Truck Movement Characteristics on Selected Truck Routes in Washington State

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by

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EWITS Research Reports:
Background and Purpose

This report is the sixth in a series of Working Papers current topics related to the mission of the Eastern Washington Intermodal Transportation Study (EWITS)) to accompany EWITS reports providing information on the multimodal network necessary for the efficient movement of both freight and people into the next century.

EWITS is a six-year study funded jointly by the Federal government and the Washington State Department of Transportation as a part of the Intermodal Surface Transportation Efficiency Act of 1991. Dr. Ken Casavant of Washington State University is Director of the study. A state-level Steering Committee provides overall direction pertaining to the design and implementation of the project. The Steering Committee includes Jerry Lenzi, Regional Administrator (WSDOT, Eastern Region), Richard Larson (WSDOT, South Central Region); Don Senn (WSDOT, North Central Region); Charles Howard (WSDOT, Planning Manager), and Jay Weber (Douglas County Commissioner Pat Patterson represents the Washington State Transportation Commission on the Steering Committee. An Advisory Committee with representation - from a broad range of transportation interest groups also provides guidance to the study. The following are key goals and objectives for the Eastern Washington Intermodal Transportation Study:

- *Facilitate existing regional and state-wide transportation planning efforts.*
- *Forecast future freight and passenger transportation service needs for eastern Washington.*
- *Identify gaps in eastern Washington's current transportation infrastructure.*
- *Pinpoint transportation system improvement options critical to economic competitiveness and mobility within eastern Washington.*

For additional information about the Eastern Washington Intermodal Transportation Study or this Working Paper, please contact Ken Casavant at the following address:

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EWITS PREVIOUS REPORTS NOW AVAILABLE

1. Gillis, William R. and Kenneth L. Casavant. "Linking Transportation System Improvements to New Business Development in Eastern Washington." EWITS Research Report Number 1. February 1994.

2. Gillis, William R. and Kenneth L. Casavant. "Lessons from Eastern Washington: State Route Mainstreets, Bypass Routes and Economic Development in Small Towns." EWITS Research Report Number 2. February 1994.

3. Gillis, William R. and Kenneth L. Casavant. "Washington State Freight Truck Origin and Destination Study: Methods, Procedures, and Data Dictionary." EWITS Research Report Number 3. December 1994.

4. Gillis, William R. and Kenneth L. Casavant. "Major Generators of Traffic on U.S. 395 North of Spokane: Including Freight Trucks and Passenger Vehicles Crossing the International Border." EWITS Research Report Number 4. January 1995.

5. Newkirk, Jonathan, Ken Eriksen, and Kenneth L. Casavant. "Transportation Characteristics of Wheat and Barley Shipments on Haul Roads To and From Elevators in Eastern Washington." EWITS Research Report Number 5. March 1995.

6. Jessup, Eric and Kenneth L. Casavant. "A Quantitative Estimate of Eastern Washington Annual Haul Road Needs for Wheat and Barley Movement." EWITS Research Report Number 6. March 1995.

7. Gillis, William R., Emily Gruss Gillis, and Kenneth L. Casavant. "Transportation Needs of Eastern Washington Fruit, Vegetable and Hay Industries." EWITS Research Report Number 7. March 1995.

8. Casavant, Kenneth L. and William R. Gillis. "Importance of U.S. 395 Corridor For Local and Regional Commerce in South Central Washington." EWITS Research Report Number 8. April 1995.

9. Gillis, William R., Eric L. Jessup, and Kenneth L. Casavant. "Movement of Freight on Washington's Highways: A Statewide Origin and Destination Study." EWITS Report Number 9, November 1995.

10. Chase, Robert A. and Kenneth L. Casavant. "Eastern Washington Transport-Oriented Input-Output Study: Technical Report." EWITS Research Report Number 10. March 1996.

11. Chase, Robert A. Kenneth L. Casavant. "The Economic Contribution of Transport Industries to Eastern Washington." EWITS Report Number 11. April 1996.

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3. Ellis, John, Eric Jessup, and Ken Casavant. "Modeling Changes in Grain Transportation Flows in Response to Proposed Snake River Drawdowns: A Case Study for Eastern Washington." EWITS Working Paper #3, March, 1996.

4. Painter, Kate and Ken Casavant. "A Comparison of Canadian Versus All Truck Movements In Washington State With A Special Emphasis On Grain Truck Movements." EWITS Working Paper #4, March 1996.

