ANPR SCOPING STUDY REPORT

2008
ANPR SCOPING STUDY REPORT OVERVIEW

Since May 2007, the CrimTrac Agency has led a whole-of-government scoping study to explore the issues associated with a national Automated Number Plate Recognition (ANPR) capability for Australia. I am pleased to present this final report, which details the findings and recommendations of the scoping study.

The scoping study involved an extensive literature review, examination of legislative and privacy issues, development of technical and architectural options, and a stocktake of existing and planned camera infrastructure within Australia. An environment scan and cost/benefit analysis also formed part of the scoping study. There was comprehensive engagement of road transport, infrastructure, law enforcement and private sector agencies across Australia, and I am very grateful to all participating agencies and their staff.

Overseas experience, particularly in the United Kingdom, has demonstrated the profound benefits to crime prevention, reduction and detection that can be harnessed through adopting ANPR. The technology, which gained additional prominence following its role in the London bombings investigation, matches vehicle number plates against hotlists of wanted vehicles. While it is used to some extent in most Australian jurisdictions, there is a significant opportunity for governments to establish a national capability to deliver road safety, law enforcement and national security outcomes. The potential of ANPR to target serious and organised cross-border crime is as worthy as its potential to reduce serious road trauma through monitoring heavy vehicle traffic.

There are, of course, risks associated with implementing a national ANPR capability. Initial capital investment would be significant, real and perceived privacy concerns would need to be addressed, and downstream implications for road transport and law enforcement agencies would require further consideration. For these reasons, the scoping study proposes a measured and staged approach that involves continuing a privacy dialogue, refinement of technical approaches and critical analysis of empirical results. Transparency and accountability will be maintained through regular reporting to Australia’s police and road minister’s on the benefits realised.

The scoping study has involved significant effort by representatives from all jurisdictions and I would particularly like to acknowledge the guidance provided by the Chair of the ANPR Sponsoring Group, Mr Ken Moroney, AO APM, and the ANPR Programme Manager, Mr Darren Booy.

With ANPR we have a significant opportunity to leverage technology to help police and road transport agencies protect the community and reduce crime and road trauma. This is an exciting prospect for Australian law enforcement and regulatory agencies and I take much pleasure in commending this report to you.

Ben McDevitt
Chief Executive Officer
CrimTrac Agency

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EXECUTIVE SUMMARY

In 2006, a whole-of-government workshop led by CrimTrac recognised the benefits that Automatic Number Plate Recognition (ANPR) technology could bring to Australia’s safety and security. Subsequently, a national scoping study into the feasibility of implementing a national ANPR capability was approved by the former Minister for Justice and Customs in 2007.

The ANPR scoping study has involved national whole-of-government participation across road safety, law enforcement and national security agencies. It has also involved extensive engagement with law enforcement agencies in the United Kingdom to learn and draw upon their experiences from their national model of ANPR deployment.

The study recommends implementation of a national ANPR capability. This capability will provide significant benefits to the community and governments, particularly in the areas of road safety, law enforcement and national security. A significant investment will be required by governments, however there is a moderate benefit-cost ratio.

A national ANPR capability will support agencies to meet their strategic objectives. It also aligns with the Council of Australian Government’s commitment to a whole-of-government philosophy. A national ANPR capability will facilitate inter-agency and cross-jurisdictional sharing of ANPR data, enhancing agencies effectiveness and capability.

A national ANPR capability for Australia was recommended by the Parliamentary Joint Committee on the Australian Crime Commission in its September 2007 inquiry into the future impact of serious and organised crime on Australian society. The Federal Labor Party also provided an election commitment to support the establishment of a national ANPR capability in 2007.

How ANPR works

Automated Number Plate Recognition technology uses camera and optical character recognition software to capture an image of a vehicle, locate the number plate within the image, and then convert the number plate value to a text string. The text string is stored in a database and can be matched in real time to hotlists of number plates, such as those of unregistered or stolen vehicles. The database can be used for analysis and a range of other purposes.

An evidenced based approach

An environment scan of literature and studies of ANPR, has found that it is highly desirable and feasible to establish a national ANPR capability in Australia. Such a capability would provide the technical infrastructure to improve:

- road transport management, by reducing the number of unregistered or unsafe vehicles and unlicensed or disqualified drivers on the road, and illegal road behaviour
- law enforcement, by providing better intelligence and crime prevention as a result of detecting and disrupting criminal activities involving motor vehicles
- national security, by protecting critical infrastructure and national security interests, and enhancing intelligence capability
The report concludes that a central national ANPR system that complements agency-based processing would be far more effective than brokering information between independent systems. It would garner efficiency gains from integration and standardisation. The scan has identified that there are gaps in empirical evidence, particularly for national security, however the available evidence clearly supports the case for a national ANPR capability.

Legislation and privacy

Information Integrity Solutions (IIS), led by former Federal Privacy Commissioner Malcolm Crompton conducted a privacy impact assessment (PIA) as part of the study. The PIA found that a decision by governments to implement a national ANPR capability would have the possible advantages of setting high and consistent standards for ANPR technology.

The PIA considered that a national ANPR capability would be a very significant new form of population level surveillance with potentially high-order privacy impact. The decision to implement such a capability should therefore not be undertaken lightly. To mitigate these privacy risks, IIS has made 12 recommendations. This report supports the majority of the recommendations and has incorporated these in architectural system options.

CrimTrac considers the initial PIA to be the first part of ongoing privacy consultation leading to the implementation of a national ANPR capability.

The Australian Government Solicitor (AGS) undertook an extensive review of legislation, including privacy legislation. It has identified that some ANPR data is likely to be ‘personal information’ for the purposes of Australian privacy laws. Whilst no amendments to privacy laws would be required to implement a national ANPR capability, some administrative action or legislative change to other laws would be required to enable ANPR data to be collected and disclosed nationally between agencies.

The review by AGS has found that it would be necessary to give relevant agencies the specific function of collecting and disclosing ANPR data for each of the three purposes of road safety, law enforcement and national security. This would overcome legislative barriers to sharing ANPR information nationally.

There are legislative and administrative implications in implementing a national capability across states and territories with differing legislation and administrative arrangements. This could be addressed by each state enacting its own specific ANPR Act based on a model Bill, or by enacting a Commonwealth ANPR Act.

A national ANPR capability

The scoping study examined the current ANPR and enforcement camera infrastructure in Australia. This stocktake showed that, except for the Northern Territory, each Australian state and territory is benefiting to varying degrees from using ANPR technology for roads and traffic management, law enforcement and other uses.

However, use of the technology is not as effective as it could be because of disparate coverage, systems, information and processes.

The stocktake found that current ANPR infrastructure, even if connected, is not sufficient to allow effective coverage of Australia’s road network. Further that there is no national ANPR information sharing or network and only limited inter-agency and cross-border data sharing and cooperation on ANPR.

Nationally, all road transport, infrastructure and law enforcement agencies agreed to a single set of national business requirements. A gap analysis identified two main capabilities required to achieve a national ANPR capability. These are:
• a national ability to both capture vehicle sightings and detect vehicles of interest
• a national ability to analyse and report on all available data.

Each capability requires two components, physical infrastructure and functional processes. As these storage and functional requirements cannot be met by any existing agency system, a new ‘National Automated Vehicle Recognition’ (NAV) system will need to be built to meet the above requirements. Current agency systems will need to be upgraded to complement the new system and its agreed standards.

Various types of systems architecture could be used to implement NAV, but the preferred option is a hybrid central and distributed systems architecture model. This model will provide maximum flexibility for agencies to connect to NAV in a manner that best suits local conditions and existing business processes.

ANPR infrastructure will be acquired through a national procurement process. Adopting a strategic approach rather than focusing on service and asset management will achieve whole-of-government cost efficiencies. It will ensure national alignment of the technology through developing a single national standard and developing minimum specifications of equipment and interoperability.

A draft plan for implementing a national ANPR capability is proposed covering three phases over eight years. Such a phased approach would allow CrimTrac to conduct ongoing privacy impact assessments, measure and evaluate the benefits, and assess implementation approaches. It would also allow regular reporting on progress and outcomes to transport and police ministers.

Continued state participation in the ANPR programme will involve jurisdictional planning and consultation, and will ultimately be the subject of Ministerial and Government decisions. In certain parts of the document such as the Gap Analysis, jurisdictions were asked to forecast future ANPR requirements. A number of states were unable to provide details due to policy considerations, so CrimTrac estimated the requirements using the response of similar sized states.

The core implementation activities for a national ANPR capability are proposed to commence in July 2009 and be completed by June 2017.

Benefits of a national ANPR capability

A national ANPR capability will enhance the effectiveness and efficiency of all participating road transport, law enforcement and national security agencies. It will assist governments in attaining strategic objectives relating to enhancing community safety and improve whole-of-government efficiency.

While the benefits would be most marked in the areas of road safety, law enforcement and national security, there is potential to also benefit the health sector, through reduced road trauma and reduce insurance premiums for the community. Nationally, participating agencies have identified 67 intermediate benefits that will lead to five end benefits (improved whole-of-government coordination, financial / cost efficiencies, enhanced road safety, increased crime detection and improved national security).

Thirty eight of these benefits have been agreed as being key intermediate benefits that will be measured and reported on. To do so, a benefits realisation framework has been developed which includes defined roles, responsibilities and mechanisms for measuring, optimising and realising benefits.
Cost-benefit analysis

A cost–benefit analysis carried out by Access Economics showed that the full implementation of a national ANPR capability will result in a neutral benefit-cost ratio. The analysis by Access Economics was based on modeling unknown outcomes, using quantifiable and assumed data and tested through sensitivity analysis.

Low, central and high case scenarios were developed based on a very conservative approach. A 4.5% discount rate was applied cumulatively across all benefits and against a set five year operational life. Some important benefits were not quantified in the model such as national security benefits due to the lack of hard data. Overall, reducing road accidents accounts for close to half of the modeled benefits, with the next largest benefit through reducing unregistered vehicles.

Based on the Hybrid architecture model for NAVR, the full implementation returns a benefit-cost ratio of 1.07:1. This ratio is modeled on the central scenario and equates to a return of $879.6 million to 2021. Phase 1 implementation returns a benefit-cost ratio of 1.19:1 and equates to a return of $260 million to 2021.

Using the high case scenario, full implementation could return a benefit as high as $2.119 billion which equates to a benefit-cost ratio of 2.58:1. That is, each $1 of costs results in $2.58 of benefits.

Conclusion

The neutral benefit-cost ratio from the cost benefit analysis demonstrates the financial viability of a national ANPR capability. Enabling this national policy objective will be legislative and administrative changes that mitigate privacy risks and clearly define agency functions as it relates to collecting and disclosing ANPR data nationally. The economic viability when added to the clearly identified benefits for road safety, law enforcement and national security make the case for a national ANPR capability highly compelling.

To achieve the policy objective of establishing a national ANPR capability, this report makes eight recommendations.
RECOMMENDATIONS

RECOMMENDATION NO. 1 NATIONAL ANPR CAPABILITY

Part 1, s 3
Part 2, s 2, s 2.3
Part 5, s 3, s 4
Part 7, s 3 (rec. 1)

In order for agencies to attain strategic objectives relating to road safety, law enforcement and national security purposes, this report recommends that a national automated number plate recognition capability be implemented, comprising:

- the provision of fixed and mobile ANPR infrastructure to both state and commonwealth agencies to support real time, national ANPR coverage of Australia
- a National Automatic Vehicle Recognition system (NAVR) to integrate agency systems and enable in real time the storage, sharing and analysis of ANPR information.

RECOMMENDATION NO. 2 IMPLEMENTATION PLAN

Part 7, s 3 (rec. 6, 7)
Part 11, s 4

This report recommends that a national ANPR capability be implemented in a phased approach with:

- participation by the Commonwealth and all states in order to maximise benefits realisation
- phases to be agreed by participating jurisdictions
- ongoing privacy impact assessments
- measurement and evaluation of benefits realisation and assessment of implementation approaches
- regular reporting to transport and police ministers through the CrimTrac Board on progress and outcomes.

RECOMMENDATION NO. 3 LEGISLATION AND PRIVACY

Part 7, s 3 (rec. 9)
Part 18, s 3.6

This report recommends that each state or territory consider its existing legislative framework, to ensure a national ANPR capability can be enabled.
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<td>This report recommends that in order to allow the collection and disclosure of ANPR data nationally between agencies (including CrimTrac), agencies functions be clarified legislatively or administratively to:</td>
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<td>• enable authorised agencies to collect and disclose ANPR data</td>
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<td>• enable authorised agencies to collect and disclose ANPR data for each of the three purposes of road safety, law enforcement and national security.</td>
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<td>This report recommends that NAVR be designed in conformance with best practice architecture, security and data integrity standards.</td>
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<td>This report recommends that a funding model be agreed to by the Commonwealth and participating jurisdictions.</td>
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This part of the Automated Number Plate Recognition (ANPR) scoping study report sets out the national strategic drivers that support the development of a national ANPR capability and the business problems a national capability will address. It also outlines the background and modus operandi for the scoping study, including the governance arrangements.
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5 STRATEGIC ALIGNMENT
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   6.1 The case for a national ANPR capability
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1 SUMMARY

The Automated Number Plate Recognition (ANPR) scoping study is an initiative under the CrimTrac 2007-2010 Strategic Plan. The scoping study was approved by the former Minister for Justice and Customs in 2007 and funded from the Confiscated Assets Account established under the Proceeds of Crime Act 2002. CrimTrac is required to deliver the final report to the Ministerial Council for Police and Emergency Management – Police in mid 2009.

A national ANPR capability for Australia was recommended by the Parliamentary Joint Committee on the Australian Crime Commission in its September 2007 inquiry into the future impact of serious and organised crime on Australian society. The Federal Labor Party also provided a 2007 election commitment to support the establishment of a national ANPR capability and to work with state and territory governments on the proposal.

An ANPR programme was initiated within CrimTrac to manage the portfolio of candidate projects that will implement a national ANPR capability. The programme has a whole-of-government sponsoring group that provides strategic direction and oversight to implementation activities. The ANPR Sponsoring Group provided direction to this scoping study report and approved it.

A national ANPR capability will help attain strategic objectives of enhancing community safety and improving national efficiency.

It will do this by supporting the strategic directions articulated in a range of law enforcement, road transport and national security strategic plans, and government policy statements. By doing so, it will provide significant benefits for all Australians (see Part 10 of this scoping study report).

A national ANPR capability will:

- remove inconsistencies in legislation and policy across state borders
- provide more effective and harmonised Commonwealth–state arrangements
- contribute to Australia’s security and emergency management arrangements.

This part of the scoping study report examines government objectives (section 4) and strategic plans (section 5) to identify a range of strategic drivers that a national ANPR capability will support. This support will position agencies to more effectively attain their strategic objectives. A national ANPR capability will help participating agencies to:

- anticipate and respond to emerging issues
- optimise resource use and allocation
- enhance intelligence collection and analysis
- improve information sharing and collaboration
- reduce the incidence of crime

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• enhance road safety
• improve counter-terrorism and national security capability and responsiveness
• increase cost-effectiveness
• utilise and adopt emerging technology.

At its most basic level, a national ANPR capability aligns to strategic plans and government policy by:

• **Sharing data, systems and infrastructure.** Vehicle sightings data obtained from a camera operated by an agency would be available to all other participating agencies. A national view of data would be available through integrating data, systems and infrastructure.

• **Enhancing cross-jurisdictional cooperation and enforcement.** Participating agencies’ roles and functions would be clarified to ensure their ability to collect ANPR data for each of the three purposes of road safety, law enforcement and national security. This would facilitate the exchange of information between states and the ability of agencies to use the information.

• **Developing and utilising national standards.** Minimum national technical standards for ANPR equipment and systems would be developed, facilitating integration and information sharing.

• **National procurement.** A national procurement process would reduce the cost of ANPR technology by avoiding duplication, providing resource efficiency, and reducing the time for agencies to acquire ANPR technology.

• **Enhancing community safety through improved use of information.** A national view of ANPR data and a standard suite of analysis and reporting tools would enhance road safety and the detection and prevention of crime. It would operate in real time, allowing for rapid response and interdiction where necessary.
2 BACKGROUND

CrimTrac is an Executive Agency within the Australian Government. Its primary role is to take a leadership role in generating national approaches to information sharing to support the effective operation of law enforcement agencies across borders for a safer Australia.

Internationally, ANPR technology has provided significant dividends for law enforcement and regulatory agencies in helping to create safer communities and supporting national security initiatives. While the technology is being used within Australian jurisdictions to varying degrees, its full potential is not being realised in its current form.

The acknowledgement of ANPR as an emerging technology resulted in CrimTrac conducting a whole-of-government workshop in October 2006. The workshop, in considering the strategic potential of ANPR for use by law enforcement and road transport agencies, made a number of high-level recommendations. The workshop recommended that CrimTrac take the lead to develop an ANPR scoping study on the feasibility and options for implementing a national ANPR capability.

Following the workshop and in consultation with the Commonwealth Attorney-General’s Department, CrimTrac submitted a proceeds of crime funding application to the former Minister for Justice and Customs to undertake a whole-of-government ANPR scoping study. The Minister approved funding of $2.223 million from the Confiscated Assets Account established under section 298 of the Proceeds of Crime Act 2002.

CrimTrac entered into a memorandum of understanding with the Attorney-General’s Department for the administration and reporting arrangements to carry out the ANPR scoping study as approved by the Minister.

In accordance with the approval by the former Minister for Justice and Customs, the ANPR scoping study will:

1. produce a final report, including details of the agreed set of high-level business requirements, including:
   - a comprehensive cost-benefit analysis of a national ANPR approach
   - an assessment of the potential to leverage off existing and planned use of ANPR technology by both public and private organisations
   - an examination of various implementation approaches, including time frames for a national rollout
   - identification of any legislative and regulatory issues (including privacy) associated with a national approach

1 Workshop participants included the Sussex Police (United Kingdom); Australian policing agencies; NSW Roads and Traffic Authority; Australian Crime Commission; and Austroads.
2. be undertaken by the CrimTrac Agency (in accordance with CrimTrac’s project management methodology and framework)


CrimTrac commenced initial planning for the ANPR scoping study in May 2007, with project activities commencing formally in August 2007. A whole-of-government sponsoring group was instituted to provide strategic oversight and direction to the scoping study. The delivery of the final report to MCPEM-P was rescheduled to mid 2009.

