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Executive Summary

This report highlights the critical role of traffic flow analysis in optimising road networks, essential for both road users and the economy, and aims to offer practical insights and recommendations for more efficient road systems in Leeds. The Nagel-Schreckenberg model served as the basis for investigating traffic management measures on single-lane roads. After validating the parameters used within this model and finding that results were consistent across a range of parameter values, the model was extended to incorporate variable speed limits as well as traffic lights located at road junctions and pedestrian crossings.

A comprehensive study was carried out to examine the factors that influence the relationship between the density of cars on the road and different metrics that measure traffic flow/congestion. Increasing the duration of a green traffic light signal and reducing the number of traffic lights on the road were both found to help reduce traffic congestion and improve traffic flow in some cases. Using these findings to introduce changes to a real road network in Leeds demonstrated the model's ability to determine optimal strategies for implementing traffic management measures such as enforcing speed limits or installing traffic lights in line with government regulations.

More realistic traffic simulations may be achieved through refining assumptions about vehicle acceleration and deceleration, and incorporating other types of vehicles, such as buses. Additionally, looking closely at how the studied factors interact with each other can help inform the design of more effective road networks.