

# Hazard Analysis for the Clemson Game Day Queue Warning System

This document contains a full description of the Hazard Analysis for the Clemson Game Day Queue Warning System (CGDQWS). The principle of operation of a CGDQWS is to inform road users or travelers of the presence of downstream traffic based on real-time traffic detection, using warning signs, flashing lights and other means of communication. This helps drivers anticipate an impending situation of emergency braking, reduce queue related collisions and avoid erratic behavior. The rationale behind this project implementation is based off of the huge traffic situation experienced on Clemson's game day.

## Hazard Analysis for CGDQWS

The hazard analysis is a systematic examination of systems and subsystem functions to identify and classify failure conditions of those functions according to their severity. The hazard analysis for the CGDQWS contains a listing of key components of the CGDQWS system and their associated hazard related information.

Component	Error	Hazard	Severity	Likelihood
ITS Roadway Equipment	Invalid Value	Invalid roadway warning system control value sent by the Traffic Management Center	Catastrophic	Extremely Remote
ITS Roadway Equipment	No Value	Traffic Management Center doesn't send control information	Catastrophic	Extremely Remote
Traffic Management Center	Invalid Value	Incorrect or Invalid traffic flow and images from the ITS Roadway Equipment	Hazardous	Extremely Remote
Traffic Management Center	No Value	ITS Roadway Equipment fails to send data	Hazardous	Extremely Remote
Roadside Equipment	Invalid Value	Invalid or Incorrect value sent by ITS Roadway Equipment	Catastrophic	Extremely Remote

Roadside Equipment	No Value	Traffic Management Center fails to send queue warning application data	Catastrophic	Extremely Remote
Driver	Invalid Value	Invalid or Incorrect value from the ITS Roadway Equipment	Catastrophic	Extremely Improbable
Driver	No Value	Vehicle OBE fails to send driver updates to the driver	Catastrophic	Extremely Improbable
Vehicle OBE	Value Error	Driver sends wrong information.	Hazardous	Remote
Vehicle OBE	Invalid Value	Roadside Equipment send invalid or incorrect value to the Vehicle OBE	Catastrophic	Extremely Improbable
Roadside Equipment	No Value	Vehicle OBE fails to send vehicle environmental data to Roadside equipment	Catastrophic	Extremely Improbable
Vehicle Databus	Invalid Value	Vehicle OBE sends invalid or incorrect data to Vehicle Databus	Catastrophic	Extremely Improbable
Vehicle Databus	No Value	Vehicle OBE fails to send host vehicle status data	Catastrophic	Extremely Improbable
Remote Vehicle OBEs	Value Error	Invalid or incorrect vehicle control event and vehicle location and motion data from the Vehicle OBE	Major	Remote
Remote Vehicle OBEs	No Value	Vehicle OBE fails to send data	Hazardous	Extremely Remote
Transportation information	Value Error	Transportation information Center misinterpret data from Traffic Management	Catastrophic	Extremely Improbable

Center		Center		
System	Service Error	System Automatically disengages with input from any of the peripherals	Major	Remote