

# ESAL CALCULATOR



ESAL forecasts are primarily used to determine pavement thickness for road construction and rehabilitation projects.

Data Source: Six Year Plan & PNS

Data Source: HIS & EXOR

Data Source: SPAC Corridor Studies & Traffic Forecasting Database

Data Source: Portable Traffic Recorder Reports

Data Source: CTS Counts Database

Before making entries, save this shell to your own hard-drive under a different file name. Gather all pertinent source materials such as special counts, previous forecasts, copies of station and count maps, TVS and PTR printouts, classification count printouts, and coal-haul data.

Make direct entries in columns F and N. (Blue-shaded cells. Caution: yellow-shaded cells contain formulas and can be overwritten!)

## IDENTIFICATION / BACKGROUND

Your Name and Initials (XX)  
MARS No.  
Item No.  
Our Forecast Number  
Requestor  
Priority (Low/Medium/High)  
Project Description

Nathan Wilkinson  
NTW  
80226 01 D  
2-180.00  
07.056  
District 2 Design

KY 911 Major Widening from US 41-A to just east of KY 115  
Build  
KY 911 from MP 0.000 to MP 1.830  
10/02/07  
02/01/08  
Christian

KY 911  
Thompsonville Lane  
5  
2  
17  
0.000  
1.830

99.050, 03.069, 04.050  
2008  
2030  
2010

024203, 024F02  
0.1, 1.0  
G

Volume Source -- ADT Growth Rate, station Milepoint  
Do you want to enter a Future ADT (F) or a Growth Rate (G)?

Enter Future ADT (F)  
Current Year ADT  
Design Year ADT  
Other Design Year(s)  
Construction Year

2008 10000  
2009 20000  
2010 3.20%  
2008 9600  
2009 3.50%  
2030 20000  
ADT 9600  
ADT 20000  
Growth Rate 3.50%

Enter ADT Growth Rate for years 20-40  
Other Growth Rates for years 20-40  
Non-Coal Trucks  
Non-Coal Trucks Axles/Truck  
Non-Coal Trucks EALS/Axle

3.50%  
2.50%  
1.30%  
2.00%

Christian ESAL.xls

4:47 PM, 2/25/2008

DHV Entries  
Station  
High Hourly Count  
Days Total  
K-factor - with 2% added  
High Hourly Count  
Days Total  
K-factor - with 2% added  
Func. Class Avg. K-factor  
K-factor Source  
Forecaster's adjusted K-factor

Peak Hour Factor  
High 15 minute count  
High Hourly Count  
Calculated Peak Hour Factor

ATR Data Parameters  
PHF Source  
ATR #  
Related ATR# Route  
Related ATR# K-factor  
PHF for Related ATR  
Peak Hour Factor You Want to Use

Turning Movements  
T/M program used? (Y/N)  
DHV Directional Factor

CLASSIFICATION DATA  
Source - % Trucks  
Source - Axles per Truck  
Source - EALS/Axle  
Source - Growth Rate  
Source - Coal Trucks

Number of Coal Trucks per Veh. Cts. Cnt.  
Coal Tonnage  
Number of Coal Trucks per Day

Percent Trucks  
Truck percentage from available source  
Selected Truck % this road segment  
Growth Rate  
Truck Percent (DHV) this road segment  
Enter Truck Growth Rate for years 20-40

Non-coal Trucks  
Source Axles / Truck  
Axles/Truck (AT)  
Growth Rate (GR)  
EALS/Axle (EALS/A)  
Growth Rate (GR)

Coal Trucks  
Axles/Truck (A/CT)  
Growth Rate (GR)  
EALS/Axle (EALS/CA)  
Growth Rate (GR)

TF Shipped on:

Million EALS:

024203, 024F02  
823  
9207  
9.9%  
774  
9542  
9.5%  
11.2%  
024203, 024F02  
9.90%

2030 DHV= 2000

If PHF needed enter high 15 min enter high hour #VALUE!

ATR Data  
45  
CS 1577  
10.1%  
0.94  
0.94

Y  
0.55

024203, 024F02  
0.1, 1.0  
024203, 024F02  
2006 Aggregated ESALS  
2006 Aggregated ESALS  
2006 COALSEG