5. Jessup, Eric, John Ellis, and Ken Casavant. "Estimating the Value of Rail Car Accessibility for Grain Shipments: A GIS Approach." EWITS Working Paper #5, April 1996.

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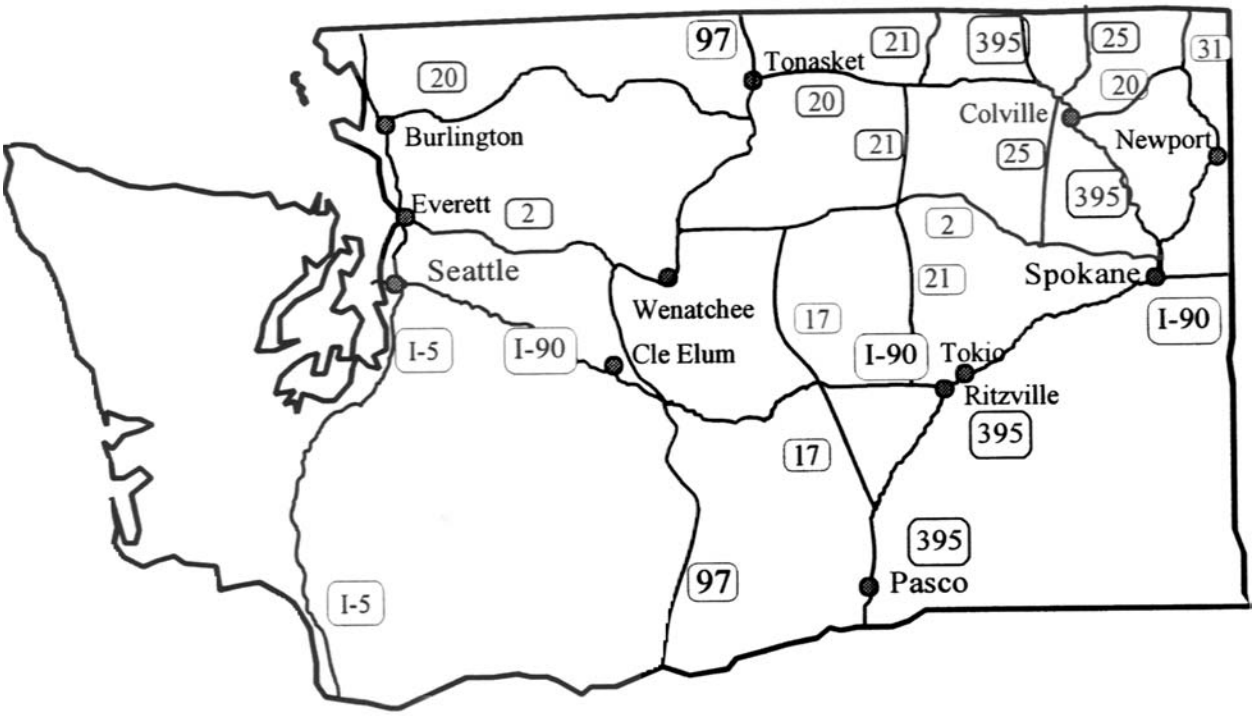
Introduction

Information for this report was provided by an extensive two-year study of freight truck movements on major Washington State highways conducted under the Eastern Washington Intermodal Transportation Study (EWITS). This study was the first in the United States to collect statewide freight truck origination and destination data through direct interviews of truck drivers at weigh stations. Over 300 persons conducted these personal interviews at 28 different locations. A total of 30,000 truck drivers were interviewed, providing an extensive data base on freight and goods movements in Washington State.

Methods of Analysis

This report examines basic characteristics of truck traffic by season for selected major truck routes in Washington State (see Figure 1). These routes include Interstate 90 (I-90) and State Routes (SR) 395, 20, 2, 97, 31, 25, 21, and 17. Data from the EWITS study used in this report include payload weight, number of trucks per 24-hour period, truck route, and commodity classification of freight.

