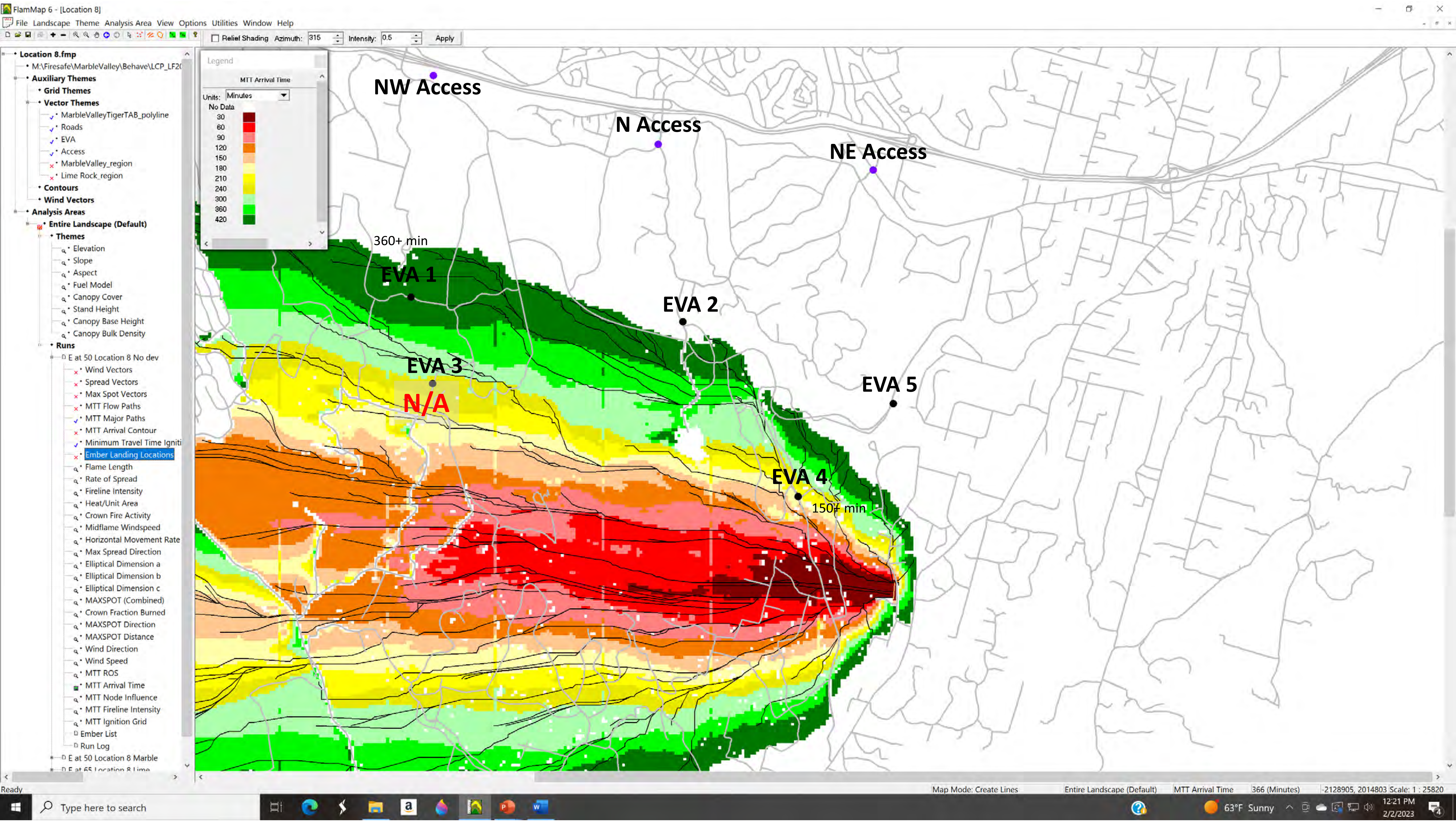
Location 7 SSE wind at 50 mph Lime – Scn 7G



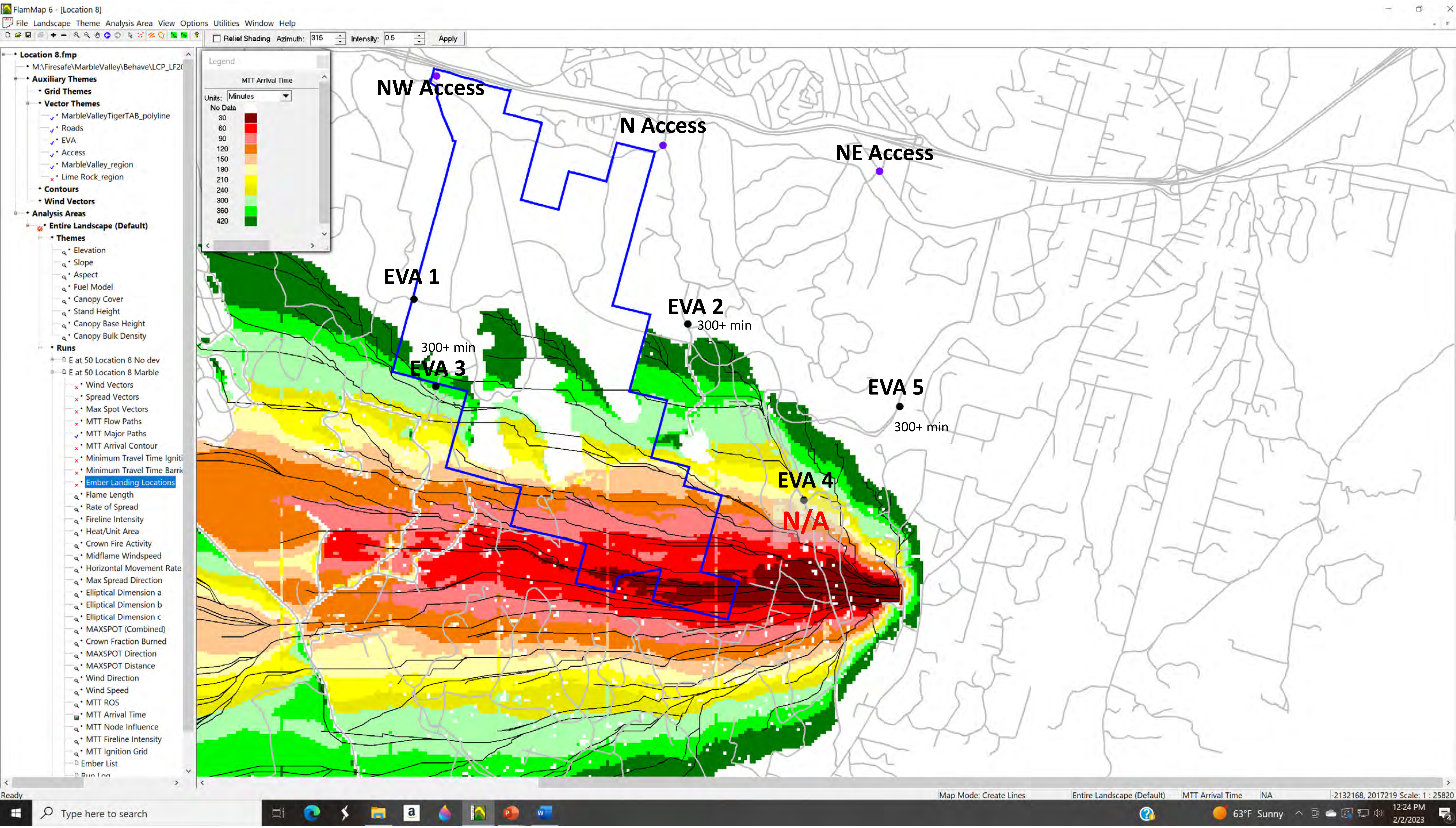
Location 7 SSE wind at 50 mph Both – Scn 7H



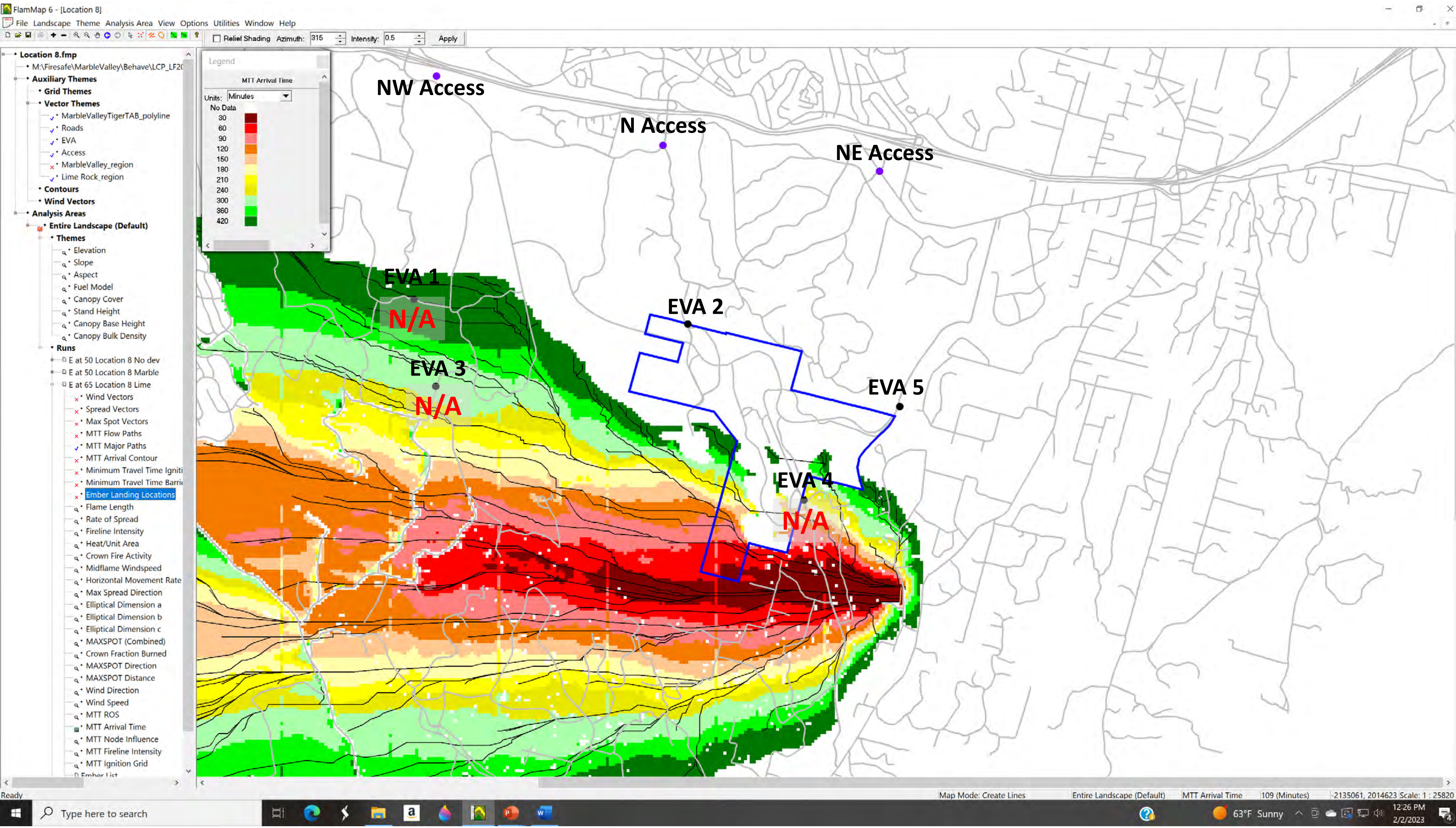
Location 8 E wind at 50 mph No Dev – Scn 8A



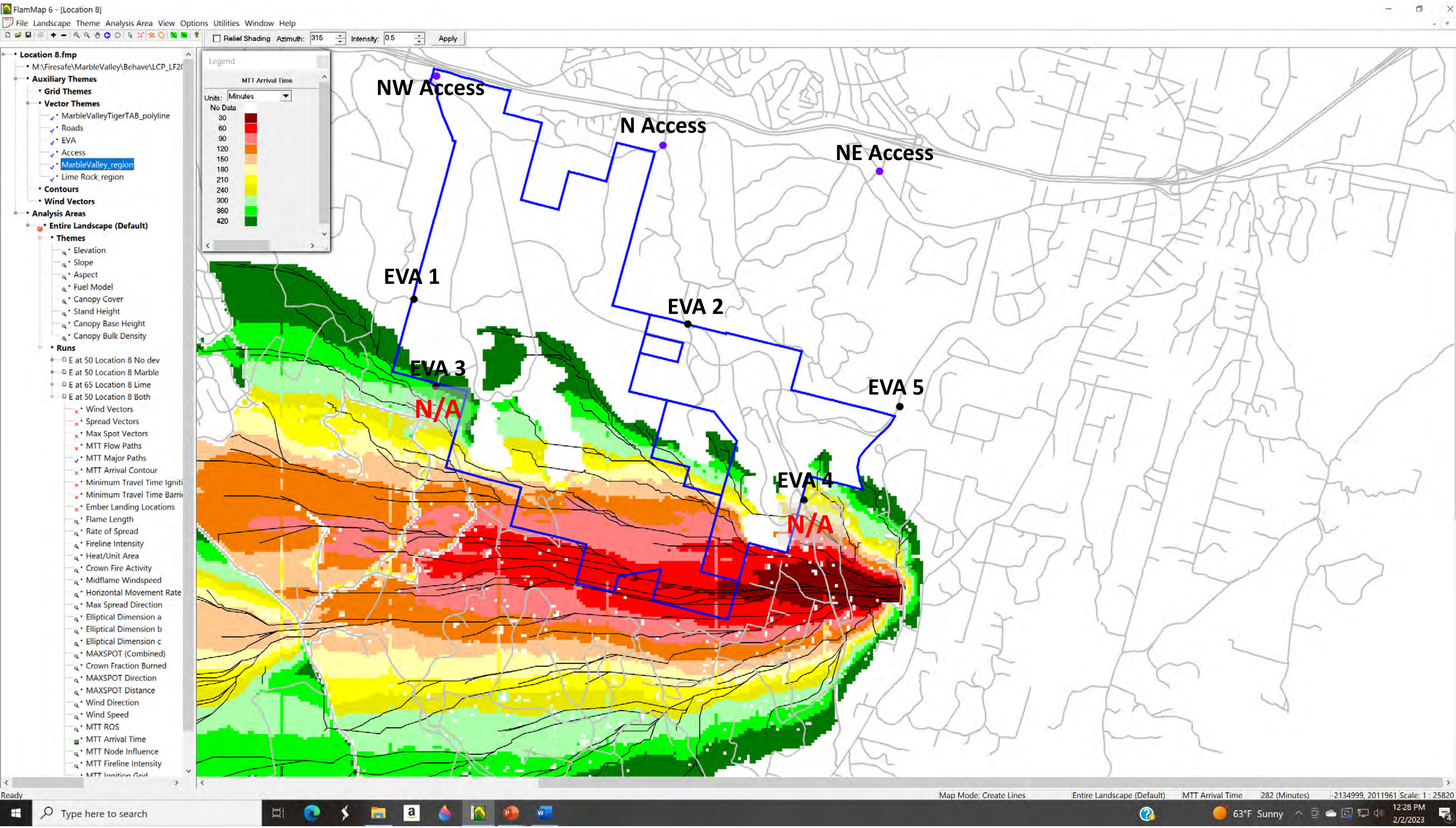
Location 8 E wind at 50 mph Marble – Scn 8B



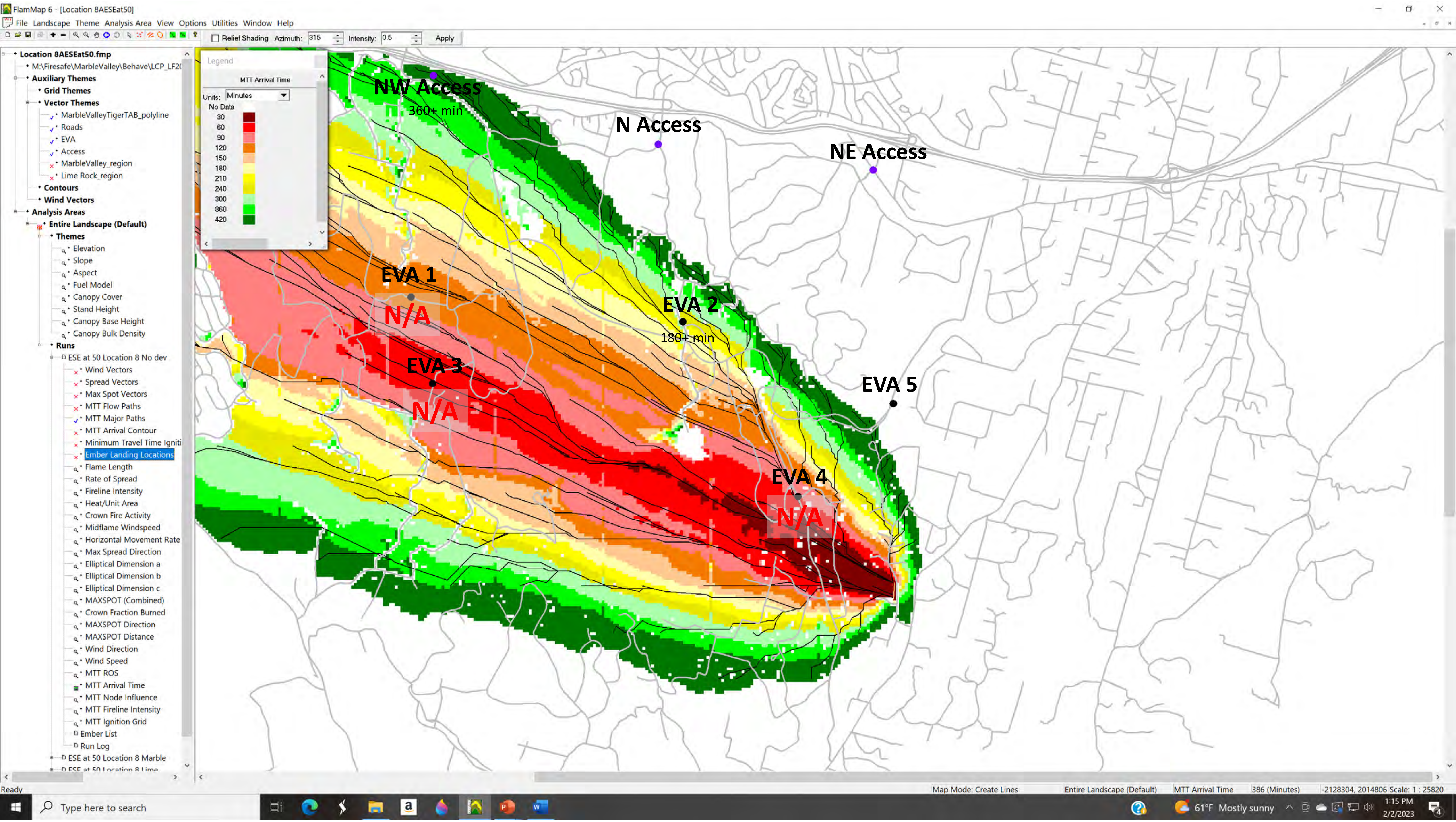
Location 8 E wind at 50 mph Lime – Scn 8C



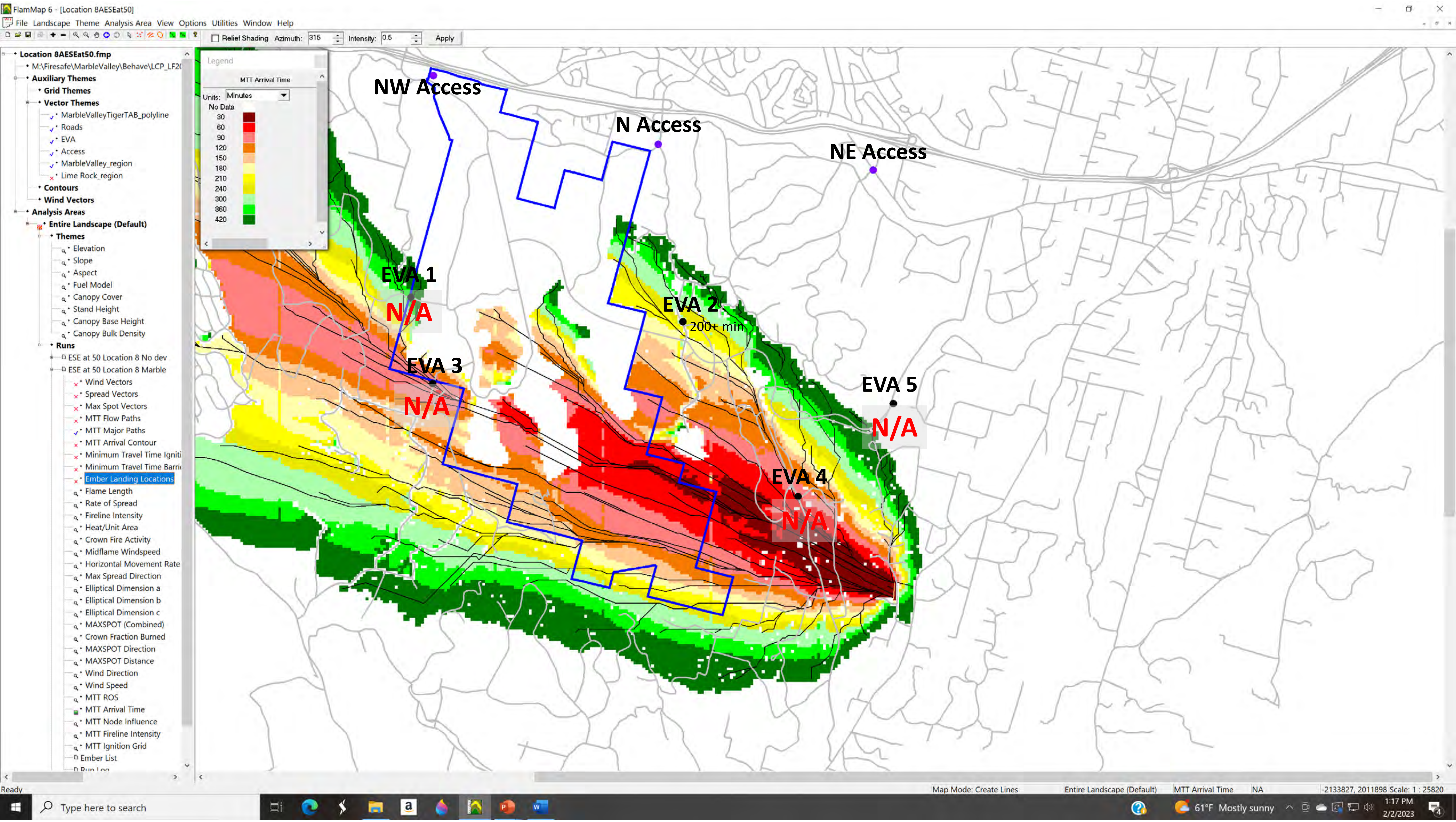
Location 8 E wind at 50 mph Both – Scn 8D



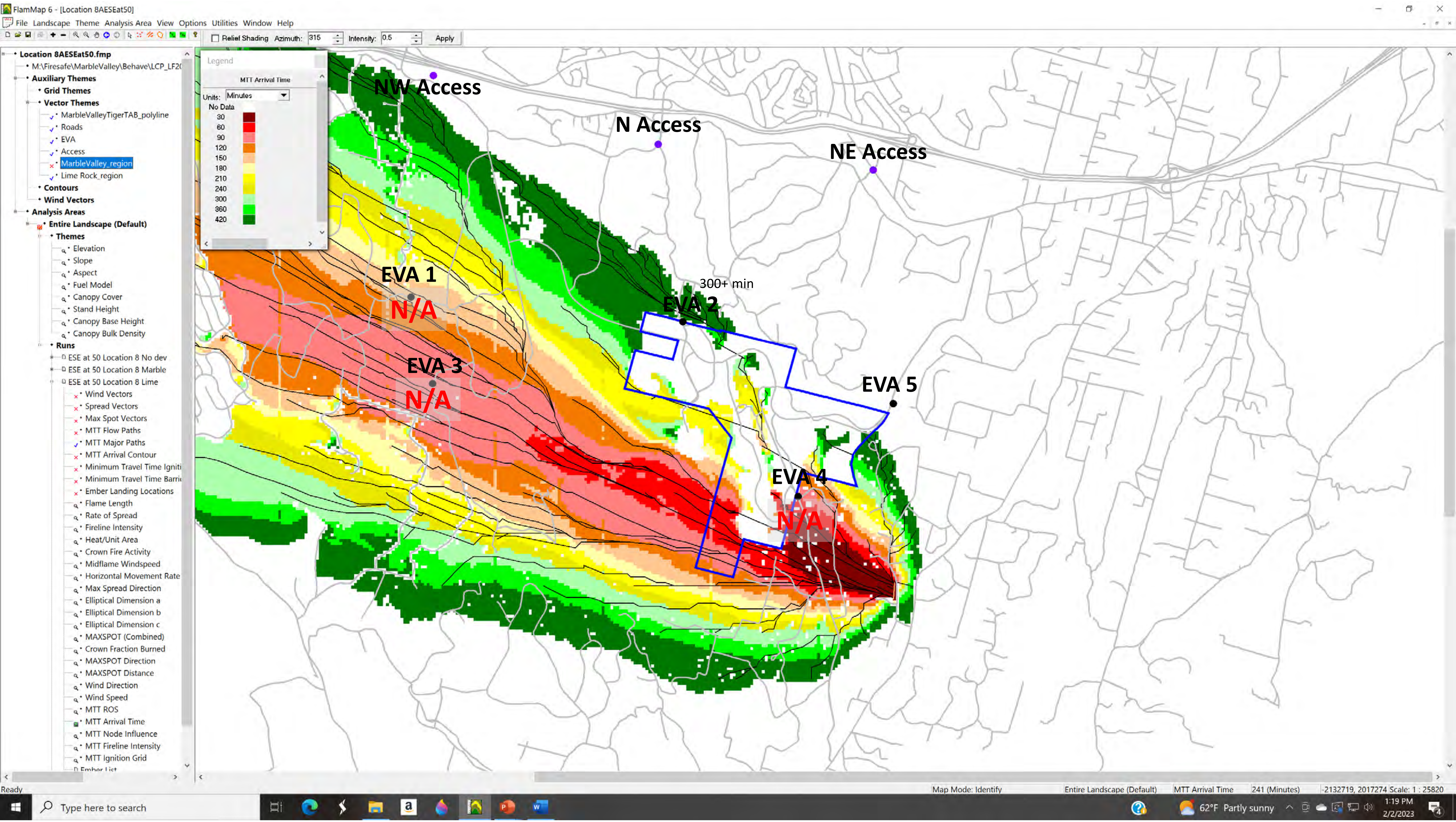
Location 8 ESE wind at 50 mph No Dev – Scn 8E



Location 8 ESE wind at 50 mph Marble – Scn 8F

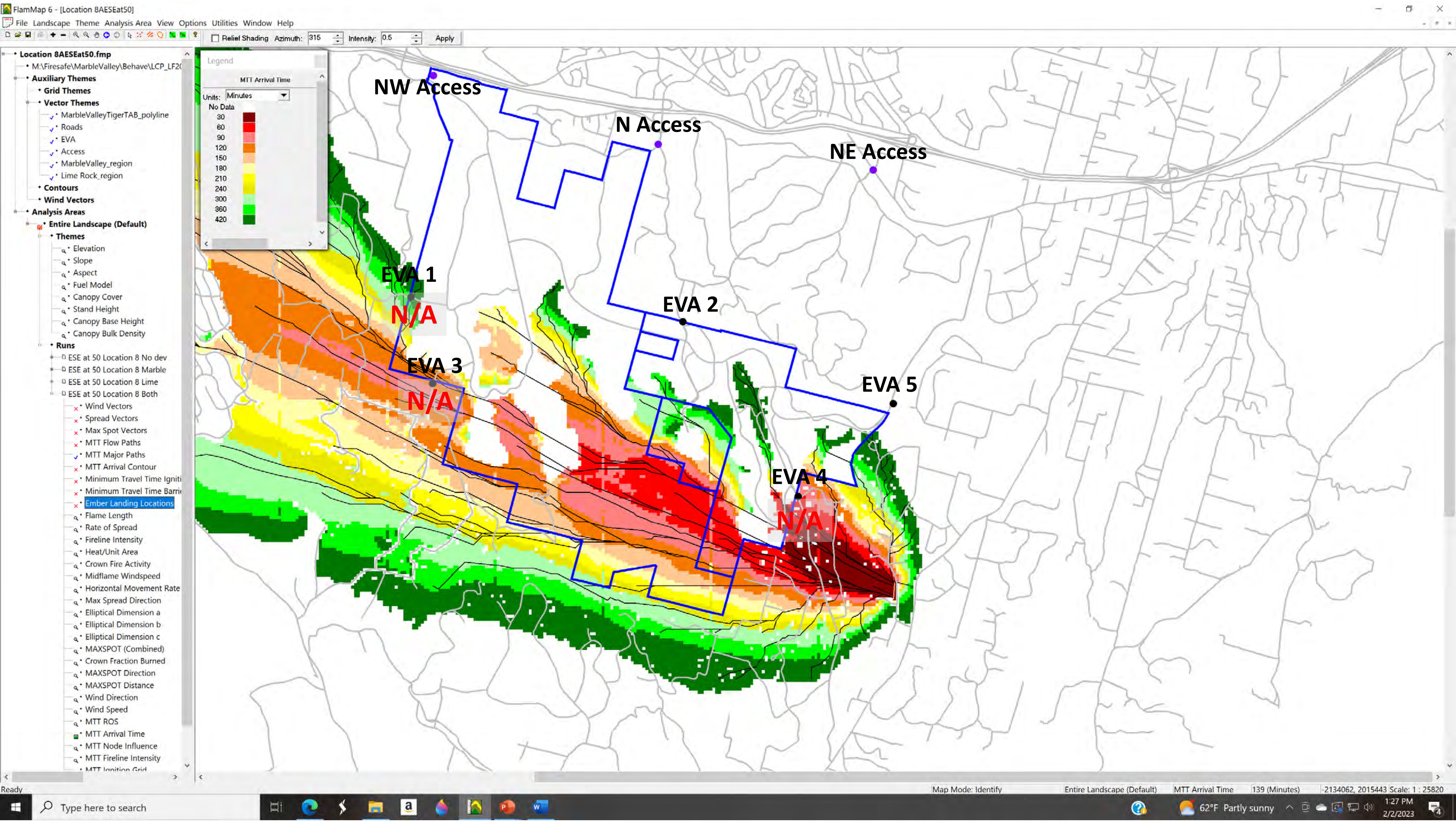


Location 8 ESE wind at 50 mph Lime – Scn 8G

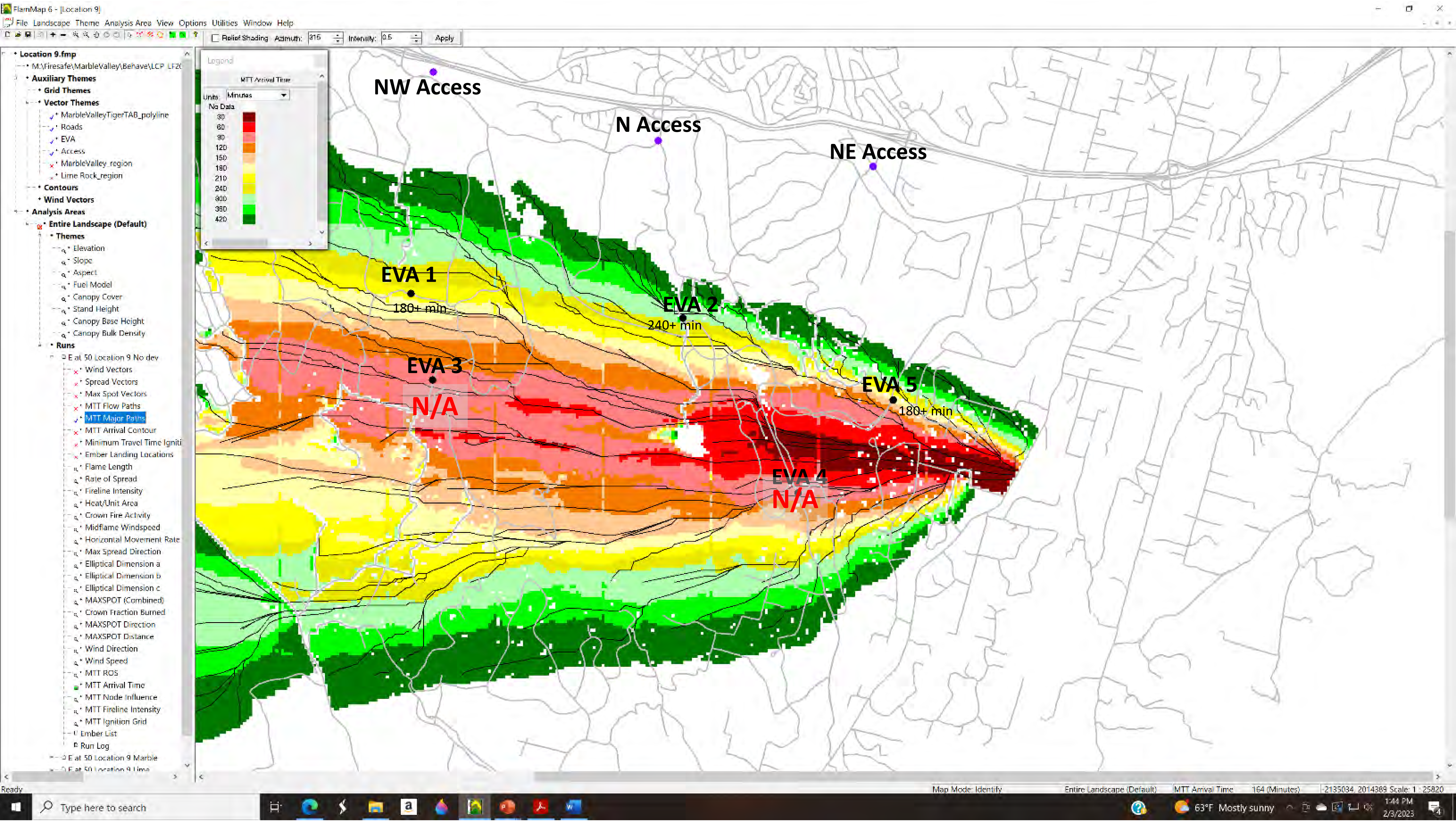


Location 8 ESE wind at 50 mph Both – Scn 8H

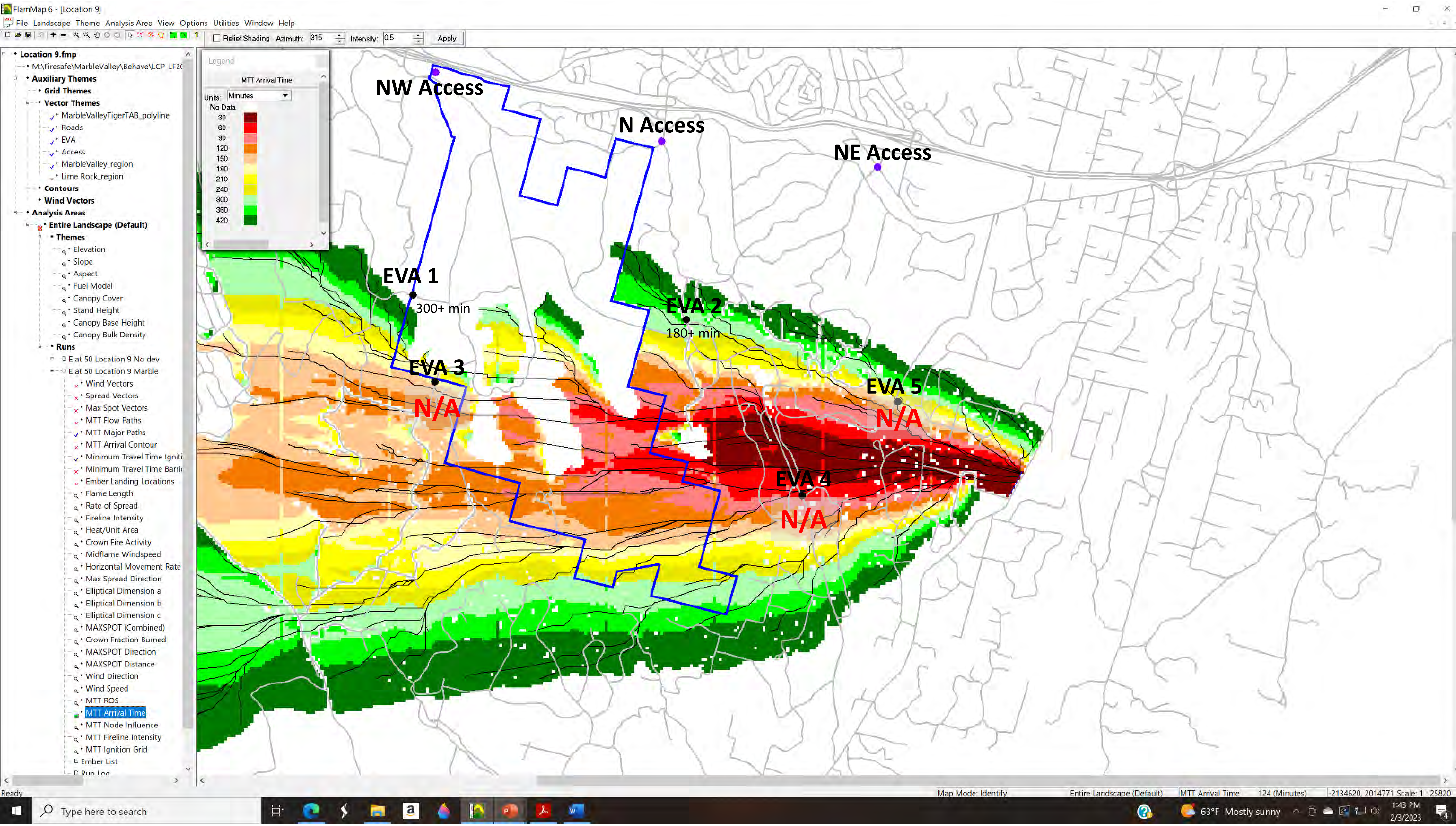
120 min 90 min



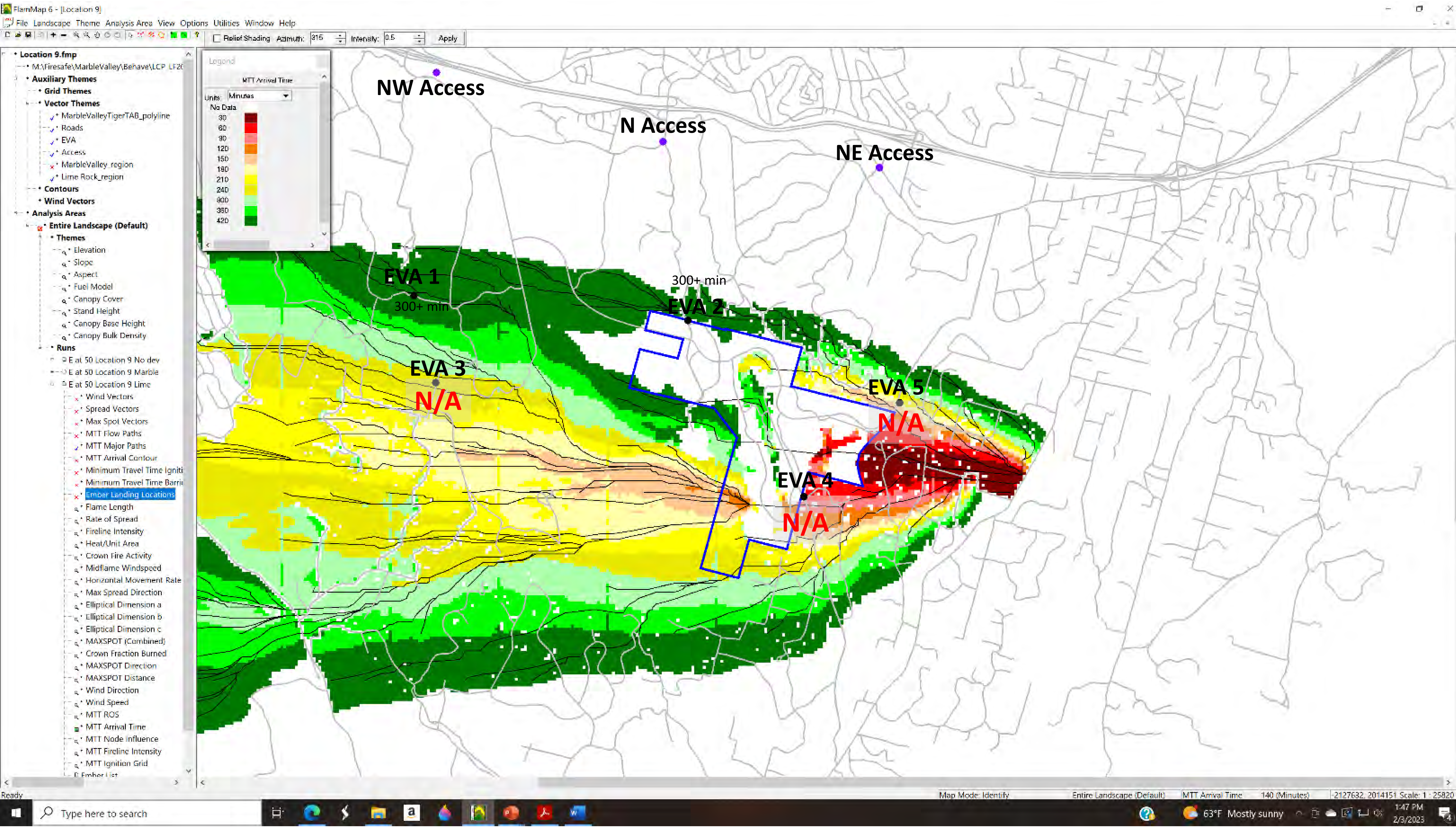
Location 9 E wind at 50 mph No Dev – Scn 9A



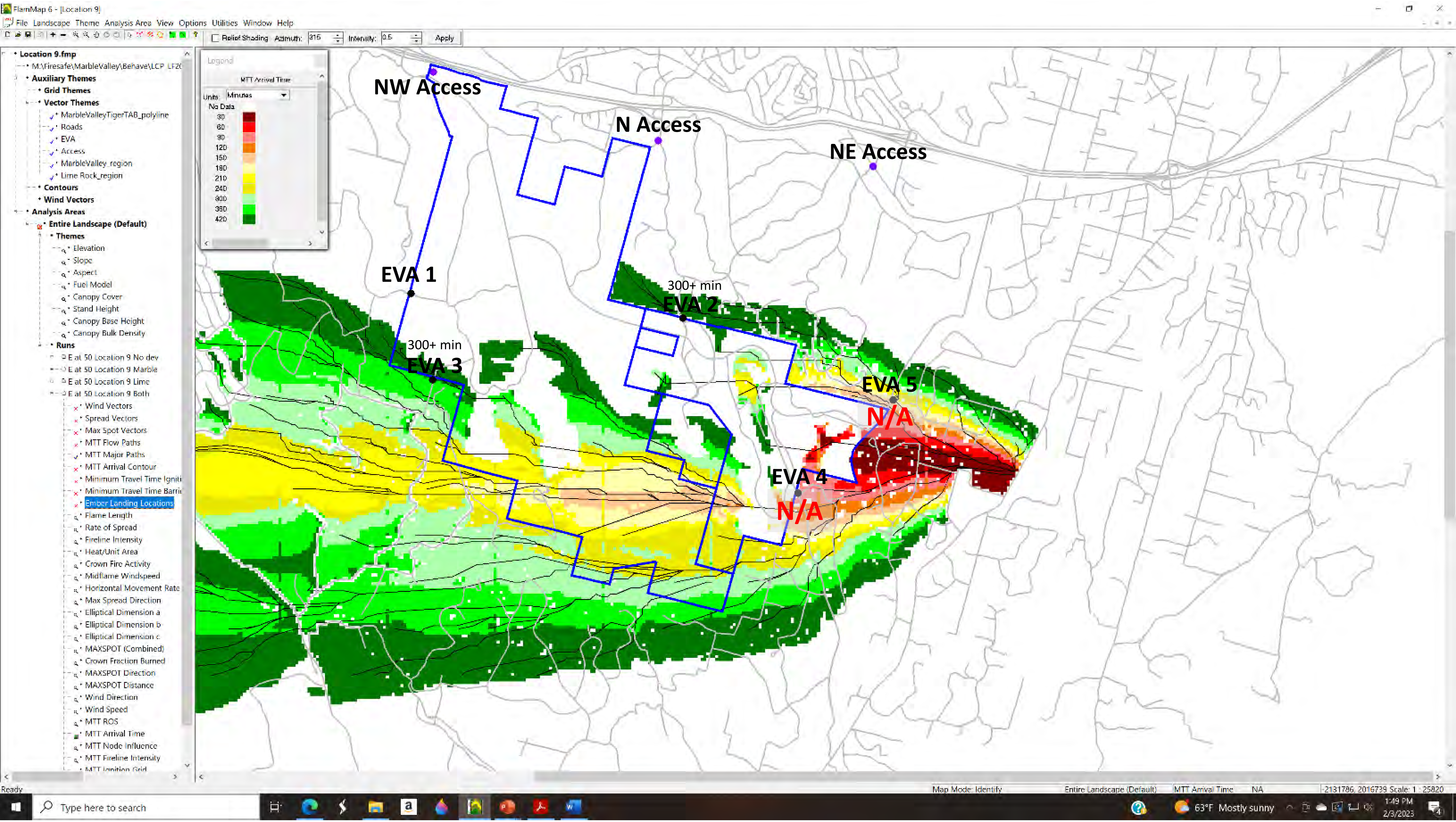
Location 9 E wind at 50 mph Marble – Scn 9B



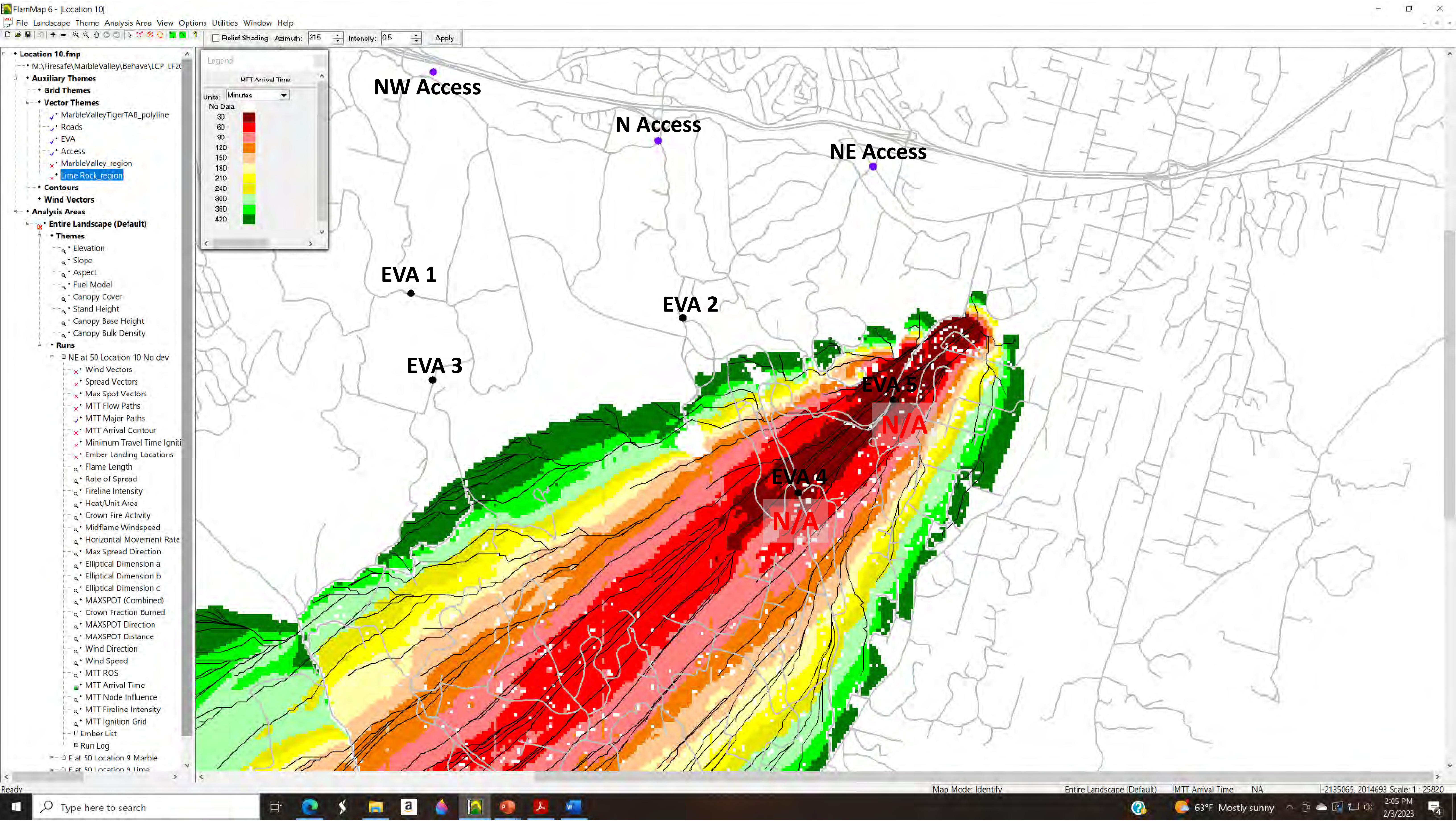
Location 9 E wind at 50 mph Lime – Scn 9C



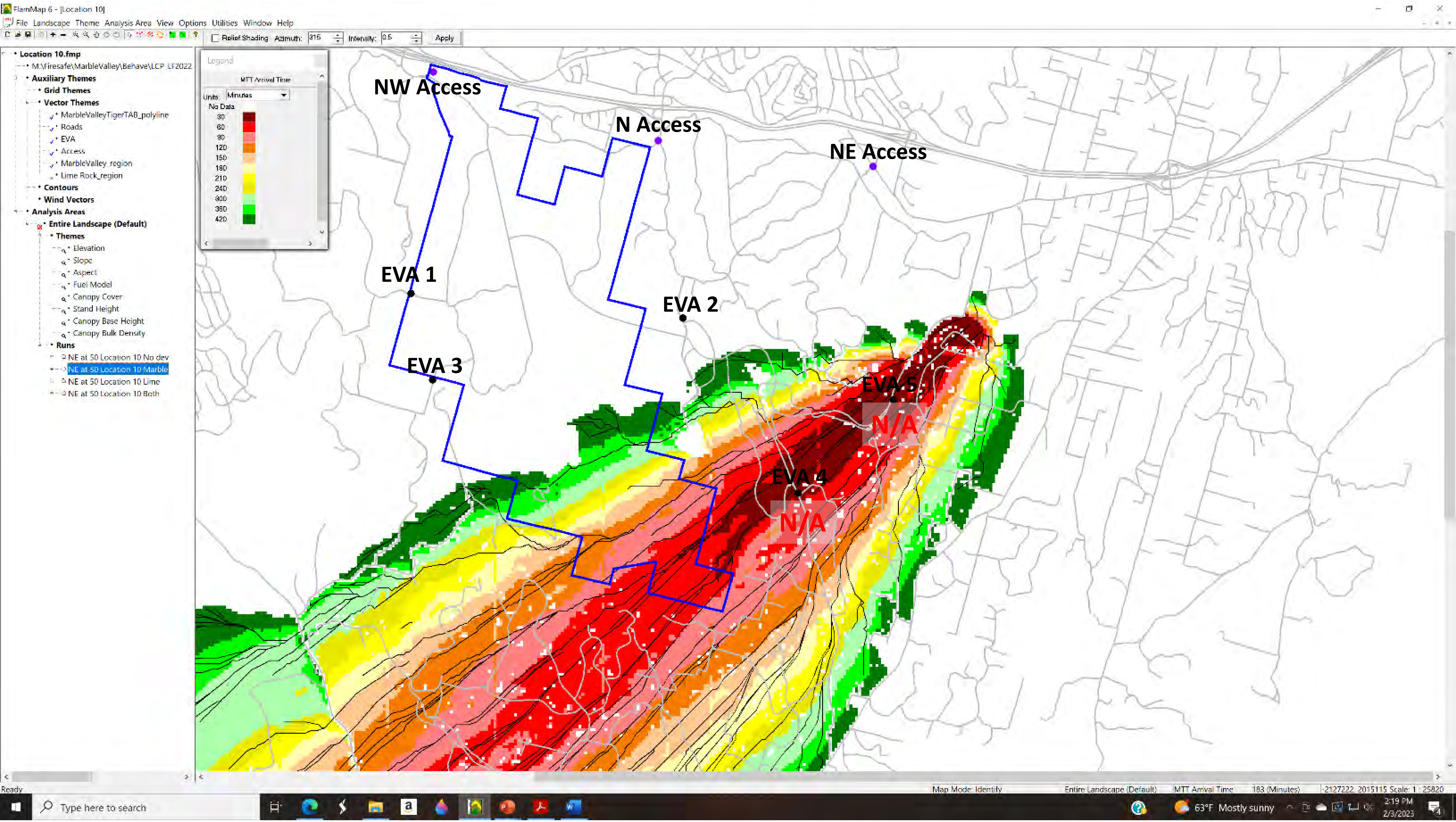
Location 9 E wind at 50 mph Both – Scn 9D



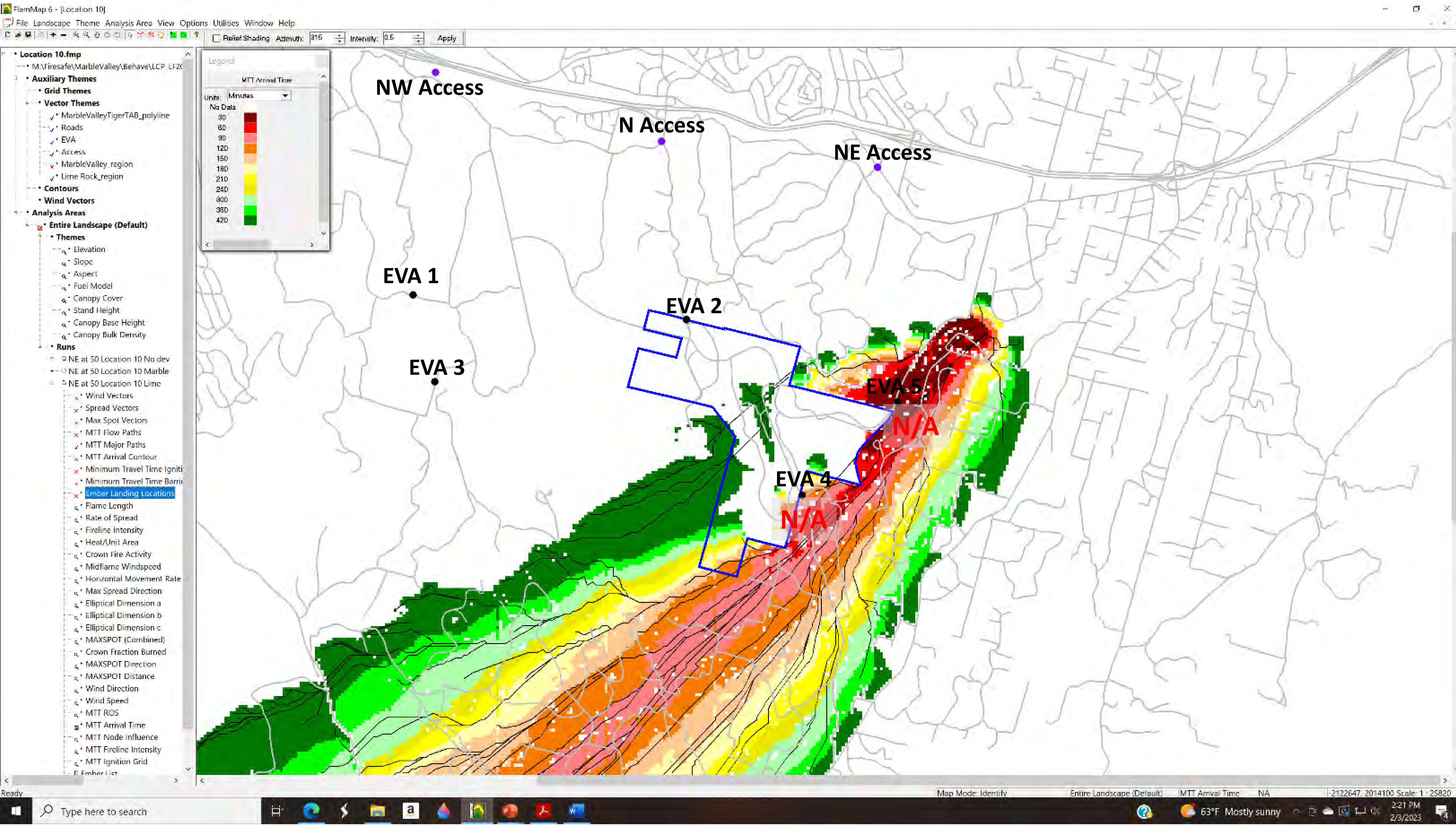
Location 10 NE wind at 50 mph No Dev – Scn 10A



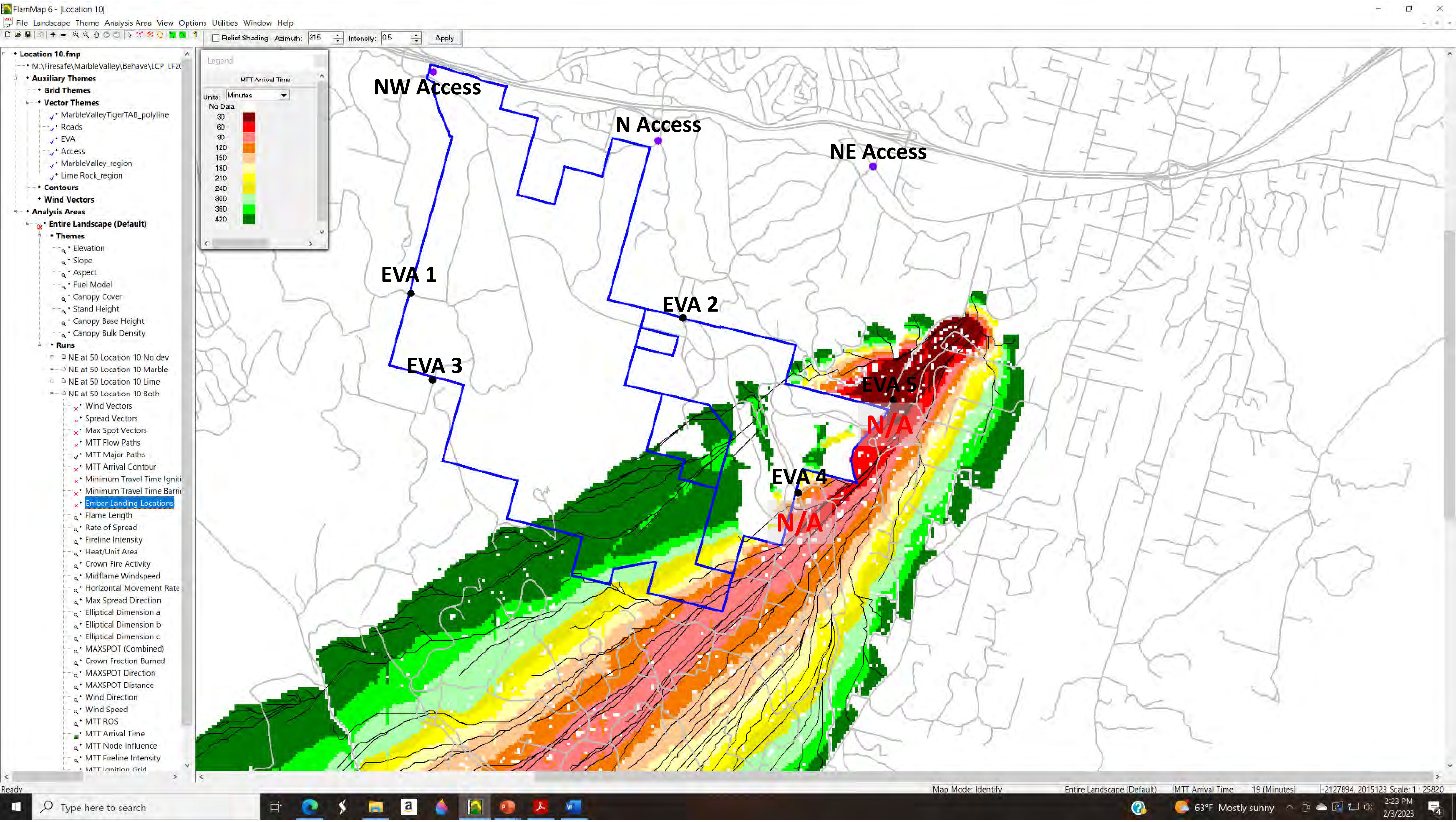
Location 10 NE wind at 50 mph Marble– Scn 10B



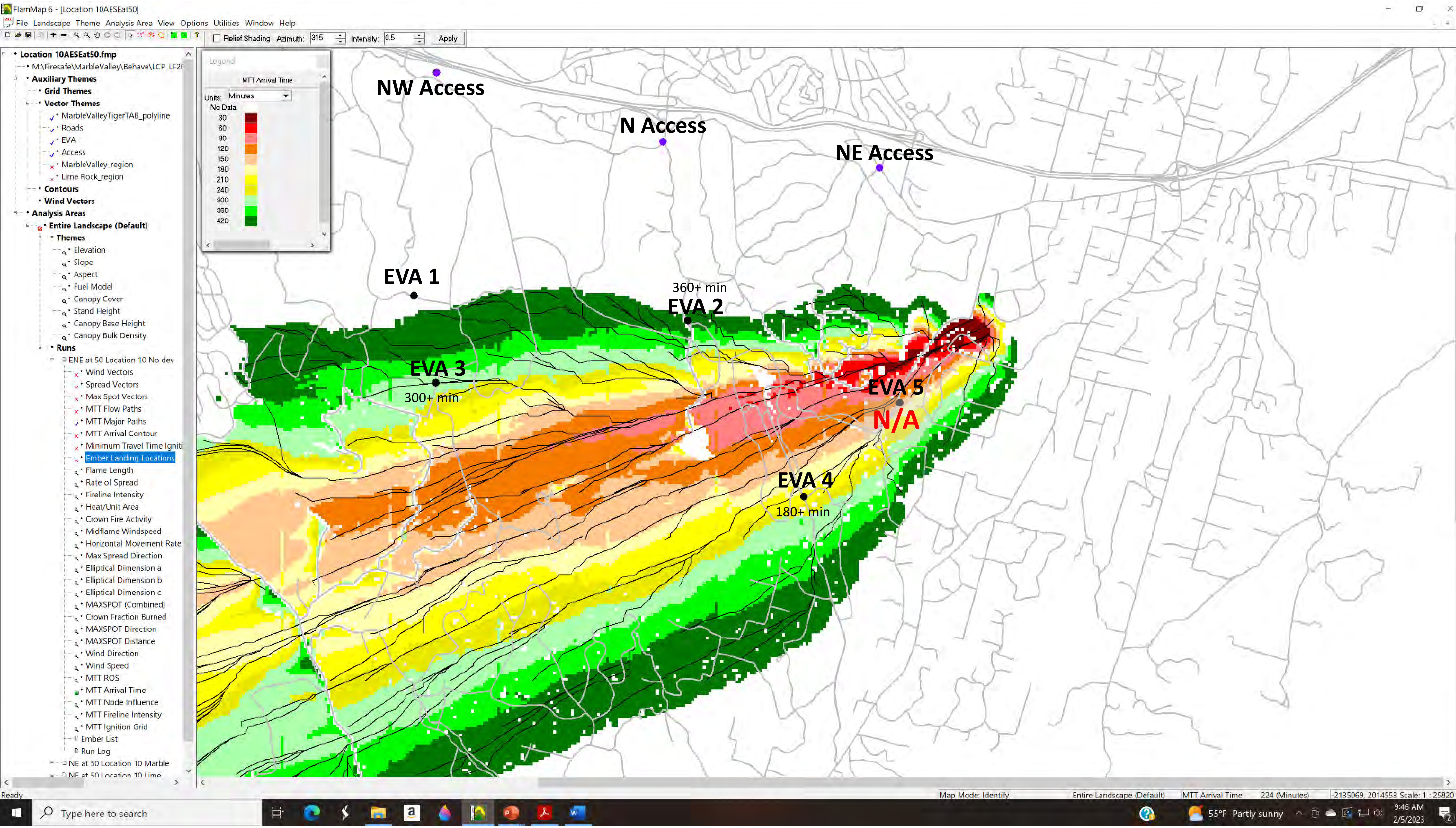
Location 10 NE wind at 50 mph Lime– Scn 10C



