Evaluation of New Weigh-In-Motion Technology At The Virginia Smart Road

BY
KEVIN M. SIEGEL

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Dr. Imad L. Al-Qadi, Chair
Dr. Gerardo Flintsch
Dr. Amara Loulizi

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ABSTRACT

Weigh-in-Motion (WIM) systems have improved the process of collecting data from heavy vehicles on the U.S. highway system and enforcing the laws that govern vehicle weights. The benefits of WIM are reaped by everyone from highway designers and government officials, to truck drivers and transportation industry owners. The data collected by WIM devices is essential for proper pavement design, developing pavement management systems, weight enforcement strategies, modeling traffic improvement projects, and predicting load-related distresses and performance. While WIM offers many advantages over its alternative, static weighing, the technology is limited by problems associated with the accuracy of its measurements. Weigh-in-Motion systems that lack accuracy require vehicles to travel slower and can result in higher queues, longer delays, and potential hazards. For these reasons, WIM system performance must be improved in order to adequately serve its purpose.

In order to evaluate WIM system performance and determine what vehicle characteristics have the most affect on it, two systems in the Commonwealth of Virginia were evaluated. The first system was an in-service WIM system at the Troutsville weigh station on I-81. The Troutsville station has bending plate WIM scales located in both the northbound and southbound directions. The second system is a newly developed WIM system manufactured by Omni Weight Corporation (OWC) and was installed at the Virginia Smart Road for evaluation. The OWC scale is a completely sealed and buried system that has ten strain gauge sensors in its interior.

Evaluation of both scales was performed by conducting a number of tests runs under varying load conditions. Testing at Troutsville was performed using four different test vehicles with multiple loads on each. Variation in load was achieved by loading the test vehicles with various numbers of concrete Jersey Walls. Testing on the OWC scale was performed using only two test vehicles while varying the speed, load, tire pressure, and direction of travel over the scale.

The study showed that the scales at the Troutsville weigh station yielded 10% error or less on only 77% of the tests, not complying with the required 95% set forth by ASTM E-1318. In comparison, using the manufacturer's processed data for the OWC scale yielded only 18% of its tests with 10% error or less, far below the ASTM standard. A model was developed to re-calculate the axle weights using the raw sensor data from the OWC scale; and an evaluation of the accuracy of this data showed that the OWC scale performed much better. While compliance with the ASTM standards was still not achieved, it rose from 18% to 71% of the tests having 10% error or less. Repeatability of the Troutsville scales and OWC scales was found to be comparable.

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CHAPTER 1: INTRODUCTION

1.1 Forward

The United States transportation infrastructure is the largest and most heavily traveled system in the world. It is the backbone of one of the world's strongest and most active economies; transporting approximately five trillion dollars worth of goods every year. Along with that monumental productivity volume comes the task of maintaining such a marvel of engineering. United States governmental agencies spend more than 90 billion dollars annually to maintain and rehabilitate the nearly 6.3 million kilometers of roadways included in that transportation infrastructure system.

The most crucial and susceptible component of the transportation infrastructure is the roadway pavement. Pavement engineers have found that heavy vehicles traveling on the roadway network pose the most damage to the pavement system (Cottrell, 1992). A major cause of early deterioration in roads is heavy vehicular loading. Since the beginning of the last century, highway designers have realized the crucial role that heavy truck loads play in highway design. For this reason, truck weight regulations have been implemented and monitoring of truck weights has become a common practice.

Monitoring and controlling truck weights are essential to effective design and management of roadways. One of the most efficient ways of performing both of these tasks is with Weigh-in-Motion (WIM) devices. In addition to insuring that heavy vehicles are not overweight, WIM devices posses the capabilities to collect useful information about heavy vehicles. This information can be used for pavement design purposes, as with the Equivalent Single Axle Load (ESAL) procedure. Additionally, the proposed mechanistic-empirical design procedure of the *2002 AASHTO Guide for the Design and Rehabilitation of Pavement Structures* calls for detailed traffic data, which too can be collected by WIM devices.

The data collected by WIM devices is essential for pavement design, developing pavement management systems, weight enforcement strategies, modeling alternative traffic improvement projects, and predicting load-related distresses and performance. Weigh-in-Motion offers many advantages over its alternative, static weighing. These advantages include providing higher efficiencies with less delay to trucks and a reduction in congestion at weigh stations.

1.2 Problem Statement

One of WIM technologies biggest barriers is the problem associated with the accuracy of its measurements, especially at highway speeds. The low levels of accuracy attained by WIM can be attributed to many sources, such as problems in their installation, maintenance, and use (Cunagin *et al.*, 1991). Currently, standard specifications that guide the installation of WIM systems do not exist. The ASTM standards for WIM only dictate the system classifications, performance requirements, and testing procedures (ASTM, 1999). The means and methods for installing WIM systems are left to the manufacturer and user of each individual system. In addition, once installed, limited financial means and resources usually result in poor maintenance of WIM systems. In order to insure WIM systems function properly, which is essential to obtain high levels of accuracy, the systems must be correctly installed and maintained.

Weigh-in-Motion systems that lack accuracy have negative affects on the efficiency of weigh station operations. This lack of accuracy requires vehicles to travel slower and can result in higher queues, longer delays, and potential hazards due to vehicles backing up on the roadway at weigh stations. For these reasons, WIM system accuracy must be improved in order to adequately serve its purpose.

1.3 Objective

In order to address the aforementioned problem statement, the performance of current WIM technology needs to be quantified and analyzed. The objective of this thesis was to evaluate WIM system performance and determine what vehicle characteristics have the most affect on it. To do this, two WIM systems in the Commonwealth of Virginia were evaluated. The first was an in-service WIM at the Troutsville weigh station on Virginia Interstate 81 (I-81); and the second was a newly developed experimental WIM at the Virginia Smart Road in Blacksburg, VA. The performance of both scales was analyzed. Relationships between certain scale performance measures and passing vehicle characteristics were developed in an attempt to identify which characteristics most affect scale performance.

1.4 Scope

To achieve the objective of the study, first a literature review of various technical papers and other informational sources was conducted to analyze both state-of-practice and emerging WIM technologies. The literature review investigated current and past research in order to develop an understanding of the benefits and weaknesses associated with existing WIM technology. Topics covered included the various WIM systems characteristics, ASTM standards and classifications, system evaluation techniques and case studies, and sources of error associated with WIM systems. This literature review is presented in Chapter Two.

In order to quantify the relative performance of the newly developed WIM system installed at the Virginia Smart Road, it is necessary to evaluate the performance of an existing in-practice WIM system to use for comparison. Chapter Three presents the evaluation of one such system, the WIM scales at the Troutsville weigh station. This chapter is an evaluation of the accuracy and repeatability of the WIM scales located at this weigh station. Both the northbound and southbound scales are studied to look for consistencies between the two identical systems. Additionally, relationships between the system performance and characteristics of the traffic passing over the scale are identified. This task is achieved using a variety of analytical tools. The traffic characteristics considered are the vehicle type, axle configuration, and vehicle load.

A similar evaluation is performed on the newly developed *Oy Omni Weight Control Ltd. Safe Load System™ WIM Dynamic Scale* (OWC scale) installed at the Virginia Smart Road. Chapter Four details the procedure that was followed for the installation of the scale. The particulars of the installation process are important in identifying sources of error that could results in poor performance of the scale. The performance of the OWC scale is evaluated in Chapter Five. The evaluation of the scale is similar to the Troutsville scale evaluation. However, the traffic characteristics considered in this portion of the study are axle configuration, axle load, vehicle speed, direction of travel, and tire pressure. The temperature of the hot-mix asphalt (HMA) above the scale is also taken into consideration when analyzing the scale's performance. In addition to evaluating the accuracy of the scale and identifying relationship that may exist between performance and traffic characteristics, an analysis of the weight calculation methodology is performed in an attempt to improve the scale's performance.

Finally, Chapter Six summarizes the findings of the study, and offers conclusions and recommendations for further study on this topic.

1.5 Contribution

This study reports the relative capabilities of both in-service WIM stations in the Commonwealth of Virginia and that of a newly developed WIM system installed at the Virginia Smart Road. Monitoring the performance of such systems will cut costs in both the private and public sectors of the transportation industry. Trucking industry operators could save time and money through the prevention of unnecessary weigh station delays. State and highway agencies could save money through increased efficiency and improved enforcement of law governing heavy load vehicles.

CHAPTER 2: STATE OF KNOWLEDGE

2.1 Current State of Weigh-in-Motion

There are a multitude of WIM systems in use today across North America and around the world. The systems exist primarily to aide in maintaining proper transportation infrastructure functioning. Weigh-in-Motion technology provides information on the characteristics of traffic loads, speeds, and vehicle dimensions. The purpose of this data is to influence highway and pavement design, regulation enforcement, and safety evaluation (Zhi, 1999).

The main users of WIM systems in the United States are state highway agencies. Such agencies use these systems to monitor the traffic on their highways and to enforce weight regulations set by the state and federal governments. There are other organizations and industries that use WIM technologies. The shipping industry uses WIM in the monitoring of freight and cargo coming into and out of ports. Weigh-in-Motion has also been used to weigh vehicles making deposits at landfills in order to determine how much to charge them.

While the use of WIM proves convenient for these various other industries, they are not the driving force behind advances in WIM. Weigh-in-Motion technologies are generally governed by the needs and requirements of the transportation industry. The only specifications that exist in the United States to govern WIM are those specified by The American Society for Testing and Materials, ASTM. American Society for Testing and Materials standard E1318–94 dictates the Standard Specification for Highway Weigh-in-Motion Systems with User Requirements and Test Method (ASTM, 1999). This specification states that highway WIM systems generally have three applications: collecting statistical traffic data; aiding enforcement; and enforcement.

2.1.1 Benefits of Weigh-in-Motion

The use of WIM in aiding enforcement and as an enforcement device has proven to be economically beneficial. The benefits of WIM have been found to far outweigh the costs involved with its implementation and operation. Truck operators and enforcement personnel experience greater efficiency, the highway infrastructure benefits from fewer illegal overloads, and transportation planners have access to valuable data with which to plan maintenance and construction activities (Bergan *et al.*, 1998).

Weigh-in-Motion provides for greater efficiencies in weight enforcement than the sole use of traditional static weighing methods because current WIM technologies actually act in conjunction with static scales. The WIM functions as a prescreening for a passing vehicle. Current WIM processors have limited accuracy and are only a preliminary indicator of the vehicle's actual weight. Any vehicle found to be within a certain range of violating the legal weight (depending on the accuracy of the particular scale) is then directed to the static scale for a more accurate weighing (Coffinbargar, 1990). By prescreening the trucks to find only those close to violating the weight limits, you are both reducing queue and the delay experienced by those trucks not violating the limit (Cottrell, 1991).

This same concept also helps to reduce the number of illegal overloads. Reducing the queue of trucks being weighed prevents the weigh station operators from having to close down the weigh station when the queue gets too long. Weight violating trucks cannot bypass the station when it is closed, thus preventing illegal overloads. Data collected by weigh stations using WIM scales is less bias than the data collected by those using solely static scales because there is minimal scale avoidance (Cottrell, 1991).

In addition to improving weight enforcement practices, the use of WIM technologies at weigh stations has the ability to collect large amounts of traffic data easily and quickly. The high processing rate provided by WIM systems gives engineers and planners a way of collecting vast amounts of traffic data such as counts, speeds, types of vehicles in the flows, and of course weights. The data is collected without interference to the traffic flow. Planning for future infrastructure investments using the weighing of vehicles and the collection of traffic data is an integral part of highway management activities. These activities are made easier by WIM (Bergan *et al.*, 1998).

2.1.2 Need for Development of Weigh-in-Motion

While WIM systems have developed quite extensively over the years, a need to develop them further exists. One of WIM technologies biggest barriers is the problem associated with the accuracy of its measurements, especially at highway speeds. The low levels of accuracy attained by WIM are mainly associated with problems in their installation, maintenance, and use (Cunagin et al., 1991). Currently, no standard specifications that guide the installation of WIM systems exist. The ASTM standards for WIM only dictate the system classifications and performance requirements, along with testing procedures (ASTM, 1999). The means and methods for installing WIM systems are left to the manufacturer and user of each individual system. In addition, once installed, limited financial means and resources usually result in lack of maintenance of WIM systems. To insure WIM systems function properly, which is essential to obtain high levels of accuracy, the systems must be correctly installed and maintained.

2.2 Existing WIM Technologies

There are numerous types of WIM systems in operation today. The systems vary in the type of sensors they use, the software that processes the data, the set-up of each, and countless other variations. Each type of system has its own advantages and disadvantages. There are, however, four major elements that most WIM system used for weight enforcement have in common: the roadway component, computer component, signalization component, and tracking component (Laurita et al., 1994). While these four components are common to most WIM systems, the types of components used, and the way the components are set-up are generally what make the systems differ from one another. The type of system an entity chooses to use and types of components involved in that system, are generally determined by the type of data that one would want to get out of the system and what that data would be used for (McCall & Vodrazka, 1997).

The roadway component includes any part of the system installed to collect the data from the passing vehicles. This includes the WIM scale itself, the sensors, any equipment installed to detect speed or presence of the vehicle, and any sort of height detector. The computer component includes those parts of the system that record, analyze, and display the data being collected. This accounts for any desktop computer, software, graphic displays, field units, or printers. The signalization components are the parts of the system that direct the movement of the vehicles involved in the weighing process. These include a signal control assembly, directional traffic signals, and variable message signs. For a WIM system not used directly for weight enforcement, the signalization component may not be included. Lastly, the tracking component is a series of networked in-road inductive loops that generally are also used to detect vehicle presence and speed (Laurita et al., 1994).

2.2.1 Weigh-in-Motion Classifications

The types of WIM systems vary in many ways; one way in which WIM systems can be classified is by the permanency of their installation and use. Weigh-in-Motion systems can be classified as permanent, semi-permanent, or portable (Tirums et al., 1999). All three types may be used at either traffic collection data sites or at truck weigh stations. Permanent systems generally are imbedded slightly below the road surface and attached in such a way that they cannot easily be removed and transferred to another location to be used again. Portable systems are systems where the components of the system, especially the sensors, can fairly easily and quickly be placed, removed, and replaced, and are simply stuck to the road surface (Cebon, 2000). The semi-permanent systems are similar to the portable systems, but do require additional work and finances to make them portable.

The American Society for Testing and Materials classifies WIM systems into four different types. The classification is based on the permanency of the system, system application, traffic traversing the system, and various other desired characteristics. Tables 2-1 and 2-2 illustrate certain characteristics of the four types of systems. The types are designated as Types I, II, III, and IV (ASTM, 1999). There are certain functional performance requirements for each system designating the level of precision required. Systems of the Type I and Type II classification are both used for the sole purpose of traffic data collection (Strathman, 1998). Type I is designed for permanent or semi-permanent installation at traffic data collection sites, while Type II is designed for portable use at traffic data collection sites. Type III and Type IV systems are both designated for use in weight enforcement operations.

Table 2-1 - ASTM classification and performance specification for WIM systems (after Strathman, 1998)

WIM System Type	Purpose	Speed (km/h)	Precision (at 95% confidence level)	
Type I	Traffic Data Collection	16-113	Axle Load Axle Group Load Gross Vehicle Weight	± 20% ± 15 ± 10
Type II	Traffic Data Collection	16-113	Axle Load Axle Group Load Gross Vehicle Weight	± 30% ± 20 ± 15
Type III	Identification of Vehicles Suspected of Weigh-Limit and Load-Limit Violations ("Screening")	24-80	Axle Load Axle Group Load Gross Vehicle Weight	± 15% ± 10 ± 6
Type IV	Detection of Weight-Limit or Load-Limit Violations at Weight-Enforcement Stations ("Enforcement")	0-16	Axle Load Axle Group Load Gross Vehicle Weight	± 2.5 - 4.2% ± 3.5 - 4.8 ± 3.1 - 4.2

The Type III system is designed for installation at weight enforcement stations to identify approaching vehicles suspected of weight violations. The Type III system is generally a high-speed WIM system, requiring vehicles to maintain speeds of anywhere between 24-80 km/h. These speeds result in a fairly wide range of precision, and are therefore used for initial screening and directing violators to static scales to be weighed. The Type IV WIM system is designed for use at weight enforcement stations to detect weight limit violations itself without the use of a static scale. This requires much lower speeds of between 0-16 km/h inclusive. These lower speeds result in a much higher precision of measurement (Strathman, 1998).

2.2.2 Weigh-in-Motion Sensor Type

As one of the four essential components in a WIM system, the sensor comes in many forms. In the last several decades, there have been several sensor types that have proven to be useful in WIM systems. Each of the sensor types offers its own advantages over the others, while at the same time offering its own disadvantages. This section describes the most common types of sensors used, the operation principle, the installation methodology, permanency, and additional system components needed for the system.

Table 2-2 - ASTM weigh-in-motion system characteristics
(after FHWA "State's Successful Practices Weigh-in-Motion Handbook" and ASTM E 1318)

Characteristic	CLASSIFICATION			
	Type I	Type II	Type III	Type IV
Speed Range	(16-113 km/h)	(16-113 km/h)	(24-80 km/h)	(0-16 km/h)
Application	traffic data collection	traffic data collection	Weight enforcement	Weight enforcement
Number of Lanes	up to four	up to four	up to two	up to two
Wheel Load	X		X	X
Axle Load	X	X	X	X
Axle-Group Load	X	X	X	X
Gross Vehicle Weight	X	X	X	X
Speed	X	X	X	X
Center-to-Center Axle Spacing	X	X	X	X
Vehicle Class	X	X		
Site Identification Code	X	X	X	X
Lane and Direction of Travel	X	X	X	
Date and Time of Passage	X	X	X	X
Sequential Vehicle Record Number	X	X	X	X
Wheelbase	X	X		
Equivalent Single-Axle Load	X	X		
Violation Code	X	X	X	X

2.2.2.1 Capacitive Weigh Mat

The capacitive weigh mat/pad is constructed of two or three steel plates, placed parallel to each other, and separated at known distances by a synthetic dielectric material with known elastic properties (Blab & Jacob, 2000). The synthetic dielectric material placed between the steel plates is typically rubber. The weigh mat acts as a variable two or three-plate capacitor within a tuned circuit (Cottrell, 1991). The capacitance of the mat is integrated into an oscillatory circuit with a given frequency controlled by an electronic device. As a vehicle passes over the sensor, the wheel load causes a compression of the sensor, which in turn results in a change in the oscillating frequency of the tuned circuit (Haines *et al.*, 1991). The maximum frequency variation is obtained for each pass of a wheel. This magnitude of the change in frequency is then interpreted by a microprocessor as a weight.

Typically, the capacitive weigh mat is placed in the path of one side of vehicle, where it weighs the wheel loads on just that side of the vehicle. The weights for each wheel are then doubled in order to obtain the axle weight. In addition to obtaining the axle weights for the vehicle, the weigh mat can also determine the axle spacing and the vehicle's classification (Cottrell, 1991).

The capacitive weigh mat system is one of several portable WIM systems available from many manufactures. The sensors and supporting systems are fairly easy to install and remove. In the typical installation of such a device, a vehicle would transport the weigh mats to the site, ready to be installed. The proper installation measurements would be made prior to the installation time in order to maximize the efficiency of the installation process. The edges of the mats are covered with duct tape, as to make the removal of the mat easier and faster. A bitumen adhesive tape is then used to attach the mat to the roadway. The ambient temperature must be at least 10°C and the pavement must be dry to ensure adequate adhesion of the bitumen tape to the existing pavement (Cottrell, 1991).

2.2.2.2 Capacitive Strip

The theory behind the capacitive strip sensor is similar to that of the capacitive mat sensor. The difference is in the way they are constructed and the way in which they interpret the signals from the circuits. The capacitive strip consists of three main elements: an aluminum extrusion, and inner isolated electrode, and an electronic oscillator circuit. Inside the aluminum extrusion (channel), there is a dielectric material that surrounds the inner electrode. This set up acts like a capacitor just as the plates due to the capacitive mat. As a vehicle passes over the strip, the aluminum extrusion is compressed and deforms elastically. As a result, there is a variation in capacitance of the electrode and aluminum channel that measures the deformation of the channel. The elastic deformation is actually measured by the variation of the electronic oscillator circuit frequency, which is induced by the variation in capacitance. The frequency change is proportional to the elastic deformation of the channel (Blab and Jacob, 2000).

The strips are generally installed in half of the vehicle lane only, where they measure the wheel load on one side of the vehicle. The wheel loads are then doubled in order to obtain the axle loads and gross vehicle weight of the vehicle (Caprez *et al.*, 2000). The installation of the sensors is done by permanently attaching the aluminum channels to pavement using an adhesive. For capacitive strips that are to be used at permanent weigh stations, the sensors are placed into slots cut across the surface of the road (Cebon & Cole, 1992). The channels are set even with the surface of the pavement in order to limit any extra impact forces from the vehicle. In addition to installing the capacitive strip sensors, induction loops are also installed in the roadway in order to determine the speed, length and class of the vehicle, as well as determining the presence of a vehicle. These induction loops mats are attached to the roadway using an adhesive such as bituminous tape. The total installation of the sensors and induction loops can take anywhere from 40 to 90 minutes (Blab and Jacob, 2000).

2.2.2.3 Piezoelectric Cable Sensors

Piezoelectric cable sensors are based on the theory behind the piezoelectric effect. This is a phenomenon whereby mechanical energy is converted to electrical energy, and vice versa, within certain insulating materials (Stewart, 1989). The piezoelectric cable sensor is constructed of a solid copper wire core placed inside a solid copper outer sheathing. In between the inner wire and outer sheathing is a highly compressed powdered ceramic or polymer insulation. This insulation acts as a dielectric. The cable is then placed inside an aluminum channel and encapsulated in an epoxy resin mixture (Cottrell, 1991).

As a vehicle passes over the aluminum channel the pressure felt by the cable produces electrical charges of opposite polarity to appear at the parallel faces of the insulation material. The size of the charge produced is dependant on the load causing the pressure. The result is that the sensor yields a voltage output related to the stress rate applied to them. This signal is processed through the data acquisition electronics of WIM systems to yield load measurements as axles pass over the sensor (Papagiannakis *et al.*, 2001).

The installation of the sensors requires that a groove be cut in the pavement perpendicular to the travel lane, and the sensors secured in the grooves with an epoxy. Piezoelectric cable sensors are installed as permanent sensors. The sensors are then attached to a field unit that is used to receive and interpret the signals, and to collect the data. Installation of the sensors requires the lanes to be closed to traffic for several hours.

2.2.2.4 Bending Plate

A bending plate WIM system uses strain gauges, attached to plates, to interpret the vehicle weight. The strain gauges are attached to the underside of the weighing platforms, or plates. These weighing platforms are installed in the pavement flush with the surface (Haines *et al.*, 1991), and can be considered permanent or portable depending on the application. As a vehicle passes over the platform, the platform undergoes a deformation and a strain is produced. The strain gauges measure the induced strain and convert that strain into an electrical impulse. The electrical output is proportional to the wheel load and is used to calculate the dynamic load passing over the scale (Brulant-Reversat *et al.*, 2000).

2.2.2.5 Hydraulic Load Cells

Weigh-in-Motion systems using hydraulic load cells work similar to those using strain gauges. The difference is in the way the load cell works. The hydraulic load cell is an oil-filled piston that is placed in between two steel plates (Haines *et al.*, 1991). The steel plates are permanently mounted in the pavement flush with the wearing surface. The hydraulic load cell interprets the load passing over by measuring the hydraulic pressure change in the cell as it deforms with the plate it is connected to (Strathman, 1998). This pressure change is proportional to the load passing over and is converted into a dynamic load.

2.2.2.6 Emerging Sensor Technology

There are some new sensor technologies that are emerging in a hope to produce better and cheaper WIM systems. Among those technologies are the quartz crystal sensor and the fiber-optic sensor. The quartz crystal sensor was introduced to the market in 1997, and it performance and operation experience is thus limited. Fiber-optic systems are not yet available commercially, but research indicates that this technology is potentially capable of achieving high levels of accuracy and precision at a moderate cost (Strathman, 1998).

2.2.3 Approaches to Weigh-in-Motion

Weigh-in-Motion systems can be divided into two main categories, single sensor WIM and multiple sensor WIM (MS-WIM) systems. The aim of both systems is the same, to estimate the static axle weights and/or gross vehicle weights of heavy vehicles at highway speeds (Cebon, 2000a). The WIM systems achieve this goal by recording instantaneous dynamic wheel loads and converting those loads into static loads. Both approaches to the WIM systems actually can use the same types of sensors. The difference between the two approaches to WIM is the number of sensors recording the data, the way in which the dynamic loads are interpreted, and the accuracy of the measurements.

2.2.3.1 Single Sensor Weigh-in-Motion

Single sensor WIM systems are the most commonly used WIM systems today. A single sensor WIM system uses one sensor to measure the vehicle load passing over to estimate the static load of that vehicle. However, as Cebon (2000a) describes in the "Handbook on Vehicle Roadway Interaction", the instantaneous dynamic force generated by each measured axle can be significantly different to the static axle load that would be measured on a conventional static scale.

The single sensor WIM takes only a single sample of a wheel force history as an estimate of a static wheel load (Cebon, 1990). Since the sensor is actually only recording the instantaneous dynamic force of that tire at the moment in time that the reading is taken, it is not getting an accurate static weight. Thus, the accuracy of a single sensor WIM system is limited fundamentally by vehicle dynamics (Cebon, 1990). Those vehicle dynamics, or dynamic tire forces, are caused by the vibration induced in a vehicle. According to Cebon (1990), the main cause of the dynamic tire forces fluctuation is that the road surface roughness excites vibration of the vehicle.

The fluctuation in dynamic tire forces due to the road surface roughness introduces a source of error in the dynamic force reading of the single sensor WIM. In addition, Cebon describes a second major source of error in the single sensor WIM measurements. This second source of error is the dynamic sensor error, the error associated with the inaccuracy of the sensor itself independent of outside influences such as road roughness. These two sources of error render the single sensor WIM quite inaccurate. While it is hard to remove the dynamic sensor error, practitioners often try to reduce the error associated with the fluctuation in dynamics tire forces due to road surface roughness by making the road as smooth as possible for some distance in the lead-up to the WIM system (Cebon, 2000a).

2.2.3.2 Multiple Sensor Weigh-in-Motion

The theory behind using MS-WIM systems is that the error associated with dynamic tire forces can be minimized The reason for this is that by taking an average of the individual sensor readings, the bias and error can be significantly reduced for the overall reading. Cebon has developed a very simple algorithm that averages the sensor readings:

$$\overline{P} = \frac{1}{n}\sum_{j=1}^{n} S_j \qquad \textbf{(2-1)}$$

where $\overline{P}$ is an estimate of the static tire force, n is the number of sensors in the array, and S_j is the output of the j^th sensor (Cebon, 2000a). There are many other relationships that process the output of the sensor array to yield an estimate of the static load, including some more sophisticated statistical analysis procedures. However, averaging the outputs of the individual sensors tends to be the simplest.

Two very important aspects of the MS-WIM sensor array are the number of sensors and the spacing of those sensors within the array. Glover analyzed the effects of various numbers of sensors within the MS-WIM array (Glover, 1988). He used 1, 2, 9, 19, and 81 sensors with a variety of spacing. He found that good results can be achieved when using a 9-sensor, evenly spaced array. However, the higher the number of sensors, generally the better the results will be (Cebon, 2000a). The accuracy of a WIM array improves gradually as the number of 'optimally' spaced sensors is increased above two, with diminishing improvements for large arrays. The insensitivity to speed and frequency variations could be improved with more sensors (Cebon, 2000b).

The spacing of the sensors can vary as well. Spacing arrangements can be linear, geometric, logarithmic, or uniform. The uniform, evenly spaced, sensor array offers high accuracy and ease of computation. Cebon (2000b) developed a simple formula that takes into account several factors about the traffic to develop the spacing of the sensors given that the average traffic speed is known. The equation relates the number sensors n, the average speed of traffic $\overline{V}$, and a frequency in Hz related to the dynamic tire load $\overline{f}$, to the spacing Δ. The variable $\overline{f}$ is associated with rigid body motion combined with suspension system performance. Values for this variable usually range anywhere from one to five Hz (www.ornl.gov). A frequency of 2.5 Hz is the typical mean vehicle resonant frequency that yields reasonably accurate results for a wide range of speeds and dynamic loading frequencies (Cebon, 2000b). The equation developed by Cebon to represent this relationship is as follows:

$$\Delta = \frac{2(n-1)\overline{V}}{\overline{f}n^2}, n > 1 \qquad \textbf{(2-2)}$$

2.2.4 Weigh-in-Motion Error and Calibration

Cebon describes very clearly in his "Handbook on Vehicle Roadway Interaction" that there are many sources of error associated with the dynamic sensors. Error, and variation in the sensor readings, is the reason the system calibration is required. Those sources of error can generally be grouped into two categories, those directly related to the sensors and those related to the mounting arrangements of the sensors. Likewise, the effects of those sources of error can also be grouped into two categories. The errors can either be random error without bias, or they can be bias errors without randomness. Each source of error has a certain affect on the probability density function (PDF) of the dynamic load error. The random error causes a spread of the PDF, and the bias error causes a horizontal shift of the PDF.

2.2.4.1 Sensor Error

There are several sources of error associated with the sensor itself. The first of those sources are those that cause a spread of the probability density function, or random error, and include non-uniformity of output, tire tread pattern, and electrical noise. Non-uniformity of output results from sensitivity of the scale to where the load passes over the sensor. The sensors are more sensitive in some places than others and may react different to the same load in different positions. Tire tread pattern can cause large errors depending on the size of the tread and its relation to the sensor size. For narrow strip sensors such as capacitance and piezoelectric, the sensor is often smaller than the contact area, so the variation in contact pressure due to treads can affect it. Electrical noise in the sensor is often a problem for the functioning of the sensor (Cebon, 2000a).

Biased error in the sensor is caused by such sources as sensitivity to loaded area, non-linearity, temperature sensitivity, and sensitivity to duration and rate of loading. Sensitivity to loading depends on the contact area of the tires, tire type, and the number of tires. Non-linearity of the output with the applied load will cause error in the calibration factor. Temperature sensitivity can cause significant variability in the calibration factors. Sensitivity to duration of rate of loading is caused by error produced by the speed and duration that the tire is in contact with the sensor (Cebon, 2000a).

2.2.4.2 Error Due to Mounting

Some of the error due to mounting is actually caused by problems associated with the mounting adhesive. This is because the adhesive actually gets in the load transmission path between the contact area and the sensor. The adhesive that gets in the load transmission path introduces material problems such as stiffness, viscoelasticity, and uneven thickness that will affect the way that the load is transmitted. Similarly, error can result from pavement material becoming part of the transmission path. Stiffness, nonuniform stiffness, and viscoelasticity of the pavement material can all affect the response seen by the sensor like axial stretching and longitudinal strain. Another source of error is flushness of mounting. A sensor is not mounted flush with the surface of the pavement will result in additional pressure to be exerted on the sensor because of deformation of the tire as it contacts the edge of the sensor (Cebon, 2000a).

2.2.4.3 Weigh-in-Motion Calibration

The American Society for Testing and Materials procedure recommends an eight-step process to calibrate WIM systems (ASTM). First, all WIM system settings should be adjusted to the vendor's recommendations or to a best estimate of proper setting based on previous experience. Second, vehicles that go through the system for calibration purposes must be forced into the static scales at the site or a nearby facility to obtain static weight data. With a radar gun or other means, speed data should be taken to measure the speed that the truck moves through the WIM sensors. Third, tire loads and axle spacing should be recorded at the static scales. Fourth, the difference should be calculated between the WIM system estimate and the reference value for the speeds, wheel loads, axle loads, axle group loads, gross vehicle weights, and axle spacing measurements. The differences should be expressed in percents and a mean value should be obtained for each set of measurements. Fifth, the calibration factors should be entered into the WIM system. Sixth, it should be determined whether or not the calibrated system can be expected to perform at the necessary tolerances. Seventh, if a large number of differences for the data occurs and does not meet the tolerances' levels shown in the ASTM values for the specified system, the system will most likely not perform to a beneficial level. Eighth, precision and bias information should be noted, although at this time no procedure has been developed to determine what effect this data has on WIM system performance (Katz, 2001).

2.3 Summary

Weigh-in-Motion technology has revolutionized vehicle weight enforcement. Additionally, accurate WIM systems would benefit highway design and maintenance by allowing the building and maintaining of a highway system capable of carrying the trucks that traverse it. With so many WIM systems and sensors readily available today, there are many options for users to choose from. However, the technology is still developing, and research is needed to address many areas of concern associated with WIM system limitations; especially accuracy. Other areas of concern include the performance and durability of WIM systems. It is only with research and testing that WIM technology can improve to its full potential.

CHAPTER 3: TROUTSVILLE WEIGH-IN-MOTION FIELD EVALUATION

Weigh-in-Motion is key to maintaining efficient and effective weigh station operations. Emerging WIM technologies offer many advances over existing state-of-practice WIM systems. To evaluate these advances and their improvement over existing WIM systems, it is necessary first to evaluate existing WIM system accuracy. The limitations in WIM accuracy have resulted in using static weighing devices in conjunction with WIM systems at most truck weigh stations. This coupling defeats the main purpose of using WIM and the efficiency that it is supposed to provide.

Identification of the limiting factors of current state-of-practice WIM systems is crucial to improving the accuracy of emerging systems. This chapter presents a performance evaluation of a typical weigh station WIM system in the Commonwealth of Virginia. This evaluation provides the basis for a comparison to a new WIM system that is introduced and evaluated in Chapters Four and Five.

The layout of this chapter will be as follows: (1) a brief description of the research approach; (2) a description of the testing methodology including the testing variables, testing procedure, and data collection procedure; (3) a data analysis; and (4) a summary discussion of results from this portion of the study.

3.1 Research Approach

The research approach involves evaluating the Troutsville WIM scales to examine the effect of vehicle load and axle configuration on the performance of the scales. Other factors that could affect the performance of the WIM scales located at the Troutsville station include pavement approach roughness and speed of traffic. However, these factors were not taken into consideration in this study. A comparison between the measured WIM weights and the measurements made by the station static scales was conducted. Both the static and WIM scales at the Troutsville station measure axle group loads only, and do not measure or record the individual axle loads. The analysis of the data recorded in this portion of the study was used to establish trends relating the accuracy of the WIM scales to varying loads and axle configurations.

This chapter addresses the objective of this study as to the state-of-practice WIM system: Evaluate the performance of the Troutsville WIM system by quantifying the performance of the system; determine the factors that most influence its performance. The Troutsville weigh station is located at milepost 146 on Interstate 81 in Troutsville, Virginia. The WIM scale operating at the Troutsville weigh station are bending plate scales.

3.2 Data Collection and Testing

3.2.1 Testing Variables

In evaluating the WIM scales at the Troutsville weigh station, only a limited number of variables could be considered. Those variables include the vehicle load and vehicle axle configuration. Temperature, traffic speed, and tire pressure are other factors that have effect on the accuracy of the scale; however, they were beyond the scope of this portion of the study and kept constant throughout the study.

Temperature variation was limited because the study took place over a period of five days with minimal temperature fluctuation. Limitation in varying traffic speed was due to the prohibition of interruption to the station operations. Additionally, the test vehicles had to maintain the required speed of 65 km/h while traveling through the station. Vehicle tire pressure was not considered in this study due to a lack of proper facilities to alter the tire pressure during the testing.

Variation of the vehicle load and vehicle axle configuration was accomplished by using concrete Jersey Walls and different test vehicles, respectively. In order to vary the load on the test vehicles, different numbers and arrangements of concrete Jersey Walls were used. Each wall weighed approximately 2250 kg. In addition to increasing and decreasing the number of walls loaded onto the test vehicles, the walls were arranged accordingly on the vehicle to concentrate the load over different axle groups. This was done to investigate the relationship between weighing accuracy and axle groups.

Using several testing vehicles provided various axle configurations. This allowed studying the relationship between axle configuration and accuracy. In total, four different vehicle configurations were considered (Figure 3-1). This included a six axle flat bed tractor trailer, a two axle dump truck, a three axle dump truck, and a three axle dump truck pulling a two axle equipment trailer. The six axle flat bed tractor trailer consisted of three axle groups; a single steering axle at the front of the tractor, a tandem axle at the rear of the tractor, and a tridem axle at the rear of the flat bed trailer. The three axle dump truck consisted of two axle groups; a single steering axle at the front of the truck, and tandem axle group at the rear of the truck. The three axle dump truck and two equipment trailer combination consisted of the previously mentioned three axle dump truck pulling an equipment trailer which had a tandem axle in the rear.

Figure 3-1 - Test vehicles: 6-axle tractor trailer (top left); 2-axle dump truck (top right); 3-axle dump truck with equipment trailer (bottom left); 3-axle dump truck (bottom right)

3.2.2 Testing Procedure

Since the weigh station was open to truck traffic during the testing, the testing procedure required that there be very minimal interruption to the weigh station operation. In order to accomplish this, a staging area was set up in the weigh station truck parking area. This staging area was used to store the concrete Jersey Walls, front end loader, and testing vehicles, and also to load and unload the testing vehicles for the test runs.

The procedure consisted of loading a vehicle, parked in the staging area, to the first of three loads. The vehicle was then weighed using two portable load cells, measuring each of the vehicle axles loads. The vehicle then began the test loop, where it entered the interstate heading northbound and turned around at the first interchange (Figure 3-2). The vehicle then reentered the interstate heading southbound and continued on to the southbound scales. As it entered the southbound weigh station, it passed over the WIM scales and then proceeded onto the static scales (Figure 3-3). Both the WIM and static readings were recorded in the weigh station control tower. The weights displayed were the measured axle group loads; where the axle group load is the sum of all tire loads on a group of adjacent axles (ASTM, 1998). The vehicle then reentered the interstate continuing southbound to the first interchange, where it turned around and continued to the northbound weigh station and repeated the weighing process. This procedure was repeated four times. The vehicle then made a stop at the northbound station, where the weight was changed, and then it continued the procedure for each of three loads.

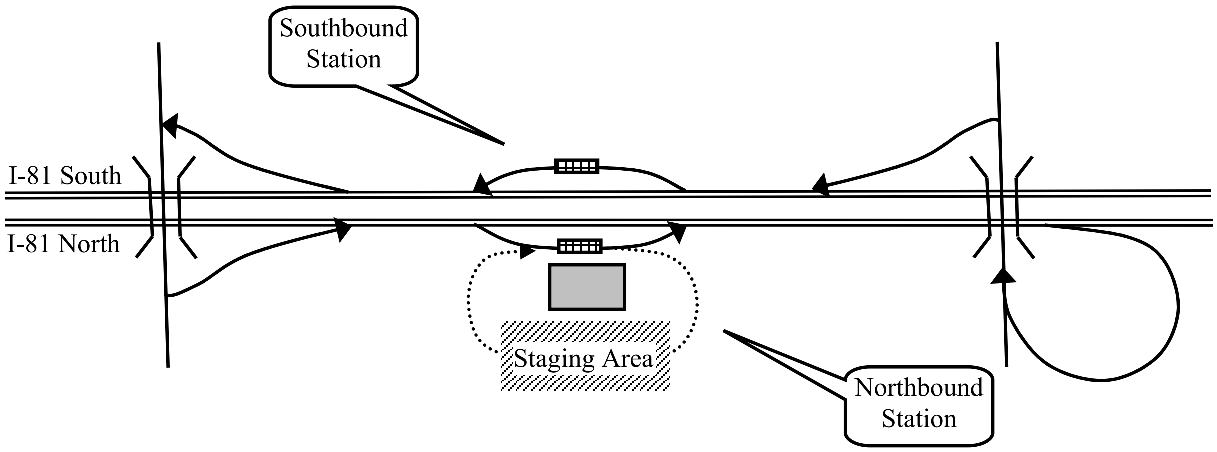

Figure 3-2 - Diagram of complete test run scenario

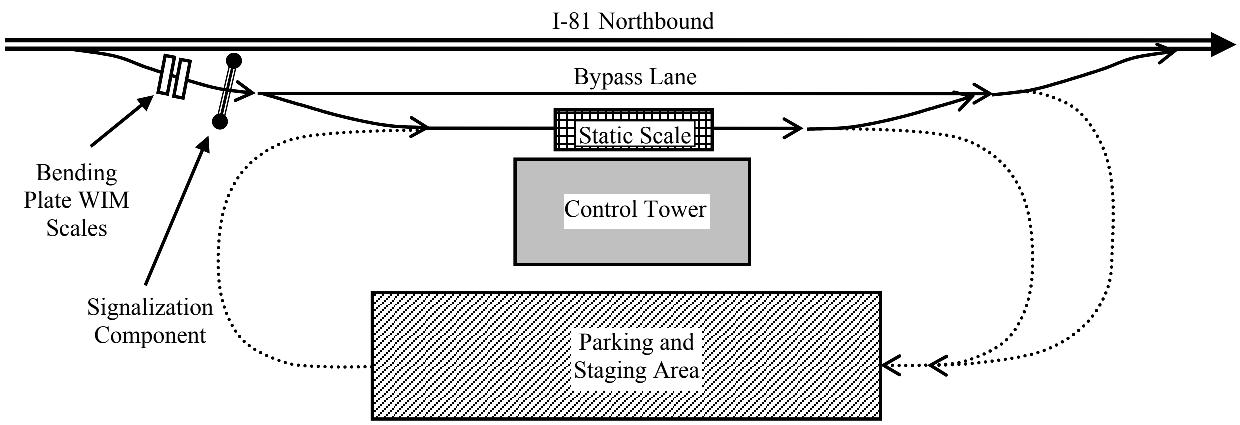

Figure 3-3 - Northbound weigh station configuration

In total, 114 runs were performed with the four vehicles over a five day period. On the first day (February 11, 2002) 18 runs were conducted with the two axle dump truck. Twenty-four runs were conducted for each of the remaining four days of testing (June 10-13, 2002) using the other three axle configurations. Each day, half of the runs were made in the northbound direction, and half in the southbound direction. The following table shows the number of runs conducted with each test vehicle. Two days of testing were conducted with the 6-axle flatbed tractor trailer since it better represents the population of trucks that would be passing through the weigh station during a typical day. The loads and recorded data are discussed in the Data Analysis section of this chapter.

Table 3-1 - Test runs conducted at Troutsville weigh station

	Direction	**Vehicle Type**			
		6-axle Flatbed	2-axle Dump	3-axle Dump	3-axle Dump w/ trailer
Number of runs	Northbound	24	9	12	12
	Southbound	24	9	12	12

3.3 Data Analysis

In analyzing the performance, two main statistical measures were considered. The measures analyzed were the accuracy and repeatability of the WIM scales. The accuracy measures the closeness, or the degree of agreement, of the measured WIM weights to the reference value. The reference values in this case are the measured static weights. On the other hand, analyzing the repeatability of the WIM readings allows us to measure how well the WIM scale can consistently determine the same weight; otherwise referred to as the scale's precision.

The majority of the analysis and calculations were conducted using the SAS® System for Windows Release 8.02 statistical analysis software. This software allows multiple comparisons of the data to be made. It also allows examining various measures and treatment variables to determine their effect on the WIM performance.

3.3.1 Repeatability

The purpose of this section is to analyze the repeatability of the measurements taken by the Troutsville WIM scales. The repeatability of the recorded data gives a good indication as to the degree of precision achieved by the scales measurements (Cottrell, 1991). The two measures that were used in this study were the standard deviation and the coefficient of variation. Both of these statistical measures are used to define the amount of dispersion, or spread, of the recorded data. When dispersion is high, the repeatability is low. Likewise, when dispersion is low, repeatability is high. For WIM technology to be considered repeatable, the latter is desirable.

The standard deviation, *s*, is often the best way to measure the amount of dispersion associated with given data. Standard deviation can be defined as follows:

$$s = \sqrt{\frac{\sum_{j=1}^{N}(X_j - \overline{X})^2}{N-1}} \qquad \textbf{(3-1)}$$

where $\overline{X}$ is the mean of N data points, X_j. This is a way of measuring the absolute dispersion of the data, so that the resultant measure is dependant on the units used in the above equation.

The second statistical measure is the coefficient of variation (COV). The COV makes use of the standard deviation and offers the ability to measure the relative dispersion of the data independent of the units and is expressed as a percentage variation:

$$COV = \frac{s}{\overline{\overline{X}}} \times 100 \quad \textbf{(3-2)}$$

A high COV indicates a high variability in the measurements. Thus, the preferred measurable outcome in this study would be for the data to have a low COV.

In the case of the data collected at the Troutsville weigh station, the WIM data was analyzed for repeatability based on several different classifications. First within-test data was analyzed, then all tests for the same scale were evaluated, and finally measurements taken on similar axle types were examined. These analyses were conducted in order to check for any apparent relationship between repeatability of the scales and the three classifications made.

3.3.1.1 Within-Test

The within-test classification refers to each "set of tests" made in which no parameters being examined changed between "tests" (i.e., those tests where vehicle, load, and direction remained the same). A single "test" then defines the weighing of an individual axle group. In total, there were 71 different "sets of tests" conducted, comprised of a total of 281 individual "tests". The coefficient of variation was calculated for each of the 71 different "sets of tests" based on the standard deviation and calculated mean.

Overall, for the 71 "sets of tests", the COV ranged from a minimum of 0.2% to a maximum of 18%. The histogram presented in Figure 3-4 shows the distribution of the reliability for the 71 "sets of tests". The distribution is heavily skewed towards the left, showing that most of the tests have a very low coefficient of variation, or good repeatability.

Over 90% of the sets of tests conducted displayed a coefficient of variation less then 10%, with over 60% displaying better than 5% COV. Figure 3-5 shows the actual percentage of test sets falling into certain ranges of COV. This data shows that the WIM scales at the Troutsville weigh station are fairly repeatable in their measurements. However, this analysis is only based on a limited number of repetitions. An increase in the number of repetitions for each test could possibly improve the COV.

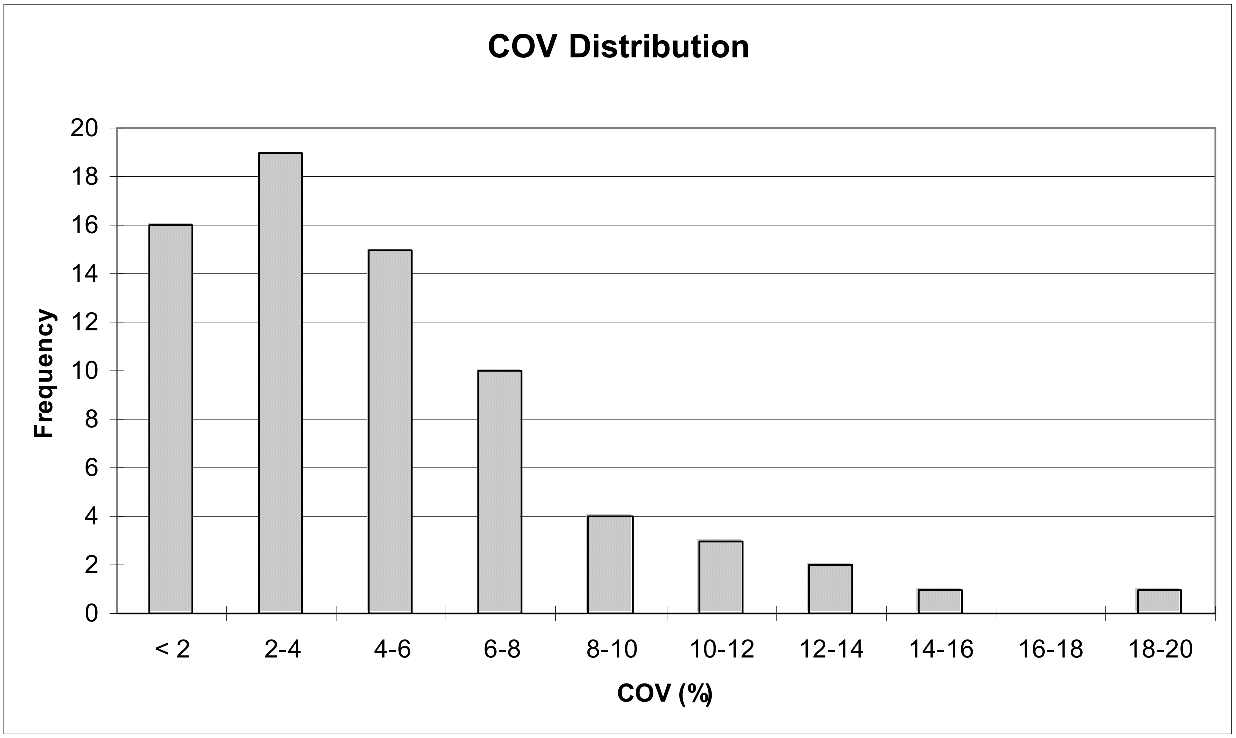

Figure 3-4 - Distribution of COV for the 71 tests conducted at Troutsville weigh station

3.3.1.2 Effect of Scale

The purpose of this section is to compare the overall repeatability of the northbound and southbound WIM scales at the Troutsville weigh station. There are many possible factors that could affect the scales repeatability, including both internal scale error and external error influences. External error influences could include such factors as the scale pavement approaches being different for the two scales, or the occurrence of passing vehicles driving off-center over the scale. These errors will have an adverse influence on the scales repeatability that can not be accounted for in the overall COV.

Of the 281 individual tests conducted, 134 were on the northbound WIM scale and 147 were on the southbound WIM scale. There is a discrepancy in the number of tests conducted on each scale because some passes of the test vehicle over the WIM scale were not successfully identified during data collection. Missed passes could be caused by two things: (1) vehicle did not drive completely over the loop detector and was missed; or (2) weight was not identified by researcher on screen. As a result of this, not all test runs were used in the comparison between the two scales. Only those runs possessing the same testing parameters that were recorded on both scales were used. The COV was then calculated for 66 different sets of tests; 33 identical sets of tests on each of the two scales.

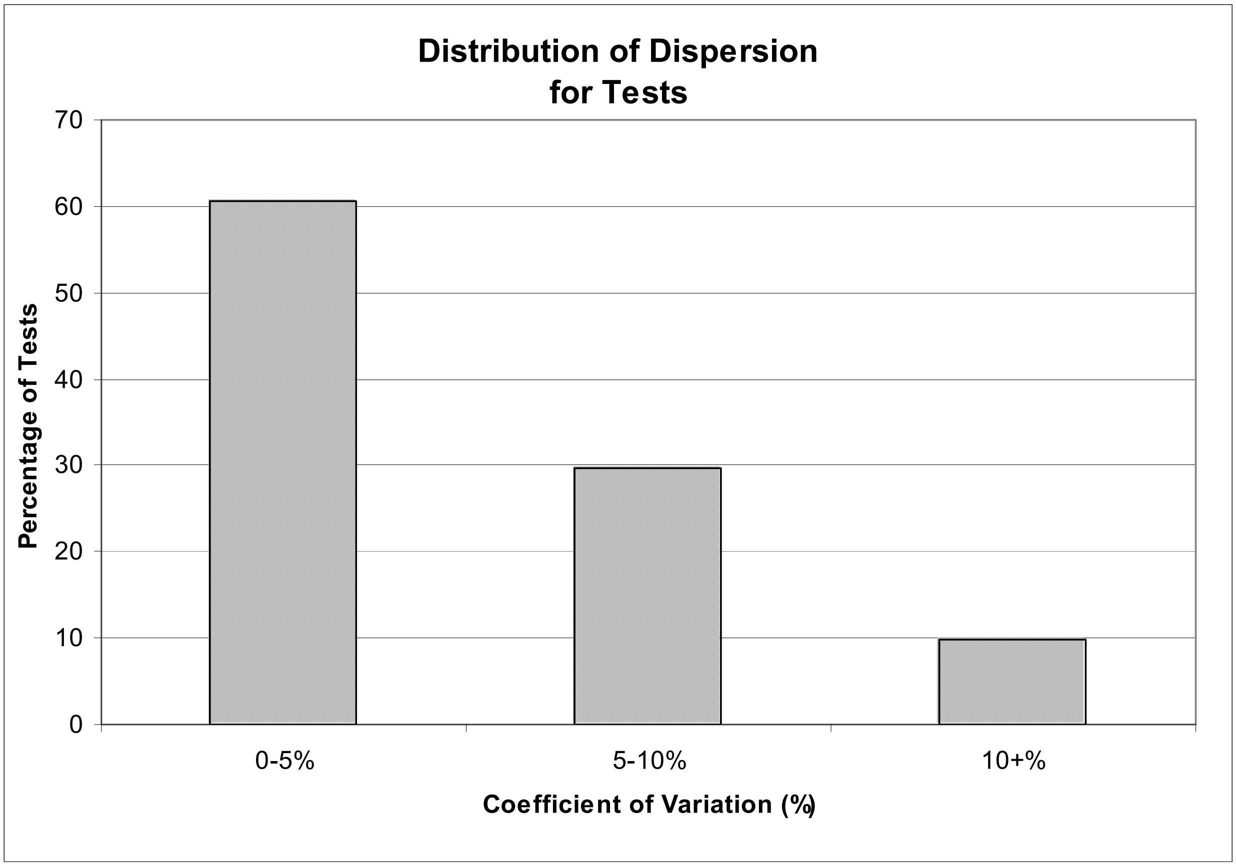

Figure 3-5 - Percentage of tests by range of COV

Figure 3-6 shows the 33 comparisons of the COV for the sets of tests conducted on each of the two scales. There is no consistent pattern showing that one scale is more repeatable than the other. Rather, both scales are subject to error. The average COV for the southbound scale is 4.6% and for the northbound scale is 4.8%

3.3.1.3 Effect of Axle Group Type

Axle group type refers to the different number of closely spaced axles that make up an axle group. In the testing conducted at Troutsville, three different axle group types were considered: single, tandem, and tridem. Single refers to an axle group consisting of only one axle; tandem refers to an axle group consisting of two axles; and tridem refers to an axle group consisting of three axles spaced very closely together. These three axle groups types were chosen for the study because they make up the most frequently observed types of axle groups passing through the weigh station.

