

TRUCK ROUTE ACCESS EVALUATION

Westvaco Corporation
Ballard County
Site #2683

Report Number KTC-99-15

“Freight Movement and Intermodal Access in Kentucky”
SPR 98-189

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1.0 Introduction

The Freight Movement and Intermodal Access in Kentucky Study (SPR 98-189), undertaken by the Kentucky Transportation Center (KTC) on behalf of the Kentucky Transportation Cabinet (KYTC), has two main objectives. These objectives include 1) the evaluation of access for trucks between intermodal or other truck generating sites and the National Highway System (NHS) and 2) furthering the understanding of freight commodity flows throughout the state. This report summarizes the access evaluation for one facility located in Ballard County in the Purchase Area Development District (ADD) and KYTC (Kentucky Transportation Cabinet) Highway District #1. The location of the site is shown in Figure 1. Work on other specific sites as well as the freight commodity flow task are on-going and are documented elsewhere.

The sites to be evaluated were selected from two existing databases (a truck facility survey from 1994 and the intermodal facility inventory) based on ADD and KYTC planner recommendations, geographic location, distance to the NHS, and the number of trucks accessing the site. Consideration was also made for the freight type handled and transportation modes used.

The facility for study is the Westvaco paper factory in Wickliffe, and the initial trip to the site revealed that there were no other significant sources of truck traffic in the vicinity. The site was visited for videotaping on April 18, 1998 and the site visit for data collection was on July 7, 1998. Early into the study process, phone surveys were conducted so that facility managers could identify the truck routes and provide insight into potential access-limiting issues. The phone survey completed on the facility, which is located in Appendix A, found that approximately 90 trucks per day (180 one-way trips) are accessing the facility. The most common size truck is a 53 foot semi-trailer.

2.0 Truck Routes in Use

There are three routes used for access to the NHS. Westvaco has truck entrances located on US 51 just south of Wickliffe. The first route (the south route) has trucks travelling south on US 51 through Ballard, Carlisle, Hickman, and Fulton Counties to the Purchase Parkway interchange north of Fulton. US 51 is in the AAA weight class, indicating that it was designed for 80,000 pound loads. Total route length is approximately 34.4 miles. There is no traffic signal control along the entire route. The south route is predominately rural in character and passes through small towns such as Bardwell and Arlington in Carlisle County and Clinton in Hickman County.

The second route (north route) has trucks proceeding north on US 51 to its intersection with US 60 in Wickliffe, at which point US 51 becomes a NHS route. US 51 then proceeds northwest and crosses the Mississippi River into Illinois. Trucks can either travel on US 51 to Illinois and then to Missouri, or they can continue north on US 60

McCracken County. US 62 then continues east to the interchange of I-24 near Paducah. Total route length is approximately 27 miles. All roads on this route are included in the AAA weight class and thus are designed for 80,000 pound loads. However, this route would be in STAA violation for 53-foot long, 102-inch wide trucks.

The average daily traffic (ADT) volumes were extracted from the HIS database for all route segments. Table 1 contains the range of ADTs (as well as the year each KYTC traffic count was conducted) for each route segment. In cases where the route segment had only one ADT listed, the value was included in the “highest” column.

Table 1: Average Daily Traffic (ADT) along Each Route

County	Road	Milepoints	Average Daily Traffic (ADT)			
			Lowest	Year	Highest	Year
North Route						
Ballard	US 51	2.0 - 3.644	5,360	1998	6,258	1994
South Route						
Ballard	US 51	0.0 - 2.0	3,512	1997	5,360	1998
Carlisle	US 51	0.0 - 12.527	2,009	1996	5,621	1993
Hickman	US 51	0.0 - 14.451	2,339	1994	7,771	1998
Fulton	US 51	0.064 - 5.472	2,606	1996	4,443	1996
Southeast Route						
Ballard	US 51	2.0 - 3.376	5,360	1998	6,258	1994
Ballard	KY 121	0.0 - 8.609	1,288	1998	4,836	1993
Carlisle	KY 121	0.0 - 9.714	1,288	1988	2,095	1996
Graves	KY 121	11.728 - 22.559	2,052	1993	7,319	1998
Alternate Route						
Ballard	US 51	2.0 - 3.376	5,360	1998	6,258	1994
Ballard	KY 121	8.269 - 8.609			4,836	1993
Ballard	KY 286	0.0 - 14.415	2,331	1994	3,304	1994
McCracken	KY 286	0.0 - 2.281	2,648	1994	3,642	1998
McCracken	US 62	3.269 - 11.837	5,055	1994	15,946	1994

3.0 Route Data Collection and Evaluation

The route features that are to be evaluated in this study are shown in Table 2 along with a brief description of the evaluation method. While some of these features required only subjective evaluation by the engineer during site inspection, others required quantitative measurement in order to label the particular point or section as “preferred”, “adequate”, or “less than adequate” for truck access. The guidelines for labeling a point or section into one of these three descriptive categories are provided in both the interim and final report for this project. In several cases, measurements were only taken where subjective evaluation indicated a problem might exist.

Table 2: Route Features and Method of Evaluation

Feature	Methodology	Team Consensus based on Committee Meeting and Draft Report Feedback	Feature Type
Offtracking	Lane Width with formula based on wheel and axle spacing	Evaluate where observation of trucks indicates possible offtracking - use HIS data and collect in field	Point
Max. Safe Speed on a Curve	Ball Bank Indicator Reading	Evaluate complete route due to ease of data collection	Point
Grade	Speed Reduction Tables with Percent Grade and Direct Observation	Evaluate where observation of trucks indicates speed reduction occurs using HIS data and collect in field as needed	Continuous
Lane Width	HIS data and field measurement	Review complete route due to ease of data collection	Continuous
Clear Zone	Observation	Subjective evaluation	Subjective
Shoulders	HIS data and field measurement	Evaluate where HIS data is available and estimate based on observation elsewhere	Continuous
Pavement Condition	Observation	Subjective evaluation	Subjective
Truck Stopping Sight Distance	Field measurements	Measure only when observation indicates possible problem	Point
Turning Radii	Field measurements and observations of trucks	Measure only when observation indicates possible problem	Point
Accident History	Accident data files and KTC High Truck Accident Report	Do for entire route	Subjective
Intersection LOS	Traffic counts	Only where problems are indicated by facility managers	Point
Route LOS	Traffic counts and travel time studies	Only where problems are indicated by managers	Continuous
RR Crossings	Field Observation	Evaluate all level crossings	Point
Bridges	KYTC Sufficiency Rating	Evaluate all bridges	Point

