Thesis Project Portfolio

Old Ivy Road Mixed-Use Development

(Technical Report)

Calmer Streets, Tenser Drivers? The Mental Health Impact of Traffic Calming

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

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Bachelor of Science, School of Engineering

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Executive Summary

Civil engineers are a critical link within our society. Our technical report explores this relationship through designing a residential development in Charlottesville, Virginia. Through the Science, Technology and Society research paper, I explore the links that civil engineers make between drivers and their mental health. Both of these topics involve the impacts of choices Civil engineers make. Through upholding design standards and use of best judgment, they change society at a small and large scale.

In Charlottesville, Virginia, affordable housing is a large issue. Increasing the number of homes for use is one way of lowering pricing. On Old Ivy road, there is a plot of land that our team was tasked with developing into a neighborhood with 250-300 units. Our team took a holistic approach, creating a design which incorporated site layout, grading plan, stormwater management, traffic analysis, and construction planning into a unified design. Compliance with regulations such as zoning and roadway regulations were essential.

Our final design has 300 housing units, retail areas on the first floor of the apartment buildings, and amenities such as a community park and a pool. The site contains a mini roundabout and is able to be integrated into the Charlottesville Area Transit (CAT) bus network. The existing pond on site is modified into a level 2 BMP that will be able to handle the stormwater that the site generates. Traffic analysis was performed and found to increase traffic by 21%, and we developed a construction package to assist with implementation. This design creates a cohesive neighborhood that will be sustainable as it continues into the future. It is positive for its residents and Charlottesville at large, as it may help with the housing shortage.

Design of roadways in the United States is shifting towards a systems based approach, which brings new strategies and roadway designs. I ask the question: “How do modern roadway enhancements to control traffic and speed impact the long term mental and physical health outcomes of its users?” Under current guidelines and implementation criteria, the user experience on a roadway is not officially considered part of the design process. To explore this question, I consulted literature from the Federal Highway Administration, the Virginia Department of Transportation, relevant research studies, and examined the failed implementation of traffic calming at Gold Coast Street in California. I viewed the issue through the lens of actor network theory and manifest and latent functions.

The available literature shows that traffic calming, which alters neighborhood roadways, slows cars down and reduces the amount of collisions. There is evidence to support the idea that these reductions are caused by increased driver attention and alertness due to fear of being in an accident. The extent of this fear and anxiety is not established and is not considered as a weighting factor when implementing roadway designs. Certain populations, such as teenagers and younger senior citizens, may experience detrimental outcomes from induced roadway anxiety caused by these roadway designs. A clearer investigation and understanding of the mental health risks associated with modern roadway designs needs to be established.

The decisions made by engineers have immediate and delayed secondary effects, which make all encompassing design and thinking critical. Through the upholding of existing standards and designing for community use, engineers can create safer, more impactful designs. Whether designing a private community or a public road, these principles remain true.