



# COMMONWEALTH of VIRGINIA

## DEPARTMENT OF TRANSPORTATION

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Commissioner

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December 17, 2020

The Honorable Ralph Northam  
Members of the General Assembly  
Members of the Commonwealth Transportation Board

Dear Ladies and Gentlemen:

Chapters 401 and 568 of the 2019 Virginia Acts of Assembly direct the Commissioner of Highways to report annually to the Governor, the General Assembly and the Commonwealth Transportation Board certain data regarding the implications in the Commonwealth of overweight trucks on the frequency and severity of crashes, maintenance and infrastructure needs, and vehicle miles traveled. Specifically, at a minimum, the report shall include:

- Data regarding the frequency and severity of incidents and crashes involving overweight trucks compared to other trucks,
- Maintenance and infrastructure needs of routes frequently used by overweight trucks and the comparison of needs to similar routes not frequented by such trucks, and
- Estimated number of additional vehicle miles that would be necessary if such vehicles were not permitted to carry overweight loads.

The attached report is an update of the 2019 report and represents the second and final report produced in response to the legislation. Please contact Catherine McGhee at (434) 293-1973 if you have any questions.

Sincerely,

A handwritten signature in blue ink that reads "Stephen C. Brich".

Stephen C. Brich, P.E.  
Commissioner of Highways

## **Legislative Response**

### **Chapters 401 and 568 of the 2019 Acts of Assembly (HB 2800 and SB 1775)**

#### **EXECUTIVE SUMMARY**

Chapters 401 and 568 of the 2019 Virginia Acts of Assembly direct the Commissioner of Highways to report annually to the Governor, the General Assembly and the Commonwealth Transportation Board certain data regarding the implications of overweight trucks on the frequency and severity of crashes, maintenance and infrastructure needs, and vehicle miles traveled. Specifically, at a minimum, the report shall include:

1. Data regarding the frequency and severity of incidents and crashes involving overweight trucks compared to other trucks,
2. Maintenance and infrastructure needs of routes frequently used by overweight trucks and the comparison of needs to similar routes not frequented by such trucks, and
3. Estimated number of additional vehicle miles that would be necessary if such vehicles were not permitted to carry overweight loads.

In submitting the report, the Commissioner shall indicate if additional data is needed to provide further reports and, if so, include a proposal for additional data collection. The Acts do not require the Commissioner to prospectively gather additional data not already being collected by any transportation agency. This report is an update of the 2019 report and represents the second and final report produced in response to Chapters 401 and 568.

In response to this legislation, multiple meetings were held with representatives of several VDOT Divisions, the Virginia Department of Motor Vehicles, the Virginia Port Authority, the Virginia Department of Rail and Public Transportation, and the Virginia State Police. By way of these meetings, both the data necessary to address the three questions posed in the legislation and the availability of those data were examined.

#### **Frequency and Severity of Incidents Involving Overweight Trucks**

Based on the information that is currently collected by DMV and VSP, it is not possible to directly measure either the frequency or severity of incidents (crashes) involving overweight trucks. In order to compare the frequency and severity of incidents and crashes involving overweight trucks and trucks weighing no more than 80,000 pounds, specific data on the weights of all trucks involved in crashes and incidents needs to be accurately recorded. Amended methods for properly determining and recording weights of trucks involved in crashes could potentially be instituted.

#### **Maintenance and Infrastructure Needs for Overweight Truck Routes**

It is difficult to infer roadway and bridge maintenance requirements associated with the use of overweight trucks, as there is currently insufficient data on the number and weight of trucks using most roadways. Accurate truck weights and counts by weight for specific routes are needed to perform a comparison of infrastructure maintenance needs for routes carrying higher numbers of heavy vehicles versus those that are carrying fewer such vehicles. Additional weight and truck

count data derived from additional weigh-in-motion (WIM) sites would increase the collection of the information needed to better determine the correlation between maintenance needs and truck weight.

### **Additional Vehicle Miles of Truck Travel That Would Result without Overweight Trucks**

No single data set or combination of data that was identified as being collected by DMV, VPA, DRPT, VSP, or VDOT or discussed among the study members was found to be sufficient in estimating the number of additional vehicle miles that would be necessary to offset the elimination of overweight vehicles currently allowed on Virginia's roadways. Estimating the additional vehicle miles that would be necessary without overweight loads is likely the most difficult of the three questions addressed in this study. This is due primarily because most, if not all of the data required to make these estimations would require cooperation of industry.

### **Conclusions**

After thorough examination of the available data, it was determined that insufficient data currently exists to:

- compare the frequency and severity of crashes involving overweight trucks compared to other trucks,
- compare the maintenance needs of routes frequently used by overweight trucks as compared to routes not frequented by such trucks,
- estimate the number of additional vehicle miles that would be necessary if such vehicles were not permitted to carry overweight loads.

However, below are several options identified through this study that would serve to provide or potentially improve the availability of pertinent data:

- Existing WIM data and single trip hauling permit information could be used to make some very limited assumptions about the impacts of overweight trucks on crashes, maintenance, and vehicle miles traveled. To begin, a single corridor could be identified with sufficient length to capture maintenance and crash impacts, likely 25-50 miles.
- The modification of the Commonwealth of Virginia – Department of Motor Vehicles Police Crash Report form and the increased deployment of DMV's mobile scales would allow for increased collection of the weights of trucks involved in some crashes.
- Additional WIM data could be collected by way of some combination of additional portable and permanent sites. Input from a variety of stakeholders would be needed to determine where these additional sites should be located.

If deemed appropriate, the following actions could be taken to provide limited input to the questions raised by Chapters 401 and 568 of the 2019 Virginia Acts of Assembly:

- Identify a roadway segment believed to have trucks operating above the current legal limit by blanket permit, exemption, or single trip permit that is of sufficient length to capture both maintenance and safety impacts, likely 25-50 miles.
- Install WIM stations at every interchange and in every lane to capture the weight characteristics of the traffic stream.