3.1 Traffic Operations and Level of Service

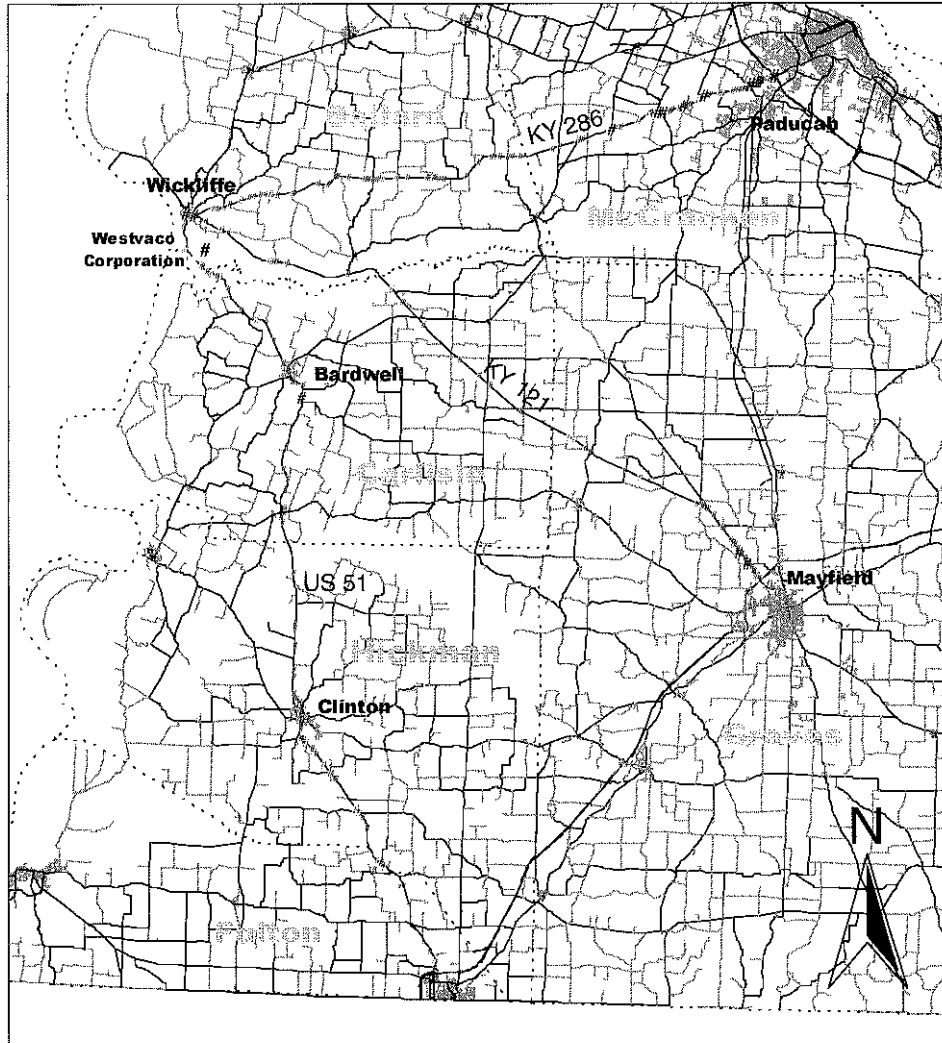
The survey of this site indicated that there were no operational problems or concerns for this site. Traffic counts and level of service calculations were only conducted in this study when phone surveys indicated possible traffic/operational concerns. Thus, the routes are assumed to operate at an acceptable level of service.

3.2 Accidents

In 1997 the Kentucky Transportation Center studied all the state-maintained roads throughout Kentucky and determined average truck accident rates for different types of road sections. A critical accident rate is then calculated using the average accident rate for a specific highway type along with an assumed level of statistical significance and exposure (vehicle miles traveled). There are no non-NHS sections of these truck routes with an accident rate higher than the critical rate for the highway type. KY 286, which was indicated in the phone survey as being preferred over US 60 (NHS route) for travel towards Paducah and I-24, had three sections (all in Ballard County) with critical rate factors greater than one. The route sections are between the following milepoints: 0.3 and 0.9, 5.9 and 6.9, and 3.3 and 4.2. The critical rate factor for all these sections is 1.04, where the critical rate factor is the ratio of the actual accident rate to the critical accident rate. This value indicates that the number of accidents involving trucks is 1.04 times the critical rate and thus is a problem.

Figure 2 shows the locations of accidents during the years 1995, 1996, and 1997. A summary of the accidents along the four truck routes (for all roads, not just state-maintained roads) is shown in Tables 3 - 6 for the same three-year period. The 40% of accidents involving trucks along the north route is higher than the 16.4% trucks found on US 51. This suggests that there are some concerns for the north route from a recent accident history point of view. The remaining routes had a higher percentage of truck traffic than truck accidents. However, the relatively high number of accidents on the alternate route (230 total and 21 involving trucks) indicates that there also concerns for this route. Perhaps part of this problem can be attributed to the 9- to 10-foot lanes found on the route.

Figure 2: Accident Locations



LEGEND

- # Facility
- Accidents: 1
- Accidents: 2-3
- # Accidents: 4-9
- # Accidents: 10-18

Scale - 1:350000

5 0 5 10 Miles



5 0 5 10 15 Kilometers



Table 3: Accident Types along North Truck Route

	<i>Non-Truck Accidents</i>	<i>Truck Accidents</i>	<i>Percent Trucks</i>
Total	6	4	40.0
Fatal Accidents	0	0	0.0
Injury	2	0	0.0
Intersection	4	2	33.3

Table 4: Accident Types along South Truck Route

	<i>Non-Truck Accidents</i>	<i>Truck Accidents</i>	<i>Percent Trucks</i>
Total	77	10	11.5
Fatal Accidents	0	0	0.0
Injury	34	4	10.5
Intersection	12	2	14.3

Table 5: Accident Types along Southeast Truck Route

	<i>Non-Truck Accidents</i>	<i>Truck Accidents</i>	<i>Percent Trucks</i>
Total	73	12	14.1
Fatal Accidents	0	2	100.0
Injury	28	5	15.2
Intersection	8	4	33.3

Table 6: Accident Types along Alternate Truck Route

	<i>Non-Truck Accidents</i>	<i>Truck Accidents</i>	<i>Percent Trucks</i>
Total	209	21	9.1
Fatal Accidents	1	1	50.0
Injury	58	7	10.8
Intersection	68	9	11.7

3.3 Cross Section Features

Figures 3 and 4 illustrate the sections of the route with different lane widths and shoulder types, respectively. Tables B1 and B2 of Appendix B contain all the roadway sections with less than “preferred” lane widths and shoulders. The majority of the roads have “adequate” 11-foot lanes or “less than adequate” 10-foot lanes. The only 9-foot lanes are found on the alternate route on US 62 and KY 286. These narrow lanes are possibly the reason why trucks from the facility are not allowed to use the route. The majority of the roads have 2- to 4-foot turf shoulders with only limited sections of 10-foot paved shoulders on the north and south routes which are “preferred”.