This scoping study report presents the findings and recommendations as required by initial ministerial approval. As well as Police Ministers through MCPEM – P, this report is also intended for Transport Ministers through the Australian Transport Council.

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PART 1 - INTRODUCTION
3 AUSTRALIAN GOVERNMENT COMMITTEES AND COMMITMENTS

3.1 Parliamentary Joint Committee on the Australian Crime Commission

Between December 2006 and August 2007 the Parliamentary Joint Committee on the Australian Crime Commission (ACC) conducted an inquiry into the future impact of serious and organised crime on Australian society. The inquiry received 25 written submissions and conducted seven public hearings.

The committee’s report made 22 recommendations arising from the inquiry’s findings:

Due to the broad nature of the enquiry, it was difficult to examine any one area in great detail. Rather, this inquiry served to bring to the surface several issues that are currently or may in the future pose a challenge to the effectiveness of law enforcement agencies efforts to address serious and organised crime in Australia. The committee urges all governments in Australia to give consideration to these findings (Parliamentary Joint Committee on the Australian Crime Commission, September 2007, p. 3).

In September 2007 the Parliamentary Joint Committee released its report on this inquiry. The committee made one recommendation relating to ANPR:

Recommendation 19: The committee recommends that the Commonwealth, state and territory governments implement a national number plate recognition system.

3.2 Federal Labor Party commitment

Prior to the 2007 federal election, the Police Federation of Australia (PFA) wrote to the major political parties to ascertain each party’s position on its document, Law and order in Australia: Policies for the future. The Federal Labor Party responded to the PFA’s policy paper. Policy proposal number 5, which relates to ANPR, states:

The PFA seeks a commitment to funding [to be determined by a scoping exercise to be conducted through CrimTrac] for development and establishment of a national Automated Number Plate Recognition (ANPR) system.

The Federal Labor Party responded to the PFA during November 2007, stating that:

Labor supports the establishment of a national Automated Number Plate Recognition System. Labor will conduct a scoping exercise with CrimTrac participation to map out its implementation and will consult with state and territory governments concerning the proposal (Federal Labor Party, 2007).
4 NATIONAL AND WHOLE-OF-GOVERNMENT APPROACHES

To derive the significant benefits expected of a national ANPR capability, a national approach between states, and a whole-of-government approach within each state, is recommended. These approaches should cover:

- policy development
- planning
- implementation
- delivery
- accountability
- reporting.

The approaches used in this scoping study are consistent with:

- the good practice guide in the Australian Government’s Management Advisory Committee Report on *Connecting government: Whole of government responses to Australia’s priority challenges*
- the Council of Australian Governments’ commitment to a whole-of-government philosophy
- the objectives of a major review of the Australian Government’s use of information and communication technology (ICT) by Sir Peter Gershon.
This section describes how a national ANPR capability aligns to and supports strategic plans and objectives across the CrimTrac Agency, road safety, law enforcement and national security agencies.

5.1 CrimTrac Agency

The ANPR scoping study is an initiative under the CrimTrac Strategic Plan 2007-2010 and is one of five key priorities for CrimTrac during 2008. It aligns to key activities CrimTrac is required to undertake as defined by Recital E of the Intergovernmental Agreement establishing CrimTrac. Recital E requires CrimTrac to provide the means for meeting requirements for emerging law enforcement information sharing requirements across states.

A national ANPR capability aligns to the CrimTrac 2007-2010 Strategic Plan in the following areas:

- continuously improving the law enforcement information sharing capability
- considering and meeting emerging policing information requirements across jurisdictions
- providing greater national consistency in ICT, business processes and information management
- evaluating and developing new information sharing and technical opportunities
- CrimTrac contributing to greater harmonisation of legislation, policies and procedures to facilitate national information sharing.

5.2 Law enforcement

A national ANPR capability aligns to the strategic objectives of various law enforcement agencies in the following areas:

Directions in Australasian Policing Plan 2005-2008

- proactively addressing the needs of the community through policing activities such as crime prevention and reduction, community reassurance, and effective strategies to manage road safety and emergency situations
- enhancing effectiveness and efficiency in operating practices by developing common standards, improved information sharing, and better coordination in operations
- enhancing effectiveness and efficiency in managing and applying resources.
Australian Federal Police Strategic Plan 2007–2011
- facilitating collaboration and cooperation in relationships
- pursuing a technological advantage over crime, identifying and examining benefits and challenges of new and emerging technologies, and exploring and exploiting next generation systems
- recognising the true business value of information
- exposing the unknown as opportunities and vulnerabilities, informing internal and external decision making.

- identifying and capitalising on new opportunities to impact against serious criminal threats
- maximising intelligence outcomes from all the organisation’s activities
- fostering an information technology/operational partnership that develops and integrates new technologies and intelligence rapidly
- developing advanced intelligence collection and analytical capabilities to provide a more sophisticated and predictive understanding of criminal threats and trends.

Australian Customs Service Strategic Statement 2007–2010
- continually developing the capabilities and powers needed to detect the illegal movement of people or harmful goods in an environment characterised by short intervention time frames
- jointly leveraging off Customs and other agencies’ intelligence, examination and investigation capabilities to identify and bring to account those attempting to breach Australia’s borders
- coordinating security approaches with other government agencies, allowing mutual recognition of compliance with each other’s requirements, wherever possible.

5.3 Road safety
A national ANPR capability aligns to the strategic objectives of various road safety organisations in the following areas:

- improving the safety of roads
- using new technology to reduce human error
- improving road safety programs and policy by researching safety outcomes.

- providing a ‘whole transport’ approach to improving national transport productivity, efficiency, safety and environmental performance and regulatory efficiency
developing efficient regulatory arrangements that maximise the likelihood of achieving best national land transport outcomes

ensuring land transport regulation remains relevant, vibrant and effective in achieving the best national land transport outcomes.

Austroads Strategic Plan 2007–2012

improving the productivity and reliability of the road network in moving people and goods

reducing road trauma through a safe systems approach

promoting best practice in technology

taking an integrated approach to transport issues and working cooperatively with others.

5.4 National security

A national ANPR capability aligns to the strategic objectives of various national security organisations and policies in the following areas:


enabling partnerships with Australian intelligence and law enforcement agencies as part of the whole-of-government approach to counter-terrorism

enabling partnerships with border security and transport security agencies

introducing systems to better exploit the larger amounts of information that must be managed to progress investigations

facilitating strategic, investigative and complex analysis; threat assessments; border security; critical infrastructure protection; policy contribution; and support to prosecutions

maintaining and enhancing all-source security intelligence collection, complex tactical and technical analysis, technical research and development; counter-terrorism response.

National Counter Terrorism Committee (NCTC) National Counter Terrorism Plan 2005

providing strategic and policy advice to heads of government and relevant ministers

coordinating an effective nationwide counter-terrorism capability

maintaining effective arrangements for sharing appropriate intelligence and information between all relevant agencies in all jurisdictions.

NCTC National Guidelines for Protecting Critical Infrastructure from Terrorism

Under the guidelines the Australian Government is responsible for:

ensuring protection of foreign missions

ensuring protection of official establishments, such as defence establishments, Parliament House, official residents and the Australian Nuclear Science and Technology Organisation
• ensuring that protective security arrangements are in place for Australian regulated sectors, such as airports, ports, telecommunications, banking and finance
• ensuring that protective security arrangements are in place to protect offshore critical infrastructure assets and multi-jurisdictional assets.

5.5 Other

A national ANPR capability aligns to the strategic objectives of various other organisations, including:

National Motor Vehicle Theft Reduction Council Strategic Plan 2007
• adopting state-of-the-art vehicle identification/security technologies
• enabling innovation in police response to car crime
• applying a more forensic approach to data analysis.

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6 BUSINESS CONTEXT

6.1 The case for a national ANPR capability

A national ANPR capability has the potential to link existing and future fixed and mobile ANPR-enabled cameras to a national system, providing valuable instantaneous national information. The data held within the national system would be available to road transport, law enforcement and national security agencies to assist agencies attain their strategic objectives.

It is anticipated that a national approach to using ANPR technology will provide significant benefits for all Australians as it provides all police forces and other stakeholders the ability to identify and track vehicles of interest within and across state borders.

A national ANPR capability at its most basic level offers great value to its stakeholders, as discussed below.

6.2 Sharing of data, systems and infrastructure

A national ANPR system offers:

- the ability to identify vehicles of interest [on hotlists] from one state that are photographed in another, for every site where ANPR is used
- the ability to leverage off specialised interstate and national databases for creating more complex and comprehensive hotlists. The national ANPR application would also provide valuable information that helps inform law enforcement officers about potential threats and to enhance operational safety
- help with investigative work, intelligence gathering and road use analysis. These require information to be pooled and would require real time access to ANPR data across the nation.

In all cases, there are privacy concerns, and these escalate with each level of use. The identified uses have been subjected to a privacy impact assessment [see Part 7 and Appendix B].

6.3 Cross-jurisdictional cooperation and enforcement

Due to its broad geographic spread and its federated governmental arrangements, Australia faces unique issues in law enforcement. Crime committed in multiple states poses particular problems for investigation and enforcement, especially when suspects move interstate. ANPR is not a complete solution for these issues, but its capacity to passively locate vehicles and individuals (associated with a vehicle) can significantly help locate suspects and analyse travel patterns across borders.
6.4 National standards

A requirement of the national system is that the various state systems can share data and that ANPR equipment produces a minimum set of data outputs to enable matching against hotlists and other relevant processing. It follows that there is an opportunity to cooperate nationally on minimum standards for ANPR equipment and systems sharing data. National standardisation might be able to be extended to the configuration of heavy vehicle monitoring stations and optimum locations for ANPR cameras.

6.5 National procurement

Establishing a national ANPR procurement strategy is proposed as part of the CrimTrac ANPR scoping study (see Part 9). This identifies strategic aims and processes rather than a full procurement strategy, which would commence should the recommendations of the scoping study be adopted. It would be desirable as part of a national procurement approach to test products nationally and set genuine national standards. This, in turn, may allow Australia a greater role in influencing international standards and specifications, whilst reducing the cost of ANPR technology overall.

6.6 Reduction in crime and improved road safety

Appropriately configured ANPR systems provide significant efficiency dividends, in that there is continuous checking of vehicle registrations regardless of whether there are also prescribed enforcement actions being undertaken (such as red-light or speed identification).

A national ANPR approach will be of significant benefit to countering vehicle theft, as opportunities arise for law enforcement to intercept more stolen vehicles and deploy resources based on pattern and time-series analysis. In addition, there is likely to be a greater impact on the interstate movement of stolen vehicles through increased detection and prosecution of offenders.

While normal intervention and prosecution of unlicensed drivers and unregistered vehicles is a difficult task for law enforcement agencies, appropriately configured ANPR systems will help them detect and prosecute these drivers. Threats to public safety may also be reduced, for example, by reducing the need for police to seek public assistance to locate vehicles when there is a threat to life or to quickly locate potential violent offenders. A national ANPR system would have the capability to quickly locate these vehicles should they move through an ANPR-enabled camera, removing the need for public intervention and enhancing public safety.

The broader benefits to crime prevention and reduction and national security are discussed later in this report, but it is widely accepted that ANPR will be a valuable tool for governments across Australia.
PART 2
ENVIRONMENT SCAN

CRASH MARKERS
FATALITIES INJURIES

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This part of the CrimTrac Automated Number Plate Recognition (ANPR) scoping study report examines how ANPR technology is being used internationally, and how it can be used strategically in Australia for road safety, law enforcement and national security. It collates and presents empirical and theoretical evidence on the benefits of using ANPR. Together with Parts 3 and 4, this part informs Parts 5 and 12 of the scoping study report.
1 SUMMARY

Some of the benefits of ANPR are already available to states and territories, even without a national system. However, use of ANPR technology in Australia is much less effective than it could be because of poor overall coverage, the fact that many ANPR systems are specialised or stand alone implementations, and the particular ANPR models that are being used. There is very little automated ANPR capability at the cross-border or national level.

A national approach to ANPR would involve Australian Government assistance to augment state infrastructure and capability, and a national system for collecting, storing, evaluating and analysing ANPR data. A national approach would bring additional benefits from having a national procurement strategy and setting agreed technical standards.

This part of the scoping study report:

- explains what a national ANPR capability would mean for Australia (section 2)
- explores the benefits of increased real-time visibility of vehicles across state borders (section 3)
- outlines the benefits of a national ANPR sightings data set, particularly for policing, national security and border control, as well as for traffic compliance and road transport management (section 4)
- explores possible new uses for ANPR and ways to bring ANPR to new users (section 5)
- outlines the current and future challenges to a national ANPR system (section 6)
- provides supplementary information on unregistered vehicles, how ANPR works, how hotlists and alerts work, data storage, complementary vehicle identification systems, and Australian and international use of ANPR (section 7).

The information presented in this environment scan indicates that it is highly desirable and feasible to establish a national ANPR system in Australia. Such a system would provide the technical infrastructure for improved road transport management, policing and national security. A single national system would be far more effective and responsive than collecting and collating data from multiple jurisdictions. It would garner efficiency gains from integration and standardisation.
2 ANPR IN AUSTRALIA

ANPR uses a camera and optical character recognition (OCR) software to capture an image of a vehicle, locate the number plate within the image, and then convert the number plate value to a text string. The text string is stored in a database and can be matched to hotlists of number plates, such as those of unregistered or stolen vehicles. The database can be used for analysis and other purposes as described in this part of the report.

The technology works best with digital images. Infra-red and visible spectrum cameras can be used, although infra-red provides suitable images under a wider range of conditions. Section 7.2 of this part of the report contains more detail about how ANPR works.

ANPR is a well-established technology, being developed by the United Kingdom (UK) Government in the 1970s to deal with national security issues. Police in the UK were using it by the early 1990s [PA Consulting Group 2007]. Now it is widely used around the developed world, including in Australia, for civil and law enforcement purposes. Its accuracy has improved since the 1980s, and advances in technology have opened up new possibilities for using ANPR data.

In Australia, the states have introduced ANPR incrementally in response to specific civil and law enforcement needs. The government sector uses ANPR mainly for managing road traffic, while the private sector uses it for parking lots, toll roads and security systems. Section 7.6 contains a summary of ANPR use in Australia and overseas.

While much of the ANPR infrastructure is based on fixed cameras, mobile roadside, in-vehicle and hand-held units are also used. They are particularly valuable for covert operations, and for identifying vehicles of interest and recovering stolen vehicles.

2.1 Potential to reduce costs

ANPR has the potential to reduce three broad categories of very significant costs currently borne by governments and communities:

1. The first category is foregone revenue from licence, registration and various infrastructure cost-recovery fees. It is likely that between 2% and 5% of all vehicles on the road are unregistered, and therefore do not have third-party insurance. This represents millions of dollars in foregone annual state revenue (see section 7.1).

2. The second category is the costs of insurance and compensation payments resulting from traffic accidents. These costs are ultimately linked to the incidence of traffic accidents and, to the extent that ANPR makes the roads safer, fewer costs will be passed on to insured drivers. This category includes third-party compensation payments in accidents involving unregistered drivers. Unregistered, and therefore uninsured, vehicles involved in traffic accidents, by default, impose a financial burden on nominal defendant funds: a cost to the state and to registered, insured drivers, whose premiums contribute to such funds.
3. The third category is the costs of preventable behaviour, including excessive wear and tear on roads caused by speeding heavy vehicles, traffic noise, pollution, the costs associated with stolen vehicles, and the ongoing costs to the health system of treating road traffic accident victims. This category also includes the cost of crimes that might be prevented by using ANPR, such as some organised crime and terrorist activity.

Some of these costs are difficult to quantify, but there is no doubting their significance and the fact that they are largely borne by governments and communities. The Bureau of Transport Economics quantified the costs of road crashes as $15 billion in 1996, increasing to $17.3 billion in 2003 (Connelly & Supangan 2006), as shown in Figure 2.1.

Figure 2.1  Road crash cost estimates, 1996–2003

![Cost Estimates Graph]

(Bureau of Transport Economics 2000; Connelly & Supangan 2006; Risby et al. 2007)

2.2 Established benefits of ANPR

The use of ANPR in Australia provides three main benefits:

- enhanced road safety, for example, by ensuring vehicle safety, monitoring driving behaviour and heavy vehicles, and detecting unregistered vehicles and unlicensed or disqualified drivers
- more effective law enforcement, for example, by recovering stolen vehicles and number plates
- improved national security, for example, by ensuring the security of protected sites, and monitoring customs and immigration.

ANPR is also used for road use research and planning.

While ANPR is also used in the private sector, such use is largely beyond the scope of this report.

The key benefits of ANPR arise from being able to identify vehicles and match them against lists.
2.2.1 ENHANCED ROAD SAFETY

ANPR can help reduce the incidence of unregistered or unsafe vehicles and unlicensed or disqualified drivers on the road. It can also help reduce illegal road behaviour, for example, driving illegally in transit lanes and speeding.

Figure 2.2 and Figure 2.3 show that road fatalities have declined over several decades. Significant declines in fatalities appear to correspond with major preventive interventions such as the introduction of seat belts, aggressive random breath testing, the introduction of speed cameras, and community awareness campaigns.

Note that the figures have not been adjusted for the growing number of registered vehicles. For example, in the period covered by Figure 2.2, the number of registered vehicles in Australia increased from about 8 million to 14 million, an increase of 75%, or 1.9% per annum [Bureau of Infrastructure, Transport and Regional Economics 2008]. In the same period, Australia's population increased from 15 million to 21 million, an increase of 40%, or 1% per annum [Australian Bureau of Statistics 2006].

The introduction of a national ANPR system could improve safety outcomes even more.

Figure 2.2 Road fatalities in Australia, showing major interventions, 1965–2005
Similar patterns have been observed in New Zealand. In that country, the introduction of roadside vehicle impoundment in 1999, a measure enabled by ANPR, led to a 25% decline in the number of unlicensed and disqualified drivers involved in crashes leading to fatalities and injuries, and a 38% reduction in disqualified driving offences (Land Transport New Zealand 2003, p. 26).

