

Otterdale Road Drainage Improvements

(Technical Report)

Competing Priorities in U.S. Urban Intersection Design

(Sociotechnical Research Paper)

An Undergraduate Thesis Portfolio

Presented to the Faculty of the

School of Engineering and Applied Science

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science in Civil Engineering

by

Joshua Callanan Frye

08 May, 2025

Contents

Preface

Otterdale Road Drainage Improvements

Competing Priorities in U.S. Urban Intersection Design

Prospectus

Preface

Optimized U.S. transportation infrastructure development is crucial for economic growth and public safety. Policymakers, engineers, and advocacies must navigate competing priorities in transportation system management. Balancing safety, efficiency, accessibility, and equity is difficult when participants have diverging interests. These conflicts impact project outcome and user trust in infrastructure, with public health and well-being at stake. A holistic approach integrating technical expertise, policy, and community engagement is essential for developing and maintaining infrastructure that meets diverse needs.

Otterdale Road in Chesterfield, Virginia, crosses Otterdale Branch. A conceptual redesign was developed to improve roadway safety and flood resilience at this crossing. Multiple residential developments rely on Otterdale Road for access to necessities. During heavy storms, flooding along Otterdale Road has isolated local neighborhoods. Close to the Otterdale Branch crossing, narrow roads and limited sight distances indicate deficient roadway geometry. A stormwater model with the bridge design was developed to ensure that during extreme storm events water will not overtop the roadway. A simple span bridge structure with sufficient space to pass stormwater was designed with seamless connection to redesigned roadway geometry.

Urban intersection design in the United States must be optimized to balance safety, equity, and sustainability without compromising efficiency and access. Competing priorities among policymakers, engineers, and advocacies shape intersection design, leading to tension between participants and unintended consequences. In intersection design, engineers must account for safety, mobility, sustainability and equity.