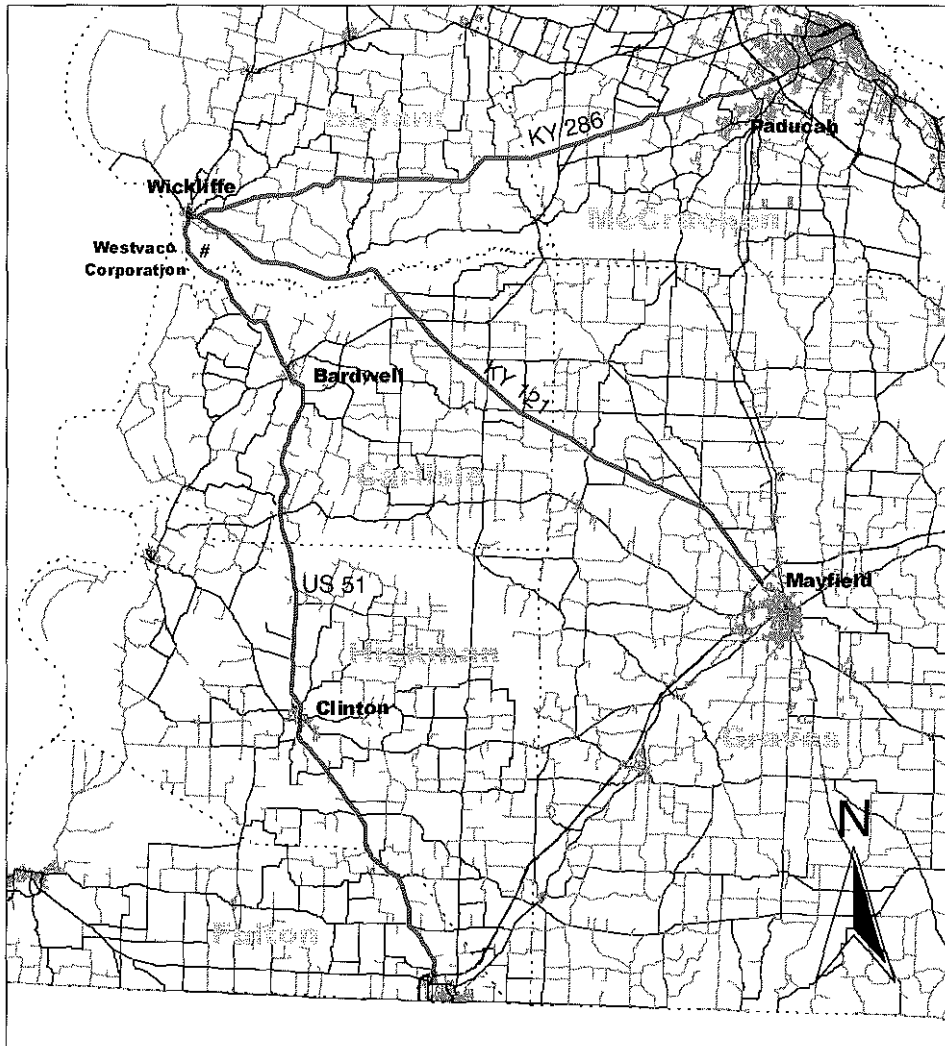
3.4 Curvature Features

Offtracking is considered a problem where a truck cannot stay in its lane through a curve. Figure 5 shows the locations of problematic sections of horizontal curvature. Table B3 of Appendix B contains all the roadway sections where offtracking is a problem given the roadway’s particular lane width and 53-foot semi-trailers.

Curve safe speed along this route was tested by the use of the ball-bank indicator. By maintaining the posted speed limits and advisory speeds through curves, the ball-bank indicator allows for the determination of whether or not the curve should be driven at indicated speeds. Figure 5 shows one curve along the south truck route that resulted in a less than “preferred” ball bank indicator reading. Located at approximately milepoint 7.3 on US 51 in the town of Bardwell, this curve resulted in a ball-bank reading greater than 10°. Given the 25 mile-per-hour advisory speed, this curve is considered “less than adequate”. The alternate route was not tested using the ball bank indicator since trucks are not allowed to use it.

One left turning radius was observed as being problematic for trucks. Figure 6 shows the intersection of US 60 and US 51 in Wickliffe. During the site visit, trucks were observed offtracking into opposing lanes in order to make the turn onto the NHS (US 51 westbound). The stop bar on eastbound US 51 has been set back from the intersection to allow trucks more space to make their left turns, but the rear wheels of some trucks were observed passing close to opposing vehicles. This turning radius is considered to be “less than adequate”.

Figure 3: Lane Widths



LEGEND

#	Facility
—	Lane Width: 9-11 Feet
—	Lane Width: 12-14 Feet
—	Lane Width: 15-19 Feet
—	Lane Width: 20-22 Feet

Scale - 1:350000

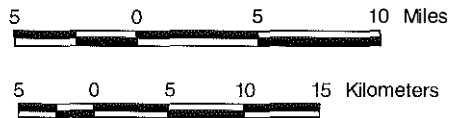
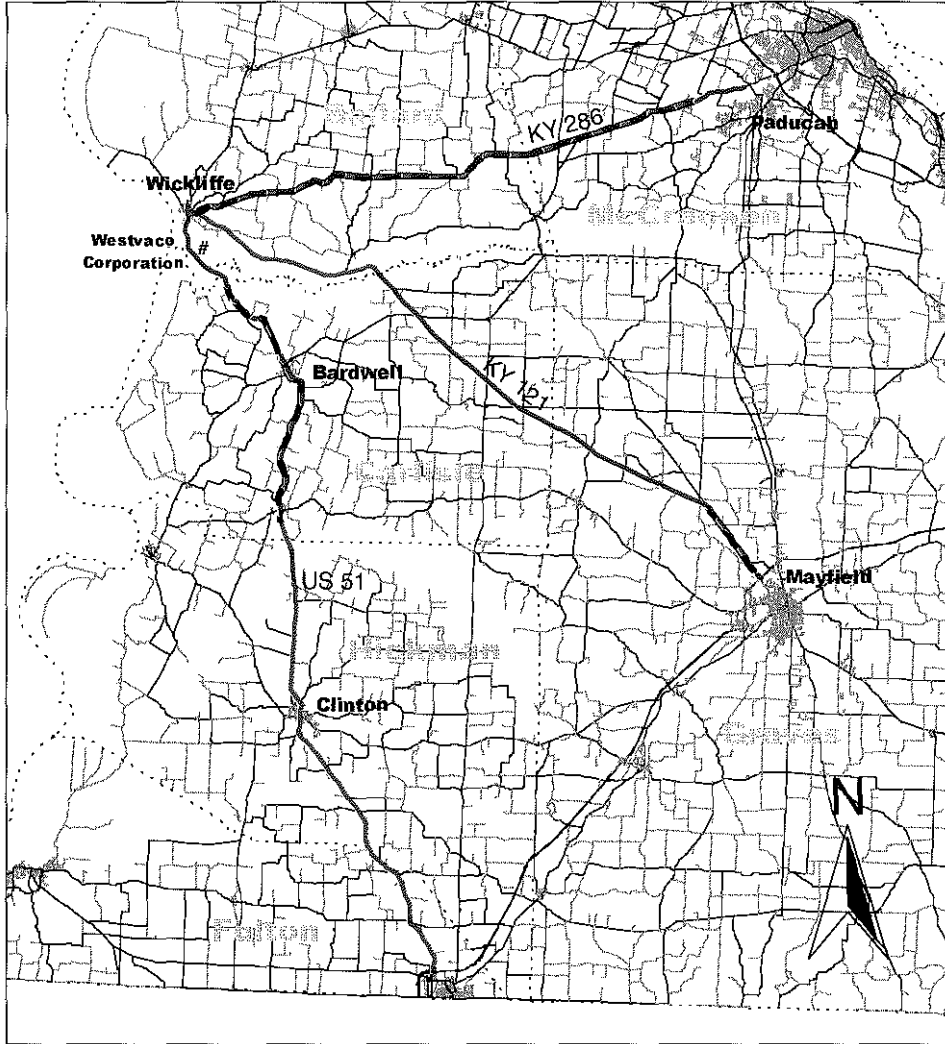