Figure 1: Selected Truck Routes in Washington State



The selection of interview sites allowed detailed analysis by road segment for major routes. The main east-west traffic flow on I-90 is broken into three sections: Spokane to Tokio, Tokio to Cle Elum, and Cle Elum to Seattle. The western section reflects data collected from truck traffic westbound from Cle Elum, the central section uses data from traffic eastbound from Cle Elum and westbound from Tokio, and the eastern section relies on data from traffic eastbound from Tokio and westbound from Spokane. For all

other routes, road segment data were collected from all surveys based on truckers' stated route for each trip, due to lack of weigh stations on the smaller roads. For example, if a trucker being interviewed at the Tokio weigh station on I-90 was traveling from Canada via SR 395 to I-90, survey data on this truck would be included for I-90, and also for the northern section of SR 395. If the trucker was traveling on a road other than I-90, survey data for I-90 would exclude this observation even if the route for this trucker included I-90 at some point. Results from this approach differ considerably from actual 24-hour truck counts by the Washington State Department of Transportation (WSDOT) on corresponding truck segments, for obvious reasons[1]. The random nature of this trucker survey does provide extremely useful data on commodities being hauled, extent of empty back hauls, and seasonality of road use, among others. The results of this report provide a useful complement to WSDOT truck count reports by road segment.

This survey procedure underestimates traffic on roads that were not individually surveyed as it misses short haul and local traffic on these roads. Comparison to WSDOT traffic counts on selected roads indicates at 20%-40% underestimate. Other roads where specific interview sites were located had higher estimates of truck traffic volume than the WSDOT traffic counts by this technique, perhaps due to the fact that the surveys were done on weekdays. Road counts appear to be very sensitive to the selection of interview sites. However, the purpose of this report is to examine relative characteristics on different highway sections, including traffic characteristics of commodity composition, payload weight and seasonal variations. This detailed information is available for the first time due to the in-depth nature of this statewide survey.

The other major east-west routes were also broken into several sections. SR 2 is divided into a western portion between Everett and Wenatchee and an eastern portion between Wenatchee and Spokane. SR 20 is split into three sections: Burlington to Tonasket, Tonasket to Colville, and Colville to Newport.

Six north-south routes were examined in this study. Two specific sections of SR 395 were from Spokane to Canada and from Ritzville to Pasco. The remaining north-south routes, SR 97, SR 31, SR 25, SR 21, and SR 17, were not broken down into subsections.

[1] The WSDOT average daily traffic (ADT) reports count traffic with equipment that uses either air or magnetic fields to count vehicles and distinguish between trucks and cars. They generally have about 200 days of observations from which they create the ADT count. These ADT counts include weekends, when traffic is generally lighter. Recreation vehicles (RVs) are included in the ADT counts. The EWITS study surveyed truckers on a weekday, when truck traffic is generally higher. RVs were not included in this study. The EWITS study includes all truck traffic on a particular route, while a WSDOT counter would miss traffic entering the route at some point beyond the counter. For example, on the Pasco to Ritzville section of SR 395, the WSDOT counter is just north of Pasco. Traffic entering SR 395 above the counter would be excluded, including trucks heading north on SR 395 from SR 26 and SR 260.

Results

I-90

As shown in Table 1, the average daily volume of 3025 trucks on the central I-90 section, Cle Elum to Tokio (Figure 1), is 55% higher than traffic in the eastern section (Tokio to Spokane) and 78% higher than traffic in the western section (Seattle to Cle Elum). The highest seasonal volume is experienced in the fall for the central and eastern sections and in the spring for the western section. Although the highest volume of truck traffic occurs in the central section, the average payload is lightest for trucks in this section at 11.84 tons (Table 1). Trucks in the western section have the highest average payload at 13.68 tons. Empty payloads are excluded from the calculation of these averages.

Table 1--I-90 Truck Traffic Volume (24-hour) and Average Payload Weight (tons) by Season and Section

	Fall	Winter	Spring	Summer	Aver.*
24-HOUR TRUCK VOLUME:					
Spokane to Tokio	2405	1940	1479	1960	1946
Tokio to Cle Elum	3303	2956	3151	2690	3025
Cle Elum to Seattle	1820	1347	1972	1673	1703
AVERAGE PAYLOAD (LBS.):					
Spokane to Tokio	11.77	13.27	13.62	15.26	13.48
Tokio to Cle Elum	12.06	11.18	9.89	14.23	11.84
Cle Elum to Seattle	13.65	14.42	12.77	13.89	13.68

*Average payload is weighted by the percentage annual volume for that season.

Tables 2 through 4 summarize the percentage of empty trucks by season and type of commodity for trucks with loads for the three I-90 sections. The central section has the highest number of empty trucks at 32%, followed by 25% for the eastern section and 23% for the western. The percent of empty trucks is remarkably stable by season for the western and central section; empty trucks for the Spokane to Tokio section varies from 19% in the spring to 27% in the fall. For loaded trucks, food is the most common commodity being hauled for all sections, 22% for the eastern and western sections and 20% for the central section. For the western section, farm produce is carried by another 22% of trucks, averaged over the four seasons. Forest products make up the next largest category of freight, comprising 10% of all truck traffic in the central and eastern sections and 11% in the western section.