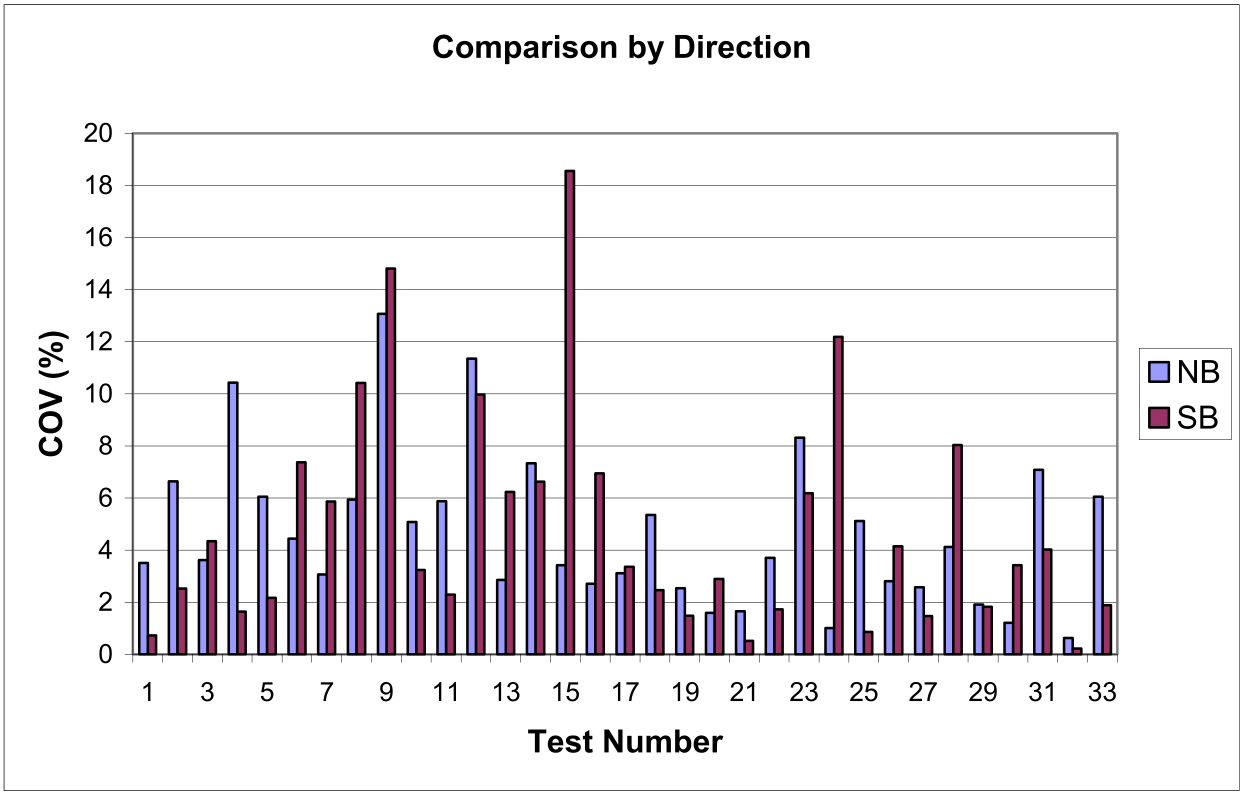

Figure 3-6 - Comparison of repeatability for northbound and southbound scales

An analysis of the scale's performance by axle group was conducted, rather than for gross vehicle weight (GVW), because it has been shown that overloaded axles cause the most significant damage to the infrastructure. It is important to detect an overloaded axle versus just an overloaded vehicle, because it is highly probable that a vehicle will have an overloaded axle without violating GVW limitations. The number of tests conducted with each type of axle group is shown in Table 3-2 by direction.

Table 3-2 - Tests conducted at Troutsville weigh station

Direction	Group	# Passes
Northbound	TOTAL	134
Northbound	Single	58
Northbound	Tandem	52
Northbound	Tridem	24
Southbound	TOTAL	147
Southbound	Single	65
Southbound	Tandem	59
Southbound	Tridem	23

An analysis of the repeatability of each scale was conducted, examining the effect of the type of axle group. The average COV was calculated for each of the three axle types for both directions of travel. Figure 3-7 below shows the calculated averages. The hashed bars depict the values for the southbound direction and the dotted bars depict the values for the northbound direction. As can be seen in Figure 3-7, the axle group type does not appear to influence the repeatability of the scales. While it does appear that for the northbound scale the average COV decreases as the number of axles in the group increase, the trend is insignificant. Since the same trend does not occur for the southbound scale, it is most likely that the trend found for the northbound scale is random.

While the results of this testing indicate that precision of the WIM scales is not related to the group type, there is still reason to believe that axle group type could still play a role in the precision achieved by a scale. Closely spaced axles, such as tridem axles, have a greater amount of inter-effect of the induced dynamic forces. The inter-effect of such forces could result in a decrease in the precision of a scale's measurements. The roughness of the approach roadway could also induce variation in dynamic forces as the vehicle passes over the scale. This variation could lead to a shifting in the amount of force that each axle in the group has on the WIM sensors. This can result in imprecise readings of the axle group weight as the axles pass over the scale. Additional testing would need to be conducted on the Troutsville WIM scales to determine if this could be the case.

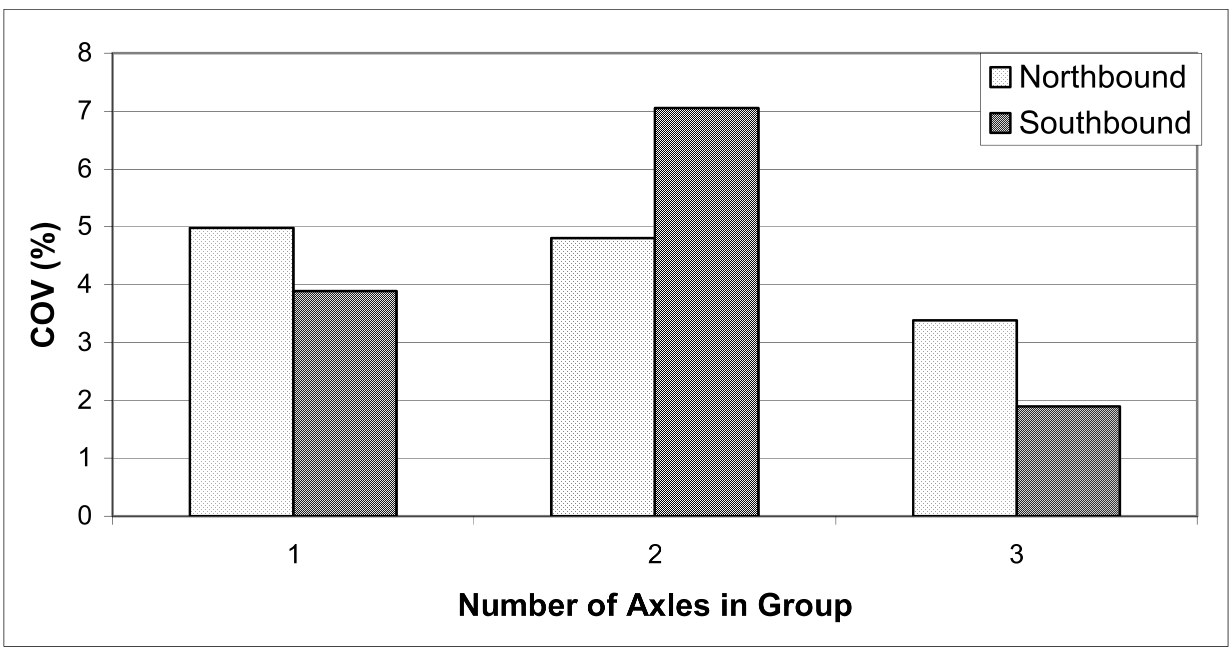

Figure 3-7 - Repeatability of scales by axle group type

3.3.2 Accuracy

An analysis of the accuracy achieved by WIM scales provides three things. The first is an indication as to whether certain testing parameters have more effect on the accuracy of the scales readings than others. The second is evidence as to whether or not, under these testing conditions, the scale satisfies ASTM standards for a type III WIM system. Thirdly, it provides an in-practice comparison to the WIM device installed at the Virginia Smart Road which is discussed in the next two chapters.

Accuracy can be defined as the degree of conformity a measure has to a true value (Cottrell, 1991). In this study, the true value is taken to be the axle group weights determined by the weigh station static scales, and the measure as the WIM axle group weights. An inaccurate scale can introduce a high amount of systematic error into the measurements. Proper calibration could potentially remove a significant amount of that systematic error. The accuracy measure is defined as a percentage difference between the true value and the recorded value. As such, the larger the percentage difference, the worse the accuracy of the scale. The value of accuracy can be defined as follows:

$$Accuracy = \frac{W_d - W_s}{W_s} \times 100\% \tag{3-3}$$

where W_d is the weight measured by the WIM scale, and W_s is the weight measured by the static scale. If the mean value of this equation for a sample of weight observations does not differ significantly from zero, then the WIM scale is said to be accurate. Any difference from zero can be thought of as a systemic error, or bias, in the WIM measurement (Strathman, 1998).

Accuracy is the key issue associated with WIM technology. Error in scale accuracy results in lower efficiency at a weigh station. In order to accommodate for lower accuracies in the WIM scales, weigh station operators apply weight threshold factors. The weight threshold factor in effect reduces the maximum permitted vehicle weight allowed through the scale. This results in vehicles that are not actually overweight being stopped and statically weighed. An analysis of the actual accuracy of the WIM scales can help to identify whether a weight threshold is necessary, and also what factors are affecting the achieved accuracy.

The purpose of this section is to try to identify any trends relating the calculated accuracies and the parameters that were varied in the testing. Identifying those parameters will help in developing future technologies to be more efficient and accurate. The parameters that are examined in this section are the axle group type, vehicle type, and direction. As before, the three axle groups are the single, tandem, and tridem axles; the four vehicle types remain the two axle dump truck, the three axle dump truck, the five axle dump truck / equipment trailer combination, and the six axle flatbed; and the two directions refer to the separate northbound and southbound scales. Each of the 281 individual tests (axle group passes) was categorized according to direction, axle group type, and vehicle type.

3.3.2.1 Parameter Significance

An Analysis of Variance (ANOVA) was conducted on the collected data. This was done to determine which parameters (direction, vehicle, and axle group) had the most influence on the accuracy of the measurements. The ANOVA determines the significance of a parameter by ranking how different its mean is from the other parameters. The ranking is quantified by the p-value. A very small p-value indicates a parameter with high significance; while a large p-value indicates little or no significance. At the 95% level of confidence, a p-value would be considered significant if it is less than 0.005. The analysis revealed that the direction and axle group type had a significant degree of influence on the accuracy of the measurements, with p-values of 0.0025 and 0.0042, respectively. The vehicle type, however, showed no evidence of influencing the accuracy significantly with a p-value of 0.5281.

Table 3-3 - Type III sums of square ANOVA results

Source	D.F.	Type III SS	Mean Square	p-value
Direction	1	321.25	321.25	**0.0025**
Vehicle Type	3	76.52	25.5	**0.5281**
Axle Type	2	383.88	191.94	**0.0042**

3.3.2.2 Parameter Means

A Tukey's Standardized Range (Honestly Significant Difference) test was conducted on the testing parameters at the 0.05 level of confidence. This analysis determines if significant differences exist between the mean accuracies of the various treatments parameters (vehicle type, axle group type, or direction). Significant differences among the means of a parameter would indicate that that parameter has a high level of influence on the accuracy.

In the analysis of the four different vehicle types, no consistent pattern of significant difference was detected between the means of the parameters. Of the six possible vehicle type comparisons, only one (between the two-axle dump and three-axle dump) indicated a significant comparison. This is consistent with the analysis of the p-value from the ANOVA, which indicated that the vehicle type was insignificant in affecting the accuracy measurements.

Of the three axle group types, two of the three comparisons indicated significant difference in means. The comparison between the single and tridem axle did not show a significant difference. These findings are consistent with the p-value of the ANOVA, which showed strong evidence that the axle group type had an effect on the accuracy. However, with only three comparisons made, it is difficult to draw a strong conclusion.

The Tukeys' analysis of the direction parameter did indicate that there was a significant difference between the two means. However, the Tukeys' cannot accurately be used on only two treatments to describe the difference between the means. In addition to using the results of the Tukeys' to examine which parameters had a significant effect on the accuracy, the accuracy data was examined graphically. However, graphical solutions indicated no trends relating any of the parameters to the accuracy measurements. In particular, accuracy was graphed against axle group type, vehicle type, and load. None of these comparisons resulted in significant trends. Rather, they indicated that accuracy is not significantly affected by any one of these parameters.

3.3.2.3 ASTM Compliance

American Society of Testing and Materials standard E-1318 sets the standards for the accepted level of accuracy of in-practice WIM systems. These requirements, as discussed in section 2.2.1, are based upon the percentage of measurements that achieve a certain level of accuracy. American Society of Testing and Materials standard E-1318 requires that the scales at the Troutsville weigh station, which are Type III WIM scales, achieve 10% accuracy or better on 95% of the axle group weighings.

The accuracy of the collected data was analyzed to see if it complied with the ASTM standards. The data was analyzed in terms of all tests, by axle group type, and by vehicle type for each direction. Table 3-4 shows the results of this analysis. It indicates that, overall, the WIM scales at the Troutsville weigh station do not conform to the ASTM standards.

3.4 Summary

Repeatability of the WIM scales at the Troutsville weigh station was based on an analysis of the coefficient of variation (COV), a highly accepted measure of precision. For the overall analysis of the 71 sets of tests conducted, the scales were found to be highly repeatable, with over 90% of the tests having a 10% or better COV. Additionally, the two scales examined in the study, northbound and southbound, did not exhibit a significant difference in their repeatability. Nor did it appear that the axle group type had any influence on the repeatability of the scales. The average COV for single axles was 5.0% on the northbound scale and 3.9% on the southbound scale. For tandem axles the COV was 4.8% and 7.0% for on the northbound and southbound scales, respectively; and 3.4% and 1.9% for the tridem axles.

The analysis of the scales' accuracy suggested insignificant relationships between several testing parameters and the measured accuracy. The accuracy appears to be independent of the axle group type, vehicle type, and direction. While the Tukey's determined that the axle group type has the most influence on the accuracy, there is not enough evidence to determine that it significantly affects the accuracy. The average percentage error (accuracy) for each of the three axle types; single, tandem, and tridem, is 5.6%, 8.0%, and 5.1%, respectively. The lack of a trend among the percentage error with axle group type suggests that the axle group type may not have an influence on the accuracy of the scale's measurements.

Table 3-4 - ASTM compliance

		Direction	Percent Conformity	Complies ASTM
All Tests		All	77	No
		North	86	No
		South	69	No
AXLE	Single	North	83	No
		South	86	No
	Tandem	North	90	No
		South	41	No
	Tridem	North	83	No
		South	91	No
VEHICLE	1	All	92	No
		North	83	No
		South	100	Yes
	2	All	56	No
		North	88	No
		South	46	No
	3	All	74	No
		North	86	No
		South	61	No
	4	All	79	No
		North	86	No
		South	72	No

One factor that can have a great influence on the accuracy and repeatability of a WIM system is the roughness of the approach leading up to the scale. The approach at the Troutsville weigh station is not perfectly flat. There is a high probability that it is affecting the scales readings. Determining what portion of the inaccuracy is due to the approach roughness and what portion is due to scale error, was not part of this study. However, it is fair to recognize both sources of error.

Based on the tests conducted in this study, the WIM scales at the Troutsville weigh station were found not to comply with the ASTM standards for Type III WIM scales. The overall percent compliance of the collected data was 77%, well below the required 95%.

CHAPTER 4: SMART ROAD WEIGH-IN-MOTION INSTALLATION

The Virginia Smart Road is an all-weather, controlled traffic, transportation testing facility located in Blacksburg, Virginia. The facility offers the unique ability to conduct research on various new technologies while controlling the specific parameters of the testing. The controlled traffic capabilities, which allows for testing to be conducted without the influence of public traffic, make this facility an optimal environment to evaluate a WIM system. The Virginia Smart Road allows for testing with various simulated traffic loads, some of which would not be permitted on public access highways.

In addition, an underground conduit network with manhole access (bunker) is used for operating a power and data collection network without interfering with traffic flow. The conduits are placed on both sides of the heavily instrumented roadway to provide access to power and communications without running bare wires across the roadway. The bunkers are equipped with all necessary data acquisition systems for the roadway sensors. The conduit network also routes power to the bunker, where all pavement instruments are connected to the data acquisition system. A fiber optic network serves to provide transmission of digital data originating from on-site data acquisition systems, and provides real-time monitoring capabilities.

The facility also serves as a pavement research facility which includes a heavily instrumented pavement test bed. The pavement research facility is approximately 2.5 km in length, of which 1.3 km is flexible pavement that is divided into 12 sections of approximately 100 m each. Each flexible pavement test section is comprised of a multi-layer pavement system and possesses a unique structural configuration. The 12 flexible pavement sections are equipped with over 500 different sensors installed in the pavement to monitor pavement response to traffic and environmental loadings.

4.1 Selection and Installation of a Weigh-in-Motion System

The system selected for evaluation at the Virginia Smart Road was the *Oy Omni Weight Control Ltd. Safe Load System™ WIM Dynamic Scale* (OWC scale). This system was chosen because it offers many unique characteristics aimed to reduce some of the common problems seen today with existing WIM systems. The design and construction of the OWC scale, and its supporting software, is thought to address the limitations associated with traditional WIM technologies. Among the advances made by the OWC scale are that the system is completely sealed from the environment, it is a multiple-sensor WIM system, it can be used in varying geometric conditions, and it is designed to be accurate for high-speed traffic.

The OWC scale consists of a carbon steel weighing element pre-cast into a steel reinforced Portland cement concrete (PCC) base. The total weight of the scale and PCC base is approximately 2000 kgs. The PCC base measures 1600 mm longitudinally by 4000 mm transversely, and is approximately 110 mm thick. The carbon steel weighing element is a closed box measuring 1100 mm longitudinal to traffic direction by 3500 mm transverse to traffic direction. The frame of the weighing element includes five steel beams that run longitudinally at equal spacing, to which the sensors are attached. The 200 mm high beams are spaced 850 mm on center. The sensor elements (strain gauges) are attached to small plates which were then welded to the each face of the beams at the ends. In total, ten strain gauges are used. Another ten strain gauges are installed as backups.

On the exterior of the top of the scale is a steel grid. The purpose of the steel grid is to interlock with the HMA during installation. On the underside of the top of the scale, there are four temperature sensors. The weighing element is attached to the PCC base by welding it at connection points to the steel reinforcement.

With a completely sealed system, the scale has been designed to be free from the effects of the environment. Hence, no maintenance would be expected after installation. This prevents corrosion and deterioration of the electronic and internal parts of the scale due to moisture. By sealing the system, maintenance costs are in effect eliminated, and reliability of the system should increase. In addition, all steel has been painted with two layers of protective paint to prevent corrosion.

While the idea of MS-WIM is not new, the OWC scale and its software have advanced the technology by offering to allow trucks to pass over the scale at highway speeds with expected accurate readings. This could be accomplished through the use of an array of 20 sensors installed in the scale, and a neurological computer software system that is constantly calibrating the scale. Only ten sensors are functioning at any one time, while the remaining sensors are spares. If for any reason a sensor malfunctions, the remaining sensors are put into use. This increases the reliability of the scale. The high-speed accuracy that is offered by the scale's manufacturer promises to help reduce the delay that is incurred by truckers at weigh stations. The manufacturer suggests that the scale "will continue to supply reliable results for its expected lifetime of over 10 years" (OWC, 2001).

4.2 Installation of Weigh-in-Motion System

The installation of the OWC scale at the Virginia Smart Road occurred over a period of three days, from May 21 to May 23, 2001. The installation was the joint efforts of a team from the *Omni Weight Corporation*® and the Roadway Infrastructure Group at Virginia Tech. Excavation, placement of the WIM scale, and paving work were performed by an outside contractor.

4.2.1 Site Selection

Selection of the installation site of the OWC scale at the Virginia Smart Road was governed primarily by three factors. First, per manufactures instructions, the scale could be installed on a roadway with a slope of up to two percent. The manufacture further suggested its application in a slope up to six percent, given that the actual scale is installed level. Second, the scale had to be installed in a location where it could be easy connected to an instrumented bunker equipped with fiber optic lines. Third, the scale could not interfere with instrumentation previously installed in the roadway. It was also desirable to have the scale located in a fairly straight stretch of roadway, with at least 100 m of straight roadway preceding the scale (Omni Weight Corporation, 2001).

The installation site was selected using the aforementioned criteria. Section C of the Virginia Smart Road was selected for the installation of the scale, approximately 36 m preceding bunker two (bunker two is located at Station 105.48). The limitation of the roadway slope restricted the scale from being installed past the Jennell Road Bridge, where the slope reaches six percent. The roadway preceding the bridge is at a slope of just over two percent. While this exceeds the two percent limitation, it was the minimal slope for any adequate installation site on the road. In addition, since this scale offers the unique ability to operate under varying geometric conditions, it was desirable to install it on a sloped portion in order to quantify the impact of grade on the system performance.

Bunker two was the most adequate bunker to install the necessary hardware in for data acquisition from the scale; it has the least instrument connections. Bunker two provided enough room for the installation of the new equipment, in addition to being equipped with fiber optic lines for the transmission of the data being produced. The scale was also installed in the instrumented lane for easier connection of the conduit to the bunker, and minimal damage to the road during construction. The scale had to be installed far enough away from the bunker to prevent interference with instrumentation already installed in the pavement, such as strain gauges, pressure cells, and thermocouples.

4.2.2 Site Preparation

After the installation site had been determined, measurements were taken and a layout was painted on to the existing roadway wearing surface outlining the portion of the pavement structure that was to be removed. The area to be excavated was a rectangular section measuring 4.0 m in the direction of traffic and 6.6 m in the transverse direction. The transverse dimension extends from the centerline of the roadway to the edge of the pavement. Although the actual scale is only 4.0 m long in the transverse direction, the pit was excavated to the edge of the shoulder for ease of excavation and installation of the conduit pipe. The scale only measures 1.6 m in the longitudinal direction, but the pit was cut to 4.0 m so that the material around the scale could be compacted tightly around it to ensure its stability in the roadbed.

In addition to laying out the portion of pavement structure to be removed, a line was painted from the excavation site to bunker two, along which the conduit was to be laid. This line was approximately 0.75 m from the edge of the pavement.

4.2.3 Excavation of Pit

The first step in removing the existing pavement structure was to make saw cuts into the pavement to allow for easier removal, with minimal damage to surrounding pavement. A large self-propelled wet saw with a diamond tipped blade was used to cut full depth through the existing flexible pavement. The initial cuts were made around the perimeter of the area, extending down through the top three layers: SM 9.5E surface mix; BM-25.0 base mix; and the open graded drainage layer (OGDL), to a depth of approximately 280 mm. The surface mix contained aggregate of maximum nominal aggregate size of 9.5 mm, and a binder type PG 76-22, designated as E. The BM-25.0 base mix contains aggregate of maximum nominal aggregate size of 25.0 mm and binder type PG 64-22. The OGDL is stabilized using 2% of PG 64-22 binder.

Figure 4-1 - Saw-cutting of existing pavement prior to removal

Prior to layer removal, cylindrical and beam cores were extracted from the pavement for laboratory testing. A backhoe was brought in to lift out the pavement material after it had been cut from the road. After an initial attempt to remove the top three layers, it was found that the pavement structure was extremely strong, and that the material had to be cut up into smaller pieces in order to remove it from the pit. As attempts to use a Jack Hammer to break up the pavement were unsuccessful, additional cuts with the wet saw were made in both the longitudinal and transverse directions. The backhoe was then able to remove the top three layers in large pieces, where they were taken to another site for disposal.

Figure 4-2 - Removal of existing pavement by backhoe

Removal of the top three layers of the pavement exposed the 21-A subbase, a cement treated aggregate material. The 21-A aggregate has 100% passing the 50 mm sieve and 8% fines passing the 0.075 mm sieve. The percent of stabilizing cement mixed in with the aggregate is 3.5%. The wet saw was then lifted down into the pit and used to make cuts around the perimeter of the pit, down through the 21-A to a depth of about 150 mm. Since the cement treated aggregate would be very difficult to remove without first cutting it into smaller pieces, an additional saw cut was made down the middle of the pit in the transverse direction. In addition, the Jack Hammer was used to make five rows of holes in the longitudinal direction. These rows of holes introduced lines of weakness that allowed the 21-A to break into smaller pieces as it was removed from the pit.

After removing the 21-A, the next layer to be removed was the 21-B subbase, a non-bonded aggregate material. The composition of the 21-B material is the same as that of the 21-A, excluding the cement stabilization and less amount of fines. There are 5% fines passing the 0.075 mm sieve for the 21-B material. In removing the 21-A layer however, a portion of the 21-

B material had also been removed; so determining its actual thickness was not possible. From the original design, it was estimated to be about 175 mm. In removing the 21-B material to expose the subgrade, it was also necessary to remove the geotextile fabric that had been placed under the subbase to prevent infiltration of fines from the subgrade into the subbase. Removal was achieved by pulling up the fabric with the backhoe shovel.

4.2.4 Leveling of Pit

In order to ensure optimal performance of the scale, the manufacture recommended that the scale be installed horizontal level, not necessarily parallel to the surface of the road (Omni Weight Corporation, 2001). In this situation, the road not only sloped in the longitudinal direction, but also in the transverse direction. The road crowned at the shoulder line of the lane in which the scale was being installed. This meant that the four corners of the scale would not be equal depths from the roadway surface, but in fact would all sit at varying depths from the surface. The bottom of the pit was only required to be level under the footprint of the scale, not the remainder of the pit.

Figure 4-3 - Leveling of the excavated pit

The manufacturer also recommended that the scale be covered with at least 50 mm of HMA. It was then necessary to accurately determine the required depth of the pit to be dug so that the scale could be covered with 50 mm of HMA at its shallowest point. The scale itself measures 350 mm in height. In addition to the thickness of the HMA and the height of the scale itself, about 75 mm of compacted sand was allowed for under the scale. At its shallowest point then, the pit needed to be excavated to a depth of 475 mm.

Using a level and surveying rod, the excavating crew leveled out the bottom of the pit so that at its shallowest point it was at about 475 mm. This was done by removing subgrade material a shovel full at a time, and repeatedly spot checking to make sure the depth and level were adequate. Once the base was at adequate depth, crushed limestone sand was brought in from a local quarry to bring the bottom of the pit up to proper level, and to serve as support for the scale. A laser beam aligner was set up for leveling the base of the pit as the sand was added. Spot-checking under the footprint of the scale, for proper depth, assured that the scale would sit level in the pit. The sand was brought up to a depth of 375 mm from the roadway surface at its shallowest point. This allowed for about 25 mm of settlement once the sand was compacted, which would bring the final depth of the sand base from the surface to 400 mm at the

Figure 4-4 - Compaction of the base material prior to placement of the scale

shallowest point. Once the sand was placed, a small, hand driven, roller compactor was brought in to compact the sand for a solid level base. After compaction, the sand was rechecked for level and depth, and minor adjustments were made.

4.2.5 Placement of Scale

The scale was delivered to the site approximately one week prior to the installation date. Shipped from Finland via cargo ship, and transported to the Virginia Smart Road by truck, the scale came in a wooden crate. After removing the wooden crate from around the scale, the scale was prepared to be lifted into the pit. At each of the four corners of the concrete slab that the scale sits on, there is a built-in lifting lug. Two chains were attached to the slab; one chain to each of the two diagonal corners of the slab. A small boom truck was brought in to lift the scale off of its pallet and into the pit. The chains were then attached to the truck, with an attempt being made to keep all lengths of the chain equal for level lifting.

Figure 4-5 - Initial placement of the scale by VDOT boom truck

Lifting the scale proved difficult because of the weight of the scale. At approximately 2040 kilograms, the small boom truck was not powerful enough to maneuver the scale easily. The scale had to be set down several times so that the truck could move and retain enough strength to place the scale into position.

An initial attempt was made to set the scale into position. At this time, the scale was still completely wrapped in the plastic it had been shipped in. The scale was lifted by the boom truck and placed in the pit temporarily to check the level and depth. It was positioned so that it was placed against the edge of the pit along the centerline of the roadway, and centered in the pit in the longitudinal direction. After checking the level and depth, the scale was lifted back out of the pit and set on the adjacent pavement.

It was necessary to place the rolling compactor back in the pit and re-compact the sand to achieve proper level and depth. The scale was then reattached to the boom and lifted over the pit. The protective plastic tarp was then removed, and then the scale was placed in the pit for final positioning making sure it was perpendicular to the centerline of the roadway. In order to ensure final leveling, several bar levels were placed on the scale in multiple directions. Once adequate level and depth were confirmed, the chains were disconnected from the lifting lugs and removed from the scale.

After final positioning of the scale, measurements were taken to determine the actual depth from the top of the scale to what would be the final wearing surface of pavement once it was placed.

As expected, the measurements at all four corners of the scale to the future wearing surface varied. On the side of the scale nearest the centerline, the depths to the top of the two corners were 75 mm and 50 mm (up-slope corner then down-slope corner, respectively). On the side of the scale nearest the shoulder line, the depths to the top of the two corners were 255 mm and 230 mm (see Appendix A).

4.2.6 Scale Set-up

While the excavation of the pit was taking place, a team from the *Omni Weight Corporation®* (OWC) was equipping the bunker for the data collection and processing of information from the scale. The bunker was outfitted with the external SLS electronics and peripherals that collect the signals from loads on the scale and transmit them to the analyzing software. In addition, they set up connection to the Internet, via fiber optic lines, that would transmit the data from the bunker to the analyzing computers. A small whole was drilled in the side of the concrete bunker, through which a small conduit would pass to carry the cables into the bunker and be attached to the equipment.

Figure 4-6 - Installation of conduit and grounding wires

Cables that would pass through underground conduit pipes to the bunker made connection of the scale to the external electronics. After the pit excavation was finished, the excavating crew began digging the trench that would house the conduit carrying the cables, outside the shoulder. The trench was dug to the same depth as the pit, so that the PVC piping carrying the cables would not have to make any changes in the vertical direction. After the trench was dug to the proper depth, approximately 75 mm of the manufactured sand was placed in the bottom of the trench to act as a stable foundation for the conduit.

Connected to the scale element itself, were two 16 mm^2 x 20 m exposed copper cables for grounding of the device. One of the cables was laid around the perimeter of the pit, while the other was laid along the bottom of the conduit trench. Each of the cables was laid uncovered, making sure not to come into contact with anything else. The cables were then covered with sand to protect them.

The OWC team then began the connection process between the scale and the equipment inside the bunker. The scale had a 100 mm diameter conduit outlet for the system connection cables. The cables were then fed through a length of 100 mm diameter PVC conduit that brought the cables to the grass shoulder of the roadway. The PVC conduit was then prepared and connected to the conduit outlet on the scale. The process continued as the OWC team fed the cables through the PVC conduit down the length of the trench, attaching each piece of PVC conduit as they were placed. The cable coming from the scale only reached half way down the trench. The team then started from the bunker end and continued the same process towards the scale. At mid-length along trench, the meeting cables had to be spliced together; and the final connections of the PVC conduit made.

Final connections and setup of the hardware inside the bunker continued, while the excavation and paving crews continued work on the pit and trench.

4.2.7 Backfill and Paving

Figure 4-7 - Placement of granular base material over conduit

Once the wiring and the final connections of the conduit had been completed, backfill of the trench and pit was begun. A layer of 21-B granular base material was first placed in the pit covering the PVC conduit and around the PCC base. The granular base material over the PVC conduit served to protect the conduit from the high heat of the HMA during the paving process. Direct contact of the HMA to the conduit running from the scale to the shoulder could result in damage to the wiring. Additionally, the 21-B granular material placed around the scale base would hold it in place during paving. The 21-B material was filled to a thickness of about 50 mm from the top of the scale's steel frame, covering the PCC base that the scale rests on. This material was then compacted to ensure a stable base for the HMA.

Marks where made around the edge of the pit with paint, designating the depth to which each lift of HMA was to be laid. Four lifts total where placed, two of base-mix and two of wearing surface. The base mix that was placed was BM-2. The mix came from L.H. Sawyer Paving CO., Inc., in Salem, VA. It was mixed and placed on May 22, 2001. The BM-2 mix is very similar to the BM-25.0 that was taken out of the pit; however, it is not a Superpave mix design. The mix design for the BM-2 is shown below in Table 4-1.

Table 4-1 - BM-2 mix design

Sieve Size	Total % Passing	Design/Spec. Range
37.5	100.0	100
25.0	92.4	90 - 100
19.0	76.9	90 Max
2.4	22.2	19 - 45
0.1	3.5	1 - 7
Asphalt Content = 4.2%		

The BM-2 was placed in two lifts, the first of which was placed to a level of approximately 80 mm from the existing pavement. The HMA was dumped from the truck, and then spread around by the backhoe and shovels. This lift was compacted using a small rolling compactor. The second lift brought the level to about 50 mm from the top of the existing pavement. This lift was compacted using the large pavement roller.

Figure 4-8 - Placement of first lift of BM-2 layer

The wearing surface was placed over a two-day period due to inclimate weather. The first lift of the wearing surface was placed on May 22, 2001. The wearing surface material was SM-9.5D, from Asphalt Ready Mix, Inc., a subsidiary of Adam's Construction Company, Blacksburg VA. The SM-9.5D mix design is shown in Table 4-2. The first lift of the wearing surface was placed to a depth of approximately 25 mm below the existing surface. After being placed with an asphalt paver, this lift was compacted using the large pavement roller. As the second and final lift of the

Table 4-2 - SM-9.5D mix design

Sieve Size	Total % Passing	Design/Spec. Range
1/2	100.0	99 - 100
3/8	96.0	90 - 100
#4	60.5	90 Max
#8	38.9	32 - 67
#200	4.7	2 - 10
Asphalt Content = 5.6%		

wearing surface was being placed, a storm moved in and significant rainfall occurred. The paver was able to get the final wearing surface lift spread in the instrumented lane, but not in the shoulder. The large rolling compactor was used to try to compact the wearing surface, but because the rain was falling so rapidly, the asphalt cooled very quickly and became difficult to adequately compact. It was decided to hold off placing the final wearing surface mix down in the shoulder until the next day.

On the morning of May 23, 2001, the final wearing surface lift was placed at the shoulder. The HMA that was delivered was an SM-9.5D from L.H. Sawyers Paving CO., Inc., Salem VA. Using the asphalt paver, the SM-9.5D was placed in the shoulder to bring it up to existing surface grade, and then compacted using the large rolling compactor. This lift was much easier to compact, as the temperature of the material remained hot enough for adequate compaction.

After paving was completed, the excavation crew moved in to backfill the conduit trench. They first placed about 100 mm of the 21-B subbase material over the conduit pipe. This granular material was then compact to stabilize the conduit and to limit settlement. The trench was then backfilled with the subgrade material that was originally removed from the trench.

4.3 Problems Encountered

Throughout the three-day installation process, intermittent rainstorms developed. Rainfall during the placement of the wearing surface over the scale was of particular concern. The rain could lower the temperature of the newly placed HMA and affect the proper compaction of the HMA. That could contribute to the resulted dip in the pavement in that location. This dip in the pavement was noticeable while driving over the scale at high speeds. This could have effect on the WIM reading.

The accuracy of the scale itself can be affected as a result of the installation procedure. Two of the most important factors affecting the scale, resulting from the installation, are the dynamic response of the pavement as the tires of the vehicle pass over, and the profile of the pavement approaching the scale (Cunagin, 1988). The result can be inaccurate readings of the scale due to the dynamic forces acting on the scale as a result of the bouncing of the truck

Previous research has found that an adequate distance before and after the scale would help reduce the effect of an oscillating vehicle, increasing the scale's accuracy. However, what qualifies as an adequate distance has not been determined. The manufacturer of the OWC scale suggests four meters of mill and resurfacing on each side of the scale (OWC, 2001) to ensure smooth pavement. However, the resurfacing of only 1.2 m on each side of the scale was done in accordance with the manufacturer's direct recommendation. Cunagin *et al.*. (1991) found, however, that the pavement profile up to 155 m (500 ft) preceding the scale and 31 m (100 ft) after the scale can influence the oscillation of the vehicle, hence increasing dynamic forces and reducing accuracy.

While it may be most beneficial to the accuracy to resurface 155 m before and 31 m after the scale, as suggested by Cunagin *et al*., it is not necessarily economically prudent. Determination of an adequate distance to resurface the pavement is dependant on the roughness of the existing pavement. In the case of the the installation at the Virginia Smart Road, the existing pavement was in very good condition. It is the opinion of the Virginia Tech research team that at least 20 m of resurfacing should be performed in the installation of a completely buried scale to ensure smooth pavement around the scale. If the pavement outside this zone is found to be rough, appropriate measures should be taken.

4.4 Calibration

The scale was calibrated using a flatbed tractor-trailer at varying load and speed for 36 tests. The truck used in the calibration process was an International 8200 Class 887 with an engine power of 350 hp at 2100 rpm. The truck was loaded to three different weights using concrete Jersey walls; each wall weighing approximately 2250 kg. Figure 4-9 below depicts a schematic showing the axle configuration and sample loading for the truck and the trailer.

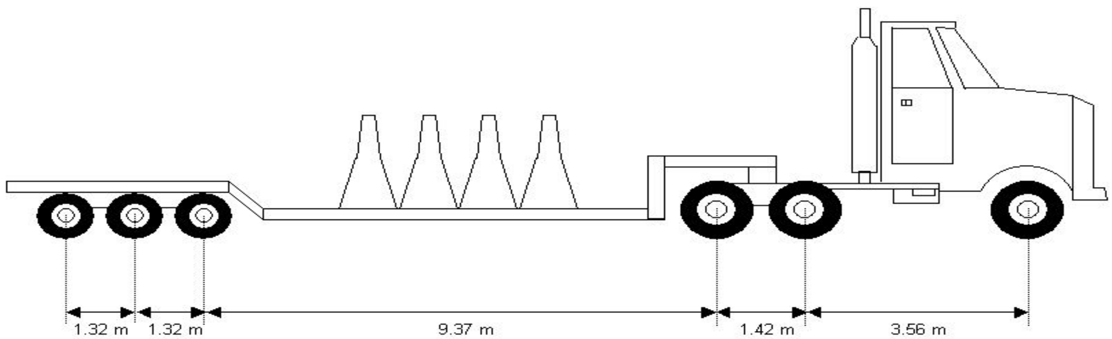

Figure 4-9 - Calibration vehicle schematic

For each of the three load arrangements placed on the truck, several runs over the scale were conducted. For each run, direction (uphill/downhill), speed, and time were recorded so that the manufacturer could then input that information into the calibration software to "train" the scale. Axle weights were taken after each of the different loads was placed on the truck. This was done using two portable static load scales.

The scales used were General Electrodynamics Corporation Portable Low Profile Weighing Platforms Model LP400E. The scale is hydraulically operated. There are six piston activated load cells in each scale. As the wheel rests on the platform, the load is transmitted from the platform to the load cells, and the fluid in the load cells is compressed. The compression of the fluid drives the pressure transducer, which in turn results in signal outputs from the integral transducers. The signal outputs are summed and averaged using a patented process and then displayed on the screen (GEC, 1998). Measurements were taken on both sides of the vehicle for each of the six sets of axles. The speed and time were recorded using a GPS unit placed on top of the truck. The GPS data is then slaved onto a laptop computer inside the truck and recorded for calibration purposes.

CHAPTER 5: SMART ROAD WEIGH-IN-MOTION FIELD EVALUATION

New WIM technologies are being implemented to improve the performance and durability of WIM systems. These new technologies aim to reduce the deficiencies that have led to inefficient weigh stations and undetected overweight vehicles. Changes in current WIM technology include new state-of-the-art sensor types, the use of multiple-sensors, environmentally resistant scales, low cost systems, and maintenance free systems. The ultimate goal of these changes is to improve weigh station operations; and hence, protecting the United States highway system. However, the performance of the systems that use these new WIM technologies needs to be quantified in order to evaluate their actual success.

The system evaluated in this study is the one introduced in Chapter Four of this report, the *Omni Weight Corporation (OWC) Safe Load System Weigh-in-Motion Dynamic Scale*, which has been installed at the Virginia Smart Road. The OWC system was evaluated to determine the accuracy and repeatability of its measurements. Additionally, the WIM sensor responses were analyzed to possibly improve the weighing procedure.

The layout of this chapter is as follows: (1) a brief discussion of the research approach at the Virginia Smart Road; (2) a description of the testing methodology and data collection, including the testing parameters and testing procedure; (3) data analysis; and (4) a discussion of the results.

5.1 Research Approach

The research approach in this portion of the study involves evaluating the OWC's newly developed WIM scale in a controlled traffic testing facility to determine its accuracy and the affects of various testing parameters on the scales precision. The precision of the scale is analyzed to determine the repeatability of its measurements. The evaluation considers five different testing variables and their effect on the scale's repeatability.

The data measured by the OWC scale is collected by a computer housed in an underground bunker at the Virginia Smart Road. The data is then sent electronically in real time to the manufacturer in Finland for processing. Once processed, it is retrieved by the research team through a World Wide Web interface. The research team receives both the raw data from the scales sensors, and the processed data from the manufacturer, which gives the predicted measured resultant axle weights. A portion of the raw data recorded by the scale was also analyzed in an attempt to consider an alternative procedure for calculating the vehicle weight that possibly improves its performance.

5.2 Data Collection and Testing

5.2.1 Testing Parameters

The evaluation of the OWC scale at the Virginia Smart Road considers the effect of various different testing parameters on the scales performance. The use of the controlled traffic testing facility provides the ability to perform testing that could not be conducted on public roads; hence, allowing the use of a wide range of testing parameters. The parameters considered include the vehicle load, axle configuration, tire pressure, speed, direction of vehicle travel, and pavement temperature.

Variation of the vehicle load was accomplished by the use of concrete Jersey Walls. To vary the loads on the test vehicles, different numbers and arrangements of concrete Jersey Walls were used. Each wall weighed approximately 2250 kg. For each test vehicle, three different loading arrangements were used during each set of tests. While limitations exist on public highways for a vehicles gross and axle weights, this was not a limitation in this study because the Virginia Smart Road is a testing facility.

To study the relationship between axle configuration and accuracy, testing vehicles with different axle configurations were used. Only two different vehicles were used: a six axle flat bed tractor trailer and a two axle dump truck. The six axle flat bed tractor trailer consisted of three axle groups: a single steering axle at the front of the tractor, a tandem axle at the rear of the tractor, and a tridem axle at the rear of the flat bed trailer. The Virginia Department of Transportation supplied the testing vehicles and operators for this study.

To determine the effect of tire pressure on the scale performance, the tire pressure of the two vehicles was varied. Three different tire pressures were used on each of the test vehicles during the study: 550, 650, and 725 kPa. In addition, the tests were conducted at four different vehicle speeds: 8, 25, 40, and 75 km/h. The aforementioned were varied as the testing was conducted in both directions over the scale.

To achieve a wide temperature range, testing was conducted in November, 2001, December, 2001, and August 2002. By testing during several days throughout the year, effect of the environment could be considered. This is desirable because the characteristics of the HMA pavement covering the scale are temperature dependant.

5.2.2 Testing Procedure

A comprehensive testing program was conducted at the Virginia Smart Road to evaluate the OWC WIM scale. As part of the program, a statistically significant number of test runs were made over the scale, while vital information about the vehicle and its load were recorded.

Using a front end loader, each of the two test vehicles were loaded with varying numbers of concrete Jersey Walls. Three different loading scenarios were used on each vehicle. The vehicles tire pressure was then checked and set at one of three different pressures. Prior to making the test runs, the test vehicle was statically weighed using two portable static load cells After being weighed statically, the OWC scale weighed the test vehicle using its WIM technology. This procedure was repeated for all test parameter combinations. Additionally, a GPS unit was placed in the vehicle to record the vehicle speed.

5.3 Data Analysis

Analysis of the data collected during testing examines several aspects of the OWC scale's performance, including the following: the probability of detecting the correct number of axles; conformity of the scale accuracy to ASTM standards; and the repeatability of the scale's measurements. Additionally in this section, the raw data sensor recordings were examined to determine if any improvement in the scale's performance could be achieved.

5.3.1 Axle Detection Probability

The manufacturer of the OWC WIM scale provides processed weight data to the user, which shows the number of axles detected and the weight of each axle as the vehicle passes over the scale. The processed data is the result of mathematical algorithms being applied to the raw sensors' responses. One of the problems found during this study was that the results provided by the manufacturer exhibit a low probability detecting the correct number of axles passing over the scale.

This misdetection of axles only occurred during tests conducted with the six-axle flatbed tractor trailer. During the testing with the two-axle vehicle, the correct numbers of axles were detected 100% of the time. In order to identify the possible cause of the problem, an analysis was conducted to determine the probability of detecting the correct number of axles as the vehicle passes.

The data was analyzed to check for trends in the probability based on (1) the speed of the vehicle as is passed over the scale or (2) the direction of travel. Table 5-1 shows that the results do not differ significantly based on the direction of travel over the scale. However, the results do indicate that speed does play a significant role in the detection of the correct number of axles. At lower speeds, the detection of the correct number of axles is very poor and improves as the speed increases.

Table 5-1 - Percentage of detecting correct number of axles for six-axle vehicle

Speed (kph)	Direction	
	Down	Up
8	11%	16%
25	60%	54%
40	81%	60%
75	65%	63%
All	58%	50%
Overall	54%	

It appears that more fine-tuning of the scale is needed, especially for tests conducted at low speeds. At low speeds, the scale tends to recognize a passing vehicle as multiple vehicles, each possessing fewer axles. For example, in one instance the six-axle vehicle passing the scale at 8 km/h was recognized as two separate passes; one pass of a vehicle with four axles and one pass of a vehicle with five axles. At higher speeds, however, the scale has been detecting a six –axle vehicle as a vehicle possessing anywhere between four and nine axles.

It appears that the problem with detecting the correct number of axles is related to the large spacing between groups of axles on the six axle flatbed tractor trailer. The software used to analyze the scale data appears to detect axle groups as being on the same vehicle only if they fall within a certain time period. Those axle groups detected over a certain time-frame are recognized as a separate vehicle. The maximum time-frame in which different axle group passes were deemed to be on the same vehicle was found to be approximately three seconds for this study. The large spacing (9.37 m) between the tandem and tridem axles on the six axle tractor trailer caused them to be recognized as separate vehicles because the time between them hitting the scale was greater then the three second time-frame. The problem is worse at lower speeds since the time between the axle groups hitting the scale was longer.

5.3.2 Accuracy

As discussed earlier in sections 2.2.1 and 3.3.2.3, ASTM standards for WIM systems require that such systems achieve a certain accuracy based on their ASTM classification type. The OWC scale is classified as a Type III WIM system by the manufacturer. As such, it is required by ASTM E-1318 to achieve 10% accuracy or better on 95% of the axle group weighings.

The accuracy of the weight data processed by OWC was analyzed to see if it complied with the ASTM standards for a Type III system. Only the data collected during testing with the two-axle test vehicle was considered. This was because of the problem mentioned in the previous section of not being able to identify the correct axle measurement during testing with the six axle vehicle, resulting in a very limited amount of data. Three separate analyses were conducted. The first considered the compliance for all the tests, and then for the tests conducted in each direction. The second analyses considered the tests conducted at low temperatures, while the third analysis considered those tests conducted at high temperatures. Table 5-2 shows the results of all three analyses. In addition, Table 5-2 gives the average percentage error and standard deviation of the percentage error for each category of tests. It can be seen from Table 5-2 that the OWC scale does not satisfy the ASTM standards for Type III WIM systems. Overall, only 18% of the tests complied with the ASTM requirement of 10% accuracy or better. The highest degree of compliance achieved for any testing category was 62% for the cold temperature testing conducted at 25 km/h in the uphill direction.

Conformity with the ASTM standards, and therefore accuracy, was better at low temperatures than during warmer temperatures. Hot-mix asphalt properties are susceptible to environmental effects. The binder becomes stiffer at cold temperatures and more flexible at high temperatures. This becomes significant in the case the OWC scale, because there is a layer of HMA present between the acting load and the scale itself. Depending on the environmental conditions, the load transfer capability of HMA would be different. It is apparent that the accuracy of the measurements taken by the scale is affected by the stiffness of the HMA on top of the scale. It appears that the logarithms that have been used by the manufacturer to estimate the vehicle's weight do not accurately take into account the effect of temperature.

Table 5-2 - ASTM Compliance

	Speed (km/h)	Direction	Average % Error	Standard Deviation	Percent Conformity	Complies ASTM
Overall	All		40.6	30.5	18	**NO**
	Up		47.0	22.2	21	**NO**
	Down		34.3	36.0	14	**NO**
Low Temperature	All		20.2	21.6	35	**NO**
	8	Up	13.4	20.7	61	**NO**
		Down	14.6	19.5	51	**NO**
	25	Up	13.7	22.3	62	**NO**
		Down	21.2	15.8	21	**NO**
	40	Up	15.2	26.0	56	**NO**
		Down	18.6	18.8	29	**NO**
	75	Up	19.6	21.2	29	**NO**
		Down	36.9	15.6	0	**NO**
High Temperature	All		55.3	27.4	5	**NO**
	8	Up	70.2	13.7	0	**NO**
		Down	61.9	10.9	0	**NO**
	25	Up	77.6	21.7	0	**NO**
		Down	43.3	15.0	1	**NO**
	40	Up	74.7	24.9	0	**NO**
		Down	51.6	16.7	0	**NO**
	75	Up	54.4	28.5	2	**NO**
		Down	17.7	12.4	33	**NO**

5.3.3 Repeatability

The repeatability of the data that was processed by the manufacturer and collected during testing was analyzed. The analysis considered variation in testing parameters to determine which parameters, if any, influenced the repeatability of the scale's measurements. The parameters that were investigated were vehicle speed, tire pressure, load, direction of travel, and pavement temperature.

As with the Troutsville testing data, the repeatability of the Virginia Smart Road testing data is quantified using the coefficient of variation (COV), see 3.3.1. The COV was calculated for all sets of test runs having the same testing parameters. Only those tests where the correct number of axles was detected were used in the analysis. In all, there were 864 test sets from the two-axle vehicle testing and 456 usable test sets from the six-axle testing.

For the testing conducted with the two-axle vehicle, the minimum COV was 0.1%, while the maximum COV was found to be 25.5%. However, for the tests conducted with the six-axle test vehicle, the minimum COV was 0.0%, while the maximum COV was 82.8%. Figure 5-1 and Figure 5-2 show the distribution of the COV for all tests conducted with the two-axle and six-axle vehicles, respectively. Both figures show the same general trend of data skewed to the left, with the highest frequency of occurrence between 2 and 6%.

Figure 5-3 and Figure 5-4 show the distribution of the COV as a percentage of tests for the two-axle and six-axle tests, respectively. The testing using the six-axle vehicle displayed higher dispersion of the COV, indicating less repeatable results. In the case of the testing using the two-axle vehicle, 58% of the tests had a COV of 5% or less. In the case of the six-axle testing, only 47% of tests showed that level of repeatability.

In trying to identify which parameters may have the most influence on the repeatability of the scale, a series of analysis were conducted in which the calculated COV were graphed against certain measured parameters. Those parameters not showing any affect on the repeatability of the scale were removed from the analysis in order to isolate the parameters that did have influence on the repeatability. The analysis only considers the data collected during the testing with the two-axle vehicle, because of the incorrect detection of axles with the six-axle test vehicle. An examination of each parameter and its affect on the repeatability follows.