Analysis of ANPR data can lead to more effective targeting of operations using intelligence-led policing, and more efficient police patrols (PA Consulting Group 2007). Similar benefits accrue from monitoring heavy vehicles and dangerous goods.

An analysis of Australian experience suggests that between 7% and 5% of vehicles on the road in Australia are unregistered. This has serious consequences where these vehicles are involved in accidents, and represents a substantial shortfall in state revenue. Experience in Tasmania suggests that the introduction of ANPR monitoring of unregistered vehicles has led to a significant decline in the number of unregistered vehicles involved in crashes, but it is not yet clear whether it has led to a corresponding fall in total crashes (see Figure 2.4 and section 7.1). Note that the quite impressive Tasmanian results do not involve roadside vehicle impoundment.
2.2.2 MORE EFFECTIVE LAW ENFORCEMENT

In crime prevention and general law enforcement, ANPR can provide better intelligence and crime prevention by deterring and disrupting criminal activities involving motor vehicles, as follows:

- ANPR can lead to faster and more effective recovery of stolen vehicles and number plates, and help deter and investigate rural and remote area crimes (see section 3.1.1).
- Sufficiently powerful and sophisticated ANPR systems, in concert with appropriate technology and tactics such as controlling traffic lights and using road blocks, can lead to more efficient and safer vehicle intercepts (PA Consulting Group 2007).
- ANPR can play a valuable role in post-incident analysis (see section 4.1 and Box 2.1).
Box 2.1 Use of ANPR for post-incident analysis

The following example illustrates the role that ANPR can play.

Three robberies with similar modus operandi that were carried out in Maidstone, Ashford and Margate in the UK were analysed using ANPR data. The shared data showed there were:

- 5000 vehicles in the vicinity of Maidstone from 12:05 – 14:05
- 13,000 vehicles in the vicinity of Ashford from 13:10 – 15:10
- 22,000 vehicles in the vicinity of Margate from 14:30 – 16:30.

Triangulation of the data [see diagram] showed that two suspect vehicles were in all three vicinities. The evidence obtained focused the UK law enforcement response and, within a short time, the offenders were arrested and later convicted of these robberies. ANPR use led to greater efficiency and provided valuable intelligence.

ANPR and investigations of presence of vehicle near scene

Source: Bond 2006

ANPR would also support more effective enforcement of bail orders, parole requirements, control orders and legislated orders where the movements of the subjects are restricted.

In the UK, which now has extensive experience in using ANPR, the most common forms of arrests in which ANPR played a role were drug offences, unlicensed and disqualified driving, and vehicle crime, as shown in Figure 2.5.
Figure 2.5 Category of arrests made by UK intercept teams, 2006–07
(PA Consulting Group 2007, p. 46)

Drugs, 15%

Burglary, 3%

Vehicle crime, 12%

Section 25, 2%

Theft/burglary, 4%

Warrant, 9%

Violence against person, 2%

Disqualified driving, 14%

Other, 30%

The arrests categories in Figure 2.5 do not include ANPR detection of licence and registration (insurance) violations. Figure 2.6 shows the full picture.

Figure 2.6 Offences identified using ANPR in the UK, 2006–07
(PA Consulting Group 2007)

Violence against a person, 1%

Theft, burglary & robbery, 5%

Warrants, 3%

Disqualified driving, 4%

Vehicle crime, 3%

Drugs, 4%

Other, 9%

MoT offences, 6%

Insurance offences, 44%

Licence offences, 21%
Boxes 2.2 and 2.3 provide more examples of the value of using ANPR.

**Box 2.2: Use of ANPR by the Northamptonshire Roads Policing Unit**

The following table shows the significant results gained from using ANPR for 660 hours of deployments by the Northamptonshire Roads Policing Unit.

<table>
<thead>
<tr>
<th>WITHOUT ANPR</th>
<th>WITH ANPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 arrests</td>
<td>21 arrests</td>
</tr>
<tr>
<td>1 traffic offence</td>
<td>14 traffic offences</td>
</tr>
<tr>
<td>25 vehicle excise licence offences</td>
<td>65 vehicle excise licence offences</td>
</tr>
<tr>
<td>28 intelligence logs</td>
<td>64 intelligence logs</td>
</tr>
</tbody>
</table>

Source: Bond 2006

**Box 2.3: Operation Tango**

Merseyside Police conducted Operation Tango in order to remove uninsured vehicles from the road using ANPR. Analysis comparing figures from May 2005 to May 2006 has shown that the removal of these vehicles corresponded with a reduced number of:

- calls to the fire brigade about burning vehicles
- calls about vehicles being used in antisocial behaviour
- drive-offs from petrol stations.

While the analysis does not prove a direct link between the increase in vehicle seizures and crime reduction, it does provide a framework for more detailed evaluation (PA Consulting 2007, p. 52). Promotion of collaborative use of ANPR between regulatory and law enforcement agencies will help detect unregistered and uninsured vehicles and increase the rate of registered and insured vehicles. If the inference is correct, additional benefits in terms of the above three points may be realised.

Source: PA Consulting 2007
The PA Consulting 2007 review of ANPR in the UK (p. 58) concluded that:

As well as providing relatively high volumes of cross border arrests, ANPR operations provide a key capability in intercepting criminals involved in serious crime. During Operation Pacman, CMPG the Central Motorway Police Group regularly recorded arrests of individuals involved in or wanted in connection to serious crime investigations across the UK.

Cross-border issues in the UK are comparable to Australian conditions as there are issues with data sharing between jurisdictional boundaries of each of the 43 police forces. This means that crimes committed in one county are not necessarily visible to police in other counties. The National Policing Improvement Agency (2008a) has embarked on a long-term strategy for improving data sharing between police forces.

There are a range of possible civil uses for ANPR that are not widely implemented in Australia, such as route planning, estimating journey times and overall transport planning. Other uses include congestion charging and road pricing to encourage the use of public transport, monitoring to detect or deter environmental damage, including firebugs, illegal hunting, or trafficking in protected flora and fauna. Higher-level analysis may be useful for tourism planning.

2.2.3 IMPROVED NATIONAL SECURITY

ANPR has great potential to be used to improve protection of critical infrastructure and national security interests, and for customs and immigration monitoring.

A national ANPR system offers possibilities for enhanced surveillance of access roads to critical infrastructure sites such as airports, dams, bridges, power stations, ports and embassies, as well as areas that might be associated with customs or immigration risks.

ANPR could be used for locating or tracing the journeys of vehicles that are of interest to the Australian Customs Service, especially in combination with other technology for monitoring the movements of shipping containers. ANPR is used extensively in Europe for airport security, and the UK, United States and Canada use ANPR for customs and dangerous goods monitoring.

In the UK, for example, ANPR is being used on major investigations to gather intelligence on potential witnesses and suspect vehicle movements. Intelligence gained from using ANPR has contributed to major cases against serious and organised criminals and terrorist suspects.

2.3 Moving to a national ANPR system

It is highly desirable and feasible to establish a national ANPR system in Australia. It would provide technical infrastructure for improved road transport management, policing and national security.

Currently, ANPR coverage in most areas of Australia is thin or patchy, and the numerous installations are not seamlessly interoperable, even within the states. Many of the installations have been set up with a narrow purpose in mind, and the implementation of holists and other desirable features is often a matter of resourceful improvisation rather than robust system design.

As a result, there are many inconsistent data sets, some data has to be manually transferred, and databases are updated according to different timetables. Sometimes only weekly, many holists are manually operated, and there is little capacity for the kind of sophisticated national data analysis needed for security, cross-border law enforcement operations and organised crime operations.

The need for a national data set is perhaps best illustrated by the Watkins case, which was reported to the Australian Senate Parliamentary Joint Committee on the Australian Crime Commission 2007 inquiry into the future impact of serious and organised crime on Australian society. Mr Mark Burgess, Chief Executive Officer of the Police Federation of Australia, stated:
Watkins had three days earlier murdered sisters Colleen and Laura Irwin in Melbourne. He had then driven 5,000 kilometres to Western Australia, where he came under the notice of Senior Constable Shane Gray at Karratha for failing to pay for petrol. When Gray did a check on Watkins via the Western Australian police computer system he was not considered a suspect. The system was not accessible via the Western Australian system. Watkins attacked Gray and tried to grab the firearm. Gray was seriously injured in the incident, and Watkins was eventually shot and killed. (Parliamentary Joint Committee on the Australian Crime Commission 2007, p. 124).

A national ANPR system would interface with the National Police Reference System, which provides information from all Australian police systems. In the Watkins case, a national ANPR system would have made two alternative outcomes possible:

- the necessary information from Victoria would have been available as part of normal system functioning, giving the arresting officers the information they needed
- Watkins could have been detected in or leaving Victoria, and this may have led to an earlier arrest.

Most policing and road traffic agencies in Australia include among their goals the increased use of technology for the intelligent monitoring of traffic.

A national system would ensure strategic coverage of border crossings and appropriate coverage on main road infrastructure, have more concentrated coverage in more highly populated centres, and provide adequate coverage in and around less populated areas.

As a result, the benefits of ANPR would become available to new users. It would also enable additional uses for and benefits from the data. The states would be able to introduce ANPR, expand their current use of it, or use it for new purposes. National security agencies would be able to access such data on a nation-wide basis for the first time. Subject to privacy constraints, there may be potential for aggregated ANPR statistics to be supplied to tourism and public transport bodies, or even to private sector organisations, to improve services. This is further discussed in section 5.4.

Significant new uses for ANPR would derive from the ability to access data collected from all the states, and to analyse large amounts of historical data. The benefits of a national ANPR system will mainly be felt in law enforcement and national security, road traffic compliance and transport management.

A national ANPR approach would involve a national ANPR data system that would collect raw data from collection systems, many of which would be operated by state governments. Some collection systems would be operated directly by the Australian Government, and it is recommended that the Australian Government help the states expand their infrastructure. It is not envisaged that data from private facilities such as toll roads, parking systems, service stations and airports would be immediately incorporated, although this is technically possible.

The raw data would include at least one image of each vehicle's number plate, and potentially an image of the vehicle, together with the date, time and location of the image captured. The images would be used for manual checking or confirmation of number plates (a process known as 'adjudication'), and sometimes images would be used as evidence.

The periods data would be held for would depend on how the data was to be used. Section 7.4 contains more discussion on data storage.
If a vehicle is identified as a vehicle of interest, a higher-resolution image might be retained that may enable the occupants to be identified, subject to camera orientation. Further manual analysis of the data might be necessary to see whether the vehicle’s appearance matches the details associated with the number plate. In addition, it might be possible to record the speed and direction of vehicles.

In the future, using ANPR coupled with other technology platforms, it may be possible to include additional automatically recognised data such as the type and model of the vehicle, its colour, its approximate weight and the number of wheels.

Complementary systems to ANPR cameras for identifying vehicles are radio frequency identification (RFID) infrastructure, as exemplified by the electronic toll road tags used in several states, and global positioning system (GPS) infrastructure.

But it is likely that ANPR infrastructure would continue to dominate for general traffic management for the foreseeable future because of its relative reliability and ease of installation, and the value of the visual data captured. However, RFID and GPS systems would typically capture the same data acquired by ANPR systems (such as vehicle identification, date, time and location) and could naturally be linked into a national ANPR system. Section 7.5 contains more information about complementary systems such as RFID and GPS.

ANPR recognises number plates (not vehicles or drivers) and, in most cases, a number plate is legitimately associated with one vehicle. But even where the number plate is an illegal duplicate, or is attached to the wrong vehicle, ANPR can help locate the offending vehicle.

Comparison with other databases would reveal additional details about who the vehicles identified plates belong to. This could include vehicle type, colour, ownership, involvement in previous criminal offences and association with persons of interest. Data mining or analysis may produce further information, such as the route taken by a vehicle, its average speed and time spent in locations of interest (see Boxes 2.1, 2.2 and 2.3). The system could be configured to sound alerts if number plates of interest appeared in specified areas or crossed state borders.

A higher level of analysis could, for example, identify actual or potential traffic congestions in real time, or produce statistics about intrastate and interstate movements during holiday periods or major sporting or cultural events.

Some of the benefits of ANPR are already available to the states, even without a national system. But the benefits are limited by poor overall ANPR coverage and the fact that many ANPR systems are specialised or stand-alone implementations. There is little automated ANPR capability at the cross-border or national level.
3 NATIONAL ANPR COVERAGE ACROSS BORDERS

A national approach to ANPR would involve Australian Government assistance to augment state infrastructure and capability, and a national system for collecting, storing, evaluating and analysing ANPR data. A national approach would bring additional benefits from utilising a national procurement strategy and setting agreed technical standards.

There are major benefits to be gained from introducing a national ANPR system. At present, ANPR coverage is very uneven, with little or no ANPR in some states. Except for the Safe-T-Cam system for monitoring heavy vehicles between New South Wales and South Australia, vehicles are monitored only within the boundaries of some states.

A national ANPR approach would enable a number plate from one state to be identified in any other state. It would enable authorities to monitor a vehicle seamlessly across state borders by detecting it as it moves past ANPR cameras, as opposed to just being able to determine its historical movement.

3.1 Benefits for policing, national security and border control

The introduction of a national ANPR system would contribute to a safer, more secure environment through better intelligence, targeting of operations and crime prevention achieved by deterring and disrupting criminal activities. It would help protect critical infrastructure and national security interests.

ANPR would also support more effective enforcement of bail orders, parole requirements, control orders and legislated orders where movements of the subjects are restricted. For example, a convicted paedophile, after release from prison, might be subject to travel restrictions, either interstate or in the vicinity of schools or other community infrastructure where they are deemed likely to re-offend. ANPR could complement existing techniques for monitoring such offenders.

Traffic offenders are more likely to be criminals, and so the more detection of these offenders has the potential to disrupt criminal activity [Albuquerque Police 2008; Chenery et al. 1999; Rosa 2000; Steer & Carr-Hill 1967, UK Metropolitan Police 2004]. For example, the Metropolitan Police study found that 57% of a sample of drivers apprehended for unlicensed or unregistered driving had a history of criminal offending. Of these, 70% had a history of offending in two or more categories of offence. Unlicensed drivers are also associated with a cluster of high-risk activities such as drink driving, speeding, failing to wear seat belts and using motorcycles [Watson & Walsh 2008]. In the UK, uninsured and disqualified drivers are 10 times more likely than insured drivers to have been convicted of drink driving, six times more likely to have been convicted of driving an unroadworthy vehicle, and three times more likely to have been convicted of driving without due care and attention [National Policing Improvement Agency 2008b].
3.1.1 HOTLISTS AND SURVEILLANCE

A national ANPR system would collect data in real time and would include a hotlist facility that would generate alerts, also in real time. Alerts could be triggered by the mere presence of a vehicle on the roads, or by its presence in a location of interest, or in the act of crossing a border. Alerts might be generated by a convergence of vehicles on a specified route or location. Section 7.3 contains more information on how hotlists work.

Hotlists could be established for a wide range of law enforcement and national security purposes, including the identification of vehicles of interest, or vehicles associated with persons of interest. They could be used to monitor persons whose movements are restricted under correctional orders, persons on the national child sex offender register or other lists of offenders or persons of interest. While hotlists are widely used, including in Australia, the advantage of a national ANPR system would be instantaneous national coverage.

A national ANPR system would enable faster and more effective recovery of stolen vehicles before they are abandoned, destroyed, stripped or re-birthed. The ability to monitor vehicles nationally should increase recovery rates where stolen cars are driven across borders for stripping or re-birthing. Positive outcomes will depend on how quickly details of stolen vehicles are added to hotlists, as recovery rates drop dramatically in the first hours after a vehicle is stolen [National Motor Vehicle Theft Reduction Council 2006]. Figure 2.7 shows the growth in stolen vehicle recovery following the introduction of an ANPR strategy for the UK police service.

Figure 2.7 Number of stolen motor vehicles recovered by ANPR intercept teams in the UK, 2005-06 and 2006-07

[PA Consulting Group 2007, p. 51]

ANPR is especially valuable in remote and rural areas where a physical police presence on roads is limited because of distance and low traffic density. In these areas, well-secured ANPR installations would help deter and investigate crimes such as cattle rustling.
3.1.2 VEHICLE INTERCEPTS

ANPR can reduce some of the risks of injury and collateral damage associated with police pursuits and intercepts by:

- monitoring the speed and route of a target vehicle, in real time, to help intercept it safely, as an alternative to high-speed pursuit
- accessing information from police databases. A national ANPR system could provide police or security agencies with information about occupational risks associated with a vehicle, such as a history of violence or possession of firearms by the likely occupants. ANPR is used in this way in the UK and in some states in Australia [PA Consulting Group 2007, Part 3 of this scoping study report].

3.1.3 NUMBER PLATE ANOMALIES

A national ANPR system would be able to identify stolen number plates, illegal duplicate plates, forged or cloned plates, and unregistered numbers, and draw attention to obscured plates. There are examples of such use in the UK [PA Consulting Group 2007].

Illegal duplicates may be detected by the kind of sophisticated analysis that would only be possible in a national system. Such a system would identify, for example, that the same set of plates was on the road in two locations at the same time.

At present, it is difficult to efficiently match sightings with plates from all the states. The ability of a national system to monitor vehicle movements would help intercept vehicles bearing such plates and would lead to a significant improvement in this area by making legitimate and illegal duplicates visible to adjudicators.

Some countries, notably the UK, have adopted stringent legislation in response to number plate fraud and theft, especially cloning. These responses include higher penalties and vehicle seizures, and form part of a broader response to unauthorised driving.

3.2 Benefits for traffic and road transport compliance

Non-compliance with traffic and road transport law can, in some cases, amount to serious criminal behaviour and this is where the benefits identified in the previous sections come into play. There are additional benefits for general traffic compliance and some that are of specific value for heavy vehicle and dangerous goods compliance. A national ANPR system is likely to result in better compliance, leading to safer roads and communities. In New South Wales, for example, it is estimated that at any given time 2% of vehicles on the road are unregistered [NSW Audit Office 2003], while Western Australia estimates that 4% of driving is unauthorised [Western Australia Auditor General 2009]. Unlicenced drivers are four times more likely to be involved in a fatal crash [Clark & Biebavy 2008], resulting in a substantial loss of state revenue.