Average tons of freight per day based on surveys of truckers passing through weigh stations on I-90 is presented in Table 5. The Tokio to Cle Elum section receives the heaviest freight traffic, averaging 24,355 tons daily, followed by the Spokane to Tokio section at 20,199 tons per day and the Cle Elum section at 17,473 tons per day. Overall, heaviest freight traffic occurs during summer and fall.

Table 2--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for I-90, Spokane to Tokio Section, Percent

Empty/Loaded, Commodity	Fall	Winter	Spring	Summer	Weighted Aver.
Empty	27	23	19	22	23
Loaded	73	77	81	78	77
Farm produce	9	14	17	8	12
Food	22	23	21	23	22
Forest products	12	9	11	8	10
Other	57	54	51	61	56
TOTAL	100	100	100	100	100

Table 3--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for I-90, Tokio to Cle Elum Section, Percent

Empty/Loaded, Commodity	Fall	Winter	Spring	Summer	Weighted Aver.
Empty	31	34	32	31	32
Loaded	69	66	68	69	68
Farm produce	4	8	4	4	6
Food	19	21	21	20	20
Forest products	12	8	7	12	10
Other	65	64	68	64	64
TOTAL	100	100	100	100	100

Table 4--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for I-90, Cle Elum to Seattle Section, Percent

Empty/Loaded, Commodity	Fall	Winter	Spring	Summer	Weighted Aver.
Empty	26	24	26	22	25
Loaded	74	76	74	78	75
Farm produce	30	22	20	19	22
Food	19	13	28	28	22
Forest products	19	5	9	9	11
Other	32	59	42	44	45
TOTAL	100	100	100	100	100

Table 5--Tons of Freight Hauled per Day on I-90 by Section and Season

	Fall	Winter	Spring	Summer	Aver.
Spokane to Tokio	20,664	19,823	16,317	23,329	20,199
Tokio to Cle Elum	27,486	21,812	21,191	26,412	24,355
Cle Elum to Seattle	18,384	14,762	18,635	18,126	17,473

SR 2

Average daily truck traffic on SR 2 is analyzed in two sections, from Everett to Wenatchee, which includes Stevens Pass over the Cascade Mountains, and Wenatchee to Spokane (see Table 6 and Figure 1). Daily truck volume averaged 469 trucks for the Everett to Wenatchee section and 210 trucks for the Wenatchee to Spokane section (Table 6). Fall truck traffic is nearly twice as heavy as that in other seasons for both sections of the route. This can be attributed to the marketing of farm products as well as good weather conditions for timber harvesting and hauling. The average payload of 15.57 tons for the western section is one-third lighter than that of the eastern section, due mainly to the higher percentage of trucks carrying forest products in the eastern section of SR 2. Empty trucks make up 35% of the SR 2 traffic for the Everett to Wenatchee section (Table 7) and 19% of the Wenatchee to Spokane section (Table 8). Lumber, wood, or pulp products comprise 13% of all truckloads for the western section and 45% for the eastern section. Although the average daily truck volume for the western section of SR 2 is more than double that of the eastern section, the average daily freight for the Wenatchee to Everett section is slightly higher (20%) at 4,747 tons compared to 3,929 tons (Table 9) due to a higher average payload weight of loaded vehicles. Freight levels fluctuate considerably across the seasons, with the highest volume in fall and lowest volume in winter for both sections of this route.

Table 6--SR 2 Average Daily Truck Volume and Payload (tons) by Season and Average over the Year by Section

	Fall	Winter	Spring	Summer	Aver.*
24-HOUR TRUCK VOLUME:					
Everett to Wenatchee	786	366	347	376	469
Wenatchee to Spokane	382	151	183	122	210
AVERAGE PAYLOAD (LBS.):					
Everett to Wenatchee	12.80	12.84	17.56	17.60	15.57
Wenatchee to Spokane	23.73	21.72	21.45	25.34	23.10

Table 7--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for Everett to Wenatchee Section of SR 2, Percent

Empty/Loaded, Commodity	Fall	Winter	Spring	Summer	Weighted Average
Empty	22	45	24	37	35
Loaded	78	55	76	63	65
Food	10	7	8	23	15
Forest products	13	5	12	13	13
Other products	77	78	80	54	72
TOTAL	100	100	100	100	100