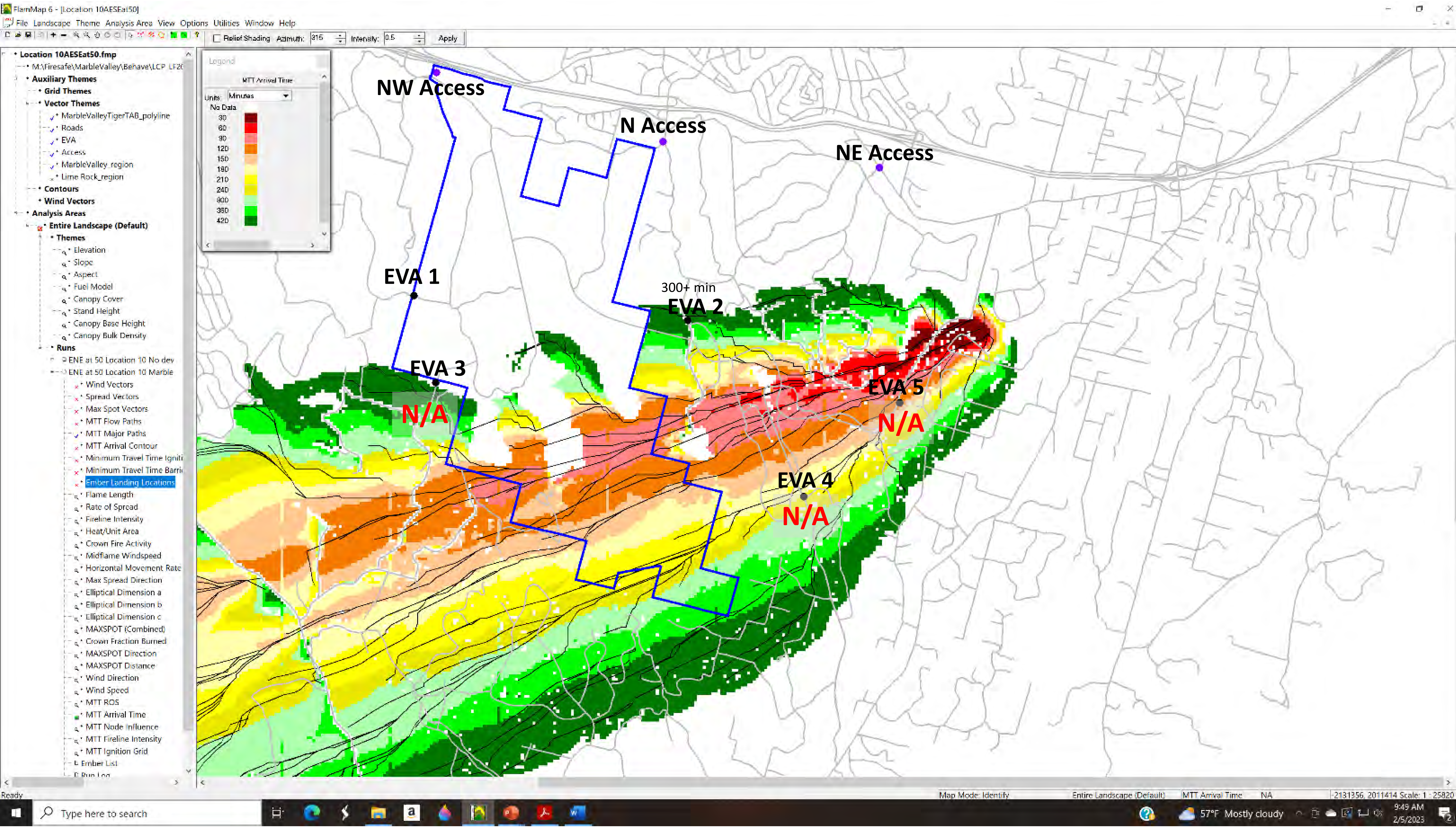
Location 10 NE wind at 50 mph Both – Scn 10D



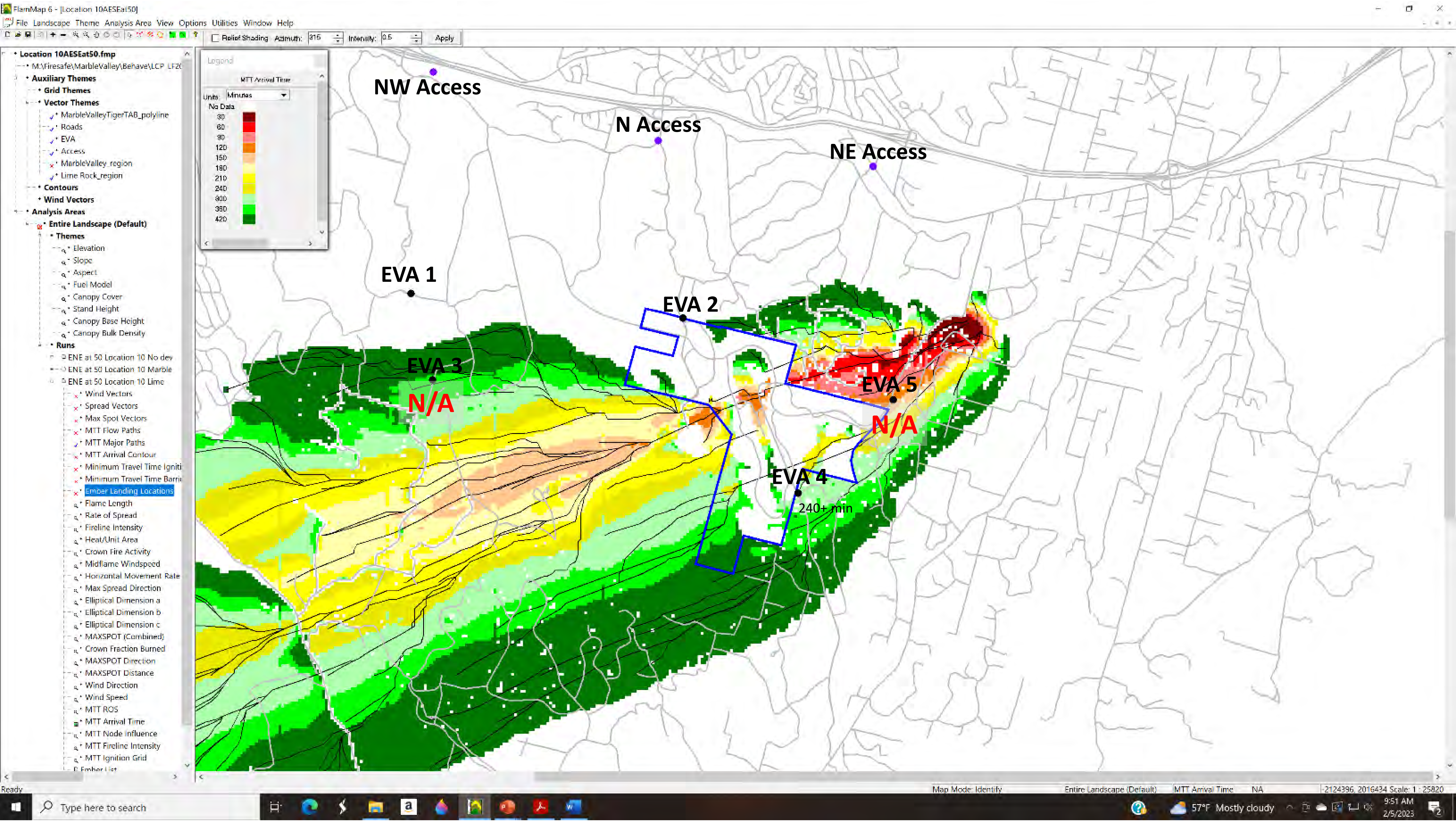
Location 10 ENE wind at 50 mph No Dev – Scn 10E



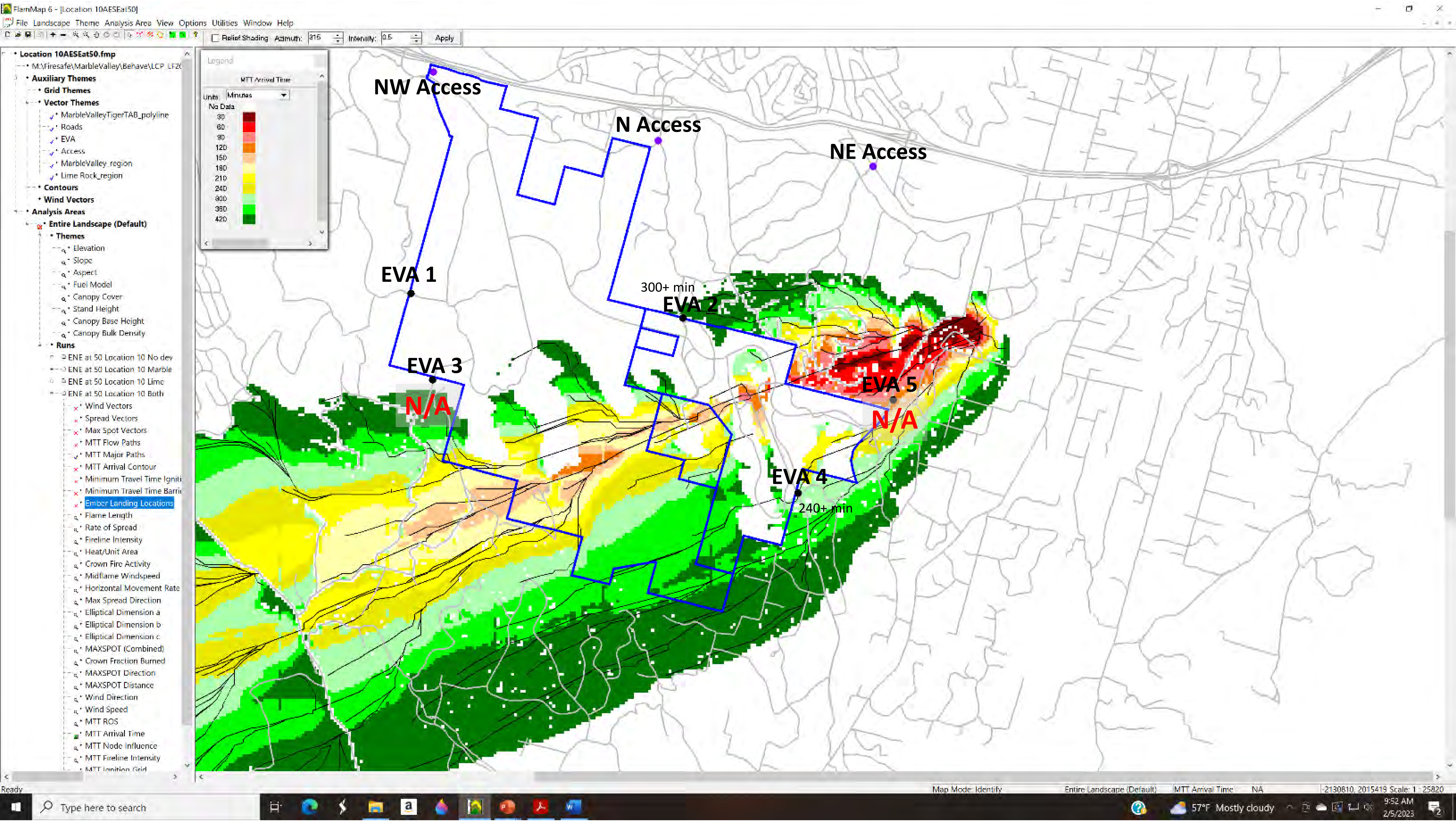
Location 10 ENE wind at 50 mph Marble – Scn 10F



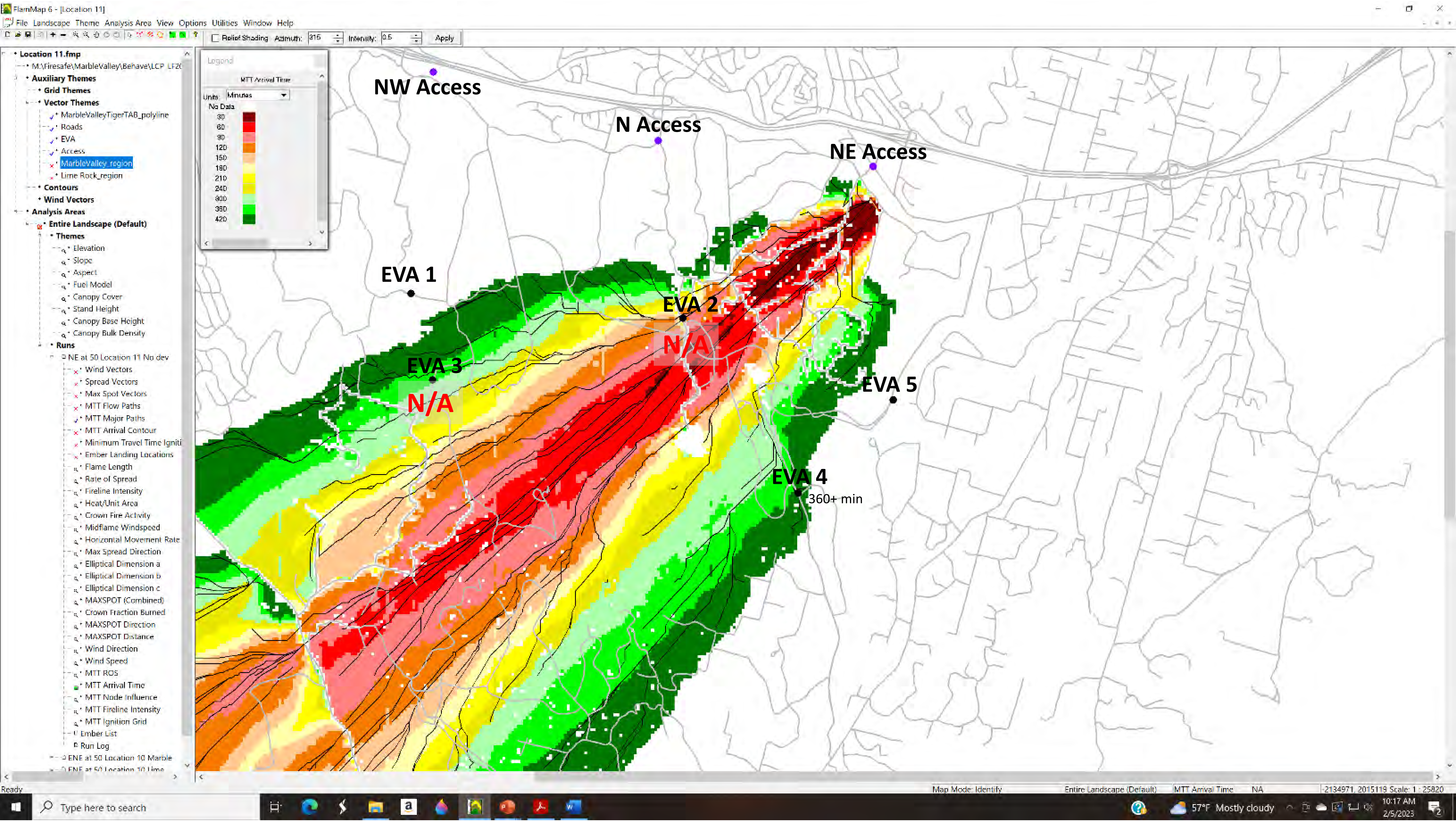
Location 10 ENE wind at 50 mph Lime– Scn 10G



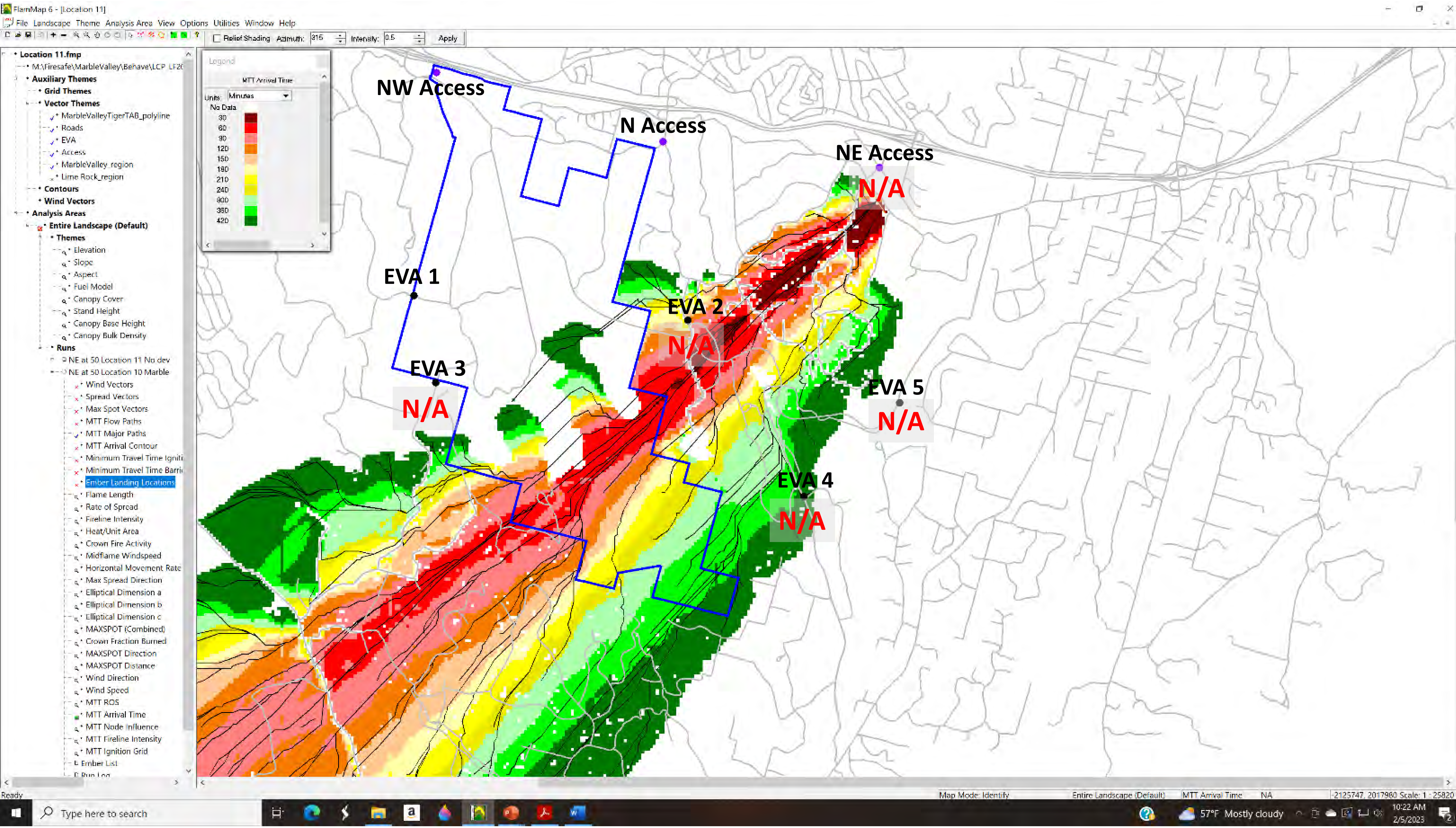
Location 10 ENE wind at 50 mph Both – Scn 10H



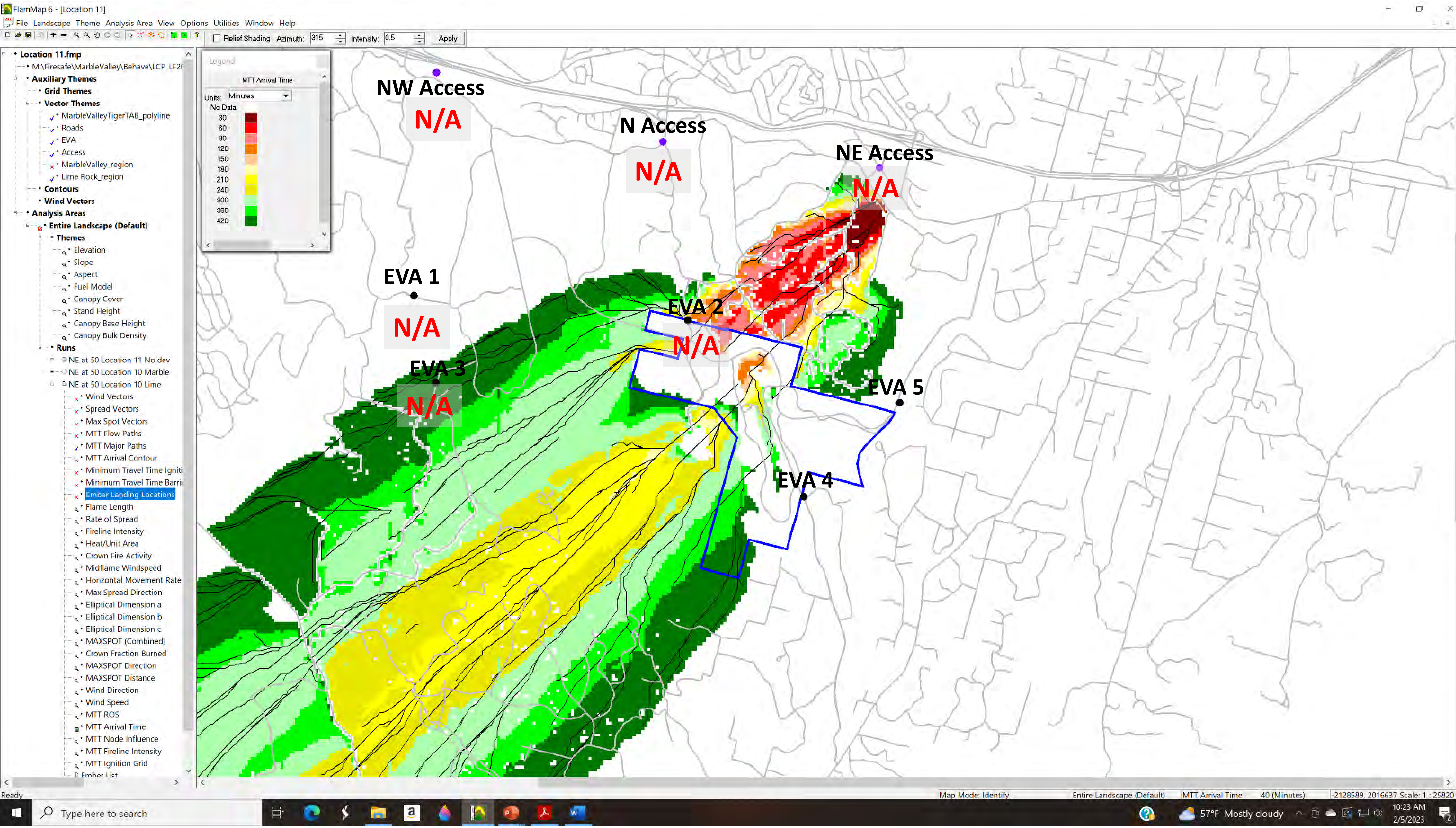
Location 11 NE wind at 50 mph No Dev – Scn 11A



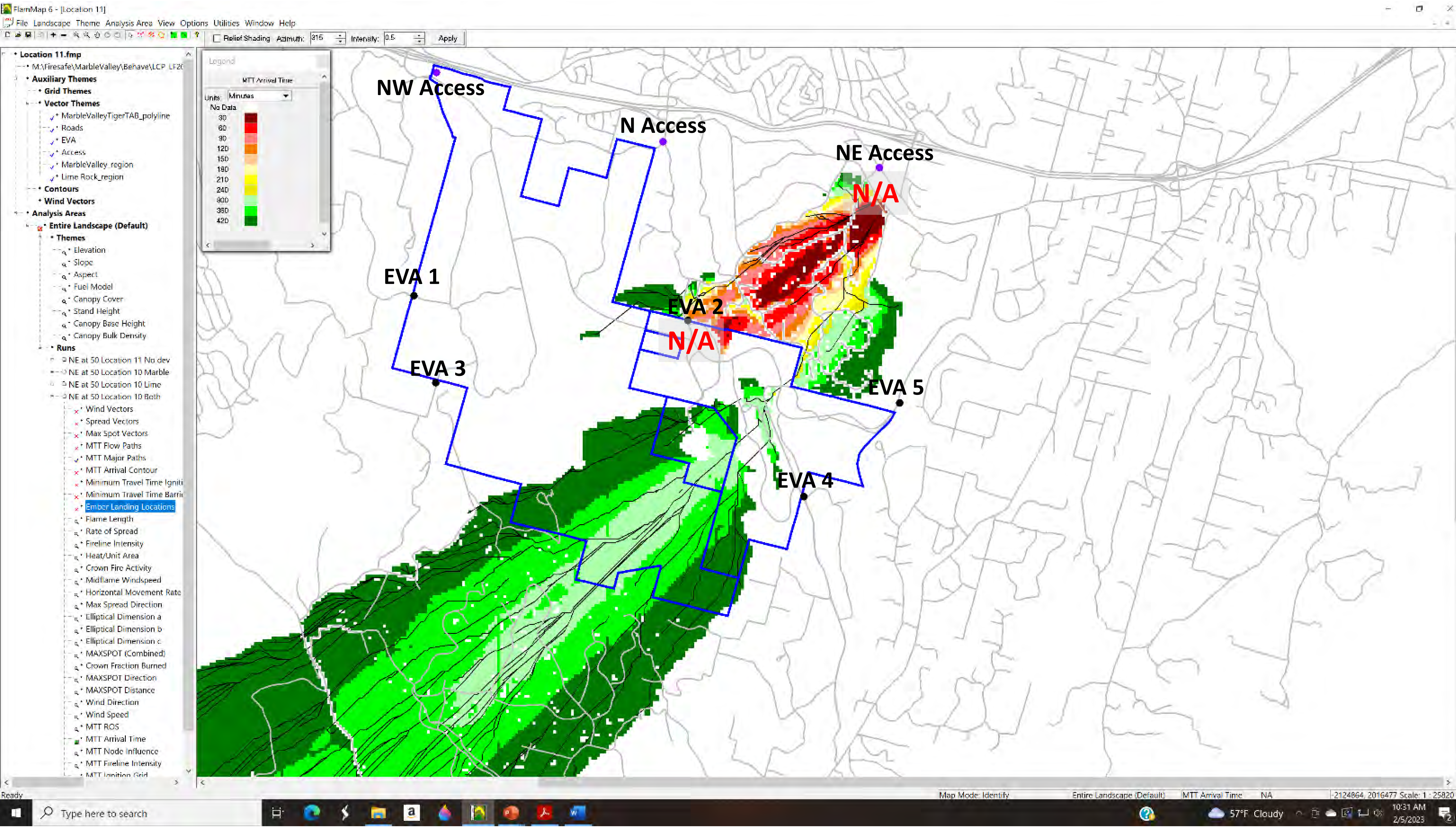
Location 11 NE wind at 50 mph Marble – Scn 11B



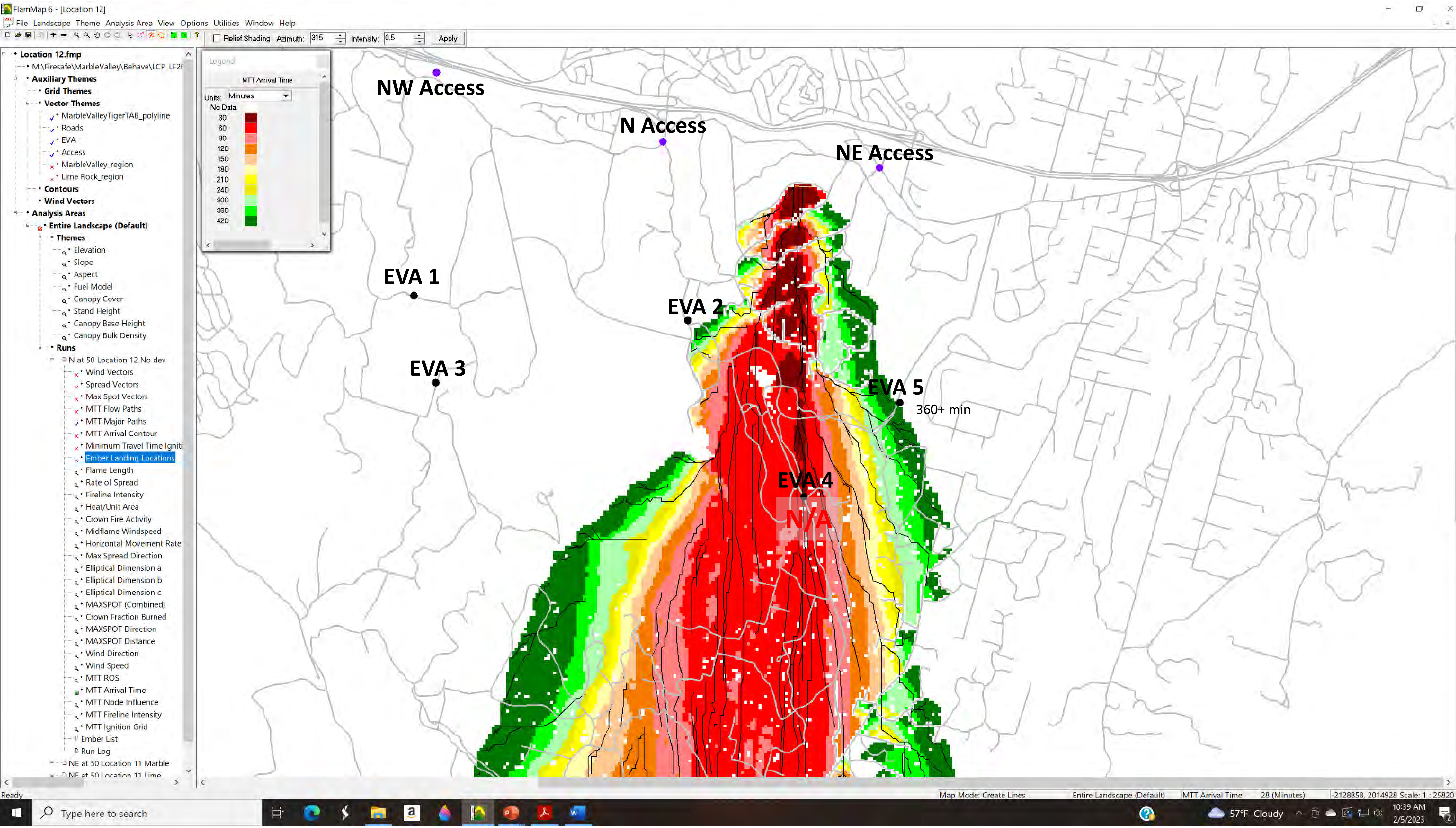
Location 11 NE wind at 50 mph Lime – Scn 11C



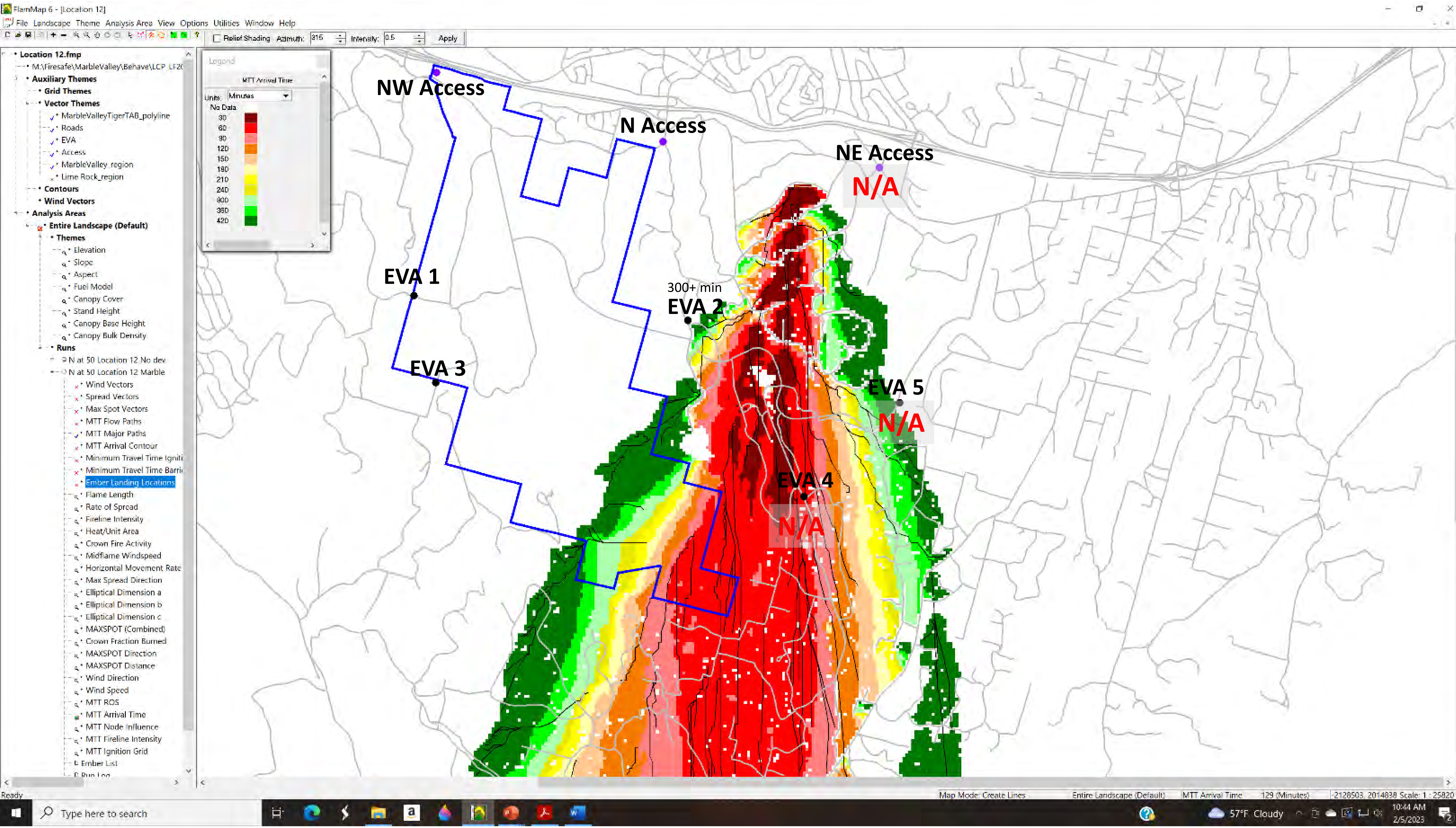
Location 11 NE wind at 50 mph Both – Scn 11D



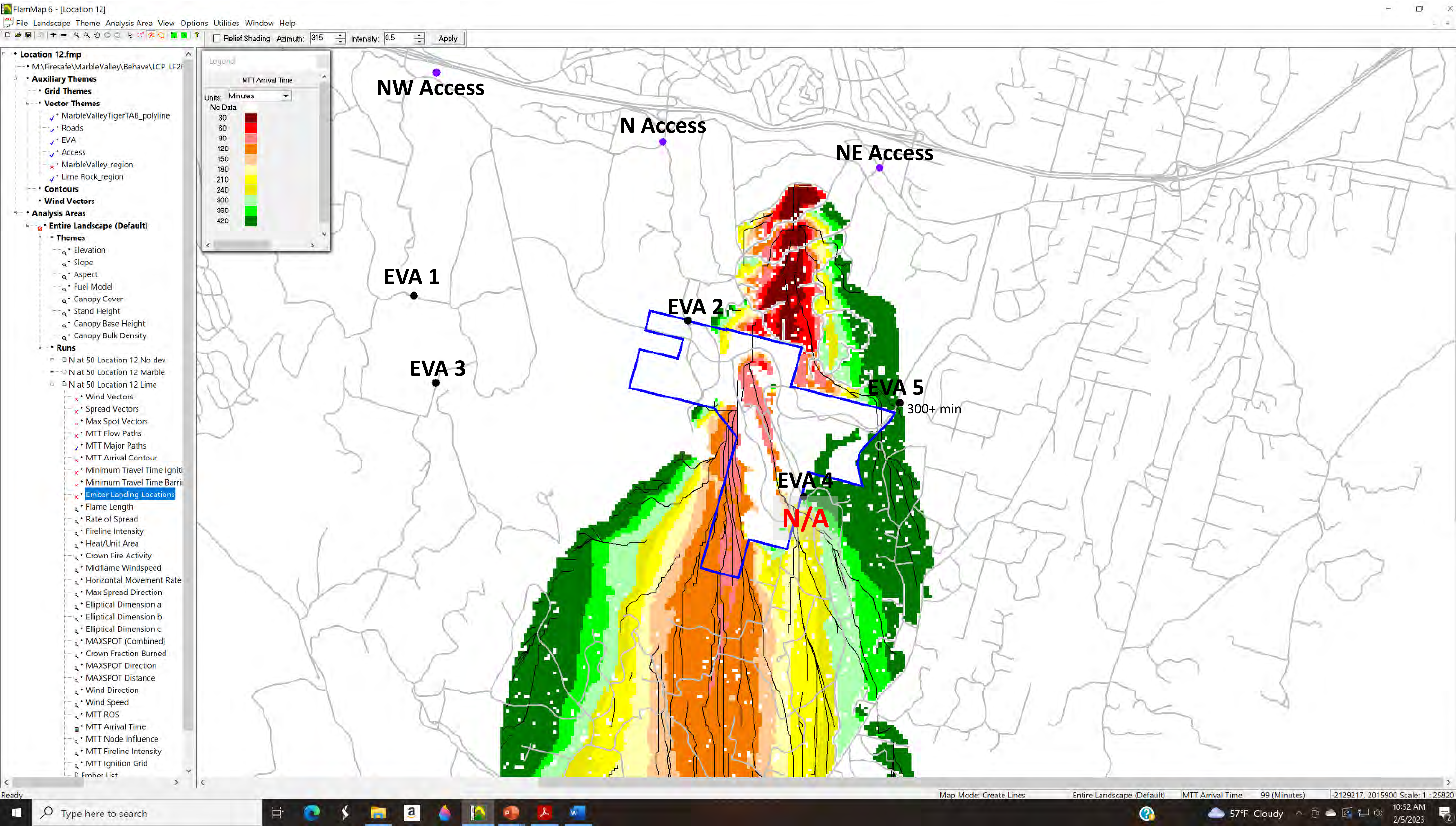
Location 12 N wind at 50 mph No Dev – Scn 12A



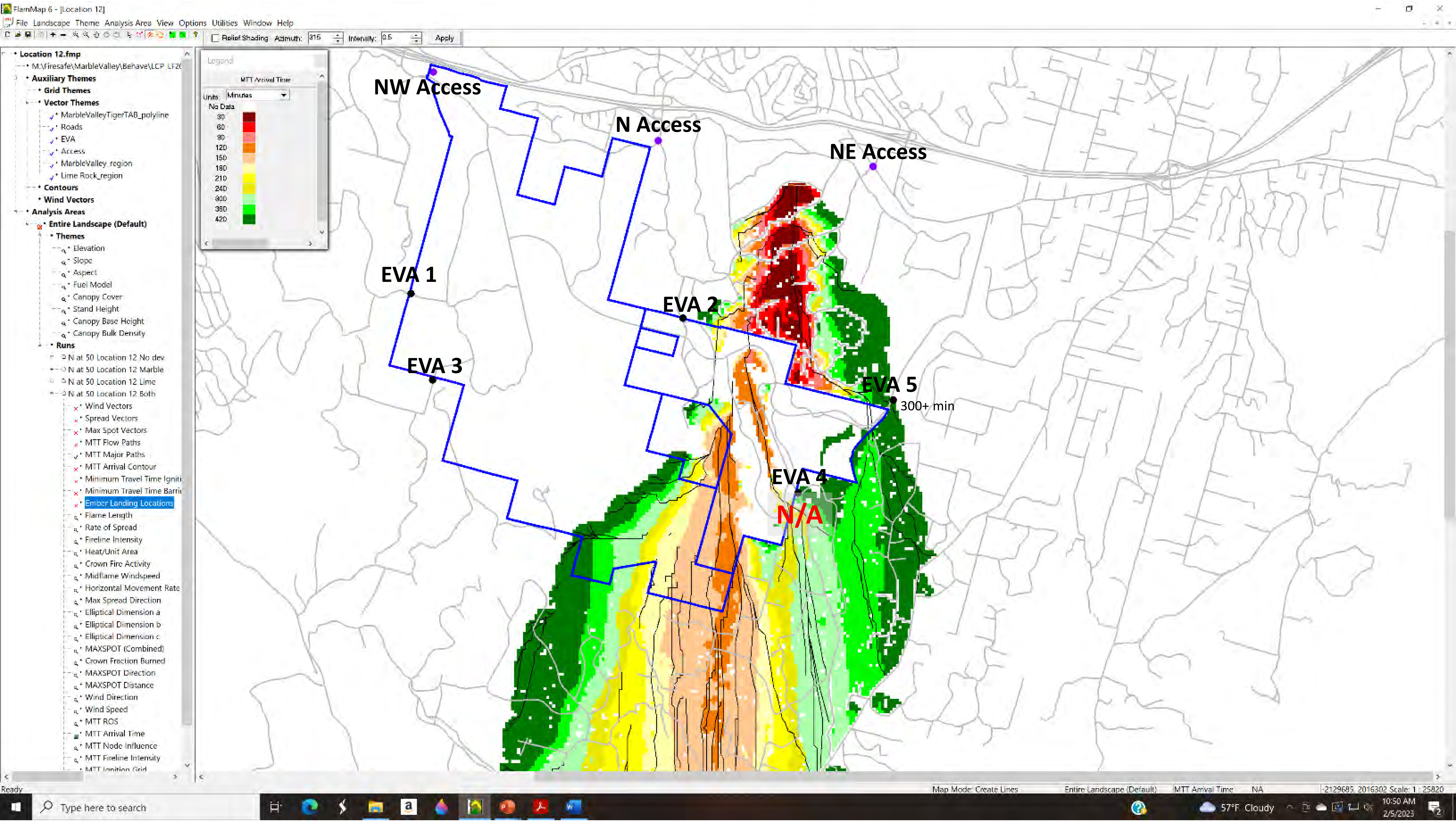
Location 12 N wind at 50 mph Marble – Scn 12B



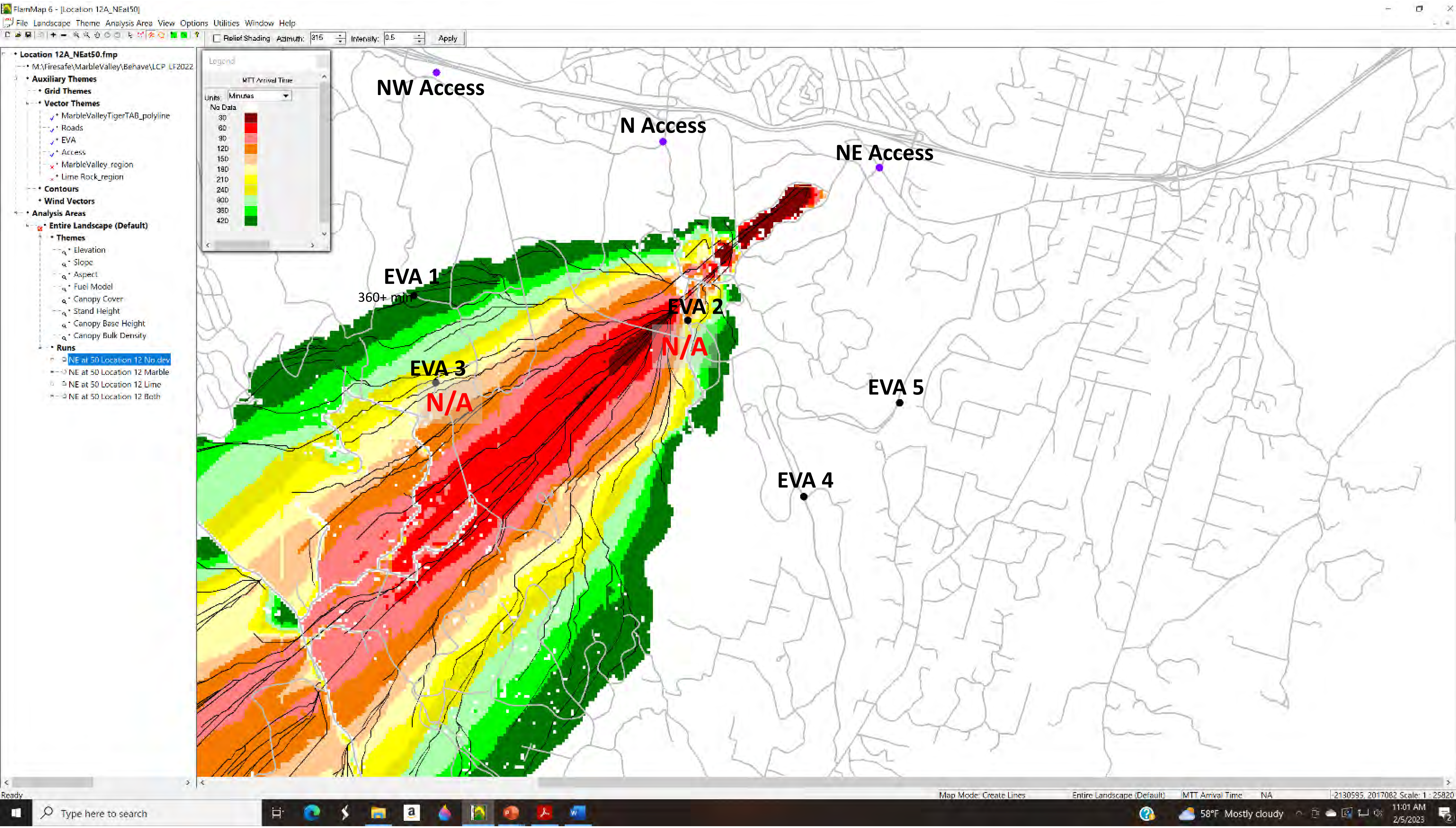
Location 12 N wind at 50 mph Lime – Scn 12C



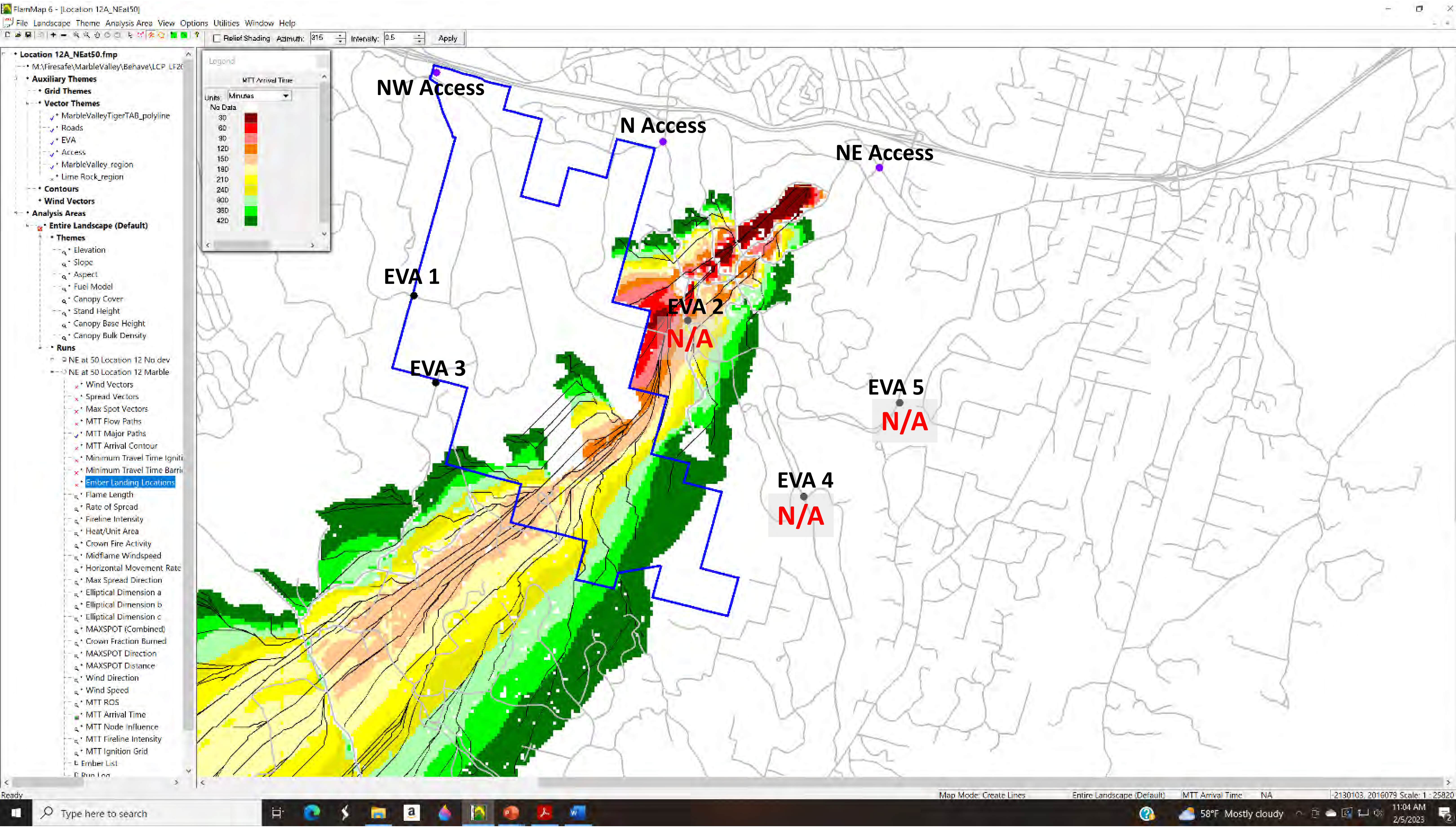
Location 12 N wind at 50 mph Both – Scn 12D



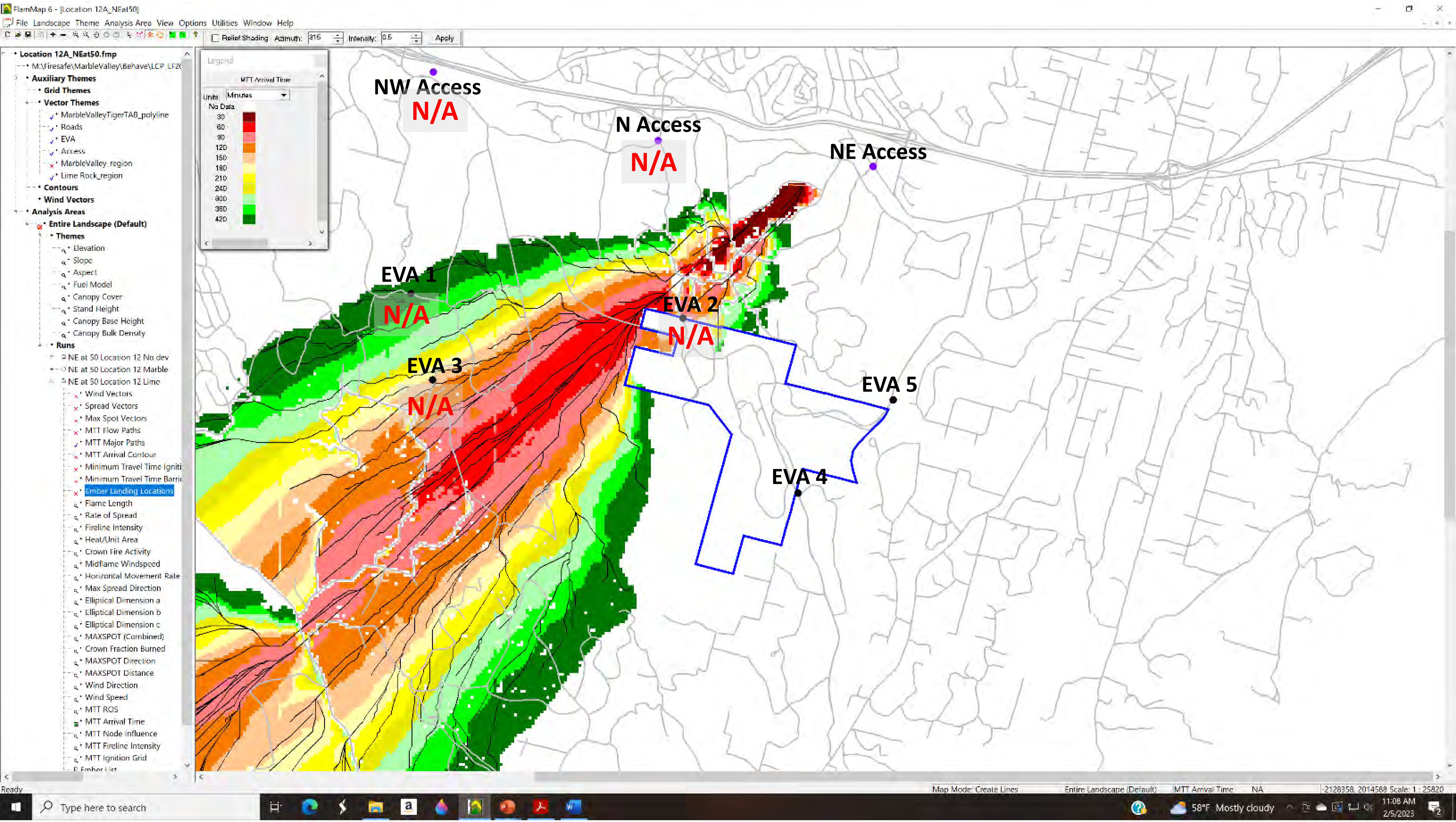
Location 12 NE wind at 50 mph No Dev – Scn 12E



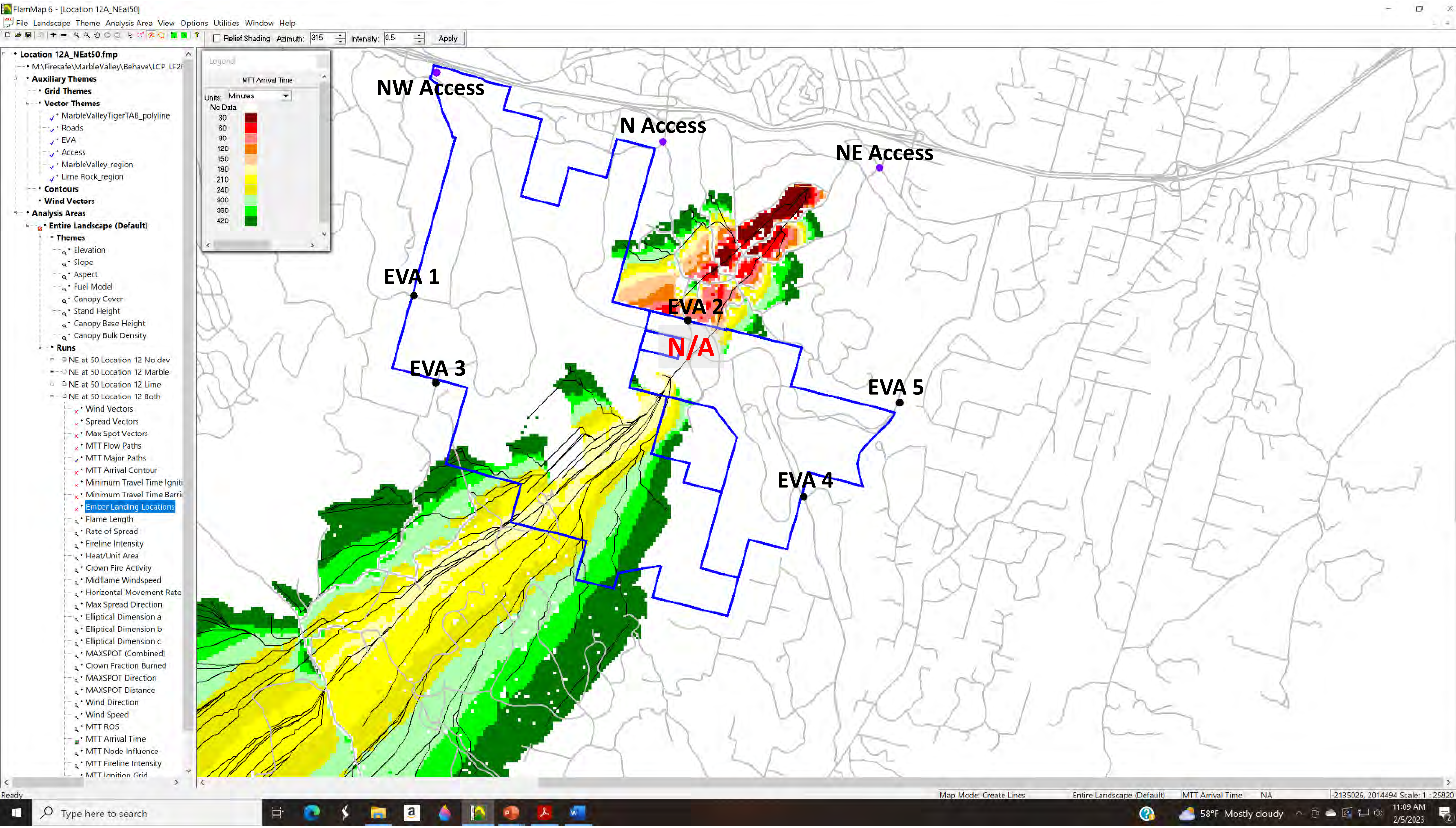
Location 12 NE wind at 50 mph Marble – Scn 12F



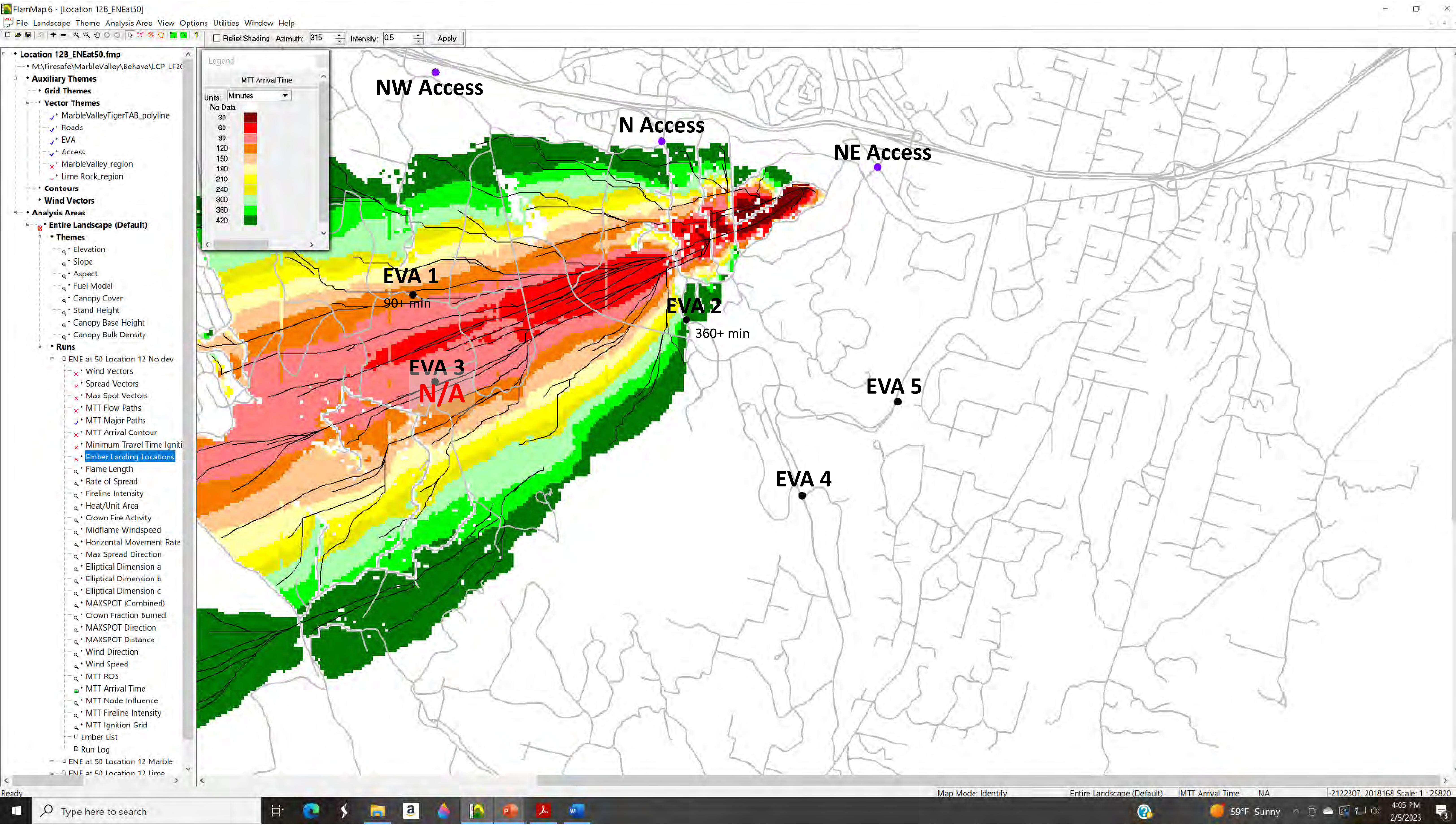
Location 12 NE wind at 50 mph Lime – Scn 12G



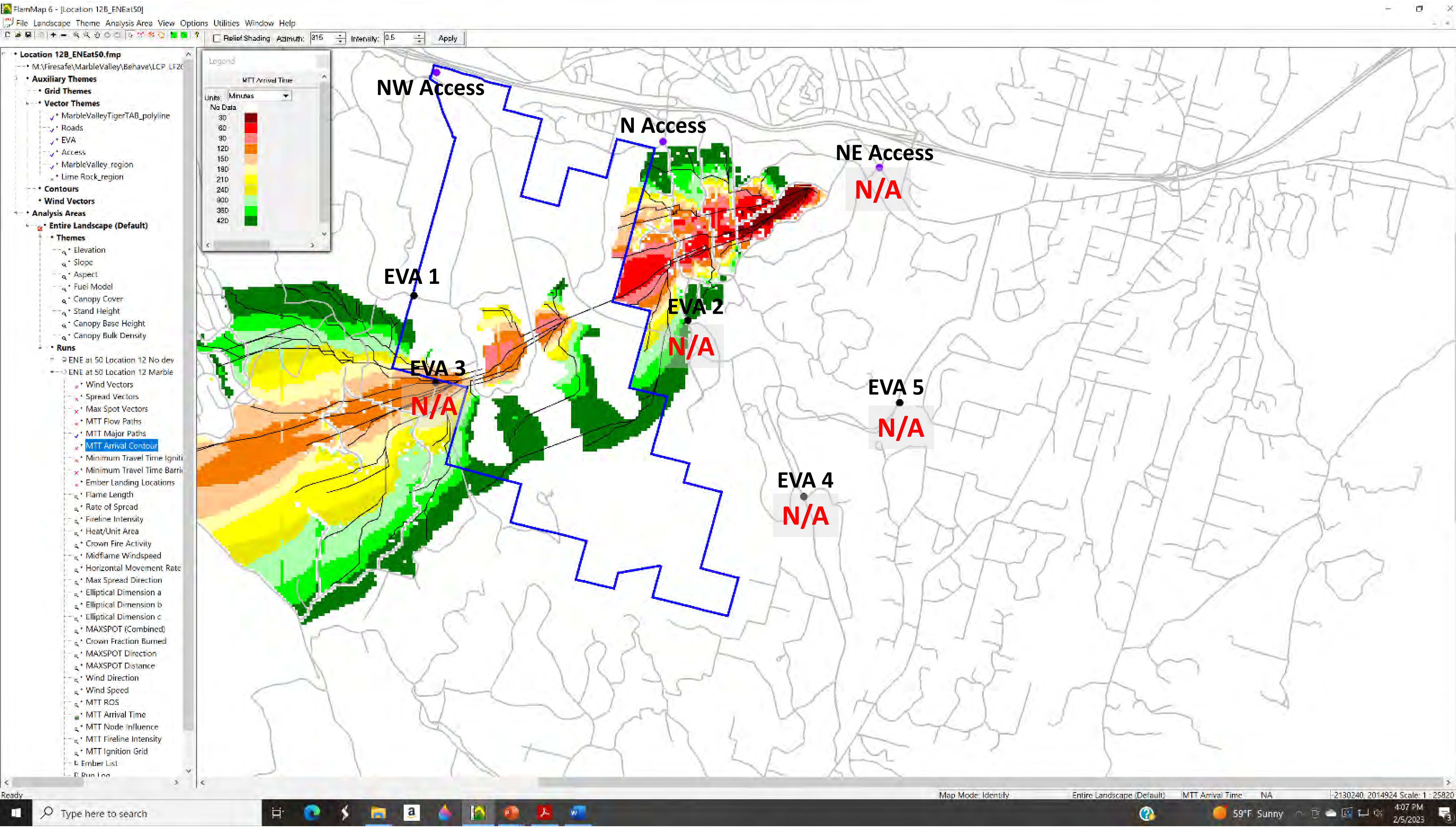
Location 12 NE wind at 50 mph Both – Scn 12H



