

Analysis of Freight Rail Rates for Chemical Shippers

Prepared for
American Chemistry Council

By
Escalation Consultants, Inc.
December 2012



4 Professional Drive Ste. 129
Gaithersburg, MD 20879
(301)977-7459
EscalationConsultants.com

Analysis of Freight Rail Rates for Chemical Shippers

Introduction

Chemical shippers rely on the nation's freight railroads to move many of their products. These chemicals ultimately help produce a wide range of goods, including building materials, pharmaceuticals, safe drinking water, automobile components, and electronics.

Chemical shippers have experienced significant increases in rail rates in recent years. Data from Class I railroads show that revenue per carload for chemicals increased over 25% in 4 years, and that chemical shippers pay higher rates than other key commodity groups (Exhibit 1).

Escalation Consultants was retained by the American Chemistry Council to assess revenue-to-variable-cost ratios (RVCs)¹ for chemical traffic, and to quantify the economic cost to the chemical industry from rail rates that exceed the Surface Transportation Board (STB) jurisdictional threshold. The RVC is an important indicator for examining freight rail rates because traffic with rates greater than 180% RVC are subject to potential STB review for being unreasonably high.

Methodology

Escalation Consultants examined the STB's 2010 Public Use Waybill Sample, a sample of carload waybills for all U.S. rail traffic submitted by rail carriers, to calculate railroad revenues and variable costs for chemical traffic. For each group of related chemical commodities, Escalation Consultants calculated the average rate for all movements with less than a 180% RVC and the average rate for all movements with

¹ RVC = Rate ÷ Railroad's variable cost for movement (example: \$2,000 rate ÷ \$1,000 variable cost = 200% RVC).

an RVC above 180%. The difference between these averages was then multiplied by the number of carloads for each commodity group with rates above a 180% RVC to calculate the total premium charged to chemical shippers. Escalation Consultants then broke out the carloads and the premium charged to chemical shippers by RVC ranges (180-240%, 241-300%, and above 300%). Exhibit 11 further details the methodology used in this analysis. To provide a baseline for comparison, chemical data from the 2005 waybill was also analyzed.

Summary of Findings

- In 2010, three-quarters of all chemical traffic that originated or terminated in the U.S. moved under rates which had RVC's greater than 180%.
- As a result, the premium charged to chemical shippers for rates which had an RVC above 180% totaled more than \$3.9 billion.
- Many chemical carloads moved at RVC ratios far above 180%, with more than half of all chemical traffic having rates above a 240% RVC and more than one-third above a 300% RVC.
- The chemical commodity most impacted is plastic resin. In 2010, plastic shippers alone paid more than a \$1 billion premium on rail rates with more than a 180% RVC.
- Shipments that originated in Canada were more likely to move under rates that had less than a 180% RVC than those that originated in the U.S. (40 percent in Canada vs. 23 percent in the U.S.), creating a competitive disadvantage for U.S. chemical producers.
- Between 2005 and 2010, chemical traffic moving under rates with more than a 180% RVC climbed from 60 percent to 75 percent.

- As a result, the premium charged to chemical shippers for rates above a 180% RVC rose dramatically, from \$2.2 billion in 2005 to \$3.9 billion in 2010 (an increase of more than 78 percent).

