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The effects of automated road safety cameras on speed and road safety

- Road safety cameras installed during 2006

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Foreword

This study has been carried out on behalf of the Swedish Road Administration (SRA) with the objective of evaluating the more modern generation of Automated Road Safety Cameras (in Sweden called ATK) with regard to its effects on speed and road safety.

Earlier knowledge was based on data from a small number of road sections with ATK.

This report has been compiled by the SRA in close collaboration with the Swedish Road and Transport Research Institute VTI and Vectura. VTI has analysed accident data while Vectura carried out speed measurements which were compiled and analysed. The following people have taken part in this work: Håkan Gelin, Anna Aronsson and Magnus Lindholm from the SRA, Ulf Brüde, Jörgen Larsson and Anna Vadeby from VTI, and Maria Varedian, Joakim Sundén, Jörgen Andersson and Mohsen Towliat from Vectura (formerly the SRA Consulting Services).

Borlänge, February 2009

Håkan Gelin

GLOSSARY

Term	Explanation
AADT	Annual average daily traffic
Argus I	Old ATK system used between 1996 and 2005
Argus II	New ATK system used from 2006 onwards
ATK	Automated Road Safety Camera system incl. functions for measuring, communication and investigation
F	Fatalities
F rate	Number of fatalities per one million axle pairs kilometer
FSI	Fatalities and severe injuries
FSI rate	Fatalities and severe injuries per one million axle pairs kilometre
STRADA	Injury data from VV accident database
Vectura	Vectura Consulting AB, formerly Vägverket Konsult
VTI	Swedish Road and Transport Research Institute

Summary

The purpose of this report is to present evaluations of Automated Road Safety Camera system Control with regard to

- The effects on speed. This project was performed by Vectura.
- The effects on road safety. This project was performed by VTI.

In order to evaluate what effect ATK has on speed, speed measurements were made using pneumatic tube sensors at about 80 of the 350 cameras installed on completely new stretches of road during 2006. A further 100 locations were also measured, about 50 of which are sited between cameras. Measurements were made during one week before installation and during another week one year later.

The evaluation shows that the greatest reduction in speed occurred at the road safety cameras, but that speed also dropped between cameras, although to a smaller extent. The cameras had the greatest effect where the speed limit is 70 km/h, and a slightly lesser effect where the limit is 90 km/h. The cameras had a greater effect on the behaviour of car drivers than on the behaviour of lorry drivers. The average speed decreased by approximately 4.3 per cent taken over all the road sections and all speed limits. The proportion of drivers who exceed the speed limit decreased by approximately 34,5 per cent. It can also be seen that those who had driven fastest were influenced the most to reduce their speed. The average speed before installation also has a considerable influence on the extent of the speed reduction. The cameras have had the greatest effect where speeds had been highest.

In order to evaluate how accidents have been affected by cameras installed during 2006, both on completely new sections and sections where the old cameras had been replaced, the number of fatalities (F) and the number of fatalities and severe injuries (FSI) in 2007 were analysed by both before-after and with-without studies.

The results indicate that ATK reduces the number of fatalities by about 20-30 per cent and the number of FSI by about 20 per cent. These results are not in all cases statistically verified, the explanation for which is that the statistical accident data is still very small in extent. Using calculations with the power model, the injury results appear to represent a reduction in average speed over all the ATK sections by about 5 per cent.

In view of the number of ATK sections that had been installed by the end of 2006, a total of about 1 770 km, it is estimated that the number of lives saved annually (based on a 30 per cent reduction) is approximately 13 persons and the annual reduction in FSI (based on a 20 per cent reduction) about 48 persons. When an adjustment is made to the number of ATK sections at the end of 2007, about 2 400 km, the number of lives saved annually is approximately 18 and the annual reduction in FSI about 65. With a further 250-300 km of roads with ATK during 2008, the total annual saving is about 20 fatalities and about 70 FSI. If it is instead assumed that there is only a 20 per cent reduction in the number of fatalities, the above annual savings in lives (13, 18 and 20) would instead come to about 8, 11 and 12 respectively.

The analysis shows that the target "to reduce average speed and speed violations in the road transport system and thus help reduce the number of fatalities and severe injuries" was achieved during the after period which had been evaluated. It is very important that ATK should be monitored for a further extended period, both to obtain more reliable results and to see whether these results remain stable over time.

Contents

1 INTRODUCTION

1.1 Background

Observance of speed limits has generally been very bad in Sweden. In 2004, up to one half of all drivers drove more than 5 km/h too fast in the countryside[1] and 5-6 per cent drove more than 25 km/h too fast. Speed is of critical importance, both for the number of accidents and for the injury outcome of the accidents. As part of the endeavours to reduce the number of speed violations and thus help improve road safety, the SRA and the National Police Board began in 2006 to invest in a more modern version of automated traffic surveillance and control, in the following referred to as ATK. About 700 units of the new type were installed on about 100 road sections with a total length of almost 2 000 km. The new generation of units replaced the old units, but Road Safety Cameras were also installed on new road sections. Sections where new cameras replaced the old ones are in the rest of the report referred to as “upgraded sections” and sections where there had been no cameras before as “new sections”.

The objective of ATK is:

- to help reduce the number of fatalities and severe injuries
- to reduce the number of speed violations and thus reduce speeds in the road transport system
- to reduce average speeds.

No national monitoring and evaluation had previously been carried out on a large number of sections equipped with ATK. Monitoring and evaluation of the new ATK system is important for the continued trust and support of the public at large, but also for new installations and the management of the system. The initiative was therefore taken to embark on this independent evaluation project, the aim of which is both to verify the results of earlier trial activities and to analyse the effects with a view to developing the system.

1.2 Objective

The objective of this project was to evaluate the effects of the more modern generation of ATK on speed and the number of accidents.

The project comprised two parts:

- Evaluation of the effects on speed. Before and after studies were performed at selected locations on 39 of the “new” sections, with the speed measured and analysed. On the basis of these analyses, an overall assessment and analysis of the results was carried out. This part of the project was performed by Vectura which also made measurements at specific sites on behalf of the regional offices of the SRA.

- Evaluation of the effects on road safety. Injury data from STRADA relating to accidents before and after the installation of ATK, analyses of all “new” sections/sites installed during 2006 which had no ATK at all previously. In addition, sections where old ATK had been replaced by new ATK were also evaluated. This part of the project was carried out by VTI.

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1) Refers to roads with speed limits of 70 and 90 km/h in rural areas [SRA, 2005]

2 ROAD SAFETY CAMERAS

Since 1996, the police in Sweden have used ATK as a supplement to other traffic surveillance. The cameras are used as both stationary cameras in fixed housings along roads and as mobile cameras mounted in police buses or on trailers. Between 1996 and 2005 the system used was Argus I which required a high degree of manual input from qualified police staff when they had to move the camera from housing to housing and to retrieve data from the systems. During 2006 a new system, Argus II, was introduced which uses digital technology. Each road safety camera comprises a system which, using tracking radar, measures the speed of all passing vehicles. When the camera has been activated and a vehicle drives past faster than the permissible speed, a picture is taken showing the vehicle, the driver and the registration plate. The picture is complemented with data concerning e.g. time, location and speed. This evidence is then automatically sent to the police who investigates and imposes a fine on the driver, or sends the matter further to the prosecution authority.

The measurement system of ATK comprises:
- Trackning radar sensor for speed measurement
- Digital camera
- Flash unit
- Computer to control the various functions of the system and to transmit speeding violation evidence.

2.1 Criteria for a measurement site

The sections of road which have been equipped with the new generation of road safety cameras 2006, i.e. both old and upgraded sections, were selected in collaboration between the SRA and the police. For a section to be equipped with road safety cameras, it should satisfy the following criteria:

- It must be prone to accidents (more than 0.08 fatalities and severe injuries per km annually)
- The average speed over the section must be at least 5 km/h above the speed limit [Berg 2005].

High values of FSI/km often occur on road sections without opposing lane dividers and with AADT in excess of 4 000.

Many ATK are located near an intersection. For an intersection to be equipped with road safety cameras, it must satisfy the following criteria:

- It must be the scene of accidents (more than 0.2 fatalities and severe injuries at a speed limit of 50 km/h and 0.3 at a speed limit of 70 km/h)
- The average speed over the section must be at least 5 km/h above the speed limit [Berg 2005].

The following two are examples of the types of intersection where these criteria are often satisfied:
- **Intersection C**, i.e. four-way intersection with a left-turn lane on the major road channelised with a traffic island, speed limit 70 km/h and AADT > 8 000.
- **Intersection E**, i.e. signalised intersection, speed limit 70 km/h and AADT > 12 000.

Another condition is access to electricity and telecommunications, since it is very expensive to lay new cables. Other aspects to take into consideration are conditions for speed measurement, the assessed risk of vandalism/sabotage, access/establishment cost for the service position and aesthetics. Attention must also be paid to known measures planned at the measurement section/location.

From 2006 onwards, sites/sections have been classified in nine groups:

1. Rural road, no central barrier, at least 2 measurement sites per direction, with distance between sites 3 km or longer. (70 sites)
2. Rural road, no central barrier, at least 2 measurement sites per direction, with distance between sites less than 3 km. (11 sites)
3. Rural road, no central barrier, less than 2 measurement sites per direction. (10 sites)
4. Rural road, central barrier, at least 2 measurement sites per lane and direction. (0 sites)
5. Urban road, no central barrier, at least 2 measurement sites per direction. (1 site)
6. Urban road, central barrier, at least 2 measurement sites per lane and direction. (1 site)
7. Urban road, no central barrier, less than 2 measurement sites per direction. (4 sites)
8. Intersection. (3 sites)
9. Road in tunnel, central barrier. (3 sites)

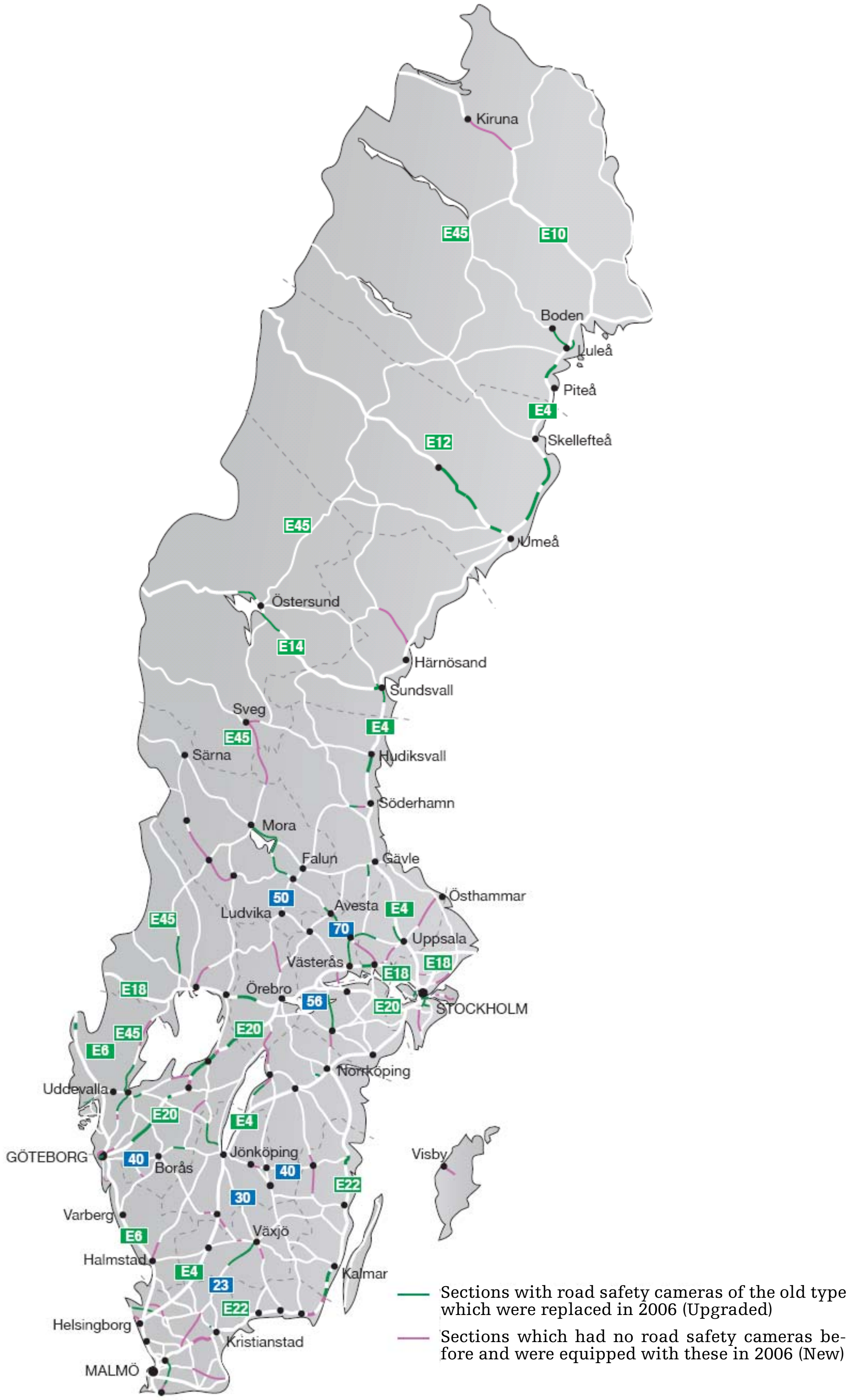
However, this classification was not used in the evaluation since the majority of sections are in the same class.

Vectura evaluated 39 of the 51 new ATK sections. With these as the basis, a general evaluation was performed. 12 sections could not be studied because of unfavourable measurement conditions.

VTI evaluated 51 new ATK sections in a before-after study. A with-without study comprises, apart from the above new sections, also 45 of the 55 upgraded ATK sections.

2.2 ATK sections in Sweden

The figure overleaf shows sections of road equipped with ATK at the end of 2006.



3 METHOD

In order that the above evaluations may be carried out, different methods must be used for measurement and analysis. For speed evaluations traditional pneumatic tube measurements were applied. For the road safety analysis, injury data from STRADA, the accident database of the SRA, were used.

3.1 Speed analysis

Speed measurements were made before and after at a number of sites where ATK had been established in 2006. For each section there is a report with detailed results from each section[2]. This report gives an overall analysis of the effects of ATK on speed.

3.1.1 Measurement data

Speed was measured at 39 of the 51 new sections established in 2006. See Appendix No 1 for the list of sections included.

Before measurements were made prior to camera installation, generally a short time prior to this, and were then followed up with after measurements about a year later. Before measurements were made during the whole of 2006, with some made already in the autumn of 2005. Most after measurements were made in the spring or autumn of 2007, but some not until 2008.

Broadly speaking, measurements were made over a time period of one (1) week during the before and after periods.

Speeds were measured using Meteor 3000 with pneumatic tube sensors. Time, vehicle type and speed are recorded for each vehicle passage. For each measurement site and direction, the following are calculated from the collected data:
- Flow per day
- arithmetic average of the spot speeds[3]
- proportion of vehicles driving faster than the speed limit
- proportion of vehicles exceeding speed limit by 6 km/h or more
- 85th per centile which describes how fast the speed violators are driving, and is the speed which 85 per cent of vehicles do not exceed and 15 per cent thus do exceed.

All the parameters are available for the following vehicle classes:
- passenger cars without a trailer (us)
- lorries with a trailer (ms)
- all vehicles, which also includes the other vehicle classes.

3.1.2 Measurement sites

Along each section, measurements were made at the cameras, between the cameras and at other locations. Measurements were made at 82 of the cameras that had been newly installed in 2006. Around a further 100 measurements were made at locations along the section, of which about 50 are between the cameras. The number of sites of different types is set out in Table 1. For each measurement site the speed limit applicable to this site is also given.

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2) Information relating to the reports for individual sections is available at www.vv.se

3) This describes not the running speed over a section but only the speed at certain sites.

Table 1. Number of measurement sites

Speed limit	50 km/h	70 km/h	90 km/h
Forward direction	7	33	42
Reverse direction	7	28	37
Between	2	9	39
Sign	0	8	11
Outside	2	3	16
Reference point	0	3	13

For measurements at the camera sites, the two directions are analysed individually. The direction in which the vehicle is approaching the camera is called **forward direction**. It is these vehicles that risk being fined if they are driving too fast. The direction away from the camera is called **reverse direction**. Vehicles travelling in this direction are not registered by the radar in the camera. Many measurement sites are located **between** cameras but not in their direct vicinity. For calculation of the distance from the camera, each direction is treated separately. There are also measurements at **the sign** which indicates the start of the section[4] and a little **outside** the section but on the same road. Near some sections there is also a **reference point** on a similar road in the vicinity that has no road safety cameras. The terms used for the measurements are also shown in *Figure 1* below.

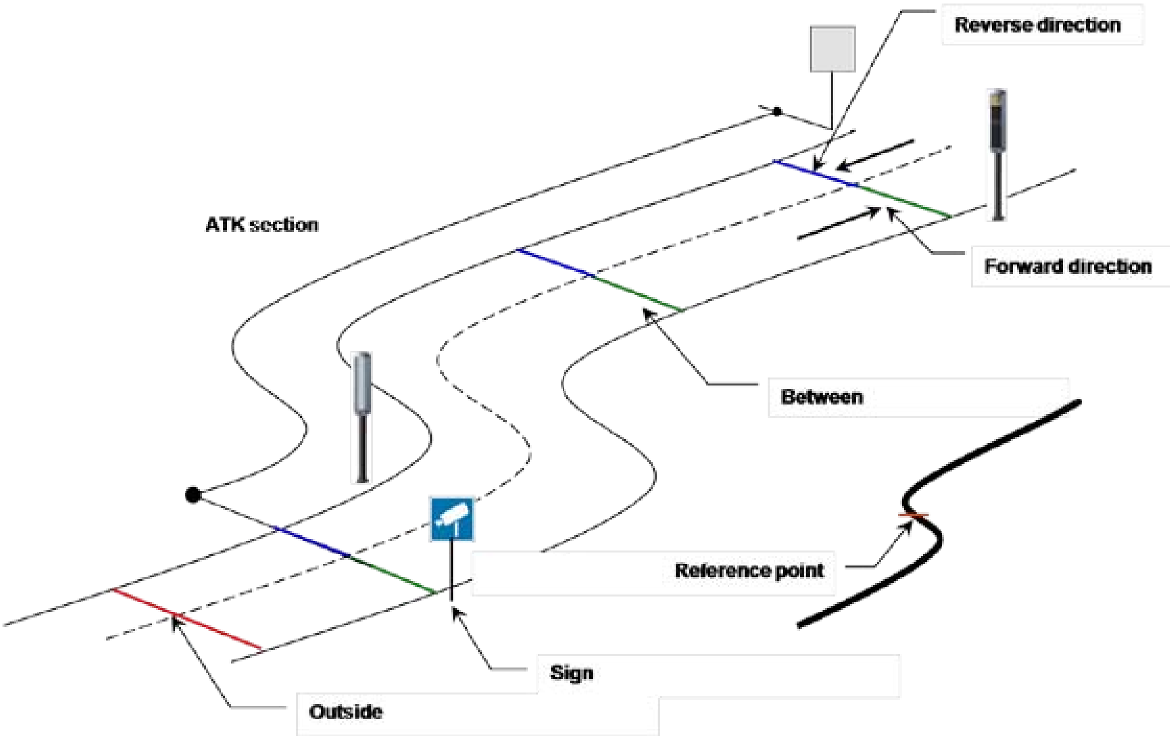

Figure 1. Sites of measurement, and their designations, in relation to cameras.

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4) Marking was later changed so that there is one sign before each camera, but when this survey was carried out the start of the section was denoted by a camera sign showing also the length of the section, and the sign was also repeated at a number of suitable places along the section.