Table 8--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for Wenatchee to Spokane Section of SR 2, Percent

Empty/Loaded, Commodity	Fall	Winter	Spring	Summer	Weighted Average
Empty	18	21	19	23	19
Loaded	82	79	81	77	81
Food	4	4	6	3	4
Forest products	51	46	43	25	45
Other products	45	50	51	72	51
TOTAL	100	100	100	100	100

Table 9--Tons of Freight Hauled per Day on SR 2 by Section and Season

	Fall	Winter	Spring	Summer	Wted. Aver.
Everett to Wenatchee	7,847	2,585	4,631	4,169	4,747
Wenatchee to Spokane	7,433	2,591	3,180	2,380	3,929

SR 20

The North Cascades Highway, SR 20, is divided into three segments: Burlington to Tonasket, Tonasket to Colville, and Colville to Newport (Figure 1). Average daily truck traffic is more than two times higher for the western section at 76 trucks per day, compared to 32 for the central section and 28 for the eastern section (Table 10). There is a great deal of seasonal variation in traffic levels for the western section; winter truck traffic is twice the seasonal average due to the hauling of sand and gravel. Average payload weights are approximately 20% higher in the eastern section than in the central and western sections at 24.70 tons (Table 10).

Table 10--SR 20 Truck Traffic Volume (24-hour) and Average Payload Weight (tons) by Season and Section

	Fall	Winter	Spring	Summer	Aver.
24-HOUR TRUCK VOLUME:					
Burlington to Tonasket	43	143	70	47	76
Tonasket to Colville	30	32	19	45	32
Colville to Newport	22	32	36	22	28
AVERAGE PAYLOAD (TONS)					
Burlington to Tonasket	16.80	20.78	15.97	30.20	20.94
Tonasket to Colville	21.78	25.06	10.73	23.87	20.34
Colville to Newport	16.50	28.89	23.03	30.39	24.70

The predominant freight for trucks in the western section of SR 20 is food at 18% of truckloads (Table 11). Forest products comprise another 13% of freight while rock and sand makeup another 12% in the western section. Forest products are the most common freight on trucks operating in the eastern and central sections of SR 20, comprising 47% and 50% of truckloads, respectively (Tables 12 and 13). Farm produce makes up another 16% of freight on the eastern section.

Table 11--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for SR 20, Burlington to Tonasket Section, Percent

Empty/Loaded, Commodity	Fall	Winter	Spring	Summer	Weighted Average
Empty	0	17	37	3	17
Loaded	100	83	63	97	83
Farm produce	44	0	0	9	7
Rock/sand	0	18	0	20	12
Food	0	21	36	0	18
Forest products	0	17	3	26	13
Other products	56	44	61	45	50
TOTAL	100	100	100	0	100

Table 12--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for SR 20, Tonasket to Colville Section, Percent

Empty/Loaded, Commodity	Fall	Winter	Spring	Summer	Weighted Average
Empty	13	34	31	27	26
Loaded	87	66	69	73	74
Food	0	10	0	0	3
Forest products	27	34	19	83	47
Other products	73	56	81	17	50
TOTAL	100	100	100	100	100

Table 13--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for SR 20, Tonasket to Colville Section, Percent

Empty/Loaded, Commodity	Fall	Winter	Spring	Summer	Weighted Average
Empty	0	31	25	0	17
Loaded	100	69	75	100	83
Farm produce	60	0	13	0	16
Forest products	0	78	25	100	50
Other products	40	22	61	0	34
TOTAL	100	100	100	100	100

The Burlington to Tonasket section of SR 20 has more than twice the average daily freight of the other two sections of this route at 1317 tons per day (Table 14). Average daily freight levels on the Tonasket to Colville and Colville to Newport sections are 505 and 573 tons respectively. Winter and summer truck traffic levels on the Burlington to Tonasket section (2466 and 1377 tons, respectively) are several times higher than levels during the rest of the year due to the hauling of rock and sand. In both this section and the Tonasket to Colville section, spring freight levels are considerably lower than the other seasons at 53% and 28% of the annual daily average.

