The DOT provided the following response to our I-Team story on the length of yellow lights:

"North Carolina DOT went through a very thorough process in 2005 to review our practice of setting yellow and all red times at traffic signals. We made some minor tweaks to account for grade of the approach, and process to handle calculations of excessively long values. Our formula is slightly different.

"The question that you asked is there a need to revisit the formula. The fact that the formula has several variables, in addition to some assumptions that may (or may not) be true in all conditions is not a reason to rethink the formula. The reason for this is that there is not a formula or program that will provide an "answer" to all possible situations. A thorough understanding of the formula, the variables used, and traffic engineering will help explain.

"In the equation t_{pr} is the perception and reaction time needed for the driver to see and decide what they will do. The length of the perception reaction time varies from one individual to the other and depending on the situation. Typically we will use 1 to 1.5 seconds for perception and reaction time because it is reasonable for a driver to expect that a traffic signal will turn yellow. In some highway design areas, a perception reaction time as high a 2.5 or 3.5 seconds may be used.

"In the equation, v_o is the initial velocity (travel speed) of the vehicle, in feet per second. The decision of how fast any particular vehicle is traveling is a guessing game. If we use the speed limit, then during very traffic periods, the free flow speeds of vehicles typically are 7 to 12 miles above the speed limit depending on if it is an urban or rural location. In addition, the individual drivers choose their speeds in these cases and it is highly variable based upon the individuals' preferences. In highly congested time periods, the speeds are likely to be lower more consistent because there is less freedom of movement because of the congestion. In a multilane situation, the speeds across the lanes are often different as well.

"In the equation, *a*, represents acceleration, which is actually deceleration in this case. This is a major assumption that the deceleration of any vehicle in the traffic flow is constant. Not only is it not likely to be constant the whole time a specific driver is pressing the brakes, it is also dependent upon the other factors. These factors include the mechanical condition of the vehicle, the individual drivers' comfort in stopping, and to some degree the thermal expansion of the metal used in the brake rotors or drums. All of these items vary from car to car and driver to driver. In order to make the formula work, it is reasonable to develop an assumption used and to put in reasonable values. These values for deceleration typically range from 10 to 12 feet per second squared. However, emergency braking can create a higher value or in wet road condition may even create a lower value depending on the type of braking system and the condition of the tires. This particular formula does not account for the grade of the approach. If the vehicle is traveling up hill, gravity will assist the vehicle in slowing. And conversely, if the vehicle is traveling down a hill approaching a signal, gravity will make it take longer to slow the vehicle.

"In the equation, the term *w* represents the width of the intersection. This variable can also change depending on how it is measured. The effective width of an intersection is different for a left turning vehicle than a vehicle going straight.

"In the equation, the term L represents the length of the vehicle. This too is a variable that could be a short as a motorcycle, or a long as a tractor trailer pulling twin trailers. The value used will not be correct for every vehicle.

"There is also driver behavior to consider. Many drivers already treat the green as an "unofficial" extension of the green. If it is too long, then the yellow loses its purpose and the all red portion becomes even more critical. If the all red portion is too long, drivers tend to learn the timing and violate the red.

"In addition, there are laws that one must consider. For example, the last portion of the equation is the all red portion for clearing the intersection. The desire was to have the vehicle completely clear the intersection before the green is given to the conflicting traffic. Just because a vehicle has a green light it does not have the right to run into a vehicle that is still occupying the intersection. The driver has a duty to avoid a collision. This duty becomes more difficult when drivers try to squeeze the lights.

"Based on Mr. Maradudin's 2013 letter to the California Traffic Devices Committee, there are various instances that deviate from these assumptions. We agree and accept this a factual. There are too many variables to develop a deterministic equation or model for all conditions. This is the nature of traffic engineering. "