At a number of sites cameras are installed to monitor traffic in both directions. In such cases they are often placed opposite one another or with a slight distance between them. If a tube point is placed at such cameras, both directions are counted as forward directions. At some tube measurement points where the reverse direction may have been affected by a nearby camera, the data were deleted from the analysis to avoid a misleadingly large reduction in speed in the reverse direction. This also explains why there are fewer measurements in the reverse direction than in the forward direction.

3.1.3 Analysis

The aim of the analysis of speed data is to give a general indication of how speed changes when road safety cameras are installed, both inside and outside the monitored sections. It is also the aim to find when a greater or lesser effect can be expected.

In previous evaluations of ATK the measured effect on speed varied with the speed limit and vehicle type.

In this survey the results obtained are broken down by speed limit and vehicle class. Changes in speed are described by a number of measures. The tables of results show the average values of the measurements at the individual sites.

The reduction in speed at individual sites has been compared with the average speed before installation of ATK at the site. In this way we can study how conditions prior to installation affect the results we obtain. We also study whether the effect of ATK decreases with the distance from the last camera the vehicle had passed. The significance of traffic flow is also studied.

The effects of ATK at and between cameras and at various speed limits are aggregated into general indices. Finally, the reduction in speed on ATK sections is compared with the change in speed over the entire public road network according to the SRA's speed index which is based on measurement data from fixed stations.

3.2 Road safety analysis

ATK is expected to reduce speed over the sections with cameras and in this way reduce the number of accidents and, in particular, the number killed and severely injured. In order to estimate this effect, the number killed and severely injured before and after the intervention were studied. In addition, the outcome after (with the intervention) was compared with the "normal outcome" without the intervention.

This study fully concentrates on monitoring Argus II, the present form of camera installations and management which was introduced in 2006. At the end of 2006 there were a total of 51 "new" Argus II sections, with a total length of about 940 km and a total of 350 cameras. At the end of the same year, there were also 55 "updated" Argus II sections (which had previously had Argus I installed up to 2005) which covered about 900 km and over 350 cameras.

The road safety effect of ATK on these sections is expected to be influenced by how much speed is reduced both at and between cameras. The number of cameras may be assumed to be of critical importance for the way speed is affected over the entire section. It is also likely that the ATK effect is influenced by traffic flow, type of urban setting and the speed limit. Identification or prior warning of cameras may also be assumed to be very important. For various reasons, the effects may vary over time. The character of the intervention may have changed, one example of this being that, according to new rules, prior warning of every single camera must be given by a sign about 300 m in front of the camera. Road users may also change their speed behaviour the more experience they have of the cameras.

3.2.1 Data

Accident data for the period 2003-2007 were obtained directly from the seven regions of the SRA. These data were produced through STRADA. Other data concerning length, AADT, road width, speed limit, number of cameras and central rumble strips, if any, were also obtained with the help of the regions. In many cases the information is very approximate and unreliable.

The analysed accident/injury data relate to all accidents on links and nodes. Only the number of F (fatalities) and FSI (fatalities and severe injuries) were analysed.

3.2.2 Before-after studies of "new" Argus II sections

In before-after studies, the outcome during 2003-2005 is compared with the outcome interventions in 2007. The installation year 2006 is not included in the analysis. The reason that the analysis does not reach further back in time is that, from 2003 onwards, the SRA adopted a new accident and injury data system, STRADA. One great drawback of this system is that it has not the same direct coupling to road and traffic data as the previous accident data system OLY/VITS.

In order that the effect of an intervention may be correctly estimated in a before-after study, *the regression effect* must be eliminated. The sections on which cameras were installed were selected because of a high number of fatalities or severe injuries (FSI). Since, because of this biased selection, the outcomes during the before period were to a greater or lesser extent of random magnitude, it is to be expected that the outcomes during the after period would decrease even if no interventions had been made.

The regression effect can, in principle, be eliminated by various methods. One generally accepted way is to use the Empirical Bayes method (EB method). In this method, the observed outcome in the before period and the "normal" outcome in the before period are weighted together in order to obtain an estimate of the "true" value in the before period. In the present study this was done as follows:

$$"True"\,FSI_{before} = normal + \frac{0.1 \cdot normal}{1 + 0.1 \cdot normal} \cdot (observed_{before} - normal)$$

In order that the method may be used in a satisfactory manner, it is necessary that the underlying data (normal rates) for determination of the normal outcome should be of good quality. In view of the changes in the accident data system and the lack of good sampling tools, it has been increasingly difficult in recent years to ensure that the quality of the normal rates is satisfactory.

There are other ways in which the regression effect can be eliminated in a more standardised way. The "worst" yearly outcomes in the before period may be deleted, or a standard curve for the "normal regression effect", as a function of the estimated mean for the population from which the biased sample had been taken, may be applied [Brüde & Larsson, 1988].

The quality of a before-after study may be further improved by taking account of changes in traffic mileage and the general trend for fatalities and severe injuries. This, however, presupposes that such data are available. The adjustments made have been of a standardised nature.

3.2.3 With-without studies of "new" and "updated" Argus II sections

With the help of with-without studies, the actual outcomes during 2007 are compared with normal or expected outcomes for the same year and the same types of road without camera surveillance. The problem with normal rates that are not quality assured is at least as great as in before-after studies. The advantage of with-without studies is that "updated" Argus II sections can also be studied. Consequently the number of analysed sites is almost doubled and full coverage is achieved.

The primary risk in before-after studies is that the effect on fatalities and severe injuries is overestimated (regression effect). The drawback of with-without studies is rather the tendency to underestimate the effect, because the outcome without intervention would in reality fact have been greater than what the normal rates show (a lower local safety standard or higher than normal speeds).

3.2.4 The effects of other measures

Around ten of both the new and updated sites were also provided with rumble strips at the roadway centre, which may affect estimates of the effects. The effect of central rumble strips is however assumed to be small compared with that of ATK.

3.2.5 Indirect estimates with the help of the power model

One alternative or complementary way of estimating the effect of cameras on fatalities and severe injuries is to study changes in average speed (over all the camera sections) after installation of the cameras. For sections with small injury rates this may even be the best, or only possible, tool for analysis. The material that is available here is derived from speed measurements by Vectura.

According to the power model [Nilsson, 2000], if the average speed drops by 1 per cent, the number of fatalities (F) is expected to decrease by over 4 per cent. The same decrease in average speed is expected to reduce the number of fatalities or severe injuries (FSI) by over 3 per cent. The exact indices which are currently used are 4.5 and 3.7 respectively.

3.2.6 Previous monitoring of Argus I

A first preliminary monitoring of a limited number of old Argus I sections (18 sections, 340 km and 149 cameras) was carried out by VTI in 2004 [Andersson & Larsson, 2005]. After the intervention, large effects were found on the number of fatalities (about 50 per cent) and the number of FSI (about 30 per cent), but no attempt was made to eliminate the regression effect.

A review [Brüde 2006, unpublished] was later carried out of all "old" Argus I sections that had been established by the end of 2005 (about 55 sections, about 1000 km and 400 camera housings, in most cases with no camera). In this before-after study also, 50 per cent fewer fatalities were noted after the introduction of ATK – but the regression effect explained 30-35 per cent of the reduction, and thus 25-30 per cent of the reduction was actually due to the intervention effect of ATK on the number of fatalities. The intervention effect on the number of fatalities or severe injuries, FSI, was estimated at about 20 per cent reduction. It should also be noted that the estimated "true" values, before the intervention, of fatalities F and fatalities or severe injuries FSI were about 30 and 20 per cent respectively higher than the normal values which applied at the time. According to the power model, the estimated effects for the old Argus I sections correspond to a drop of about 7 per cent in average speed.

3.2.7 Other reviews of ATK

TØI report 851/2006 [Erke & Elvik, 2006] presents the estimated effects, on the basis of several studies, of both "spot ATK" (speed control at individual sites, spot speeds) and "section ATK" (average speed control over longer sections); the effects of "spot ATK" are shown to be considerably smaller than the effects of "section ATK".

4 RESULTS

This section gives details of different results. Speed effects at and between cameras, and an aggregate index, are presented first, followed by effects on fatalities and severe injuries.

4.1 Speed effects

4.1.1 At the cameras

Changes in speed at the cameras, in the direction in which they make measurements, are set out in Table 2. This type of measurement site is referred to here as "forward direction" according to Figure 1. Changes in average speed and the proportion of drivers who exceed the speed limit are the parameters presented. The changes are calculated with a 95 per cent confidence interval.

Table 2. Average speeds and speed violations at the cameras, in the forward direction, for different vehicle classes broken down by speed limit (us=no trailer, ms=trailer)

Speed limit	50 km/h			70 km/h			90 km/h		
	Before	*After*	*Change*	*Before*	*After*	*Change*	*Before*	*After*	*Change*
Average speed	km/h		%	km/h		%	km/h		%
Cars (us)	55.2	48.3	-12.5 (±3.6)	74.2	64.3	-13.4 (±2.1)	88.6	81.7	-7.7 (±1.0)
Lorries (ms)	57.5	51.7	-10.0 (±4.1)	74.5	67.6	-9.3 (±1.7)	82.6	81.0	-1.8 (±0.7)
All vehicles	55.4	48.6	-12.3 (±3.7)	74.1	64.9	-12.4 (±2.1)	87.7	81.5	-7.0 (±0.9)
Speed violations	%		%	%		%	%		%
Cars (us)	67.1	28.7	-57.2(±11.9)	59.5	14.3	-76.0(±11.4)	42.3	11.7	-76.0 (±8.9)
Lorries (ms)	79.7	53.5	-32.9 (±8.1)	67.1	30.7	-54.3 (±9.0)	6.4	3.2	-49.9(±25.6)
All vehicles	68.8	30.6	-55.0(±11.6)	60.1	15.7	-73.9(±10.6)	37.9	10.8	-71.5 (±8.9)

The measurements show that the speed of all vehicle classes dropped irrespective of the speed limit. This applies to both average speed and the proportion of vehicles which exceed the speed limit. Drivers tend to decrease their speed to a greater extent at 50 and 70 km/h than at 90 km/h. However, the results for roads with the 50 km/h speed limit are less reliable because there are relatively few measurement sites on these sections.

Another conclusion is that the drivers of cars generally decrease their speed more than lorry drivers. However, on roads with a speed limit of 90 km/h the speed to be observed by lorries with a trailer is 80 km/h. Because of this, there are not many lorry drivers who drive at over 90 km/h. But neither do lorries decrease their speed by as much as cars at 50 and 70 km/h.

4.1.2 Between cameras

Speed effects between cameras are set out in *Table 3.*

Table 3. Average speeds and speed violations between cameras, in the forward direction, for different vehicle classes broken down by speed limit

Speed limit	50 km/h			70 km/h			90 km/h		
	Before	*After*	*Change*	*Before*	*After*	*Change*	*Before*	*After*	*Change*
Average speed	km/h		%	km/h		%	km/h		%
Cars (us)	49.6	49.5	-0.2 (±0.7)	73.7	69.9	-5.2 (±1.7)	89.9	86.5	-3.8 (±0.6)
Lorries (ms)	50.7	50.5	-0.5 (±3.7)	72.6	69.5	-4.2 (±1.8)	82.9	81.5	-1.7 (±0.5)
All vehicles	49.5	49.4	-0.2 (±0.8)	73.5	69.8	-5.1 (±1.7)	89.0	85.8	-3.6 (±0.5)
Speed violations	%		%	%		%	%		%
Cars (us)	39.0	38.4	-1.6 (±5.9)	64.7	45.8	-29.3 (±8.1)	44.3	30.0	-32.4 (±4.3)
Lorries (ms)	47.9	50.5	5.6(±28.2)	60.7	44.5	-26.7 (±9.8)	6.3	3.9	-38.4(±18.4)
All vehicles	39.1	38.4	-1.7 (±7.0)	64.4	45.8	-28.9 (±8.1)	40.0	26.9	-32.9 (±4.4)

As will be seen from the results, ATK also has an effect between the cameras, although not to the same extent as at the cameras. Between cameras also the effect is greatest at 70 km/h and for passenger cars. Measurements of speeds at the cameras but in the opposite direction, reverse direction, show that the effect is broadly the same as between the cameras. At the mark that shows where the section begins, outside the section and at the reference sites, the speed has also dropped although not by the same amount. Detailed figures regarding the above speed effects are given in *Appendix No 2*.

Automated traffic surveillance has a good effect on motorists' speed behaviour and this positive behaviour persists, both between cameras, directly outside the sections and at reference sites (other road sections) near the selected sections.

4.1.3 Vehicles with major speed violations

The 85th per centile, i.e. those who drove fastest during the before-after study, and the proportion of drivers who exceed the speed limit by 6 km/h or more, are presented in Table 4 at the cameras and in Table 5 between cameras.

Table 4. The 85th per centile and the proportion exceeding the speed limit by 6 km/h or more <u>at the cameras</u>, in the forward direction, for different vehicle classes broken down by speed limit.

Speed limit	50 km/h			70 km/h			90 km/h		
	Before	*After*	*Change*	*Before*	*After*	*Change*	*Before*	*After*	*Change*
85th per centile	km/h		%	km/h		%	km/h		%
Cars (us)	63.6	52.7	-17.1(±4.5)	84.0	69.4	-17.3(±2.6)	98.8	88.5	-10.5(±1.1)
Lorries (ms)	64.8	56.8	-12.4(±5.6)	81.8	72.5	-11.3(±1.6)	88.0	86.6	-1.6(±0.5)
All vehicles	63.8	53.2	-16.6(±4.5)	83.7	70.3	-16.0(±2.5)	97.7	88.2	-9.7 (±1.1)
Proportion exceeding speed limit by 6 km/h or more	%		%	%		%	%		%
Cars (us)	39.2	9.5	-75.7(±23.8)	37.8	4.3	-88.6 (±18.5)	20.8	2.8	-86.4 (±12.9)
Lorries (ms)	49.2	16.4	-66.7(±28.3)	42.6	7.7	-81.9 (±19.5)	0.8	1.1	38.1 (±116)
All vehicles	39.9	10.0	-74.9(±23.8)	38.0	4.7	-87.7 (±17.5)	18.3	2.6	-85.5 (±13.0)

Table 5. The 85th per centile and the proportion exceeding the speed limit by 6 km/h or more <u>between cameras</u>, for different vehicle classes broken down by speed limit.

Speed limit	50 km/h			70 km/h			90 km/h		
	Before	*After*	*Change*	*Before*	*After*	*Change*	*Before*	*After*	*Change*
85th per centile	km/h		%	km/h		%	km/h		%
Cars (us)	55.1	54.8	-0.6(±0.9)	82.8	77.4	-6.6(±1.9)	99.5	94.4	-5.1(±0.6)
Lorries (ms)	56.1	56.0	-0.3(±4.5)	79.7	75.5	-5.5(±1.9)	87.9	86.7	-1.3(±0.4)
All vehicles	55.1	54.8	-0.6(±1.0)	82.7	77.3	-6.4(±1.8)	98.5	93.5	-5.1(±0.6)
Proportion exceeding speed limit by 6 km/h or more	%		%	%		%	%		%
Cars (us)	13.6	12.5	-8.3 (±9.5)	38.1	21.4	-43.8 (±11.9)	22.6	13.0	-42.2 (±6.9)
Lorries (ms)	16.2	15.6	-3.7(±56.6)	33.4	20.0	-40.1 (±16.7)	2.2	1.5	-35.3(±53.9)
All vehicles	13.6	12.5	-8.2(±10.1)	37.9	21.5	-43.3 (±11.8)	20.0	11.5	-42.5 (±6.8)

The results in *Table 4* may be compared with those in *Table 2*. Both apply <u>at cameras</u>, but *Table 4* shows the change for those who drive fastest. In the same way, *Table 5* may be compared with *Table 3* for changes <u>between cameras</u>. It can be seen that the drivers who drive the fastest are also affected the most by the speed cameras. At the after measurements in the forward direction, it can also be seen that the 85th per centile has dropped very close to a legal level. However, speed did not drop so low between the cameras.

ATK affects all motorists because the motivation of all motorists is the same – not to be caught for driving too fast.

4.1.4 The effect relative to average speed before installation

The average speed before installation of the cameras has great significance for the reduction in speed that is achieved. *Figures 2-4* show this relationship for the different speed limits.

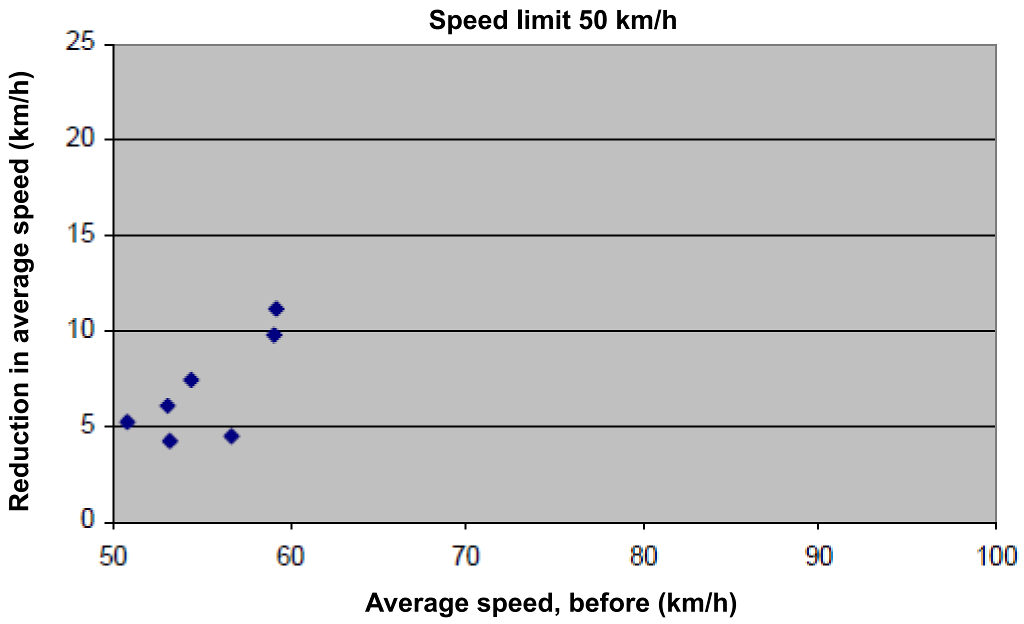

Figure 2. Reduction in average speed for different average speeds prior to ATK installation. Sites at the camera in the forward direction at a speed limit of 50 km/h. Cars without a trailer.

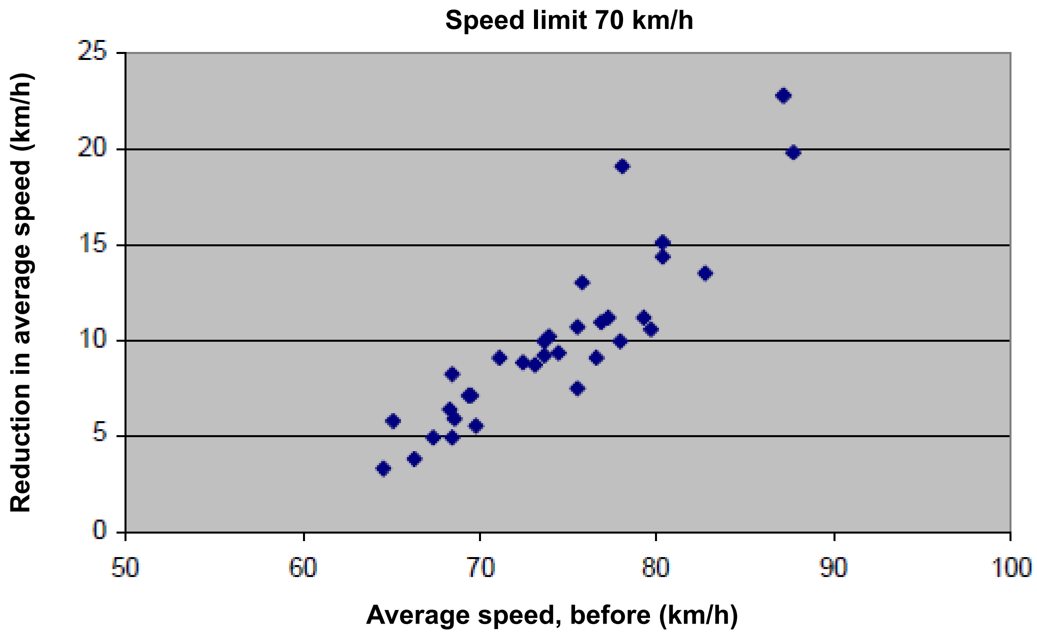

Figure 3. Reduction in average speed for different average speeds prior to ATK installation. Sites at the camera in the forward direction at a speed limit of 70 km/h. Cars without a trailer.