- Include license plate capture capability that is linked to the WIM system to allow weights to be associated with specific vehicles.
- Maintain database of weight/license plate data for a minimum of 48-hours for post-crash identification.
- Collect additional pavement condition data within the roadway segment. If the number of overweight vehicles varies over the length of the segment, some limited information on the impact of those vehicles on maintenance needs could be estimated. If the number of overweight vehicles is consistent across the segment, a second roadway segment or distinct roadway with different fleet composition will be required to estimate maintenance impacts.

Two additional activities could also help to inform this effort.

- A Freight Advisory Committee continues to be under development. The committee, comprising representatives of government agencies and industry, could be engaged to provide feedback on other data collection opportunities.
- Virginia's Department of Motor Vehicles continues in its efforts to procure a new online overdimensional truck permitting system. That system could provide additional data on specific routes and weights.

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## INTRODUCTION

### Original Legislation

This report is in response to Chapters 401 and 568 of the 2019 Virginia Acts of Assembly, which direct the Commissioner of Highways to report annually to the Governor, the General Assembly, and the Commonwealth Transportation Board certain data regarding the implications of overweight trucks on the frequency and severity of crashes, maintenance and infrastructure needs, and vehicle miles traveled. Specifically, Chapters 401 and 568 provide:

*Be it enacted by the General Assembly of Virginia:*

*1. § 1. The Commissioner of Highways shall report annually by December 1 to the Governor, the General Assembly, and the Commonwealth Transportation Board regarding the operation of overweight vehicles on highways of the Commonwealth. The report shall include, at a minimum, (i) data regarding the frequency and severity of incidents and crashes involving overweight trucks compared to other trucks, (ii) the maintenance and infrastructure needs of routes frequently used by overweight trucks and comparison of such needs to similar routes not frequented by such trucks, and (iii) the estimated number of additional vehicle miles that would be necessary if such vehicles were not permitted to carry overweight loads. In submitting the report, the Commissioner shall indicate if additional data is needed to provide further reports, and if so, include a proposal for additional data collection. Nothing herein shall be construed to require the Commissioner to prospectively gather additional data not already collected by the Commissioner or any transportation agency.*

2. That the provisions of this act shall expire on January 1, 2021.

### Summary of Chapters 553 and 554 of the 2018 Acts of Assembly Legislative Report

Chapters 553 (HB 1276) and 554 (SB 504) of the 2018 Acts of Assembly directed the Virginia Department of Transportation (VDOT) to convene a work group to identify the implications of the Commonwealth's participation in a hypothetical federal data collection pilot program or project involving six-axle tractor truck semitrailer combinations weighing up to 91,000 pounds and utilizing interstate highways. In response to that legislation, stakeholders were identified and three stakeholder meetings were held. Extensive literature was reviewed on the topic of increased weight limits on safety, mobility, infrastructure, mode shift, and enforcement/compliance. Although there were insufficient data available to fully quantify the impacts of 91,000-pound, six-axle vehicles, potential impacts were identified in *Senate Document No.3, Report of the Virginia Department of Transportation: Impact of Virginia Participation in a Federal Pilot Study of 91,000-Pound, Six-Axle Vehicles Utilizing the Interstate (Chapter 554, 2018)* (Commonwealth of Virginia, 2019) (the 2018 Report) and are summarized below.

The introduction of the heavier pilot vehicles was said to pose a potential increase in the number of crashes and/or crash severity in comparison to the 80,000-pound vehicles currently operating on interstate highways. Other studies referenced found increased crash rates associated with such increases in size and weight, but the studies recognized that it was not possible to draw national

conclusions due to a lack of relevant crash data associated with such vehicles. Additionally, a possible increase in the number of safety violations, particularly regarding brakes on heavier vehicles, is a concern highlighted in earlier research.

The 2018 Report highlighted the concern that the heavier pilot vehicles would further degrade the speed of the overall traffic stream on interstates, particularly on steep grades; pilot vehicles may operate at slower speeds than the current 80,000-pound vehicles, further reducing the speed of traffic. Additionally, the heavier pilot vehicles may be less capable than the 80,000-pound vehicles to accelerate at entrance ramps, degrading the flow of traffic within the vicinity of ramps. Operations off the interstate were also a point of concern.

It was determined that the impact on pavement condition of a 91,000-pound, 6-axle truck will depend on the axle spacing and configuration of the vehicle. Some configurations could result in decreased per-axle loads that would result in little to no impact while other configurations could have more significant negative impacts. Shortening the service life of routes included in a pilot could potentially increase maintenance costs substantially.

With respect to the impact of heavier loads on bridges, because a specific vehicle configuration was not included in the proposed pilot, it was not possible to evaluate each structure and determine its capacity to safely carry a specified load through a process referred to as “load rating.” Additionally, long-term deterioration was also identified as a concern. Most size and weight studies in the literature reviewed anticipate an increase in deterioration rates for structures when subjected to increased frequency of heavier loads, leading to increased maintenance and replacement costs.

The 2018 Report concluded that there was insufficient data available to fully quantify the impacts of 91,000-pound, 6-axle combination vehicles on safety, operations, infrastructure condition, mode shift, or compliance and enforcement on Virginia’s transportation system. A properly designed pilot focused on data collection could address these issues and provide an opportunity for meaningful evaluation of impacts attributable to the 91,000-pound, 6- axle vehicles. The report noted that potential implications of participation in a pilot that should be considered include the following:

- Any meaningful pilot would have to be of sufficient duration to allow for adequate data collection as well as for some return on investment by carriers that upgrade their equipment.
- Safety must remain a primary consideration. Increases in crash rates among the heavier trucks could occur and, although a measureable decrease in safety would be a trigger for discontinuation of the pilot, any injuries or loss of life resulting from the pilot would be unacceptable.
- Enforcement of differing weight limits for participating and non-participating vehicles would place an additional burden on enforcement personnel.

The 2018 Report also noted that there are uncertainties regarding the design and implementation of a federal pilot that make it difficult to evaluate potential pilot risks and benefits. Concerns about infrastructure damage, safety, and operational impacts resulting from these heavier loads remained a primary consideration. Accordingly, it was recommended that Virginia refrain from committing

to a pilot at the time of the study. It was stated that if a federal pilot program is authorized, VDOT would review the parameters of the pilot and evaluate potential participation.