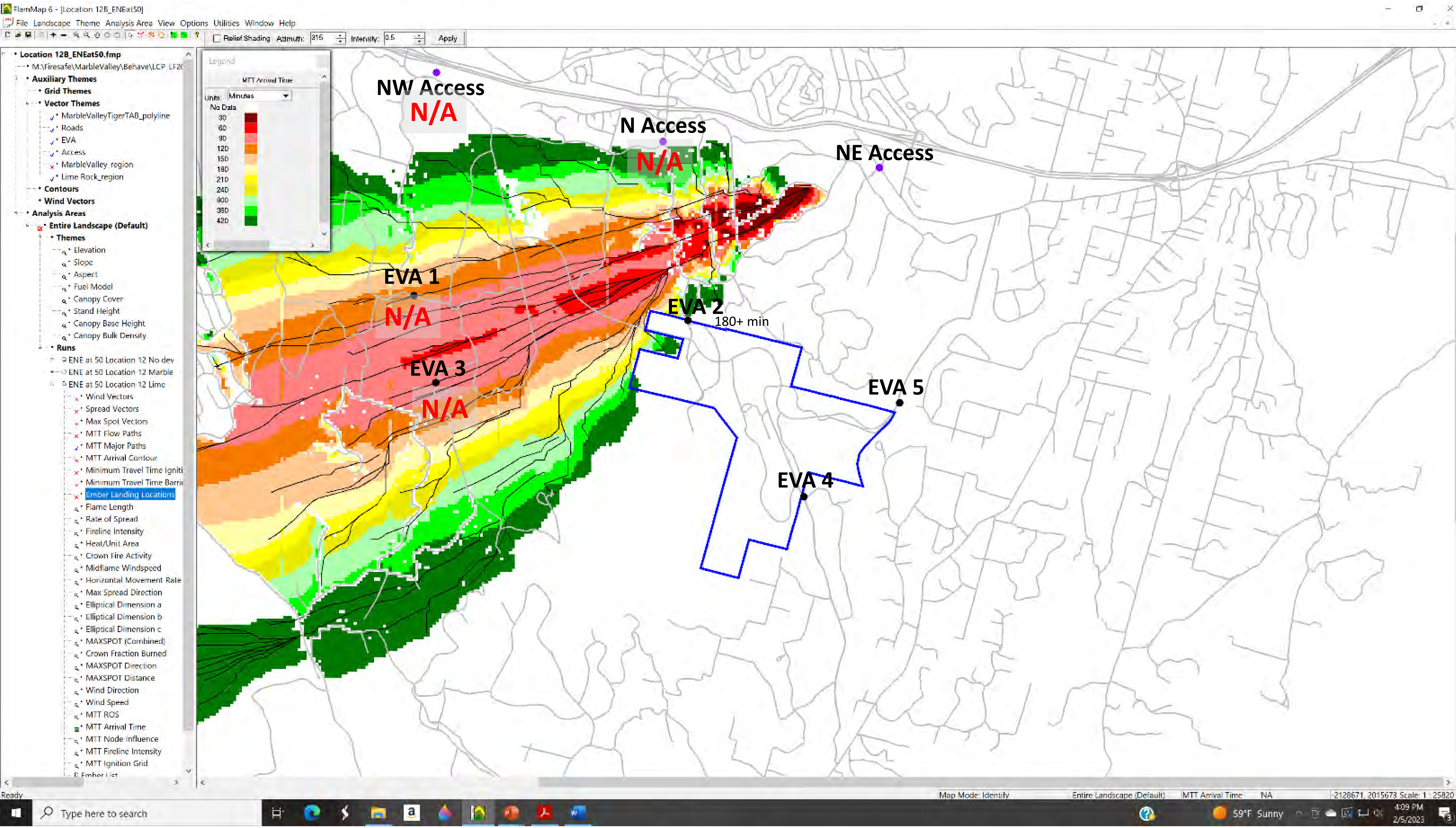
Location 12 ENE wind at 50 mph No Dev – Scn 12I



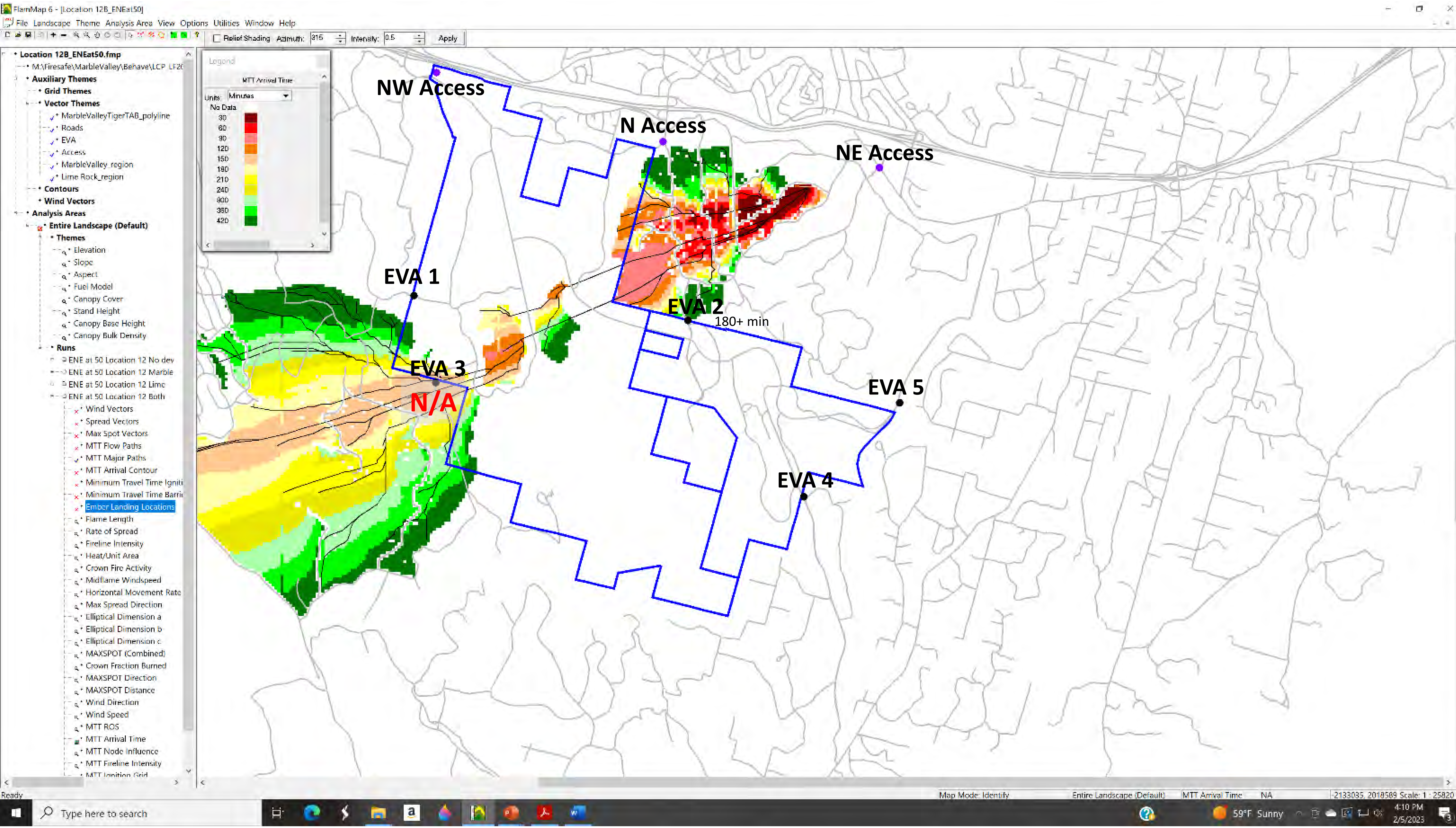
Location 12 ENE wind at 50 mph Marble– Scn 12J



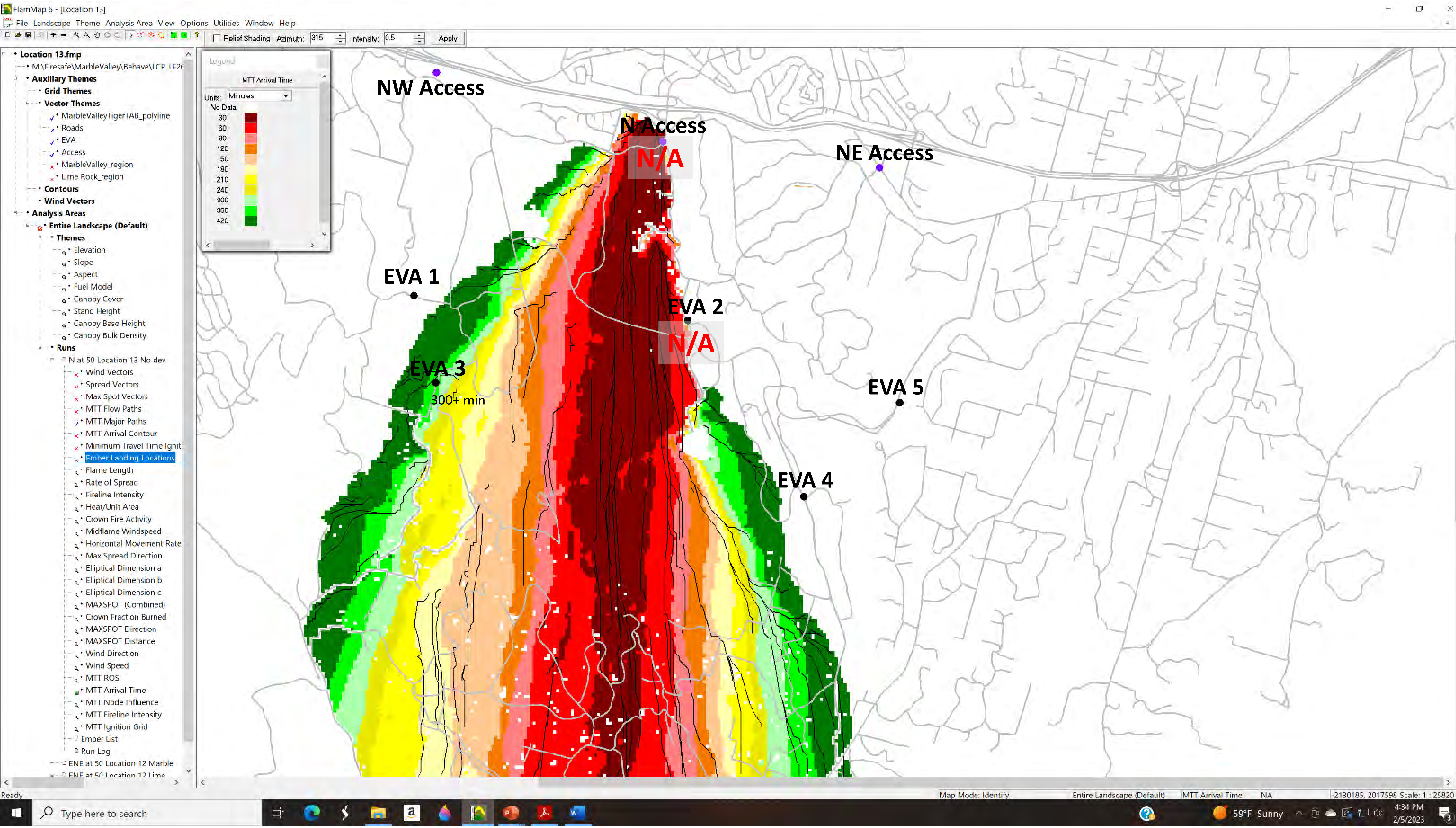
Location 12 ENE wind at 50 mph Lime– Scn 12K



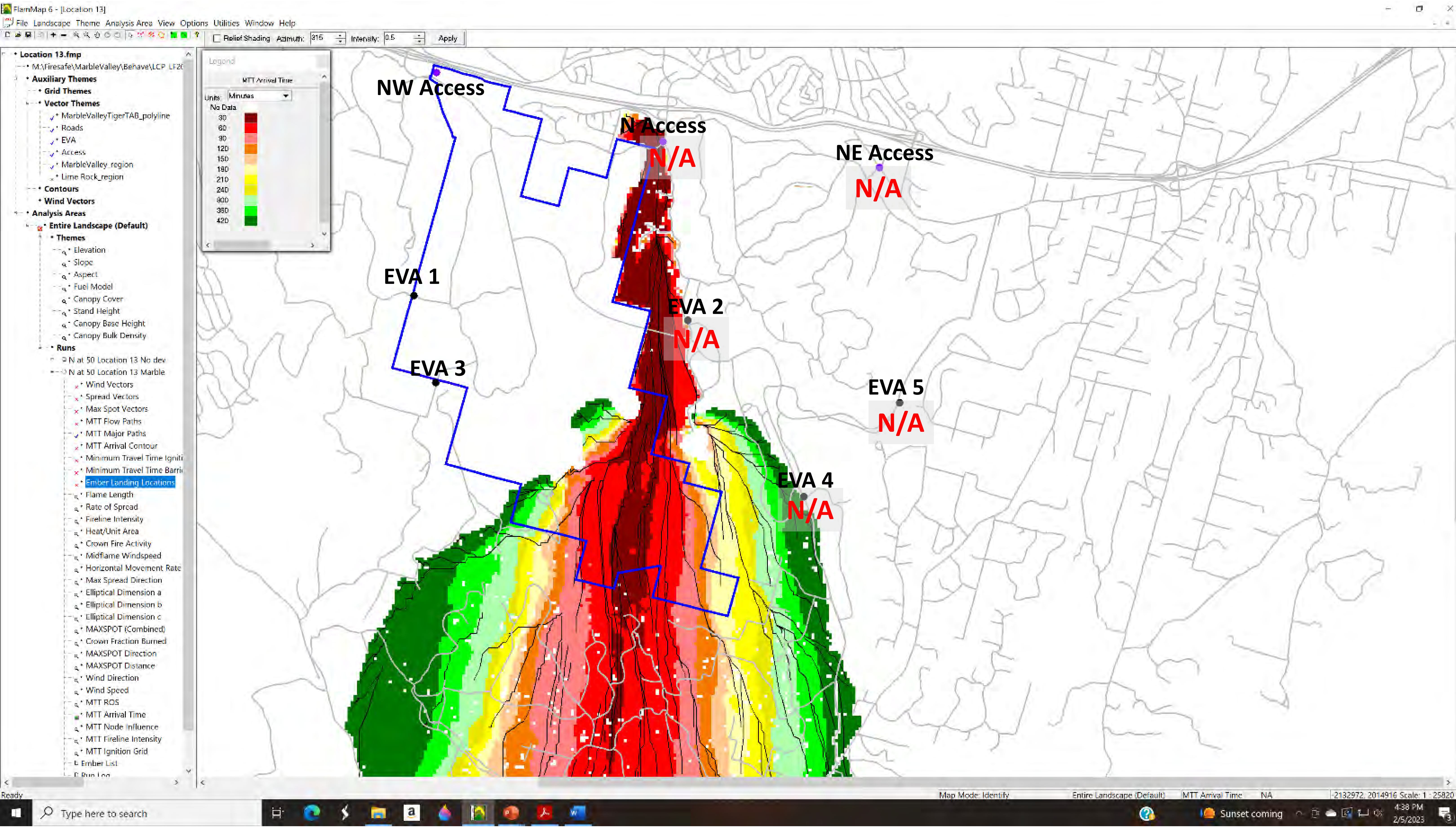
Location 12 ENE wind at 50 mph Both– Scn 12L



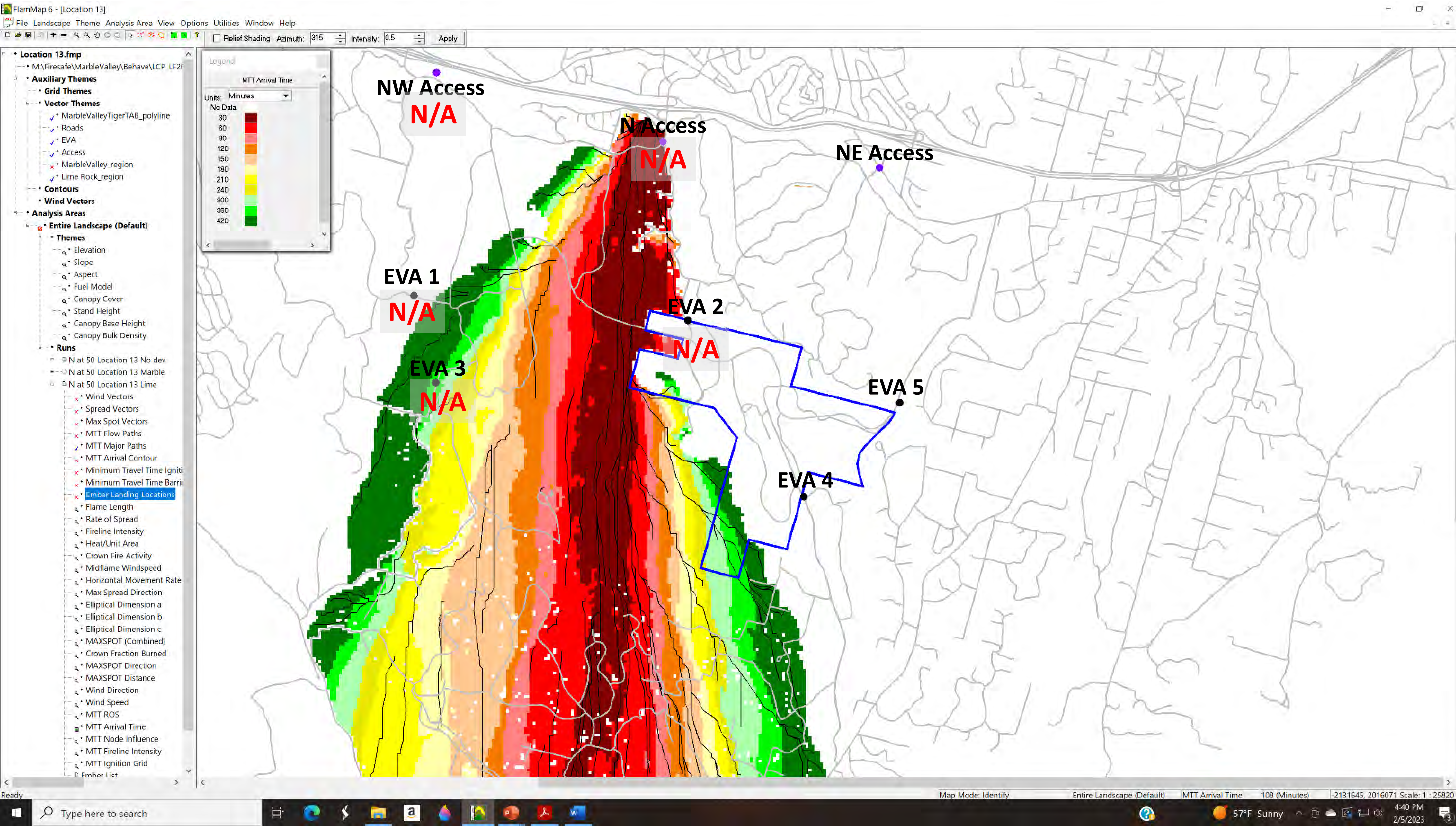
Location 13 N wind at 50 mph No Dev – Scn 13A



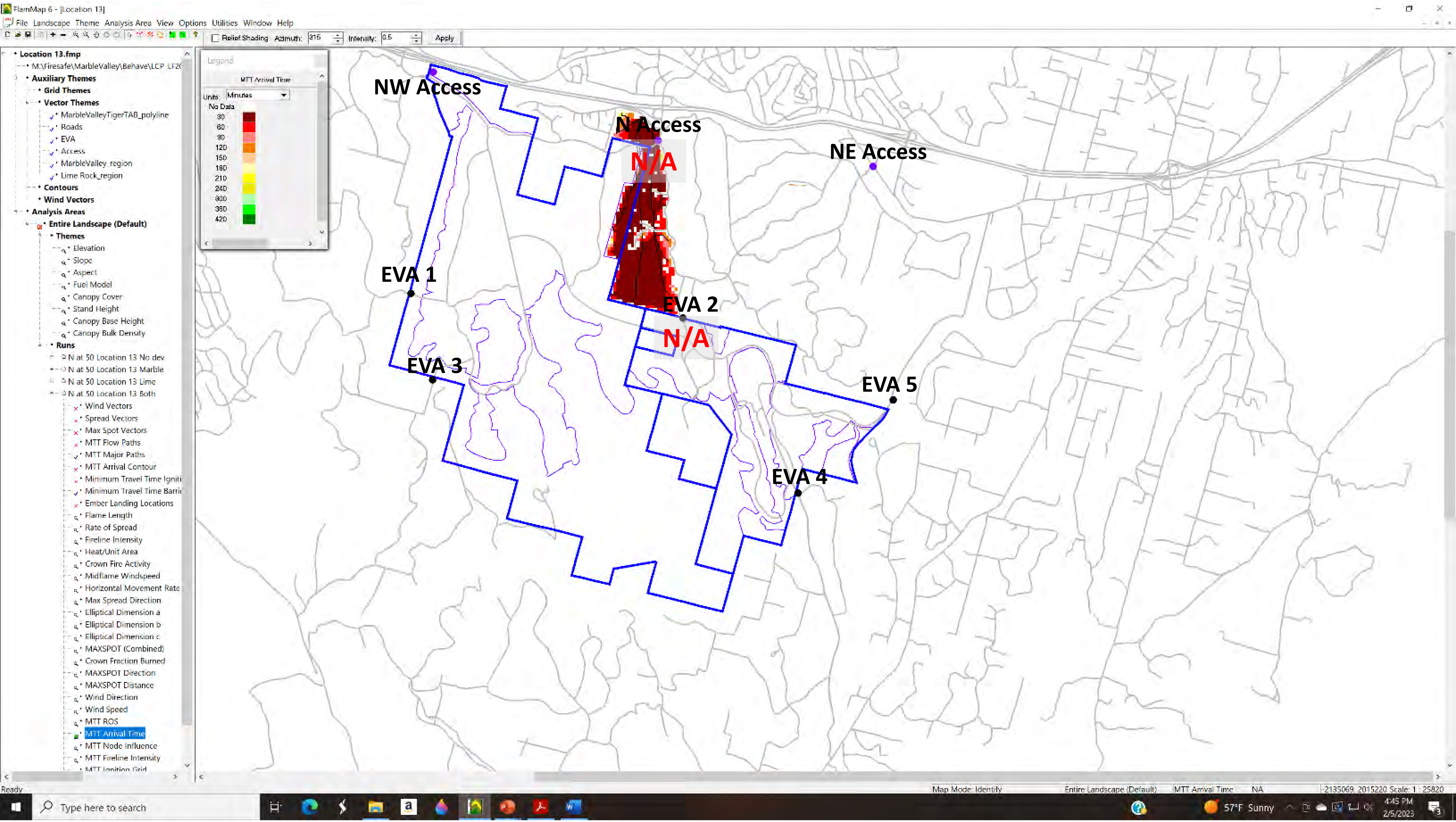
Location 13 N wind at 50 mph Marble – Scn 13B



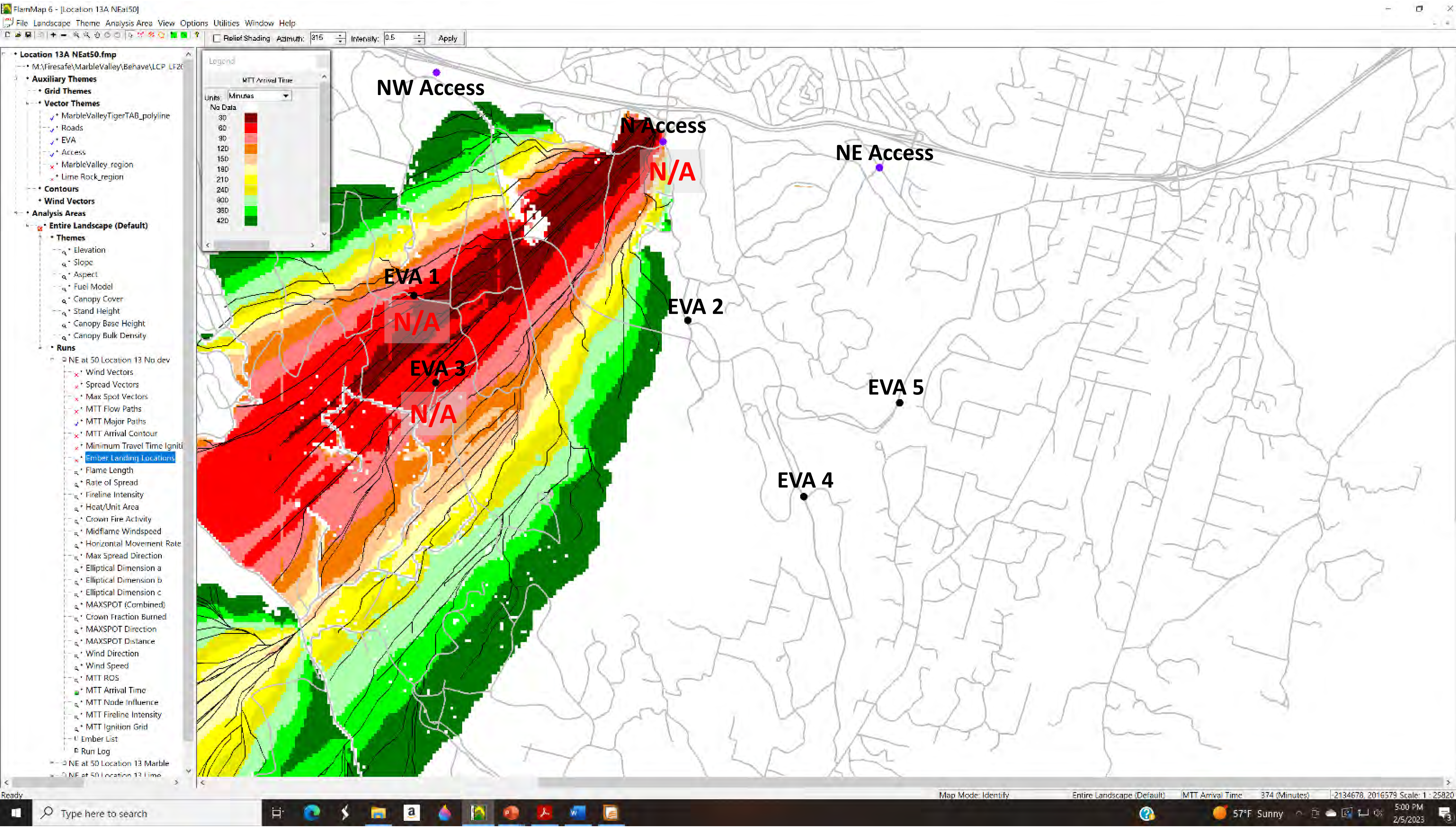
Location 13 N wind at 50 mph Lime – Scn 13C



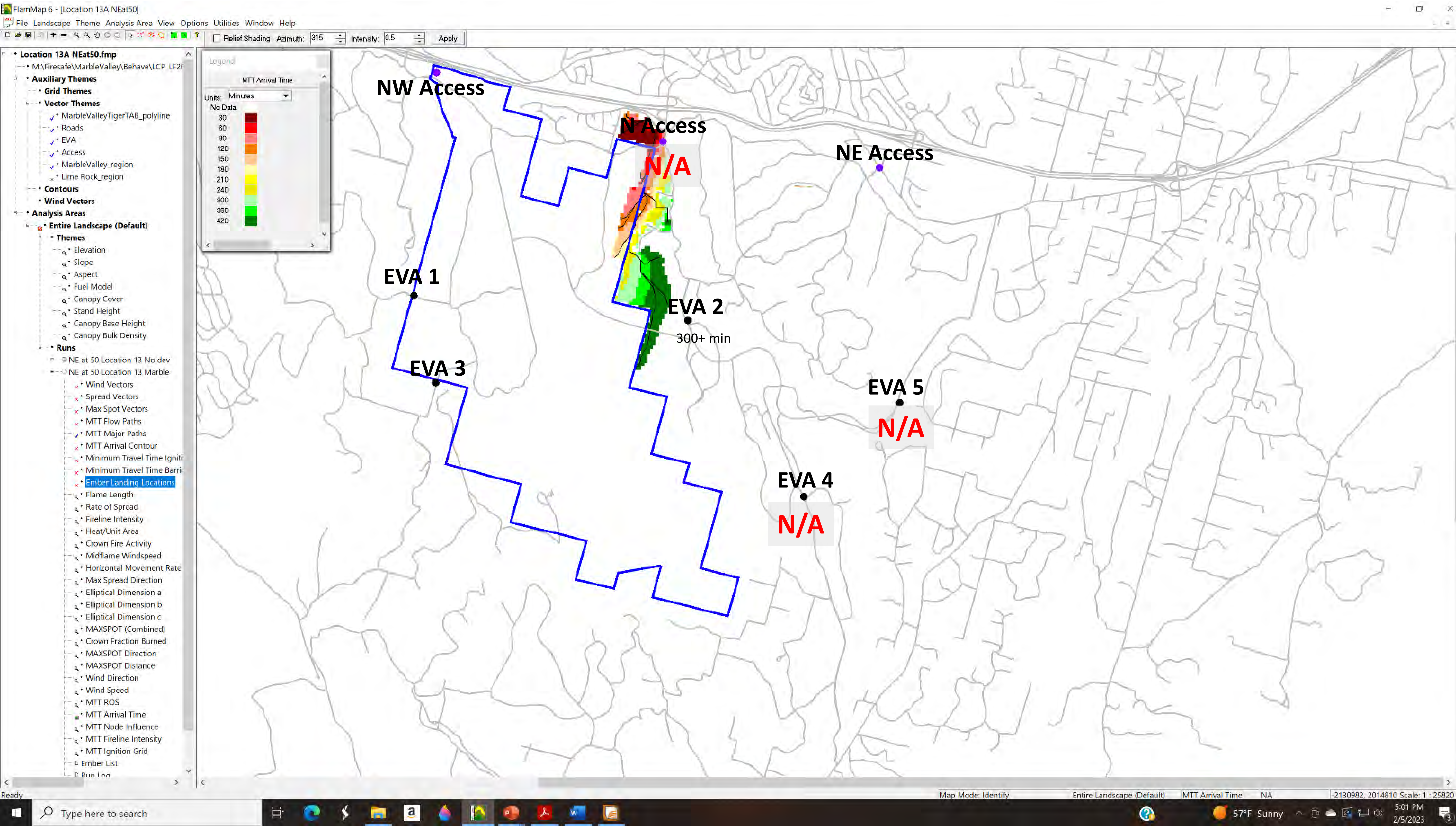
Location 13 N wind at 50 mph Both– Scn 13D



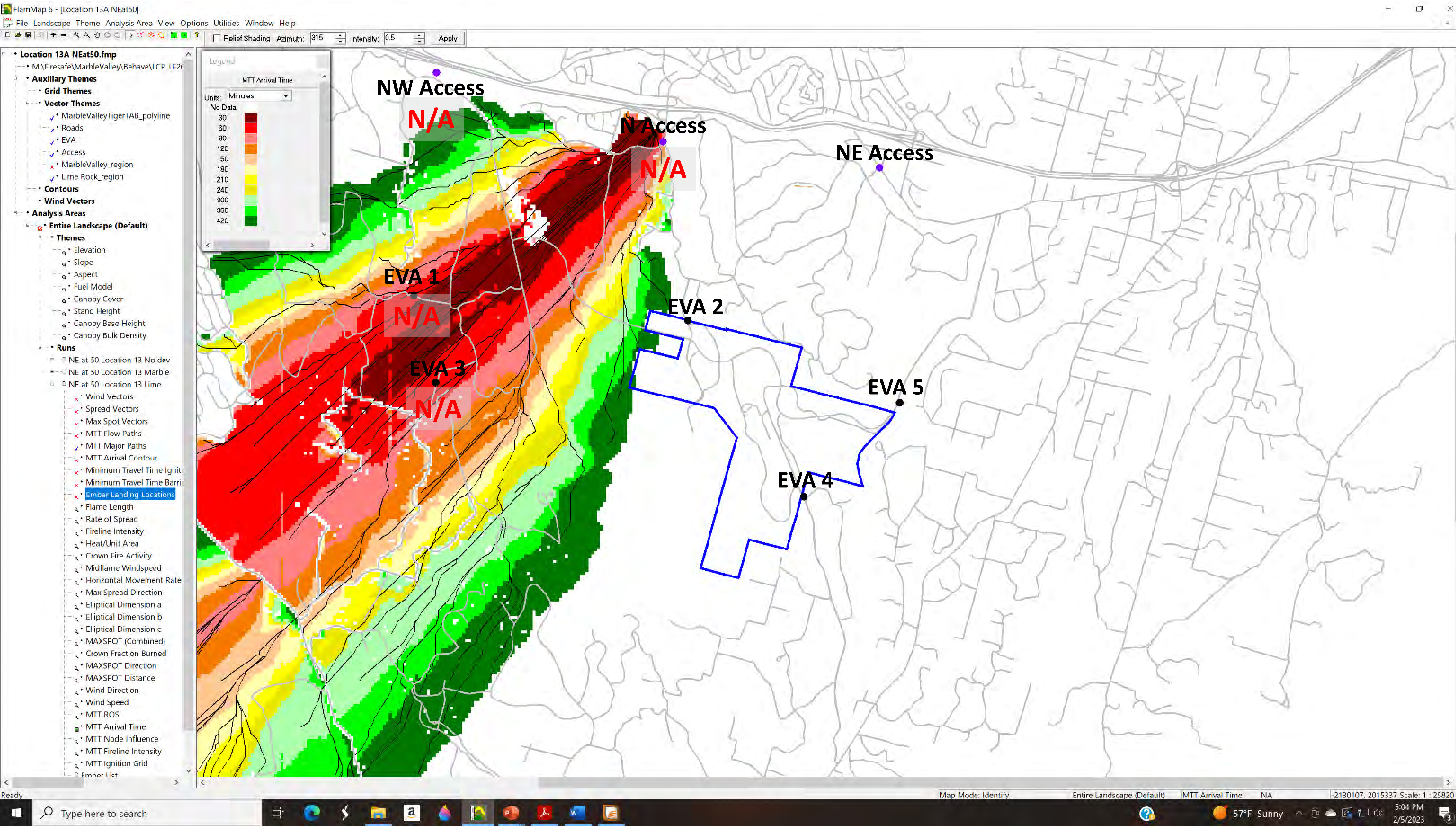
Location 13 NE wind at 50 mph No Dev – Scn 13E



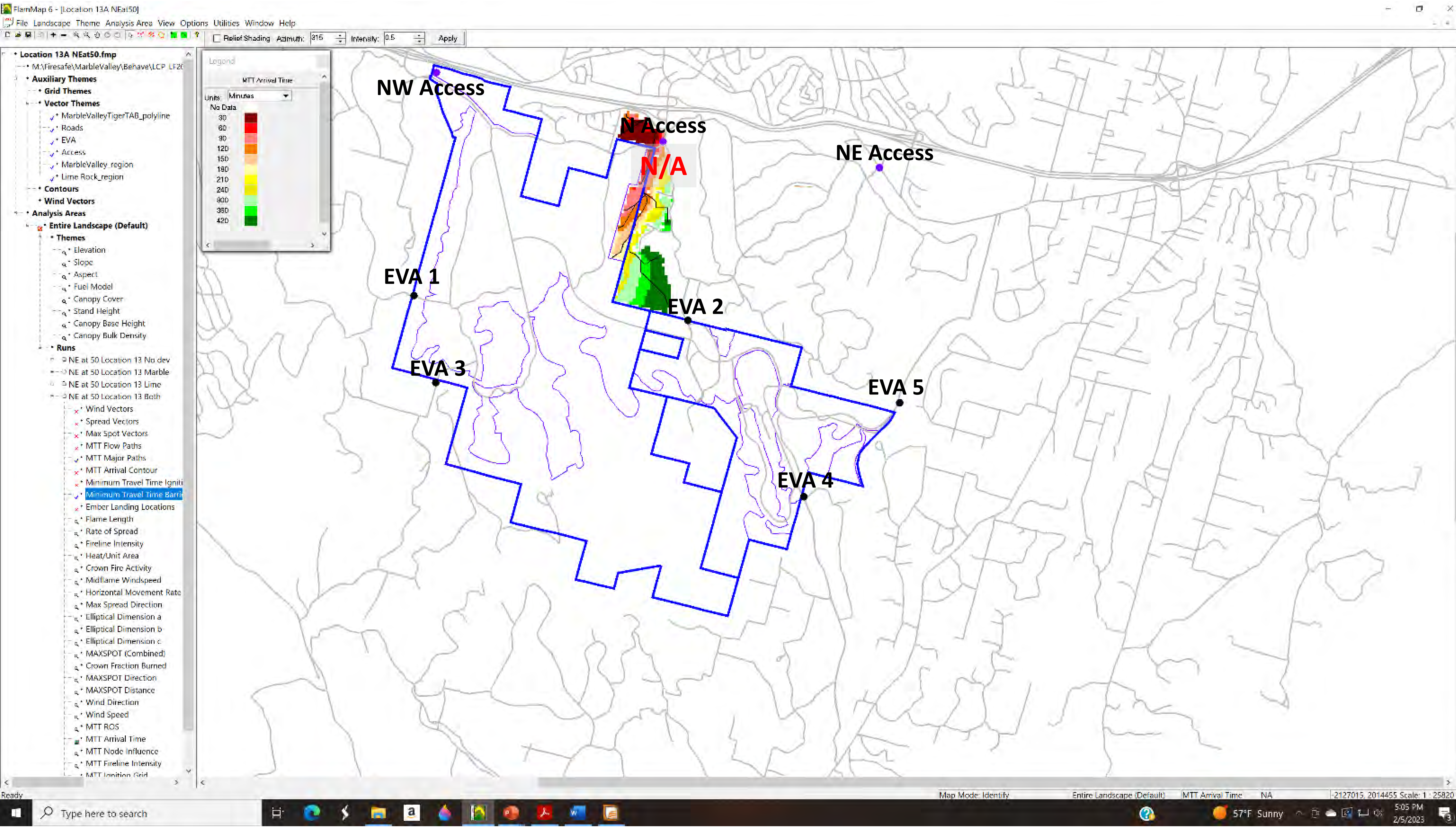
Location 13 NE wind at 50 mph Marble – Scn 13F



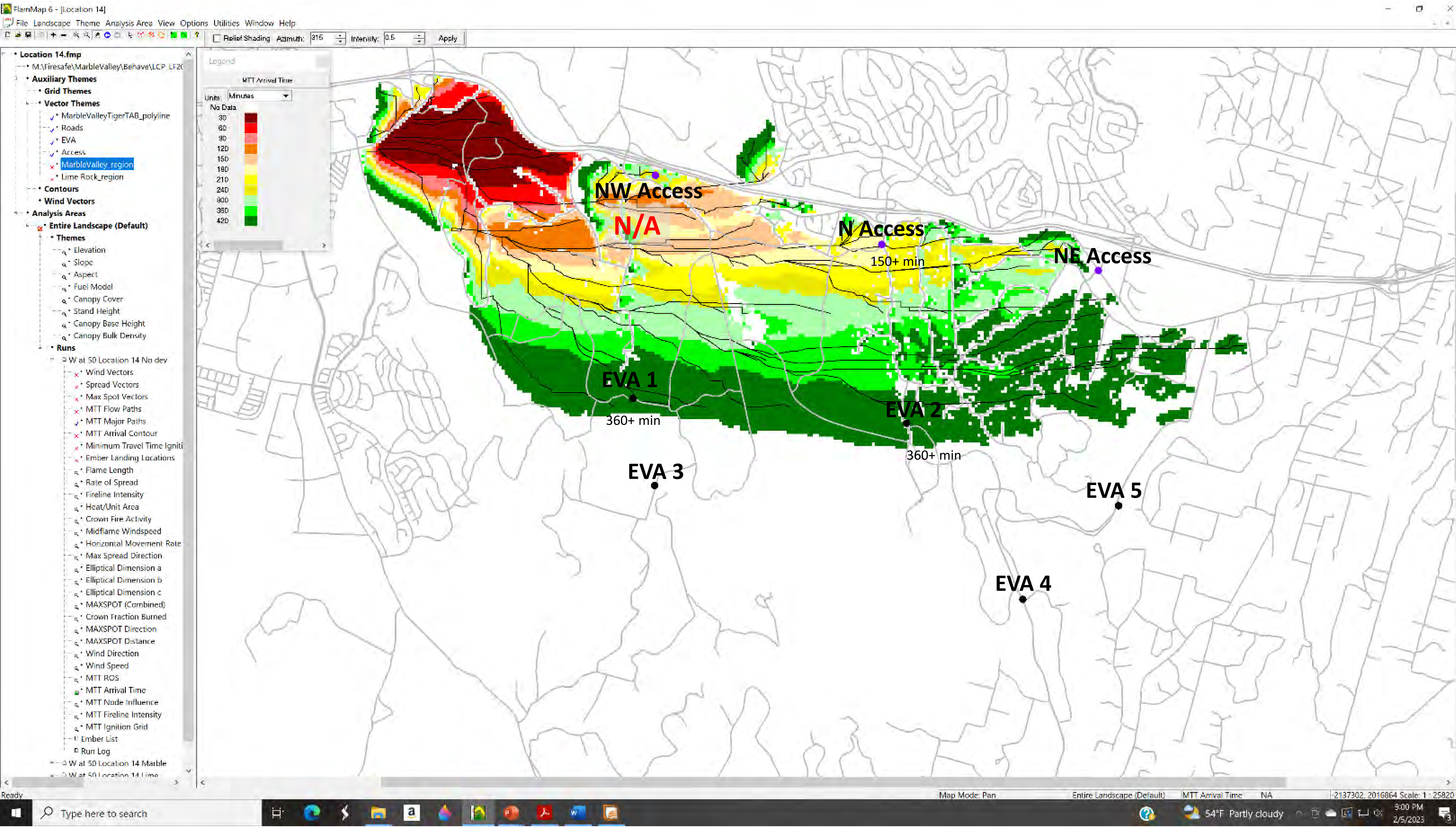
Location 13 NE wind at 50 mph Lime – Scn 13G



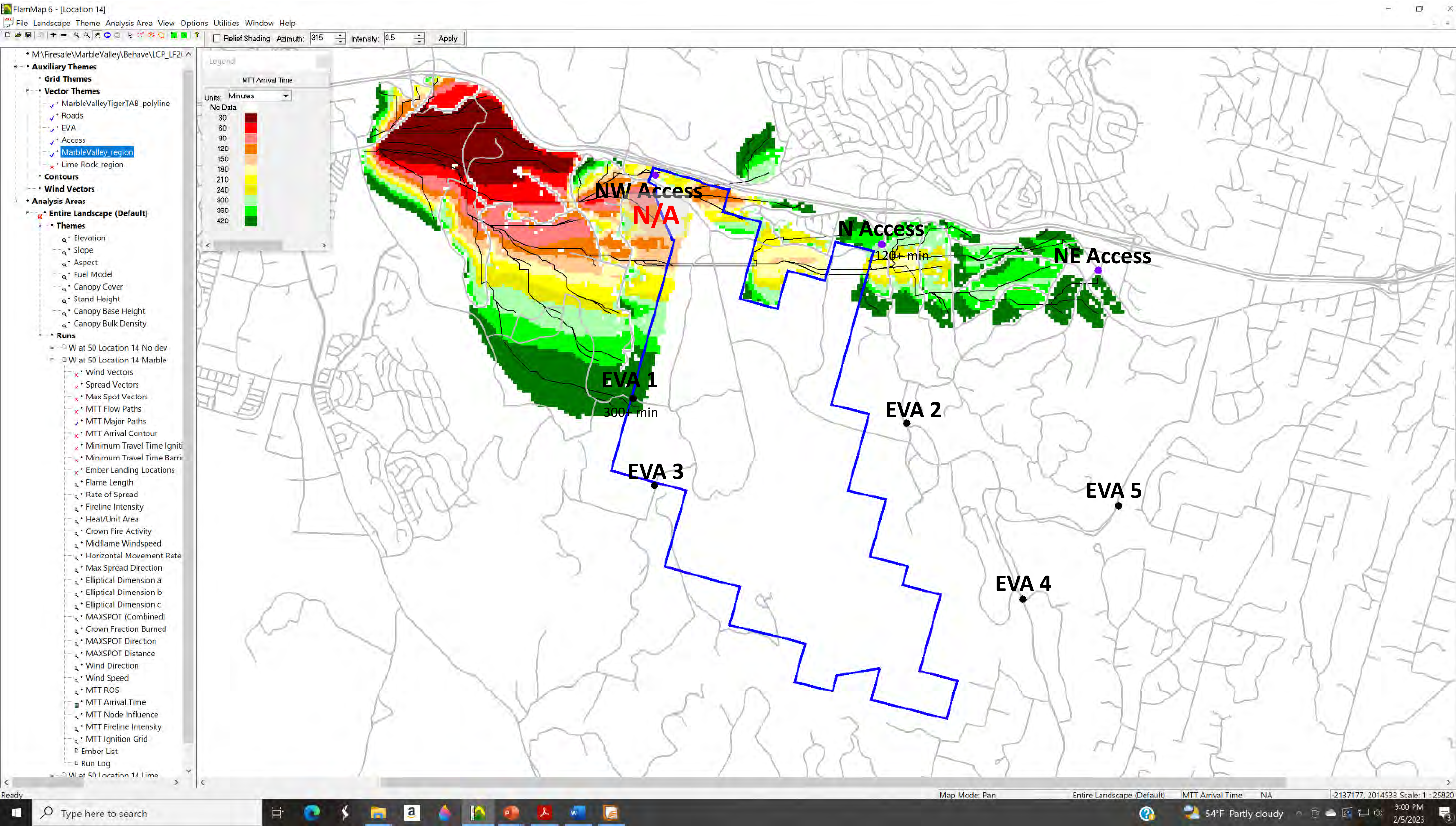
Location 13 NE wind at 50 mph Both – Scn 13H



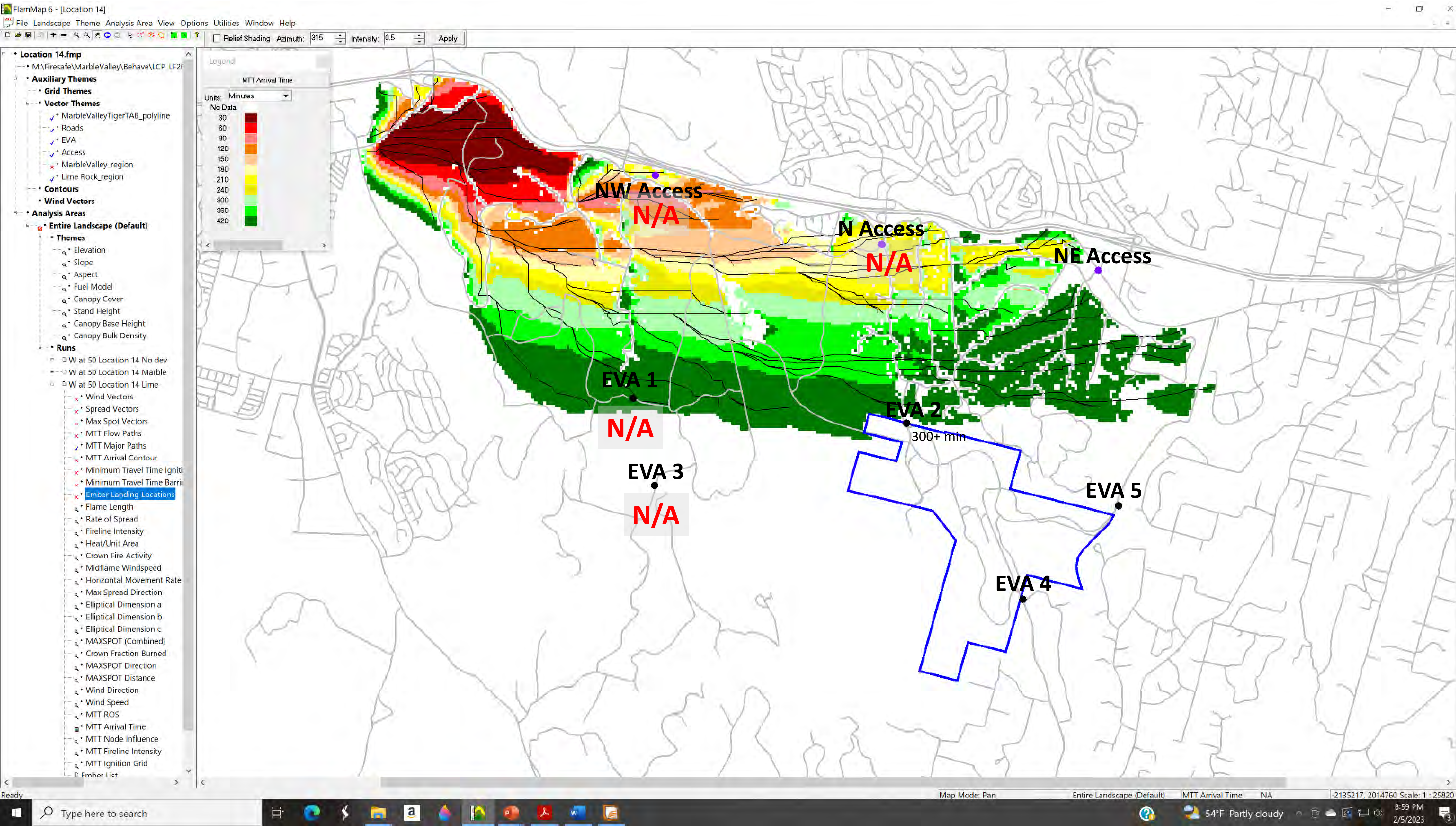
Location 14 W wind at 50 mph No Dev – Scn 14A



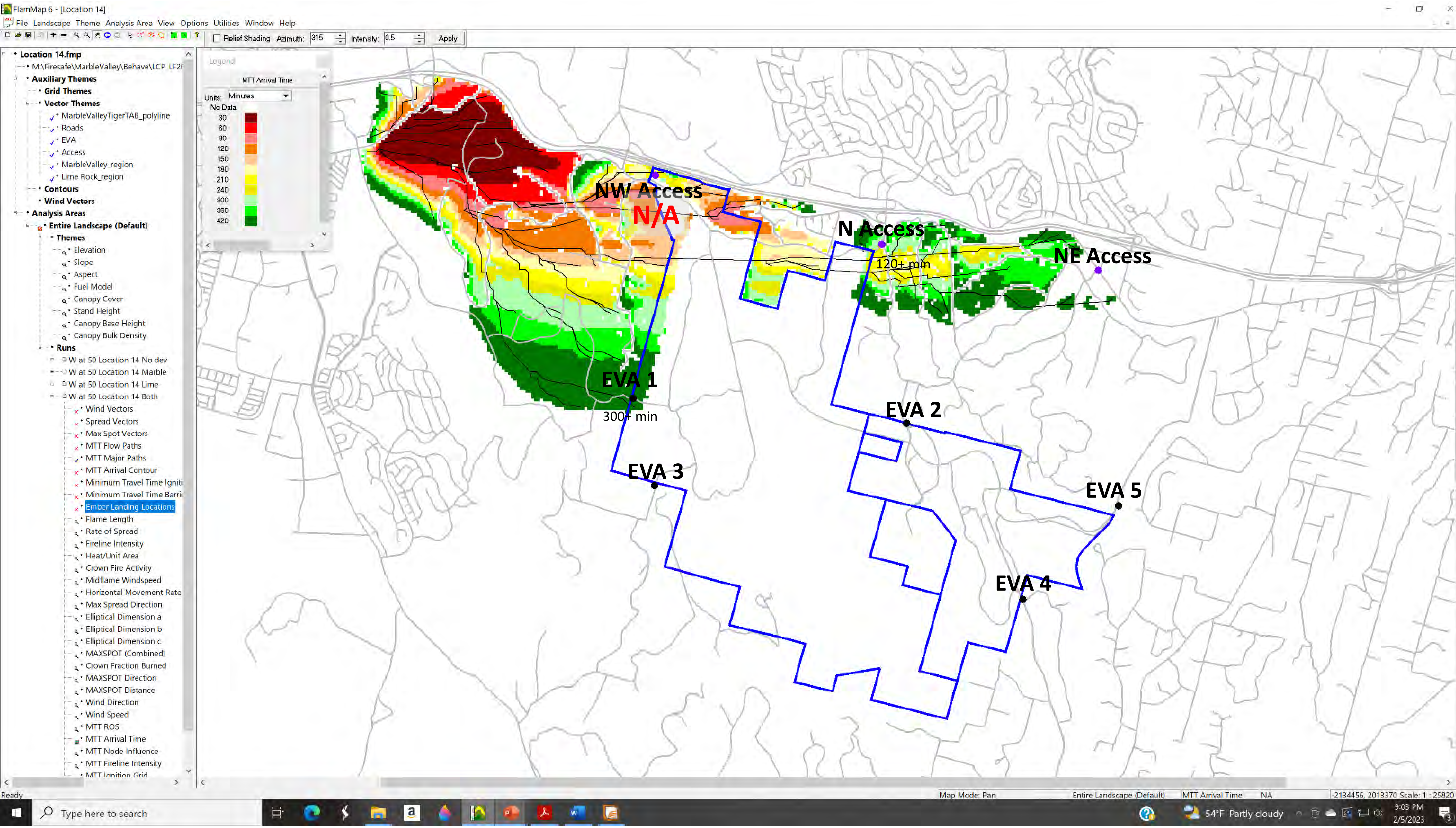
Location 14 W wind at 50 mph Marble – Scn 14B



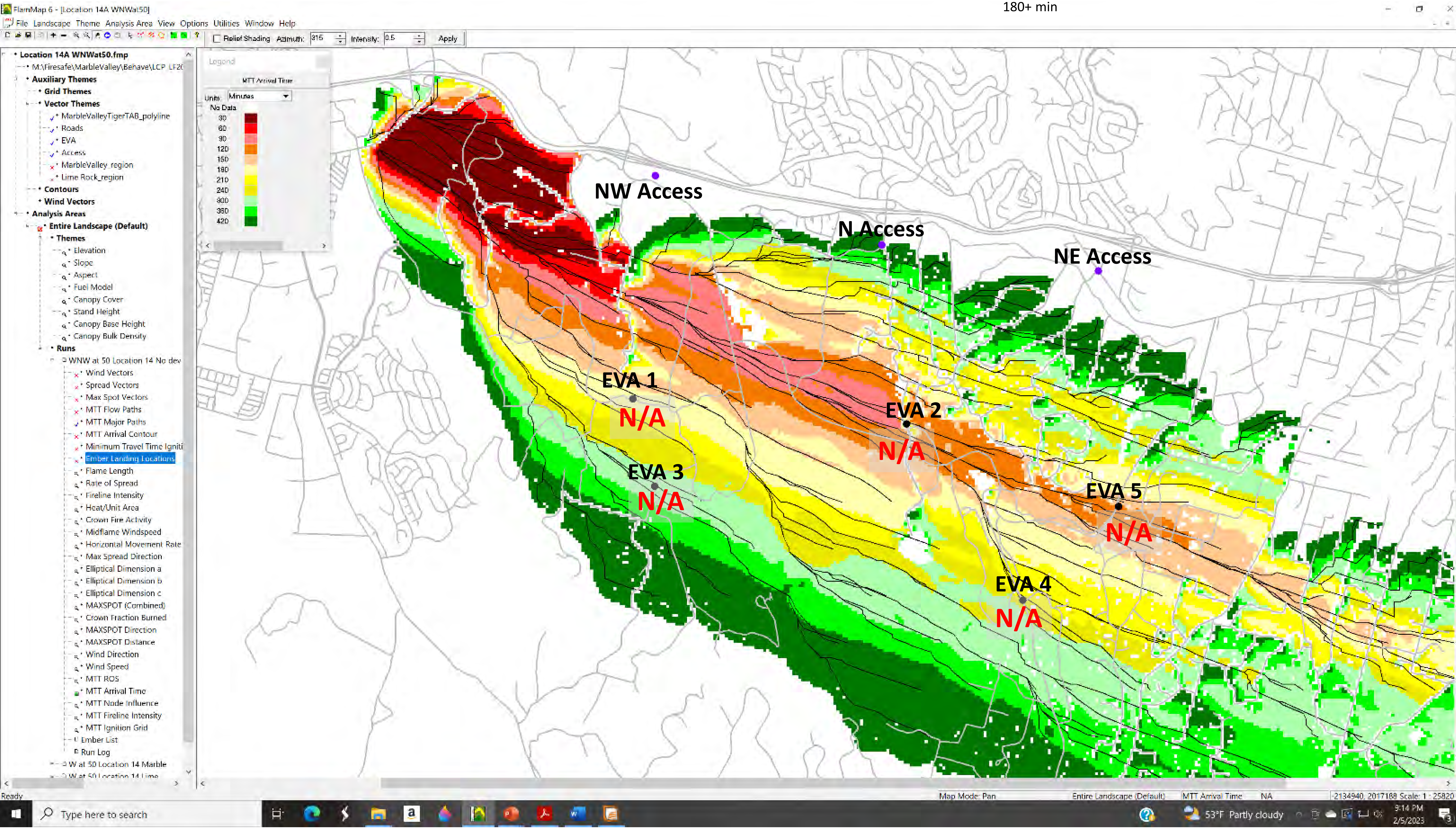
Location 14 W wind at 50 mph Lime – Scn 14C



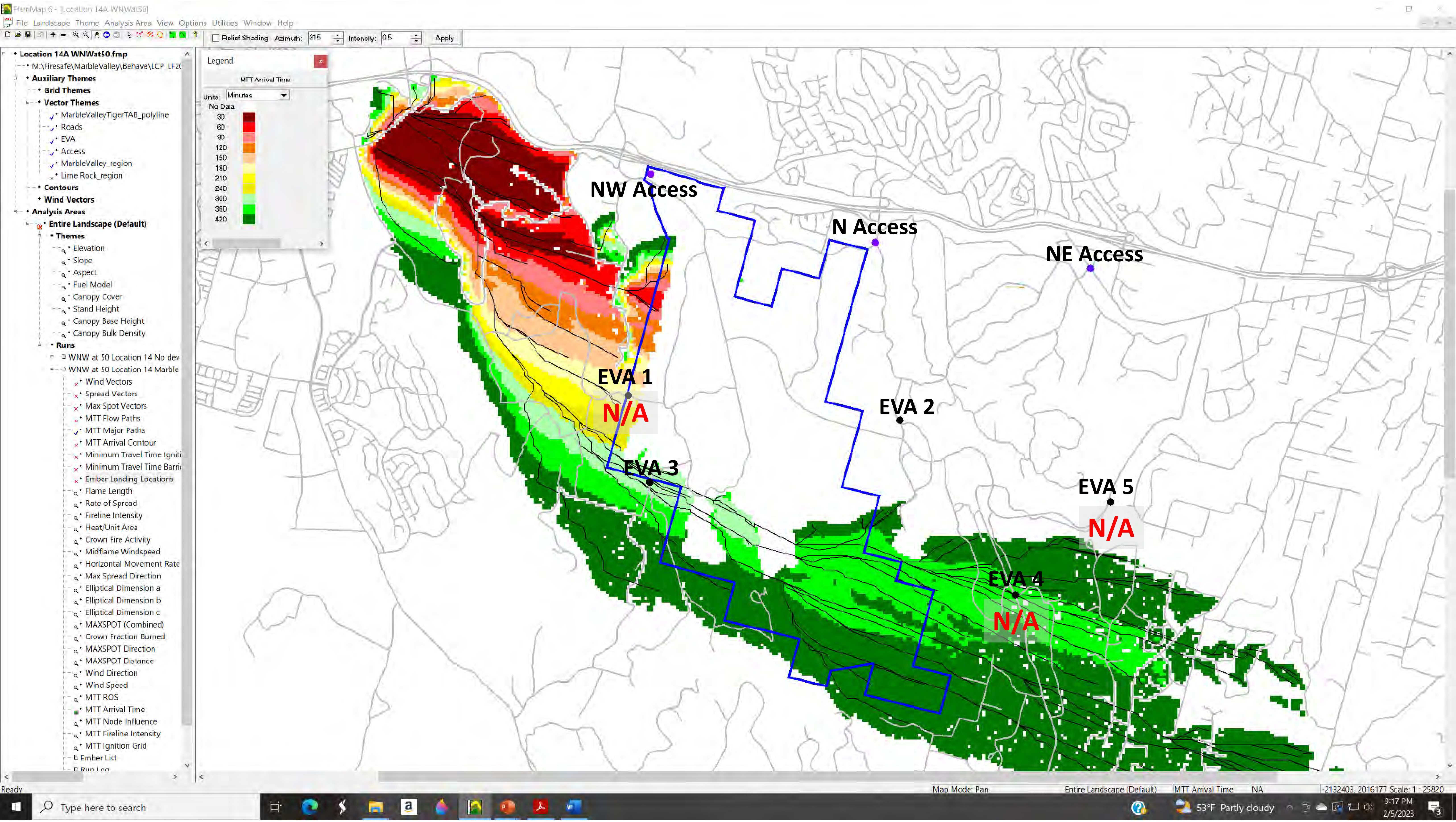
Location 14 W wind at 50 mph Both – Scn 14D



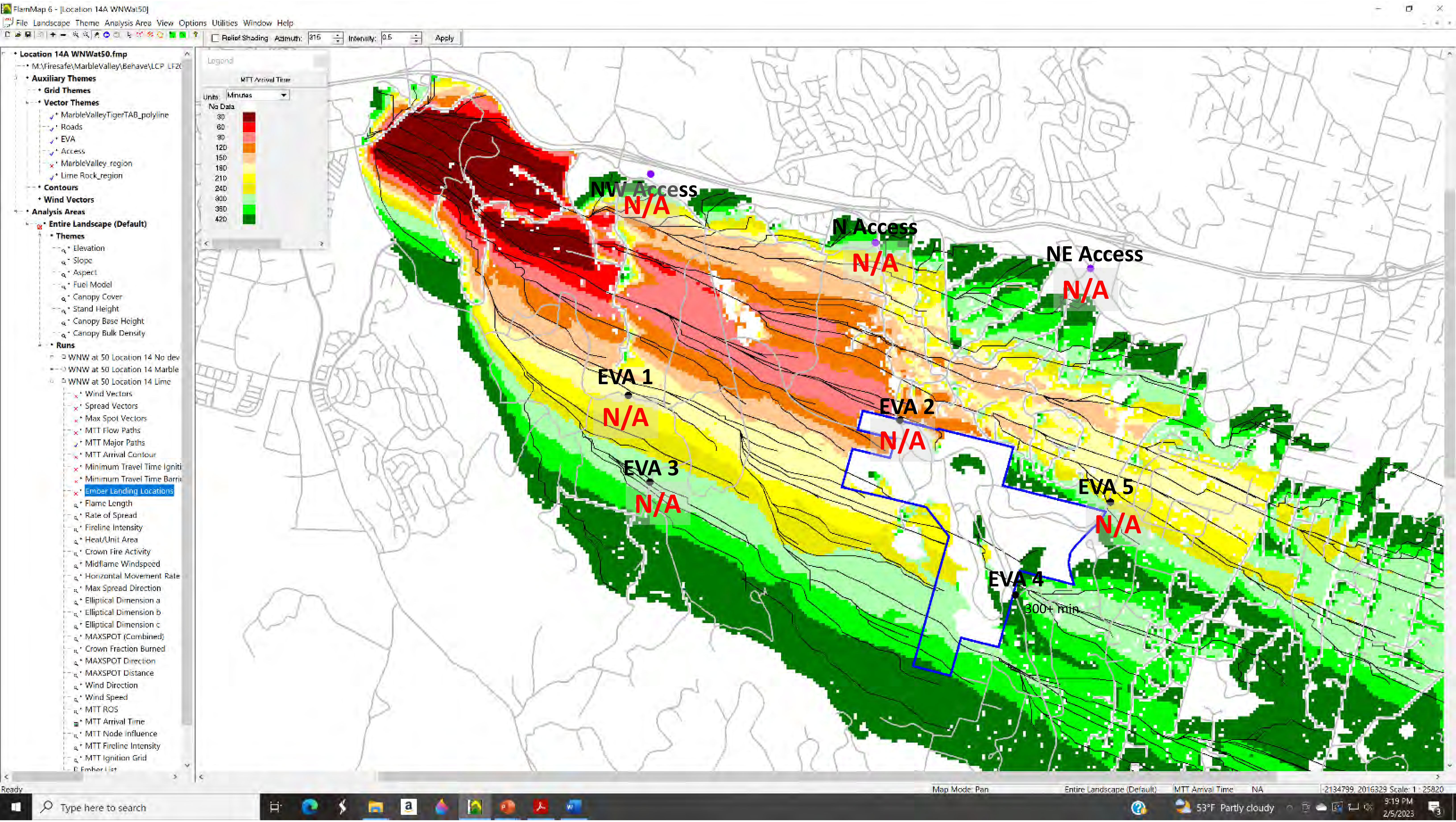
Location 14 WNW wind at 50 mph No Dev – Scn 14E