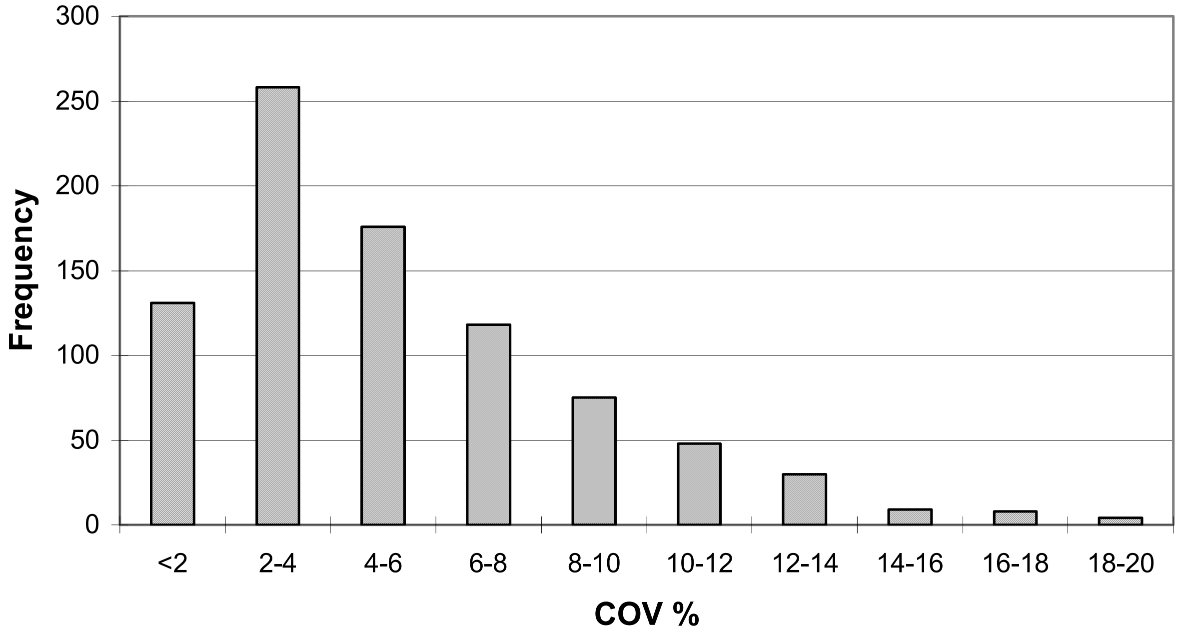

Figure 5-1 - COV distribution for 2-axle vehicle testing at the Virginia Smart Road

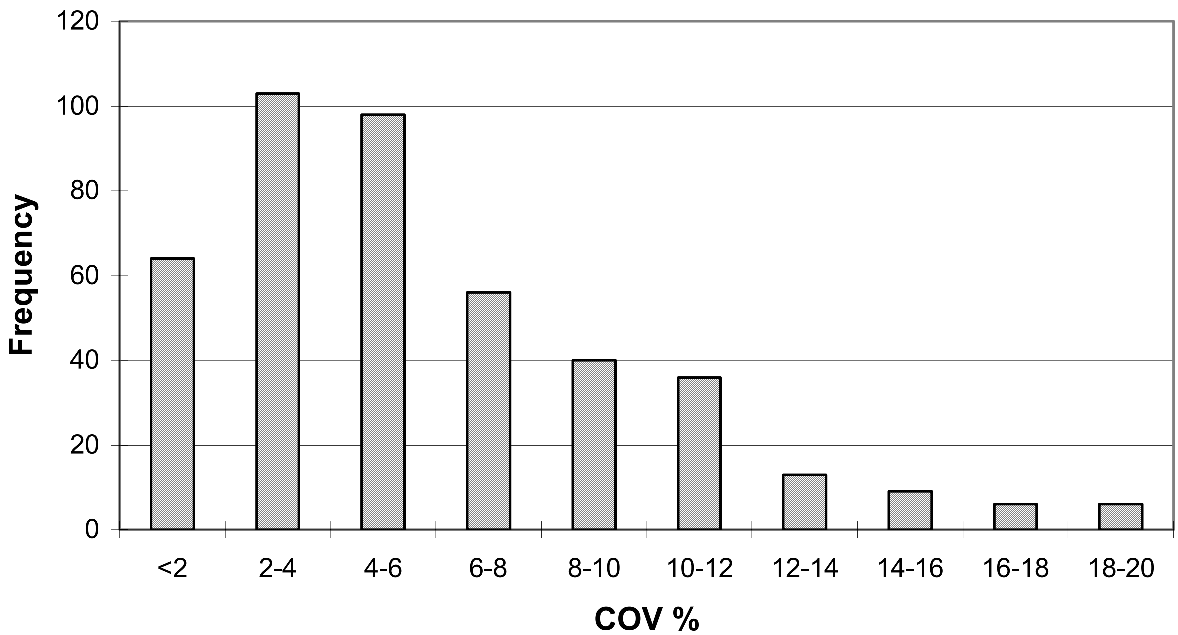

Figure 5-2 - COV distribution for 6-axle vehicle testing at the Virginia Smart Road

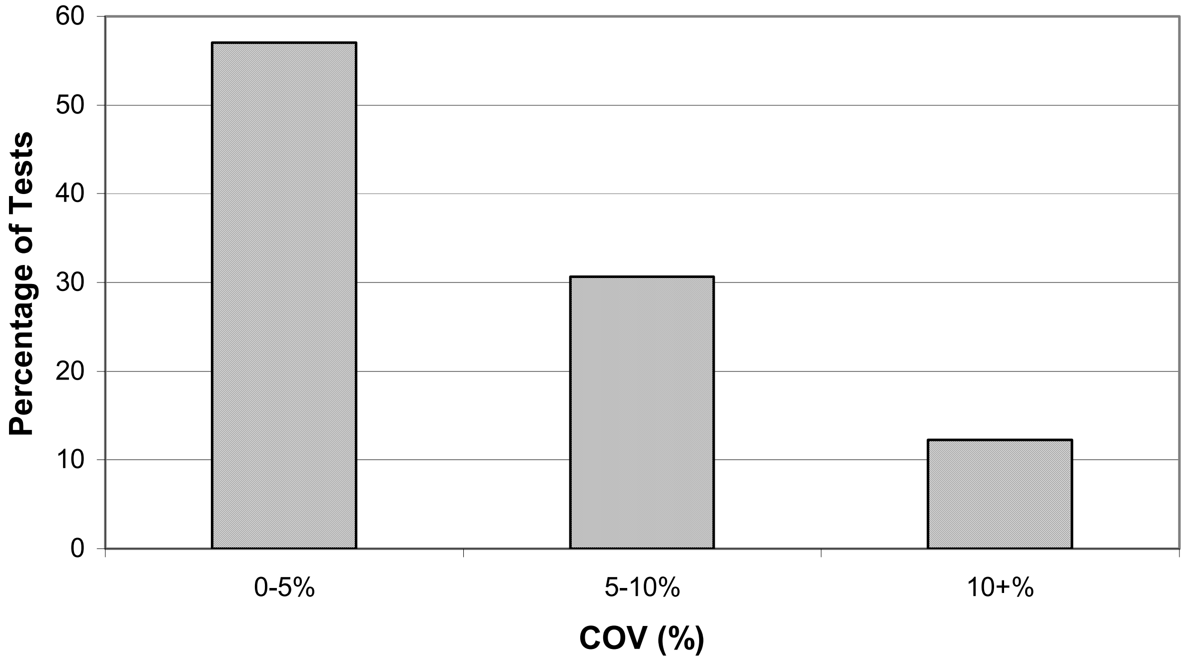

Figure 5-3 - Percentage of tests by range of COV for testing with two-axle vehicle

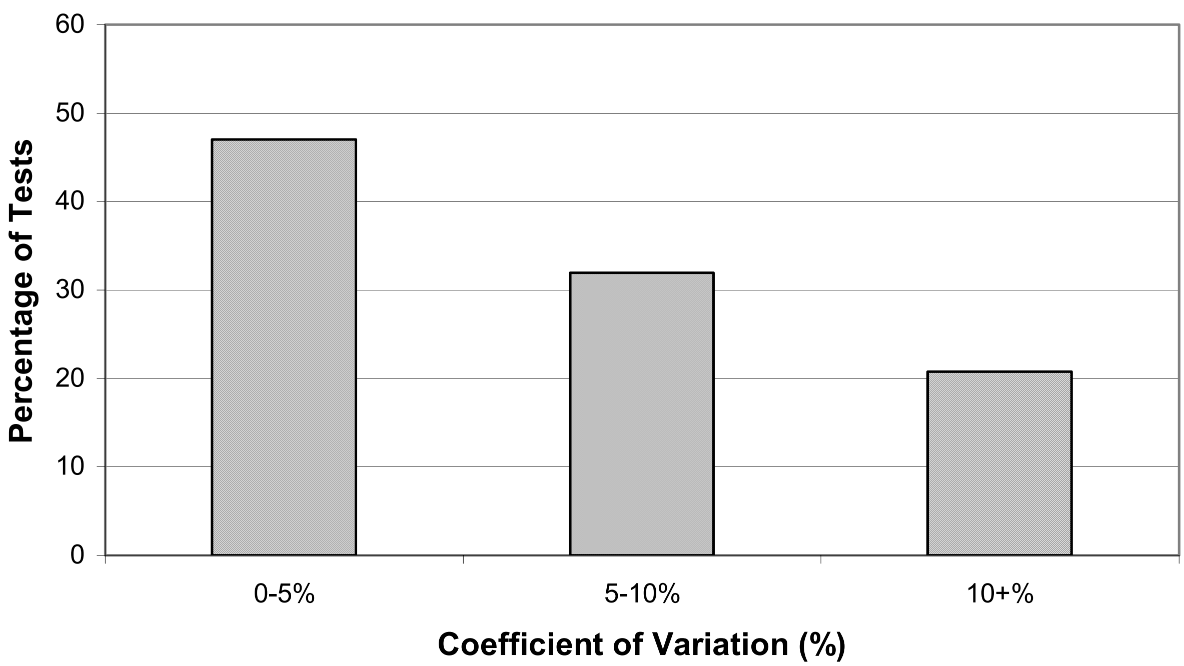

Figure 5-4 - Percentage of tests by range of COV for testing with six-axle vehicle

5.3.3.1 Tire Pressure

In analyzing the influence of variation in tire pressure on the repeatability of the scale's measurements, sixteen graphs were produced. Each graph produced displayed the relationship between varying tire pressure and the calculated COV for a specific direction, load, speed, and range of temperatures (season). Doing this isolated tire pressure as the only parameter that differed between tests on each graph. The three tire pressures that were considered in the study were 550 kPa, 650 kPa, and 725 kPa.

It was determined from this analysis that the tire pressure does not appear to have an affect on the repeatability of the scale. Figure 5-5 depicts the relationship between the three tire pressures and the scale repeatability for those tests conducted with a load of approximately 3700 kg at 25 km/h in the uphill direction at a temperature of about 28°C. This figure is an example of the typical trend that is found for tire pressure for all sets of tests. There appears to be no change in the range of repeatability for the same tests conducted at different tire pressures. This is also the case for all other temperature ranges, speeds, and loads. Graphs produced for all other sets of tests at the varying testing parameters are presented in Appendix B.

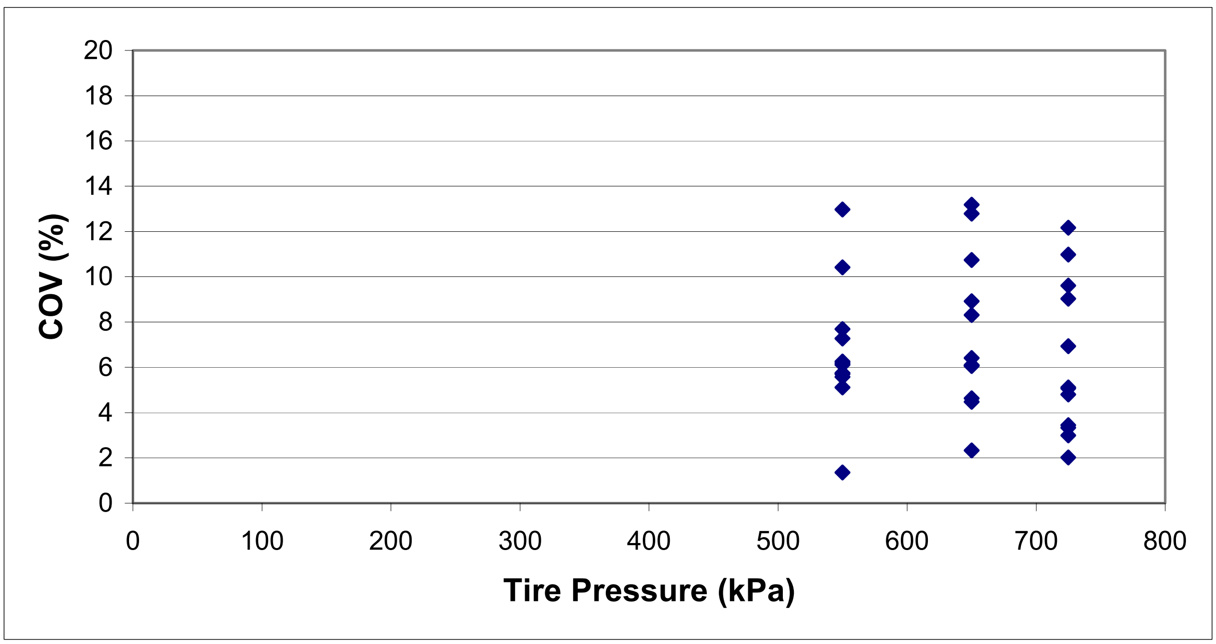

Figure 5-5 - Influence of tire pressure on scale repeatability

5.3.3.2 Temperature

From the same graphs produced in the previous section, it is possible to observe the effect of temperature range on repeatability of the scale. Since a set of identical graphs were produced at each temperature (seasons: winter and summer), then any change in the two sets of graphs for similar testing conditions could be attributed to the temperature effect. Figure 5-6 and Figure 5-7 show an example of two such graphs, one for the high temperature and one for the low temperature, respectively. The high temperature is approximately 28°C, while the low temperature is approximately 12°C. The two graphs depict a comparison made for tests conducted with a load of approximately 3700 kg at 8 km/h in the downhill direction. The figures show that the range of COV for the tests does not differ for the two temperatures; and therefore, the repeatability is not dependant on the temperature. Similar results were found for the tests conducted in the uphill direction.

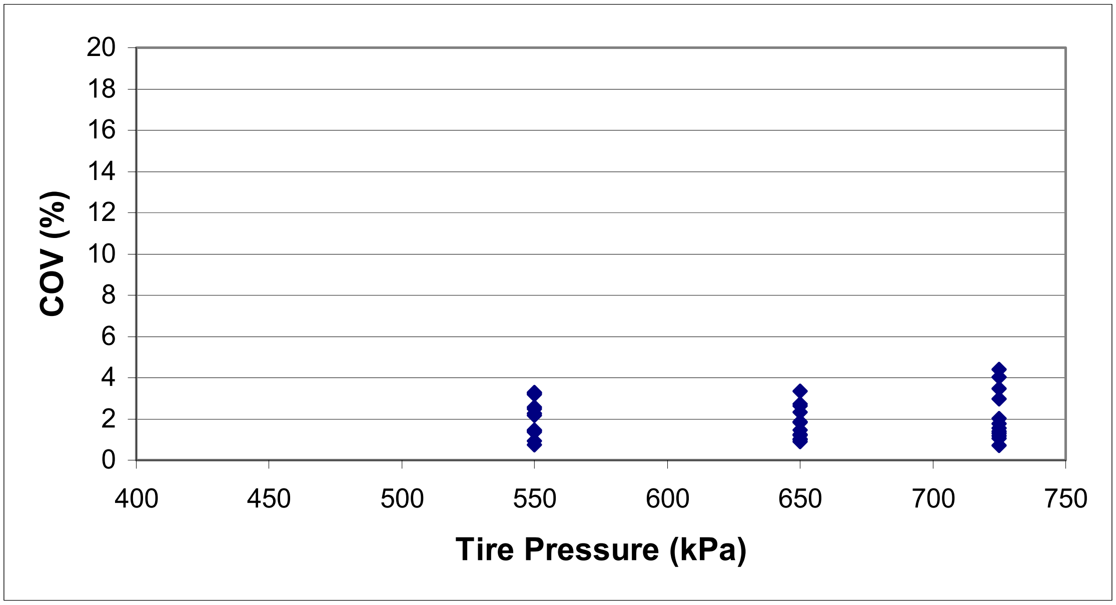

Figure 5-6 - Influence of temperature on scale repeatability (high temperatures)

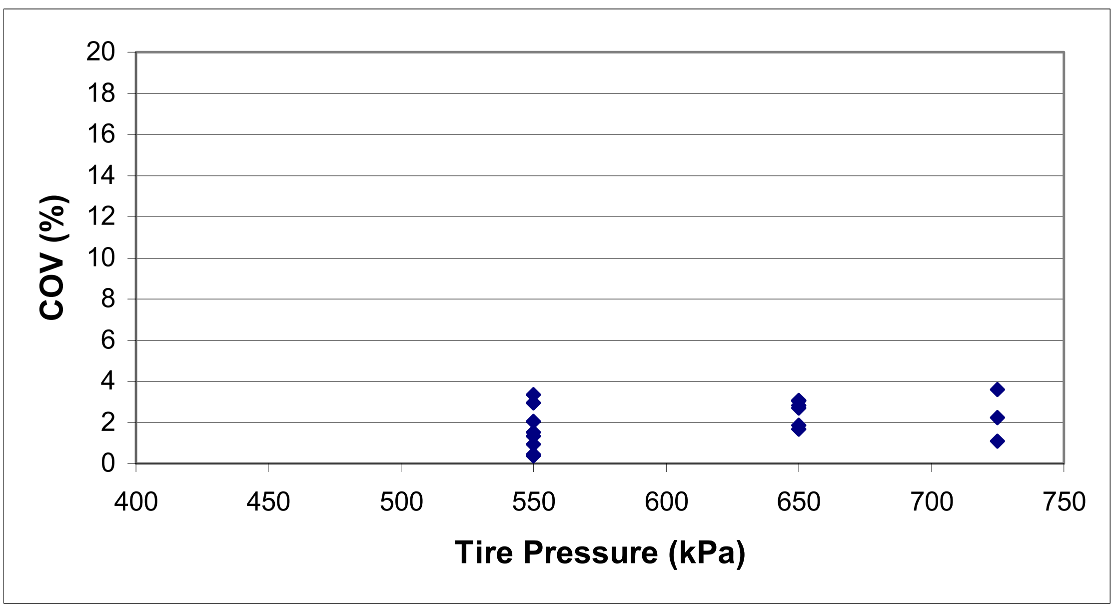

Figure 5-7 - Influence of temperature on scale repeatability (low temperatures)

5.3.3.3 Direction of Travel

The analysis conducted on the manufacturer's processed data shows that the direction of travel over the scale does not appear to affect the scale's repeatability. This conclusion was reached by comparing those tests conducted over the scale in both directions, in which no other parameters differed. These comparisons show that approximately the same range of COV is achieved for identical tests in opposite directions, 2% to 11%.

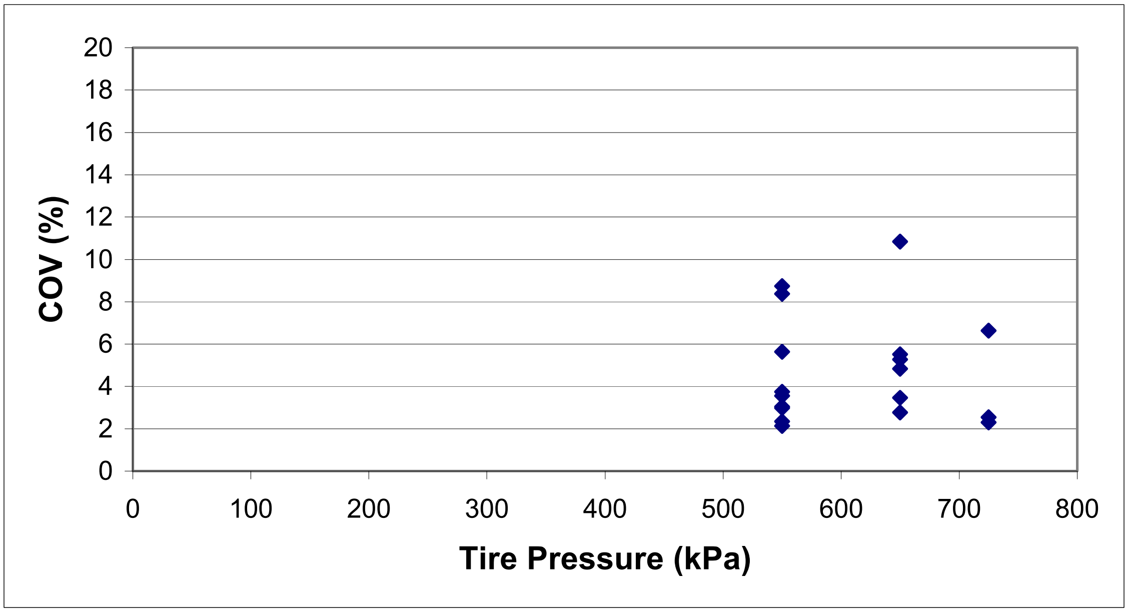

Figure 5-8 - Influence of direction on scale repeatability (downhill direction)

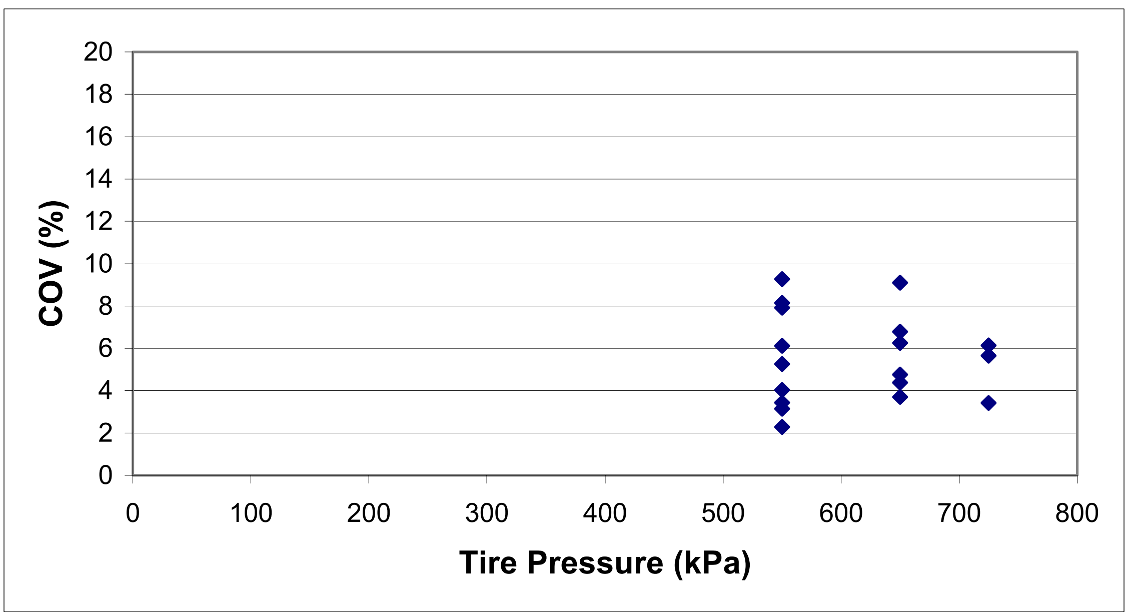

Figure 5-9 - Influence of direction on scale repeatability (uphill direction)

Figure 5-8 and Figure 5-9 show the results of a comparison for tests conducted at 25 km/h for a load of approximately 3700 kg in the winter climate. Figure 5-8 shows the COV for tests conducted in the downhill direction, while Figure 5-9 shows the COV for tests conducted in the uphill direction. As can be seen from the figures, there is not a noticeable difference between the achieved ranges of COV for the two directions. Similar results were found for tests conducted at various testing parameters in opposite directions. These results can be seen in appendix B.

5.3.3.4 Speed

The influence of vehicle speed on the repeatability of the scale measurements was examined. The previously discussed analysis allowed other testing parameters, such as tire pressure, temperature, and direction, to be removed from consideration. As such, only speed and load were considered in this portion of the analysis. Analyses were conducted for each of the four speed ranges: 8, 25, 40, and 75 km/h. In the analysis, a graph was produced for each speed range comparing the relationship between axle load and repeatability of the scale (COV). Comparison of the four graphs shows that the range of COV is approximately the same for each of the four speeds. This indicates that variation in speed does not influence the repeatability of the scale. Figure 5-10 and Figure 5-11 exhibit the similarity in range of repeatability found for tests conducted at the two extreme speeds, 8 km/h and 75 km/h. Similar results were found for tests conducted at other speeds and can be seen in appendix B.

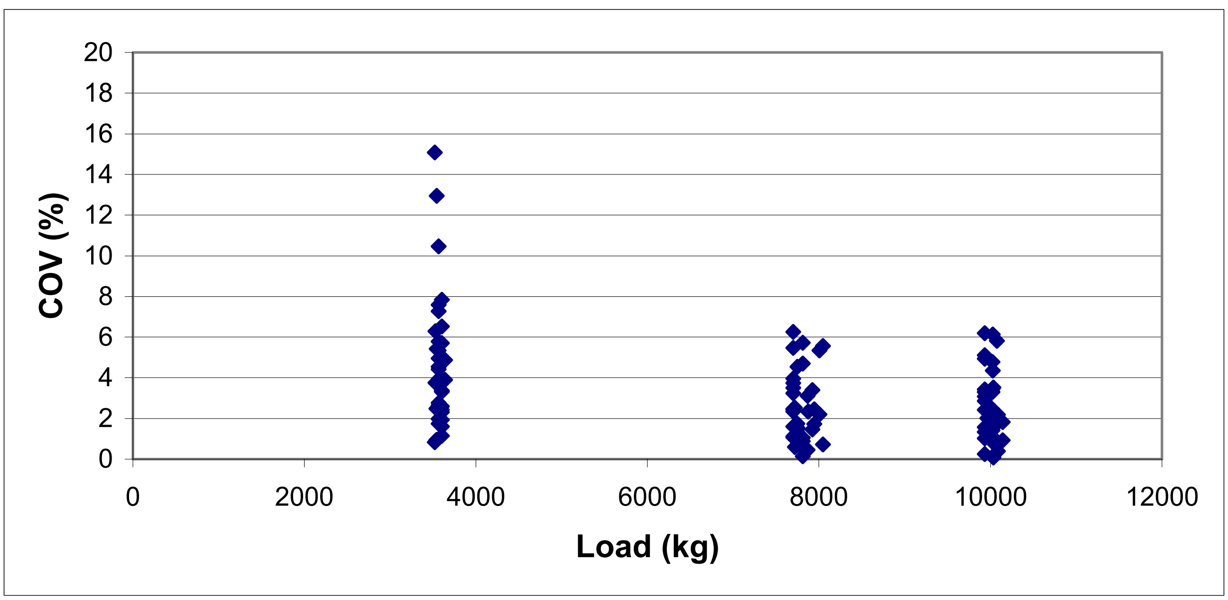

Figure 5-10 - Influence of speed on the scale repeatability (8 km/hr)

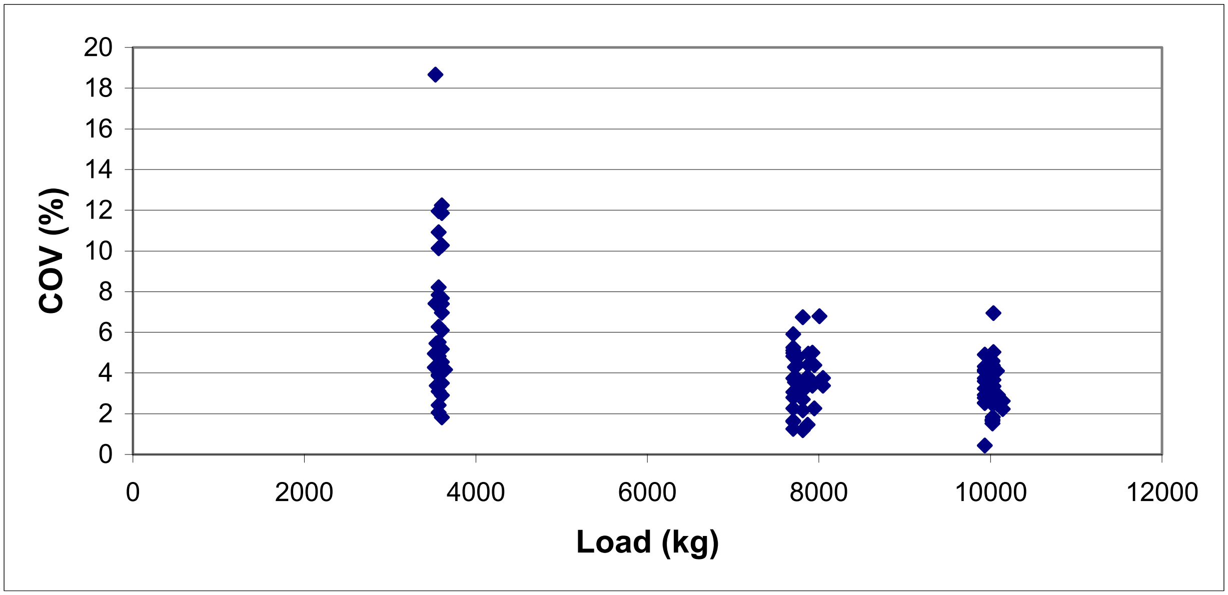

Figure 5-11 - Influence of speed on scale repeatability (75 km/hr)

5.3.3.5 Load

Using the four graphs produced in the previous section, the effect of load on the repeatability of the scale can be observed. The loads used in these graphs are the three axle loads achieved during testing, approximately 3700, 7900, and 10000 kg. The graphs allowed for the influence of load on the COV to be isolated and identified. The graphs show that there appears to be a slight effect of the load on the repeatability of the scale. Figure 5-12 shows an example of this trend. As the load increases, it appears that the range of COV decreases (repeatability of the scale increases). While the trend may not be dramatic, it does show the influence of axle load on repeatability.

Decreased repeatability of the scale at lower loads is most likely due to the effect that axle load has on vehicle dynamics. Vehicles experience more bounce when their axles are carrying less load. This effect is increased on rougher pavements. As discussed earlier in chapter four, problems during installation and paving resulted in a dip in the pavement over the scale. This dip in the pavement resulted in a rough ride over the scale, which increases the variation of dynamic forces from the axle. It is highly possible that the decrease in repeatability experienced by the scale at low axle loads can be attributed to this dip.

The affect of the aforementioned parameters on the scale repeatability suggest that the resultant errors may mainly be systematic and inherent errors. Such errors can be corrected for using appropriate calibration procedures.

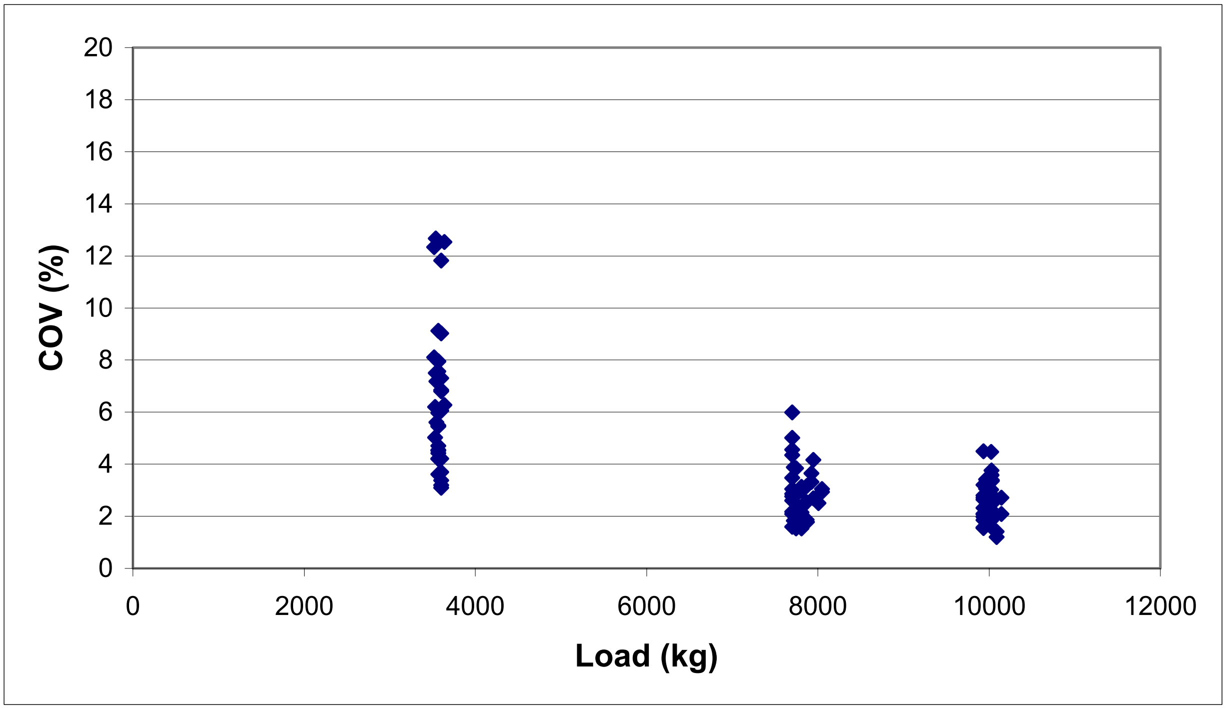

Figure 5-12 - Influence of axle load on scale repeatability

5.3.4 WIM Weight Calculation Procedure

The preceding evaluation of the OWC scale relied on the resultant weight data that was processed and provided by the manufacturer. The performance of the scale based on that data was analyzed for its repeatability and accuracy. Examination of the scale's accuracy showed that the scale did not comply with the ASTM standards for a Type III WIM system. In an attempt to improve the scale's accuracy, this section proposes new methods to recalculate the resultant weights from the scale's raw sensor responses.

The OWC scale operates on the principles similar to that of a bending plate WIM scale. The OWC scale uses ten sensors (strain gauges) evenly spaced across the width of the scale to collect the weight data. The ten sensors in the OWC scale measure the stress on the five supporting beams of the scale across the lane width. There is one sensor on each side of the five supporting beams. As a vehicle passes over the scale, the beams undergo a deformation and a strain is produced. The general setup of the scale is shown in Figure 5-13. The electrical output is proportional to the wheel load and is used to estimate the dynamic load passing over the scale (Brulant-Reversat *et al.*, 2000). The strain sensor responses are collected and stored by the processing unit in the bunker. For each pass of an axle over the scale, the strain responses are being collected every three milliseconds (approximately 333 Hz). The number of responses collected for each pass is, therefore, dependant on the speed of the passing vehicle.

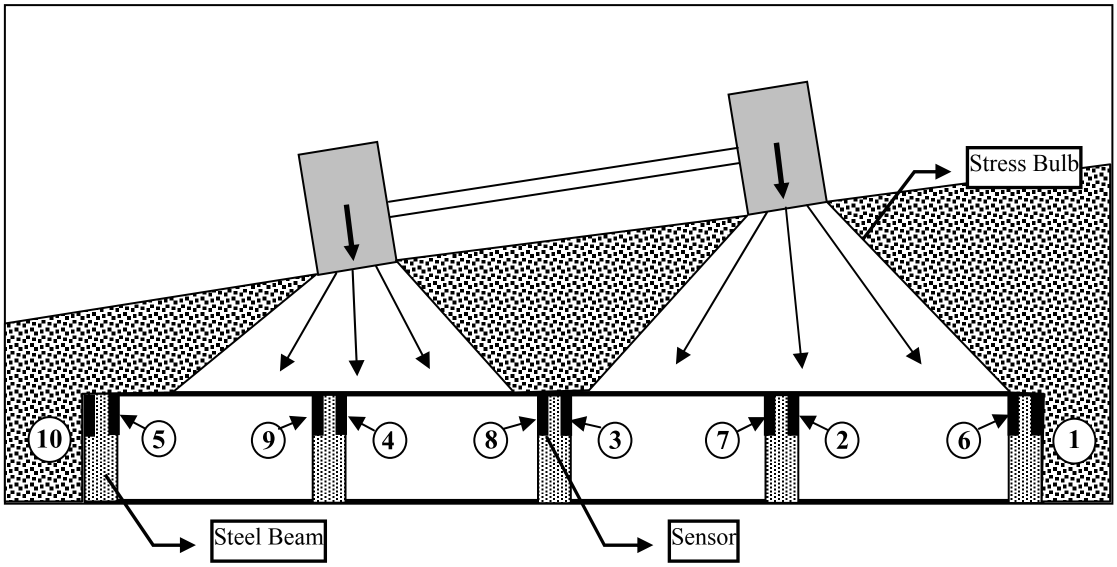

Figure 5-13 - General location and set-up of sensors (*not to scale*)

Although a passing vehicle's path of wander over the scale may change, each of the sensors within the scale "feels" a certain amount of strain. As a vehicle passes over the scale, stress is transferred from the tire to the HMA layer above the scale. The stress then travels down through the pavement system, spreading out into what is called the stress bulb. By the time the stress bulb reaches the scale, the stress is spread out over the surface of the scale. The resultant strain at each of the beams is then measured by two strain gauges. The path of wander over the scale results in variation in the sensor responses.

5.3.4.1 Sensor Response

Since each of the ten sensors measures a portion of the resultant strain induced by the passing vehicle axle, the sum of the maximum strain felt by the ten sensors should be proportional to the true static weight. The method used in this analysis relates the summed sensor responses to the axle weight.

Limited information was provided from the manufacturer about the construction and operation of the scale and its sensors due to confidentiality of the technology. With additional information about the sensors, such as their orientation and spatial relation to the applied tire loads, alternate algorithms for the sensor responses may prove more reliable. The inability to accurately locate where the vehicle wheel passed over the scale limited the analysis of the sensor responses. Therfore, the method of summing the maximum sensor responses was the most reliable procedure to be implemented based on the provided information. Development of a relationship between the summed sensor response and the vehicle weight is discussed later in the chapter.

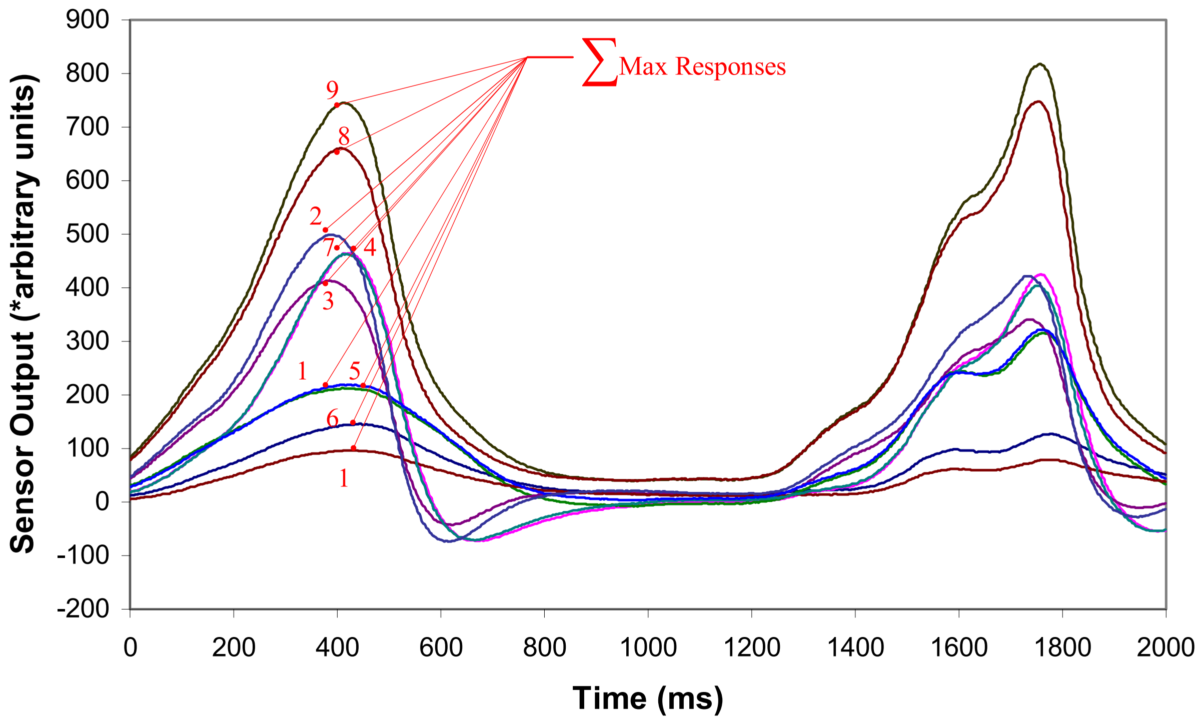

Figure 5-14 - Sample response of the ten strain gauge sensors for the pass of a two-axle vehicle

**This unit (which is based on Hooke's Law) is a resultant of the Modulus of Steel multiplied by the induced strain*

For each pass of a vehicle, the scale collects a series of sensor responses (voltage) from each of the ten sensors. Figure 5-14 depicts the responses for one such pass of the two-axle test vehicle. The figure shows the ten sensor's responses for the approximately two seconds the scale was recording data. As can been seen, there are also two distinctive peaks, one for each of the two axles. A graph like this was made for each pass of a test vehicle during testing. The maximum response for each sensor was then determined, and a sum of the ten maximum responses was calculated. This information was tabulated along with the true static weight, speed, pavement temperature, and direction of travel over the scale.

This analysis was conducted for two days of testing. One day of testing in winter climate, December 3, 2001, and one day from summer climate, August 15, 2002, were selected. All testing parameters from these two days were identical except for the environmental conditions (i.e., temperature). In total, 360 axle passes were examined; 180 passes in the winter and 180 passes in the summer. These sets of tests were conducted at the same tire pressure. Earlier studies at the Virginia Smart Road have shown that the tire pressure may not be significant at these depths in the HMA pavement (Loulizi *et al*., 2002).

5.3.4.2 Estimation of Weight

Improving the performance of the OWC scale required an evaluation of the procedure used to estimate the axle load from the scale's raw data. Since details of this procedure were not provided by the manufacturer, an attempt was made to develop a new procedure that would improve the scale's performance. The new procedure involves the use of a set of equations that relate the sensor response to certain characteristics of the HMA and passing vehicle.

The equations that were produced in this analysis were based on the installation of the scale at the Virginia Smart Road. The geometrics of the roadway over the scale, including HMA thickness, roadway slope, and roughness (see appendix A), could potentially affect the accuracy of the equations. For that reason, the equations are unique to only the Virginia Smart Road installation. However, similar procedures could be used at any installation site to produce such equations.

The goal was to develop a single equation to relate the summed sensor responses to the vehicle weight. Such an equation would account for variation in vehicle speed, temperature, and vehicle load, as these are the factors that affect the sensor response. It was decided, however, that two separate equations would be developed for each direction of travel over the scale. In a real world installation of the scale at a weigh station, traffic would only be traveling over the scale in one direction. Providing the operator with a set of equations, based on the direction of travel over the scale, would allow the operator to then select the proper set of equations to use for that unique installation.

In developing the regression model, the relationships between speed and sensor response and temperature and sensor response for each load were first examined to see if linear relationships were appropriate. The relationship between speed and sensor response was found to be linear, as can be seen in Figure 5-15 and Figure 5-16. The figures indicate that as the speed increases, the sensor response will decrease. These figures show the relationship for both the summer and winter months. Separate relationships were developed for the summer and winter temperatures because temperature has also been shown to affect the sensor response, as will be discussed next. The linear relationship allows speed to be included in the regression analysis so that one can interpolate for other speeds.

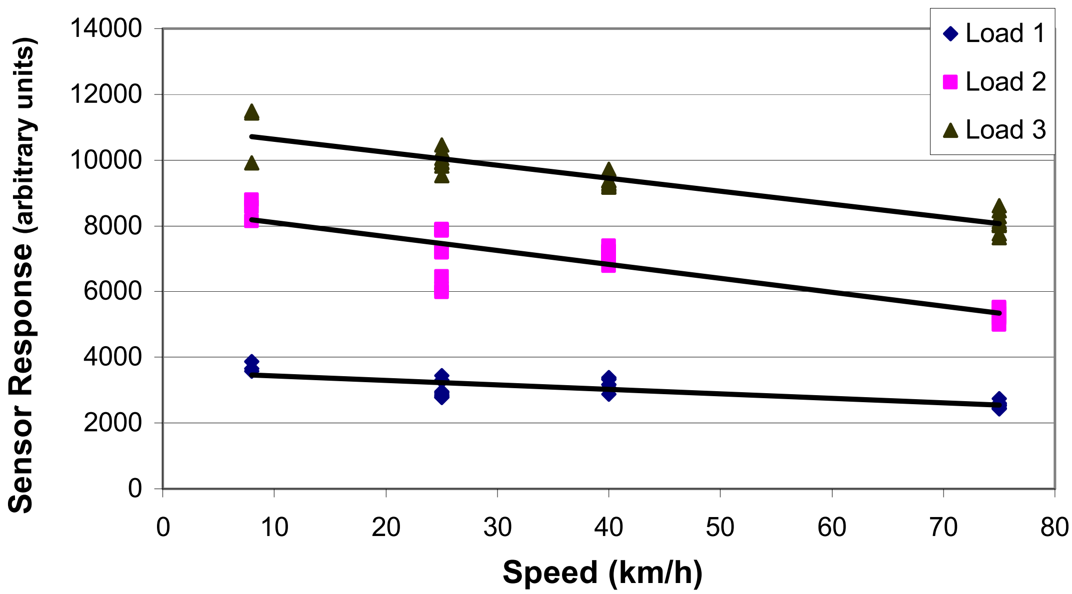

Figure 5-15 - Linear relationship between speed and voltage for summer

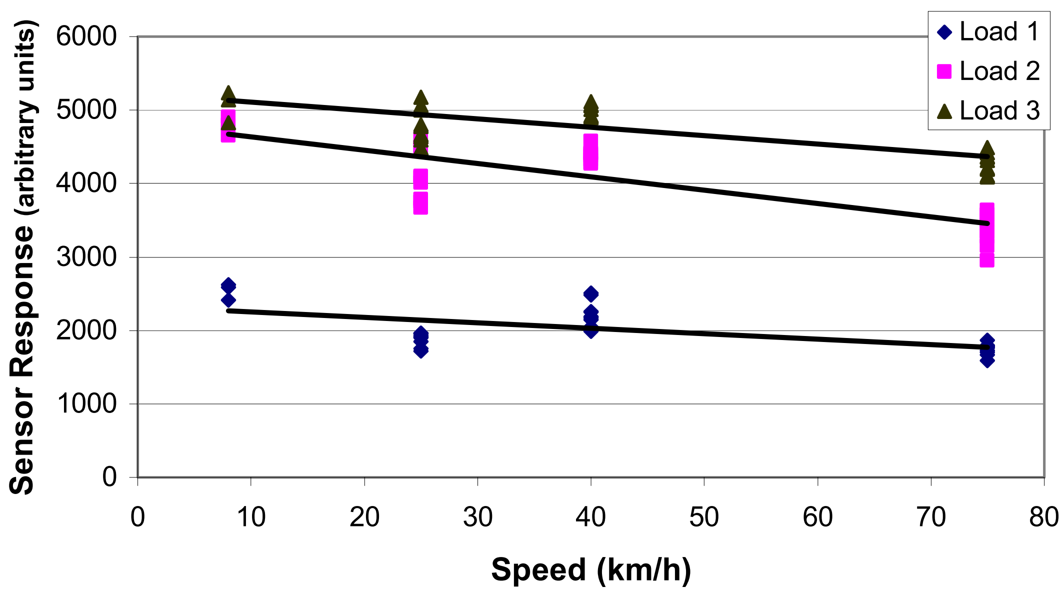

Figure 5-16 - Linear relationship between speed and voltage for winter

The effect that temperature has on the sensor response is a function of both the effect that temperature has on the HMA and the sensors themselves. As was shown in Figure 5-15 and Figure 5-16, for the tests conducted at the same load and speed, the temperature will affect the sensor response. The problem, however, in trying to determine the type of relationship that the temperature has on sensor response is a lack of temperature variation. As was mentioned earlier, the dates analyzed are for two days of testing: one in the summer and one in the winter. While this gives two extreme temperature ranges, there is a large gap of data in between the two ranges. The temperature in the HMA (approximately 63 mm below the surface) during the summer testing remained approximately the same during the testing; ranging from 24°C to 27°C. During the winter testing, the pavement temperature ranged from 10°C to 13°C. This poses a problem, because while it appears that a linear fit is adequate, it could not be verified based on only two points. Figure 5-17 shows an example of the relationship between the temperature and voltage. This particular graph shows that relationship for testing conducted at 40 km/hr, indicating that as temperature increases the sensor response will also increase.

It would be preferable to conduct testing at a much wider range of temperatures in order to accurately include the temperature variable in the regression equation. Conducting the testing over a wide range of temperatures would allow the relationship between voltage and temperature in this missing range to be observed. Since this data was not available, using one equation to predict the temperature influence over a wide range of temperatures is not appropriate. Rather, two equations were developed, one for each temperature range; in this case the summer and winter testing. Each of these equations was developed assuming that the relationship between temperature and sensor response was linear for that temperature range.

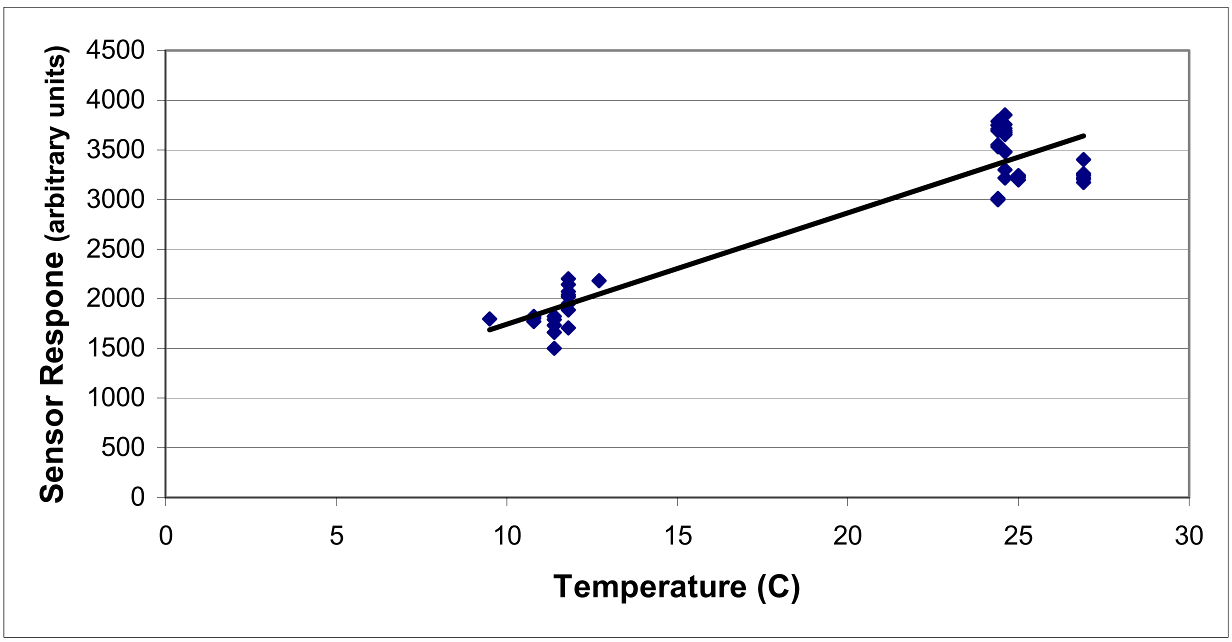

Figure 5-17 - Linear relationship between temperature and voltage

Requiring separate equations be used for each season means that an operator in the field (assuming condition are the same as those at the Virginia Smart Road installation) would have to choose between four different equations. There would be two equations for the downhill direction (direction 1) and two equations for the uphill direction (direction two). Figure 5-18 shows the decision tree that would be used for selecting the proper function to use (labeled 1-s, 1-w, 2-s, 2-w).

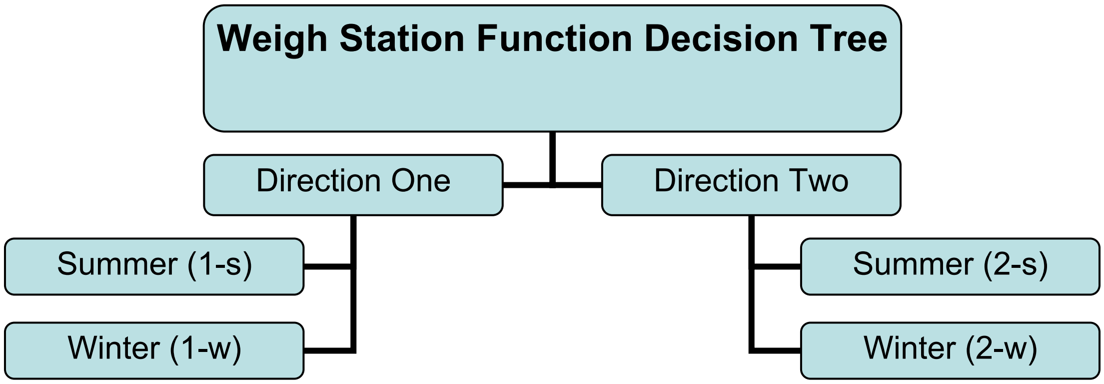

Figure 5-18 - Decision tree for weight calculation functions

The equations that were developed were based on a linear regression analysis of the data at the 95% confidence level from the two selected days of testing. The dependant variable in this case was the summed maximum response from the sensors. The independent variables were the speed, axle load, and pavement temperature. While weight has the largest effect on the magnitude of the response felt by the sensors, temperature and speed have a less significant effect. This produces a regression equation in the form of the one seen in equation 5.1, where load is in kilograms, speed is in km/h, and temperature is in Celsius.

$$SR = a(AL) + b(Sp) + c(Temp) \tag{5-1}$$

where,

SR = sum of maximum sensor responses (arbitrary units);

AL = axle load (kg);

Sp = speed (km/h);

Temp = temperature (°C); and

a, b, c = regression constants.

