

SOUTH AUSTRALIA SPEED CAMERA AUDIT

A report to the Department for Planning, Transport and Infrastructure

September 2018

James Holgate

Martin Small

+61 428 111 960
martin@martinsmallconsulting.com
www.martinsmallconsulting.com

PO Box 515
Torrens Park
South Australia 5062
Australia

INTRODUCTION	3
BACKGROUND	4
EFFECTIVENESS OF THE CAMERA PROGRAM	6
CRASH DATA	6
OFFENCE DATA	7
TRENDS IN SPEEDS AND SPEEDING	9
HAVE SPEED CAMERAS REDUCED SPEEDING AND THE NUMBER AND SEVERITY OF ROAD CRASHES IN THE LOCATIONS IN WHICH THEY HAVE BEEN PLACED?	11
LOCATIONS OF SPEED CAMERAS.....	12
FIXED CAMERAS	12
MOBILE CAMERAS.....	15
HAVE SPEED CAMERAS BEEN LOCATED IN AREAS IDENTIFIED AS HAVING THE GREATEST ROAD SAFETY RISK?.	19
ATTITUDES	21
FINDINGS FROM COMMUNITY ATTITUDE SURVEYS.....	21
CONCLUSIONS REGARDING COMMUNITY ATTITUDES	22
DISCUSSION.....	24
ENFORCEMENT STRATEGIES.....	24
POTENTIAL CRITERIA FOR FIXED CAMERA INSTALLATION	24
CONCLUSIONS AND RECOMMENDATIONS.....	26
ANNEX: SPEED CAMERA ENFORCEMENT COMPARISON DATA.....	28
REFERENCES	31

Introduction

Martin Small Consulting was commissioned by the Government of South Australia to help undertake an audit of speed cameras in the State to ensure that they are operating for safety purposes and not to raise revenue.

The focus of the audit was on two questions:

1. Have speed cameras reduced speeding and the number and severity of road crashes in the locations in which they have been placed?
2. Have speed cameras been located in areas identified as having the greatest road safety risk?

This report responds to these two questions. In so doing, it draws conclusions relating to trends in speeding behaviour generally as well as the community's attitudes to speed enforcement.

The focus of the analysis has been the network of fixed speed cameras, but the report also considers the role of mobile cameras as part of the suite of measures available for speed enforcement.

The findings of the report are based on a number of sources – particularly recent research projects undertaken by the University of Adelaide's Centre for Automotive Safety Research (CASR). Camera program information was also provided by the Department of Planning, Transport and Infrastructure (DPTI) and South Australia Police (SAPOL), and additional community attitudes information was supplied by the Motor Accident Commission (MAC) and the RAA. A full list of references consulted is provided at the end of this report.

The following tasks were undertaken:

- Review and summarise the CASR reports that analysed trends in crashes and offences associated with fixed safety cameras (Kloeden, Mackenzie & Hutchinson, 2018) and (Kloeden & Hutchinson, 2018)
- Identify and summarise other information sources relating to the effectiveness of speed camera enforcement in South Australia
- Review public information and other information provided by DPTI relating to the processes for identifying and prioritising the selection of fixed camera sites and assess compliance with these
- Review public information from other jurisdictions, and information provided by SAPOL relating to the processes for identifying and prioritising the selection of mobile camera sites.
- Review guidelines in place in other jurisdictions for fixed camera site selection, and potential guidelines developed by CASR (Kloeden, Bailey & Hutchinson, 2018)
- Analyse patterns of offence types detected by different camera methods in different locations
- Review the results of the YourSAy community survey and other sources
- Collate the above information to recommend opportunities to improve the effectiveness of fixed and mobile camera operations in particular and South Australia's speed enforcement program generally.

This report should be read in association with the reports prepared by CASR (noted above), and the DPTI report on the YourSAy survey.

Background

“Towards Zero Together” South Australia’s road safety strategy to 2020 was an early expression in Australia of what is referred to now as an elimination agenda in road traffic safety. The safe system approach articulated in the strategy is based on a rejection of fatal and serious injury as an inevitable or acceptable consequence of everyday people making everyday use of the roads.

There is a significant body of research evidence demonstrating the association between motor vehicle speed and road trauma, which makes speed management a major focus of road safety attention worldwide. Speed management has a number of components including:

- Road design
- Speed limit setting
- Vehicle technology
- Driver education
- Marketing and communications
- Enforcement
- Financial and licence sanctions.

Crash and injury risks are extremely sensitive to changes in speed. Small reductions in speed can have immediate and significant benefits. For example, it has been estimated that a 1 km/h reduction in average speeds on Adelaide’s 60 km/h roads could reduce injuries by 3.1%, and fatalities by 7.3%. Similar potential reductions were found for other roads (Doecke, Kloeden and McLean, 2011).

The role of enforcement is critical in achieving reductions in speed, particularly when it is accompanied by complementary communications, ideally as part of a comprehensive speed management strategy. Speed cameras are a highly efficient means of controlling and reducing speed. South Australia’s speed camera program comprises:

- 82 Fixed intersection cameras
- 21 Fixed pedestrian crossing cameras
- 14 Fixed rail level crossing cameras
- 11 Fixed mid-block cameras
- 6 Point to point (average) camera sections (including 24 spot cameras)
- 18 mobile speed cameras.

Successful speed enforcement is dependent upon specific deterrence (a person is deterred from speeding because of being personally caught and punished for speeding) and general deterrence (a person is deterred from speeding because they believe they may be caught with undesirable consequences). Both are needed, but the emphasis needs to be on general deterrence, because this can influence the behaviour of many more drivers.

General deterrence enforcement strategies rely on maximising the perceived risk of detection. The following factors increase people’s perceived risk of detection:

- High levels of perceived enforcement activity
- Mix of stationary enforcement (in fixed locations and seen by more people) and mobile enforcement (less predictable and affecting a larger area)

- Mix of overt enforcement (visible to more people) and covert enforcement (not visible, less predictable and affecting a larger area)
- Targeting enforcement activity to when and where speeding is most likely to occur or the overall safety risk is highest, and
- Use of road safety communications and advertising based on the risk of enforcement. (Small, Job & Dahdah, 2015)

The benefits of speed enforcement, and speed cameras in particular, have been demonstrated through a number of studies by researchers and through audits of camera programs.

For example, the Cochrane Collaboration (an authoritative global network of researchers promoting evidence-informed health decision making) examined the results of 35 separate studies and concluded that speed cameras resulted in a consistent reduction in speeds and crashes (Wilson et al, 2010).

More specifically in Australia, a report on the Victoria's road safety camera program by the State's Auditor General concluded that:

Road safety cameras improve road safety and reduce road trauma, and their ongoing use as an enforcement tool remains appropriate ... A strong body of research shows road safety cameras improve the behaviour of road users and reduce speeding and road crashes (Victorian Auditor General's Office, 2011).

Similar conclusions were reached in New South Wales during a performance audit by the Auditor General:

In general, speed cameras change driver behaviour and have a positive road safety impact. We found that the number of speeding offences, and the total number of crashes, injuries and fatalities reduced after the introduction of fixed speed cameras (Audit Office of NSW, 2011).

Nevertheless, despite the evidence base in favour of speed cameras, an audit in the Australian Capital Territory failed to demonstrate a benefit from their speed camera program (Australian Capital Territory, 2014). Steps were subsequently taken to strengthen the program, including preparation of a camera enforcement strategy, and a mobile camera deployment strategy. A review of fixed camera site selection was also undertaken. (Small, Dutschke & Kloeden, 2015)

As in other road safety areas encompassing driver behaviour, sustainable speed management programs are built on community understanding and acceptance. This can be achieved through good program design, as well as ongoing transparency in both the objectives and implementation of any program, review and feedback on its performance, and continuous improvement to policy and practice.

