Evacuation Route Modeling and Planning Project

Prepared for

The County of Santa Barbara

by:

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KLD PROPOSAL 22-007

I. Introduction

The County of Santa Barbara is along the California coast and includes the Sierra Madre Mountains, the San Rafael Mountain Range and Los Padres National Forest. The county includes the cities of Buellton, Carpinteria, Goleta, Guadalupe, Lompoc, Santa Barbara, Santa Maria, and Solvang, as well as the communities of Toro Canyon, Summerland, Mission Canyon, Gaviota, Mission Hills, and Vandenburg Village. The county spans approximately 2,700 square miles (on land) and has a permanent resident population of approximately 450,000 people according to the 2020 Census. Many cities and census-designated places within the county are along the coastline and are surrounded by parks and wooded areas with Santa Ynez Mountains, the Sierra Madre Mountains and the Los Padres National Forest to the north/east. These parks, Lake Cachuma, the coast, and other tourist attractions (golf courses and day camps) in the county attract a significant number of tourists to the city in addition to the permanent resident population. There are also many special facilities in the county including schools and medical facilities. According to the 2019 Census American Community Survey, there are approximately 67,000 employees commuting into the county on a daily basis to work.

Due to climate and land use changes, wildfires are occurring more frequently along the West Coast. The Sherpa Fire and Rey Fire burned a combined 40,000 acres in 2016. In 2017, the Whittier Fire and Thomas Fire burned over 300,000 acres combined. These fires destroyed over 1,000 structures. The fuel within the county and surrounding the major cities and census-designated places presents significant wildfire risk to the people living in, working in and visiting these areas.

There could be as many as 500,000 people throughout the county on a typical day. Some or all of these people may have to evacuate in the event of a wildfire or other emergency. Given the unique geography of the county with the Pacific Ocean to the west and the mountains to the east, evacuees must predominately travel north or south to evacuate the cities along the coastline using limited evacuation routes (California Highway (CA) 154, CA 192 or US Highway 101). Evacuating so many people with so few roads presents significant risk. If flames or smoke from the wildfire block one of these evacuation routes, the risk is exacerbated.

The objective of this project is to analyze the county's preliminary evacuation routes to understand their capacity, safety, and viability under emergency scenarios. A detailed traffic model of focus areas, and a baseline evaluation of evacuation routes, will be conducted. This project will accurately estimate the number of people and vehicles that may need to be evacuated from the focus areas during a wildfire or other emergency, build a traffic simulation model of the focus areas, and then use that model to analyze the how the major evacuation routes within the focus areas will operate under emergency conditions, as well as to estimate how long it would take to evacuate under various conditions (season, day of the week, time of day, weather, etc.). This is referred to as an Evacuation (ETE) study. A baseline ETE value will be computed based on the city population and the assumption that all evacuation routes are operational. Then a number of sensitivity or "what if" scenarios will be considered to see if different tactics (police controlling critical intersections, carpooling, contraflow, etc.) can reduce the evacuation time. Sensitivity studies will also be conducted to see if some adverse conditions (i.e., roadway closures) will prolong ETE. The results of this ETE study will help the County of Santa Barbara to assess the capacity, safety, and viability of the evacuation routes within the county and, therefore, comply with Assembly Bill Number 747.

II. Qualifications

Company Information

KLD Engineering, P.C. is a professional corporation (wholly owned and operated by licensed professional engineers) based in New York State, which was founded in 1997. We have 25 full-time employees, with approximately 10 of those employees specifically working on ETE studies. We have only one office location at 1601 Veterans Memorial Highway in Islandia, New York, which is centrally located in Long Island approximately 40 miles east of New York City. ***KLD Engineering, P.C. is a Minority Business Enterprise (MBE) which is 71% owned by Asian-Americans. KLD Engineering, P.C. is also a small Disadvantaged Business Enterprise (DBE).***

KLD Engineering, P.C. has its roots in another company, KLD Associates, Inc., which was founded in 1973. KLD Associates was under contract with the Federal Highway Administration (FHWA) in the late 1970's to develop traffic simulation software. After the incident at Three Mile Island in 1979, FHWA recommended KLD Associates to the Federal Emergency Management Agency (FEMA) to develop a traffic simulation software specific to evacuation. Over the next several years, KLD Associates developed the Dynamic Evacuation (DYNEV) software under contract to FEMA. By the late 1980's, DYNEV was being used to develop evacuation plans and Evacuation Time Estimates (ETE) for most nuclear power plants in the United States. In 1988, the U.S. Nuclear Regulatory Commission (NRC) contracted one of the best transportation engineering programs in the country – the Texas Transportation Institute (TTI) at Texas A&M University – to review the DYNEV model. TTI undertook a study to model rush hour traffic leaving Austin, Texas using DYNEV and compare it to actual traffic data (vehicle counts and travel times) for the major roadways leaving Austin. The results of TTI's study are documented in two regulatory documents – NUREG/CR-4873 and NUREG/CR-4874 – which concluded that DYNEV predicted actual traffic movement with "reasonable accuracy", thereby validating the use of DYNEV for evacuation planning and ETE development.

DYNEV was used throughout the 1980's for ETE studies for active nuclear plants, as well as for plants seeking licensure (most notably Shoreham and Seabrook which involved extensive federal hearings and expert testimony by KLD senior staff). In the early 1990's and early 2000's, DYNEV was used for most nuclear plants in the United States to update ETE studies based on the latest decennial Census data. In 1997, KLD Engineering, P.C. was formally founded to adhere with New York State regulations that engineering studies were to be done by professional corporations wholly owned by licensed professional engineers. In 2008, all ETE work was shifted from KLD Associates, Inc. to its affiliate KLD Engineering, P.C. In 2013, KLD Associates, Inc. and KLD Engineering, P.C. formally split into two independent companies with no overlap in ownership. KLD Associates, Inc. is still operational and focuses on government contracts related to accident investigation and traffic safety. KLD Engineering, P.C. has more than doubled in size since the split of the companies.

Qualifications – ETE Experience for Nuclear Power Plants

In 2006 through 2011, KLD Engineering, P.C. (KLD from here on) was the industry leader in ETE studies for nuclear power plants, having done the ETE studies for 16 of 19 new plant applications filed with the U.S. NRC. During that time, KLD developed the standard methodology and technical report for ETE studies for nuclear plants. In 2009 through 2011, KLD senior staff were actively involved with the Nuclear Energy Institute (NEI) and with Entergy (one of the largest utilities in the U.S. at that time) to review draft

rulemaking from the NRC that pertained to ETE studies for nuclear power plants. The draft rule on ETE was molded into a more reasonable and practical (for industry) final rule in large part due to the efforts and professional opinions of KLD senior staff. The final guidance document on performing ETE studies – NUREG/CR-7002 published in November 2011 – was almost a direct plagiarizing of the ETE reports that KLD had been submitting to the NRC for the past 5 years related to new plant applications. While no credit was given to KLD, we were at a competitive advantage as our methodology and report template had been adopted as the federal standard.

In 2012, all nuclear plants in the United States were required to update their ETE studies to account for 2010 Census data and the new regulations and guidance published by the federal government in November 2011. KLD won the contracts to perform the ETE studies for 49 of the 65 nuclear plants in the United States. All studies were completed and submitted to the NRC on time. All 49 of the studies were found by the NRC to be in compliance with the regulations and guidance (the NRC does not "approve" studies, it only finds them to be "in compliance") without revision. One utility who owned and operated 10 nuclear plants at the time awarded their ETE contract to another company. The NRC rejected their studies 3 times as being non-compliant. After the third rejection, the utility contracted with KLD to redo their studies in a 6-month timeframe. All studies were completed on time and found by the NRC to be compliant without revision.

In addition to our work in the United States, KLD has done ETE studies for 6 nuclear plants in Japan, all 4 nuclear plants in Canada, and the only nuclear plant in Slovenia. We are currently working on an ETE study for the only nuclear plant in the United Arab Emirates, located approximately 3 hours west of Abu Dhabi. We are also currently under contract with all 54 active nuclear power plants in the U.S. and 3 of the 4 active nuclear power plants in Canada to update their ETE studies based on new census data.

Evacuation and Emergency Planning (E&EP) is one of three main business lines at KLD, with Traffic Engineering (TE) and Geographic Information Systems (GIS) being the other two. Our traffic engineering business line mostly focuses on traffic simulation, signal retiming and Intelligent Transportation Systems (ITS) in New York City (NYC). NYCDOT and the Port Authority of New York and New Jersey have on-call contracts with KLD to simulate traffic on NYC streets and crossings (bridges and tunnels). Simulating traffic in NYC is not a trivial task. Our GIS business line typically supports the E&EP and TE business lines, but does do several standalone projects, most notably acoustical modeling of emergency siren systems and development of bus routes.

Qualifications – ETE Experience for Wildfires and Other Hazards

In addition to KLD's work in nuclear evacuation planning, we have done several evacuation studies for other hazards:

1. **San Lorenzo Valley, California** – KLD, under contract with Pacific Gas & Electric (PG&E), conducted a pilot **wildfire ETE study** for a cluster of seven communities in the San Lorenzo Valley between Santa Cruz and San Jose. The goals of the study were twofold: (1) determine how long it would take to evacuate these communities (individually and as a whole); and (2) provide a framework/methodology for other cities/communities in high fire risk areas to estimate how long it would take to evacuate. There are approximately 21,000 permanent residents living in the seven communities. The study included several sensitivity studies to test different tactics that

could reduce ETE. The study also included consideration of employees, tourists, special facilities (schools, daycares, medical facilities, etc.) and those with functional and access needs.

2. **Sammamish, Washington** – KLD, under contract with the City of Sammamish, is currently conducting a **wildfire ETE study** and updating existing emergency plans based on the results of the ETE study. The scope of work is similar to the San Lorenzo Valley study. The study includes several sensitivity studies and consideration of various population groups that could potentially have to evacuate.
3. **Laguna Beach, California** – KLD, under contract with the City of Laguna Beach, conducted a **wildfire ETE study** and updated existing emergency plans based on the results of the ETE study. The scope of work was similar to the San Lorenzo Valley study. The study identified communities that have limited egress/ingress routes and developed a traffic management plan to facilitate egress during an emergency and reentry once the area is safe for return. Similar to the San Lorenzo Valley study above, the study included several sensitivity studies and consideration of various population groups that could potentially have to evacuate. An emergency planning website and mobile app were developed for this project to provide valuable emergency planning information to people living in, working in, and visiting the city.
4. **Ashland, Oregon** – KLD, under contract with the City of Ashland, conducted a **wildfire ETE study.** The purpose of the study was to identify and address deficiencies in wildfire emergency preparedness by creating an evacuation plan including elements such as population density, fuels, weather, and traffic models. The project tasks included conducting a vulnerability assessment to identify the most at-risk areas and population groups, including the disabled population, those without vehicles, tourists, and other needs and limitations. A wildfire occurred in the study area for this project while the study was ongoing. KLD's Senior VP was interviewed by local media regarding the study: **https://kobi5.com/news/ashland-city-to-make-changes-to-emergency-evacuation-plan-138042/** This study was funded by a federal grant.
5. **Oceanside, California** – KLD recently completed work under contract with the City of Oceanside to conduct a pilot **wildfire ETE study** for the community of Ocean Hills, with a permanent resident population of approximately 8,000 people. The purpose of this study was to identify all critical facilities (schools, daycares, medical facilities), all tourist attractions (churches, golf courses, etc.) and major employers in the community, then estimate the potential evacuating population for the community. A detailed traffic/evacuation simulation model was built to estimate how long it would take to evacuate the community. Several sensitivity studies were conducted to test different tactics to potentially reduce ETE. Finally, an emergency evacuation plan template was created based on the results of the evacuation study to provide for an orderly evacuation in the event of an emergency. This study and the emergency plan template will be used to develop plans for other communities in the City of Oceanside.
6. **Diablo Canyon Nuclear Plant (San Luis Obispo County, California) and San Onofre Nuclear Generating Station (SONGS – Orange County, California)** – As we learned from Fukushima in Japan, an earthquake and/or tsunami can cause a radiological release from a nuclear power plant. KLD did extensive **earthquake evacuation studies** for Diablo Canyon and SONGS to estimate the impact on ETE of damage caused by earthquakes. Roadways and bridges can become structurally

deficient due to the shaking of the earthquake. Roadways can also be covered by mud and debris from a landslide caused by an earthquake. The sensitivity studies considered various roadway closures as predicted by HAZUS (FEMA's earthquake shake model) and estimated the impact on ETE, which was very significant for some magnitude earthquakes. The results were used to enhance emergency planning and to prioritize bridge retrofitting projects.

7. **Washington, D.C.** – KLD was contracted by the District Department of Transportation (DDOT) to simulate an evacuation for two scenarios: (1) a **potential terrorist attack** – a simulated dirty bomb at the Walter Reed Medical Center with a plume blowing over downtown Washington, D.C.; and (2) a **chemical explosion** at the Blue Plains Wastewater Treatment Plant. The project took nearly two years to complete. It included the evacuation of over 1,000,000 people. All modes of evacuation (vehicular, transit and pedestrian) were simulated as part of the study. The results of the study were used by DDOT to enhance emergency planning in the nation's capital.
8. **Town of Brookhaven, NY** – KLD was contracted to conduct a **hurricane evacuation study** for the Shirley-Mastic peninsula on the south shore of Long Island in New York. The peninsula is only a few feet above sea level and is extremely prone to flooding from hurricanes and/or storm surge. KLD computed ETE for Category 1 through Category 4 hurricanes. One of the key findings of the study was that the railroad that runs the length of Long Island along the south shore is a major constraint to evacuation as there are a limited number of at-grade railroad crossings. Several temporary crossings were recommended to facilitate the evacuation. This study also considered a **wildfire** in a nearby Wildlife Refuge with smoke and flames blowing over the major evacuation route (William Floyd Parkway) deeming it unusable.