Table 14--Tons of Freight Hauled per Day on SR 20 by Section and Season

	Fall	Winter	Spring	Summer	Aver.
Burlington to Tonasket	722	2466	704	1377	1317
Tonasket to Colville	568	529	141	782	505
Colville to Newport	363	638	622	669	573

SR 395

Average daily truck traffic on the southern section of SR 395, Ritzville to Pasco, is highest among all routes examined in this report except I-90 (Table 15). (Calculations for I-90 were based on weigh station observations only; for the remaining roads, calculations were based on the incidence of that road in truckers' stated routes due to lack of strategically placed weigh stations for the smaller roads. Using weigh station observations only creates a smaller data set than using all incidences of that road in surveyed truckers' state route.) For SR 395 south, observations during the summer of 1994 are much lower than the annual average due to road construction during this time period. Spring and summer traffic on the Spokane to Canada section are lower during this time period, so some seasonal variation may also be responsible. Although the average daily volume for the northern section is just a fraction of that for the southern section, average payload weights are 51% higher with an average weight of 23.55 tons. Forest products comprised 46% of the loads in the northern section, compared to just 14% in the southern section of SR 395 (Tables 16 and 17).

Table 15--SR 395 Truck Traffic Volume (24-hour) and Average Payload Weight (tons), Season and Section

	Fall	Winter	Spring	Summer	Average*
24-HOUR TRUCK VOLUME:					
Spokane to Canada	576	602	401	282	465
Ritzville to Pasco	8612	7140	8634	3452	6960
AVERAGE PAYLOAD (TONS)					
Spokane to Canada	23.58	23.59	22.25	25.23	23.55
Ritzville to Pasco	13.86	14.33	16.25	20.50	15.54

*Average payload is weighted by the percentage annual volume for that season.

Table 16--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for SR 395, Ritzville to Pasco Section

Commodity	Fall	Winter	Spring	Summer	Average
Empty	22	18	23	28	22
Loaded	78	82	77	72	78
Food	19	23	21	25	21
Forest products	16	15	13	9	14
Other products	65	62	66	66	65
TOTAL	100	100	100	100	100

Table 17--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for SR 20, Tonasket to Colville Section, Percent

Commodity	Fall	Winter	Spring	Summer	Average
Empty	23	25	20	32	24
Loaded	77	75	80	68	76
Food	2	2	9	2	4
Forest products	49	40	34	72	46
Other products	49	58	57	26	50
TOTAL	100	100	100	100	100

The importance of the Ritzville to Pasco SR 395 section for movement of freight in this state is revealed in Table 18. With average freight movement of nearly 84,364 tons per day, this road carries the most freight of all state routes examined in this study. Freight loads peak during spring, averaging 108,033 tons per day. However, these survey estimates are higher than roadway traffic counts of WSDOT. The Spokane to Canada section of SR 395 carries approximately one-tenth the average daily freight of the Ritzville to Pasco section, averaging 8,323 tons per day.

Table 18--Tons of Freight Hauled per Day on SR 395 by Section and Season

	Fall	Winter	Spring	Summer	Wted. Aver.
Spokane to Canada	10,458	10,651	7,138	4,838	8,323
Ritzville to Pasco	93,103	83,899	108,033	50,952	84,364

SR 17

The remaining north-south routes are analyzed in Tables 19-25. SR 17 experiences the highest truck traffic, averaging more than 1,500 trucks per 24-hour period over the entire year (Table 19). The highest payloads at 22.50 tons occur during the summer months. Traffic volume is also slightly higher in summer. Payloads are 1.0 to 1.5 tons lighter over the rest of the year. A high percentage of empty trucks, 31%, are seen on SR 17 (Table 20). Farm produce and food make up a large portion of truck traffic at 39% and 23% respectively.

Table 19--Average Daily Truck Volume and Payload by Season and Average over the Year for Five North-South Truck Routes in Washington State

	Fall	Winter	Spring	Summer	Average
AVERAGE DAILY VOLUME:					
SR 17	1488	1584	1450	1740	1566
SR 21	476	508	200	286	368
SR 25	916	1889	98	246	787
SR 31	393	694	56	251	349
SR 97	1437	1549	1699	251	1234
AVERAGE PAYLOAD (TONS)					
SR 17	20.39	20.90	20.80	22.49	21.15
SR 21	22.15	20.95	21.03	22.75	21.72
SR 25	20.12	18.10	15.86	24.40	19.62
SR 31	22.92	21.74	20.91	20.03	21.40
SR 97	19.90	19.34	19.86	20.03	19.78

Table 20--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for SR 17

Empty/Loaded, Commodity	Fall	Winter	Spring	Summer	Weighted Average
Empty	33	32	31	27	31
Loaded	67	68	69	73	69
Farm produce	45	41	36	36	39
Food	15	25	25	27	23
Forest products	6	6	6	0	4
Other products	34	28	28	37	33
TOTAL	100	100	100	100	100

SR 21

While not a principal highway, SR 21 does extend approximately one-third of the way into the state from the northern border between SR 17 and SR 395. It averages 368 trucks per 24-hour period, with much higher levels in the fall and winter and much lower levels in spring and summer (Table 21). Average payload weights are slightly higher in summer and fall than the rest of the year, with a yearly average of 21.72 tons. Empty trucks comprise 27% of trips, with farm produce and food making up an additional 19% each. Forest products are carried on an additional 11% of truck trips.