Location 14 WNW wind at 50 mph Marble – Scn 14F

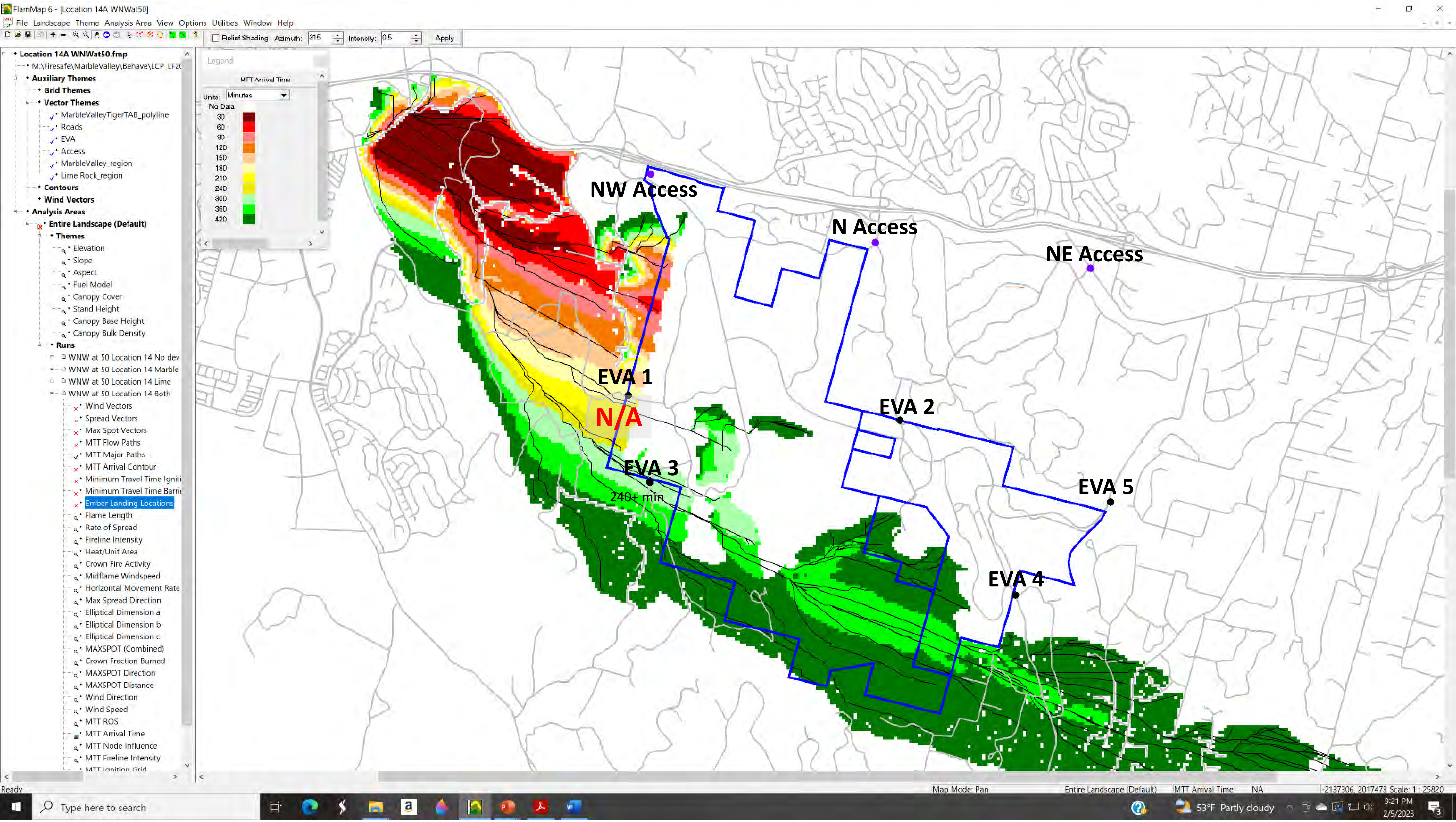


Location 14 WNW wind at 50 mph Lime – Scn 14G

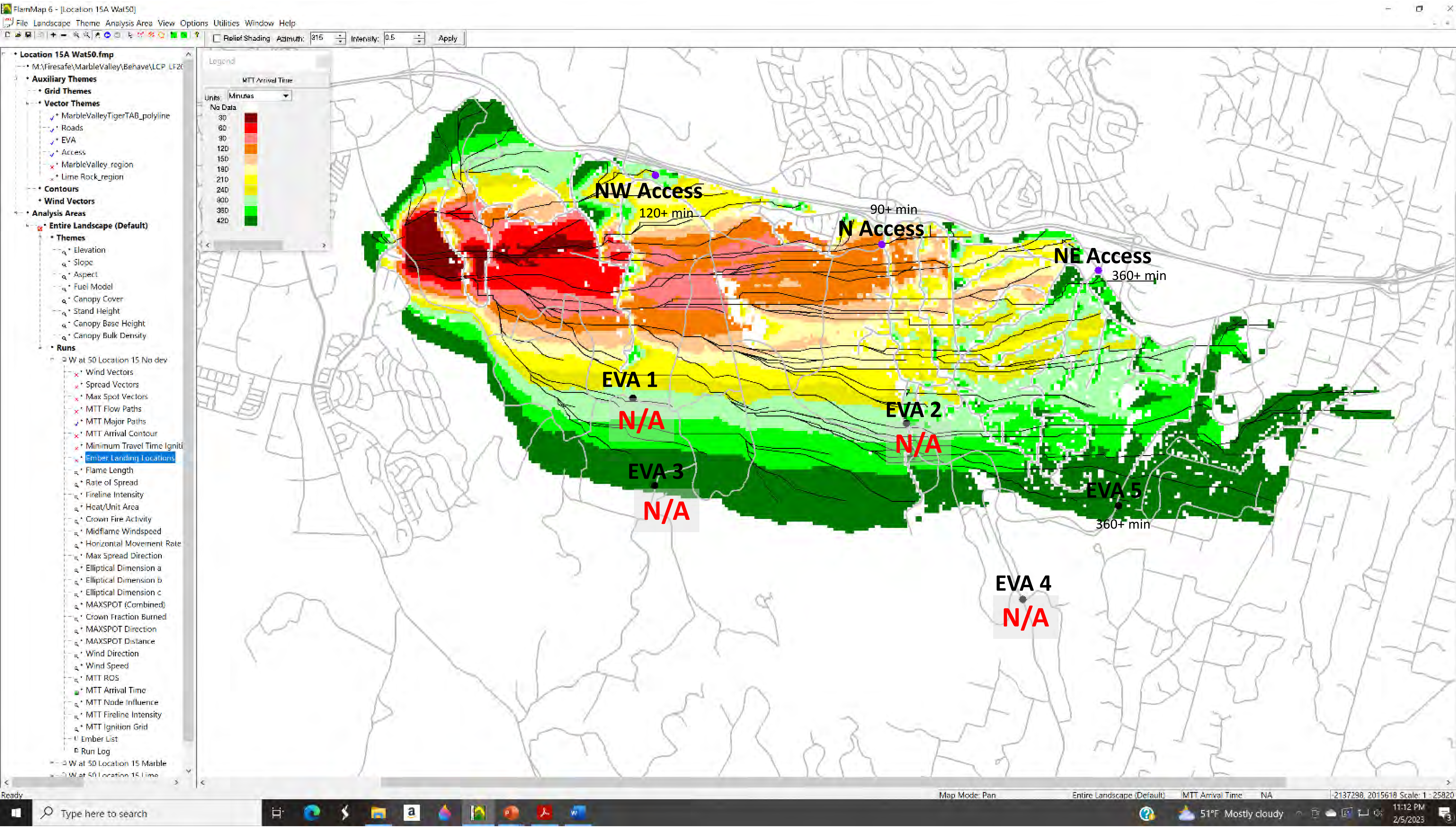


Location 14 WNW wind at 50 mph Both– Scn 14H

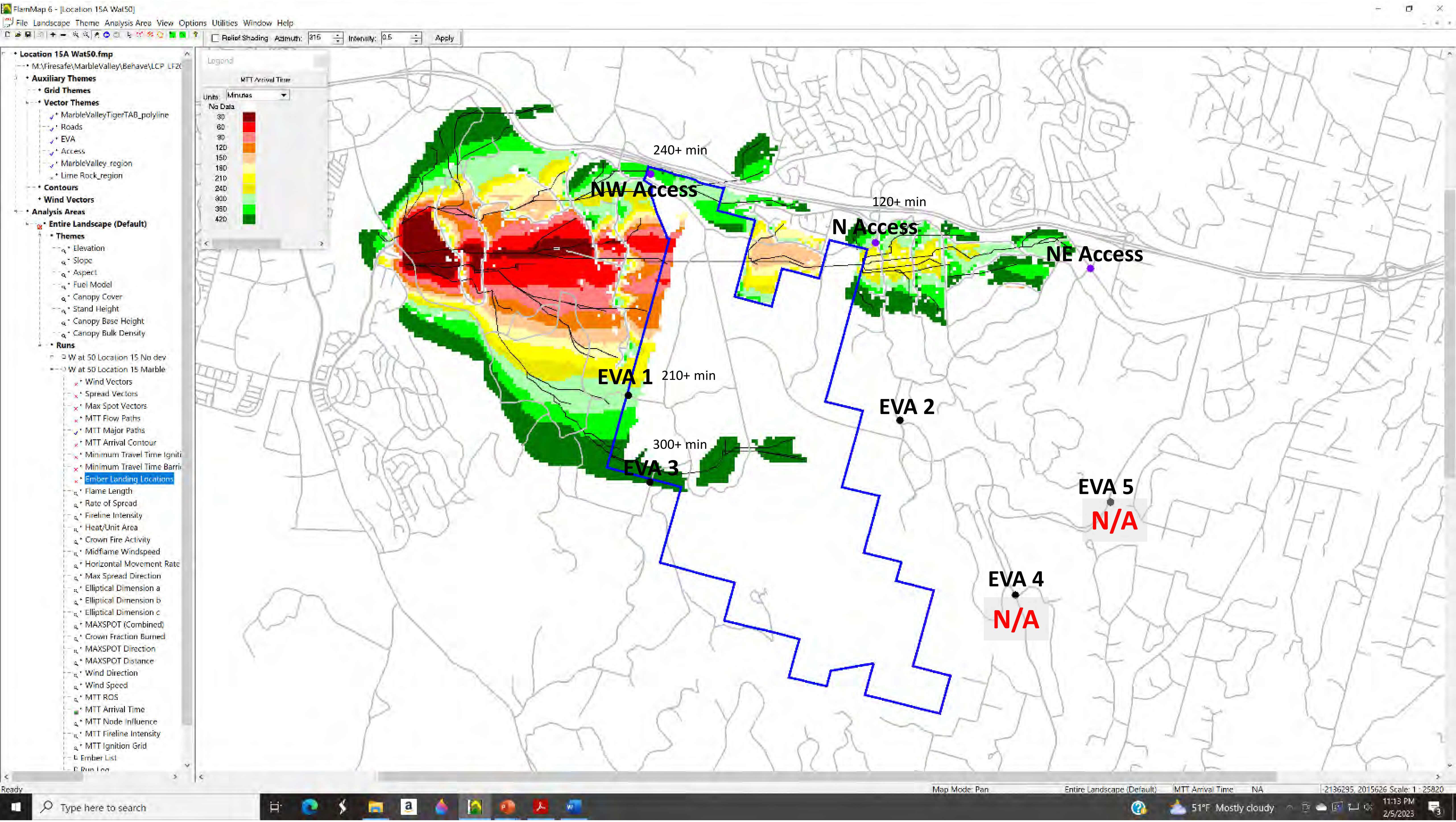
120+ min



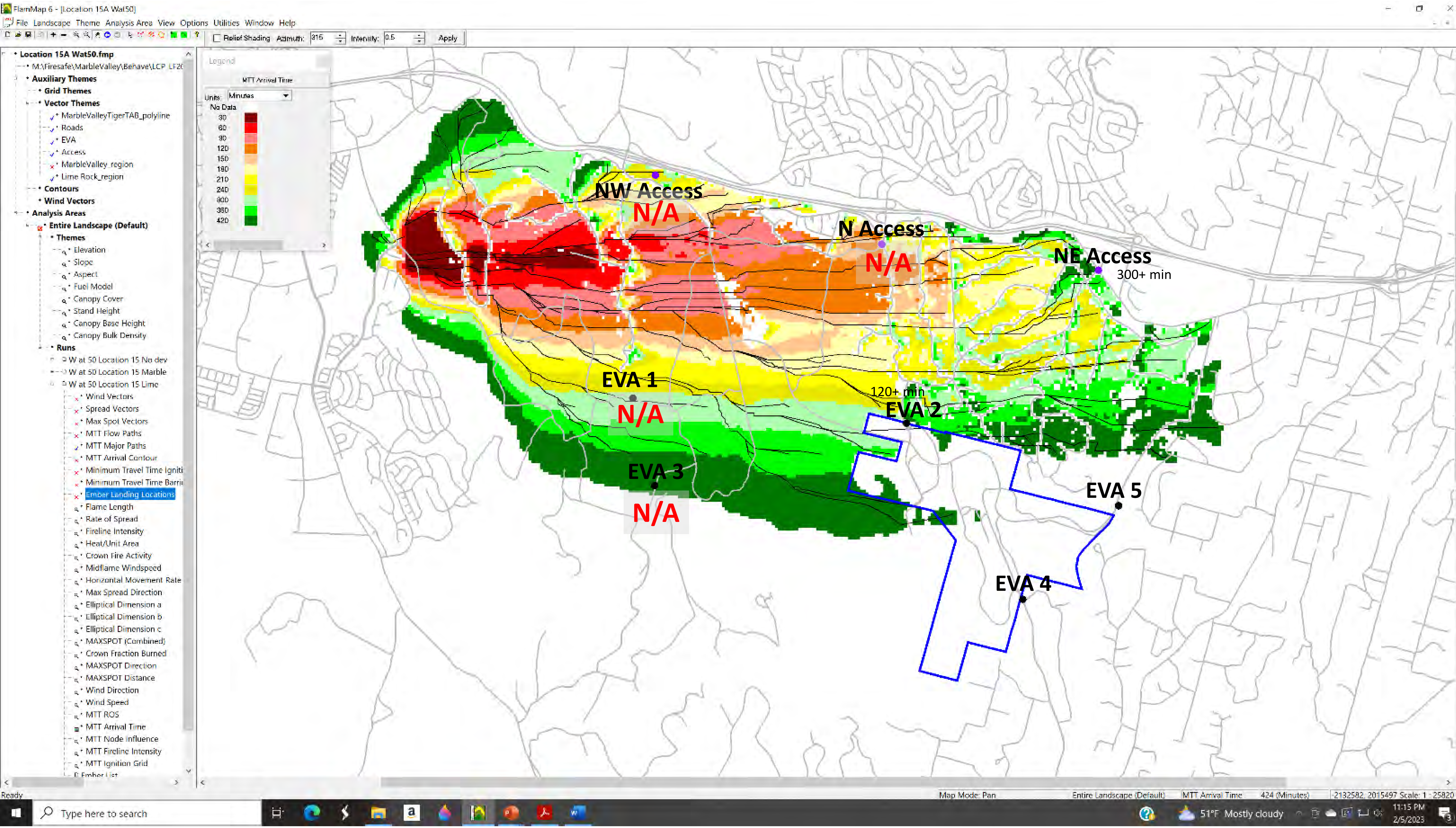
Location 15 W wind at 50 mph No Dev – Scn 15A



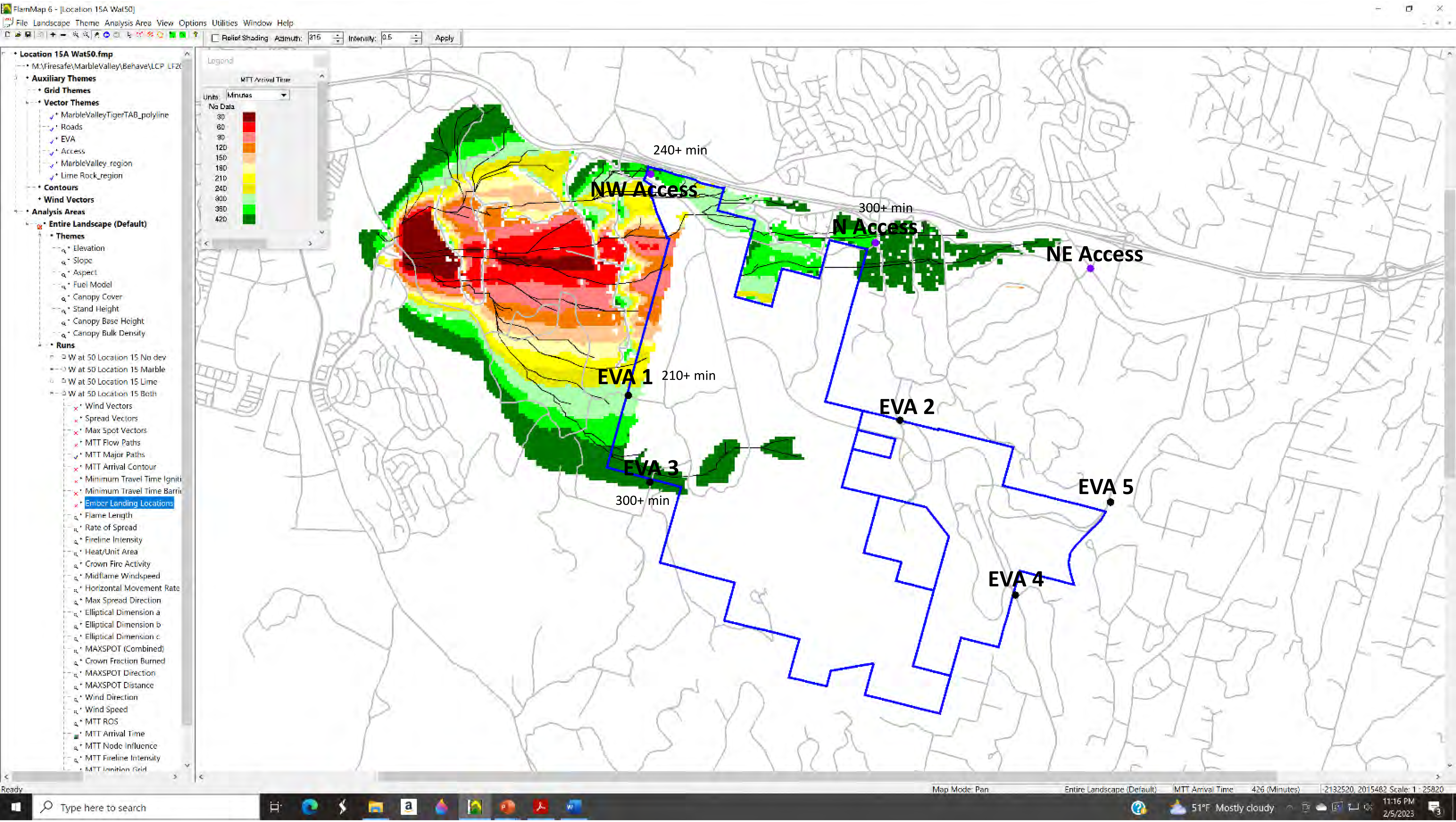
Location 15 W wind at 50 mph Marble – Scn 15B



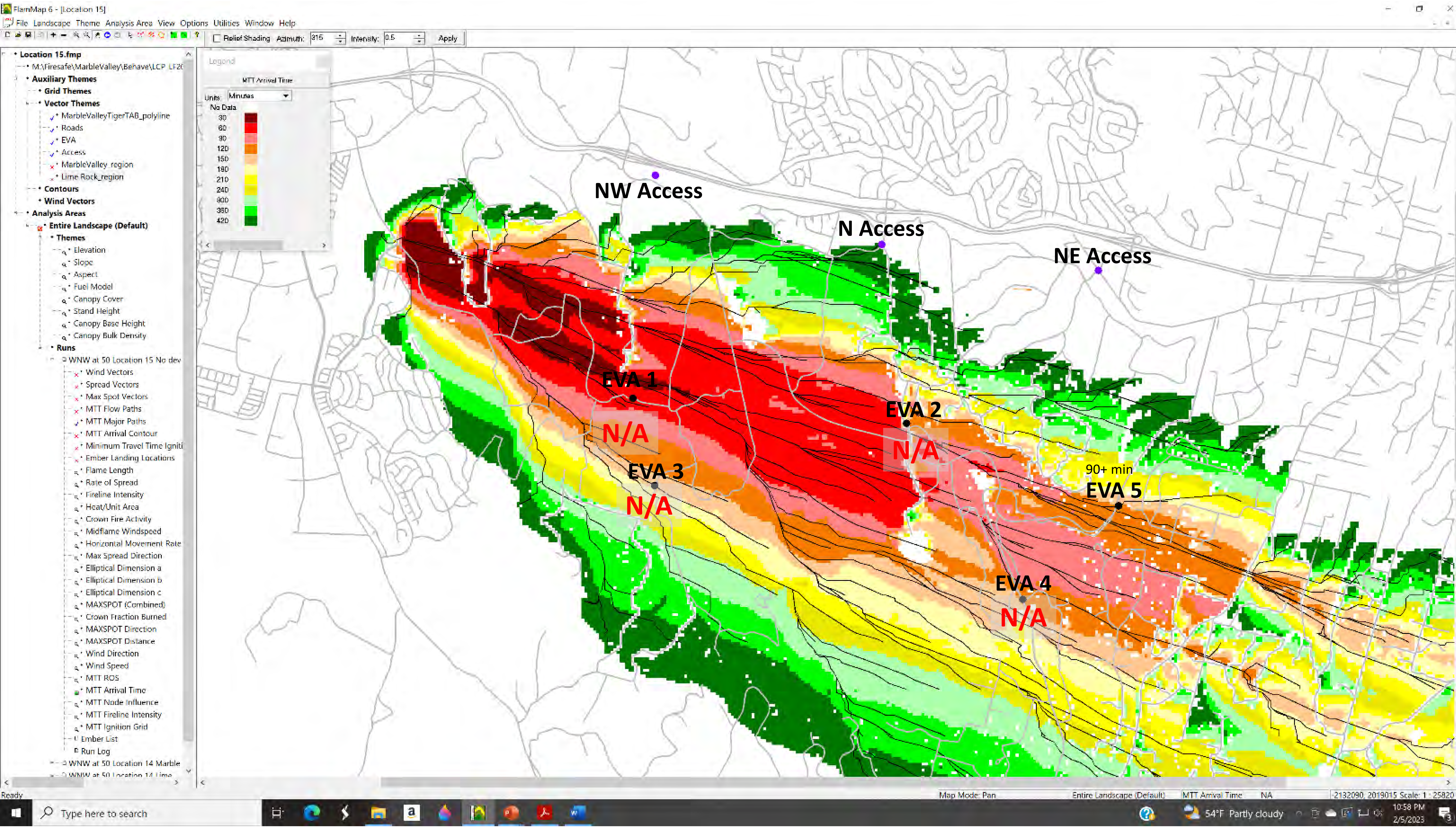
Location 15 W wind at 50 mph Lime – Scn 15C



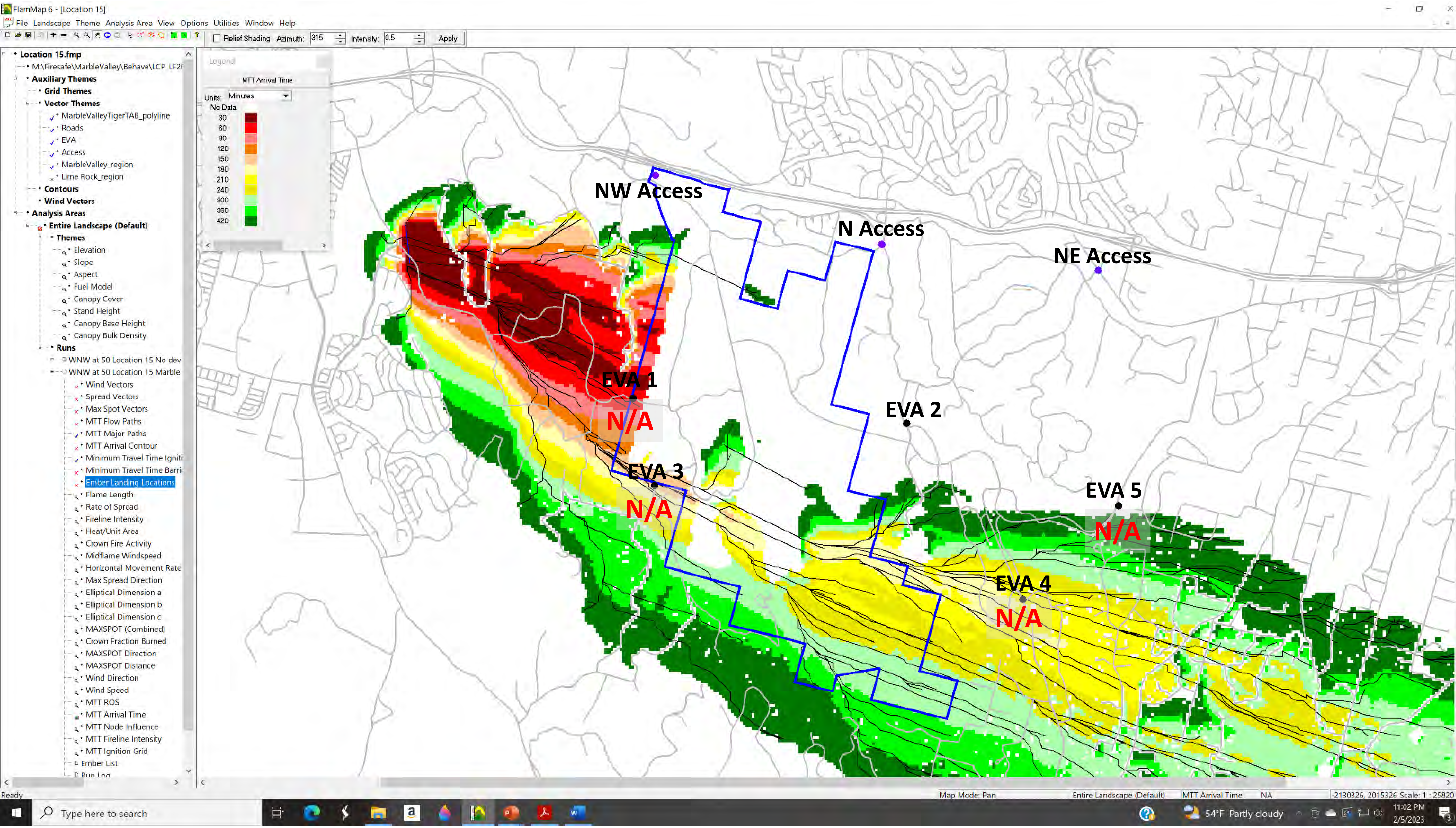
Location 15 W wind at 50 mph Both– Scn 15D



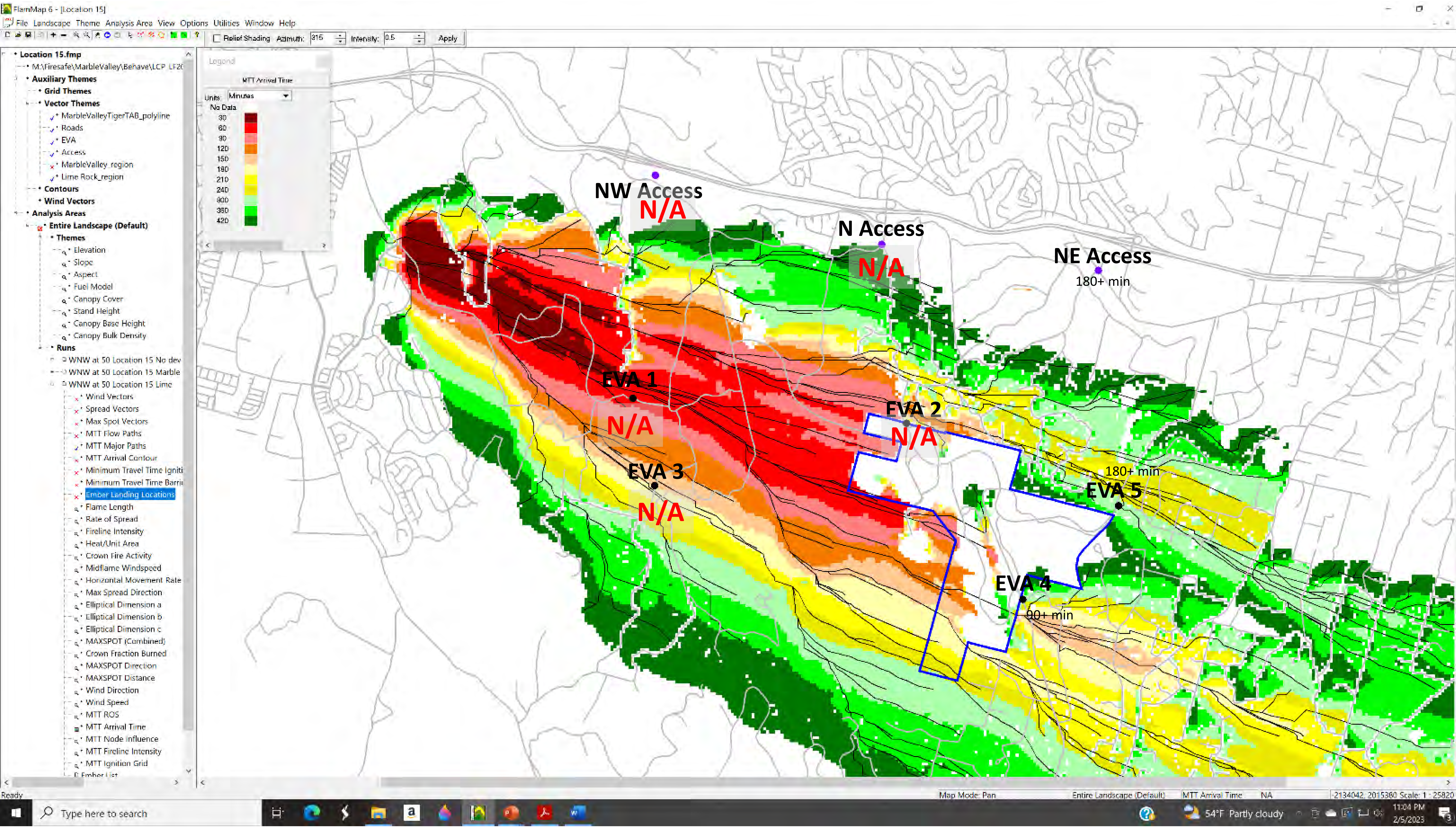
Location 15 WNW wind at 50 mph No Dev – Scn 15E



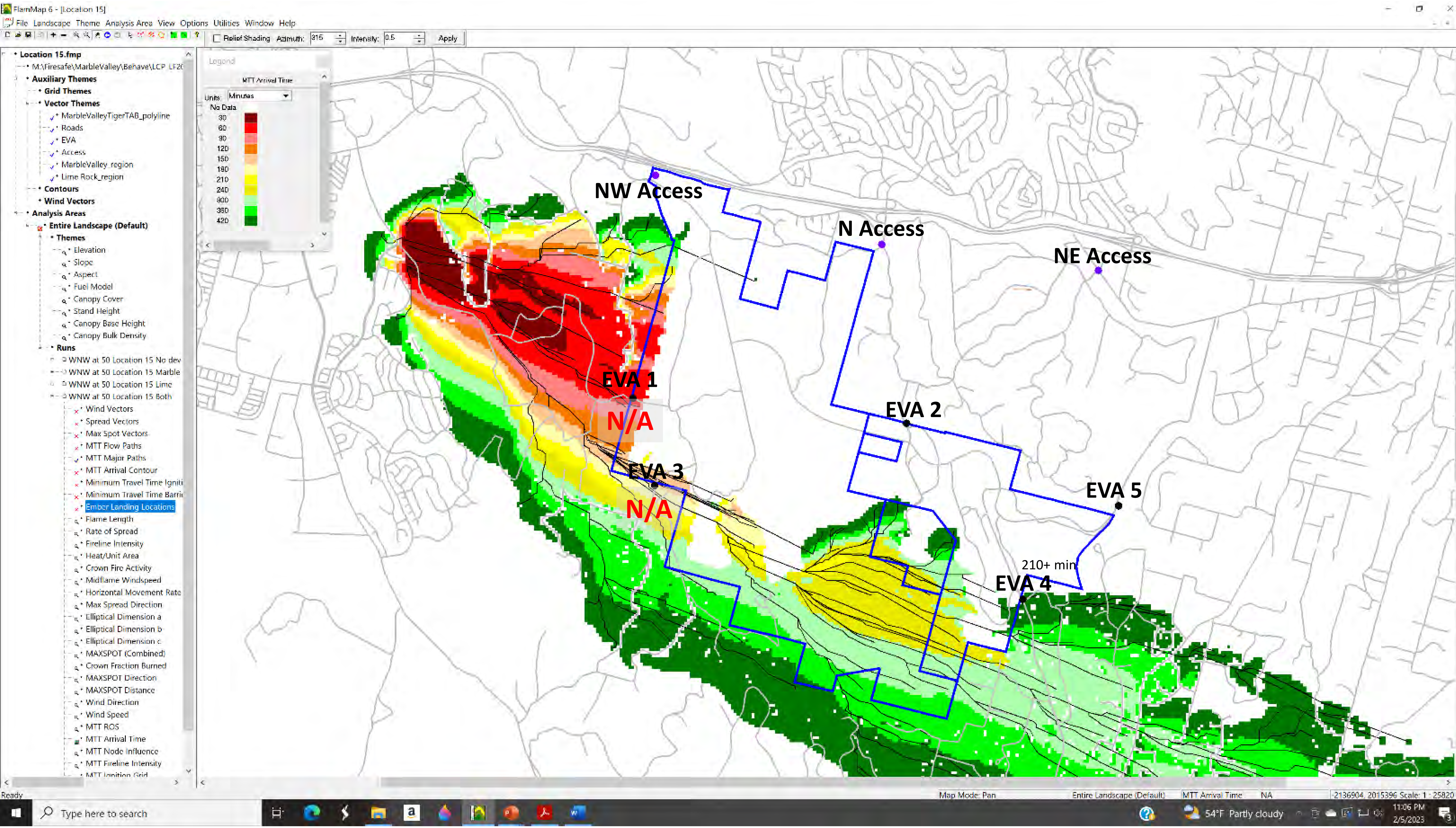
Location 15 WNW wind at 50 mph No Dev – Scn 15F



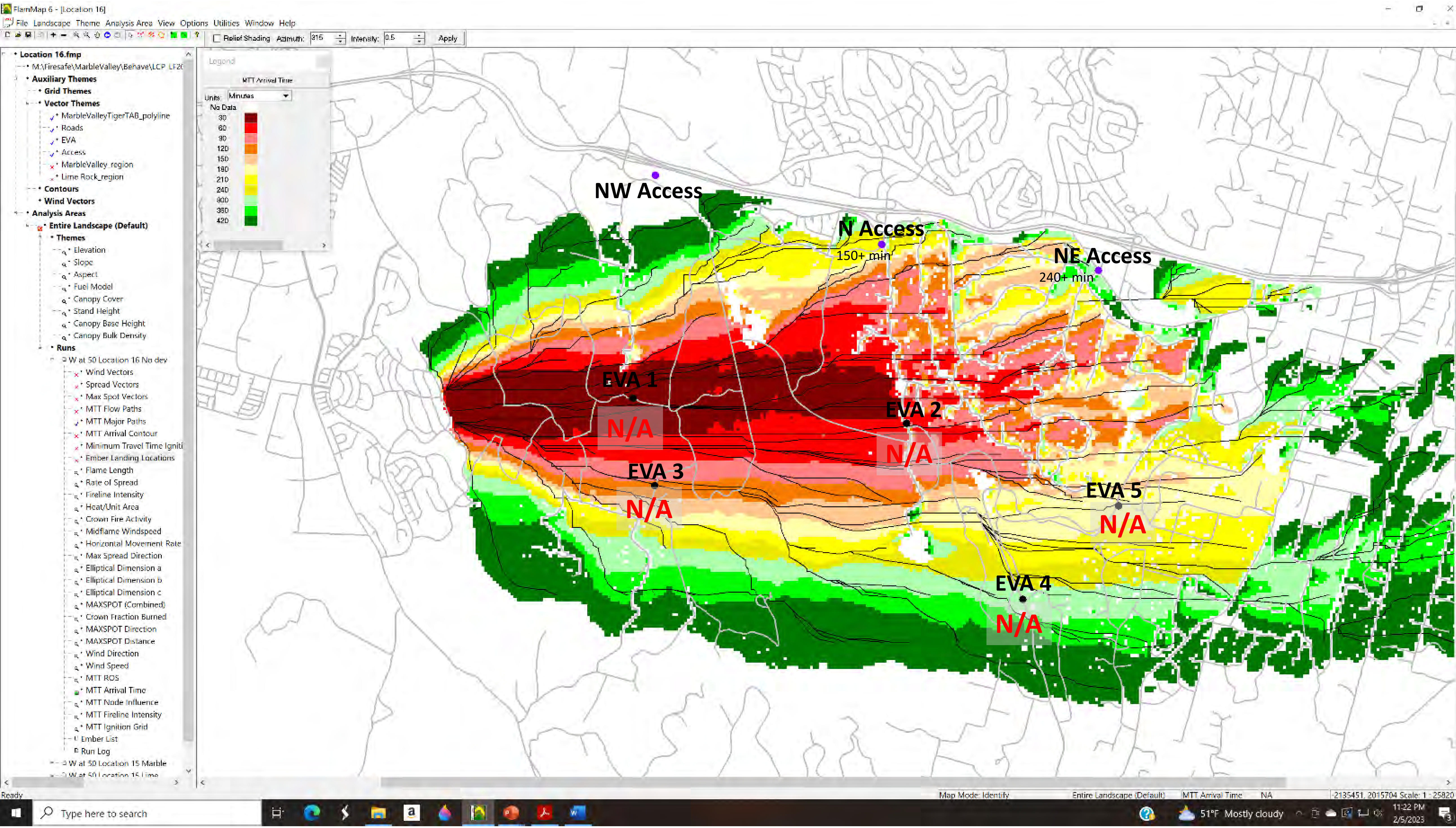
Location 15 WNW wind at 50 mph No Dev – Scn 15G



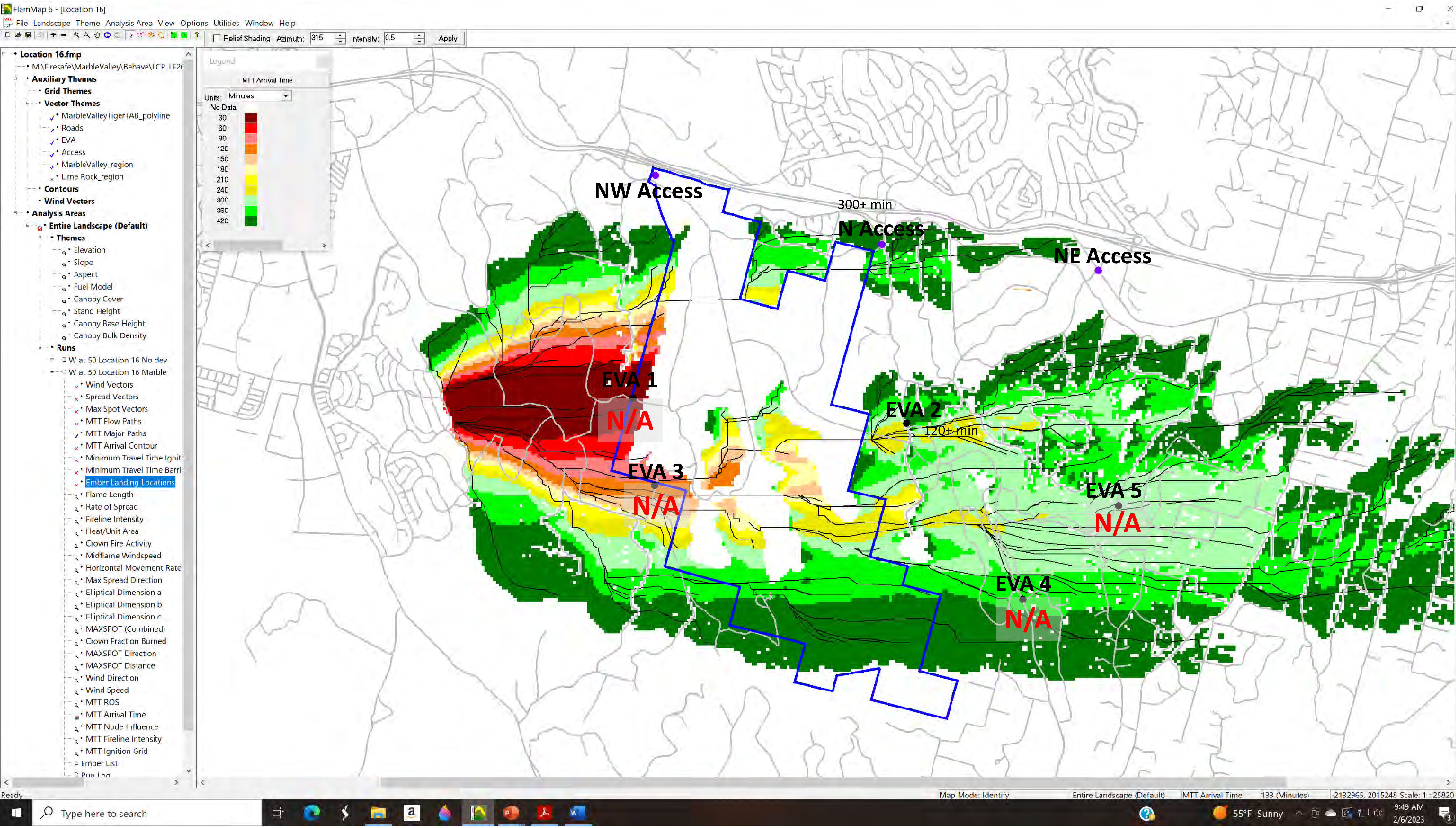
Location 15 WNW wind at 50 mph No Dev – Scn 15H



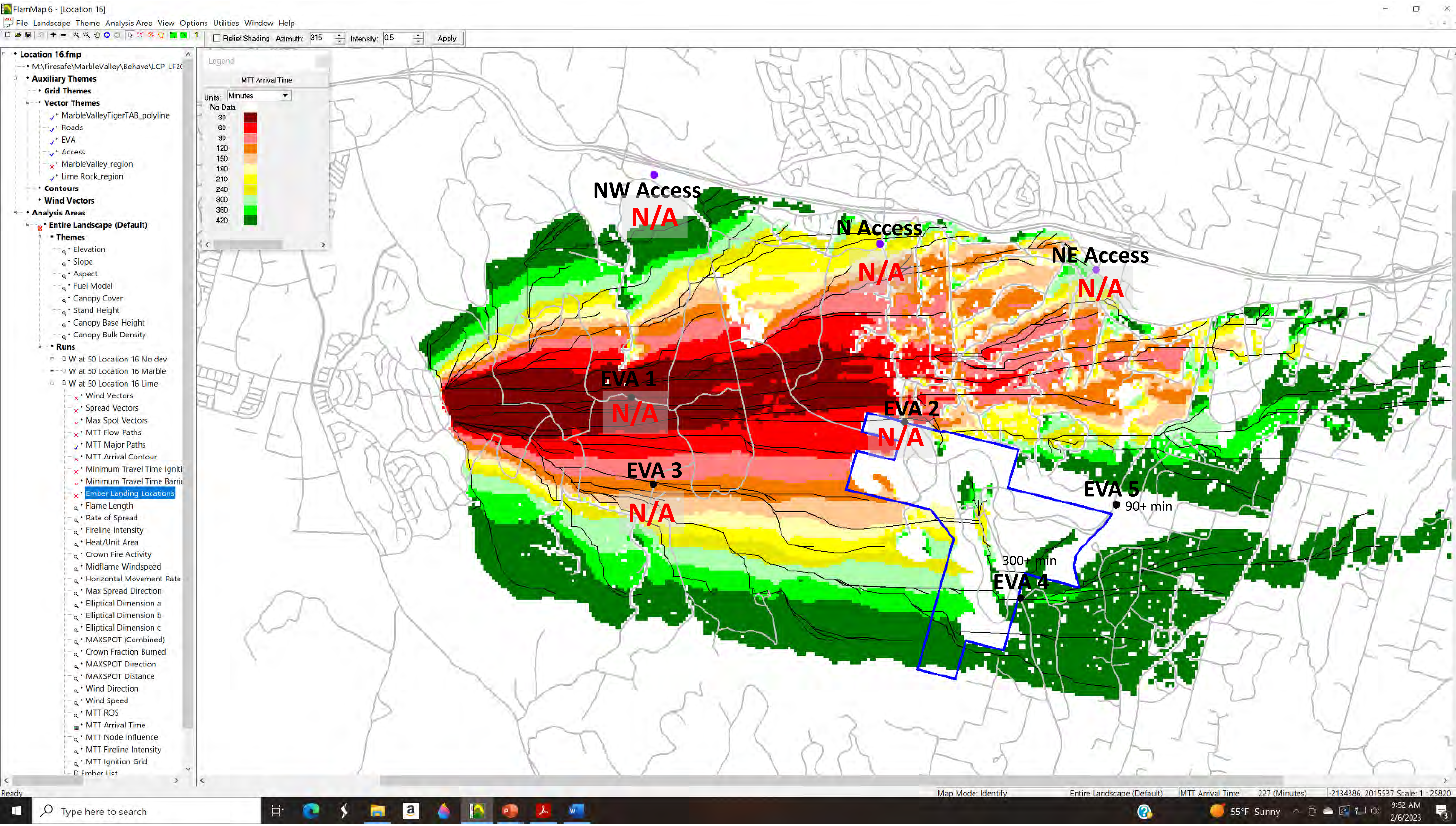
Location 16 W wind at 50 mph No Dev – Scn 16A



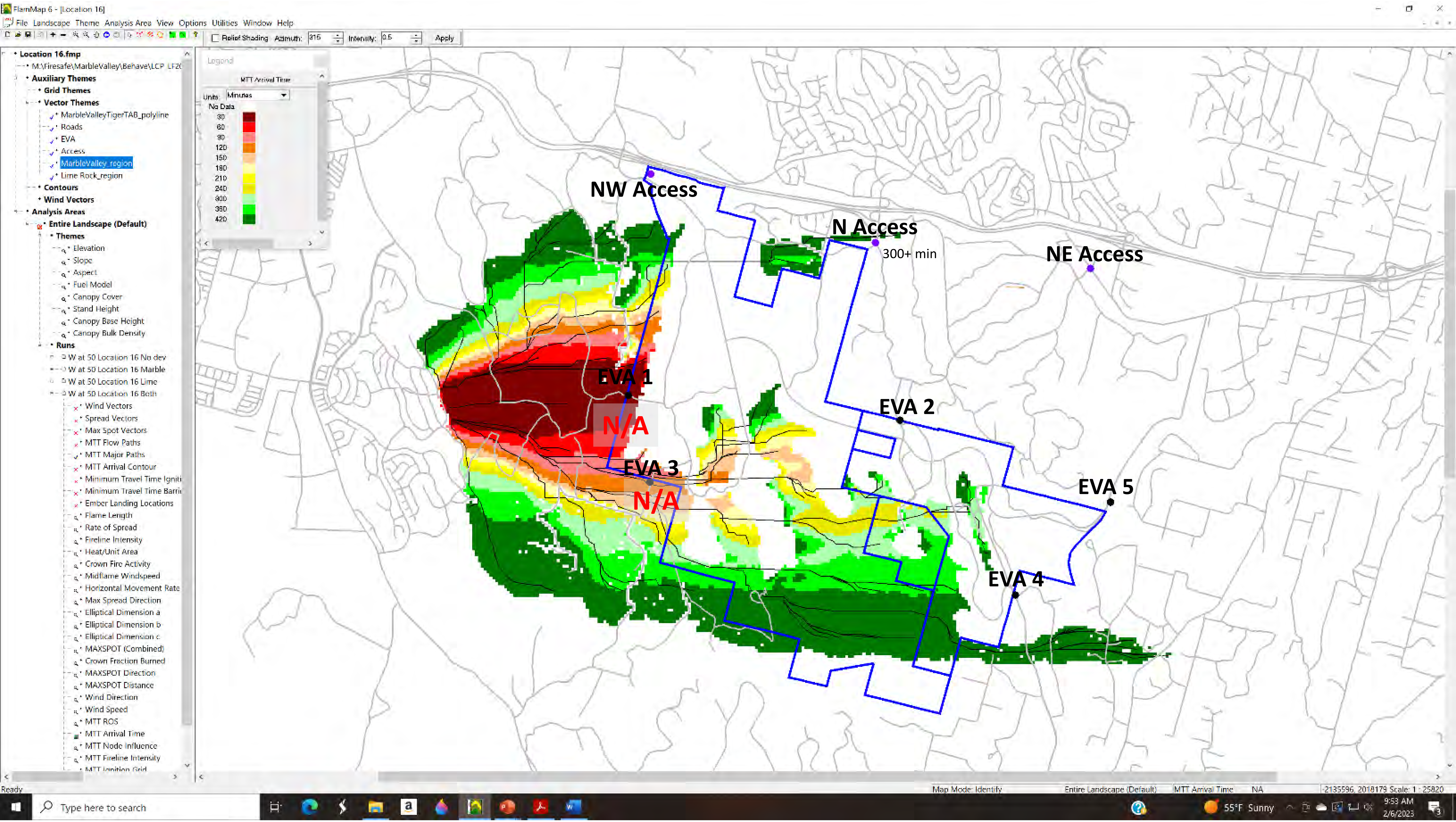
Location 16 W wind at 50 mph Marble – Scn 16B



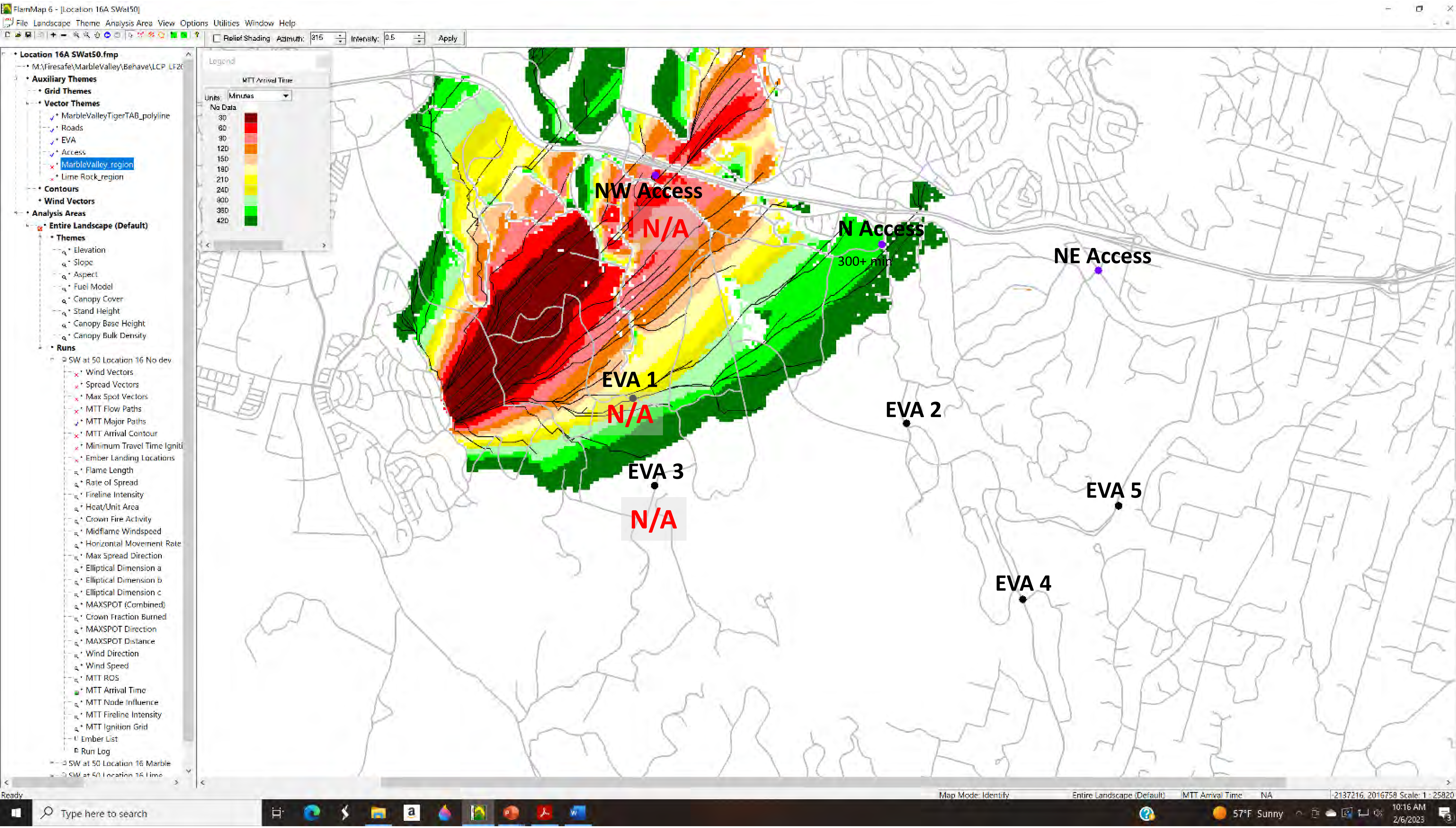
Location 16 W wind at 50 mph Lime – Scn 16C



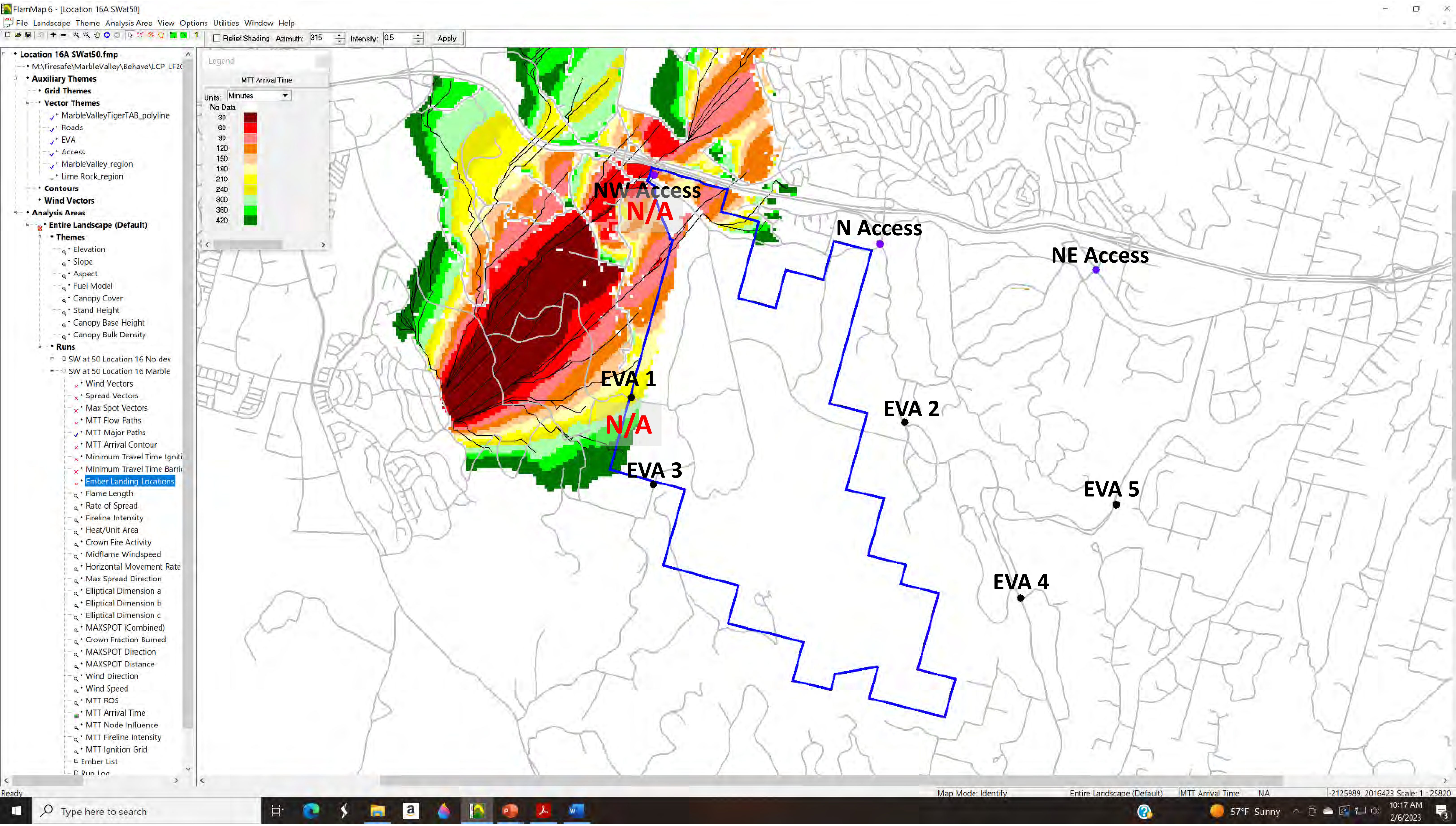
Location 16 W wind at 50 mph Both – Scn 16D



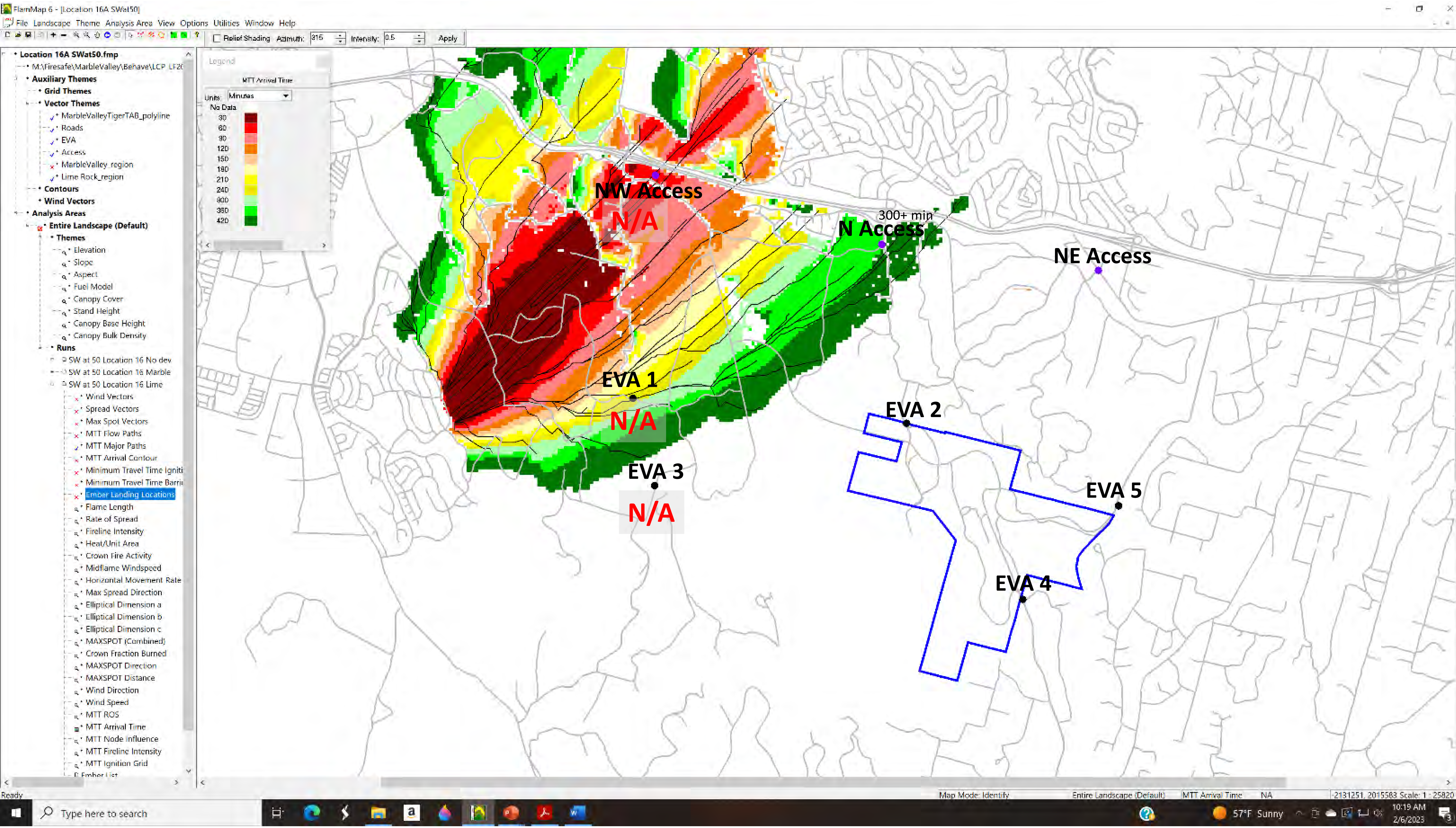
Location 16 SW wind at 50 mph No Dev – Scn 16E



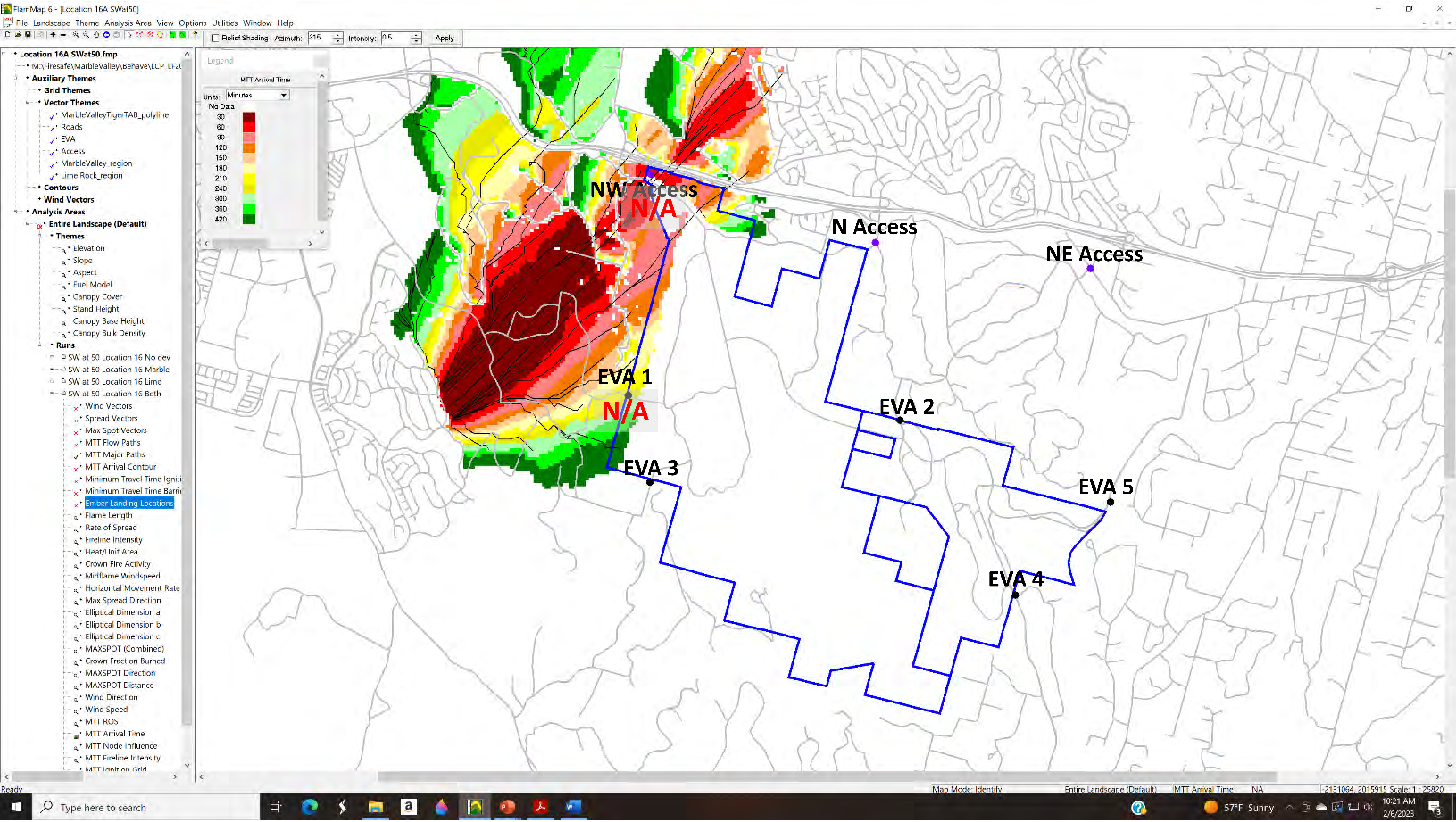
Location 16 SW wind at 50 mph Marble – Scn 16F



Location 16 SW wind at 50 mph Lime – Scn 16G



Location 16 SW wind at 50 mph Both – Scn 16H



Inputs: SURFACE

Description		Lime Rock Fuel Comparison

Fuel/Vegetation, Surface/Understory

Fuel Model		gr1, gr2, gr4, gs1, gs2, sh2, sh5, s

Fuel Moisture

1-h Fuel Moisture	%	3
10-h Fuel Moisture	%	4
100-h Fuel Moisture	%	5
Live Herbaceous Fuel Moisture	%	30
Live Woody Fuel Moisture	%	50

Weather

20-ft Wind Speed (upslope)	mi/h	0, 30, 40, 50, 65
Wind Adjustment Factor		0.5

Terrain

Slope Steepness	%	50

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].
Fire spread is in the HEADING direction only [SURFACE].
Wind is blowing upslope [SURFACE].
Wind and spread directions are degrees clockwise from north [SURFACE].
Wind direction is the direction from which the wind is blowing [SURFACE].