## **PURPOSE AND SCOPE**

This study has been conducted in response to Chapters 401 and 568 of the 2019 Virginia General Assembly (HB 2800 and SB 1775, respectively). The Chapters require the Commissioner of Highways to report annually to the Governor, the General Assembly and the Commonwealth Transportation Board by December 1, 2019 and 2020 information regarding overweight trucks, including the frequency and severity of crashes of these trucks as compared to non-overweight trucks; the maintenance and infrastructure needs of routes commonly used by these trucks as compared to the needs of routes not commonly used by overweight trucks; and the increase in the number of vehicle miles that would be necessary if these trucks were not permitted to carry overweight loads. Further, based on the data determined to be available, the study attempts to identify what additional data is needed to adequately address each of these questions and as well as a proposed method for data collection.

## **APPROACH**

The majority of the research conducted in response to the legislation was conducted as part of the development of the first (2019) annual report and is described in Tasks 1 – 5 below. The work undertaken to update the report for this second (2020) annual report is outlined in Tasks 6 and 7.

### **Task 1: Meetings with Potential Data Providers**

Representatives from VDOT's Government and Legislative Affairs Division and Research Council identified divisions of the agency and other transportation related agencies that would potentially be responsible for collection and/or maintenance of data sets that would address any of the three areas specified in Chapters 401 and 568. Those requested to participate in the study included representatives from VDOT's Structure and Bridge, Maintenance, Traffic Engineering, and Transportation Planning and Mobility Divisions as well as representatives from the Virginia Department of Motor Vehicles (DMV), the Virginia Port Authority (VPA), the Virginia Department of Rail and Public Transportation (DRPT), and the Virginia State Police (VSP). For the first annual (2019) report three meetings were held over the span of 11 weeks from May through July. The purpose of the first meeting was to discuss the data that would be needed to address the legislative request and ascertain what potentially relevant data each entity collected. The purpose of the second meeting was to examine and further discuss the relevant data currently collected by each entity and to request additional data if necessary. The third meeting was used to discuss the additional data provided following the second meeting and review a proposed outline and content for the document that would serve as the final deliverable for the study.

### **Task 2: Data Evaluation**

Between the meetings of the larger study group, which included both VDOT and the non-VDOT transportation agencies noted previously, data provided by the participating agencies was further



assessed by members of the internal VDOT working group and, when necessary, additional information or clarification was requested.

### **Task 3: Identification of Additional Data Needed**

As stated in Task 1, the data required to answer each of the three questions put forth in the legislation was discussed among the members of the larger study group, but was also based in part on earlier work done in the process of completing the study required as a result of Chapters 553 (HB 1276) and 554 (SB 504) (Commonwealth of Virginia, 2019). Once all related data known to be available was gathered and evaluated, it was compared against the data that would be needed to address each of the three elements set forth in the legislation.

### **Task 4: Methods for Obtaining Additional Data Needed**

Approaches for collecting any additional data needed to adequately address the three questions were primarily taken from *Senate Document No.3, Report of the Virginia Department of Transportation: Impact of Virginia Participation in a Federal Pilot Study of 91,000-Pound, Six-Axle Vehicles Utilizing the Interstate (Chapter 554, 2018)* (Commonwealth of Virginia, 2019). That study identified the data required to assess the impacts an overweight pilot program on Virginia's roadway infrastructure and described methods for obtaining the data necessary to determine these impacts.

### **Task 5: 2019 Report Development**

A final report for 2019 was developed highlighting the intent of the research effort, a description of the data available, additional data needed to adequately address the implications of overweight trucks on safety, infrastructure, and vehicle miles traveled.

### **Task 6: Request for New and Updated Data**

Each of the VDOT divisions, as well as DMV, VPA, DRPT, and VSP were contacted in June and July of 2020 to determine if new or additional data was available that would be applicable to the questions posed in the original legislation, and if so, they were asked to make this data available for analysis and inclusion in the 2020 report. Following this request and receipt of data, a separate meeting was held with DMV representatives to discuss the potential relevance of a dataset that was not included in the 2019 report.

### **Task 7: New Data Evaluation and Incorporation**

The 2020 responses and new or updated data provided by VDOT divisions and other agencies were reviewed and assessed by the internal VDOT working group. Modifications to the 2019 report consisted of only those changes or data updates that were deemed relevant based on the original Purpose and Scope of the study.

## FINDINGS AND DISCUSSION

The following sections summarize the types of data that were obtained from various transportation related entities in both 2019 and 2020. The adequacy of these data to address the requests included in Chapters 401 and 568, a description of additional data that would be necessary, and a proposed method for obtaining those data are also discussed.

### Relevant Data Available through Virginia Transportation Agencies

#### Department of Motor Vehicles

It was determined that the Department of Motor Vehicles collects extensive data on truck weights and axle spacing. Information is collected at its 16 weigh-in motion (WIM) sites, at stationary scales, and by way of its permitting process. DMV also has the capability to deploy portable WIM technology at a location temporarily upon request. DMV provided the bulk of the data that was obtained for the study, including the following:

- Hauling permit statistics for calendar years 2016 – July 2020
  - Number of issued permits
  - Listing of exempt commodities<sup>a</sup>
  - Miles traveled (for Single-Trip Permits only)<sup>b</sup>
    - <sup>a</sup> – Twelve exempt commodities are reducible, but are allowed to travel without being reduced; are exempt to normal weight limits; vary by code; are limited to containerized cargo and fluid milk on interstates
    - <sup>b</sup> – DMV issues Single Trip and Blanket permits. Single Trip permits are valid for one move between a set origin and destination. Blanket permits cover multiple moves over a specified period of time.
- Total vehicle counts collected at WIM sites for vehicles in Classes 9-13<sup>c,d</sup> for calendar years 2017-July 2020
  - WIM counts by location
    - <sup>c</sup> – Based on the Federal Highway Administration’s vehicle classification definitions (FHWA, 2014)
    - <sup>d</sup> – 2019 report incorrectly labelled vehicle counts for Classes 9-15. The data provided was actually for Classes 9-13.
- Number of overweight citations issued for calendar years 2017 – July 2020
- Commercial Motor Vehicle (CMV) truck crashes by crash type

Each of these data sets is described below. It should be noted that the years for which the data was provided (in most cases, 2016 to present) do not represent the extent of the data available from DMV, but simply served as an example of the data currently captured and maintained. Data for years prior to 2016 are also available.