This audit report is a step towards increasing the transparency of South Australia's speed camera program, and an investment in the health and ongoing improvement of the program.

Effectiveness of the Camera Program

The first question for the audit to consider is whether speed cameras have reduced speeding and the number and severity of road crashes in the locations in which they have been placed.

In support of the audit, CASR was commissioned to evaluate crashes (Kloeden, Mackenzie & Hutchinson, 2018; referred to here as CASR Report 143) and infringements (Kloeden & Hutchinson, 2018; referred to here as CASR Report 146) in the vicinity of fixed speed cameras. Except where otherwise indicated, the discussion on the effectiveness of the camera program is drawn from these two studies.

Crash data

CASR analysed crash data at locations where safety (generally red light and speed) cameras had been installed in South Australia. The study was undertaken in order to determine if there had been any changes in crash numbers at those locations associated with the installation of cameras (CASR Report 143).

The selection criteria to determine whether locations would be included in the study included:

- Five years of post-installation data was available
- Adelaide metropolitan sites, to ensure sufficient volume of data
- No previous camera installation
- Camera only installed on one intersection leg, to allow comparison between intersection approaches with cameras to ones without.

This selection resulted in 35 intersections being evaluated, and these are listed in the CASR report. Changes in injury crashes were measured – that is, crashes involving a fatality, a person taken to hospital, or a person treated by a doctor. Restricting the analysis to more severe crashes was considered but not pursued due to either insufficient numbers of crashes (fatalities) or improvements in data validation (serious injuries). Both would have prevented meaningful results from being possible.

Analysis of these 35 intersections identified 819 crashes before camera installation and 712 crashes afterwards. It showed that, for approaches monitored by safety cameras, there were 21.1% fewer crashes in the five years after installation, compared with the five years before installation. In comparison, crashes at the same intersections for approaches that did not have safety cameras fell by only 7.2%.

This result needs to be reviewed with some caution as the difference is not statistically significant. Nevertheless, the reduction is consistent with results reported elsewhere (Wilson et al, 2010).

The real effect of cameras could be greater if the cameras also provide some benefits for untreated approaches. This could arise if drivers are aware of cameras at an intersection but are uncertain as to their precise direction of operation. Hence, some of the 7.2% reduction in these crashes may also be attributable to the cameras but this is unknown.

There was considerable variation in results for individual intersections – 21 sites experienced a reduction in crashes, 11 experienced an increase, and three stayed the same.

However, the report concludes that these data do not indicate that any cameras had caused an increase in crashes at any location as the variations were all within the bounds of normal statistical variation (CASR Report 143).

Offence data

To identify trends in compliance, CASR examined all offence data from safety cameras between 1 July 2000 and 31 December 2017 (CASR Report 146). Sites were excluded from the analysis if they were:

- Commissioned before 1 July 2000
- Had experienced subsequent changes in camera operation, speed limit, intersection design, or
- Had not been in operation for more than 12 months.

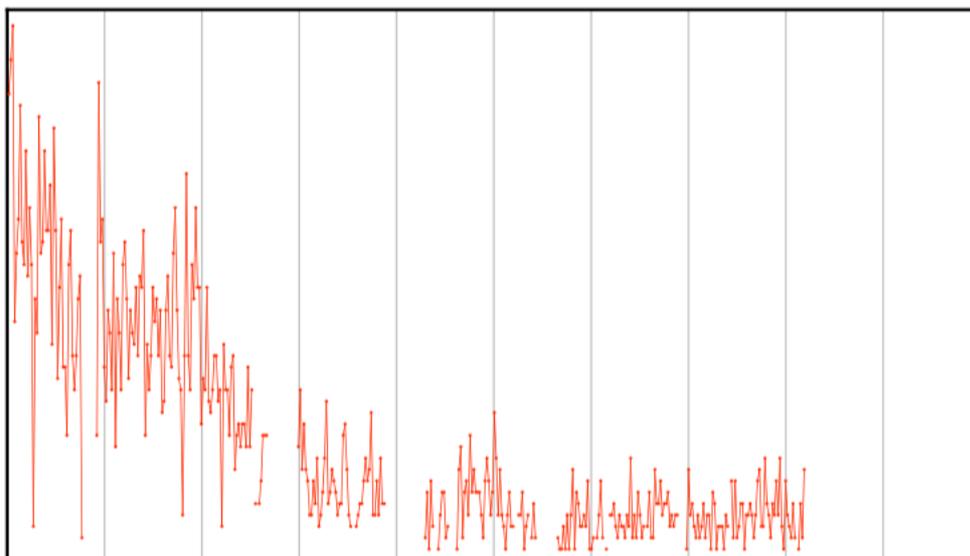
Offence data was analysed for 155 sites installed between 2004 and 2016. These sites included speed and red light cameras installed at intersections, pedestrian crossings and railway level crossing and speed cameras installed at mid-block locations and as point-to-point systems. The point-to-point systems detect non-compliance at each camera (spot) as well as over the length between two cameras (average).

Speeding offences

Weekly offence numbers were totalled for all weeks from the day after the first recorded offence for each of 154 speed camera sites. Results were plotted on a standardised graph and identification of trends were made from visual observation.

A typical plot (Site 103, at the intersection of Montefiore Road and War Memorial Drive in North Adelaide) is shown at Figure 1.

Figure 1: Example standard format graph of offences



In this example, the week with the highest number of offences, 47, is shown at the top of the graph. Just over eight years of data are shown.

This graph shows a pattern typical of many of the sites analysed and set out in the CASR report. There is a rapid reduction in the period immediately after installations, followed by a more gradual but continued reduction of subsequent years.

This pattern is consistent with the cameras being successful in achieving a rapid deterrent effect when installed (fewer vehicles were speeding), and this effect continuing and strengthening slightly over time. This positive result was seen with all camera types but was less apparent at low volume sites. Point to point cameras, for both average and spot measurements, show reductions at some sites but no consistent pattern was observed.

The audit did not examine site characteristics at locations where consistent reductions were not observed but high visibility of cameras and the very high weekly variation, often more than 100% week to week, would make any trends after installation difficult to detect.

There is significant week to week variation across the sites. Many cameras showed extended periods with no offences detected, probably coinciding with periods of downtime (as a result of maintenance work for example). Some of these sites then exhibited a rebound in offences once operations re-started, but this trend was not consistent.

Table 1 shows the number of sites of each type of camera that was analysed, and the range of maximum weekly offences for each. This number is a maximum not an average, which would be considerably less as the effect of the camera increases over time, as discussed above. The table also shows the number of sites with a maximum no more than 14 – these sites have therefore never experienced an weekly average of more than two offences per day.

Table 1 Speeding offences detected per week for each camera

Camera type	Cameras assessed	Range of maximum weekly offences	Sites with no weeks above 14 offences
Intersections	75	3 to 532	22
Pedestrian crossings	21	24 to 380	0
RLX	14	1 to 36	8
Mid-block	8	28 to 777	0
Point to point (spot)	24	4 to 64	12
Point-to-point (average)	12	7 to 65	3

The sites varied considerably in the number of offences recorded at each with one midblock site (Montague Road, Ingle Farm) initially recording 777 offences in a week. However, in June 2018, five and a half years after commissioning, this site recorded just 58 speeding offences per week (South Australia, 2018a). At the other extreme, 45 sites, or just under 30% of sites, never recorded more than two per day.

Regarding the low offence rates for point to point average speed detection, CASR commented that the enforcement tolerance for these offences could reasonably be reduced compared with spot measurements as they already eliminated offences from momentary, inadvertent speeding due to the nature of the measurement.

Red light offences

A similar graphical analysis of red light offences was conducted for 76 intersection cameras, 21 pedestrian crossing cameras and 14 railway level crossing cameras.