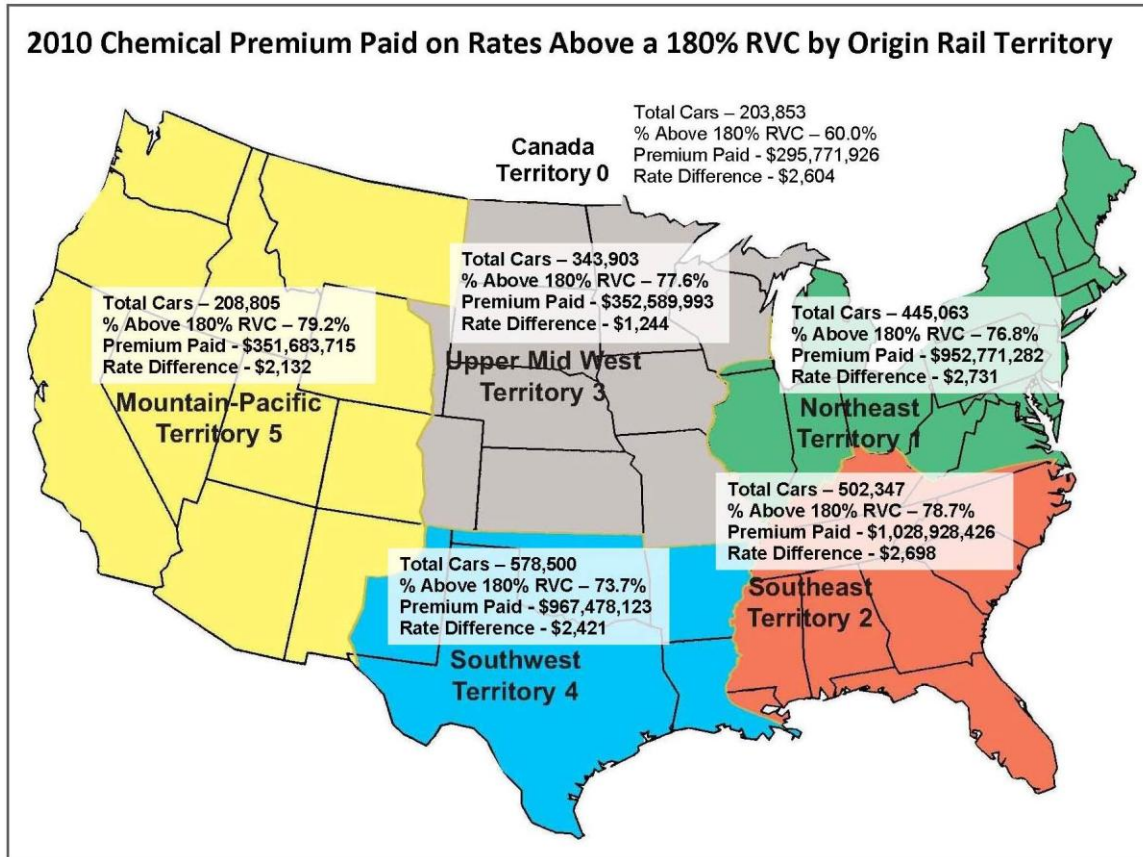
Results from Analysis

The premium for Chemical movements with rates above a 180% RVC in this study are broken out for each of the five rail territories in the U.S. as well as for rail Territory 0 (zero) which includes Canada and Mexico. Almost all chemical movements originating in Territory 0 are Canadian movements and as a result Territory 0 origins are referred to as Canadian origins in this Study. The map on page 4 shows the area for each rail territory along with the 2010 results for each territory. The map shows the:

- Total chemical carloads;
- The percentage of cars with rates above a 180% RVC;
- The premium paid on moves with rates above a 180% RVC; and,
- The difference in rates for moves with RVC's above and below 180%.

Greater detail on the breakdown of all chemical traffic is included in Exhibit 2 of the Appendix.

**The 2010 Total Premium Paid on Chemical Movements
with Rates Above a 180% RVC = \$3,949,129,465**



The Study points out some important information about the breakdown of chemical traffic. Some pertinent points for 2010 chemical traffic are as follows:

- The reason that the chemical rate premium is so large is because 75.3% of all chemical traffic in North American that originates or terminates in the U.S. moves under rates above a 180% RVC. (see Exhibit 2 of the Appendix)
- Only 60% of Canadian origins terminating in the U.S. have rates above a 180% RVC and when Canadian origins are excluded 76.8% of U.S. chemical carloads have rates above a 180% RVC. (see Exhibit 2 of the Appendix)

- Rates with more than a 180% RVC are on average 85.1% higher than rates with less than a 180% RVC (Exhibit 2 of the Appendix), but six chemicals have rates that are more than 130% greater. (see Exhibit 5 of the Appendix)
- Chlorine (Standard Transportation Commodity Code (STCC) 28128) has the biggest difference between rates above and below a 180% RVC. Chlorine rates above a 180% RVC are 262% higher than rates below the 180% RVC level. The top ten chemicals with the largest difference between rates above and below the 180% RVC level are included in Exhibit 5 of the Appendix. The breakdown for Chlorine is in Exhibit 8 of the Appendix.
- The commodity most significantly impacted by rates above the 180% RVC level is Plastics (STCC 28211). Plastic shippers pay more than a billion dollars to railroads above what their rates would be if they had rates below the 180% RVC level for their rail movements (refer to Exhibit 3 of the Appendix). The premium for rates above a 180% RVC for Plastics is very high because 358,564 carloads move under these rates and there is close to a \$3,000 difference (the sixth largest rate difference for any chemical) between rates above and below the 180% RVC level. The premium for rates above a 180% RVC for plastics is in Exhibit 7 of the Appendix.
- The geographic regions of the country where chemicals are most impacted by railroads rates above a 180% RVC are as follows: (see Exhibit 2 of the Appendix)