#### *Hauling Permits*

A hauling permit allows an overweight and/or overdimensional load to operate on Virginia’s highway system. The number of hauling permits issued since 2016 is shown in Table 1. It should

be noted that three types of permits are included in tabulating the total number of hauling permits issued on an annual basis: (1) blanket permits which allow the permitted vehicle to make multiple trips over a specified period of time; (2) single trip permits allowing one move between a predetermined origin and destination, and (3) exempt permits (as previously described in footnote <sup>a</sup>) that are issued to specific commodities. Vehicles traveling on blanket permits or exempt permits can make unlimited trips on any allowed route. Therefore, it is difficult to accurately ascertain routes traveled.

**Table 1. Department of Motor Vehicle Hauling Permit Statistics: Issued Permits**

Calendar Year	Blankets	Exempt	Single Trip	Total	Exceeding 80k lbs
2016	10,247	8,648	68,643	87,538	30,600
2017	10,852	8,833	68,342	88,027	32,289
2018	11,765	9,863	70,515	92,143	34,831
2019	12,838	9,537	67,029	89,404	33,578
2020 (through 7/31)	7,443	5,473	32,833	45,749	16,279

The miles traveled information is shown in Table 2 and is based exclusively on the origin and destination information required for a single trip permit. Based on this information and that provided in Table 1, the approximately 70,000 single trip permits issued each year account for roughly 12,000,000 miles traveled on Virginia roadways. It should be noted that these permits could be for over-weight or overdimensional loads.

**Table 2. Department of Motor Vehicle Hauling Permit Statistics: Miles Traveled**

Calendar Year	Blankets	Exempt	Single Trip	Total
2016	n/a	n/a	12,188,033	12,188,033
2017	n/a	n/a	12,005,870	12,005,870
2018	n/a	n/a	12,346,821	12,346,821
2019	n/a	n/a	11,603,383	11,603,383
2020 (through 7/31)	n/a	n/a	5,620,354	5,620,354

### *WIM Counts*

The WIM data provided shows the total number of vehicles falling in one of five vehicle category classifications (Classes 9-13) based on the Federal Highway Administration’s 13-category rule set and further subdivided by 10,000 pound gross vehicle weight ranges from 80,000 to over 120,000 pounds. Class 9 represents five-axle, single trailer trucks. Class 10 represents six or more axle, single trailer trucks. The counts for each weight category and each vehicle class for the years 2017, 2018, 2019 and the first seven months of 2020 are shown in Table 3.

In addition to the total counts, DMV provided example data sets showing WIM counts for each of the 16 locations, which provides information on both the route and direction of travel for the vehicles being weighed. As part of the search for additional data for the 2020 report, DMV

provided the working group with monthly count data for a 30-month period for the Stephens City I-81 northbound and southbound WIM sites, as provided by International Road Dynamics, Inc. Though there were a number of apparent errors in some of the counts for certain months, overall, this data set is potentially useful.

### *Overweight Citations*

The total number of gross weight overweight citations (i.e., this total does not include overweight citations based on axle weight) issued at all of the DMV weigh stations are shown in Table 4. These are broken down by weight ranges from less than 80,000 pounds to more than 120,000 pounds in 10,000-pound increments. Data for calendar years 2017, 2018, 2019, and the first seven months of 2020 were provided and are shown in the table. It should be noted that trucks under the legal limit of 80,000 pounds can be cited for an overweight violation if the load puts too much weight on any single axle.

### *CMV Truck Crashes by Type*

DMV provided total crash data for trucks for the calendar years 2016-2019 and through October of 2020. This data was further separated into trucks with gross vehicle weight rating of 55,000 pounds or less and those greater than 55,000 pounds (see Table 5), based on vehicle identification number. The weight rating of 55,000 pounds is used by DMV as the classification breakpoint because the weights are taken from VIN information and the threshold some of the vehicle manufacturers use when assigning weight values included in the VIN. If a higher weight classification was used (i.e., 80,000 pounds), not all truck manufacturers would be captured. Included in the data are the number of crashes resulting in fatalities, injuries, or property damage. Both statewide totals and totals by county were provided. This information was taken from the Traffic Records Electronic Data System; it is based solely on the weight rating of the truck (the highest load the vehicle can carry or pull) and does not indicate the presence, absence, or weight of the cargo the truck was carrying at the time of the crash.

**Table 3. Trucks Entering Department of Motor Vehicles Weigh-In-Motion Sites by Class and Weight.**  
**Classification is based on the Federal Highway Administration's 13-Category Rule Set.**