It is known from Victoria Police research and trials that the use of ANPR in Australia appears to result in a greater than 2500% increase in efficiency for police patrols detecting unregistered vehicles [Victoria Police 2006]. It is also estimated that more than 40% of heavy vehicle offences are not captured because they occur across state boundaries [CrimTrac 2009]. A Queensland trial of ANPR for managing driver fatigue in one week detected 409 offences from 70% heavy vehicle image captures (5.8%), two-thirds of the annual average number of offences detected by other methods (629). The same trial detected 1162 heavy and light vehicles as being unregistered [Queensland Department of Transport, Trade, Employment and Industrial Relations 2008]. It can be expected therefore that wider ANPR deployment will lead to more efficient use of police and road transport resources.
According to Young & Regan (2007, pp. ix-x):

The use of automated enforcement technologies [such as ANPR] can improve the effectiveness, accuracy and efficiency of police traffic enforcement activities by increasing the actual and perceived chance of traffic violations being detected without increasing the number of police resources required.

and Clark & Bobevski (2008, p. x):

Watson's (2004) theory of disqualiﬁed drivers' behaviour, which is the most comprehensive one to date, suggests that in many cases the necessary conditions to deter unlicensed driving are not currently being achieved by simply applying classical deterrence theory. His theory suggests that drivers will be deterred from unlicensed driving if they perceive a high likelihood of apprehension and if the penalties are perceived to be certain and swift.

3.2.1 GENERAL TRAFFIC

The most basic function of an ANPR system is its ability to identify number plates attached to vehicles that are being driven. There are a number of circumstances where an offence is committed by merely driving a vehicle, including driving unregistered or uninsured vehicles, or vehicles that have been issued with defect notices. ANPR is used in Australia for detecting such offences. A national ANPR system would not only be able to identify such infringements, but be able to do so when they occur outside the state where the vehicle is registered.

Similarly, a national ANPR system could draw attention to the presence on the road, in any state, of vehicles associated with unlicensed or disqualified drivers. Of course it will be necessary to manually identify the driver from the captured image, or through interrogation, as a car associated with one person can always be driven by another. In practice, a hotlist of high-risk disqualified drivers might be the preferred mode of monitoring.

Again, ANPR serves this role in most Australian states, but a national ANPR system would detect interstate offenders.

ANPR systems can be configured to detect and record certain information about the non-compliant behaviour of vehicles. A national system would streamline the processing of infringements involving interstate vehicles.

The established methods of speed detection are Doppler radar and laser speed cameras that directly measure the speed of a vehicle. ANPR makes possible point-to-point speed calculation of speed over distance. This involves measuring the time taken for a vehicle to transit between two ANPR cameras and dividing it by the road distance between the cameras. For this to work, the ANPR cameras have to be coupled to the same information system.

A disadvantage of radar and laser speed detection cameras is that drivers slow down when they become aware that they are being detected. It is sometimes argued that this can adversely affect traffic ﬂows and can be dangerous if drivers brake suddenly, although there appears to be little evidence to support this claim (Wills 2006). Point-to-point speed measurement should not lead to this behaviour (Camman et al. 2003). Studies have shown that overt single-point cameras, whether ﬁxed or mobile, cause a reduction in speed for only 1.5 kilometres before the camera and 500 metres afterward (Camman et al. 2003).

What is known is that speed cameras are very effective in reducing speeding, and speeding is associated with trafﬁc accidents. Point-to-point systems are arguably safer than ﬁxed single cameras as they calculate average speeds (Wills 2006). There is some evidence from the UK that they are highly effective in reducing speed and trafﬁc accident injuries (Camman et al. 2003).

A point-to-point system has been implemented on the Hume Highway in Victoria and the Safe-T-Cam network in New South Wales and South Australia.
Safe-T-Cam is an ANPR-based system aimed at reducing the incidence of heavy vehicle speeding and fatigue. It identifies vehicles that have travelled at excessive speed, or beyond prescribed driving hours. It also detects vehicles that are unregistered or have attempted to avoid detection.

Safe-T-Cam is part of a wider enforcement program that includes vehicle inspectors, checking stations, in-car checking technology and roadside inspection areas (NSW Roads & Traffic Authority 2003).

A national ANPR system would enable point-to-point speed detection throughout Australia, including across state boundaries.

### 3.2.2 HEAVY VEHICLES AND DANGEROUS GOODS

Heavy vehicles are involved in a high number of fatalities and injuries each year, as shown in Figure 2.8.

**Figure 2.8 Deaths from crashes involving articulated trucks in Australia, 12 months rolling total, 1989 - 2006**

![Graph showing deaths from crashes involving articulated trucks in Australia, 1989 - 2006](image)

Each point shows the number of deaths in the preceding 12 months.

(Australian Transport Safety Bureau 2007b)

The whole-of-government submission to the Queensland Government’s TravelSafe Committee Inquiry into ANPR reported that heavy vehicles contributed 15.1% to the Queensland road toll between 2002 and 2006, but represented only 2.6% of the vehicle fleet (Queensland Department of Transport, Trade, Employment and Industrial Relations 2008).

The governments of Australia are collaborating on transport reform with the aims of:


While these objectives are supported by heavy vehicle monitoring systems in some states, with the exception of the NSW and South Australian Safe-T-Cam system, the systems do not support automated monitoring across borders. A national ANPR system would complement the intelligent...
Access Program. This program provides for improved heavy vehicle access to the road network in return for monitoring their compliance with specific access conditions, using vehicle telematics.

Such a monitoring scheme could address some risk factors for driver fatigue, such as inadequate work breaks. It could monitor point-to-point speed and route compliance, weigh vehicles in motion and record their configuration. National ANPR could also be used for monitoring dangerous goods transport.

National ANPR infrastructure could facilitate a finer-grained, more cost-reflective system of transport pricing for heavy vehicles. This is among the matters under consideration by the Council of Australian Governments following an inquiry by the Productivity Commission in 2007 [Productivity Commission 2007].
4 A NATIONAL ANPR SIGHTINGS DATA SET

A national ANPR database would enable the extraction, aggregation and analysis of data over a period extending from the present to five or more years beforehand. There are many potential benefits of such a system. Sections 5.2 and 5.3 outline some uses of the system by government agencies and potential uses by non-government organisations. This section focuses on the benefits for:

- policing, national security and border control
- road traffic compliance and transport management.

4.1 Benefits for policing, national security and border control

A national ANPR sightings data set, with up to five-year’s history, is potentially a rich resource for analysis and data mining by law enforcement, regulatory and security agencies in order to detect crime patterns and analyse movements of persons of interest. It would assist in the post-incident analysis of crimes involving vehicles. For example, in the case of a hit and run incident, ANPR data could help narrow the search for witnesses or suspects.

Information may be extracted about traffic movements to help with security planning for critical infrastructure and major events. Examples of major events with national and state security implications are the 2007 Asia-Pacific Economic Cooperation forum and the 2008 World Youth Day events in Sydney. A national ANPR system could provide sophisticated monitoring of vehicles to both detect risks and manage congestion.

4.2 Benefits for road traffic compliance and transport management

For the purposes of traffic compliance, the national data set would assist with post-incident analysis of serious traffic accidents. Furthermore, analysis of traffic flows would contribute to intelligence-led policing by targeting enforcement interventions such as the placement of mobile speed cameras or breath alcohol testing units. It would also help target high-risk areas of driver non-compliance and serious recidivist traffic offenders.

For transport management, a national ANPR data set would provide much more accurate and detailed data about traffic flows and congestion at different times of the day and year. It could provide information about use of major roads by different types of vehicles, which would help with infrastructure and maintenance planning. It might be possible to develop predictive models of congestion and other risk factors at black spots.

With suitably stationed cameras, the system could provide real time travel time advice on important routes, such as central business districts to airports. It would enable analysis of comparative traffic volumes on alternative routes and the impact of police operations and road works on surrounding transport routes. It is one technology that can support variable speed limits.
5  BRINGING ANPR TO NEW USERS

5.1 National security and border control agencies

This report identifies a number of benefits for policing and law enforcement. The establishment of a highly capable and secure national ANPR system would make these benefits directly available to support national security and law enforcement, providing additional tools to address organised crime, drug running, terrorism and threats to border security.

Terrorists, drug runners and other organised criminals routinely use motor vehicles in the course of their criminal activities. As one of the key uses of ANPR is to use helicopters to detect vehicles of interest associated with persons of interest, ANPR can play a role in monitoring or providing intelligence about such activity.

ANPR originated in the UK as a national security initiative, followed by general policing and road traffic use. Australia’s use of ANPR has grown incrementally, and has been primarily aimed at managing road traffic. Australia could be the first nation to introduce a multi-jurisdictional comprehensive ANPR system, providing a national perspective on vehicle movements and associated information.

According to the official evaluation of ANPR in the UK [PA Consulting Group 2007]:

ANPR resources are being used on major investigations to gather intelligence on potential witness and suspect vehicle movements [p. 97].

Information from ANPR is being used as intelligence and evidence on major investigations and has contributed to cases against serious and organised criminals and terrorist suspects. With the planned wider coverage of ANPR infrastructure and supporting back office systems INADC and BOF III, the potential use of ANPR on investigations will increase substantially [p. 97].

The use of ANPR to track vehicle movements has provided Forces with the opportunity to improve the efficiency of target surveillance [p. 98].

As an intelligence and investigative tool, the use of ANPR is starting to deliver benefits. ANPR information has contributed to successful investigations against serious and organised criminals, terrorist suspects and individuals involved in volume crime. As an intelligence tool, ANPR information has enhanced intelligence products and improved the efficiency of surveillance. There is potential for further benefits to be realised as information from ANPR is better integrated with other crime and intelligence data [p. 101].

A single national system would be far more effective and responsive than collecting and collating data from multiple jurisdictions. It would garner efficiency gains from integration and standardisation.

Users of the national system would have a national view of the movement of vehicles of interest, thereby increasing efficiency and enabling a holistic view for monitoring these vehicles. Customs,
immigration and environmental protection authorities might benefit from the ability to analyse certain kinds of vehicle movements, for example, on roads leading to remote and coastal areas.

A national system would make it easier for jurisdictions to target interstate operations based on vehicle location and movement intelligence.

5.2 State jurisdictions

Because of the cost and complexity involved, most Australian states would be unlikely to develop an ANPR database with:

- the capacity to store historical data in accordance with regulatory frameworks and business requirements, for example, up to one year or up to five years. The exact length of storage depends on the outcomes of further privacy assessments.
- the speed to produce information and analysis in real time
- sufficient security
- interoperability with other states.

But if the cost of the national system is shared by eight jurisdictions, with substantial funding from the Australian Government, the states and territories are more likely to be able to participate. Establishing a national procurement strategy and associated standards, and a list of preferred vendors, would reduce the cost and time taken to implement ANPR for all jurisdictions.

5.2.1 SAVINGS IN INSURANCE AND HEALTH COSTS

There are benefits for government and the community generally in terms of positive impacts on the health system and reduced insurance premiums that would result from fewer traffic accidents and associated injuries, fatalities, insurance payouts and litigation.

5.2.2 PUBLIC TRANSPORT AUTHORITIES

Some public transport authorities would benefit from being able to analyse historic traffic flows for the purpose of route planning and estimating journey times, and for overall transport planning. Potentially, a national ANPR data set could support congestion charging and road pricing systems designed to foster public transport use. In London, ANPR is used for congestion charging [Government Office for London 2003] and, in the words of one academic review of the system:

The highly publicised launch of London was on the 17th February 2003—and it seems to work. There are clearly some technical problems with the scheme but the management of it seems sufficiently robust to cope. Indeed more than two years after the launch of the scheme reduction in traffic is still around 15–18% and the difference in the environment and travel-times within the cordon is remarkable. This has led to a rethink by many local authorities as to their options for charging [Blythe 2005, p. 58].

ANPR could be used to monitor infringements related to public transport, such as parking in bus lanes, crossing in front of trams and disobeying rail signals.

5.2.3 ENVIRONMENTAL AGENCIES

Environmental agencies might benefit from being able to analyse certain kinds of vehicle movements, for example, on roads leading to parks and reserves. This may help identify vehicles responsible for environmental damage, illegal hunting or traffic in protected flora and fauna.
As noted in the previous section, ANPR could support systems designed to increase public transport use, such as congestion charging.

5.2.4 EMERGENCY SERVICES AGENCIES

Emergency services agencies may benefit from access to certain data, such as the number of vehicles travelling into areas threatened by natural disasters, and the number emerging. For example, ANPR might help monitor vehicle traffic into and out of bushfire areas, areas affected by severe flooding or earthquakes, or tunnels affected by fire or collapse. ANPR can also be used to help identify arsonists through post-incident data analysis and active surveillance of suspected travel routes. There is some evidence that increasing policing from low to moderate levels had a positive impact on arson (Australian Institute of Criminology 2008). So the use of ANPR in remote, currently poorly monitored areas may have benefits.

5.2.5 LOCAL GOVERNMENT AND TOWN PLANNING AGENCIES

Local government and planning authorities may benefit from analysing trends in traffic flows. Some Aboriginal communities would benefit from using ANPR to monitor traffic movements to administer permits and prevent alcohol smuggling and cattle rustling.

5.2.6 TOURISM AGENCIES

Tourism agencies could benefit significantly from analysing vehicle flows to and from tourism areas, including interstate flows during holiday periods or sporting or cultural events.

5.3 Other potential users

There are numerous potential private sector interests in a national ANPR system. Some private collectors of ANPR data, such as petrol stations, may be interested in having their data added to the national data set. Other private firms would be attracted to analysis of traffic flows, for example, in planning the location of businesses such as fast food outlets and shopping malls. But serious privacy issues surround the supply of ANPR information to private firms and non-government organisations, and this is not presently envisaged as an element of a national ANPR system.

Undoubtedly there would also be researchers in Australian universities whose work would benefit from access to aggregated or de-identified data.

5.4 Revenue opportunities

This section has identified a number of valuable ways in which a national ANPR data set could be used. There is, therefore, the potential for a national ANPR system to earn revenue by providing aggregated or de-identified data or research services.

Decisions about any revenue opportunities arising from a national ANPR approach would be influenced or determined through legislative and privacy considerations and government policy.
There are several issues to be overcome if a national ANPR system is to be implemented. Broadly, these fall into the categories of:

- regulatory impediments, system and data interoperability issues
- technical difficulties arising from legitimately issued duplicate and unreadable plates, and plates on trailers and motorcycles.

Once a national system is established, there are some challenges to ensuring its ongoing effectiveness. These mainly take the form of avoidance behaviour.

6.1 Regulation and system interoperability

6.1.1 PRIVACY

The first set of regulatory issues is that of privacy, which is governed by the Australian Government and state and territory laws. This is a serious and complex area, and is dealt with in Part 7 of this scoping study report.

6.1.2 REGULATORY FRAMEWORKS FOR ANPR

The second set of regulatory issues arises from the fact that ANPR in the various states operates under a range of legislation, in both the law enforcement and civil administrative domains. Some of this legislation regulates what data is collected, how it is used, and the extent to which it may be shared with other agencies. Part 8 of this scoping study report outlines these issues.

6.1.3 INTEROPERABILITY

A national ANPR system will draw on data in a number of different formats, created, distributed and stored in a range of different information technology systems. It will be necessary for the Australian Government and state agencies operating the infrastructure to settle on agreed data exchange formats and transfer protocols. Part 6 of this scoping study report deals with this and other technical issues.

6.2 Number plates

The systems for issuing number plates have evolved independently over the last hundred years in the different states. For most of this period, digital ANPR was not implemented, and its requirements were not reflected in number plate systems. As a result, there are legitimately issued
duplicate number plates on the road, as well as plates that may not be easily recognisable by ANPR systems. Furthermore, there may be impediments to ANPR associated with where number plates are placed on vehicles such as trailers, four-wheel drives and motorcycles.

### 6.2.1 Legitimate Duplicate Plates

Australia has a significant problem with number plates that are duplicated across and within states. This is a result of a number plate value being issued by more than one state, or for more than one class of vehicle within a state.

While these plates are distinguished by the state identifier or vehicle class identifier and, as such, are not genuine duplicates, ANPR may currently be unable to read these identifiers due to their small size.

One approach to this problem would be to take higher-resolution images to provide more detail for the character recognition software. However, it would be important that with current technology the capture, transmission and processing of higher-resolution images did not slow down and degrade the real-time characteristics of the system.

Analysis is a possibility but is expensive and would slow down the processing; nor is it always effective with images at the current resolution.

The ideal solution would be to remove duplicate plates from circulation and to ensure that all new number plate values are, in some way, unique nationally, and conform to an agreed national standard. This would need to include personalised plates.

### 6.2.2 Unreadable Plates

Some legitimate number plate configurations are difficult or even impossible for ANPR systems to read, especially some types of personalised plates. Older plates often do not have reflective backgrounds, or the reflective paint has partly worn off. This affects the ability of the OCR engine to read the plate. Depending on the technology provider, the plate may not be recognised by the ANPR system and therefore not captured.

Some font types are more difficult than others to accurately interpret, while some colour combinations are unreadable and others are difficult to read with a high level of accuracy.

Backgrounds containing multiple colours can also make reading the number plate difficult (Harney & Priest 2005). Some standard plates currently being issued in Australia are not ANPR-friendly.

For ANPR to be universally and equitably applied, it must not be possible for some vehicles to legally avoid detection.

Ideally, unreadable plates would be phased out and new plates would meet an agreed national standard that is ANPR-compliant. A May 2008 meeting of the Austroads Registration and Licensing Program Task Force agreed that the states would stop producing non-reflective plates.

### 6.2.3 Trailers and Motorcycles

Number plates on motorcycles are usually located only on the rear of the vehicle. On trailers, number plates can be detected only from the rear. In the case of heavy vehicle trailers, it is particularly important to separately identify the trailer.