<u>Origin Territory</u>	<u>Origin Region</u>	<u>Rate Premium</u>	<u>Percent of Cars with RVCs Above 180%</u>
2	Southeast U.S.	\$1,028,928,426	78.7%
4	Southwest U.S.	\$967,478,123	73.7%
1	Northeast U.S.	\$952,771,282	76.8%

- Inter-switching rail regulations in Canada² give Canadian chemical plants a big advantage over U.S. plants as 40% of Canadian traffic has rates with RVC's less than 180% versus only 23.2% of U.S. Chemical moves (see Exhibit 2 of the Appendix). Canada, therefore, has almost twice the percentage of low RVC Chemical movements as the U.S. and this gives Canadian chemical rail traffic a transportation advantage over U.S. traffic.
- Canada is a major chemical production area for U.S. industries as Canada originates almost the same number of chemical carloads as the Mountain Pacific Region of the U.S. (Mt. Pacific Region 208,805 chemical carloads versus Canada 203,853 carloads) (see Exhibit 2 of the Appendix)
- Thirty-five percent (35%) is the highest percent of carloads with rates below an RVC of 180% for any commodity. The commodity with the highest percent of low RVC traffic is Miscellaneous Fertilizer Compounds (STCC 28714). Four other commodities have more than 30% of their carloads with low RVC's. Exhibit 6 of the Appendix contains the top ten chemicals with the largest percent of rail carloads moving under rates with less than 180% RVC's.

Breakdown by RVC Range

The premium for rates above a 180% RVC in this study is broken out by RVC range. This breakdown shows that more than half of all chemical traffic has more than a 240% RVC while more than a third of chemical traffic has an RVC greater than 300%. Most of the premium for rates above a 180% RVC is generated from movements with RVC's greater than 300%³ as they represent 72.9% of the \$3.9 billion

² Canada has inter-switching which allows an industry to have access to all of the railroads that serve a station if the industry is within 18 miles of the station. The Canadian Transportation Agency can prescribe an even greater distance for an interchange with another railroad to allow a plant to have rail competition.

³ An RVC greater than 300% means that the rates for the movement are more than 200% greater than the railroads variable cost of the movement. This is some of the most profitable traffic moved by rail.

premium for rates above a 180% RVC. Table 1 below shows the breakdown of Chemical carloads with RVC's above 180% and the premium paid for these movements by RVC range.

Table 1

2010 RVC Breakdown of Chemical Carloads and Costs with RVC's Greater than 180%

RVC Range	Carloads	Carload % Breakdown	Premium Paid for Moves with RVC's Above 180%	Premium % Breakdown
<180	564,459	24.7%		
180-240	523,953	23.0%	\$402,945,412	10.2%
241-299	381,722	16.7%	\$665,473,520	16.9%
>300	812,337	35.6%	\$2,880,710,533	72.9%
Total	2,282,471	100.0%	\$3,949,129,465	100.0%

Changes Between 2005 and 2010

The study also looked at movements in 2005 to determine changes that occurred to chemical movements over the five years between 2005 and 2010. This five year comparison shows that the fastest growing segment of railroads chemical traffic is in high profit movements with more than 300% RVC's. The results of this comparison are summarized in Table 2 which shows that between 2005 and 2010:

- Chemical carloads with less than a 180% RVC decreased by 29.9% while carloads with RVC's above 300% increased by 63.6%; and,
- The premium paid for traffic with rates that had more than a 300% RVC increased by 88.7%.