<b>Calendar Year</b>	<b>Weight Range</b>	<b>Class 9</b>	<b>Class 10</b>	<b>Class 11</b>	<b>Class 12</b>	<b>Class 13</b>	<b>Total</b>
<b>2017</b> (01/01/17 - 12/31/17)	80000 - 90000	683,349	10,101	15,643	8,027	3,689	720,809 <sup>e</sup>
	90001 - 100000	86,827	4,256	1,063	909	2,360	95,415 <sup>e</sup>
	100001 - 110000	7,602	1,635	48	112	2,607	12,004 <sup>e</sup>
	110001 - 120000	973	469	3	20	2,361	3,826 <sup>e</sup>
	120000 +	103	160	7	49	5,107	5,426 <sup>e</sup>
	<b>CY 2017 TOTAL:</b>	<b>778,854</b>	<b>16,621</b>	<b>16,764</b>	<b>9,117</b>	<b>16,124</b>	<b>837,480</b>
<b>2018</b> (01/01/18 - 12/31/18)	80000 - 90000	893,570	8,447	20,970	10,138	3,206	936,331 <sup>e</sup>
	90001 - 100000	49,916	3,608	863	664	2,470	57,521 <sup>e</sup>
	100001 - 110000	1,560	1,581	18	29	2,587	5,775 <sup>e</sup>
	110001 - 120000	46	515	0	1	2,526	3,088 <sup>e</sup>
	120000 +	10	166	0	1	5,314	5,491 <sup>e</sup>
	<b>CY 2018 TOTAL:</b>	<b>945,102</b>	<b>14,317</b>	<b>21,851</b>	<b>10,833</b>	<b>16,103</b>	<b>1,008,206</b>
<b>2019</b> (01/01/19 - 12/31/19)	80000 - 90000	952,969	9,556	19,991	14,174	2,425	999,115
	90001 - 100000	107,141	4,532	1,022	907	2,012	115,614
	100001 - 110000	4,725	1,615	350	226	1,955	8,871
	110001 - 120000	2,975	522	592	429	2,087	6,605
	120000 +	17,480	275	1,868	644	4,878	25,145
	<b>CY 2019 TOTAL:</b>	<b>1,085,290</b>	<b>16,500</b>	<b>23,823</b>	<b>16,380</b>	<b>13,357</b>	<b>1,155,350</b>
<b>2020 - Partial Year</b> (01/01/20 - 07/31/20)	80000 - 90000	685,993	6,533	11,212	8,796	1,565	714,099
	90001 - 100000	33,590	2,909	263	327	1,566	38,655
	100001 - 110000	1,651	1,015	2	5	1,121	3,794
	110001 - 120000	66	240	0	0	1,116	1,422
	120000 +	14	70	0	0	2,362	2,446
	<b>Partial CY 2020 TOTAL:</b>	<b>721,314</b>	<b>10,767</b>	<b>11,477</b>	<b>9,128</b>	<b>7,730</b>	<b>760,416</b>

<sup>e</sup> – 2019 report incorrectly included values attributed to Class 14 and Class 15 in totals

**Table 4. Overweight Citations (Based on Gross Weight) Issued by Weight Range**

<b>Calendar Year</b>	<b>Weight Range</b>	<b>Number of Overweight Citations Issued</b>
<b>2017</b>	1-79999	1,332
(01/01/17 - 12/31/17)	80000 - 90000	5,895
	90001 - 100000	46
	100001 - 110000	17
	110001 - 120000	7
	120000 +	22
	<b>CY 2017 TOTAL:</b>	<b>7,319</b>
<b>2018</b>	1-79999	992
(01/01/18 - 12/31/18)	80000 - 90000	6,277
	90001 - 100000	71
	100001 - 110000	9
	110001 - 120000	7
	120000 +	14
	<b>CY 2018 TOTAL:</b>	<b>7,370</b>
<b>2019</b>	1-79999	1,032
(01/01/19 - 12/31/19)	80000 - 90000	5,534
	90001 - 100000	58
	100001 - 110000	15
	110001 - 120000	8
	120000 +	18
	<b>CY 2019 TOTAL:</b>	<b>6,665</b>
<b>2020-Partial Year</b>	1-79999	329
(01/01/20 - 07/31/20)	80000-90000	1,950
	90001-100000	31
	100001-110000	4
	110001-120000	2
	120000 +	6
	<b>Partial CY 2020 TOTAL:</b>	<b>2,322</b>

**Table 5. Commercial Motor Vehicle (CMV) Crashes by Type: Total, Over and Under 55,000 lbs**

<b>CMV Truck Crashes by Crash Type</b>				
<b>Year</b>	<b>Crashes</b>			
	<b>Fatal Crashes</b>	<b>Injury Crashes</b>	<b>Property Damage Crashes</b>	<b>Total</b>
2016	80	1,831	2,905	4,816
2017	91	1,728	2,959	4,778
2018	95	1,897	3,357	5,349
2019	97	2,035	2,790	4,922
2020 <sup>f</sup>	78	1,356	2,577	4,011
<b>Crashes Involving CMV Trucks with a Weight Rating of 55,001 lbs or More</b>				
<b>Year</b>	<b>Crashes</b>			
	<b>Fatal Crashes</b>	<b>Injury Crashes</b>	<b>Property Damage Crashes</b>	<b>Total</b>
2016	3	77	115	195
2017	2	88	113	203
2018	3	105	152	260
2019	9	95	178	282
2020 <sup>f</sup>	1	58	125	184
<b>Crashes Involving CMV Trucks with a Weight Rating of 55,000 lbs or Less</b>				
<b>Year</b>	<b>Crashes</b>			
	<b>Fatal Crashes</b>	<b>Injury Crashes</b>	<b>Property Damage Crashes</b>	<b>Total</b>
2016	77	1,754	2,790	4,621
2017	89	1,640	2,846	4,575
2018	92	1,792	3,205	5,089
2019	88	1,940	2,612	4,640
2020 <sup>f</sup>	77	1,298	2,452	3,827

<sup>f</sup> – 2020 data is through 10/31/20

### **Virginia Port Authority**

The Virginia Port Authority provided a detailed explanation of the types of data it collects as a part of its normal operations.

#### *Weights of Containers*

Containers that are imported (coming to the port by way of a vessel) are not weighed at the port, however, the weight of each container is included in the manifest provided by the ship lines. The

accuracy of these weights are not known or verified by VPA or the terminal operator, Virginia International Terminals (VIT). The motor carriers are responsible for selecting the proper chassis (dual or tri-axle) required to legally haul the containers.

Trucks carrying containers that are to be exported (leaving the port by way of a vessel) are weighed just prior to entering the terminal using stationary scales. The weights of the truck and chassis are subtracted from the total weight based on fleet file weights that are on record. VIT compares the measured weight of the container to that listed on the manifest. This process is not required but done by VIT to ensure proper weight distribution on the exporting vessel.

VPA also provided monthly counts of inbound and outbound loads less than 55,000 pounds and greater than 55,000 pounds for calendar years 2016 through May 2019.

