**Progress Report: Wildfire Evacuation Analysis in the Travis County Wildland Urban Interface**



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**1. Introduction**1.1 Summary

This report was prepared by Flame Consulting to explain the progress made in identifying the pinch points and Community Refuge Areas (CRAs) within the Wildland Urban Interface (WUI) of Travis County, Texas. Since presenting to our client, Austin Fire Department Wildfire Division, and its representative, Nate Casebeer, Geographic Information Systems (GIS) Analyst, on February 27, 2018, we have started work on the project. This report is an update on what we have achieved to date, what we are currently working on, and what we still have left to do broken up by tasks.

1.2 Purpose

This project is vital to safety in future wildfire emergencies. This groundwork will identify wildfire pinch points, which will help with evacuations and emergency response. It will also be used to define CRAs based on the closest location to each at-risk neighborhood. This will help the refuge sites prepare and maintain sufficient disaster resources.

1.3 Scope

The scope for the project has not changed. We are still studying the Wildland Urban Interface (WUI) which covers all of Travis County with the exclusion of the urban core of the city of Austin. However, the urban core will still be used for network analysis purposes. This project should be able to assist all who reside within Travis County, but particularly those within the WUI.

**2. Project Tasks**

2.1 Road Classes

Road widths were determined by checking the Master Plans for several cities within the WUI. We then took the average for each class. Some of the road classes in our dataset were misidentified, and we were able to pare the roads down to eight classes. We created a CSV (comma-separated value) file with road widths and titles for each road class, joined it to the roads layer, and then created separate layers for each class.

The biggest problem that we ran into with the road widths was the lack of standardization. The road widths are not only not standardized across the state, they are not standardized within the cities. While regulations are usually standardized now, historically this has not always been the case. Therefore, within each city you will find a range of widths for each class. Furthermore, road classes are determined by the author of the GIS layer. Road types, such as arterial roads, do have a specified definition, and we were able to use these to determine how to label each class within our study area. Another problem that came up was connector roads. There were several classes of roads within our study area that contained one to five pieces of road only. Through observation we were able to determine that these connected two ends of a road (making it a through road), and were added at a later date. One entire class was added by a different author and were attributed to a class 16, when they should have been a class 6. GIS is still a new enough field that there are not accepted standards for these things, and this may be an area that will require future study.

2.2 Pinch Points

Our team has completed parts of the work on the wildfire pinch point layer. We have completed the process of preparing the vegetation hazard layer by reclassifying it into a separate raster for each of our road classes where each raster includes all of the flame lengths that are half of the road width or greater. The result of this process was two raster values, 0 and 1. Then, using extract by attributes, we took out our desired raster value of 1 for each road class. After we went through this process, we had to convert each of the vegetation hazard rasters to vector format. Then, we added a buffer to all of the roads, 30 meters on each side, in order to capture wildfire risk that is adjacent to the roads. We intersected each of the vector vegetation hazards with their respective buffered road layer. Then we clipped each of the original line road classes to these intersections, resulting in a pinch point layer. Several of these steps along the way, such as the extractions and the conversions, were not foreseen, but adjustments were made to compensate.

Now, we are in the process of merging all of these pinch point layers into a single master pinch point layer and clipping it to the WUI polygon. Furthermore, we need to verify that our pinch point layer has the correct attributes and add additional attribute fields, which can be tricky as a lot of different attributes, some repetitive, some meaningless, have been added during our entire GIS process thus far. Significant attribute fields that need to be correctly included are road\_class, road\_width, and class\_name. Also, we will filter through and delete unnecessary attribute fields and fields that have <null> values.

2.3 At-risk Communities

At-risk communities will include neighborhoods that either have only one point of entry/exit, or neighborhoods where pinch points will render exits too dangerous to cross, leaving only one accessible point of exit. Analysts have processed the Travis County Structures file provided by the client. The data was clipped to include only structures that are in fact structures, and that are within the Wildland Urban Interface (WUI). This clip excluded buildings in the urban core. Next, the clipped version of the structure data had a buffer of 400 feet applied, then dissolved, resulting in several polygons representing neighborhoods and other building clusters in the WUI.

We are currently working diligently to define and identify neighborhoods, based on the polygons which resulted from the dissolved buffer. For our purposes, a neighborhood is defined as a group of at least 30 homes, with at least one central road connecting them. Some neighborhoods are very small, containing 30 to 35 homes, and some are very large, containing close to 100 homes or more. The dissolve tool resulted in quite a few defined neighborhood polygons, but some will need to be visually assessed and split up, due to large overlapping areas of buffers. This may take some time, but should be completed within a few days.

After the neighborhoods have been identified and made into a suitable number of polygons, analysts will need to run an intersect analysis. The result should indicate how many roads intersect with each polygon/neighborhood. This method is expected to identify all limited ingress and egress communities within the WUI.

2.4 Refuge Service Areas

Once we identify the at-risk neighborhoods, we will then be able to locate the refuge service areas. To locate these areas we intend on creating a network analysis by using the roads layer for the City of Austin. Furthermore, once the network analysis is completed, we will use the Closest Facility Tool. This tool will be used to create routes from neighborhoods within the WUI that are at risk to the nearest area that’s listed as a refuge facility. Then we will create a map with the incremental zones of travel time, in minutes, around the refuge facilities that are nearest to at-risk communities.

2.5 Vulnerable Facilities

On the list of tasks to be completed, we still have to identify selected vulnerable facilities within the WUI, which includes daycares and assisted living centers. We plan to locate the facilities by using google maps then entering the physical address in the network analysis to plot the locations. We will then include the vulnerable facilities in a map to visualize where these areas lie in comparison to the refuge facilities.

2.6 Revised Timeline

Our timeline has remained unchanged, but we are including it again as a reminder. Completed tasks are highlighted (next page).

Table 3. Project timeline visualization

|  |  |
| --- | --- |
| **WEEK** | **ACTIVITY** |
| **Week 1 (Jan. 22nd)** | Introduction to Project |
| **Week 2 (Jan. 29th)** | **First Client Visit**, Project Visualization |
| **Weeks 3 & 4 (Feb. 5th & 12th)** | Proposal Writing |
| **Week 5 (Feb. 19th)** | Finish Writing Proposal, Rehearse Proposal Presentation |
| **Week 6 (Feb. 26th)** | **Second Client Visit**, Proposal Presentation |
| **Weeks 7 & 8 (Mar. 5th & 12th)** | GIS Digitization and Pre-Processing |
| **Week 9 (Mar. 19th)** | Finish GIS Digitization and Pre-Processing, Rehearse Progress Report Presentation |
| **Week 10 (Mar. 26th)** | **Third Client Visit**, Progress Report Presentation |
| **Weeks 11 & 12 (Apr. 2nd & Apr. 9th)** | GIS Analysis and Interpretation |
| **Week 13 (Apr. 16th)** | Finish GIS Analysis and Interpretation, Create Final Map Poster and Website |
| **Week 14 (Apr. 23rd)** | Finish and Submit Deliverables, Rehearse Final Presentation |
| **Week 15 (Apr. 30th)** | **Fourth Client Visit**, Final Presentation |

**3. Conclusion**

In our project thus far, we have not had any major issues, but we have had a few minor setbacks. Identifying road widths and standardizing them has proved to be more of a challenge than originally thought. Also, there has been more steps than foreseen in processing the vegetation hazard raster. Additionally, our method of determining the at-risk communities has changed by creating dissolved buffers around the structures. Each buffer has been created as its own polygon, which will make them easier to manipulate and identify. Overall, our project is going well and is on track with the timeline we have set. We foresee no issues with staying on pace and finishing the complete project on time.