Consistent patterns were much less apparent, possibly due to the very low number of offences, as shown in Table 2. Many sites showed considerable week to week variation and periods of downtime, as with speed cameras. However, only some sites showed clear evidence of reductions over time, with some showing periods of increased non-compliance.

Table 2 Red light offences detected per week for each camera

Camera type	Cameras assessed	Range of maximum weekly offences	Sites with no weeks above 14 offences
Intersections	76	4 to 111	26
Pedestrian crossings	21	2 to 38	12
RLX	14	3 to 42	6

This low number of offences does not necessarily demonstrate lack of effectiveness. Red light running is a less common offence than speeding. In fact, the percentage of those speeding only recently fell below 15% on Adelaide's arterials (Kloeden, & Woolley, 2017). However, offence rates need to be assessed with consideration for the inherent risk associated with the offence. Whereas both speeding and red-light running are associated with increased risk, running a red light puts road users at risk of an immediate, and severe, collision from the resulting traffic conflict.

Overall, the analysis of speed and red light compliance trends was limited by the fact that there was no comparable offence information to allow offence rates before and after installation to be examined. This effect would help explain the low levels seen at many sites, which may have experienced an immediate reduction between installation and the first available data. CASR noted, in particular, that this effect may be stronger for rural locations, where the camera are likely to be more visible and therefore more likely to have an immediate effect.

That said, in reviewing the overall effectiveness of safety cameras, CASR concluded that:

Evidence was found that (fixed) safety cameras do prevent vehicle speeding and to a lesser extent red light running in urban areas and that the effect increases over time. Making them more conspicuous from the time of installation may accelerate their positive effects (CASR Report 146).

Trends in speeds and speeding

Towards Zero Together, South Australia's Road Safety Strategy 2020, identifies two sets of performance indicators relating to safer speeds: average free traffic speed (metro and rural), and vehicles exceeding the speed limit.

To monitor these results, measurements are regularly taken at more than 100 sites on a number of roads across South Australia at the same time each year. These provide

estimates of changes in driving behaviour generally rather than the changes at camera locations described above, but a brief review of the results is relevant.

The tables below show a summary of speeds on the roads most associated with cameras, and other enforcement. The table shows free speeds – that is, the speeds drivers choose when unimpeded by other vehicles in front. While this may bias the results towards times when traffic is lightest, it largely removes the influence of changes in traffic congestion from the results. Table 3 shows speeds relative to the prevailing speed limits for each road type and Table 4 shows the proportion of drivers who choose to drive above the limit.

Table 3 Average free speeds (Summarised from Kloeden & Woolley, 2017)

	Adelaide collector roads (50)	Adelaide arterials (60)	Rural hills arterials (80)	Rural arterials (100)	Rural arterials (110)
2007 average -v-limit	+0.82 km/h	-2.65 km/h	-0.47 km/h	-1.59 km/h	-6.18 km/h
2016 average -v-limit	-1.82 km/h	-4.69 km/h	-4.99 km/h	-3.45 km/h	-8.01 km/h
2007-2016 change in average speed	-2.64 km/h	-2.04 km/h	-4.52 km/h	-1.86 km/h	-1.83 km/h

Table 4 Compliance with speed limits (Summarised from Kloeden & Woolley, 2017)

	Year	Adelaide collector roads (50)	Adelaide arterials (60)	Rural hills arterials (80)	Rural arterials (100)	Rural arterials (110)
vehicles above limit	2007	55.48%	33.20%	45.01%	47.53%	29.83%
	2016	44.26%	18.71%	29.99%	38.15%	19.37%
vehicles >10km/h above limit	2007	9.37%	2.06%	11.46%	11.98%	4.89%
	2016	5.16%	0.76%	5.62%	7.82%	2.52%

Over the last ten years, to 2016, all road types in South Australia have seen a reduction in average speeds and an increase in compliance with speed limits. As described above, these apparently quite small reductions in the order of a few kilometres per hour can have a significant impact on the numbers of crashes, particularly for the more severe crashes.

The Adelaide arterials result is particularly significant due to the amount of traffic carried by the roads. For 60 km/h arterials in Adelaide, the proportion of drivers above the limit has dropped from 1 in 3 to less than 1 in 5 and the proportion of drivers more than 10 km/h over the limit has dropped from 1 in 50 to 1 in 130. Despite these improvements, crash data for 2013-17 (South Australia, 2018b) indicates that 50% of injury crashes, 29% of serious injury crashes and 22% of fatal crashes in South Australia occurred on roads with a

60 km/h limit, demonstrating the continuing need for improvements. Non-compliance is greater on other road types, but all have seen substantial improvements.

While there would have been many factors influencing these results, there is no doubt that enforcement at fixed camera sites, at mobile camera sites and through direct enforcement by Police, has played a large part in this success.

Have speed cameras reduced speeding and the number and severity of road crashes in the locations in which they have been placed?

The lack of a formal evaluation process for the safety camera program has limited the data available to provide a definitive response to some aspects of this audit question. In particular, the collection of speed and compliance data before installation would greatly assist in determining the immediate impact of camera installation.

Nevertheless, the available data supports a conclusion that speed cameras in South Australia have improved driver behaviour in their vicinity and hence improve safety. The 21% reduction in injury crashes at fixed camera sites is consistent with the extensive body of research into this matter.

This is reinforced by trends in vehicle speeds across the network, measured as part of the monitoring program for South Australia's road safety strategy. These trends show a sustained reduction in free traffic speeds and improved compliance, which suggests that State's speed camera enforcement program generally has made an effective road safety contribution.

Locations of speed cameras

The second question for the audit to consider is whether speed cameras have been located in areas identified as having the greatest safety risk.

Information was gathered on the guidelines or processes that are used in locating speed cameras, and consideration was given to how these guidelines might be improved to maximise safety outcomes and, specifically, the criteria applied for ten proposed new fixed camera locations.

Site selection is considered first for fixed and then for mobile speed cameras.

Fixed cameras

The locations of fixed safety cameras are determined by DPTI, in consultation with SAPOL.

DPTI consolidated their fixed safety camera site selection guidelines this year, and advise that they reflect previous practice. The guidelines aim to improve safety by enforcing speed limits and compliance with traffic signals at high risk locations and also, through deployment widely across the network, to act as a more general deterrent. (South Australia, 2018)

Higher priority is given to the following situations, depending on the type of fixed speed camera being installed:

- Crash History – total number of crashes over five years is considered with greater weighting for more severe crashes and those involving pedestrians
- Crash type – more right angle and right turn crashes
- Number of lanes – roads with a greater number of lanes in both directions
- Speed zone – higher speed zones
- Traffic volume – higher traffic volumes
- Heavy vehicles – higher proportion of heavy vehicles in the traffic stream
- Pedestrian crossings – presence of crossings, particularly school crossings
- School – presence of school, particularly primary schools

Site selection involves a three-part process:

1. Identification Phase

- Identify the road safety hazard; presence of vulnerable pedestrians e.g. children, speeding and/or red light running
- Identify crash rates relating to the road safety hazard
- Identify the road safety risk likely to be affected by a fixed safety camera by assessment against standard prioritisation criteria
- Identify the availability of any other road safety treatments which may mitigate the hazard, removing the necessity for a fixed safety camera.

2. Investigation Phase

- Investigate the location proximity to any existing fixed safety cameras
- Investigate the geographical location for infrastructure suitability
- Investigate the appropriate fixed safety camera technology
- Consult with DPTI and SAPOL safety camera stakeholders regarding the installation, operation and resourcing of a fixed safety camera at the identified location

- Confirm the suitability of the site for the deployment of a fixed safety camera.

3. Project Implementation Phase

- Obtain necessary approvals
- Construct site and installation of cameras by DPTI
- Site testing by DPTI
- Handover to SAPOL once testing demonstrates accuracy
- Cameras are then maintained by SAPOL with other site infrastructure, such as traffic detection loops, maintained by DPTI.