#### *Routes of Trucks Traveling to and from the Port*

No data regarding routing of cargo entering or exiting the port is currently being collected by either VPA or VIT. Hampton Roads Chassis Pool II (HRCPII), a provider of chassis for approximately 85% of the motor carriers operating out of the port, is evaluating GPS technology as a means to monitor potential chassis tampering. Port representatives indicated that this technology, if implemented, could be beneficial in the tracking of containers both coming into and exiting the port.

### **Department of Rail and Public Transportation**

Representatives from the Department of Rail and Public Transportation provided information regarding the truckload equivalents removed from the roadway from 2015 to 2019 as a result of the three rail programs: completed rail enhancement projects, rail industrial access funded projects, and rail preservation projects. According to DRPT, for each railcar utilized, 3.4 truckloads are removed from the roadway.

### **Virginia State Police**

The Virginia State Police currently has seven sets of portable scales that are primarily used to verify the weights of vehicles to determine if they are a commercial motor vehicle by definition and to administer overweight enforcement actions. This is a critical requirement used to determine if the vehicle is subject to the Federal Motor Carrier regulations (49 CFR 390.5T) and therefore able to be inspected by the Virginia State Police Motor Carrier trained inspectors. DMV performs the annual calibration of the scales for VSP.

### **Virginia Department of Transportation**

#### *Traffic Count Data*

VDOT currently conducts and maintains continuous traffic count coverage on interstates through its Continuous Count Stations (CCS) and Non-Intrusive Continuous Count Stations (NCCS) sites. From the information collected through this system, average annual daily traffic (AADT) and vehicle miles traveled (VMT) are determined. The percentage of trucks on any segment of the interstate can also be estimated.



### *Roadway Infrastructure Condition Information*

VDOT routinely collects surface distress (cracking, roughness, rutting, and faulting) data annually for all interstate and primary roads that it maintains. This information aids in effectively managing its operations and maintenance programs. Similarly, VDOT collects condition information on bridge components and assigns condition ratings. These describe the current condition of bridges as compared to their condition when they were new. National Bridge Inspection Standards have a prescribed bridge inspection interval of 24 months for bridges longer than 20 feet. More frequent inspections can be required, depending on the condition of the bridge.

### **Significance and Deficiencies of Data Collected**

The following sections highlight the discrepancies between the data collected or known to be readily available from VDOT or other transportation-related agencies that participated in this study and the data specifically requested in Chapters 401 and 568.

### **Frequency and Severity of Incidents Involving Overweight Trucks**

Based on the information that is currently collected by DMV and VSP, it is not possible to directly measure either the frequency or severity of incidents (specifically, crashes) involving overweight trucks. The CMV truck crash information provided by DMV through the Traffic Records Electronic Data System relies on a truck's VIN to classify the vehicle's weight rating (the highest load the vehicle – truck or tractor – can carry or pull) as being 55,000 pounds or less, or more than 55,000 pounds. There is no information on the weight of the cargo being hauled at the time of the crash. DMV has the capability to weigh trucks that have been involved in crashes, assuming the load is still intact. If, however, the truck has overturned or lost part of its load because of the crash, there is also no way to measure this weight. Because the weights at which trucks are operating are not known at the time of the crash, it is not possible to estimate with any degree of certainty how often overweight trucks are involved in crashes. Similarly, no estimate or comparison can be made regarding the severity of crashes involving overweight trucks and trucks operating at 80,000 pounds or less.

Though not currently done, in very select instances the weight of trucks involved in crashes could be estimated by determining the weight of the truck when it last went through one of DMV's weigh stations. However, two additional problems arise when trying to determine the weight of the truck in this instance: (1) DMV only stores images of the truck license plates going through each of its weigh stations for 24 hours. The only data captured is for vehicles that are ticketed for being overweight. No weights of any non-ticketed trucks are captured or stored. (2) It would be difficult to determine if the truck in question had offloaded any portion of the contents it was carrying at the time it was weighed or if additional weight had been added.

Based on current practices it is also not possible to compare trucks involved in crashes with DMV blanket permits because these permits can be issued based on the license number of a trailer, commodity number of the cargo being transported, or the VIN. This significantly reduces any possibility to cross-reference blanket permit information with DMV's crash database as the latter information is based solely on the VIN of the tractor. Even in instances where the VIN of the truck was used to obtain the blanket permit from DMV, and therefore the two databases could be cross-

referenced, because of the open nature of the blanket permit, there is no way to ascertain if the weight of the load at the time of the crash matches the weight for which the permit was obtained. The exception to this is when a permitted vehicle is involved with a bridge strike. In these instances, VSP, DMV, and VDOT are deployed and, if site conditions permit, crews will use mobile scales to weigh the vehicle to compare the actual weight to what was provided on the permit.

It appears that it would be possible to cross-reference the single trip permits issued by DMV based on truck VIN and the crash database to gain a somewhat better understanding of the number and severity of crashes involving overweight trucks. Since these permits are based on a single, one-way trip, it could be assumed that these vehicles are operating at a weight close to their permitted weight at the time of the crash – if they were traveling on the permitted route at the time of the crash. The ability to cross-reference the single trip permits and the crash database, however, would be limited to the following instances:

- trucks that obtained single trip permits (approximately 70,000/year)
- the permit is for a truck that is over 80,000 pounds (less than 50% of all single trip permits)
- the permit was based on the truck VIN (percentage unknown)
- crash involving truck occurred on the permitted route
- no changes in the gross vehicle weight occurred along the permitted route.

While this scenario may provide some information on the severity of crashes involving a subset of overweight trucks, it would not allow for a comparison with non-overweight trucks because the weight status of all other trucks not meeting these criteria would be unknown.

## **Maintenance and Infrastructure Needs for Overweight Truck Routes**

### *Pavements*

The surface distress data currently collected by VDOT on an annual basis provides some insight into the current condition of the interstates and primary roads maintained by VDOT. Though this information does not provide in-depth information on the structural strength of the pavement layers and subgrade soil, it does serve as a measure of the condition of the road surface and is therefore a good measure of roadway maintenance needs. For many of the same reasons it is difficult to determine the safety implications of overweight trucks, it is also challenging to infer roadway maintenance requirements from the use of overweight trucks, as there is currently insufficient data on the number and weight of trucks using most roadways.