Output Variables

Surface Fire Rate of Spread (ch/h) [SURFACE]
Surface Fireline Intensity (Btu/ft/s) [SURFACE]
Surface Fire Flame Length (ft) [SURFACE]

Notes

Lime Rock Fuel Comparison

Head Fire

Surface Fire Rate of Spread (ch/h)

Fuel Model	20-ft Wind Speed (upslope) mi/h 0	30	40	50	65
gr1	12.4	27.3	27.3	27.3	27.3
gr2	26.7	244.3	244.3	244.3	244.3
gr4	53.6	679.4	1005.4	1287.8	1287.8
gs1	13.3	164.3	184.8	184.8	184.8
gs2	18.6	225.7	333.7	454.9	513.8
sh2	6.2	59.8	86.1	115.1	163.1
sh5	37.2	406.2	556.7	714.5	962.4
sh7	26.5	263.8	359.6	459.8	616.9
tu4	9.7	116.8	180.3	254.5	383.9
tu5	7.7	55.5	74.7	94.8	126.3
tl1	0.7	1.4	1.4	1.4	1.4
tl2	1.0	3.7	3.7	3.7	3.7
tl3	1.3	5.2	5.2	5.2	5.2
tl4	1.8	10.0	10.0	10.0	10.0
tl5	3.1	28.9	36.9	36.9	36.9
tl6	4.2	42.2	62.8	86.2	95.5
tl8	4.5	38.7	56.1	75.6	108.1
SCAL14	11.6	89.7	113.8	137.5	172.4
SCAL15	13.3	122.0	160.9	200.4	260.7
SCAL16	19.7	188.5	250.5	313.9	411.0
SCAL17	21.0	242.5	350.8	470.3	667.1

66 feet to the chain/80 chains to the mile

gr4 is traveling 16 mph in a 50 mph wind
sh5 is traveling 12 mph in a 65 mph wind

Lime Rock Fuel Comparison

Head Fire

Surface Fireline Intensity (Btu/ft/s)

Fuel Model	20-ft Wind Speed (upslope) mi/h 0	30	40	50	65
gr1	20	44	44	44	44
gr2	127	1165	1165	1165	1165
gr4	496	6287	9304	11917	11917
gs1	86	1058	1190	1190	1190
gs2	196	2372	3506	4779	5398
sh2	169	1623	2338	3126	4428
sh5	1315	14373	19697	25281	34052
sh7	1267	12609	17190	21982	29492
tu4	232	2776	4285	6049	9126
tu5	431	3103	4177	5299	7056
tl1	2	3	3	3	3
tl2	3	12	12	12	12
tl3	5	22	22	22	22
tl4	9	53	53	53	53
tl5	24	222	283	283	283
tl6	41	413	614	843	933
tl8	68	590	857	1155	1651
SCAL14	814	6295	7983	9643	12093
SCAL15	422	3882	5121	6380	8299
SCAL16	783	7489	9952	12471	16330
SCAL17	337	3888	5626	7540	10696

Lime Rock Fuel Comparison

Head Fire

Surface Fire Flame Length (ft)

Fuel Model	20-ft Wind Speed (upslope) mi/h 0	30	40	50	65
gr1	1.8	2.6	2.6	2.6	2.6
gr2	4.2	11.6	11.6	11.6	11.6
gr4	7.8	25.1	30.1	33.7	33.7
gs1	3.5	11.1	11.7	11.7	11.7
gs2	5.1	16.1	19.2	22.2	23.4
sh2	4.8	13.5	16.0	18.2	21.4
sh5	12.2	36.8	42.5	47.7	54.7
sh7	12.0	34.6	39.9	44.7	51.2
tu4	5.5	17.3	21.1	24.7	29.8
tu5	7.3	18.2	20.8	23.2	26.5
tl1	0.6	0.8	0.8	0.8	0.8
tl2	0.8	1.4	1.4	1.4	1.4
tl3	1.0	1.9	1.9	1.9	1.9
tl4	1.3	2.8	2.8	2.8	2.8
tl5	1.9	5.4	6.0	6.0	6.0
tl6	2.5	7.2	8.6	10.0	10.5
tl8	3.1	8.5	10.1	11.5	13.6
SCAL14	9.8	25.2	28.1	30.6	34.0
SCAL15	7.3	20.1	22.9	25.3	28.6
SCAL16	9.6	27.3	31.1	34.5	39.0
SCAL17	6.5	20.2	23.9	27.3	32.1

Discrete Variable Codes Used
Lime Rock Fuel Comparison

Fuel Model

101	gr1	Short, sparse, dry climate grass (D)
102	gr2	Low load, dry climate grass (D)
104	gr4	Moderate load, dry climate grass (D)
121	gs1	Low load, dry climate grass-shrub (D)
122	gs2	Moderate load, dry climate grass-shrub (D)
142	sh2	Moderate load, dry climate shrub (S)
145	sh5	High load, dry climate shrub (S)
147	sh7	Very high load, dry climate shrub (S)
164	tu4	Dwarf conifer understory (S)
165	tu5	Very high load, dry climate timber-shrub (S)
181	tl1	Low load, compact conifer litter (S)
182	tl2	Low load broadleaf litter (S)
183	tl3	Moderate load conifer litter (S)
184	tl4	Small downed logs (S)
185	tl5	High load conifer litter (S)
186	tl6	High load broadleaf litter (S)
188	tl8	Long-needle litter (S)
14	SCAL14	Manzanita
15	SCAL15	Chamise 1
16	SCAL16	North Slope Ceanothus
17	SCAL17	Chamise 2

Fuel model parameters / **Dead Component Calculation**

Fuel Model Code	Fuel Model Number	Climate	Fuel load (t/ac) 1-hr	10-hr	100-hr	Live herb	Live woody	Fuel model type[a]	SAV ratio (1/ft)[b] Dead 1-hr	Live herb	Live woody	Fuel bed depth (ft)	Dead fuel extinction moisture (percent)	Heat content BTU/lb)[c]	Fuel Model Code	Dead	100% Transfer Herb	Dead load	Total Load	Percentage ıd Component
SCAL14	N/A	N/A	3.00	4.50	1.05	1.45	5.00	static	350	1500	250	3.0	15	9211	SCAL14	8.55	no transfer	8.55	15.00	57%
SCAL15	N/A	N/A	2.00	3.00	1.00	0.50	2.00	static	640	220	640	3.0	13	10000	SCAL15	6.00	no transfer	6.00	8.50	71%
SCAL16	N/A	N/A	2.25	4.80	1.80	3.00	2.85	static	500	1500	500	6.0	15	8000	SCAL16	8.85	no transfer	8.85	14.70	60%
SCAL17	N/A	N/A	1.30	1.00	1.00	2.00	2.00	static	640	2200	640	4.0	20	8000	SCAL17	3.30	no transfer	3.30	7.30	45%
GR1	101	Dry	0.10	0.00	0.00	0.30	0.00	dynamic	2200	2000	9999	0.4	15	8000	GR1	0.10	0.30	0.19	0.40	48%
GR2	102	Dry	0.10	0.00	0.00	1.00	0.00	dynamic	2000	1800	9999	1.0	15	8000	GR2	0.10	1.00	1.10	1.10	100%
GR4	104	Dry	0.25	0.00	0.00	1.90	0.00	dynamic	2000	1800	9999	2.0	15	8000	GR4	0.25	1.90	2.15	2.15	100%
GS1	121	Dry	0.20	0.00	0.00	0.50	0.65	dynamic	2000	1800	1800	0.9	15	8000	GS1	0.20	0.50	0.45	1.35	33%
GS2	122	Dry	0.50	0.50	0.00	0.60	1.00	dynamic	2000	1800	1800	1.5	15	8000	GS2	1.00	0.60	1.36	2.60	52%
SH1	141	Dry	0.25	0.25	0.00	0.15	1.30	dynamic	2000	1800	1600	1.0	15	8000	SH1	0.50	0.15	0.52	1.95	27%
SH2	142	Dry	1.35	2.40	0.75	0.00	3.85	static	2000	9999	1600	1.0	15	8000	SH2	4.50	no transfer	4.50	8.35	54%
SH5	145	Dry	3.60	2.10	0.00	0.00	2.90	static	750	9999	1600	6.0	15	8000	SH5	5.70	no transfer	5.70	8.60	66%
SH7	147	Dry	3.50	5.30	2.20	0.00	3.40	static	750	9999	1600	6.0	15	8000	SH7	11.00	no transfer	11.00	14.40	76%
TU1	161	Dry	0.20	0.90	1.50	0.20	0.90	dynamic	2000	1800	1600	0.6	20	8000	TU1	2.60	0.20	2.64	3.70	71%
TU4	164	Dry	4.50	0.00	0.00	0.00	2.00	static	2300	9999	2000	0.5	12	8000	TU4	4.50	no transfer	4.50	6.50	69%
TU5	165	Dry	4.00	4.00	3.00	0.00	3.00	static	1500	9999	750	1.0	25	8000	TU5	11.00	no transfer	11.00	14.00	79%
TL1	181	N/A	1.00	2.20	3.60	0.00	0.00	static	2000	9999	9999	0.2	30	8000	TL1	6.80	no transfer	6.80	6.80	100%
TL2	182	N/A	1.40	2.30	2.20	0.00	0.00	static	2000	9999	9999	0.2	25	8000	TL2	5.90	no transfer	5.90	5.90	100%
TL3	183	N/A	0.50	2.20	2.80	0.00	0.00	static	2000	9999	9999	0.3	20	8000	TL3	5.50	no transfer	5.50	5.50	100%
TL4	184	N/A	0.50	1.50	4.20	0.00	0.00	static	2000	9999	9999	0.4	25	8000	TL4	6.20	no transfer	6.20	6.20	100%
TL5	185	N/A	1.15	2.50	4.40	0.00	0.00	static	2000	9999	1600	0.6	25	8000	TL5	8.05	no transfer	8.05	8.05	100%
TL6	186	N/A	2.40	1.20	1.20	0.00	0.00	static	2000	9999	9999	0.3	25	8000	TL6	4.80	no transfer	4.80	4.80	100%
TL8	188	N/A	5.80	1.40	1.10	0.00	0.00	static	1800	9999	9999	0.3	35	8000	TL8	8.30	no transfer	8.30	8.30	100%

Only three fuel models have fuel bed depths over 4 foot.

Inputs: SURFACE

Description		Chaparral Fuel Scenario Worst Case

Fuel/Vegetation, Surface/Understory

Chaparral Fuel Bed Depth	ft	8
Chaparral Dead Load Fraction	%	32, 33, 34, 35, 36, 40, 41, 42, 43,
Chaparral Total Fuel Load	ton/ac	25, 28, 29, 31

Fuel Moisture

1-h Fuel Moisture	%	3
10-h Fuel Moisture	%	4
100-h Fuel Moisture	%	5
Live Herbaceous Fuel Moisture	%	30
Live Woody Fuel Moisture	%	50

Weather

20-ft Wind Speed	mi/h	65
Wind Adjustment Factor		0.5
Wind Direction (from north)	deg	45

Terrain

Slope Steepness	%	50
Site Aspect	deg	45

Run Option Notes

Maximum effective wind speed limit IS imposed [SURFACE].

A special case fuel model is used: chaparral (Rothermel and Philpot 1973) [SURFACE].

Fire spread is in the HEADING direction only [SURFACE].

Wind is in specified directions [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

Output Variables

Surface Fire Rate of Spread (ft/min) [SURFACE]

Surface Fireline Intensity (kW/m) [SURFACE]

Surface Fire Flame Length (ft) [SURFACE]

Surface Fire Dir of Max Spread (from north) (deg) [SURFACE]

Chaparral Total Dead Fuel Load (ton/ac) [SURFACE]

Chaparral Fuel Scenario Worst Case

Head Fire

Surface Fire Rate of Spread (ft/min)

Chaparral Fuel Dead Load Fraction %	Chaparral Total Fuel Load ton/ac 25	28	29	31
32	719.0	712.7	710.6	706.5
33	717.4	711.2	709.2	705.1
34	715.1	709.0	706.9	702.9
35	711.9	705.9	703.9	699.9
36	707.9	702.0	700.0	696.1
40	683.6	678.3	676.6	673.1
41	675.5	670.5	668.8	665.3
42	666.7	661.8	660.1	656.9
43	657.0	652.3	650.8	647.6
44	646.5	642.1	640.6	637.6
45	635.3	631.1	629.7	626.9
46	623.2	619.3	618.0	615.3
47	610.3	606.8	605.6	603.1
48	596.7	593.4	592.3	590.0
49	582.2	579.3	578.3	576.2
50	566.8	564.3	563.4	561.5

Chaparral Fuel Scenario Worst Case

Head Fire

Surface Fireline Intensity (kW/m)

Chaparral Fuel Dead Load Fraction	Chaparral Total Fuel Load ton/ac			
%	25	28	29	31
32	81327	92797	96604	104181
33	82535	94220	98100	105824
34	83627	95515	99464	107328
35	84600	96679	100693	108688
36	85451	97707	101781	109900
40	87601	100433	104708	113237
41	87820	100764	105078	113691
42	87911	100954	105304	113992
43	87873	101002	105384	114139
44	87703	100907	105317	114133
45	87402	100668	105103	113972
46	86966	100282	104737	113654
47	86391	99746	104218	113175
48	85673	99055	103540	112531
49	84805	98201	102697	111714
50	83779	97177	101679	110716

Chaparral Fuel Scenario Worst Case

Head Fire

Surface Fire Flame Length (ft)

Chaparral Fuel Dead Load Fraction	Chaparral Total Fuel Load ton/ac			
%	25	28	29	31
32	46.1	49.0	49.9	51.7
33	46.4	49.3	50.3	52.0
34	46.7	49.6	50.6	52.4
35	46.9	49.9	50.9	52.7
36	47.2	50.2	51.1	52.9
40	47.7	50.8	51.8	53.7
41	47.8	50.9	51.9	53.8
42	47.8	50.9	51.9	53.8
43	47.8	50.9	51.9	53.9
44	47.7	50.9	51.9	53.9
45	47.7	50.9	51.9	53.8
46	47.5	50.8	51.8	53.8
47	47.4	50.6	51.7	53.7
48	47.2	50.5	51.5	53.5
49	47.0	50.3	51.3	53.3
50	46.7	50.0	51.1	53.1

Chaparral Fuel Scenario Worst Case

Head Fire

Surface Fire Dir of Max Spread (from north) (deg)

Chaparral Fuel Dead Load Fraction %	Chaparral Total Fuel Load ton/ac 25	28	29	31
32	225	225	225	225
33	225	225	225	225
34	225	225	225	225
35	225	225	225	225
36	225	225	225	225
40	225	225	225	225
41	225	225	225	225
42	225	225	225	225
43	225	225	225	225
44	225	225	225	225
45	225	225	225	225
46	225	225	225	225
47	225	225	225	225
48	225	225	225	225
49	225	225	225	225
50	225	225	225	225

Chaparral Fuel Scenario Worst Case

Head Fire

Chaparral Total Dead Fuel Load (ton/ac)

Chaparral Fuel Dead Load Fraction %	Chaparral Total Fuel Load ton/ac 25	28	29	31
32	8.000	8.960	9.280	9.920
33	8.250	9.240	9.570	10.230
34	8.500	9.520	9.860	10.540
35	8.750	9.800	10.150	10.850
36	9.000	10.080	10.440	11.160
40	10.000	11.200	11.600	12.400
41	10.250	11.480	11.890	12.710
42	10.500	11.760	12.180	13.020
43	10.750	12.040	12.470	13.330
44	11.000	12.320	12.760	13.640
45	11.250	12.600	13.050	13.950
46	11.500	12.880	13.340	14.260
47	11.750	13.160	13.630	14.570
48	12.000	13.440	13.920	14.880
49	12.250	13.720	14.210	15.190
50	12.500	14.000	14.500	15.500

Appendix N
Evacuation Analysis

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Lime Rock Valley Specific Plan Fire Evacuation Assessment - Draft

Prepared for:
County of El Dorado

November 3, 2023

RS22-4228

FEHR PEERS

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Executive Summary

This report presents the results of the wildfire evacuation time analysis conducted for the Lime Rock Valley Specific Plan Project (hereafter referred to as "Lime Rock Valley Specific Plan" or "Project") to comply with the requirements of the California Environmental Quality Act (CEQA) as established in the CEQA Statute and CEQA Guidelines and applicable/published court decisions.

Purpose

The purpose of this wildfire evacuation assessment is to address CEQA guidance released by the Attorney General in response to recent California Environmental Quality Act (CEQA) court decisions whereby EIRs were deemed to be inadequate due to the lack of a sufficient analysis around the Project's effect on the ability of the local community to evacuate due to a wildfire or similar disaster, and compliance with CalFire regulations related to wildfire evacuation and emergency access.

Project Description

The Project includes the of up to 800 dwelling units, on approximately 360 acres, an eight-acre park plus additional neighborhood parks, and about 333 acres of public and private open space. The total site is approximately 740 acres. The Project expands the Community Region of El Dorado Hills to include the Project area and to rezone existing districts.

US 50 access will be through the US 50 / Bass Lake Road and US 50 / Cambridge Road interchanges. Marble Valley Parkway is proposed as a continuous roadway connecting the Bass Lake Road and Cambridge Road interchanges. Access to the US 50 / Bass Lake Road and US 50 / Cambridge Road interchanges will be provided by Marble Valley Parkway, Marble Lake Boulevard, and Lime Rock Valley Road. A portion of Marble Valley Parkway is outside the plan area. Marble Lake Boulevard, which is planned as a four- to two-lane roadway, will connect Marble Valley Parkway and Lime Rock Valley Road. Lime Rock Valley Road will extend east of Marble Lake Boulevard to the Project as a two-lane roadway. Marble Lake Boulevard will be four lanes from US 50 to just south of Marble Valley Parkway. Major intersections along Marble Lake Boulevard are planned to have roundabout control.

Study Overview

The study uses evacuation time estimates as a metric to evaluate evacuation performance. Evacuation time is defined as the estimated time necessary to safely evacuate all evacuees, from the time when a hazard is first identified until the time when the last evacuee leaves a hazardous area.

The study was conducted in coordination with Firesafe Planning Solutions, emergency service providers, and fire agencies. The evacuation assesses the four development scenarios under existing conditions:

- No Project – Represents existing conditions (i.e., existing residents).
- Lime Rock Valley Specific Plan – Represents existing conditions with buildout of the Lime Rock Valley Specific Plan.
- Marble Valley Specific Plan – Represents existing conditions with buildout of the Marble Valley Specific Plan.
- Lime Rock Valley & Marble Valley Specific Plans – Represents existing conditions with buildout of both the Lime Rock Valley and Marble Valley Specific Plans.

Wildland Fire Evacuation Risk and Fire Behavior Report

Firesafe Planning Solutions prepared a wildland fire risk report for the Lime Rock Valley Specific Plan, *Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project* to assess the risk related to wildfires and the intensity of a wildfire approaching the Project site and covers the following topics:

- Current Environmental Conditions – Identifies the location of the project site and adjacent wildland and agency responsible for fire protection.
- Wildland Fire Evacuation Risk and Fire Behavior Report – Analyzes the likelihood and intensity of wildfire hazards and the risk/vulnerability of the project to wildfire hazards.
- Project Impacts Related to Wildland Fires – Analyzes the project design relative to wildfire events and incorporates the fire history of the project area, weather (i.e., temperature, relative humidity, wind), fuel (i.e., wildland and built environment), geography (i.e., slope, aspect, elevation), and historical fire activity.
- Water Supply and Infrastructure – Describes the existing and proposed water supply and infrastructure.
- Fire Protection Resources – Identifies the existing and proposed fire resources.
- Risk Reduction Measures – Outlines risk reduction measures required by code, ordinance, and standards as well as additional benefits that the project provides to existing communities.

The analysis considers existing/future vegetative interface fuels, topography, fire, and weather conditions during extreme fire conditions. The report provides results of computer modeling that measured the fire intensity, flame lengths, rate of spread, and fire travel distance (arrival times) from worst-case scenario wildfires in both the extreme (Diablo wind) and the predominant (Onshore wind) wind conditions.

The results of fire behavior modeling have been incorporated into the analysis of the interfaces of the project with adjacent wildlands and the potential ingress/egress routes used by the Project site daily and under emergency conditions where evacuation might be necessary. **Appendix A** includes the *Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project*.

Evacuation Time Estimates

The study uses evacuation time as a metric to evaluate evacuation performance.

As outlined in the *Wildland Evacuation Fire Risk Report, Fire Behavior – The Lime Rock Valley Project*, the fire scenarios modeled are extreme and the results indicate the fire will be traveling at a rate faster than fire suppression activity will allow for control lines. The size, location and configuration of the Project site makes it unlikely that a fire will impact the entire evacuation area, but rather the fire will impact different portions over time. Consequently, evacuation time estimates are developed for the following evacuation conditions:

- Self-Evacuation – Represents the evacuation of populations in the direct path of the fire where advanced notice is not available due to the fire's progression. These vulnerable populations are in the red areas (i.e., where the fire's progression is 60 minutes or less) shown in **Figures ES1 through ES4**. As analyzed, evacuation is assumed to begin within 15 minutes of the fire's recognition. However, self-evacuation may be a part of an Ordered Evacuation, representing an initial phase of the evacuation that occurs before the Sheriff issues an order to evacuate. Evacuation time is estimated from the evacuation trip origin to the closest safe location not in the direct path of the fire, which may be inside or outside the study area shown on **Figure 2**.
- Ordered Evacuation – Represents the evacuation of the entire population (residents, students, employees, and visitors) in the evacuation area for an event with ample notice where emergency services are participating in the evacuation. As analyzed, the evacuation window is 3 hours (180 minutes) beginning from the Sheriff ordering the evacuation. Evacuation time is estimated from the evacuation trip origin to the study area gateways, outside the study area.

Self-Evacuation (Vulnerable Population)

The analysis results for Self-Evacuation are summarized in **Figures ES-1 through ES-4**.

As shown, the addition of the Project changes the progression of the fire event. Consequently, the vulnerable population changes in the existing community compared to existing conditions due to the fuels removed by the Project, fuels management activities, and the creation of fire breaks conducted around the Project perimeter. However, the vulnerable evacuees remain the same with a slight decrease in the number of evacuation vehicle trips. Under Fire Scenarios 2 with the Project, the time to safety for the vulnerable evacuees would decrease compared to existing conditions due primarily to the addition of evacuation route added with the Project. Under Fire Scenarios 2 and 4 all the existing community areas would be outside the vulnerable areas with the addition of both the Project and Marble Valley Specific Plan.

For all fire scenarios, it would take less than about 20 minutes to move all the vulnerable evacuees (i.e., existing or project evacuees) to a safe location, which is less than the 30-minute fire progression shown in **Figures ES-1 through ES-4**. With the addition of the Project, the maximum total time to evacuate would remain the same or decrease for existing vulnerable evacuees. This is due to the increased access to evacuation routes and the slowed progression of the fire created by the removal of fuels and vegetation and fuels management activities occurring with the Project, which creates additional safe areas for vulnerable evacuees to access. Similarly, the effect of both the Project and Marble Valley Specific Plan would eliminate or reduce existing vulnerable populations and the maximum total time to evacuate.

Ordered Evacuation

The analysis results for the Ordered Evacuation are summarized in **Figures ES-5 through ES-8.**

For all fire scenarios, it would take less than 200 minutes to evacuate the study area. For all fire scenarios, the addition of Project evacuees would not increase the maximum total time to evacuate existing residents. This is due to the increase in available evacuation routes (i.e., more routes) and an increase in the availability of evacuation routes (i.e., routes remain viable for evacuation longer), and the slower progression of the fire due to hardened site conditions and removal of wildland fuels (i.e., from development), and vegetation and fuels management implemented as part of the project.

With the addition of both the Project and the Marble Valley Specific Plan, the total time to evacuate the existing evacuees would be like no project conditions. Again, this is due to the increased access to evacuation routes and the and the slower progression of the fire due to hardened site conditions and removal of wildland fuels (i.e., from development), and vegetation and fuels management implemented as part of the project.

The EVAC+[1] results do not include potential unknown factors that could produce much longer travel times such as road closures due to stalled or inoperable vehicles or other blockages such as falling trees.

Cumulative Conditions

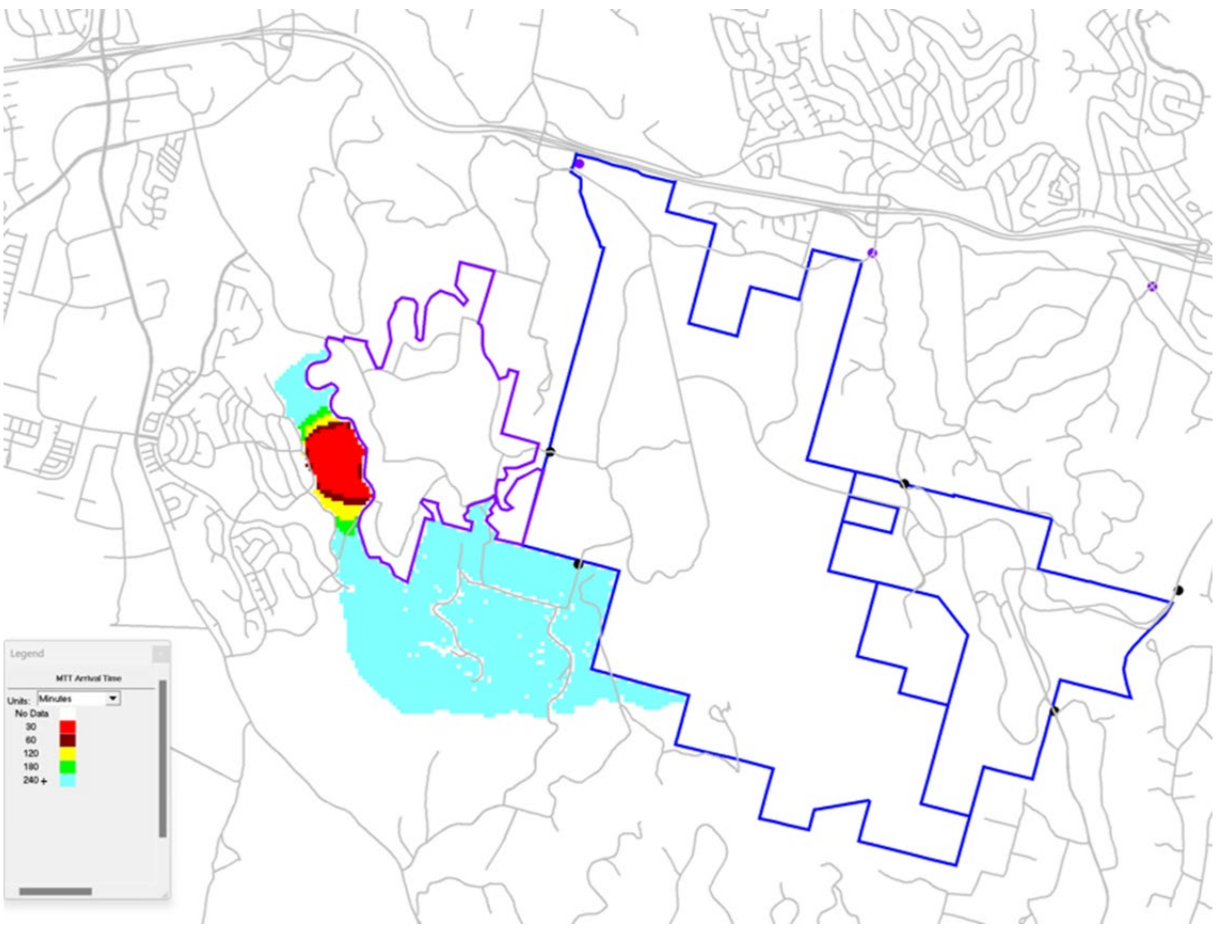
The analysis results presented above for existing conditions are applicable to cumulative conditions, since the Project and proposed Marble Specific Plan are the only significant development projects in the study area that would add substantial population and transportation facilities that may affect the evacuation routes that may be used by the existing communities.

[1] EVAC+ is a dynamic traffic assignment model, is built in TransCAD 8.0, sensitive to how demand flows in short periods of time affects the speed of travel on the roadway network and the resulting ability of individual roadway segments to accommodate that demand.

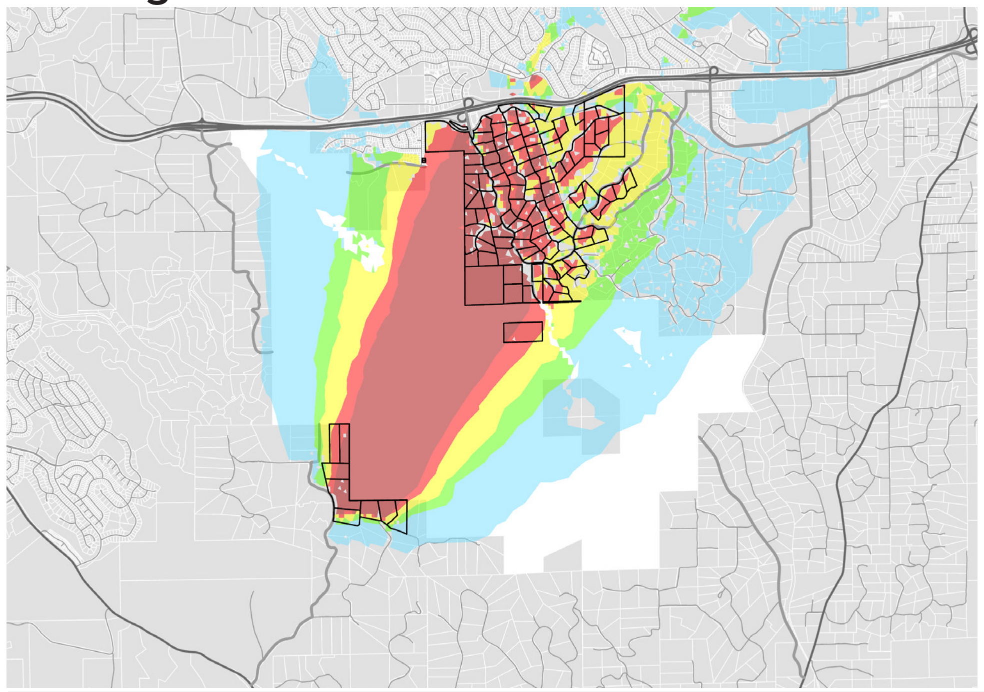
East Ridge Village is an approved planned residential development between the Project (i.e., to the west) and the existing Blackstone community, east of Latrobe Road. As a planned development, East Ridge Village was not assumed in the evacuation time estimates presented above. In addition, East Ridge Village does not include any full access roadway connections to the Project or to the evacuation routes shown on **Figure 2**.

However, future development of East Ridge Village would affect the behavior of Fire Scenario 16 by reducing the progression of the fire event under cumulative conditions. **Figure ES-9** shows the progression of Fire Scenario 16 with the addition of the approved East Ridge Village development. As shown, East Ridge Village would substantially delay the progression of the fire event to the point where the fire would take 200 or more minutes to reach the Marble Valley Specific Plan and the fire would not burn through to the Project or to existing communities to the east due to slower progression of the fire due to hardened site conditions and removal of wildland fuels (i.e., from development), and vegetation and fuels management implemented as part of East Ridge Village.

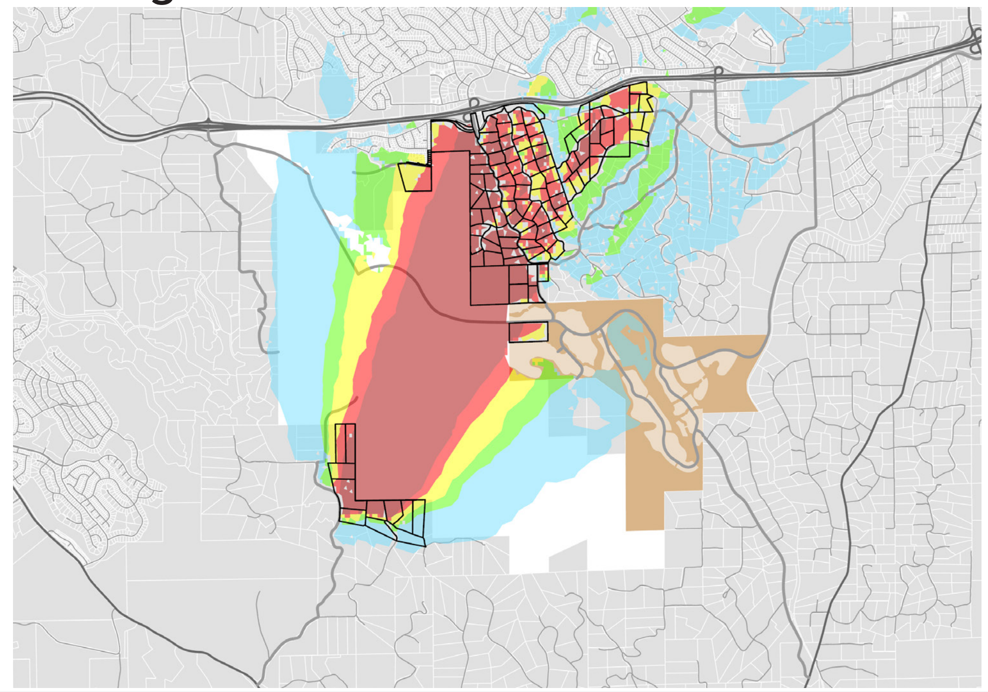
Figure ES-9: Fire Scenario 16 With Approved East Ridge Village Development



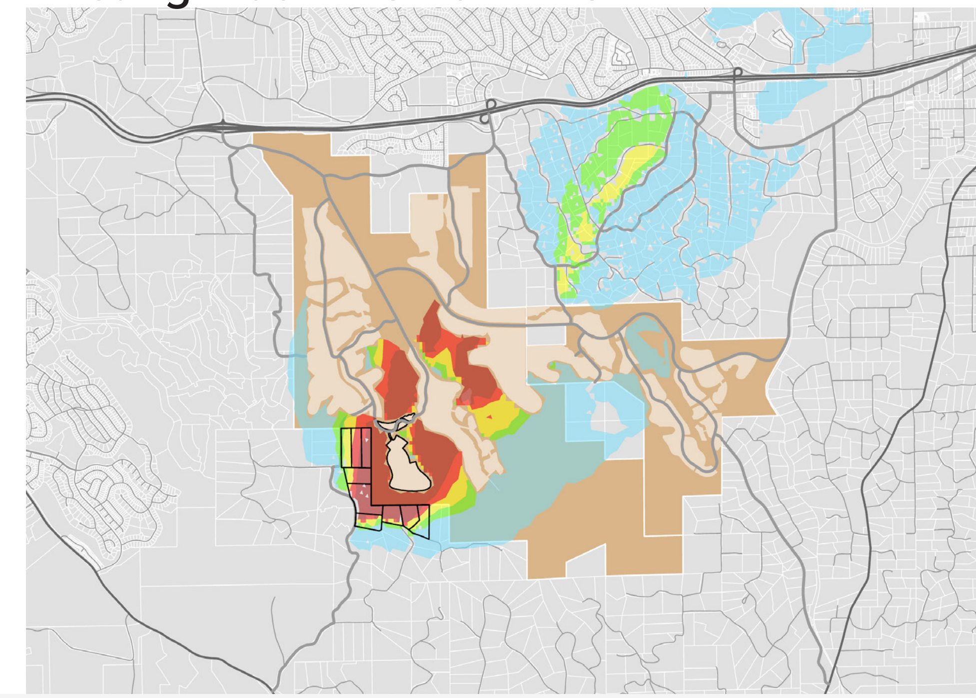
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Progression (minutes): 30 | 60 | 120 | 180 | 240 — Project Area — Project Residential Area — Vulnerable Parcels — Evacuation Routes

Existing

Vulnerable Evacuees

108 Existing Population | 45 Existing Households | 20 Existing Employees

Evacuation Vehicle Trips

85 Existing Evacuees

Total Time to Safety (minutes)

18.1

Existing Plus LRVSP

Vulnerable Evacuees

108 Existing Population | 45 Existing Households | 20 Existing Employees

0 Project Population | 0 Project Households | 0 Project Employees

Evacuation Vehicle Trips

73 Existing Evacuees | 0 Project Only Evacuees

Total Time to Safety (minutes)

17.9

N/A

Existing Plus MVSP & LRVSP

Vulnerable Evacuees

0 Existing Population | 0 Existing Households | 0 Existing Employees

264 Project Population | 100 Project Households | 0 Project Employees

Evacuation Vehicle Trips

0 Existing Evacuees | 189 Project Only Evacuees

Total Time to Safety (minutes)

N/A

19.1

Vulnerable evacuees are the population directly in the path of the fire (Red Area <= 60 minute fire progression). They are assumed to start self evacuation immediately, i.e., within 15 minutes of fire.

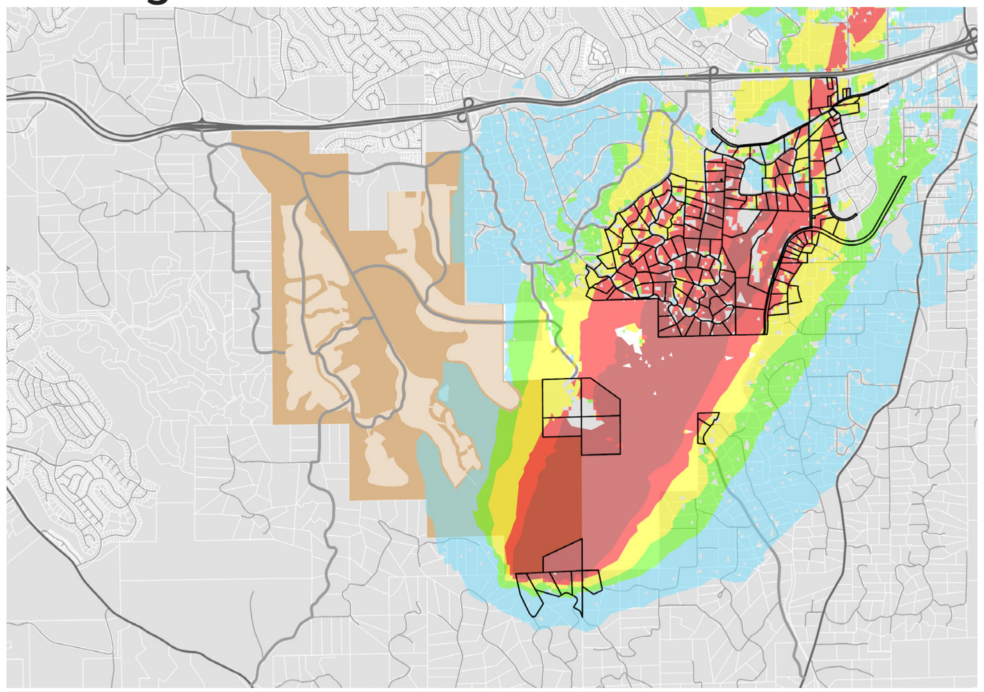
Travel time to safety is defined as the time required for the vulnerable evacuees to exit the red area.

Figure ES1

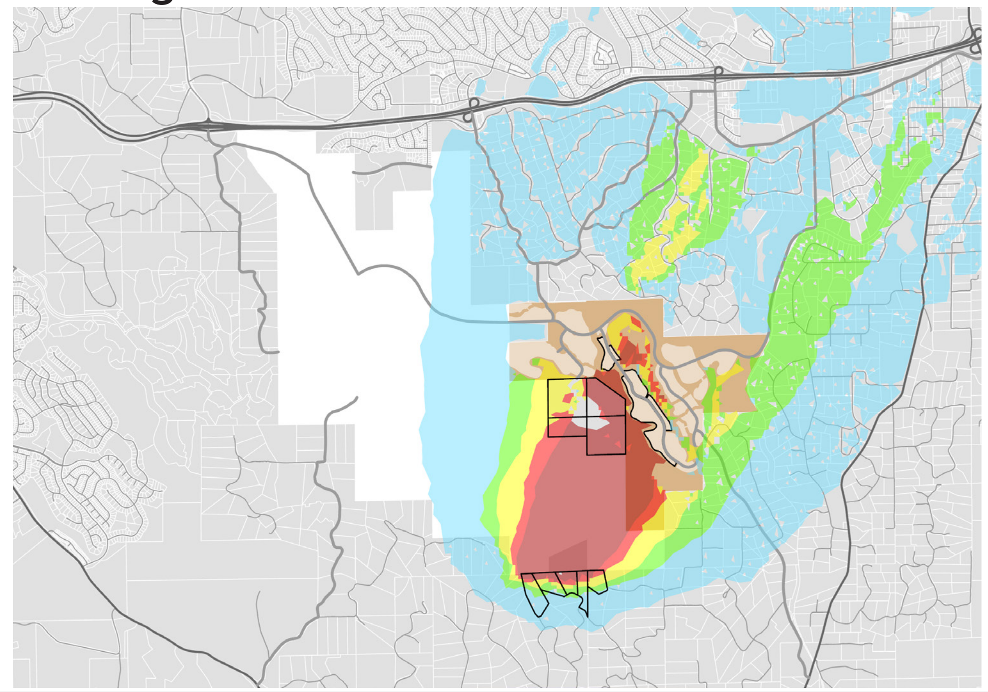
Travel Time to Safety for Vulnerable Evacuees
Fire Scenario 2

Evacuation Begins at 11am

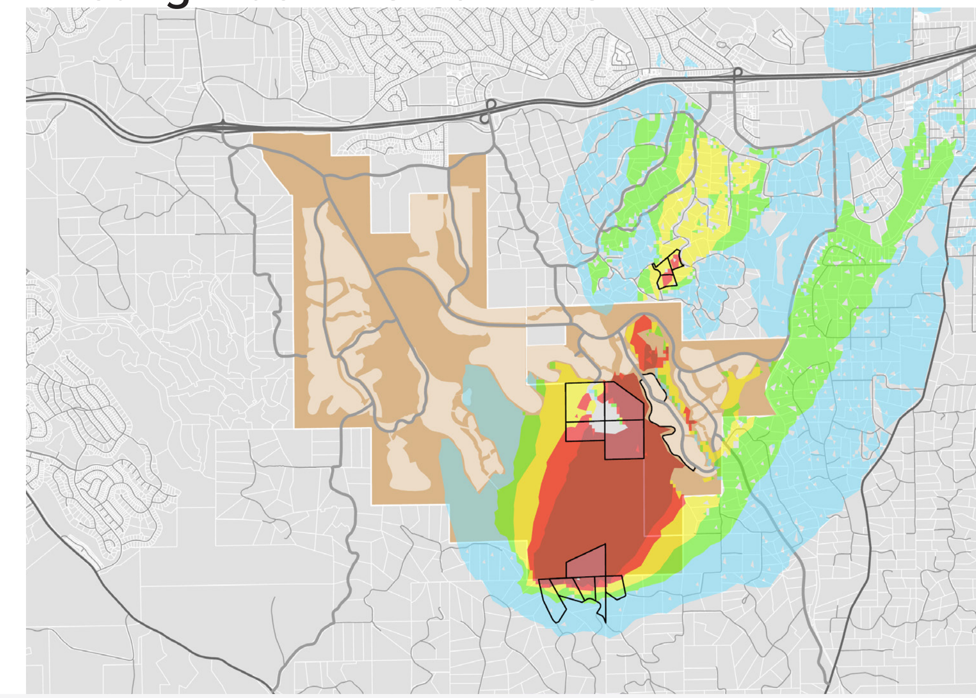
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Progression (minutes): 30 | 60 | 120 | 180 | 240 — Project Area — Project Residential Area — Vulnerable Parcels — Evacuation Routes

Existing

Vulnerable Evacuees

193 Existing Population **80** Existing Households **241** Existing Employees

Evacuation Vehicle Trips

212 Existing Evacuees

Total Time to Safety (minutes)

19.8

Existing Plus LRVSP

Vulnerable Evacuees

0 Existing Population **0** Existing Households **0** Existing Employees

404 Project Population **160** Project Households **0** Project Employees

Evacuation Vehicle Trips

0 Existing Evacuees **303** Project Only Evacuees

Total Time to Safety (minutes)

N/A

18.2

Existing Plus MVSP & LRVSP

Vulnerable Evacuees

0 Existing Population **0** Existing Households **0** Existing Employees

404 Project Population **160** Project Households **0** Project Employees

Evacuation Vehicle Trips

0 Existing Evacuees **303** Project Only Evacuees

Total Time to Safety (minutes)

N/A

18.2

Vulnerable evacuees are the population directly in the path of the fire (Red Area <= 60 minute fire progression). They are assumed to start self evacuation immediately, i.e., within 15 minutes of fire.

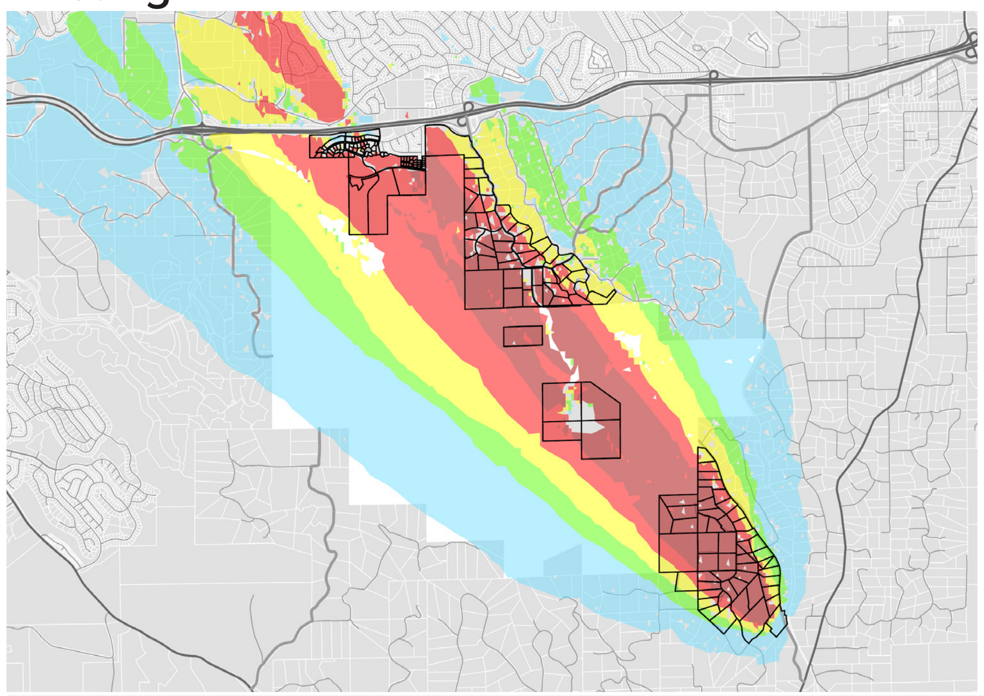
Travel time to safety is defined as the time required for the vulnerable evacuees to exit the red area.

Figure ES2

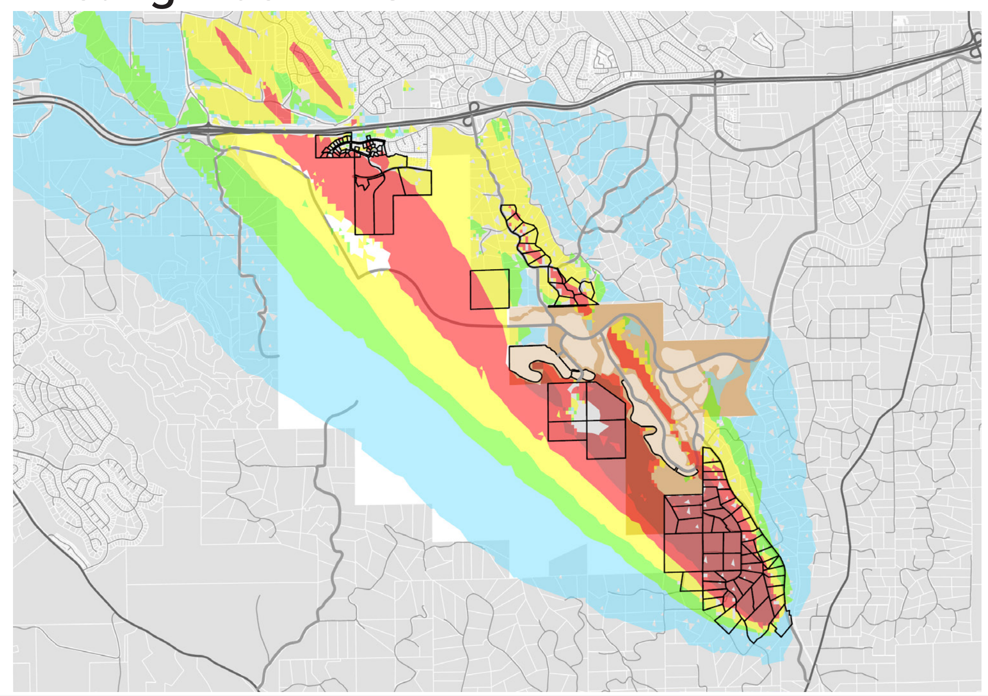
Travel Time to Safety for Vulnerable Evacuees
Fire Scenario 4

Evacuation Begins at 11am

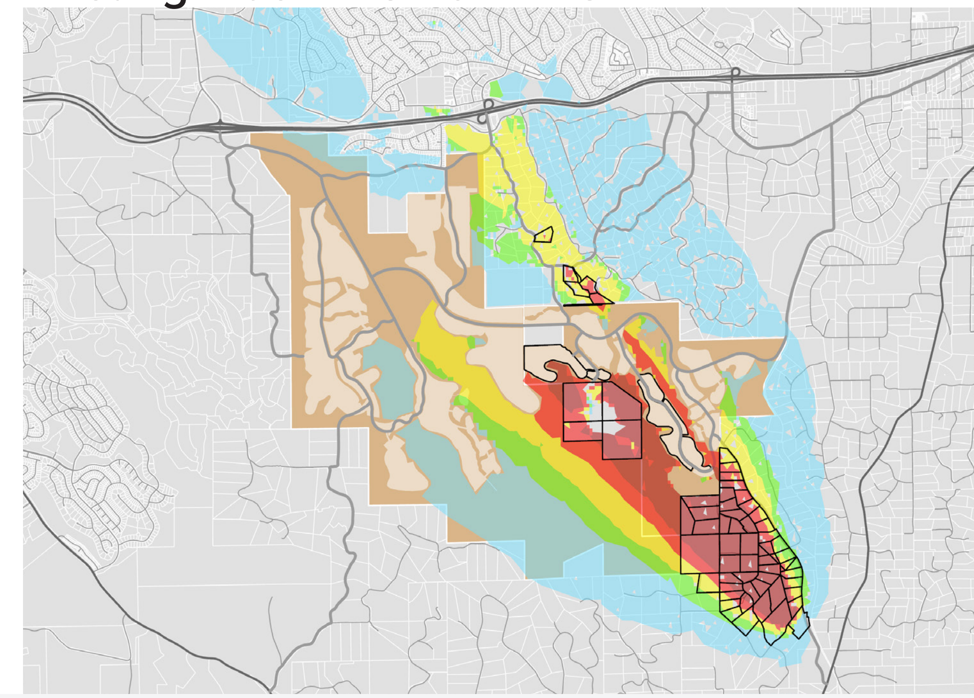
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Progression (minutes): 30 | 60 | 120 | 180 | 240 — Project Area — Project Residential Area — Vulnerable Parcels — Evacuation Routes

Existing

Vulnerable Evacuees

557 Existing Population **235** Existing Households **15** Existing Employees

Evacuation Vehicle Trips

445 Existing Evacuees

Total Time to Safety (minutes)

20.4

Existing Plus LRVSP

Vulnerable Evacuees

284 Existing Population **119** Existing Households **1** Existing Employees

323 Project Population **128** Project Households **0** Project Employees

Evacuation Vehicle Trips

248 Existing Evacuees **243** Project Only Evacuees

Total Time to Safety (minutes)

19.9

18.2

Existing Plus MVSP & LRVSP

Vulnerable Evacuees

207 Existing Population **86** Existing Households **0** Existing Employees

323 Project Population **128** Project Households **0** Project Employees

Evacuation Vehicle Trips

163 Existing Evacuees **243** Project Only Evacuees

Total Time to Safety (minutes)

19.9

18.2

Vulnerable evacuees are the population directly in the path of the fire (Red Area <= 60 minute fire progression). They are assumed to start self evacuation immediately, i.e., within 15 minutes of fire.

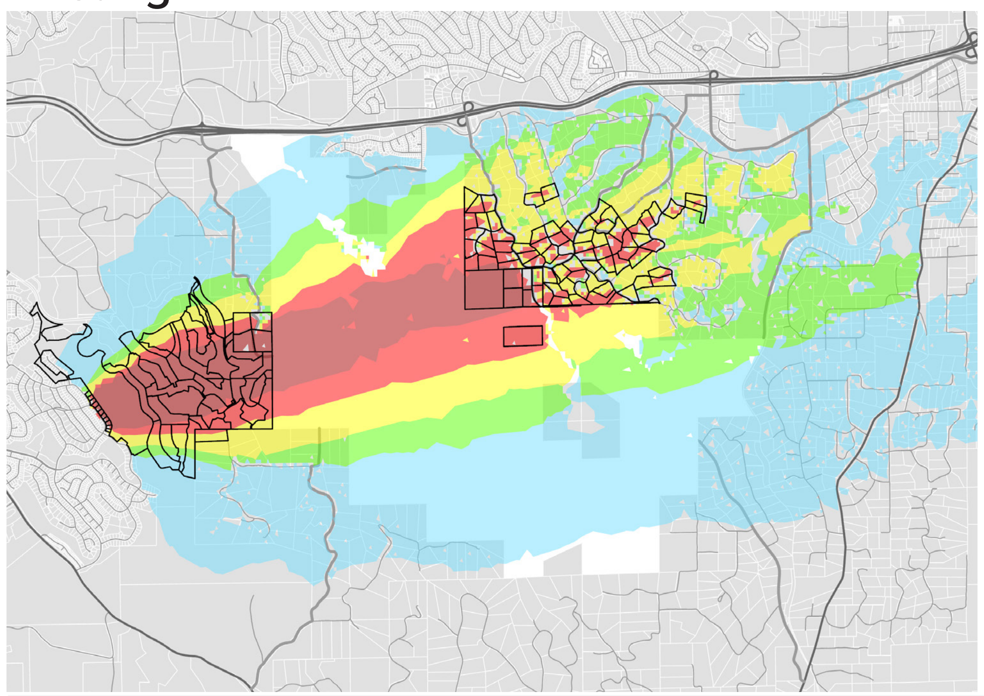
Travel time to safety is defined as the time required for the vulnerable evacuees to exit the red area.

Figure ES3

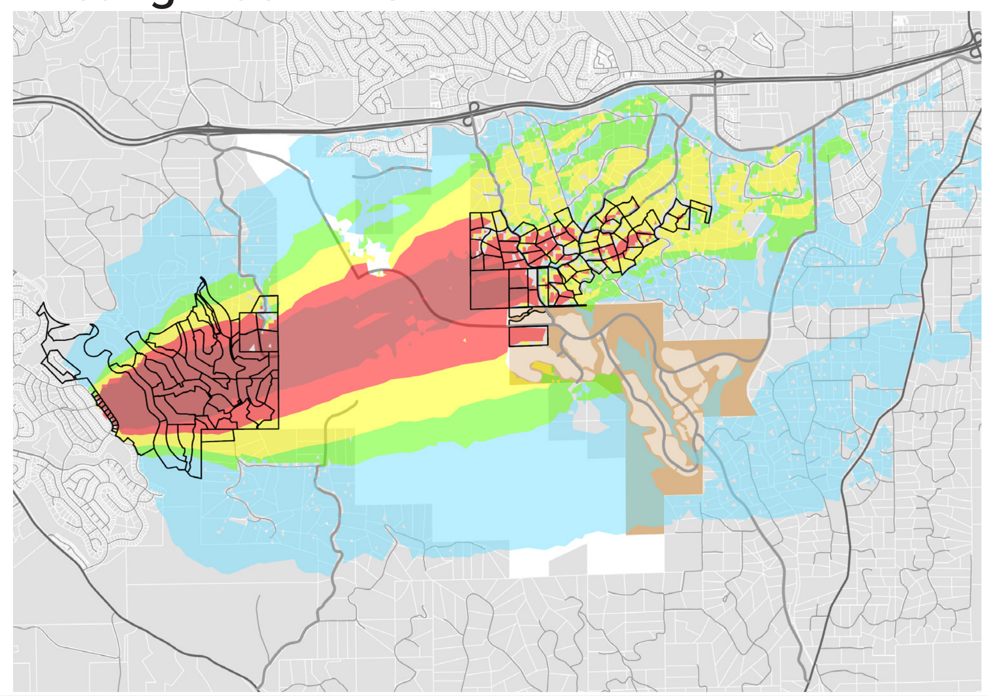
Travel Time to Safety for Vulnerable Evacuees
Fire Scenario 7

Evacuation Begins at 7am

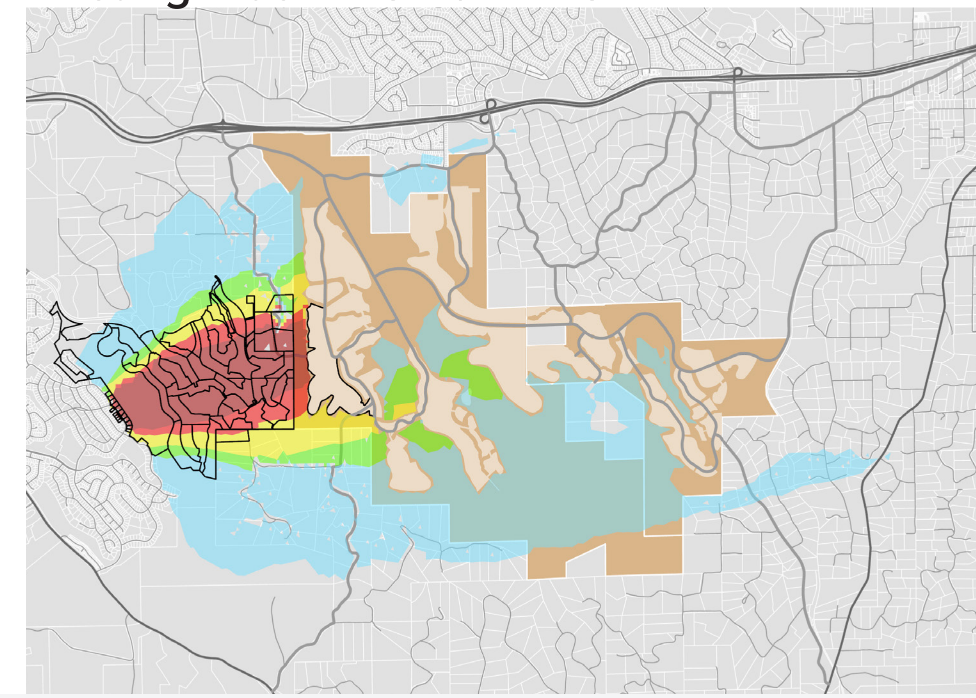
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Progression (minutes): 30 | 60 | 120 | 180 | 240 — Project Area — Project Residential Area — Vulnerable Parcels — Evacuation Routes

Existing

Vulnerable Evacuees

112 Existing Population | **46** Existing Households | **6** Existing Employees

Evacuation Vehicle Trips

97 Existing Evacuees

Total Time to Safety (minutes)

17.7

Existing Plus LRVSP

Vulnerable Evacuees

105 Existing Population | **42** Existing Households | **6** Existing Employees

0 Project Population | **0** Project Households | **0** Project Employees

Evacuation Vehicle Trips

84 Existing Evacuees | **0** Project Only Evacuees

Total Time to Safety (minutes)

17.7

N/A

Existing Plus MVSP & LRVSP

Vulnerable Evacuees

75 Existing Population | **29** Existing Households | **0** Existing Employees

124 Project Population | **49** Project Households | **0** Project Employees

Evacuation Vehicle Trips

55 Existing Evacuees | **93** Project Only Evacuees

Total Time to Safety (minutes)

17.5

18.1

Vulnerable evacuees are the population directly in the path of the fire (Red Area <= 60 minute fire progression). They are assumed to start self evacuation immediately, i.e., within 15 minutes of fire.

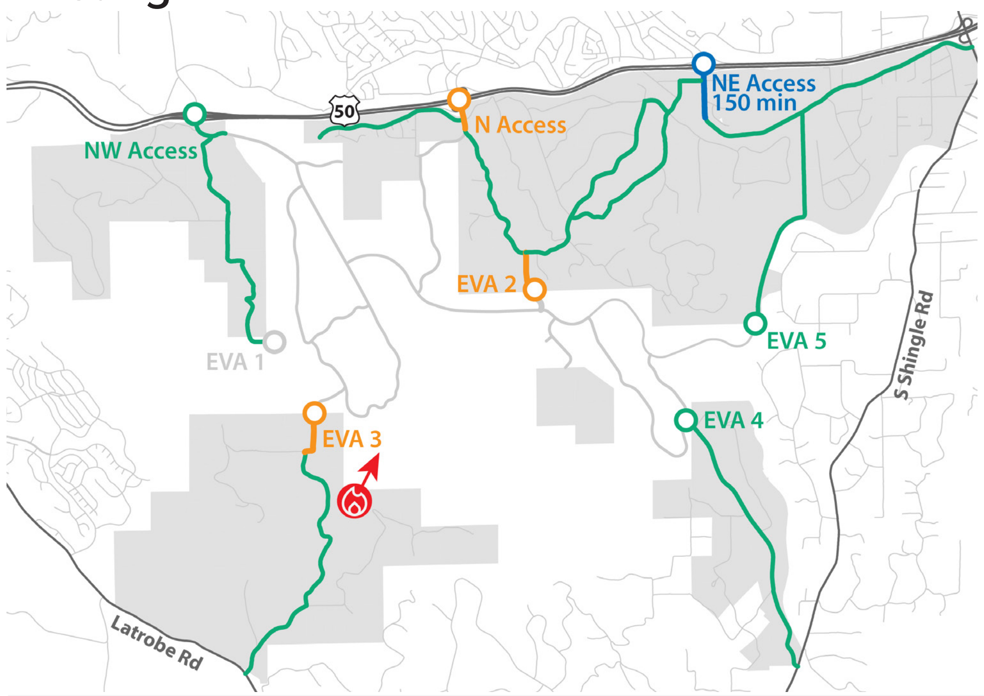
Travel time to safety is defined as the time required for the vulnerable evacuees to exit the red area.

Figure ES4

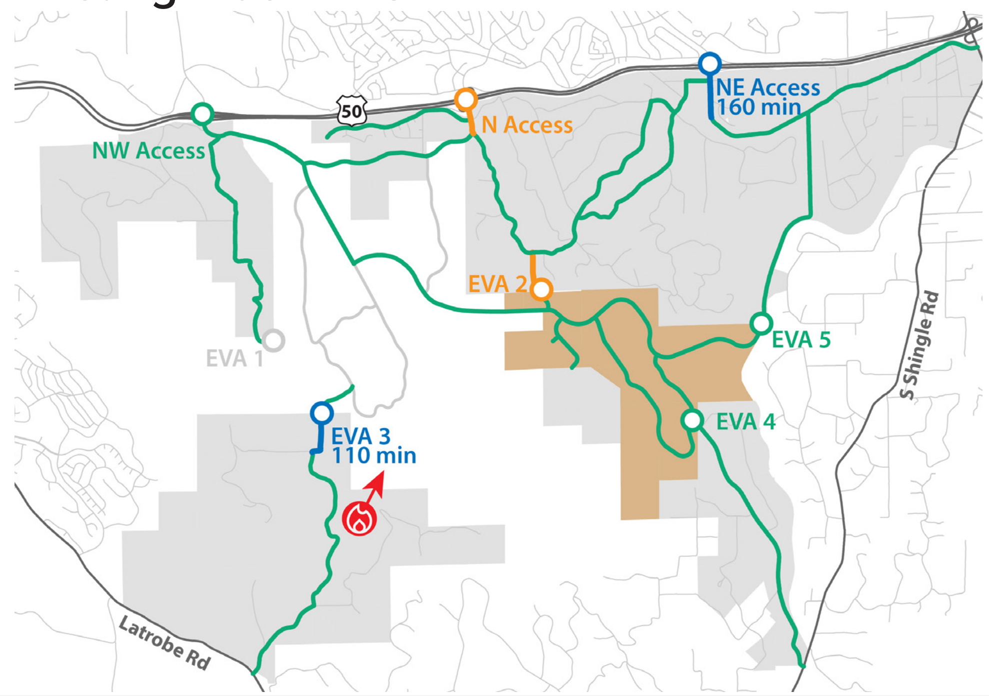
Travel Time to Safety for Vulnerable Evacuees
Fire Scenario 16

Evacuation Begins at 1pm

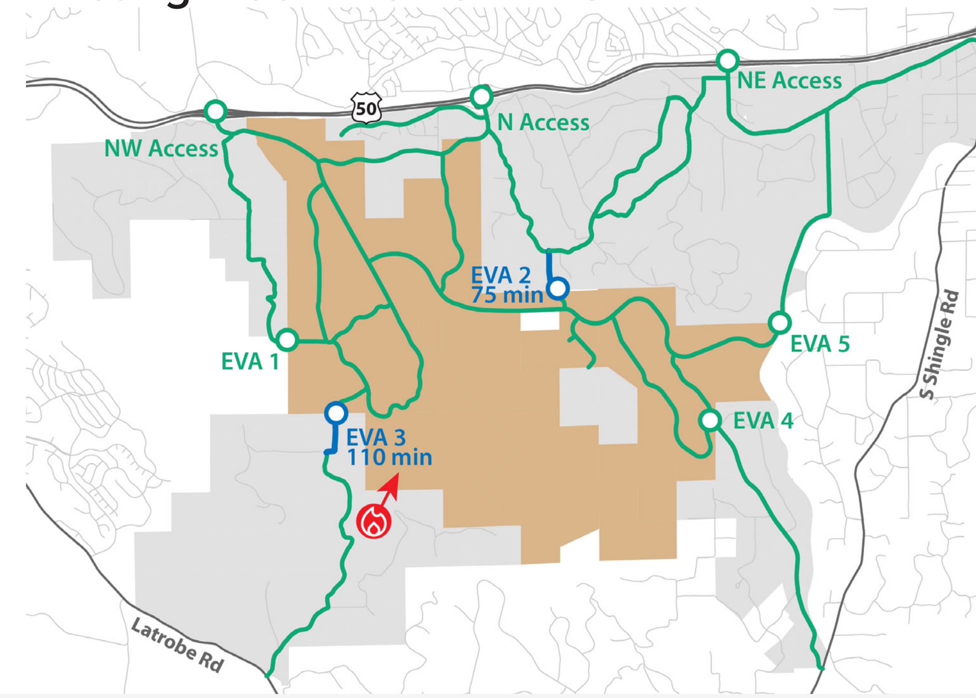
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Location and Wind Direction — Evacuation Routes: Available — Not Available — Partially Available (minutes) — Existing Evacuation Area — Project Evacuation Area

Existing

Evacuees

2,804 Existing Population — 1,132 Existing Households — 1,090 Existing Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees

Total Time to Evacuation (minutes)

188

Existing Plus LRVSP

Evacuees

2,804 Existing Population — 1,132 Existing Households — 1,090 Existing Employees

2,022 Project Population — 800 Project Households — 0 Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees — 1,216 Project Only Evacuees

Total Time to Evacuation (minutes)

187

195

Existing Plus MVSP & LRVSP

Evacuees

2,804 Existing Population — 1,132 Existing Households — 1,090 Existing Employees

10,079 Project Population — 4,368 Project Households — 1,595 Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees — 7,080 Project Only Evacuees

Total Time to Evacuation (minutes)

186

196

Evacuation window is 180 minutes.