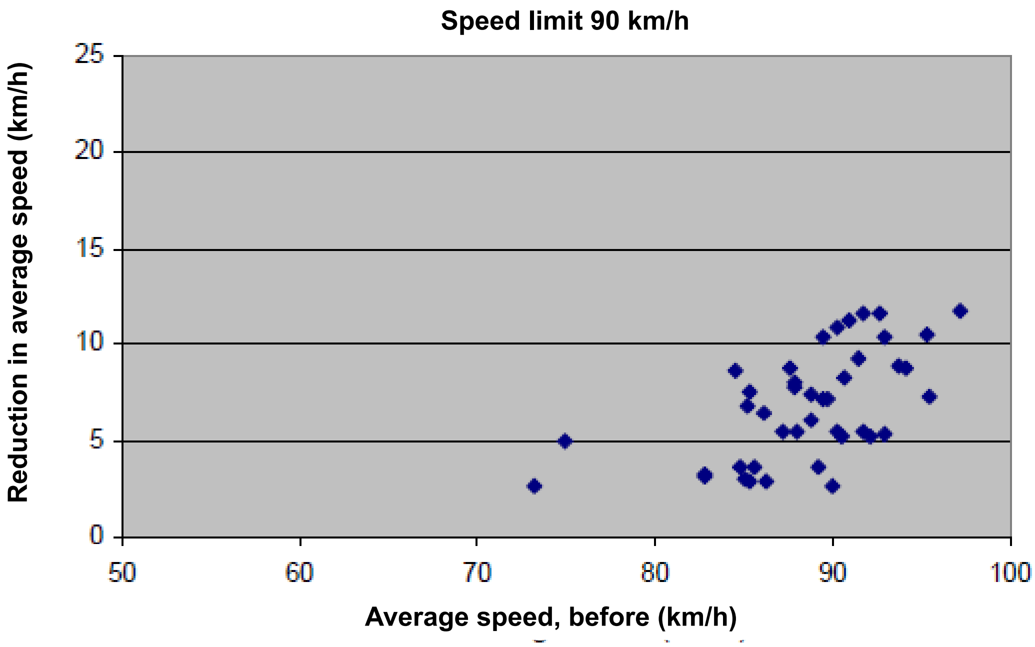

Figure 4. Reduction in average speed for different average speeds prior to ATK installation. Sites <u>at the camera</u> in the forward direction at a speed limit of 90 km/h. Cars without a trailer.

The conclusion here is that the road safety cameras have the best effect where speeds had previously been too high. This is particularly clear on roads with a speed limit of 70 km/h.

4.1.5 Effects beyond the camera

Figures 5 and 6 show the relationship between speed reduction and the distance beyond the last camera for speed limits of 70 and 90 km/h.

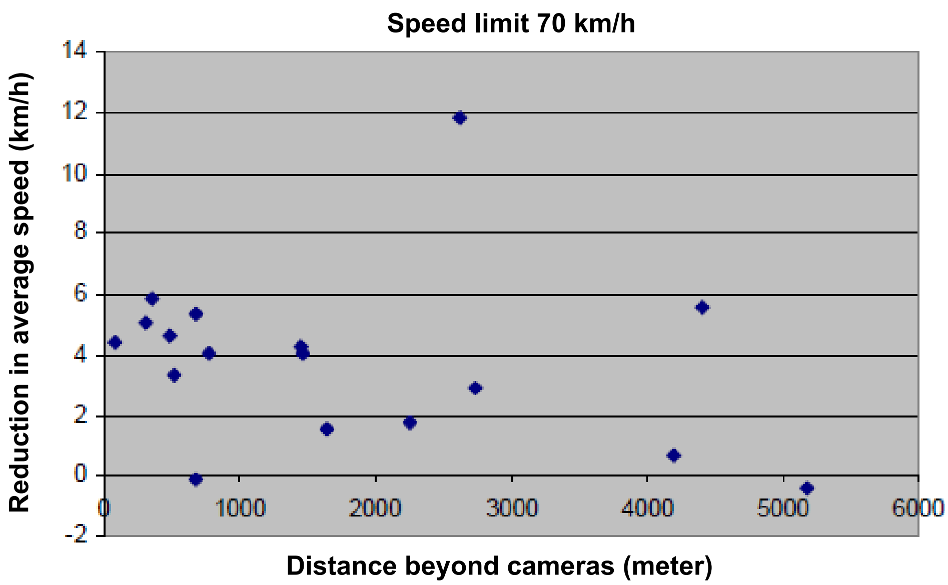

Figure 5. Reduction in average speed at different distances beyond the camera. Sites <u>between cameras</u> at a speed limit of 70 km/h. Cars without a trailer.

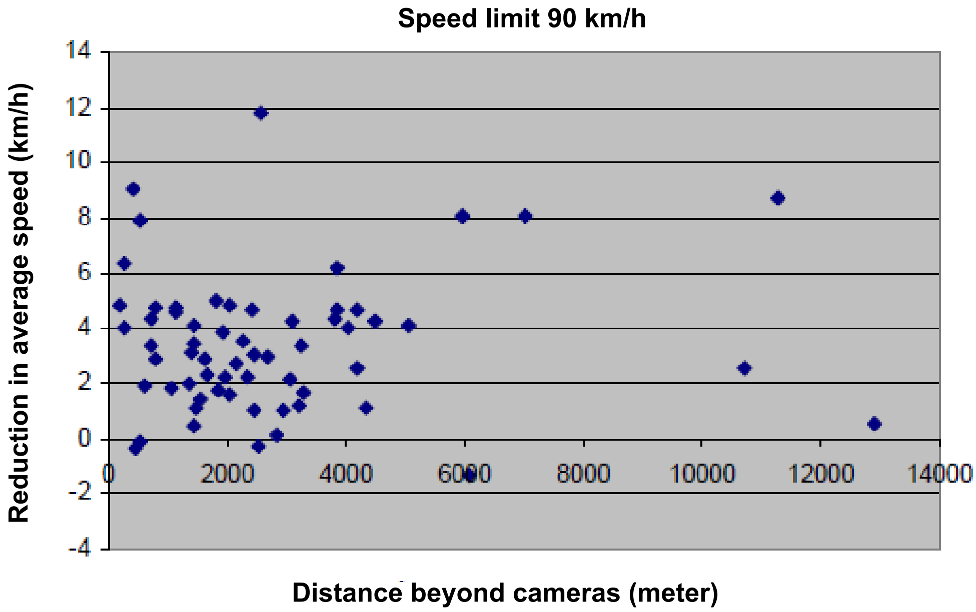

Figure 6. Reduction in average speed at different distances beyond the camera. Sites <u>between cameras</u> at a speed limit of 90 km/h. Cars without a trailer.

The conclusion is that the distance beyond the last camera has no major significance for the extent of speed reduction at a site between the cameras. The effect of ATK between cameras on the studied road sections appears to be the same irrespective of the distance from the camera.

4.1.6 The significance of traffic flow

Figures 7 and *8* show the relationship between traffic flows and speed reduction at speed limits of 70 and 90 km/h.

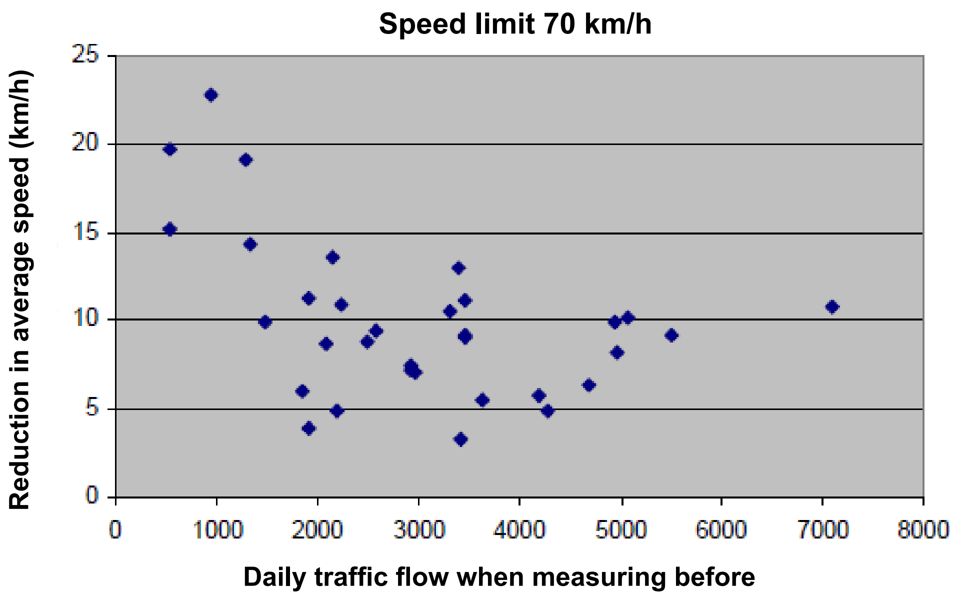

Figure 7. Reduction in average speed at different traffic flows. Sites <u>at the camera</u> in the forward direction at a speed limit of 70 km/h. Cars without a trailer.

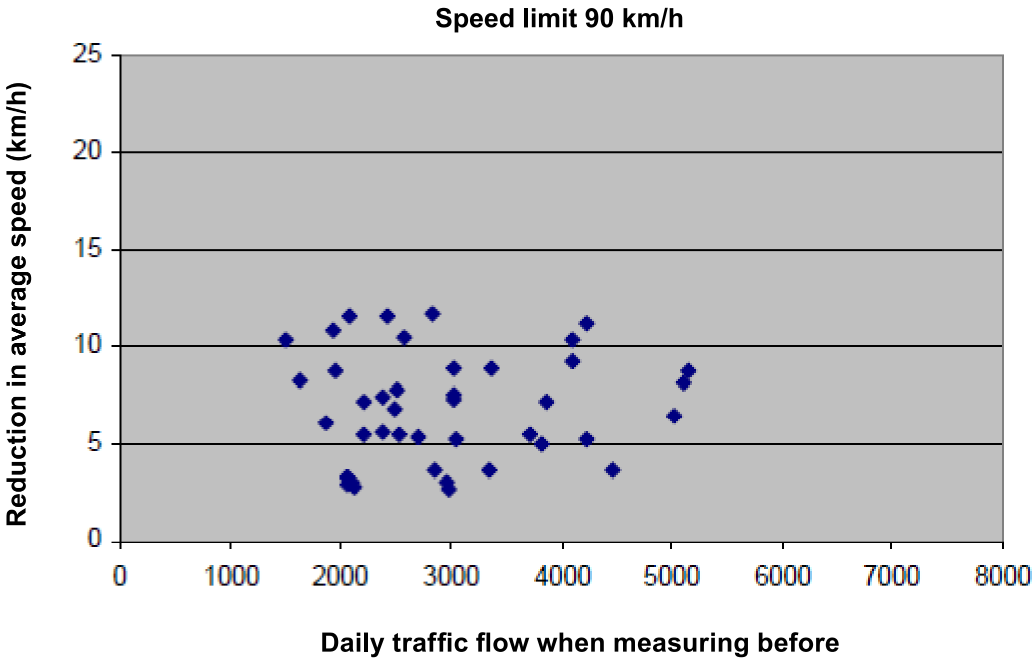

Figure 8. Reduction in average speed at different traffic flows. Sites at the camera in the forward direction at a speed limit of 90 km/h. Cars without a trailer.

The conclusion from the analysis of this relationship is that the size of the traffic flow also has no great significance for the effect of ATK; there might possibly be a greater effect at very low flows.

4.1.7 Effects over the entire section

In order to arrive at an overall index of the effects on speed, we have weighted the effects of ATK at cameras and between cameras and at different speed limits.

In agreement with VTI which is studying the road safety effects of ATK, effects at the cameras were given a weight of 10 per cent and effects between cameras were weighted with the remaining 90 per cent[5]. In *Table 6* the effect of ATK on average speed has been weighted in the same way. The different speed limits were then aggregated in accordance with the distribution of traffic mileage between the speed limits applicable on the sections with cameras[6].

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5) In the special reports for individual sections, aggregation was performed by another method.

6) Data are obtained from a calculation of traffic mileage at the appropriate speed limit for all camera sections established up to and including December 2006.

Table 6. Aggregated effects on average speed and speed violations (per centages).

	Speed limit			
Average speed	*50 km/h*	*70 km/h*	*90 km/h*	*Aggregated*
Cars	-1.4	-6.0	-4.2	-4.5
Lorries	-1.4	-4.7	-1.7	-2.5
All vehicles	-1.4	-5.8	-3.9	-4.3
Speed violations	*50 km/h*	*70 km/h*	*90 km/h*	*Aggregated*
Cars	-7.1	-34.0	-36.4	-34.4
Lorries	1.7	-29.5	-39.6	-35.1
All vehicles	-7.0	-33.4	-36.7	-34.5

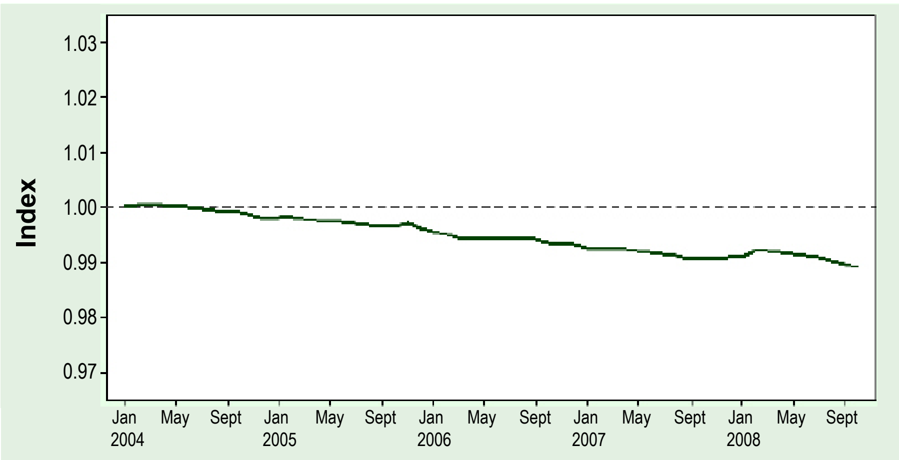
The aggregated indices apply for the sections in this study, i.e. sections established in 2006. The effect on new sections may be expected, on average, to be similar if sections are selected and designed in a similar way.

ATK on a specific section may have a greater or lesser effect depending on the properties and conditions of the road section concerned, e.g the speed before installation of ATK.

4.1.8 General speed change on state maintained roads

During the period this study was in progress, average speeds on the state maintained roads decreased slightly, by about 1 per cent from January 2004 to the autumn of 2008. See *Figure 9*[7].

Figure 9. Monthly speed index, seasonally adjusted and smoothed. January 2004 to September 2008. State maintained road network, the whole country and all speed classes.



As we had found before, the reduction in speed was much greater on the ATK sections compared with the general index for the remainder of the road network. At the reference sites in the vicinity of the ATK sections also, we have seen a greater reduction in speed compared with the general index for the road network.

This means that ATK has an evident effect on motorists' speed behaviour. However, we cannot with a satisfactory degree of certainty claim that the ATK sections as such were a contributory cause of the general reduction in speed on the remainder of the road network.

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7) The figure is taken from the report on speed indices and is available on www.vv.se

4.2 Road safety effects

4.2.1 Before-after studies of "new" Argus II sections

The data for the analysis are shown in *Appendix No 3*. The total number of "new" sections is 51. They were installed in 2006. Before then, there was no ATK on these sections. The total length is 940 km and the total number of cameras 350. The average AADT is about 5 200 vehicles per day, which corresponds to about 5 700 axel pairs per day. On nine of the sections central rumble strips have been added. It is not known whether any other changes have occurred.

For each section, a normal F rate (fatalities per 1 million axle pairs km) and a normal FSI rate (fatalities and severe injuries per 1 million axle pairs km) were determined. The values are quoted per 1 million axel pairs km for links and nodes and are taken from the road safety section of the new *Catalogue of Effects (EVA version, October 2008)*, of the SRA. One very awkward fact is that, previously in the ATK project, road width classes were defined in a different way from that in the Catalogue. The normal rates used here (*see Appendix No 4)* have been approximated from the original values in the Catalogue (*see Appendix No 5, Normal rates*).

Figure 10 shows that the observed F rate *before* was 0.0100 (2003-2005) and *after* 0.0081 (2007), i.e. 19 per cent lower. In absolute terms, this is a reduction from about 20 fatalities annually to 16 (*Figure 11*). Had the outcome after the intervention been one (1) less or one (1) more fatality, the reduction would have been about 25 and 15 per cent respectively. The uncertainty in the estimated reduction after the intervention is particularly great because of the small absolute numbers.

The normal F rate *before*, taken over all 51 sections, was 0.0091 which corresponds to about 18 fatalities annually (*Figures 10 and 11*).

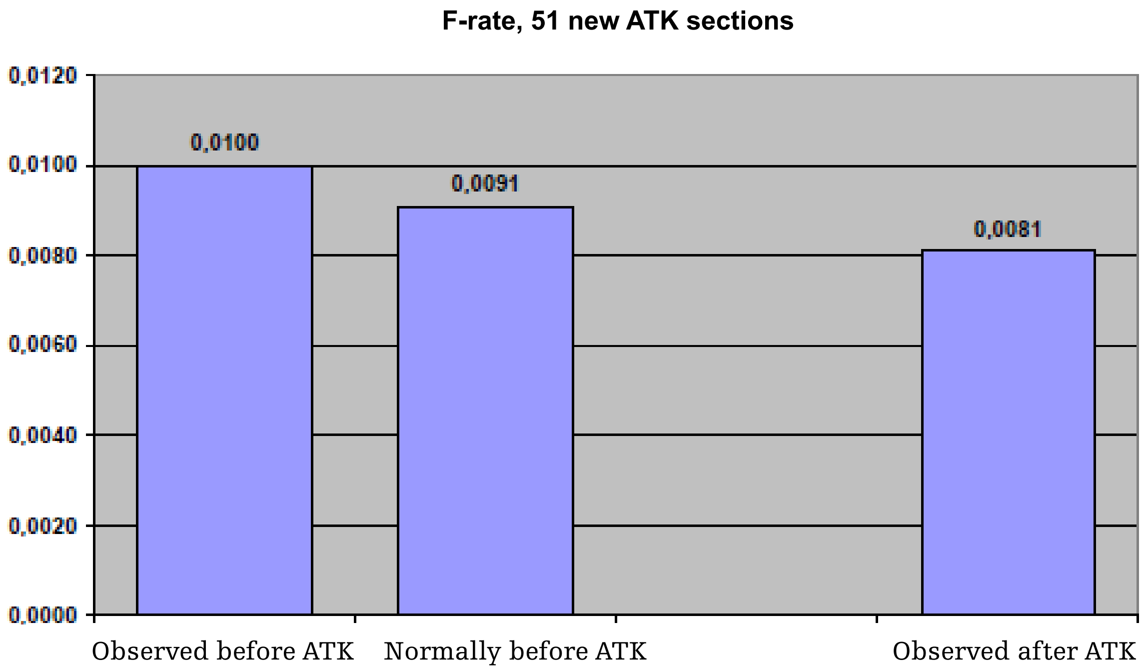

Figure 10. F rate before (2003-2005) and after (2007) the introduction of Argus II.