0  
0  
0

4.6%  
4.6%  
2.500%  
5.4%  
3%

024203, 024F02  
3.007  
1.300%  
0.152  
2.0%

4.466  
0.000%  
2.700  
0.000%  
01/30/08  
2.7

10:46 AM, 2/25/2008

## 2006 Aggregated ESALS:

	T%	GR	A/T	GR	EALS/A	GR	A/CT	GR	EALS/CA	GR	ADT	GR
1	31.1%	1.6%	4.5	0.1%	0.29	2.0%	4.64	0.0%	0.88	0.0%	41,900	3.1%
2	14.4%	2.0%	3.6	0.5%	0.26	1.6%	5.12	0.0%	3.30	0.0%	10,700	2.7%
6	14.4%	2.0%	3.6	0.5%	0.26	1.6%	5.12	0.0%	3.30	0.0%	3,800	2.6%
7	10.4%	2.0%	3.1	0.8%	0.25	1.6%	4.36	0.0%	2.70	0.0%	2,500	1.6%
8	10.4%	2.0%	3.1	0.8%	0.25	1.6%	4.36	0.0%	2.70	0.0%	1,600	1.3%
9	10.4%	2.0%	3.1	0.8%	0.25	1.6%	4.36	0.0%	2.70	0.0%	2,900	1.3%
11	16.2%	2.5%	4.2	0.9%	0.27	2.0%	4.78	0.0%	0.88	0.0%	63,800	2.9%
12	9.5%	2.5%	3.6	1.5%	0.30	2.0%	4.34	0.0%	3.43	0.0%	32,400	2.2%
14	9.5%	2.5%	3.6	1.5%	0.30	2.0%	4.34	0.0%	3.43	0.0%	24,700	1.9%
16	8.6%	2.5%	3.0	1.3%	0.15	2.0%	4.47	0.0%	2.70	0.0%	12,100	0.9%
17	8.6%	2.5%	3.0	1.3%	0.15	2.0%	4.47	0.0%	2.70	0.0%	11,800	1.5%
19	8.6%	2.5%	3.0	1.3%	0.15	2.0%	4.47	0.0%	2.70	0.0%	11,800	1.5%

Note: The physical size of coal trucks is not expected to increase.

## Functional Classes:

- 1 1 - Rural Interstate
- 2 2 - Rural Principal Arterial
- 6 6 - Rural Minor Arterial
- 7 7 - Rural Major Collector
- 8 8 - Rural Minor Collector
- 9 9 - Rural Local
- 11 11 - Urban Interstate
- 12 12 - Urban Freeway or Expressway
- 14 14 - Urban Principal Arterial
- 16 16 - Urban Minor Arterial
- 17 17 - Urban Collector
- 19 19 - Urban Local

## Lane Distribution Factors:

- lane, 1 way 1.000
- or 3 lane, 2 way 0.500
- or 5 lane, 2 way 0.476
- lane, 1 way 0.350
- 5 lane, 1 way 0.300
- 6 lane, 2 way 0.404
- 6 lane, 1 way 0.250
- > 6 lane, 2 way 0.343
- > 6 lane, 1 way 0.300

Data Source: ATR Stations With Classification Data

Data Source: ATR Stations With Weigh in Motion Data



One coal truck has the same approximate impact on a road as 2,500 passenger cars.

## Segment 4 of US 641: KY 3169 to Fredonia Quarry Road (No-Build)

Year	ADT	Car %	Truck %	Cars	Trucks	CT%	AX/T	ESAL/AX	AX/CT	ESAL/CA	LD%	ESALS
2010	2,900	81.0%	19.0%	2,349	551	0.51%	3.87	0.27	5.123	3.3	0.500	116,462
2011	3,010	80.6%	19.4%	2,427	583	0.48%	3.89	0.28	5.123	3.3	0.500	125,105
2012	3,125	80.2%	19.8%	2,507	618	0.46%	3.91	0.28	5.123	3.3	0.500	134,444
2013	3,243	79.8%	20.2%	2,589	654	0.43%	3.93	0.29	5.123	3.3	0.500	144,535
2014	3,367	79.4%	20.6%	2,674	692	0.41%	3.95	0.29	5.123	3.3	0.500	155,436
2015	3,494	79.0%	21.0%	2,761	733	0.39%	3.97	0.30	5.123	3.3	0.500	167,221
2016	3,627	78.6%	21.4%	2,851	776	0.36%	3.99	0.30	5.123	3.3	0.500	179,952
2017	3,765	78.2%	21.8%	2,943	822	0.34%	4.00	0.30	5.123	3.3	0.500	193,710
2018	3,908	77.7%	22.3%	3,038	870	0.33%	4.02	0.31	5.123	3.3	0.500	208,576
2019	4,057	77.3%	22.7%	3,136	921	0.31%	4.04	0.31	5.123	3.3	0.500	224,640
2020	4,211	76.8%	23.2%	3,236	975	0.29%	4.06	0.32	5.123	3.3	0.500	241,998
2021	4,371	76.4%	23.6%	3,338	1,033	0.27%	4.08	0.32	5.123	3.3	0.500	260,757
2022	4,537	75.9%	24.1%	3,444	1,093	0.26%	4.10	0.33	5.123	3.3	0.500	281,028
2023	4,709	75.4%	24.6%	3,552	1,157	0.24%	4.12	0.34	5.123	3.3	0.500	302,934
2024	4,888	74.9%	25.1%	3,663	1,226	0.23%	4.14	0.34	5.123	3.3	0.500	326,608
2025	5,074	74.4%	25.6%	3,777	1,298	0.22%	4.16	0.35	5.123	3.3	0.500	352,197
2026	5,267	73.9%	26.1%	3,893	1,374	0.21%	4.18	0.35	5.123	3.3	0.500	379,832
2027	5,467	73.4%	26.6%	4,013	1,454	0.19%	4.20	0.36	5.123	3.3	0.500	409,707
2028	5,675	72.9%	27.1%	4,135	1,540	0.18%	4.22	0.36	5.123	3.3	0.500	441,993
2029	5,890	72.3%	27.7%	4,260	1,630	0.17%	4.24	0.37	5.123	3.3	0.500	476,883
2030	6,114	71.8%	28.2%	4,388	1,726	0.16%	4.26	0.37	5.123	3.3	0.500	514,569

Note: Truck % increases annually while Car % decreases. According to count data, truck volumes are growing faster than car volumes.

Note: The percentage of overall traffic comprised by coal trucks decreases annually because coal is a non-renewable resource.



According to research, truck traffic is increasing at a rate 2-3 times as fast as passenger cars.