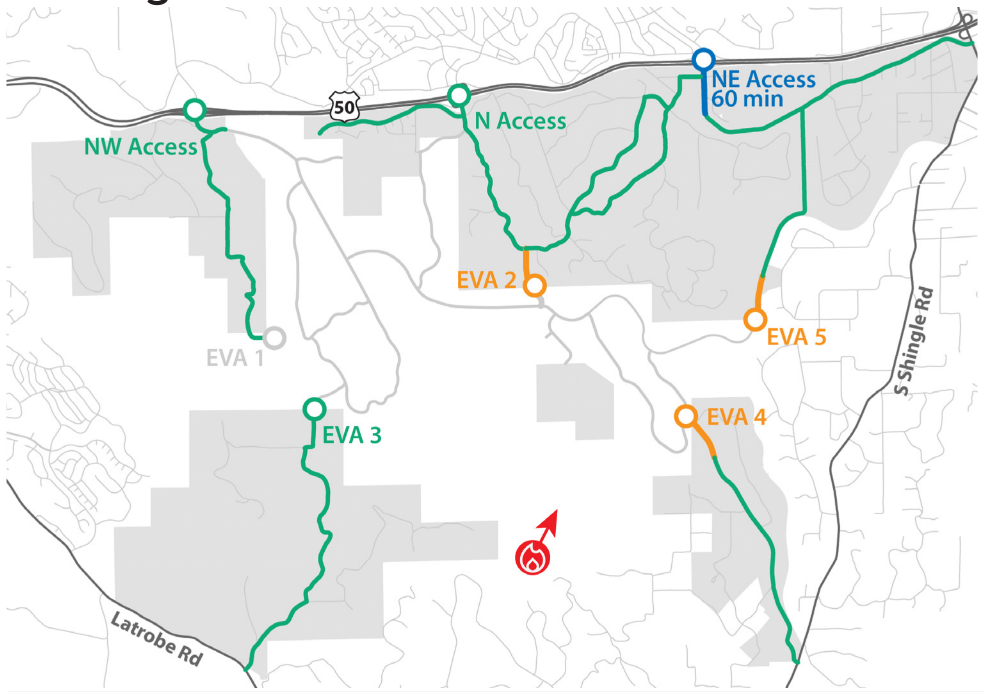
Total time required to evacuate is evacuation window + time required to exit the evacuation area for evacuees starting evacuation within the last 15 minutes.

Figure ES5

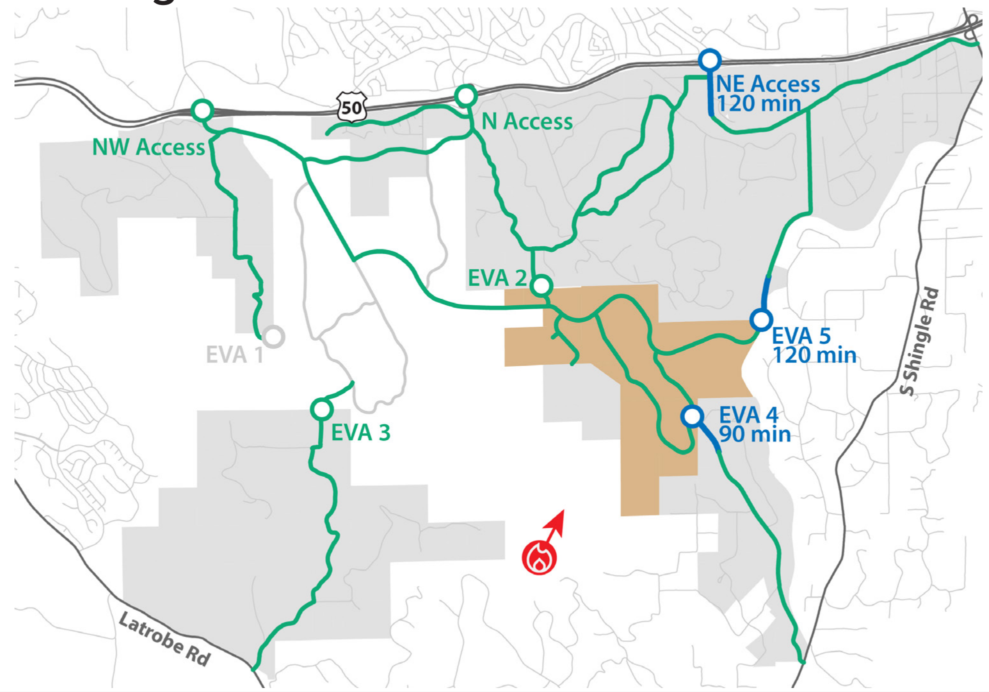
Total Travel Time to Evacuate to the Evacuation Area Fire Scenario 2

Evacuation Window 11am - 2pm

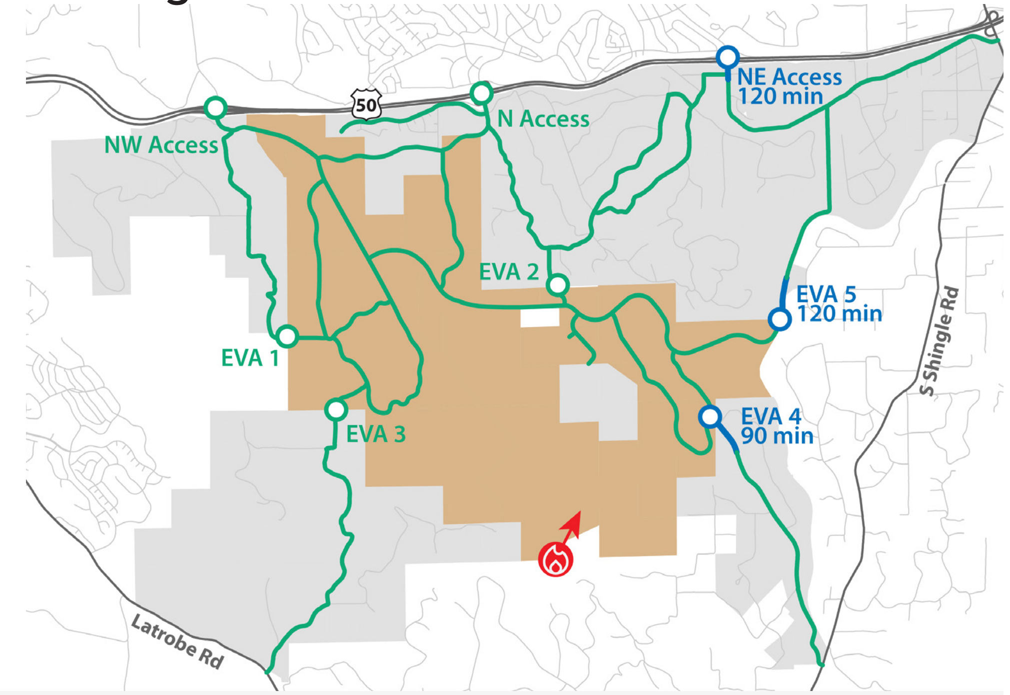
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Location and Wind Direction Evacuation Routes: Available Not Available Partially Available (minutes) Existing Evacuation Area Project Evacuation Area

Existing

Evacuees

2,804 Existing Population 1,132 Existing Households 1,090 Existing Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees

Total Time to Evacuation (minutes)

187

Existing Plus LRVSP

Evacuees

2,804 Existing Population 1,132 Existing Households 1,090 Existing Employees

2,022 Project Population 800 Project Households 0 Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees 1,216 Project Only Evacuees

Total Time to Evacuation (minutes)

185

186

Existing Plus MVSP & LRVSP

Evacuees

2,804 Existing Population 1,132 Existing Households 1,090 Existing Employees

10,861 Project Population 4,368 Project Households 1,595 Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees 7,080 Project Only Evacuees

Total Time to Evacuation (minutes)

187

198

Evacuation window is 180 minutes.

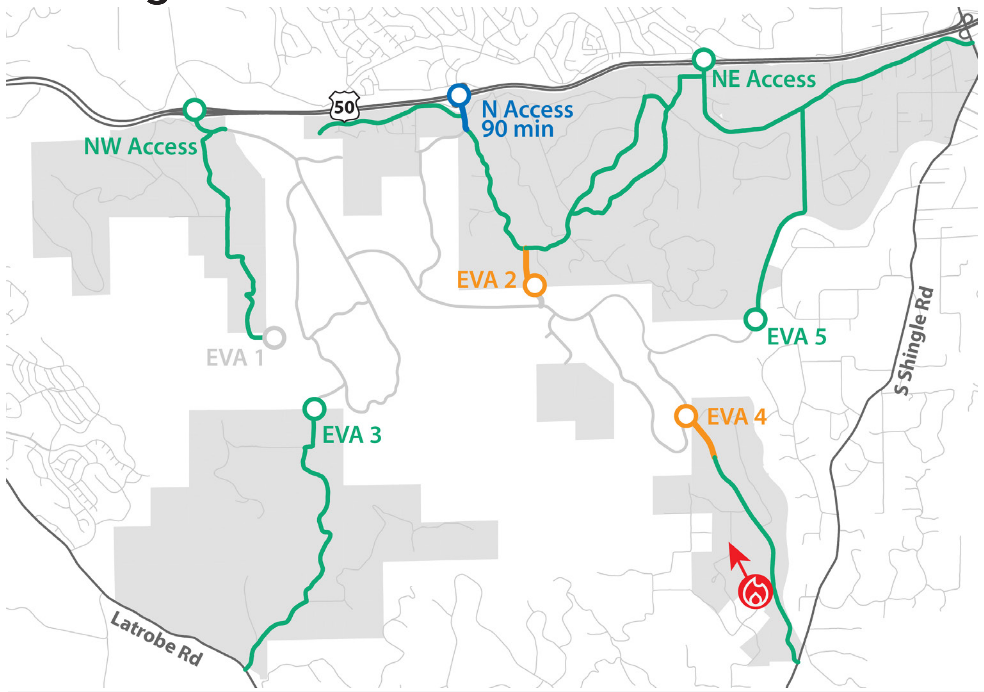
Total time required to evacuate is evacuation window + time required to exit the evacuation area for evacuees starting evacuation within the last 15 minutes.

Figure ES6

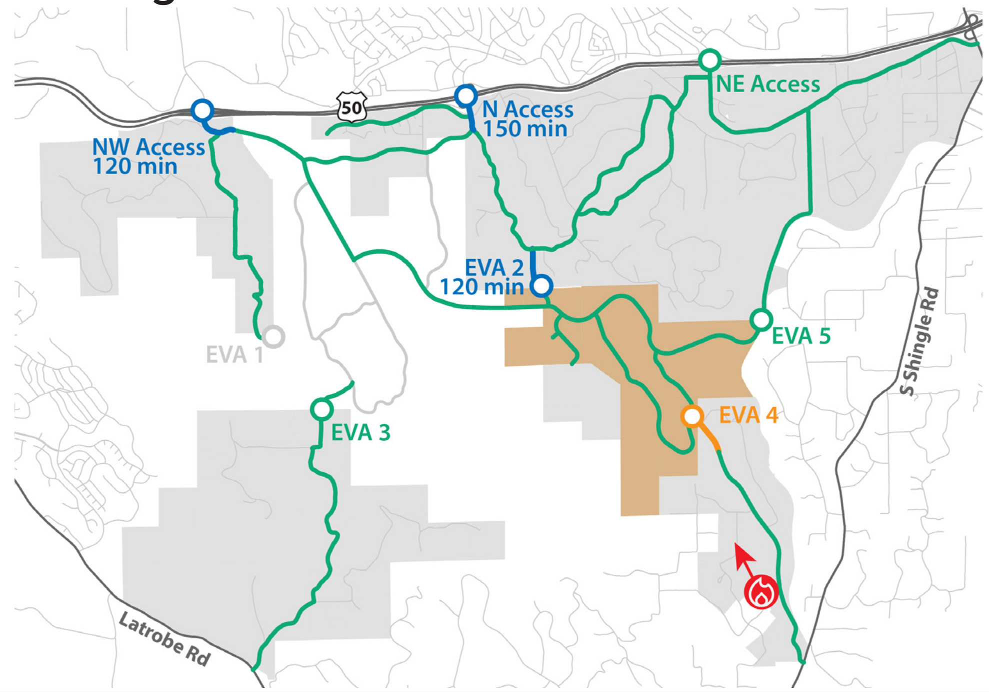
Fire Scenario 4

Evacuation Window 11am - 2pm

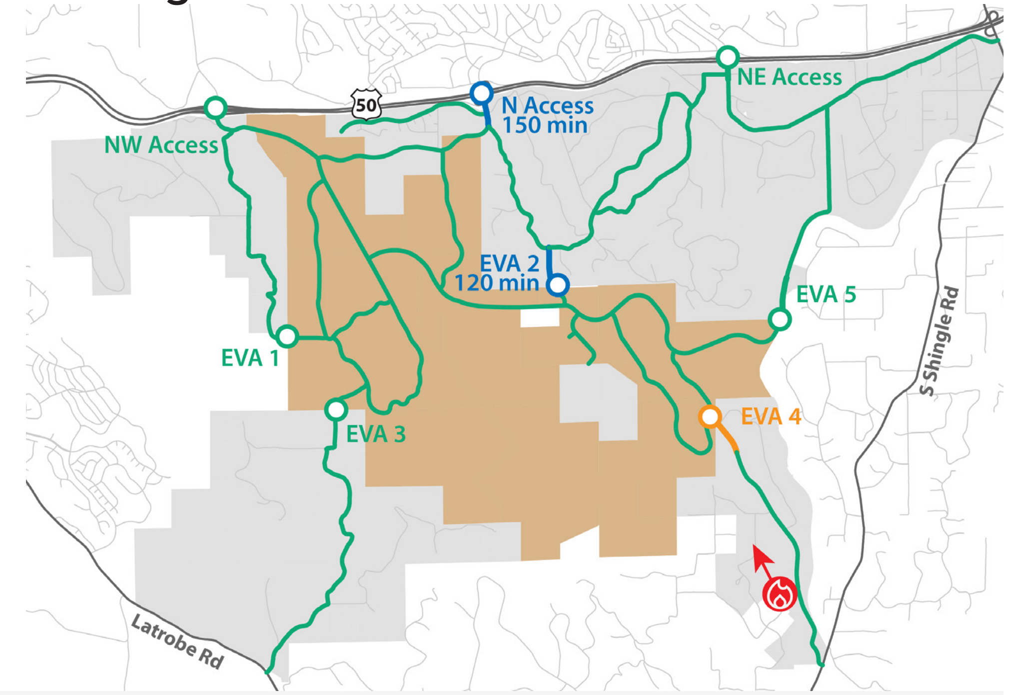
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Location and Wind Direction Evacuation Routes: Available Not Available Partially Available (minutes) Existing Evacuation Area Project Evacuation Area

Existing

Evacuees

2,804 Existing Population | 1,132 Existing Households | 1,090 Existing Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees

Total Time to Evacuation (minutes)

188

Existing Plus LRVSP

Evacuees

2,804 Existing Population | 1,132 Existing Households | 1,090 Existing Employees

2,022 Project Population | 800 Project Households | 0 Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees | 1,216 Project Only Evacuees

Total Time to Evacuation (minutes)

187

195

Existing Plus MVSP & LRVSP

Evacuees

2,804 Existing Population | 1,132 Existing Households | 1,090 Existing Employees

10,079 Project Population | 4,368 Project Households | 1,595 Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees | 7,080 Project Only Evacuees

Total Time to Evacuation (minutes)

186

196

Evacuation window is 180 minutes.

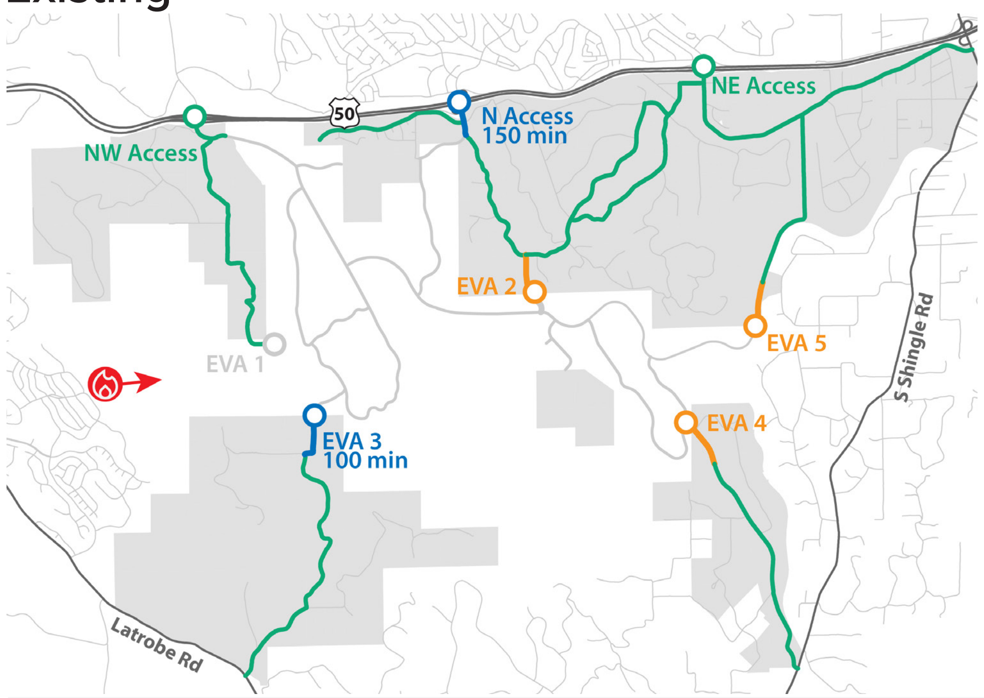
Total time required to evacuate is evacuation window + time required to exit the evacuation area for evacuees starting evacuation within the last 15 minutes.

Figure ES7

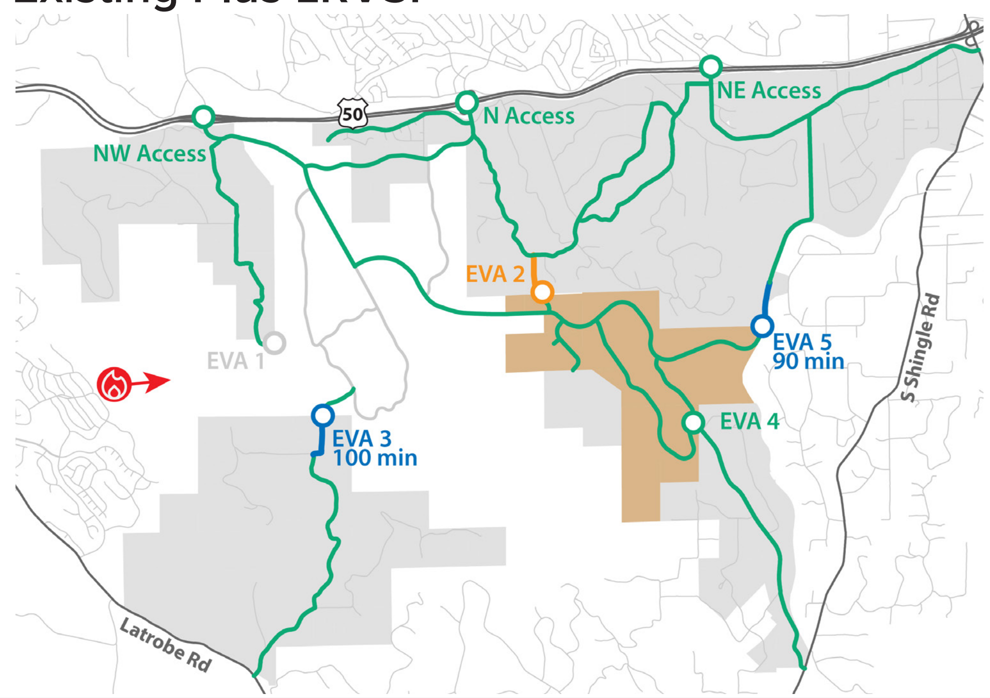
Fire Scenario 7

Evacuation Window 7am - 10am

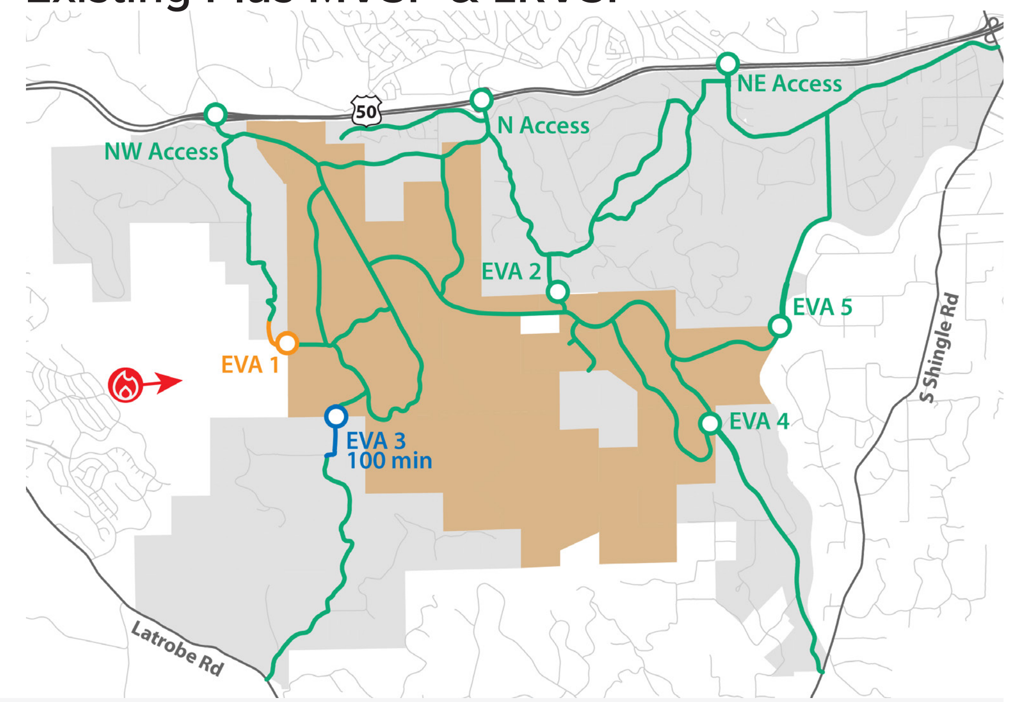
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Location and Wind Direction — Evacuation Routes: Available — Not Available — Partially Available (minutes) — Existing Evacuation Area — Project Evacuation Area

Existing

Evacuees

2,804 Existing Population — **1,132** Existing Households — **1,090** Existing Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees

Total Time to Evacuation (minutes)

188

Existing Plus LRVSP

Evacuees

2,804 Existing Population — **1,132** Existing Households — **1,090** Existing Employees

2,022 Project Population — **800** Project Households — **0** Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees — **5,864** Project Only Evacuees

Total Time to Evacuation (minutes)

188

187

Existing Plus MVSP & LRVSP

Evacuees

2,804 Existing Population — **1,132** Existing Households — **1,090** Existing Employees

10,861 Project Population — **4,368** Project Households — **1,595** Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees — **7,080** Project Only Evacuees

Total Time to Evacuation (minutes)

186

188

Evacuation window is 180 minutes.

Total time required to evacuate is evacuation window + time required to exit the evacuation area for evacuees starting evacuation within the last 15 minutes.

Figure ES8

Fire Scenario 16

Evacuation Window 1pm - 4pm

1. Introduction

This report presents the results of the wildfire evacuation time analysis conducted for the Lime Rock Valley Specific Plan Project (hereafter referred to as "Lime Rock Valley Specific Plan" or "Project") to comply with the requirements of the California Environmental Quality Act (CEQA), guidance provided by the Attorney General's office, and applicable/published court decisions.

This chapter describes the purpose of this document, describes the Project, summarizes the fire risk and behavior report that informs the evacuation analysis, outlines guidance from the Attorney General guidance and CalFire Regulations, defines fire hazard severity zones, summarizes consultation with local agency staff, discusses the limitations of the emergency evacuation assessment, and outlines the report organization.

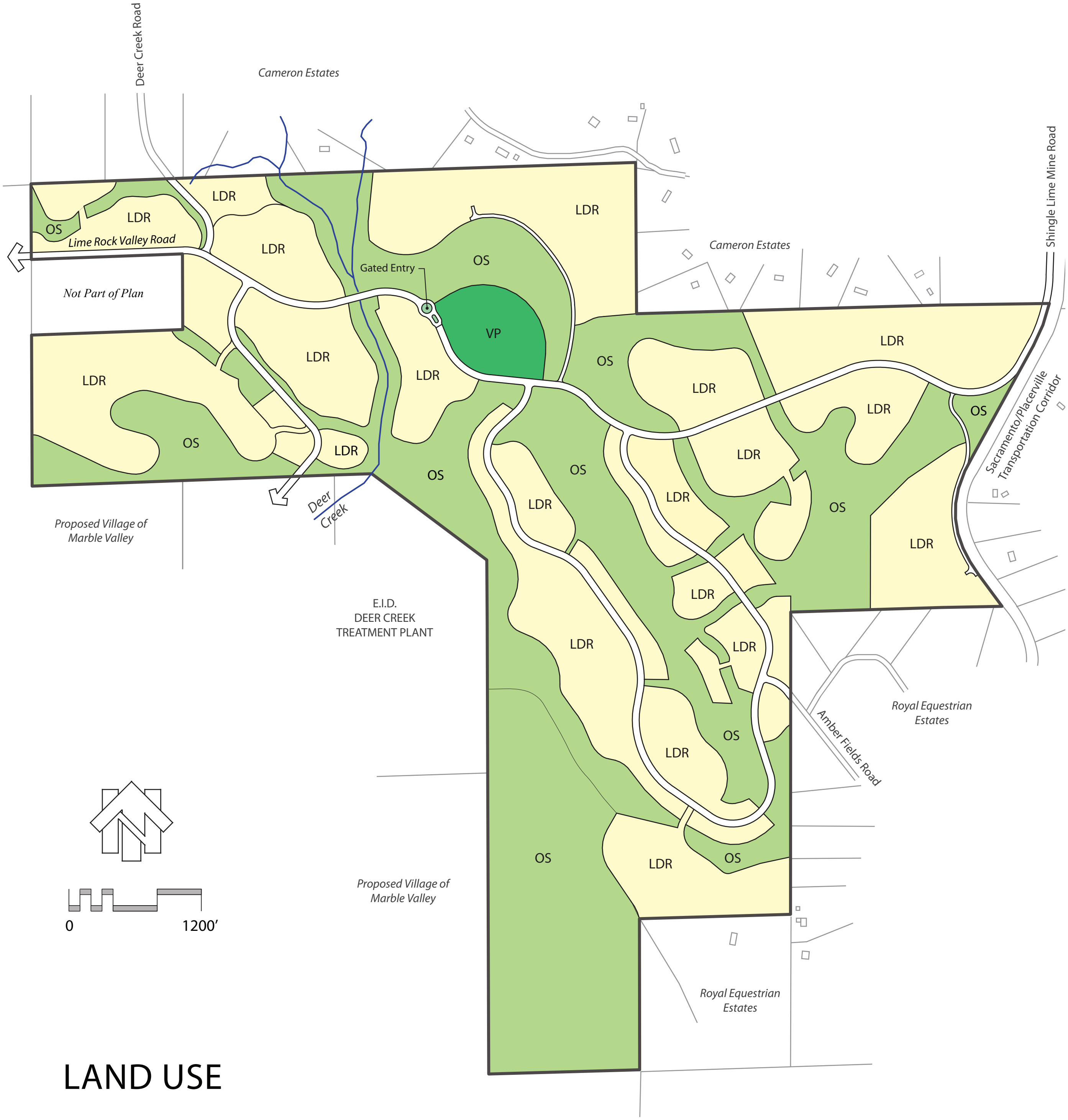
Purpose

The purpose of this wildfire evacuation assessment is to address CEQA guidance released by the Attorney General in response to recent California Environmental Quality Act (CEQA) court decisions whereby EIRs were deemed to be inadequate due to the lack of a sufficient analysis around the Project's effect on the ability of the local community to evacuate due to a wildfire or similar disaster.

Project Description

The Project includes the of up to 800 dwelling units, on approximately 360 acres, an eight-acre park plus additional neighborhood parks, and about 333 acres of public and private open space. The total site is approximately 740 acres. The Project expands the Community Region of El Dorado Hills to include the Project area and to rezone existing districts.

US 50 access will be through the US 50 / Bass Lake Road and US 50 / Cambridge Road interchanges. Marble Valley Parkway is proposed as a continuous roadway connecting the Bass Lake Road and Cambridge Road interchanges. Access to the US 50 / Bass Lake Road and US 50 / Cambridge Road interchanges will be provided by Marble Valley Parkway, Marble Lake Boulevard, and Lime Rock Valley Road. A portion of Marble Valley Parkway is outside the plan area. Marble Lake Boulevard, which is planned as a four- to two-lane roadway, will connect Marble Valley Parkway and Lime Rock Valley Road. Lime Rock Valley Road will extend east of Marble Lake Boulevard to the Project as a two-lane roadway. Marble Lake Boulevard will be four lanes from US 50 to just south of Marble Valley Parkway. Major intersections along Marble Lake Boulevard are planned to have roundabout control. **Figure 1** shows the Project and backbone roadway network.



LAND USE

LDR	Low Density Residential
VP	Village Park
OS	Open Space

Figure 1
Proposed Project

Wildland Evacuation Fire Risk and Behavior Report

Firesafe Planning Solutions prepared a wildland fire risk report for the Lime Rock Valley Specific Plan, *Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project*, to assess the risk related to wildfires and the intensity of a wildfire approaching the Project site and covers the following topics:

- Current Environmental Conditions – Identifies the location of the project site and adjacent wildland and agencies responsible for fire protection. The fire risk and behavior report presents the existing vegetation on and near the Project beginning on Page 9.

- Wildfire Hazard and Risk Analysis – Analyzes the likelihood and intensity of wildfire hazards and the risk/vulnerability of the project to wildfire hazards. The fire risk and behavior report discusses the wildland fuels on and near the Project beginning on Page 29.

- Project Impacts Related to Wildland Fires – Analyzes the project design relative to wildfire events and incorporates the fire history of the project area, weather (i.e., temperature, relative humidity, wind), fuel (i.e., wildland and built environment), geography (i.e., slope, aspect, elevation), vegetation and fuels management included in the proposed Project, and historical fire activity. The fire risk and behavior report discusses the effect of the Project on wildland fire behavior beginning on Page 50.

- Water Supply and Infrastructure – Describes the existing and proposed water supply and infrastructure, beginning on Page 69.

- Fire Protection Resources – Identifies the existing and proposed fire protection resources available to serve the proposed Project, beginning on Page 72.

- Risk Reduction Measures – Outlines risk reduction measures required by code, ordinance, and standards as well as additional elements of the proposed Project that reduce wildfire risk for the Project site and existing communities. This discussion begins on Page 78.

This wildland fire risk report provides the results of that assessment and objective hazard and risk assessments that can be used to establish the community risk reduction measures (hazard less reduction measures = risk) that are equal to or greater than the hazards that would be encountered in a worst-case scenario. The analysis considers existing/future vegetative interface fuels, topography, fire, and weather conditions during extreme fire conditions. The report provides results of computer modeling that measured the fire intensity, flame lengths, rate of spread, and fire travel distance (arrival times) from worst-case scenario wildfires in both the extreme (Diablo wind) and the predominant (Onshore wind) wind conditions.

The results of fire behavior modeling have been incorporated into the analysis of the interfaces of the project with adjacent wildlands and the potential ingress/egress routes used by the Project site daily and under emergency conditions where evacuation might be necessary. **Appendix A** includes the *Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project*.

Attorney General Guidance

On October 10, 2022, the Attorney General's office published *Best Practices for Analyzing and Mitigating Wildfire Impacts of Development Projects Under the California Environmental Quality Act* (AG Guidance). The AG Guidance is designed to help lead agencies comply with CEQA when considering whether to approve projects in wildfire-prone areas. The guidance provides "*suggestions for how best to comply with CEQA when analyzing and mitigating a proposed project's impacts on wildfire ignition risk, emergency access, and evacuation*."

The AG Guidance describes CEQA's requirements in the following two analysis categories.

- Analyzing Impact on Wildfire Risk
- Analyzing Impact on Evacuation & Emergency Access

Section IV.B of the AG guidance outlines variables that should be considered in the analysis of impact on wildfire risk related to the following project characteristics.

- Project Density
- Project Location in the Landscape
- Water Supply and Infrastructure

This information is included in the fire risk and behavior report.

Section IV.C of the AG Guidance contains the following recommendations regarding evacuation and emergency access. Specifically, evacuation modeling and analysis should include the following:

- Evaluation of the capacity of roadways to accommodate project and community evacuation and simultaneous emergency access.
- Assessment of the timing for evacuation.
- Identification of alternative plans for evacuation depending upon the location and dynamics of the emergency.
- Evaluation of the project's impact on existing evacuation plans.
- Consideration of the adequacy of emergency access, including the project's proximity to existing fire services and the capacity of existing services.
- Traffic modeling to quantify evacuation time estimates under various likely scenarios.

The evacuation analysis contained in this report addresses the recommendations in Section IV.C of the AG Guidance.

CalFire Regulation Compliance

The El Dorado Hills Fire Department is the current service provider on the west side of the Project and the El Dorado County Fire Protection District is the current service provider to the east side of the Project.

If approved, the LAFCO will examine the current boundaries and adjust them to provide for the "natural service provider" based on each agency's ability to provide the services to the new areas. The Project Site includes a fire station site, which may be a relocation of Fire Station 92 (Ryan Ranch) that is currently unstaffed. **Appendix A** includes the *Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project*, provides additional discussion of fire protection resources.

Overall wildland fire jurisdiction is classified as FRA (Federal Responsibility Area), SRA (State Responsibility Area) or LRA (Local Responsibility Area). FRA is federal land, (i.e., a national forest). SRA is land with the State of California that the state has the primary responsibility for wildland fire protection. CalFire provides that service for SRA in El Dorado County. LRA is land within incorporated cities and unincorporated land within the county that does not meet the criteria for inclusion in the SRA (i.e., normally developed to a density that makes it urban).

The Project is located on lands designated as a State Responsibility Area (SRA), where CalFire is the primary emergency response agency responsible for wildland fire protection. As a result, the Project must comply with state requirements for wildfire protection and safety, as reviewed and approved by CalFire. These state requirements include State Minimum Fire Safe Regulations, California Building and Residential Codes (Materials and Construction Methods for Exterior Wildfire Exposure), and California Fire Code Chapter 49 (Requirements for Wildland-Urban Interface Areas).

Fire Hazard Severity Zones

Fire Hazard Severity Zones (FHSZ) are currently based on potential fuels, fire weather conditions, and terrain and represent potential fire hazard exposure to structures and other human infrastructure assets. FHSZ areas are adopted as a Title 14 regulation, fulfill the obligations laid out in Public Resources Code (PRC) Sections 4201-04, and are essential in various fire safety regulations, building construction standards, and real estate hazard disclosure requirements. These zones were determined in November 2007 for SRA and September 2008 for LRA and are currently in the process of being revised by CalFire (CalFire Website). The 2007 Fire Severity Zone Map is provided in the Reference section of the *Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project*, in **Appendix A**. New "draft" maps are out for review for the SRA areas for the entire state. As proposed in the new maps (November 21, 2022), the Protect site and adjacent lands are classified as Very High and High Fire Hazard Severity Zones. Adoption of the new maps is anticipated in 2024. Changes (due to the comment period) are not expected for the Project site.

Local Agency Consultation

The following emergency service providers and agency staff were consulted during the preparation of the fire behavior analysis and the evacuation assessment:

- El Dorado Hills Fire Department – Fire Chief, Maurice Johnson and Division Chief/Fire Marshal, Chrishana Fields.
- El Dorado County Fire Protection District – Fire Chief, Tim Cordero.
- El Dorado County Office of Emergency Services (OES) – Sergeant, Leslie Schlag.
- CalFire (Amador/El Dorado Unit) – Battalion Chief Wildfire Resiliency Program, Jeff Hoag.
- El Dorado County Department of Transportation – Supervising Civil Engineer, Adam Bane and Senior, Civil Engineer Dave Spiegelberg.

On November 10, 2022, a coordination meeting was held to review the input assumptions to the fire behavior analysis, including existing/future vegetative interface fuels, topography, fire, weather conditions, evacuation routes (primary routes and emergency vehicle access), and the evacuation area. The input assumptions and feedback received during this coordination meeting were incorporated in the analysis presented in the *Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project* (**Appendix A)**, and the evacuation time estimates presented in this report.

In February 2023, coordination with El Dorado County Department of Transportation (DOT) was initiated to identify input parameters for the evacuation time estimates assessments. These parameters included identification of appropriate fire scenarios, time period for evacuation analysis, evacuation area, evacuation routes, data on recent evacuation events, and availability of fire protection and evacuation plans. DOT delegated input on these parameters to the emergency providers (e.g., Fire Departments and County OES). Email correspondence on February 23, 2023.

Coordination with El Dorado County Office of Emergency Services (Sergeant Leslie Schlag) included a coordination meeting on April 19, 2023, to discuss post evacuation experience to support the evacuation time estimates, including the various stages of evacuation and the time required for evacuations. Email correspondence on June 7, 2023, confirmed Tahoe Basin and South Lake Tahoe evacuation performance during the Caldor Fire. Key input relevant to the evacuation time estimate assessment included the duration of the evacuations in the Tahoe Basin during the Caldor Fire. The evacuation of the Tahoe Basin was planned and conducted in stages. The evacuation of the entire Tahoe Basin took about 10 hours, and the staged evacuation of the City of South Lake Tahoe took approximately three hours, with over two and a half hours of stop-and-go conditions.

In addition to local agency consultation, a survey of first responders and emergency service professionals that had participated in the Camp Fire (Butte County) response or currently work in the region was circulated to gather travel time estimates on Skyway (i.e., the primary evacuation route serving the City of Paradise) between the City of Paradise and the City of Chico during the Camp Fire. A key finding of this survey, relevant to the evacuation time estimate assessment, was the duration of the evacuation. Based on the responses, during the Camp Fire, roughly 30,000 to 50,000 people evacuated, and first responders observed two to five hour evacuation times for evacuees on Skyway to get from Neal Road in the City of Paradise to Bruce Road in the City of Chico. Full survey responses can be found in **Appendix B**.

Disclaimer – Limitations of Emergency Evacuation Assessment

Emergency evacuations can occur due to a variety of events. Any emergency movement involves some uncertainty because individual behavior depends on personal risk assessment for the specific type of emergency event and associated evacuation instructions that will be specific to the context of that event. As such, this assessment is intended to provide a broad understanding of the travel time expectations during an evacuation scenario and what effect the Lime Rock Valley Specific Plan project will have on those times. The analysis does not provide a guarantee that evacuations will follow modeling that is used for analysis purposes, nor does it guarantee that the findings are applicable to any or all situations. The analysis will isolate the general effect of the project on evacuation travel times.

Moreover, as emergency evacuation assessment is an emerging field, there is no established standard methodology and there is no established standard for the appropriate length of time to evacuate an area. Fehr & Peers has adopted existing methodologies in transportation planning that, in our knowledge and experience, we believe are the most appropriate. Nevertheless, such methodologies are necessarily also limited by the tools and data available, and by current knowledge and state of the practice.

This assessment is intended to help the county better understand the project's effect on evacuation travel time. As such, the results are based on a set of scenarios and modeling. Fehr & Peers cannot and does not guarantee the efficacy of the analysis beyond a general assessment of the project's effect on evacuation travel time. Any other use of the information would be beyond our professional duty and capability given the uncertainty of evacuation events and analysis limitations noted above.

Report Organization

The following chapters are included in this report to address the Attorney General's guidelines for evaluating evacuation impacts of the proposed Project:

Chapter 1 – Introduction includes the purpose of this document, Project description, consultation with local agency staff, discusses the limitations of the emergency evacuation assessment, and outlines the report organization.

Chapter 2 – Evacuation Scenarios describes the evacuation scenarios used to analyze the evacuation time of the Project and the Project's effect on the ability of the local community to evacuate due to a wildfire or similar disaster.

Chapter 3 – Methodology describes the evacuation time methodology, including the evacuation area and evacuation routes, the evacuation model, and evacuation vehicle trip demand.

Chapter 4 – Evacuation Time Estimates describes the evacuation time results for various evacuation scenarios.

2. Evacuation Scenarios

This chapter presents the study area and evacuation scenarios used for the evacuation assessment.

Fehr & Peers, in coordination with Firesafe Planning Solutions, emergency service providers, and fire agencies identified study area and evacuation routes for analysis, which are shown on **Figure 2**.

The evacuation assessment includes the following four development scenarios:

- No Project – Represents existing conditions (i.e., existing residents).
- Lime Rock Valley Specific Plan – Represents existing conditions with buildout of the Lime Rock Valley Specific Plan.
- Marble Valley Specific Plan – Represents existing conditions with buildout of the Marble Valley Specific Plan.
- Lime Rock Valley & Marble Valley Specific Plans – Represents existing conditions with buildout of both the Lime Rock Valley and Marble Valley Specific Plans.

Study Area

The study area, which was developed through consultation with emergency service providers and agency staff as outlined above, includes the area generally bounded by US 50, Latrobe Road, and South Shingle Road. Labeled as evacuation corridors, these facilities represent the destination for evacuees when considering the evacuation of the entire study area. The shaded parcels in **Figure 2** represent the area that would potentially be evacuating simultaneously with the Project evacuees and may be using the same routes to exit the evacuation area. Actual evacuation areas will depend on the origin and behavior characteristics of the fire event and the evacuation order issued in response to the event.

Evacuation Routes

As shown in **Figure 2**, the Project site includes two general use access points that will be used daily for ingress and egress that will connect to US 50 at the Bass Lake Road and Cambridge Road interchanges. Five EVA (Emergency Vehicle Access) points are identified, with three primarily serving the Lime Rock site and two primarily serving the Marble Valley site, but all of which could be used by either project. The five EVAs are identified below:

- EVA 1 – Connection to Diablo Trail/Marble Ridge Road under existing conditions with a potential future connection to the approved East Ridge Village project.
- EVA 2 – Connection to Deer Creek Road (gate-controlled neighborhood).
- EVA 3 – Connection to China Diggins Road/Ryan Ranch Road.

- EVA 4 – Connection to Amber Fields Drive (gate-controlled neighborhood).
- EVA 5 – Connection to Shingle Lime Mine Road.

The evacuation analysis assumes that all five EVAs outlined above are available for evacuation with the use of an EVA depending on the specific fire scenario being analyzed.

Additional future EVAs would be provided through the approved East Ridge Village project that would provide access to Latrobe Road and to Valley View Parkway. The future EVAs would also be available to the East Ridge Village and Blackstone communities for evacuation (i.e., to the east) and access by emergency responders.

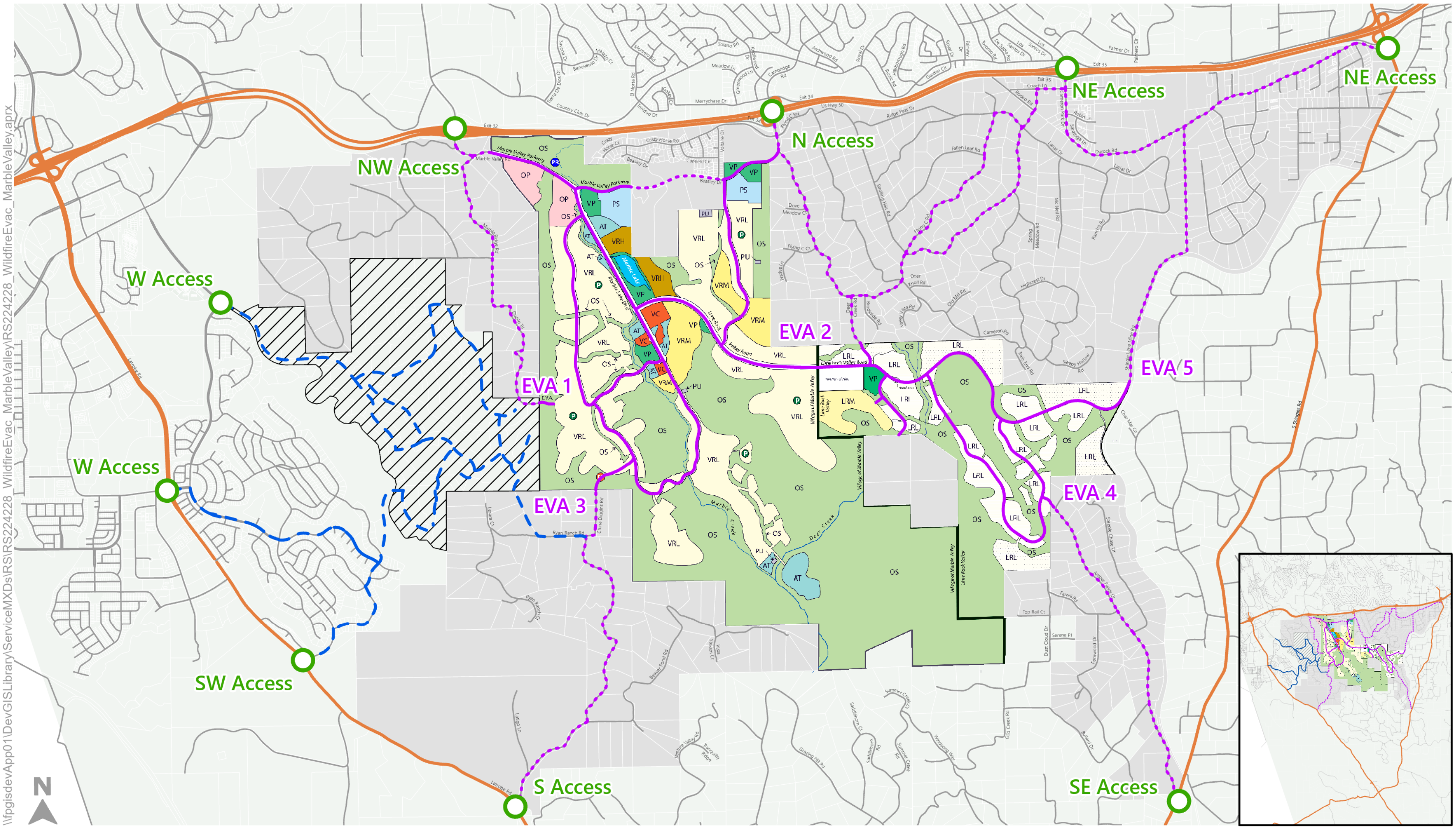
All EVA roadways will be required to meet Public Resources Code (PRC) Section 4290 requirements (e.g., road width, compaction rating, slope, surface material, gates, etc.), which may require off-site improvements to bring existing roadways up to standard.

Evacuation Window

The evacuation time window is the time between when the evacuation order is received, and the time evacuees must begin their evacuation. This does not represent the total time required to evacuate the study area as the total time needed for evacuation will be longer due to distance traveled to exit the evacuation area and congestion.

For this study, a 3-hour evacuation window (i.e., 180 minutes) is used based on the input received from El Dorado County Office of Emergency Services (Sergeant Leslie Schlag), regarding the time to evacuate the City of South Lake Tahoe during the Caldor Fire, and the survey of first responders and emergency service professionals that participated in the Camp Fire in Butte County.

The evacuation window does not apply to self-evacuation, which represents the evacuation of populations in the direct path of the fire where advanced notice is not available due to the fire’s progression.



Evacuation Corridor
Evacuation Route (on-site)
Evacuation Route (off-site)
Future Evacuation Routes
Existing Roads
* Evacuation Area
Future Evacuation Area (East Ridge)
External Gateways

Figure 2

* Evacuation area shown are "potential" areas. Actual evacuation areas with depend on the origin and behavior characteristics of the fire event and the evacuation order issues in response to the event.

Study Area and Evacuation Routes

Study Fire Scenarios

Firesafe Planning Solutions conducted fire behavior modeling for 16 locations surrounding the study area and included different wind direction and speed assumptions, resulting in a total of 33 fire scenarios. Each scenario also includes analysis for no project, with Lime Rock Valley, with Marble Valley, and with both projects resulting in a total of 132 scenarios. **Figure 3** shows the fire behavior modeling locations. Please refer to **Appendix A,** which includes the *Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project*, which summarizes the detailed results of the fire behavior modeling for the 132 scenarios. Each scenario includes how long it will take the fire to reach each evacuation route and the routes that will not be available during a fire scenario.

Fehr & Peers screened all the fire scenarios developed by Firesafe Planning Solutions to identify a worst case set of fire scenarios to use for the evacuation time estimates. The screening considered the availability of evacuation routes and affected area under existing (i.e., no Project) conditions and existing condition with the addition of the Project. Based on this screening, the fire scenarios developed from Locations 2, 4, 7, and 16, shown on **Figure 3**, were selected for the evacuation time estimate assessment. These four scenarios were selected because they would produce the fewest routes available for evacuation for the shortest amount of time. The evacuation performance of the other fire scenarios would be similar to or better than these scenarios. Therefore, detailed analysis is not necessary and their performance can be inferred using the results of the worst-case fire scenarios. **Figures 4 through 7** show the progression of each fire event over time for Fire Scenarios 2, 4, 7, and 16, respectively, for the following analysis conditions:

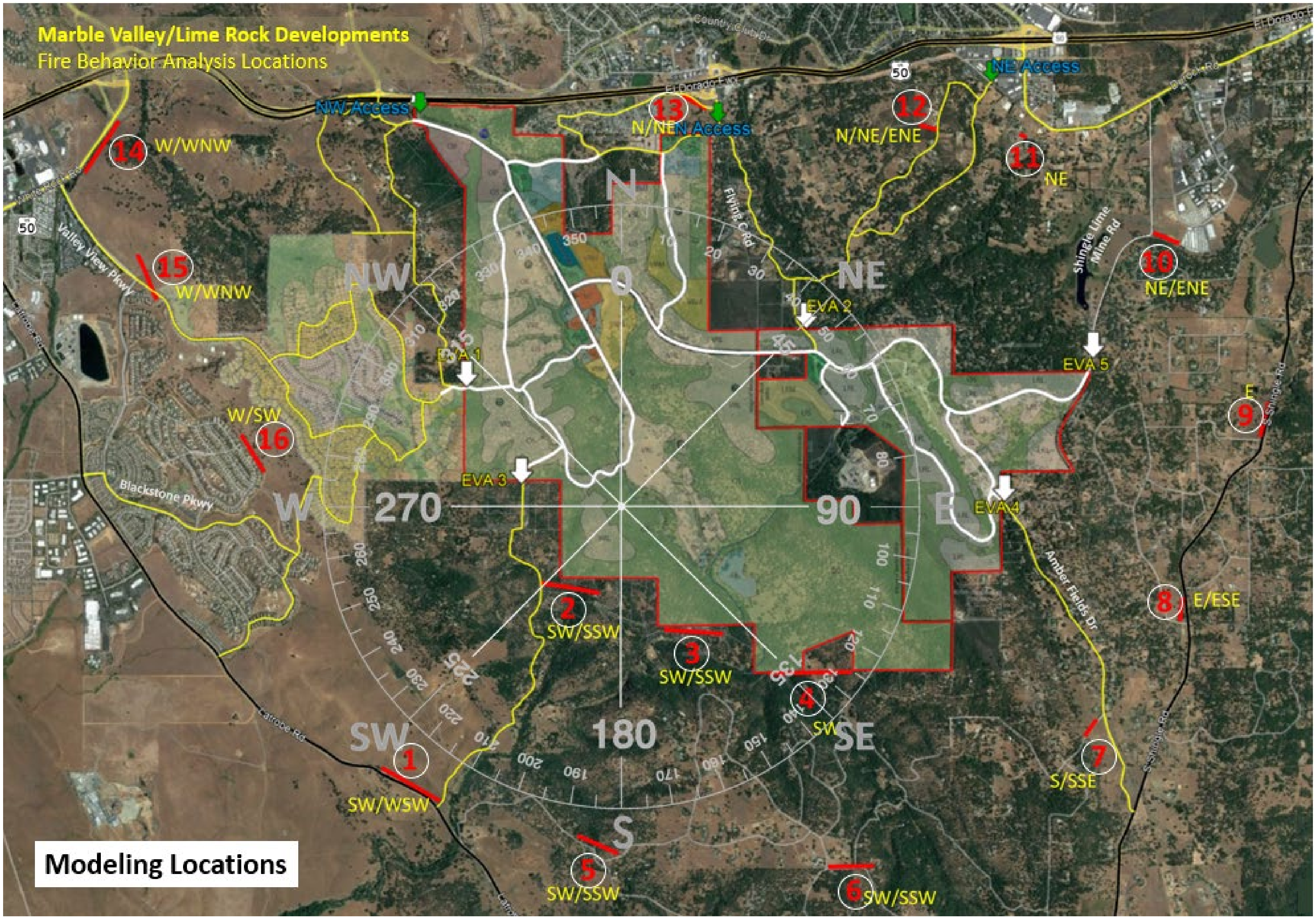
- No Project – Represents existing conditions (i.e., existing residents).
- Lime Rock Valley Specific Plan – Represents existing conditions with buildout of the Lime Rock Valley Specific Plan.
- Marble Valley Specific Plan – Represents existing conditions with buildout of the Marble Valley Specific Plan.
- Lime Rock Valley & Marble Valley Specific Plans – Represents existing conditions with buildout of both the Lime Rock Valley and Marble Valley Specific Plans.

Table 1 summarizes the fire analysis scenarios, including the fire origin, the wind direction, and wind speed. For each fire scenario, **Table 1** summarizes the availability of each evacuation route and the time the route is available for evacuation. Each evacuation route is categorized as follows:

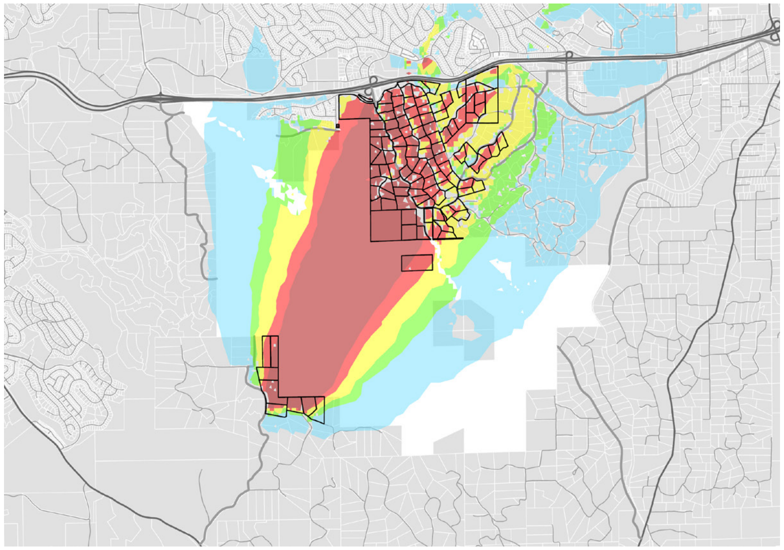
- Available Routes: Evacuation routes available for more than 180 minutes.
- Partially Available Routes: Evacuation routes available less than 180 minutes but more than 30 minutes. For these routes, the time the route will remain available is identified.
- Not Available Routes: Evacuation routes available for 30 minutes or less.

The scenario numbers and names are consistent with the fire behavior modeling scenarios conducted by Firesafe Planning Solutions.

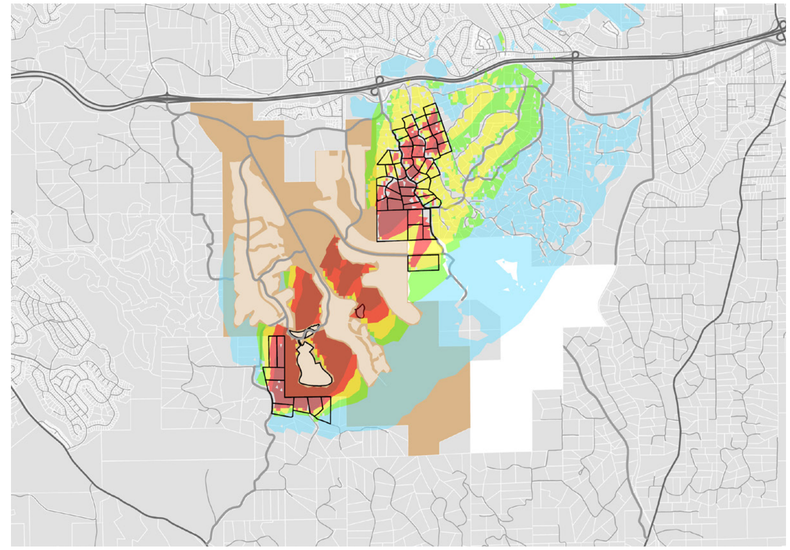
Figure 3: Fire Behavior Modeling Locations



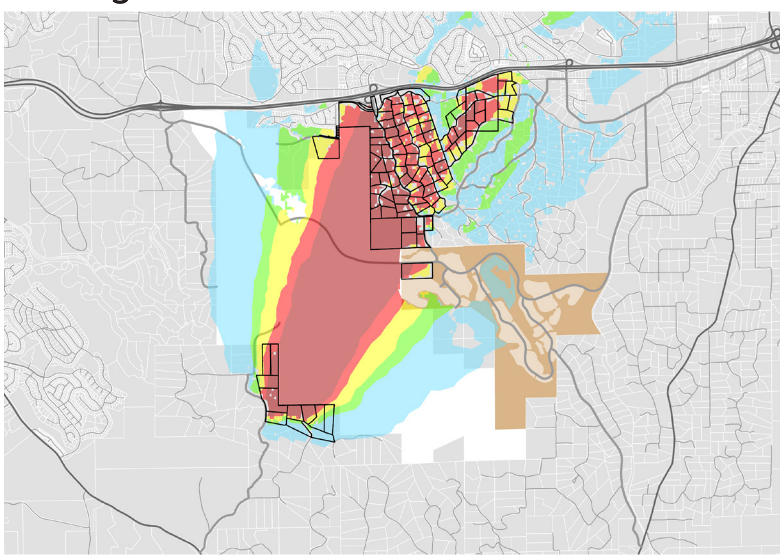
Existing - 2A



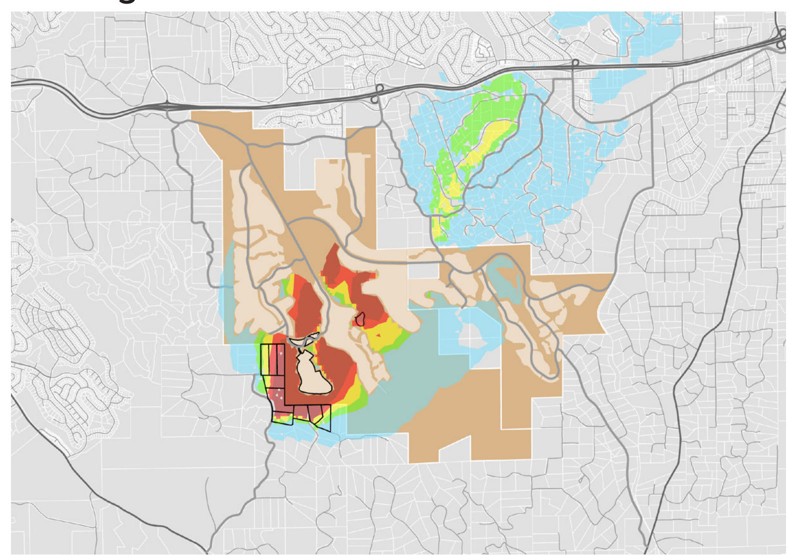
Existing Plus MVSP - 2B



Existing Plus LRSVP - 2C



Existing Plus MVSP & LRSVP - 2D



Fire Progression (minutes):

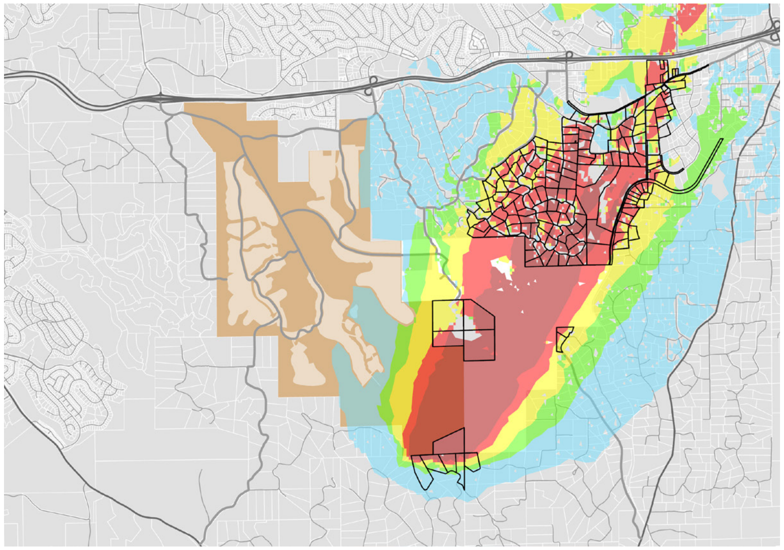
- 30
- 60
- 120
- 180
- 240

- Project Area
- Project Residential Area
- Vulnerable Parcels
- Evacuation Routes

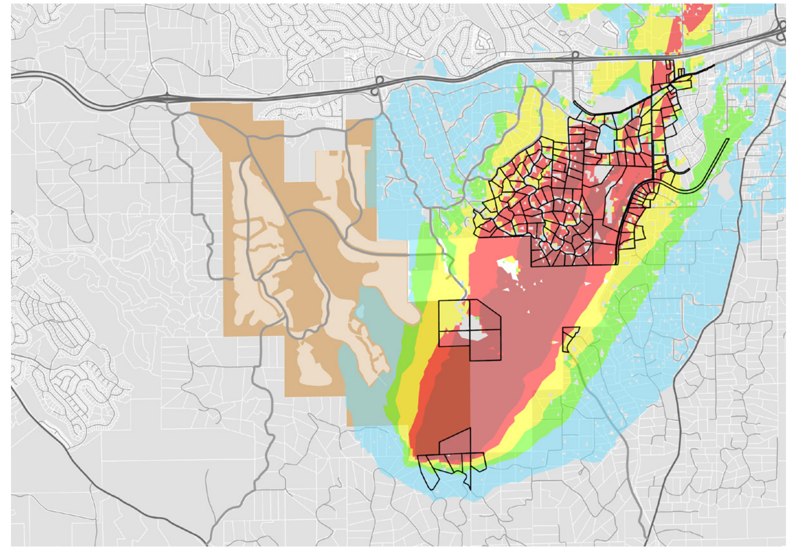
Figure 4

Fire Analysis Scenario 2

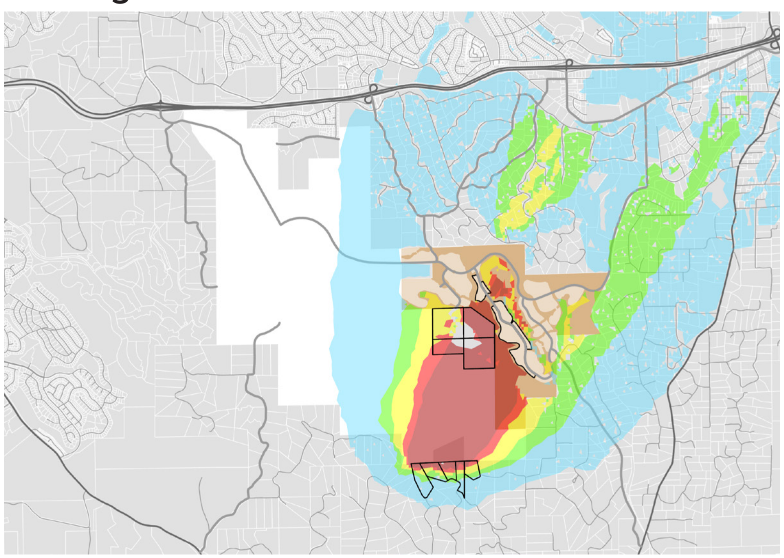
Existing - 4A



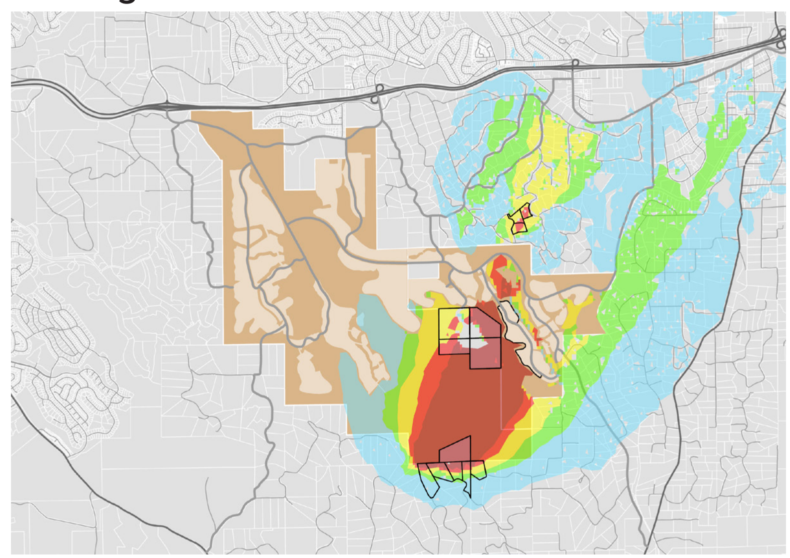
Existing Plus MVSP - 4B



Existing Plus LRSVP - 4C



Existing Plus MVSP & LRSVP - 4D



Fire Progression (minutes):