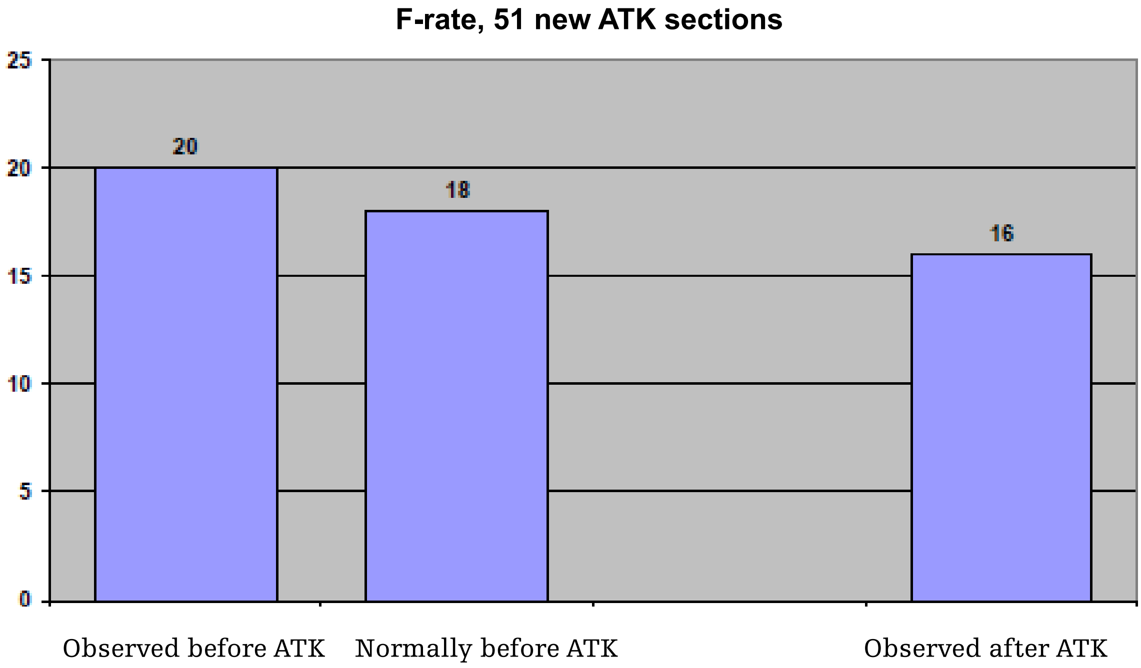

Figure 11. Annual number of fatalities before (2003-2005) and after (2007) the introduction of Argus II.

Figure 12 below illustrates that the observed FSI rate *before* was 0.0675 and *after* 0.0443, i.e. 34 per cent lower. In absolute terms, there is a reduction from about 133 FSI annually to 87; *see Figure 13*.

Since the introduction of ATK was dictated by the criterion that there were many FSI, it is evident that only part of the observed reduction can be counted as an effect of the intervention. Some of the decrease could therefore be explained by *the regression effect*.

Section by section, the "true" number of FSI before intervention has been calculated according to the Empirical Bayes method which is given in the *Catalogue of Effects*. The formula below is actually fact intended for the total number of injuries, and it is not obvious that it is optimal for the number of FSI (or F).

$$\text{"True" } DSS_{before} = normal + \frac{0{,}1 \cdot normal}{1 + 0{,}1 \cdot normal} \cdot (observered_{before} - normal)$$

Conversion of the "true" number of FSI before, to an annual figure, gives 114. The decrease from 133 to 114 (-14 per cent) is thus *the calculated regression effect, see Figure 13*. It is only the decrease from *the true expected value before without intervention (i.e. 114)* that can be regarded as the effect of the intervention (without further influencing factors, but see below). The decrease from 114 to 87 (the outcome in 2007) is thus 24 per cent. This means that the true FSI rate decreased from 0.0580 to 0.0443; see *Figure 12*.

Practically the same estimate of the "true" number of FSI before is obtained if the 16 annual FSI outcomes which are relatively the most "extreme" (marked red in *Appendix No 3*) are deleted and replaced by the mean value, for the other two years, for the section concerned. A regression effect of approximately the same order is also obtained with the previously produced standard curves. *Figures 12* and *13* also illustrate the calculations made to estimate the actual intervention effect of Argus II on the number of FSI after elimination of other disturbing effects (see the explanation after *Figure 13*).

The observed values before (0.0675 or 133) and normal values before (0.0524 or 103) have been converted by the EB method into 0.0580 or 114. Note that the "true" value is smaller than the observed value, but also *larger than* the normal value before (about 10 per cent larger). The observed value had therefore been both randomly large and also "truly" large because of special circumstances on the selected sections on which cameras were installed.

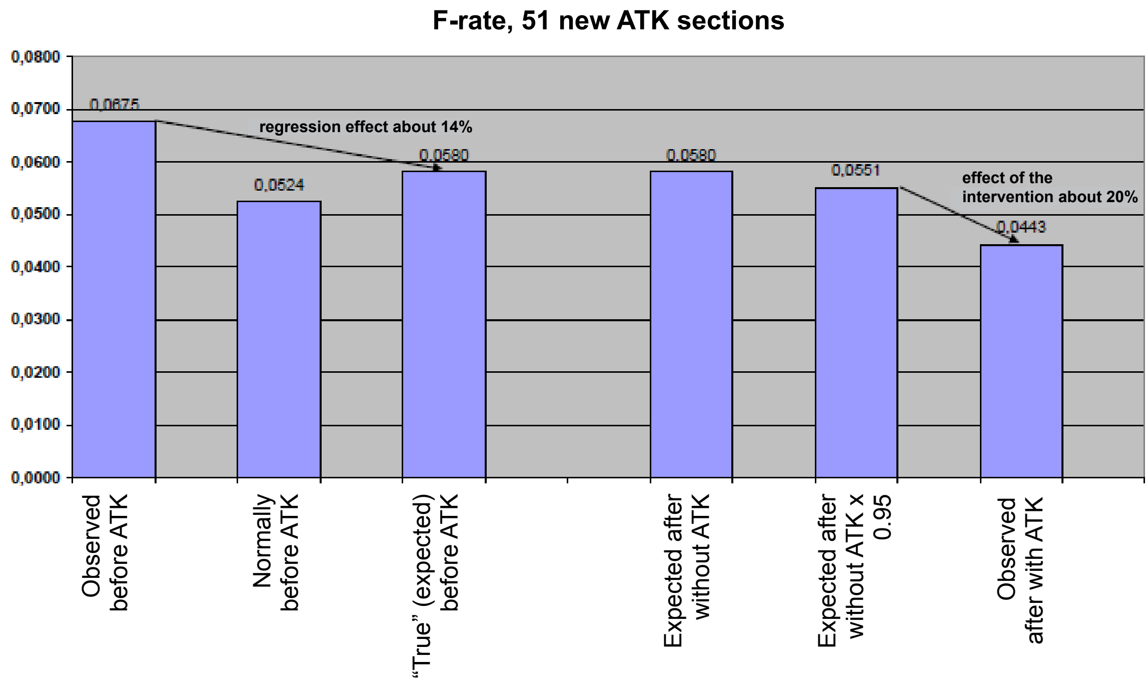

Figure 12. FSI rate before (2003-2005) and after (2007) the introduction of Argus II.

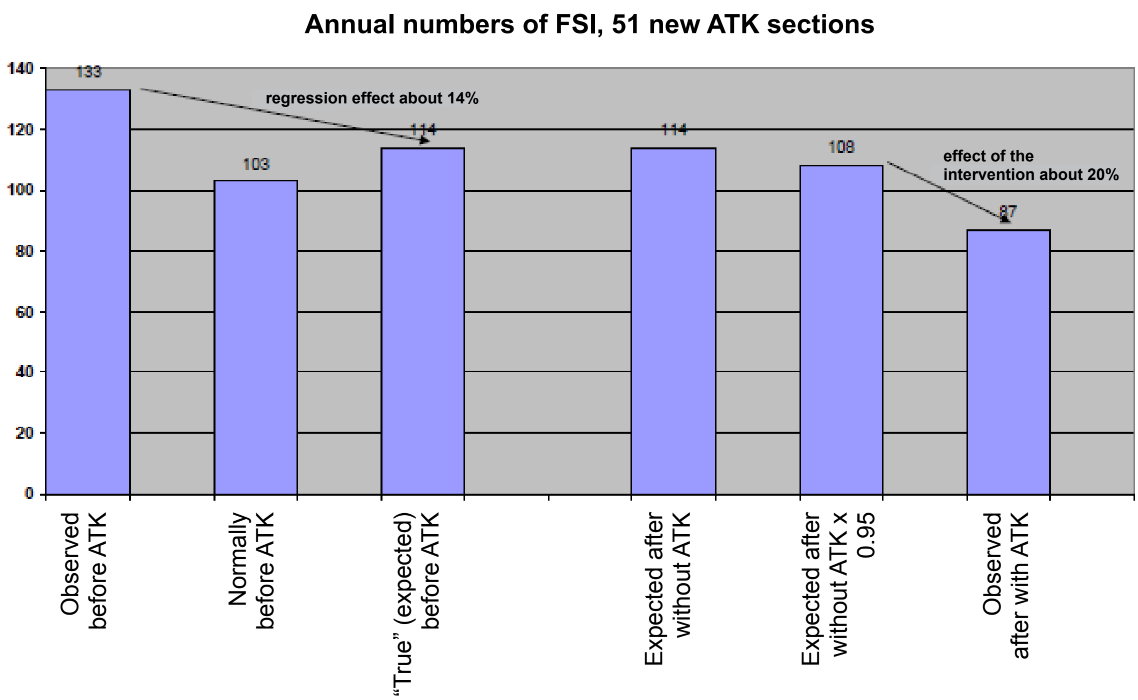

Figure 13. Annual number of FSI before (2003-2005) and after (2007) the introduction of Argus II.

The expected values during the after period, without intervention, should agree with the true (expected) values before the intervention if all other factors were constant. But traffic mileage increased slightly over time, there may be a general trend with a lower risk, or something else may have changed. One very rough assessment is that the expected value during the after period would have decreased by about 5 per cent (to 0.0551 or 108.3) even without ATK. The observed values after, and with ATK, (0.0443 or 87) are therefore compared with the above adjusted values. The estimated intervention effect on the number of FSI is then obtained as a 20 per cent reduction.

Let us now regard 108 as the value of a parameter (which is not entirely undisputed). Without ATK, a prediction interval for fatalities and severe injuries in 2007 would be obtained as $108 \pm 2\sqrt{108} = 108 \pm 21$, i.e. 87 - 129 (approximately 90 per cent uncertainty interval since it refers to injured persons and not to accidents), or as $108 \pm 3\sqrt{108} = 108 \pm 31$, i.e. 77 – 139 (doubled variance and approximately 95 per cent uncertainty interval). It is only with the lower degree of confidence that the estimated intervention effect is precisely on the borderline to being significantly different from zero. The reason that significance is not achieved may obviously be due to the fact that the accident material in this before-after study is still very small and only covers one after year.

4.2.2 With-without studies of "new" and "updated" Argus II sections

Data for the analysis of "new" Argus II sections is set out in Appendix No 3, and that for "updated" Argus II sections in Appendix No 6. For particular reasons, ten of the updated sections have been deleted from the analysis (tunnels, special road type or lack of data). The number of analyzed new sections is 51 and that of updated sections 45, a total of 96. The lengths are 940 and 830 km respectively, a total length of 1 770 km (just under 2 per cent of the total public road network maintained by the SRA). The number of cameras is 350 and 332 respectively, a total of 682. Average AADT (vehicles) is about 5 200 and 6 500 respectively, which corresponds to about 5 700 and 7 200 axel pairs per day respectively. Nine and ten respectively of the sections also have central rumble strips.

The total annual traffic mileage for the new sections is 1 966 million axel pairs-km, and that for the updated sections 2 179, a total of 4 145 million axels pairs km and thus about 7 per cent of the total traffic mileage on the state maintained road network.

The observed outcomes with ATK have been compared with "adjusted" normal outcomes *without* ATK. Adjustment comprised raising the normal rates used by 10 per cent to take account of the fact that the ATK sections were probably somewhat more dangerous than normal without intervention (compare with the calculations on the previous pages for estimating the "true" before values in before-after studies). Consideration could also be given to trends etc by also multiplying by a factor slightly less than 1, which however has not been done. The results obtained are given in *Tables 7* to *10* and in *Figures 14* and *15*.

Table 7. Observed FSI rates in 2007 with ATK compared with adjusted normal rates without ATK.

	Normal FSI rate without ATK	”Adjusted” FSI rate without ATK*	Observed FSI rate in 2007 without ATK	Per centage difference
New	0.0524	0.0576	0.0443	-23.2%
Updated	0.0492	0.0541	0.0441	-18.6%
All	0.0507	0.0558	0.0441	-20.9%

*”Adjusted” FSI rate without ATK calculated as normal FSI rate without ATK x 1.10

Table 8. Observed number of FSI in 2007 with ATK compared with adjusted normal number of FSI without ATK.

	Normal number of FSI per year without ATK	”Adjusted” number of FSI per year without ATK*	Observed number of FSI in 2007 with ATK	Relative difference with/without	Absolute difference with/without
New	103.0	113.3	87	-23.2%	-26.3
Updated	107.3	118.0	96	-18.6%	-22.0
All	210.3	231.3	183	-20.9%	-48.3

*”Adjusted” number of FSI without ATK calculated as Normal number of FSI without ATK x 1.10

$231 \pm 3\sqrt{231} = 231 \pm 46$, i.e. 185 – 277, or $231 \pm 2\sqrt{231} = 231 \pm 30$, i.e. 201 – 261

Significant result at risk level of 90 per cent and on borderline to being significant at risk level of 95 per cent.

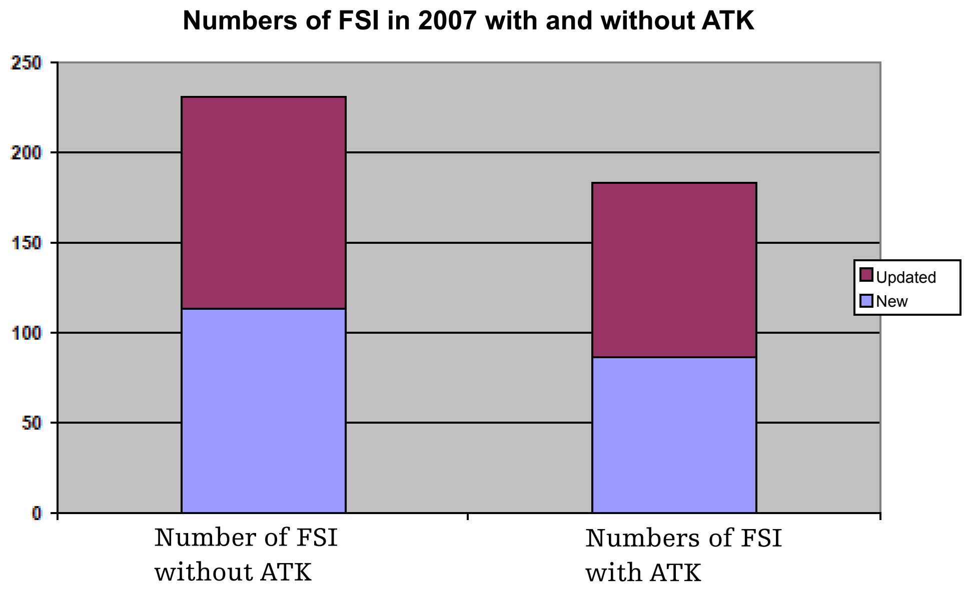

Figure 14. Number of FSI in 2007 on sections concerned with and without Argus II.

Overall, it is estimated that there are 48 fewer FSI in 2007 as a result of the introduction of Argus II.

Table 9. Observed F rates in 2007 with ATK compared with adjusted normal rates without ATK.

	Normal F rate without ATK	"Adjusted" F rate without ATK*	Observed F rate in 2007 without ATK	Per centage difference
New	0.0091	0.0100	0.0081	-18.8%
Updated	0.0090	0.0099	0.0055	-44.7%
All	0.0091	0.0100	0.0068	-32.4%

*"Adjusted" F rate without ATK calculated as normal F rate without ATK x 1.10

Table 10. Observed number of F in 2007 with ATK compared with adjusted normal number of F without ATK.

	Normal number of F per year without ATK	"Adjusted" number of F per year without ATK*	Observed number of F in 2007 with ATK	Relative difference	Absolute difference
New	17.9	19.7	16	-18.8%	- 3.7
Updated	19.7	21.7	12	-44.7%	- 9.7
All	37.6	41.4	28	-32.4%	-13.4

*"Adjusted" number of F without ATK calculated as normal number of F without ATK x 1.10

$41 \pm 3\sqrt{41} = 41 \pm 19$, i.e. 22 – 60, or $41 \pm 2\sqrt{41} = 41 \pm 13$, i.e. 28 – 44.

Non-significant result at risk level of 95 per cent but on borderline to being a significant result at risk level of 90 per cent.

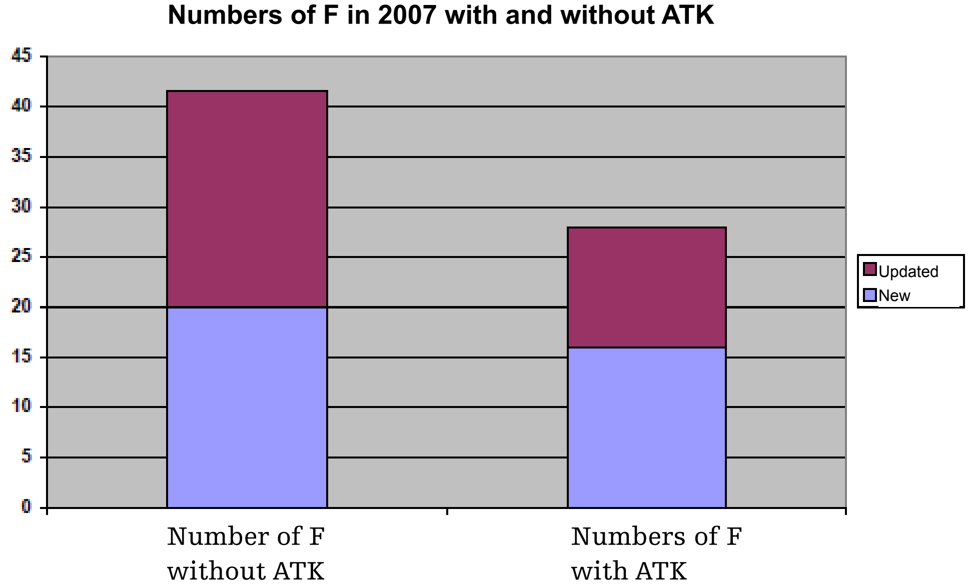

Figure 15. Number of F in 2007 on the sections concerned with and without ATK.

Overall, it is estimated that there are 13 fewer F in 2007 as a result of the introduction of Argus II.