Figure 4: Shoulders



LEGEND

#	Facility
—	No Shoulder
—	Shoulder Width: 2-3 Feet
—	Shoulder Width: 4-6 Feet
—	Shoulder Width: 7-10 Feet
—	Shoulder Width: 20 Feet

Scale - 1:350000

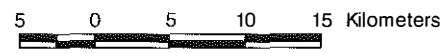
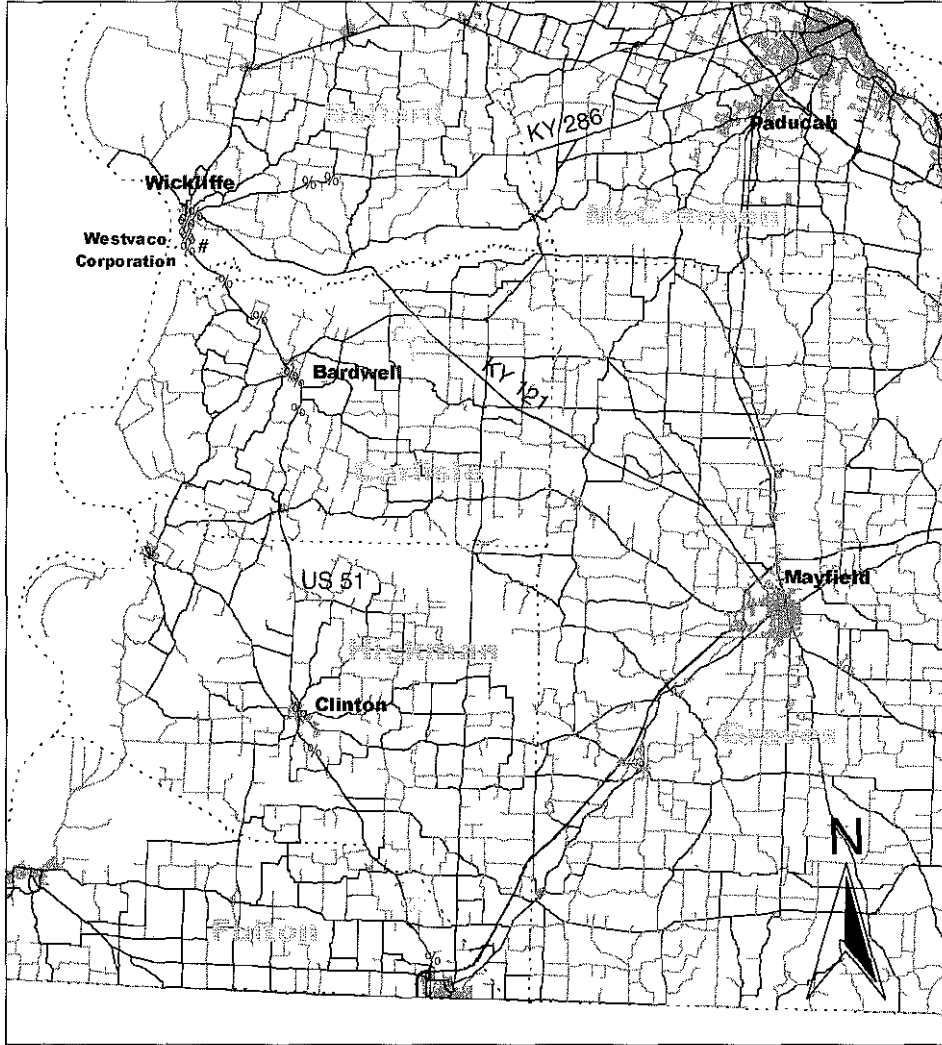


Figure 5: Curves Where Offtracking Could Occur



LEGEND

- # Facility
- % Offtracking - Adequate
- % Offtracking - Less than Adequate

Scale - 1:350000

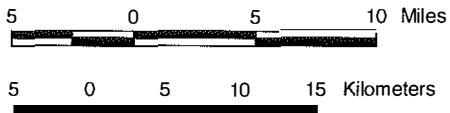


Figure 6: Intersection of US 51 and US 60 in Wickliffe



Grades are considered to be problematic if they cause trucks to slow excessively. Figure 7 shows the locations of less than “preferred” grades found along the access routes to the site. Table B4 of Appendix B contains all the roadway sections where grades are considered to be less than “preferred”. The majority of these grades are found along the south and southeast routes.