All evacuation studies are similar in that people and vehicles are trying to move away from the hazard to the extent permitted by the roadway system. The hazards can be fixed or moving. DYNEV is capable of computing ETE for all types of hazards – fixed or moving, manmade or natural. DYNEV is computationally efficient, running faster than real-time (i.e., a 9-hour evacuation for a nuclear plant with 300,000+ people evacuating takes about 15 minutes to simulate). DYNEV running faster than real-time was one of the design criteria specified by FEMA when it was developed as they wanted to use the software to run what-if scenarios at Emergency Operation Centers in real-time.

III. Staffing

The KLD organization chart is provided in Figure 1.

Kevin Weinisch, P.E. is the Senior Vice President of KLD and will serve as the Principal in Charge for this work effort. Mr. Weinisch has spent his entire 20-year career conducting ETE studies and improving emergency plans. He is widely considered one of the world's foremost experts on ETE studies, having done evacuation studies for more than one hundred locations throughout the world for manmade and natural hazards. He has managed projects with budgets ranging from a few thousand dollars to well in excess of one million dollars. He consistently completes jobs on schedule and within budget. Mr. Weinisch will serve as the single point of contact with the County of Santa Barbara and the stakeholders.

Rebecca Cohen, P.E., PTOE – Senior Project Manager at KLD – will oversee the evacuation modeling and ETE computations. Ms. Cohen has conducted evacuation studies for most of her 11-year career, including

serving as the project manager for KLD's wildfire evacuation studies for Ashland, Laguna Beach and the San Lorenzo Valley.

Efe Tuncer – Senior Traffic Engineer – will be the lead engineer for this project, developing the link-node analysis network, overseeing the demographic survey, preparing the DYNEV input streams, running the simulations, and analyzing the results. He has been doing exclusively ETE work at KLD for four years, including being the lead engineer for the Sammamish, Laguna Beach, Oceanside and San Lorenzo Valley wildfire ETE studies. His graduate studies were specifically on evacuation as well.

Amy Jiang – GIS Specialist II – will oversee GIS mapping and data collection for the study. Ms. Jiang has been doing GIS mapping and spatial analysis for evacuation studies for the last six years at KLD.

Michael Giambrone – Computer Programmer – will develop the website for the demographic survey (Task 3) and handle any other programming and information technology (IT) issues for the project.

Resumes for each of the key project staff are provided in Appendix A.

IV. Required Tasks and Deliverables

TASK 1: CONDUCT A PROJECT KICKOFF MEETING

A project kickoff meeting will be held with key stakeholders, including, but not limited to, local representatives from emergency management agencies, state and local police (traffic control), fire department, public works, and any other stakeholders identified by the county within 10 working days of authorization to commence work. A PowerPoint presentation will be given summarizing the evacuation expertise of the project team and outlining the proposed methodology for the study, as well as timeline, milestones, and budget. The presentation will also focus on data needed from the stakeholders and key project assumptions. Meeting notes will be taken and provided electronically to stakeholders after the meeting, as well as a copy of the attendance roster for the meeting. It is assumed that the kickoff meeting will be held virtually.

The study area to be considered will be discussed at the project kickoff meeting with the stakeholders and will be finalized within two weeks of the completion of the kickoff meeting. Figure 2 shows the proposed study area used in preparing this proposal and determining the project cost. As per the RFP, the study area for the baseline evaluation of evacuation routes is the entire county with detailed traffic modeling in the following focus areas: the Carpinteria Valley foothills, the Toro Canyon Community Plan area, the Summerland Community Plan area, the Mission Canyon Community Plan area, the Eastern Goleta Valley Community Plan area, the Goleta Community Plan area, the Gaviota Coast Plan area, Mission Hills and Vandenberg Village, and State Route 154 near Lake Cachuma and Paradise Road. This area will serve as the starting point for the discussion of the study area to be considered.

Task 1 Deliverables

Electronic version of meeting notes and a copy of the meeting roster. A map of the agreed upon study area.

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TASK 2: GATHER RELEVANT DATA AND IDENTIFY MODELING FOCUS AREAS

KLD with work with project stakeholders to obtain copies of at least the following (to the extent these documents already exist):

- Community Wildfire Protection Plans
- Standard of Cover studies
- Unit Strategic Fire Plans
- The Montecito Evacuation Study
- Emergency Operations Plan(s)
- Evacuation Plan(s)
- Evacuation Management Zones (EMZ), if applicable
- Wildland-Urban Interface Fire Response Plan(s)
- Traffic Management Plan(s)

KLD will perform a comprehensive review of these plans and information to ensure that the traffic modelling matches what will be implemented during an emergency as per the plans. It is expected that there will be regular communication throughout this review to answer all questions raised during the review.

In addition, the following data will be collected as part of this study:

- Annual average daily traffic counts
- Traffic pattern forecasts
- 2020 Census data[1]
- Roadway characteristics and specifications, including infrastructure constraints and roadway conditions
- Any available bus data regarding commuting patterns
- Areas with large animals to evacuate
- The County's Temporary Evacuation Points (TEPs)
- Land use information
- Information on access and/or functional needs (AFN) individuals
- Relevant GIS data, including any geospatial data on wildfire information and spread
- The County's Traffic Demand Model (TDM)
- CALFIRE Fire Hazard Severity Zones

To accurately analyze evacuation route capacity and viability in the focus areas, accurate evacuation demand must be estimated. In addition to permanent resident population, there may be people working or recreating in the study area that also need to be evacuated. Also, population at special facilities (medical facilities, schools, daycares, correctional facilities, camps, etc.) needs to be considered. Transit-dependent population (those who do not own or have access to a vehicle) needs to be estimated. This includes homeless population, which is typically difficult to estimate. KLD will work with project stakeholders to estimate the number of homeless people in the city. Those residents with AFN who live at home ("non-institutionalized") also need to be considered.

1 Permanent resident population in the study area will be based on 2020 Census data. These data will be extrapolated to Year 2022 using growth rates computed from the U.S. Census Bureau's annual population estimates.

This study will include an extensive data collection effort to identify major employers, tourist attractions, special facilities, transit-dependent population and residents with functional and access needs. Phone calls to specific facilities will be made to gather data. Census databases on employment will be accessed.

It is expected that the County of Santa Barbara and other project stakeholders will assist in gathering data and information needed for the study. Local stakeholders are typically familiar with the staff operating schools, medical facilities and other special facilities in the area. It is far easier for local stakeholders to get the data/information than it is for an independent consultant from out of state (calling facilities from a phone number that is not local) to get the information.

Special care will be taken to avoid double-counting. Someone who lives and recreates within the study area could be counted twice. Overestimating population will result in longer ETE and ineffective emergency planning.

The total demand estimation will be derived for all evacuees by population group, including their vehicles. The summary tables will provide an indication of the total number of people and vehicles to be evacuated from each of the population groups identified in each focus area.

The number of transportation resources available (buses, wheelchair transport and ambulances) will be estimated and compared with the number or resources needed to evacuate the transit-dependent population, special facilities, and those with functional and access needs. If multiple "waves" of transit vehicles are needed (more resources needed than available), the study will document the time needed to complete the various waves. Any shortfalls in transport resources will be identified as part of Task 4.3.

Task 2.2: Online Demographic Survey

Some of the data critical to an evacuation study (e.g., number of vehicles residents will use to evacuate, time it will take people to mobilize/prepare for evacuation) are not available through the Census. Historically, this data for an ETE study was gathered through a telephone survey of residents within the study area. However, given the limited reliance upon landline telephones and the privacy protection on cellular phones, telephone surveys are becoming increasingly difficult to complete.

KLD proposes the following approach for conducting a community demographic survey, which has been used for several wildfire ETE studies in California and Oregon in the past 5 years:

- Develop a demographic survey instrument (list of questions to be asked) in consultation with stakeholders.
- Publish the survey online. An example of a demographic survey used in the San Lorenzo Valley in California can be seen at the following website: **http://surveys.kld.engineering**
- Develop an electronic postcard and poster or flyer advertising the demographic survey and the need for the community to participate to enhance emergency planning. A scannable QR code will be included on the postcard and poster which can be scanned using a smart device and bring the user directly to the survey website. Figure 3 is an example of the postcard used for the San Lorenzo Valley study.
- Work with the County and other stakeholders to distribute the survey through their communication platforms (website, social media, etc.)
- The County may also decide to distribute the survey in person. If they do, this proposal assumes that County staff will set up a booth outside a public gathering place (supermarket, library, community center, etc.) with a sign reading "Wildfire Emergency Planning" or something similar and printed copies of the

aforementioned posters on display. Paper copies of the survey on clipboards, tablet computers with the survey website available, and postcards to hand out to people if they wish to take the survey at home are strongly encouraged at the booth. Establishing booths ensures more complete coverage of the population within the study area as the online approach potentially excludes those who are not active on social media, do not have internet access at home, or do not own a mobile device. Figure 4 shows a booth set up at a local market in the San Lorenzo Valley with several community residents filling out the survey on tablet computers. We recommend using the online survey approach first to see if a representative sample is obtained for the County as a whole. If the online approach does not produce a representative sample, then in-person surveying at booths can be explored.

The desired response rates are discussed in Task 7.1 of this proposal. A statistical analysis of the data gathered from the demographic survey will be conducted to identify important demographic information (average household size, number of evacuating vehicles per household, percentage of households with commuters, etc.) and mobilization/preparation times for the ETE study. Mobilization times are a vital piece of an ETE study as they determine the distribution of evacuating vehicles over time after an advisory to evacuate. Accurate mobilization times lead to realistic estimates of evacuation time.

It should be noted that in an effort to reduce cost, this task will be combined with Task 7.1. As such, the cost that is provided for this task is only the *additional* cost to include, analyze, and apply the questions that pertain to the demographic and mobilization information from the public into the study. It is assumed that the demographic survey will be predominantly web based. It is assumed the County and other project stakeholders will advertise the web based demographic survey to residents using their communication platforms (website, social media, etc.). If the County decides to conduct the survey in-person at booths at public gathering places, the booths will be staffed by local volunteers. It is further assumed that any printed materials (posters, postcards, etc.) at the booths will be printed by the County. If the County would like KLD to staff the booths and provide the printed materials, it will result in additional cost for labor and for additional travel and other direct costs.

Task 2 Deliverables

All population and vehicle data will be stored in a geodatabase using GIS software. A GIS shapefile of the special facilities, as well as transient facilities and major employers, including all of the data obtained for use in the study. A list of key data gathered for the Focus Area modeling and countywide analysis will be provided, including descriptions of each Focus Area.

TASK 3: IDENTIFY HAZARD AND EVACUATION SCENARIOS

Once the Focus Areas are finalized with project stakeholders (as part of Task 2), hazard and evacuation scenarios will be developed for each.

A shadow evacuation – people outside the declared evacuation zone or Focus Area who may choose to evacuate thereby delaying those in the evacuated area – will also be considered. Hurricane Rita made landfall near Galveston, Texas only a few weeks after Hurricane Katrina made landfall near New Orleans, Louisiana. Seeing the devastation that Hurricane Katrina caused, hundreds of thousands of people outside the declared evacuation zone for Hurricane Rita chose to evacuate anyway. This resulted in congested freeways and vehicles running out of gas and being left abandoned, thereby hampering the evacuation. The potential evacuation of populated areas surrounding the Focus Areas and the consumption of available roadway capacity will be considered in this

study. The proposed Shadow Region is 1 mile beyond all Focus Areas. Thus, if these areas evacuate as well, they could inhibit the egress of evacuees from the Focus Areas. The proposed Shadow Region will also be discussed with stakeholders and refined during the project kickoff meeting (Task 1) and early in the project.

This study will consider several evacuation regions (spatial extent of evacuation) by including an evacuation of each Focus Area, of multiple Focus Areas (to be discussed with stakeholders), and of all Focus Areas at once. A staged evacuation approach can also be considered, if desired.

A scenario is a combination of circumstances, including time of day, day of week, season, and wildfire spread and behavior. Scenarios define the population components, response times for the affected population groups, and applicable highway speeds and capacities. This study will consider several scenarios to capture the temporal variations in the number of people to be evacuated.

There are an infinite number of possible wildfire scenarios depending on the ignition point and the atmospheric and fuel conditions at the time of ignition. A fire that ignites a few miles from the Focus Areas could impact the area in minutes, while a fire that ignites farther away could take several hours to impact the area. Regardless of the circumstance of the fire, it is imperative to know the range of times needed to evacuate the area, which is the objective of this study. A specific plan cannot be built for each possible scenario as you would have infinitely many different plans. The bounding constraints of a wildfire on the County would be that one or more of the major evacuation routes would not be passable due to the wildfire. Local road closures due to the wildfire would have less impact as everyone leaving the city would wind up on one of the major evacuation routes in order to leave the Focus Areas.

Available wildfire datasets, including CAL FIRE and other relevant sources, that were collected in Task 2 will be leveraged. The expertise of the Evacuation Advisory Group (EAG) will also be considered in the development of the wildfire scenarios. These datasets will be used to determine the appropriate roadways to close to represent the wildfire cases based on the file ignition point, direction of travel, rate of speed, etc. This data can also be used to determine if a staged/phased evacuation is appropriate and which areas should be staged.

Rather than develop a detailed fire spread model, three bounding evacuation cases will be considered to represent bounding conditions for possible wildfire scenarios. One case will consider a wildfire originating from the north and traveling toward the Focus Areas in the southbound direction. This case will assume northbound evacuation routes are closed and all evacuees must evacuate southbound. The second case will consider a wildfire originating from the south and traveling toward the Focus Areas in the northbound direction. This case will assume southbound evacuation routes are closed and all evacuees must evacuate northbound. The third case will consider a wildfire originating from the east and traveling toward the Focus Areas in the westbound direction. This case will assume eastbound evacuation routes are closed and all evacuees must evacuate northbound or southbound only. The aforementioned datasets will be used to accurately model these bounding cases, including the closure of appropriate roadways and direction of traffic flow away from the wildfire.

All regions and scenarios will be reviewed with the County and the other stakeholders to assure their agreement prior to conducting any analyses. A list of draft scenarios will be provided to the county and stakeholders for review. A virtual meeting will be held with a presentation to lead the discussion. After the meeting, a list of the final “approved” scenarios will be provided to the County and project stakeholders.