Table 2
**Change in Premium Paid for Chemical Rates
 Between 2005 and 2010 by RVC Range**

RVC Range	Carloads				Premium Paid for Rates with RVC's Above 180%			
	2005	2010	Change	% Chg.	2005	2010	Change	% Chg.
<180	805,730	564,459	-241,271	-29.9%				
180-240	439,305	523,953	84,648	19.3%	\$277,338,616	\$402,945,412	\$125,606,796	45.3%
241-299	287,170	381,722	94,552	32.9%	\$408,998,427	\$665,473,520	\$256,475,093	62.7%
>300	496,548	812,337	315,789	63.6%	\$1,526,824,867	\$2,880,710,533	\$1,353,885,666	88.7%
Total	2,028,753	2,282,471	253,718	12.5%	\$2,213,161,910	\$3,949,129,465	\$1,735,967,555	78.4%

These results demonstrate that the railroads rate making practice for chemicals changed dramatically between 2005 and 2010 as railroads increased rates to levels that substantially reduced the amount of traffic that moved under low RVC rates. Table 2 shows that while chemical traffic increased by 253,718 carloads between 2005 and 2010, low RVC carloads decreased by 241,271. The reason for the decrease in low RVC cars was that high RVC carloads increased by 494,989.

The commodities with the largest increase in the premium paid for rates above a 180% RVC between 2005 and 2010 are in Exhibit 10.

Exhibits to the Analysis of Freight Rail Rates for Chemical Shippers

Exhibit 2 – Premium for All Chemical Rail Rates with RVC's Above 180% (Summary for STCC 28)

Exhibits 3 - 6 in the Appendix contain the top ten chemical commodities in 2010 broken out as follows:

Exhibit 3 – Chemicals Most Impacted from Rates with RVC's Above 180%

Exhibit 4 – Chemicals with the Largest Percent of Carloads with Rates Above 180% RVC's

Exhibit 5 – Chemicals with Largest Difference Between Rates Above and Below a 180% RVC

Exhibit 6 – Chemicals with Largest Percent of Carloads with RVC's Below 180%

Exhibits 7 and 8 provide the breakdown for specific chemicals in 2010.

Exhibit 7 – Breakdown for Premium Paid on Plastic Movements (STCC 28211)

Exhibit 8 – Breakdown for Premium Paid on Chlorine Movements (STCC 28128)

Exhibit 9 and 10 show changes that occurred between 2005 and 2010

Exhibit 9 – Change in Chemical Carloads with Low and High RVC's By Territory Between 2005 and
2010

Exhibit 10 – Chemicals With the Largest Increase in Rate Premium between 2005 and 2010

Exhibit 11 provides details on the methodology for calculating the premium for Chemical rail rates with
RVC's above 180%

Appendix

Exhibit 11

Methodology for Calculating the Premium Paid to Railroads by Chemical Shippers on Movements with RVC's Above 180%

The 2010 Public Use Waybill Sample (Sample) was used to calculate the premium Chemical shippers pay to railroads for rates that have RVC's above 180%. The Sample represents 100% of all rail shipments that originate or terminate in the U.S. The Sample is a collection of railroad waybill records submitted by railroads to the Surface Transportation Board (STB); it is roughly a 3% sample of all rail movements which is then expanded to represent 100% of all rail traffic. The 2010 Sample consists of 580,928 waybills. Chemical or Allied Product shipments, excluding intermodal movements, numbered 48,973 Waybills. Escalation Consultants analyzed the 48,973 chemical records and 655 records were eliminated from the file because they were found to contain errors not detected or deemed significant by the STB¹. The 48,318 Waybills (48,973 – 655) when expanded to represent all chemical rail traffic total to 2,282,471 chemical carloads.

Movement characteristics for each chemical record were evaluated to determine the number of interchanges, car type, weight/car, rail territory of origin, destination and all relevant movement parameters so that railroad variable costs could be computed. All movements were run through the Optimized Rail Bid Evaluation (ORBE) batch processing program that can analyze the cost for thousands of movements utilizing the STB costing program, the Uniform Rail Costing System (URCS). The ORBE calculated the following for each chemical movement:

- Railroad variable cost;
- The Revenue to Variable Cost Ratio (RVC) ($RVC = \text{Revenue} \div \text{Variable Cost}$); and,
- Profit (revenue per movement less variable cost).

The ORBE then summarized and segregated all chemical movements by type of chemical and the rail territory of origin.