4.2.3 Discussion and conclusions

Attempts to estimate the effect of new Argus II have been made using both before-after studies and with-without studies. All accident material has been obtained from STRADA for the period 2003-2007. The accident material is still very small in extent, especially with regard to the number of fatalities. There is some uncertainty in the background data, and the methods used are not entirely unobjectionable

The before-after and with-without studies yield about the same results, which is a strong point. The regression effect has as far as possible been eliminated, and an attempt has also been made to take account of other disturbing factors. *The better a study has been performed, the less the estimated intervention effect tends to become.* This is the interesting conclusion that can be drawn regarding before-after studies from a study carried out by TØI [Elvik, 1997].

The results indicate that ATK reduces the number of fatalities by about 20-30 per cent and the number of FSI by about 20 per cent. The results are still not fully statistically verified (as regards effects significantly different from zero). This may however be very well explained by the fact that the statistical data are still small in extent. Compared with the power model, this appears to indicate that the average speeds over all the ATK sections would have decreased by approximately 5 per cent.

The way the results may be interpreted is that the updated, i.e, first installed ATK sections, yielded the largest per centage reductions in the number of fatalities.

With the number of analyzed ATK sections that were available at the end of 2006, a total of about 1770 km, the estimated effects which have been obtained indicate that the annual number of lives saved would be about 13 (assuming a reduction of about 30 per cent) and that the reduction in the annual number of FSI would be about 48 (assuming a reduction of about 20 per cent). Expanded in a standard manner to the number of ATK sections at the end of 2007, about 2 400 km, the annual number of lives saved is about 18 and the annual reduction in the number of FSI about 65. It is estimated that in 2008 a further 250-300 km of ATK sections were added, after which the number of lives saved annually is roughly estimated to come to about 20 and the annual reduction in the number of FSI to about 70. If it is instead assumed that the reduction in the number of fatalities is only 20 per cent, the above numbers of lives saved annually (13, 18 and 20) would instead be about 8, 11 and 12 respectively.

It is very important that ATK should be monitored for a further number of years, both to obtain more reliable results and to see whether the results remain stable over time.

5 DISCUSSION AND OVERALL CONCLUSIONS

5.1 Conclusions

This evaluation shows that the target of reducing average speeds and speed violations in the road transport system and thus helping to reduce the number of fatalities and severe injuries was achieved during the after period which has now been evaluated. The following conclusions can be drawn from the results presented.

Average speed generally decreased on the sections. The variation among sections is relatively large depending on the permissible speed and on the magnitude of previous violations on the section. This is confirmed by the aggregation of all the sections that had been measured, where the reduction in average speed was roughly estimated at 4.3 per cent. The reduction in average speed is greatest on sections with 70 km/h where the reported reduction is 5.8 per cent; the corresponding figures for sections with 90 km/h are 3.9 per cent and for sections with 50 km/h they are 1.4 per cent.

A previous evaluation [SRA, 2007] showed a reduction of 8 per cent in average speed, with the reductions in speed at the cameras being given the same importance as those between cameras (see Subsection 4.1.7). This was also the result of measurements made on one single section, the one first established in 2006 with the new generation of cameras. This was a section which, prior to the installation of cameras, had an aggregated average speed that was about 6 km/h above the speed limit, which meant that the section had a relatively high before level compared with the average for the ATK sections now evaluated. This demonstrates that there is an evident relationship between the reduction in average speed that can be expected as a result of the installation of cameras and the level of average speed in relation to the speed limit without cameras.

As expected, the reduction in speed is greatest at the sites which measured the speed of the vehicle in the immediate vicinity of the camera, with surveillance of the vehicle in its direction of travel.

The reduction at the measurement sites between cameras is slightly smaller, but here also the reduction is pronounced.

Both the average speed and the proportion of speed violations decreased on the sections where cameras had been installed. The decrease is particularly noticeable for vehicles with high speed violations.

If cameras are installed on sections and in places that are particularly likely to have serious accidents, it is probable that the effect on road safety will be somewhat higher than if cameras are installed at random over the road network.

The road safety analysis shows, for the short after period that was analyzed, a clear reduction in the number of fatalities and severe injuries which is in good agreement with the change in average speed that occurred on the sections now studied.

Prior to expansion of ATK, it was assumed that on wide roads with 90 km/h the speed would decrease from 92 to 88 km/h which is over 4 per cent, and that this would produce a reduction in the number of fatalities by about 20 per cent [Bergh, 2005, unpublished]. In the road safety effects now presented, there is nothing to indicate that this assumption was wrong. It also appears reasonable in view of this to assume that the effect of ATK on the number of fatalities will remain about 20 per cent.

5.2 Discussion

As expected, the measurements show that the level of permissible speed, and the extent of speed violations prior to installation of the cameras, have a great effect on the results. The greatest relative reduction was measured on sections where the speed limit was 50-70 km/h and where the greatest proportion of speed violations had occurred prior to surveillance. The way the proportion of serious accidents was affected on sections with 50-70 km/h in comparison with sections with 90 km/h should however be analyzed further. This will be particularly important when new speed limits are introduced, to find how a speed limit better adapted to the road layout, in combination with active surveillance, can influence the number of fatalities and severe injuries in the traffic system.

There is a clear difference in average speed reduction at sites between cameras and at cameras. The question is how this affects the accident outcome, in view of the fact that the sites for the cameras were predominantly chosen with regard to the injury risk at the site. By far the most sites are located at connecting roads, intersections and other accident prone places over the section. In view of the short after period for the study of road safety effects, it is too early to draw conclusions as to what effect the sitting strategy adopted has had.

The way the cameras influence the general respect for speed limits is not apparent from this evaluation. It may however be assumed that the cameras convey a clear message to road users that observance of speed limits is accorded great importance from the standpoint of public safety. In view of the great interest regarding why and how the cameras have been sited on certain roads where many accidents had occurred, the issue of speed has been in focus to an extent that would not otherwise have been the case. It may therefore be assumed that cameras are of some significance with regard to speeds on the road network.

The significance of the distance between cameras over a section could not be determined in these measurements. It is likely that the reduction in average speed on a section where there is a large distance between cameras is lower than where the distance between cameras is short. On the other hand, by having a larger distance between cameras, it has been possible to provide cameras on more sections with an accident history than would have been possible if it had been decided to have a shorter distance between cameras. A maximum distance between cameras should however be specified in order that a section may be regarded as a contiguous section under surveillance and not as individual sites with cameras.

Another factor about which it is difficult to draw conclusions is the significance of signposting the section. This applies both to how well road users are informed about the speed limit and to the way the sign with the camera symbol and the additional sign showing the length of the section are regarded by road users. The signs used during these measurements have, from 2008 onwards, been changed so that each site has a clear sign with both the speed limit and the camera symbol. The additional signs indicating the length of the section were removed at the same time.

Whether a possible support system with vehicle-actuated illuminated signs of the type "you are driving too fast" or a similar message at a number of appropriate sites over a section might influence the speeds of drivers is an interesting question that could not be evaluated in this survey.

The measurements show that a very low proportion of vehicles exceed the limit for being reported at the cameras (speed limit + 6 km/h). This shows that road users regard the system as credible. This is probably due the fact that drivers now know that each site has equipment that can record violations. Bearing in mind the extent to which a certain camera may be active and record actual violations in relation to the investigatory capacity of the police, the measurements show that the capacity allocated annually for investigating such matters (about 200 000) has been fully adequate for the system to achieve the desired effect.

The accident analysis that has been performed does not show how different types of accident have been affected. A combination of other physical measures such as rumble strips and the presence of barriers at the sides of the road may, for example, be factors that have an effect on this.

5.3 Further work

Further work should focus on monitoring the continued change in rate of accidents and injuries on the sections with cameras over an extended period.

As regards monitoring of speeds, the system supplies continuous information about speeds at camera sites, and therefore continuous reports on these are available.

Further monitoring of speeds between measurement sites should be carried out to see whether the results now obtained change over time, and how the use of other types of surveillance such as the use of mobile ATK cameras can influence this.

Effects on accidents and speeds at intersections are another area that should be studied further in view of the fact that a certain proportion of cameras are located at intersections.

The effects of changed speed limits with and without ATK should be studied further to find whether these effects are influenced by increased surveillance.

Calculations which show the national economic effects of ATK on different typical road sections should also be carried out, account being taken of all effects such as travel times, road safety, noise, CO_2 emissions, particle emissions and fuel costs.

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7 APPENDIXES

Appendix No 1. Measurement sites for the speed study

Table 11. Number of measurement sites per section and their placing. Reports for individual sections are given in under Trafiksäkerhet/Hastighet/Trafik-säkerhetskameror/Effekter och nytta/Publicerade rapporter.

Section Code	Section	Forward direction	Reverse direction	Between	At mark	Outside	Ref. point
2008	Lv222 Ålstäket – Strömma	1	1	6		2	
2009	Lv268 Upplands Väsby – Vallentuna	2	2	2			
2010	Lv225 Ösmo – Vårsta	5	4	4			
4003	Rv56 Länsgräns – Katrineholm	2	2	8			
5003	Rv 50 Vadstena – Motala	2	2	4			
6005	Rv27 Kärda – Bredaryd	2	2	4	2		2
6006	Rv33 Nässjö – Eksjö	4	4	8	2		2
7002	Rv 23 Lövhult – Stora Hammaren	2	2	4	2	2	
7003	Rv25 Sjöatorp – Forsa	2	2	2	4		2
7004	Rv27 Ingelstad – Växjö	2	2	4	2		
9001	Lv143 Roma – Roma kyrkby	2	2	2	2	2	
10001	E22 Jämjö	2	2	4	2	2	
10002	E22 Björketorp	2			2	2	
12004	Lv 111 Laröd – Domstenkamera	2	2	2		4	
12005	Rv 13 Klippan – Munka Ljungby	2	2	2			
12006	Rv 23 Rolsberga – Sandåkra	3	2	2	2	2	
12007	Rv 11 Sjöbo – Ö Tomarp	4	4	2		2	
12008	Lv 108 Svedala – Trelleborg			2	2		
12009	E22 Tätort Linderöd	1	1			2	
12010	E22 Tätort Sätaröd	2	2				
13001	Lv158 Särö – Kungsbacka	1	1	2		2	2
13002	Rv 41 Veddige (865) – Länsgränsen	2	2	2		2	
13003	Rv 26 Halmstad – Oskarström	3	1	2	2	2	2
14011	Rv44 Håsten – Gålstad	2	2	2	2		
14012	E20 Skara – Lundsbrunn	2	2	2			4
14013	Rv46 Falköping – Borgunda	2	2	4	2		2
14014	Lv160 Myggenäs – Varekil	2	2	2		2	
14015	Lv190 Angered – Stannum	2	2	2		2	2
14016	Rv44 Filsbäck – Götene	2	1	2	2	2	2
14017	E45 Brålanda – Solberg	2	2	2	2	2	
14018	E45 Ånimskog – Åmål	2	1	2	2		
14019	E6_20	2	1	2		2	2
14021	Lv156 Hyssna	2	2			2	2
14022	E45 Göta – Trollhättan	2	1				2
17003	Rv63 Karlstad – Molkom	2	2	4	2	2	
18003	Rv50 Axbergshammar – Löa	2	2	4		2	
20005	E45 Noppikoski – Älvros	2	2				
21005	Rv50 Glössbo – Söderhamn	2	2	2			
22005	Rv90 Veda – Sollefteå	2	2	2			

Appendix No 2. Measured average speeds

Table 12. Average speed at different places in relation to the camera, broken down by speed limits. All measurement sites.

Speed limit	50 km/h			70 km/h			90 km/h		
	Before	*After*	*Change*	*Before*	*After*	*Change*	*Before*	*After*	*Change*
Forward direction	km/h		%	km/h		%	km/h		%
Cars	55.2	48.3	-12.5(±3.6)	74.2	64.3	-13.4(±2.1)	88.6	81.7	-7.8 (±1.0)
Lorries	57.5	51.7	-10.0(±4.1)	74.5	67.6	-9.3(±1.7)	82.6	81.0	-1.8 (±0.7)
All vehicles	55.4	48.6	-12.3(±3.7)	74.1	64.9	-12.4(±2.1)	87.7	81.5	-7.0 (±0.9)
Reverse direction	km/h		%	km/h		%	km/h		%
Cars	56.4	53.2	-5.7(±2.1)	74.5	70.2	-5.7(±1.2)	88.3	85.1	-3.6 (±0.6)
Lorries	57.7	55.5	-3.9(±2.3)	72.9	70.1	-3.8(±2.7)	82.0	81.2	-1.0 (±0.5)
All vehicles	56.3	53.3	-5.4(±2.0)	74.1	70.4	-5.1(±1.3)	87.4	84.5	-3.3 (±0.6)
Between	km/h		%	km/h		%	km/h		%
Cars	49.6	49.5	-0.2(±0.7)	73.7	69.9	-5.2(±1.7)	89.9	86.5	-3.8 (±0.6)
Lorries	50.7	50.5	-0.5(±3.7)	72.6	69.5	-4.2(±1.8)	82.9	81.5	-1.7 (±0.5)
All vehicles	49.5	49.4	-0.2(±0.8)	73.5	68.8	-5.1(±1.7)	89.0	85.8	-3.6 (±0.5)
Mark	km/h		%	km/h		%	km/h		%
Cars				72.1	69.1	-4.1(±1.5)	89.5	87.2	-2.6 (±2.6)
Lorries				70.8	68.5	-3.2(±1.8)	82.0	81.6	-0.4 (±0.7)
All vehicles				71.9	69.0	-4.0(±1.5)	88.5	86.5	-2.2 (±1.2)
Outside	km/h		%	km/h		%	km/h		%
Cars	51.7	49.7	-3.8(±5.3)	77.5	75.2	-2.9(±1.5)	92.6	89.7	-3.1 (±1.8)
Lorries	52.4	51.2	-2.4(±4.5)	70.5	69.4	-1.6(±4.5)	83.6	82.5	-1.3 (±1.1)
All vehicles	51.7	49.9	-3.6(±5.2)	77.1	74.8	-3.0(±1.6)	91.5	88.9	-2.8 (±1.8)
Reference point	km/h		%	km/h		%	km/h		%
Cars				78.0	74.3	-4.8(±2.3)	90.4	89.7	-0.7 (±0.8)
Lorries				75.3	70.8	-5.9(±2.5)	81.0	80.7	-0.4 (±0.8)
All vehicles				77.6	73.9	-4.8(±2.3)	89.4	88.8	-0.6 (±0.8)

Table 13. Proportions of speed violations at different places in relation to the camera, broken down by speed limits. All measurement sites.

Speed limit	50 km/h			70 km/h			90 km/h		
	Before	After	Change	Before	After	Change	Before	After	Change
Forward direction	km/h		%	km/h		%	km/h		%
Cars	67.1	28.7	-57.2(±11.9)	59.5	14.3	-76.0(±11.4)	42.3	11.7	-72.3 (±8.9)
Lorries	79.7	53.5	-32.9 (±8.1)	67.1	30.7	-54.3 (±9.0)	6.4	3.2	-49.9(±25.6)
All vehicles	68.0	30.6	-55.0(±11.6)	60.1	15.7	-73.9(±10.6)	37.9	10.8	-71.5 (±8.9)
Reverse direction	km/h		%	km/h		%	km/h		%
Cars	70.5	57.3	-18.7(±5.2)	60.5	41.8	-30.8(±4.9)	43.0	27.4	-36.3 (±6.1)
Lorries	80.1	73.1	-8.7 (±6.5)	62.9	47.8	-24.1(±9.1)	4.5	3.0	-35.0(±17.7)
All vehicles	70.6	58.4	-17.4(±4.3)	61.2	43.6	-28.8(±4.9)	38.4	24.3	-36.9 (±6.1)
Between	km/h		%	km/h		%	km/h		%
Cars	39.0	38.4	-1.6(±5.9)	64.7	45.8	-29.3(±8.1)	44.3	30.3	32.4 (±4.3)
Lorries	47.9	50.5	5.6(±28.2)	60.7	44.5	-26.7(±9.8)	6.3	3.9	-38.4(±18.4)
All vehicles	39.1	38.4	-1.7(±7.0)	64.4	45.8	-28.9(±8.1)	40.0	26.9	-32.9 (±4.4)
Mark	km/h		%	km/h		%	km/h		%
Cars				51.6	38.6	-25.2 (±9.5)	42.4	30.6	-27.8(±10.9)
Lorries				50.5	40.0	-20.7(±11.2)	3.9	3.5	-9.9(±43.8)
All vehicles				51.3	38.5	-24.9(±9.5)	37.3	27.5	-26.3(±11.5)
Outside	km/h		%	km/h		%	km/h		%
Cars	50.8	38.8	-23.6(±30.1)	71.3	63.2	-11.4(±6.9)	56.4	44.4	-21.3 (±9.5)
Lorries	63.1	51.6	-18.2(±20.3)	51.0	47.3	-7.3(±32.6)	7.1	6.4	-10.4(±47.5)
All vehicles	51.1	39.8	-22.2(±30.2)	70.1	62.1	-11.5(±7.5)	49.0	38.4	-21.6(±10.3)
Reference point	km/h		%	km/h		%	km/h		%
Cars				82.7	69.3	-16.2(±6.8)	46.5	44.0	-5.5 (±5.7)
Lorries				77.7	55.9	-28(±12.4)	4.1	3.4	-17.2(±40.4)
All vehicles				76.2	64.1	-15.8(±5.9)	42.3	40.4	-4.6 (±6.1)

Table 14. 85th per centile at different places in relation to the camera, broken down by speed limits. All measurement sites.

Speed limit	50 km/h			70 km/h			90 km/h		
	Before	*After*	*Change*	*Before*	*After*	*Change*	*Before*	*After*	*Change*
Forward direction	km/h		%	km/h		%	km/h		%
Cars	63.6	52.7	-17.1 (±4.5)	84.0	69.4	-17.3 (±2.6)	98.8	88.5	-10.5 (±1.1)
Lorries	64.8	56.8	-12.4 (±5.6)	81.8	72.5	-11.3 (±1.6)	88.0	86.6	-1.6 (±0.5)
All vehicles	63.8	53.2	-16.6 (±4.5)	83.7	70.3	-16.0 (±2.5)	97.7	88.2	-9.7 (±1.1)
Reverse direction	km/h		%	km/h		%	km/h		%
Cars	64.9	60.3	-7.1 (±3.0)	83.9	77.9	-7.1 (±1.4)	99.0	93.6	-5.5 (±0.7)
Lorries	65.8	61.7	-6.3 (±3.6)	80.2	77.0	-4.1 (±2.3)	87.4	86.7	-0.8 (±0.3)
All vehicles	64.9	60.4	-6.9 (±2.7)	83.6	78.5	-6.1 (±1.8)	97.9	92.8	-5.2 (±0.7)
Between	km/h		%	km/h		%	km/h		%
Cars	55.1	54.8	-0.6(±0.9)	82.8	77.4	-6.6 (±1.9)	99.5	94.4	-5.1 (±0.6)
Lorries	56.1	56.0	-0.3(±4.5)	79.9	75.5	-5.5 (±1.9)	87.9	86.7	-1.3 (±0.4)
All vehicles	55.1	54.8	-0.6(±1.0)	82.7	77.3	-6.4 (±1.8)	98.5	93.5	-5.1 (±0.6)
Mark	km/h		%	km/h		%	km/h		%
Cars				80.4	76.3	-5.1 (±2.0)	98.7	94.7	-4.1 (±1.5)
Lorries				77.6	74.7	-3.8 (±1.5)	87.1	87.0	-0.1 (±0.5)
All vehicles				80.0	76.1	-4.9 (±1.8)	97.7	93.9	-3.9 (±1.5)
Outside	km/h		%	km/h		%	km/h		%
Cars	57.4	54.4	-5.3 (±7.0)	87.0	84.0	-3.5 (±1.9)	102.6	99.0	-3.5 (±1.9)
Lorries	58.0	55.1	-5.0 (±5.6)	77.8	76.4	-1.8 (±3.9)	88.3	87.5	-0.8 (±0.9)
All vehicles	57.4	54.6	-5.0 (±6.9)	86.7	83.6	-3.5 (±1.9)	101.6	98.1	-3.4 (±1.9)
Reference point	km/h		%	km/h		%	km/h		%
Cars				87.2	83.6	-4.1 (±1.4)	100.6	99.8	-0.8 (±0.8)
Lorries				83.4	79.0	-5.2 (±2.6)	86.7	86.5	-0.3 (±0.7)
All vehicles				86.7	83.2	-4.0 (±1.4)	99.7	98.9	-0.8 (±0.8)

Table 15. Proportion exceeding the speed limit by 6 km/h or more at different places in relation to the camera, broken down by speed limits. All measurement sites.