Prior to running any simulations, an assumptions memo will be provided to the County and project stakeholders for review and comment/approval. The memo will include all project and model assumptions, scenarios, evacuation routes, regions, and trip generation distribution curves to be used in the analysis.

Task 3 Deliverables
The project assumptions memo.

TASK 4: EVACUATION MODELING AND ANALYSIS
Under this task KLD will conducted the modeling and analysis of the County's evacuation routes. The routes will be assessed for capacity, safety, and viability under a range of emergency scenarios.

An analysis of areas with clusters of households and limited ingress/egress will also be included in this task. Using GIS software, Census blocks will be overlaid with the city boundary to locate areas that have a cluster of households within the city limits. Those Census blocks with 250 households (this threshold will be discussed with project stakeholders) per square mile or more will be selected. Next, these Census blocks will be overlaid with aerial imagery and evacuation routes within the study area and high wildfire risk zones. Those Census blocks that have more than one route in/out will be removed from the analysis. The remaining Census blocks will be flagged as Tier 1 access impaired neighborhoods. Next, a second level of analysis will be conducted to consider the potential for the ingress/egress route to be blocked by fire and/or smoke. Roadways that are surrounded by fuel or wooded areas will be considered to be at risk of being blocked by fire/smoke. Areas that fit these criteria will be selected as Tier 2 access impaired neighborhoods. This preliminary analysis and list of neighborhoods will then be discussed with stakeholders during the next bi-weekly project status meeting. Meeting attendees will be able to further refine the list of access impaired neighborhoods based on their local knowledge of the area. Those communities that would not require any special precautions during a wildfire emergency based on stakeholder input will be removed from the analysis. Those neighborhoods identified as access impaired neighborhoods will be identified, mapped and discussed in the deliverables for this task. KLD will provide recommendations for safe refuge area options (if any) in these access impaired neighborhoods.

Task 4.1: Traffic Modeling for Focus Areas
A field survey of the roadways within the Focus Areas will be conducted by experienced traffic engineers. The survey will identify the key features of the roads that comprise the highway network within the study area. A tablet personal computer equipped with GIS software and GPS will be used to gather data during the survey. Data will be gathered to describe the topology and characteristics of the highway system. A video and audio recording of the survey will be taken. Signal control locations will be identified, as will stop control and other highway signing. A representative sampling of traffic signal timings will be taken for pre-timed signals, if there are any. Speed advisory signing will be noted; grade, horizontal curvature, pavement and shoulder widths will be estimated. Actual free speeds (speed that traffic is actually moving at, which is typically about 10% higher than the posted speed limit) will be observed, as well as lane usage. Additionally, narrow streets, time of day streets are heavily parked, and resident parking in the neighborhoods at night will be observed and noted as part of the road survey. KLD will gain approval from the stakeholders and notify law enforcement prior to conducting the road survey.

Estimates of highway capacity will be based on data compiled during the field survey and by applying the procedures of the 2016 Highway Capacity Manual (HCM). KLD will also use tools such as Google Earth and GIS software for aerial imagery to confirm the number of lanes on roadways and the location of traffic signals.

A detailed computer representation of the roadway system within the study area will be developed. This representation consists of a network defined by nodes which represent intersections and locations where the characteristics of the road change (horizontal curve, grade change, add or drop a lane), and links which represent the sections of roadway between nodes. This representation of the roadway system, referred to as the link-node analysis network, is accepted practice in computer modeling and defines the input data for the DYNEV model (discussed in Task 10). Figure 5 provides an example of the link-node analysis network created for the wildfire ETE study in the San Lorenzo Valley.

The link-node analysis network will explicitly model the Focus Areas and any large-scale development projects that may be completed prior to the completion of this study. The baseline traffic model can only consider developments and roadway improvements that are/will be in place when the study is complete. If a development is modeled in the baseline study that is ultimately not built, the study may not be valid.

Any traffic control points, or traffic management tactics, identified in the plans (Task 2) will be modeled explicitly to make sure they are efficient and necessary to increase the flow of evacuation.

The detailed attributes of the physical highway system gathered during the road survey will be input for each link and node such that the link-node analysis network is an exact replica of the actual physical roadway network in the study area. This is imperative in computing accurate ETE and assessing roadway capacity, safety, and viability.

The link-node analysis network will be overlaid with the population/vehicle geodatabase (from Task 2) such that the correct number of people and vehicles are assigned to each roadway section (link) in the network. This is essential to accurately depicting the spatial distribution of evacuees, which is in turn essential to accurately assessing how the roadways will operate under evacuation conditions for each evacuation scenario.

The Dynamic Evacuation (DYNEV) II evacuation modeling system will be used to compute ETE and assess the capacity and viability of the major evacuation routes for the Focus Areas. A brief history and overview of DYNEV is provided below:

> DYNEV was developed by KLD under contract to the Federal Emergency Management Agency (FEMA) in the early 1980's. KLD was doing traffic simulation work for the federal government in the late 1970's when the nuclear incident occurred at the Three Mile Island Nuclear Generating Station in Pennsylvania in 1979. The federal government saw the importance of building a traffic simulation model to determine how long it would take to evacuate the area around a nuclear plant and thus contracted KLD to develop such a model. The model has been significantly extended and refined over the past 40 years since its initial development.
>
> By the late 1980's DYNEV was being used to compute ETE for nearly all nuclear power plants in the United States. At that time, the U.S. Nuclear Regulatory Commission (NRC) sponsored an independent agency to undertake a study of the DYNEV model. Two reports were issued (NUREG/CR-4873, 4874) at the completion of the study. One of these reports, CR-4873, compared the results produced by the DYNEV model with field data obtained from a congested freeway environment in Austin, TX. The congested freeway environment was as close to a typical evacuation environment as could be studied. These reports concluded, "DYNEV produces results that are reasonably consistent with the observed data on a congested freeway." The NRC validated the DYNEV model again

in 2016 using a rigorous regression analysis of population density and roadway density around U.S. nuclear plants and concluded that the ETE predicted by DYNEV were consistent with their findings.

The DYNEV model is still being used today to compute ETE for every active nuclear power plant in the United States and Canada, as well as nuclear plants in Japan, Slovenia and the United Arab Emirates. The DYNEV model has also been used to complete ETE for other hazards in recent years including 4 wildfire evacuation studies in the Pacific Northwest, earthquake studies in California, potential terrorist attacks in our nation's capital, and hurricane evacuation studies on the Atlantic coast. DYNEV has been used to compute ETE for more than 100 evacuation studies in the U.S. and abroad in the last 40 years.

An essential feature of an evacuation model is its ability to represent the routing pattern of evacuating trips. The model must be able to compute the outward-bound destinations of evacuation trips (trip "distribution") and their paths of travel to these destinations (trip "assignment"). KLD's Traffic Assignment and Distribution (TRAD) model, a component of DYNEV, integrates the trip assignment and distributions using well-established behavioral "equilibrium" principles. Some other models do not have this capability: the analyst must "assume" vehicle routing patterns. Such approximations can artificially limit the number of travel paths, thereby unrealistically "focusing" traffic demand and improperly increasing ETE.

The core algorithms of DYNEV are aligned with international guidance for traffic engineering and traffic flow as documented in the 2016 Transportation Research Board's Highway Capacity Manual. DYNEV incorporates state-of-the-art "dynamic routing" that ensures the simulation of evacuating traffic represents reasonable driver behavior in the event traffic congestion creates an "imbalance" between traffic demand and capacity. Specifically, if traffic along an evacuation route experiences pronounced delays, it is reasonable to expect that evacuees will be inclined to select more attractive alternative routes.

Potential reception/relocation centers or host facilities outside of the Focus Areas and away from the fire risk will be identified. Evacuees from the Focus Areas will be routed out of the city in the general direction of these reception centers.

The data gathered in the previous tasks are input into the DYNEV evacuation simulation model and ETE are computed for all regions and scenarios identified in Task 3. ETE will be provided as follows:

1. General population with vehicles
2. Transit-Dependent Population (residents who do not own or have access to a private vehicle)
3. Special facility population:
    a. Schools, preschools, daycares
    b. Medical facilities
    c. Correctional facilities, if any
4. Homebound population with AFN

Table 1 presents an example tabulation of ETE for a wildfire evacuation of the City of Ashland, Oregon. Table 2 is an example of ETEs for schools in the City of Ashland. These ETE results will be used to analyze the capacity and viability of the evacuation routes within the Focus Areas.

Task 4.1.1: Site Visits to Target Areas

KLD staff will visit target areas that are either identified by the Tier 2 analysis discussed above or are identified by the County or stakeholders (during the project kickoff meeting or one-on-one stakeholder meetings discussed in Task 4.4) for further examination. KLD plans to combine the visits to these additional target areas into a single

trip after having met and discussed with all stakeholders. KLD will survey the minor roadways in these areas (major routes were already covered in Task 4.1). If desired, county personnel and/or project stakeholders can accompany KLD on the site visits to provide local knowledge of everyday traffic and potential issues during an evacuation.

It is assumed that the trip for site visits target areas is combined with the road survey and the in-person EAG meeting.

Task 4.2: Baseline Evacuation Route Analysis for Unincorporated County

Due to the lower hazard risks, a baseline evaluation of the evacuation routes outside of the Focus Areas will be conducted. Available data from the County, other stakeholders, ESRI ArcMap, FHWA, etc. will be leveraged to develop a comprehensive dataset of all the evacuation routes within the county that are not within the Focus Areas. Roadway characteristics including free flow speed, roadway type, number of lanes, lane width, shoulder width, pavement condition, horizontal and vertical alignment (curvature and grade), percent truck traffic, control device (and timing, if it is a signal), etc. will be used to estimate the roadway capacity based on the 2016 Highway Capacity Manual.

Once the capacity of the route is estimated, the viability will be analyzed. The best way to measure the viability of the route will be to determine if the population demand utilizing the route exceeds the estimated capacity. In this case, it will operate below capacity and is likely to have bottlenecks and operational constraints. The 2020 census will be used to estimate the likely demand for each route based on the population density in the proximity of the route. The vehicular demand will be estimated using pre-approved occupancy assumptions and 2020 census data in ArcGIS.

ArcGIS will also be used to determine the safety of the various evacuation routes outside of the Focus Areas. Proximity to fuel, bridges and other crossings, and accident and flooding historical data will be used to analyze the safety of the evacuation routes.

Additional inputs to the baseline analysis can include, poverty status, disability (percent institutionalized), age, vehicle availability, percentage in high fire threat district, limited ingress/egress, etc. Local knowledge and experience of the Evacuation Advisory Group will be used as an additional input to the baseline evacuation route analysis as applicable.

A Microsoft Excel database and ArcGIS shapefile will be provided that includes all the parameters used to rank the evacuation routes outside of the Focus Areas as part of the baseline analysis.

Task 4.3: Modeling Results, Interpretation, and Problem Area Identification

Screen captures from KLD's Evacuation Animation (EVAN) software will be provided to identify congestion patterns during evacuation and to locate potential bottlenecks. Figure 6, Figure 7, and Figure 8 are snapshots of an EVAN animation of the evacuation traffic environment for a wildfire evacuation of the City of Ashland, Oregon. The locations and extent of congestion (Level of Service, LOS F) are clearly visible. Traffic congestion peaks at 1 hour after the advisory to evacuate (Figure 6) and dissipates over the next several hours as shown in Figure 7 and Figure 8. A sequence of such snapshots displays the changing traffic environment over time. These visualizations of traffic congestion are invaluable as they clearly identify bottlenecks during evacuation and provide the starting point for improving evacuation times and assessing roadway capacity constraints.

In addition to identifying areas with bottlenecks or disruptive traffic delays, issues pertaining to transportation resources, evacuation of AFN populations, and other evacuation difficulties will be identified as part of this task.

Task 4.4: Evacuation Advisory Group Collaboration

An in-person meeting will be held to discuss the project progress with the Evacuation Advisory Group (EAG). A PowerPoint presentation will be given summarizing the model assumptions, scenarios, evacuation routes, and the results. The presentation will include the baseline evaluation route analysis, a summary of results and how to interpret the results, and the identification and short description of bottlenecks and other problem areas and/or operational constraints. Meeting notes will be taken and provided electronically to stakeholders after the meeting, as well as a copy of the attendance roster for the meeting.

It is assumed this meeting occurs during the same trip as Task 4.1.1 and the cost is computed accordingly.

Task 4 Deliverables

Those neighborhoods identified as access impaired neighborhoods will be identified, mapped and discussed in a technical memo, including recommendations for safe refuge area options (if any) in these access impaired neighborhoods. A Microsoft Excel database and ArcGIS shapefile will be provided that includes all the parameters used to rank the evacuation routes outside of the Focus Areas as part of the baseline analysis (Task 4.2). Video files that show the evacuation animation will also be provided.

TASK 5: DEVELOP RECOMMENDATIONS AND SUCCESS STORIES

Once the baseline (all roads operational) ETE is computed, several sensitivity studies that will consider the impact on ETE and roadway viability of the following "what if" scenarios:

1. Mobilization time – if people take less time or more time to prepare to evacuate, what is the impact on ETE?
2. Number of evacuating vehicles per household – some ETE studies assume 1 evacuating vehicle per household. Other ETE studies rely on demographic studies which result in closer to 2 evacuating vehicles per household. What is the impact on ETE of varying numbers of vehicles per household?
3. Contraflow – if inbound lanes are used as additional outbound evacuation lanes, what is the impact on ETE?
4. Traffic Management Plan (TMP) – traffic control points (TCPs) are designed to help traffic flow out of the area at risk while access control points (ACPs) are designed to stop the flow of traffic into an area being evacuated. Together, TCPs and ACPs comprise the TMP. What impact does the TMP (if one exists) have on ETE?
5. Shadow Evacuation – federal guidelines suggest 20% shadow evacuation. What is the impact on ETE if there is no (0%) shadow evacuation, or full (100%) shadow evacuation?
6. Roadway Closures – this study will explore the impact on ETE of major evacuation routes being closed due to the wildfire or other potential hazards to Santa Barbara County, such as tsunamis and earthquakes.
7. Infrastructure improvements – adding capacity (an additional lane for example) can help to improve the evacuation.
8. Removal or opening of barricades within the Focus Areas, if feasible

Running "what if" scenarios such as these will help the stakeholders develop a robust emergency plan and test different tactics to reduce evacuation time. If the baseline ETE is 5 hours based on the existing roadway capacities and wildfire spread modeling indicates that the wildfire will reach the study area in 4 hours, contraflow, traffic control (police at critical intersections) and other tactics can be tested to see if the baseline ETE can be reduced below 4 hours.

