

**Appendix M**  
**Derivation of AADT and AAWT Factors**



### Derivation of AADT and AAWT Factors

Factors are required to convert the peak hour and inter peak flows to Average Annual Daily Traffic (AADT) and Average Annual Weekday Traffic (AAWT) for the purposes of highway design, appraisal and accident analysis. These factors were derived from traffic count data that was collected at numerous locations during the survey period.

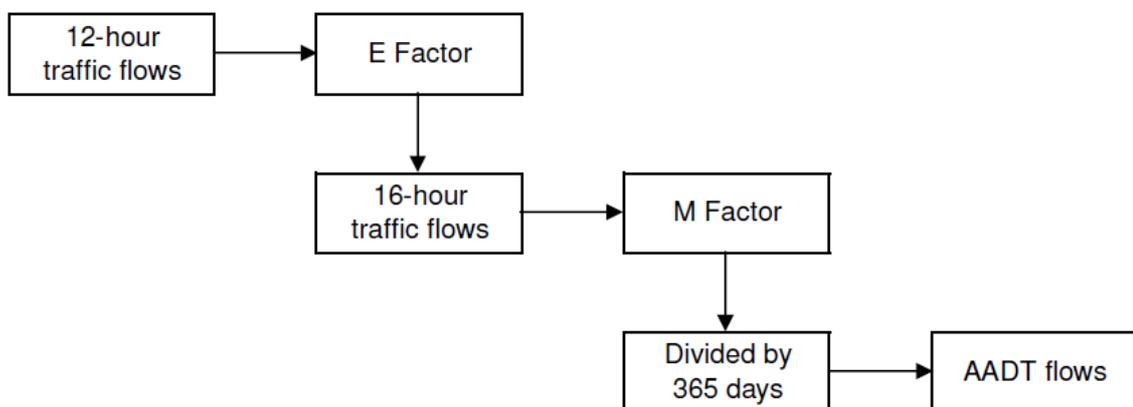
According to DMRB Volume 13, Section 1, “Traffic Flow Input to COBA” (COBA manual), there are two types of variations of traffic that need to be taken into account when converting weekday peak hour flows to AADT and AAWT flow, as below:

- The variation of total hourly flow throughout the year; and
- The variation in vehicle type composition in each hour.

The variation of traffic that occurs throughout the year can be represented by the Seasonality Index, which is subsequently used to derive M factor. The Seasonality Index is defined as the ratio of the average August weekday flow to the average weekday flow in the neutral months (April, May, June, September and October – excluding Bank holidays). The variation in vehicle type composition is not applicable for this study as the forecast flows were in Cars, LGVs, and HGVs.

The COBA manual describes the method of obtaining the AADT flows from four sources of input data, 12-hour (07:00-19:00) weekday flows, 16-hour (06:00-22:00) weekday flows in a neutral month, Annual Average Daily Traffic (AADT), and Annual Average Hourly Traffic (AAHT). As the forecast models covered the AM Peak, Inter Peak, and PM Peak weekday traffic in a neutral month, the average 12-hour weekday flows in a neutral month were used as the inputs to compute the AADT flows. The process of obtaining the AADT flows was extracted from “Figure 9/1 – Calculation of AAHT Flows by Group”, COBA manual, as presented in Figure M.1 below.

**Figure M.1: Process of Deriving AADT Flows**



Where:

12-hour weekday flows (07:00-19:00) were obtained from AM peak, Inter peak and PM peak weekday flows with factors to convert from one-hour flows to three-hour flows for the AM peak and PM peak.

E factor is used to convert from 12-hour weekday flows to 16-hour (06:00-22:00) weekday flows. The COBA manual provides the default value of 1.15. Data observed from ATC during the survey period for the study area showed a factor of 1.167.