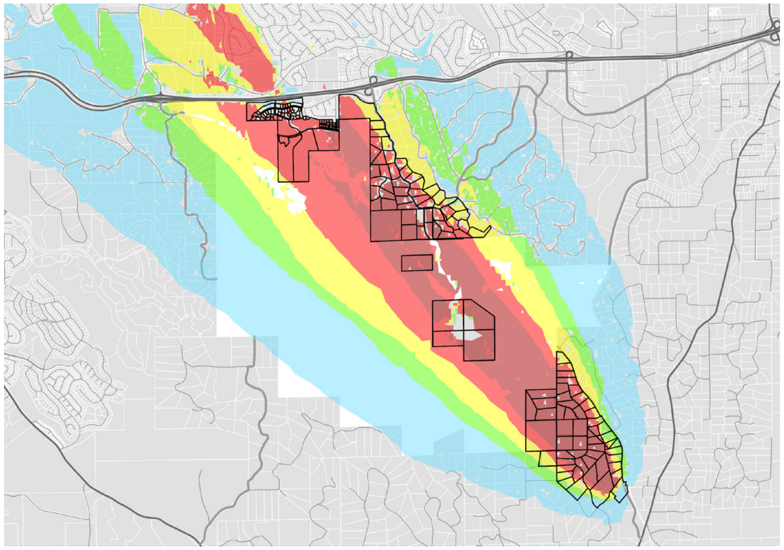
30 | 60 | 120 | 180 | 240

Project Area
Project Residential Area
Vulnerable Parcels
Evacuation Routes

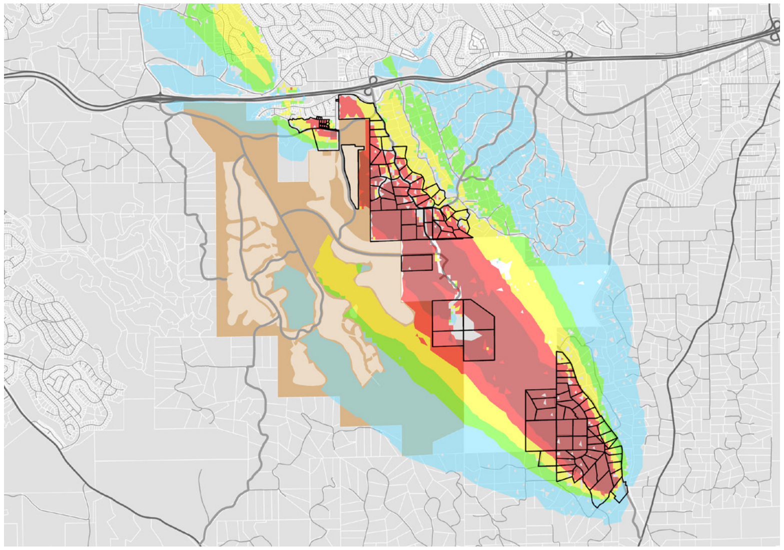
Figure 5

Fire Analysis Scenario 4

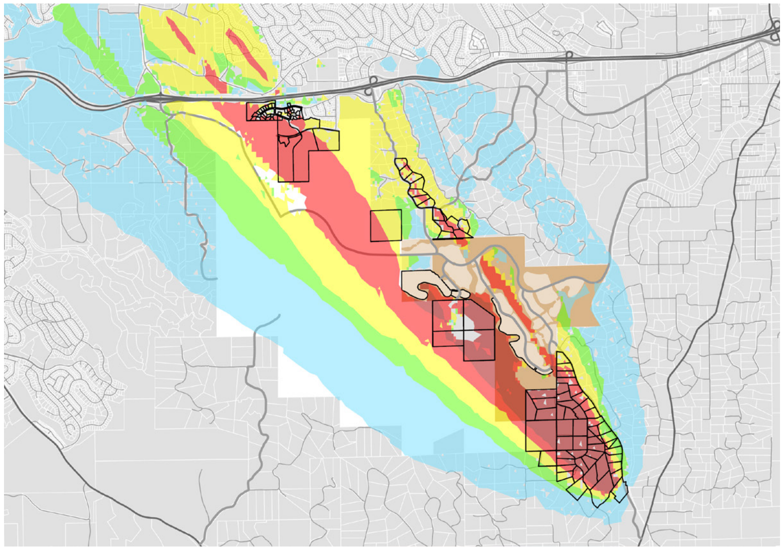
Existing - 7E



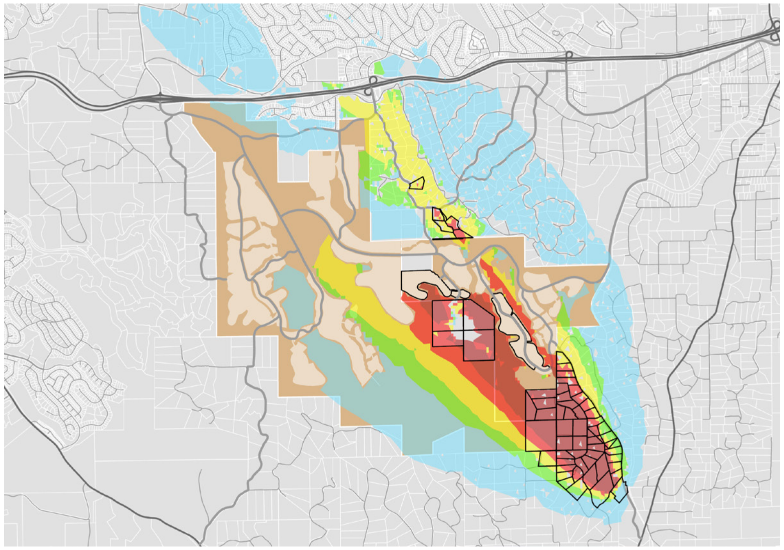
Existing Plus MVSP - 7F



Existing Plus LRSVP - 7G



Existing Plus MVSP & LRSVP - 7H



Fire Progression (minutes):

30 | 60 | 120

180 | 240

Project Area

Project Residential Area

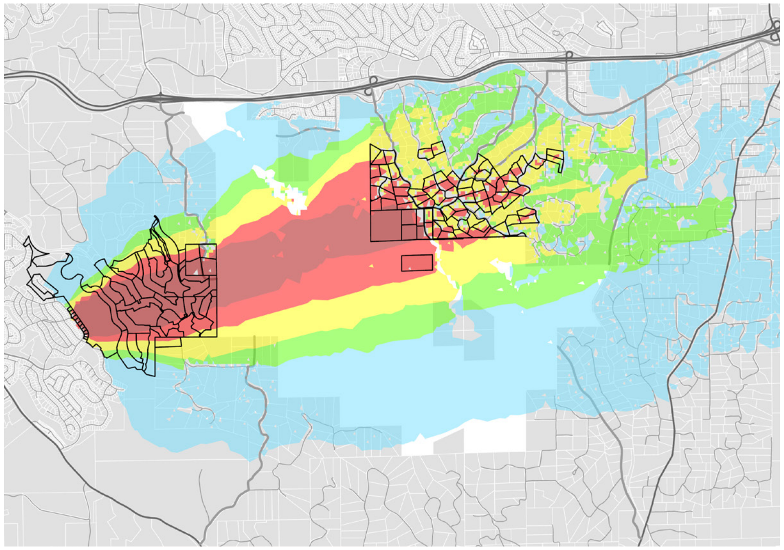
Vulnerable Parcels

Evacuation Routes

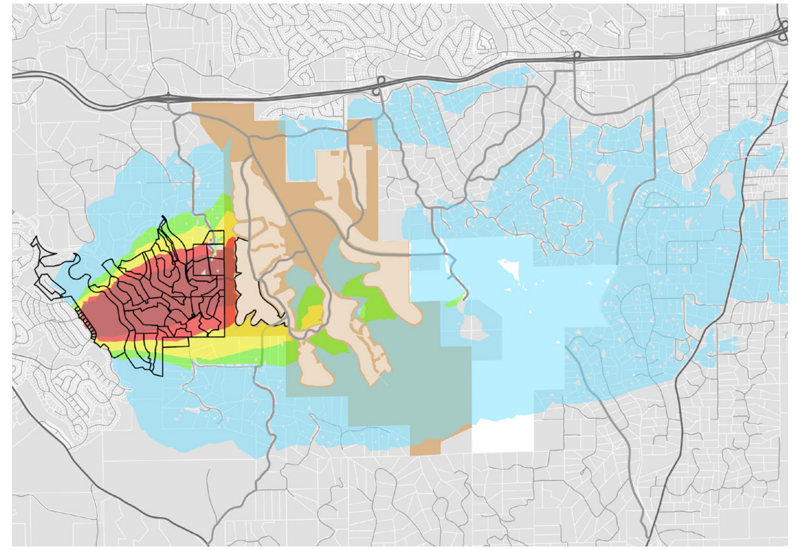
Figure 6

Fire Analysis Scenario 7

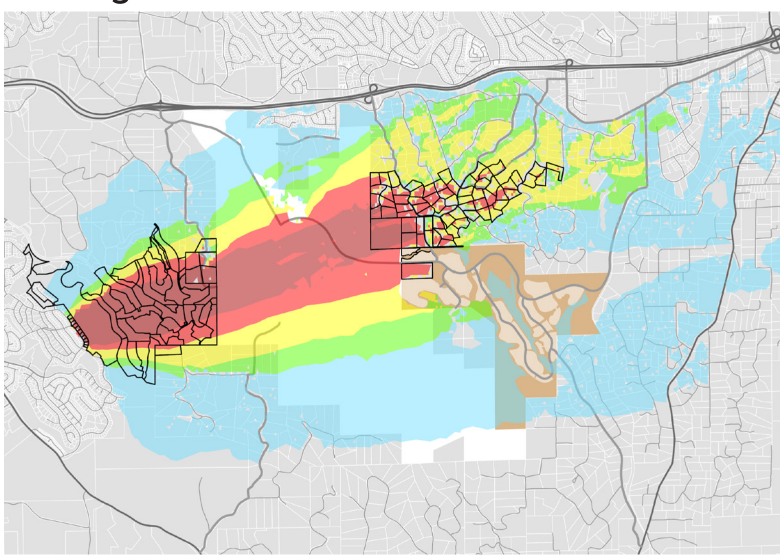
Existing - 16A



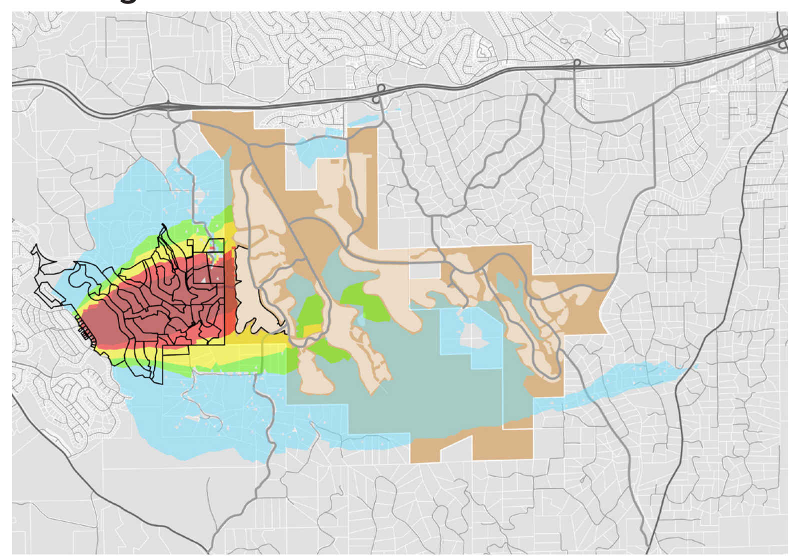
Existing Plus MVSP - 16B



Existing Plus LRSVP - 16C



Existing Plus MVSP & LRSVP - 16D



Fire Progression (minutes):

30 | 60 | 120 | 180 | 240

Project Area

Project Residential Area

Vulnerable Parcels

Evacuation Routes

Figure 7

Fire Analysis Scenario 16

Table 1: Evacuation Analysis Scenarios

Fire Location	Wind Direction and Speed	Analysis Scenario	Fire Scenario ID	Evacuation Routes and Route Availability (minutes)							
				NW	N	NE	EVA 1	EVA 2	EVA 3	EVA 4	EVA 5
Ryan Ranch Rd to Beaver Pond Rd	SW 65 mph	Existing Conditions	2-A			150					
		Existing Plus Marble Valley Specific Plan	2-B		145	150			115		
		Existing Plus Lime Rock Valley Specific Plan	2-C			160			110		
		Existing Plus Marble Valley & Lime Rock Valley Specific Plans	2-D					75	110		
End of Summer Creek Ct	SW 65 mph	Existing Conditions	4-A			60					
		Existing Plus Marble Valley Specific Plan	4-B			90		150			
		Existing Plus Lime Rock Valley Specific Plan	4-C			120				90	120
		Existing Plus Marble Valley & Lime Rock Valley Specific Plans	4-D			120				90	120
Bullard Dr west of Amber Fields Dr	SSE 65 mph	Existing Conditions	7-E	100	90						
		Existing Plus Marble Valley Specific Plan	7-F		90						
		Existing Plus Lime Rock Valley Specific Plan	7-G	120	150			120			
		Existing Plus Marble Valley & Lime Rock Valley Specific Plans	7-H		150			120			
East of Aspen Meadows Dr and Cornerstone Dr	W 50 mph	Existing Conditions	16-A		150				100		
		Existing Plus Marble Valley Specific Plan	16-B					120	100		120
		Existing Plus Lime Rock Valley Specific Plan	16-C						100		90
		Existing Plus Marble Valley & Lime Rock Valley Specific Plans	16-D						100		

Source: Firesafe Planning Solutions, 2023
Fehr & Peers, 2023

Notes:

	Available Routes: Evacuation routes available for more than 180 minutes
(minutes)	Partially Available Routes: Evacuation routes available less than 180 minutes but more than 30 minutes
	Not Available Routes: Evacuation routes available for 30 minutes or less

3. Methodology

Forecasting evacuation travel times relies on similar methodology to what is used in conventional travel demand forecasting and traffic operations analysis albeit with modifications to account for the unique circumstances of an evacuation event. The basic steps involve forecasting the demand across specific time periods, determining the distribution of associated trips, assigning the trips to specific routes, and analyzing the capacity of the routes to accommodate those trips. Since evacuation events can generate substantial demand in a brief time, the ability of the roadway network under typical operations can be challenged to accommodate that demand without causing substantial delays such as those reported during the Caldor Fire. Delays experienced would be characterized by forced flow, stop-and-go conditions, and extensive vehicle queuing. With ample notice, an evacuation event could occur with minimal impact to roadway traffic operations and usual travel times. For this study, a short evacuation window is analyzed to isolate the project's effect on evacuation travel times during more severe conditions.

The emergency evacuation time estimates include the following steps:

- Preparing the sub-area network representing the study area and the associated background trips (some background travel demand occurs on portions of the network from people traveling for common activities and not affected by the evacuation).
- Forecasting evacuation vehicle trips during the wildfire event.
- Dynamically assigning trips to the sub-area network.

EVAC+ Model

The Fehr & Peers EVAC+ model has been applied for numerous evacuation time estimates for projects throughout California and was utilized to evaluate the estimated travel time for the four fire scenarios outlined in Chapter 2. EVAC + uses inputs from the El Dorado County Travel Demand Model for a typical weekday and modifies the travel demand and transportation network to represent the evacuation condition. EVAC+ is built in TransCAD 8.0 and is a dynamic traffic assignment model sensitive to how demand flows in short periods of time affects the speed of travel on the roadway network and the resulting ability of individual roadway segments and intersections to accommodate that demand. After determining the evacuation travel demand and associated transportation network, a dynamic traffic assignment with 15-minute intervals is used to capture the demand and capacity relationship that produces resulting travel speeds and evacuation travel times. Note that this model does not include estimating the time people need to prepare for the evacuation.

Trips were assigned using the EVAC+ tool. The EVAC+ tool relies on the Study Area traffic analysis zones and existing roadway network extracted from the El Dorado County model. Areas affected by the evacuation event are then processed through the EVAC+ tool trip estimator to estimate the number and sequencing of trips that occur due to the event.

The sub-area extracted network and new trip tables are then input into a dynamic traffic assignment model. A dynamic traffic assignment model estimates traffic and levels of congestion on 15-minute intervals and, as link demand builds (i.e., roads fill with cars), it dynamically reassigns traffic to less congested routes. This is a more accurate way of estimating trip assignment and identifying congested locations on the network that should be considered during an evacuation event. The EVAC+ tool processes are outlined in **Figure 8 and Figure 9**.

Figure 8: EVAC+ Model Framework

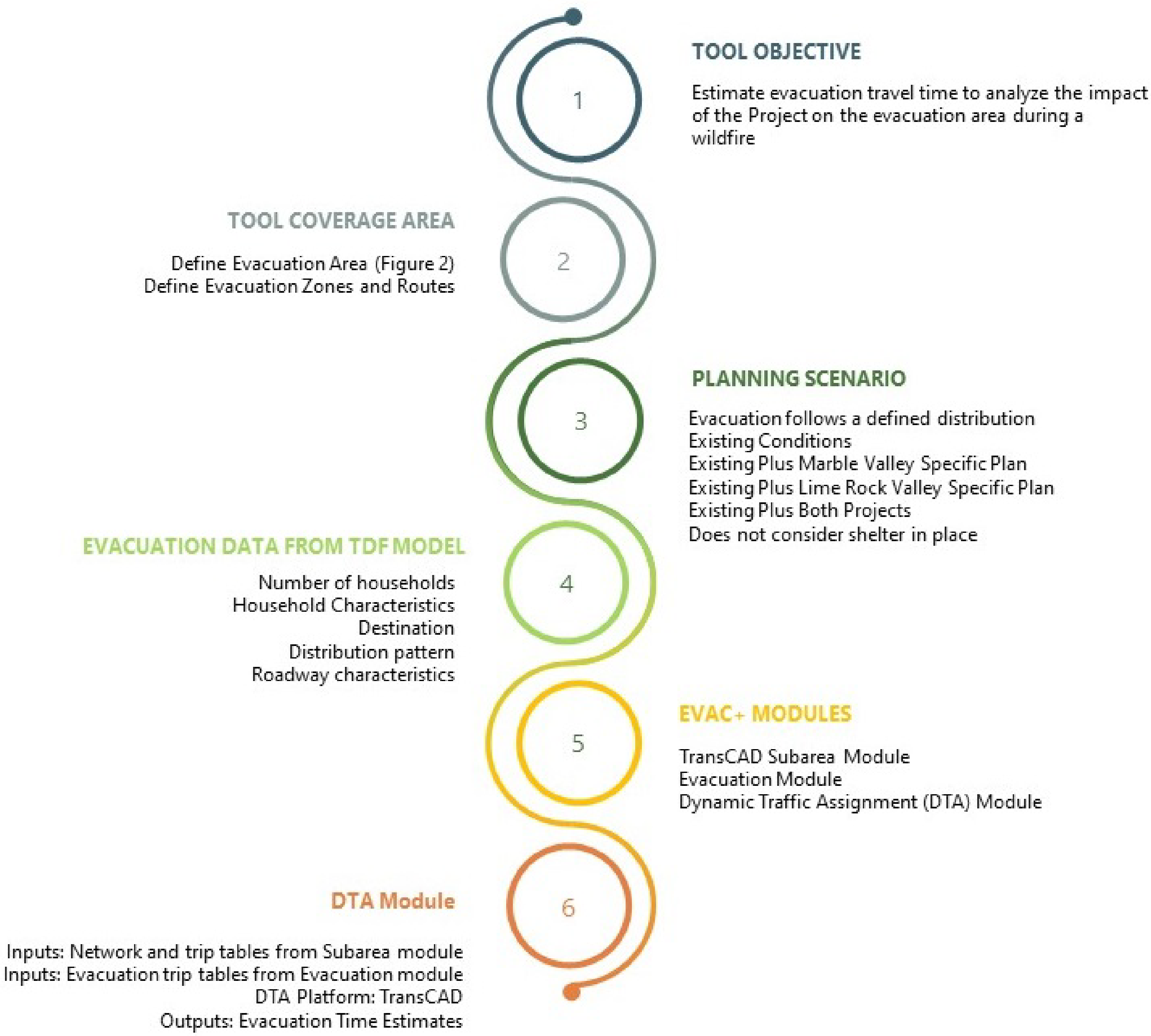
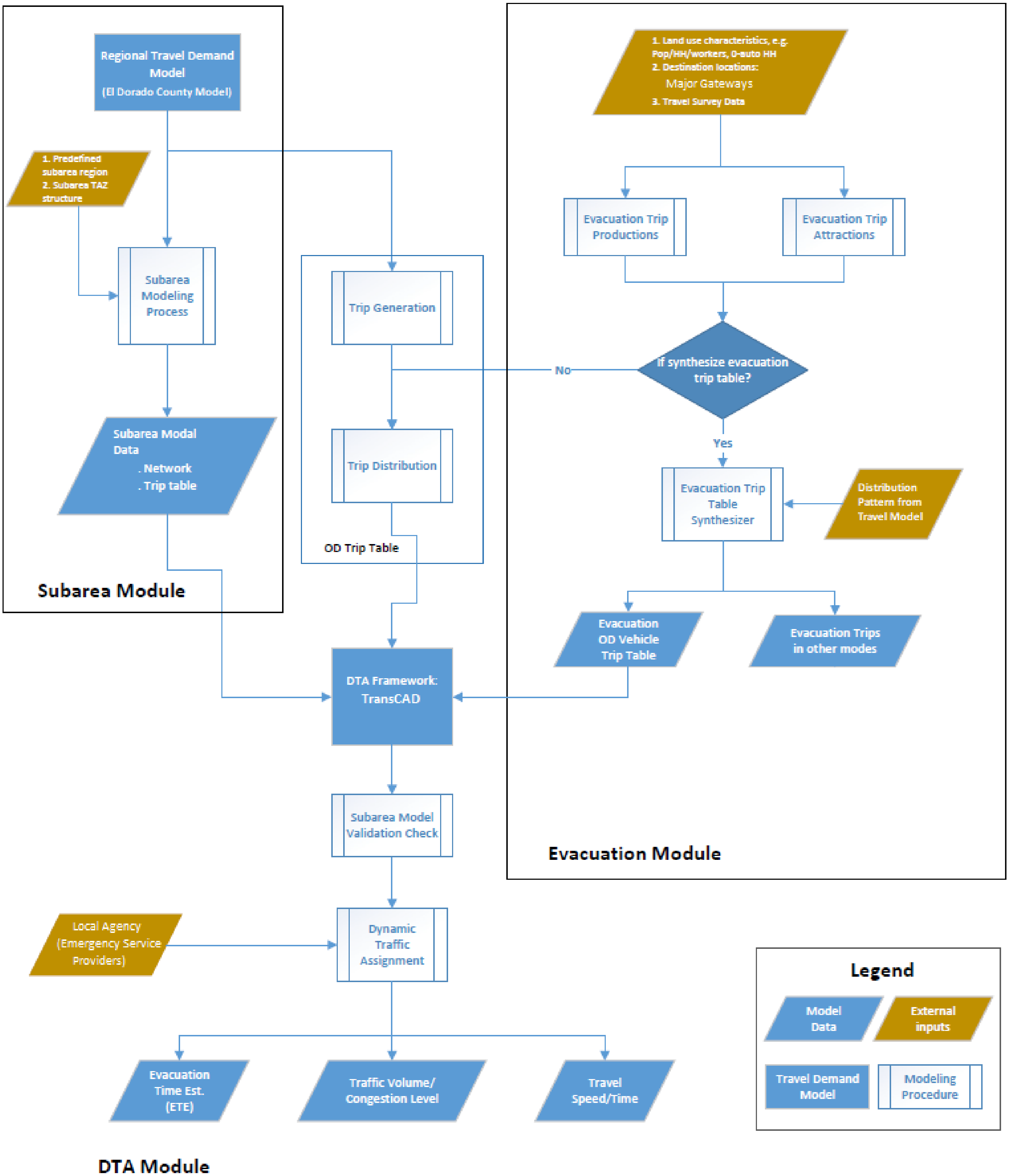


Figure 9: EVAC+ Dynamic Traffic Assignment (DTA) Module



Model Inputs

The travel demand considers the number of people and automobiles used by those evacuating, the background vehicle traffic, and the type of activities being conducted based on the type and timing of the evacuation event. The dynamic traffic assignment model only reflects personal vehicle traffic. Due to the nature of this model, travel made by those in publictransit, other shared modes (i.e., vanpool), or walking/biking are not analyzed. The overall vehicle travel demand was based on the typical travel for each hour of daily activity until the evacuation notice was given. The travel demand for evacuation zones was separated from background traffic not associated with evacuation zones.

The inputs to the EVAC+ model are discussed below and include the transportation network, background and evacuation trip matrix, evacuation window, and distribution.

Model Network

EVAC+ includes a transportation network to represent the evacuation condition. The evacuation sub-area is a subset of the EL Dorado County travel demand model. A "sub-area extraction" is performed to develop the sub-area model network.

Background Traffic

Background traffic is associated with trips traveling to or from evacuation zones and is taken directly from the El Dorado County travel model for a typical day, then distributed over each hour of the day. Trips that do not end in evacuation zones go about their normal activity regardless of if the evacuation order has been given. Trips that end in the evacuation zone after the evacuation order is given do not travel and stay in the original zone.

Background traffic in the EVAC+ is added as a matrix that shows trips between origins and destinations within the sub-area. The matrix is converted from hourly traffic to 15-minute bins to run the dynamic traffic assignment. Background trips change based on the time of day.

Evacuation Traffic

Evacuation traffic consists of traffic generated by residents, students, employees, and visitors of the evacuation zones. The EVAC+ model uses the land use and vehicle trip inputs to create a matrix of trips between origins and gateways (i.e., destinations) within the sub-area. The matrix is created based on the evacuation departure time and total vehicle trips.

As outlined in the *Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project* (**Appendix A**), the fire scenarios modeled are extreme and the results indicate the fire will be traveling at a rate faster than fire suppression activity will allow for control lines. The size, location and configuration of the Project site makes it unlikely that a fire will impact the entire evacuation area simultaneously (shown in **Figure 2**), but rather the fire will impact different portions over time. Consequently, evacuation time estimates are developed for the following evacuation conditions:

- Self-Evacuation – Represents the evacuation of populations in the direct path of the fire where advanced notice is not available due to the fire's progression. These vulnerable populations are in the red areas (i.e., where the fire's progression is 60 minutes or less) shown in the fire scenario figures (**Figures 4 through 7**). As analyzed, evacuation is assumed to begin within 15 minutes of the fire's recognition. However, self-evacuation may be a part of an Ordered Evacuation, representing an initial phase of the evacuation that occurs before the Sheriff issues an order to evacuate. Evacuation time is estimated from the evacuation trip origin to the closest safe location not in the direct path of the fire, which may be inside or outside the study area shown on **Figure 2**.

- Ordered Evacuation – Represents the evacuation of the entire population (residents, students, employees, and visitors) in the evacuation area for an event with ample notice where emergency services are participating in the evacuation. As analyzed, the evacuation window is 3 hours (180 minutes) beginning from the Sheriff ordering the evacuation. Evacuation time is estimated from the evacuation trip origin to the study area gateways identified on **Figure 2**.

Traffic analysis zone geographies were used to represent neighborhoods and estimate the number of trips for households, employees, students, and visitors. Vehicle trips for evacuation were informed by the existing land use and socio-economic data in each traffic analysis zone. The socio-economic data includes a variety of information based on 2020 5 Year ACS Data Table - B08201, including persons per household, number of employees, auto-ownership information, population, and other factors that could affect the number of vehicles per household used during an evacuation event.

Table 2 summarizes the socio-economic data inputs used to develop the evacuation trips for self-evacuation of vulnerable populations by analysis scenario.

As shown on shown on the fire scenario figures (**Figures 4 through 7)** and summarized in **Table 2**, the addition of the Lime Rock Valley Specific Plan and/or the Marble Valley Specific Plans affect the progression of the fire event. Consequently, the vulnerable population in the existing areas will decrease or remain unchanged.

The change in vulnerable population results from the fuel modification/defensible spaces created by the development, which will be constructed in accordance with the following code, standards, and requirements that are applicable to new development in the Very High Fire Hazard Severity Zones:

- Public Resources Code
- Fire Code
- California Building Code
- California Residential Code

- Fire Department Requirements

Please refer to **Appendix A,** which includes the *Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project,* for a comprehensive discussion of fire behavior and the effect of development on fire progression.

Table 2: Self-Evacuation (Vulnerable Population) Scenario: Land Use and Trip Summary

Fire Scenario	Study Areas & Analysis Scenarios		Vulnerable Population							
			Population		Households		Employees		Evacuation Vehicle Trips	
			Existing	Project	Existing	Project	Existing	Project	Existing	Project
2	Study Area	Existing Area	108	N/A	45	N/A	20	N/A	85	N/A
		LRVSP	108	0	45	0	20	0	73	0
		MVSP	32	264	14	100	5	0	31	189
		LRVSP & MVSP	0	264	0	100	0	0	0	189
	Analysis Scenario	Existing Conditions	108		45		20		85	
		Existing Plus LRVSP	108		45		20		73	
		Existing Plus MVSP	296		114		5		220	
		Existing Plus LRVSP & MVSP	264		100		0		189	
4	Study Area	Existing Area	193	N/A	80	N/A	241	N/A	212	N/A
		LRVSP	0	404	0	160	0	0	0	303
		MVSP	159	0	67	0	12	0	95	0
		LRVSP & MVSP	0	404	0	160	0	0	0	303
	Analysis Scenario	Existing Conditions	193		80		241		212	
		Existing Plus LRVSP	404		160		0		303	
		Existing Plus MVSP	159		67		12		95	
		Existing Plus LRVSP & MVSP	404		160		0		303	

Table 2: Self-Evacuation (Vulnerable Population) Scenario: Land Use and Trip Summary (Continued)

Fire Scenario	Study Areas & Analysis Scenarios		Vulnerable Population							
			Population		Households		Employees		Evacuation Vehicle Trips	
			Existing	Project	Existing	Project	Existing	Project	Existing	Project
7	Study Area	Existing Area	557	N/A	235	N/A	15	N/A	445	N/A
		LRVSP	284	323	119	128	1	0	248	243
		MVSP	301	132	125	50	12	0	237	95
		LRVSP & MVSP	207	323	86	128	0	0	163	243
	Analysis Scenario	Existing Conditions	557		235		15		445	
		Existing Plus LRVSP	607		247		1		491	
		Existing Plus MVSP	433		175		12		332	
		Existing Plus LRVSP & MVSP	530		214		0		406	
16	Study Area	Existing Area	112	N/A	46	N/A	6	N/A	97	N/A
		LRVSP	105	0	42	0	6	0	84	0
		MVSP	75	124	29	49	0	0	55	93
		LRVSP & MVSP	75	124	29	49	0	0	55	93
	Analysis Scenario	Existing Conditions	112		46		6		97	
		Existing Plus LRVSP	105		42		6		84	
		Existing Plus MVSP	199		78		0		148	
		Existing Plus LRVSP & MVSP	199		78		0		148	

Source: Fehr & Peers, 2023
LRVSP – Lime Rock Valley Specific Plan
MVSP – Marble Valley Specific Plan
Note: Evacuation vehicle trips include evacuation of the vulnerable population (residents, students, employees, and visitors).

Table 3 summarizes the socio-economic data inputs used to develop the evacuation trips for an Ordered Evacuation by analysis scenario.

Table 3: Ordered Evacuation Scenario: Land Use and Trip Summary

Analysis Scenarios	Population	Households	Employment	Evacuation Vehicle Trips
Existing Conditions	2,804	1,132	2,413	1,596
Lime Rock Valley Specific Plan	*2,022*	*800*	*0*	*1,804*
Marble Valley Specific Plan	*8,057*	*3,236*	*1,595*	*6,649*
Existing Plus Lime Rock Valley Specific Plan	4,826	1,932	2,413	3,400
Existing Plus Marble Valley Specific Plan	10,861	4,368	4,008	8,245
Existing Plus Lime Rock Valley & Marble Valley Specific Plans	12,883	5,168	4,008	10,049

Source: Fehr & Peers, 2023
LRVSP – Lime Rock Valley Specific Plan
MVSP – Marble Valley Specific Plan
Note: Evacuation vehicle trips include evacuation of the entire population (residents, students, employees, and visitors).

Evacuation Distribution

The evacuation time window is the time between when the evacuation order is received, and the time evacuees must begin their evacuation. As discussed in **Chapter 2**, a 3-hour (180 minutes) evacuation window is used for the analysis of the Ordered Evacuation.

Evacuation events are not linear, and it is anticipated that evacuation rate will closely resemble a bell curve from the time that the evacuation order is issued. This is consistent with other research on short-notice evacuation events as documented in the study by Noh et. al[2] and Florida Hurricane Evacuation[3]. For this study, curves developed from stated preference surveys of Ashland residents by KLD Engineering were used as a guide. A weighted average distribution was created for all evacuees. **Figure 10** shows the curves from the Ashland survey (i.e., in red, green, and blue) and the curve used for this study (i.e., in yellow). **Table 4** shows the time distribution for each 15-minute time bin. Note that although this is the assumed distribution for the EVAC+ model, emergency scenarios are often unpredictable, and driver behavior can be disorderly.

Depending on the fire event, traffic may be evacuating directly or may be returning home before evacuating, allowing for families to regroup prior to evacuating (i.e., residents with commuters). The

[2] Noh, Chiu, Zheng, Hickman, and Mirchandani, *Approach to Modeling Demand and Supply for a Short-Notice Evacuation,* Transportation Research Record 2091

[3] Roberto Miguel, *Florida Statewide Hurricane Evacuation Model/TIME*, December 9, 2015

number of vehicle trips depends on the type and time of the event, the number of drivers in the household, and the number of vehicles available.

Figure 10: Evacuation Trip Distribution

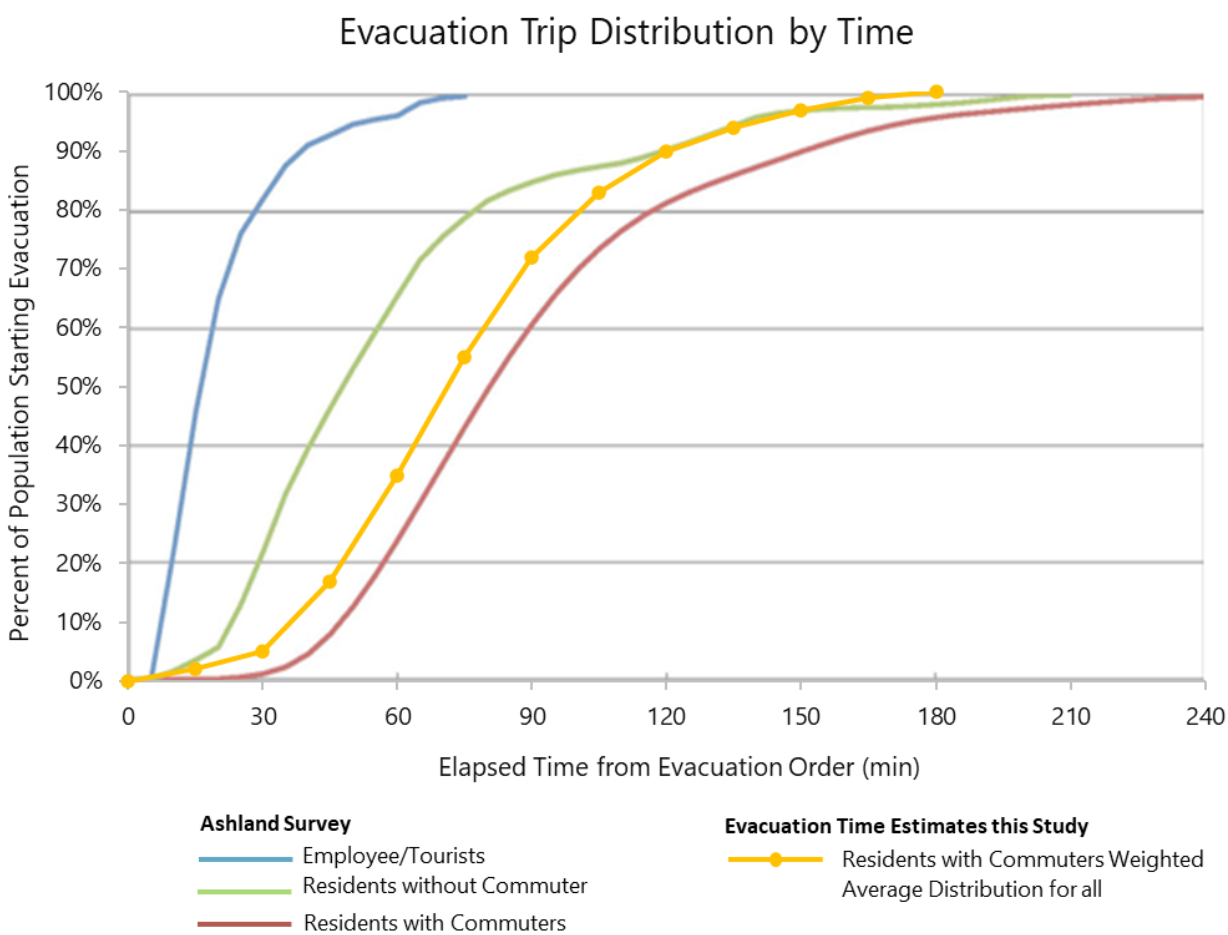


Table 4: Evacuation Distribution Assumptions

Time Analysis Interval (minutes)	Percent Evacuating
0-15	2%
15-30	3%
30-45	12%
45-60	18%
60-75	20%
75-90	17%
90-105	11%
105-120	7%
120-135	4%
135-150	3%
150-165	2%
165-180	1%

Source: Fehr & Peers, 2023

Evacuation Start Time

The start time leaving the evacuation zones varies by type of the event. With different evacuation starting times, the impact of the evacuation trips on the roadway conditions will be different. For example, evacuations occurring at nighttime when all household members are at home will be different from evacuations occurring when all or part of household members have made their regular trips from or to the evacuation areas.

For events where ample notice is given or the family unit is already together, less time is needed to prepare for the evacuation. On the other hand, where little notice of an event or when the family unit is not together, the time required to prepare for an evacuation is typically longer as residents may need to prepare belongings, collect their animals, and conduct other coordination before beginning their evacuation trip.

Evacuation start time for each fire scenario was identified based on the historic wind events used to develop the fire analysis scenarios shown on **Figures 4 through 7**. The fire scenarios were developed based on site-specific wind speeds and directions. Each of the fire scenarios corresponds to historic wind data from weather sites near the study area.

The extreme fire events used in the modeling correspond to "extreme fire weather" or "red flag warning" conditions. Under these conditions, some fraction of the population may complete some preparations for evacuation and be able to evacuate sooner and more efficiently than at other times. However, because it would be speculative to try and estimate the percentage of the population that may make advanced preparations, what those preparations might be, and how they would help expedite the overall evacuation process, this issue is not incorporated into the modelling.

For the evacuation time estimates, the historic wind data was reviewed to identify the time of day the winds for the specific fire scenario occurred. *Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project*, includes the detailed analysis of the fire analysis scenarios. **Table 5** shows the evacuation start times for each scenario.

Table 5: Evacuation Start Time Assumptions

Fire Scenario	Wind Direction	Evacuation Start Time
2	SW	11:00 AM
4	SW	11:00 AM
7	SSE	7:00 AM
16	W	1:00 PM

Source: Fehr & Peers, 2023

Evacuation Destination

The destination of evacuating trips depends on whether the evacuation is a Self-Evacuation of vulnerable populations or an Ordered Evacuation. For a Self-Evacuation, the destination is to the closest safe location, which may be inside or outside the study area. For an Ordered Evacuation, the destination is outside the study area using a study area gateway shown on **Figure 2**.

Selectzone model runs were performed to estimate gateway travel for each analysis scenario. **Table 6** shows the gateway weights or trip attractions for each scenario. The weights are for “Typical Weekday” conditions and vary by analysis scenario. The gateway weights are a starting point for assigning evacuation trips to the study area gateways and adjust through the iterative dynamic traffic assignment process, based on the route availability for each fire scenario as summarized in **Table 1**. The percentages in **Table 6** represent the share of evacuation trips assigned to each study area gateway at the beginning of the evacuation, prior to effect of congestion and rerouting of traffic to less congested routes that occurs with dynamic traffic assignment.

Table 6: Evacuation Gateway Weights

Gateways	Existing	Existing Plus LRVSP	Existing Plus MVSP	Existing Plus LRVSP and MVSP
East of Durock Rd and North of S Shingle Rd	18%	20%	10%	11%
North of Cameron Park Drive/US 50	53%	48%	28%	28%
North of Cambridge Rd/ US 50	12%	12%	20%	22%
North of Marble Valley Rd/US 50	2%	14%	32%	32%
North of Latrobe Rd	6%	2%	4%	3%
South of Latrobe Rd and S Shingle Rd	9%	5%	6%	4%

Source: Fehr & Peers, 2023
Notes: Gateway weights are calculated from selectzone model runs.
LRVSP – Lime Rock Valley Specific Plan
MVSP – Marble Valley Specific Plan

Transportation Network Assignment

Depending on the event, the dynamic traffic assignment can model the change in accessibility and use of a roadway over the duration of the event. Some operating conditions that the model can evaluate are described below.

Normal Roadway Conditions

The evacuation time estimate analysis assumes typical daily operating conditions for both the number of travel lanes per direction and associated hourly capacity per lane. This condition allows for the opposite direction of evacuation traffic to be used for emergency responders to access the evacuation area and for background traffic to operate normally.

Contra-Flow Operations

Contra flow operations refer to evacuation travel where traffic is flowing in only one direction (e.g., using both travel lanes of a two-lane roadway for evacuation in the same direction). This condition does not allow for the opposite direction of evacuation traffic to be used for emergency responders to access the evacuation area and prohibits background traffic travel in the opposite direction from the evacuation traffic. The evacuation time estimate analysis does not rely on contra-flow operations.

Capacity Restrictions

The routes that are operational longer than 180 minutes during a fire scenario are assumed to be “Available” for evacuation. The available routes are assumed to be operational at normal capacity.

The roadways that will be operational during a fire scenario for less than 30 minutes are assumed to be "Not Available" for evacuation. These routes are turned off in the dynamic traffic assignment model.

If an evacuation route is available for a specific amount of time that is less than the evacuation window (i.e., 180 minutes), that route is assumed to be "Partially Available" for evacuation. The Partially Available routes are assumed to be turned off after they are not available for evacuation, as specified by the fire behavior analysis. This is indicated in the model by an "incident." The incident's start time varies by scenario and is set according to the availability of the routes in **Table 1**. This means that those routes will operate at normal capacity until the fire affects their availability for evacuation. At that point (at incident start time), the route will be closed to evacuation and vehicles rerouted to other evacuation routes/gateways. This will cause additional congestion in the dynamic traffic assignment model.

Model Output

The output for the EVAC+ model includes the following:

- Congested Skim Matrix – Includes matrices of travel time between each zone and gateway for each 15-minute bin (i.e., four per hour) for each hour of the day for a total of 96 matrices.
- Evacuation Vehicle Trip Matrix – Includes matrices of evacuation trips between each zone and gateway for each 15-minute bin that includes evacuation trips. A total of 96 bins are created, but only the time bins within the specified evacuation window are populated.
- Link Flow Network – Includes vehicle volume for each 15-minute bin on the roadway network.

Results from the model are summarized for different population groups to create evacuation time estimate results.

4. Evacuation Time Estimate Results

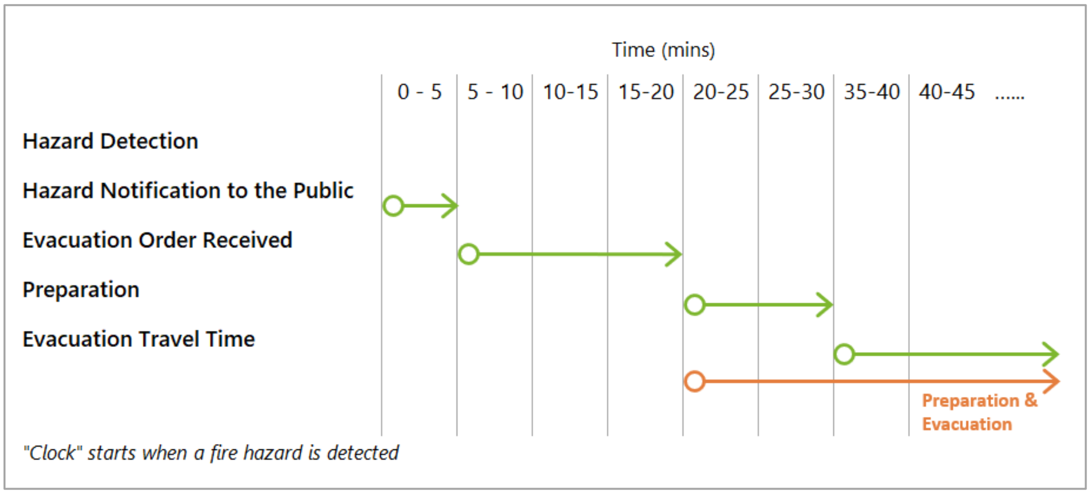
An evacuation time estimate is a metric that is defined as the estimated time necessary to safely evacuate all evacuees, from the time when a hazard is first identified until the time when either the last evacuee leaves a hazardous area, or the remaining population is forced to shelter-in-place. The determination of whether it is the last evacuee or forced shelter-in-place is made by emergency response personnel, is hazard-specific, and considers factors such as the type of hazard or threat, level of notice, population characteristics of the area at the time of the hazardous event, and evacuee behavior. There are several phases of an evacuation time estimate described below:

- Hazard Detection – Time when hazard is first identified.
- Hazard Notification to the Public – Time when any official releases an evacuation order to the public.
- Evacuation Order Received – Time when people receive the evacuation order.
- Preparation – Time it takes to prepare to depart after receiving evacuation order.
- Self-Evacuation Time (Vulnerable Population) – The total elapsed time until all vehicles are out of harm's way, including time driving (moving) and delay due to congestion. The calculated evacuation time is estimated from the evacuation trip origin to the closest safe location not in the direct path of the fire, which may be inside or outside the study area shown on **Figure 2**.
- Ordered Evacuation Time – The total elapsed time until all vehicles are out of the Evacuation Area including time driving (moving) and delay due to congestion. The calculated evacuation time is estimated from the evacuation trip origin to the study area gateways identified on **Figure 2**.

  Note: The calculated evacuation time does not account for unexpected complications or incidents on the roadways during the evacuation.

It should be noted that some phases may not occur. This can result from a variety of events including failure of officials to identify the hazard, slow response in sending evacuation orders, damaged or non-functional communication networks, and/or a sufficiently high perceived threat of the hazard by residents that results in substantial self-evacuation. Additionally, research on California wildfire evacuations found that some people evacuated their home prior to receiving an evacuation order (Wong et al. 2020). This assessment assumes that El Dorado County officials and emergency response personnel will be able to send out informed evacuation orders in a timely manner. **Figure 11** shows typical evacuation phases.

Figure 11: Evacuation Phases



For the Self-Evacuation (Vulnerable Population), the analysis estimates the evacuation time beginning from the hazard being detected by the evacuees.

For the Ordered Evacuation, the analysis estimates the evacuation time beginning from the evacuation order being received by the evacuees. The evacuation time estimates do not account for the time it takes for a hazard to be identified or the amount of time it takes for the official release of an evacuation order to the public.

Modeling Results

The EVAC+ evacuation time estimates for the Self-Evacuation and Ordered Evacuation analysis are summarized below for the fire scenarios outlined in **Table 1** for the following analysis scenarios:

- Existing Conditions – Represents existing conditions (i.e., existing residents).
- Existing Conditions Plus Lime Rock Valley Specific Plan – Represents existing conditions with buildout of the Lime Rock Valley Specific Plan.
- Existing Conditions Plus Lime Rock Valley & Marble Valley Specific Plans – Represents existing conditions with buildout of both the Lime Rock Valley and Marble Valley Specific Plans.

Self-Evacuation (Vulnerable Population)

Self-Evacuation represents the evacuation of populations in the direct path of the fire where advanced notice is not available due to the fire's progression. These vulnerable populations are in the red areas (i.e., where the fire's progression is 60 minutes or less) shown in figures (**Figures 12 through 15**). As analyzed, evacuation is assumed to begin within 15 minutes of the fire's recognition. However, self-evacuation may be a part of an Ordered Evacuation, representing an initial phase of the evacuation that occurs before the Sheriff issues an order to evacuate. Evacuation time is estimated from the evacuation trip origin to the closest safe location not in the direct path of the fire, which may be inside or outside the study area shown on **Figure 2**.

The analysis results for Self-Evacuation summarized in **Table 7** are supported by summary figures for each fire scenario. **Figures 12 through 15** present the following information for Fire Scenario 2, 4, 7, and 16, respectively, for each analysis scenario:

- Fire Progression – Shows the progression of the fire scenario in minutes for each analysis scenario.
- Vulnerable Areas – Identifies the areas/parcels in the red areas that have a fire progression of 60 minutes or less.
- Vulnerable Evacuees – Identifies the number of evacuees in vulnerable areas.
- Evacuation Vehicle Trips – Identifies the number of vulnerable evacuation trips for each analysis scenario.
- Maximum Total Time to Safety – Summarizes the total time required to move the vulnerable evacuees to the closest safe location not in the direct path of the fire, which may be inside or outside the study area shown on **Figure 2**.

As shown, the addition of the Project changes the progression of the fire event. Consequently, the vulnerable population changes in the existing community compared to existing conditions due to the fuels removed by the Project, fuels management activities, and the creation of fire breaks conducted around the Project perimeter. However, the vulnerable evacuees remain the same with a slight decrease in the number of evacuation vehicle trips. Under Fire Scenarios 2 with the Project, the time to safety for the vulnerable evacuees would decrease compared to existing conditions due primarily to the addition of evacuation route added with the Project. Under Fire Scenarios 2 and 4 all the existing community areas would be outside the vulnerable areas with the addition of both the Project and Marble Valley Specific Plan.

For all fire scenarios, it would take less than about 20 minutes to move all the vulnerable evacuees (i.e., existing or project evacuees) to a safe location, which is less than the 30-minute fire progression shown in **Figures 12 through 15**. With the addition of the Project, the maximum total time to evacuate would remain the same or decrease for existing vulnerable evacuees. This is due to the increased access to evacuation routes and the slowed progression of the fire created by the removal of fuels and vegetation and fuels management activities occurring with the Project, which creates additional safe areas for vulnerable evacuees to access. Similarly, the effect of both the Project and Marble Valley Specific Plan would eliminate or reduce existing vulnerable populations and the maximum total time to evacuate.

Table 7: Self Evacuation (Vulnerable Population) Time Estimates - Lime Rock Valley Specific Plan

Fire Location	Wind Direction and Speed	Analysis Scenario	Fire Scenario ID	Evacuation Vehicle Trips[1]		Evacuation Start Time	Maximum Total Time to Safety (Minutes)	
				Existing	Project		Existing	Project
Ryan Ranch Rd to Beaver Pond Rd	SW 65 mph	Existing Conditions	2-A	85	-	11:00 AM	18.1	-
		Existing Conditions Plus Lime Rock Valley Specific Plan	2-C	73	-		17.9	-
		Existing Conditions Plus Lime Rock Valley & Marble Valley Specific Plans	2-D	-	189		-	19.1
End of Summer Creek Ct	SW 65 mph	Existing Conditions	4-A	212	-	11:00 AM	19.8	-
		Existing Conditions Plus Lime Rock Valley Specific Plan	4-C	-	303		-	18.2
		Existing Conditions Plus Lime Rock Valley & Marble Valley Specific Plans	4-D	-	303		-	18.2
Bullard Dr west of Amber Fields Dr	SSE 65 mph	Existing Conditions	7-E	445	-	7:00 AM	20.4	-
		Existing Conditions Plus Lime Rock Valley Specific Plan	7-G	248	243		19.9	18.2
		Existing Conditions Plus Lime Rock Valley & Marble Valley Specific Plans	7-H	163	243		19.9	18.2
East of Aspen Meadows Dr and Cornerstone Dr	W 50 mph	Existing Conditions	16-A	97	-	1:00 PM	17.7	-
		Existing Conditions Plus Lime Rock Valley Specific Plan	16-C	84	-		17.7	-
		Existing Conditions Plus Lime Rock Valley & Marble Valley Specific Plans	16-D	55	93		17.5	18.1

Source: Feher & Peers, 2023
(1) Evacuation vehicle trips include evacuation of the entire population (residents, students, employees, and visitors).

Table 8: Ordered Evacuation Time Estimates – Lime Rock Valley Specific Plan

Fire Location	Wind Direction and Speed	Analysis Scenario	Fire Scenario ID	Evacuation Vehicle Trips[1]		Evacuation Window	Maximum Total Time to Evacuate (Minutes)	
				Existing	Project		Existing	Project
Ryan Ranch Rd to Beaver Pond Rd	SW 65 mph	Existing Conditions	2-A	1,596	-	11:00 AM To 2:00 PM	188	-
		Existing Conditions Plus Lime Rock Valley Specific Plan	2-B	1,596	3,400		187	195
		Existing Conditions Plus Lime Rock Valley & Marble Valley Specific Plans	2-D	1,596	10,049		186	196
End of Summer Creek Ct	SW 65 mph	Existing Conditions	4-A	1,596	-	11:00 AM To 2:00 PM	187	-
		Existing Conditions Plus Lime Rock Valley Specific Plan	4-B	1,596	3,400		185	186
		Existing Conditions Plus Lime Rock Valley & Marble Valley Specific Plans	4-D	1,596	10,049		187	198
Bullard Dr west of Amber Fields Dr	SSE 65 mph	Existing Conditions	7-E	1,596	-	7:00 AM To 10:00 AM	188	-
		Existing Conditions Plus Lime Rock Valley Specific Plan	7-F	1,596	3,400		185	189
		Existing Conditions Plus Lime Rock Valley & Marble Valley Specific Plans	7-H	1,596	10,049		186	188
East of Aspen Meadows Dr and Cornerstone Dr	W 50 mph	Existing Conditions	16-A	1,596	-	1:00 PM To 4:00 PM	187	-
		Existing Conditions Plus Lime Rock Valley Specific Plan	16-B	1,596	3,400		188	187
		Existing Conditions Plus Lime Rock Valley & Marble Valley Specific Plans	16-D	1,596	10,049		186	188

Source: Feher & Peers, 2023
(1) Evacuation vehicle trips include evacuation of the entire population (residents, students, employees, and visitors).

Ordered Evacuation

Ordered Evacuation represents the evacuation of the entire population (residents, students, employees, and visitors) in the evacuation area for an event with ample notice where emergency services are participating in the evacuation. As analyzed, the evacuation window is 3 hours (180 minutes) beginning from the Sheriff ordering the evacuation. Evacuation time is estimated from the evacuation trip origin to the study area gateways identified on **Figure 2**.

The analysis results for the Ordered Evacuation summarized in **Table 8** are supported by summary figures for each fire scenario. **Figures 16 through 19** present the following information for Fire Scenario 2, 4, 7, and 16, respectively, for both no project and with project scenarios:

- Fire Location and Wind Direction – Identifies the location and wind direction for the fire scenario.
- Evacuation Area – Identifies the evacuation area for the existing and project population.
- Evacuation Routes – Identifies the evacuation routes for each fire scenario, including available routes (i.e., 180 minutes or more), routes that are not available (i.e., less than 30 minutes), and routes that are partially available (i.e., more than 30 minutes but less than 180 minutes).
- Evacuation Vehicle Trips – Identifies the number of evacuation trips for existing and project populations.
- Evacuation Time Estimate – Summarizes the total time to evacuate the different populations for existing conditions and existing plus project conditions.

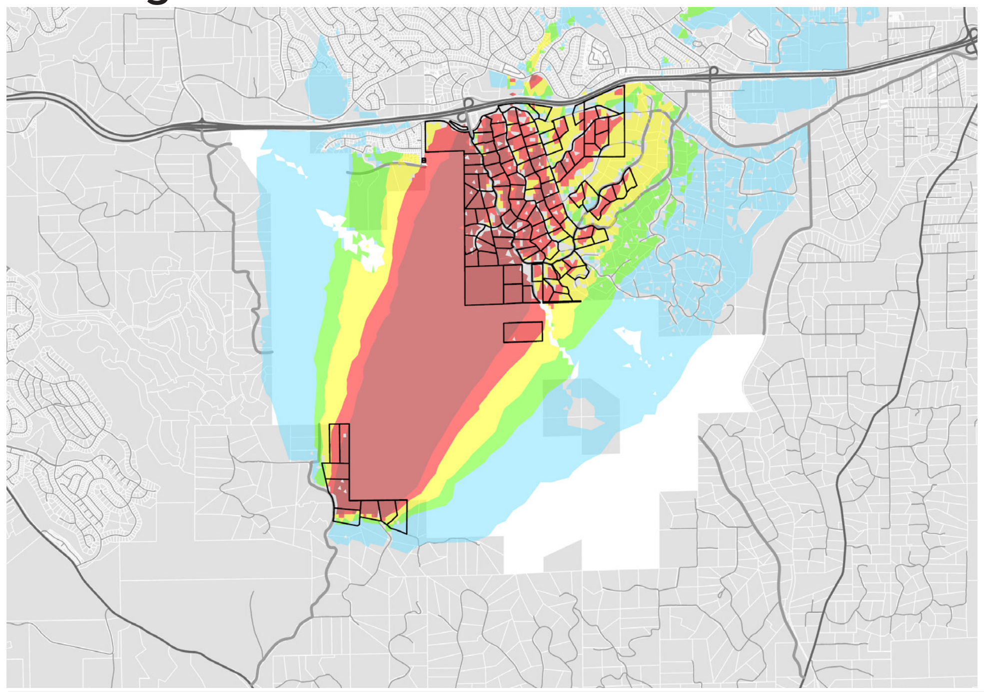
For all fire scenarios, it would take less than 200 minutes to evacuate the study area. For all fire scenarios, the addition of Project evacuees would not increase the maximum total time to evacuate existing residents. This is due to the increase in available evacuation routes (i.e., more routes) and an increase in the availability of evacuation routes (i.e., routes remain viable for evacuation longer), and the slower progression of the fire due to hardened site conditions and removal of wildland fuels (i.e., from development), and vegetation and fuels management implemented as part of the project.

With the addition of both the Project and the Marble Valley Specific Plan, the total time to evacuate the existing evacuees would be like no project conditions. Again, this is due to the increased access to evacuation routes and the and the slower progression of the fire due to hardened site conditions and removal of wildland fuels (i.e., from development), and vegetation and fuels management implemented as part of the project.

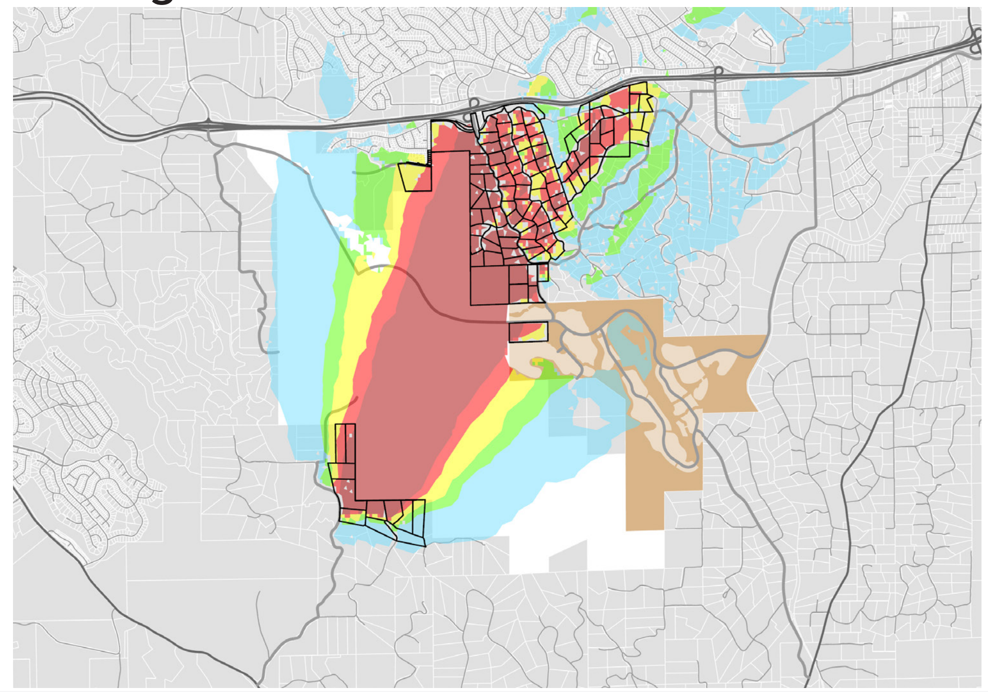
The EVAC+[4] results do not include potential unknown factors that could produce much longer travel times such as road closures due to stalled or inoperable vehicles or other blockages such as falling trees.

[4] EVAC+ is a dynamic traffic assignment model, is built in TransCAD 8.0, sensitive to how demand flows in short periods of time affects the speed of travel on the roadway network and the resulting ability of individual roadway segments to accommodate that demand.

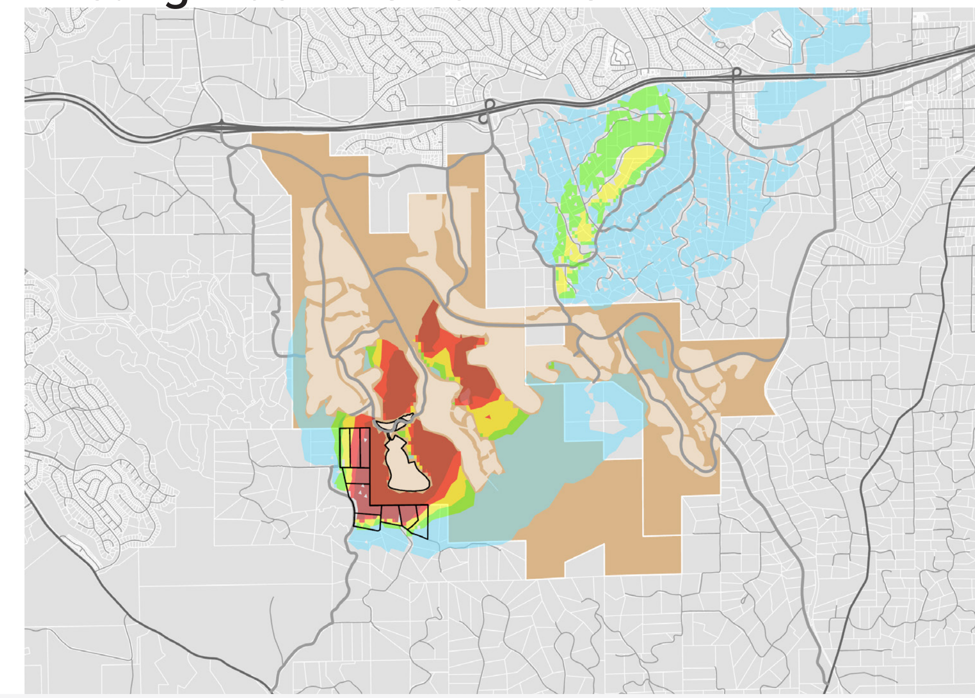
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Progression (minutes): 30 | 60 | 120 | 180 | 240 — Project Area — Project Residential Area — Vulnerable Parcels — Evacuation Routes

Existing

Vulnerable Evacuees

108 Existing Population **45** Existing Households **20** Existing Employees

Evacuation Vehicle Trips

85 Existing Evacuees

Total Time to Safety (minutes)

18.1

Existing Plus LRVSP

Vulnerable Evacuees

108 Existing Population **45** Existing Households **20** Existing Employees

0 Project Population **0** Project Households **0** Project Employees

Evacuation Vehicle Trips

73 Existing Evacuees **0** Project Only Evacuees

Total Time to Safety (minutes)

17.9

N/A

Existing Plus MVSP & LRVSP

Vulnerable Evacuees

0 Existing Population **0** Existing Households **0** Existing Employees

264 Project Population **100** Project Households **0** Project Employees

Evacuation Vehicle Trips

0 Existing Evacuees **189** Project Only Evacuees

Total Time to Safety (minutes)

N/A

19.1

Vulnerable evacuees are the population directly in the path of the fire (Red Area <= 60 minute fire progression). They are assumed to start self evacuation immediately, i.e., within 15 minutes of fire.

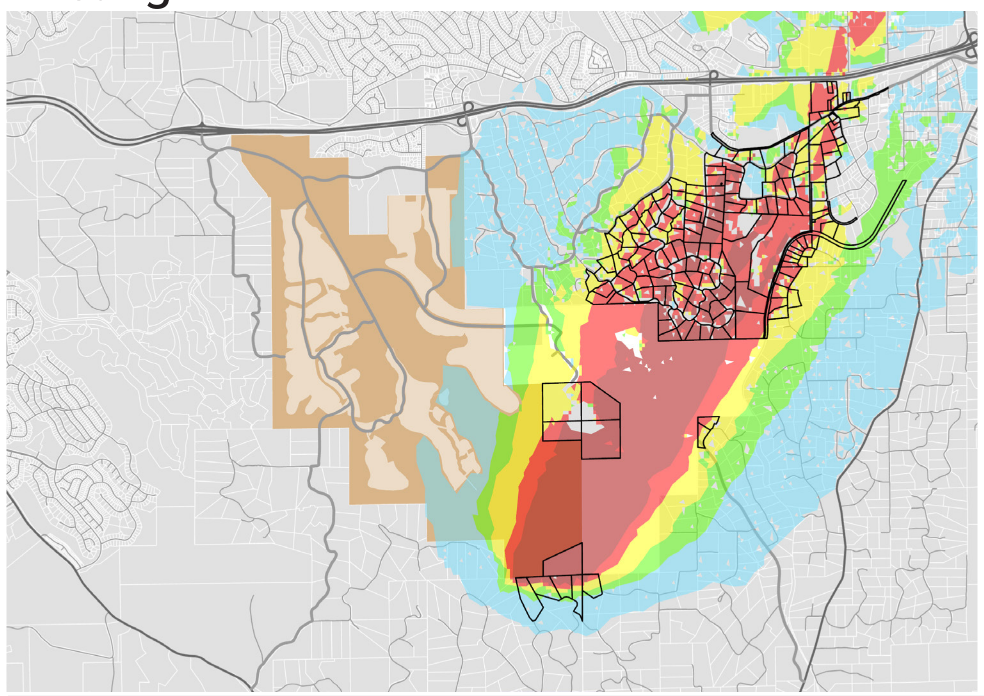
Travel time to safety is defined as the time required for the vulnerable evacuees to exit the red area.