In performing the regression, the intercept of the equation was forced to zero. The reason for this is that in observing the response from the scale (see Figure 5-14), the sensor response is approximately zero when there is no load on the scale. By solving for the weight variable in the regression equation, the weight for other axle passes can be predicted, provided the scale output, the vehicle speed, and pavement temperature are known.

$$AL = \frac{SR - b(Sp) - c(Temp)}{a} \tag{5-2}$$

Equations 5-3 through 5-6 show the four functions that have been developed to represent the axle load in kg, as a function of the scale output, vehicle speed in km/h, and the pavement temperature in °C. An evaluation of each of the functions shows that the most influential variable is the summed sensor response, while the speed and temperature factors minorly adjust the value to compensate for their affect on the sensor responses. Table 5-3 lists the root mean square error and the R^2 values of each of the equations. It shows how well the chosen regression equations represent the data. Development of a single model for each direction without regard for the season produced much less reliable results. These models, shown in equations 5-7 and 5-8, have R^2 values of 0.76 and 0.66, respectively; and root mean square errors of 1234 and 1711, respectively. The lack of reliability with a single model shows that two models for each direction (5-3 through 5-6) is more appropriate.

$$AL = \frac{SR + 32.88(Sp) - 28.54(Temp)}{1.00} \qquad \textbf{(5-3) : 1-s}$$

$$AL = \frac{SR + 12.50(Sp) - 49.62(Temp)}{0.48} \qquad \textbf{(5-4) : 1-w}$$

$$AL = \frac{SR - 7.41(Sp) + 36.00(Temp)}{1.14} \qquad \textbf{(5-5) : 2-s}$$

$$AL = \frac{SR - 6.02(Sp) - 26.49(Temp)}{0.49} \qquad \textbf{(5-6) : 2-w}$$

Table 5-3 - Regression statistics

Equation	RMSE	R^2
1-s	620	.95
1-w	299	.94
2-s	818	.93
2-w	449	.89

$$AL = \frac{SR + 37.16(Sp) - 131.14(Temp)}{0.27} \qquad \textbf{(5-7) : 1}$$

$$AL = \frac{SR + 14.61(Sp) - 126.04(Temp)}{0.60} \qquad \textbf{(5-8) : 2}$$

The validity of the four developed functions (5-3 through 5-6) was evaluated using data from additional testing. The data was obtained from tests performed on December 17, 2001, and August 15, 2002. This provided testing data performed at the same range of temperatures as the data used to derive the models. The evaluation was performed to determine if there had been any improvement over the manufacturer's method analyzed in section 5.3.2. The accuracy was calculated for each season, and also for each speed range by direction. Additionally, the performance of the scale was evaluated to determine whether it complied with the ASTM standards for Type III WIM systems. The values are tabulated in Table 5-4. Overall, for the summer testing, only 38% of the data complied with the ASTM standard of 10% accuracy or better. For the winter testing, the value was 39% compliance. The compliance values for the summer and winter temperatures were much closer than they were using the manufacturer's processed data. This indicates that the procedure used here, and the four equations developed in this section, better account for variation in pavement temperature than the manufacturer's suggested procedure. Although the average accuracy of the scale is improved using this procedure, compliance with the ASTM standards of 95% conformity is still not achieved. It is believed that if better information about the WIM system was available to this study, in addition to a wider range of temperature data, a more accurate model could be developed.

Table 5-4 - ASTM Compliance

	Speed (km/h)	Direction	Average % Error	Standard Deviation	Percent Conformity	Complies ASTM
Summer	All		12.8	6.7	38	**NO**
	8	Downhill	5.9	.8	100	**YES**
		Uphill	17.4	3.8	0	**NO**
	25	Downhill	8.6	5.9	50	**NO**
		Uphill	18.3	3.4	0	**NO**
	40	Downhill	16.8	6.2	17	**NO**
		Uphill	7.7	5.3	75	**NO**
	75	Downhill	17.4	3.8	0	**NO**
		Uphill	14.9	6.2	25	**NO**
Winter	All		16.4	11.6	39	**NO**
	8	Downhill	2.3	2.1	100	**YES**
		Uphill	7.9	3.5	83	**NO**
	25	Downhill	13.4	7.1	33	**NO**
		Uphill	19.5	9.9	25	**NO**
	40	Downhill	18.5	7.8	25	**NO**
		Uphill	15.5	12.8	50	**NO**
	75	Downhill	31.8	11.7	0	**NO**
		Uphill	10.7	5.1	50	**NO**

5.4 Summary

Due to the low probability of the OWC scale detecting the correct number of axles on the six-axle test vehicle, 54% overall, the majority of this portion of the study relied on the tests conducted with the 2-axle vehicle. Indications are that the small time-frame in which a vehicle is recognized is not compatible with the speeds and axle spacings seen in the field.

An analysis of the accuracy of the scale measurements, based on the manufacturer's processed data, found that the scale was not performing in accordance with the ASTM E-1318 standards for a Type III WIM scale. While compliance of the ASTM requirements was not met for any tests, the scale was shown to perform better at low temperatures. This indicates that the algorithms used by the manufacturer do not adequately take into account variation in temperature and its affect on the HMA and sensors.

Repeatability of the OWC WIM scale was based on an analysis of the coefficient of variation (COV). The weight data used for this analysis was processed by the manufacturer. For the overall analysis of tests conducted with the 2-axle vehicle, approximately 89% of the tests had a COV less than 10%. On the other hand, for the tests conducted with the 6-axle vehicle in which the correct number of axles was detected, only about 79% of the tests had a COV of less than 10%. Additionally, it was found that better repeatability could be achieved at higher axle loads. The dip in the pavement over the scale appears to increase the dynamic forces from the axle, especially at low loads, reducing the repeatability of the scale. Variation in tire pressure, temperature, speed, and direction showed no evidence of affecting the repeatability of the scale measurements.

In an effort to improve the accuracy of the scale, a new procedure was proposed that relates the axle weight to the sensor output, vehicle speed, and pavement temperature. The sensor output is the sum of the maximum response from each of the ten strain gauges in the scale. Two equations were developed for each direction of travel over the scale based on a linear regression analysis of the recorded data at the 95% confidence level. One equation was developed for each season, as there were not adequate tests over a wide range of temperature to produce one equation for all temperatures. In total, a set of four equations were proposed to predict the axle load.

An evaluation of the proposed equations showed an improvement of the scale's accuracy over the manufacturer's procedure. The scale achieved an overall average error of 14.6% using the new procedure, versus 40% using the manufacturer's suggested procedure. Additionally, the proposed equations appear to account better for the pavement temperature variation than does the manufacturer's method. The achieved accuracies for each season are much closer than that achieved from the manufacturer's processed data. Despite the improvement in accuracy of the scale using the proposed equations, the scale still does not comply with the ASTM standards for a Type III WIM system. However, with further testing at a wider range of temperatures, it is believed that the equations would improve enough to comply with the ASTM requirements.

CHAPTER 6: FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The collection of accurate and reliable information from weigh stations is essential to sustain a healthy and functional highway system. Weigh-in-Motion technology has developed extensively from its origins over the years, but is far from perfect. In order to understand the limitations of WIM and those factors preventing the technology from performing better, accuracy and repeatability of such systems needs to be quantified. This study examined both the in-practice WIM scales at the Troutsville weigh station and the newly developed OWC WIM scale at the Virginia Smart Road to evaluate their performance and to identify those parameters most affecting that performance.

6.1 Findings

A field evaluation of an in-practice WIM scale in the Commonwealth of Virginia, Troutsville weigh station, was conducted in order to provide an idea of how well current WIM technologies are performing. The WIM scales at the Troutsville weigh station are bending plate scales, a commonly used WIM type. Understanding how well commonly used systems perform helps to evaluate newly developed systems such as the one at the Virginia Smart Road.

The following were found during the evaluation of the Troutsville weigh station performance:

a) The northbound and southbound scales performed similarly.
b) Over 90% of the tests achieved a coefficient of variation of 10% or better, indicating highly repeatable measurements by the scales.
c) The scale measurements had an average error of 6.6% for all tests.
d) Neither the repeatability nor the accuracy of the scale was influenced by variation in testing parameters such as load and axle configuration.
e) Seventy-seven percent of the axle group weighings achieved 10% error or less.

Evaluation of the OWC WIM scale at the Virginia Smart Road was conducted to determine whether the fully imbedded scale was performing better than current in-practice systems. Additionally, by evaluating the influence of testing parameters (such as speed, axle load, pavement temperature, and tire pressure) on the scales performance, a basis is provided to help improve the scale's measurements.

The performance evaluation of the OWC WIM scale using the weigh data produced from the manufacturer showed that the scale did not perform as well as the scales at the Troutsville weigh station. The following was found during the evaluation of the OWC WIM scale:

a) Eighty-nine percent of the tests achieved a coefficient of variation of 10% or better.

b) The scale measurements had an average error of 40.6%.

c) Accuracy was much worse during warmer temperatures, indicating that the algorithms used by the manufacturer do not account properly for HMA dependency on temperature.

d) Eighteen percent of the axle group weighings achieved 10% error or less

In an attempt to improve the performance of the OWC scale, an alternative to the manufacturer's procedure was developed. This procedure was based on a regression analysis of a portion of raw sensor response data from the scale for two days of testing. Using the raw sensor data, it was determined that taking a sum of the maximum response from each sensor should yield a proportional value to the axle weight. A linear regression analysis was performed which yielded four equations to relate the axle weight as a function of the summed sensor response, the vehicle speed, and the pavement temperature. Two equations were developed for each direction of travel over the scale, one for the cold climate and one for the warm climate.

Using the developed equations to evaluate the scale showed a dramatic improvement in the scales accuracy. An average error of only 14.6% was yielded using the new procedure. Additionally, the new procedure accounted much better for the effect of temperature on HMA. While the average accuracy was reduced closer to the value found for the Troutsville weigh station, the OWC scale still did not comply with the ASTM standards using the new procedure. Overall, only 39% of the tests conducted on the OWC scale using the new procedure complied with the ASTM standard of 10% or less error. While this figure is an improvement over the compliance obtained using the manufacturer's data, it does not compare to the 77% compliance found at the Troutsville weigh station.

6.2 Conclusions

Based on this study, the following conclusions can be made:

a) The Troutsville WIM scales did not satisfy the ASTM E-1318 standards for Type III WIM systems of 10% error or less on at least 95% of the weighings.

b) The OWC scale did not satisfy the ASTM E-1318 standards for Type III WIM systems of 10% error or less on at least 95% of the weighings.

c) A set of regression models were developed for the OWC WIM Scale to predict the axle weight as a function of the WIM output, vehicle speed, and pavement temperature.

d) The developed models could be significantly improved if data is available over a wide range of temperature and more information is available about the WIM system.

6.3 Recommendations for Further Research

Based on the results of this study, the following recommendations are made:

1) Further validation of the proposed procedure to predict the vehicle weight based on the OWC WIM output, vehicle speed, and pavement temperature is required. This validation should include testing to be done at a wide range of temperatures throughout the year to produce full environmental repeatability. Evaluating the scale over a large range of temperatures would allow for the influence of the behavior of HMA on the scale to be understood. Appropriate sample size of data should be obtained to insure statistically reliable results.

2) The research conducted at the Virginia Smart Road was performed with a very limited population of testing vehicles. In order to simulate more real world traffic conditions, a more diverse population of test vehicles types should be considered. Doing so will help in developing a procedure to predict the axle weight from the scale output while removing any systematic error associated with an individual axle type.

3) In order to adequately evaluate the repeatability of the OWC WIM scale, it would be desirable to remove any influence from outside factors, such as an uneven approach. As such as re-evaluation of the scale should be performed after resurfacing of the pavement over the scale.

4) Lastly, while the study conducted on the OWC scale at the Virginia Smart Road was a thorough evaluation of the scale's performance, the results can only be confirmed for this installation site. An evaluation of the scale should be performed for alternate installation conditions. This would allow the influence of roadway geometrics, alignment, and pavement characteristics to be considered in the evaluation of the scale.

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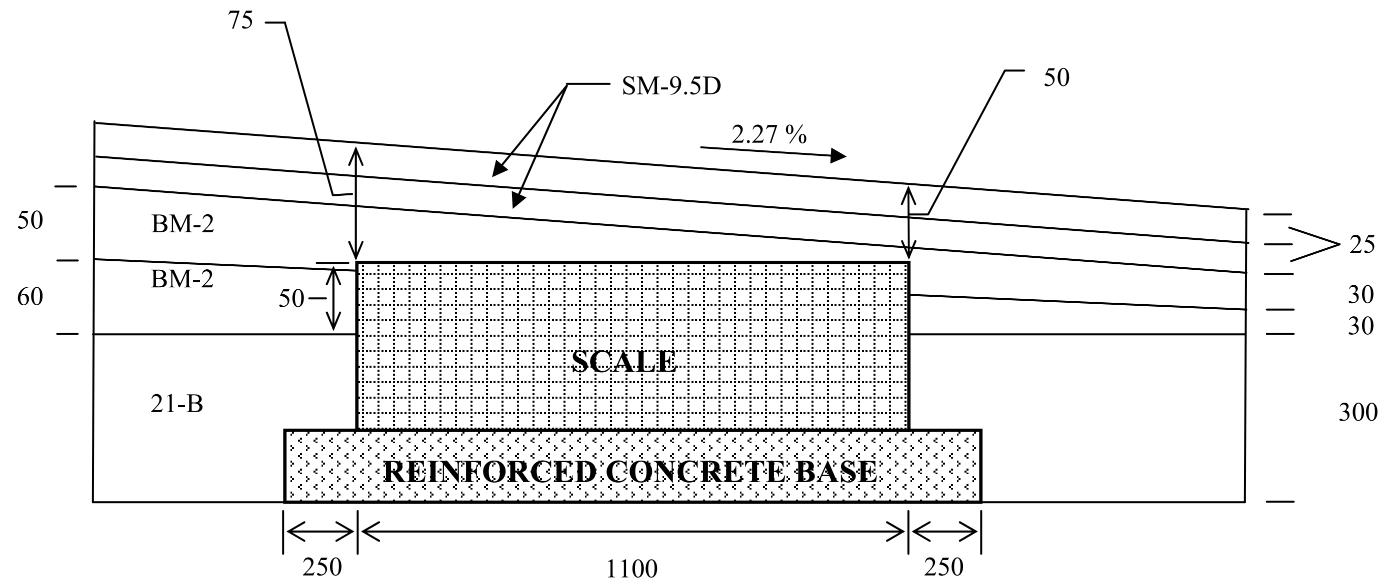
APPENDIX A

OWC Scale Installation Profile

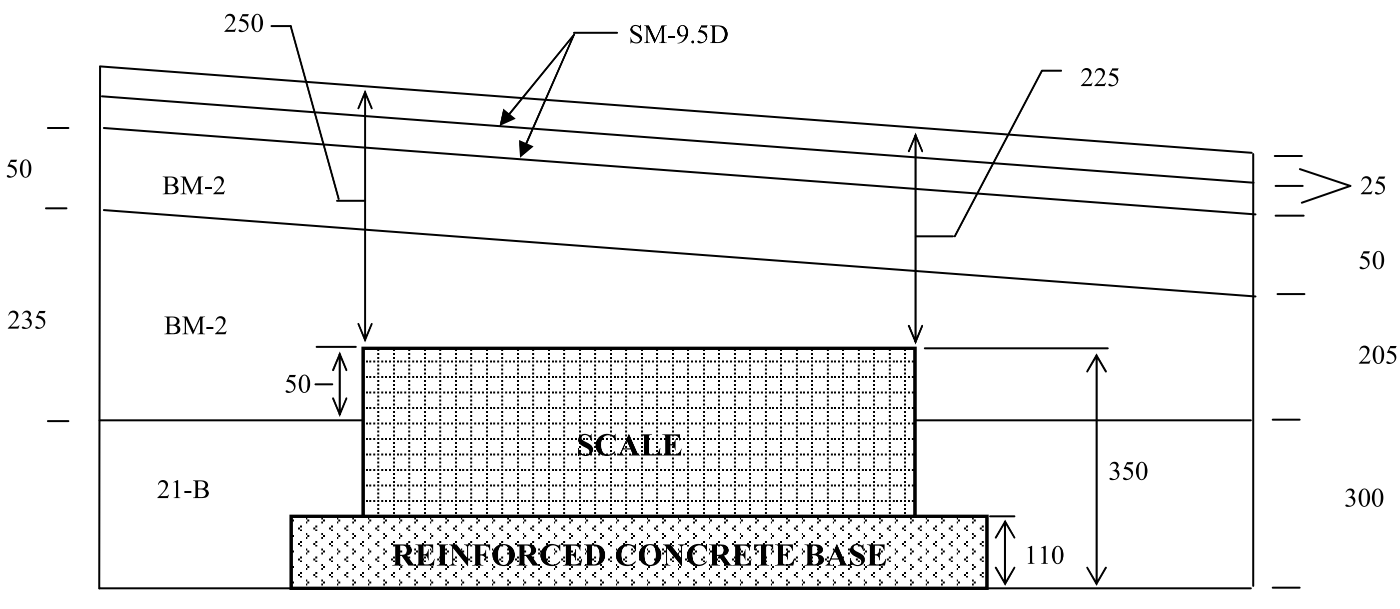
WIM Installation Profile



Profile at Centerline Side of Scale

Uphill towards Control

Downhill towards Bunker Two

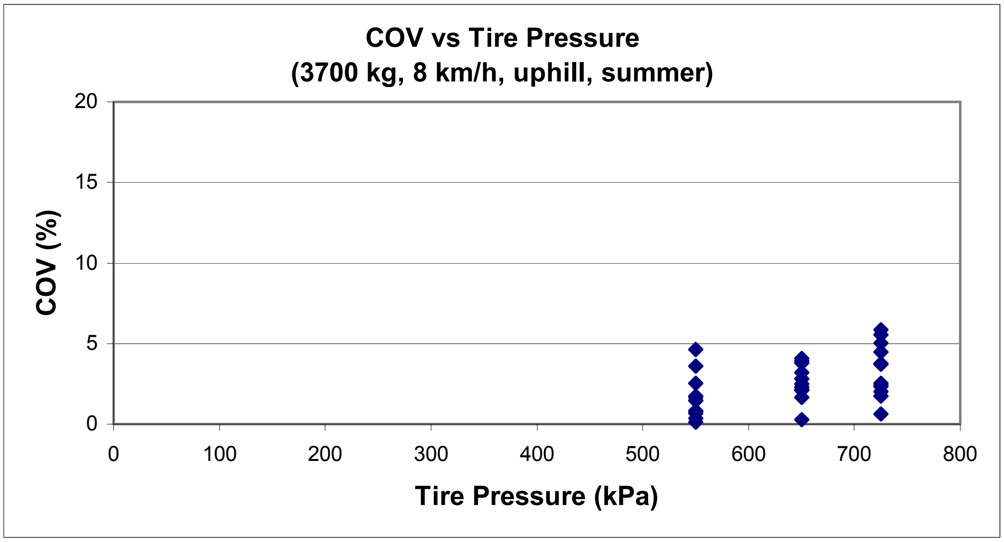


Profile at Fog-line Side of Scale

* All measurements are in millimeters and approximate

APPENDIX B

Repeatability Trends for Manufacturer's Processed Weight Data


COV vs Tire Pressure
(3700 kg, 8 km/h, uphill, summer)
COV (%)
Tire Pressure (kPa)
0
5
10
15
20
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100
200
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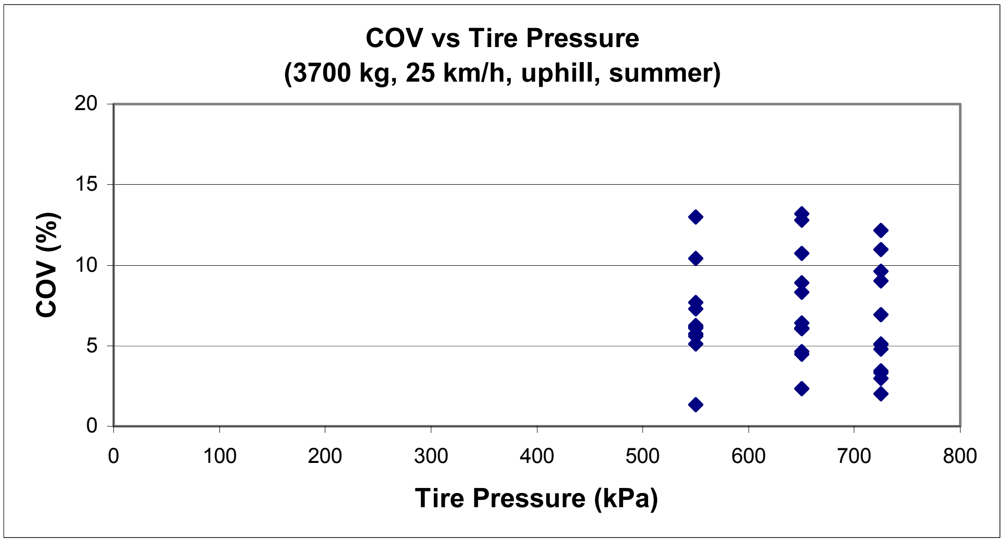
COV vs Tire Pressure
(3700 kg, 25 km/h, uphill, summer)
COV (%)
Tire Pressure (kPa)
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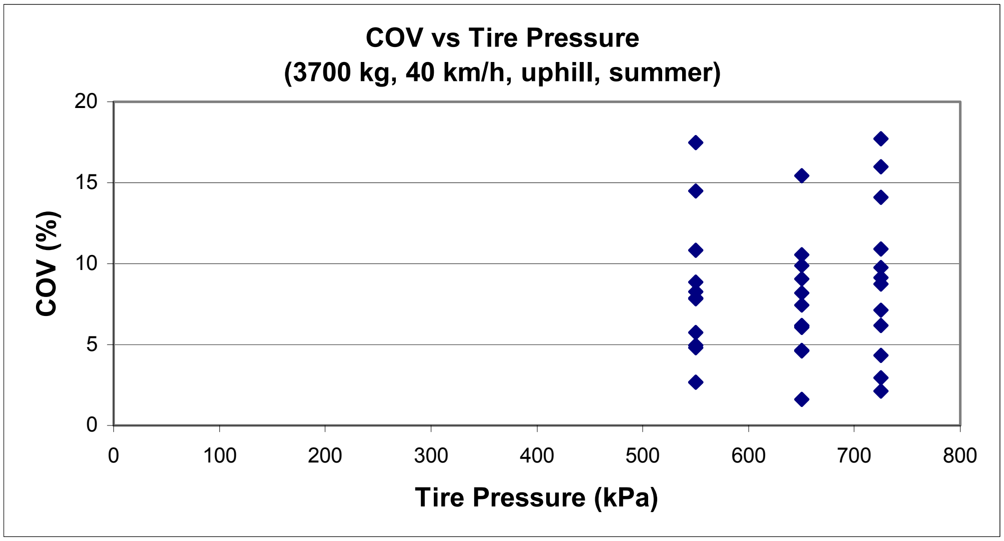
COV vs Tire Pressure
(3700 kg, 40 km/h, uphill, summer)
COV (%)
Tire Pressure (kPa)
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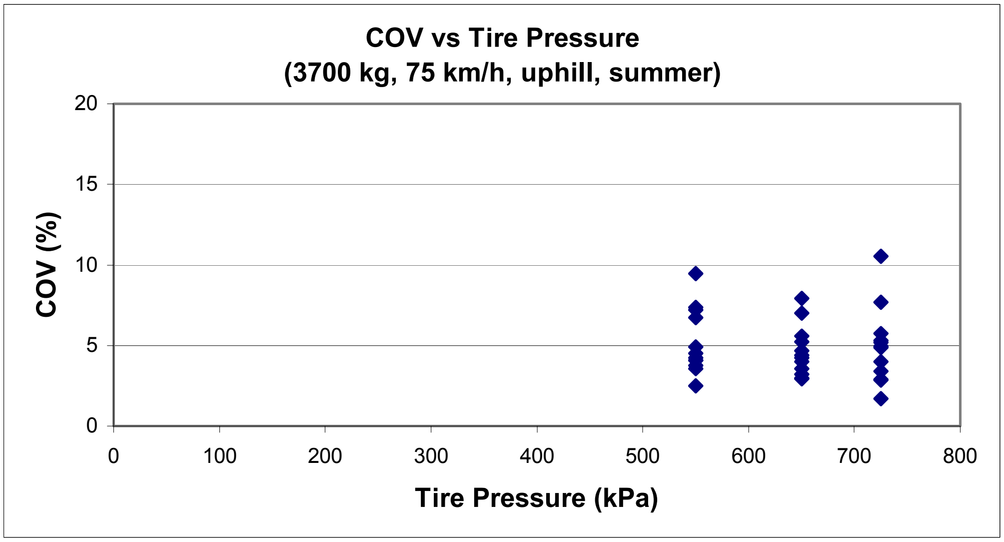
COV vs Tire Pressure
(3700 kg, 75 km/h, uphill, summer)
COV (%)
Tire Pressure (kPa)
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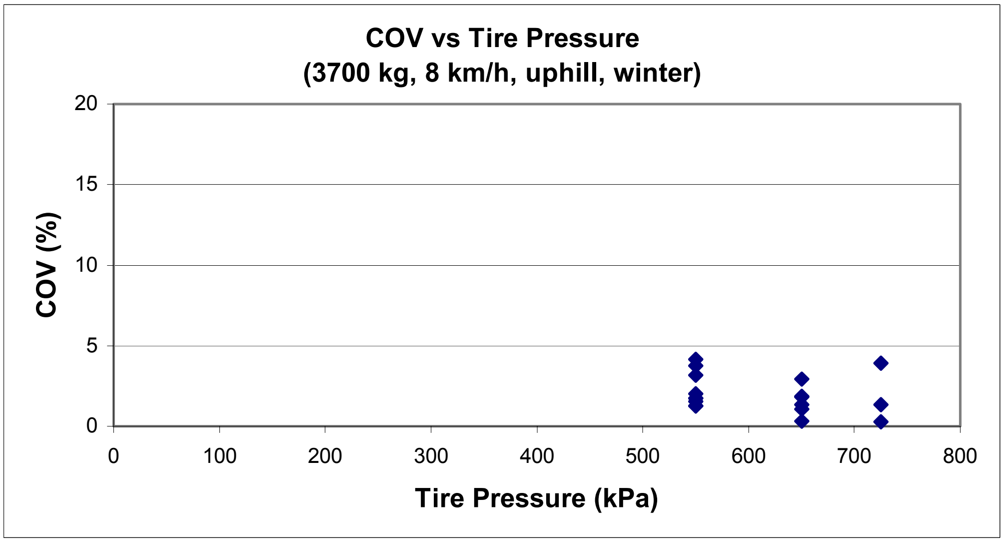
COV vs Tire Pressure
(3700 kg, 8 km/h, uphill, winter)
COV (%)
Tire Pressure (kPa)
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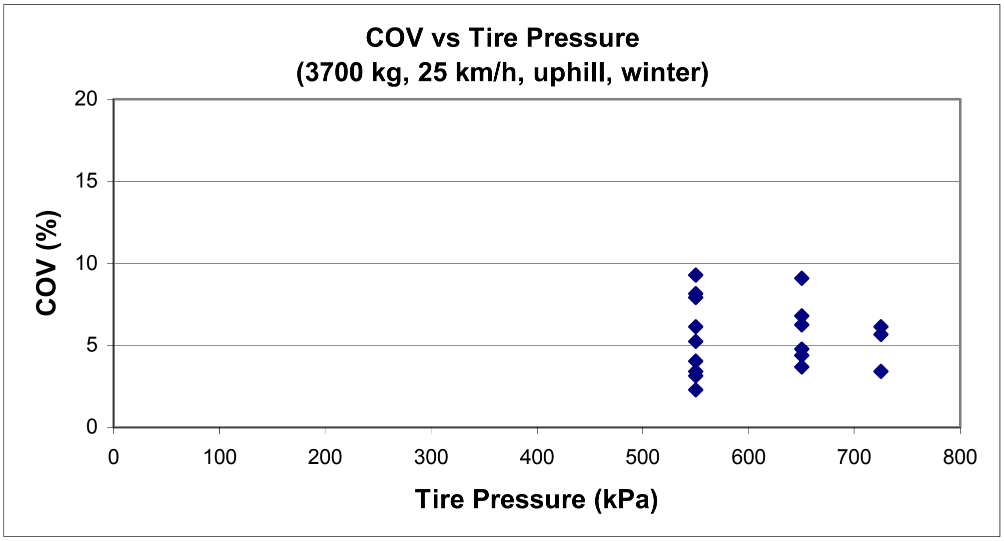
COV vs Tire Pressure
(3700 kg, 25 km/h, uphill, winter)
COV (%)
Tire Pressure (kPa)
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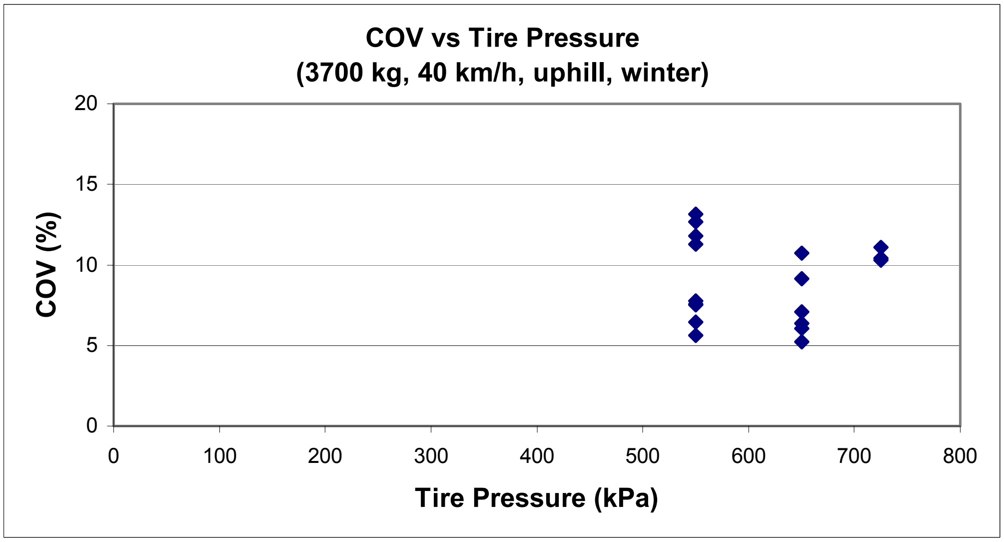

COV vs Tire Pressure
(3700 kg, 40 km/h, uphill, winter)
COV (%)
Tire Pressure (kPa)
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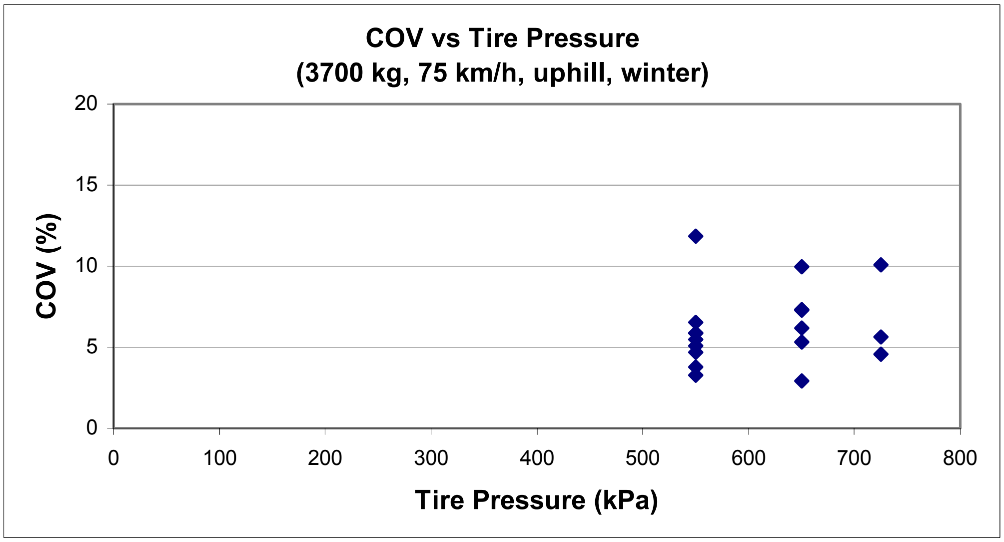

COV vs Tire Pressure
(3700 kg, 75 km/h, uphill, winter)
COV (%)
Tire Pressure (kPa)
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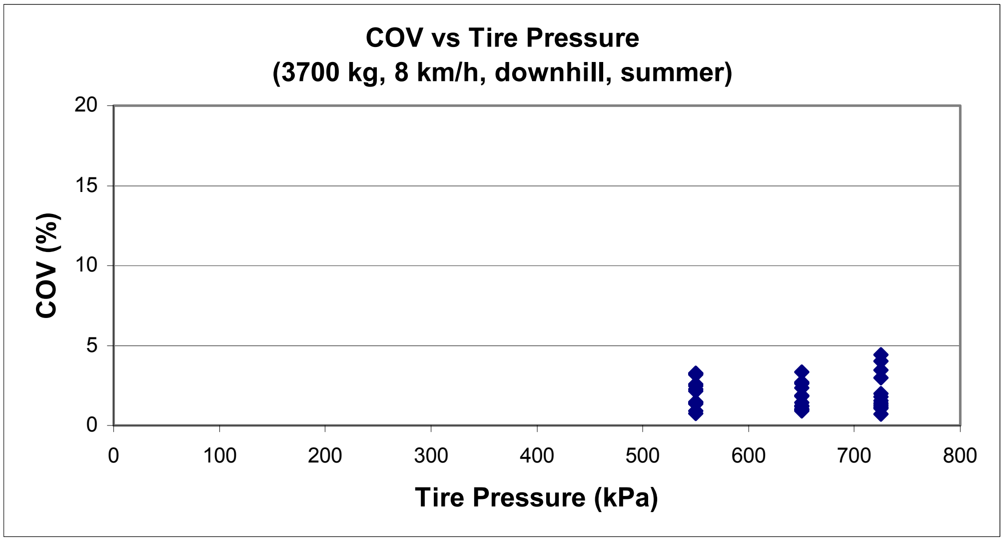

COV vs Tire Pressure
(3700 kg, 8 km/h, downhill, summer)
COV (%)
Tire Pressure (kPa)
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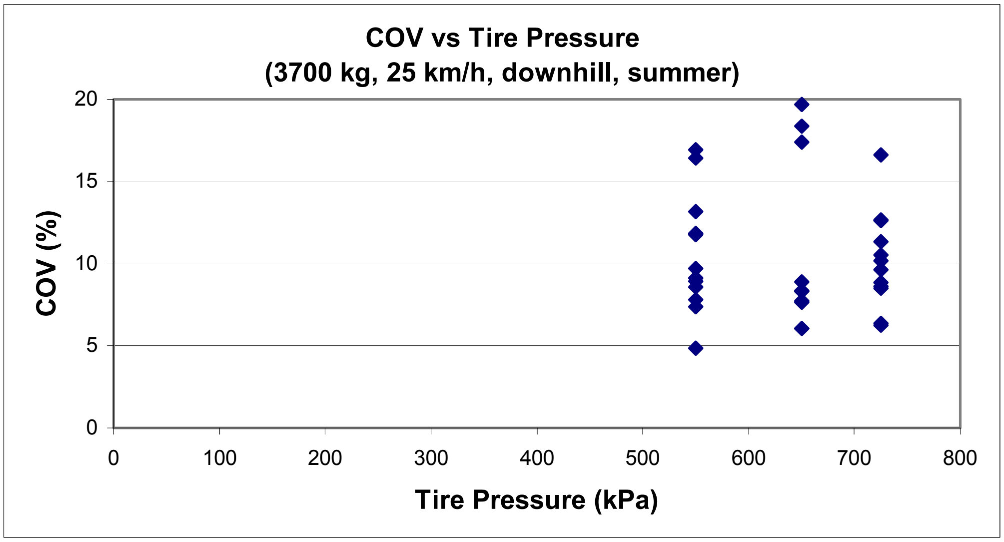
800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(3700 kg, 25 km/h, downhill, summer)
COV (%)
Tire Pressure (kPa)
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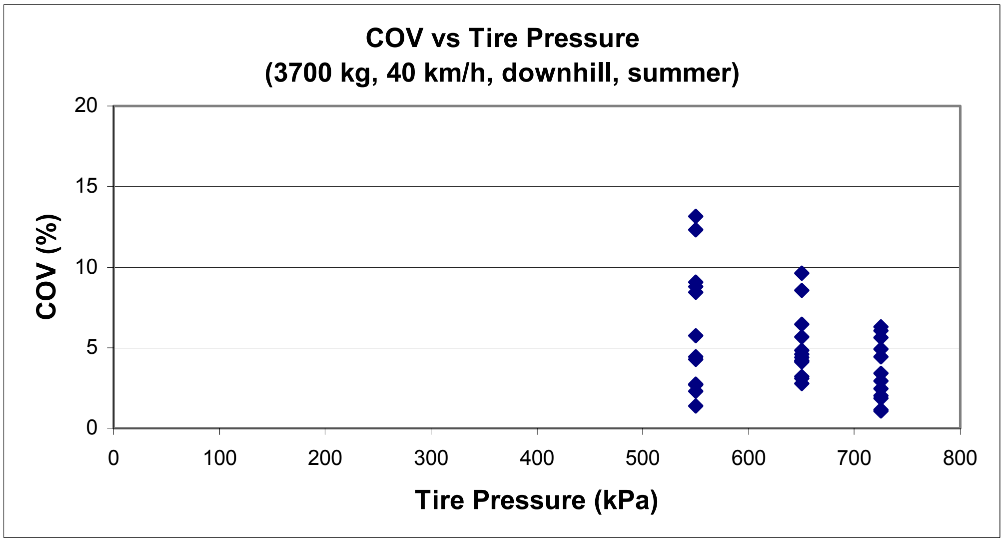
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COV (%)
Tire Pressure (kPa)
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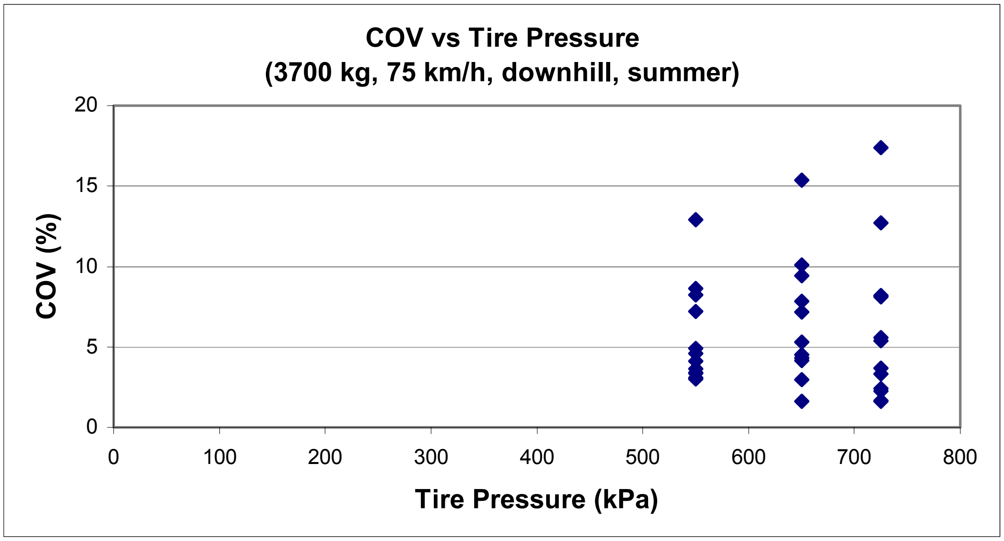
COV vs Tire Pressure
(3700 kg, 75 km/h, downhill, summer)
COV (%)
Tire Pressure (kPa)
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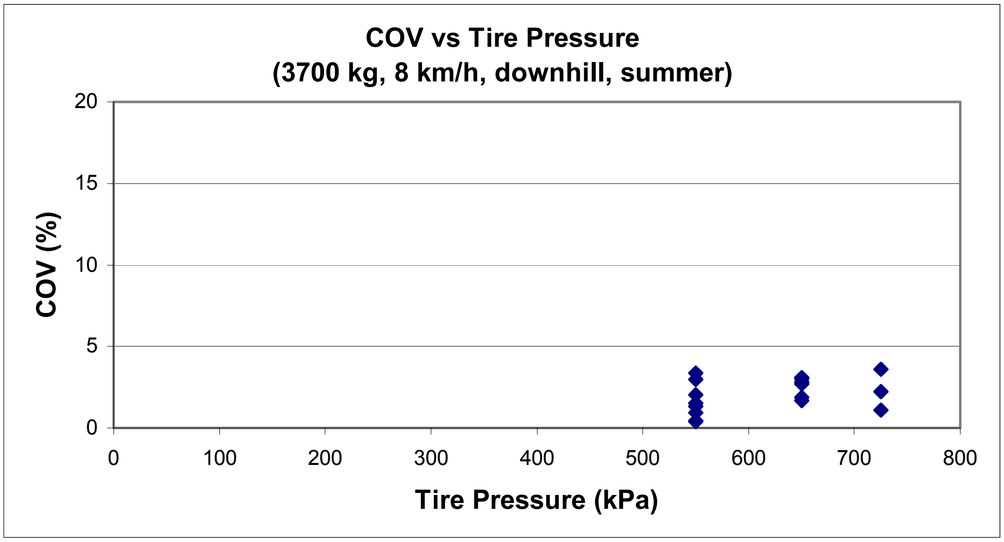
COV vs Tire Pressure
(3700 kg, 8 km/h, downhill, summer)
COV (%)
20
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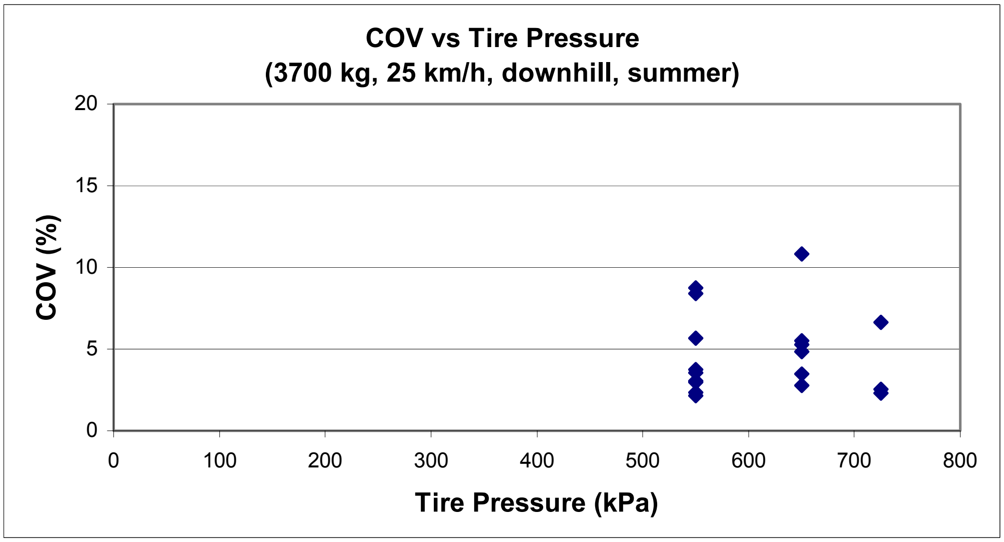
500
600
700
800
Tire Pressure (kPa)


COV vs Tire Pressure
(3700 kg, 25 km/h, downhill, summer)
COV (%)
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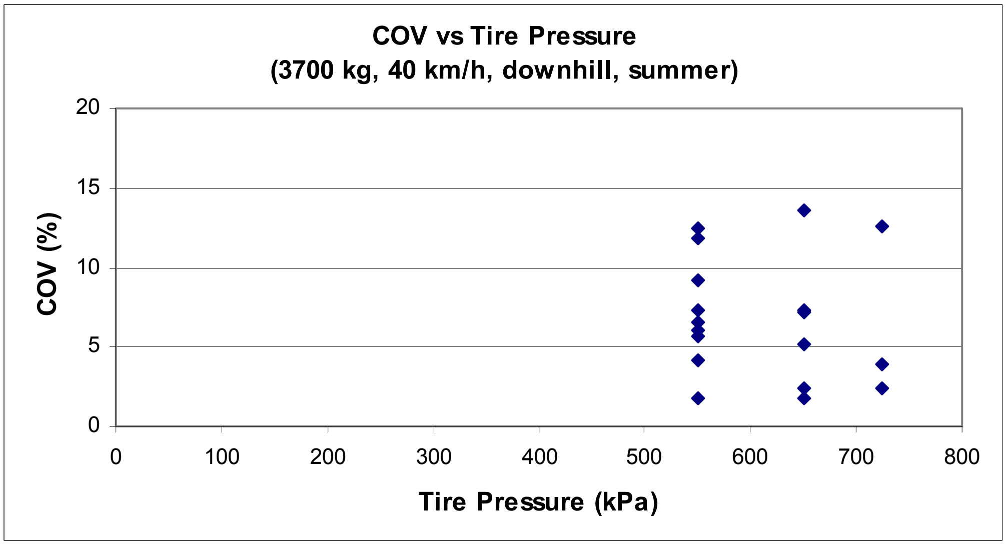
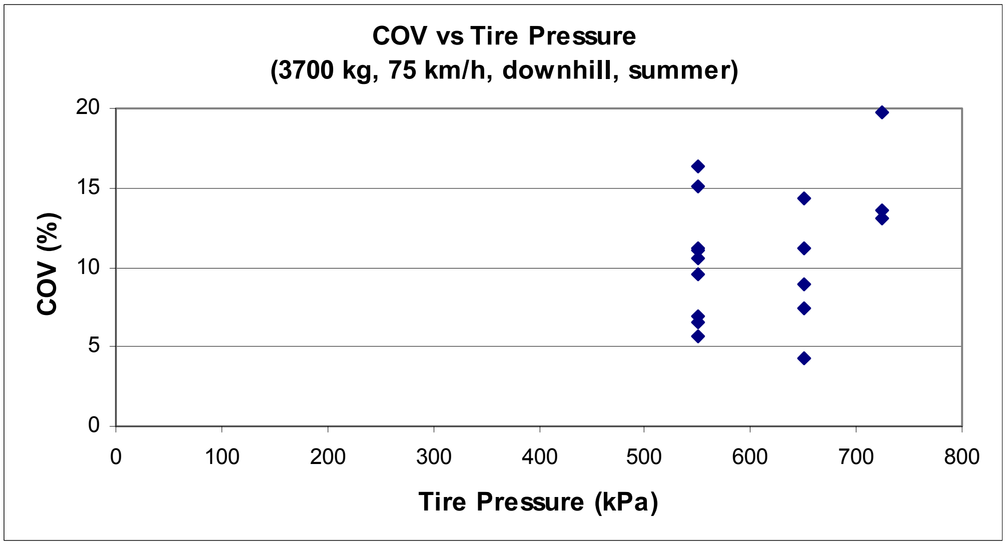
600
700
800
Tire Pressure (kPa)


COV vs Tire Pressure
(3700 kg, 40 km/h, downhill, summer)
COV (%)
20
15
10
5
0
0
100
200
300
400
500
600
700
800
Tire Pressure (kPa)


COV vs Tire Pressure
(3700 kg, 75 km/h, downhill, summer)
COV (%)
Tire Pressure (kPa)
0
5
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15
20
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100
200
300
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500
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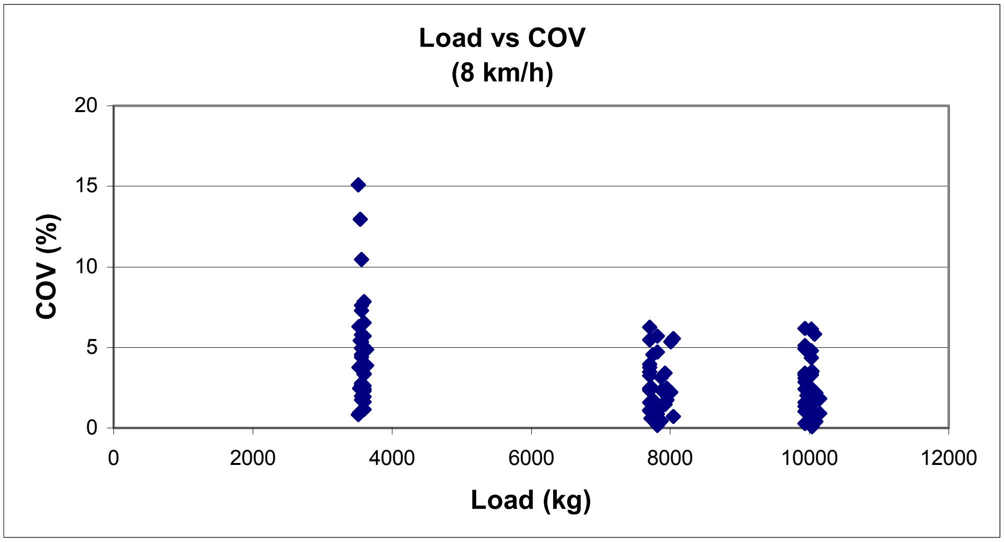
Load vs COV
(8 km/h)
COV (%)
Load (kg)
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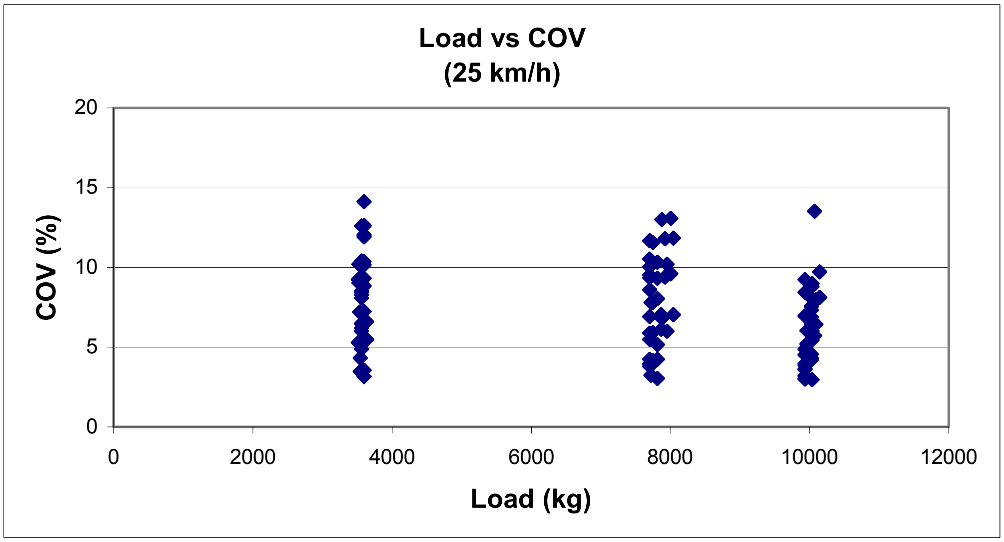
5
10
15
20
0
2000
4000
6000
8000
10000
12000