A SAPOL document published in 2016 “Fixed Safety Camera Operating Practices” summarises the site selection process, referencing the DPTI assessment (South Australia, 2016a).

Compliance with guidelines

There is no evidence that any fixed cameras do not meet the broad criteria documented in SAPOL’s 2016 document on operating practices for these cameras. There is also no evidence that any fixed cameras do not meet the criteria set by DPTI guidelines at the time the selection was made. This may be because the criteria focuses on prioritisation of sites, rather than setting a certain risk threshold that must be met.

Nevertheless, some observations can be made by examining whether the sites that are ranked highest according to the criteria have been treated in preference to other locations.

A review of casualty crashes at signalised intersections (2012-2016) was undertaken by DPTI, and this identified 596 intersections at which at least one injury crash occurred in that period.

Of the top 50 sites ranked according to the guidelines:

- 3 already have cameras
- 5 are recommended
- 2 are recommended as reserve sites
- 7 have other treatments planned
- 7 are Adelaide City Council roads
- 11 were deemed unsuitable
- 15 have no action identified.

Of the remaining lower ranked intersections, 67 have safety cameras. However, many of these do not have current risk rankings so their relative priority at the time of installation cannot be determined. It could be expected that, if these sites have successfully reduced the number of crashes, their ranking will have subsequently fallen.

Local Council roads are excluded as there is a need for DPTI access to the road for construction and maintenance of the necessary infrastructure. Additional governance and or financial arrangement may be required to extend the program to Council roads but there appears to be no legislative impediment to doing so.

Ten proposed sites

The opportunity has been taken in this audit report to examine the selection of ten proposed fixed safety camera sites. The installation of ten additional cameras has been agreed, but their location has yet to be determined.

Five intersection sites proposed for camera installation are:

Key road	Intersecting road	Suburb	Ranking
Maxwell Road	Main North Road	Parafield	1
Main North Road	Tolmer Road	Elizabeth Park	6 ⁼
Globe Derby Drive	Port Wakefield Road	Globe Derby Park	13
Tapleys Hill Road	Old Port Road	Royal Park	19 ⁼
Walkleys Road	Montague Road	Ingle Farm	21

Proposed reserve sites are:

Key road	Intersecting road	Suburb	Ranking
Ifould Road	Main North Road	Elizabeth Park	3 ⁼
Unley Road	Greenhill Road	Adelaide	23 ⁼

Five pedestrian activated crossings sites (adjacent to schools) proposed are:

Location	Suburb	Ranking
Grange Road	West Hindmarsh	1
Marion Road	Park Holme	2
Brighton Road	Somerton Park	5
Ascot Avenue	Vale Park	6
Goodwood Road	Pasadena	8

Proposed reserve sites are:

Location	Suburb	Ranking
Stephen Terrace	Walkerville	11
Beach Road	Morphett Vale	12

Where there was some apparent deviation from selecting sites strictly in accordance with the ranking, a response from DPTI was sought to understand the reasons for this.

The priority for the site at Ifould Road and Main North Road was lowered as there are already a number of cameras on Main North Road monitoring north east bound traffic. Although the Ifould Road intersection may also have warranted a camera, installing one

elsewhere on the network was considered likely to help spread the impact of camera enforcement more broadly across the network.

A number of intersections have not been ranked because they have already been assessed as not suitable for technical reasons, they are Adelaide Council roads, or there was already sufficient information to identify that camera enforcement at the intersection would not be justified.

A key issue in assessing the proposed ten sites is whether a split of five intersection cameras and five pedestrian crossing cameras is the most effective distribution between two quite different applications. As it stands, considerably more casualty crashes are occurring at the proposed intersection sites than the proposed pedestrian crossing sites. There were no guidelines or documented strategy available against which to assess the split decision that was made. That is, there is no overall framework through which it is determined that available resources should not be invested solely in either intersection or pedestrian crossing cameras, or spread further to include rail level crossings or point to point systems.

Looking more widely at the best use of available resources to achieve improvements in speed compliance would include examination of whether additional investment should be made into mobile speed camera enforcement. This would require greater consideration of operational as opposed to capital funding requirements, and consideration of SAPOL not just DPTI resources.

Notwithstanding these constraints within which the investment decisions are made, these ten proposed sites have been selected in strict compliance with the prioritisation criteria with no higher ranked sites excluded unless they were deemed unsuitable for safety camera installation.

Mobile cameras

Whereas fixed cameras are permanently installed at a limited number of locations, mobile cameras can be deployed at many locations and can be moved between these locations. Fixed cameras can deter speeding at locations associated with increased crash risks and/or increased speeding. As noted previously, offences at these sites decrease over time.

Mobile cameras can increase drivers' perceptions that their speeding can be detected anywhere and at any time, providing a wider, more generalised deterrence. Based on the detection rates of all passing vehicles, mobile speed cameras in South Australia have been found to detect twenty times more speeding drivers than fixed cameras during 2013-14 (Maxwell, 2015).

In most jurisdictions, as in South Australia, mobile speed cameras form part of the suite of enforcement tools used to manage speeding. A number of jurisdictions explicitly define this role through comprehensive speed management strategies.

New South Wales

A New South Wales Speed Camera Strategy has been documented as a tool to guide their enforcement programs and communicate the rationale for the program to the public (TfNSW, 2012).

This strategy was developed at a time when mobile camera enforcement in New South Wales had been at a very low level following a suspension of operations in response to

safety concerns for camera operators. The strategy notes that future increases in operations would be accompanied by extensive public education.

The strategy outlines the following guidelines for mobile camera locations:

- Frequency and severity of crashes and/or
- Risk of road trauma or previous fatal crash, or
- Police nominated, or
- Community nominated, or
- Location is difficult to enforce using conventional methods.

Cameras are required to be highly visible with advanced warnings. As at July 2018, 1,024 sites had been approved for operations across New South Wales (TfNSW, 2018).

Victoria

Victorian guidelines are also outlined in a public document (Victoria, 2015). One of the following categories must apply for a site to be selected for mobile speed camera enforcement:

- Documented history of serious and major injury collisions within the previous three years
- Subject to a validated complaint of excessive speeds
- Identified by Police to be a speed-related problem site
- Alternative speed enforcement deemed not practicable.

Cameras are unmarked with no advanced warnings. Deliberate concealment is not permitted but use of vegetation etc are permitted to reduce incidents being initiated by others (this may relate to issues of wilful damage or operator safety).

The following field evaluation criteria are used:

- Site must be safe for operators, road users and the equipment
- Camera cannot be on a bend or, except for school zones, within 200 m of a change in speed zone
- Camera must not be likely to interrupt traffic flow
- Site shall not be near an overpass or other location likely to carry traffic near the radar beam
- Satisfactory completion evaluation for sources of radar reflection
- Completion of a full inspection of camera site and enforcement area
- Completion of a monitoring session to ensure camera detected speeds are consistent with Police observations.

As at August 2018, 1,677 sites had been approved for operations across Victoria (Victoria, 2018). Identification of problem sites by the Police is the most common criterion invoked for 1,574 sites, 744 sites are in response to complaints of excessive speeding, 499 sites have a documented history of crashes and 21 sites were deemed not suitable for alternative enforcement. Some sites meet multiple criteria.

Sites are regularly audited with 1,560 sites audited during 2018.

Queensland

Queensland's selection criteria for mobile camera sites are (Queensland 2018a):

- Speed-related crash history
- High risk of speeding
- School zones
- Roadwork sites.

Sites are approved by regional Speed Management Advisory Committees, which include representatives of Police Service, Department of Transport and Main Roads, RACQ and local governments. The sites can be used at any time using marked or unmarked vehicles by uniformed or plain clothed police. Mobile cameras are either mounted in parked vehicles, or are hand-held or on tripods.

As at May 2018, there were 3,483 parked camera sites and 63 camera trailer sites approved (Queensland, 2018b).