Table 21--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for SR 21

Empty/Loaded, Commodity	Fall	Winter	Spring	Summer	Weighted Average
Empty	44	30	23	9	27
Loaded	56	70	77	91	73
Farm produce	20	17	13	26	19
Food	16	17	17	22	19
Forest products	14	16	5	9	11
Other products	50	50	65	43	51
TOTAL	100	100	100	100	100

SR 25

SR 25 extends from the Canadian border to SR 2 between SR 395 and SR 31. It is heavily used in winter with an average of 1,889 trucks per 24-hour period (Table 19). Fall traffic on this route averages just half the winter traffic, while spring and summer truck traffic falls to an average of 98 and 246 trucks per day, respectively. Payload weights fluctuate considerably over the year. The average summer payload is 24% higher than the yearly average of 19.62 tons. The average spring payload is 19% lower than the annual average. Food products comprise the largest number of loads averaging 24% over the year, while forest products are second at 18% (Table 22).

Table 22--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for SR 25

Commodity	Fall	Winter	Spring	Summer	Average
Empty	25	32	24	16	24
Loaded	75	68	76	84	76
Farm produce	17	12	0	18	12
Food	19	24	33	19	24
Forest products	27	18	11	19	18
Other products	37	47	57	44	46
TOTAL	100	100	100	100	100

SR 31

SR 31 is very short, extending perhaps 20 miles south of the Canadian border from the far northeast corner of the state. It has the lowest average 24-hour truck traffic volume at 349 trucks, with the same seasonal trend observed for SR 25 (Table 19). Average payload weights are slightly higher in fall and winter, averaging 21.40 tons over the year. Forest products make up 21% of the truck traffic for this route. Food products and farm produce each make up 12% of loaded trucks (Table 23).

Table 23--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for SR 31

Commodity	Fall	Winter	Spring	Summer	Average
Empty	13	28	26	34	25
Loaded	87	70	74	66	75
Farm produce	30	12	0	0	12
Rock/sand	0	0	14	6	5
Food	11	18	0	17	12
Forest products	26	18	27	12	21
Other products	32	51	59	65	50
TOTAL	100	100	100	100	

SR 97

SR 97 extends the length of the state from north to south just east of the Cascade Mountain Range. This route has the second highest traffic volume at 1,234 trucks per day (Table 19). Traffic is relatively constant from fall through spring, dropping off to a small fraction of the rest of the year during the summer. Payload weights are fairly constant over the year with an annual average of 19.78 tons. Farm produce is the most commonly hauled freight, making up 20% of loaded trucks (Table 24). Food and lumber or wood products are hauled on another 13% of truck trips, while rock and sand comprise 12% of truck traffic.

Table 24--Distribution of Trucks with Payloads and Types of Commodities Hauled by Season for SR 97

Commodity	Fall	Winter	Spring	Summer	Average
Empty	37	31	31	4	26
Loaded	63	69	69	96	74
Farm produce	25	29	33	0	20
Rock/sand	0	0	0	35	12
Food	11	17	13	11	13
Forest products	17	14	10	8	13
Other products	46	39	39	45	42
TOTAL	100	100	100	100	100

Overall, average payloads are fairly similar on all five of these north-south routes, averaging from 19.62 to 21.72 tons (Table 19). There is a great deal of seasonal variation in daily traffic flow for these routes. Truck traffic is highest during winter for SR 21, SR 25, and SR 31. The highest truck traffic occurs in summer for SR 17 while on SR 97 it occurs in spring. Forest products play a large role in truck traffic on all routes except SR 21. Farm produce and food make up a significant percentage of payloads on all of these routes.

An average of 22,853 tons per day is hauled on SR 17(Table 25), second only to the Pasco to Ritzville section of SR 395. SR 97 has the next highest average daily tonnage at 18,062. An average of 11,735 tons daily is hauled on SR 25. The remaining two routes, SR 21 and SR 31, have considerably lower levels of freight, averaging 5,835 and 18,062 tons per day. Seasonal variation mirrors the truck traffic levels discussed above.