"Thinking outside the box" will be emphasized in this task. Can we use the 12-foot shoulder on the Interstate as an extra evacuation lane? Can we bring buses in and evacuate everyone via bus to reduce the traffic on the roadways and get people out quicker? Is there rail service in the area that can be used effectively during evacuation? Is pedestrian evacuation feasible?

The aforementioned congestion diagrams will be compared side-by-side for the what-if scenarios to visualize the impact of the various parameters on traffic flow and on ETE. Figure 9 provides an example of a side-by-side comparison of congestion patterns for an evacuation of the City of Laguna Beach, CA with various road closures due to smoke and/or flames from a wildfire.

KLD will work closely with stakeholders to ensure potential evacuation improvements are realistic and implementable.

After the "what-if" scenarios will be used to develop recommendations on how to best address evacuation vulnerabilities that were identified in Task 4. A set of EAG-vetted recommendations for physical and operational evacuation improvements to alleviate problem areas will be provided.

Task 5 Deliverables

As part of this task, a list and short description of each success story (beneficial "what if" scenario, project milestones, engaging WUI residents and vulnerable populations, or task milestones) throughout the project will be provided.

TASK 6: COUNTYWIDE EVACUATION ROUTE PLAN

A countywide evacuation route plan documenting the baseline evacuation route analysis will be drafted. The document will include the project purpose and objectives, demand estimation methodology and results, the highway capacity estimation, the computed ETE, any bottlenecks and/or problem areas and/or operational constraints that were identified, and recommendations for physical and operational evacuation improvements. Final mapped evacuation zones and routes will also be included in the plan, as well as a description of the project' public education program efforts and its products. Areas of further analysis will also be identified in the plan. Appendices will present a description of the traffic simulation and trip distribution and assignment algorithms utilized in the DYNEV modeling system, the technical details of the study and the supporting data.

Task 6.1: Draft Plan

A draft plan will be provided to stakeholders (including the EAG) in electronic format (Adobe Acrobat PDF) for review and comment. Typically, a virtual meeting is held about 2 weeks after the stakeholders have had a chance to review the draft report. At the meeting, KLD will give a comprehensive PowerPoint presentation which summarizes the methodology, data gathered, ETE results. Ample time will be allotted for stakeholders to provide comments and feedback on the draft report and to ask questions about the results.

Meeting notes and a copy of the meeting attendance roster will be provided electronically after the meeting.

Once all comments from the evacuation advisory group have been received, a comment resolution form will be developed to provide a high-level summary of key input from the EAG and the proposed resolutions to each comment. The comment resolution form will be provided to the EAG for approval before the changes are made to the draft plan for finalization. A second virtual meeting with the EAG will be held to ensure their comments have been properly addressed. Meeting notes and a scanned copy of the meeting attendance roster will be provided electronically after the meeting.

Task 6.2: Final Plan

A final plan will be provided shortly after the second EAG meeting with all resolution changes incorporated.

Task 6 Deliverables

A draft plan, meeting notes and attendance roster from both EAG meetings, a comment resolution form, and a final plan will be provided as the deliverables for this task.

TASK 7: PUBLIC EDUCATION PROGRAM

Task 7.1: Develop and Conduct Community Survey

KLD will develop an online survey to help the project stakeholders understand the public's existing evacuation knowledge. The survey will be developed using Google Forms, JotForm, or whatever platform the client prefers. KLD has conducted more than 50 such online surveys in the past 3 years for natural and humanmade disasters. An example of an ongoing wildfire survey for the City of Sammamish, Washington can be seen at the following address: **https://Sammamishsurvey.kld.engineering**

KLD will draft a survey instrument (list of questions) based on our experience in wildfire emergency planning and on discussions with project stakeholders. For example, the following questions could be included:

1. Do you know which evacuation route to use in an emergency?
2. Where will your schoolchildren be evacuated to if school is in session in an emergency?
3. Do you have essential items pre-packed for an emergency, or would you have to pack them prior to evacuating?
4. Do you know which reception center serves your community in an emergency?

The survey instrument will be reviewed by project stakeholders and revised as needed. A domain name (web address) will be purchased based on stakeholder input and domain availability; the survey will be published to the domain. An electronic flyer will be developed to advertise the survey including the purpose of the survey, the website address, and a message encouraging the public to participate in the survey. The flyer will include a scannable QR code that brings the user to the website when scanned with a mobile phone or smart device. The flyer will also include a phone number to be called (typically the county emergency management agency) to have a paper copy of the survey mailed to a home if the home does not have access to the internet or anyone living there that is computer literate. A sample flyer is provided in Figure 10.

There are approximately 450,000 people living in 160,000 households in Santa Barbara County according to the 2020 Census. Assuming one survey per household will be completed by an adult, a sample size of approximately

400 completed surveys would provide a statistically relevant sample (±5% sampling error at the 95% confidence level) for the number of households in the county. The responses to the survey are stored in a secure database when the respondent clicks "Submit" at the end of the survey. Once there are at least 400 completed surveys in the database, the results will be processed and summarized for each question. A technical memo will be drafted to summarize the results.

The project stakeholders will advertise the survey to the public using their websites, social media platforms and other communication methods. In our experience, it may take several iterations of notifying the public to get a reasonable response rate and achieve the desired sample size. The NextDoor app and/or website is one of the most effective ways of communicating the survey to the public. Unlike other social media sites that are primarily at entertaining the public, those using NextDoor are seeking to be actively involved in their local neighborhoods.

Task 7.2: Develop Education Materials

Handouts, brochures, and/or infographics with maps and evacuation information for each Focus Area will be developed. Maps will be high resolution, production quality GIS maps appropriately labeled to facilitate identification of key landmarks for the public. Figure 11 provides an example of an infographic that can be created as part of this task. Similar maps would be created for this project to facilitate the Know Your Zone campaign and better educate the public on wildfire emergency preparedness. The maps will show Zone boundaries, evacuation routes, and reception centers available to the Zone. Schools within the Zone will also be mapped along with the reception center they will be evacuated to.

An online mapping tool will also be developed to assist the public in identifying which Zone they live in. KLD has developed several interactive websites and mobile applications for nuclear power plants and for wildfire prone areas to help the public identify which Zone they live in and to help them plan for an emergency. An example of an interactive website developed for the Diablo Canyon Nuclear Power Plant (DCNPP) is available here: **https://diablocanyonpublic.info/dc/evacuationbasics.html**. The user can either zoom in on the map to identify their neighborhood and identify which Zone they live in, or type in their address and click "Search" to identify which Zone they live in. Once the Zone is identified, a list of carless pickup points is provided that people can walk to in order to be picked up by a bus if they need transportation assistance in an emergency. Additional information could be added to the interactive tool including which evacuation route to use and which reception center to report to. The "Evacuation of Schools" page of the DCNPP website (**https://diablocanyonpublic.info/dc/schools.html**) has additional features including hyperlinks to school relocation centers that parents can click to identify where their children have been evacuated to and to get turn-by-turn directions to that facility.

An example of a wildfire emergency planning website created for the City of Laguna Beach, California can be seen at: **http://lagunabeachevacuation.com**. The website includes an online registration form for those people with access and/or functional needs. The website also includes an interactive map showing major evacuation routes and a more detailed, downloadable map for each Zone in the City.

This proposal assumes that KLD's programmers will work with the County of Santa Barbara's IT staff to develop the interactive GIS features/tools on a platform that meshes with the existing county website for wildfire emergency preparedness: **https://www.countyofsb.org/620/Wildfires**

Task 7.2.2: GIS Support for Online Tool Integration

This task includes the necessary support to build and integrate the public education and outreach GIS tool into the County's existing ESRI ArcGIS Online map platform. KLD would be granted temporary access to the County's ArcGIS Online account to build the necessary map(s) and functions (i.e., address locator to determine which Zone or Focus Area the person lives in). Depending on the privileges that are granted, KLD may need the County's administrator rights to embed the map, or assistance embedding the map if administrator rights cannot be granted. (This task does not include hosting the data.)

Task 7 Deliverables

As part of this task, the following deliverables will be provided:

- A survey instrument
- An electronic flyer for advertising the survey
- Handouts, brochures, and/or infographics with maps and evacuation information for each Focus Area
- An online mapping tool

Project Status Meetings

It is expected that regular discussions will be needed between KLD, the County, and the stakeholders. KLD proposes bi-weekly conference calls to discuss project status and address any open items. It is assumed these meetings would last less than an hour and would require no presentation to be prepared.

In addition to the conference calls, there are 5 milestone meetings (plus 3 virtual meetings of any kind). Table 3 summarizes the meetings for this project. The first is the project kick off meeting. Next, KLD will provide an assumptions memo to the stakeholders which will summarize the key assumptions and data for the project. The memo will also include the scenarios and regions to be considered (Task 3). One in-person meeting is scoped during the road survey and site visits to target areas to meet with the EAG. Once the stakeholders have had sufficient time to review the memo, KLD will facilitate a virtual progress meeting. Once the evacuation route analysis is completed and the draft report is written, KLD will facilitate two additional virtual progress meeting to present the results and solicit feedback from the project stakeholders.

A PowerPoint presentation will be given for each milestone meeting. Meeting notes will be provided to stakeholders after the meeting for all milestone meetings as well.

Task 8: Additional Virtual Meetings

In the event additional meetings are needed, an additional task is presented to represent the cost of additional virtual meetings. These may include one-on-one stakeholder meetings, additional EAG meetings, etc. To establish a cost for this task, three additional virtual meetings are scoped. The level of effort for each meeting may vary depending on the materials that need to be prepared.

Quality Assurance/Quality Control

Quality assurance and quality control (QA/QC) are of the utmost importance to KLD in this project and in all projects that we do. Over the course of our nearly 40 years of ETE experience, we have developed a rigorous QA/QC procedure. The procedure involves two levels of checking – the first is done by the analyst (either GIS

technician or traffic engineer) and the second is done by the project manager. A checklist of several hundred items has been generated to ensure that every step of the ETE study is done properly and double checked. Both the analyst and the project manager check each of these items, initialing and dating to ensure the check was complete. The draft and final reports also have several hundred checkpoints to ensure that all data and results are consistent throughout the report. Like our methodology, our QA/QC procedure has been refined over the years based on feedback from stakeholders and from discussions with federal agencies.

V. Cost Proposal

KLD is pleased to provide the project cost, broken down by task and direct labor costs, shown in Table 4 for your consideration. Travel and other direct costs are summarized in Table 5. Fully burdened (includes overhead, fringe benefits, fee, etc.) hourly rates are provided in Table 6.

The following assumptions are made in computing the job cost:

- The draft and final reports will be in electronic format. No hard copies will be provided.
- The Focus Areas will be at most 250 square miles with a permanent resident population of at most 100,000 people. A larger study area and more permanent resident population will result in additional cost. Similarly, a smaller Shadow Region and study area could reduce the cost.
- The study includes review of existing emergency plans (all-hazards or wildfire specific) as Task 2. It does not include the development of a wildfire specific emergency plan for the study area.
- If there are existing emergency plans for the study area, they will be reviewed and critiqued. However, they will not be revised by the KLD team as part of this project.
- It is assumed that the survey (Task 7) will be entirely web based. The County and other project stakeholders will advertise the web-based survey to residents using their communication platforms (website, social media, etc.) It is further assumed that any printed materials (posters, postcards, etc.) will be printed and distributed by the County at the County's expense.
- There is one trip budgeted for this project for the as part of Task 4, including one in-person meeting. If additional in-person meetings are required, it would result in additional cost.
- Additional meetings or work outside of the agreed upon scope will be charged on a time and materials basis using the rates in Table 6 and the actual cost of travel and other direct costs.
- Task 3 includes at most 20 evacuation regions and at most 8 evacuation scenarios. Additional regions and scenarios will result in additional cost.
- The County and other project stakeholders will assist in information and data gathering (Task 2) because they are local to the area and are familiar with staff operating special facilities in the Focus Areas. Relying on KLD to gather all the project data will result in additional cost.
- The DYNEV model is proprietary and will not be a deliverable for this project. The results output by the model will be provided as tables and plots in the draft and final reports.
- The unit costs shown in Table 5 assume the following:
    - Airfare – round trip flight. Also includes the cost of transportation to the departure airport and parking at the departure airport.
    - Hotel – typical nightly rates for standard hotels in the area
    - Subsistence – meals and beverages
    - Rental car – includes car rental, insurance, gas and tolls

This job is being bid as firm fixed price. Invoices will be submitted monthly indicating the percentage of each task completed, the overall project percentage completion and the corresponding dollar amount due. Our preferred payment terms are Net 30.

VI. Schedule

KLD proposes the draft schedule shown in Table 7. Any delay in contract execution and/or notice to proceed with the project will result in similar delays to the completion of subsequent tasks. The dedicated staff discussed in Section III will be available for the duration of the project such that the proposed schedule will be met.

VII. References

KLD has done over 100 ETE studies in the past decade. Below are references for four projects that are most similar to the scope of work for this study. We would be happy to provide additional references upon request.

Client: City of Laguna Beach, CA
Project Description: ETE study for an evacuation of the City of Laguna Beach due to wildfire
Client Project Manager: Mr. Brendan Manning
Client Phone Number: (949) 497-0350

Client: City of Ashland, OR
Project Description: ETE study for an evacuation of the City of Ashland due to wildfire
Client Project Manager: Chief Tighe O'Meara
Client Phone Number: (541) 552-2142

Client: City of Oceanside, CA
Project Description: ETE Study for an evacuation of the Ocean Hills Community due to wildfire and development of a wildfire emergency plan template
Client Project Manager: Chief David Parsons
Client Phone Number: (760) 435-4313

Client: Pacific Gas & Electric
Project Description: ETE Study for an evacuation of 7 Communities in the San Lorenzo Valley, CA
Client Project Manager: Mr. Mike Ginn
Client Phone Number: (805) 545-3446

VIII. Insurance

KLD will maintain the coverage and types of insurance identified in Attachment 1, Exhibit C of the RFP throughout the term of the project. KLD's Certificate of Insurance is included in Appendix B.