Australian Capital Territory

The mobile speed camera program in the Australian Capital Territory is supported by a mobile camera deployment strategy (Australian Capital Territory, 2015). This strategy reference the need to amend legislation to support “anytime anywhere” operations. The strategy is directly linked to performance measures, and sets deployment principles: “The deployment of mobile cameras to roads across the Territory will be based on three deployment principles of crashes, police information, and anywhere, anytime.” These are given equal weighting, and are supported by an automated deployment process to “ensure the deployment of cameras ‘anywhere, anytime’ is genuinely random.”

Current South Australia Guidelines

SAPOL published similar information regarding South Australian mobile speed camera operations in 2016 (South Australia, 2016b).

In summary, sites are selected on current intelligence and trends, taking into account:

- Local intelligence
- Traffic Watch complaints
- DPTI black spot data
- Crash history over the previous four years
- Traffic flow and volume data
- Equitable presence of safety cameras.

Candidate sites are assessed for their suitability based on

- Operator safety
- Consistent speed limit – not within 200m of a speed limit change
- Not on a bend
- Clear of issues that may affect the radar beam or prevent a clear photograph
- Cameras are deployed in unmarked Police vehicles, covert operation can be approved in certain situations.

The Commissioner of South Australia Police made available for review the standard operating procedure (SOP) for the deployment of mobile speed cameras. Police procedures such as these provide daily direction to SAPOL officers regarding the discharge of their duties, and so are not routinely provided to external bodies. A confidentiality agreement

was signed to allow this to occur in relation to this audit, which required the approval of the Commissioner prior to publication of the contents of the procedures.

A summary of the procedure was prepared and has been approved for release by the Commissioner.

The SOP was first documented in 2005, and has been reviewed at least every three years since then. It allows mobile speed cameras to be deployed at locations which pose a road safety risk. The assessment of that risk is based on:

- Whether the location has a crash history
- Whether the location contributes to crashes in other locations
- Whether there is prevailing intelligence of speed related dangerous driving or road safety risk
- Whether the physical conditions of a location create a road safety risk.

Cameras are not to be deployed on a down slope or foot of a hill unless there is an identified road safety risk associated with that section of road.

A road safety risk rating is established for each location based on the following factors, from the highest to the lowest weighting factor:

1. The number of casualty crashes
2. The number of Traffic Watch complaints relating to speed
3. The number of expiation notices for speed greater than 30 km/h over the limit
4. The number of expiation notices issued.

That is, the number of casualty crashes is given greatest weighting and the number of expiations the lowest. An example of a 1.3 km section of road with a high risk rating which spans the east/west boundaries of a metropolitan Adelaide suburb illustrates the weighting. Over 90% of the rating for the road is derived from casualty crashes, and less than 1% of the weighting is given to the history of expiations.

The system application which generates the road safety risk rating refreshes daily, using data from the two years immediately preceding that date. It generates information on roads which includes:

- The 200 roads with the highest risk rating for each of the four metropolitan Local Service Areas (LSAs)
- The 50 roads with the highest risk rating for each of the seven rural Local Service Areas
- Other roads which have been identified through intelligence as a road safety risk (due, for example, in relation to an event or a longer-term safety risk).

Road sections in metropolitan Adelaide are identified by road and suburb name. Given there are approximately 400 suburbs in metropolitan Adelaide, the effect of this is to establish a relatively short length of road, such as the 1.3 km road section referred to above. This allows for relatively precise targeting of these road sections.

Road sections in rural South Australia are identified in longer sections, using the name of the road and the locality. What looks like a rather typical example of roads in one rural locality showed four roads radiating out from one town to the nearest four settlements. These road lengths were approximately 5, 8, 16 and 20 kilometres long.

LSA deployment schedules are then prepared for both metropolitan and rural operations. These deployments are understood to be flexible and responsive, in line with the SOP. The SOP states, for example, that in order to maximise the general deterrent effect, the deployment schedule should include a spread of higher and lower risk rating roads. The SOP also states that deployment of speed cameras regularly to the same location should be avoided, unless there is a high repeat offending rate.

The general deterrent effect is critical in any mobile speed camera program as it is seeking to maximise the perception that speeding drivers will be detected anywhere anytime. The rotation of mobile cameras around the network is a critical part of this, and the SOP provides direction in favour of spreading deployment. There is no obvious mechanism for achieving this spread, and it seems possible that, over time, the actual deployment becomes overly concentrated on the highest risk roads.

While a fully randomised deployment of cameras will necessarily generate some sites that have higher volumes of offences (because of traffic volume alone), this could explain why some sites appear with particularly high volumes of expiations. That is, there may be a natural tendency in the deployment process to return to sites with the highest crashes, and this may not achieve the greatest general deterrent effect.

Have speed cameras been located in areas identified as having the greatest road safety risk?

Any assessment of risk is a complex task. It should involve estimates of risk based on past experience of crashes, but it should also involve estimates of inherent risk due to other factors that may not yet have resulted in crashes. The DPTI process is one method for assessing this risk.

The existing and proposed fixed safety cameras are not located at sites that have the greatest history of crashes over the last five full years of data, for which several factors need to be considered.

Firstly, some high-risk sites are not feasible for cameras due to individual site characteristics or alternative treatments being more effective.

Secondly, broader estimates of risk, such as those used by DPTI in its prioritisation criteria, may outweigh estimates based just on historic crashes. These criteria should be reviewed to ensure that estimated risk matches available evidence as closely as possible. The lack of speed surveys to determine the likely impact of cameras is a key gap in this aspect of the current guidelines.

Thirdly, overall speed management strategies may demand camera locations that do not necessarily reflect local risk but that contribute to overall general deterrence. An example would be the use of cameras in locations where speeding is common, even though risks at that point may be relatively low. The use of speed cameras at pedestrian crossings near schools reflects this strategy: speed is identified as an issue to be addressed even though these sites do not have significant crash histories.

In relation to mobile cameras, the location of enforcement sites is based on historical risk, and is heavily weighted to casualty crashes. There may be a case to say that in fact the deployment of mobile cameras is too highly calibrated to the highest risk roads, which may

lead to a concentration of enforcement effort, and a reduction in the general deterrent effect which is sought from mobile camera operations.

Consideration should be given in the mobile speed camera program to increasing the number of sites which may be enforced, extending the time period within which crash analysis is undertaken from two years to five years, and introducing a simple means of ensuring a wide rotation of sites are enforced.

Attitudes

Community attitudes towards enforcement in general and individual speed cameras in particular have been gathered from a range of sources:

- National research undertaken for Austroads in 2011 into attitudes to speed enforcement conducted a telephone poll with 3,155 respondents nationally including 167 from South Australia (Austroads, 2013)
- A report by the RAA reporting on views expressed by their RAA Member Panel in response to questions about a number of speed enforcement issues
- Research on behalf of the Motor Accident Commission which included a number of focus groups and an on-line quantitative survey with 1,005 respondents to understand general sentiment about speed cameras
- Consultation through the YourSAy website in 2018 sought views on current camera locations as well as more general views on camera enforcement. It received 240 valid responses from people who chose to participate.

Findings from community attitude surveys

Some of the key findings from these are summarised below.

Views on effectiveness and support for different camera types

Austroads: Respondents were asked about the extent that they approved of different initiatives. Combined red-light and speed cameras that were sign-posted were approved by 83%, second only to marked police cars. In terms of effectiveness, 12% of respondents from South Australia considered safety cameras effective at slowing drivers down at particularly dangerous locations, which was considerably more than respondents across all jurisdictions for whom the figure is 8%.

RAA: 64% of respondents believed that safety cameras at intersections were effective in deterring speeding. But only 30% believed that safety cameras generally had contributed to reductions in crashes, with 28% unsure.