Speed limit	50 km/h			70 km/h			90 km/h		
	Before	After	Change	Before	After	Change	Before	After	Change
Forward direction	km/h		%	km/h		%	km/h		%
Cars	39.2	9.5	-75.7(±23.8)	37.8	4.3	-88.6(±18.5)	20.8	2.8	-86.4(±12.9)
Lorries	49.2	16.4	-66.7(±28.3)	42.6	7.7	-81.9(±19.5)	0.8	1.1	38.1 (±116)
All vehicles	39.9	10.1	-74.9(±23.8)	38.0	4.7	-87.7(±17.5)	18.3	2.6	-85.5(±13.0)
Reverse direction	km/h		%	km/h		%	km/h		%
Cars	45.1	30.6	-32.1(±17.2)	37.8	21.9	-42.2(±11.9)	21.2	10.7	-49.5 (±9.8)
Lorries	57.4	40.9	-28.7(±10.9)	36.7	19.7	-46.2(±20.6)	0.5	1.1	113.8(±272)
All vehicles	45.5	31.3	-31.2(±16.7)	38.5	22.6	-41.3(±12.5)	18.7	9.4	-49.8 (±9.6)
Between	km/h		%	km/h		%	km/h		%
Cars	13.6	12.5	-8.3 (±9.5)	38.1	21.4	-43.8(±11.9)	22.6	13.0	-42.2 (±6.9)
Lorries	16.2	15.6	-3.7(±56.6)	33.4	20.0	-40.1(±16.7)	2.2	1.5	-35.3(±53.9)
All vehicles	13.6	12.5	-8.2(±10.1)	37.9	21.5	-43.3(±11.8)	20.0	11.5	-42.5 (±6.8)
Mark	km/h		%	km/h		%	km/h		%
Cars				28.4	17.9	-36.9(±20.5)	21.3	12.8	-36.9(±18.0)
Lorries				27.8	17.7	-36.2(±27.6)	1.2	0.6	-48.6(±82.0)
All vehicles				28.3	17.9	-36.7(±21.0)	18.4	11.4	-38.2(±17.9)
Outside	km/h		%	km/h		%	km/h		%
Cars	21.0	13.3	-36.5(±41.5)	49.9	42.5	-14.9 (±8.7)	31.6	23.1	-27.1(±11.8)
Lorries	26.4	14.7	-44.5(±21.3)	27.3	26.6	-2.4(±39.0)	3.9	1.3	-67.6(±95.7)
All vehicles	21.1	13.8	-34.8(±41.6)	48.7	41.4	-15.1 (±9.4)	26.5	19.2	-27.5(±12.5)
Reference point	km/h		%	km/h		%	km/h		%
Cars				60.7	44.5	-26.7 (±8.4)	25	23.1	-7.5 (±8.3)
Lorries				50.3	30.9	-38.6(±12.9)	3.4	1.7	-50.9(±64.0)
All vehicles				50.8	37.3	-26.6(±12.0)	22.5	21.0	-6.6 (±8.4)

Appendix No 3. New ARGUS II sections, injury data

New ARGUS II sections (i.e. they had never had ARGUS I) Before=2003-2005 After=2007

All accident types

Version 2008-11-25				ant.				2003			2004			2005			mv 2003-2005			mv 03-05	2006			2007		
Sträcka	**ID nr**	**ÅDT***	**km**	**kam**	**brk**	**hgr**	**räf**	D	SS	DSS	D	SS	DSS	D	SS	DSS	D	SS	DSS	DSS/km	D	SS	DSS	D	SS	DSS
E10 Kiruna-Svappa (VN)	25004	2000	41	9	3	90	0	1	1	2	0	2	2	0	1	1	0,3	1,3	1,7	0,04	0	0	0	0	2	2
VN tot			**41**	**9**			**0**	**1**	**1**	**2**	**0**	**2**	**2**	**0**	**1**	**1**	**0,3**	**1,3**	**1,7**	**0,04**	**0**	**0**	**0**	**0**	**2**	**2**
71 Vansbro-Sälen (VM)	20004	2400	43	10	23	90	0	2	7	9	2	1	3	1	7	8	1,7	5	6,7	0,16	0	3	3	0	1	1
45 Noppikoski-Älvros (VM)	20005	1200	89	9	2	90	1	3	3	6	0	1	1	0	0	0	1	1,3	2,3	0,03	1	3	4	0	0	0
50 Mo-Söderhamn (VM)	21005	6000	17	4	34	90	0	0	2	2	0	2	2	0	0	0	0	1,3	1,3	0,08	0	0	0	0	1	1
90 Veda-Sollefteå (VM)	22005	3500	59	7	234	90	1	0	5	5	0	4	4	0	9	9	0	6	6	0,10	0	4	4	0	1	1
VM tot			**208**	**30**			**2**	**5**	**17**	**22**	**2**	**8**	**10**	**1**	**16**	**17**	**2,7**	**14**	**16**	**0,08**	**1**	**10**	**11**	**0**	**3**	**3**
VST; 276 Åkersberga-Rosla	02006	5000	16	10	2	70	0	1	3	4	0	3	3	0	11	11	0,3	5,7	6	0,38	0	1	1	0	4	4
VST; 261 Tappström-Bromr	02007	20500	9	13	3	70	0	0	2	2	0	8	8	0	4	4	0	4,7	4,7	0,52	0	8	8	0	2	2
VST; 222 Ålstäket-Stavsnäs	02008	7500	8	10	2	70	0	1	5	6	0	1	1	1	6	7	0,7	4	4,7	0,58	0	4	4	0	1	1
VST; 268 UpplVäsby-Valler	02009	12500	9	8	2	70	0	0	0	0	1	5	6	1	1	2	0,7	2	2,7	0,30	0	0	0	0	3	3
VST; 225 Ösmo-Vårsta	02010	7000	24	12	2	70	0	1	14	15	1	7	8	1	9	10	1	10	11	0,46	0	4	4	0	4	4
VST; 143 Roma-Roma kyrk	09001	4500	4	2	3	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	1	1	0	0	0
VST tot			**70**	**55**			**0**	**3**	**24**	**27**	**2**	**24**	**26**	**3**	**31**	**34**	**2,7**	**26**	**29**	**0,41**	**0**	**18**	**18**	**0**	**14**	**14**
VVÄ; 158 Särö-Kungsbacka	13001	11900	6	6	4	90	0	0	0	0	0	1	1	0	1	1	0	0,7	0,7	0,11	0	1	1	0	0	0
VVÄ; 41 Veddige-länsgr	13002	4700	8	4	2	70	0	0	0	0	0	4	4	1	0	1	0,3	1,3	1,7	0,21	0	0	0	0	0	0
VVÄ; 26 Halmstad-Oskarss	13003	8900	10	6	23	90	0	0	1	1	0	1	1	0	7	7	0	3	3	0,30	0	2	2	0	2	2
VVÄ; 44 Håsten-Gålstad	14011	7200	6	2	24	90	0	1	0	1	0	2	2	0	0	0	0,3	0,7	1	0,17	0	0	0	0	1	1
VVÄ; E20 Skara-Lundsbrun	14012	8500	9	4	3	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	1	0	1
VVÄ; 46 Falköp-Borgunda	14013	4300	19	8	2	90	0	0	0	0	3	3	6	0	0	0	1	1	2	0,11	0	0	0	0	0	0
VVÄ; 160 Myggenäs-Vareki	14014	6300	10	6	23	90	0	0	0	0	2	3	5	0	2	2	0,7	1,7	2,3	0,23	0	0	0	0	3	3
VVÄ; 190 Gunnilse-Stannur	14015	6500	12	8	3	70	0	0	0	0	1	3	4	0	2	2	0,3	1,7	2	0,17	0	0	0	0	0	0
VVÄ; 44 Filsbäck-Götene	14016	6200	13	6	4	90	0	0	3	3	0	0	0	0	2	2	0	1,7	1,7	0,13	1	1	2	1	2	3
VVÄ; E45 Brålanda-Solberg	14017	8000	19	7	2	90	0	0	4	4	0	6	6	0	1	1	0	3,7	3,7	0,19	0	4	4	1	4	5
VVÄ; E45 Ånimskog-Åmål	14018	5400	25	10	3	90	0	1	3	4	1	2	3	0	2	2	0,7	2,3	3	0,12	2	6	8	1	2	3
VVÄ; E6.20 Väder-Klaraber	14019	9900	15	11	3	70	0	0	2	2	0	4	4	0	5	5	0	3,7	3,7	0,24	0	0	0	2	4	6
VVÄ; 156 Sandvad-Hyssna	14021	5000	4	4	2	90	0	0	3	3	0	0	0	1	1	2	0,3	1,3	1,7	0,42	0	0	0	0	5	5
VVÄ; E45 Del gm Göta	14022	9300	3	2	4	50	0	0	0	0	0	0	0	0	2	2	0	0,7	0,7	0,22	0	0	0	0	0	0
VVÄ; 63 Kstad-Molkom	17003	4800	25	10	2	90	0	2	2	4	0	0	0	3	2	5	1,7	1,3	3	0,12	1	1	2	0	0	0
VVÄ tot			**184**	**94**			**0**	**4**	**18**	**22**	**7**	**29**	**36**	**5**	**27**	**32**	**5,3**	**25**	**30**	**0,16**	**4**	**15**	**19**	**6**	**23**	**29**
VMN; 70 Enköp-Sala	3003	5500	38	11	24	90	0	0	6	6	0	4	4	0	4	4	0	4,7	4,7	0,12	0	1	1	0	2	2
VMN; 55 Örsundsbro-Kvarn	3004	7800	15	6	4	90	0	1	1	2	0	3	3	0	1	1	0,3	1,7	2	0,13	0	4	4	2	2	4
VMN; 288 Leista-Gimo-Östh	3005	5000	45	11	2	90	0	1	6	7	0	3	3	0	1	1	0,3	3,3	3,7	0,08	0	2	2	0	2	2
VMN; 55 Elängr-Kholm	4003	5400	15	5	3	90	1	1	0	1	0	2	2	2	4	6	1	2	3	0,20	0	0	0	0	0	0
VMN; 52 Skavsta-Nyköping	4004	7000	1	2	4	70	0	0	0	0	0	0	0	0	1	1	0	0,3	0,3	0,33	0	0	0	0	0	0
VMN; 50 Elängr-Åsbo	18002	5700	42	10	234	90?	0	2	5	7	0	1	1	1	2	3	1	2,7	3,7	0,09	0	7	7	0	2	2
VMN; 50 Axbergsham-Löa	18003	4500	32	10	34	90	0	0	6	6	1	6	7	1	8	9	0,7	6,7	7,3	0,23	1	2	3	2	2	4
VMN; 53 Kvicksund-Västjäd	19003	6400	11	3	3	90	1	0	1	1	0	2	2	0	7	7	0	3,3	3,3	0,30	0	1	1	0	3	3
VMN tot			**199**	**58**			**2**	**5**	**25**	**30**	**1**	**21**	**22**	**4**	**28**	**32**	**3,3**	**25**	**28**	**0,14**	**1**	**17**	**18**	**4**	**13**	**17**
VSÖ; 50 Vadstena - Motala	5003	5400	12	6	2	70?	0	0	0	0	1	1	2	1	1	2	0,7	0,7	1,3	0,11	0	0	0	0	0	0
VSÖ; 27 Bor - Bredasten	6004	5800	7	4	23	90	0	0	0	0	0	0	0	0	1	1	0	0,3	0,3	0,05	1	0	1	0	0	0
VSÖ; 27 Kärda - Bredaryd	6005	6500	8	6	2	90	1	0	0	0	2	1	3	0	0	0	0,7	0,3	1	0,13	0	1	1	0	1	1
VSÖ; 33 Nässjö - Eksjö	6006	8000	11	7	2	90	0	0	1	1	2	3	5	0	0	0	0,7	1,3	2	0,18	0	3	3	0	0	0
VSÖ; 25 Sjöatorp - Forsa	7003	7000	3	2	34	90	0	0	0	0	0	3	3	0	0	0	0	1	1	0,33	0	0	0	0	1	1
VSÖ; 27 Ingelstad - Växjö	7004	5400	11	6	4	90	0	1	4	5	0	0	0	0	1	1	0,3	1,7	2	0,18	0	1	1	0	0	0
VSÖ; 34 Målilla - Gullringer	8004	4500	46	16	3	90	1	0	4	4	0	2	2	0	6	6	0	4	4	0,09	0	2	2	1	0	1
VSÖ; E22 Lösen - Jämjö	10001	8200	9	5	3	90	1	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	1	1
VSÖ; E22 Björketorp, korsn	10002	11800	1	2	3	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0
VSÖ tot			**108**	**54**			**3**	**1**	**9**	**10**	**5**	**10**	**15**	**1**	**9**	**10**	**2,3**	**9,3**	**12**	**0,11**	**1**	**7**	**8**	**1**	**3**	**4**
VSK; 111 Domsten-Laröd	12004	11800	3	4	23	90	1	0	1	1	0	0	0	0	2	2	0	1	1	0,33	1	3	4	2	2	4
VSK; 13 Klippan-Ängelholm	12005	5600	26	7	2	90	0	0	1	1	0	1	1	0	1	1	0	1	1	0,04	0	0	0	0	0	0
VSK; 23 Sandåkra-Rollsber	12006	6800	45	10	234	90	0	2	4	6	3	0	3	0	1	1	1,7	1,7	3,3	0,07	1	1	2	0	5	5
VSK; 11 Sjöbo - Ö Tomarp	12007	4000	40	16	23	90	0	1	2	3	1	9	10	1	5	6	1	5,3	6,3	0,16	0	1	1	3	6	9
VSK; 108 Svedala-Trellebor	12008	4700	14	7	2	90	0	1	2	3	0	5	5	0	0	0	0,3	2,3	2,7	0,19	0	1	1	0	0	0
VSK; E22 Tätort Linderöd	12009	8000	1	2	3	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0
VSK; E22 Tätort Sätaröd	12010	8000	1	2	3	50?	1	0	3	3	0	0	0	0	0	0	0	1	1	1,00	0	0	0	0	0	0
VSK; E22 Tätort Tollarp	12011	7700	1	2	3	90	0	0	1	1	0	1	1	0	0	0	0	0,7	0,7	0,67	0	0	0	0	0	0
VSK tot			**131**	**50**			**2**	**4**	**14**	**18**	**4**	**16**	**20**	**1**	**9**	**10**	**3**	**13**	**16**	**0,12**	**2**	**6**	**8**	**5**	**13**	**18**
Summa			**941**	**350**			**9**	**23**	**108**	**131**	**21**	**110**	**131**	**15**	**121**	**136**	**20**	**113**	**133**	**0,14**	**9**	**73**	**82**	**16**	**71**	**87**
Totalt antal sträckor =	**51**	** ÅDT fordon, ÅDT axelpar = ca 1,10 x ÅDT fordon*															19,7	113,0	132,7							

Mean per year and site 0.39 2.22 2.6

Sträcka=section
ÅDT=AADT vehicles, AADT axle pairs = about 1.10xAADT vehicles
ant kam=number of cameras
Brk=width class
hgr=speed limit
räf=rumble strips
D=F
SS=SI
DSS= FSI
Mv=mean value

F per year and 10 km before= 0.21
FSI per year and 10 km before= 1.41
No of cameras per km= 0.37

131+131+136 = 398 FSI before
398-99+40 = 339 FSI before if “random corrected” (the “worst” annual outcomes replaced by means for othertwo years)