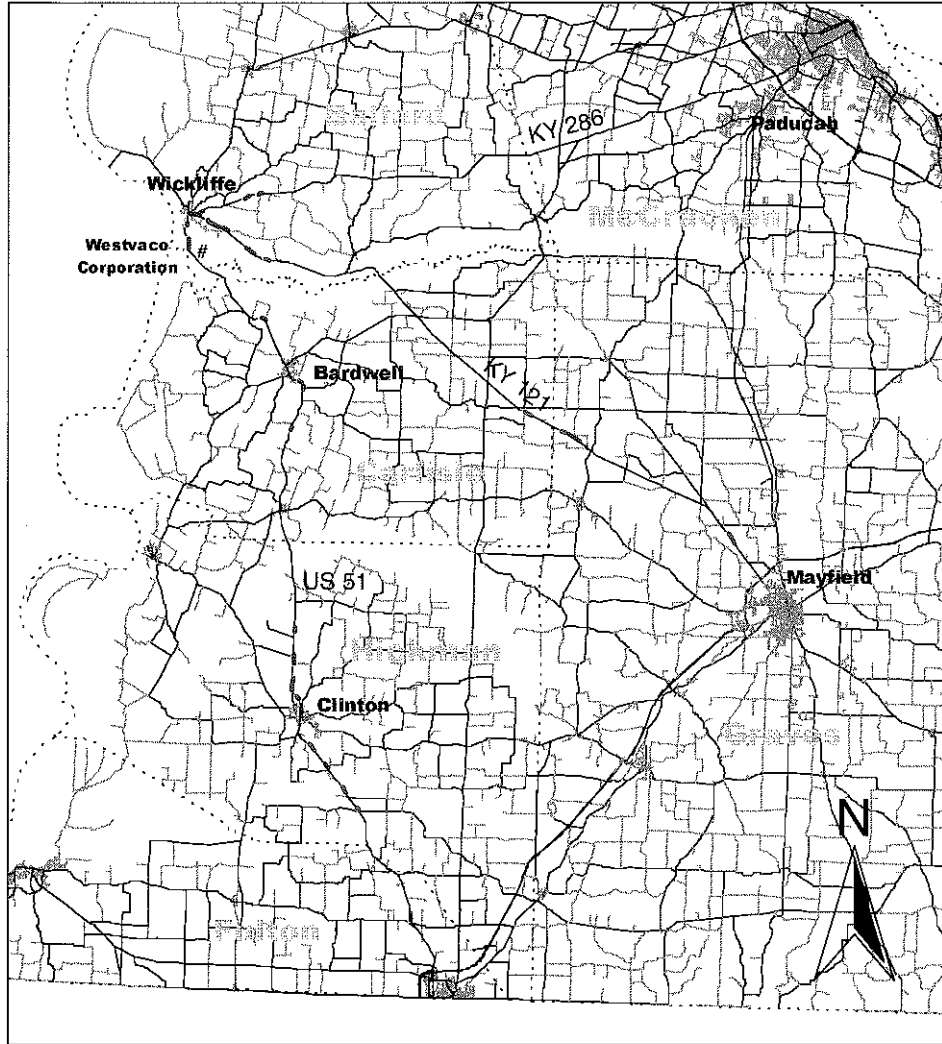
3.5 Railroad Crossings

There are no at-grade railroad crossings along these routes.

3.6 Bridges

There are numerous bridges along each route, as shown in Figures 8 and 9. The Kentucky Transportation Cabinet’s Division of Operations maintains a database of bridge sufficiency ratings that are based on the serviceability (as well as other factors) of the structure. Bridges were evaluated as “preferred”, “adequate”, or “less than adequate” using the sufficiency rating. Table B5 in the appendix contains the ratings for all the less than “preferred” bridges found along the routes.