MAC: 64% of respondents understand and agree that the aim of speed cameras is to improve safety. Point to Point cameras generated the greatest support, particularly for their safety impact and a way to stop people speeding. Mobile speed cameras were less likely to be seen as effective. Table 5 provides more detail.

Table 5: Percentage of respondents agreeing or strongly agreeing

	Good way to stop people speeding	Generally in appropriate places	I'd like to see more
Point to Point cameras	63%	61%	44%
Safety cameras at intersections	59%	55%	37%
Fixed speed cameras	54%	46%	35%
Mobile speed cameras	45%	34%	28%

YourSAy: Although YourSAy participants' support was not explicitly questioned, their responses indicated that 33% supported cameras, 28% did not support and 38% did not provide a clear indication. The level of support was fairly consistent for different ages, genders and metro/rural locations.

Revenue raising

Austroroads: When asked whether speeding fines were used mainly for revenue raising, 66% of South Australian respondents agreed, the highest of any jurisdiction and significantly greater than the national average. For all respondents, the technique perceived to be most closely associated with revenue raising was fixed speed cameras (36%) but only 7% had this view about red-light speed cameras. However, 14% of South Australian respondents held this view.

MAC: More people (63%) mentioned revenue raising as something that came to mind when thinking about speed cameras than any other thing. However, this was not universally negative. Revenue raising was regularly raised as a benefit in relation to each of the speed camera enforcement types.

YourSAy: Of the 28% who did not support speed cameras, 88% referred to the cameras as revenue raising (24% of all respondents).

Other issues

MAC: 41% distrust how speed cameras are managed.

YourSAy: In response to questions about particular sites, respondents mentioned two sites in particular:

- South Eastern Freeway (6% of respondents) prompted concerns about revenue raising as it was too easy to speed
- Glover Avenue, Bakewell (5% of respondents) also caused concerns about revenue raising with the suggestion that the installation of an underpass may have removed the need for the camera.

Improvements

Potential improvements suggested by respondents consistently raised issues of fairness, and favoured deterrence at specific locations perceived as risky.

MAC: 69% reported that support would increase if they were put in place where accidents have happened. Support was also significant for cameras placed around schools, hospitals etc, if people knew the benefits, and if revenue went to roads or road safety.

RAA: 71% agreed that improved speed limit signage before cameras would help, 50% believed that this would modify their driving behaviour.

YourSAy: 11% believed residents' feedback and speed surveys should be included in the site selection criteria. 8% believed cameras should not be placed on a downwards gradient.

Conclusions regarding community attitudes

There is a tension between measures required to improve the community's acceptance of cameras, and measures required to improve the effectiveness of the camera program.

Drivers believe that visible sites in higher risk locations provide them with the opportunity to respond and avoid penalty. This is a feature of visible fixed camera enforcement which is most usefully directed at deterring speeding at particular sites. Broadly speaking, there is an alignment between the current South Australian fixed camera program and community attitudes.

The role of speed enforcement, and mobile cameras in particular, in preventing speeding across the road network is not well understood however. The use of mobile speed cameras in detecting speeding drivers anywhere anytime may be a more effective measure, but may also be more likely to result in negative perceptions of fairness and revenue raising, particularly when it is covert.

Communication programs to increase transparency of camera location, align camera location and visibility to reduce speed and hence risk at specific locations may succeed. However, more strategic communications to decrease the social acceptability of speeding, and hence support for less targeted enforcement are also required.

The substantial cohort of drivers and stakeholders who believe that revenue raising is a benefit, and do not mind that speeding drivers are caught unawares, may be the key group to engage in this communication.

Discussion

Addressing the two audit questions raises two major points for discussion.

Enforcement strategies

One of the gaps in the current South Australian program is a published strategy to explain the overall speed management program and to show the role of different enforcement methods within this strategy. The preparation of such a strategy would help determine the overall mix of different enforcement types required for maximum effectiveness.

Based on the evidence regarding the effectiveness of the different camera systems in different situations, a World Bank study concluded that good practice programs include a mix of camera operations (Small, Job & Dahdah, 2015):

- A network of fixed cameras would be focused on very high volume urban roads where there are significant crash histories or safety risks that are not susceptible to or have not yet received significant engineering safety treatments
- A network of fixed intersection cameras enforcing both red light running and speeding at signalised intersections which have the highest volume of fatal and serious crashes that are not susceptible to or have not yet received significant engineering safety treatments
- A network of average speed cameras which enforce long lengths of high volume rural and regional roads (although some urban environments may also support successful deployment), between townships or other points where substantial traffic is likely to move onto or off the roadway
- A large number of mobile cameras mounted in light vehicles which can be deployed on a randomised basis across a very large number of sites which have been selected because they either present specific crash risks, or they will support an increased perception of detection.

Overall objectives for the different methods should be different and this should flow down to selection and prioritisation guidelines that reflect these objectives.

Two key objectives should be

- Reducing speeds at locations of known risk
- Reducing travel speeds generally.

While the first objective may be met through highly visible fixed camera sites, the role of mobile camera and other enforcement may also lead to this as well as contributing to drivers' perceptions that they could be caught anywhere and at anytime if they speed.

Key to the acceptance of this will be the public communication of the strategy, along with issues such as explanation of the rationale for certain speed limits, supported by other methods such as infrastructure, where additional prompts for driver behaviour are required.

Potential criteria for fixed camera installation

The DPTI guidelines for fixed camera site selection provide a standardised process to ensure objective assessment of site priorities. However, there are a number of areas that could be reviewed to improve their effectiveness.

While the process to prioritise individual sites is defined, there is not a documented process to determine which sites should be considered. This raises the question of whether more risky sites are being overlooked through lack of a rigorous top-down approach. For example, the allocation of cameras between intersections and arterials and rail level crossings with quite different risks needs to be supported by a coherent speed camera enforcement strategy.

In relation to the individual prioritisation criteria, further study may be needed to validate that these are the most effective. For example, the guidelines give lower priority to roads with a 60 km/h limit or lower despite the fact that most trauma is occurring on these roads. CASR has estimated that a 1 km/h reduction in speeds on Adelaide's 50 km/h and 60 km/h could prevent 160 injuries, while the same speed reduction on rural 100 km/h and 110 km/h roads would prevent 30 injuries (Doecke, Kloeden and McLean, 2011).

Overall, DPTI has adopted a relatively complex prioritisation process for fixed camera site selection. A more strategic approach that addresses the longer term mix and balance of speed camera enforcement methods could be supported by a simpler methodology, based on crash history and/or traffic speeds.

Work by CASR (Kloeden, Bailey & Hutchinson, 2018) reviewed practices in a number of jurisdictions regarding the deployment and evaluation of speed cameras. The paper concluded that there was no definitive best practice that could be recommended based on evidence of effectiveness. However, selection processes for different camera types were recommended for consideration.

These processes generally rank sites by crash history and then examine the high-ranking sites to determine feasibility and undertake speed surveys to ensure that speed cameras are located at sites where speeding and crash risk are both present. For cameras at pedestrian crossings additional weight should be given to pedestrian volumes. Locations with more children, older pedestrians or near where alcohol is served should be prioritised.

For railway level crossing cameras, where there will not be a significant crash history, surveys of speeding and red-light running are proposed instead to assess risk. This could be enhanced by using other risk measures, such as incident reports from the rail operator or risk ratings, such as the Australian Level Crossing Assessment Model.

Conclusions and Recommendations

The available data indicates that fixed speed cameras in South Australia have improved driver behaviour in their vicinity and hence improve safety. The 21% reduction in injury crashes at fixed camera sites is consistent with the extensive body of research into this matter.

An outcome evaluation of the mobile speed camera activity has not been undertaken. There has however been a sustained reduction in average traffic speed, and in vehicles exceeding the speed limit. Some confidence in the speed camera program as a whole can be taken from this as these are the relevant key performance indicators in South Australia's road safety strategy *Towards Zero Together*.