Permit information gathered by DMV is of limited benefit. Blanket permits can be route-specific but many allow the permittee to travel over most of the state with some restrictions. Therefore, it is not possible to determine what route a blanket-permitted vehicle is traveling, at what weight that vehicle is operating, or the number of trips made by that vehicle within a certain time range.

With the exception of the small number of roadways that have WIM technology, not only are the weights of the trucks unknown, the number of truck trips is unknown as well. For the limited number of locations where WIM stations are located, it would be possible to compare surface roadway conditions. This comparison could take into account total traffic counts, truck counts,

truck weights, axle loadings, and axle configurations and determine how these variables are related to pavement surface conditions. Trying to determine the correlation would not be ideal, as it would not account for other variables that would have an effect on pavement condition such as pavement type, subgrade conditions, etc.

### *Structures and Bridges*

Many of the same data constraints that prevent a strong analysis of the maintenance requirements of pavements experiencing overweight trucks versus those that do not carry a significant number of these vehicles prevent an analysis of the impacts on VDOT's structures and bridges. Similarly, however, it is assumed that for those structures that are near the relatively small number of DMV operated WIM sites, a limited analysis could be performed. Specifically, the correlation between bridge maintenance and overweight trucks could be derived using the bridge condition information collected by VDOT. A very significant and limiting difference, however, when trying to correlate bridge maintenance with the prevalence of overweight trucks is that bridge deterioration can take substantially longer to become detectable than roadway deterioration. Additionally, the pattern of deterioration can vary depending on the type of structure. For these reasons, even in locations where there is some information on the weights of trucks using certain structures, it is challenging to fully quantify the resulting impacts in a short time frame (FHWA, 2015).

### **Additional Vehicle Miles of Truck Travel That Would Result without Overweight Trucks**

No single data set or combination of data that was identified as being collected by DMV, VPA, DRPT, VSP, or VDOT or discussed among the study members was found to be sufficient in estimating the number of additional vehicle miles that would be necessary to offset the elimination of overweight vehicles currently allowed on Virginia's roadways.

The blanket permits issued by DMV provide little to no routing information. As a result, it is not possible to determine how many miles are traveled by each permittee. Additionally, it is not known at what weight these vehicles operate or how many trips they make at heavier weights (having a permit does not mean that every trip taken is overweight). The single trip permits, however, would allow for the calculation of total miles traveled, at weights that could reasonably be assumed to be close to their permitted weight. These two sets of values (vehicle miles traveled and gross weights), could be used to estimate the number of additional trucks or trips that would be necessary to compensate for that subset of vehicles (single trip permitted vehicles) being required to operate at a reduced weight.

VDOT develops and reports statewide vehicle miles of travel by vehicle class, however, that data does not capture the weight of the vehicle. Additionally, VDOT maintains a very limited number of Weigh-in-Motion sites (and links to sites maintained by DMV) that provide weights of vehicles by vehicle class. However, the limited number of sites makes the estimation of vehicle miles of travel, and particularly additional vehicle miles of travel without overweight trucks, of limited accuracy.

Accurately determining the number of additional vehicle miles that would be necessary to compensate for not utilizing overweight trucks is not possible given the data that is currently available. Additional data would need to be collected on many different factors that could potentially influence truck route choice and control for them in a multivariate regression analysis

to isolate and determine the impact of overweight permits on route choice. It would be valid to reason that this would be difficult to determine even if additional data were collected because outside factors (e.g., modal shift, indivisibility of loads) that are not easily addressed by additional data collection are said to potentially affect this calculation (FHWA, 2015).

## **ADDITIONAL DATA DEEMED NECESSARY AND PROPOSED METHODS FOR ITS COLLECTION**

### **Frequency and Severity of Incidents**

In order to compare the frequency and severity of incidents and crashes involving overweight trucks and trucks weighing no more than 80,000 pounds, specific data on the weights of all trucks involved in crashes and incidents needs to be accurately recorded. One step that would be required would be the modification of Virginia's Crash Report form, which is currently used by law enforcement agencies statewide for the reporting of crashes. This step was identified in *Senate Document No.3, Report of the Virginia Department of Transportation: Impact of Virginia Participation in a Federal Pilot Study of 91,000-Pound, Six-Axle Vehicles Utilizing the Interstate (Chapter 554, 2018)* (Commonwealth of Virginia, 2019).

Prior to properly recording the weights of trucks involved in crashes, those weights would need to be accurately determined. Based on numerous national studies, there does not appear to be a consistently viable method for measuring the weight of trucks at the crash site. Weighing at the scene of a crash is nearly impossible if the truck has lost some portion of its load and it would not be practical to assume that VSP could purchase and operate mobile scales that would be necessary to accurately determine weights at all crash sites. As previously stated, DMV does have mobile scales that could be deployed; making them available for truck crashes in a given area would require an on-call, two-person crew.

Though limited in extent, crashes in proximity of WIM sites and involving trucks could be analyzed. This would allow for the direct comparison of the severity of crashes of trucks of known weights, as determined at the recently passed WIM site (though it should be noted that even in cases where crashes occur close to WIM sites, weight information will not be available for all vehicles because WIM technology present on the interstates only take readings from the rightmost travel lane). A method for estimating an acceptable distance from each WIM site would need to be developed. In addition, because the number of existing WIM sites is relatively small, the installation of additional WIM sites would correspondingly increase the robustness of the analysis. Based on earlier estimates developed by VDOT, the 10-year installation and operation of each new WIM site is estimated to be \$530,000 (Commonwealth of Virginia, 2019). Alternatively, portable WIM technology could be used, but again, determining where to deploy these devices would be critical as would allocating adequate resources for their operation and the analysis of the data collected.