Figure 7: Problematic Grade Locations



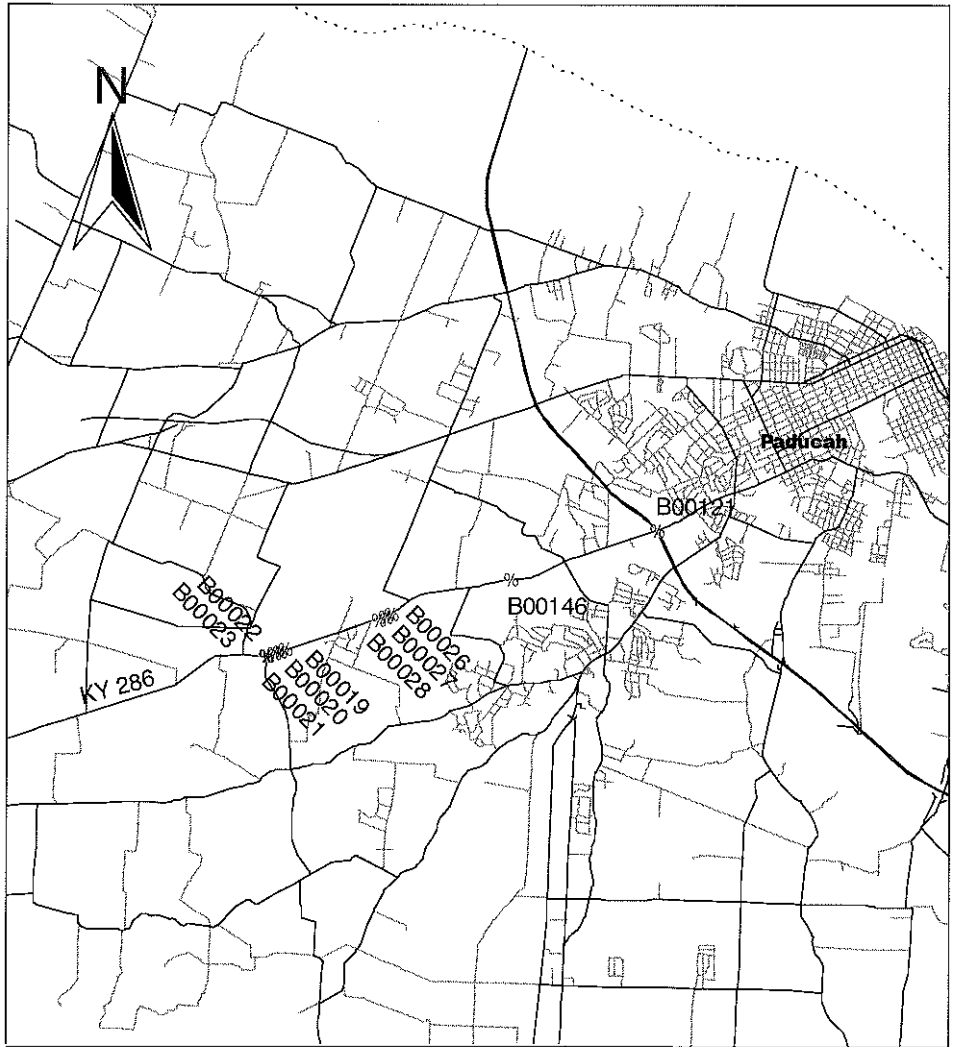
LEGEND

- # Facility
- Grade - Adequate
- Grade - Less than Adequate

Scale - 1:350000



Figure 8: Bridges along the Alternate Route



LEGEND

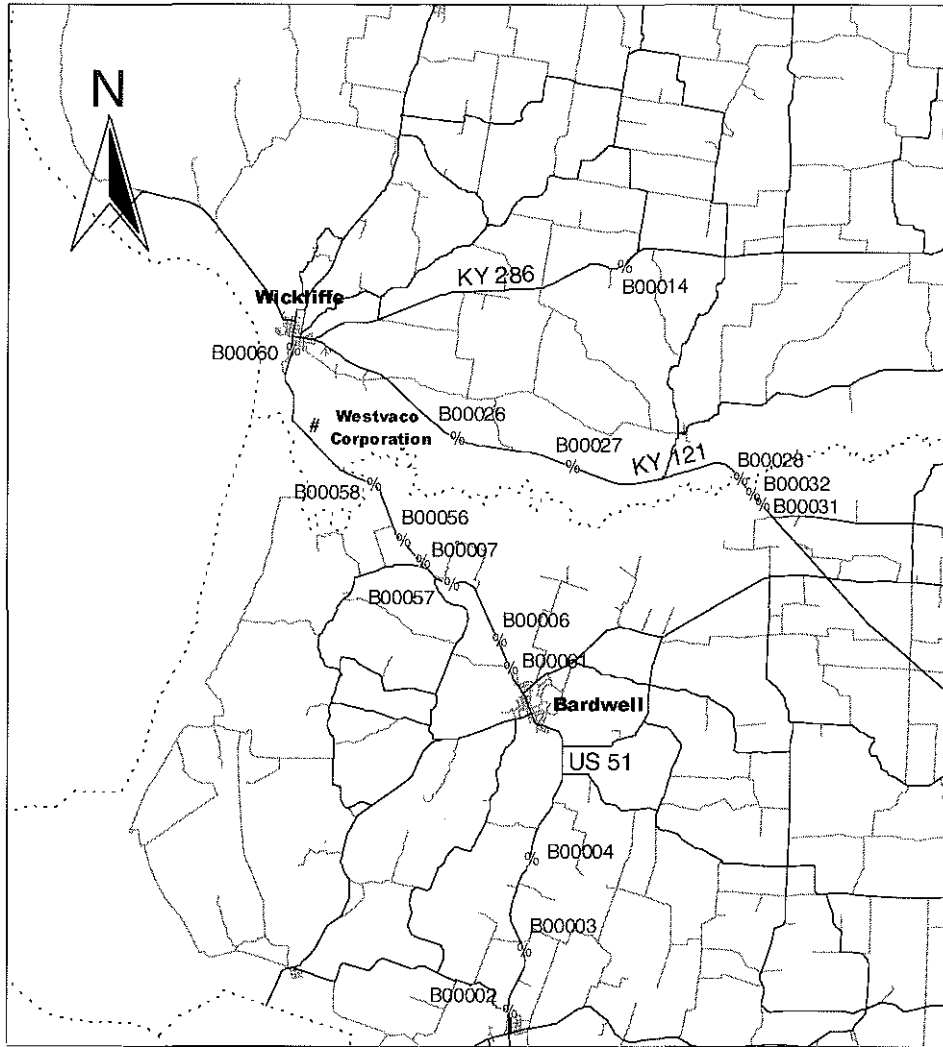
#	Facility
% B00000	Bridge Number

Scale - 1:100000

1 0 1 2 Miles

1500 0 1500 3000 Meters

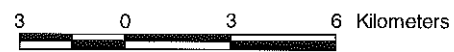
Figure 9: Bridges



LEGEND

#	Facility
% B00000	Bridge Number

Scale - 1:150000



3.7 Sight Distance

There were no problems associated with sight distance along these routes.

4.0 Complete Route Evaluation and Recommendations

4.1 Problem Truck Miles and Truck Points

In order to compare different routes to consider the relative urgency of needed route improvements, the features rated “preferred”, “adequate”, and “less than adequate” along a route are to be normalized for the number of miles, number of points, and number of trucks using the section. In the case of these Ballard County truck routes, seven features (lane width, shoulders, grades, curve safe speed, offtracking, turning radii, and bridges) that were evaluated quantitatively have points or sections that are considered only “adequate” or “less than adequate”. A section or point that is considered “less than adequate” is weighted two times that of an “adequate” point or section. Less than “preferred” sections (as opposed to points) are weighed by length as well as the number of trucks passing that point.

Table 7 contains the total problem truck miles and total problem points for lane width, shoulders, turning radii, and bridges along each route. Traffic counts for use in the calculation of problem truck-miles and truck-points were conducted for the KYTC Division of Planning in the summers of 1997 and 1998. The rating of these routes relative to others evaluated will be reported in the final report.

Table 7: Summary of Problem Truck Miles and Points for Each Route

Feature	ROUTE			
	North	South	Southeast	Alternate
Lane width Truck-miles	0	17,507.3	12,649.0	21,867.4
Shoulders Truck-miles	1,179.7	30,378.3	23,133.3	23,060.8
Grade Truck-miles	686.2	2,622.3	2,651.1	1,186.3
Curve safe speed Truck-points	0	1,460.0	0	0
Offtracking Truck-points	2,470.0	6,366.0	1,976.0	2,840.0
Turning Radii Truck-points	988.0	0	0	0
Bridges Truck-points	0	6,368.0	1,867.0	8,712.0

4.2 Maintenance Improvement Locations

One maintenance-related issue that could be addressed would be to replace the pavement edge markings along the repaved section of KY 121 on the southeast route (repaved just before the site visit). The section, beginning approximately 21.2 miles southeast of the Westvaco truck entrance, had centerlines but no edge markings.

4.3 Overall Route Rating

In order to account for both the subjectively and objectively evaluated route features along truck routes throughout the state, a panel of Kentucky Transportation Center engineers who are responsible for studying the routes associated with this project devised a scale for quantitatively scoring the route from 1 to 10. The interpretation for this scale can be seen in Table 8. The ratings for each route are shown in Table 9. The alternate route was not given a rating since trucks are not allowed to use it.

Table 8: Interpretation of the Overall Route Rating

Overall Route Rating	Qualitative Interpretation of Rating
1	Trucks should not be using this route
2	Major construction is required to improve this route
3 to 5	Minor improvements are required on this route
6 to 8	Minor improvements could improve this route
9	Minor problems exist that do not seriously impede truck access
10	Trucks are served with reasonable access

Table 9: Route Ratings

Route	Length	Rating
North	1.6 miles	7
South	33.7 miles	4
Southeast	27.4 miles	5

4.4 Conclusions and Recommendations

In conclusion, the following problems were identified along the truck access routes to Westvaco in Wickliffe:

- Significant lengths of each route with less than "preferred" lane widths and shoulders;
- Numerous less than "preferred" bridge sufficiency ratings;
- Numerous less than "preferred" grades;
- Numerous curves where offtracking may occur;
- One curve with safe speed problems (south route); and
- One problematic intersection (US 51 and US 60 in Wickliffe on the north route) with problems for left turning trucks.