Both DPTI and SAPOL have sought to maximise the safety effect of fixed and mobile camera through siting fixed and mobile cameras at locations of greatest risk. However, any assessment of risk is a complex task and involves assessment of both past experience (which is the focus of the DPTI approach) and inherent risk. As well, a critical element of speed enforcement is to increase the perceived risk of detection at all times.

Fixed safety cameras are not all located at sites that have the greatest history of crashes, but there is no suggestion that this has been to raise revenue. Some high-risk sites are not feasible for cameras due to individual site characteristics or alternative treatments being more effective. It is more notable that there is no overall framework to determine the best mix of different fixed camera installations – intersection, midblock, pedestrian crossing, rail level crossing or point to point.

In relation to mobile cameras, the location of enforcement sites is also based on historical risk. There may be a case to say that in fact the deployment of mobile cameras is too highly calibrated to the highest risk roads, which can lead to a concentration of enforcement effort in a smaller number of sites, and a reduction in the general deterrent effect across the road network which is sought from mobile camera operations.

It is recommended that, in consultation with other stakeholders, DPTI and SAPOL develop a comprehensive strategy to define roles of different speed enforcement methods and fixed camera locations. Such a strategy should:

- *Be focused on the speed management performance indicators derived from the current road safety strategy, or new indicators prepared as part of a successor strategy*
- *Identify the safety criteria that should be used to deploy different speed camera enforcement methods, particularly whether redesign of the road environment (including speed limit change) should be favoured over fixed camera enforcement*
- *Establish the future mix of speed camera enforcement methods – for example the mix between fixed and mobile cameras, and between specific deterrence at problem sites and general deterrence across the road network*
- *Explain the safety benefits of different speed camera enforcement methods.*

The proposed sites for ten further cameras are appropriate, but whether the mix of five intersection and five pedestrian crossing cameras is best depends on the camera enforcement strategy. Considerably more casualty crashes are occurring at the proposed intersection sites than the proposed pedestrian crossing sites. It is possible that additional

capital investment in fixed speed camera installations may be better allocated to point to point systems.

It is also possible that additional capital investment may be better allocated to expanding mobile camera operations. Operational resources would need to be re-allocated to mobile camera operations if this were done. It is possible that, from a safety perspective, the current weighting of mobile cameras to casualty crash sites is constraining the general deterrent effect (“anytime, anywhere”) which mobile speed camera operations are best designed to achieve.

It is recommended that, within a wider speed camera enforcement strategy addressing the best use of speed camera enforcement methods, particularly in relation to fixed cameras:

- *DPTI’s prioritisation method for fixed camera installations should be reviewed and simplified, and make greater use of site specific speed data*
- *SAPOL’s deployment of mobile cameras is reviewed to:*
 - *increase the number of sites which may be enforced*
 - *extend the casualty crash analysis period from two years to five years*
 - *incorporate an automated rotation around sites.*

This audit report should be considered as one step in increasing transparency and understanding around speed camera operations in South Australia, and more transparency and understanding can be provided over time. For example, there is extensive South Australian road traffic crash and offence data available online, but it would require a major effort for a member of the public to collate and analyse this data. As well, it was not possible in this audit to go back and make a retrospective assessment of historical decisions regarding fixed or mobile camera operations.

The pro-active collation of information is more likely to increase transparency and understanding than reactive responses to questions or complaints, particularly when undertaken as part of an overall strategy to tackle speeding in South Australia. Further effort in this regard would seem to be important in closing the gap between measures which will maximise the effectiveness of the camera program in safety terms, and community acceptance of those measures.

It is recommended that:

- *Any decisions on new fixed speed camera installations are accompanied by a release and explanation of data which illustrates the rationale behind those sites being selected*
- *A process is undertaken for releasing and updating the sites for potential mobile speed camera enforcement*
- *An ongoing information and audit program is developed which ensures regular collation, interpretation and release of crash and offence data relevant to South Australia’s speed camera program, and promotes community understanding and acceptance of the program.*

That said, there is likely to be some negative perception of speed cameras for some time, generally amongst those who speed. Strategic programs to reduce speeding and the social acceptability of speeding should therefore build on general community concerns about road trauma, rather than attempt to win over the falling numbers of those who speed.

Annex: Speed Camera Enforcement Comparison Data

The purpose of the audit has been to answer two questions regarding the effectiveness of the speed camera program and the location of speed camera enforcement.

Answering these questions has necessarily raised matters regarding the overall speed enforcement strategy. An analysis was conducted of 2017/18 general expiation notices, which are publicly available (South Australia, 2018a). Methods of enforcement, enforcement intensity, and distribution of offences by severity and speed zones were examined. These were compared with public data available for two other jurisdictions.

This brief comparison of offence data supports the value of South Australia looking at its overall speed camera enforcement program, considering the mix of fixed and mobile camera operations, and the targeting of lower level speeding

594,722 records were reviewed. These include various traffic, parking, licensing and registration matters as well as matters unrelated to road use. Triggering events that led to culled records that do not meet evidentiary standards were also included. 231,602 related to speeding.

Table A1 shows the distribution of offence types from each method of camera detection as well as for non-camera enforcement (Other). The role of fixed cameras in detecting unregistered and/or uninsured vehicles appears to be as significant as detecting speeding. This role could be recognised and considered in determining locations. Market research could be used to test the community's response to this aspect.

Table A1: General expiation notices South Australia 2017-2018

Offence type	Enforcement type			
	Fixed	Fixed point to point	Mobile camera	Other
Unregistered/uninsured vehicles	81,067	0	1,681	23,031
Red light running at pedestrian crossings	4,227	0	0	
Red light running at railway level crossings	1,669	0	0	
Other red light running – generally intersections	35,792	0	0	2,868
Exceed speed	84,461	5,703	94,567	46,871
Other	106	0	0	138,281
Culled	65,548	(included in Fixed)	8,900	
Total	272,870	5,703	105,148	211,051

Note:

1. Blank data indicates these items could not be separately identified. Numbers are expected to be very low.
2. Notices for unregistered or uninsured are for vehicles also detected for speeding or red light offences.
3. Other offences include a range of traffic offences, such as failure to give way, as well as a range of offences unrelated to road use that are also processed through the expiation notice system.

Table A2 compares the South Australian camera data to that for Queensland (TMR, 2017) and Victoria (Victoria, 2018a). Note that, for Victoria, published data does not distinguish between fixed and mobile cameras.

Compared to some other jurisdictions, the proportion of camera offences detected by mobile cameras is relatively low as are detection rates per head.

Table A2: Interstate comparison of camera detected speeding offences

Camera type	South Australia	Queensland	Victoria
Mobile	94,567	477,533	
Fixed	84,461	152,828	
Point to point	5,703	6,623	
Total	184,731	636,948	1,223,864
Offences per 100,000 population	10,700	12,800	19,200

Tables A3 to A5 show expiation data for the same three jurisdictions according to the level of speeding detected.

Both Queensland and Victoria detect a much greater proportion of offences for low-range speeding than does South Australia.

Table A3: General expiation notices for exceed speed South Australia 2017-2018

Camera type	Speed above limit					Total
	<10 km/h	10-19 km/h	20-29 km/h	30-44 km/h	>44 km/h	
Mobile	41,691	48,921	3,270	560	125	94,567
Fixed	33,352	46,531	3,547	737	294	84,461
Point to point	0	5,101	478	114	10	5,703
Other	10,958	27,395	5,267	1,349	400	45,369
Total	86,001	127,948	12,562	2,760	829	230,100

Note: There is no enforcement of average speed offences below 10 km/h in South Australia as these cameras only operate in 110 km/h and 110 km/h speed zones.