For practical reasons, not every ANPR site can have both forward and rear facing cameras. The cost of using rear facing cameras for heavy vehicle monitoring is likely to be justified by the benefits. Motorcycles, on the other hand, represent only about 3% of the vehicle population (Australian...
Bureau of Statistics 2007). It is therefore desirable that a system of front number plates or decals be developed for motorcycles. Motorcycles are also over-represented in theft, with poor recovery rates (see Figure 2.9), and in road crashes, and the ability for ANPR to recognise them would help reduce the incidence of motorcycle theft and of non-compliant behaviour.

Figure 2.9 Theft and recovery, by type of vehicle, 2005–06, rate per 1000 registrations (Australian Institute of Criminology 2007)

6.3 Avoidance behaviour

ANPR is vulnerable to number plate fraud and theft, including car cloning, where a legitimate plate is stolen or copied and attached to another vehicle. Cloning is most effective when the plates are attached to a vehicle of a similar make, model, colour and configuration as the original.

There is anecdotal evidence that ANPR may in fact cause an increase in these types of crime by persons seeking to avoid detection, as appears to have been the experience in the UK (Blake 2005; Haines 2008; PA Consulting Group 2007). However, the incidence of vehicle cloning may be exacerbated by non-ANPR related behaviour, such as increasing petrol prices and congestion charging.
7.1 Estimates of unregistered vehicles on the road

The UK Government recently estimated that more than two million vehicles, or one in fifteen vehicles, are being driven uninsured on British roads [DirectGov 2008].

The equivalent measure in Australia, where we have compulsory third-party insurance, is unregistered vehicles on the roads. While it is difficult to accurately determine the proportion of vehicles that are unregistered, Australian data suggests that 2-5% of vehicles on the roads are unregistered and that this could be as high as 10% in some areas [Australian Bureau of Statistics 2004]. More specifically:

- NSW Road Traffic Authority data indicates that 2% of vehicles on NSW roads (100,000 vehicles) are unregistered [NSW Audit Office 2003]

- Queensland estimates it has 2% unregistered vehicles, although earlier surveys showed 5% and 4% [Queensland Department of Transport, Trade, Employment and Industrial Relations 2008]

- Western Australia estimates it has 3% unregistered vehicles [Western Australia Auditor General 2008].
How ANPR works

The basic process of Automated Number Plate Recognition is shown in Figure 2.10 and described below.

Figure 2.10 Automated Number Plate Recognition process

ANPR is used to identify a motor vehicle from a photographic image containing the vehicle number plate. It uses OCR software to locate the number plate within the image and convert the image pixels to a text string.

The presence of a vehicle is detected by one of two methods:

- an external sensor triggers the camera to capture an image, or
- the software reading the image detects the vehicle or number plate within the image stream from the camera and triggers the current frame to be captured. This is known as frame grabbing.

Two types of character recognition software are used: OCR and intelligent character recognition. The latter uses more sophisticated artificial intelligence techniques, typically artificial neural networks. The net effect of both methods is that they extract number plate values from images of vehicles, and the term OCR will be used to refer to both methods here.

The camera usually needs to produce digital images for OCR to work, but there are ways to extract number plate values from non-digital media such as video images and wet film photographs. Infrared and visible spectrum cameras can be used, with infra-red providing suitable images under a wider range of conditions, especially low light and at night. This is because OCR works best with the higher contrast images produced by infra-red cameras (Constant 2008).

It is also important to reduce glare and to obtain as clear an image as possible. Infra-red cameras record less glare, but obtaining adequate reflective light depends on the reflectivity of the number plate and careful placement of the camera and infra-red illumination source. The surface of a retro-reflective number plate is covered in tiny hemispheres that cause light to be always reflected back to the source. This makes them very visible (Constant 2008).
Most ANPR cameras process several images of the same vehicle to increase the validity of the result [Constant 2008]. After processing multiple images, the software returns a statistical estimate of the success of the read.

Once the number plate has been recognised, the image, or more typically the part of the image containing the number plate (known as the 'plate patch'), together with the corresponding text string, can be transmitted, processed and stored in computer networks.

7.3 How hotlists and alerts work

A hotlist is a database of number plates, which may be:

- a whitelist – a list of plates for which no further action is to be taken, or
- a blacklist – a list of number plates which, if recognised, should generate an alert.

An example of a whitelist would be the list of number plates for all currently registered vehicles. If a number is detected that is not on this list, then an alert would be generated for an unregistered vehicle.

An example of a blacklist would be a list of vehicles of interest to the police in a particular state. It might include a vehicle known to have been used in committing a crime. If it is recognised by an ANPR camera, it will be matched against the blacklist and an alert automatically issued to the relevant police force.

Hotlists may be based on simple factual data, such as the fact that vehicles are registered. They may also be based on suspected associations, warnings, probable involvements in unlawful activities, and other analytical and intelligence information.

Once a vehicle is identified from a hotlist, inferences can be drawn, such as who might be driving it and whether interdiction action might be warranted. This process is illustrated in Figure 2.11.

Figure 2.11 Observation and inference boundaries in ANPR hotlists

The data used in hotlists is usually extracted from various primary databases, such as motor vehicle registries or police information management systems, and placed in a single hotlist database for matching with identified vehicles.
When a match is made, an alert is sent to an appropriate destination for processing. This is often a processing centre or back office, an in-vehicle computer or a laptop PC, and can include messages to particular individuals. Alerts may be configured to be sent to an individual via email or SMS, or to a group of persons such as an investigation team or communications centre. Recipients could be from within an agency or from an external agency.

Each alert is adjudicated to eliminate read errors and data mismatches. An appropriate action is then determined.

Figure 2.12 shows the various data interactions that might occur in a basic ANPR system using readily available national data sets.

Figure 2.12 Data sources for ANPR hollists
7.4 Factors influencing data storage requirements

There is a relationship between the uses to which ANPR data sets are put and the length of time data must be kept and, therefore, the amount of storage capacity required.

For the purpose of processing infringements or preparing simple statistical reports, data needs to be kept only for as long as it is needed for adjudication and, perhaps, for evidentiary purposes.

Surveillance and investigation can be expected to require longer data holding times, so as to allow sufficient time to accumulate information to build a case.

Intelligence and data analysis uses require even longer-term data storage so as to enable patterns to become evident. Cold cases or cases undiscovered for some time also require longer periods of data storage if information is to be available.

7.5 Complementary vehicle identification systems

Complementary technologies to ANPR are radio frequency identification (RFID) systems and global positioning systems (GPS).

Toll road 'eTags' are the most well known use of RFID transponders for Australian traffic control and involve having a transponder device attached to a vehicle. This is interrogated by a transmitter-receiver station. The transponder responds by transmitting information about the vehicle.

Simple RFID systems are actually powered by the interrogating radio signal and transmit a preset code that is looked up in a database. They have a very short range. More complex systems can include other information, and may have their own power supplies and therefore a longer range.

Some types of GPS can also transmit information about a vehicle and have the significant advantage of transmitting accurate location and speed information without the use of roadside tracking devices. GPS tracking is often used for fleet management. It is also the key technology for Australia's Intelligent Access Program for heavy vehicle monitoring. This is a voluntary industry 'opt-in' program, with monitoring and reporting undertaken by accredited third-party providers.

The core data generated by these systems is the same as that generated by ANPR cameras, except for the digital image.
7.6 Australian and international use of ANPR

7.6.1 AUSTRALIAN USE OF ANPR

The following information was collated as part of the 2008 CrimTrac ANPR stocktake.

<table>
<thead>
<tr>
<th>JURISDICTION</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT</td>
<td>ACT Policing has two portable roadside units that are used in conjunction with intercept teams. These teams often include ACT Road Traffic Authority staff who check vehicle safety. These mobile units are also available to the Australian Federal Police for intelligence gathering purposes.</td>
</tr>
<tr>
<td>NSW</td>
<td>The NSW Road Traffic Authority uses fixed ANPR for heavy vehicle monitoring (via its Safe-T-Cam network), point-to-point speed checking, monitoring transit ways and bus lanes. NSW also uses ANPR for toll collection on the Sydney Harbour Bridge and for an emissions monitoring camera in the M5 East tunnel. NSW Police have several mobile ANPR units which are used throughout the state on a rotational basis as part of intercept teams.</td>
</tr>
<tr>
<td>NT</td>
<td>The Northern Territory has no ANPR capability at present.</td>
</tr>
<tr>
<td>QLD</td>
<td>The Queensland Department of Main Roads uses fixed and mobile ANPR for heavy vehicle monitoring and road use surveys and research. Fixed cameras are also used to detect vehicles using the Brisbane Urban Corridor as a through route instead of bypassing it as required. Queensland Transport has two mobile ANPR units. Queensland Police have trialled ANPR. The Queensland Parliamentary Travelsafe Committee is conducting an inquiry into ANPR, which is expected to be completed during the second half of 2009.</td>
</tr>
<tr>
<td>SA</td>
<td>The South Australian Department of Transport, Energy and Infrastructure uses fixed ANPR for heavy vehicle monitoring via its Safe-T-Cam network, which is connected to the NSW Road Traffic Authority's network. It also uses ANPR for traffic monitoring and regulation. South Australia Police have a mobile intercept team, with two roadside ANPR and in-vehicle units for law enforcement.</td>
</tr>
<tr>
<td>TAS</td>
<td>The Tasmanian Department of Infrastructure, Environment and Resources has a fixed network of four ANPR cameras for heavy vehicle monitoring and road traffic regulation. It also has four mobile ANPR cameras for checking vehicle registration and drivers licences. Tasmania Police have one mobile ANPR roadside camera.</td>
</tr>
<tr>
<td>JURISDICTION</td>
<td>NOTES</td>
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</tr>
<tr>
<td>VIC</td>
<td>Victoria Police have two portable roadside ANPR units, which are used in conjunction with intercept teams. They also receive data from VicRoads, which is checked for unregistered and unlicensed drivers, stolen vehicles, stolen plates and vehicles of interest. VicRoads administers a network of ten point-to-point speed monitoring cameras on the Hume Highway to regulate speed over distance for all vehicles. Other regulatory agencies use ANPR from time to time.</td>
</tr>
<tr>
<td>WA</td>
<td>Western Australia Police use four mobile ANPR units for law enforcement throughout the state.</td>
</tr>
</tbody>
</table>

**Table 2.2 Additional uses of ANPR in Australia**

<table>
<thead>
<tr>
<th>USE</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toll roads</td>
<td>All Australian toll roads use ANPR to complement the use of RFID transponder tags. ANPR is used to identify vehicles where no tag signal is detected. ANPR cameras and systems used by toll roads are outside the scope of this study, although there are shared interests in national data sets and management of strategic roads.</td>
</tr>
<tr>
<td>Research</td>
<td>Several Australian research and commercial organisations are conducting research into ANPR. This activity is outside the scope of this study.</td>
</tr>
<tr>
<td>Other</td>
<td>ANPR is used for a variety of commercial uses, mainly petrol station security and car parking. These uses are outside the scope of this study.</td>
</tr>
</tbody>
</table>

**7.6.2 INTERNATIONAL USE OF ANPR**

ANPR is used in many countries throughout the world. The major users of ANPR technology are in UK and Europe, North America and Asia, including some Gulf States, India, South East Asia and Japan. The primary uses of ANPR worldwide are traffic regulation, heavy vehicle management, traffic management, road use charging, general policing, site security and toll roads.

It is difficult to obtain comprehensive information about ANPR use around the world but there are likely to be thousands of systems in use. Table 2.3 provides an overview of how and where ANPR is used, based on the best (albeit incomplete) information available.
<table>
<thead>
<tr>
<th>Country</th>
<th>Urban Precinct Security</th>
<th>Airports</th>
<th>Traffic Management and/or Monitoring</th>
<th>Traffic Flows and Travel Times (Incl. Research)</th>
<th>Law Enforcement/Crime Fighting</th>
<th>Parking Control and/or General Security</th>
<th>Speed Advisories (E.g., at Construction Sites)</th>
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<tbody>
<tr>
<td>Australia</td>
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<td>DANGEROUS GOODS TRANSPORT MANAGEMENT</td>
<td>ROAD USER CHARGING (TOLLS)</td>
<td>ROAD USER CHARGING (CONGESTION)</td>
<td>SITE SECURITY</td>
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</table>
7.7 Australian ANPR outcomes

The data in Table 2.4 is referred to in section 3.2. It is sourced from data supplied to CrimTrac by the relevant agencies.

Table 2.4: Outcomes from using ANPR in Australia

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Results</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Vehicles scanned</td>
<td>13 127</td>
<td>109 362</td>
<td>15 369</td>
<td>40 504</td>
<td>150 367</td>
</tr>
<tr>
<td>Total hours</td>
<td>21</td>
<td>277.5</td>
<td>86.5</td>
<td>116</td>
<td>418</td>
</tr>
<tr>
<td>Vehicles scanned per hour</td>
<td>625</td>
<td>394</td>
<td>178</td>
<td>349</td>
<td>360</td>
</tr>
<tr>
<td>Total offences &amp; actions</td>
<td>274</td>
<td>3981</td>
<td>957</td>
<td>894</td>
<td>1 270</td>
</tr>
<tr>
<td>Number of offences &amp; actions per hour</td>
<td>13</td>
<td>14</td>
<td>11</td>
<td>8</td>
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<tr>
<td><strong>Offences &amp; actions</strong></td>
<td></td>
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<tr>
<td>Unregistered vehicles</td>
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<td>1 065</td>
<td>14</td>
<td>218</td>
<td>789</td>
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<tr>
<td>Unlicensed drivers/licence offences</td>
<td>12</td>
<td>2 188</td>
<td>86</td>
<td>175</td>
<td>481</td>
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<tr>
<td>Defect notices (vehicles of interest)</td>
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<td>134</td>
<td>116</td>
<td>216</td>
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<tr>
<td>Other offences</td>
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<td>5</td>
<td>238</td>
<td>252</td>
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<td>Warnings/cautions</td>
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<td>446</td>
<td>421</td>
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<tr>
<td>Warrants/arrests/summons</td>
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<td>128</td>
<td>82</td>
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<td>Wanted vehicles</td>
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<tr>
<td><strong>Statistics for scanned vehicles</strong></td>
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<tr>
<td>Percentage of scanned vehicles creating an offence</td>
<td>2.1%</td>
<td>3.6%</td>
<td>6.2%</td>
<td>2.2%</td>
<td>0.8%</td>
</tr>
</tbody>
</table>
The Victorian trial occurred in inner-city Melbourne and gives several useful benchmarks for comparing both the other Australian data and the UK results.

1. In the year before the trial, Victorian patrols detected 32,796 unregistered vehicles during over 2,340,650 hours on patrol without using ANPR. This equates to one unregistered vehicle every 6.5 hours, or 0.15 per hour.

2. The Victorian ANPR trial estimated that 70–80% of an ANPR officer’s time was spent ‘in the field’. This compares well to the UK finding in which 79% of an ANPR officer’s time is spent on-task, versus 57% ‘on-task’ for other officers (IPA Consulting Group 2003). The UK finding excludes some overheads and there are differences in the operating models.

3. The rate of detection for unregistered vehicles during the ANPR trial was five per hour. This is a 3250% increase in outcomes compared to ordinary patrols. This also compares well with the UK data in which ANPR officers were found to be five times as effective as operational officers and ten times as effective as operational and non-operational officers combined (IPA Consulting Group 2003).

The South Australian data is taken from a 12-month period of mature ANPR metropolitan operations. Its unregistered detection rate is four vehicles per hour over general urban roads. The West Australian data reflects a sample on both metropolitan and rural roads over 12 months. The unregistered detection rate is one per five hours, which appears to reflect the geography and demographics of the state. The Australian Capital Territory is also a metropolitan sample.

The Tasmanian data focuses on unregistered vehicles and unlicensed drivers. This has resulted in a significant drop in the number of unregistered vehicles involved in crashes and is discussed in section 2.2.1.
PART 3
STOCKTAKE
This part of the CrimTrac Automated Number Plate Recognition (ANPR) scoping study report presents the findings of a stocktake undertaken by CrimTrac to determine the feasibility of introducing a national ANPR capability in Australia. The stocktake examined how ANPR technologies are being used in Australia. The information obtained was then used to determine the gap between current use and future requirements, and this is outlined in Part 5 of the scoping study report.
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1 SUMMARY

The CrimTrac stocktake was carried out mainly by law enforcement and regulatory agencies. It showed that, except for the Northern Territory, each Australian state and territory is benefiting to varying degrees from using ANPR technology for roads and traffic management, law enforcement and other uses. However, use of the technology is not as effective as it could be because of disparate coverage, systems, information and processes.

The stocktake revealed the following:

1. Current ANPR infrastructure is not sufficient to allow effective coverage of Australia’s road network.

2. There is no national ANPR information sharing or network, and only limited inter-agency and cross-border data sharing and cooperation. Hotlists, alerts and sightings are not generally shared between agencies, and cross-border information is not usually included in hotlists.

3. Sightings data is not stored beyond immediate operational requirements and aggregate data is not generally made available to other agencies. This limits the effectiveness of ANPR for law enforcement, national security, and research and planning.

4. There are disparate implementations of ANPR technology at agency level in the states, with a number of business processes and systems which address a limited range of business requirements, but which could provide a good baseline for implementing a national system. However, current implementations are often small, and are mostly disconnected and decentralised.

5. Agencies are obtaining some benefits expected from ANPR, but the benefits are largely confined to heavy vehicle management and a small amount of road traffic regulation, law enforcement, research and planning activity.

The major use of ANPR in Australia is for heavy vehicle management. New South Wales and South Australia have a shared Safe-T-Cam network, while Tasmania, Victoria and Queensland also have fixed ANPR networks for heavy vehicle management. Queensland uses mobile ANPR as well.

All states with mobile ANPR use it for road safety through detecting unregistered and unlicensed drivers, and most use it for law enforcement, such as detecting vehicles of interest and criminal investigations. The Australian Federal Police and Victoria use ANPR for some critical infrastructure protection. Queensland also uses ANPR for road use research.

The stocktake identified that various agencies are moving towards updating analogue camera networks to digital. In addition, there are a range of camera replacement programs to upgrade existing red light and speed camera sites. Such works present timely opportunities to upgrade or replace camera sites with ANPR-enabled technology and integrate them into a national ANPR system.