The Staggers Rail Act of 1980 set a legislative demarcation for captive rail rates as those rates with an RVC of 180% or greater. The 180% RVC level is referred to as the Jurisdictional Threshold, signifying the STB has no authority over tariff rates of less than 180%, therefore, movements are defined as captive if they have an RVC of 180% or greater and are considered competitive if they have an RVC of less than 180%.

The premium Chemical shippers pay to railroads is determined by calculating the average difference in the rates per car between moves with RVC's above and below 180% for each commodity in each territory and then multiplying this rate difference by the number of cars with RVC's above 180% for that commodity and territory. The sum of the rate premium amounts for all territories represents the total premium for a chemical.

The most detailed chemical commodities in the Sample are five-digit Standard Transportation Commodity Codes (five-digit STCC's). The Sample contains sixty (60) different five-digit chemical codes which represent all chemicals shipped by rail. The overall amount for chemicals (STCC 28) is the sum of the sixty (60) five-digit chemical codes.

In calculating the rate for moves with less than a 180% RVC some chemicals did not contain any low RVC movements in a rail territory and in other cases the makeup of low RVC traffic was substantially different than the makeup of high RVC traffic. In these instances low RVC rail rates were computed based on the jurisdictional threshold of 180%. In these situations the rates for low RVC traffic was

determined by multiplying the average high RVC cost per car for a commodity in a territory by 180%. This is a conservative assumption on low RVC rates as it assumes that the low RVC rates for all movements in a territory are at the absolute highest possible low RVC rate level which is 180% greater than the railroads' average variable cost of high RVC movements. The cost of high RVC movements represents the difference between low RVC and high RVC rates for a specific commodity in a territory so by establishing the low RVC rate at the highest level possible the Study minimizes the premium paid for high RVC movement when the low RVC rate is a calculated amount.

Due to the calculations reference in the preceding paragraph, the premium paid on moves with RVC's greater than 180% at the 2-digit STCC 28 level for all chemicals cannot be calculated by multiplying the rate difference for low RVC and high RVC carloads by high RVC carloads, as you can at the 5-digit STCC level. The overall premium paid on moves with RVC's greater than 180% for all chemicals at the STCC 28 level is the total of all sixty chemical commodities included on the Waybill and analyzed in this Study.

Railroads are allowed to mask contract revenue either up or down in the Sample which means that rates may be over or understated to the extent that revenue masking occurs in the Sample. To the extent that revenue masking occurs in the Sample it would apply to the rates for both high RVC and low RVC movements. The premium paid to railroads on moves with RVC's greater than 180% is calculated as the difference between average high RVC and low RVC rates and both types of movements would be impacted by revenue masking so the premium paid to railroads for chemical movements should not be materially impacted by any masking of revenue in the Sample.²

In calculating the difference in the premium paid to railroads on movements with RVC's above 180% between 2005 and 2010 the same process was followed in both years in order to make meaningful

comparisons of changes occurring in chemical traffic. The only difference in calculations were as follows:

1. 2005 URCS Cost data was used to calculate the cost for movements on the 2005 Waybill; and,
2. Miscellaneous revenue was added to the rate revenue in 2005 as some railroads reported fuel surcharge revenue differently in the 2005 Waybill.

Waybill data in the Sample have been used by shippers, consultants, railroads and various federal and state governmental agencies in a wide array of cases before the ICC (now the STB), state regulatory bodies and the courts. The premium for rates above 180% RVC calculations in the Study utilized the Public Use Waybill Sample which contains the most detailed data the STB makes available to the public on rail movements.

¹ The movements which were eliminated fell into the following categories:

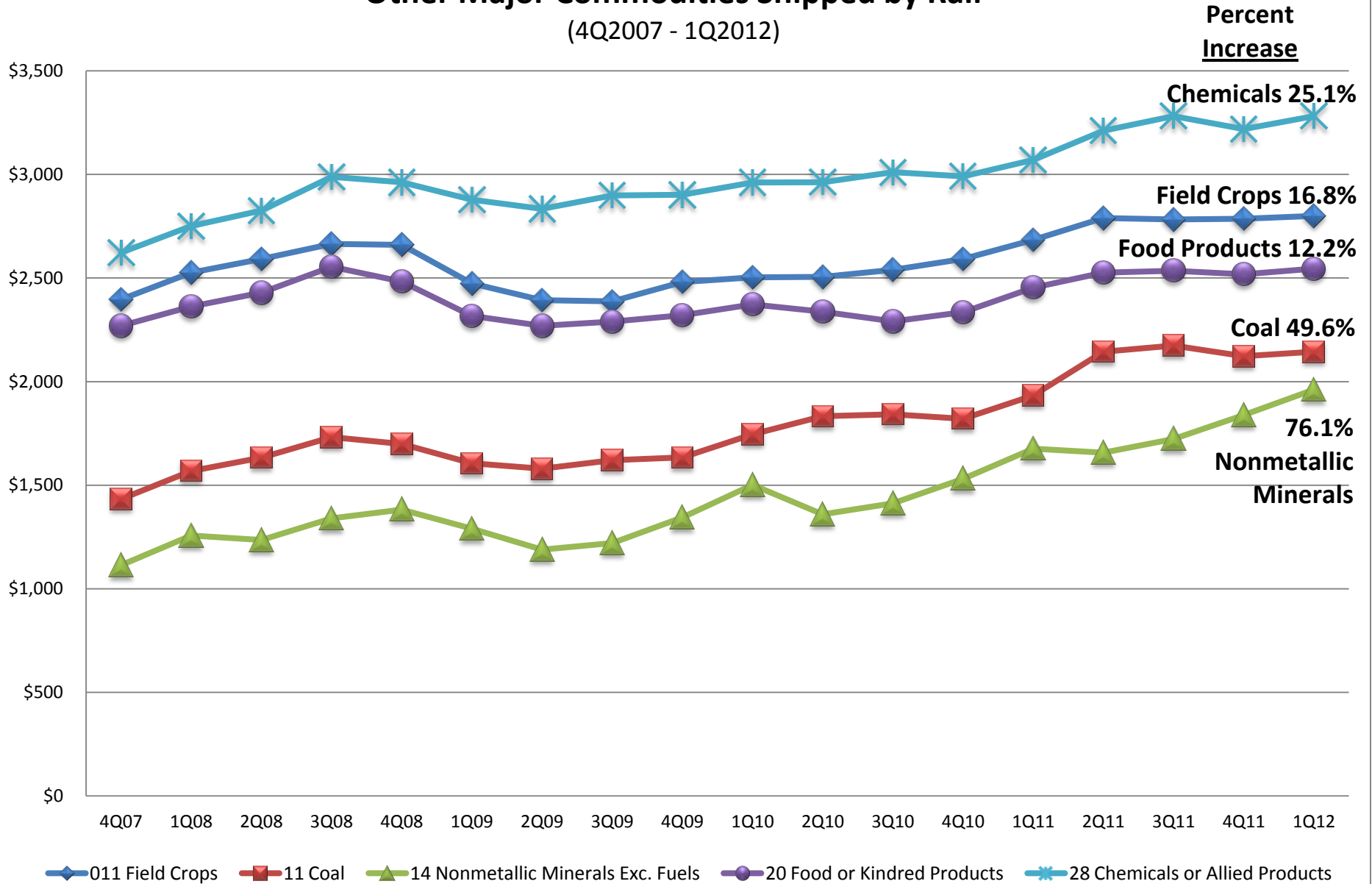
- Laden weights of 130 tons or more per car,
- Laden weights of zero tons per car,
- Rates of zero dollars per car,
- RVC levels of less than 50%,
- Rates of \$30,000 or above per car.

Gross track weight limitations are 286,000 lbs or 143 tons. The tare weight or empty weight of typical railcars range between 26 and 55 tons, adding 130 tons of laden to an empty car will exceed the 143 ton limit. Shipping zero tons, or having a rate of \$zero or \$30,000 and above per car is deemed an input error; people do not ship commodities without weight, railroads do not tend to ship commodities for free and shippers do not tend to ship commodities at rates at or in excess of \$30,000 per car. An RVC level of less than 50% is indicative of an input error in the STB's Waybill regarding the rate or the distance per movement.

² To test the accuracy of results based on different algorithms that could be used to mask rail revenue and different cost assumptions Escalation Consultants ran several iterations of the Waybill. The premium paid to railroads on moves with RVC's above 180%.