The intersection of US 51 and US 60 could be improved by widening the lanes on US 51 so that trucks have more space available to turn into. In order to correct the lane width, shoulder, and curve deficiencies along these routes, complete reconstruction would be necessary. If growth in the area were to increase truck volumes, such action may be considered.

Appendices

Appendix A: Phone Survey Conducted with Facility Manager

PHONE SURVEY RESULTS

<u>Facility ID</u> 2683	<u>Facility Name</u> WESTVACO	<u>Location / City</u> WICKLIFFE	<u>County</u> BALLARD	<u>ADD</u> PURCHASE
<u>Contact Name</u> JOHN KELLER	<u>Title</u>	<u>Phone</u> 502-335-3131	<u>Fax</u> 502-335-4115	

1. Is the location of your facility on the map correct? NO
2. Our information shows about 90 trucks per day access your facility. Is that correct? *If not, fill in correct volume.*
3. Is the truck traffic to and from your facility seasonal or mostly constant? CONSTANT
4. (If truck traffic is seasonal) Is the trucks/day for the peak season?
5. What is the most common size truck operating at your facility? 53' SEMITRAILER
6. What is the largest truck operating at your facility? FLATBED
7. What type of freight or commodity is shipped, and is incoming and outgoing freight different? (one may be an empty truck) IN - TIMBER, MACHINE PARTS, ACID, RAW MATERIALS
OUT - PAPER, (CARBON PLANT - ACTIVATED CARBON), WAGNER PAPER-PADUCAH SHIPS PAPER 6-8 TRUCK/DAY
8. Does the truck traffic peak at specific times of the day? (e.g., out in the morning and return in the afternoon) AFTERNOON - OUT
9. What traffic congestion and delay problems along the routes are you aware of, or feel need improvement?
Location (route segment, intersection, etc.) NONE Time and Day of Week
10. Where do trucks at your facility go to and come from? (This may be an interstate, cities, general direction-N,S,E,W)
11. Do you have any other problems or concerns along the route you would like us to consider? I-24 TO PADUCAH - US 60 IS DESIGNATED ROUTE BUT KY 286 IS A BETTER RD. - TRUCKS NOT ALLOWED
12. Would you like a copy of the final report (roadway/route evaluation ???) YES

NOTES/COMMENTS:

Appendix B: Summary of Problem Truck Miles and Points for Each Route

Table B1: Problem Truck Miles for Lane Widths

Route	County	Highway	BEGIN_MP	END_MP	Rating	Trucks / Day	Truck-miles
North	None less than "preferred"						
South	Ballard	US 51	0.00	1.93	1	494	953.4
	Carlisle	US 51	0.00	12.53	1	730	9144.7
	Fulton	US 51	0.23	5.47	1	320	1677.4
	Hickman	US 51	0.00	6.36	2	284	3611.3
	Hickman	US 51	6.36	6.86	1	284	142.0
	Hickman	US 51	7.49	14.45	1	284	1978.3
						Total	17507.3
Southeast	Ballard	KY 121	0.00	8.27	1	258	2133.4
	Carlisle	KY 121	0.00	9.71	1	258	2506.2
	Graves	KY 121	11.93	15.17	2	577	3747.0
	Graves	KY 121	15.17	22.56	1	577	4262.3
						Total	12649.0
Alternate	Ballard	KY 286	0.00	14.42	2	288	8303.0
	McCracken	KY 286	0.00	2.28	2	404	1843.0
	McCracken	US 62	3.27	11.42	2	702	11441.2
	McCracken	US 62	11.42	11.54	2	702	164.3
	McCracken	US 62	11.54	11.70	1	702	115.8
						Total	21867.4

Table B2: Problem Truck Miles for Shoulders

Route	County	Highway	Begin_MP	End_MP	Rating	Trucks / Day	Truck-miles
North	Ballard	US 51	2.000	2.880	2	494	869.4
	Ballard	US 51	3.330	3.570	2	494	237.1
	Ballard	US 51	3.570	3.644	2	494	73.1
						Total	1179.7
South	Ballard	US 51	0.000	2.000	2	494	1976.0
	Carlisle	US 51	0.000	0.785	2	730	1146.1
	Carlisle	US 51	0.785	1.024	2	730	348.9
	Carlisle	US 51	1.259	1.448	2	730	275.9
	Carlisle	US 51	1.448	7.975	2	730	9529.4
	Carlisle	US 51	7.975	8.056	2	730	118.3
	Carlisle	US 51	8.177	9.867	2	730	2467.4
	Carlisle	US 51	9.867	10.392	2	730	766.5
	Carlisle	US 51	10.392	11.228	2	730	1220.6
	Carlisle	US 51	11.228	11.445	2	730	316.8
	Carlisle	US 51	11.445	11.985	2	730	788.4
	Carlisle	US 51	11.985	12.527	2	730	791.3
	Fulton	US 51	0.230	2.450	2	320	1420.8
	Fulton	US 51	2.750	5.472	2	320	1742.1
	Hickman	US 51	0.000	6.580	2	284	3737.4
	Hickman	US 51	6.580	7.485	2	284	514.0
	Hickman	US 51	7.485	12.800	2	284	3018.9
	Hickman	US 51	14.100	14.451	2	284	199.4
						Total	30378.3
	Southeast	Ballard	US 51	2.000	2.880	2	494
Ballard		US 51	3.330	3.570	2	494	237.1
Ballard		US 51	3.570	3.644	2	494	73.1
Ballard		KY 121	0.000	8.269	2	258	4266.8
Ballard		KY 121	8.269	8.609	2	258	175.4
Carlisle		KY 121	0.000	9.714	2	258	5012.4
Graves		KY 121	11.728	11.765	2	577	42.7
Graves		KY 121	11.765	11.835	2	577	80.8
Graves		KY 121	11.835	11.965	2	577	150.0
Graves		KY 121	11.965	12.122	2	577	181.2
Graves		KY 121	12.122	13.320	2	577	1382.5
Graves		KY 121	13.320	15.174	2	577	2139.5
Graves		KY 121	15.174	22.559	2	577	8522.3
						Total	23133.3

Figure B2 (continued): Problem Truck Miles for Shoulders

Route	County	Highway	Begin_MP	End_MP	Rating	Trucks / Day	Truck-miles
Alternate	Ballard	US 51	2.000	2.880	2	494	869.4
	Ballard	US 51	3.330	3.570	2	494	237.1
	Ballard	US 51	3.570	3.644	2	494	73.1
	Ballard	KY 121	0.000	8.269	2	258	4266.8
	Ballard	KY 121	8.269	8.609	2	258	175.4
	Ballard	KY 286	0.000	14.415	2	288	8303.0
	McCracken	KY 286	0.000	2.281	2	288	1313.9
	McCracken	US 62	3.269	8.315	2	702	7084.6
	McCracken	US 62	8.315	8.587	1	702	190.9
	McCracken	US 62	10.400	11.725	2	702	1860.3
						Total	24374.6