Table 25--Tons of Freight Hauled Per Day by Section and Season for Five North-South Routes

	Fall	Winter	Spring	Summer	Average
SR 17	20,328	22,512	20,810	28,567	22,853
SR 21	5,904	7,450	3,239	5,921	5,835
SR 25	13,822	23,250	1,181	5,042	11,735
SR 31	7,837	10,561	867	3,318	5,601
SR 97	18,016	20,671	23,282	4,826	18,062

Summary

This report analyzes average daily truck traffic, payload weights, and type of commodities hauled on selected Washington State truck routes. Data for I-90 are based on truck surveys conducted at weigh stations located in Cle Elum, Tokio, and Spokane. The highest average daily flow of 3,025 trucks was found between Cle Elum and Tokio; these trucks had the lightest average load. The highest volume of traffic by season was spring for the western section and fall for the eastern and central sections. Farm produce and food products each made up 22% of loaded trucks in the western section. In the central section, food products comprise the largest category by commodity at 20% of truck trips. For the eastern section, food products made up 22% of truck trips while farm products made up 12%. Average daily tonnage of freight hauled on I-90 was 17,473 for the Seattle to Cle Elum section, 24,355 for the Cle Elum to Tokio section, and 20,199 for the Tokio to Spokane section.

SR 2 was analyzed in two sections, from Everett to Wenatchee and from Wenatchee to Spokane. The average daily flow of truck traffic was more than double for the western section from Everett to Wenatchee at 469. The average payload weight was one-third lighter for the western section; due primarily to the high percentage of trucks hauling wood and lumber products in the eastern section. These products are hauled on 45% of trucks with freight in the eastern section, compared to 13% of trucks with freight in the western section. The average daily freight for the western section of this route is only slightly higher than that for the eastern section at 4,747 tons compared to 3,929.

SR 20, the North Cascade Highway, is more heavily used by truck traffic in the western section from Burlington to Tonasket. Average daily flow is 76 trucks, compared to 32 for the Tonasket to Colville section and 28 for the Colville to Newport section. Trucks in the eastern section carried 20% higher payloads than trucks in the western and eastern sections due to the high percentage of forest products (50%) and farm produce (16%)

being hauled. Trucks in the central section also carried a high percentage of forest products, averaging 47% of loaded trucks. Average daily freight on SR 20 was 573 tons for the eastern section, 505 tons for the central section, and 1317 tons for the western section.

SR 395 is heavily used by truck traffic along the southern section from Ritzville to Pasco with an average daily flow of 6960 trucks. The northern section from Spokane to Canada has an average daily flow of 456 trucks, but the average payload is higher at 23.55 tons compared to 15.54 tons for the southern section. Food makes up the highest category of payloads for the southern section at 21% of trucks, with an additional 14% carrying forest products. In the northern section, forest products make up 46% of truck trips while food is carried on just 4% of loaded trucks. The Ritzville to Pasco section moves an average of 84,364 tons of freight per day, the highest level of all state routes examined in this study. Freight loads peak during spring, averaging 108,033 tons per day. The Spokane to Canada section of SR 395 carries an average of 8,323 tons of freight per day throughout the year.

For the remaining north-south routes in this report, SR 17 and SR 97 are used most frequently with average daily flows of 1566 and 1234 respectively. SR 25 is next frequently traveled with an average daily flow of 787, while SR 21 and SR 31 have average daily flows of 368 and 349 trucks respectively. Farm produce makes up the largest category of goods for SR 17, at 39% of truck trips. Food products make up the next largest group at 23% of trucks. On SR 97, farm produce makes up 20% of loads while forest products and food comprise another 13% each. Food products make up 24% of loads on SR 25 and forest products are carried on 18% of truck trips. Farm produce and food products comprise 19% each of truck traffic on SR 21. On SR 31, food products make up the largest category of commodities at 21% of truck trips. Average payload weights on these north-south routes were fairly similar, ranging from approximately 19.62 to 21.72 tons. An average of 22,853 tons per day is hauled on SR 17, second only to the Pasco to Ritzville section of SR395. SR 97 has the third highest level of freight averaging 18,062 tons per day.

The date reported in this study afford a relative evaluation of traffic characteristics by road segment. The dominant characteristic by truck is the commodity being carried, as commodity type will affect average payload, seasonal traffic levels, and extent of empty back hauls, among other characteristics. The resultant differences in traffic over road segments affect road usage and the continuing need for highway investment over time.