Parts 2, 4, 5 and 6 of the ANPR scoping study report contain discussions of ANPR processes, technologies, benefits and options.
CrimTrac undertook the ANPR stocktake to provide information for the ANPR scoping study. The objective was to provide an up-to-date view of the nature and extent of current ANPR technology and enforcement camera use and applications in Australia by law enforcement and regulatory agencies, and toll road operators. This included examining the business objectives being supported and the key processes used. CrimTrac then used the information obtained from the stocktake to determine infrastructure requirements for the gap analysis and inform the ANPR environment scan.

The stocktake focused on ANPR use by law enforcement and regulatory agencies. Law enforcement agencies are the federal and state police services and the Australian Customs Service. Regulatory agencies are the various roads and traffic authorities and government departments involved in roads and traffic management and transport infrastructure. Toll road operators were also included in the stocktake because of their use of ANPR for traffic management and their management of strategic roads.

Some of the information collected during the stocktake was commercial in-confidence or law-enforcement in-confidence and is therefore not included here.
3.1 Business functions model

A model of key business functions and activities involving ANPR was developed from known uses of ANPR (see Figure 3.1). It was used during the stocktake to help respondents state their business objectives for using ANPR. The model distinguishes between road safety, law enforcement and national security, with the detection of unregistered, uninsured vehicles and unlicensed drivers treated as road safety functions, and the detection of vehicles and persons of interest as law enforcement functions.

This distinction is based on the road safety outcomes of reducing the number of unregistered and uninsured vehicles. It is noted here because these functions can also be described as a form of detecting vehicles and persons of interest, and these terms therefore do not adequately separate the road safety and law enforcement uses of ANPR. The model does not cover commercial arrangements.
3.2 Generic ANPR system model

A generic model of a fully featured ANPR capability was also developed [see Figure 3.2]. This incorporated key aspects of ANPR uses such as fixed and mobile cameras, back office processing and vehicle intercepts, remote or centralised evaluation, and wired or wireless communications. The model was used to help develop technical questions and was provided to help respondents conceptualise the survey questions. The needs of the gap analysis were considered and a small set of technical questions relating to interoperability and standardisation was included. These questions covered data structures, data sources and repositories, and communications. Respondents were also asked to list existing non-ANPR camera infrastructure where it was a fixed site or where
mobile equipment could be upgraded to use ANPR. These questions were asked in order to obtain a national picture of camera enforcement infrastructure and to determine likely upgrade requirements.

Figure 3.2 Generic ANPR system configuration

3.3 Survey

As part of the stocktake, CrimTrac used a survey to collect information about ANPR use in Australia as source materials were scarce within the public domain and often not current or detailed enough to be of real value. Information from survey participants varied in the amount of detail and is documented in section 4. Any information regarded as sensitive and commercial-in-confidence has been excluded.

The survey was divided into two parts. Part 1 provided an overview of the survey and sought qualitative information about business objectives and ANPR use. Part 2 included detailed enumerative data required to answer some of the questions listed in Part 1. CrimTrac sought feedback on the survey design and content from a small number of stakeholders in order to reduce the size and complexity, but at the same time ensure that sufficient information was collected.

CrimTrac held an information session with law enforcement and regulatory agencies before the survey was distributed to describe the purpose and nature of the survey and allow participants to ask questions. Following a request for additional information, CrimTrac arranged a separate meeting with toll road operators from New South Wales.

The survey was then further refined, taking into account a number of common issues raised, and responses from individual operators.

CrimTrac distributed 33 surveys, and asked participants to respond within two months. In all, 21 responses were received, with all police services and all roads and traffic authorities responding.
4 STOCKTAKE RESULTS

4.1 Business focus

In most states, fixed ANPR networks are owned and operated by regulatory agencies for road safety, heavy vehicle management, and traffic control. While most states use fixed ANPR cameras for heavy vehicle management, only South Australia and New South Wales share information about cross-border heavy vehicles to help manage driver fatigue and speeding. Queensland uses the information for road pricing heavy vehicles. Fixed networks are also used for point-to-point speed enforcement in some states, and New South Wales is currently trialling ANPR, coupled with other technologies, to identify vehicles exceeding noise and emissions limits.

Some regulatory agencies have a mobile intercept capability, obtained by sharing mobile equipment with law enforcement agencies, or by working with law enforcement mobile ANPR intercept teams. Queensland's regulatory agency also uses mobile ANPR for road use research.

Law enforcement agencies mainly own and operate mobile ANPR units. The main use of mobile ANPR technology is to conduct mobile intercept operations for the purpose of road safety and law enforcement.

Toll road operators use radio frequency identification (RFID) transponders known as eTags to identify vehicles and collect payments. ANPR is used to identify vehicles where an eTag signal is not detected.

4.2 Coverage

At present, ANPR coverage is very uneven, with little or no ANPR in some states. Regulatory agencies in the Northern Territory, Western Australia, and the Australian Capital Territory have no ANPR technology. All other states have access to mobile or fixed ANPR capability, but geographic coverage is limited to major roads in large population centres, accident or non-compliance hotspots, and major transport routes. Mobile ANPR units provide some coverage of regional areas, but they operate only when an ANPR intercept operation is conducted. The mobile deployment location is largely determined by local law enforcement priorities.

4.3 ANPR systems

The four major types of ANPR systems used by the various agencies are:

- large fixed networks
- small fixed networks or single fixed cameras
- portable roadside cameras
- in-vehicle systems.

For most fixed networks (large and small), automated evaluation and alert generation occurs in a processor located at the camera site, with only alerted sightings being transferred to a back
office within a local system for adjudication. Generally, alerts generated from fixed networks target only road offences (for example, speed). A judicial file is created for alerts that could result in a notification being posted to the vehicle owner. This is not required for intercepts as the matter is resolved on the spot. Some fixed networks have fully centralised evaluation and adjudication of sightings, with all sightings being transmitted to a back office for processing. In some cases, sightings are stored locally and transmitted periodically for adjudication.

Mobile systems (portable and in-vehicle) are mostly disconnected from a network, with hotlists being manually collated and downloaded to a portable computer at the start of an operation. Enforcement and statistical data may be uploaded to a central server at the end of the operation. General ANPR sightings data is not uploaded, although data associated with alerts of infringements (traffic and criminal) is uploaded in some cases.

4.4 ANPR hotlists

All ANPR hotlists are based on data sourced from vehicle registration and drivers licence data. Most hotlists are sourced from within a single state and may include adjacent interstate data for both law enforcement and road safety purposes, although data sharing is rarely automated. Most hotlist data is no more than 24 to 48 hours old on average, although less time-critical operations may use data up to one month old. In most cases, it is sourced shortly before being added to the hotlist.

Law enforcement agency hotlists also usually include information such as vehicles or persons of interest. Information from other agencies can be included in law enforcement hotlists, depending on the nature of the hotlist and the priority of the information. Some agencies have created automated tools to help incorporate interstate data, but it is usually added to hotlists manually by extracting data from multiple databases, which is difficult and time consuming. Toll roads do not use externally provided hotlists, but can request information about the identity of a vehicle from regulatory agencies as required.

4.5 Data storage

Data storage periods vary from state to state, according to legislative, judicial and operational requirements. Most agencies do not store general sightings data for any longer than required for system operations, such as point-to-point processing. Alerts, judicial files, adjudications and enforcements are stored for longer periods because they form part of the judicial process.

4.6 Data sharing

Data sharing between agencies is governed by privacy regulations in each state. Responses to the stocktake did not provide an adequate overview of these regulations. However, CrimTrac also commissioned a privacy impact assessment [see Appendix B of the stocktaking study report].

Law enforcement agencies generally have limited access to networks managed by regulatory agencies. A warrant or similar authority is required for access to data held by commercial organisations. Regulatory agencies generally do not have access to data collected by law enforcement agencies. New South Wales and South Australian roads and traffic authorities have a data sharing agreement for heavy vehicle management, while general vehicle registration and drivers licence data is shared nationally through the Austroads National Exchange of Vehicle and Driver Information System (NEVOIS). Police information is available nationally to law enforcement agencies through CrimTrac.

There are no common standards for ANPR data files and transfer protocols. Agencies with a small amount of ANPR equipment often rely on proprietary formats for data and communications. Those with larger systems, especially New South Wales, require vendors to meet data structure and common communications protocols to facilitate interoperability.
5 CURRENT CAMERA USE IN AUSTRALIA

The stocktake obtained information about ANPR and other road safety and law enforcement cameras (see Table 3.1). Non-ANPR camera sites can be converted to ANPR sites by upgrading equipment or adding ANPR equipment. Fixed cameras and mobile equipment can be upgraded to ANPR in some cases, and this is indicated by the ANPR-ready columns in Table 3.1.

Table 3.1 Current camera use in Australia

<table>
<thead>
<tr>
<th>States</th>
<th>ANPR</th>
<th>NON-ANPR</th>
<th>TOTALS, BY STATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed</td>
<td>Mobile (portable)</td>
<td>Total fixed</td>
</tr>
<tr>
<td></td>
<td>Sites</td>
<td>Systems</td>
<td>Sites</td>
</tr>
<tr>
<td>ACT</td>
<td>Regulatory agencies</td>
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<td>0</td>
</tr>
<tr>
<td></td>
<td>Law enforcement agencies</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NSW</td>
<td>Regulatory agencies</td>
<td>62</td>
<td>204</td>
</tr>
<tr>
<td></td>
<td>Law enforcement agencies</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NT</td>
<td>Regulatory agencies</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Law enforcement agencies</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Released by the CrimTrac Agency under the Freedom of Information Act 1982
<table>
<thead>
<tr>
<th></th>
<th>ANPR</th>
<th>NON-ANPR</th>
<th>TOTALS, BY STATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed</td>
<td>Mobile (portable)</td>
<td>Total fixed</td>
</tr>
<tr>
<td></td>
<td>Sites</td>
<td>Cameras</td>
<td>Systems</td>
</tr>
<tr>
<td>QLD Regulatory agencies</td>
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<td>16</td>
</tr>
<tr>
<td>QLD Law enforcement agencies</td>
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<td>0</td>
</tr>
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<td>12</td>
<td>0</td>
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<tr>
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<td>2</td>
</tr>
<tr>
<td>TAS Regulatory agencies</td>
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<td>4</td>
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<tr>
<td>TAS Law enforcement agencies</td>
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</tr>
<tr>
<td>WA Regulatory agencies</td>
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<td>0</td>
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<tr>
<td>WA Law enforcement agencies</td>
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<td>0</td>
<td>4</td>
</tr>
<tr>
<td>VIC Regulatory agencies</td>
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<td>10</td>
<td>0</td>
</tr>
<tr>
<td>VIC Law enforcement agencies</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>103</td>
<td>245</td>
<td>55</td>
</tr>
</tbody>
</table>
5.1 Australian Capital Territory

The Australian Capital Territory regulatory agency does not use fixed ANPR cameras, but is developing a strategy to use the cameras for road safety purposes. However, it does not expect to implement fixed ANPR cameras in the near future.

- The two mobile cameras in the Australian Capital Territory are owned and operated by law enforcement agencies. The cameras are used for law enforcement and road safety purposes, as in other states.

These mobile units are also used by law enforcement agencies for intelligence gathering purposes. They are used to scan vehicle details and compare the details to a predetermined 'blacklist'. The blacklist contains vehicles that have been identified as potential vehicles of interest that require further investigation.

5.2 New South Wales

In New South Wales, fixed ANPR cameras are owned and operated by the Roads and Traffic Authority (RTA). The RTA has 204 fixed network ANPR-capable cameras, which are used for traffic lane enforcement and heavy vehicle speed and fatigue management.

Types of fixed network ANPR cameras include the Safe-T-Cam network for heavy vehicle speed and fatigue management, bus priority enforcement (including transitway), and heavy vehicle emission enforcement. There are 191 existing fixed speed cameras and red-light cameras used for road safety and speed enforcement that are also ANPR-capable when upgraded.

These ANPR cameras are used in conjunction with detection devices (such as speed, sound) that capture the details of passing vehicles when an offence is detected. For some types of enforcement, a detected offence is automatically sent to a central office for manual adjudication and/or verification before being forwarded to the State Debt Recovery Office. The State Debt Recovery Office then issues an infringement notice. All offence information is kept as future evidence, including the sighting image and number plate read output.

As part of the heavy vehicle management initiative, New South Wales and South Australia have an information sharing agreement whereby all sightings data pertaining to heavy vehicles is stored on a server and shared between agencies. This initiative is to aid cross-border fatigue and speed compliance.

New South Wales also has 24 mobile cameras that are owned and operated by the New South Wales Police Service. These cameras use manually targeted hotlists that contain relevant information from other law enforcement and regulatory agency systems. Mobile units are used within an intercept team, which adjudicates the alert, investigates the offence, and issues infringement notices if non-compliance is detected.

5.3 Northern Territory

No ANPR cameras are used in the Northern Territory.
The Queensland Police Service trialled ANPR technology in 2004 and 2005, examining a number of technical and operational issues. Queensland currently has 12 fixed ANPR cameras owned by regulatory agencies.

These fixed cameras are placed along the Brisbane Urban Corridor and at other selected sites for law enforcement and road safety purposes. When a potential offence is detected from a fixed camera, an alert is sent to the agency's back office facility for adjudication and enforcement, when required.

In addition, regulatory agencies also use fixed ANPR cameras for heavy vehicle management, but have identified the need for a further rollout of fixed ANPR cameras on key truck routes. This would improve the ability to monitor and audit heavy vehicles operating under schemes such as Higher Mass Limits and the Intelligent Access Program.

Queensland also has 16 mobile ANPR cameras that are used by regulatory agencies for traffic control purposes. These cameras are positioned at identified entry and exit roads to an area of interest to record sightings data. Analysis of the aggregated data provides details of vehicle movements within the capture area. This information can be used for traffic flow planning.

5.5 South Australia

South Australia's regulatory agencies use 12 fixed network ANPR cameras, which are all part of the Safe-T-Cam network. They are used mainly for heavy vehicle management. Sightings data is captured and stored temporarily, and then compared with later vehicle sightings to detect possible infringements (for example, fatigue, point-to-point speed). South Australia and New South Wales have an agreement to store heavy vehicle data on a common server so that sightings data can be shared.

South Australia has two mobile ANPR cameras, which are used by law enforcement agencies. As in most of the states, they are deployed with ANPR intercept teams for law enforcement and road safety purposes. They are also used for targeted intelligence gathering where a specific request is made for a deployment that involves sightings data being provided directly to an intelligence/investigations unit. Examples include monitoring a specific street where a drug target resides, or monitoring designated roads in the Adelaide Hills as part of Operation NOMAD, a bushfire prevention operation.

5.6 Tasmania

ANPR cameras in Tasmania are mainly owned by regulatory agencies. Law enforcement agencies have one mobile ANPR camera, which they make available for regulatory agencies to use on request.

There are four fixed network ANPR cameras in Tasmania, which are positioned at designated intersections in accordance with the Tasmania Police Road Safety Camera Site Selection/Operating Criteria. The fixed network cameras are coupled with a back office facility that produces some law enforcement and road safety infringements.

The four mobile units are used by ANPR intercept teams with in-vehicle cameras for law enforcement and road safety purposes. Data is processed by a back office facility and warning notices are sent to infringing vehicle owners.

Law enforcement and regulatory agencies in Tasmania work collaboratively on operations where possible. They have also identified the potential for ANPR to be used for covert operations.
5.7 Western Australia

Western Australian law enforcement agencies use four mobile ANPR cameras for law enforcement and road safety purposes.

While the state’s regulatory agencies do not use ANPR technology, they are considering using ANPR for point-to-point speed measurement, fixed speed cameras, heavy vehicle management, and for general traffic flow monitoring and statistics.

It is envisaged that any future purchase of ANPR equipment by Western Australia would include fixed network cameras for state border control, and in-vehicle units for road safety and law enforcement purposes.

5.8 Victoria

Victorian law enforcement agencies use two mobile ANPR cameras for law enforcement and road safety purposes. Victoria Police deploy mobile ANPR teams (comprising a vehicle and two crew members) to regional areas for vehicle interception and enforcement of infringements. The sightings data is not required for judicial purposes, but may be maintained for other purposes.

Victoria also uses 10 fixed network ANPR cameras on the Hume Highway for point-to-point speed detection.

Victoria plans to purchase additional ANPR units to improve law enforcement, road safety and critical infrastructure protection. This has seen ANPR cameras installed around some critical infrastructure sites in Victoria.

5.9 Toll roads

All toll roads in Australia are operated by private companies, except for the Sydney Harbour Bridge. The companies use ANPR on toll roads to identify vehicles without an eTag.

Privacy and commercial concerns prevent toll road operators from sharing sightings data at present, and any extension to the use of such data would need to address and work through these concerns.
A number of issues were identified from responses to the survey carried out as part of the stocktake, including:

- privacy and legislative issues
- intrastate and interstate plate duplication
- public and media perception
- remoteness of sites
- interoperability standards.

Appendix B of the scoping study report contains a privacy impact assessment and Appendix C contains a legislative review. These address privacy and legislative issues. All other identified issues are addressed in Part 2 of the scoping study report.
The stocktake showed that all states except the Northern Territory are benefiting to varying degrees from using ANPR technology for roads and traffic management, law enforcement and other uses. However, use of the technology is not as effective as it could be because of disparate coverage, systems, information and processes. Detailed findings are as follows:

1. ANPR coverage in Australia is limited, with fixed networks largely confined to major transport routes and capital cities. The relatively small number of mobile ANPR units generally permits only isolated operations. Together, the fixed networks and mobile equipment are not sufficient to allow effective coverage of Australia’s road network.

2. There is no national ANPR information sharing or network, and only limited inter-agency and cross-border data sharing and cooperation. Agencies generally do not evaluate their sightings against other agency hotlists, do not generally have access to the networks of other agencies, and most networks stop at state boundaries. Hotlists generally do not include data from other states, such as vehicle registrations, drivers licence data, warrants, or vehicle whereabouts requests. The local development of ANPR systems means that available bandwidth may be currently insufficient for a national network, and there is often no connectivity at all. There are no generally accepted interoperability standards for sharing ANPR data.