Table B3: Problem Truck Points for Curves

Route	County	Highway	BEGIN_MP	END_MP	Rating	Trucks / Day	Truck - Points
North	Ballard	US 51	2.378	2.473	1	494	494
	Ballard	US 51	2.486	2.645	1	494	494
	Ballard	US 51	2.954	3.049	2	494	988
	Ballard	US 51	3.087	3.201	1	494	494
						Total	2470
South	Ballard	US 51	1.923	2.037	1	494	494
	Carlisle	US 51	5.436	5.568	1	730	730
	Carlisle	US 51	6.762	6.875	1	730	730
	Carlisle	US 51	7.271	7.309	2	730	1460
	Carlisle	US 51	9.896	10.009	1	730	730
	Carlisle	US 51	12.221	12.448	1	730	730
	Fulton	US 51	0.621	0.735	1	320	320
	Fulton	US 51	3.182	3.239	1	320	320
	Hickman	US 51	5.540	5.616	2	284	568
	Hickman	US 51	7.485	7.561	1	284	284
						Total	6366
Southeast	Ballard	US 51	2.378	2.473	1	494	494
	Ballard	US 51	2.486	2.645	1	494	494
	Ballard	US 51	2.954	3.049	2	494	988
						Total	1976
Alternate	Ballard	US 51	2.378	2.473	1	494	494
	Ballard	US 51	2.486	2.645	1	494	494
	Ballard	US 51	2.954	3.049	2	494	988
	Ballard	KY 286	0.000	0.095	1	288	288
	Ballard	KY 286	4.931	5.442	1	288	288
	Ballard	KY 286	5.914	6.179	1	288	288
						Total	2840

Table B4: Problem Truck Miles for Grades

Route	County	Highway	BEGIN_MP	END_MP	Rating	Trucks / Day	Truck-miles
North	Ballard	US 51	2.92	3.03	1	494	56.3
						Total	56.3
South	Ballard	US 51	1.94	2.13	1	494	93.4
	Ballard	US 51	2.13	2.40	2	494	261.8
	Ballard	US 51	2.64	2.92	2	494	274.7
	Ballard	US 51	2.92	3.03	1	494	56.3
	Carlisle	US 51	4.57	4.68	1	730	80.3
	Carlisle	US 51	6.30	6.44	1	730	102.2
	Carlisle	US 51	6.54	6.73	2	730	275.9
	Carlisle	US 51	9.62	9.90	2	730	414.6
	Fulton	US 51	2.58	2.85	2	320	169.6
	Hickman	US 51	2.30	2.48	1	284	51.1
	Hickman	US 51	3.30	3.56	1	284	73.8
	Hickman	US 51	4.63	4.85	2	284	125.0
	Hickman	US 51	5.58	5.94	1	284	102.2
	Hickman	US 51	7.36	7.58	2	284	125.0
	Hickman	US 51	8.00	8.16	1	284	45.4
	Hickman	US 51	8.47	8.71	1	284	68.2
	Hickman	US 51	8.71	8.94	1	284	65.3
	Hickman	US 51	9.54	9.89	2	284	197.7
	Hickman	US 51	10.82	10.96	1	284	39.8
						Total	2622.3
Southeast	Ballard	US 51	1.94	2.13	1	494	93.4
	Ballard	US 51	2.13	2.40	2	494	261.8
	Ballard	US 51	2.64	2.92	2	494	274.7
	Ballard	US 51	2.92	3.03	1	494	56.3
	Ballard	KY 121	4.77	4.98	1	258	53.7
	Ballard	KY 121	5.47	5.87	2	258	206.4
	Ballard	KY 121	6.82	7.08	2	258	136.7
	Ballard	KY 121	7.24	7.54	2	258	156.3
	Ballard	KY 121	7.54	7.75	1	258	53.7
	Ballard	KY 121	8.13	8.30	2	258	87.7
	Ballard	KY 121	8.30	8.61	2	258	162.0
	Carlisle	KY 121	1.10	1.42	1	258	83.1
	Graves	KY 121	13.52	13.74	1	577	131.0
	Graves	KY 121	13.74	13.95	1	577	120.0
	Graves	KY 121	21.35	21.67	2	577	370.4
	Graves	KY 121	21.67	21.90	2	577	262.0
	Graves	KY 121	21.99	22.24	1	577	141.9
						Total	2651.1

Table B4 (continued): Problem Truck Miles for Grades

Route	County	Highway	BEGIN_MP	END_MP	Rating	Trucks / Day	Truck- miles
Alternate	Ballard	US 51	1.94	2.13	1	494	93.4
	Ballard	US 51	2.13	2.40	2	494	261.8
	Ballard	US 51	2.64	2.92	2	494	274.7
	Ballard	US 51	2.92	3.03	1	494	56.3
	Ballard	004 KY-121	8.30	8.61	2	258	162.0
	Ballard	004 KY-286	0.02	0.25	2	288	130.8
	Ballard	004 KY-286	2.09	2.30	2	288	119.8
	Ballard	004 KY-286	2.70	2.85	2	288	87.6
						Total	1186.3

Table B5: Problem Truck Points for Bridges

Route	County	Highway	Milepoint	Bridge Number	Rating	Trucks / Day	Truck - Points
North	None less than "preferred"						
South	Carlisle	US 51	1.58	B00002	1	730	730
	Carlisle	US 51	2.67	B00003	2	730	1460
	Carlisle	US 51	4.31	B00004	1	730	730
	Carlisle	US 51	8.66	B00006	1	730	730
	Carlisle	US 51	10.86	B00007	1	730	730
	Hickman	US 51	1.61	B00029	2	284	568
	Hickman	US 51	7.16	B00075	1	284	284
	Hickman	US 51	9.09	B00001	2	284	568
	Hickman	US 51	11.12	B00002	2	284	568
							Total
Southeast	Ballard	KY 121	0.00	B00028	1	258	258
	Ballard	KY 121	3.15	B00027	1	258	258
	Ballard	KY 121	5.27	B00026	1	258	258
	Carlisle	KY 121	9.13	B00031	1	258	258
	Carlisle	KY 121	9.38	B00032	1	258	258
	Graves	KY 121	20.19	B00112	1	577	577
							Total
Alternate	Ballard	KY 286	5.75	B00014	1	288	288
	McCracken	US 62	6.96	B00023	2	702	1404
	McCracken	US 62	6.99	B00022	2	702	1404
	McCracken	US 62	7.06	B00021	2	702	1404
	McCracken	US 62	7.13	B00020	2	702	1404
	McCracken	US 62	7.21	B00019	2	702	1404
	McCracken	US 62	8.45	B00027	1	702	702
	McCracken	US 62	8.53	B00026	1	702	702
							Total