2007 rel mv 2003-2005			2007 - mv 2003-2005							TA	D-kvot		DSS-kvot		Kamera täthet	Före DSS per	Obs 3 år före	
D	SS	DSS	D	SS	DSS	ID nr	ÅDT*	km	km x ÅDT*	(Mapkm/år	före	efter	före	efter	per km	km o år	D	DSS
-100%	50%	20%	-0,3	0,7	0,3	25004	2000	41	82000	32,9	0,0101	0,0000	0,0506	0,0607	0,22	0,04	1	5
-100%	50%	20%	-0,3	0,7	0,3			41		32,9	0,0101	0,0000	0,0506	0,0607	0,22	0,04	1	5
-100%	-80%	-85%	-1,7	-4,0	-5,7	20004	2400	43	103200	41,4	0,0402	0,0000	0,1609	0,0241	0,23	0,16	5	20
-100%	-100%	-100%	-1,0	-1,3	-2,3	20005	1200	89	106800	42,9	0,0233	0,0000	0,0544	0,0000	0,10	0,03	3	7
	-25%	-25%	0,0	-0,3	-0,3	21005	6000	17	102000	41,0	0,0000	0,0000	0,0326	0,0244	0,24	0,08	0	4
	-83%	-83%	0,0	-5,0	-5,0	22005	3500	59	206500	82,9	0,0000	0,0000	0,0724	0,0121	0,12	0,10	0	18
-100%	-78%	-82%	-2,7	-10,7	-13,3			208		208,2	0,0128	0,0000	0,0785	0,0144	0,14	0,08	8	49
-100%	-29%	-33%	-0,3	-1,7	-2,0	02006	5000	16	80000	32,1	0,0104	0,0000	0,1868	0,1245	0,63	0,38	1	18
	-57%	-57%	0,0	-2,7	-2,7	02007	20500	9	184500	74,1	0,0000	0,0000	0,0630	0,0270	1,44	0,52	0	14
-100%	-75%	-79%	-0,7	-3,0	-3,7	02008	7500	8	60000	24,1	0,0277	0,0000	0,1937	0,0415	1,25	0,58	2	14
-100%	50%	13%	-0,7	1,0	0,3	02009	12500	9	112500	45,2	0,0148	0,0000	0,0590	0,0664	0,89	0,30	2	8
-100%	-60%	-64%	-1,0	-6,0	-7,0	02010	7000	24	168000	67,5	0,0148	0,0000	0,1631	0,0593	0,50	0,46	3	33
			0,0	0,0	0,0	09001	4500	4	18000	7,2	0,0000	0,0000	0,0000	0,0000	0,50	0,00	0	0
-100%	-47%	-52%	-2,7	-12,3	-15,0			70		250,1	0,0107	0,0000	0,1159	0,0560	0,79	0,41	8	87
	-100%	-100%	0,0	-0,7	-0,7	13001	11900	6	71400	28,7	0,0000	0,0000	0,0233	0,0000	1,00	0,11	0	2
-100%	-100%	-100%	-0,3	-1,3	-1,7	13002	4700	8	37600	15,1	0,0221	0,0000	0,1104	0,0000	0,50	0,21	1	5
	-33%	-33%	0,0	-1,0	-1,0	13003	8900	10	89000	35,7	0,0000	0,0000	0,0840	0,0560	0,60	0,30	0	9
-100%	50%	0%	-0,3	0,3	0,0	14011	7200	6	43200	17,3	0,0192	0,0000	0,0577	0,0577	0,33	0,17	1	3
			1,0	0,0	1,0	14012	8500	9	76500	30,7	0,0000	0,0326	0,0000	0,0326	0,44	0,00	0	0
-100%	-100%	-100%	-1,0	-1,0	-2,0	14013	4300	19	81700	32,8	0,0305	0,0000	0,0610	0,0000	0,42	0,11	3	6
-100%	80%	29%	-0,7	1,3	0,7	14014	6300	10	63000	25,3	0,0264	0,0000	0,0922	0,1186	0,60	0,23	2	7
-100%	-100%	-100%	-0,3	-1,7	-2,0	14015	6500	12	78000	31,3	0,0106	0,0000	0,0639	0,0000	0,67	0,17	1	6
	20%	80%	1,0	0,3	1,3	14016	6200	13	80600	32,4	0,0000	0,0309	0,0515	0,0927	0,46	0,13	0	5
	9%	36%	1,0	0,3	1,3	14017	8000	19	152000	61,0	0,0000	0,0164	0,0601	0,0819	0,37	0,19	0	11
50%	-14%	0%	0,3	-0,3	0,0	14018	5400	25	135000	54,2	0,0123	0,0184	0,0553	0,0553	0,40	0,12	2	9
	9%	64%	2,0	0,3	2,3	14019	9900	15	148500	59,6	0,0000	0,0335	0,0615	0,1006	0,73	0,24	0	11
-100%	275%	200%	-0,3	3,7	3,3	14021	5000	4	20000	8,0	0,0415	0,0000	0,2076	0,6227	1,00	0,42	1	5
	-100%	-100%	0,0	-0,7	-0,7	14022	9300	3	27900	11,2	0,0000	0,0000	0,0595	0,0000	0,67	0,22	0	2
-100%	-100%	-100%	-1,7	-1,3	-3,0	17003	4800	25	120000	48,2	0,0346	0,0000	0,0623	0,0000	0,40	0,12	5	9
13%	-7%	-3%	0,7	-1,7	-1,0			184		491,6	0,0108	0,0122	0,0610	0,0590	0,51	0,16	16	90
	-57%	-57%	0,0	-2,7	-2,7	3003	5500	38	209000	83,9	0,0000	0,0000	0,0556	0,0238	0,29	0,12	0	14
500%	20%	100%	1,7	0,3	2,0	3004	7800	15	117000	47,0	0,0071	0,0426	0,0426	0,0852	0,40	0,13	1	6
-100%	-40%	-45%	-0,3	-1,3	-1,7	3005	5000	45	225000	90,3	0,0037	0,0000	0,0406	0,0221	0,24	0,08	1	11
-100%	-100%	-100%	-1,0	-2,0	-3,0	4003	5400	15	81000	32,5	0,0307	0,0000	0,0922	0,0000	0,33	0,20	3	9
	-100%	-100%	0,0	-0,3	-0,3	4004	7000	1	7000	2,8	0,0000	0,0000	0,1186	0,0000	2,00	0,33	0	1
-100%	-25%	-45%	-1,0	-0,7	-1,7	18002	5700	42	239400	96,1	0,0104	0,0000	0,0381	0,0208	0,24	0,09	3	11
200%	-70%	-45%	1,3	-4,7	-3,3	18003	4500	32	144000	57,8	0,0115	0,0346	0,1268	0,0692	0,31	0,23	2	22
	-10%	-10%	0,0	-0,3	-0,3	19003	6400	11	70400	28,3	0,0000	0,0000	0,1179	0,1061	0,27	0,30	0	10
20%	-47%	-39%	0,7	-11,7	-11,0			199		438,8	0,0076	0,0091	0,0638	0,0387	0,29	0,14	10	84
-100%	-100%	-100%	-0,7	-0,7	-1,3	5003	5400	12	64800	26,0	0,0256	0,0000	0,0512	0,0000	0,50	0,11	2	4
	-100%	-100%	0,0	-0,3	-0,3	6004	5800	7	40600	16,3	0,0000	0,0000	0,0204	0,0000	0,57	0,05	0	1
-100%	200%	0%	-0,7	0,7	0,0	6005	6500	8	52000	20,9	0,0319	0,0000	0,0479	0,0479	0,75	0,13	2	3
-100%	-100%	-100%	-0,7	-1,3	-2,0	6006	8000	11	88000	35,3	0,0189	0,0000	0,0566	0,0000	0,64	0,18	2	6
	0%	0%	0,0	0,0	0,0	7003	7000	3	21000	8,4	0,0000	0,0000	0,1186	0,1186	0,67	0,33	0	3
-100%	-100%	-100%	-0,3	-1,7	-2,0	7004	5400	11	59400	23,8	0,0140	0,0000	0,0839	0,0000	0,55	0,18	1	6
	-100%	-75%	1,0	-4,0	-3,0	8004	4500	46	207000	83,1	0,0000	0,0120	0,0481	0,0120	0,35	0,09	0	12
			0,0	1,0	1,0	10001	8200	9	73800	29,6	0,0000	0,0000	0,0000	0,0337	0,56	0,00	0	0
			0,0	0,0	0,0	10002	11800	1	11800	4,7	0,0000	0,0000	0,0000	0,0000	2,00	0,00	0	0
-57%	-68%	-66%	-1,3	-6,3	-7,7			108		248,3	0,0094	0,0040	0,0470	0,0161	0,50	0,11	7	35
	100%	300%	2,0	1,0	3,0	12004	11800	3	35400	14,2	0,0000	0,1407	0,0704	0,2814	1,33	0,33	0	3
	-100%	-100%	0,0	-1,0	-1,0	12005	5600	26	145600	58,5	0,0000	0,0000	0,0171	0,0000	0,27	0,04	0	3
-100%	200%	50%	-1,7	3,3	1,7	12006	6800	45	306000	122,9	0,0136	0,0000	0,0271	0,0407	0,22	0,07	5	10
200%	13%	42%	2,0	0,7	2,7	12007	4000	40	160000	64,2	0,0156	0,0467	0,0986	0,1401	0,40	0,16	3	19
-100%	-100%	-100%	-0,3	-2,3	-2,7	12008	4700	14	65800	26,4	0,0126	0,0000	0,1009	0,0000	0,50	0,19	1	8
			0,0	0,0	0,0	12009	8000	1	8000	3,2	0,0000	0,0000	0,0000	0,0000	2,00	0,00	0	0
	-100%	-100%	0,0	-1,0	-1,0	12010	8000	1	8000	3,2	0,0000	0,0000	0,3113	0,0000	2,00	1,00	0	3
	-100%	-100%	0,0	-0,7	-0,7	12011	7700	1	7700	3,1	0,0000	0,0000	0,2156	0,0000	2,00	0,67	0	2
67%	0%	13%	2,0	0,0	2,0			131		295,7	0,0101	0,0169	0,0541	0,0609	0,38	0,12	9	48
-19%	-37%	-34%	-3,7	-42,0	-45,7			941	4895600	1965,6	0,0100	0,0081	0,0675	0,0443	0,37	0,14	59	398

** ÅDT fordon*

Mv ÅDT 5203

16 röda >0,0900

0,0576 om "slumpkorrigerat"

ÅDT=AADT vehicles, AADT axle pairs = about 1.10xAADT vehicles
D=F
SS=SI
DSS= FSI
Mv=mean value
D-kvot=F-rate
DSS-kvot = FSI-rate
Obs=observed
Kameratäthet=cameras per distance (number/km)
Efter=after
Före=before
Förv=expected

							(a=0,10)	(a=0,10)										
			Normalkvot		**Förv. 3 år före**		**Sant 3 år före**		**Sant per år före**		**Obs per år före**		**Regr.effekt**		**Obs 1 år efter**		**Normkvot xTA**	
ID nr	**brk**	**hgr**	**D**	**DSS**	**D**	**DSS**	**D**	**DSS**	**D**	**DSS**	**D**	**DSS**	**D**	**DSS**	**D**	**DSS**	**D**	**DSS**
25004	3	90	0,0087	0,0456	0,86	4,50	0,87	4,66	0,29	1,55	0,33	1,67	-13%	-7%	0	2	0,29	1,50
					0,86	**4,50**	**0,87**	**4,66**	**0,29**	**1,55**	**0,33**	**1,67**	**-13%**	**-7%**	**0**	**2**	**0,29**	**1,50**
20004	23	90	0,0088	0,0482	1,09	5,99	1,48	11,24	0,49	3,75	1,67	6,67	-70%	-44%	0	1	0,36	2,00
20005	2	90	0,0090	0,0509	1,16	6,55	1,35	6,73	0,45	2,24	1,00	2,33	-55%	-4%	0	0	0,39	2,18
21005	34	90	0,0089	0,0454	1,09	5,58	0,99	5,01	0,33	1,67	0,00	1,33		25%	0	1	0,36	1,86
22005	234	90	0,0089	0,0472	2,21	11,74	1,81	15,12	0,60	5,04	0,00	6,00		-16%	0	1	0,74	3,91
					5,56	**29,86**	**5,63**	**38,10**	**1,88**	**12,70**	**2,67**	**16,33**	**-30%**	**-22%**	**0**	**3**	**1,85**	**9,95**
02006	2	70	0,0102	0,0716	0,98	6,90	0,98	11,43	0,33	3,81	0,33	6,00	-2%	-36%	0	4	0,33	2,30
02007	3	70	0,0099	0,0696	2,20	15,47	1,80	14,58	0,60	4,86	0,00	4,67		4%	0	2	0,73	5,16
02008	2	70	0,0102	0,0716	0,74	5,17	0,82	8,18	0,27	2,73	0,67	4,67	-59%	-42%	0	1	0,25	1,72
02009	2	70	0,0102	0,0716	1,38	9,70	1,46	8,86	0,49	2,95	0,67	2,67	-27%	11%	0	3	0,46	3,23
02010	2	70	0,0102	0,0716	2,06	14,49	2,22	25,44	0,74	8,48	1,00	11,00	-26%	-23%	0	4	0,69	4,83
09001	3	70	0,0099	0,0696	0,21	1,51	0,21	1,31	0,07	0,44	0,00	0,00			0	0	0,07	0,50
					7,58	**53,24**	**7,50**	**69,81**	**2,50**	**23,27**	**2,67**	**29,00**	**-6%**	**-20%**	**0**	**14**	**2,53**	**17,75**
13001	4	90	0,0092	0,0452	0,79	3,89	0,73	3,36	0,24	1,12	0,00	0,67		68%	0	0	0,26	1,30
13002	2	70	0,0102	0,0716	0,46	3,24	0,49	3,67	0,16	1,22	0,33	1,67	-51%	-27%	0	0	0,15	1,08
13003	23	90	0,0088	0,0482	0,94	5,17	0,86	6,47	0,29	2,16	0,00	3,00		-28%	0	2	0,31	1,72
14011	24	90	0,0091	0,0481	0,47	2,50	0,50	2,60	0,17	0,87	0,33	1,00	-50%	-13%	0	1	0,16	0,83
14012	3	90	0,0087	0,0456	0,80	4,20	0,74	2,96	0,25	0,99	0,00	0,00			1	1	0,27	1,40
14013	2	90	0,0090	0,0509	0,89	5,01	1,06	5,34	0,35	1,78	1,00	2,00	-65%	-11%	0	0	0,30	1,67
14014	23	90	0,0088	0,0482	0,67	3,66	0,75	4,55	0,25	1,52	0,67	2,33	-62%	-35%	0	3	0,22	1,22
14015	3	70	0,0099	0,0696	0,93	6,54	0,94	6,33	0,31	2,11	0,33	2,00	-6%	5%	0	0	0,31	2,18
14016	4	90	0,0092	0,0452	0,89	4,39	0,82	4,57	0,27	1,52	0,00	1,67		-9%	1	3	0,30	1,46
14017	2	90	0,0090	0,0509	1,65	9,32	1,41	10,13	0,47	3,38	0,00	3,67		-8%	1	5	0,55	3,11
14018	3	90	0,0087	0,0456	1,41	7,41	1,49	8,09	0,50	2,70	0,67	3,00	-26%	-10%	1	3	0,47	2,47
14019	3	70	0,0099	0,0696	1,77	12,45	1,50	11,65	0,50	3,88	0,00	3,67		6%	2	6	0,59	4,15
14021	2	90	0,0090	0,0509	0,22	1,23	0,23	1,64	0,08	0,55	0,33	1,67	-77%	-67%	0	5	0,07	0,41
14022	4	50	0,0040	0,0570	0,13	1,92	0,13	1,93	0,04	0,64	0,00	0,67		-4%	0	0	0,04	0,64
17003	2	90	0,0090	0,0509	1,30	7,36	1,73	8,05	0,58	2,68	1,67	3,00	-65%	-11%	0	0	0,43	2,45
					13,33	**78,28**	**13,38**	**81,35**	**4,46**	**27,12**	**5,33**	**30,00**	**-16%**	**-10%**	**6**	**29**	**4,44**	**26,09**
3003	24	90	0,0091	0,0481	2,29	12,11	1,86	13,14	0,62	4,38	0,00	4,67		-6%	0	2	0,76	4,04
3004	4	90	0,0092	0,0452	1,30	6,37	1,26	6,23	0,42	2,08	0,33	2,00	26%	4%	2	4	0,43	2,12
3005	2	90	0,0090	0,0509	2,44	13,79	2,16	12,17	0,72	4,06	0,33	3,67	116%	11%	0	2	0,81	4,60
4003	3	90	0,0087	0,0456	0,85	4,45	1,02	5,85	0,34	1,95	1,00	3,00	-66%	-35%	0	0	0,28	1,48
4004	4	70	0,0104	0,0726	0,09	0,61	0,09	0,63	0,03	0,21	0,00	0,33		-37%	0	0	0,03	0,20
18002	234	90?	0,0089	0,0472	2,57	13,61	2,65	12,11	0,88	4,04	1,00	3,67	-12%	10%	0	2	0,86	4,54
18003	34	90	0,0089	0,0454	1,54	7,87	1,60	14,10	0,53	4,70	0,67	7,33	-20%	-36%	2	4	0,51	2,62
19003	3	90	0,0087	0,0456	0,74	3,87	0,69	5,58	0,23	1,86	0,00	3,33		-44%	0	3	0,25	1,29
					11,81	**62,69**	**11,33**	**69,81**	**3,78**	**23,27**	**3,33**	**28,00**	**13%**	**-17%**	**4**	**17**	**3,94**	**20,90**
5003	2	70?	0,0102	0,0716	0,80	5,59	0,88	5,02	0,29	1,67	0,67	1,33	-56%	25%	0	0	0,27	1,86
6004	23	90	0,0088	0,0482	0,43	2,36	0,41	2,10	0,14	0,70	0,00	0,33		110%	0	0	0,14	0,79
6005	2	90	0,0090	0,0509	0,56	3,19	0,64	3,14	0,21	1,05	0,67	1,00	-68%	5%	0	1	0,19	1,06
6006	2	90	0,0090	0,0509	0,95	5,40	1,05	5,61	0,35	1,87	0,67	2,00	-48%	-7%	0	0	0,32	1,80
7003	34	90	0,0089	0,0454	0,23	1,15	0,22	1,34	0,07	0,45	0,00	1,00		-55%	0	1	0,08	0,38
7004	4	90	0,0092	0,0452	0,66	3,23	0,68	3,91	0,23	1,30	0,33	2,00	-32%	-35%	0	0	0,22	1,08
8004	3	90	0,0087	0,0456	2,17	11,37	1,78	11,70	0,59	3,90	0,00	4,00		-2%	1	1	0,72	3,79
10001	3	90	0,0087	0,0456	0,77	4,05	0,72	2,88	0,24	0,96	0,00	0,00			0	1	0,26	1,35
10002	3	50	0,0040	0,0570	0,06	0,81	0,06	0,75	0,02	0,25	0,00	0,00			0	0	0,02	0,27
					6,63	**37,14**	**6,44**	**36,45**	**2,15**	**12,15**	**2,33**	**11,67**	**-8%**	**4%**	**1**	**4**	**2,21**	**12,38**
12004	23	90	0,0088	0,0482	0,38	2,06	0,36	2,22	0,12	0,74	0,00	1,00		-26%	2	4	0,13	0,69
12005	2	90	0,0090	0,0509	1,58	8,93	1,36	6,13	0,45	2,04	0,00	1,00		104%	0	0	0,53	2,98
12006	234	90	0,0089	0,0472	3,28	17,40	3,71	12,70	1,24	4,23	1,67	3,33	-26%	27%	0	5	1,09	5,80
12007	23	90	0,0088	0,0482	1,70	9,29	1,89	13,97	0,63	4,66	1,00	6,33	-37%	-26%	3	9	0,57	3,10
12008	2	90	0,0090	0,0509	0,71	4,03	0,73	5,17	0,24	1,72	0,33	2,67	-27%	-35%	0	0	0,24	1,34
12009	3	50	0,0040	0,0570	0,04	0,55	0,04	0,52	0,01	0,17	0,00	0,00			0	0	0,01	0,18
12010	3	50?	0,0040	0,0570	0,04	0,55	0,04	0,68	0,01	0,23	0,00	1,00		-77%	0	0	0,01	0,18
12011	3	90	0,0087	0,0456	0,08	0,42	0,08	0,49	0,03	0,16	0,00	0,67		-76%	0	0	0,03	0,14
					7,80	**43,22**	**8,20**	**41,87**	**2,73**	**13,96**	**3,00**	**16,00**	**-9%**	**-13%**	**5**	**18**	**2,60**	**14,41**
			0,0091	**0,0524**	**53,6**	**308,9**	**53,4**	**342,0**	**17,8**	**114,0**	**19,7**	**132,7**	**-10%**	**-14%**	**16**	**87**	**17,9**	**103,0**

Sann kvot före 0,0090 0,0580

brk=width class
hgr=speed limit
D=F
DSS= FSI
Mv=mean value
D-kvot=F-rate
DSS-kvot = FSI-rate
Obs=observed
Kameratäthet=cameras per distance (number/km)
Efter=after
Före=before
Förv=expected
Sant=true

Appendix No 4. Normal rates for the accident study

Normal rates used in the study

		link+node	
Width class (m)	Speed limit	F rate	FSI rate
1=1.0-6.5	50	0.0040	0.0570
1=1.0-6.5	70		
1=1.0.6.5	90		
1=1.0-6.5	110		
2=6.6-8.9	50	0.0040	0.0570
2=6.6-8.9	70	0.0102	0.0716
2=6.6-8.9	90	0.0090	0.0509
2=6.6-8.9	110	0.0103	0.0514
3=9.0-12.9	50	0.0040	0.0570
3=9.0-12.9	70	0.0099	0.0696
3=9.0-12.9	90	0.0087	0.0456
3=9.0-12.9	110	0.0103	0.0486
4=13.0-	50	0.0040	0.0570
4=13.0-	70	0.0104	0.0726
4=13.9-	90	0.0092	0.0452
4=13.9-	110	0.0103	0.0461
13*	50	0.0040	0.0570
23	50	0.0040	0.0570
23	70	0.0101	0.0706
34	70	0.0101	0.0711
13	90	0.0090	0.0509
23	90	0.0088	0.0482
24	90	0.0091	0.0481
34	90	0.0089	0.0454
234	90	0.0089	0.0472
24	110	0.0103	0.0487

* Width class 13, for instance, denotes a mix of classes 1 and 3

Appendix No 5. Normal rates EVA* 2.50

Normal rates   Rural areas, all accidents with involvement of motor vehicles EVA 2.50