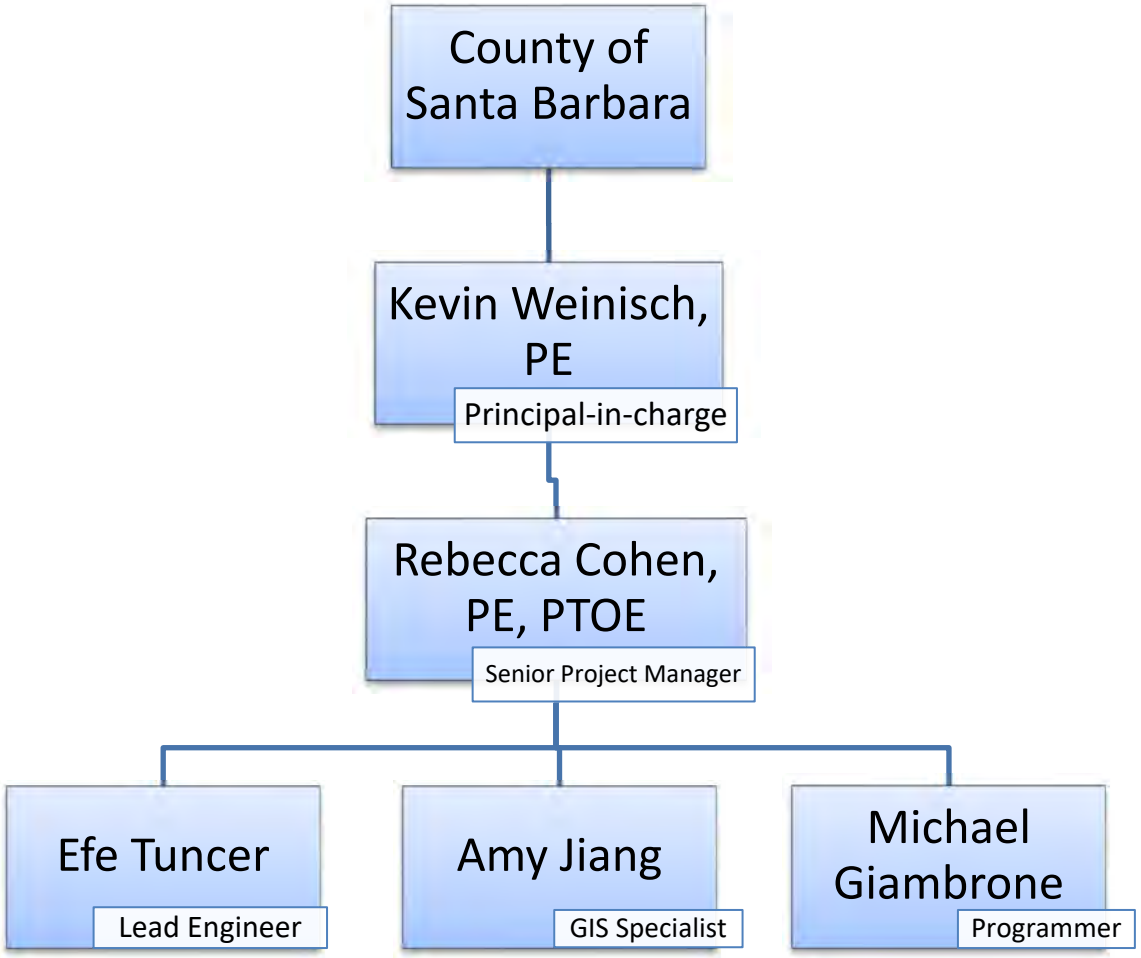

Figure 1. Organizational Chart

Figure 2. Proposed Study Area

Figure 3. Sample Postcard Advertising Demographic Survey

Figure 4. Demographic Survey Booth

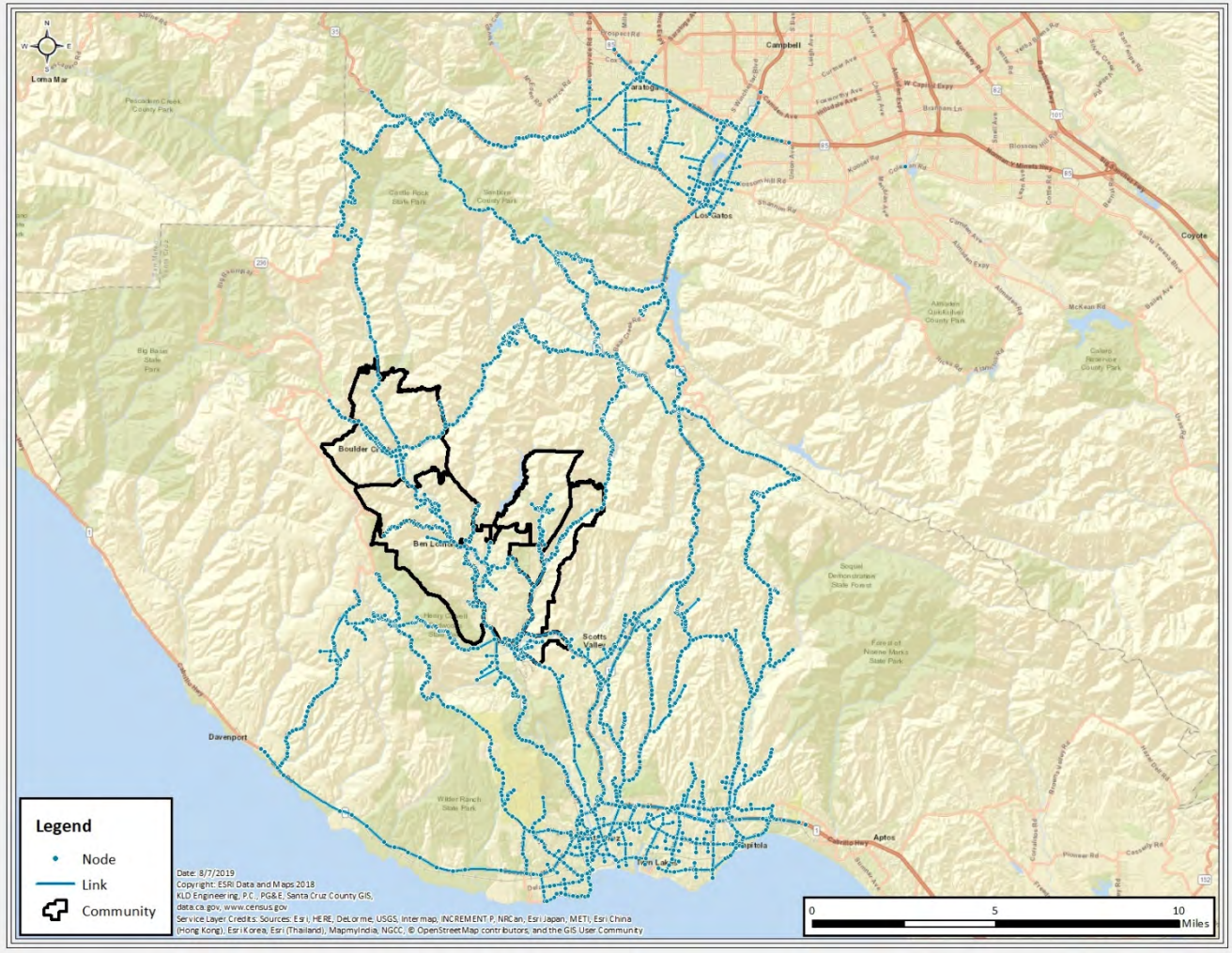

Figure 5. Link-Node Analysis Network – San Lorenzo Valley Wildfire Evacuation

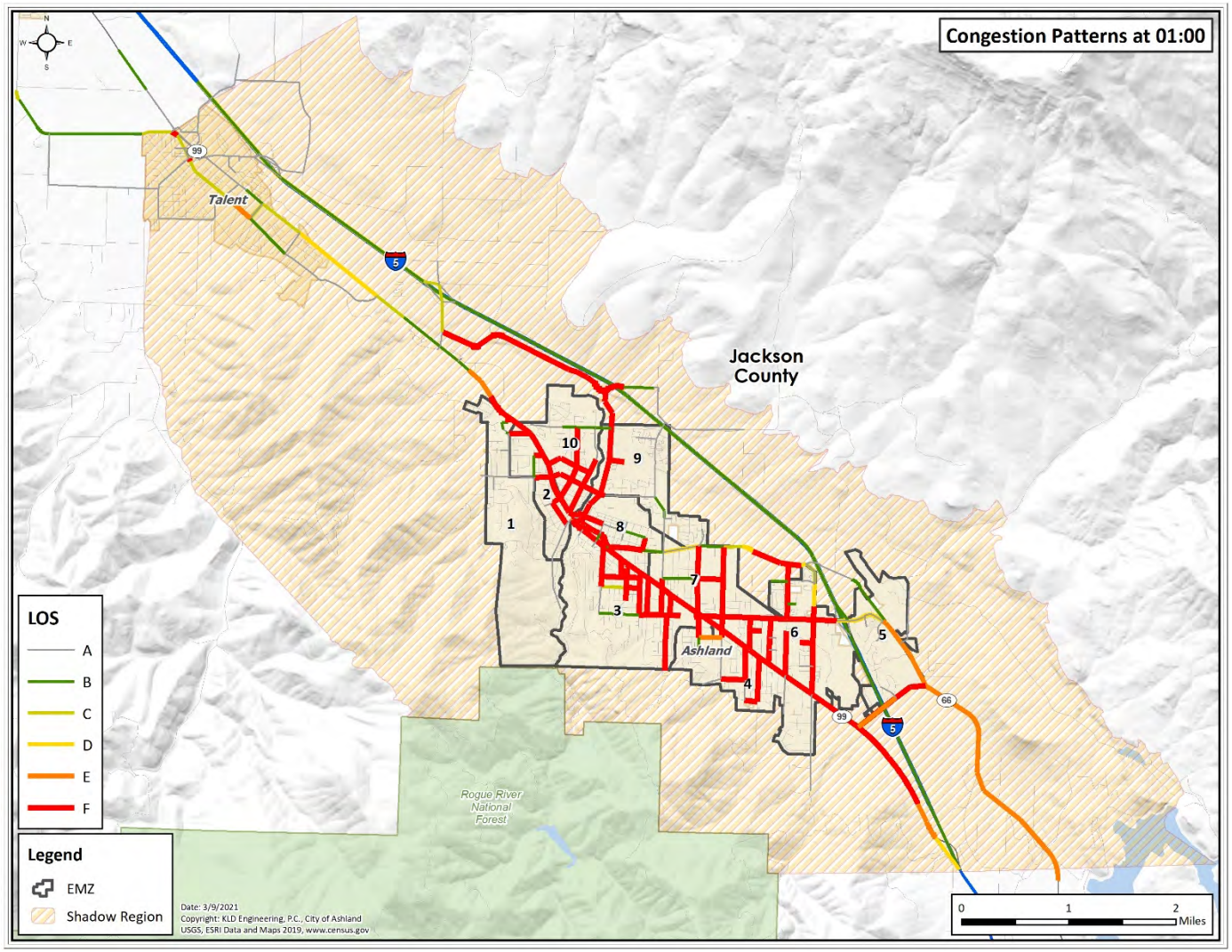

Figure 6. Traffic Congestion Patterns at 1 Hour After the Advisory to Evacuate – City of Ashland, Oregon

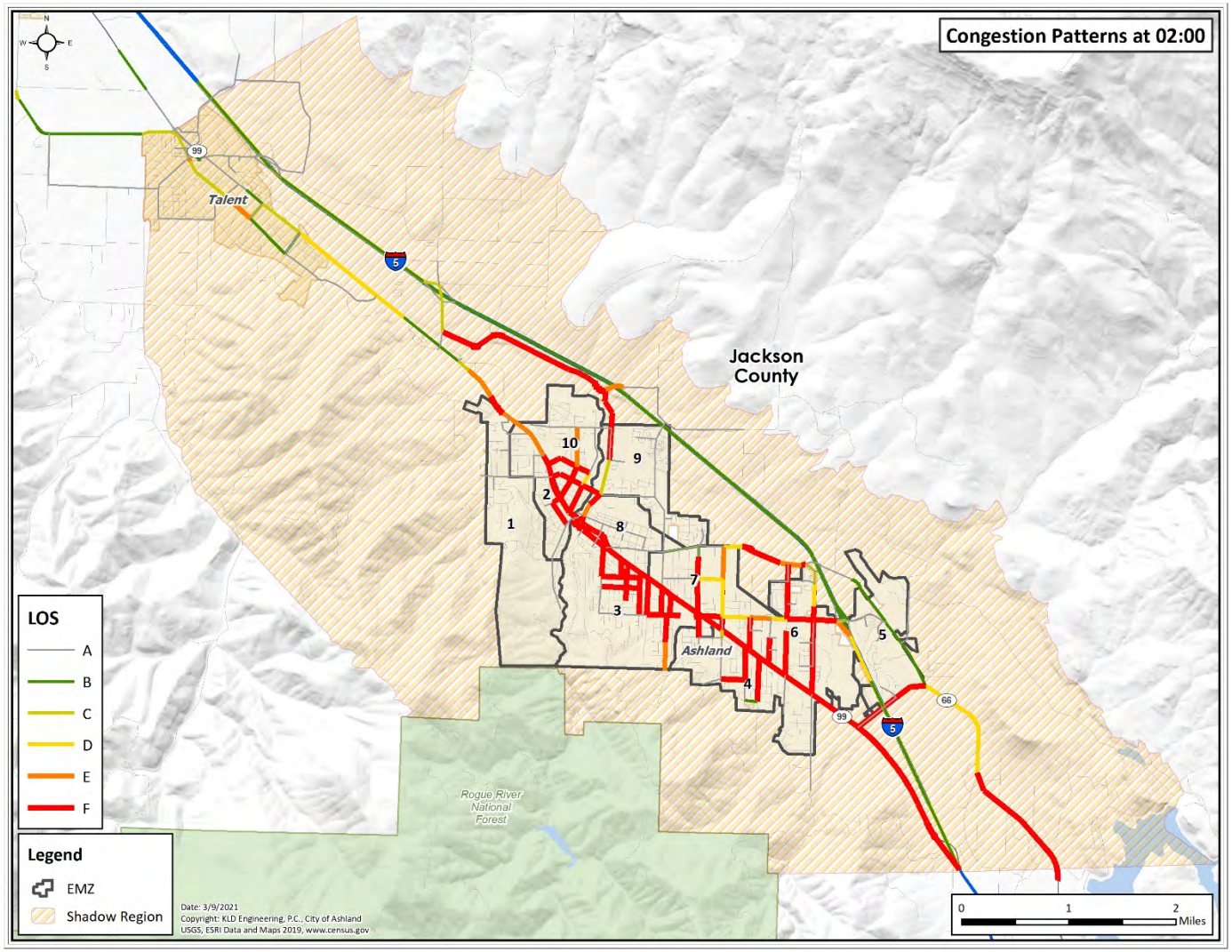

Figure 7. Traffic Congestion Patterns at 2 Hours After the Advisory to Evacuate – City of Ashland, Oregon