Figure 12

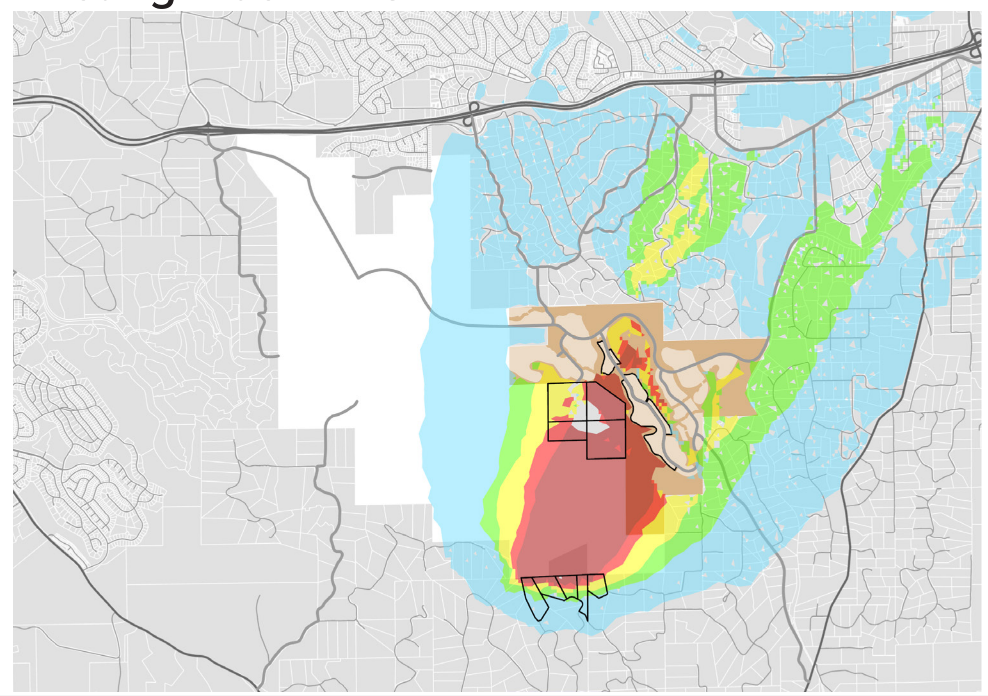
Travel Time to Safety for Vulnerable Evacuees
Fire Scenario 2

Evacuation Begins at 11am

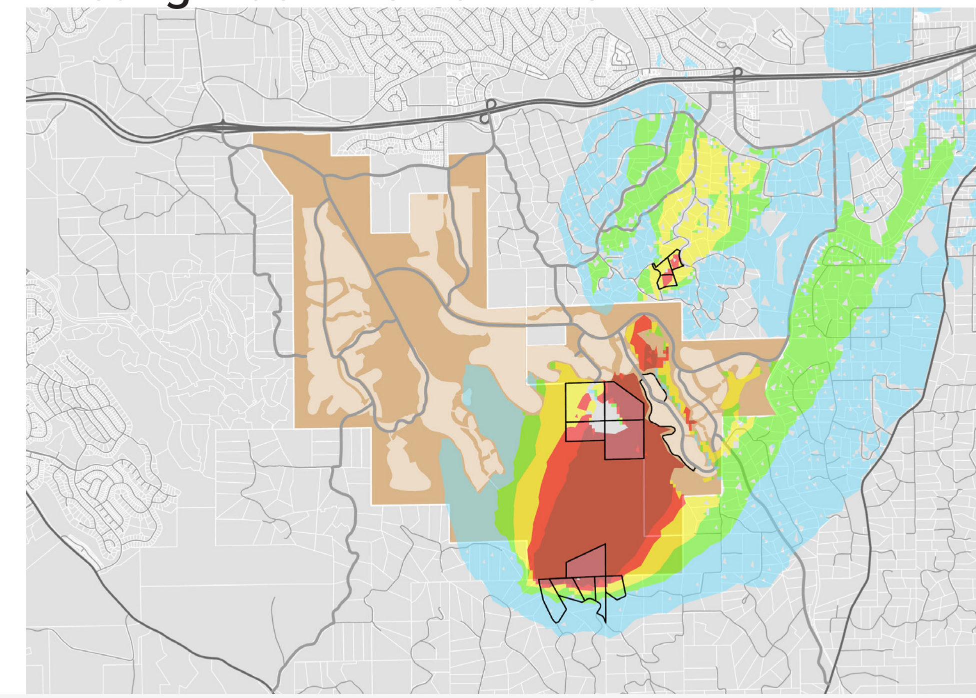
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Progression (minutes): 30 · 60 · 120 · 180 · 240 · Project Area · Project Residential Area · Vulnerable Parcels · Evacuation Routes

Existing

Vulnerable Evacuees

193 Existing Population · **80** Existing Households · **241** Existing Employees

Evacuation Vehicle Trips

212 Existing Evacuees

Total Time to Safety (minutes)

19.8

Existing Plus LRVSP

Vulnerable Evacuees

0 Existing Population · **0** Existing Households · **0** Existing Employees

404 Project Population · **160** Project Households · **0** Project Employees

Evacuation Vehicle Trips

0 Existing Evacuees · **303** Project Only Evacuees

Total Time to Safety (minutes)

N/A

18.2

Existing Plus MVSP & LRVSP

Vulnerable Evacuees

0 Existing Population · **0** Existing Households · **0** Existing Employees

404 Project Population · **160** Project Households · **0** Project Employees

Evacuation Vehicle Trips

0 Existing Evacuees · **303** Project Only Evacuees

Total Time to Safety (minutes)

N/A

18.2

Vulnerable evacuees are the population directly in the path of the fire (Red Area <= 60 minute fire progression). They are assumed to start self evacuation immediately, i.e., within 15 minutes of fire.

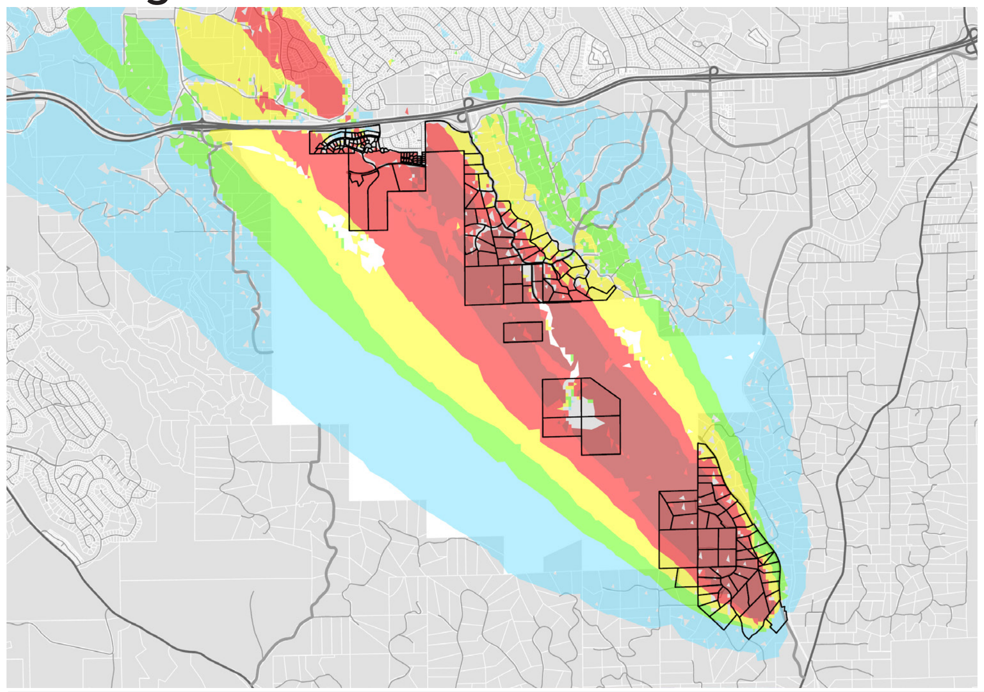
Travel time to safety is defined as the time required for the vulnerable evacuees to exit the red area.

Figure 13

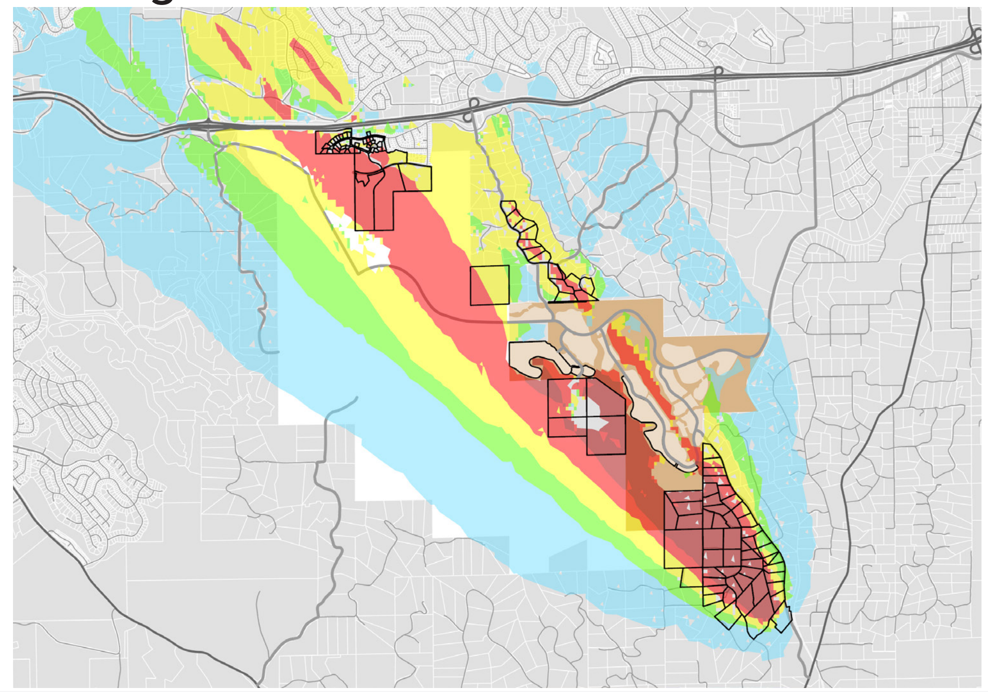
Travel Time to Safety for Vulnerable Evacuees Fire Scenario 4

Evacuation Begins at 11am

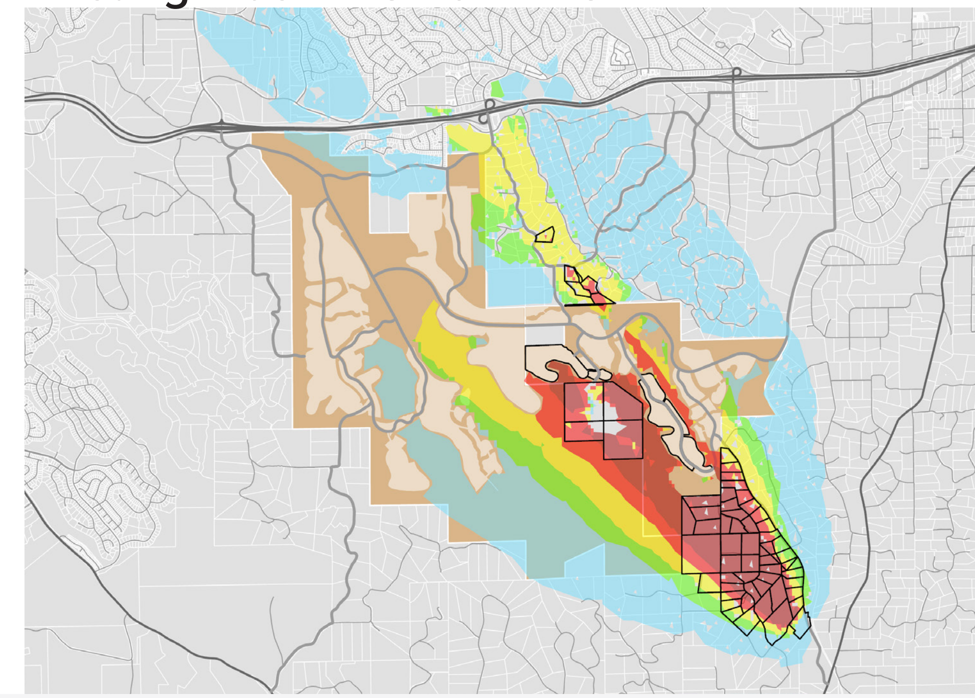
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Progression (minutes): 30 | 60 | 120 | 180 | 240 — Project Area — Project Residential Area — Vulnerable Parcels — Evacuation Routes

	Existing	Existing Plus LRVSP	Existing Plus MVSP & LRVSP
Vulnerable Evacuees	557 Existing Population	284 Existing Population	207 Existing Population
	235 Existing Households	119 Existing Households	86 Existing Households
	15 Existing Employees	1 Existing Employees	0 Existing Employees
		323 Project Population	323 Project Population
		128 Project Households	128 Project Households
		0 Project Employees	0 Project Employees
Evacuation Vehicle Trips	445 Existing Evacuees	248 Existing Evacuees	163 Existing Evacuees
		243 Project Only Evacuees	243 Project Only Evacuees
Total Time to Safety (minutes)	20.4	19.9	19.9
		18.2	18.2

Vulnerable evacuees are the population directly in the path of the fire (Red Area <= 60 minute fire progression). They are assumed to start self evacuation immediately, i.e., within 15 minutes of fire.

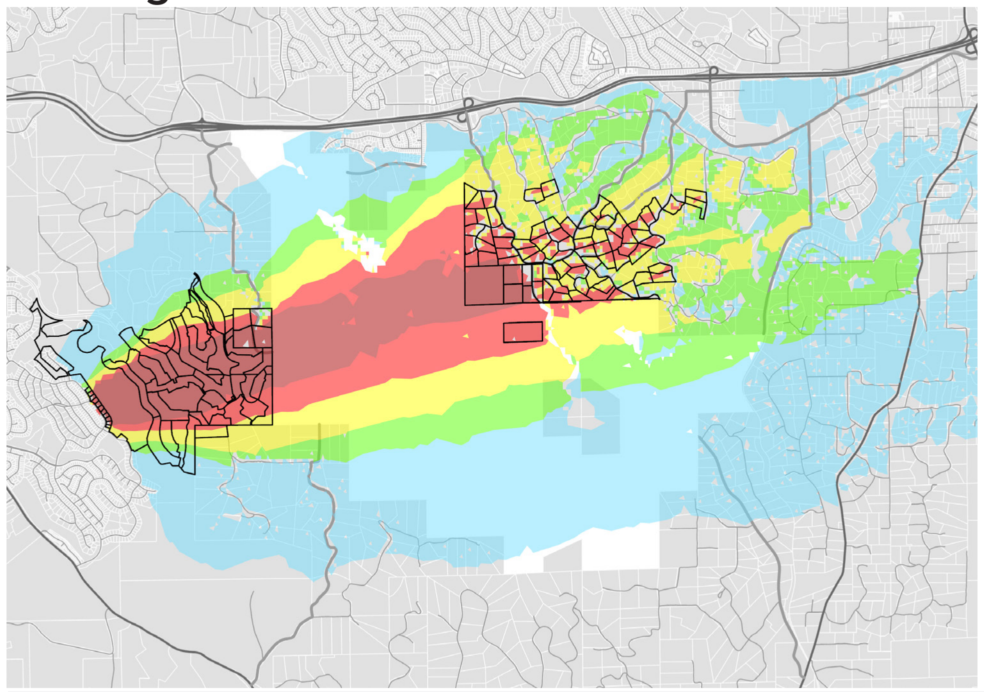
Travel time to safety is defined as the time required for the vulnerable evacuees to exit the red area.

Figure 14

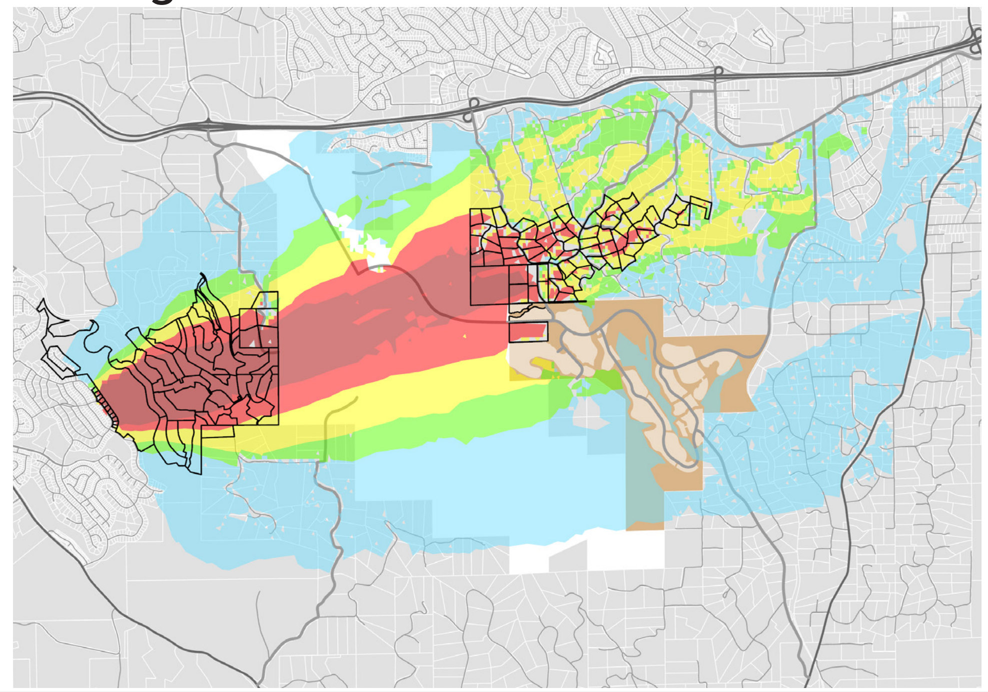
Travel Time to Safety for Vulnerable Evacuees Fire Scenario 7

Evacuation Begins at 7am

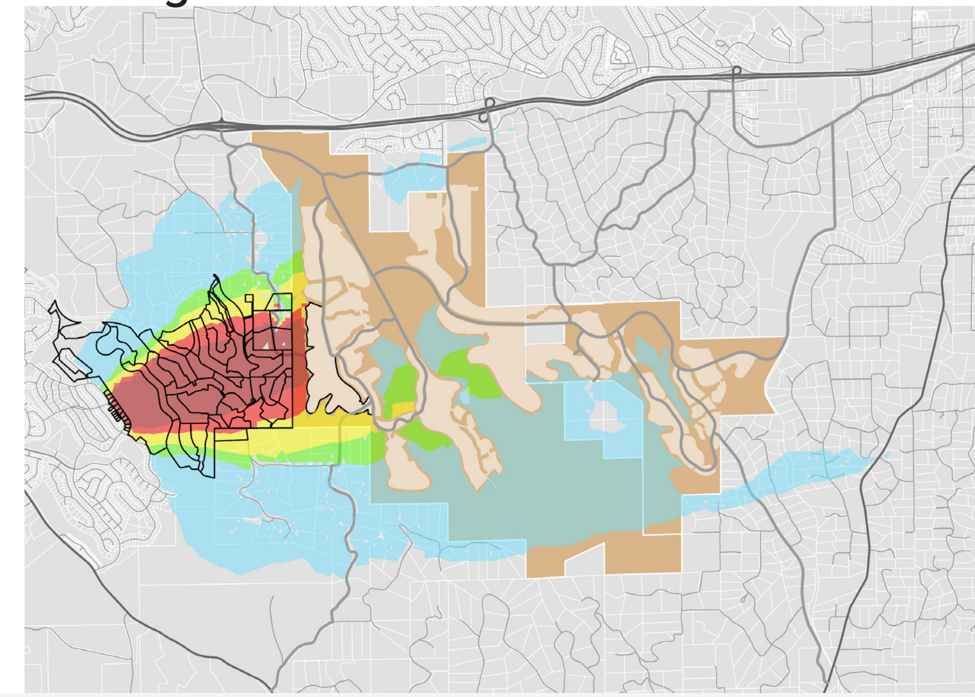
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Progression (minutes): 30 | 60 | 120 | 180 | 240 — Project Area — Project Residential Area — Vulnerable Parcels — Evacuation Routes

Existing

Vulnerable Evacuees

112 Existing Population — **46** Existing Households — **6** Existing Employees

Evacuation Vehicle Trips

97 Existing Evacuees

Total Time to Safety (minutes)

17.7

Existing Plus LRVSP

Vulnerable Evacuees

105 Existing Population — **42** Existing Households — **6** Existing Employees

0 Project Population — **0** Project Households — **0** Project Employees

Evacuation Vehicle Trips

84 Existing Evacuees — **0** Project Only Evacuees

Total Time to Safety (minutes)

17.7

N/A

Existing Plus MVSP & LRVSP

Vulnerable Evacuees

75 Existing Population — **29** Existing Households — **0** Existing Employees

124 Project Population — **49** Project Households — **0** Project Employees

Evacuation Vehicle Trips

55 Existing Evacuees — **93** Project Only Evacuees

Total Time to Safety (minutes)

17.5

18.1

Vulnerable evacuees are the population directly in the path of the fire (Red Area <= 60 minute fire progression). They are assumed to start self evacuation immediately, i.e., within 15 minutes of fire.

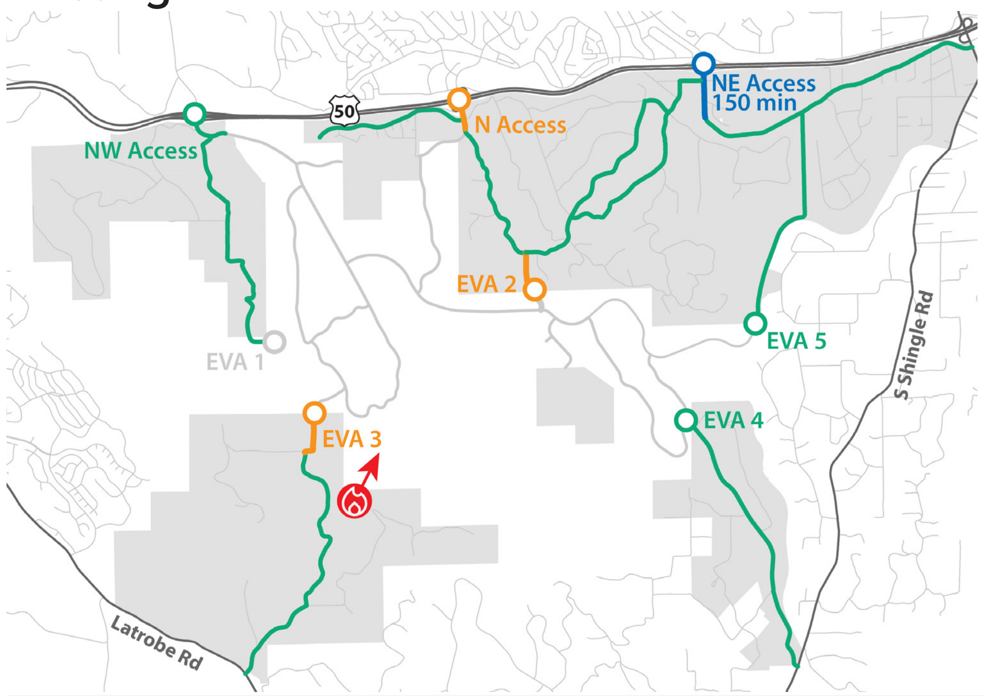
Travel time to safety is defined as the time required for the vulnerable evacuees to exit the red area.

Figure 15

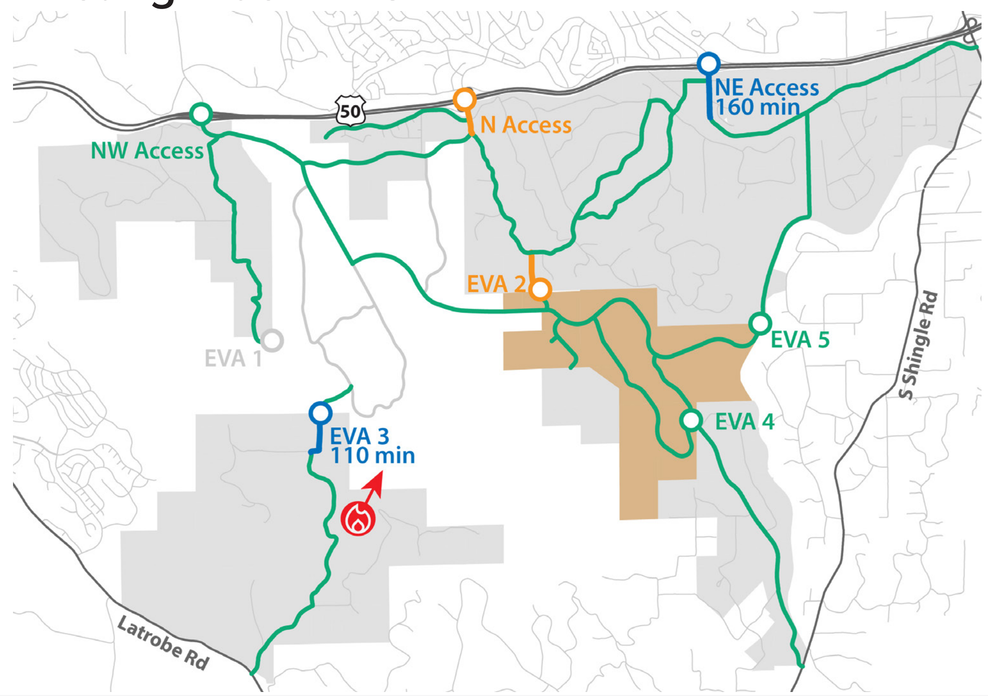
Travel Time to Safety for Vulnerable Evacuees
Fire Scenario 16

Evacuation Begins at 1pm

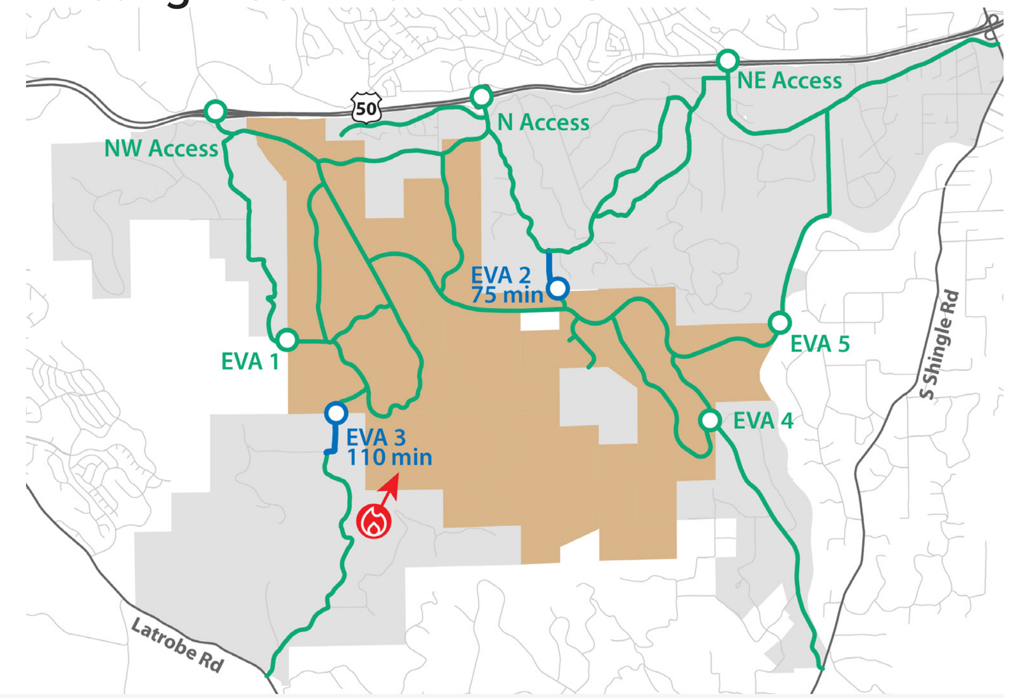
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Location and Wind Direction Evacuation Routes: Available Not Available Partially Available (minutes) Existing Evacuation Area Project Evacuation Area

Existing

Evacuees

2,804 Existing Population **1,132** Existing Households **1,090** Existing Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees

Total Time to Evacuation (minutes)

188

Existing Plus LRVSP

Evacuees

2,804 Existing Population **1,132** Existing Households **1,090** Existing Employees

2,022 Project Population **800** Project Households **0** Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees **1,216** Project Only Evacuees

Total Time to Evacuation (minutes)

187

195

Existing Plus MVSP & LRVSP

Evacuees

2,804 Existing Population **1,132** Existing Households **1,090** Existing Employees

10,079 Project Population **4,368** Project Households **1,595** Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees **7,080** Project Only Evacuees

Total Time to Evacuation (minutes)

186

196

Evacuation window is 180 minutes.

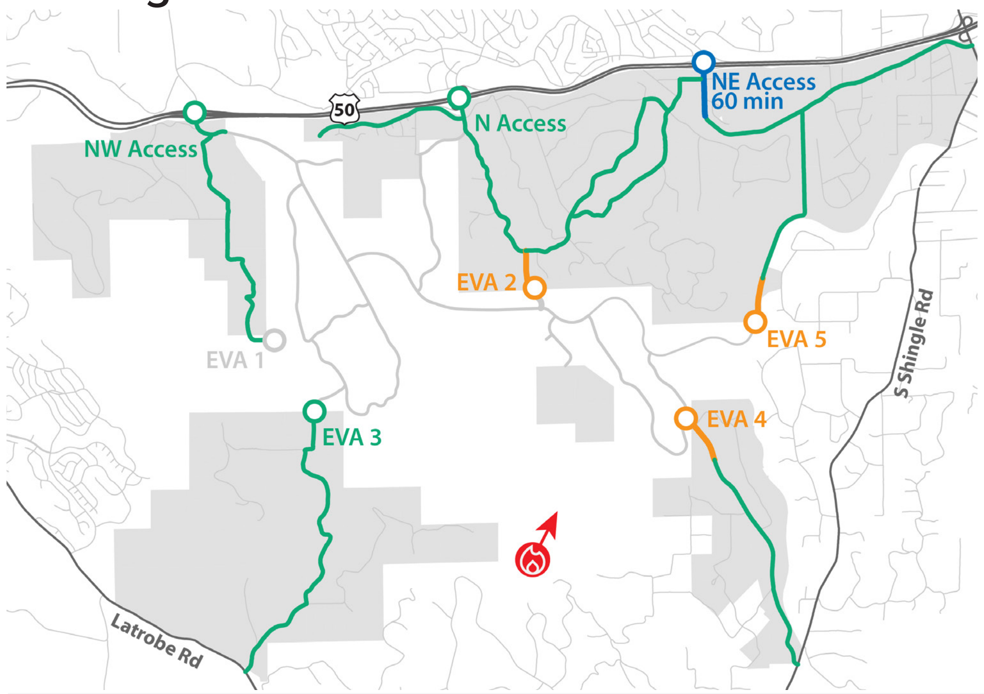
Total time required to evacuate is evacuation window + time required to exit the evacuation area for evacuees starting evacuation within the last 15 minutes.

Figure 16

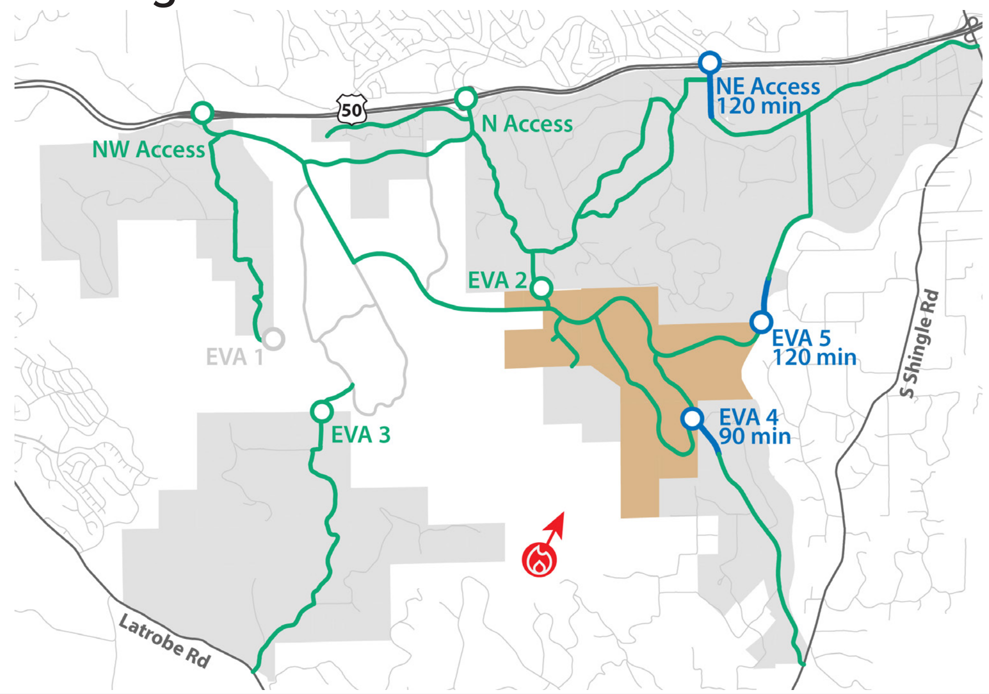
Total Travel Time to Evacuate to the Evacuation Area Fire Scenario 2

Evacuation Window 11am - 2pm

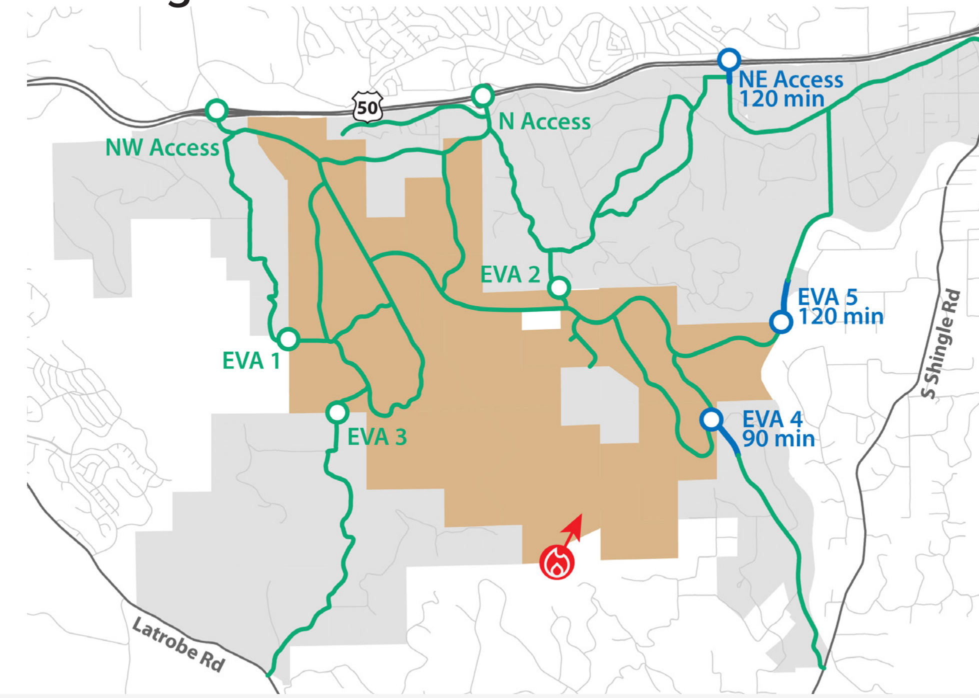
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Location and Wind Direction | Evacuation Routes: Available | Not Available | Partially Available (minutes) | Existing Evacuation Area | Project Evacuation Area

Existing

Evacuees

2,804 Existing Population | 1,132 Existing Households | 1,090 Existing Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees

Total Time to Evacuation (minutes)

187

Existing Plus LRVSP

Evacuees

2,804 Existing Population | 1,132 Existing Households | 1,090 Existing Employees

2,022 Project Population | 800 Project Households | 0 Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees | 1,216 Project Only Evacuees

Total Time to Evacuation (minutes)

185

186

Existing Plus MVSP & LRVSP

Evacuees

2,804 Existing Population | 1,132 Existing Households | 1,090 Existing Employees

10,861 Project Population | 4,368 Project Households | 1,595 Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees | 7,080 Project Only Evacuees

Total Time to Evacuation (minutes)

187

198

Evacuation window is 180 minutes.

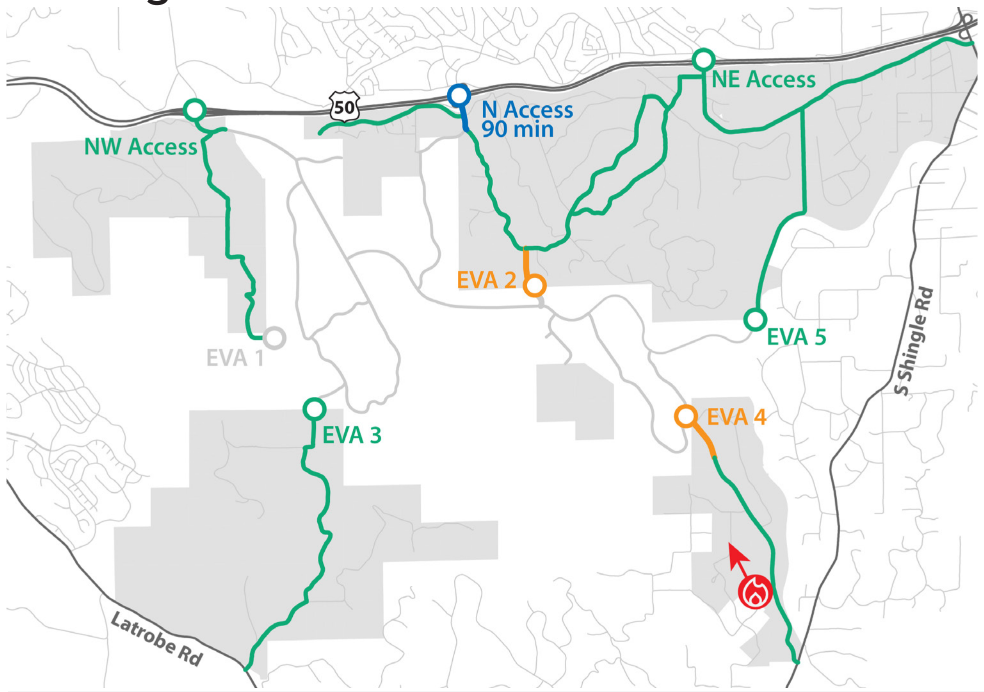
Total time required to evacuate is evacuation window + time required to exit the evacuation area for evacuees starting evacuation within the last 15 minutes.

Figure 17

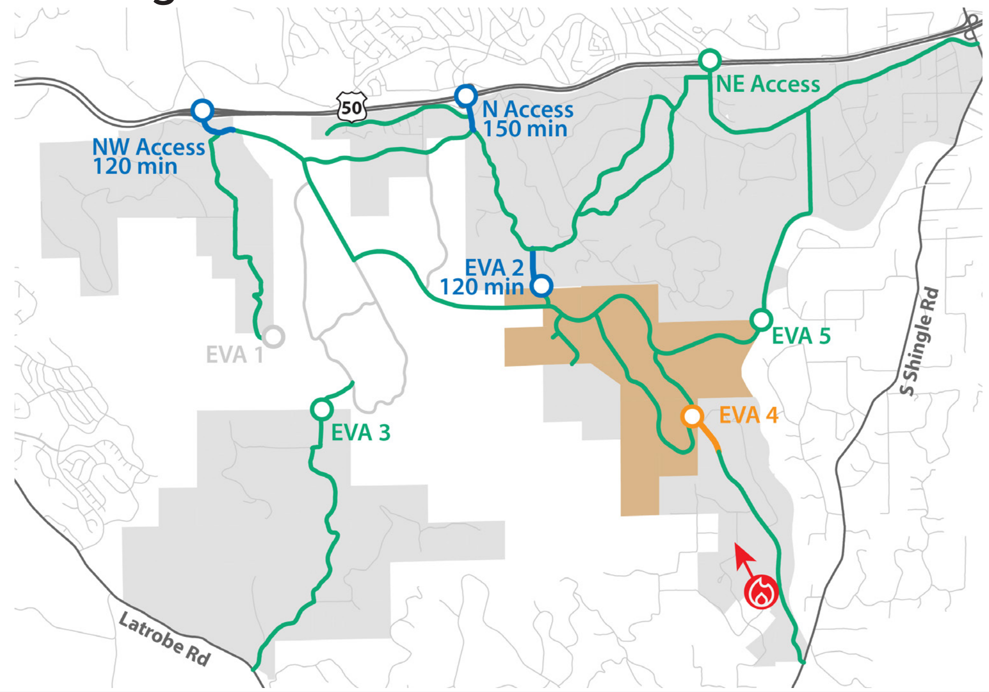
Fire Scenario 4

Evacuation Window 11am - 2pm

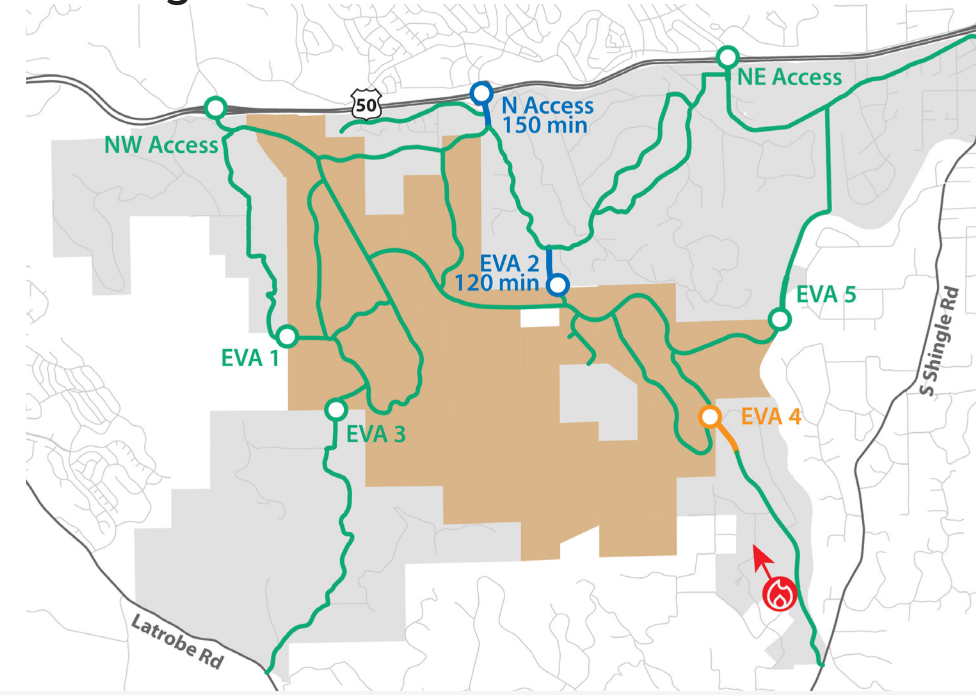
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Location and Wind Direction | Evacuation Routes: Available | Not Available | Partially Available (minutes) | Existing Evacuation Area | Project Evacuation Area

Existing

Evacuees

2,804 Existing Population | 1,132 Existing Households | 1,090 Existing Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees

Total Time to Evacuation (minutes)

188

Existing Plus LRVSP

Evacuees

2,804 Existing Population | 1,132 Existing Households | 1,090 Existing Employees

2,022 Project Population | 800 Project Households | 0 Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees | 1,216 Project Only Evacuees

Total Time to Evacuation (minutes)

187

195

Existing Plus MVSP & LRVSP

Evacuees

2,804 Existing Population | 1,132 Existing Households | 1,090 Existing Employees

10,079 Project Population | 4,368 Project Households | 1,595 Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees | 7,080 Project Only Evacuees

Total Time to Evacuation (minutes)

186

196

Evacuation window is 180 minutes.

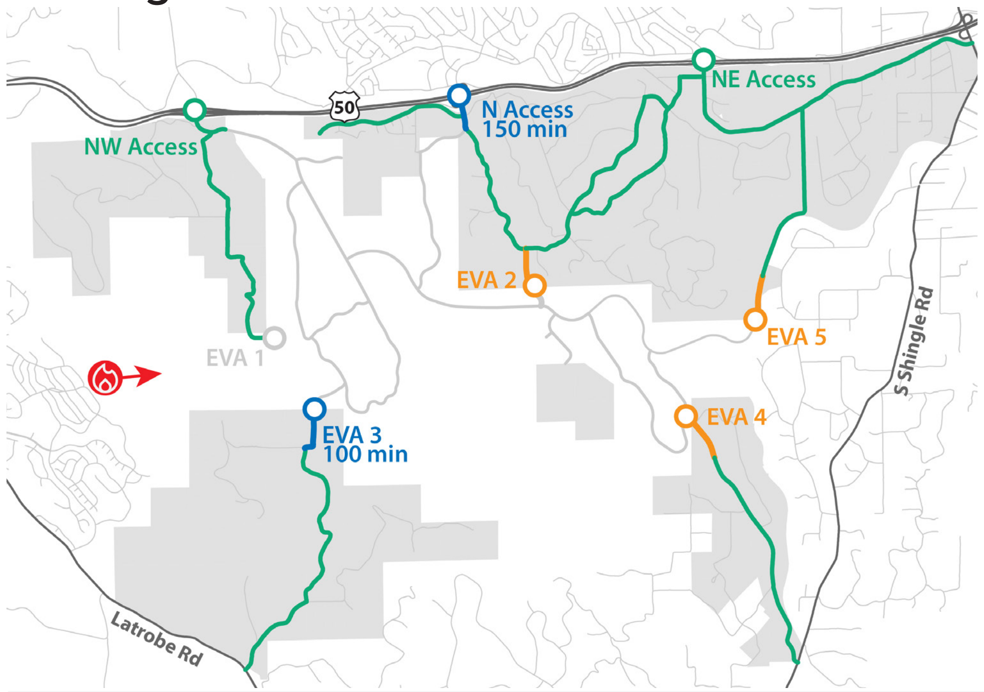
Total time required to evacuate is evacuation window + time required to exit the evacuation area for evacuees starting evacuation within the last 15 minutes.

Figure 18

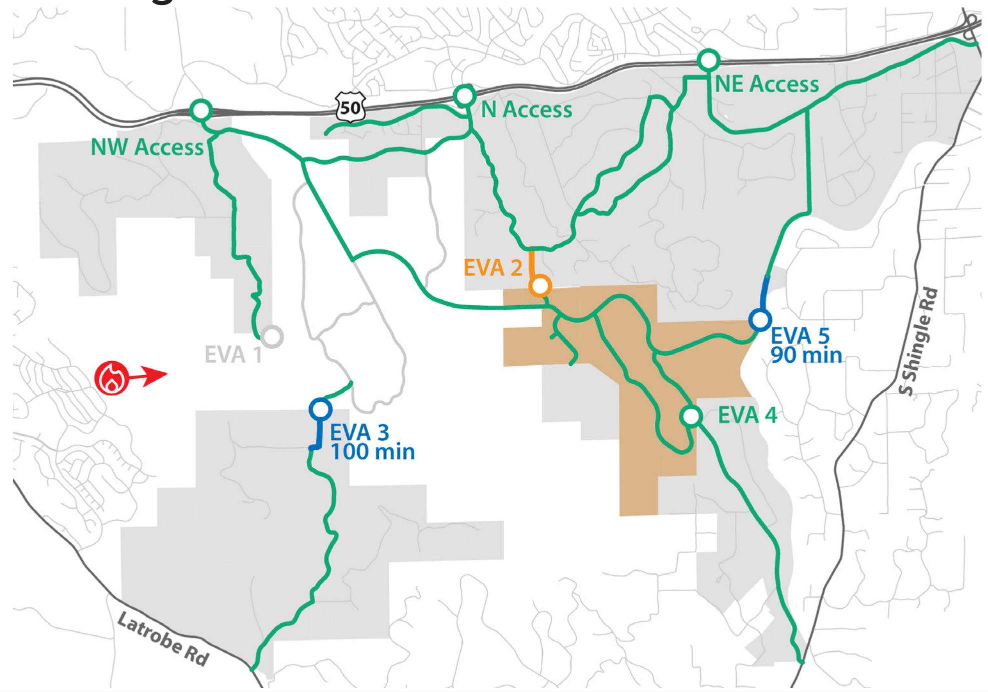
Fire Scenario 7

Evacuation Window 7am - 10am

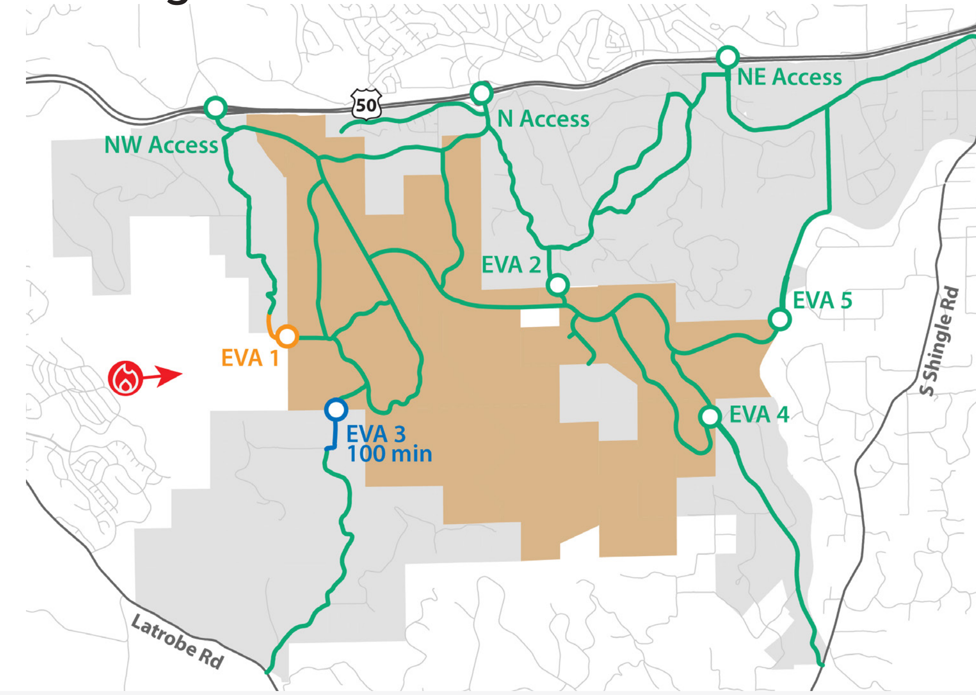
Existing



Existing Plus LRVSP



Existing Plus MVSP & LRVSP



Fire Location and Wind Direction Evacuation Routes: Available Not Available Partially Available (minutes) Existing Evacuation Area Project Evacuation Area

Existing

Evacuees

2,804 Existing Population **1,132** Existing Households **1,090** Existing Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees

Total Time to Evacuation (minutes)

188

Existing Plus LRVSP

Evacuees

2,804 Existing Population **1,132** Existing Households **1,090** Existing Employees

2,022 Project Population **800** Project Households **0** Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees **5,864** Project Only Evacuees

Total Time to Evacuation (minutes)

188

187

Existing Plus MVSP & LRVSP

Evacuees

2,804 Existing Population **1,132** Existing Households **1,090** Existing Employees

10,861 Project Population **4,368** Project Households **1,595** Project Employees

Evacuation Vehicle Trips

1,596 Existing Evacuees **7,080** Project Only Evacuees

Total Time to Evacuation (minutes)

186

188

Evacuation window is 180 minutes.

Total time required to evacuate is evacuation window + time required to exit the evacuation area for evacuees starting evacuation within the last 15 minutes.

Figure 19

Fire Scenario 16

Evacuation Window 1pm - 4pm

Cumulative Conditions

Fehr & Peers, in coordination with Firesafe Planning Solutions, emergency service providers, and fire agencies identified study area and evacuation routes for analysis, which are shown on **Figure 2**.

The evacuation assessment includes the following four development scenarios that were analyzed under existing conditions:

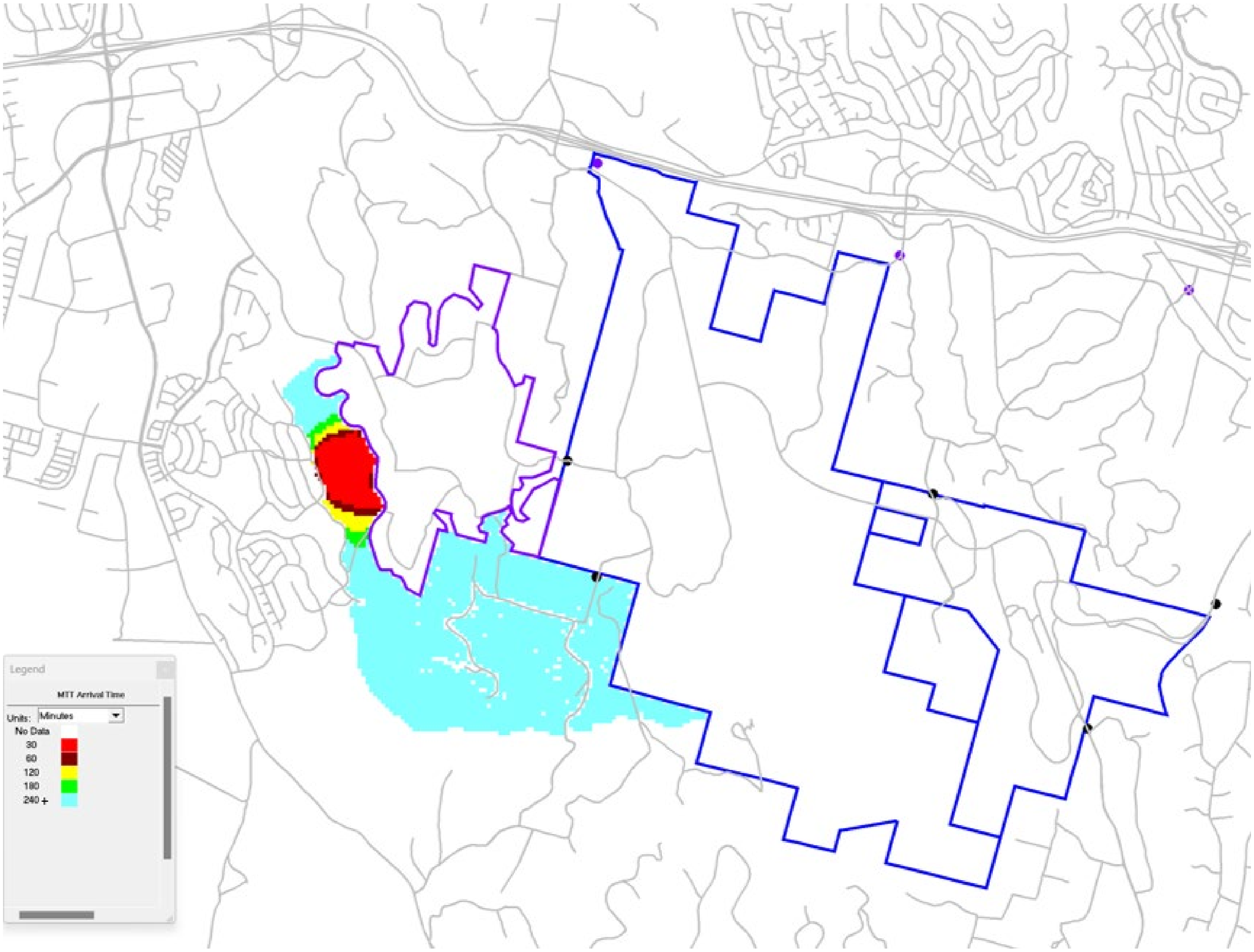
- No Project – Represents existing conditions (i.e., existing residents).
- Lime Rock Valley Specific Plan – Represents existing conditions with buildout of the Lime Rock Valley Specific Plan.
- Marble Valley Specific Plan – Represents existing conditions with buildout of the Marble Valley Specific Plan.
- Lime Rock Valley & Marble Valley Specific Plans – Represents existing conditions with buildout of both the Lime Rock Valley and Marble Valley Specific Plans.

The analysis results presented above for existing conditions are applicable to cumulative conditions, since the Project and proposed Marble Specific Plan are the only significant development projects in the study area that would add substantial population and transportation facilities that may affect the evacuation routes that may be used by the existing communities in the study area.

East Ridge Village is an approved planned residential development between the Project (i.e., to the west) and the existing Blackstone community, east of Latrobe Road. As a planned development, East Ridge Village was not assumed in the evacuation time estimates presented above under existing conditions. In addition, East Ridge Village does not include any full access roadway connections to the Project or to the evacuation routes shown on **Figure 2**.

However, future development of East Ridge Village would affect the behavior of Fire Scenario 16 by reducing the progression of the fire event under cumulative conditions. **Figure 20** shows the progression of Fire Scenario 16 with the addition of the approved East Ridge Village development. As shown, East Ridge Village would substantially delay the progression of the fire event to the point where the fire would take 200 or more minutes to reach the Marble Valley Specific Plan and the fire would not burn through to the Project or to existing communities to the east due to slower progression of the fire due to hardened site conditions and removal of wildland fuels (i.e., from development), and vegetation and fuels management implemented as part of East Ridge Village.

Figure 20: Fire Scenario 16 With Approved East Ridge Village Development



Appendix A –

Wildland Fire Evacuation Risk Report, Fire Behavior – The Lime Rock Valley Project

Appendix B –

First Responders Survey (Camp Fire, Butte County)

Appendix B: First Responders Survey Responses

Online survey responses by CalFire personnel between December 1 – December 5, 2022

1. **During the peak of the Camp Fire evacuation, how long did it take evacuees on Skyway to get from Neal Road in Paradise to Bruce Road in Chico?**
   Please provide your best estimate.
    a. Some reported 4 hours once the full scale of the evacuations were underway.
    b. I am not sure, I was at the command post.
    c. 4 hours
    d. 3 hours
    e. 2-3 hours
    f. Unknown
    g. It took me about 2.5 hours
    h. Depending on the time of day, it took between 45 min to 3 hours
    i. 3 hours
    j. Depends on the time they evacuated. Early on, it was normal drive time. Once things got bottle necked in the Chico area, it was gridlocked all the way up into Paradise.
    k. I was working off Pentz Road at this time.
    l. Unknown.
2. **During the peak of the Camp Fire evacuation, what speed would you estimate vehicles were traveling on Skyway? If you observed areas of stand-still traffic or bottlenecks, how long did they last and what was the location?**
    a. The entire Skyway was bottlenecked at one point or another. A lot of this due to the stoplights at the bottom of the Skyway stopping traffic.
    b. There was extreme bottlenecking on all roadways. Moving that many people and vehicles will cause that on any roadway.
    c. 1 MPH
    d. 0-5 MPH. The biggest bottle neck was in Chico.
    e. very slowly, <5 MPH
    f. I stayed at home in Nimshew, but it took my mom 5-6 hours to get to Chico via Skyway through Butte Meadows.
    g. It was a complete stand still. And when traffic would move it was extremely slow. This is why people were getting out and running as that was much faster.
    h. 0-1 MPH, gridlocked from Skyway/Clark Rd west to Neal Rd was bottle necked in all directions.
    i. Hour long standstills
    j. Bottle neck began in Chico at the HWY 99 interchange. All traffic should have been diverted to North bound 99 just to get the 20k people evacuating off the hill and on the highway. They could figure it out from there. Lessons learned!
    k. Gridlock occurred at Pentz Road and Billie Road in all directions during peak evacuations. The area just above Pentz opened up first as most evacuees were traveling downhill. The gridlock lasted for at least 1 hour. Many vehicles were on fire on Billie Rd and Pentz Rd blocking traffic. Many vehicles were also abandoned as residents were traveling on foot.
    l. Stand still for a while. Very slow driving in the height of the Camp Fire.

3. **What was your perception of the contra-flow lanes on Skyway during the evacuation? Any safety concerns for evacuees or first responders?**
    a. Contra-flow always brings with it significant safety hazards. Once traffic got backed up on the Skyway, the fire started catching up to citizens stuck in traffic. This brought on significant hazards to the public. The traffic lights at the bottom of the Skyway being changed to allow traffic out of Paradise unmetered access to Hwy 99, both north and south, may have helped.
    b. Contra-flow should only be used in extreme circumstances because of the safety concerns.
    c. It impeded first responder access;, I do not think there was any other option.
    d. It inhibits public safety movement during those times of one-way flow.
    e. Unknown
    f. It was very dangerous for all those involved. The traffic simply didn't flow, and all vehicles had to drive in all lanes to escape. This made it so engines and first responders couldn't enter the town, as vehicles were escaping in the on-coming lanes.
    g. From 0830 (8:30 AM) to 1300 (1:00 PM) all lanes were blocked, after 1300 (1:00 PM) the lanes cleared up and engines were able to move more freely.
    h. Oncoming traffic
    i. It was a mess. But it was an absolute disaster that we could not control or change. The contra flow was a good idea just became overwhelmed due to sheer numbers of people evacuating…
    j. N/A
    k. Once all lanes were used to get out, there was no driving in or out for fire personnel until traffic stopped. I had to drive on the sidewalk and there were times when I had to go oncoming while cars tried to get out of my way with almost no extra room. Made driving very slow.
4. **Please provide any other details or comments about your transportation experience as a first responder during the Camp Fire.**
    a. In both Camp Fire and the Oroville Dam Spillway incidents, we learned roadway improvements on these major throughfares is critical in the preservation of life. Having adequate shoulders that can support another lane, if possible, can help with emergency traffic, or emergency situations. Permanent electronic signs along the roadway that can be used to give information on contra-flow and evacuation efforts can help with large scale evacuations as well.
    b. Either slow traffic patterns, panicked people doing stupid actions, or downed power and communication lines and equipment that blocked traffic.
    c. I was a little upset that even after showing my Firefighter credentials to CHP they still were threatening to force me out of my neighborhood and told me that if I left my property, they would arrest me and my retired CalFire neighbor and we were feeding animals left behind and checking on neighbors properties per their request.
    d. The complete grid lock was due to other vehicles needing to merge onto the main roadways from the side roads. The town needs more main roads to enter/exit the town. As well as widening the roadways.
    e. Coordination between all agencies is essential to make sure traffic flow stays moving for people who need to evacuate.

f. We need to learn from this fire and all communities with similar population densities and limited evacuation routes should have plans in place to keep traffic moving. We knew that Paradise was vulnerable but nobody really though the whole town and Magalia would need to evacuate all at once. Like I stated earlier, we need to have a plan for the absolute wort case scenario even if it seems impossible. We use the PACE acronym to plan.
g. Many roads became impassable as the fire swept through. Trees, powerlines and telecommunication lines were blocking ingress and egress routes.
h. Once traffic stopped and fire started encroaching vehicles people would abandon their vehicles and would leave their vehicle parked in the middle of the road. It became very hard to access main roads after that.

5. Given the current population of Paradise and surrounding communities, if another wildfire was to strike the area, how long would it take evacuees on Skyway to get from Neal Road in Paradise to Bruce Road in Chico now?
Please provide your best estimate.

a. I would say in another large-scale evacuation it would still take a considerable amount of time. We can't plan for an evacuation as the population stands now, we have to plan for an evacuation when Paradise is fully repopulated, and all the homes are rebuilt.
b. That is a difficult question, there are so many variables. I think we could do it faster today than we did during the Camp Fire.
c. 1 hour
d. With the current population, I think the time would be significantly reduced. Perhaps 1.5 hours. The town is repopulating and within the next 10 years, the problems will be back to where they were.
e. Less than before but with growth occurring, it will return to similar time frames
f. Same if they don’t open both sides of Skyway
g. I think it would still take a very long time. There is a smaller population, but the roads are not any better. The evacuation of the towns above Paradise also needs to be considered, as Magalia and Stirling City residents have to evacuate through Paradise.
h. Less time given that the population is at 10k compared to 27k
i. 45 minutes
j. 10 minutes
k. With a lower population and great awareness of the fire severity I feel the time would be cut by 75% compared to the times during the Camp Fire.
l. Unknown. I doubt there would be the buildup or the stop and go traffic that was in the Camp Fire.

6. **Given your perception of the contra-flow lanes on Skyway during the Camp Fire evacuation, what would you change about the evacuation lanes if a similar situation occurred again today?**
    a. I would put permanent electronic signs along the Skyway that are preloaded with contra-flow instructions, change all the traffic lights on Park Ave/Skyway from Bruce Rd to Hwy 99 (west side of overpass) green to promote the traffic at the bottom of the Skyway to keep moving, and widen all shoulders along the Skyway (or major evac route) to support breakdowns, or first responder traffic.
    b. Chico PD would have to be more involved to continue the contra-flow through the City of Chico
    c. Nothing.
    d. There is no blending of both flows due to idiotic or panicked drivers.
    e. Unknown
    f. I would widen all existing roads and see where additional roads can be created. There are too many people on the roads with very few outlets to leave. It's destined to have the same deadly impact if we don't change the infrastructure.
    g. None
    h. More room for first responders
    i. Open up the choke points down in Chico. Make all traffic get on the highway in either direction just to keep the Skyway open and not backing up.
    j. N/A
    k. Any stops outside the town, such as Chico, would need to be made green to let traffic continue to flow.

7. **Please provide any other details or comments about your experience as a first responder serving communities on Skyway today.**
    a. Skyway is finally starting to look good again. There are still a couple areas in the Town of Paradise that will bottleneck, but improvements are being made. I would also add, don't think that because Paradise has lost a lot of residents, that the traffic problems would be solved. Paradise is rebuilding, and people will once again want to move there. There is still a lot to burn in Magalia, Sterling, and Inskip, which would trigger another large-scale evacuation. Decisions on the roads now will impact the community in the future.
    b. The only solutions are to add more lanes to both the Skyway and to SR-99. When SR-99 is gridlocked, there is nowhere for the traffic to go and it just backs up the Skyway.
    c. Make roadways wide enough to have disabled vehicles out of the lanes of traffic, to keep a flow moving.
    d. I was a little upset to see that on Pentz in the Ponderosa Elementary area, they appear to have completed the sidewalks and bike trail but didn't widen the road there at all. I was under the impression that they were going to make changes to Pentz to allow more traffic in an emergency.
    e. None
    f. I never want to see another community devastated like Paradise and Butte County again!