	Speed limit and width (m)	F rate link	Node increment	F rate link+node	FSI rate link	Node increment	FSI rate link+node
70 h	<5.7	0.0086	1.06	0.0091	0.0600	1.06	0.0636
km/h	5.7-6.6	0.0083	1.13	0.0094	0.0583	1.13	0.0659
	6.7-7.9	0.0083	1.23	0.0102	0.0583	1.23	0.0717
	8-10	0.0066	1.54	0.0102	0.0464	1.54	0.0715
	10.1-11.5	0.0065	1.42	0.0092	0.0457	1.42	0.0649
	11.6-	0.0064	1.62	0.0104	0.0448	1.62	0.0726
90	<5.7	0.0090	1.05	0.0095	0.0509	1.05	0.0534
km/h	5.7-6.6	0.0087	1.07	0.0093	0.0491	1.07	0.0525
	6.7-7.9	0.0087	1.11	0.0097	0.0491	1.11	0.0545
	8-10	0.0071	1.18	0.0084	0.0401	1.18	0.0473
	10.1-11.5	0.0076	1.11	0.0084	0.0398	1.11	0.0442
	11.6-	0.0077	1.19	0.0092	0.0380	1.19	0.0452
110	<5.7	-	-	-	-	-	-
km/h	5.7-6.6	0.0103	1.08	0.0111	0.0512	1.08	0.0553
	6.7-7.9	0.0099	1.07	0.0106	0.0497	1.07	0.0532
	8-10	0.0088	1.13	0.0099	0.0439	1.13	0.0496
	10.1-11.5	0.0091	1.17	0.0106	0.0429	1.17	0.0502
	11.6-	0.0094	1.10	0.0103	0.0419	1.10	0.0461

* Analysis tool for road projects

Appendix No 6. Updated ARGUS II sections, injury data

Updated ARGUS II sections from 2007 (which previously had ARGUS I)
All accident types

10 sections (marked grey) excluded from the analysis

Alla olyckstyper
Version 2008-11-25

Sträcka	ID nr	ÅDT*	km	ant. kam	brk	hgr	räf	2003 D	2003 SS	2003 DSS	2004 D	2004 SS	2004 DSS	2005 D	2005 SS	2005 DSS	mv 2003-2005 D	mv 2003-2005 SS	mv 2003-2005 DSS	mv 03-05 DSS/km	2006 D	2006 SS	2006 DSS	2007 D	2007 SS	2007 DSS
VN; E12 Umeå-Vännäs	24001	6000	18	8	13	90	0	0	2	2	0	0	0	1	1	2	0,3	1	1,3	0,07	0	3	3	0	2	2
VN; E4 Lillåbron-Bygdeå	24002	4600	10	6	3	110	0	1	4	5	0	0	0	0	0	0	0,3	1,3	1,7	0,17	0	0	0	0	0	0
VN; E4 Sikeå-Grimsmark	24003	3700	21	7	3	90	1	0	1	1	0	0	0	1	2	3	0,3	1	1,3	0,06	0	0	0	0	0	0
VN; E4 Grimsmark-Bureå	24004	3400	39	15	23	90	1	2	7	9	0	0	0	0	1	1	0,7	2,7	3,3	0,09	3	3	6	2	3	5
VN; E12 Lycksele	24006	5500	1	2	3	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0
VN; E12 Kvarntorp-Granö	24007	1000	25	14	23	90	0	0	1	1	0	5	5	0	2	2	0	2,7	2,7	0,11	0	0	0	0	1	1
VN; Storgatan Ume kommu	24008	?	1	2																						
VN; Röbäck Ume kommun	24009	?	1	1																						
VN; Holmsund Ume kommu	24010	?	1	1																						
VN; 97 Luleå-Boden	25001	7100	24	9	24	90	0	0	0	0	0	0	0	0	2	2	0	0,7	0,7	0,03	0	5	5	0	3	3
VN; E4 Rosvik-Kopparnäs	25002	8000	11	4	24	110	0	0	1	1	0	0	0	0	1	1	0	0,7	0,7	0,06	0	0	0	0	2	2
VN; 596 Bensbyn	25003	3000	1	2	2	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0
VN tot (analyserade)			**150**	**67**			**2**	**3**	**16**	**19**	**0**	**5**	**5**	**2**	**9**	**11**	**1,7**	**10**	**12**	**0,08**	**3**	**11**	**14**	**2**	**11**	**13**
VM; 70 Avesta-Hedemor	20001	8000	36	5	4	90	0	0	1	1	0	5	5	1	6	7	0,3	4	4,3	0,12	1	3	4	0	3	3
VM; 70 N Amsberg-Härad	20002	7600	33	9	3	90	0	0	4	4	0	4	4	1	1	2	0,3	3	3,3	0,10	1	5	6	0	5	5
VM; 70 Leksand-Mora	20003	6000	49	5	234	90	0	1	8	9	0	9	9	1	6	7	0,7	7,7	8,3	0,17	1	4	5	0	2	2
VM; E4 Iggesund-Hudik	21001	12300	6	6	3	90	0	0	0	0	0	0	0	0	2	2	0	0,7	0,7	0,11	0	0	0	3	7	10
VM; 50 Överbo-Bollnäs	21003	5200	34	6	3	90	0	0	0	0	0	1	1	0	2	2	0	1	1	0,03	0	2	2	0	0	0
VM; 67 Gysinge-Överhärde	21004	2900	27	2																						
VM; E4 Njurundabom-Sund	22001	14600	15	8	34	70	0	0	8	8	0	10	10	0	31	31	0	16	16	1,09	0	11	11	0	6	6
VM; E14 Timmerv-kors	22002	8700	2	2	4	70	0	0	1	1	0	2	2	0	0	0	0	1	1	0,50	0	0	0	0	0	0
VM; 86 Timmerv-Bersåker k	22003	7500	1	2	23	50	0	0	1	1	0	0	0	0	0	0	0	0,3	0,3	0,33	0	0	0	0	0	0
VM; E14 Pilgrimstad-Optan	23001	5000	23	6	2	70	0	1	1	2	0	0	0	0	0	0	0,3	0,3	0,7	0,03	1	1	2	0	1	1
VM; E14 Ås-Mörsil	23002	4600	21	10	4	90	1	0	1	1	0	4	4	0	6	6	0	3,7	3,7	0,17	0	2	2	0	3	3
VM tot (analyserade)			**220**	**59**			**1**	**2**	**25**	**27**	**0**	**35**	**35**	**3**	**54**	**57**	**1,7**	**38**	**40**	**0,18**	**4**	**28**	**32**	**3**	**27**	**30**
VST; 226 Stuvsta-Flemberg	02001	17000	18	8																						
VST; 75 Södlänk österut	02003	30000	6	3																						
VST; 75 Södlänk västerut	02004	30000	7	4																						
VST; 259 Glömsta-Jordbro	02005	12000	4	6																						
VST tot (analyserade)			**0**	**0**			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**0**	**0**	**0**	**0**	**0**	**0**
VVÄ; E45 LillaEdet-Trhätt	14001	9700	12	6	3	90	0	0	1	1	0	1	1	1	7	8	0,3	3	3,3	0,27	0	0	0	1	2	3
VVÄ; E45 Vänersb-NBrålan	14002	8800	21	12	34	90	0	2	1	3	0	0	0	2	0	2	1,3	0,3	1,7	0,08	0	2	2	0	3	3
VVÄ; 40 Getared-Toppsjön	14003	10500	9	5	3	90	0	0	0	0	2	3	5	0	2	2	0,7	1,7	2,3	0,26	0	2	2	0	2	2
VVÄ; E6.21 Lundbytunnel	14004	?	3	4																						
VVÄ; 161 Skår-Rotviksbro	14005	5000	9	7	23	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0
VVÄ; E20 Alingsås-Ribbing	14006	12000	28	16	34	90	1	1	6	7	1	1	2	1	4	5	1	3,7	4,7	0,17	1	14	15	0	1	1
VVÄ; E20 Hassle-Holmesta	14007	7900	33	10	3	90	0	1	3	4	0	1	1	2	10	12	1	4,7	5,7	0,17	0	5	5	2	5	7
VVÄ; E20 Hova-Bahult	14008	8600	10	5	2	90	0	0	1	1	0	0	0	0	0	0	0	0,3	0,3	0,03	0	0	0	0	3	3
VVÄ; E45 Stallbackabron	14009	7600	3	2	3	?	0	0	1	1	0	0	0	0	0	0	0	0,3	0,3	0,10	0	2	2	1	0	1
VVÄ; E6 del gm Skee	14010	25000	3	2	23	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0,00	0	0	0	0	0	0
VVÄ; E45 Fagerås-Sunne	17002	5600	40	12	2	90	1	0	1	1	0	5	5	1	2	3	0,3	2,7	3	0,07	0	2	2	1	0	1
VVÄ tot (analyserade)			**168**	**77**			**2**	**4**	**14**	**18**	**3**	**11**	**14**	**7**	**25**	**32**	**4,7**	**17**	**21**	**0,13**	**1**	**27**	**28**	**5**	**16**	**21**
VMN; E18 Enköp-Sagån	03001	16800	9	6	4	90	0	3	9	12	0	1	1	3	2	5	2	4	6	0,67	0	5	5	0	6	6
VMN; 600 Uppsala-Björkling	03002	12100	9	3	4	90	0	0	5	5	0	3	3	0	1	1	0	3	3	0,33	0	2	2	0	2	2
VMN; 55 Strängn.bron-Hjuls	04001	5200	12	6	2	90	1	0	1	1	1	1	2	0	0	0	0,3	0,7	1	0,08	0	0	0	0	1	1
VMN; 56 Kholm-StSundby	04002	4200	32	7	23	90	1	1	4	5	0	0	0	0	1	1	0,3	1,7	2	0,06	0	1	1	0	6	6
VMN; E18 Lekhytt-Karlskog	18001	11800	15	3	24	90	0	0	0	0	0	0	0	2	5	7	0,7	1,7	2,3	0,16	1	5	6	0	0	0
VMN; 56 Västerås-Sala	19001	8400	24	6	4	90	0	0	2	2	1	2	3	0	2	2	0,3	2	2,3	0,10	1	1	2	0	0	0
VMN; 72 Sala-Clänsgr	19002	4300	25	7	2	90	1	1	4	5	0	2	2	1	2	3	0,7	2,7	3,3	0,13	1	7	8	0	2	2
VMN tot (analyserade)			**126**	**38**			**3**	**5**	**25**	**30**	**2**	**9**	**11**	**6**	**13**	**19**	**4,3**	**16**	**20**	**0,16**	**3**	**21**	**24**	**0**	**17**	**17**
VSÖ; 50 Vadstena-Omberg	05001	3400	21	10	2	90	0	1	4	5	0	0	0	0	0	0	0,3	1,3	1,7	0,08	1	2	3	0	1	1
VSÖ; 1153 E4 Skärblack	05002	3800	9	6	23	90	0	0	0	0	0	2	2	0	0	0	0	0,7	0,7	0,07	0	0	0	0	2	2
VSÖ; 26/47 Månseryd-Slätt	06002	5600	32	18	23	90	1	0	1	1	1	0	1	2	3	5	1	1,3	2,3	0,07	3	5	8	1	2	3
VSÖ; 23 Lövhult-StHammar	07002	4000	28	12	23	90	0	0	1	1	0	2	2	0	1	1	0	1,3	1,3	0,05	0	3	3	1	0	1
VSÖ; E22 Bröms-Påboda	08001	3500	14	11	2	90	0	0	2	2	0	0	0	0	1	1	0	1	1	0,07	0	0	0	0	3	3
VSÖ; E22 Hossmo-Rinkaby	08002	11000	5	6	2	70	0	0	0	0	0	1	1	0	0	0	0	0,3	0,3	0,07	0	3	3	0	0	0
VSÖ; E22 Gladham-Verkeb	08003	5000	6	9	34	90	0	0	0	0	0	1	1	0	0	0	0	0,3	0,3	0,06	0	4	4	0	0	0
VSÖ tot (analyserade)			**115**	**72**			**1**	**1**	**8**	**9**	**1**	**6**	**7**	**2**	**5**	**7**	**1,3**	**6,3**	**7,7**	**0,07**	**4**	**17**	**21**	**2**	**8**	**10**
VSK; 21 Kungsborg	12001	?	1	2																						
VSK; 108 Svedala-Lund	12002	8000	25	9	23	90	0	1	0	1	2	3	5	0	2	2	1	1,7	2,7	0,11	1	3	4	0	2	2
VSK; 112 Åstorp-Höganäs	12003	4500	24	10	34	90	1	0	1	1	0	0	0	0	2	2	0	1	1	0,04	0	2	2	0	3	3
VSK tot (analyserade)			**49**	**19**			**1**	**1**	**1**	**2**	**2**	**3**	**5**	**0**	**4**	**4**	**1**	**2,7**	**3,7**	**0,07**	**1**	**5**	**6**	**0**	**5**	**5**
Summa analyserade			**828**	**332**			**10**	**16**	**89**	**105**	**8**	**69**	**77**	**20**	**110**	**130**	**15**	**89**	**104**	**0,13**	**16**	**109**	**125**	**12**	**84**	**96**
Antal analyssträckor =	**45**																									
Exkluderade sträckor =	10		69	33												Mv per år o objekt	0,3	2,0	2,3							

** ÅDT fordon, ÅDT axelpar = ca 1,10 x ÅDT fordon*

brk = breddklass
hgr = hastighetsgräns
räf = förekomst av räfflor

Antal kameror per km (på analyssträckor) = 0,40

Antal kameror per km = 0,40

Analyserade plus exkluderade | 897 | 365

Sträcka=section
ÅDT=AADT vehicles, AADT axle pairs = about 1.10xAADT vehicles
ant kam=number of cameras
brk=width class
hgr=speed limit
räf=rumble strips
D=F
SS=SI
DSS= FSI
Mv=mean value

						TA	D-kvot			DSS-kvot			Normalkvot		Normkvot xTA	
ID nr	**ÅDT***	**km**	**brk**	**hgr**	**km x ÅDT***	**(Mapkm/år)**	**2003-05**	**2006**	**2007**	**2003-05**	**2006**	**2007**	**D**	**DSS**	**D**	**DSS**
24001	6000	18	13	90	108000	43,4							0,0090	0,0509	0,39	2,21
24002	4600	10	3	110	46000	18,5							0,0103	0,0486	0,19	0,90
24003	3700	21	3	90	77700	31,2							0,0087	0,0456	0,27	1,42
24004	3400	39	23	90	132600	53,2							0,0088	0,0482	0,47	2,57
24006	5500	1	3	50	5500	2,2							0,0040	0,0570	0,01	0,13
24007	1000	25	23	90	25000	10,0							0,0088	0,0482	0,09	0,48
24008	**?**	1														
24009	**?**	1														
24010	**?**	1														
25001	7100	24	24	90	170400	68,4							0,0091	0,0481	0,62	3,29
25002	8000	11	24	110	88000	35,3							0,0103	0,0487	0,36	1,72
25003	3000	1	2	50	3000	1,2							0,0040	0,0570	0,00	0,07
		150				**263,5**	**0,0063**	**0,0114**	**0,0076**	**0,0443**	**0,0531**	**0,0493**	**0,0091**	**0,0485**	**2,41**	**12,78**
20001	8000	36	4	90	288000	115,6							0,0092	0,0452	1,06	5,23
20002	7600	33	3	90	250800	100,7							0,0087	0,0456	0,88	4,59
20003	6000	49	234	90	294000	118,0							0,0089	0,0472	1,05	5,57
21001	12300	6	3	90	73800	29,6							0,0087	0,0456	0,26	1,35
21003	5200	34	3	90	176800	71,0							0,0087	0,0456	0,62	3,24
21004	2900	27														
22001	14600	15	34	70	219000	87,9							0,0101	0,0711	0,89	6,25
22002	8700	2	4	70	17400	7,0							0,0104	0,0726	0,07	0,51
22003	7500	1	23	50	7500	3,0							0,0040	0,0570	0,01	0,17
23001	5000	23	2	70	115000	46,2							0,0102	0,0716	0,47	3,31
23002	4600	21	4	90	96600	38,8							0,0092	0,0452	0,36	1,75
		220				**617,9**	**0,0027**	**0,0065**	**0,0049**	**0,0642**	**0,0518**	**0,0486**	**0,0092**	**0,0517**	**5,67**	**31,97**
02001	17000	18														
02003	30000	6														
02004	30000	7														
02005	12000	4														
		0				**0**									**0,00**	**0,00**
14001	9700	12	3	90	118340	47,5							0,0087	0,0456	0,41	2,17
14002	8800	21	34	90	182160	73,1							0,0089	0,0454	0,65	3,32
14003	10500	9	3	90	94500	37,9							0,0087	0,0456	0,33	1,73
14004	**?**	3														
14005	5000	9	23	70	43000	17,3							0,0101	0,0706	0,17	1,22
14006	12000	28	34	90	336000	134,9							0,0089	0,0454	1,20	6,12
14007	7900	33	3	90	260700	104,7							0,0087	0,0456	0,91	4,77
14008	8600	10	2	90	86000	34,5							0,0090	0,0509	0,31	1,76
14009	7600	3	3	70?	25840	10,4							0,0099	0,0696	0,10	0,72
14010	25000	3	23	90	77500	31,1							0,0088	0,0482	0,27	1,50
17002	5600	40	2	90	226240	90,8							0,0090	0,0509	0,82	4,62
		168				**582,3**	**0,0080**	**0,0017**	**0,0086**	**0,0366**	**0,0481**	**0,0361**	**0,0089**	**0,0480**	**5,18**	**27,94**
03001	16800	9	4	90	151200	60,7							0,0092	0,0452	0,56	2,74
03002	12100	9	4	90	108900	43,7							0,0092	0,0452	0,40	1,98
04001	5200	12	2	90	62400	25,1							0,0090	0,0509	0,23	1,28
04002	4200	32	23	90	134400	54,0							0,0088	0,0482	0,47	2,60
18001	11800	15	24	90	177000	71,1							0,0091	0,0481	0,65	3,42
19001	8400	24	4	90	201600	80,9							0,0092	0,0452	0,74	3,66
19002	4300	25	2	90	107500	43,2							0,0090	0,0509	0,39	2,20
		126				**378,6**	**0,0114**	**0,0079**	**0**	**0,0528**	**0,0634**	**0,0449**	**0,0091**	**0,0472**	**3,44**	**17,87**
05001	3400	21	2	90	71400	28,7							0,0090	0,0509	0,26	1,46
05002	3800	9	23	90	34200	13,7							0,0088	0,0482	0,12	0,66
06002	5600	32	23	90	179200	71,9							0,0088	0,0482	0,63	3,47
07002	4000	28	23	90	112000	45,0							0,0088	0,0482	0,40	2,17
08001	3500	14	2	90	49000	19,7							0,0090	0,0509	0,18	1,00
08002	11000	5	2	70	55000	22,1							0,0102	0,0716	0,23	1,58
08003	5000	6	34	90	30000	12,0							0,0089	0,0454	0,11	0,55
		115				**213,1**	**0,0063**	**0,0188**	**0,0094**	**0,036**	**0,0985**	**0,0469**	**0,0090**	**0,0511**	**1,92**	**10,89**
12001	**?**	1														
12002	8000	25	23	90	200000	80,3							0,0088	0,0482	0,71	3,87
12003	4500	24	34	90	108000	43,4							0,0089	0,0454	0,39	1,97
		49				**123,7**	**0,0081**	**0,0081**	**0**	**0,0297**	**0,0485**	**0,0404**	**0,0088**	**0,0472**	**1,09**	**5,84**
		828			**5427180**	**2179,0**	**0,0067**	**0,0073**	**0,0055**	**0,0477**	**0,0574**	**0,0441**	**0,0090**	**0,0492**	**19,7**	**107,3**

** ÅDT fordon, ÅDT axelpar = ca 1,10 x ÅDT fordon*

Mv ÅDT (fordon) = 6555

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