3. Sightings data is not stored beyond immediate operational requirements in most states (for example, point-to-point speed calculation) and aggregate data is not generally made available to other agencies. This limits the effectiveness of ANPR for law enforcement, national security, and research and planning within states.

4. There are disparate implementations of ANPR at agency level within the states, with a number of business processes and systems which address a limited range of business requirements, but could provide a good baseline for implementing a national system. However, current implementations are often small, and are mostly disconnected and decentralised.

5. Agencies are obtaining some benefits expected from ANPR, but the benefits are largely confined to heavy vehicle management and a small amount of road traffic regulation, law enforcement, research and planning activity.
This part of the CrimTrac Automated Number Plate Recognition (ANPR) scoping study report presents the business requirements for the proposed national ANPR system. The requirements were gathered through consultation with stakeholders, analysis of results and a national prioritisation of requirements by stakeholders. The analysis identified key capabilities and linked them to high-level requirements. The information obtained was then used to determine future requirements for the gap analysis, and this is outlined in Part 5 of the scoping study report.
1 SUMMARY

CrimTrac gathered business requirements to identify high-level requirements for a national approach to using ANPR technology. It consulted major project stakeholders in each state and asked them to identify requirements, benefits, risks and issues associated with implementing a national ANPR capability. The process focused on information and communications technology systems and requisite ANPR technology. Stakeholders then participated in a process to prioritise national requirements.

The information was analysed to separate functional and non-functional (enabling) requirements, remove duplications, identify required capabilities and establish links between requirements and capabilities, strategic outcomes and benefits. CrimTrac then disseminated the results to stakeholders for approval. The requirements gathering process is described in sections 2 to 7 of this part of the scoping study report.

The following capabilities were identified:

- **Capability 1:** National ability to (in real time) capture vehicle sightings and detect vehicles of interest.
- **Capability 2:** National ability to share information associated with vehicles of interest, including sightings, warnings, associated persons and vehicles, and registration details.
- **Capability 3:** Ability to interrogate aggregate national data to aid investigation, intelligence gathering and road use analysis.

The capabilities are linked to strategic outcomes and business benefits, as shown in section 8. Section 9 shows how they are linked to the high-level business requirements, which are discussed in sections 13 and 14. Risks and issues are discussed in sections 11 and 12.

The national business requirements and capabilities for the national ANPR system have been agreed to by all stakeholders listed in section 5 and endorsed by the ANPR Sponsoring Group.
This part of the CrimTrac Automated Number Plate Recognition (ANPR) scoping study report presents the business requirements for the proposed national ANPR system. It identifies:

- the methodology used to gather and analyse business requirements
- capabilities and potential business benefits that ANPR may help realise
- alignment between capabilities and the strategic outcomes of law enforcement and regulatory agencies
- high-level business requirements that will enable the capability
- high-level non-functional business requirements
- key issues
- top 10 risks.

Together with Parts 2 and 3 this part provides the foundations for Parts 5 and 6 of the scoping study report.
3. TIMELINE

1. **Business requirement workshops** (3 December 2007 to 18 March 2008) - CrimTrac visited all stakeholders, gathering their business requirements and potential issues, risks and business benefits.

2. **Collation of business requirements** (11 March 2008 to 25 March 2008) - CrimTrac collated all stakeholder business requirements and priority levels into the priority matrix document for discussion at the ANPR stakeholder conference.

3. **ANPR stakeholder conference** (26 March 2008) - stakeholders discussed, clarified and re-prioritised all the business requirements to achieve a national priority level for each requirement.

4. **Documentation of business requirements** (31 March 2008 to 24 April 2008) - CrimTrac formally documented the analysed business requirements.

5. **Stakeholder coordinator and organisation review** (24 April 2008 to 12 May 2008) - stakeholders formally reviewed the business requirements document and provided feedback to CrimTrac.

6. **Stakeholder sign-off** (after 19 May 2008) - participating stakeholders formally signed off the business requirements.
Figure 4.1 outlines the approval process for the ANPR business requirements.

**Figure 4.1 Approval process**

- Format stakeholder organisation sign-off
- Endorsed by ANPR Project Board
- Endorsed by ANPR Sponsoring Group
## 5 MAJOR STAKEHOLDERS

Table 4.1 lists the major stakeholders CrimTrac identified.

<table>
<thead>
<tr>
<th>STAKEHOLDER GROUP</th>
<th>STAKEHOLDER ORGANISATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Law enforcement agencies</td>
<td>Victoria Police</td>
</tr>
<tr>
<td></td>
<td>South Australia Police</td>
</tr>
<tr>
<td></td>
<td>Western Australia Police</td>
</tr>
<tr>
<td></td>
<td>Northern Territory Police</td>
</tr>
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<td></td>
<td>Queensland Police</td>
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<td>New South Wales Police</td>
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<td>Tasmania Police</td>
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<td>ACT Policing</td>
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<td>Australian Federal Police [AFP]</td>
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<td></td>
<td>Attorney-General's Department (AGD)</td>
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<tr>
<td></td>
<td>Australian Customs Service [ACS]</td>
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<tr>
<td></td>
<td>Australian Crime Commission [ACC]</td>
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<tr>
<td>Regulatory agencies</td>
<td>Roads and Traffic Authority (NSW)</td>
</tr>
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<td>NSW Ministry of Transport (NSW)</td>
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<tr>
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<td>Victoria Department of Justice (VIC)</td>
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<td>Department of Planning and Infrastructure (NT)</td>
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<tr>
<td></td>
<td>Department of Territory and Municipal Services (ACT)</td>
</tr>
</tbody>
</table>
6 METHODOLOGY FOR GATHERING BUSINESS REQUIREMENTS

CrimTrac used the following methodology to gather the business requirements from each stakeholder organisation:

1. Key stakeholders were identified [see Table 4.1].
2. Each workshop was organised in collaboration with the stakeholder coordinator to ensure sufficient representation at multiple levels for each organisation.
3. Each workshop gathered the business requirements, perceived business benefits, issues and risks for each organisation. Participants prioritised each risk and business requirement accordingly.

6.1 Workshop objectives and structure

The objectives for each workshop were to:

- provide participants with an insight into current applications of ANPR in Australia and around the world
- describe potential uses of the ANPR sightings data in aiding business processes and activities
- describe the benefits and advantages ANPR could offer in the Australian environment, along with known issues derived from current operations
- gather future high-level business requirements by determining
  - how ANPR sightings data is required to be used in the future
  - what business processes and activities are required to enable the use of ANPR sightings data
  - what ANPR sightings data is required to support various business applications
  - what other data and services are required from external organisations to add value to the ANPR sightings data and provide context to an alert
- gather the perceived business benefits, risks and issues
- prioritise business requirements and risks.

Each workshop consisted of a 1-hour introductory information session, a 2-hour brainstorming session, and a 30-minute session to raise issues, risks and potential business benefits.
The following methodology was used to analyse the business requirements gathered from each stakeholder organisation:

1. All business requirements and associated priorities gathered from the workshops were placed into the priority matrix (described below), by responsible organisation.

2. A priority weightings structure (described on the next page) was applied to the priority matrix to determine the overall national priority level for each requirement.

3. A re-prioritisation conference was held with all stakeholder coordinators to review priorities from a national perspective.

7.1 Priority matrix

CrimTrac listed all the business requirements gathered from the workshops held in each stakeholder organisation in a priority matrix.

To help gather and analyse the requirements, they were collated under the following high-level categories:

- data requirements
- information sharing requirements
- system functions
- other requirements.

The stakeholders then subjected the individual requirements to a priority assessment, after which they attended a re-prioritisation conference to reassess all requirements in a national context.
7.2 Priority ratings

Requirements in the matrix were assigned a base level priority at stakeholder level according to the ratings shown in Table 4.2.

Table 4.2 Definition of priorities

<table>
<thead>
<tr>
<th>OVERALL PRIORITY</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Must have [MH]</td>
<td>Essential to the business</td>
</tr>
<tr>
<td>Highly desirable [HD]</td>
<td>Beneficial to the business but not essential</td>
</tr>
<tr>
<td>Nice-to-have [NTH]</td>
<td>'Bells and whistles'</td>
</tr>
</tbody>
</table>

Individual stakeholder priority ratings were then weighted to more accurately reflect the national importance of each requirement.

In weighting, CrimTrac assigned all priorities a specific number of 'points' that represented the importance of the requirement. MH priorities were assigned three points (indicating that they are three times as important as an NTH priority), while HD priorities were assigned two points and NTH priorities one point. The average percentage of the total determined the average weighted points (%), and was used with Table 4.2 to establish the overall priority.

Any business requirements that had an overall priority of HD or MH were considered essential, and are further analysed in section 13 of this part of the scoping study report. Some requirements were deemed out of scope of the ANPR Programme, and these are clearly identified in the priority matrix in Section 7.

As the objective of this part of the scoping study report is to outline only the essential high-level business requirements, any requirement rated NTH or associated with one or more MH but with an overall priority of NTH was excluded from further analysis. However, the requirements remain in the priority matrix for consideration during implementation phases of the project.

Table 4.3 shows the criteria for priority rating after weightings have been applied.

Table 4.3 Criteria for priority rating

<table>
<thead>
<tr>
<th>OVERALL PRIORITY</th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Must have [MH]</td>
<td>Average of weighted points (%) greater than 66%.</td>
</tr>
<tr>
<td>Highly desirable [HD]</td>
<td>Average of weighted points (%) 33–66%.</td>
</tr>
<tr>
<td>Nice-to-have [NTH]</td>
<td>Average of weighted points (%) less than 33%.</td>
</tr>
</tbody>
</table>

The national view presented in the priority matrix is expected to provide the foundations for determining the scope of the ANPR Programme during the implementation phase.
8 KEY CAPABILITY OF ANPR SYSTEM

Table 4.4 contains a summary of the key capabilities of a national ANPR system and their alignment with the strategic outcomes and key business benefits of law enforcement and regulatory agencies.

Table 4.4 Key capabilities, outcomes and benefits

<table>
<thead>
<tr>
<th>CAPABILITY</th>
<th>STRATEGIC OUTCOME</th>
<th>KEY BUSINESS BENEFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capability 1</td>
<td>Improved national security capability</td>
<td>Increased deterrence to criminal activity</td>
</tr>
<tr>
<td></td>
<td>Increased crime detection</td>
<td>Increased detection of vehicle of interest and/or person of interest associated with vehicles</td>
</tr>
<tr>
<td></td>
<td>Enhanced community safety</td>
<td>Greater safety of operation through information sharing</td>
</tr>
<tr>
<td></td>
<td>Better policing and efficient use of resources</td>
<td>Increased ability to deploy resources in response to intelligence through improved detection of crime patterns and enhanced general investigations</td>
</tr>
<tr>
<td></td>
<td>Enhanced road safety</td>
<td>Increased ability to derive and report on road safety and criminal intelligence</td>
</tr>
<tr>
<td></td>
<td>Improved whole-of-government coordination</td>
<td>Potential to disrupt organised crime activities and counter-terrorism</td>
</tr>
<tr>
<td></td>
<td>Financial/cost efficiencies</td>
<td>Increased road safety compliance and fatigue management</td>
</tr>
</tbody>
</table>

Enabler: To support the above three capabilities, stakeholders require a business unit dedicated to support the use of the ANPR system by law enforcement and regulatory agencies, both within and across states.
To achieve each capability, the high-level business requirements outlined in Table 4.5 must be supported as part of the ANPR implementation project.

Note that the term 'business requirement' describes in business terms what must be delivered or accomplished to provide value (for more information visit http://en.wikipedia.org/wiki/Requirement).

Table 4.5 High-level business requirements

<table>
<thead>
<tr>
<th>CAPABILITY</th>
<th>HIGH-LEVEL BUSINESS REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capability 1</td>
<td>1. Ability to capture real-time data and images of every vehicle that passes an ANPR location.</td>
</tr>
<tr>
<td>National ability to [in real time] capture vehicle sightings and detect vehicles of interest</td>
<td>2. Ability to manage hotlists, detect and generate real-time alerts when a vehicle of interest is sighted.</td>
</tr>
<tr>
<td></td>
<td>3. Ability to build national infrastructure to support the capture, detection and generation of alerts.</td>
</tr>
<tr>
<td>Capability 2</td>
<td>4. Ability to gather, store and disseminate nationwide vehicle sightings data, operator and/or owner details, and associated warnings to law enforcement and regulatory agencies.</td>
</tr>
<tr>
<td>National ability to share information associated with vehicles of interest, including sightings, warnings, associated persons and vehicles, and registration details</td>
<td>5. Facilitate national information sharing of all available data among law enforcement and regulatory agencies.</td>
</tr>
<tr>
<td>Capability 3</td>
<td>6. Ability to search and query all available aggregated national data.</td>
</tr>
<tr>
<td>Ability to interrogate aggregate national data to aid investigation, intelligence gathering and road use analysis</td>
<td>7. Ability to analyse all available aggregated national data.</td>
</tr>
<tr>
<td></td>
<td>8. Ability to report on all available aggregated national data.</td>
</tr>
</tbody>
</table>
10 NON-FUNCTIONAL BUSINESS REQUIREMENTS

Non-functional business requirements are the constraints or quality components that are required to support the delivery of the capabilities. They are listed in Table 4.6.

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>NON-FUNCTIONAL BUSINESS REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td>An accessible system that will enable utilisation of the aggregated national data and associated services, both locally and nationally.</td>
</tr>
<tr>
<td>Interoperability</td>
<td>An interoperable system that can effectively connect to current and future key stakeholder systems and technology.</td>
</tr>
<tr>
<td>Scalability</td>
<td>A scalable system that can efficiently and effectively respond to future changes to the business environment.</td>
</tr>
<tr>
<td>Security</td>
<td>Effective protection and physical security of infrastructure, data and access to the system.</td>
</tr>
<tr>
<td>Audibility</td>
<td>An auditable system that will provide traceability of actions performed against controlled assets.</td>
</tr>
<tr>
<td>Performance criteria</td>
<td>A system that will meet all technical performance criteria set by stakeholders, based on their business environment.</td>
</tr>
<tr>
<td>Maintenance</td>
<td>A system that facilitates effective and efficient ongoing maintenance.</td>
</tr>
<tr>
<td>Retention period</td>
<td>Defines the short-term and long-term retention needs of aggregated national data.</td>
</tr>
<tr>
<td>Standards/legal</td>
<td>Defines the need for the ANPR system to meet nationally agreed standards for operation and information sharing.</td>
</tr>
<tr>
<td>Resources</td>
<td>Requirements for hardware, software and human resources to manage the significant volume of data envisaged for the ANPR system.</td>
</tr>
<tr>
<td>Usability</td>
<td>Refers to the elegance and clarity with which the interaction with a computer program is designed.</td>
</tr>
</tbody>
</table>

CrimTrac ANPR Report

Responsive • Innovative • Accountable

Released by the CrimTrac Agency under the Freedom of Information Act 1982.
Stakeholders identified a number of issues during the workshops, which were then analysed by CrimTrac. The issues need to be mitigated before developing a national ANPR system, as they have the potential to impede or restrict future implementation. The key issues are shown in Table 4.7.

Table 4.7 Key Issues

<table>
<thead>
<tr>
<th>KEY ISSUE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Current federal and state privacy and legal frameworks may not support the desired capabilities of a national ANPR system.</td>
<td></td>
</tr>
<tr>
<td>• Current ANPR technology does not detect originating state of number plates. Due to number plate duplication, it is essential that the state can be determined to ensure accurate identification of vehicles sighted.</td>
<td></td>
</tr>
<tr>
<td>• The public and/or media may perceive the ANPR Programme to be a mass surveillance or revenue raising capability.</td>
<td></td>
</tr>
<tr>
<td>• The magnitude of investment required to implement a national ANPR system may be beyond the resources of individual states and may require significant support by the Australian Government. Failure to embrace all states will directly affect the success of the national Programme.</td>
<td></td>
</tr>
<tr>
<td>• New technologies are emerging that potentially offer complementary capabilities for vehicle identification, additional to ANPR technology. Failure to consider incorporation of new technologies into the national ANPR system may limit the overall effectiveness and business benefit.</td>
<td></td>
</tr>
<tr>
<td>• Where covert vehicles are not known to the National Exchange of Vehicle and Driver Information System (as is sometimes the case), this has the potential to impact negatively on covert operations.</td>
<td></td>
</tr>
<tr>
<td>• Future changes to state and/or federal legislation around ANPR will affect processes within the system that will need to be changed in line with legislative deadlines.</td>
<td></td>
</tr>
<tr>
<td>• Quality and currency of data is likely to vary among stakeholders and will need to be aligned to ensure an effective national system.</td>
<td></td>
</tr>
</tbody>
</table>
A number of risks were identified by stakeholders and then analysed by CrimTrac. The risks need to be mitigated before developing a national ANPR system, as they have the potential to impede or restrict future implementation. The top 10 risks identified are shown in Table 4.8.