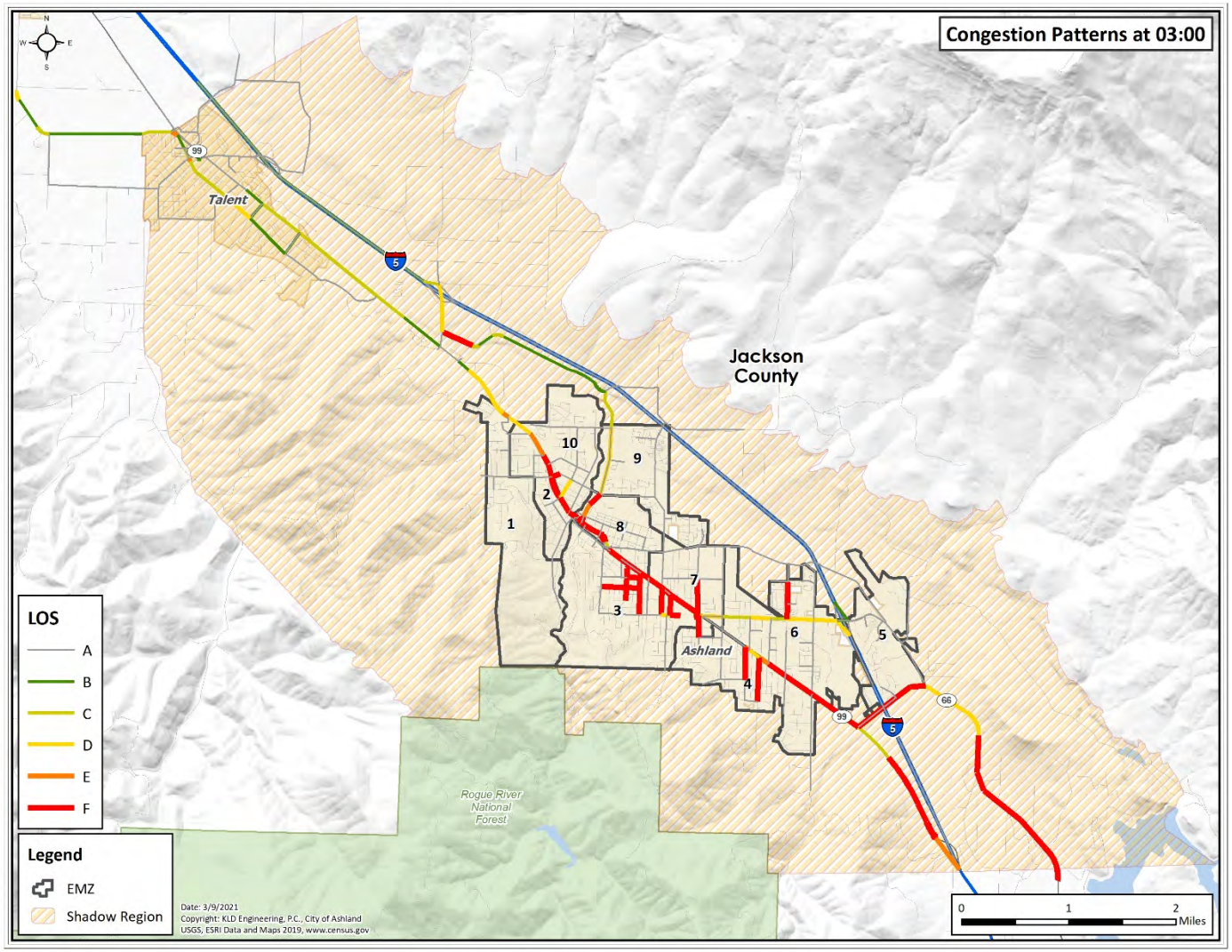

Figure 8. Traffic Congestion Patterns at 3 Hours After the Advisory to Evacuate – City of Ashland, Oregon

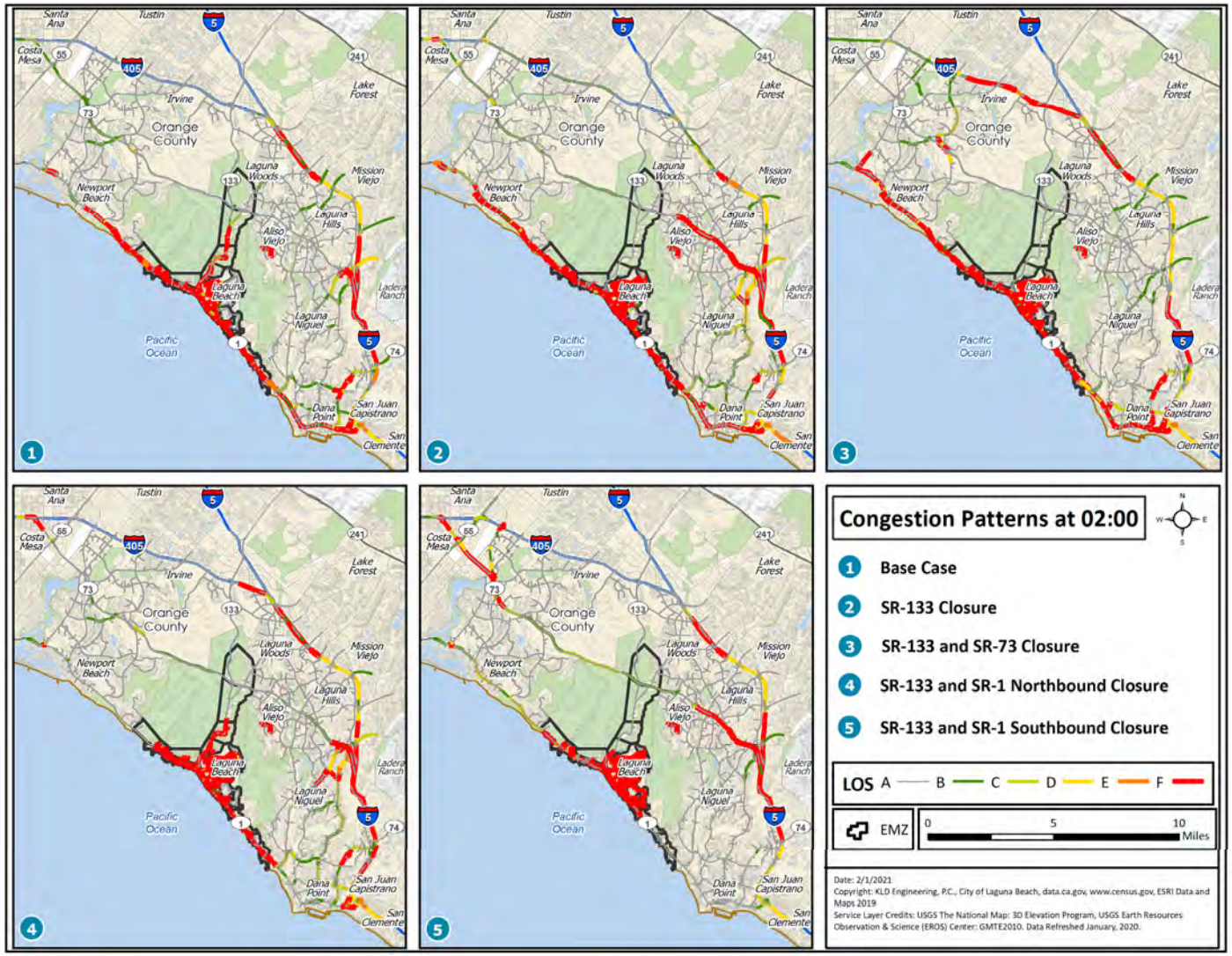

Figure 9. Road Closure Congestion Patterns at 2 Hours after the Advisory to Evacuate – City of Laguna Beach, CA

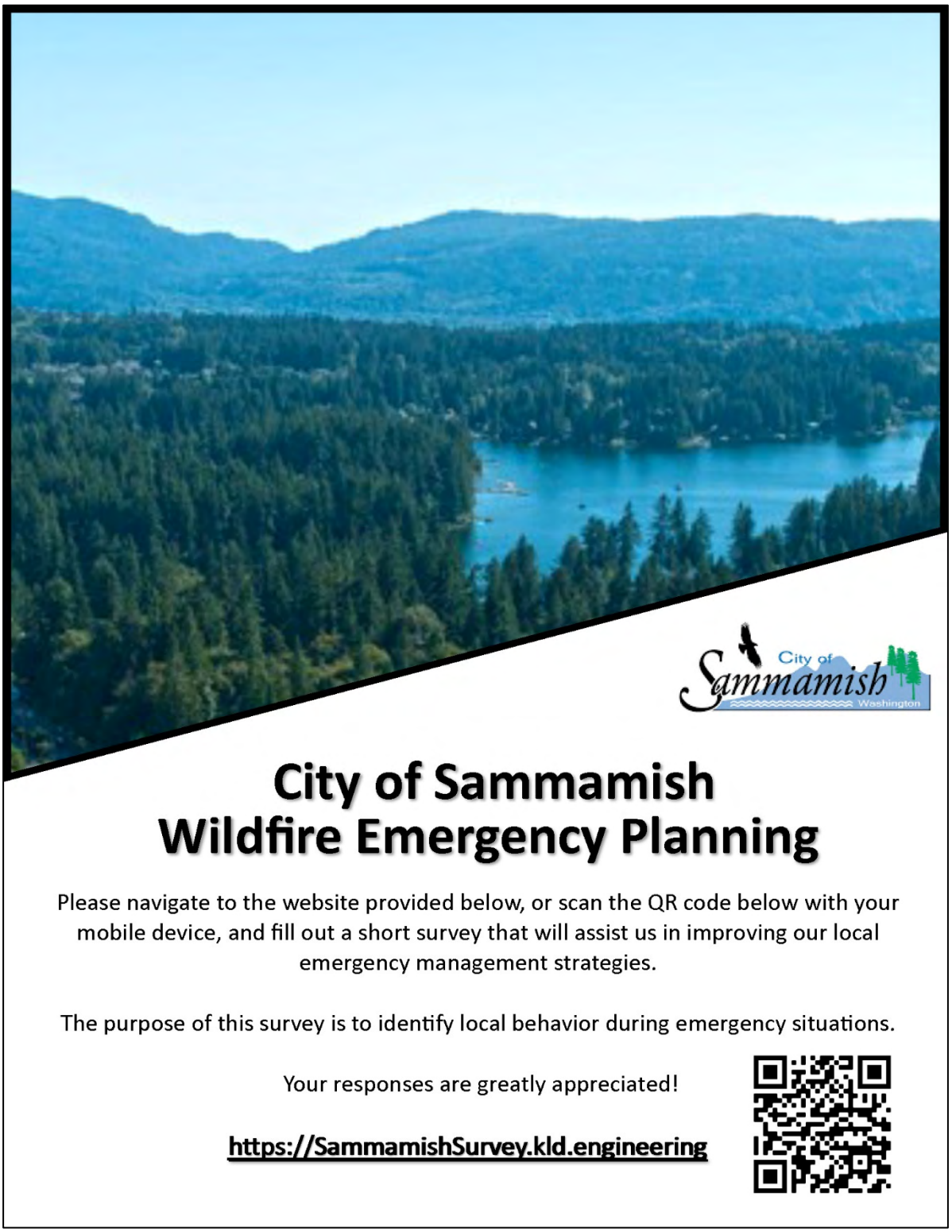

Figure 10. Sample Flyer Advertising Survey

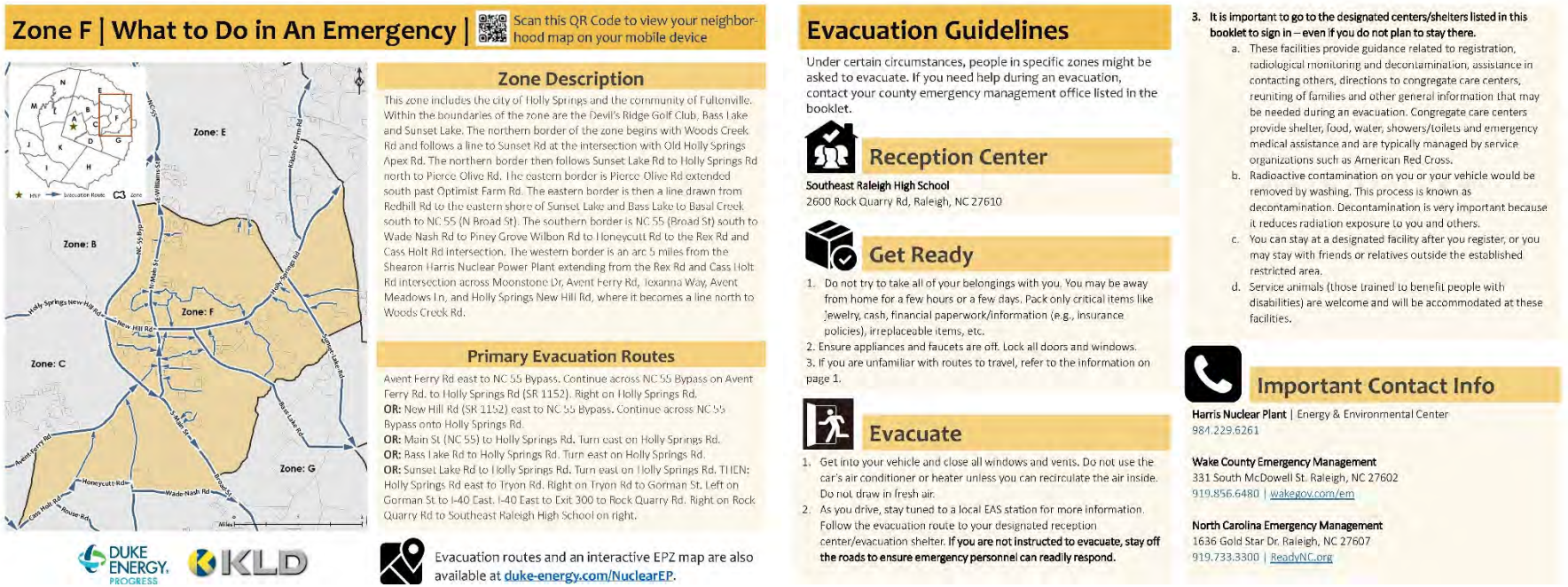

Figure 11. Infographic Example

KLD PROPOSAL 22-007

Table 1. Time to Clear the Indicated Area of *90* Percent of the Affected Population – City of Ashland, Oregon