### **Maintenance and Infrastructure Needs for Overweight Truck Routes**

To correctly discern the infrastructure maintenance needs for routes frequented by overweight trucks in comparison to routes not used by overweight trucks, data beyond that collected as part of

VDOT's normal pavement and bridge maintenance efforts is required.

Accurate truck weights and counts for specific routes are needed to perform a comparison of infrastructure maintenance needs for routes carrying heavy versus those that do not. One way of capturing this data is with WIM technology as described in the previous section. Routes having various levels of overweight trucks could be determined from this additional WIM information. This combined with the pavement deterioration and structural information described below would allow for the direct comparison between overweight truck and non-overweight truck routes.

Pavement deterioration comparisons would require structural condition information that can be collected by technologies such as Falling Weight Deflectometer and Ground Penetrating Radar. This additional information would need to be collected on a three year cycle at an approximate cost of \$430 per lane mile (combined cost) and would be used in combination with surface distress data currently collected on an annual basis (Commonwealth of Virginia, 2019). The pavement condition derived from these data could then be compared to truck count and weight information.

Structural information that would need to be collected includes fatigue and serviceability data for steel and concrete structures, respectively. This would require additional modeling of both parameters and concentrated field evaluations. In addition to these efforts, bridge deck deterioration, expansion joint deterioration, bearing assembly wear, and bearing seat and anchorage deterioration would need to be monitored. Similar to the pavement condition information described above, in combination with the truck weight and count information for specific routes, collecting the structural data described here would allow for a direct comparison of the rate of deterioration (and corresponding maintenance costs) for roads frequently used by overweight trucks versus those that are not used by these vehicles.

### **Additional Vehicle Miles Necessary without Overweight Loads**

Estimating the additional vehicle miles that would be necessary without overweight loads is likely the most difficult of the three questions addressed in this study. This is due primarily because most, if not all of the data required to make these estimations would require cooperation of industry.

It would be extremely difficult to estimate this increase in vehicle miles traveled even if data were available that would allow for the determination of accurate truck weights, origin-destination information, and route information. Again, WIM technology can be used to determine vehicle weights at specific locations along certain routes, but this will not provide information on the origin or destination of these vehicles. From a technological standpoint, it is possible that trucks could be instrumented so that weight and specific route information (to include origin-destination) could be determined and collected. The availability and use of this information captured in this manner would be at the discretion of the vehicle owner and not something that would be publically available.

Even if this data did exist and was available, additional information would be needed regarding the divisibility of the cargo to determine the number of additional vehicles (or trips) that would be necessary. For example, in cases where cargo that is easily divisible, such as fluid milk, the number of additional trucks required to transport the quantity of milk that contributed to a vehicle being overweight could be calculated. Once the number of additional vehicles (tankers in this case)

necessary were determined, this information would then be used in combination with the origin-destination information to calculate the number of miles the milk would be transported. The number of additional vehicles necessary multiplied by the trip length would provide the number of additional vehicle miles traveled as a result of the fluid milk trucks not being allowed to operate in an overweight status.

The method of calculation would be similar, but not the same, for larger cargo such as vehicles, heavy machinery, etc. Therefore, assuming the weight, route, and origin-destination information were available, estimations such as this would need to be done for each of the various types of cargo that are currently transported with a gross weight in excess of 80,000 pounds to accurately estimate the additional vehicles miles traveled.

## **CONCLUSIONS**

After thorough examination of the available data, it was determined that insufficient data currently exists to:

- compare the frequency and severity of crashes involving overweight trucks compared to other trucks,
- compare the maintenance needs of routes frequently used by overweight trucks as compared to routes not frequented by such trucks,
- estimate the number of additional vehicle miles that would be necessary if such vehicles were not permitted to carry overweight loads.

However, below are several options identified through this study to be considered by the Governor, the General Assembly, and the Commonwealth Transportation Board that would provide some data or have the potential to improve the availability of pertinent data:

- Use of existing WIM data and single trip hauling permit information could be used to make some very limited assumptions about the impacts of overweight trucks on crashes, maintenance, and vehicle miles traveled. To begin, a single corridor could be identified with sufficient length to capture maintenance and crash impacts, likely 25-50 miles.
- The modification of the Commonwealth of Virginia – Department of Motor Vehicles Police Crash Report form and the increased deployment of DMV’s mobile scales would allow for increased collection of the weights of trucks involved in some crashes.
- Additional WIM data could be collected by way of some combination of additional portable and permanent sites. Input from a variety of stakeholders would be needed to determine where these additional sites should be located.

If deemed appropriate, the following actions could be taken to provide limited input to the questions raised by Chapters 401 and 568 of the 2019 Virginia Acts of Assembly:

- Identify a roadway segment believed to have trucks operating above the current legal limit by blanket permit, exemption, or single trip permit that is of sufficient length to capture both maintenance and safety impacts, likely 25-50 miles.
- Install WIM stations at every interchange and in every lane to capture the weight characteristics of the traffic stream.

- Include license plate capture capability that is linked to the WIM system to allow weights to be associated with specific vehicles.
- Maintain a database of weight/license plate data for a minimum of 48-hours for post-crash identification.
- Collect additional pavement condition data within the roadway segment. If the number of overweight vehicles varies over the length of the segment, some limited information on the impact of those vehicles on maintenance needs could be estimated. If the number of overweight vehicles is consistent across the segment, a second roadway segment on distinct roadway with different fleet composition will be required to estimate maintenance impacts.

Two additional activities could also help to inform this effort.

- A Freight Advisory Committee continues to be under development. The committee, comprising representatives of government agencies and industry, could be engaged to provide feedback on other data collection opportunities.
- Virginia's Department of Motor Vehicles continues in its efforts to procure a new online overdimensional truck permitting system. That system could provide additional data on specific routes and weights.

## REFERENCES

Commonwealth of Virginia. *Report of the Virginia Department of Transportation: Impact of Virginia Participation in a Federal Pilot Study of 91,000-Pound, Six-Axle Vehicles Utilizing the Interstate (Chapter 554, 2018)*. Senate Document No. 3, Virginia General Assembly. Richmond, 2019.

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