M factor is used to convert from 16-hour weekday flows to annual flows, which covers the Off-peak and weekend periods. The M factor is calculated by the following formula:  $M = a + (b \times SI)$  where a, b are parameters which vary over months in a year (provided in "Table 9/2 - Variation of M-Factor with Seasonality Index", COBA Manual), and SI is the Seasonality Index.

The first stage of this process involved expanding the peak hour flows into 12-hour weekday flows. This was achieved by using the factors that were obtained from the analysis of the ATC data collected over a period of 5 weeks (12th May to 15th June 2008). The process of expanding from peak hour modelled flows to 12-hour traffic flows is described below using the formula:

$$12\text{-hour Flow} = (F1 * \text{AM Hourly Flow} + 6 * \text{IP Hourly Flow} + F2 * \text{PM Hourly Flow})$$

Where:

F1 = observed AM Period flow (07:00-10:00) / observed AM Peak Hour flow (08:00-09:00), [F1 = 2.602];

F2 = observed PM Period flow (16:00-19:00) / observed PM Peak Hour flow (17:00-18:00), [F2 = 2.728];

For the Inter peak period the factor was assumed to be equal to 6 since an average of the six hours consisting the Inter peak period has been modelled.

Once the 12-hour flows had been established, further adjustments were needed in order to convert to AADT and AAWT levels.

AAWT flows are required for air quality assessment and to calculate accident benefits and are calculated over a 24-hour period. The factors were calculated as part of the traffic count data analysis. The formula that was used to derive the AADT flows from the 12 hour flows is as follows:

$$\text{AADT 24-Hour Flow} = (12\text{-hour Flow}) * F3 * F4$$

Where:

F3 = observed 24-hour average weekday flows / observed 12-hour (07:00-19:00) average weekday flows, [F3 = 1.231];

$F4 = \text{observed average 24-hour 7-day flows} / \text{observed average 24-hour average 5-day flows}$ , [ $F4 = 0.947$ ].

The overall factor to convert from 12-hour weekday flows to AADT 24-hour flows is therefore equal to  $F3 * F4 = 1.231 * 0.947 = 1.167$ .

The calculation of AADT was also carried out by applying the COBA method, in which an E factor was obtained from the local ATC data, [E factor = 1.167], and an M factor was calculated by applying the formula  $M = a + (b \times SI)$  with a, b as given for the period of May and June (during the survey period). As currently there is no local data to calculate the Seasonality Index, therefore Seasonality Index, it was assumed to vary from 0.95 to 1.50 as described in the COBA manual.

An M factor calculated from the above formula was then multiplied by the E factor and divided by 365 days to convert from 12-hour weekday flows to AADT flow. Table M.1 below shows the conversion factors with the Seasonality Index varying from 0.95 to 1.50.

**Table M.1: Conversion Factor with Variation of Seasonality Index**

Month	E factor	M factor		Conversion Factor			
		a	b	SI = 0.95	SI = 1.00	SI = 1.25	SI = 1.50
May	1.167	316	33	1.111	1.116	1.142	1.169
June	1.167	408	-57	1.131	1.122	1.077	1.031

As can be seen from Table M.1, the COBA-based conversion factors to convert from 12-hour weekday flows to AADT flows vary from 1.031 to 1.169 as compared to the overall factor of 1.167 as calculated from observed ATC data. The factor of 1.167 is more representative for the study area as it does take into account the locality of traffic within the study area, therefore the factor of 1.167 was used for the purpose of computation of the AADT flows for the study.

AAWT 18-hour factors were calculated as part of the data analysis for the 18-hour period between 06:00-24:00. Flows expressed in terms of AAWT 18-hours are required for the purpose of Traffic Noise assessment calculations. The formula used to derive the AAWT flows from 12-hour flows is as follows:

$$\text{AAWT 18-Hour Flow} = (\text{12-hour Flow}) * F5$$

Where:

$F5 = \text{observed average 18-hour (06:00-24:00) weekday flow} / \text{observed 12-hour (07:00-19:00) weekday flow}$ , [ $F5 = 1.202$ ].