	Summer			Fall		
	Midweek	Weekend	Midweek Weekend	Midweek	Weekend	Midweek Weekend
Scenario:	(1)	(2)	(3)	(4)	(5)	(6)
Region	Midday	Midday	Evening	Midday	Midday	Evening
R01 – EMZ 1	1:55	1:45	1:40	1:55	1:45	1:40
R02 – EMZ 2	1:55	1:50	1:45	1:55	1:50	1:45
R03 – EMZ 3	1:40	1:50	1:45	1:35	1:50	1:45
R04 – EMZ 4	2:00	1:55	1:55	2:00	1:55	1:55
R05 – EMZ 5	1:30	1:25	1:20	1:30	1:30	1:20
R06 – EMZ 6	1:50	1:50	1:50	1:45	1:50	1:50
R07 – EMZ 7	1:50	1:50	1:50	1:50	1:50	1:50
R08 – EMZ 8	1:50	1:55	1:50	1:50	1:55	1:50
R09 – EMZ 9	1:55	1:50	1:50	1:55	1:50	1:50
R10 – EMZ 10	1:55	1:55	1:55	1:55	1:55	1:55
R11 - Western Ashland	1:50	1:50	1:45	1:35	1:50	1:45
R12 - Eastern Ashland	1:50	1:50	1:50	1:55	1:50	1:50
R13 - Northern Ashland	2:00	1:55	1:50	2:00	1:55	1:50
R14 - Central Ashland	1:45	1:50	1:45	2:30	1:50	1:45
R15 - Southern Ashland	2:05	1:55	1:55	2:45	1:55	1:55
R16 - Northern and Central Ashland	1:55	1:50	1:50	2:30	1:50	1:50
R17 - Southern and Central Ashland	1:55	1:50	1:50	1:50	1:50	1:50
R18 - All EMZs	2:35	2:25	2:15	3:10	2:25	2:20

Table 2. School Evacuation Time Estimates – Good Weather

School	Driver Mobilization Time (min)	Loading Time (min)	Dist. To Safety (mi)	Average Speed (mph)	Travel Time to Safety (min)	ETE (hr:min)
City of Ashland, OR						
Helman Elementary School	90	15	2.8	3.7	45	**2:30**
Ashland High School	90	15	3.2	2.6	74	**3:00**
Walker Elementary School	90	15	4.0	10.4	24	**2:10**
Ashland Middle School	90	15	5.3	11.1	29	**2:15**
John Muir Elementary School	90	15	0.3	10.1	2	**1:50**
Bellview Elementary School	90	15	6.9	21.1	20	**2:05**
Southern Oregon University	90	15	6.1	12.1	30	**2:15**
					Maximum ETE:	**3:00**
					Average ETE:	**2:20**

Table 3. Project Meetings

Task	Meeting	Virtual	In Person
1	Kickoff	1	-
3	Assumption Memo Meeting	1	-
4.4	EAG (and other relevant stakeholders)	-	1
6.1	Stakeholders (including EAG)	2	-
8	Additional Virtual Meetings (of any kind)	3	-
-	bi-weekly project status conference calls (assumed to be less than 1 hour & no presentation)	∞	-

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Table 4. Project Cost

Task	Title / Description	PIC	Senior PM	Senior TE	GIS II	Programmer	TOTAL Hours	TOTAL Amount
	Loaded Hourly Rate	$300	$200	$140	$135	$150		
1	Project Kickoff Meeting	8	16	12	8	0	44	$8,360
2	Gather Data and Identify Modeling Focus Areas	16	96	160	64	2	338	$55,340
3	Identify Hazard and Evacuation Scenarios	16	16	48	24	0	104	$17,960
4	Evacuation Modeling and Analysis	32	128	216	40	0	416	$70,840
5	Develop Recommendations and Success Stories	24	64	80	12	0	180	$32,820
6	Countywide Evacuation Route Plan	40	88	120	20	0	268	$49,100
7	Public Education Program (including Survey)	26	76	80	104	60	346	$57,240
-	Project Status Meetings (including 3 milestone meetings)	30	50	60	18	0	158	$29,830
	Total Hours	192	534	776	290	62	1,854	$321,490
	Travel and Other Direct Costs (See Table 5)							$4,300
	Contingency							$32,579
	Project Total							**$358,369**

Table 5. Travel and Other Direct Costs

Road Survey + In Person EAG Meeting + Site Visits to Target Areas (Task 4)					
Item	Senior PM	Senior TE	Unit Cost	Units	Total
Airfare	1	1	$ 650	2	$ 1,300
Hotel per night	5	5	$ 150	10	$ 1,500
Subsistence per day	6	6	$ 75	12	$ 900
Rental Car	6	0	$ 100	6	$ 600
				Trip Total	*$ 4,300*
				Grand Total - Travel and Other Direct Costs	**$ 4,300**

Table 6. Fully Burdened Labor Rates

Staff	Hourly Rate
Principal in Charge	$300
Senior Project Manager	$200
Programmer	$150
Senior Traffic Engineer	$140
GIS Specialist II	$135

Table 7. Proposed Project Schedule

Task	Description	Completion Date
-	Authorization to Commence Work	11/3/2022
1	Project Kickoff Meeting	11/10/2022
2	Gather Data and Identify Modeling Focus Areas	1/27/2023
3	Identify Hazard and Evacuation Scenarios	2/17/2023
-	Project Status Meeting	2/14/2023
4	Evacuation Modeling and Analysis	4/28/2023
-	Project Status Meeting	5/5/2023
5	Develop Recommendations and Success Stories	7/7/2023
6	Countywide Evacuation Route Plan (draft)	9/8/2023
	Project Status Meeting	9/25/2023
	Countywide Evacuation Route Plan (final)	10/9/2023
7	Public Education Program (including Survey)	1/12/2024

Appendix A

Resumes of Key Personnel

Kevin Weinisch, P.E.

Senior Vice President, Treasurer KLD

EDUCATION

MS, Transportation Engineering, Polytechnic University, 2005
BS, Chemical Engineering, University of Notre Dame, 2002

PROFESSIONAL REGISTRATION

Professional Engineering in New York #084968

Background

Since joining the company in August 2002, Kevin Weinisch has worked extensively on developing evacuation plans and Evacuation Time Estimates (ETE) for nuclear power plants (NPPs) and other human made and natural disasters in the United States and abroad. Having worked on the ETE studies for all 65 NPP sites in the U.S., all four NPP sites in Canada, six sites in Japan, one in Slovenia, and one in the United Arab Emirates, Mr. Weinisch is the foremost expert on NPP evacuation studies. He has served as a subject matter expert (SME) for various utilities and for the Nuclear Energy Institute. He is called upon regularly by federal and local agencies to provide advice on NPP ETE studies. During his 20-year career, Mr. Weinisch has interacted with some of the largest utilities in the country, as well as hundreds of local and state emergency management agencies. He has managed hundreds of traffic engineering and ETE projects with budgets ranging from several thousand dollars to in excess of one million dollars. He has a proven traffic record of delivering projects on time and within budget. Mr. Weinisch is well versed in all aspects of emergency planning, traffic engineering principles, traffic simulation, traffic mitigation, traffic safety, maintenance and protection of traffic (MPT) and capacity estimation.

Project Experience

PG&E, Pilot Evacuation Study, Santa Cruz County, CA – Senior Project Manager. Dollar Value: $650,000 (2019 – 2021)

Kevin served as the Senior Project Manager on a pilot evacuation study for seven communities in Santa Cruz County, California. The objective of the study was to apply KLD's years of NPP ETE experience and the DYNEV model to evacuation planning and computation of ETE for wildfires. The pilot study was commissioned by Pacific Gas & Electric (PG&E) in response to the deadly wildfire in Paradise, California in November 2018 that killed more than 80 people due to fast-spreading fire and limited evacuation routes. The pilot study explored different techniques (contraflow, traffic control, limiting the number of evacuation vehicles) to reduce evacuation time and potentially save lives in the process. An emergency planning website and mobile application were developed for Santa Cruz County to educate the public based on the results of the wildfire evacuation study. KLD partnered with evacuation experts from Louisiana State University and Old Dominion University on the study.

City of Laguna Beach, Wildfire Evacuation Study, Laguna Beach, CA – Senior Project Manager. Dollar Value: $200,000 (2019 – 2021)

Kevin served as the Senior Project Manager on an evacuation study for the City of Laguna Beach. The scope of work was similar to the Santa Cruz County study discussed above. Laguna Beach is a coastal city nestled amongst various county/state parks and open spaces. There are only three evacuation routes servicing the city of nearly 23,000 permanent residents – California State Highway 1 (CA-1) northbound, CA-1 southbound, and CA-133 northbound. The study computed the evacuation time with all three evacuation routes available and with each of the evacuation routes closed individually to estimate the impact on evacuation time. The results of the study will be used to update the city's emergency plan, including updating the traffic management plan and evacuation

routing. An emergency planning website and mobile application were developed for this project to educate the public based on the results of the wildfire evacuation study.

City of Ashland, Wildfire Evacuation Study, Ashland, OR – Senior Project Manager. Dollar Value: $40,000 (2020 – 2021)

Kevin served as the Senior Project Manager on an evacuation study for the City of Ashland, Oregon. The study is also similar in scope to the Santa Cruz County and Laguna Beach studies discussed above. Ashland, similar to Laguna, is surrounded by large fuel sources and has limited evacuation routes available – Interstate 5 north and south, and State Highway 99 north and south. The study considered a fire to the north such that everyone must evacuate the city southbound and a fire to the south such that everyone must evacuate northbound. The results of the study will be used to update the city's emergency plan, including updating the traffic management plan and evacuation routing.

Ocean Hills Community, Wildfire Evacuation Study, Oceanside, CA – Senior Project Manager. Dollar Value: $20,000 (February 2021 – December 2021)

Kevin served as the Senior Project Manager on an evacuation study for the Ocean Hills Community (small private community with about 8,000 permanent residents) in the City of Oceanside, CA. The scope for this study was similar to the scopes for the Santa Cruz, Laguna Beach and Ashland studies discussed above. One key difference in this study was that a wildfire specific emergency plan template was developed for the Ocean Hills Community. The template followed FEMA's emergency planning framework. KLD outlined the plan and highlighted key areas that the community (e.g., identifying reception centers, identifying transportation resources for vulnerable population, etc.) had to work on in the future to complete the emergency plan. This template will also be used by the City of Oceanside to help other communities in the city develop wildfire specific emergency plans.

Memberships

Institute of Transportation Engineers (ITE) Member, NEI Member, ANS Member, TRB Member

Publications

- "The impact of shadow evacuation on evacuation time estimates for nuclear power plants" – Journal of Emergency Management, March/April 2015, Volume 13, Number 2, Co-authored with Paul Brueckner.
- "The impact of a major earthquake on the evacuation of the emergency planning zone of a nuclear power plant" – Journal of Emergency Management, March/April 2015, Volume 13, Number 2, Co-authored with Rebecca Cohen, EIT.
- "Always Have an Escape Route" – Transportation Management and Engineering (TME) Magazine, October 2005, Volume 10, No. 4, Co-authored with Reuben Goldblatt, PE, PTOE.
- "Evacuation Planning, Human Factors, and Traffic Engineering: Developing Systems for Training and Effective Response" – Transportation Research (TR) News, May-June 2005, No. 238, Co-authored with Reuben Goldblatt, PE, PTOE.

Honors and Awards

- 2007 American Council of Engineering Companies (ACEC) of New York Platinum Award for Engineering Excellence for contributions to the Evacuation Time Estimates for the Indian Point Energy Center.
- 2006 Institute of Transportation Engineers (ITE) Young Consultants Award for efforts in developing the Evacuation Time Estimates for the Turkey Point Nuclear Power Plant.
- 2004 Intelligent Transportation Systems (ITS) New York Best Student Paper for paper entitled, "Implementing ITS Technologies to Facilitate an Emergency Evacuation".

Rebecca Cohen, P.E., PTOE

Senior Project Manager — KLD

EDUCATION

MS, Transportation Planning and Engineering, New York University, May 2015
BS, Civil Engineering, Rutgers University, May 2011

PROFESSIONAL REGISTRATION

Professional Engineering in New York #095930
Professional Traffic Operations Engineer Certificate #4736

Background

Since joining KLD in 2011, Mrs. Cohen has served as lead traffic engineer/analyst in many traffic-engineering projects including the Lincoln Tunnel Helix Rehabilitation project that was awarded a 2014 American Council of Engineering Companies (ACEC) of New York Silver Award for Engineering Excellence. She has also worked extensively in evacuation and emergency planning, specifically in the development of Evacuation Time Estimates (ETE) for nuclear power plants and wildfire evacuations in the United States and in Canada.