Load vs COV
(25 km/h)
COV (%)
Load (kg)
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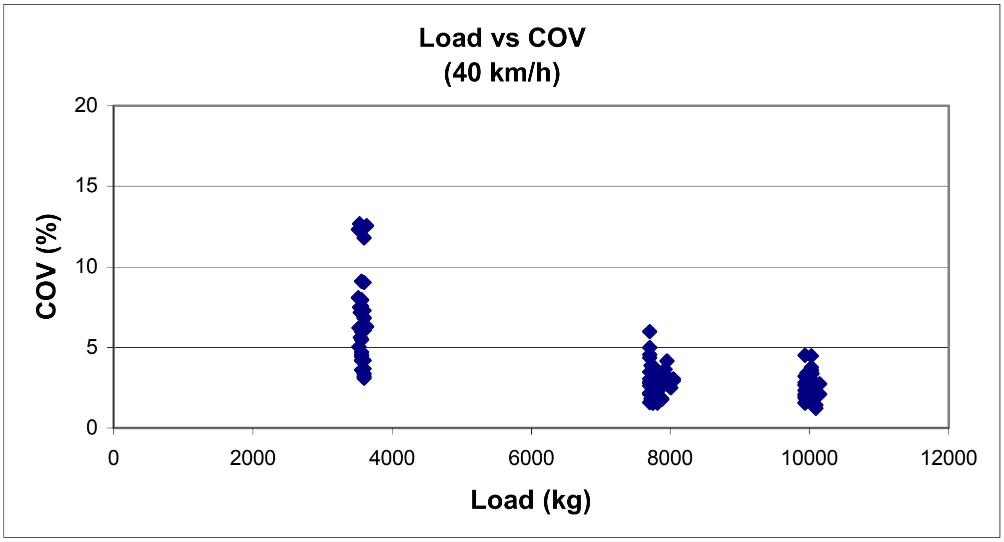
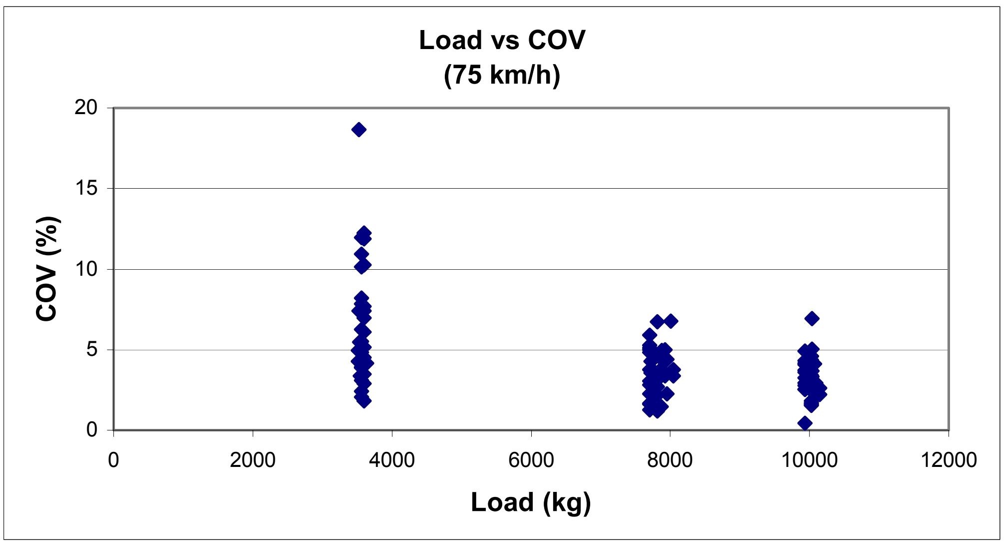
5
10
15
20
0
2000
4000
6000
8000
10000
12000


Load vs COV
(40 km/h)
COV (%)
20
15
10
5
0
0
2000
4000
6000
8000
10000
12000
Load (kg)


Load vs COV
(75 km/h)
COV (%)
20
15
10
5
0
0
2000
4000
6000
8000
10000
12000
Load (kg)

APPENDIX C

Troutsville Field Evaluation Data

Direction	North	1
	South	2
Vehicle Type	Dump	1
	Tandem Dump	2
	Equip Trailer	3
	Flat Bed	4
Axle Type	Single	1
	Tandem	2
	Tridem	3

Direction	Vehicle	Axle	Test Set #	Static Load (kg)	WIM Load (kg)
1	1	1	1	3538	3583
1	1	1	1	3447	3810
1	1	1	1	3538	3810
1	1	1	2	3583	3765
1	1	1	2	3583	3447
1	1	1	2	3583	3311
1	1	1	3	3629	3266
1	1	1	3	3629	3221
1	1	1	3	3629	3447
1	1	1	4	7847	6985
1	1	1	4	7893	8482
1	1	1	4	7893	8346
1	1	1	5	5625	5262
1	1	1	5	5625	5216
1	1	1	5	5625	5806
1	1	1	6	3538	3221
1	1	1	6	3493	3175
1	1	1	6	3493	3447
1	2	1	7	5670	5262
1	2	1	7	5670	5625
1	2	1	7	5670	5579
1	2	1	7	5670	5398
1	2	2	8	6033	6123
1	2	2	8	6033	6123
1	2	2	8	6033	5761
1	2	2	8	6033	5398
1	3	1	9	5625	5262
1	3	1	9	5625	5262
1	3	1	9	5579	5670
1	3	1	9	5579	4128
1	3	1	10	5488	5670

1	3	1	10	5488	5216
1	3	1	10	5488	5670
1	3	1	10	5488	5171
1	3	1	11	5761	5579
1	3	1	11	5761	5851
1	3	1	11	5761	5080
1	3	1	11	5761	5625
1	3	2	12	6396	6305
1	3	2	12	6622	6396
1	3	2	12	6396	7303
1	3	2	12	6396	5534
1	3	2	13	9707	9389
1	3	2	13	9752	9253
1	3	2	13	9707	9843
1	3	2	13	9707	9299
1	3	2	14	11521	11431
1	3	2	14	11521	12020
1	3	2	14	11521	10115
1	3	2	14	11521	11657
1	3	2	15	3084	2812
1	3	2	15	3084	2994
1	3	2	15	3130	3039
1	3	2	15	3130	2903
1	3	2	16	7394	7530
1	3	2	16	7394	7303
1	3	2	16	7394	7394
1	3	2	16	7394	7167
1	3	2	16	7394	7257
1	3	2	16	7394	7756
1	3	2	16	7394	7303
1	3	2	16	7394	7620
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1	4	1	17	5080	5262
1	4	1	17	5080	4990
1	4	1	17	5080	4899
1	4	1	18	4944	4853
1	4	1	18	4899	4899
1	4	1	18	4899	4627
1	4	1	18	4899	5262
1	4	1	19	4717	4400
1	4	1	19	4717	4173
1	4	1	19	4672	4173
1	4	1	19	4763	4218
1	4	1	20	4672	4309
1	4	1	20	4672	4173
1	4	1	20	4672	4309
1	4	1	20	4672	4309
1	4	1	21	4808	4581

1	4	1	21	4808	4763
1	4	1	21	4808	4672
1	4	1	21	4763	4627
1	4	1	22	4899	4400
1	4	1	22	4899	4581
1	4	1	22	4899	4672
1	4	1	22	4899	4808
1	4	2	23	11521	11068
1	4	2	23	11521	10024
1	4	2	23	11476	12292
1	4	2	23	11521	11249
1	4	2	24	10024	9934
1	4	2	24	10070	9843
1	4	2	24	10115	10024
1	4	2	24	10024	10070
1	4	2	25	7394	7666
1	4	2	25	7394	6940
1	4	2	25	7394	6895
1	4	2	25	7394	6985
1	4	2	26	7394	7484
1	4	2	26	7394	7620
1	4	2	26	7394	7257
1	4	2	26	7348	7167
1	4	2	27	9026	9389
1	4	2	27	8981	8890
1	4	2	27	9026	9299
1	4	2	27	8981	9389
1	4	2	28	10297	9480
1	4	2	28	10251	9979
1	4	2	28	10206	10387
1	4	2	28	10297	9616
1	4	3	29	11204	11884
1	4	3	29	11249	11703
1	4	3	29	11249	12247
1	4	3	29	11249	11884
1	4	3	30	9389	9979
1	4	3	30	9389	9888
1	4	3	30	9344	10024
1	4	3	30	9389	9752
1	4	3	31	5761	5806
1	4	3	31	5806	5670
1	4	3	31	5761	5670
1	4	3	31	5806	5625
1	4	3	31	5761	6577
1	4	3	31	5851	6532
1	4	3	31	5806	6441
1	4	3	31	5806	6396
1	4	3	32	11567	12565

1	4	3	32	11567	12383
1	4	3	32	11567	12519
1	4	3	32	11567	12519
1	4	3	33	12519	12338
1	4	3	33	12519	12383
1	4	3	33	12474	13653
1	4	3	33	12519	11884
2	1	1	34	3538	3629
2	1	1	34	3538	3583
2	1	1	34	3493	3629
2	1	1	35	3583	3583
2	1	1	35	3583	3493
2	1	1	35	3583	3674
2	1	1	36	3674	3810
2	1	1	36	3629	3583
2	1	1	36	3629	3901
2	1	1	37	7847	7893
2	1	1	37	7847	8119
2	1	1	37	7847	7893
2	1	1	38	5625	5625
2	1	1	38	5625	5398
2	1	1	38	5625	5579
2	1	1	39	3493	3674
2	1	1	39	3493	3221
2	1	1	39	3493	3266
2	2	1	40	6214	7031
2	2	1	40	6214	7121
2	2	1	40	6214	5942
2	2	1	40	6214	7031
2	2	1	41	6577	7303
2	2	1	41	6577	6849
2	2	1	41	6532	6985
2	2	1	41	6532	7530
2	2	1	42	5670	6260
2	2	1	42	5670	5942
2	2	1	42	5670	6577
2	2	1	42	5670	5761
2	2	2	43	9934	9163
2	2	2	43	9934	8074
2	2	2	43	9934	7484
2	2	2	43	9934	9344
2	2	2	44	11612	10115
2	2	2	44	11567	10659
2	2	2	44	11567	11068
2	2	2	44	11567	10251
2	2	2	45	6033	5262
2	2	2	45	6033	5443
2	2	2	45	6033	5806

2	2	2	45	6033	5262
2	3	1	46	5625	5534
2	3	1	46	5579	4354
2	3	1	46	5625	4309
2	3	1	46	5625	5670
2	3	1	47	5534	5488
2	3	1	47	5534	5715
2	3	1	47	5534	5715
2	3	1	47	5534	5942
2	3	1	48	5942	5806
2	3	1	48	5806	5670
2	3	1	48	5806	5987
2	3	1	48	5806	5761
2	3	2	49	6396	5534
2	3	2	49	6396	6895
2	3	2	49	6396	6169
2	3	2	49	6396	5715
2	3	2	50	9752	9389
2	3	2	50	9707	8119
2	3	2	50	9752	8709
2	3	2	50	9752	8437
2	3	2	51	10795	11567
2	3	2	51	11521	9934
2	3	2	51	11567	10387
2	3	2	51	11521	10977
2	3	2	52	3084	3402
2	3	2	52	3130	3856
2	3	2	52	3130	4990
2	3	2	52	3084	3493
2	3	2	53	7394	8210
2	3	2	53	7394	7031
2	3	2	53	7394	7439
2	3	2	53	7394	7212
2	3	2	54	7620	7394
2	3	2	54	7394	7121
2	3	2	54	7394	8074
2	3	2	54	7394	7484
2	4	1	55	5080	5398
2	4	1	55	5080	5579
2	4	1	55	5080	5216
2	4	1	56	4944	5262
2	4	1	56	4944	5126
2	4	1	56	4944	5398
2	4	1	56	4944	5398
2	4	1	57	4672	4672
2	4	1	57	4717	4536
2	4	1	57	4717	4536
2	4	1	57	4717	4536

2	4	1	58	4672	4808
2	4	1	58	4672	4717
2	4	1	58	4672	4717
2	4	1	58	4672	4491
2	4	1	59	4808	5080
2	4	1	59	4853	5126
2	4	1	59	4808	5080
2	4	1	59	4808	5126
2	4	1	60	4944	4990
2	4	1	60	4853	4899
2	4	1	60	4899	5080
2	4	1	60	4899	5080
2	4	2	61	11567	9934
2	4	2	61	11521	10342
2	4	2	61	11521	11204
2	4	2	62	10251	11793
2	4	2	62	10115	9979
2	4	2	62	10070	9344
2	4	2	62	10070	9072
2	4	2	63	7439	6033
2	4	2	63	7439	6123
2	4	2	63	7439	6033
2	4	2	63	7439	6123
2	4	2	64	7394	5897
2	4	2	64	7394	5942
2	4	2	64	7394	5715
2	4	2	64	7394	6305
2	4	2	65	8981	7620
2	4	2	65	9026	7711
2	4	2	65	8981	7711
2	4	2	65	8981	7893
2	4	2	66	10251	9571
2	4	2	66	9435	10297
2	4	2	66	10297	8890
2	4	2	66	10251	8618
2	4	3	67	11204	11793
2	4	3	67	11249	11884
2	4	3	67	11249	11476
2	4	3	68	9344	9616
2	4	3	68	9389	9843
2	4	3	68	9389	9117
2	4	3	68	9389	9299
2	4	3	69	5761	5126
2	4	3	69	5761	5080
2	4	3	69	5806	5488
2	4	3	69	5806	5443
2	4	3	69	5806	5670
2	4	3	69	5806	5670

2	4	3	69	5806	5398
2	4	3	69	5806	5443
2	4	3	70	11567	11521
2	4	3	70	11567	11521
2	4	3	70	11567	11567
2	4	3	70	11567	11567
2	4	3	71	12519	12837
2	4	3	71	12610	12519
2	4	3	71	12519	13109
2	4	3	71	12519	12882

APPENDIX D

Smart Road Field Evaluation Data
Two-Axle Vehicle

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1	1	650	10.0	5509	5611	3683	3602	30.9
2	2	650	9.0	5759	6069	3683	3602	30.9
3	1	650	7.7	5706	5655	3683	3602	30.9
4	2	650	8.9	5812	6084	3683	3602	30.9
5	1	650	7.4	5890	5386	3683	3602	30.9
6	2	650	8.4	6066	6197	3683	3602	30.9
7	1	650	22.7	4797	5182	3683	3602	30.9
8	2	650	22.9	5861	5273	3683	3602	30.8
9	1	650	22.0	4916	5370	3683	3602	30.8
10	2	650	22.4	6017	5234	3683	3602	30.8
11	1	650	26.6	4982	4540	3683	3602	30.8
12	2	650	22.2	6017	5060	3683	3602	30.8
13	1	650	23.2	4631	4663	3683	3602	30.8
14	2	650	26.9	5728	5484	3683	3602	30.8
15	1	650	22.4	4797	5425	3683	3602	30.8
16	2	650	17.4	5456	4961	3683	3602	30.8
17	1	650	19.0	5129	5067	3683	3602	30.8
18	2	650	19.8	5415	5312	3683	3602	30.8
19	1	650	40.7	5420	4286	3683	3602	30.6
20	2	650	39.4	5643	6082	3683	3602	30.6
21	1	650	40.6	5186	4304	3683	3602	30.6
22	2	650	40.1	5481	6395	3683	3602	30.6
23	1	650	41.8	5093	4663	3683	3602	30.6
24	2	650	40.9	5109	6303	3683	3602	30.6
25	1	650	41.5	4871	4450	3683	3602	30.6
26	2	650	41.7	5146	6570	3683	3602	30.6
27	1	650	37.7	5436	3835	3683	3602	30.6
28	2	650	35.7	5795	5543	3683	3602	30.6
29	1	650	38.8	5127	4049	3683	3602	30.6
30	2	650	39.4	5915	5902	3683	3602	30.5
31	1	650	72.3	4104	3906	3683	3602	30.4
32	2	650	72.3	4914	6014	3683	3602	30.4
33	1	650	70.3	4301	4164	3683	3602	30.4
34	2	650	68.4	5087	5755	3683	3602	30.4
35	1	650	71.1	3821	3831	3683	3602	30.4
36	2	650	72.4	4908	6601	3683	3602	30.4
37	1	650	74.0	3476	3964	3683	3602	30.4
38	2	650	71.6	4585	6547	3683	3602	30.4
39	1	650	70.5	4191	4050	3683	3602	30.4
40	2	650	64.5	5215	5395	3683	3602	30.4
41	1	650	71.9	4155	3978	3683	3602	30.4
42	2	650	71.6	5178	5943	3683	3602	30.4
43	1	650	7.4	6032	6589	3683	3602	34.8
44	2	650	8.0	6594	7008	3683	3602	34.8
45	1	650	8.2	6106	6589	3683	3602	34.8
46	2	650	7.9	7049	7075	3683	3602	34.8
47	1	650	7.4	6255	5872	3683	3602	34.8
48	2	650	6.9	6591	6755	3683	3602	34.8
49	1	650	23.5	5734	5908	3683	3602	34.8
50	2	650	22.9	7244	5928	3683	3602	34.8
51	1	650	23.7	5628	5476	3683	3602	34.8
52	2	650	22.4	7326	6265	3683	3602	34.8
53	1	650	24.9	5702	4884	3683	3602	34.8
54	2	650	25.6	6861	7578	3683	3602	34.8
55	1	650	31.2	5434	5124	3683	3602	34.8
56	2	650	27.7	6472	8226	3683	3602	34.8
57	1	650	18.2	5768	5795	3683	3602	35.1
58	2	650	21.2	7133	6912	3683	3602	35.1
59	1	650	21.7	5164	6171	3683	3602	35.1

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
60	2	650	23.5	7133	7051	3683	3602	35.1
61	1	650	41.7	6496	5332	3683	3602	35.1
62	2	650	41.4	6598	7819	3683	3602	35.1
63	1	650	41.2	6171	5459	3683	3602	35.1
64	2	650	41.7	6565	8682	3683	3602	35.1
65	1	650	46.2	6053	6254	3683	3602	35.1
66	2	650	42.0	6206	8798	3683	3602	35.1
67	1	650	45.4	6039	6018	3683	3602	35.1
68	2	650	42.3	6039	8563	3683	3602	35.1
69	1	650	40.9	6458	5488	3683	3602	35.1
70	2	650	39.3	6951	7558	3683	3602	35.2
71	1	650	39.8	6148	5222	3683	3602	35.2
72	2	650	41.0	7085	7676	3683	3602	35.2
73	1	650	71.1	3793	4347	3683	3602	35.2
74	2	650	73.1	5815	8053	3683	3602	35.2
75	1	650	75.2	3527	4098	3683	3602	35.2
76	2	650	72.9	5670	7603	3683	3602	35.4
77	1	650	74.2	3418	3646	3683	3602	35.4
78	2	650	72.4	5854	7919	3683	3602	35.4
79	1	650	71.5	3889	3808	3683	3602	35.4
80	2	650	73.5	5697	7751	3683	3602	35.4
81	1	650	70.8	4180	4199	3683	3602	35.4
82	2	650	71.1	6116	7320	3683	3602	35.4
83	1	650	71.5	4276	3768	3683	3602	35.6
84	2	650	71.0	5984	7155	3683	3602	35.6
85	1	650	10.3	6363	6650	3683	3602	30.6
86	2	650	9.2	6264	6936	3683	3602	30.6
87	1	650	9.3	6250	5712	3683	3602	30.6
88	2	650	9.8	6111	6508	3683	3602	30.6
89	1	650	9.2	6396	6003	3683	3602	30.6
90	2	650	8.5	6311	6859	3683	3602	30.6
91	1	650	25.3	5550	5512	3683	3602	30.6
92	2	650	22.5	6616	5795	3683	3602	30.6
93	1	650	14.2	5272	5868	3683	3602	30.6
94	2	650	22.7	6421	5887	3683	3602	30.6
95	1	650	28.0	5293	4633	3683	3602	30.6
96	2	650	25.7	6683	5731	3683	3602	30.6
97	1	650	29.5	5030	4368	3683	3602	30.6
98	2	650	24.6	5832	6040	3683	3602	30.7
99	1	650	26.2	5695	4762	3683	3602	30.7
100	2	650	25.7	6976	5567	3683	3602	30.7
101	1	650	24.0	5558	5816	3683	3602	30.7
102	2	650	23.0	6276	6035	3683	3602	30.7
103	1	650	39.6	5779	4716	3683	3602	30.7
104	2	650	40.4	6122	6734	3683	3602	30.7
105	1	650	40.1	6040	4997	3683	3602	30.7
106	2	650	41.4	6207	6904	3683	3602	30.7
107	1	650	42.6	5895	5162	3683	3602	30.7
108	2	650	43.8	5861	7097	3683	3602	30.7
109	1	650	40.1	5937	5231	3683	3602	30.7
110	2	650	39.6	5889	7103	3683	3602	30.8
111	1	650	37.8	6031	4189	3683	3602	30.8
112	2	650	40.6	6516	6635	3683	3602	30.8
113	1	650	39.8	6265	4356	3683	3602	30.8
114	2	650	40.7	6497	6654	3683	3602	30.8
115	1	650	71.1	4339	4039	3683	3602	30.9
116	2	650	70.8	5476	7420	3683	3602	30.9
117	1	650	71.3	4606	4435	3683	3602	30.9
118	2	650	70.7	5485	7207	3683	3602	30.9

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
119	1	650	75.3	3792	4054	3683	3602	30.9
120	2	650	71.5	5333	7257	3683	3602	30.9
121	1	650	71.5	4599	4732	3683	3602	30.9
122	2	650	71.1	5387	7208	3683	3602	30.9
123	1	650	71.3	4466	4441	3683	3602	30.9
124	2	650	68.9	5876	7056	3683	3602	30.9
125	1	650	74.8	4758	4282	3683	3602	30.9
126	2	650	72.9	5889	6380	3683	3602	30.9
127	1	650	7.4	5460	11822	3674	7702	30.3
128	2	650	10.6	5793	13700	3674	7702	30.3
129	1	650	9.0	5739	12346	3674	7702	30.3
130	2	650	7.1	5829	13210	3674	7702	30.3
131	1	650	7.4	5520	12279	3674	7702	30.3
132	2	650	7.1	6024	13840	3674	7702	30.3
133	1	650	24.0	5455	10236	3674	7702	30.3
134	2	650	24.8	6253	14647	3674	7702	30.3
135	1	650	22.7	5248	9891	3674	7702	30.3
136	2	650	23.0	6156	13535	3674	7702	30.3
137	1	650	24.8	5400	10990	3674	7702	30.3
138	2	650	26.4	5227	15456	3674	7702	30.3
139	1	650	24.6	4127	10850	3674	7702	30.3
140	2	650	25.3	5560	15638	3674	7702	30.3
141	1	650	22.5	5361	9728	3674	7702	30.2
142	2	650	24.9	7325	13006	3674	7702	30.2
143	1	650	20.8	5489	11637	3674	7702	30.2
144	2	650	21.7	7106	12119	3674	7702	30.2
145	1	650	41.4	5560	11584	3674	7702	30.2
146	2	650	37.5	5093	13584	3674	7702	30.2
147	1	650	40.6	5514	11391	3674	7702	30.2
148	2	650	41.4	5480	13477	3674	7702	30.2
149	1	650	43.9	5422	10994	3674	7702	30.2
150	2	650	43.8	4817	12833	3674	7702	30.2
151	1	650	42.2	5018	10914	3674	7702	30.2
152	2	650	41.0	5109	13200	3674	7702	30.2
153	1	650	40.9	6180	11269	3674	7702	30.2
154	2	650	38.9	5844	13077	3674	7702	30.2
155	1	650	40.6	6297	10741	3674	7702	30.2
156	2	650	40.2	6251	13122	3674	7702	30.2
157	1	650	67.6	2712	9009	3674	7702	30.2
158	2	650	62.1	3775	10938	3674	7702	30.2
159	1	650	69.8	3041	9289	3674	7702	30.2
160	2	650	62.9	3992	10929	3674	7702	30.2
161	1	650	73.5	2795	8983	3674	7702	30.1
162	2	650	62.4	4449	11367	3674	7702	30.1
163	1	650	71.0	2921	8957	3674	7702	30.1
164	2	650	62.9	4466	11709	3674	7702	30.1
165	1	650	71.1	4262	9528	3674	7702	30.1
166	2	650	62.0	4692	11910	3674	7702	30.1
167	1	650	71.6	4760	9471	3674	7702	30.1
168	2	650	59.1	4337	11764	3674	7702	30.1
169	1	650	8.4	6130	12487	3674	7702	32.3
170	2	650	7.6	6207	15106	3674	7702	32.3
171	1	650	6.6	5851	13253	3674	7702	32.3
172	2	650	7.9	6020	14716	3674	7702	32.3
173	1	650	6.9	5974	13474	3674	7702	32.3
174	2	650	7.2	6275	15154	3674	7702	32.3
175	1	650	23.8	5712	10856	3674	7702	32.3
176	2	650	24.0	6777	16462	3674	7702	32.3
177	1	650	24.0	5839	11013	3674	7702	32.4

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
178	2	650	24.0	6646	16299	3674	7702	32.4
179	1	650	21.1	6141	10763	3674	7702	32.4
180	2	650	28.6	6000	17928	3674	7702	32.4
181	1	650	22.5	5097	11194	3674	7702	32.4
182	2	650	27.2	6262	18151	3674	7702	32.4
183	1	650	22.4	5869	12566	3674	7702	32.4
184	2	650	23.7	7974	14006	3674	7702	32.4
185	1	650	22.5	6303	11140	3674	7702	32.4
186	2	650	24.6	7424	14497	3674	7702	32.4
187	1	650	40.7	6385	12955	3674	7702	32.6
188	2	650	35.6	5836	16822	3674	7702	32.6
189	1	650	41.7	6417	12766	3674	7702	32.6
190	2	650	40.6	6338	16345	3674	7702	32.6
191	1	650	40.4	6087	12758	3674	7702	32.6
192	2	650	40.2	6195	15989	3674	7702	32.6
193	1	650	42.6	6630	12672	3674	7702	32.6
194	2	650	40.1	5739	15978	3674	7702	32.6
195	1	650	40.9	6868	12840	3674	7702	32.6
196	2	650	40.4	6065	15724	3674	7702	32.6
197	1	650	40.7	6846	11885	3674	7702	32.6
198	2	650	42.0	6784	15610	3674	7702	32.6
199	1	650	72.3	3451	9834	3674	7702	32.6
200	2	650	61.6	5132	14505	3674	7702	32.6
201	1	650	71.3	4154	10850	3674	7702	32.6
202	2	650	60.2	5067	14583	3674	7702	32.6
203	1	650	71.3	3352	9742	3674	7702	32.6
204	2	650	61.6	5153	13631	3674	7702	32.6
205	1	650	71.9	2982	9747	3674	7702	32.6
206	2	650	59.7	5174	14983	3674	7702	32.6
207	1	650	70.3	4581	10759	3674	7702	32.6
208	2	650	60.4	5862	13658	3674	7702	32.6
209	1	650	71.8	4516	10291	3674	7702	32.6
210	2	650	60.5	5309	15362	3674	7702	32.6
211	1	650	8.9	6515	13787	3674	7702	35.7
212	2	650	9.7	6057	13527	3674	7702	35.7
213	1	650	8.7	6524	13945	3674	7702	35.7
214	2	650	9.2	6049	13621	3674	7702	35.7
215	1	650	8.9	6622	12996	3674	7702	35.7
216	2	650	9.8	6082	14157	3674	7702	35.7
217	1	650	26.4	5836	11565	3674	7702	35.7
218	2	650	23.3	7072	15735	3674	7702	35.7
219	1	650	22.5	5666	11271	3674	7702	35.7
220	2	650	22.0	6933	15438	3674	7702	35.7
221	1	650	25.4	5411	12136	3674	7702	35.7
222	2	650	24.9	6091	16374	3674	7702	35.7
223	1	650	28.3	5375	12669	3674	7702	35.7
224	2	650	24.1	6755	15899	3674	7702	35.7
225	1	650	20.3	5410	10843	3674	7702	35.8
226	2	650	25.1	7262	14713	3674	7702	35.8
227	1	650	26.6	5934	11742	3674	7702	35.8
228	2	650	23.5	6581	15091	3674	7702	35.8
229	1	650	41.0	6189	12442	3674	7702	35.8
230	2	650	38.6	5561	14665	3674	7702	35.8
231	1	650	41.4	5985	12461	3674	7702	35.8
232	2	650	42.0	5828	14014	3674	7702	35.8
233	1	650	44.9	5910	11255	3674	7702	35.8
234	2	650	41.8	5347	13351	3674	7702	35.8
235	1	650	44.1	5714	11300	3674	7702	35.8
236	2	650	40.9	5757	14192	3674	7702	35.8

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
237	1	650	42.6	5651	11307	3674	7702	35.8
238	2	650	41.5	5590	14026	3674	7702	35.8
239	1	650	40.7	6040	12218	3674	7702	35.8
240	2	650	39.1	6878	15448	3674	7702	35.8
241	1	650	37.2	6316	12952	3674	7702	35.8
242	2	650	42.2	6362	14135	3674	7702	35.8
243	1	650	52.6	5106	11126	3674	7702	35.8
244	2	650	62.9	4810	11619	3674	7702	35.8
245	1	650	70.3	3998	10574	3674	7702	35.8
246	2	650	63.1	4841	10963	3674	7702	35.8
247	1	650	71.0	3781	10247	3674	7702	35.8
248	2	650	61.2	4724	11246	3674	7702	35.8
249	1	650	70.7	4222	10206	3674	7702	35.8
250	2	650	61.0	4269	10134	3674	7702	36.0
251	1	650	69.2	4337	10429	3674	7702	36.0
252	2	650	59.4	4856	10607	3674	7702	36.0
253	1	650	8.9	5868	16882	3520	9934	30.1
254	2	650	7.9	5212	16527	3520	9934	30.1
255	1	650	6.4	5607	16553	3520	9934	30.1
256	2	650	6.5	5561	16422	3520	9934	30.1
257	1	650	6.6	5890	16985	3520	9934	30.1
258	2	650	8.9	5579	16752	3520	9934	30.1
259	1	650	25.1	5556	13835	3520	9934	30.1
260	2	650	22.0	6167	18824	3520	9934	30.1
261	1	650	22.9	5625	13227	3520	9934	30.1
262	2	650	21.1	6007	18150	3520	9934	30.1
263	1	650	22.4	5179	14120	3520	9934	30.1
264	2	650	22.4	5460	19585	3520	9934	30.1
265	1	650	23.8	5006	14695	3520	9934	30.1
266	2	650	22.5	5764	19376	3520	9934	30.1
267	1	650	23.8	4953	14618	3520	9934	30.1
268	2	650	23.5	6251	18894	3520	9934	30.1
269	1	650	25.9	5339	13935	3520	9934	30.1
270	2	650	24.5	5345	19645	3520	9934	30.1
271	1	650	40.9	5649	15310	3520	9934	30.1
272	2	650	36.7	5291	18807	3520	9934	30.1
273	1	650	41.7	5873	15204	3520	9934	30.1
274	2	650	39.4	5132	18645	3520	9934	30.1
275	1	650	40.6	5726	15339	3520	9934	30.2
276	2	650	40.2	5423	18488	3520	9934	30.2
277	1	650	41.0	5383	14671	3520	9934	30.2
278	2	650	41.0	5333	17803	3520	9934	30.2
279	1	650	41.8	5837	15081	3520	9934	30.2
280	2	650	37.8	6289	18451	3520	9934	30.2
281	1	650	42.6	5762	14643	3520	9934	30.2
282	2	650	38.8	5477	18390	3520	9934	30.2
283	1	650	63.2	3525	13087	3520	9934	30.2
284	2	650	56.2	4235	15614	3520	9934	30.2
285	1	650	71.6	3719	12570	3520	9934	30.2
286	2	650	56.8	4581	16735	3520	9934	30.2
287	1	650	69.0	3743	13330	3520	9934	30.2
288	2	650	55.7	4565	16924	3520	9934	30.2
289	1	650	71.0	3748	12565	3520	9934	30.2
290	2	650	56.3	4564	16476	3520	9934	30.2
291	1	650	71.6	3979	12937	3520	9934	30.2
292	2	650	56.3	4562	16567	3520	9934	30.2
293	1	650	71.6	3327	12574	3520	9934	30.2
294	2	650	55.4	4532	15464	3520	9934	30.2
295	1	650	9.2	6167	18970	3520	9934	33.3

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
296	2	650	8.7	5865	17895	3520	9934	33.3
297	1	650	6.6	6051	18434	3520	9934	33.3
298	2	650	8.9	6008	18230	3520	9934	33.3
299	1	650	9.2	6066	19347	3520	9934	33.3
300	2	650	7.6	6123	20047	3520	9934	33.3
301	1	650	23.8	6200	14484	3520	9934	33.3
302	2	650	21.2	6814	21178	3520	9934	33.3
303	1	650	23.5	5890	14769	3520	9934	33.3
304	2	650	24.9	6831	21636	3520	9934	33.3
305	1	650	25.3	5916	15414	3520	9934	33.6
306	2	650	24.0	6802	22251	3520	9934	33.6
307	1	650	25.3	4871	15815	3520	9934	33.6
308	2	650	24.8	6106	22757	3520	9934	33.6
309	1	650	23.3	5656	16197	3520	9934	33.6
310	2	650	28.8	6210	23411	3520	9934	33.6
311	1	650	29.3	5374	16295	3520	9934	33.6
312	2	650	25.7	6054	22475	3520	9934	33.6
313	1	650	24.9	5420	16415	3520	9934	33.6
314	2	650	27.2	5305	23214	3520	9934	33.6
315	1	650	38.8	5760	16912	3520	9934	33.6
316	2	650	39.4	5785	20764	3520	9934	33.6
317	1	650	42.0	6211	17242	3520	9934	33.6
318	2	650	38.3	5774	21918	3520	9934	33.6
319	1	650	41.7	6387	17235	3520	9934	33.6
320	2	650	37.5	5879	21840	3520	9934	33.8
321	1	650	40.2	6520	17634	3520	9934	33.8
322	2	650	38.3	5959	22175	3520	9934	33.8
323	1	650	41.8	6289	17170	3520	9934	33.8
324	2	650	38.1	5688	21385	3520	9934	33.8
325	1	650	39.6	6352	17569	3520	9934	33.8
326	2	650	38.8	5832	21803	3520	9934	33.8
327	1	650	69.5	3444	14044	3520	9934	33.8
328	2	650	57.0	4737	18048	3520	9934	33.8
329	1	650	71.9	4133	14767	3520	9934	34.1
330	2	650	54.7	5208	19962	3520	9934	34.1
331	1	650	69.8	3979	15083	3520	9934	34.1
332	2	650	56.2	4888	19205	3520	9934	34.1
333	1	650	70.7	3509	14450	3520	9934	34.1
334	2	650	56.3	4731	18720	3520	9934	34.4
335	1	650	71.6	4031	14881	3520	9934	34.4
336	2	650	55.7	4833	18204	3520	9934	34.4
337	1	550	9.8	5597	5087	3738	3565	27.4
338	2	550	8.9	5860	6073	3738	3565	27.4
339	1	550	9.3	5789	6245	3738	3565	27.4
340	2	550	8.9	5991	6199	3738	3565	27.4
341	1	550	7.2	5967	5960	3738	3565	27.4
342	2	550	9.3	5830	5988	3738	3565	27.4
343	1	550	23.5	5056	5556	3738	3565	27.4
344	2	550	24.8	6224	5824	3738	3565	27.4
345	1	550	23.7	5317	5488	3738	3565	27.4
346	2	550	23.2	6297	5948	3738	3565	27.4
347	1	550	26.4	5608	4793	3738	3565	27.4
348	2	550	27.8	5782	6755	3738	3565	27.5
349	1	550	25.1	4937	4481	3738	3565	27.5
350	2	550	25.1	5735	6047	3738	3565	27.5
351	1	550	24.8	5284	4525	3738	3565	27.5
352	2	550	27.2	6678	5227	3738	3565	27.5
353	1	550	24.6	5419	5581	3738	3565	27.5
354	2	550	24.1	6217	6301	3738	3565	27.5

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
355	1	550	40.7	5672	4628	3738	3565	27.5
356	2	550	39.9	5977	6496	3738	3565	27.5
357	1	550	39.8	5640	4769	3738	3565	27.5
358	2	550	41.0	5820	7154	3738	3565	27.5
359	1	550	40.4	5572	4743	3738	3565	27.5
360	2	550	39.6	6051	6242	3738	3565	27.5
361	1	550	39.4	5659	4431	3738	3565	27.5
362	2	550	40.1	6160	6204	3738	3565	27.5
363	1	550	39.1	5714	4232	3738	3565	27.5
364	2	550	40.7	6276	6106	3738	3565	27.5
365	1	550	39.3	5807	4222	3738	3565	27.5
366	2	550	41.4	6174	6311	3738	3565	27.5
367	1	550	73.7	4105	4347	3738	3565	27.5
368	2	550	72.4	5064	7151	3738	3565	27.5
369	1	550	71.0	4351	4204	3738	3565	27.5
370	2	550	71.3	4914	6884	3738	3565	27.5
371	1	550	74.0	3929	3814	3738	3565	27.5
372	2	550	72.4	4991	6828	3738	3565	27.5
373	1	550	77.2	3435	3227	3738	3565	27.5
374	2	550	71.1	5009	6962	3738	3565	27.5
375	1	550	73.1	4327	4218	3738	3565	27.5
376	2	550	71.9	5400	6793	3738	3565	27.5
377	1	550	73.9	4262	4610	3738	3565	27.6
378	2	550	73.9	5538	6507	3738	3565	27.6
379	1	550	8.7	6130	5637	3683	3602	30.1
380	2	550	7.6	6759	6689	3683	3602	30.1
381	1	550	7.1	5997	5999	3683	3602	30.1
382	2	550	7.2	6722	6494	3683	3602	30.1
383	1	550	7.2	5962	6054	3683	3602	30.1
384	2	550	7.4	6668	6798	3683	3602	30.1
385	1	550	25.7	5423	5070	3683	3602	30.1
386	2	550	24.1	7109	5558	3683	3602	30.1
387	1	550	23.8	5307	5361	3683	3602	30.1
388	2	550	23.2	6741	6266	3683	3602	30.1
389	1	550	23.7	5104	4835	3683	3602	30.1
390	2	550	23.8	6533	7370	3683	3602	30.1
391	1	550	24.1	5071	4804	3683	3602	30.1
392	2	550	23.7	6014	7207	3683	3602	30.1
393	1	550	23.3	5449	6507	3683	3602	30.1
394	2	550	24.0	6914	5433	3683	3602	30.3
395	1	550	21.7	5295	5185	3683	3602	30.3
396	2	550	23.7	6871	6511	3683	3602	30.3
397	1	550	40.7	6043	5338	3683	3602	30.3
398	2	550	41.4	6167	7659	3683	3602	30.3
399	1	550	40.4	6138	5436	3683	3602	30.3
400	2	550	31.7	6220	8015	3683	3602	30.3
401	1	550	41.8	5814	5821	3683	3602	30.3
402	2	550	40.1	6007	7790	3683	3602	30.3
403	1	550	42.2	6236	5576	3683	3602	30.3
404	2	550	41.0	5604	8020	3683	3602	30.3
405	1	550	41.4	6610	4396	3683	3602	30.3
406	2	550	40.1	6496	7357	3683	3602	30.3
407	1	550	40.9	6381	4412	3683	3602	30.3
408	2	550	39.9	6595	7257	3683	3602	30.5
409	1	550	72.7	4438	4917	3683	3602	30.5
410	2	550	71.8	5385	8083	3683	3602	30.5
411	1	550	74.0	3545	3839	3683	3602	30.5
412	2	550	72.1	5208	7132	3683	3602	30.5
413	1	550	74.2	3752	3636	3683	3602	30.5

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
414	2	550	71.0	5362	7542	3683	3602	30.5
415	1	550	74.0	4029	3666	3683	3602	30.5
416	2	550	71.1	5590	7836	3683	3602	30.5
417	1	550	72.3	4533	4279	3683	3602	30.5
418	2	550	71.0	5828	6901	3683	3602	30.5
419	1	550	73.5	4837	4167	3683	3602	30.6
420	2	550	71.0	5706	6695	3683	3602	30.6
421	1	650	9.2	5843	5980	3738	3565	27.2
422	2	650	15.1	6152	6410	3738	3565	27.2
423	1	650	7.4	5782	5541	3738	3565	27.2
424	2	650	9.0	5772	5957	3738	3565	27.2
425	1	650	9.3	5699	6018	3738	3565	27.2
426	2	650	8.9	5927	6460	3738	3565	27.2
427	1	650	24.5	5198	5113	3738	3565	27.2
428	2	650	22.4	6193	5525	3738	3565	27.2
429	1	650	23.3	5251	5434	3738	3565	27.2
430	2	650	22.9	6264	5156	3738	3565	27.2
431	1	650	25.1	5146	4391	3738	3565	27.2
432	2	650	26.4	6018	6572	3738	3565	27.2
433	1	650	24.6	5172	4643	3738	3565	27.2
434	2	650	25.4	5928	6594	3738	3565	27.2
435	1	650	25.1	5211	5349	3738	3565	27.2
436	2	650	25.1	6226	6178	3738	3565	27.2
437	1	650	30.6	5566	4446	3738	3565	27.2
438	2	650	26.4	6272	5557	3738	3565	27.2
439	1	650	41.7	5532	4654	3738	3565	27.2
440	2	650	40.2	5844	6254	3738	3565	27.2
441	1	650	38.5	5836	4326	3738	3565	27.2
442	2	650	39.4	5899	6434	3738	3565	27.2
443	1	650	42.3	5604	4770	3738	3565	27.2
444	2	650	40.7	5439	6736	3738	3565	27.2
445	1	650	41.7	5522	4674	3738	3565	27.2
446	2	650	39.6	5484	6522	3738	3565	27.2
447	1	650	38.9	5220	3836	3738	3565	27.2
448	2	650	39.8	5478	5368	3738	3565	27.2
449	1	650	40.7	5906	4265	3738	3565	27.2
450	2	650	40.9	6057	6336	3738	3565	27.2
451	1	650	57.8	2601	4025	3738	3565	27.2
452	2	650	71.3	5071	6435	3738	3565	27.3
453	1	650	74.4	4310	4374	3738	3565	27.3
454	2	650	73.4	5002	6907	3738	3565	27.3
455	1	650	74.5	4322	4570	3738	3565	27.3
456	2	650	70.3	4893	6918	3738	3565	27.3
457	1	650	74.0	3300	3708	3738	3565	27.3
458	2	650	71.6	5113	6728	3738	3565	27.3
459	1	650	75.2	4114	3949	3738	3565	27.3
460	2	650	69.0	5436	6569	3738	3565	27.3
461	1	650	72.6	4134	3913	3738	3565	27.3
462	2	650	71.0	5397	6275	3738	3565	27.3
463	1	550	7.2	5579	11698	3602	7720	29.1
464	2	550	7.7	6075	14270	3602	7720	29.1
465	1	550	7.2	5651	12115	3602	7720	29.1
466	2	550	7.4	6058	14102	3602	7720	29.1
467	1	550	7.4	5654	11538	3602	7720	29.1
468	2	550	6.9	6147	14186	3602	7720	29.1
469	1	550	25.3	5492	10364	3602	7720	29.1
470	2	550	24.1	6345	14691	3602	7720	29.1
471	1	550	22.0	4973	9957	3602	7720	29.1
472	2	550	25.1	6450	15147	3602	7720	29.1

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
473	1	550	23.0	5202	10299	3602	7720	29.1
474	2	550	24.3	5822	15708	3602	7720	29.1
475	1	550	24.5	4543	10734	3602	7720	29.1
476	2	550	26.2	5962	15860	3602	7720	29.2
477	1	550	24.0	5187	10088	3602	7720	29.2
478	2	550	24.9	5858	14414	3602	7720	29.2
479	1	550	22.4	5560	9809	3602	7720	29.2
480	2	550	23.2	6794	12698	3602	7720	29.2
481	1	550	41.5	5968	11633	3602	7720	29.2
482	2	550	40.7	5850	13579	3602	7720	29.2
483	1	550	40.2	5912	11794	3602	7720	29.2
484	2	550	41.7	5785	13957	3602	7720	29.2
485	1	550	40.6	4888	11792	3602	7720	29.2
486	2	550	41.8	5444	13928	3602	7720	29.2
487	1	550	41.2	4839	11653	3602	7720	29.2
488	2	550	41.0	5351	13619	3602	7720	29.2
489	1	550	39.9	6661	10624	3602	7720	29.2
490	2	550	41.8	6054	13342	3602	7720	29.2
491	1	550	40.7	6385	11644	3602	7720	29.2
492	2	550	41.8	6695	13457	3602	7720	29.3
493	1	550	71.1	3709	9347	3602	7720	29.3
494	2	550	62.0	4900	12548	3602	7720	29.3
495	1	550	71.9	3844	9405	3602	7720	29.3
496	2	550	62.0	4864	11963	3602	7720	29.3
497	1	550	72.3	3909	10312	3602	7720	29.3
498	2	550	62.8	4975	12879	3602	7720	29.3
499	1	550	72.3	3489	9514	3602	7720	29.3
500	2	550	61.5	4814	12863	3602	7720	29.3
501	1	550	72.4	5259	9115	3602	7720	29.3
502	2	550	61.0	5140	11842	3602	7720	29.4
503	1	550	72.3	4711	9632	3602	7720	29.4
504	2	550	61.8	5307	12549	3602	7720	29.4
505	1	550	9.0	6047	13495	3674	7702	31.0
506	2	550	6.3	5974	13502	3674	7702	31.0
507	1	550	9.7	5952	12604	3674	7702	31.0
508	2	550	8.9	5926	13462	3674	7702	31.0
509	1	550	7.6	6122	13464	3674	7702	31.0
510	2	550	9.0	5785	14250	3674	7702	31.0
511	1	550	7.6	6417	13620	3674	7702	31.0
512	2	550	24.5	6231	15983	3674	7702	31.0
513	1	550	24.8	5884	10598	3674	7702	31.0
514	2	550	23.2	6926	15166	3674	7702	31.0
515	1	550	21.7	5645	10649	3674	7702	31.0
516	2	550	22.9	6286	15862	3674	7702	31.0
517	1	550	23.7	5543	11509	3674	7702	31.0
518	2	550	23.3	5926	16112	3674	7702	31.0
519	1	550	25.1	6039	10736	3674	7702	31.0
520	2	550	25.1	6480	15028	3674	7702	31.0
521	1	550	23.5	5847	10402	3674	7702	31.0
522	2	550	23.2	7199	12295	3674	7702	31.2
523	1	550	39.4	6239	12520	3674	7702	31.2
524	2	550	35.4	5630	14937	3674	7702	31.2
525	1	550	45.5	5825	11539	3674	7702	31.2
526	2	550	38.9	5589	14354	3674	7702	31.2
527	1	550	43.0	5576	11179	3674	7702	31.2
528	2	550	38.1	5616	14491	3674	7702	31.2
529	1	550	41.8	5716	11704	3674	7702	31.2
530	2	550	36.2	5600	15087	3674	7702	31.2
531	1	550	39.9	6084	12738	3674	7702	31.2

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
532	2	550	39.1	6374	15012	3674	7702	31.2
533	1	550	42.8	6080	12109	3674	7702	31.2
534	2	550	37.8	7164	15093	3674	7702	31.2
535	1	550	72.7	4283	10533	3674	7702	31.2
536	2	550	60.7	5015	12931	3674	7702	31.4
537	1	550	70.7	4399	10644	3674	7702	31.4
538	2	550	60.4	5055	13016	3674	7702	31.4
539	1	550	66.1	4020	10970	3674	7702	31.4
540	2	550	59.9	5092	12981	3674	7702	31.4
541	1	550	67.8	5051	10905	3674	7702	31.4
542	2	550	61.3	5162	12618	3674	7702	31.4
543	1	550	68.6	4657	10830	3674	7702	31.4
544	2	550	62.0	5590	12794	3674	7702	31.4
545	1	550	68.6	4477	10625	3674	7702	31.4
546	2	550	60.2	5133	12704	3674	7702	31.6
547	1	650	9.3	5448	11677	3602	7747	27.6
548	2	650	9.0	5068	11796	3602	7747	27.6
549	1	650	7.6	5552	11466	3602	7747	27.5
550	2	650	8.9	5128	11655	3602	7747	27.5
551	1	650	7.7	5652	11326	3602	7747	27.5
552	2	650	8.4	5464	12664	3602	7747	27.5
553	1	650	24.1	4941	9139	3602	7747	27.5
554	2	650	22.2	5393	12017	3602	7747	27.5
555	1	650	23.0	4791	9096	3602	7747	27.5
556	2	650	22.5	5578	12233	3602	7747	27.5
557	1	650	25.1	4953	9710	3602	7747	27.5
558	2	650	25.4	4816	12066	3602	7747	27.5
559	1	650	24.1	4812	9935	3602	7747	27.5
560	2	650	24.0	5462	12819	3602	7747	27.5
561	1	650	23.5	4989	9035	3602	7747	27.5
562	2	650	24.6	5361	11379	3602	7747	27.5
563	1	650	22.5	4885	9081	3602	7747	27.5
564	2	650	22.9	6229	10159	3602	7747	27.5
565	1	650	40.6	5019	10136	3602	7747	27.5
566	2	650	40.2	4686	12161	3602	7747	27.5
567	1	650	40.6	5239	10253	3602	7747	27.5
568	2	650	39.4	4860	11832	3602	7747	27.5
569	1	650	40.6	4569	9522	3602	7747	27.5
570	2	650	43.9	5002	11746	3602	7747	27.5
571	1	650	43.1	4824	10083	3602	7747	27.5
572	2	650	40.7	4653	11842	3602	7747	27.5
573	1	650	40.6	5247	10320	3602	7747	27.5
574	2	650	37.0	5816	12885	3602	7747	27.5
575	1	650	41.0	5278	10142	3602	7747	27.5
576	2	650	40.4	5830	12595	3602	7747	27.5
577	1	650	56.5	4075	9249	3602	7747	27.5
578	2	650	63.4	3989	10353	3602	7747	27.5
579	1	650	70.3	3332	8454	3602	7747	27.5
580	2	650	64.1	4127	10809	3602	7747	27.5
581	1	650	70.7	3579	8363	3602	7747	27.5
582	2	650	62.4	4110	10121	3602	7747	27.5
583	1	650	71.1	3343	8794	3602	7747	27.5
584	2	650	62.9	3817	9707	3602	7747	27.5
585	1	650	74.0	3709	8703	3602	7747	27.5
586	2	650	63.6	3869	9536	3602	7747	27.5
587	1	650	73.5	3329	8058	3602	7747	27.5
588	2	650	64.4	4047	10549	3602	7747	27.4
589	1	550	9.2	5695	16995	3520	9934	29.6
590	2	550	9.2	5623	17751	3520	9934	29.6

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
591	1	550	7.1	5850	16787	3520	9934	29.6
592	2	550	7.7	5619	18939	3520	9934	29.6
593	1	550	7.9	5996	17787	3520	9934	29.6
594	2	550	8.7	5632	17140	3520	9934	29.6
595	1	550	17.7	5473	14545	3520	9934	29.6
596	2	550	23.2	6558	19801	3520	9934	29.7
597	1	550	23.5	5661	14069	3520	9934	29.7
598	2	550	23.3	6418	19827	3520	9934	29.7
599	1	550	24.6	5775	14872	3520	9934	29.7
600	2	550	26.4	5908	20784	3520	9934	29.7
601	1	550	26.9	4602	14955	3520	9934	29.7
602	2	550	23.3	5872	19966	3520	9934	29.7
603	1	550	22.5	6162	15169	3520	9934	29.7
604	2	550	24.9	5608	21155	3520	9934	29.7
605	1	550	27.2	5714	14581	3520	9934	29.7
606	2	550	23.2	6417	18991	3520	9934	29.7
607	1	550	21.1	5459	13896	3520	9934	29.7
608	2	550	17.7	6501	15708	3520	9934	29.7
609	1	550	41.7	6138	16120	3520	9934	29.7
610	2	550	35.1	5654	20416	3520	9934	29.7
611	1	550	45.1	5309	15703	3520	9934	29.7
612	2	550	36.0	5644	20071	3520	9934	29.7
613	1	550	43.5	5107	14897	3520	9934	29.8
614	2	550	36.7	5521	19147	3520	9934	29.8
615	1	550	40.9	6196	15982	3520	9934	29.8
616	2	550	35.6	6424	19918	3520	9934	29.8
617	1	550	41.4	6008	16070	3520	9934	29.8
618	2	550	34.4	6487	20513	3520	9934	29.8
619	1	550	71.6	3701	12987	3520	9934	29.8
620	2	550	54.4	5064	17994	3520	9934	29.8
621	1	550	67.4	4376	14248	3520	9934	29.8
622	2	550	55.2	4964	17674	3520	9934	29.8
623	1	550	66.1	4281	14592	3520	9934	29.8
624	2	550	54.2	5106	17889	3520	9934	29.8
625	1	550	69.7	3988	13446	3520	9934	29.8
626	2	550	55.2	5068	17877	3520	9934	29.8
627	1	550	68.2	4776	14283	3520	9934	29.8
628	2	550	55.4	5615	16787	3520	9934	29.8
629	1	550	70.0	4504	14114	3520	9934	29.8
630	2	550	55.0	5273	16280	3520	9934	29.8
631	1	550	7.9	5840	16337	3520	9934	31.6
632	2	550	7.2	6127	18854	3520	9934	31.6
633	1	550	6.4	5915	16399	3520	9934	31.6
634	2	550	9.8	6145	18991	3520	9934	31.6
635	1	550	7.2	5945	16318	3520	9934	31.8
636	2	550	7.4	6293	19427	3520	9934	31.8
637	1	550	24.9	5517	14989	3520	9934	31.8
638	2	550	24.9	6751	20554	3520	9934	31.8
639	1	550	23.2	5672	14207	3520	9934	31.8
640	2	550	22.7	6827	20484	3520	9934	31.8
641	1	550	24.6	4794	15633	3520	9934	31.8
642	2	550	25.1	6221	21399	3520	9934	31.8
643	1	550	24.8	4434	15358	3520	9934	31.8
644	2	550	24.3	5879	21718	3520	9934	31.8
645	1	550	23.5	5992	13398	3520	9934	31.8
646	2	550	28.0	6393	20448	3520	9934	31.8
647	1	550	21.9	6268	13265	3520	9934	31.8
648	2	550	25.1	6628	20086	3520	9934	31.8
649	1	550	41.2	6134	15108	3520	9934	31.8