Table A4: Camera infringements Queensland 2016 (TMR, 2017)

Camera type	Speed above limit					Total
	<13 km/h	13-20 km/h	21-30 km/h	31-40 km/h	>40 km/h	
Mobile	373,246	89,821	12,397	1,427	642	477,533
Fixed	113,094	33,961	4,577	772	424	152,828
Point to point	3,113	2,985	415	64	46	6,623
Total	489,453	126,767	17,389	2,263	1,112	636,984

Table A5: Fixed and mobile camera infringements Victoria 2016-2017 (Victoria, 2018a)

Speed above limit	<10 km/h	10-14 km/h	15-24 km/h	25-29 km/h	30-39 km/h	>39 km/h	Total
Number of infringements	923,074	203,435	79,162	8,670	6,656	2,867	1,223,864

Note: 154,042 infringements were also issued for red light offences

Table A6 illustrates the differing roles the various methods have in South Australia's overall speed enforcement program. A notable pattern is the use of fixed and mobile cameras in relatively low speed environments with 75% of fixed camera offences, and 93% of mobile camera offences occurring on roads with speed limits of 60 km/h or less.

Notably, the top four sites for infringements in Victoria were all 40 km/h sites and averaged just under 39,000 infringements per site in 2016-2017 (Victoria, 2018a). South Australia's top site, the South East Freeway site at Leawood Gardens, resulted in 8,879 infringements being issued in 2017/2018.

Table A6: Exceed speed expiation notices South Australia 2017-2018

Speed zone	Enforcement type			
	Fixed	Fixed point to point	Mobile camera	Other
<40 km/h	0		0	607
40 km/h	546		2,592	497
50 km/h	11,908		62,414	6,716
60 km/h	50,958		23,240	12,153
70 km/h	1,194		1307	696
80 km/h	2,080		3,829	6,242
90 km/h	9,426		125	1,579
100 km/h	947	358	529	6,090
110 km/h	7,402	5,345	531	10,832

Note, owing to obvious coding errors, approximately 1,000 records arising from "other" enforcement have been excluded.

References

- Australian Capital Territory, 2014, "Speed Cameras in the ACT", ACT Auditor-General's Office Performance Audit Report No. 1 / 2014, Canberra, March 2014
- Australian Capital Territory, 2015, "Mobile Camera Program Deployment Strategy" accessed from http://cdn.justice.act.gov.au/resources/uploads/JACS/Road_Safety/PDFs/Mobile_Camera_Deployment_Strategy.pdf on 27 August 2018
- Audit Office of New South Wales, 2011, "Performance Audit - Improving Road Safety: Speed Cameras", New South Wales Auditor-General's Report, ISBN 978 1921252 549, Sydney, July 2011
- Austrroads, 2013, "Driver Attitudes to Speed Enforcement", Austrroads Research Report, AP-R433-13, Sydney, April 2013
- Doecke, S.D., Kloeden, C.N. & McLean, A.J., 2011, "Casualty crash reductions from reducing various levels of speeding", Report CASR076, Centre for Automotive Safety Research, Adelaide, February 2011
- Department of Planning Transport and Infrastructure, 2018, "All casualty crashes at signalised intersections" Department of Planning, Transport and Infrastructure, unpublished data, DOCS_AND_FILES-#12912478-v1-Safety_Camera_Program_2017_18_-_10_priority_locations_-_Safety_camera_review_data.XLSX, compiled 17 July 2108
- Kloeden, C.N. & Woolley, J.E., 2017, "Vehicle speeds in South Australia", Report CASR144, Centre for Automotive Safety Research, Adelaide, November 2017
- Kloeden, C.N., Mackenzie, J.R.R. & Hutchinson, T.P., 2018, "Analysis of crash data from safety camera intersections in South Australia", Report CASR143, Centre for Automotive Safety Research, Adelaide, February 2018
- Kloeden, C.N., Bailey, T.J. & Hutchinson, T.P., 2018, "Locating and evaluating fixed safety cameras in South Australia", Report CASR145, Centre for Automotive Safety Research, Adelaide, July 2018
- Kloeden, C.N. & Hutchinson, T.P., 2018, "An examination of offences at South Australian safety camera sites", Report CASR146, Centre for Automotive Safety Research, Adelaide, July 2018
- Maxwell, P., 2015, "Review of South Australia's fixed and mobile speed camera programs", Proceedings of the 2015 Australasian Road Safety Conference, Gold Coast, October 2015
- Queensland, 2018a, "Types of speed cameras and red light cameras" downloaded from <https://www.qld.gov.au/transport/safety/finest/speed/cameras> on 10 August 2018
- Queensland, 2018b, "Active mobile speed camera sites", Queensland Police, downloaded from <https://data.qld.gov.au/dataset/active-mobile-speed-camera-sites> on 10 August 2018
- Small, M., Job, S. & Dahdah, S, (2015) "High Performing Road Safety Camera Programs", Unpublished Advisory Note, World Bank
- Small, M., Dutschke, J. & Kloeden, C. 2015, "Review of Road Safety Camera Siting Criteria and Locations" retrieve August 2018 http://cdn.justice.act.gov.au/resources/uploads/JACS/Road_Safety/Review_of_Road_Safety_Camera_Siting_Criteria_and_Locations.pdf.

South Australia, 2016a, "Fixed safety camera operating practices", Version 1.3, South Australia Police, downloaded from <https://www.police.sa.gov.au/services-and-events/expiations/how-traffic-cameras-work> on 23 July 2018

South Australia, 2016b, "Mobile safety camera operating practices", Version 1.5, South Australia Police, downloaded from <https://www.police.sa.gov.au/services-and-events/expiations/how-traffic-cameras-work> on 23 July 2018

South Australia, 2018, "Fixed safety camera – Priority site selection criteria" South Australia Department of Planning, Transport and Infrastructure, Unpublished Draft 12046460

South Australia, 2018a, "Expiation Notice System Data 2017-2018" Data SA South Australian Government Data Directory, downloaded from <https://data.sa.gov.au/data/dataset/expiation-notice-system-data> on 8 August 2018

South Australia, 2018b, personal communication from Department of Planning, Transport and Infrastructure following retrieval of Data SA South Australian Government Data Directory, from <https://data.sa.gov.au/data/dataset/road-crash-data> on 12 August 2018

TfNSW, 2012, "NSW Speed Camera Strategy", Transport for NSW Publication M.144, ISBN 978-1-922030-19-1, Sydney, June 2012

TfNSW, 2018, "Mobile speed camera locations", Transport for NSW, downloaded from <http://roadsafety.transport.nsw.gov.au/speeding/speedcameras/current-locations.html> on 10 August 2018

TfNSW, 2018a, "Speed Camera Programs: 2017 Annual Review", Version 0.6, Transport of NSW, Centre for Road Safety, Sydney, May 2018

TMR, 2017, "Annual Report 2016-17" Department of Transport and Main Roads, Brisbane, September 2017

Victorian Auditor-General's Office, 2011, "Road Safety Camera Program", Auditor-General's Report PP No 3, Session 2011–12, ISBN 978 1 921650 85 7, Melbourne, August 2011

Victoria, 2015, "Mobile Digital Road Safety Camera Policy & Operations Manual", Victoria Police Traffic Camera Office, Version 5.0, October 2015

Victoria, 2018, "Mobile camera locations – August 2018", Department of Justice and Regulation, Victoria, downloaded from <https://www.camerassavelives.vic.gov.au/camera-locations/approved-mobile-camera-locations> on 7 August 2018

Victoria, 2018a, "Speeding " accessed from <https://www.camerassavelives.vic.gov.au/road-safety/statistics> on 12 August 2018

Wilson C., Willis C., Hendrikz J.K., Le Brocque R. & Bellamy N., 2010, "Speed cameras for the prevention of road traffic injuries and deaths", Cochrane Database of Systematic Reviews 2010, Issue 11. Art. No.: CD004607. DOI: 10.1002/14651858.CD004607.pub4.