Comparison of the Average Revenue Per Car for Chemicals vs Other Major Commodities Shipped by Rail

(4Q2007 - 1Q2012)



Source: Average revenue per car is based on BNSF, CSXT, NS and UP's Quarterly Freight Commodity Statistic filings to the STB as contained in Rail Rate Checker.

Year 2010
Premium Paid for Rail Rates with RVC's Above 180% for STCC 28
 (Chemicals or Allied Products)

	Avg. Below 180% RVC		Avg. Above 180% RVC		Rate Difference	Carloads			Rate Premium
	Rate	Carloads	Rate	Carloads		Total	% Below 180% RVC	% Above 180% RVC	
Territory 0 Canada	\$3,615.70	81,532	\$6,220.40	122,321	\$2,604.70	203,853	40.0%	60.0%	\$295,677,926
Territory 1 Northeast	\$2,547.00	103,085	\$5,277.80	341,978	\$2,730.80	445,063	23.2%	76.8%	\$952,771,282
Territory 2 Southeast	\$2,349.00	106,925	\$5,047.40	395,422	\$2,698.40	502,347	21.3%	78.7%	\$1,028,928,426
Territory 3 Upper Mid West	\$2,557.20	77,158	\$3,801.40	266,745	\$1,244.20	343,903	22.4%	77.6%	\$352,589,993
Territory 4 Southwest	\$2,363.00	152,224	\$4,784.30	426,276	\$2,421.30	578,500	26.3%	73.7%	\$967,478,123
Territory 5 Mountain-Pacific	\$3,455.30	43,535	\$5,587.10	165,270	\$2,131.80	208,805	20.8%	79.2%	\$351,683,715
Average	\$2,685.70		\$4,970.00		\$2,284.30				
Total		564,459		1,718,012		2,282,471	24.7%	75.3%	\$3,949,129,465
Total US Only		482,927		1,595,691		2,078,618	23.2%	76.8%	\$3,653,451,539
% Difference					85.1%				

Chemicals Most Impacted by Rates with RVC's Above 180%
(Top Ten Chemicals)

STCC	Commodity	Rate Premium on Moves with RVC's Above 180% ⁽¹⁾
28211	Plastic Materials/Synthetic Resins	\$1,090,618,986.30
28184	Alcohols	\$485,958,255.50
28123	Sodium Compounds, exc. Sodium Alkalies	\$250,900,747.30
28128	Chlorine	\$187,695,595.80
28198	Anhydrous Ammonia	\$148,843,864.00
28125	Potassium Compounds, exc. Potassium Alkalies	\$145,251,142.20
28181	Misc. Acyclic Organic Chemical, exc. Organic Dyes	\$145,246,465.70
28186	Organic Acids or Salts, exc. Acid Dyes	\$126,115,297.50
28193	Sulphuric Acid	\$107,408,353.90
28122	Sodium Alkalies	\$106,276,883.80
	TOP TEN TOTAL	\$2,794,315,592.00
	TOTAL ALL CHEMICAL COMMODITIES	\$3,949,129,464.80

⁽¹⁾ The rate premium represents the difference between the amount chemicals shippers pay to railroads on high RVC movements above the rates on movements with RVC's less and 180%.

Chemicals with Largest Percent of Carloads with RVC's Above 180%

STCC	Commodity	Carloads Below 180%	Carloads Above 180%	Percent of Cars with RVC's Above 180%
28996	Blacks	280	16,920	98.4%
28198	Anhydrous Ammonia	848	39,480	97.9%
28128	Chlorine	2,360	38,320	94.2%
28182	Misc. Acyclic Organic Chemical, exc. Organic Dyes	1,720	21,196	92.5%
28181	Misc. Acyclic Organic Chemical, exc. Organic Dyes	10,583	69,093	86.7%
28133	Carbon Dioxide	2,320	13,840	85.6%
28713	Ammoniating Fertilizer Solution or Nitrogen Fertilizer Solution	9,664	52,131	84.4%
28151	Cyclic Intermediates Benzene/Toluene/Naphthalene/Anthracene/Pyridine	6,680	35,980	84.3%
28186	Organic Acids or Salts, exc. Acid Dyes	7,708	41,372	84.3%
28998	Misc. Chemical Compounds, exc. Sealants	2,400	11,440	82.7%

Note: Based on STCCs that have more than 10,000 carloads with RVC's above 180%.