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
650	2	550	36.4	5851	19566	3520	9934	31.8
651	1	550	41.7	6207	15110	3520	9934	31.8
652	2	550	40.4	5993	19428	3520	9934	31.8
653	1	550	41.7	5305	14618	3520	9934	31.8
654	2	550	39.9	5248	19592	3520	9934	31.8
655	1	550	41.4	5143	14866	3520	9934	31.8
656	2	550	40.1	5379	20030	3520	9934	31.8
657	1	550	40.4	7089	15453	3520	9934	31.8
658	2	550	40.2	5632	17697	3520	9934	31.8
659	1	550	40.4	6628	15293	3520	9934	31.8
660	2	550	40.2	5619	18539	3520	9934	31.8
661	1	550	70.3	3549	12909	3520	9934	31.8
662	2	550	54.9	4516	16666	3520	9934	31.8
663	1	550	70.8	3622	12371	3520	9934	31.8
664	2	550	55.0	4768	17139	3520	9934	32.0
665	1	550	70.5	3607	13002	3520	9934	32.0
666	2	550	53.8	5285	17914	3520	9934	32.0
667	1	550	70.2	3731	12907	3520	9934	32.0
668	2	550	54.9	4377	15642	3520	9934	32.0
669	1	550	70.2	4868	11818	3520	9934	32.0
670	2	550	55.7	5005	16124	3520	9934	32.0
671	1	550	70.8	3677	12738	3520	9934	32.0
672	2	550	54.7	5143	16210	3520	9934	32.0
673	2	650	7.6	5306	15991	3547	10033	27.4
674	1	650	7.4	5404	14189	3547	10033	27.4
675	2	650	7.7	5483	16502	3547	10033	27.4
676	1	650	6.9	5295	14912	3547	10033	27.4
677	2	650	7.6	5247	15809	3547	10033	27.4
678	1	650	22.9	4961	11858	3547	10033	27.4
679	2	650	24.3	5635	16621	3547	10033	27.4
680	1	650	24.1	4986	12294	3547	10033	27.4
681	2	650	23.8	5553	16912	3547	10033	27.4
682	1	650	24.6	5249	13438	3547	10033	27.4
683	2	650	28.6	4706	17481	3547	10033	27.4
684	1	650	24.1	3460	13444	3547	10033	27.4
685	2	650	26.6	4817	17573	3547	10033	27.3
686	1	650	23.0	5564	11150	3547	10033	27.3
687	2	650	22.4	5157	15293	3547	10033	27.3
688	1	650	23.5	5387	11442	3547	10033	27.3
689	2	650	21.6	6598	15420	3547	10033	27.3
690	1	650	41.0	5262	12892	3547	10033	27.3
691	2	650	40.1	5164	15464	3547	10033	27.3
692	1	650	41.2	5001	12185	3547	10033	27.3
693	2	650	40.4	5039	15668	3547	10033	27.3
694	1	650	42.3	5390	12632	3547	10033	27.3
695	2	650	40.2	4808	15831	3547	10033	27.3
696	1	650	42.2	4496	12792	3547	10033	27.3
697	2	650	41.2	4785	15537	3547	10033	27.3
698	1	650	39.8	5579	13281	3547	10033	27.3
699	2	650	42.8	5899	14941	3547	10033	27.3
700	1	650	40.1	5985	12864	3547	10033	27.3
701	2	650	41.4	4897	14916	3547	10033	27.3
702	1	650	71.8	3112	10030	3547	10033	27.3
703	2	650	56.2	3937	14494	3547	10033	27.3
704	1	650	71.1	2819	9503	3547	10033	27.3
705	2	650	58.1	4018	13678	3547	10033	27.3
706	1	650	70.7	2858	10621	3547	10033	27.3
707	2	650	57.0	3854	13794	3547	10033	27.3
708	1	650	71.0	2568	10756	3547	10033	27.3

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
709	2	650	57.6	3841	13479	3547	10033	27.2
710	1	650	72.6	4388	10838	3547	10033	27.2
711	2	650	56.8	3864	13163	3547	10033	27.2
712	1	650	71.8	4014	10647	3547	10033	27.2
713	2	650	57.6	4573	13430	3547	10033	27.2
714	1	650	7.7	5356	14435	3547	10033	27.2
715	2	650	7.9	5590	16637	3547	10033	27.2
716	1	650	8.0	5454	14871	3547	10033	27.2
717	2	650	7.9	5353	16048	3547	10033	27.2
718	1	650	7.2	5367	14411	3547	10033	27.2
719	2	650	7.6	5361	16440	3547	10033	27.2
720	1	650	23.8	4943	12294	3547	10033	27.2
721	2	650	24.3	5815	17445	3547	10033	27.1
722	1	650	23.2	4740	11990	3547	10033	27.1
723	2	650	24.3	5861	17183	3547	10033	27.1
724	1	650	24.0	4965	13992	3547	10033	27.1
725	2	650	24.1	5114	18335	3547	10033	27.1
726	1	650	23.2	4584	14298	3547	10033	27.1
727	2	650	23.8	5099	18307	3547	10033	27.1
728	1	650	23.7	5825	11953	3547	10033	27.1
729	2	650	25.1	5612	17486	3547	10033	27.1
730	1	650	24.6	5541	11789	3547	10033	27.1
731	2	650	24.5	5579	17246	3547	10033	27.1
732	1	650	41.4	5404	13446	3547	10033	27.1
733	2	650	38.8	5212	16317	3547	10033	27.1
734	1	650	41.8	5400	12970	3547	10033	27.1
735	2	650	38.5	5172	16554	3547	10033	27.1
736	1	650	41.7	5136	12784	3547	10033	27.1
737	2	650	39.4	4626	16601	3547	10033	27.1
738	1	650	41.2	5205	12603	3547	10033	27.1
739	2	650	39.9	4745	16272	3547	10033	27.1
740	1	650	41.4	5558	13757	3547	10033	27.1
741	2	650	39.3	5331	15112	3547	10033	27.1
742	1	650	41.0	5864	12877	3547	10033	27.1
743	2	650	40.2	6917	16063	3547	10033	27.1
744	1	650	68.2	2893	10820	3547	10033	27.1
745	2	650	55.2	4228	15275	3547	10033	27.1
746	1	650	70.0	3219	11211	3547	10033	27.1
747	2	650	57.3	4287	14684	3547	10033	27.1
748	1	650	71.1	2564	10112	3547	10033	27.1
749	2	650	57.1	4221	14842	3547	10033	27.1
750	1	650	69.8	2826	11158	3547	10033	27.1
751	2	650	56.0	4224	15257	3547	10033	27.1
752	1	650	70.5	3804	10781	3547	10033	27.1
753	2	650	55.4	4452	14429	3547	10033	27.1
754	1	650	70.0	4235	10977	3547	10033	27.1
755	2	650	54.7	3984	14116	3547	10033	27.1
756	1	725	12.1	6051	5774	3738	3565	29.4
757	2	725	9.7	5937	6679	3738	3565	29.4
758	1	725	9.2	6341	6710	3738	3565	29.4
759	2	725	9.7	5848	5996	3738	3565	29.4
760	1	725	10.0	6073	6692	3738	3565	29.4
761	2	725	7.7	6474	6964	3738	3565	29.6
762	1	725	7.4	6642	6105	3738	3565	29.6
763	2	725	24.5	7099	5491	3738	3565	29.6
764	1	725	24.1	5674	5782	3738	3565	29.6
765	2	725	23.8	6004	5766	3738	3565	29.6
766	1	725	23.3	5582	5522	3738	3565	29.6
767	2	725	24.9	6791	5578	3738	3565	29.6

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
768	1	725	28.0	5349	4837	3738	3565	29.6
769	2	725	27.5	6645	6018	3738	3565	29.6
770	1	725	24.3	5566	5951	3738	3565	29.6
771	2	725	26.4	7390	5687	3738	3565	29.6
772	1	725	24.5	5677	5949	3738	3565	29.6
773	2	725	22.4	6950	6242	3738	3565	29.6
774	1	725	43.1	5959	4795	3738	3565	29.6
775	2	725	42.5	6287	7727	3738	3565	29.6
776	1	725	41.5	5895	4962	3738	3565	29.6
777	2	725	42.8	6181	7534	3738	3565	29.6
778	1	725	45.2	6031	5432	3738	3565	29.6
779	2	725	43.6	5992	7603	3738	3565	29.6
780	1	725	45.1	5870	5077	3738	3565	29.6
781	2	725	44.1	5963	7571	3738	3565	29.8
782	1	725	42.6	5898	4975	3738	3565	29.8
783	2	725	38.8	6551	7075	3738	3565	29.8
784	1	725	40.9	6017	5084	3738	3565	29.8
785	2	725	43.1	6603	6891	3738	3565	29.8
786	1	725	74.8	3915	3948	3738	3565	29.8
787	2	725	71.5	5419	7051	3738	3565	29.8
788	1	725	71.8	4908	4999	3738	3565	29.8
789	2	725	72.1	5532	7296	3738	3565	29.8
790	1	725	72.7	4290	4544	3738	3565	29.8
791	2	725	69.7	5492	7041	3738	3565	29.8
792	1	725	73.7	4110	4247	3738	3565	29.8
793	2	725	68.1	5587	7674	3738	3565	29.8
794	1	725	74.4	4631	4666	3738	3565	29.9
795	2	725	68.9	5815	6879	3738	3565	29.9
796	1	725	75.6	4645	4708	3738	3565	29.9
797	2	725	74.2	5775	7253	3738	3565	29.9
798	1	550	9.3	5737	5894	3683	3602	28.1
799	2	550	8.2	5808	6381	3683	3602	28.1
800	1	550	9.3	5874	6080	3683	3602	28.1
801	2	550	7.6	5779	6264	3683	3602	28.1
802	1	550	7.4	5626	5437	3683	3602	28.0
803	2	550	10.0	5714	6510	3683	3602	28.0
804	1	550	24.1	5182	5354	3683	3602	28.0
805	2	550	20.4	5810	5589	3683	3602	28.0
806	1	550	21.9	5042	5357	3683	3602	28.0
807	2	550	21.6	5897	5240	3683	3602	28.0
808	1	550	26.4	5091	4363	3683	3602	28.0
809	2	550	22.7	6025	5026	3683	3602	28.0
810	1	550	24.5	4732	4478	3683	3602	28.0
811	2	550	25.7	5899	6176	3683	3602	28.0
812	1	550	22.4	4856	4511	3683	3602	28.0
813	2	550	18.8	5967	4973	3683	3602	28.0
814	1	550	24.3	5289	5408	3683	3602	28.0
815	2	550	19.5	6006	6031	3683	3602	28.0
816	1	550	39.3	5596	4069	3683	3602	28.0
817	2	550	41.8	5561	6572	3683	3602	28.0
818	1	550	40.7	5530	4145	3683	3602	28.0
819	2	550	38.5	5651	6678	3683	3602	28.0
820	1	550	41.0	5567	4286	3683	3602	27.9
821	2	550	42.8	5637	6647	3683	3602	27.9
822	1	550	42.6	5249	4446	3683	3602	27.9
823	2	550	41.8	5670	6704	3683	3602	27.9
824	1	550	42.2	5436	4200	3683	3602	27.9
825	2	550	40.2	5951	6199	3683	3602	27.9
826	1	550	40.4	5492	4327	3683	3602	27.9

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
827	2	550	40.1	5881	6188	3683	3602	27.9
828	1	550	57.3	4374	4760	3683	3602	27.9
829	2	550	72.3	4808	6601	3683	3602	27.9
830	1	550	74.5	3721	3812	3683	3602	27.9
831	2	550	70.8	4982	6711	3683	3602	27.9
832	1	550	72.7	4071	4127	3683	3602	27.9
833	2	550	72.7	4708	6569	3683	3602	27.9
834	1	550	76.6	3841	3738	3683	3602	27.9
835	2	550	72.6	4882	6672	3683	3602	27.9
836	1	550	70.5	4515	4710	3683	3602	27.9
837	2	550	70.7	5191	6450	3683	3602	27.9
838	1	550	75.0	4087	4372	3683	3602	27.9
839	2	550	72.4	5071	6409	3683	3602	27.9
840	1	550	9.7	5674	5978	3683	3602	28.2
841	2	550	7.2	6290	6632	3683	3602	28.2
842	1	550	7.1	5796	5669	3683	3602	28.2
843	2	550	7.2	6565	6446	3683	3602	28.2
844	1	550	7.2	5651	5629	3683	3602	28.2
845	2	550	6.6	6585	6457	3683	3602	28.2
846	1	550	24.1	5227	5127	3683	3602	28.2
847	2	550	24.6	6747	5423	3683	3602	28.2
848	1	550	22.9	5038	5244	3683	3602	28.2
849	2	550	24.6	6689	5426	3683	3602	28.2
850	1	550	22.9	4852	4521	3683	3602	28.2
851	2	550	24.1	5987	6900	3683	3602	28.2
852	1	550	24.1	4743	4510	3683	3602	28.2
853	2	550	23.0	6170	6657	3683	3602	28.2
854	1	550	22.9	5160	6047	3683	3602	28.2
855	2	550	24.3	6460	6032	3683	3602	28.2
856	1	550	23.2	5052	6282	3683	3602	28.3
857	2	550	27.0	6786	6396	3683	3602	28.3
858	1	550	41.2	5811	5060	3683	3602	28.3
859	2	550	40.6	5939	7321	3683	3602	28.3
860	1	550	41.7	5623	5006	3683	3602	28.3
861	2	550	40.1	5785	7101	3683	3602	28.3
862	1	550	41.5	5416	5656	3683	3602	28.3
863	2	550	41.0	5742	7503	3683	3602	28.3
864	1	550	39.9	5845	5485	3683	3602	28.3
865	2	550	40.2	5234	7325	3683	3602	28.3
866	1	550	40.4	5703	4966	3683	3602	28.3
867	2	550	40.4	6303	6868	3683	3602	28.3
868	1	550	41.5	5747	4895	3683	3602	28.3
869	2	550	40.9	6562	6969	3683	3602	28.3
870	1	550	73.7	3443	3841	3683	3602	28.3
871	2	550	70.7	5263	7260	3683	3602	28.3
872	1	550	72.3	3767	4315	3683	3602	28.3
873	2	550	71.0	5053	6868	3683	3602	28.3
874	1	550	71.8	3484	3519	3683	3602	28.3
875	2	550	69.8	5109	7003	3683	3602	28.3
876	1	550	73.2	3808	3632	3683	3602	28.3
877	2	550	70.3	4801	6957	3683	3602	28.3
878	1	550	71.3	4072	4515	3683	3602	28.3
879	2	550	63.1	4932	7023	3683	3602	28.3
880	1	550	71.9	4356	4743	3683	3602	28.3
881	2	550	70.8	5367	6520	3683	3602	28.3
882	1	725	7.4	5610	12054	3602	7747	30.0
883	2	725	7.2	6472	14419	3602	7747	30.0
884	1	725	7.2	5687	12414	3602	7747	30.0
885	2	725	7.2	6486	14770	3602	7747	30.0

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
886	1	725	5.6	5835	12229	3602	7747	30.0
887	2	725	7.9	6069	14279	3602	7747	30.0
888	1	725	24.6	5604	10492	3602	7747	30.0
889	2	725	23.7	6732	15612	3602	7747	30.0
890	1	725	21.1	5553	10305	3602	7747	30.0
891	2	725	24.9	6547	15489	3602	7747	30.0
892	1	725	24.5	5387	11383	3602	7747	30.0
893	2	725	25.4	6104	16641	3602	7747	30.2
894	1	725	25.4	4841	11550	3602	7747	30.2
895	2	725	25.3	6106	16433	3602	7747	30.2
896	1	725	23.2	5571	9960	3602	7747	30.2
897	2	725	24.8	7789	13748	3602	7747	30.2
898	1	725	24.3	5651	10418	3602	7747	30.2
899	2	725	22.5	7125	12153	3602	7747	30.2
900	1	725	39.9	5843	11796	3602	7747	30.2
901	2	725	41.2	5814	14873	3602	7747	30.2
902	1	725	40.6	5876	12008	3602	7747	30.2
903	2	725	41.5	6210	15061	3602	7747	30.2
904	1	725	42.5	5967	11932	3602	7747	30.2
905	2	725	41.2	5576	14201	3602	7747	30.2
906	1	725	43.1	5306	11684	3602	7747	30.2
907	2	725	41.2	5629	14803	3602	7747	30.2
908	1	725	40.4	5547	11560	3602	7747	30.2
909	2	725	40.1	6226	15032	3602	7747	30.2
910	1	725	41.2	5881	11992	3602	7747	30.4
911	2	725	41.2	7179	14458	3602	7747	30.4
912	1	725	71.6	3479	9187	3602	7747	30.4
913	2	725	61.5	4899	13101	3602	7747	30.4
914	1	725	71.6	3807	9803	3602	7747	30.4
915	2	725	61.6	5096	13800	3602	7747	30.4
916	1	725	71.3	3371	9892	3602	7747	30.4
917	2	725	61.5	4828	12798	3602	7747	30.4
918	1	725	74.2	3022	8928	3602	7747	30.4
919	2	725	61.5	4851	13127	3602	7747	30.4
920	1	725	71.6	3465	9854	3602	7747	30.5
921	2	725	60.8	5564	12330	3602	7747	30.5
922	1	725	72.1	3876	9874	3602	7747	30.5
923	2	725	61.6	5747	13177	3602	7747	30.5
924	1	550	9.8	5611	11241	3674	7702	28.3
925	2	550	8.0	5743	13115	3674	7702	28.3
926	1	550	7.4	5452	11060	3674	7702	28.3
927	2	550	7.2	5763	13085	3674	7702	28.3
928	1	550	7.4	5535	11003	3674	7702	28.3
929	2	550	8.0	5720	13344	3674	7702	28.3
930	1	550	23.2	5089	9199	3674	7702	28.3
931	2	550	22.9	5876	12984	3674	7702	28.3
932	1	550	23.5	4929	9386	3674	7702	28.3
933	2	550	23.2	5830	13327	3674	7702	28.3
934	1	550	26.1	4681	10879	3674	7702	28.3
935	2	550	25.6	5059	14487	3674	7702	28.3
936	1	550	25.4	4053	10124	3674	7702	28.3
937	2	550	24.6	5383	14387	3674	7702	28.3
938	1	550	22.7	4817	8599	3674	7702	28.3
939	2	550	23.8	5770	12217	3674	7702	28.2
940	1	550	22.4	5128	9085	3674	7702	28.2
941	2	550	22.9	6845	11335	3674	7702	28.2
942	1	550	41.0	5349	10436	3674	7702	28.2
943	2	550	40.6	5198	12440	3674	7702	28.2
944	1	550	40.1	5427	10909	3674	7702	28.2

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
945	2	550	40.4	5291	12477	3674	7702	28.2
946	1	550	39.4	4623	11034	3674	7702	28.2
947	2	550	40.1	4700	12305	3674	7702	28.2
948	1	550	41.7	4687	10355	3674	7702	28.2
949	2	550	39.6	4809	12777	3674	7702	28.2
950	1	550	39.8	5476	10549	3674	7702	28.2
951	2	550	40.4	5563	12821	3674	7702	28.2
952	1	550	39.6	5821	10484	3674	7702	28.2
953	2	550	40.7	5943	12598	3674	7702	28.2
954	1	550	72.4	3023	7390	3674	7702	28.1
955	2	550	63.4	4188	10448	3674	7702	28.1
956	1	550	70.8	3296	8479	3674	7702	28.1
957	2	550	59.2	4460	11660	3674	7702	28.1
958	1	550	72.1	3004	8520	3674	7702	28.1
959	2	550	63.1	3889	9763	3674	7702	28.1
960	1	550	72.4	2700	8083	3674	7702	28.1
961	2	550	63.4	4327	10292	3674	7702	28.1
962	1	550	70.5	3440	8054	3674	7702	28.1
963	2	550	63.2	5034	10581	3674	7702	28.1
964	1	550	69.7	4308	8316	3674	7702	28.1
965	2	550	62.8	4839	10475	3674	7702	28.1
966	1	550	10.8	5883	11571	3674	7702	28.0
967	2	550	10.0	5595	12508	3674	7702	28.0
968	1	550	7.6	5989	12782	3674	7702	28.0
969	2	550	7.9	5756	13785	3674	7702	28.0
970	1	550	9.3	5697	13181	3674	7702	28.0
971	2	550	8.4	5576	12299	3674	7702	28.0
972	1	550	10.6	6020	12569	3674	7702	28.0
973	2	550	22.4	6268	13894	3674	7702	28.0
974	1	550	22.5	5488	10036	3674	7702	28.0
975	2	550	22.4	5895	12730	3674	7702	28.0
976	1	550	21.9	5251	9928	3674	7702	28.0
977	2	550	23.2	5886	14148	3674	7702	28.0
978	1	550	26.7	5620	10969	3674	7702	28.0
979	2	550	23.7	6003	14852	3674	7702	28.0
980	1	550	21.9	5234	9959	3674	7702	28.0
981	2	550	21.7	6847	11441	3674	7702	28.0
982	1	550	21.7	5324	10348	3674	7702	28.0
983	2	550	22.5	6512	11126	3674	7702	28.0
984	1	550	41.8	5626	11194	3674	7702	28.0
985	2	550	38.1	5027	13112	3674	7702	28.0
986	1	550	42.2	5828	11538	3674	7702	28.0
987	2	550	36.0	4842	12621	3674	7702	28.0
988	1	550	40.7	5713	11961	3674	7702	28.0
989	2	550	38.3	5231	13325	3674	7702	28.0
990	1	550	42.6	5585	11198	3674	7702	28.0
991	2	550	37.3	5222	13842	3674	7702	28.0
992	1	550	42.6	5488	10776	3674	7702	28.0
993	2	550	37.7	6988	14174	3674	7702	28.0
994	1	550	42.0	5853	11662	3674	7702	28.1
995	2	550	36.4	7245	14208	3674	7702	28.1
996	1	550	42.6	5904	11670	3674	7702	28.1
997	2	550	38.0	5210	13852	3674	7702	28.1
998	1	550	72.6	3934	9837	3674	7702	28.1
999	2	550	61.6	4824	12469	3674	7702	28.1
1000	1	550	72.1	3964	10021	3674	7702	28.1
1001	2	550	62.3	4733	12015	3674	7702	28.1
1002	1	550	72.3	4162	9692	3674	7702	28.1
1003	2	550	61.3	4605	11484	3674	7702	28.1

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1004	1	550	72.1	4396	9997	3674	7702	28.1
1005	2	550	61.0	5165	12119	3674	7702	28.1
1006	1	550	71.3	4296	10294	3674	7702	28.1
1007	2	550	61.3	5485	11802	3674	7702	28.1
1008	1	550	9.5	5444	14038	3520	9934	28.5
1009	2	550	8.9	4863	16073	3520	9934	28.5
1010	1	550	9.8	5679	14677	3520	9934	28.5
1011	2	550	8.2	4884	15147	3520	9934	28.5
1012	1	550	8.0	5481	15487	3520	9934	28.5
1013	2	550	9.2	5274	16016	3520	9934	28.5
1014	1	550	24.1	4916	12981	3520	9934	28.5
1015	2	550	23.3	5605	16764	3520	9934	28.5
1016	1	550	23.0	5059	12836	3520	9934	28.5
1017	2	550	22.7	5706	16664	3520	9934	28.5
1018	1	550	21.9	5149	12281	3520	9934	28.5
1019	2	550	22.7	5563	16321	3520	9934	28.5
1020	1	550	22.4	4781	13115	3520	9934	28.5
1021	2	550	22.4	5579	16887	3520	9934	28.5
1022	1	550	21.6	5190	11960	3520	9934	28.5
1023	2	550	22.7	6508	15036	3520	9934	28.5
1024	1	550	22.4	5204	12083	3520	9934	28.4
1025	2	550	20.9	6468	15658	3520	9934	28.4
1026	1	550	41.5	5121	13242	3520	9934	28.4
1027	2	550	37.2	4744	15838	3520	9934	28.4
1028	1	550	41.2	5302	12934	3520	9934	28.4
1029	2	550	36.5	4845	15830	3520	9934	28.4
1030	1	550	44.1	4604	12854	3520	9934	28.4
1031	2	550	36.7	4758	15762	3520	9934	28.4
1032	1	550	43.1	4719	13358	3520	9934	28.4
1033	2	550	34.4	4784	16564	3520	9934	28.4
1034	1	550	41.4	5251	13118	3520	9934	28.4
1035	2	550	32.2	6612	16774	3520	9934	28.4
1036	1	550	41.5	5112	12892	3520	9934	28.4
1037	2	550	36.5	4899	16201	3520	9934	28.4
1038	1	550	71.5	3296	11092	3520	9934	28.4
1039	2	550	57.5	4289	13598	3520	9934	28.3
1040	1	550	71.3	4050	11720	3520	9934	28.3
1041	2	550	56.6	4389	13613	3520	9934	28.3
1042	1	550	71.6	3137	10922	3520	9934	28.3
1043	2	550	57.3	4199	13663	3520	9934	28.3
1044	1	550	73.9	3472	11372	3520	9934	28.3
1045	2	550	58.6	4156	13620	3520	9934	28.3
1046	1	550	71.1	3886	11428	3520	9934	28.3
1047	2	550	58.1	4106	13528	3520	9934	28.3
1048	1	550	71.3	3619	11137	3520	9934	28.3
1049	2	550	59.7	4159	13704	3520	9934	28.3
1050	1	550	7.4	5484	15569	3520	9934	27.9
1051	2	550	8.7	5469	17036	3520	9934	27.9
1052	1	550	6.8	5204	14607	3520	9934	27.9
1053	2	550	8.4	5394	16509	3520	9934	27.9
1054	1	550	7.4	5530	15433	3520	9934	27.9
1055	2	550	7.7	5771	17479	3520	9934	27.9
1056	1	550	23.5	5116	13493	3520	9934	27.9
1057	2	550	24.9	5368	17548	3520	9934	27.9
1058	1	550	24.1	4752	13169	3520	9934	27.9
1059	2	550	23.7	5941	18176	3520	9934	27.9
1060	1	550	24.8	4605	15268	3520	9934	27.9
1061	2	550	23.8	5080	18710	3520	9934	27.9
1062	1	550	24.1	4765	14258	3520	9934	27.9

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1063	2	550	23.2	5331	19084	3520	9934	27.9
1064	1	550	23.5	5102	12758	3520	9934	27.9
1065	2	550	23.7	5382	17958	3520	9934	27.9
1066	1	550	23.3	5183	12041	3520	9934	27.9
1067	2	550	23.8	7095	17366	3520	9934	27.9
1068	1	550	42.0	5314	13844	3520	9934	27.9
1069	2	550	40.6	5151	16862	3520	9934	27.9
1070	1	550	41.2	5512	14052	3520	9934	27.9
1071	2	550	40.2	5296	16528	3520	9934	27.9
1072	1	550	42.0	5074	13909	3520	9934	27.9
1073	2	550	38.0	4881	17376	3520	9934	27.9
1074	1	550	40.4	4522	13663	3520	9934	27.9
1075	2	550	39.6	4929	17380	3520	9934	27.9
1076	1	550	41.2	5517	13227	3520	9934	27.9
1077	2	550	39.4	4683	16379	3520	9934	27.9
1078	1	550	41.0	5800	13648	3520	9934	27.9
1079	2	550	39.4	5266	16370	3520	9934	27.9
1080	1	550	69.0	3426	10888	3520	9934	27.9
1081	2	550	54.1	4503	15478	3520	9934	28.0
1082	1	550	70.5	3440	11474	3520	9934	28.0
1083	2	550	54.2	4523	15514	3520	9934	28.0
1084	1	550	70.5	3235	11480	3520	9934	28.0
1085	2	550	54.9	4474	15261	3520	9934	28.0
1086	1	550	70.8	4330	11001	3520	9934	28.0
1087	2	550	54.1	4356	15298	3520	9934	28.0
1088	1	550	70.8	3695	10800	3520	9934	28.0
1089	2	550	55.4	5140	14319	3520	9934	28.0
1090	1	725	10.1	5604	5132	3738	3565	28.4
1091	2	725	8.2	5778	5804	3738	3565	28.4
1092	1	725	7.9	5560	5620	3738	3565	28.4
1093	2	725	8.9	5597	6016	3738	3565	28.4
1094	1	725	8.2	5541	5695	3738	3565	28.4
1095	2	725	9.0	5756	5997	3738	3565	28.4
1096	1	725	8.4	5674	5804	3738	3565	28.4
1097	2	725	23.2	6158	5043	3738	3565	28.4
1098	1	725	24.5	4987	4933	3738	3565	28.4
1099	2	725	22.9	6115	5317	3738	3565	28.4
1100	1	725	23.8	5218	5200	3738	3565	28.4
1101	2	725	23.5	6163	5568	3738	3565	28.4
1102	1	725	24.1	5001	5053	3738	3565	28.4
1103	2	725	23.7	6163	5274	3738	3565	28.3
1104	1	725	23.7	5029	5335	3738	3565	28.3
1105	2	725	27.0	6086	5147	3738	3565	28.3
1106	1	725	27.7	4917	4247	3738	3565	28.3
1107	2	725	25.6	5699	5960	3738	3565	28.3
1108	1	725	41.8	5303	4315	3738	3565	28.3
1109	2	725	42.3	5647	6403	3738	3565	28.3
1110	1	725	42.3	5443	4620	3738	3565	28.3
1111	2	725	41.0	5635	6955	3738	3565	28.3
1112	1	725	42.0	5415	4461	3738	3565	28.3
1113	2	725	41.7	5618	6203	3738	3565	28.3
1114	1	725	43.3	5310	4808	3738	3565	28.3
1115	2	725	42.6	5498	6507	3738	3565	28.3
1116	1	725	43.8	5372	4588	3738	3565	28.3
1117	2	725	43.8	5550	6507	3738	3565	28.3
1118	1	725	41.8	5407	4564	3738	3565	28.3
1119	2	725	40.4	5974	6163	3738	3565	28.3
1120	1	725	73.1	4049	4241	3738	3565	28.3
1121	2	725	74.0	4955	6841	3738	3565	28.3

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1122	1	725	75.3	4049	4152	3738	3565	28.3
1123	2	725	74.7	4760	6474	3738	3565	28.3
1124	1	725	75.5	3276	3324	3738	3565	28.3
1125	2	725	73.1	4830	6924	3738	3565	28.3
1126	1	725	76.0	3353	3554	3738	3565	28.3
1127	2	725	73.4	4754	6561	3738	3565	28.3
1128	1	725	73.5	3581	3606	3738	3565	28.3
1129	2	725	71.3	5445	6338	3738	3565	28.3
1130	1	725	73.2	3987	4148	3738	3565	28.3
1131	2	725	74.7	5258	6618	3738	3565	28.3
1132	1	725	8.5	6040	6399	3738	3565	32.2
1133	2	725	7.2	6674	6853	3738	3565	32.2
1134	1	725	7.4	6022	6076	3738	3565	32.2
1135	2	725	7.4	6749	6769	3738	3565	32.2
1136	1	725	7.1	6105	6265	3738	3565	32.2
1137	2	725	6.9	6682	7280	3738	3565	32.2
1138	1	725	24.0	5839	5841	3738	3565	32.2
1139	2	725	24.3	7345	6601	3738	3565	32.4
1140	1	725	22.4	5811	6130	3738	3565	32.4
1141	2	725	23.5	7230	6534	3738	3565	32.4
1142	1	725	27.0	5034	5066	3738	3565	32.4
1143	2	725	23.3	7220	6870	3738	3565	32.4
1144	1	725	26.9	5512	4875	3738	3565	32.4
1145	2	725	23.3	7003	7690	3738	3565	32.4
1146	1	725	12.7	5723	5491	3738	3565	32.4
1147	2	725	21.9	7252	7274	3738	3565	32.4
1148	1	725	22.5	5517	6819	3738	3565	32.4
1149	2	725	23.2	7440	6704	3738	3565	32.4
1150	1	725	41.2	6381	5537	3738	3565	32.4
1151	2	725	40.1	6920	8686	3738	3565	32.4
1152	1	725	41.2	6526	5575	3738	3565	32.4
1153	2	725	40.4	7218	8842	3738	3565	32.4
1154	1	725	41.5	6345	6376	3738	3565	32.4
1155	2	725	42.0	6312	8587	3738	3565	32.4
1156	1	725	43.0	6109	6359	3738	3565	32.4
1157	2	725	40.4	7407	7829	3738	3565	32.4
1158	1	725	38.5	6755	5083	3738	3565	32.7
1159	2	725	41.4	7549	8054	3738	3565	32.7
1160	1	725	41.0	6298	5462	3738	3565	32.7
1161	2	725	40.6	7088	7818	3738	3565	32.7
1162	1	725	74.8	3800	3664	3738	3565	32.7
1163	2	725	71.3	5681	7814	3738	3565	32.7
1164	1	725	73.9	3889	4278	3738	3565	32.7
1165	2	725	72.1	5510	7549	3738	3565	32.7
1166	1	725	75.5	3742	3835	3738	3565	32.7
1167	2	725	69.4	6010	7819	3738	3565	32.7
1168	1	725	74.8	4156	4497	3738	3565	32.9
1169	2	725	70.0	6066	7731	3738	3565	32.9
1170	1	725	69.8	4599	4784	3738	3565	32.9
1171	2	725	70.8	5927	8131	3738	3565	32.9
1172	1	725	71.6	4729	4758	3738	3565	32.9
1173	2	725	70.7	6412	7851	3738	3565	32.9
1174	1	725	8.9	6275	5741	3738	3565	32.9
1175	2	725	7.4	7027	7174	3738	3565	32.9
1176	1	725	8.0	6510	6268	3738	3565	32.9
1177	2	725	8.5	6533	7078	3738	3565	33.1
1178	1	725	9.2	6824	6612	3738	3565	33.1
1179	2	725	9.5	6224	6454	3738	3565	33.1
1180	1	725	11.1	6587	6279	3738	3565	33.1

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1181	2	725	9.3	6631	7165	3738	3565	33.1
1182	1	725	22.0	5537	6359	3738	3565	33.1
1183	2	725	21.7	7116	7052	3738	3565	33.1
1184	1	725	22.4	5554	6232	3738	3565	33.1
1185	2	725	21.6	6994	7139	3738	3565	33.1
1186	1	725	22.5	5607	6106	3738	3565	33.1
1187	2	725	24.0	7427	5781	3738	3565	33.1
1188	1	725	21.9	5763	6494	3738	3565	33.1
1189	2	725	23.7	7412	6111	3738	3565	33.1
1190	1	725	27.0	5550	5097	3738	3565	33.1
1191	2	725	27.4	7585	6616	3738	3565	33.1
1192	1	725	40.4	6344	4958	3738	3565	33.1
1193	2	725	42.6	6915	8646	3738	3565	33.1
1194	1	725	38.6	6660	4954	3738	3565	33.1
1195	2	725	41.2	6871	8649	3738	3565	33.4
1196	1	725	43.6	6483	5716	3738	3565	33.4
1197	2	725	45.4	6681	8072	3738	3565	33.4
1198	1	725	43.0	6598	5865	3738	3565	33.4
1199	2	725	41.0	6528	8938	3738	3565	33.4
1200	1	725	42.6	6486	5918	3738	3565	33.4
1201	2	725	42.8	6747	8164	3738	3565	33.4
1202	1	725	43.6	6232	5410	3738	3565	33.4
1203	2	725	45.2	6841	8005	3738	3565	33.4
1204	1	725	75.8	5031	5296	3738	3565	33.4
1205	2	725	71.3	6236	8868	3738	3565	33.4
1206	1	725	77.4	4310	4566	3738	3565	33.4
1207	2	725	72.6	6242	8814	3738	3565	33.4
1208	1	725	74.7	4408	4837	3738	3565	33.7
1209	2	725	69.0	6083	8355	3738	3565	33.7
1210	1	725	75.3	4320	4858	3738	3565	33.7
1211	2	725	73.9	6217	8541	3738	3565	33.7
1212	1	725	74.4	4724	5230	3738	3565	33.7
1213	2	725	73.1	6187	7510	3738	3565	33.7
1214	1	725	74.5	4758	4882	3738	3565	33.7
1215	2	725	71.5	6610	7971	3738	3565	33.7
1216	1	725	9.5	5264	11492	3583	7811	29.1
1217	2	725	8.5	5226	12407	3583	7811	29.1
1218	1	725	7.4	5333	11471	3583	7811	29.1
1219	2	725	7.2	5552	12421	3583	7811	29.1
1220	1	725	8.4	5571	11310	3583	7811	29.1
1221	2	725	7.6	5189	12385	3583	7811	29.1
1222	1	725	22.7	4642	8857	3583	7811	29.1
1223	2	725	22.4	5782	12600	3583	7811	29.1
1224	1	725	23.2	4657	8899	3583	7811	29.1
1225	2	725	22.5	5510	12255	3583	7811	29.1
1226	1	725	24.5	4870	9503	3583	7811	29.1
1227	2	725	26.2	5698	12443	3583	7811	29.1
1228	1	725	25.9	4758	9718	3583	7811	29.1
1229	2	725	24.5	5803	12752	3583	7811	29.1
1230	1	725	22.7	5120	8769	3583	7811	29.1
1231	2	725	23.8	5415	10548	3583	7811	28.9
1232	1	725	23.7	4751	9032	3583	7811	28.9
1233	2	725	22.9	6247	10846	3583	7811	28.9
1234	1	725	41.5	5096	10576	3583	7811	28.9
1235	2	725	42.0	5112	12273	3583	7811	28.9
1236	1	725	41.2	5185	10436	3583	7811	28.9
1237	2	725	36.7	4790	13007	3583	7811	28.9
1238	1	725	44.4	4950	10062	3583	7811	28.9
1239	2	725	42.0	4675	12178	3583	7811	28.9

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1240	1	725	46.7	5033	9725	3583	7811	28.9
1241	2	725	39.9	4666	12408	3583	7811	28.9
1242	1	725	44.3	5088	10120	3583	7811	28.9
1243	2	725	39.6	5930	12628	3583	7811	28.9
1244	1	725	40.6	5207	10471	3583	7811	28.9
1245	2	725	39.8	6426	12492	3583	7811	28.9
1246	1	725	71.6	4065	8778	3583	7811	28.9
1247	2	725	65.2	4296	10561	3583	7811	28.9
1248	1	725	72.6	3610	8884	3583	7811	28.9
1249	2	725	63.6	4158	10689	3583	7811	28.9
1250	1	725	72.7	3200	8801	3583	7811	28.9
1251	2	725	63.9	3875	10399	3583	7811	28.9
1252	1	725	73.7	3114	8670	3583	7811	28.9
1253	2	725	64.2	4100	10546	3583	7811	28.9
1254	1	725	69.2	4007	8587	3583	7811	28.9
1255	2	725	63.9	4024	11027	3583	7811	28.9
1256	1	725	71.8	3385	8778	3583	7811	28.9
1257	2	725	63.7	4076	10431	3583	7811	28.8
1258	1	725	8.0	5422	11854	3583	7811	28.3
1259	2	725	7.6	5593	13430	3583	7811	28.3
1260	1	725	6.6	5553	11840	3583	7811	28.3
1261	2	725	8.4	5705	13409	3583	7811	28.3
1262	1	725	7.6	5441	11631	3583	7811	28.3
1263	2	725	7.7	5824	13535	3583	7811	28.3
1264	1	725	23.2	5202	9863	3583	7811	28.3
1265	2	725	24.6	6153	14146	3583	7811	28.3
1266	1	725	23.0	5201	9692	3583	7811	28.3
1267	2	725	21.7	6112	14051	3583	7811	28.3
1268	1	725	23.7	4281	10453	3583	7811	28.3
1269	2	725	23.8	5750	15158	3583	7811	28.3
1270	1	725	22.5	3901	10667	3583	7811	28.3
1271	2	725	22.4	5869	15000	3583	7811	28.3
1272	1	725	23.0	5418	9274	3583	7811	28.3
1273	2	725	24.1	6747	12288	3583	7811	28.3
1274	1	725	21.7	5202	9823	3583	7811	28.3
1275	2	725	22.9	7240	11728	3583	7811	28.3
1276	1	725	40.2	5537	11469	3583	7811	28.3
1277	2	725	40.2	5263	13265	3583	7811	28.3
1278	1	725	41.0	5599	11529	3583	7811	28.3
1279	2	725	40.7	5614	14055	3583	7811	28.3
1280	1	725	41.2	5223	11348	3583	7811	28.3
1281	2	725	41.8	5967	13600	3583	7811	28.3
1282	1	725	39.3	5378	11582	3583	7811	28.3
1283	2	725	40.4	5321	13945	3583	7811	28.3
1284	1	725	40.6	5670	11094	3583	7811	28.3
1285	2	725	40.2	6156	13442	3583	7811	28.3
1286	1	725	42.0	5510	11348	3583	7811	28.3
1287	2	725	41.8	6181	13960	3583	7811	28.3
1288	1	725	72.1	3161	8817	3583	7811	28.3
1289	2	725	59.4	4356	12392	3583	7811	28.3
1290	1	725	72.3	3014	8200	3583	7811	28.3
1291	2	725	61.3	4831	12281	3583	7811	28.3
1292	1	725	70.8	2972	8672	3583	7811	28.3
1293	2	725	60.2	4363	12086	3583	7811	28.3
1294	1	725	72.7	3418	9634	3583	7811	28.3
1295	2	725	62.1	4515	11709	3583	7811	28.3
1296	1	725	71.1	4111	9797	3583	7811	28.3
1297	2	725	61.8	4871	11408	3583	7811	28.3
1298	1	725	72.9	3509	9282	3583	7811	28.3

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1299	2	725	60.7	4643	11778	3583	7811	28.3
1300	1	725	9.2	6218	13294	3583	7811	31.2
1301	2	725	8.2	5879	13653	3583	7811	31.2
1302	1	725	7.7	6180	12500	3583	7811	31.2
1303	2	725	8.0	5586	14196	3583	7811	31.2
1304	1	725	7.4	6040	14037	3583	7811	31.3
1305	2	725	8.0	6275	14987	3583	7811	31.3
1306	1	725	7.9	6033	12467	3583	7811	31.3
1307	2	725	23.7	6797	16414	3583	7811	31.3
1308	1	725	21.1	5771	11950	3583	7811	31.3
1309	2	725	22.4	7170	16349	3583	7811	31.3
1310	1	725	21.7	5677	11075	3583	7811	31.3
1311	2	725	25.4	6299	17474	3583	7811	31.3
1312	1	725	24.1	5755	11723	3583	7811	31.3
1313	2	725	23.0	6860	17227	3583	7811	31.3
1314	1	725	21.7	5897	11306	3583	7811	31.3
1315	2	725	24.3	7219	13612	3583	7811	31.3
1316	1	725	21.9	5664	11343	3583	7811	31.3
1317	2	725	22.5	6911	14793	3583	7811	31.3
1318	1	725	41.8	6446	13434	3583	7811	31.3
1319	2	725	37.7	5918	16436	3583	7811	31.3
1320	1	725	42.6	6461	13061	3583	7811	31.3
1321	2	725	38.8	6094	16566	3583	7811	31.3
1322	1	725	46.0	6008	12360	3583	7811	31.8
1323	2	725	41.5	6152	16158	3583	7811	31.8
1324	1	725	44.9	5683	12785	3583	7811	31.8
1325	2	725	38.0	6249	17104	3583	7811	31.8
1326	1	725	42.3	6523	13206	3583	7811	31.8
1327	2	725	37.7	8782	16875	3583	7811	31.8
1328	1	725	43.9	6545	13235	3583	7811	31.8
1329	2	725	38.0	8026	16970	3583	7811	31.8
1330	1	725	74.5	4523	10830	3583	7811	31.8
1331	2	725	62.1	5591	15410	3583	7811	31.8
1332	1	725	73.9	4351	11142	3583	7811	31.8
1333	2	725	60.4	5585	15471	3583	7811	31.8
1334	1	725	73.9	3731	11375	3583	7811	31.8
1335	2	725	61.6	5312	14902	3583	7811	31.9
1336	1	725	75.2	4314	11681	3583	7811	31.9
1337	2	725	60.8	5597	15365	3583	7811	31.9
1338	1	725	70.2	5146	11856	3583	7811	31.9
1339	2	725	60.4	5687	14407	3583	7811	31.9
1340	1	725	72.7	4706	11684	3583	7811	31.9
1341	2	725	59.7	6010	15003	3583	7811	31.9
1342	1	725	6.3	5370	15208	3484	10024	28.6
1343	2	725	7.7	5350	16717	3484	10024	28.6
1344	1	725	7.1	5264	15283	3484	10024	28.6
1345	2	725	7.7	5539	16956	3484	10024	28.6
1346	1	725	6.9	5227	14610	3484	10024	28.6
1347	2	725	8.2	5292	16407	3484	10024	28.6
1348	1	725	23.0	5222	12390	3484	10024	28.6
1349	2	725	24.3	5629	17091	3484	10024	28.6
1350	1	725	22.7	5127	12385	3484	10024	28.6
1351	2	725	24.0	5756	16762	3484	10024	28.6
1352	1	725	25.1	3806	14002	3484	10024	28.6
1353	2	725	24.5	5149	18008	3484	10024	28.6
1354	1	725	23.7	4417	13601	3484	10024	28.6
1355	2	725	24.6	5052	17997	3484	10024	28.6
1356	1	725	25.3	3436	13764	3484	10024	28.6
1357	2	725	22.9	6356	16497	3484	10024	28.6

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1358	1	725	23.3	5273	12005	3484	10024	28.6
1359	2	725	24.6	6630	16131	3484	10024	28.6
1360	1	725	41.7	5306	13273	3484	10024	28.6
1361	2	725	39.6	4910	16198	3484	10024	28.6
1362	1	725	40.2	5214	13634	3484	10024	28.6
1363	2	725	40.2	5219	16270	3484	10024	28.6
1364	1	725	44.6	4761	13129	3484	10024	28.6
1365	2	725	40.1	4820	16124	3484	10024	28.6
1366	1	725	43.9	4889	12657	3484	10024	28.6
1367	2	725	39.3	4831	15940	3484	10024	28.6
1368	1	725	40.9	5243	13369	3484	10024	28.5
1369	2	725	40.1	5677	15435	3484	10024	28.5
1370	1	725	40.1	5679	13552	3484	10024	28.5
1371	2	725	39.8	6254	15975	3484	10024	28.5
1372	1	725	71.5	3000	11179	3484	10024	28.5
1373	2	725	54.2	3848	14705	3484	10024	28.5
1374	1	725	71.0	2822	10328	3484	10024	28.5
1375	2	725	58.3	3829	13918	3484	10024	28.5
1376	1	725	71.9	2937	11042	3484	10024	28.5
1377	2	725	56.5	3910	14425	3484	10024	28.5
1378	1	725	71.8	2507	10175	3484	10024	28.5
1379	2	725	57.6	3912	14214	3484	10024	28.4
1380	1	725	70.3	3403	11144	3484	10024	28.4
1381	2	725	57.0	4016	13588	3484	10024	28.4
1382	1	725	71.8	3554	11383	3484	10024	28.4
1383	2	725	57.6	3942	13492	3484	10024	28.4
1384	1	725	9.0	5623	16520	3484	10024	28.3
1385	2	725	8.5	5415	16368	3484	10024	28.3
1386	1	725	7.6	5910	16995	3484	10024	28.4
1387	2	725	7.4	5883	17322	3484	10024	28.4
1388	1	725	10.8	6093	15860	3484	10024	28.4
1389	2	725	8.2	5497	17359	3484	10024	28.4
1390	1	725	24.6	5641	13715	3484	10024	28.4
1391	2	725	23.8	6106	18989	3484	10024	28.4
1392	1	725	22.0	5513	13130	3484	10024	28.4
1393	2	725	22.9	6334	19147	3484	10024	28.4
1394	1	725	23.0	5549	13227	3484	10024	28.4
1395	2	725	24.8	5811	19147	3484	10024	28.4
1396	1	725	30.6	6036	14624	3484	10024	28.4
1397	2	725	27.2	5832	19091	3484	10024	28.4
1398	1	725	26.6	5607	13971	3484	10024	28.4
1399	2	725	22.4	6001	16063	3484	10024	28.4
1400	1	725	24.0	5723	13292	3484	10024	28.4
1401	2	725	23.8	6210	16893	3484	10024	28.4
1402	1	725	43.8	5884	14599	3484	10024	28.4
1403	2	725	36.4	5672	19160	3484	10024	28.4
1404	1	725	43.5	5676	14363	3484	10024	28.5
1405	2	725	32.8	5931	20149	3484	10024	28.5
1406	1	725	45.7	5593	14702	3484	10024	28.5
1407	2	725	38.9	5403	18877	3484	10024	28.5
1408	1	725	44.7	5581	14722	3484	10024	28.5
1409	2	725	38.3	5378	18844	3484	10024	28.5
1410	1	725	47.0	5728	14782	3484	10024	28.5
1411	2	725	34.1	7759	18792	3484	10024	28.5
1412	1	725	41.7	5774	15362	3484	10024	28.5
1413	2	725	37.3	5256	18506	3484	10024	28.5
1414	1	725	71.5	3668	12128	3484	10024	28.5
1415	2	725	57.1	4260	15964	3484	10024	28.5
1416	1	725	71.5	3475	12134	3484	10024	28.5

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1417	2	725	56.3	4747	16502	3484	10024	28.5
1418	1	725	73.5	3458	12494	3484	10024	28.5
1419	2	725	57.3	4330	15949	3484	10024	28.5
1420	1	725	74.7	3445	12516	3484	10024	28.5
1421	2	725	56.5	4291	15933	3484	10024	28.5
1422	1	725	72.7	3782	12505	3484	10024	28.5
1423	2	725	55.4	5543	16085	3484	10024	28.5
1424	1	725	71.6	4269	12571	3484	10024	28.5
1425	2	725	56.8	4650	16510	3484	10024	28.5
1426	1	725	5.8	5795	16397	3484	10024	30.1
1427	2	725	8.0	5877	17823	3484	10024	30.1
1428	1	725	7.1	5820	15940	3484	10024	30.1
1429	2	725	9.0	5806	18828	3484	10024	30.1
1430	1	725	7.2	5987	16165	3484	10024	30.1
1431	2	725	7.1	6072	19010	3484	10024	30.4
1432	1	725	23.7	5591	15131	3484	10024	30.4
1433	2	725	21.7	7006	21092	3484	10024	30.4
1434	1	725	23.3	6014	14194	3484	10024	30.4
1435	2	725	22.5	6805	21197	3484	10024	30.4
1436	1	725	23.2	4828	15854	3484	10024	30.4
1437	2	725	24.0	6675	21778	3484	10024	30.4
1438	1	725	22.7	5338	16164	3484	10024	30.4
1439	2	725	23.7	6330	22184	3484	10024	30.4
1440	1	725	23.5	6049	13816	3484	10024	30.4
1441	2	725	24.9	6312	20702	3484	10024	30.4
1442	1	725	23.8	5493	13446	3484	10024	30.4
1443	2	725	20.9	6143	18120	3484	10024	30.4
1444	1	725	40.2	6420	16654	3484	10024	30.4
1445	2	725	39.4	6319	20032	3484	10024	30.4
1446	1	725	39.8	6158	16498	3484	10024	30.4
1447	2	725	39.3	6410	20609	3484	10024	30.4
1448	1	725	42.5	5411	16356	3484	10024	30.4
1449	2	725	38.9	5630	19290	3484	10024	30.6
1450	1	725	41.8	6127	15975	3484	10024	30.6
1451	2	725	40.2	5752	20380	3484	10024	30.6
1452	1	725	39.6	6308	16869	3484	10024	30.6
1453	2	725	39.3	7235	21127	3484	10024	30.6
1454	1	725	40.7	6378	16567	3484	10024	30.6
1455	2	725	39.1	6216	18688	3484	10024	30.6
1456	1	725	71.8	4363	13717	3484	10024	30.6
1457	2	725	54.1	5202	18742	3484	10024	30.6
1458	1	725	71.6	3821	13383	3484	10024	30.6
1459	2	725	53.3	5107	18491	3484	10024	30.6
1460	1	725	70.2	2957	13023	3484	10024	30.6
1461	2	725	52.9	4808	18331	3484	10024	30.9
1462	1	725	71.3	3443	13339	3484	10024	30.9
1463	2	725	53.6	5033	18560	3484	10024	30.9
1464	1	725	71.8	4770	13962	3484	10024	30.9
1465	2	725	55.0	5585	17675	3484	10024	30.9
1466	1	725	71.9	4081	13662	3484	10024	30.9
1467	2	725	54.2	5142	16660	3484	10024	30.9
1468	1	725	7.6	5918	17057	3484	10024	34.1
1469	2	725	8.2	5870	18970	3484	10024	34.1
1470	1	725	8.0	5887	16958	3484	10024	34.1
1471	2	725	9.2	6123	18596	3484	10024	34.1
1472	1	725	8.4	6020	18452	3484	10024	35.4
1473	2	725	8.9	6151	18939	3484	10024	35.4
1474	1	725	24.9	6181	15889	3484	10024	35.4
1475	2	725	25.4	6954	22647	3484	10024	35.4