Project Experience

Various Clients, Wildfire Evacuation Egress Studies, CA and OR – Project Manager (02/2019 – 12/2021)

Ms. Cohen served as project manager in the development and documentation of wildfire evacuation studies in the San Lorenzo Valley and the City of Laguna Beach, California, as well as the City of Ashland, Oregon. She developed a methodology to assign priority to various communities based on location, demographics, population density, and percentage of fire threat. She conducted a survey of the roadway system surrounding the study area. Ms. Cohen designed a demographic survey distribution plan including dissemination using social media and manual collection. She was responsible for assigning adequate resources to ensure a successful survey. She also helped develop the methodology for simulating an evacuation under wildfire conditions. Ms. Cohen also recommended a list of priority locations for roadway improvements based on their impact to the evacuation. She conducts quality assurance and quality control on the traffic simulation model and documentation. She also ensures the project is completed on schedule and within budget.

Various Clients, Various Evacuation Time Estimate Studies, Various Sites – Senior Project Manager (10/2020-Present)

Ms. Cohen is currently serving as the senior project manager for updated ETE studies for 19 U.S. nuclear plants to incorporate 2020 Census data and new federal guidance. She is responsible for all aspects of the project including serving as the single point of contact with the client, overseeing data collection, ensuring the success of the demographic survey, performing quality assurance and quality control on all aspects of the traffic simulation model and documentation, and providing technical oversight for engineers and GIS specialists working on the studies.

Various Clients, Various Evacuation Time Estimate Studies, Various Sites – Lead Engineer (06/2011-Present)

Ms. Cohen served as lead analyst in the development and documentation of ETEs for 20 nuclear plants in the US, 4 plants in Canada and 1 plant in Slovenia, incorporating the latest Census data and the new NRC rules and guidance. Her responsibilities included statistical analyses to estimate evacuating vehicles, and their trip generation rates, within a 10-mile radius of nuclear plants based on Census data, residential and commercial telephone surveys, and public records using ArcGIS, Access, and Excel. She also designed computerized models of roadway systems within a 15-mile radius of each plant, including all roadway and signal characteristics. She analyzed evacuating traffic operations by simulating macroscopic evacuations involving tens or hundreds of thousands of vehicles using in-house software. She used the results of the analyses to detect potential evacuation problems and developed improvements by recommending locations to implement traffic control measures. Ms.

Cohen prepared and delivered 90-minute results presentations to high-ranking nuclear officials, emergency planners, and local stakeholders. Fielded in-depth questions regarding study findings and received praise from clients on presentation clarity and deliverables.

Publications and Presentations

- "The impact of a major earthquake on the evacuation of the emergency planning zone of a nuclear power plant" – Journal of Emergency Management, March/April 2015, Volume 13, Number 2, Co-authored with Kevin Weinisch, P.E.
- "The Impact of a Major Earthquake on the Evacuation of the Emergency Planning Zone of a Nuclear Power Plant". 2013, 17th International Road Federation World Meeting and Exhibition. Co-authored with Kevin Weinisch, P.E.

Efe E. Tuncer

Senior Traffic Engineer KLD

EDUCATION

BS, Civil Engineering, Louisiana State University, December 2014
MS, Civil Engineering, Louisiana State University, May 2018

Background

Efe Tuncer joined KLD Engineering in June 2018 as a Traffic Engineer. His area of expertise includes nuclear power plant and wildfire evacuations, traffic simulation, and emergency planning. He participated in a large evacuation planning research project funded by the U.S. Nuclear Regulatory Commission (NRC) during his graduate studies. The results of this study are documented in NUREG/CR-7269 (published in March 2020), which was used to inform the next revision of federal evacuation time estimate (ETE) guidance (NUREG/CR-7002, Rev. 1 published in February 2021). He also has comprehensive knowledge of static and dynamic traffic assignment modeling at both the microscopic and macroscopic level.

Project Experience

Various Clients, Wildfire Evacuation Time Estimate Studies, California — Lead Traffic Engineer (2/19-Present)

Mr. Tuncer served as the lead traffic engineer for three wildfire evacuation studies in California: (1) a pilot evacuation study for seven communities in Santa Cruz County, California; (2) the City of Laguna Beach in Orange County, California; and (3) the City of Oceanside in Orange County, California. The objective of these studies was to apply KLD's years of Nuclear Power Plant ETE experience and the DYNEV model to evacuation planning and computation of ETE for wildfires. Mr. Tuncer's responsibilities included statistical analyses to estimate evacuating vehicles and their trip generation rates and build computerized models of the roadway system, including all roadway and traffic signal characteristics. Furthermore, Mr. Tuncer studied what-if scenarios to measure the effectiveness of different state-of-the-art evacuation techniques (contraflow, traffic control, limiting the number of evacuation vehicles through carpooling).

Various Clients, Nuclear Power Plant Evacuation Time Estimate Studies, Various Locations – Lead Traffic Engineer (6/18 – Present)

Mr. Tuncer served as a lead traffic engineer in the development and documentation of ETEs for the McGuire Nuclear Station located in North Carolina and the Pickering and Darlington Nuclear Plants located in Ontario, Canada. His responsibilities included statistical analyses to estimate evacuating vehicles, and their trip generation rates, within a 10-mile radius of the nuclear plants based on US Census data, residential and commercial telephone surveys, and public records using ArcGIS, Access, and Excel. He also designed computerized models of roadway systems within a 15-mile radius of each plant, including all roadway and traffic signal characteristics. He simulated macroscopic evacuations involving tens or hundreds of thousands of vehicles using proprietary software. Mr. Tuncer is currently serving as the lead traffic engineer on updates to the ETE studies for 9 nuclear plants in the U.S. to include 2020 Census data and the changes incorporated in the new guidance document – Rev. 1 of NUREG/CR-7002.

Zhuoxing (Amy) Jiang

GIS Specialist II — KLD

EDUCATION

MUP, Urban and Regional Planning, State University of New York (SUNY) at Buffalo, 2015

Background

Since joining KLD, Ms. Jiang has spent 6 years working primarily in the evacuation and emergency planning division, providing all mapping and GIS analyses in support of Evacuation Time Estimates (ETE) studies, wildfire studies, Alert and Notification System (ANS) design reports as well as various other GIS related projects. Her essential skills include network analysis, spatial analysis, model building, GIS database development and maintenance, and enterprise map production with ArcMap and ArcGIS Online.

Project Experience

Various Clients, Various Evacuation Time Estimates Studies, Various Sites – GIS Lead (08/2016 - Present)

Ms. Jiang is currently serving/has served as the GIS lead for 54 ETE studies in the U.S., 3 studies in Canada, 1 study in Slovenia, 1 study in the United Arab Emirates, 3 wildfire evacuation studies in California, and 1 wildfire evacuation study in Oregon. Her responsibilities include road survey route planning, data collection, data analysis, population projection, QA/QC of tabular and spatial GIS data, detailed map production in ArcMap and ArcGIS Pro, as well as technical report documentation.

Various Clients, Various Annual Population Update Analyses, Various Sites – Lead Analyst (05/2016 – 04/2021)

Ms. Jiang was the Lead Analyst for annual population projections within emergency planning zones (EPZ) for 56 nuclear plants in the U.S.

Various Clients, ANS Design Reports/Acoustical Analyses, Various Sites – Lead Analyst (12/2016 - Present)

Ms. Jiang is the Lead Analyst for ANS design reports for more than a dozen nuclear plants in the U.S. Her primary responsibilities included developing the acoustic model to predict the sound coverage of outdoor warning sirens and estimating population density using parcel data. Ms. Jiang coordinated with acoustic experts to calibrate acoustic models and customize data inputs. She performed technical analysis to identify potential gaps in siren coverage and propose potential locations for new or relocated sirens. She also performed map design and production, documented the data collection, methodology and results in technical reports, developed online maps for mobile devices and trained field crew on data collection.

NYSERDA, Evaluate Transportation Resiliency Under Emerging Vulnerabilities, Western Suffolk County, NY – GIS Lead (02/2018 - 02/2020)

Ms. Jiang was the GIS Lead for a case study of ETE development for Western Suffolk County, NY to evaluate a transportation network's resilience under extreme conditions. Ms. Jiang coordinated with traffic engineers to analyze storm surge data and population estimates in developing EPZ for study area. Her responsibilities also include presenting the results in a technical report.

Westchester County Department of Emergency Services and Rockland County Office of Fire & Emergency Services, School Bus Evacuation Routes, Westchester County, Rockland County, NY – Lead Analyst (04/2016 – 12/2019)

Ms. Jiang was Lead Analyst for school bus evacuation routes for Westchester County and Rockland County, NY. Ms. Jiang developed a geoprocessing model to produce routes and direction files for school buses to evacuate from vehicle staging areas/schools to school reception centers. She also provided quality assurance and control of work and data integrity.

Michael Giambrone

System Administrator and Programmer KLD

EDUCATION

MS, Digital Media, Polytechnic Institute of NYU, 2008
BS, Digital Media, Minor in Computer Science, Polytechnic University, 2007

Background

Michael Giambrone is well versed in technology infrastructure, computer programming, video production, networking, construction, security, education, and management. He has been with KLD for 10 years overseeing all technology related aspects. Michael Giambrone has a strong Computer Science background and has received extensive mobile application development training from Xamarin (a cross platform framework to enable the use of C# code on both Android and Apple devices). He attended the Xamarin Evolve conference and training and received his Xamarin Mobile Certification.

Project Experience

Entergy/Exelon/PG&E/City of Laguna Beach, Emergency Preparedness Website and Mobile Applications, Various Locations, Lead Programmer, (2017-Present)

Developed, deployed and currently maintaining several mobile applications and websites for assistance in evacuations and emergencies. The application features turn by turn directions for evacuation, interactive maps for identifying which evacuation zone the user is in, the ability to create and share an evacuation plan and an interactive emergency checklist. The app also contains information on evacuation situations and emergency contacts. Michael also developed a website for wildfire evacuation studies in Santa Cruz County, CA and Laguna Beach, CA for residents to complete a demographic survey and provide valuable information needed for emergency planning.

All 54 Active Nuclear Power Plant Sites in the U.S., Online Demographic Surveys, Various Locations, Programmer (9/2020 – Present)

Michael created online demographic surveys to gather study area specific demographics (average household size, vehicle ownership, etc.), attitudinal responses during an emergency evacuation, and time to prepare/mobilize for an evacuation from people living and working in the study area. The surveys were created using either Google forms or JotForm based on client preference, and were redirected to an client specified web address.

National Highway Traffic Safety Administration (NHTSA), KLD Associates, Inc., Various Locations across the United States, Programmer, (10/2013 – 12/2017)

Developed a survey application for KLD employees to conduct surveys across the U.S. for NHTSA. The scope of the survey was the condition and use of Tire Pressure Monitoring Systems in vehicles. The survey application used MS Azure technologies and is FIPS-140 and FedRAMP certified. Strong use of MSSQL and MSAzure Databases, complex logic structures and optical scan software to decode manufacturer barcodes.

Specialties

Xamarin, C#, PHP, Javascript, Python, Active Directory, Novell eDirectory, G-Suite, Novell Groupwise, Blackberry Enterprise Server, SQL Server, Maya, Final Cut Pro, Avid, Flash, MS Office, EMC Retrospect, iLife, iWork, Apple Certifications

Appendix B

Certificate of Insurance

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 9/5/2022

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Hiram Cohen & Son, Inc.
486 Willis Avenue
Williston Park NY 11596

CONTACT NAME: Deborah Fiore
PHONE (A/C, No, Ext): 516-742-7180 **FAX (A/C, No):** 516-742-7209
E-MAIL ADDRESS: dfiore@hiramcohen.com

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Great Northern Insurance Co	20303
INSURER B : Federal Insurance Company	20281
INSURER C : Indian Harbor Insurance Co.	36940
INSURER D :	
INSURER E :	
INSURER F :	

INSURED KLDENGI-01
KLD Engineering PC
1601 Veterans Memorial Highway
Suite#340
Islandia NY 11749

COVERAGES **CERTIFICATE NUMBER:** 238612398 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X **COMMERCIAL GENERAL LIABILITY** [ ] CLAIMS-MADE [X] OCCUR X Contractual Liab GEN'L AGGREGATE LIMIT APPLIES PER: POLICY [ ] PRO-JECT [X] LOC OTHER:	Y	Y	36038116	3/1/2022	3/1/2023	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 1,000,000 $ 10,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
B	**AUTOMOBILE LIABILITY** X ANY AUTO [ ] ALL OWNED AUTOS [ ] SCHEDULED AUTOS X HIRED AUTOS X NON-OWNED AUTOS			73597090	3/1/2022	3/1/2023	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
B	X **UMBRELLA LIAB** X OCCUR **EXCESS LIAB** [ ] CLAIMS-MADE DED [ ] RETENTION $	Y	Y	79896231	3/1/2022	3/1/2023	EACH OCCURRENCE AGGREGATE	$ 10,000,000 $ 10,000,000
B	**WORKERS COMPENSATION AND EMPLOYERS' LIABILITY** Y / N ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? [ ] **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		71756536	3/1/2022	3/1/2023	X PER STATUTE [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ 500,000 $ 500,000 $ 500,000
C	Professional Liability			MPP903474804	3/1/2022	3/1/2023	each claim each aggregate	$5,000,000 $5,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
RFP - Santa Barbara County - Evacuation Route Modeling & Planning Project
Additional insured(s) per written contract or agreement: COUNTY, of Santa Barbara, its officers, officials, employees, agents and volunteers are to be covered.

insurance is primary & non-contributory
waiver of subrogation applies

CERTIFICATE HOLDER

County of Santa Barbara, Long Range Planning Division
123 E. Anapamu Street
Attn: Whitney Wilkinson
Santa Barbara CA 93101

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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