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1476	1	725	23.3	5702	15688	3484	10024	35.4
1477	2	725	24.3	6980	22282	3484	10024	35.4
1478	1	725	24.8	4798	16691	3484	10024	35.4
1479	2	725	25.1	6167	23614	3484	10024	35.4
1480	1	725	24.8	5762	17007	3484	10024	35.4
1481	2	725	25.6	5835	23936	3484	10024	35.4
1482	1	725	22.9	5818	14181	3484	10024	35.4
1483	2	725	27.0	6783	22153	3484	10024	35.4
1484	1	725	22.7	5747	14447	3484	10024	35.4
1485	2	725	24.6	8238	21301	3484	10024	35.4
1486	1	725	40.7	6318	17511	3484	10024	35.4
1487	2	725	38.9	6435	21672	3484	10024	35.4
1488	1	725	41.5	6323	17631	3484	10024	35.4
1489	2	725	38.8	6501	21747	3484	10024	35.7
1490	1	725	42.0	6303	16756	3484	10024	35.7
1491	2	725	39.8	5980	21107	3484	10024	35.7
1492	1	725	41.8	5677	17214	3484	10024	35.7
1493	2	725	39.9	5779	20965	3484	10024	35.7
1494	1	725	40.9	6156	17140	3484	10024	35.7
1495	2	725	39.4	7231	21342	3484	10024	35.7
1496	1	725	43.1	6602	16456	3484	10024	35.7
1497	2	725	40.4	7031	19665	3484	10024	35.7
1498	1	725	72.6	3325	13840	3484	10024	35.7
1499	2	725	53.3	5145	19920	3484	10024	35.7
1500	1	725	65.0	3618	13921	3484	10024	35.7
1501	2	725	53.6	5089	19393	3484	10024	36.0
1502	1	725	70.3	3389	14185	3484	10024	36.0
1503	2	725	52.8	5033	20077	3484	10024	36.0
1504	1	725	74.2	3491	14230	3484	10024	36.0
1505	2	725	53.3	5039	19380	3484	10024	36.0
1506	1	725	72.3	3954	14408	3484	10024	36.0
1507	2	725	52.6	5656	18088	3484	10024	36.0
1508	1	725	69.5	3610	13986	3484	10024	36.0
1509	2	725	52.6	5527	18060	3484	10024	36.0
1510	1	550	8.7	2928	8381	3556	10088	5.7
1511	2	550	8.7	2768	8356	3556	10088	5.7
1512	1	550	7.9	3048	8447	3556	10088	5.7
1513	2	550	7.4	2845	8582	3556	10088	5.7
1514	1	550	7.7	3103	8422	3556	10088	5.7
1515	2	550	8.0	2949	8728	3556	10088	5.7
1516	1	550	23.2	2666	6766	3556	10088	5.6
1517	2	550	22.5	3273	9097	3556	10088	5.6
1518	1	550	22.4	2808	6671	3556	10088	5.6
1519	2	550	22.9	3277	9137	3556	10088	5.6
1520	1	550	22.2	2806	6624	3556	10088	5.6
1521	2	550	23.8	3247	9347	3556	10088	5.6
1522	1	550	27.5	2773	7203	3556	10088	5.6
1523	2	550	28.6	2771	10023	3556	10088	5.6
1524	1	550	22.7	2990	7477	3556	10088	5.6
1525	2	550	29.5	2852	10069	3556	10088	5.6
1526	1	550	30.7	2786	7690	3556	10088	5.6
1527	2	550	29.0	2801	10132	3556	10088	5.6
1528	1	550	20.6	2801	6565	3556	10088	5.6
1529	2	550	19.6	3221	8758	3556	10088	5.6
1530	1	550	21.9	2841	6641	3556	10088	5.6
1531	2	550	19.3	3074	8215	3556	10088	5.6
1532	1	550	21.4	2859	6456	3556	10088	5.6
1533	2	550	18.8	3670	8282	3556	10088	5.6
1534	1	550	38.8	3056	8022	3556	10088	5.6

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1535	2	550	40.2	3030	9611	3556	10088	5.6
1536	1	550	40.9	3182	8084	3556	10088	5.6
1537	2	550	40.4	3056	9698	3556	10088	5.5
1538	1	550	39.3	3140	8249	3556	10088	5.5
1539	2	550	40.2	3027	9663	3556	10088	5.5
1540	1	550	44.7	2845	7966	3556	10088	5.5
1541	2	550	43.5	2882	9761	3556	10088	5.5
1542	1	550	44.7	2754	8159	3556	10088	5.5
1543	2	550	42.2	2810	9811	3556	10088	5.5
1544	1	550	43.1	2826	8203	3556	10088	5.5
1545	2	550	41.7	2874	9812	3556	10088	5.6
1546	1	550	38.8	3255	8240	3556	10088	5.6
1547	2	550	34.4	3861	9901	3556	10088	5.6
1548	1	550	38.5	3231	8282	3556	10088	5.6
1549	2	550	36.5	3791	9883	3556	10088	5.6
1550	1	550	40.2	3259	8271	3556	10088	5.6
1551	2	550	35.9	3665	9971	3556	10088	5.6
1552	1	550	70.3	2421	7120	3556	10088	5.6
1553	2	550	60.5	2645	8842	3556	10088	5.6
1554	1	550	70.2	2304	6928	3556	10088	5.6
1555	2	550	60.7	2656	8842	3556	10088	5.6
1556	1	550	69.5	2427	7395	3556	10088	5.6
1557	2	550	59.4	2639	9005	3556	10088	5.6
1558	1	550	69.7	2512	7441	3556	10088	5.6
1559	2	550	61.8	2610	9153	3556	10088	5.7
1560	1	550	75.5	1941	7104	3556	10088	5.7
1561	2	550	59.9	2653	9179	3556	10088	5.7
1562	1	550	75.5	1995	6969	3556	10088	5.7
1563	2	550	61.5	2645	8977	3556	10088	5.7
1564	1	550	67.4	2296	7243	3556	10088	5.7
1565	2	550	56.8	2895	8830	3556	10088	5.7
1566	1	550	67.9	2369	7262	3556	10088	5.7
1567	2	550	58.6	3035	8770	3556	10088	5.8
1568	1	550	69.4	2601	7543	3556	10088	5.8
1569	2	550	57.1	2830	8461	3556	10088	5.8
1570	1	550	8.0	3597	7022	3565	8006	5.9
1571	2	550	7.4	3699	8135	3565	8006	5.9
1572	1	550	7.7	3571	7530	3565	8006	6.1
1573	2	550	7.6	3691	8220	3565	8006	6.1
1574	1	550	6.9	3570	7805	3565	8006	6.1
1575	2	550	7.4	3615	7878	3565	8006	6.1
1576	1	550	23.3	3227	5855	3565	8006	6.1
1577	2	550	23.7	3787	8222	3565	8006	6.1
1578	1	550	24.3	3083	6035	3565	8006	6.1
1579	2	550	23.5	3742	8303	3565	8006	6.1
1580	1	550	23.5	3064	5985	3565	8006	6.1
1581	2	550	23.8	3713	8588	3565	8006	6.1
1582	1	550	33.6	3210	6661	3565	8006	6.1
1583	2	550	32.8	3418	9295	3565	8006	6.1
1584	1	550	33.6	3088	6907	3565	8006	6.2
1585	2	550	30.6	3137	9567	3565	8006	6.2
1586	1	550	34.9	3255	6846	3565	8006	6.2
1587	2	550	33.6	3510	9292	3565	8006	6.2
1588	1	550	18.7	3216	7014	3565	8006	6.2
1589	2	550	18.0	3768	7309	3565	8006	6.2
1590	1	550	10.8	3525	7522	3565	8006	6.2
1591	2	550	16.9	3753	6955	3565	8006	6.2
1592	1	550	14.0	3568	7604	3565	8006	6.2
1593	2	550	13.5	4222	6602	3565	8006	6.2

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1594	1	550	40.6	3483	7037	3565	8006	6.3
1595	2	550	40.2	3423	9113	3565	8006	6.3
1596	1	550	41.0	3578	6954	3565	8006	6.3
1597	2	550	42.3	3448	9163	3565	8006	6.3
1598	1	550	40.1	3501	7219	3565	8006	6.3
1599	2	550	40.6	3462	9114	3565	8006	6.3
1600	1	550	49.2	3089	7268	3565	8006	6.3
1601	2	550	44.6	3189	9182	3565	8006	6.3
1602	1	550	50.9	2928	7472	3565	8006	6.6
1603	2	550	45.7	3152	8976	3565	8006	6.6
1604	1	550	50.1	2902	7404	3565	8006	6.6
1605	2	550	45.2	3222	9001	3565	8006	6.6
1606	1	550	31.1	4071	7126	3565	8006	6.6
1607	2	550	31.2	4388	8962	3565	8006	6.6
1608	1	550	33.8	3844	7030	3565	8006	6.6
1609	2	550	31.5	3783	9059	3565	8006	6.6
1610	1	550	37.2	3704	7052	3565	8006	6.8
1611	2	550	33.6	3858	9169	3565	8006	6.8
1612	1	550	72.3	2508	6439	3565	8006	6.8
1613	2	550	67.9	2871	7302	3565	8006	6.8
1614	1	550	71.0	2597	6417	3565	8006	6.8
1615	2	550	67.6	2956	7441	3565	8006	6.8
1616	1	550	71.6	2318	6181	3565	8006	6.8
1617	2	550	68.2	2787	6831	3565	8006	6.8
1618	1	550	76.3	2183	6293	3565	8006	6.9
1619	2	550	67.8	2888	7565	3565	8006	6.9
1620	1	550	75.6	2277	6330	3565	8006	6.9
1621	2	550	67.6	2957	7249	3565	8006	6.9
1622	1	550	76.3	2194	6510	3565	8006	6.9
1623	2	550	67.9	2981	7601	3565	8006	6.9
1624	1	550	65.3	2798	6072	3565	8006	6.9
1625	2	550	63.4	3060	8454	3565	8006	7.1
1626	1	550	63.7	3353	6282	3565	8006	7.1
1627	2	550	67.4	2933	7403	3565	8006	7.1
1628	1	550	64.9	3154	5774	3565	8006	7.1
1629	2	550	60.5	2695	6710	3565	8006	7.1
1630	1	550	9.3	4275	4260	3719	3520	9.7
1631	2	550	7.7	4377	4354	3719	3520	9.7
1632	1	550	7.9	4040	4162	3719	3520	10.0
1633	2	550	7.6	4443	4410	3719	3520	10.0
1634	1	550	7.9	4032	3202	3719	3520	10.0
1635	2	550	8.5	4331	4421	3719	3520	10.0
1636	1	550	22.2	3458	3590	3719	3520	10.0
1637	2	550	22.7	4122	3998	3719	3520	10.0
1638	1	550	24.5	3498	3492	3719	3520	10.0
1639	2	550	23.5	4296	3694	3719	3520	10.0
1640	1	550	24.6	3465	3480	3719	3520	10.0
1641	2	550	23.5	4202	4061	3719	3520	10.0
1642	1	550	23.5	3546	3660	3719	3520	10.0
1643	2	550	28.0	4228	3796	3719	3520	10.0
1644	1	550	27.8	3381	2996	3719	3520	10.0
1645	2	550	28.5	3946	3835	3719	3520	10.3
1646	1	550	30.9	3648	3091	3719	3520	10.3
1647	2	550	28.0	4258	3910	3719	3520	10.3
1648	1	550	20.1	3495	3962	3719	3520	10.3
1649	2	550	17.7	4078	4231	3719	3520	10.3
1650	1	550	22.5	3385	3570	3719	3520	10.3
1651	2	550	18.5	4399	4253	3719	3520	10.3
1652	1	550	20.6	3517	3927	3719	3520	10.3

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1653	2	550	15.8	4018	4253	3719	3520	10.3
1654	1	550	39.1	3996	3118	3719	3520	10.3
1655	2	550	43.0	4093	4380	3719	3520	10.3
1656	1	550	41.4	3906	3272	3719	3520	10.3
1657	2	550	41.4	3392	3887	3719	3520	10.3
1658	1	550	39.6	3927	3285	3719	3520	10.3
1659	2	550	43.1	4022	4344	3719	3520	10.3
1660	1	550	42.6	3856	3381	3719	3520	10.3
1661	2	550	43.6	3752	4704	3719	3520	10.6
1662	1	550	49.4	3392	3995	3719	3520	10.6
1663	2	550	47.5	3735	5125	3719	3520	10.6
1664	1	550	52.6	3530	4134	3719	3520	10.6
1665	2	550	46.2	3774	4928	3719	3520	10.6
1666	1	550	37.8	4078	3026	3719	3520	10.6
1667	2	550	34.6	4221	4363	3719	3520	10.6
1668	1	550	36.2	3970	2922	3719	3520	10.6
1669	2	550	35.2	4184	4616	3719	3520	10.6
1670	1	550	39.1	3981	3250	3719	3520	10.6
1671	2	550	32.2	4363	4369	3719	3520	10.6
1672	1	550	69.7	2937	2798	3719	3520	10.6
1673	2	550	76.0	3705	4523	3719	3520	10.9
1674	1	550	70.2	3150	3042	3719	3520	10.9
1675	2	550	70.3	3631	4609	3719	3520	10.9
1676	1	550	69.8	2850	2706	3719	3520	10.9
1677	2	550	73.1	3625	4743	3719	3520	10.9
1678	1	550	76.4	2813	2833	3719	3520	10.9
1679	2	550	74.5	3514	4804	3719	3520	10.9
1680	1	550	79.5	2817	2954	3719	3520	10.9
1681	2	550	72.3	3563	4914	3719	3520	10.9
1682	1	550	80.8	2747	2783	3719	3520	11.2
1683	2	550	74.5	3470	4721	3719	3520	11.2
1684	1	550	67.1	2931	2852	3719	3520	11.2
1685	2	550	64.9	3800	4290	3719	3520	11.2
1686	1	550	67.4	3169	2862	3719	3520	11.2
1687	2	550	64.2	3735	4237	3719	3520	11.2
1688	1	550	67.3	3162	3079	3719	3520	11.2
1689	2	550	64.2	3800	4527	3719	3520	11.2
1690	1	550	8.4	3677	10273	3511	9965	12.2
1691	2	550	8.7	3541	10490	3511	9965	12.2
1692	1	550	8.9	3714	10386	3511	9965	12.2
1693	2	550	10.0	3814	10787	3511	9965	12.2
1694	1	550	7.7	3788	9989	3511	9965	12.2
1695	2	550	8.0	3639	10621	3511	9965	12.2
1696	1	550	22.0	3396	7818	3511	9965	12.2
1697	2	550	23.0	3865	10364	3511	9965	12.2
1698	1	550	23.3	3429	7970	3511	9965	12.2
1699	2	550	22.9	3763	10713	3511	9965	12.2
1700	1	550	24.6	3401	8087	3511	9965	12.2
1701	2	550	23.7	3748	10566	3511	9965	12.2
1702	1	550	23.3	3487	8308	3511	9965	12.2
1703	2	550	22.5	3846	10625	3511	9965	12.2
1704	1	550	26.1	3276	8431	3511	9965	12.2
1705	2	550	26.4	3288	11119	3511	9965	12.2
1706	1	550	24.9	3222	8933	3511	9965	12.2
1707	2	550	27.5	3416	10868	3511	9965	12.2
1708	1	550	22.9	3370	7717	3511	9965	12.1
1709	2	550	22.7	3781	9351	3511	9965	12.1
1710	1	550	20.6	3185	7699	3511	9965	12.1
1711	2	550	23.5	3437	10134	3511	9965	12.1

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1712	1	550	21.6	3338	7695	3511	9965	12.1
1713	2	550	18.3	3879	9372	3511	9965	12.1
1714	1	550	40.7	4016	8347	3511	9965	12.1
1715	2	550	40.9	3277	10361	3511	9965	12.1
1716	1	550	39.4	3596	9046	3511	9965	12.1
1717	2	550	42.3	3245	10317	3511	9965	12.1
1718	1	550	39.6	3517	8813	3511	9965	12.1
1719	2	550	41.5	3299	10791	3511	9965	12.1
1720	1	550	47.5	2949	8509	3511	9965	12.1
1721	2	550	44.2	3277	10534	3511	9965	12.1
1722	1	550	45.1	3258	8719	3511	9965	12.1
1723	2	550	43.3	3288	10246	3511	9965	12.1
1724	1	550	47.3	3150	8914	3511	9965	12.1
1725	2	550	41.2	3285	10815	3511	9965	12.1
1726	1	550	37.8	3691	9251	3511	9965	12.1
1727	2	550	36.2	4222	10584	3511	9965	12.1
1728	1	550	38.9	3524	9074	3511	9965	12.1
1729	2	550	35.1	4016	11249	3511	9965	12.1
1730	1	550	39.1	3611	9155	3511	9965	12.1
1731	2	550	36.4	4095	10909	3511	9965	12.1
1732	1	550	73.2	2449	7361	3511	9965	12.1
1733	2	550	58.6	2691	8856	3511	9965	12.1
1734	1	550	68.1	2833	8116	3511	9965	12.1
1735	2	550	57.5	2849	9836	3511	9965	12.1
1736	1	550	73.4	2502	7735	3511	9965	12.1
1737	2	550	60.7	2947	9783	3511	9965	12.1
1738	1	550	74.8	2428	7282	3511	9965	12.1
1739	2	550	59.2	2933	9790	3511	9965	12.1
1740	1	550	72.4	2239	7576	3511	9965	12.1
1741	2	550	57.9	2949	10046	3511	9965	12.1
1742	1	550	73.1	2502	8144	3511	9965	12.1
1743	2	550	59.5	2903	9895	3511	9965	12.1
1744	1	550	68.7	2477	7539	3511	9965	12.1
1745	2	550	58.9	2913	9793	3511	9965	12.1
1746	1	550	72.4	2654	7938	3511	9965	12.1
1747	2	550	56.2	3162	9637	3511	9965	12.1
1748	1	550	68.7	2467	7768	3511	9965	12.1
1749	2	550	55.2	3291	9711	3511	9965	12.1
1750	1	550	8.2	3848	8188	3615	7874	12.1
1751	2	550	8.0	3898	8684	3615	7874	12.1
1752	1	550	6.8	3862	8580	3615	7874	12.1
1753	2	550	7.2	3787	8290	3615	7874	12.1
1754	1	550	6.8	3877	8409	3615	7874	12.1
1755	2	550	6.9	3880	8534	3615	7874	12.1
1756	1	550	23.5	3390	6143	3615	7874	12.1
1757	2	550	23.3	3787	8603	3615	7874	12.1
1758	1	550	23.2	3454	6436	3615	7874	12.1
1759	2	550	23.2	3818	8621	3615	7874	12.1
1760	1	550	22.9	3483	6311	3615	7874	12.1
1761	2	550	23.8	3962	8855	3615	7874	12.1
1762	1	550	26.6	3504	7313	3615	7874	12.1
1763	2	550	31.7	3465	9378	3615	7874	12.1
1764	1	550	33.2	3567	7403	3615	7874	12.1
1765	2	550	30.6	3774	9632	3615	7874	12.1
1766	1	550	32.7	2724	7077	3615	7874	12.1
1767	2	550	29.6	3543	9815	3615	7874	12.1
1768	1	550	18.3	3844	6449	3615	7874	12.1
1769	2	550	20.0	4293	6889	3615	7874	12.1
1770	1	550	18.7	3592	6522	3615	7874	12.1

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1771	2	550	20.0	4160	7234	3615	7874	12.1
1772	1	550	20.4	3499	6543	3615	7874	12.1
1773	2	550	20.4	4333	7243	3615	7874	12.1
1774	1	550	40.1	3735	7307	3615	7874	12.1
1775	2	550	41.2	3762	9313	3615	7874	12.1
1776	1	550	40.4	3656	7386	3615	7874	12.1
1777	2	550	39.8	3656	9400	3615	7874	12.1
1778	1	550	40.6	3719	7561	3615	7874	12.1
1779	2	550	41.2	3767	9249	3615	7874	12.1
1780	1	550	47.0	3358	6930	3615	7874	12.1
1781	2	550	44.6	3439	9212	3615	7874	12.1
1782	1	550	45.5	3367	7289	3615	7874	12.1
1783	2	550	42.3	3256	9201	3615	7874	12.1
1784	1	550	44.1	3572	7228	3615	7874	12.1
1785	2	550	44.9	3361	9234	3615	7874	12.1
1786	1	550	35.2	4135	7001	3615	7874	12.1
1787	2	550	29.3	3975	8908	3615	7874	12.1
1788	1	550	35.9	3991	7106	3615	7874	12.2
1789	2	550	35.9	3639	9511	3615	7874	12.2
1790	1	550	36.9	3978	6870	3615	7874	12.2
1791	2	550	33.5	4097	9290	3615	7874	12.2
1792	1	550	72.1	2470	6098	3615	7874	12.2
1793	2	550	64.5	2950	7379	3615	7874	12.2
1794	1	550	73.5	2439	5741	3615	7874	12.2
1795	2	550	62.8	2924	7690	3615	7874	12.2
1796	1	550	71.5	2568	6449	3615	7874	12.2
1797	2	550	66.3	2858	7158	3615	7874	12.2
1798	1	550	75.6	2360	6617	3615	7874	12.2
1799	2	550	64.9	3031	8080	3615	7874	12.2
1800	1	550	76.0	2286	6487	3615	7874	12.2
1801	2	550	66.5	2942	7418	3615	7874	12.2
1802	1	550	76.0	2503	6333	3615	7874	12.2
1803	2	550	64.2	2904	7770	3615	7874	12.2
1804	1	550	67.1	2896	6167	3615	7874	12.2
1805	2	550	49.2	3618	8399	3615	7874	12.2
1806	1	550	66.6	3161	6176	3615	7874	12.2
1807	2	550	59.2	3837	7804	3615	7874	12.2
1808	1	550	68.1	2863	5982	3615	7874	12.2
1809	2	550	60.2	3549	7509	3615	7874	12.2
1810	1	650	8.4	2879	8436	3425	10142	4.1
1811	2	650	8.7	2714	8415	3425	10142	4.1
1812	1	650	8.5	2964	8407	3425	10142	4.1
1813	2	650	8.4	2764	8377	3425	10142	4.1
1814	1	650	8.0	3059	8160	3425	10142	4.1
1815	2	650	8.2	2873	8528	3425	10142	4.1
1816	1	650	23.2	2831	6679	3425	10142	4.1
1817	2	650	23.5	3108	9328	3425	10142	4.1
1818	1	650	23.7	2921	6759	3425	10142	4.1
1819	2	650	22.9	3059	9220	3425	10142	4.1
1820	1	650	23.2	2910	6522	3425	10142	4.1
1821	2	650	22.7	3191	8937	3425	10142	4.1
1822	1	650	25.6	2819	7219	3425	10142	4.1
1823	2	650	29.8	2834	9626	3425	10142	4.1
1824	1	650	28.0	2633	7594	3425	10142	4.1
1825	2	650	27.4	2991	9547	3425	10142	4.1
1826	1	650	26.6	2699	7505	3425	10142	4.1
1827	2	650	27.0	3016	9453	3425	10142	4.1
1828	1	650	20.3	2617	6220	3425	10142	4.1
1829	2	650	19.2	3406	7764	3425	10142	4.1

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1830	1	650	20.4	2550	6058	3425	10142	4.1
1831	2	650	18.5	3456	7705	3425	10142	4.2
1832	1	650	20.3	2719	6434	3425	10142	4.2
1833	2	650	19.8	3387	7603	3425	10142	4.2
1834	1	650	41.5	2973	7649	3425	10142	4.2
1835	2	650	43.6	2616	9318	3425	10142	4.2
1836	1	650	41.4	3071	7511	3425	10142	4.2
1837	2	650	43.0	2673	8955	3425	10142	4.2
1838	1	650	39.4	3042	7599	3425	10142	4.2
1839	2	650	43.3	2631	9445	3425	10142	4.2
1840	1	650	43.0	2772	7594	3425	10142	4.2
1841	2	650	39.4	2732	9563	3425	10142	4.2
1842	1	650	47.2	2678	7220	3425	10142	4.2
1843	2	650	42.2	2610	9207	3425	10142	4.2
1844	1	650	45.1	2777	7174	3425	10142	4.2
1845	2	650	40.2	2740	9502	3425	10142	4.2
1846	1	650	38.6	3050	7593	3425	10142	4.2
1847	2	650	36.7	3162	9484	3425	10142	4.2
1848	1	650	39.8	2993	7637	3425	10142	4.2
1849	2	650	36.7	2960	9486	3425	10142	4.2
1850	1	650	38.5	3074	7800	3425	10142	4.2
1851	2	650	37.2	3497	9517	3425	10142	4.2
1852	1	650	70.2	1975	6794	3425	10142	4.2
1853	2	650	58.9	2409	8551	3425	10142	4.2
1854	1	650	69.4	1896	6819	3425	10142	4.2
1855	2	650	59.2	2355	8596	3425	10142	4.2
1856	1	650	70.8	1951	6683	3425	10142	4.2
1857	2	650	61.8	2368	8326	3425	10142	4.2
1858	1	650	71.5	1913	6631	3425	10142	4.2
1859	2	650	59.7	2343	8326	3425	10142	4.2
1860	1	650	70.7	1958	6793	3425	10142	4.2
1861	2	650	62.0	2298	8157	3425	10142	4.2
1862	1	650	72.9	1861	6790	3425	10142	4.2
1863	2	650	60.4	2401	8573	3425	10142	4.2
1864	1	650	69.5	1979	6806	3425	10142	4.2
1865	2	650	56.5	2555	8201	3425	10142	4.2
1866	1	650	73.9	1749	6333	3425	10142	4.2
1867	2	650	53.1	2815	8696	3425	10142	4.2
1868	1	650	73.2	1806	6458	3425	10142	4.3
1869	2	650	54.9	2710	8396	3425	10142	4.3
1870	1	650	9.2	3250	7190	3556	8047	4.7
1871	2	650	8.0	3250	7491	3556	8047	4.7
1872	1	650	8.5	3338	6532	3556	8047	4.7
1873	2	650	7.9	3365	7520	3556	8047	4.7
1874	1	650	7.9	3237	6547	3556	8047	4.7
1875	2	650	7.9	3283	7596	3556	8047	4.7
1876	1	650	23.8	2937	5508	3556	8047	4.7
1877	2	650	23.5	3299	7525	3556	8047	4.7
1878	1	650	24.6	2953	5587	3556	8047	4.7
1879	2	650	23.8	3362	7937	3556	8047	4.7
1880	1	650	24.5	2976	5739	3556	8047	4.7
1881	2	650	23.8	3361	7948	3556	8047	4.7
1882	1	650	32.8	2961	6426	3556	8047	4.7
1883	2	650	31.1	3174	8605	3556	8047	4.7
1884	1	650	30.1	2630	6457	3556	8047	4.7
1885	2	650	29.8	3074	8639	3556	8047	4.7
1886	1	650	28.8	2827	6510	3556	8047	4.7
1887	2	650	32.2	3185	8538	3556	8047	4.7
1888	1	650	18.8	3041	5710	3556	8047	4.7

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1889	2	650	17.7	3676	6692	3556	8047	4.7
1890	1	650	18.8	3069	6475	3556	8047	4.7
1891	2	650	21.1	3370	6547	3556	8047	4.8
1892	1	650	17.5	3181	6279	3556	8047	4.8
1893	2	650	20.3	3679	6402	3556	8047	4.8
1894	1	650	41.2	3110	6519	3556	8047	4.8
1895	2	650	39.8	3169	8230	3556	8047	4.8
1896	1	650	40.9	3129	6715	3556	8047	4.8
1897	2	650	40.7	3060	7568	3556	8047	4.8
1898	1	650	40.1	3202	6558	3556	8047	4.8
1899	2	650	40.6	3132	8327	3556	8047	4.8
1900	1	650	47.3	3120	6260	3556	8047	4.9
1901	2	650	44.9	2841	8139	3556	8047	4.9
1902	1	650	46.5	2950	6726	3556	8047	4.9
1903	2	650	44.7	2922	7807	3556	8047	4.9
1904	1	650	47.3	2789	6522	3556	8047	4.9
1905	2	650	46.3	2969	8222	3556	8047	4.9
1906	1	650	36.0	3480	6352	3556	8047	4.9
1907	2	650	35.1	3354	8055	3556	8047	4.9
1908	1	650	37.0	3341	6657	3556	8047	4.9
1909	2	650	37.8	3558	8093	3556	8047	4.9
1910	1	650	36.4	3462	6174	3556	8047	4.9
1911	2	650	35.9	3174	8157	3556	8047	4.9
1912	1	650	71.3	1877	5547	3556	8047	4.9
1913	2	650	67.4	2485	6418	3556	8047	4.9
1914	1	650	72.9	1908	5440	3556	8047	4.9
1915	2	650	64.5	2546	6830	3556	8047	4.9
1916	1	650	72.7	1857	5067	3556	8047	4.9
1917	2	650	65.8	2711	7044	3556	8047	5.0
1918	1	650	75.3	1721	5665	3556	8047	5.1
1919	2	650	67.1	2519	6529	3556	8047	5.1
1920	1	650	76.0	1798	5473	3556	8047	5.1
1921	2	650	66.9	2488	6749	3556	8047	5.1
1922	1	650	74.5	1651	5462	3556	8047	5.1
1923	2	650	66.6	2464	6624	3556	8047	5.1
1924	1	650	64.7	2381	5616	3556	8047	5.1
1925	2	650	63.1	2989	6882	3556	8047	5.2
1926	1	650	68.9	1965	5552	3556	8047	5.2
1927	2	650	63.9	2838	6366	3556	8047	5.2
1928	1	650	68.4	2053	5143	3556	8047	5.2
1929	2	650	61.8	2813	6816	3556	8047	5.2
1930	1	650	8.7	3254	2841	3715	3543	5.5
1931	2	650	8.7	3577	3875	3715	3543	5.5
1932	1	650	8.0	3294	3509	3715	3543	5.5
1933	2	650	8.9	3452	3499	3715	3543	5.5
1934	1	650	9.7	3375	3648	3715	3543	5.5
1935	2	650	8.5	3479	3578	3715	3543	5.5
1936	1	650	22.5	2873	3165	3715	3543	5.5
1937	2	650	22.4	3458	3643	3715	3543	5.5
1938	1	650	22.9	2841	3125	3715	3543	5.5
1939	2	650	21.4	3439	3456	3715	3543	5.5
1940	1	650	21.4	2869	3136	3715	3543	5.5
1941	2	650	21.4	3439	3589	3715	3543	5.6
1942	1	650	24.8	3088	3023	3715	3543	5.6
1943	2	650	23.3	3480	3470	3715	3543	5.6
1944	1	650	23.3	2888	3299	3715	3543	5.6
1945	2	650	24.6	3462	3477	3715	3543	5.6
1946	1	650	23.0	2801	3114	3715	3543	5.6
1947	2	650	24.3	2989	3202	3715	3543	5.6

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
1948	1	650	22.4	2907	3152	3715	3543	5.6
1949	2	650	20.4	3415	3572	3715	3543	5.6
1950	1	650	23.2	2885	2920	3715	3543	5.6
1951	2	650	21.7	3550	3259	3715	3543	5.6
1952	1	650	22.7	2924	3023	3715	3543	5.6
1953	2	650	21.2	3452	3375	3715	3543	5.6
1954	1	650	40.9	3174	2698	3715	3543	5.6
1955	2	650	41.2	3254	3506	3715	3543	5.7
1956	1	650	41.2	3273	2624	3715	3543	5.7
1957	2	650	40.4	3387	3647	3715	3543	5.7
1958	1	650	40.7	3197	2652	3715	3543	5.7
1959	2	650	41.2	3386	3738	3715	3543	5.7
1960	1	650	40.9	3266	2728	3715	3543	5.7
1961	2	650	46.0	3158	4002	3715	3543	5.7
1962	1	650	44.4	3128	3033	3715	3543	5.7
1963	2	650	47.3	3071	3680	3715	3543	5.7
1964	1	650	45.1	3198	2917	3715	3543	5.7
1965	2	650	47.0	3185	3673	3715	3543	5.7
1966	1	650	37.8	3299	2433	3715	3543	5.7
1967	2	650	36.9	3587	3773	3715	3543	5.7
1968	1	650	36.5	3210	2453	3715	3543	5.7
1969	2	650	38.0	3541	3509	3715	3543	5.7
1970	1	650	38.5	3258	2727	3715	3543	5.7
1971	2	650	39.1	3377	3267	3715	3543	5.7
1972	1	650	72.6	2360	2503	3715	3543	5.8
1973	2	650	73.4	2981	3985	3715	3543	5.8
1974	1	650	72.6	2318	2463	3715	3543	5.8
1975	2	650	71.9	3064	4071	3715	3543	5.8
1976	1	650	72.4	2081	1637	3715	3543	5.8
1977	2	650	73.5	3054	3860	3715	3543	5.8
1978	1	650	77.1	2073	1617	3715	3543	5.8
1979	2	650	74.2	3004	3880	3715	3543	5.8
1980	1	650	78.9	2143	2277	3715	3543	5.8
1981	2	650	75.0	3006	3958	3715	3543	5.9
1982	1	650	75.6	2056	2312	3715	3543	5.9
1983	2	650	74.8	2971	4105	3715	3543	5.9
1984	1	650	69.0	2413	1502	3715	3543	5.9
1985	2	650	65.5	3410	3827	3715	3543	5.9
1986	1	650	69.7	2435	2510	3715	3543	5.9
1987	2	650	67.3	3313	3771	3715	3543	5.9
1988	1	650	68.6	2438	1496	3715	3543	5.9
1989	2	650	70.5	3276	3714	3715	3543	5.9
1990	1	550	7.4	3358	3444	3588	3638	5.9
1991	2	550	7.7	3543	3632	3588	3638	5.9
1992	1	550	7.1	3422	3223	3588	3638	5.9
1993	2	550	7.4	3444	3495	3588	3638	5.9
1994	1	550	7.4	3285	3135	3588	3638	5.9
1995	2	550	7.1	3556	3778	3588	3638	5.9
1996	1	550	24.5	2987	2804	3588	3638	6.1
1997	2	550	23.0	3481	3422	3588	3638	6.1
1998	1	550	24.1	2935	2958	3588	3638	6.1
1999	2	550	23.8	3602	3252	3588	3638	6.1
2000	1	550	23.2	2885	2953	3588	3638	6.1
2001	2	550	23.3	3514	3309	3588	3638	6.1
2002	1	550	30.1	2695	2626	3588	3638	6.1
2003	2	550	34.8	3585	3577	3588	3638	6.1
2004	1	550	34.1	2838	2660	3588	3638	6.1
2005	2	550	29.9	3455	3872	3588	3638	6.1
2006	1	550	31.5	2839	2609	3588	3638	6.1

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
2007	2	550	31.5	3410	3706	3588	3638	6.1
2008	1	550	18.8	2989	3153	3588	3638	6.1
2009	2	550	13.2	3352	3469	3588	3638	6.1
2010	1	550	14.0	2895	2966	3588	3638	6.1
2011	2	550	18.8	3713	3600	3588	3638	6.1
2012	1	550	15.3	3069	2954	3588	3638	6.1
2013	2	550	17.1	3577	3581	3588	3638	6.1
2014	1	550	40.6	3187	2727	3588	3638	6.1
2015	2	550	41.7	3313	3746	3588	3638	6.1
2016	1	550	40.9	3221	2712	3588	3638	6.1
2017	2	550	40.6	3309	3763	3588	3638	6.1
2018	1	550	40.9	3169	2649	3588	3638	6.1
2019	2	550	40.7	3346	4003	3588	3638	6.1
2020	1	550	48.6	2989	3140	3588	3638	6.1
2021	2	550	44.3	3074	4076	3588	3638	6.1
2022	1	550	40.9	3050	3158	3588	3638	6.1
2023	2	550	44.9	3113	3843	3588	3638	6.1
2024	1	550	43.0	2968	3127	3588	3638	6.1
2025	2	550	43.8	3221	4500	3588	3638	6.1
2026	1	550	41.2	3479	2252	3588	3638	6.2
2027	2	550	37.3	3469	3815	3588	3638	6.2
2028	1	550	38.1	3437	2310	3588	3638	6.2
2029	2	550	39.4	3665	3724	3588	3638	6.2
2030	1	550	40.6	3211	2577	3588	3638	6.2
2031	2	550	43.0	3488	3833	3588	3638	6.2
2032	1	550	71.6	2264	1573	3588	3638	6.2
2033	2	550	72.4	2952	3822	3588	3638	6.2
2034	1	550	71.8	2383	2438	3588	3638	6.2
2035	2	550	73.2	3073	3828	3588	3638	6.2
2036	1	550	71.9	2115	1600	3588	3638	6.2
2037	2	550	72.6	2920	3701	3588	3638	6.2
2038	1	550	73.1	2112	1590	3588	3638	6.2
2039	2	550	74.4	2929	3978	3588	3638	6.2
2040	1	550	77.7	2040	2209	3588	3638	6.2
2041	2	550	75.0	2852	3679	3588	3638	6.2
2042	1	550	75.0	2068	2334	3588	3638	6.2
2043	2	550	73.9	2962	3995	3588	3638	6.2
2044	1	550	65.7	2700	1604	3588	3638	6.2
2045	2	550	65.5	3042	3506	3588	3638	6.3
2046	1	550	66.6	2401	2461	3588	3638	6.3
2047	2	550	66.0	3153	3924	3588	3638	6.3
2048	1	550	63.4	2712	1535	3588	3638	6.3
2049	2	550	63.6	3312	3880	3588	3638	6.3
2050	1	725	9.5	2896	7682	3447	10029	5.7
2051	2	725	9.5	2810	7930	3447	10029	5.7
2052	1	725	8.7	3014	8203	3447	10029	5.7
2053	2	725	8.2	3026	8827	3447	10029	5.7
2054	1	725	8.5	3112	8351	3447	10029	5.7
2055	2	725	8.0	2990	8843	3447	10029	5.7
2056	1	725	22.0	2855	6518	3447	10029	5.6
2057	2	725	22.7	3177	8980	3447	10029	5.6
2058	1	725	22.7	2817	6817	3447	10029	5.6
2059	2	725	20.6	3149	8559	3447	10029	5.6
2060	1	725	23.2	2858	6843	3447	10029	5.6
2061	2	725	21.2	3168	8716	3447	10029	5.6
2062	1	725	25.6	2646	7472	3447	10029	5.6
2063	2	725	25.7	2918	9199	3447	10029	5.6
2064	1	725	24.1	2756	7092	3447	10029	5.6
2065	2	725	24.5	3145	9134	3447	10029	5.6

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
2066	1	725	23.8	2822	7403	3447	10029	5.6
2067	2	725	24.0	2964	8707	3447	10029	5.6
2068	1	725	23.7	2834	7532	3447	10029	5.6
2069	2	725	28.0	2921	9400	3447	10029	5.6
2070	1	725	20.3	2721	6442	3447	10029	5.6
2071	2	725	18.3	3034	8282	3447	10029	5.6
2072	1	725	20.1	2758	6409	3447	10029	5.6
2073	2	725	21.6	3480	7690	3447	10029	5.6
2074	1	725	42.3	3047	7726	3447	10029	5.6
2075	2	725	39.3	2707	9564	3447	10029	5.6
2076	1	725	40.1	3089	7938	3447	10029	5.6
2077	2	725	37.8	2708	9699	3447	10029	5.6
2078	1	725	42.5	3034	7697	3447	10029	5.6
2079	2	725	39.9	2728	9367	3447	10029	5.6
2080	1	725	41.7	2802	7447	3447	10029	5.5
2081	2	725	35.9	2692	9713	3447	10029	5.5
2082	1	725	43.0	2817	7151	3447	10029	5.5
2083	2	725	38.8	2794	9322	3447	10029	5.5
2084	1	725	44.3	2944	7155	3447	10029	5.5
2085	2	725	36.2	2772	9836	3447	10029	5.5
2086	1	725	39.9	3048	7778	3447	10029	5.5
2087	2	725	34.8	3523	9361	3447	10029	5.5
2088	1	725	37.8	3117	7780	3447	10029	5.5
2089	2	725	38.1	3229	8689	3447	10029	5.5
2090	1	725	40.7	3073	7771	3447	10029	5.5
2091	2	725	33.0	3142	9378	3447	10029	5.5
2092	1	725	72.6	1734	6270	3447	10029	5.5
2093	2	725	55.4	2383	8982	3447	10029	5.5
2094	1	725	71.1	2111	6947	3447	10029	5.5
2095	2	725	58.4	2453	8643	3447	10029	5.5
2096	1	725	71.9	2181	6933	3447	10029	5.5
2097	2	725	57.6	2241	8490	3447	10029	5.5
2098	1	725	74.7	1635	6512	3447	10029	5.5
2099	2	725	57.5	2271	8659	3447	10029	5.5
2100	1	725	70.2	2145	7140	3447	10029	5.5
2101	2	725	57.9	2363	8533	3447	10029	5.4
2102	1	725	77.6	1796	6392	3447	10029	5.4
2103	2	725	58.3	2506	8707	3447	10029	5.4
2104	1	725	63.1	2541	6820	3447	10029	5.4
2105	2	725	55.2	2504	8912	3447	10029	5.4
2106	1	725	69.2	2115	6970	3447	10029	5.4
2107	2	725	56.3	2949	8690	3447	10029	5.4
2108	1	725	72.3	2089	6808	3447	10029	5.4
2109	2	725	57.1	2895	8650	3447	10029	5.4
2110	1	725	7.7	3207	6266	3438	7924	5.3
2111	2	725	7.7	3295	7267	3438	7924	5.3
2112	1	725	7.9	3186	6197	3438	7924	5.3
2113	2	725	7.9	3352	7349	3438	7924	5.3
2114	1	725	7.6	3139	6601	3438	7924	5.3
2115	2	725	8.0	3265	7139	3438	7924	5.3
2116	1	725	23.7	2990	5458	3438	7924	5.3
2117	2	725	23.2	3294	7333	3438	7924	5.3
2118	1	725	23.8	2924	5393	3438	7924	5.3
2119	2	725	23.8	3349	7179	3438	7924	5.3
2120	1	725	23.3	2882	5270	3438	7924	5.3
2121	2	725	23.5	3187	7262	3438	7924	5.3
2122	1	725	25.6	2877	6095	3438	7924	5.3
2123	2	725	24.5	3020	8111	3438	7924	5.3
2124	1	725	23.8	2911	7505	3438	7924	5.3

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
2125	2	725	24.8	2932	7966	3438	7924	5.3
2126	1	725	27.4	2437	6178	3438	7924	5.3
2127	2	725	26.6	2913	7374	3438	7924	5.3
2128	1	725	22.4	2939	5338	3438	7924	5.3
2129	2	725	21.6	3362	6412	3438	7924	5.3
2130	1	725	23.0	3158	5930	3438	7924	5.3
2131	2	725	20.3	3435	6773	3438	7924	5.3
2132	1	725	22.2	2958	6091	3438	7924	5.3
2133	2	725	21.2	3298	6036	3438	7924	5.3
2134	1	725	41.0	3133	6163	3438	7924	5.3
2135	2	725	38.8	2856	8051	3438	7924	5.3
2136	1	725	41.0	3156	6305	3438	7924	5.3
2137	2	725	40.6	3050	7825	3438	7924	5.3
2138	1	725	40.9	3107	6393	3438	7924	5.3
2139	2	725	39.6	3112	8134	3438	7924	5.3
2140	1	725	43.3	2696	6572	3438	7924	5.3
2141	2	725	40.9	2849	7988	3438	7924	5.3
2142	1	725	42.6	2626	6545	3438	7924	5.3
2143	2	725	39.6	2932	8159	3438	7924	5.3
2144	1	725	42.8	2775	6396	3438	7924	5.3
2145	2	725	39.6	2810	7605	3438	7924	5.3
2146	1	725	39.1	3668	5982	3438	7924	5.3
2147	2	725	40.1	3768	7680	3438	7924	5.3
2148	1	725	38.3	3641	5913	3438	7924	5.3
2149	2	725	38.1	3488	7383	3438	7924	5.3
2150	1	725	41.4	3485	6274	3438	7924	5.3
2151	2	725	41.4	3230	7869	3438	7924	5.3
2152	1	725	73.1	1984	5506	3438	7924	5.3
2153	2	725	64.5	2481	6749	3438	7924	5.3
2154	1	725	71.8	2083	5637	3438	7924	5.3
2155	2	725	63.7	2621	7243	3438	7924	5.3
2156	1	725	71.8	2537	5960	3438	7924	5.3
2157	2	725	63.6	2533	6964	3438	7924	5.3
2158	1	725	72.6	1657	5626	3438	7924	5.3
2159	2	725	65.8	2637	6988	3438	7924	5.3
2160	1	725	74.8	1778	5480	3438	7924	5.3
2161	2	725	64.5	2546	7012	3438	7924	5.3
2162	1	725	73.4	1759	5560	3438	7924	5.3
2163	2	725	63.4	2605	7099	3438	7924	5.3
2164	1	725	69.0	2773	5451	3438	7924	5.3
2165	2	725	64.2	2920	6356	3438	7924	5.3
2166	1	725	69.8	2500	5320	3438	7924	5.3
2167	2	725	64.1	2852	6424	3438	7924	5.3
2168	1	725	70.8	2693	5376	3438	7924	5.3
2169	2	725	59.4	2559	6364	3438	7924	5.3
2170	1	725	9.5	3259	3099	3683	3529	5.3
2171	2	725	10.0	3325	3381	3683	3529	5.3
2172	1	725	8.0	3273	3456	3683	3529	5.3
2173	2	725	9.8	3308	3644	3683	3529	5.3
2174	1	725	10.0	3142	3113	3683	3529	5.3
2175	2	725	13.8	3312	3533	3683	3529	5.3
2176	1	725	23.0	2805	2969	3683	3529	5.3
2177	2	725	22.4	3321	3185	3683	3529	5.3
2178	1	725	23.5	2920	3002	3683	3529	5.3
2179	2	725	21.6	3273	3635	3683	3529	5.3
2180	1	725	24.0	2881	2906	3683	3529	5.3
2181	2	725	23.7	3456	3252	3683	3529	5.4
2182	1	725	23.8	2773	2650	3683	3529	5.4
2183	2	725	23.8	3332	3554	3683	3529	5.4

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
2184	1	725	30.6	2903	2406	3683	3529	5.4
2185	2	725	34.1	3291	4203	3683	3529	5.4
2186	1	725	31.1	2750	2547	3683	3529	5.4
2187	2	725	34.1	3240	3992	3683	3529	5.4
2188	1	725	24.8	2922	2882	3683	3529	5.4
2189	2	725	27.4	3495	3403	3683	3529	5.4
2190	1	725	23.3	2830	3027	3683	3529	5.4
2191	2	725	23.2	3564	3364	3683	3529	5.4
2192	1	725	24.1	2895	3211	3683	3529	5.4
2193	2	725	28.0	3475	3183	3683	3529	5.4
2194	1	725	40.6	3197	2437	3683	3529	5.4
2195	2	725	41.7	2747	3102	3683	3529	5.4
2196	1	725	41.5	3118	2529	3683	3529	5.4
2197	2	725	43.0	3218	3676	3683	3529	5.4
2198	1	725	40.1	3033	2613	3683	3529	5.4
2199	2	725	40.6	3379	3727	3683	3529	5.4
2200	1	725	39.9	3225	2554	3683	3529	5.4
2201	2	725	42.8	3266	3719	3683	3529	5.4
2202	1	725	40.2	3121	2790	3683	3529	5.4
2203	2	725	41.5	2642	3234	3683	3529	5.4
2204	1	725	42.2	3149	2833	3683	3529	5.4
2205	2	725	42.2	2817	3557	3683	3529	5.4
2206	1	725	38.5	3047	2598	3683	3529	5.4
2207	2	725	39.9	3583	3444	3683	3529	5.4
2208	1	725	37.5	3189	2635	3683	3529	5.4
2209	2	725	40.7	3567	3421	3683	3529	5.4
2210	1	725	39.9	3251	2488	3683	3529	5.4
2211	2	725	40.4	3317	3437	3683	3529	5.4
2212	1	725	71.9	2468	1639	3683	3529	5.4
2213	2	725	71.9	3117	3783	3683	3529	5.4
2214	1	725	71.5	2624	2543	3683	3529	5.5
2215	2	725	71.1	3026	3498	3683	3529	5.5
2216	1	725	72.6	2314	1571	3683	3529	5.5
2217	2	725	72.6	3025	3773	3683	3529	5.5
2218	1	725	73.4	2115	1581	3683	3529	5.5
2219	2	725	71.0	2911	3793	3683	3529	5.5
2220	1	725	75.0	1894	1688	3683	3529	5.5
2221	2	725	72.3	2893	3839	3683	3529	5.5
2222	1	725	74.5	1698	1741	3683	3529	5.5
2223	2	725	73.1	2888	3889	3683	3529	5.5
2224	1	725	71.0	2184	1542	3683	3529	5.5
2225	2	725	68.1	3233	3314	3683	3529	5.5
2226	1	725	71.3	2307	1564	3683	3529	5.5
2227	2	725	70.5	3260	3328	3683	3529	5.5
2228	1	725	72.6	2053	1535	3683	3529	5.5
2229	2	725	69.7	3092	3197	3683	3529	5.5
2230	1	650	7.6	3485	3411	3692	3538	5.9
2231	2	650	7.7	3599	3676	3692	3538	5.9
2232	1	650	7.9	3312	3513	3692	3538	5.9
2233	2	650	7.1	3587	3743	3692	3538	5.9
2234	1	650	8.0	3350	3583	3692	3538	6.0
2235	2	650	7.7	3658	3727	3692	3538	6.0
2236	1	650	25.7	2910	2681	3692	3538	6.0
2237	2	650	24.0	3680	3285	3692	3538	6.0
2238	1	650	23.0	2838	3051	3692	3538	6.0
2239	2	650	23.0	3677	3341	3692	3538	6.0
2240	1	650	24.3	3098	3071	3692	3538	6.0
2241	2	650	23.8	3608	3113	3692	3538	6.0
2242	1	650	24.1	2866	2736	3692	3538	6.0

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
2243	2	650	24.0	3487	4106	3692	3538	6.0
2244	1	650	26.2	2937	2682	3692	3538	6.0
2245	2	650	29.5	3377	3942	3692	3538	6.0
2246	1	650	23.5	2711	2875	3692	3538	6.0
2247	2	650	24.8	3296	3789	3692	3538	6.0
2248	1	650	23.8	3001	3265	3692	3538	6.0
2249	2	650	23.2	3333	3589	3692	3538	6.0
2250	1	650	22.9	3247	3118	3692	3538	6.0
2251	2	650	22.2	3441	3455	3692	3538	6.0
2252	1	650	23.7	3116	3064	3692	3538	6.0
2253	2	650	21.1	3329	3372	3692	3538	6.0
2254	1	650	41.0	3348	2660	3692	3538	6.0
2255	2	650	40.2	3425	3988	3692	3538	6.0
2256	1	650	41.4	3320	2783	3692	3538	6.0
2257	2	650	40.6	3468	3909	3692	3538	6.0
2258	1	650	41.0	3381	2839	3692	3538	6.0
2259	2	650	40.9	3408	3810	3692	3538	6.0
2260	1	650	41.7	2910	3120	3692	3538	6.0
2261	2	650	42.3	3196	4180	3692	3538	6.0
2262	1	650	42.0	3177	3018	3692	3538	6.0
2263	2	650	41.4	3162	4100	3692	3538	6.0
2264	1	650	43.8	2921	3230	3692	3538	6.0
2265	2	650	41.8	3208	4558	3692	3538	6.1
2266	1	650	40.1	3552	2525	3692	3538	6.1
2267	2	650	40.4	3742	3683	3692	3538	6.1
2268	1	650	39.9	3441	2208	3692	3538	6.1
2269	2	650	40.2	3713	3806	3692	3538	6.1
2270	1	650	40.6	3524	2340	3692	3538	6.1
2271	2	650	38.9	3603	3568	3692	3538	6.1
2272	1	650	71.8	2535	1615	3692	3538	6.1
2273	2	650	71.0	3081	4006	3692	3538	6.1
2274	1	650	70.3	2185	1490	3692	3538	6.1
2275	2	650	72.3	3103	4167	3692	3538	6.1
2276	1	650	72.9	2076	1595	3692	3538	6.3
2277	2	650	71.0	3175	3955	3692	3538	6.3
2278	1	650	71.1	2056	1673	3692	3538	6.3
2279	2	650	70.2	3071	4260	3692	3538	6.3
2280	1	650	73.1	2121	1636	3692	3538	6.3
2281	2	650	73.9	3100	3939	3692	3538	6.3
2282	1	650	74.4	1992	1571	3692	3538	6.3
2283	2	650	69.7	3092	4007	3692	3538	6.3
2284	1	650	69.7	2762	2683	3692	3538	6.3
2285	2	650	71.8	3226	3615	3692	3538	6.3
2286	1	650	69.7	2915	2604	3692	3538	6.4
2287	2	650	71.0	3146	3628	3692	3538	6.4
2288	1	650	71.5	2464	1573	3692	3538	6.4
2289	2	650	71.0	3354	4033	3692	3538	6.4
2290	1	650	10.0	3466	7520	3524	7870	6.6
2291	2	650	10.1	3337	7547	3524	7870	6.6
2292	1	650	10.9	3574	7580	3524	7870	6.6
2293	2	650	10.5	3331	7499	3524	7870	6.6
2294	1	650	9.3	3668	7578	3524	7870	6.6
2295	2	650	9.5	3412	7934	3524	7870	6.6
2296	1	650	22.0	3237	5974	3524	7870	6.7
2297	2	650	22.9	3488	7434	3524	7870	6.7
2298	1	650	22.2	3279	5891	3524	7870	6.7
2299	2	650	22.0	3596	7676	3524	7870	6.7
2300	1	650	23.0	3269	5537	3524	7870	6.7
2301	2	650	22.2	3523	7934	3524	7870	6.7

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
2302	1	650	27.7	3181	6686	3524	7870	6.7
2303	2	650	24.3	3564	8429	3524	7870	6.7
2304	1	650	25.9	3202	6381	3524	7870	6.7
2305	2	650	26.6	3489	8814	3524	7870	6.7
2306	1	650	27.5	3178	6765	3524	7870	6.7
2307	2	650	24.3	3616	8595	3524	7870	6.7
2308	1	650	29.6	2908	6849	3524	7870	6.7
2309	2	650	26.7	3353	8440	3524	7870	6.7
2310	1	650	21.6	3229	6119	3524	7870	6.7
2311	2	650	19.2	3796	7557	3524	7870	6.7
2312	1	650	21.1	3179	6309	3524	7870	6.9
2313	2	650	18.5	3393	7923	3524	7870	6.9
2314	1	650	40.9	3492	6798	3524	7870	6.9
2315	2	650	41.2	3343	8532	3524	7870	6.9
2316	1	650	41.5	3432	7110	3524	7870	6.9
2317	2	650	42.5	3177	8274	3524	7870	6.9
2318	1	650	41.4	3398	6707	3524	7870	6.9
2319	2	650	42.8	3304	8280	3524	7870	6.9
2320	1	650	39.6	3337	6904	3524	7870	6.9
2321	2	650	42.5	3116	8810	3524	7870	6.9
2322	1	650	43.1	3370	6732	3524	7870	6.9
2323	2	650	44.1	3098	8487	3524	7870	6.9
2324	1	650	42.3	3323	6802	3524	7870	6.9
2325	2	650	40.6	3267	8483	3524	7870	6.9
2326	1	650	38.6	3524	6868	3524	7870	6.9
2327	2	650	38.8	3726	8686	3524	7870	7.1
2328	1	650	38.6	3491	6831	3524	7870	7.1
2329	2	650	37.3	4032	8900	3524	7870	7.1
2330	1	650	38.8	3531	6998	3524	7870	7.1
2331	2	650	38.3	3539	8683	3524	7870	7.1
2332	1	650	72.7	2098	5968	3524	7870	7.1
2333	2	650	62.8	2915	7945	3524	7870	7.1
2334	1	650	75.2	2018	5789	3524	7870	7.1
2335	2	650	62.9	2866	8083	3524	7870	7.1
2336	1	650	74.2	2283	6187	3524	7870	7.1
2337	2	650	63.2	2859	7796	3524	7870	7.3
2338	1	650	74.2	2231	6090	3524	7870	7.3
2339	2	650	62.8	2889	7766	3524	7870	7.3
2340	1	650	70.7	2009	6147	3524	7870	7.3
2341	2	650	63.2	2830	7845	3524	7870	7.3
2342	1	650	77.2	1857	5575	3524	7870	7.3
2343	2	650	64.1	2771	7731	3524	7870	7.3
2344	1	650	76.4	1806	5652	3524	7870	7.3
2345	2	650	63.4	2806	7891	3524	7870	7.5
2346	1	650	71.5	2306	6045	3524	7870	7.5
2347	2	650	61.0	3169	7796	3524	7870	7.5
2348	1	650	70.3	2260	6135	3524	7870	7.5
2349	2	650	61.5	3312	7735	3524	7870	7.5
2350	1	650	7.7	3476	9182	3475	10033	7.8
2351	2	650	7.7	3542	10200	3475	10033	7.8
2352	1	650	8.0	3685	9170	3475	10033	7.8
2353	2	650	7.9	3552	10312	3475	10033	7.8
2354	1	650	7.7	3524	9168	3475	10033	7.8
2355	2	650	7.6	3530	10152	3475	10033	7.8
2356	1	650	23.5	3230	7768	3475	10033	7.8
2357	2	650	23.0	3619	10650	3475	10033	7.8
2358	1	650	23.5	3329	7863	3475	10033	7.8
2359	2	650	23.3	3639	10628	3475	10033	7.8
2360	1	650	24.0	3283	7926	3475	10033	7.8

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
2361	2	650	23.3	3596	10500	3475	10033	7.8
2362	1	650	23.7	3162	8855	3475	10033	7.8
2363	2	650	24.0	3401	11348	3475	10033	7.8
2364	1	650	23.8	2531	8704	3475	10033	8.0
2365	2	650	24.6	3367	11363	3475	10033	8.0
2366	1	650	23.5	3497	8811	3475	10033	8.0
2367	2	650	24.6	3316	11630	3475	10033	8.0
2368	1	650	23.2	3822	8469	3475	10033	8.0
2369	2	650	24.0	4356	9616	3475	10033	8.0
2370	1	650	24.0	3572	7819	3475	10033	8.0
2371	2	650	22.5	3487	9093	3475	10033	8.0
2372	1	650	22.4	3504	8167	3475	10033	8.0
2373	2	650	21.1	3296	9241	3475	10033	8.0
2374	1	650	39.9	3437	8859	3475	10033	8.0
2375	2	650	40.2	3229	10484	3475	10033	8.0
2376	1	650	39.6	3374	8573	3475	10033	8.0
2377	2	650	39.4	3509	10671	3475	10033	8.0
2378	1	650	40.7	3466	8654	3475	10033	8.0
2379	2	650	40.9	3374	10598	3475	10033	8.1
2380	1	650	41.5	3000	8725	3475	10033	8.1
2381	2	650	37.3	3106	11057	3475	10033	8.1
2382	1	650	40.7	3001	8501	3475	10033	8.1
2383	2	650	39.4	3040	10594	3475	10033	8.1
2384	1	650	41.2	2859	8551	3475	10033	8.1
2385	2	650	40.2	3131	9967	3475	10033	8.1
2386	1	650	40.9	3934	8503	3475	10033	8.1
2387	2	650	41.0	3473	10497	3475	10033	8.1
2388	1	650	40.2	4308	8406	3475	10033	8.1
2389	2	650	40.7	3360	10701	3475	10033	8.1
2390	1	650	40.4	3473	8557	3475	10033	8.1
2391	2	650	40.4	3625	10723	3475	10033	8.1
2392	1	650	70.3	2013	7389	3475	10033	8.3
2393	2	650	58.4	2820	9807	3475	10033	8.3
2394	1	650	71.5	2272	7460	3475	10033	8.3
2395	2	650	58.6	2224	7845	3475	10033	8.3
2396	1	650	69.5	2024	7614	3475	10033	8.3
2397	2	650	58.1	2985	9274	3475	10033	8.3
2398	1	650	70.3	1843	7517	3475	10033	8.3
2399	2	650	58.4	2623	9350	3475	10033	8.3
2400	1	650	70.7	1836	7448	3475	10033	8.4
2401	2	650	55.4	2692	9965	3475	10033	8.4
2402	1	650	71.5	1950	7707	3475	10033	8.4
2403	2	650	58.1	2710	9590	3475	10033	8.4
2404	1	650	70.7	2989	7234	3475	10033	8.4
2405	2	650	59.1	2790	8769	3475	10033	8.4
2406	1	650	70.7	2947	7252	3475	10033	8.4
2407	2	650	58.3	3229	8976	3475	10033	8.4
2408	1	650	71.5	2870	7136	3475	10033	8.5
2409	2	650	58.3	2642	8979	3475	10033	8.5
2410	1	550	10.3	2877	7320	3692	3565	2.0
2411	2	550	10.3	2790	7953	3692	3565	2.0
2412	1	550	8.9	2902	7701	3692	3565	2.0
2413	2	550	9.5	2708	7634	3692	3565	2.0
2414	1	550	7.1	2892	7420	3692	3565	2.0
2415	2	550	9.7	2708	7549	3692	3565	2.0
2416	1	550	22.2	2685	6301	3692	3565	2.0
2417	2	550	22.4	3091	8367	3692	3565	2.0
2418	1	550	22.2	2743	6395	3692	3565	2.0
2419	2	550	23.3	3050	8471	3692	3565	2.0

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
2420	1	550	22.2	2743	6128	3692	3565	1.9
2421	2	550	22.4	3067	8504	3692	3565	1.9
2422	1	550	26.7	2682	6558	3692	3565	1.9
2423	2	550	26.6	3096	8639	3692	3565	1.9
2424	1	550	27.7	2761	7096	3692	3565	1.9
2425	2	550	26.7	3052	8712	3692	3565	1.9
2426	1	550	27.8	2630	7068	3692	3565	1.9
2427	2	550	25.6	3108	8599	3692	3565	1.9
2428	1	550	22.5	2772	6163	3692	3565	1.9
2429	2	550	19.3	3117	7367	3692	3565	1.9
2430	1	550	21.6	2674	6162	3692	3565	1.9
2431	2	550	19.8	2889	7096	3692	3565	1.9
2432	1	550	20.8	2612	6144	3692	3565	1.9
2433	2	550	19.2	3014	7318	3692	3565	1.9
2434	1	550	40.2	2888	7351	3692	3565	1.9
2435	2	550	38.3	2626	9226	3692	3565	1.9
2436	1	550	41.2	2877	7367	3692	3565	1.9
2437	2	550	36.2	2747	9216	3692	3565	1.9
2438	1	550	39.3	2914	7370	3692	3565	1.9
2439	2	550	40.6	2696	8886	3692	3565	1.9
2440	1	550	39.1	2729	7441	3692	3565	1.9
2441	2	550	39.6	2429	8221	3692	3565	1.9
2442	1	550	42.6	2645	7037	3692	3565	1.9
2443	2	550	39.4	2675	9339	3692	3565	1.9
2444	1	550	44.4	2662	6950	3692	3565	1.9
2445	2	550	41.0	2564	8650	3692	3565	1.9
2446	1	550	47.2	2804	6457	3692	3565	1.9
2447	2	550	34.0	2735	9139	3692	3565	1.9
2448	1	550	36.5	2903	7507	3692	3565	1.9
2449	2	550	36.4	3572	9384	3692	3565	1.9
2450	1	550	39.6	2975	7423	3692	3565	1.8
2451	2	550	35.2	3198	9215	3692	3565	1.8
2452	1	550	68.6	1905	6612	3692	3565	1.8
2453	2	550	59.2	2363	7857	3692	3565	1.8
2454	1	550	71.9	1905	6414	3692	3565	1.8
2455	2	550	60.5	2437	8014	3692	3565	1.8
2456	1	550	73.1	1890	6037	3692	3565	1.8
2457	2	550	60.4	2445	8068	3692	3565	1.8
2458	1	550	70.8	1658	6171	3692	3565	1.8
2459	2	550	59.5	2470	8095	3692	3565	1.8
2460	1	550	68.6	2004	6812	3692	3565	1.8
2461	2	550	57.5	2566	8091	3692	3565	1.8
2462	1	550	76.0	1742	6442	3692	3565	1.8
2463	2	550	60.8	2399	7909	3692	3565	1.8
2464	1	550	68.2	2297	6903	3692	3565	1.8
2465	2	550	54.6	2674	8364	3692	3565	1.8
2466	1	550	70.5	2036	6758	3692	3565	1.7
2467	2	550	57.5	2825	8221	3692	3565	1.7
2468	1	550	66.3	2238	6901	3692	3565	1.7
2469	2	550	60.5	2756	7878	3692	3565	1.7
2470	1	550	7.2	2979	6422	3588	7947	1.8
2471	2	550	7.6	3167	6828	3588	7947	1.8
2472	1	550	7.2	2973	6214	3588	7947	1.8
2473	2	550	7.7	3210	7056	3588	7947	1.8
2474	1	550	7.2	2908	6376	3588	7947	1.8
2475	2	550	7.6	3085	6728	3588	7947	1.8
2476	1	550	24.9	2889	5268	3588	7947	1.8
2477	2	550	23.8	3200	7041	3588	7947	1.8
2478	1	550	24.8	2888	5316	3588	7947	1.8

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
2479	2	550	23.0	3191	6991	3588	7947	1.8
2480	1	550	24.1	2768	5303	3588	7947	1.8
2481	2	550	23.0	3350	7024	3588	7947	1.8
2482	1	550	25.3	2441	5937	3588	7947	1.8
2483	2	550	23.8	3041	7790	3588	7947	1.8
2484	1	550	23.8	2450	5481	3588	7947	1.8
2485	2	550	24.3	3096	7759	3588	7947	1.8
2486	1	550	25.3	2597	5771	3588	7947	1.8
2487	2	550	23.7	3123	7874	3588	7947	1.8
2488	1	550	22.4	3012	6098	3588	7947	1.8
2489	2	550	23.0	3001	6127	3588	7947	1.8
2490	1	550	24.0	3084	5474	3588	7947	1.8
2491	2	550	24.6	3132	6275	3588	7947	1.8
2492	1	550	22.0	2856	6072	3588	7947	1.8
2493	2	550	22.7	3542	6102	3588	7947	1.8
2494	1	550	41.0	3030	6045	3588	7947	1.8
2495	2	550	40.1	3121	7668	3588	7947	1.8
2496	1	550	40.7	3023	6266	3588	7947	1.8
2497	2	550	40.2	3117	8111	3588	7947	1.8
2498	1	550	41.4	3064	6285	3588	7947	1.8
2499	2	550	40.1	3117	8070	3588	7947	1.8
2500	1	550	41.5	2595	6033	3588	7947	1.8
2501	2	550	40.1	2856	7874	3588	7947	1.8
2502	1	550	40.9	2657	6124	3588	7947	1.8
2503	2	550	39.6	2920	7850	3588	7947	1.8
2504	1	550	40.7	2434	6555	3588	7947	1.8
2505	2	550	40.1	2743	7913	3588	7947	1.8
2506	1	550	39.9	3361	5680	3588	7947	1.9
2507	2	550	40.1	3120	8055	3588	7947	1.9
2508	1	550	40.4	3523	5934	3588	7947	1.9
2509	2	550	39.6	3489	7458	3588	7947	1.9
2510	1	550	39.6	3328	5915	3588	7947	1.9
2511	2	550	39.8	3345	8003	3588	7947	1.9
2512	1	550	70.5	2144	5508	3588	7947	1.9
2513	2	550	65.7	2527	6214	3588	7947	1.9
2514	1	550	71.0	2104	5557	3588	7947	1.9
2515	2	550	64.7	2617	6781	3588	7947	1.9
2516	1	550	70.5	2003	5472	3588	7947	1.9
2517	2	550	65.0	2629	6791	3588	7947	1.9
2518	1	550	71.5	1913	5400	3588	7947	1.9
2519	2	550	65.7	2556	6285	3588	7947	1.9
2520	1	550	72.3	1709	5251	3588	7947	1.9
2521	2	550	65.8	2653	6889	3588	7947	1.9
2522	1	550	71.8	2046	5709	3588	7947	1.9
2523	2	550	65.0	2639	6788	3588	7947	1.9
2524	1	550	70.7	2457	5556	3588	7947	2.0
2525	2	550	66.1	3062	6220	3588	7947	2.0
2526	1	550	70.5	2744	5465	3588	7947	2.0
2527	2	550	66.6	2637	6552	3588	7947	2.0
2528	1	550	70.0	2522	5466	3588	7947	2.0
2529	2	550	62.1	2621	6265	3588	7947	2.0
2530	1	550	9.5	3738	3727	3488	10074	6.2
2531	2	550	10.5	3719	3945	3488	10074	6.2
2532	1	550	9.3	3774	3604	3488	10074	6.2
2533	2	550	10.1	3562	3641	3488	10074	6.2
2534	1	550	9.5	3704	3636	3488	10074	6.2
2535	2	550	8.5	3871	4083	3488	10074	6.2
2536	1	550	23.8	3325	3202	3488	10074	6.2
2537	2	550	24.5	3778	3704	3488	10074	6.2

Test #	Dir	Tire Press. (kPa)	GPS Speed (km/h)	WIM Axle 1 (kg)	WIM Axle 2 (kg)	Static Axle 1 (kg)	Static Axle 2 (kg)	Temp °C
2538	1	550	21.9	3172	3452	3488	10074	6.2
2539	2	550	22.5	3729	3688	3488	10074	6.2
2540	1	550	20.6	3045	3525	3488	10074	6.2
2541	2	550	22.0	3542	3640	3488	10074	6.2
2542	1	550	32.5	3337	2728	3488	10074	6.2
2543	2	550	24.3	4031	3578	3488	10074	6.5
2544	1	550	29.3	3365	2708	3488	10074	6.5
2545	2	550	23.2	3886	3364	3488	10074	6.5
2546	1	550	27.0	3250	2569	3488	10074	6.5
2547	2	550	28.5	3812	4097	3488	10074	6.5
2548	1	550	21.6	3096	3651	3488	10074	6.5
2549	2	550	22.0	3574	3636	3488	10074	6.5
2550	1	550	22.0	3121	3669	3488	10074	6.5
2551	2	550	25.7	3706	3962	3488	10074	6.5
2552	1	550	23.3	3208	3455	3488	10074	6.5
2553	2	550	23.2	3680	3755	3488	10074	6.5
2554	1	550	39.3	3577	2831	3488	10074	6.5
2555	2	550	39.9	3469	3787	3488	10074	6.5
2556	1	550	37.7	3651	2929	3488	10074	6.6
2557	2	550	41.4	3702	4115	3488	10074	6.6
2558	1	550	39.9	3538	2677	3488	10074	6.6
2559	2	550	40.9	3755	4526	3488	10074	6.6
2560	1	550	39.1	3468	3129	3488	10074	6.6
2561	2	550	40.2	3459	3985	3488	10074	6.6
2562	1	550	41.8	3481	3164	3488	10074	6.6
2563	2	550	40.4	3523	4046	3488	10074	6.6
2564	1	550	41.4	3585	3208	3488	10074	6.6
2565	2	550	40.1	3430	4093	3488	10074	6.6
2566	1	550	37.0	3628	2568	3488	10074	6.6
2567	2	550	39.6	3325	3524	3488	10074	6.6
2568	1	550	37.5	3556	2711	3488	10074	6.6
2569	2	550	35.1	3983	3612	3488	10074	6.6
2570	1	550	36.9	3635	2594	3488	10074	6.6
2571	2	550	36.7	3939	3687	3488	10074	6.9
2572	1	550	71.9	2340	1559	3488	10074	6.9
2573	2	550	71.9	3332	4449	3488	10074	6.9
2574	1	550	70.3	2424	2474	3488	10074	6.9
2575	2	550	71.5	3345	4413	3488	10074	6.9
2576	1	550	69.7	2714	2850	3488	10074	6.9
2577	2	550	69.4	3516	4217	3488	10074	6.9
2578	1	550	71.6	2200	1677	3488	10074	6.9
2579	2	550	77.9	3223	4548	3488	10074	7.2
2580	1	550	75.2	2269	1782	3488	10074	7.2
2581	2	550	73.7	3233	4483	3488	10074	7.2
2582	1	550	73.5	2340	1686	3488	10074	7.2
2583	2	550	72.7	3281	4453	3488	10074	7.2
2584	1	550	69.2	2642	1592	3488	10074	7.2
2585	2	550	71.1	3608	4060	3488	10074	7.2
2586	1	550	70.8	2387	1664	3488	10074	7.2
2587	2	550	69.4	3648	4167	3488	10074	7.2
2588	1	550	70.8	2503	1566	3488	10074	7.2
2589	2	550	70.7	3618	4149	3488	10074	7.4

APPENDIX E

Smart Road Field Evaluation Data
Six-Axle Vehicle

Test #	Dir	Tire Pressure (kPa)	Speed (km/h)	WIM Axle 1	WIM Axle 2	WIM Axle 3	WIM Axle 4	WIM Axle 5	WIM Axle 6	Static Axle 1	Static Axle 2	Static Axle 3	Static Axle 4	Static Axle 5	Static Axle 6	Temp. °C
1	1	725	8	5139	6508	5833	2425	4247	3497	5117	6028	5634	5488	5144	5443	10.8
2	1	725	8	5701	6941	6353	2729	4330	3862	5117	6028	5634	5488	5144	5443	10.9
3	1	725	8	5755	6565	6384	6235	4330	3738	5117	6028	5634	5488	5144	5443	11.1
4	1	725	8	6185	7002	6519	2913	4423	3889	5117	6028	5634	5488	5144	5443	11.8
5	1	725	8	6106	7175	6719	3025	4523	3962	5117	6028	5634	5488	5144	5443	11.9
6	1	725	25	4421	7585	6797	2856	4264	3332	5117	6028	5634	5488	5144	5443	12.5
7	1	725	25	4329	7589	6939	2729	4425	3314	5117	6028	5634	5488	5144	5443	12.5
8	1	725	40	5244	6597	4697	4373	3788	3263	5117	6028	5634	5488	5144	5443	13.1
9	1	725	40	4712	6162	5426	3375	4396	3440	5117	6028	5634	5488	5144	5443	13.4
10	1	725	40	4860	6494	5422	3338	4316	3564	5117	6028	5634	5488	5144	5443	13.4
11	1	725	40	4496	5910	5799	3073	4274	3602	5117	6028	5634	5488	5144	5443	13.6
12	1	725	40	5430	8017	6708	2775	4195	4002	5117	6028	5634	5488	5144	5443	13.6
13	1	725	40	5410	6188	4598	4441	3992	2751	5117	6028	5634	5488	5144	5443	13.9
14	1	725	75	4372	2468	4094	5066	2416	4108	5117	6028	5634	5488	5144	5443	14.4
15	1	725	75	4210	2232	4388	6632	3502	3483	5117	6028	5634	5488	5144	5443	14.9
16	1	650	8	4950	4535	5806	5211	3946	3469	5117	6028	5634	5488	5144	5443	8.0
17	1	650	25	4090	6239	5635	2464	4143	3926	5117	6028	5634	5488	5144	5443	8.1
18	1	650	25	4115	6507	5865	2515	4471	3871	5117	6028	5634	5488	5144	5443	8.1
19	1	650	25	4395	5828	5262	2162	4004	3762	5117	6028	5634	5488	5144	5443	8.2
20	1	650	25	4581	7287	6276	2839	4574	3719	5117	6028	5634	5488	5144	5443	8.3
21	1	650	25	4645	5293	5125	3672	3378	3436	5117	6028	5634	5488	5144	5443	8.3
22	1	650	40	4598	5397	5747	2882	3825	3346	5117	6028	5634	5488	5144	5443	8.4
23	1	650	40	4712	5840	5397	2900	4047	3525	5117	6028	5634	5488	5144	5443	8.6
24	1	650	40	4739	5590	5603	2583	3895	3429	5117	6028	5634	5488	5144	5443	8.6
25	1	650	40	5053	5902	4755	3554	3492	3329	5117	6028	5634	5488	5144	5443	8.8
26	1	650	40	4595	5791	6017	2674	4601	3187	5117	6028	5634	5488	5144	5443	8.8
27	1	650	40	4566	5811	6127	2964	4290	3281	5117	6028	5634	5488	5144	5443	8.8
28	1	650	40	4474	5912	5763	3270	4160	3599	5117	6028	5634	5488	5144	5443	8.9
29	1	650	75	4252	4095	4300	2754	3975	2747	5117	6028	5634	5488	5144	5443	8.9
30	1	650	75	4198	4209	4536	2764	4115	3022	5117	6028	5634	5488	5144	5443	9.1
31	1	650	75	4118	4011	4316	2895	4155	3087	5117	6028	5634	5488	5144	5443	9.1
32	1	650	75	4204	4420	4349	2931	4046	2834	5117	6028	5634	5488	5144	5443	9.1
33	1	650	75	4642	4398	5385	2323	4081	2688	5117	6028	5634	5488	5144	5443	9.3
34	1	650	75	4036	2198	4106	5354	3857	2253	5117	6028	5634	5488	5144	5443	9.3
35	1	650	8	4256	4999	4750	4845	3577	3102	5117	6028	5634	5488	5144	5443	7.8
36	1	650	8	4200	4998	3832	4663	3285	2882	5117	6028	5634	5488	5144	5443	7.8
37	1	650	25	3597	5178	5019	2092	3714	3378	5117	6028	5634	5488	5144	5443	7.8
38	1	650	25	3690	4895	4953	2003	3697	3147	5117	6028	5634	5488	5144	5443	7.7
39	1	650	25	3484	1927	5872	5164	3135	2874	5117	6028	5634	5488	5144	5443	7.7
40	1	650	25	3350	6006	5619	3160	3479	2546	5117	6028	5634	5488	5144	5443	7.6
41	1	650	25	3502	6231	5654	2293	3964	2623	5117	6028	5634	5488	5144	5443	7.6
42	1	650	25	3877	6368	5219	2525	3871	2855	5117	6028	5634	5488	5144	5443	7.6
43	1	650	40	4042	4855	5075	2605	3607	2947	5117	6028	5634	5488	5144	5443	7.6
44	1	650	40	4049	4882	5030	2682	3586	3233	5117	6028	5634	5488	5144	5443	7.6
45	1	650	40	4208	5215	4816	2650	3578	3313	5117	6028	5634	5488	5144	5443	7.6
46	1	650	40	3922	5066	5085	3066	3727	3150	5117	6028	5634	5488	5144	5443	7.6
47	1	650	40	3979	5383	4653	2638	3762	3178	5117	6028	5634	5488	5144	5443	7.6
48	1	650	40	3853	5093	5333	2691	3847	2838	5117	6028	5634	5488	5144	5443	7.6
49	1	650	40	4329	5210	4537	3553	3325	2928	5117	6028	5634	5488	5144	5443	7.7
50	1	650	40	4351	5073	5215	2845	3604	3481	5117	6028	5634	5488	5144	5443	7.7
51	1	650	75	3981	4369	4731	2580	3443	2526	5117	6028	5634	5488	5144	5443	7.6
52	1	650	75	3724	3987	4214	2615	3553	2499	5117	6028	5634	5488	5144	5443	7.6
53	1	650	75	3873	3922	4525	2580	3644	2756	5117	6028	5634	5488	5144	5443	7.6
54	1	650	75	3991	2293	4061	4802	2416	3616	5117	6028	5634	5488	5144	5443	7.8
55	1	650	75	4024	2388	4016	4374	2507	3792	5117	6028	5634	5488	5144	5443	7.8
56	1	550	25	5095	7971	6868	3291	4916	4928	5117	6028	5634	5488	5144	5443	12.7
57	1	550	25	5077	8247	7114	3179	5047	4008	5117	6028	5634	5488	5144	5443	12.9
58	1	550	25	5038	7648	6888	2784	4884	4654	5117	6028	5634	5488	5144	5443	12.9
59	1	550	25	5541	7340	6762	2809	4639	4216	5117	6028	5634	5488	5144	5443	13.2
60	1	550	25	5408	6266	5664	3335	4585	4156	5117	6028	5634	5488	5144	5443	13.4
61	1	550	25	5168	6359	5522	4036	3247	3648	5117	6028	5634	5488	5144	5443	13.4
62	1	550	40	5626	6050	6380	3190	4029	3985	5117	6028	5634	5488	5144	5443	14.1

Test #	Dir	Tire Pressure (kPa)	Speed (km/h)	WIM Axle 1	WIM Axle 2	WIM Axle 3	WIM Axle 4	WIM Axle 5	WIM Axle 6	Static Axle 1	Static Axle 2	Static Axle 3	Static Axle 4	Static Axle 5	Static Axle 6	Temp. °C
63	1	550	40	5407	6152	6295	3421	4349	3846	5117	6028	5634	5488	5144	5443	14.1
64	1	550	40	5337	6236	5829	3015	4181	3759	5117	6028	5634	5488	5144	5443	14.1
65	1	550	40	5030	6008	6587	3010	4889	3381	5117	6028	5634	5488	5144	5443	14.3
66	1	550	40	4961	5952	6903	3167	4732	3480	5117	6028	5634	5488	5144	5443	14.3
67	1	550	40	5029	6061	6871	2972	4917	3333	5117	6028	5634	5488	5144	5443	14.3
68	1	550	40	5723	6494	5448	2631	4137	3506	5117	6028	5634	5488	5144	5443	14.6
69	1	550	40	5364	6203	5491	2754	3868	3563	5117	6028	5634	5488	5144	5443	14.6
70	1	550	40	5664	6519	5487	2750	4029	3430	5117	6028	5634	5488	5144	5443	14.6
71	1	550	75	4837	4116	4282	2931	4220	2997	5117	6028	5634	5488	5144	5443	14.8
72	1	550	75	4670	3861	3964	2960	4064	2827	5117	6028	5634	5488	5144	5443	14.8
73	1	550	75	4486	3831	3528	2835	4037	2874	5117	6028	5634	5488	5144	5443	15.0
74	1	550	75	4628	4185	3912	2956	4482	3113	5117	6028	5634	5488	5144	5443	15.0
75	1	550	75	4446	4047	3808	2791	4311	3008	5117	6028	5634	5488	5144	5443	15.2
76	1	550	75	4547	4614	4178	3142	4116	3142	5117	6028	5634	5488	5144	5443	15.2
77	1	550	75	5423	4130	4275	2546	4086	3260	5117	6028	5634	5488	5144	5443	15.3
78	1	650	8	10066	15212	16106	8556	10467	7767	5262	8192	7766	8056	7466	7267	32.3
79	1	650	8	8053	15816	16052	7625	10744	8577	5262	8192	7766	8056	7466	7267	32.3
80	1	650	8	9911	15791	13887	8846	11465	8347	5262	8192	7766	8056	7466	7267	32.3
81	1	650	25	10062	16187	15217	9208	11845	8801	5262	8192	7766	8056	7466	7267	32.6
82	1	650	25	10418	15610	14706	9774	11111	7565	5262	8192	7766	8056	7466	7267	32.6
83	1	650	25	9622	14520	16968	9284	9583	7068	5262	8192	7766	8056	7466	7267	32.8
84	1	650	40	9390	14288	17022	9828	10044	7436	5262	8192	7766	8056	7466	7267	32.8
85	1	650	40	9434	14676	15769	9034	9640	9085	5262	8192	7766	8056	7466	7267	32.8
86	1	650	40	8950	13400	14389	7104	10730	7514	5262	8192	7766	8056	7466	7267	33.1
87	1	650	75	8951	12141	14893	7701	11052	7492	5262	8192	7766	8056	7466	7267	33.1
88	1	650	75	9481	14063	16370	9140	10382	8178	5262	8192	7766	8056	7466	7267	33.1
89	1	650	75	9779	14506	17107	10106	10263	8432	5262	8192	7766	8056	7466	7267	33.4
90	1	650	8	10468	14807	14628	8182	10032	8570	5262	8192	7766	8056	7466	7267	33.4
91	1	650	8	9634	14333	15033	8327	10378	7919	5262	8192	7766	8056	7466	7267	33.4
92	1	650	8	9609	13867	16080	9088	11885	9694	5262	8192	7766	8056	7466	7267	33.6
93	1	650	25	11315	12987	15454	9905	11387	7579	5262	8192	7766	8056	7466	7267	34.0
94	1	650	25	9845	13274	15421	8589	10936	9125	5262	8192	7766	8056	7466	7267	34.0
95	1	650	40	9982	13591	16704	8816	9808	8741	5262	8192	7766	8056	7466	7267	34.0
96	1	650	40	9611	13583	16154	8366	9876	9198	5262	8192	7766	8056	7466	7267	35.5
97	1	650	40	9017	12745	15086	7834	11072	7857	5262	8192	7766	8056	7466	7267	35.5
98	1	650	75	8418	12159	14306	6752	10488	6776	5262	8192	7766	8056	7466	7267	35.5
99	1	650	75	9227	12410	15626	8479	11379	8152	5262	8192	7766	8056	7466	7267	35.5
100	1	650	75	10036	14672	14906	7937	10825	7288	5262	8192	7766	8056	7466	7267	35.7
101	1	650	8	10033	14788	14530	9259	10504	7703	5262	8192	7766	8056	7466	7267	35.7
102	1	650	8	9626	14325	14869	8415	10345	8145	5262	8192	7766	8056	7466	7267	36.0
103	1	650	25	10369	16109	14912	9692	10755	6803	5262	8192	7766	8056	7466	7267	36.0
104	1	650	25	10301	16295	15373	10389	10751	6711	5262	8192	7766	8056	7466	7267	36.4
105	1	650	25	9676	14190	16022	8553	9342	9016	5262	8192	7766	8056	7466	7267	36.4
106	1	650	40	9324	13212	16829	10103	10792	6962	5262	8192	7766	8056	7466	7267	36.4
107	1	650	40	10194	13097	16581	8836	10032	7901	5262	8192	7766	8056	7466	7267	36.6
108	1	650	40	9815	14222	15908	8349	11354	9227	5262	8192	7766	8056	7466	7267	36.6
109	1	650	75	9256	14331	16657	8316	9964	9376	5262	8192	7766	8056	7466	7267	36.6
110	1	650	75	9647	14399	15900	9223	10938	9130	5262	8192	7766	8056	7466	7267	36.6
111	1	650	8	6412	5726	5706	1521	3370	3051	4581	3765	3538	1579	2087	2041	29.8
112	1	650	8	6895	5843	5542	1723	3312	2856	4581	3765	3538	1579	2087	2041	29.7
113	1	650	40	6472	5088	4790	1578	3306	2457	4581	3765	3538	1579	2087	2041	29.6
114	1	650	40	6439	5062	4922	1733	3197	2468	4581	3765	3538	1579	2087	2041	29.6
115	1	650	75	5582	2212	2925	3690	3167	3040	4581	3765	3538	1579	2087	2041	29.4
116	1	650	75	5850	3562	3418	1247	3441	2742	4581	3765	3538	1579	2087	2041	29.4
117	1	650	25	7808	6051	5385	2033	3954	4184	4581	3765	3538	1579	2087	2041	29.4
118	1	650	25	7643	5814	5597	1803	3887	3763	4581	3765	3538	1579	2087	2041	29.4
119	1	650	75	6628	7129	7589	2673	3116	4839	4581	3765	3538	1579	2087	2041	29.6
120	1	650	75	6693	7296	6939	2224	3190	4860	4581	3765	3538	1579	2087	2041	29.7
121	1	650	75	7107	6853	6324	2271	3364	4293	4581	3765	3538	1579	2087	2041	29.7
122	1	650	8	8743	9413	9165	4131	6086	5073	4990	5724	5425	5688	5280	5389	36.4
123	1	650	8	9155	10565	10297	4906	6508	5375	4990	5724	5425	5688	5280	5389	36.7
124	1	650	75	8170	6312	9296	5201	6823	3672	4990	5724	5425	5688	5280	5389	37.8

Test #	Dir	Tire Pressure (kPa)	Speed (km/h)	WIM Axle 1	WIM Axle 2	WIM Axle 3	WIM Axle 4	WIM Axle 5	WIM Axle 6	Static Axle 1	Static Axle 2	Static Axle 3	Static Axle 4	Static Axle 5	Static Axle 6	Temp. °C
125	1	650	75	8130	6654	11060	4425	5985	3714	4990	5724	5425	5688	5280	5389	37.8
126	1	650	75	8476	6627	7776	5175	6514	4089	4990	5724	5425	5688	5280	5389	37.8
127	1	650	8	8663	10280	9415	3714	6518	5288	4990	5724	5425	5688	5280	5389	38.1
128	1	650	8	8940	9984	8461	3876	6466	5137	4990	5724	5425	5688	5280	5389	38.1
129	1	650	25	7941	11623	10494	3712	6389	5455	4990	5724	5425	5688	5280	5389	38.4
130	1	650	25	7949	10577	9086	3756	6229	5828	4990	5724	5425	5688	5280	5389	38.4
131	1	650	25	8061	11144	9955	3741	6739	5766	4990	5724	5425	5688	5280	5389	38.7
132	1	650	40	8904	10106	8911	4351	7305	5106	4990	5724	5425	5688	5280	5389	38.7
133	1	650	40	9162	9730	8751	4051	7438	5317	4990	5724	5425	5688	5280	5389	38.7
134	1	650	40	9063	10086	8601	4551	6932	5006	4990	5724	5425	5688	5280	5389	39.1
135	1	650	8	8740	10063	8561	3730	6475	5220	4990	5724	5425	5688	5280	5389	39.2
136	1	650	8	9332	10194	8819	3577	6566	5382	4990	5724	5425	5688	5280	5389	39.2
137	1	650	8	9179	10390	8828	3829	6710	5684	4990	5724	5425	5688	5280	5389	39.2
138	1	650	25	8330	12113	11228	3619	7492	6243	4990	5724	5425	5688	5280	5389	39.2
139	1	650	25	8049	10805	10023	3979	6490	5534	4990	5724	5425	5688	5280	5389	39.4
140	1	650	25	7427	9380	8634	3683	6162	5345	4990	5724	5425	5688	5280	5389	39.4
141	1	650	40	8979	10040	9142	4462	7129	4986	4990	5724	5425	5688	5280	5389	39.4
142	1	650	40	8664	9388	8767	4040	6849	4831	4990	5724	5425	5688	5280	5389	39.8
143	1	650	40	8995	9769	9115	4221	7505	4735	4990	5724	5425	5688	5280	5389	39.8
144	1	650	75	7600	7884	12446	3856	6690	3218	4990	5724	5425	5688	5280	5389	39.8
145	1	650	75	7855	5695	8728	5131	7453	3277	4990	5724	5425	5688	5280	5389	39.9
146	2	725	75	4612	4446	7028	558	3808	4341	4990	5724	5425	5688	5280	5389	14.1
147	2	725	75	4979	5753	5866	559	4258	4433	4990	5724	5425	5688	5280	5389	14.4
148	2	725	75	4801	4933	6062	587	4461	4340	4990	5724	5425	5688	5280	5389	14.5
149	2	725	75	4686	5224	6138	577	4279	4399	4990	5724	5425	5688	5280	5389	14.5
150	2	725	75	4893	5024	6860	591	4428	4685	4990	5724	5425	5688	5280	5389	14.7
151	2	725	75	5052	4737	5962	2292	3445	3582	4990	5724	5425	5688	5280	5389	14.7
152	2	725	75	5223	5034	5742	2605	3719	4366	4990	5724	5425	5688	5280	5389	15.0
153	2	650	25	4989	6133	6348	2904	4202	3900	4990	5724	5425	5688	5280	5389	8.1
154	2	650	25	4816	6089	5651	2600	3871	3841	4990	5724	5425	5688	5280	5389	8.2
155	2	650	25	4804	5962	5626	2639	3825	4144	4990	5724	5425	5688	5280	5389	8.3
156	2	650	25	4752	5966	5755	3016	3755	4112	4990	5724	5425	5688	5280	5389	8.3
157	2	650	25	6043	5193	6082	4081	4029	3810	4990	5724	5425	5688	5280	5389	8.3
158	2	650	25	5564	4933	5730	2547	3920	3690	4990	5724	5425	5688	5280	5389	8.4
159	2	650	40	4845	5064	6885	2692	4149	4154	4990	5724	5425	5688	5280	5389	8.4
160	2	650	40	4855	5535	7132	2743	4158	3996	4990	5724	5425	5688	5280	5389	8.9
161	2	650	40	4814	5591	6889	552	4266	4122	4990	5724	5425	5688	5280	5389	8.9
162	2	650	75	4875	5541	6178	3008	3796	5205	4990	5724	5425	5688	5280	5389	9.3
163	2	650	75	4954	5401	6798	3018	4049	4790	4990	5724	5425	5688	5280	5389	9.3
164	2	650	8	3954	5131	6035	2536	3735	3606	4990	5724	5425	5688	5280	5389	7.8
165	2	650	8	3719	5014	5803	2355	3709	3494	4990	5724	5425	5688	5280	5389	7.8
166	2	650	25	4364	4766	5633	2196	3777	3803	4990	5724	5425	5688	5280	5389	7.7
167	2	650	25	4391	4931	5781	2479	3577	3796	4990	5724	5425	5688	5280	5389	7.7
168	2	650	25	3979	5495	5498	2379	3611	3494	4990	5724	5425	5688	5280	5389	7.6
169	2	650	25	4066	5538	5886	2405	3764	3479	4990	5724	5425	5688	5280	5389	7.6
170	2	650	25	4431	4308	3987	5055	3592	3592	4990	5724	5425	5688	5280	5389	7.6
171	2	650	40	4360	4555	6037	2637	3721	4214	4990	5724	5425	5688	5280	5389	7.6
172	2	650	40	4364	4243	6268	2656	3755	4127	4990	5724	5425	5688	5280	5389	7.6
173	2	650	40	4233	4733	6091	2423	3841	3595	4990	5724	5425	5688	5280	5389	7.6
174	2	650	40	4253	4396	7110	2537	3720	4040	4990	5724	5425	5688	5280	5389	7.6
175	2	650	40	4170	4638	6552	2708	3846	4116	4990	5724	5425	5688	5280	5389	7.7
176	2	650	40	4906	4383	6128	2781	3432	3864	4990	5724	5425	5688	5280	5389	7.7
177	2	650	40	4827	4256	6331	2947	3837	3837	4990	5724	5425	5688	5280	5389	7.6
178	2	650	75	4555	4776	5608	2779	3537	4294	4990	5724	5425	5688	5280	5389	7.8
179	2	650	75	4330	4864	6032	2986	3908	4565	4990	5724	5425	5688	5280	5389	7.8
180	2	550	25	6274	6158	6301	3255	4851	4802	4990	5724	5425	5688	5280	5389	13.4
181	2	550	25	6476	5785	6616	3189	4616	4424	4990	5724	5425	5688	5280	5389	13.4
182	2	550	25	6323	6353	6241	3350	4990	4977	4990	5724	5425	5688	5280	5389	13.4
183	2	550	40	6291	5781	7160	3026	4254	4468	4990	5724	5425	5688	5280	5389	14.6
184	2	550	40	6308	5637	7051	3077	4401	4395	4990	5724	5425	5688	5280	5389	14.8
185	2	550	75	5194	5807	7024	579	4399	5097	4990	5724	5425	5688	5280	5389	14.8
186	2	550	75	5268	5205	6559	568	4269	5357	4990	5724	5425	5688	5280	5389	15.3

Test #	Dir	Tire Pressure (kPa)	Speed (km/h)	WIM Axle 1	WIM Axle 2	WIM Axle 3	WIM Axle 4	WIM Axle 5	WIM Axle 6	Static Axle 1	Static Axle 2	Static Axle 3	Static Axle 4	Static Axle 5	Static Axle 6	Temp. °C
187	2	550	75	5735	5772	6758	3064	4848	4511	4990	5724	5425	5688	5280	5389	15.5
188	2	550	75	5576	4437	6617	3118	4360	5146	4990	5724	5425	5688	5280	5389	15.5
189	2	650	8	9544	15789	15135	9182	9838	7270	5262	8192	7766	8056	7466	7267	32.3
190	2	650	8	8115	16372	13608	8173	11212	9270	5262	8192	7766	8056	7466	7267	32.3
191	2	650	8	7761	15272	12741	6589	10215	8569	5262	8192	7766	8056	7466	7267	32.6
192	2	650	25	8191	14392	12922	7153	9907	8556	5262	8192	7766	8056	7466	7267	32.6
193	2	650	25	9035	13900	13082	7187	10393	5088	5262	8192	7766	8056	7466	7267	32.6
194	2	650	25	9568	14782	13002	7641	11296	6490	5262	8192	7766	8056	7466	7267	32.8
195	2	650	40	9405	15965	12483	8465	10170	6968	5262	8192	7766	8056	7466	7267	32.8
196	2	650	40	8209	8680	13906	9415	12254	6036	5262	8192	7766	8056	7466	7267	32.8
197	2	650	40	8811	8926	13482	9349	11916	7505	5262	8192	7766	8056	7466	7267	33.1
198	2	650	75	8503	10266	13069	9727	11723	6547	5262	8192	7766	8056	7466	7267	33.1
199	2	650	75	9122	14219	12521	7219	9217	7546	5262	8192	7766	8056	7466	7267	33.4
200	2	650	75	9500	14495	12731	7893	9253	6236	5262	8192	7766	8056	7466	7267	33.4
201	2	650	8	9547	15555	15176	9661	10382	7618	5262	8192	7766	8056	7466	7267	33.4
202	2	650	8	7912	14321	12763	7489	10301	8620	5262	8192	7766	8056	7466	7267	33.6
203	2	650	25	8065	14875	13523	7571	11209	9100	5262	8192	7766	8056	7466	7267	33.6
204	2	650	25	9042	13811	13058	7238	10529	5439	5262	8192	7766	8056	7466	7267	34.0
205	2	650	25	9362	15849	12817	7821	10234	6191	5262	8192	7766	8056	7466	7267	34.0
206	2	650	40	9209	13972	12738	7321	10671	5535	5262	8192	7766	8056	7466	7267	34.0
207	2	650	40	8446	9362	15249	9751	12363	5993	5262	8192	7766	8056	7466	7267	35.5
208	2	650	40	8434	9143	13104	9367	12813	5767	5262	8192	7766	8056	7466	7267	35.5
209	2	650	75	8233	8184	13867	9601	12769	5690	5262	8192	7766	8056	7466	7267	35.5
210	2	650	75	10021	14556	12472	7902	9393	7472	5262	8192	7766	8056	7466	7267	35.7
211	2	650	75	9579	15300	13101	9044	9276	7085	5262	8192	7766	8056	7466	7267	35.7
212	2	650	8	9175	13627	12654	7701	9260	7101	5262	8192	7766	8056	7466	7267	35.7
213	2	650	8	8065	16051	12711	7407	10086	9013	5262	8192	7766	8056	7466	7267	36.0
214	2	650	8	8039	13816	13224	7263	10022	8389	5262	8192	7766	8056	7466	7267	36.0
215	2	650	25	8504	12496	12962	7051	9544	7484	5262	8192	7766	8056	7466	7267	36.0
216	2	650	25	9195	13911	12194	6831	10443	5788	5262	8192	7766	8056	7466	7267	36.4
217	2	650	25	9911	15610	12047	8370	11023	6428	5262	8192	7766	8056	7466	7267	36.4
218	2	650	40	9207	15090	13232	7349	10234	5884	5262	8192	7766	8056	7466	7267	36.4
219	2	650	40	8805	8875	14665	9952	12623	6852	5262	8192	7766	8056	7466	7267	36.6
220	2	650	40	8757	9702	14059	9905	12752	5727	5262	8192	7766	8056	7466	7267	36.6
221	2	650	25	7001	5995	5623	1862	3837	3836	4581	3765	3538	1579	2087	2041	29.6
222	2	650	25	7203	5946	5493	1745	3687	3719	4581	3765	3538	1579	2087	2041	29.6
223	2	650	25	7317	5702	5687	1595	3572	3418	4581	3765	3538	1579	2087	2041	29.6
224	2	650	40	6802	5962	5416	1702	3198	3441	4581	3765	3538	1579	2087	2041	29.6
225	2	650	40	6712	5468	5630	1857	2777	3793	4581	3765	3538	1579	2087	2041	29.6
226	2	650	40	6748	5884	5612	1590	3197	3070	4581	3765	3538	1579	2087	2041	29.6
227	2	650	75	6207	5750	5922	1636	3054	3795	4581	3765	3538	1579	2087	2041	29.4
228	2	650	75	5623	7015	7597	1796	2819	4258	4581	3765	3538	1579	2087	2041	29.4
229	2	650	75	6160	6108	6768	1480	2812	4639	4581	3765	3538	1579	2087	2041	29.4
230	2	650	25	7358	5415	5745	1582	3539	3210	4581	3765	3538	1579	2087	2041	29.4
231	2	650	25	7516	6115	5746	1909	3935	3581	4581	3765	3538	1579	2087	2041	29.4
232	2	650	25	7448	6108	5618	1789	3804	3439	4581	3765	3538	1579	2087	2041	29.4
233	2	650	40	7180	6041	5628	1680	3350	3310	4581	3765	3538	1579	2087	2041	29.4
234	2	650	40	7302	5857	5895	1820	3595	3414	4581	3765	3538	1579	2087	2041	29.4
235	2	650	75	6603	3095	4838	1335	4047	3143	4581	3765	3538	1579	2087	2041	29.6
236	2	650	75	6609	3227	4316	1225	3734	3096	4581	3765	3538	1579	2087	2041	29.7
237	2	650	8	8694	11594	11682	5543	6696	6011	4990	5724	5425	5688	5280	5389	36.7
238	2	650	8	8849	11671	11543	5590	6861	5829	4990	5724	5425	5688	5280	5389	36.7
239	2	650	25	9755	11596	11415	5820	7812	6373	4990	5724	5425	5688	5280	5389	37.1
240	2	650	25	9804	10787	10966	5812	7699	6331	4990	5724	5425	5688	5280	5389	37.1
241	2	650	25	9919	11438	11540	5586	7463	6541	4990	5724	5425	5688	5280	5389	37.3
242	2	650	40	9869	11347	11317	5713	7174	6272	4990	5724	5425	5688	5280	5389	37.3
243	2	650	40	9328	9917	13090	5546	7687	6610	4990	5724	5425	5688	5280	5389	37.3
244	2	650	40	9328	9742	12844	5543	8070	6970	4990	5724	5425	5688	5280	5389	37.8
245	2	650	75	9517	10013	11159	5062	6773	7189	4990	5724	5425	5688	5280	5389	37.8
246	2	650	75	9197	9388	11600	4385	7082	6516	4990	5724	5425	5688	5280	5389	37.8
247	2	650	75	9372	9129	11817	4616	7008	6501	4990	5724	5425	5688	5280	5389	37.8
248	2	650	40	9723	10209	13069	5426	8342	6559	4990	5724	5425	5688	5280	5389	38.7

Test #	Dir	Tire Pressure (kPa)	Speed (km/h)	WIM Axle 1	WIM Axle 2	WIM Axle 3	WIM Axle 4	WIM Axle 5	WIM Axle 6	Static Axle 1	Static Axle 2	Static Axle 3	Static Axle 4	Static Axle 5	Static Axle 6	Temp. °C
249	2	650	40	9525	9943	13029	4940	7467	6168	4990	5724	5425	5688	5280	5389	39.1
250	2	650	40	9273	10417	11983	5164	7202	5933	4990	5724	5425	5688	5280	5389	39.1
251	2	650	75	9451	9863	11001	4530	6872	6242	4990	5724	5425	5688	5280	5389	39.1
252	2	650	75	9240	10057	10799	5189	6603	6206	4990	5724	5425	5688	5280	5389	39.1
253	2	650	75	9992	9077	10537	4682	6953	5854	4990	5724	5425	5688	5280	5389	39.2
254	2	650	40	9671	10607	12610	5362	7753	6116	4990	5724	5425	5688	5280	5389	39.4
255	2	650	40	9550	10410	12715	5788	8269	6303	4990	5724	5425	5688	5280	5389	39.8
256	2	650	40	9751	10251	12843	5381	8144	6581	4990	5724	5425	5688	5280	5389	39.8
257	2	650	75	9543	10066	11674	5333	7099	6832	4990	5724	5425	5688	5280	5389	39.8
258	2	650	75	9188	9491	11493	4355	6799	6622	4990	5724	5425	5688	5280	5389	39.9
259	2	650	75	9264	9825	11113	5429	7002	6090	4990	5724	5425	5688	5280	5389	39.9

VITA

Kevin Marc Siegel was born in Falls Church, Virginia to Kenneth and Maryann Siegel in December 1977. His family moved to Sterling Park, Virginia in 1978. In 1996, Kevin graduated from Park View High School in Sterling with an Advanced Studies Diploma and went on to pursue his Bachelor of Science in Civil Engineering at Virginia Polytechnic Institute and State University (Virginia Tech). While completing his Bachelor's degree, Kevin completed a cooperative education placement with the Federal Highway Administration in the Eastern Federal Lands Highway Division.

After receiving his Bachelor's Degree in May 2001, Kevin continued on with his education to pursue his Master of Science in Civil Engineering through the Transportation Infrastructure and Systems Engineering Program. Kevin was married to Miss Kelly Lynn Kurek in June of 2002. After graduating with his Master's Degree in December 2002, Kevin will begin working for *Mattern & Craig Consulting Engineers & Surveryors* in Roanoke, Virginia.