<table>
<thead>
<tr>
<th>RISK DESCRIPTION</th>
<th>CONSEQUENCE</th>
<th>LIKELIHOOD</th>
<th>RISK LEVEL</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Legislative changes would not be achieved in the required time frames.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>Potential risk</td>
</tr>
<tr>
<td>2. The political support for implementing ANPR may be lost due to negative public perceptions.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>Potential risk</td>
</tr>
<tr>
<td>3. The level of legislative complexity will hinder/delay implementation of the project.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>Potential risk</td>
</tr>
<tr>
<td>4. National number plate standards are not defined when ANPR is implemented.</td>
<td>Major</td>
<td>Almost certain</td>
<td>Critical</td>
<td>Potential risk</td>
</tr>
<tr>
<td>5. Vehicle sightings and related information will not be captured to the highest quality (e.g. colour photos) or stored for the desired retention period due to lack of funding.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>Potential Risk</td>
</tr>
<tr>
<td>6. The information sharing agreement is not reached by all states, resulting in crime moving from one state to another.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>Potential risk</td>
</tr>
<tr>
<td>7. The system implementation is not planned properly, affecting stakeholder businesses.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>Potential risk</td>
</tr>
<tr>
<td>8. The national information sharing rules are not endorsed by states.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>Potential risk</td>
</tr>
<tr>
<td>9. Negative public perception against the implementation of ANPR technology.</td>
<td>Major</td>
<td>Likely</td>
<td>High</td>
<td>Potential risk</td>
</tr>
<tr>
<td>10. The ANPR system may be misused by state government departments and police.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>Potential risk</td>
</tr>
</tbody>
</table>
### Mitigation

<table>
<thead>
<tr>
<th>Event</th>
<th>Consequence</th>
<th>Likelihood</th>
<th>Risk Level</th>
<th>Risk Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior responsible officer (SRO) will manage the relationship with the Minister.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>SRO</td>
</tr>
<tr>
<td>SRO to manage the relationship with both state and Australian Government Ministers.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>SRO</td>
</tr>
<tr>
<td>The Sponsoring Group (SG) will manage the legislative impacts identified in the scoping study report, at both organisational and political levels.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>SG</td>
</tr>
<tr>
<td>The SG will lead the engagement of all state licensing authorities.</td>
<td>Major</td>
<td>Likely</td>
<td>High</td>
<td>SG</td>
</tr>
<tr>
<td>The SG will monitor budgeting arrangements between state governments and the Australian Government.</td>
<td>Moderate</td>
<td>Possible</td>
<td>Moderate</td>
<td>SG</td>
</tr>
<tr>
<td>The SG will drive the information sharing agreement principles at organisational level.</td>
<td>Major</td>
<td>Possible</td>
<td>High</td>
<td>SG</td>
</tr>
<tr>
<td>The Programme will take the lead in scheduling each stage of the implementation plan through relevant projects.</td>
<td>Moderate</td>
<td>Possible</td>
<td>Moderate</td>
<td>Programme Manager</td>
</tr>
<tr>
<td>The SG will drive the information sharing rules through their own organisational hierarchy.</td>
<td>Major</td>
<td>Unlikely</td>
<td>Moderate</td>
<td>SG</td>
</tr>
<tr>
<td>The scoping project will conduct a privacy impact assessment that will engage privacy advocates. Legislative governance will be developed prior to implementation. System design will adhere to legislative requirements and communicate to all stakeholder groups.</td>
<td>Moderate</td>
<td>Possible</td>
<td>Moderate</td>
<td>Programme Manager</td>
</tr>
<tr>
<td>The Programme will ensure that the right audit and business rules are implemented to prevent misuse of the system.</td>
<td>Moderate</td>
<td>Possible</td>
<td>Moderate</td>
<td>Project Manager</td>
</tr>
</tbody>
</table>
13 BUSINESS REQUIREMENTS ANALYSIS

The objective of this section is to examine the implications of each of the eight high-level business requirements.

13.1 Capability 1

National ability to [in real time] capture vehicle sightings and detect vehicles of interest.

13.1.1 DISCUSSION

The main function of ANPR technology is to detect vehicles of interest. This is achieved by:

- capturing every number plate as an image as each vehicle passes by an ANPR camera
- reading the number plate image to obtain the vehicle’s number plate characters
- matching [in real time] the captured number plate values against a known set of values (hotlist)

A hotlist is a list of vehicles of interest, each described by registration details and the reason why the vehicle is of interest. A positive match generates an alert, which is handled and disseminated according to the business rules.

- storing all sightings records and images for sufficient time to allow for calculations such as point-to-point speed or travel time over long distances, or to permit adjudication and any subsequent processing.

The value of this ANPR capability is as follows:

- It provides an increased ability to detect more vehicles of interest than is possible through current unconnected implementations.
- The ability to automatically obtain vehicle number plate data and perform a real-time match against a national hotlist will allow states to have more visibility and control over vehicle movements at a national level. Current deployments focus on local operations, with limited sharing of data between law enforcement and other regulatory agencies. There is currently no framework established for collecting, collating and disseminating vehicle movement data.
• By capturing millions of sighting instances at a national level, the ANPR capability has the potential to detect substantially more road-related offences, including unregistered and uninsured vehicles.

• The increased detection capability will deter future offenders.

• The ANPR capability can provide a baseline of data for post-incident investigations by road accident and law enforcement agencies.

13.1.2 ANPR SIGHTINGS AND DETECTION PROCESS

Figure 4.2 shows the main components of ANPR and the associated processes of a national ANPR system.

Figure 4.2 National ability to (in real time) capture vehicles sightings and detect vehicles of interest.
13.1.3 PROCESS STEPS

The detection process can be depicted by the following steps:

1. Hotlist entries are created either manually (direct data entry) or automatically and are available immediately within the ANPR system.
2. A vehicle passes by the ANPR camera and an image is taken.
3. Number plate characters are determined from the number plate image.
4. A sightings record is created and stored.
5. The system then determines if the read is acceptable for use.
   
   **Alternate path - if the read is deemed unacceptable, it may be sent for manual adjudication by a ‘sightings adjudicator’. These records are not available for real-time matching against the hotlist.**
6. The system matches the new sightings record against the hotlist entries in real time.
7. If a match is found, an alert is generated and investigated by the response unit. Each alert is disseminated according to configurable business rules.
8. The response unit acts in response to the alert (based on business process).
9. Action taken by the response unit is updated and stored with the alert record.

13.1.4 HIGH-LEVEL BUSINESS REQUIREMENT 1

*Ability to capture real-time data and images of every vehicle that passes an ANPR location.*

Requirements 1, 2 and 3 (as stated in Table 4.5) are required to deliver capability 1.

Using national infrastructure, requirement 1 is the ability to capture an image, identify the vehicle, and store both images and identification data for an appropriate period for local and national requirements.

Requirement 1 is described in steps 1-5 of the process (13.1.3) and is shown in Figure 4.2. Table 4.9 lists the supporting requirements for requirement 1.
### Table 4.9 Supporting requirements for requirement 1

<table>
<thead>
<tr>
<th>REQUIRED ABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To capture and store data for all vehicles passing the ANPR camera, not just the ones that match a hotlist entry.</td>
</tr>
<tr>
<td>2. To capture a nationally agreed minimum set of data for each sighting.</td>
</tr>
<tr>
<td>3. To capture clear high-resolution images of vehicle drivers.</td>
</tr>
<tr>
<td>4. To capture clear high-resolution images of number plates.</td>
</tr>
<tr>
<td>5. To recognise all number plate types and configurations, including the state where the plate was issued.</td>
</tr>
<tr>
<td>6. To retain data for a period of time that matches the needs of the business.</td>
</tr>
<tr>
<td>7. To access the image from the sightings record.</td>
</tr>
<tr>
<td>8. To meet evidentiary and/or the national standard (whichever is more stringent) in terms of storing data and/or associated images.</td>
</tr>
<tr>
<td>9. To identify and extract relevant information from secondary systems (law enforcement and/or regulatory agency databases) to automatically create and/or update a hotlist item, and notify the owner of the hotlist item of the change, if required.</td>
</tr>
<tr>
<td>10. To import (manually and/or via batch processes) a list of vehicles of interest to create hotlist items.</td>
</tr>
<tr>
<td>11. To have ANPR equipment work at agreed required standards in adverse weather conditions.</td>
</tr>
</tbody>
</table>

**Assumption**

Requirement 1 assumes that:

- all new number plates and new customised plates will be tested for readability by ANPR technology before being released to the market. This is to ensure that every image of the vehicle number can be interpreted

**Constraints**

To meet the needs of requirement 1, the following constraints will need to be individually addressed (if they arise) to ensure full benefits are realised:

- The tampering, modification or ‘bad reads’ of number plates will have an adverse effect on the overall percentage of accurate reads
- Motorbikes have only rear number plates and thus will not be detected if only front camera capture is implemented
- Heavy vehicles have different number plates for the prime mover (vehicle that provides the motive to haul a load) and the trailer (unpowered vehicle pulled by a powered vehicle which usually carries a load), so the front and rear plates will not match. If an association with a heavy vehicle is not made, this may cause an error in the read
Configurations dictate which roads a heavy vehicle is allowed to use. Therefore to aid in heavy vehicle management, the trailer plate needs to be captured (that is, front and rear plate capture is required).

- Criminal activity, including cloning and/or stealing ‘clean’ number plates, may increase as criminals attempt to avoid detection.

The constraints are in addition to the key risks and issues already raised in sections 11 and 12 above.

**Success criterion**

The criterion for measuring success in fulfilling requirement 1 is that:

- a sightings record is created to include a minimum national data set and image for every passing vehicle.

**13.1.5 HIGH-LEVEL BUSINESS REQUIREMENT 2**

**Ability to manage hotlists, detect and generate real-time alerts when a vehicle of interest is sighted.**

A number of functions centred on private and shared hotlists are required to allow vehicles of interest to be detected in real time, regardless of the state sightings occur in.

These include:

- the use of national infrastructure to provide real-time interstate connectivity
- a list of vehicles of interest (hotlist) containing a nationally agreed dataset, including details relating to the vehicle and the reason why it is on the hotlist
- matching of sightings with the hotlist data
- generation and dissemination of alerts according to the business rules governing dissemination

An **alert** is the outcome of a match between a sighting and an entry in a hotlist. It gives the respondent pertinent information about why the vehicle is of interest, associated warnings, and what action may be required.

- the ability to manually adjudicate the match and alert to confirm that the read and match were correctly recorded
- the ability to record the action taken in response to an alert, which can be as varied as a physical intercept, an adjudication process resulting in an infringement notice, or some form of covert operation.

Requirement 2 is described in steps 6-9 of the process (13.1.3) and is shown in Figure 4.2. Table 4.10 lists the supporting requirements for requirement 2.
Table 4.10: Supporting requirements for requirement 2

**REQUIRED ABILITY**

1. To have a nationally agreed set of data in the hotlist in order to ensure that matching occurs correctly and accurately, with common understanding.

2. To generate an alert containing an agreed set of information in real time in response to a positive match from the hotlist. Update and/or viewing of the record is required.

3. To configure alert handling and allow dissemination of alerts as per business rules.

4. To have covert and overt alerts.

5. To be notified if associated source data has been updated for a vehicle listed in the hotlist (i.e., change of registered owner).

6. To have a review date for hotlist items and notify the initiator before the review or expiry date.

7. To export hotlist data to mobile units that may work outside network capabilities (subject to security requirements).

**Assumptions**

Requirement 2 assumes that:

- matching of sightings data against the hotlist will be in real time and result in a real-time alert
- hotlist items will be configured at a state level to allow flexibility over generation and dissemination.

**Constraint**

To meet the needs of requirement 2, the following constraint will need to be individually addressed (if it arises) to ensure full benefits can be realised:

- The lack of availability of communication technology to deliver real-time matching, alerts and dissemination of data.

This constraint is in addition to the key risks and issues already raised in sections 11 and 12.

**Success criteria**

The criteria for measuring success in fulfilling requirement 2 are:

- a vehicle of interest is detected from the hotlist in real time, while passing an ANPR camera
- an alert is generated and disseminated in real time, according to the business rules.
13.1.6 HIGH-LEVEL BUSINESS REQUIREMENT 3

Ability to build national infrastructure to support the capture, detection and generation of alerts.

A national environment is required to enable exchange of ANPR data between the states. This includes local capture, a processing and interchange capability, a central processing and interchange capability, and a national network to connect each participating state.

The national infrastructure environment must support:

- distributed ANPR capture infrastructure capable of interacting according to agreed standards
- distributed ANPR business systems infrastructure capable of interacting according to agreed standards
- wireless and wired communications networks capable of providing real-time connectivity to both fixed and mobile locations.

Table 4.1 lists the supporting requirements for requirement 3.

Table 4.11 Supporting requirements for requirement 3

<table>
<thead>
<tr>
<th>REQUIRED ABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To have a mix of state and Commonwealth infrastructure, but sightings data be available to all users (depending on user access, etc).</td>
</tr>
<tr>
<td>2. To use a variety of ANPR equipment, including:</td>
</tr>
<tr>
<td>- fixed units - ANPR cameras attached to poles or gantries</td>
</tr>
<tr>
<td>- in-car units, for law enforcement vehicles</td>
</tr>
<tr>
<td>- mobile units, positioned in a place of choice</td>
</tr>
<tr>
<td>- units attached to non-law enforcement vehicles (e.g. fire trucks)</td>
</tr>
<tr>
<td>- covert operating cameras (e.g. not enforcing).</td>
</tr>
<tr>
<td>3. To have infrastructure that networks all cameras and systems (including remote areas) to allow efficient real-time access to the system and data captured.</td>
</tr>
<tr>
<td>4. To have physically secure and protected ANPR equipment.</td>
</tr>
<tr>
<td>5. To deploy cameras around critical infrastructure and hot spots.</td>
</tr>
</tbody>
</table>

Responsive - Innovative - Accountable

Released by the CrimTrac Agency under the Freedom of Information Act 1982
Assumptions

Requirement 3 assumes that:

- any sightings taken by any existing ANPR equipment will be available for use by any user (subject to legislative and business limitations) in any state following national ANPR implementation
- alerts will be available across organisations and states, that is, hotlists can be shared.

Constraints

To meet the needs of requirement 3, the following constraints will need to be individually addressed (if they arise) to ensure full benefits can be realised.

- Individually owned units procured before a national ANPR system is established may not be compliant with new infrastructure and software applications.
- Output from ANPR equipment in proprietary formats may need to be transformed to match data interoperability requirements.

These constraints are in addition to the key risks and issues already raised in sections 11 and 12.

Success criterion

The criterion for measuring success in fulfilling requirement 3 is that:

- all available sighting and detection records are immediately available for data matching and/or analysis, both locally and nationally, regardless of where they were collected or who owns the data and/or equipment.

13.2 Capability 2

National ability to share information associated with vehicles of interest, including sightings, warnings, associated persons and vehicles, and registration details.

13.2.1 DISCUSSION

There is significant data about vehicles, registrations, registered owners/operators and criminal histories of people stored in various law enforcement and regulatory agency systems. If this data, coupled with the ANPR sightings, was shared in real time, it would significantly benefit stakeholders by enabling greater visibility of vehicle movements and/or people movements associated with vehicle movements at a local and national level.

It is a crucial requirement that sightings data be associated with the registered owner/operator, as vehicles per se do not commit crimes or road-related offences. This will lead to better intelligence about vehicle movements, associated crimes and road-related offences by enhancing the ability to undertake analysis based on the vehicle and/or registered owner/operator.
To link sightings data to a registered owner/operator, the following data is required:

- vehicle registration details, such as number plate, status of registration, last change in ownership
- registered owner/operator details, including drivers licence and residential address details
- person of interest details of the registered owner/operator associated with the vehicle
- accreditation data for heavy vehicle operators.

An information sharing capability between agencies is required to obtain the above data. To date, this has been largely a manual process, requiring large amounts of paperwork and effort, coupled with many complicated, ambiguous and lengthy contractual agreements. Further, not all agencies have participated due to legal or business reasons.

A national approach would streamline the ability to share information at a national level.

The community will benefit through safer roads and reduced crime due to:

- greater visibility of vehicle movements within and across states
- cross-border enforcement, resulting from real-time information sharing across states
- substantially reduced times required to share information, enabling complex actions such as executing cross-border warrants and locating persons of interest to be performed more efficiently
- effective identification of vehicles of interest that may be related to crime and/or road-related offences within and across states.

13.2.2 DESCRIPTION

Information sharing relates to the two-way transfer of data between entities. In this case, ANPR sightings data will be available to law enforcement and regulatory agencies, subject to contractual agreements, privacy and legislative boundaries.

Information sharing also requires that data is provided and accepted using adequate information sharing protocols and security access control.
13.2.3 INFORMATION SHARING PROCESS

Figure 4.3 shows the main components of ANPR and the associated processes of a national ANPR system.

**Figure 4.3 Information sharing between law enforcement and regulatory agencies**

13.2.4 PROCESS STEPS

The information sharing process can be depicted by the following steps:

1. An entity [law enforcement or regulatory agency, or private organisation] captures sightings data.
2. Data is stored locally and nationally.
3. The enquiring agency accesses data or has data disseminated to it.
4. The enquiring agency accesses additional supplementary data from law enforcement and regulatory agencies.
13.2.5 High-Level Business Requirement 4

Ability to gather, store and disseminate nationwide vehicle sightings data, operator and/or owner details, and associated warnings to law enforcement and regulatory agencies.

To enable the nationwide detection of vehicles, it is crucial that agencies can access all sightings data and any supplementary data related to the sighting from other agencies, depending on their business needs.

Gathering supplementary data stored by other law enforcement and regulatory agencies will enrich detection and alert data. This will enable greater use of information already captured to give law enforcement and regulatory agencies more information before a vehicle interception or to build a case or conduct an investigation. Alternatively, if a vehicle is of interest in one state and is detected in another, it would be beneficial to know details of the registered owner/operator.

Dissemination of the data involves the ability to give data to requesting agencies. It is required to pass data and information to other agencies to allow them to gather information about an investigation or road-related purpose.

Information sharing in this context relates to:

- gathering and disseminating all available information at a national and/or state level with all stakeholders
- sharing all available supplementary data between all agencies.

Requirement 4 is described in steps 1–4 of the process (13.2.4) and is depicted in Figure 4.3. Table 4.12 lists the supporting requirements for requirement 4.

Table 4.12: Supporting requirements for requirement 4

**REQUIRED ABILITY**

1. To access all available (based on security rights) ANPR data (sightings, alerts, hollists, infringements and warnings) nationally.

2. To access any overt person of interest information from law enforcement agencies in all states, including any warnings about the person of interest, as appropriate.

3. To access all available ANPR data (includes by last or current registered owner, registered owner includes company details), vehicle registration, road worthiness and non-compliant vehicle details from road and traffic databases nationally (includes all licensing information and information in the National Exchange of Vehicle and Driver Information System).

4. To access data (criminal history, firearm registration, warrants, etc) made available by other law enforcement agencies or national law enforcement databases (e.g., Customs, Australian Crime Commission, Centrelink, Interpol, CrimTrac).

5. To gather ANPR data from private organisations (e.g., toll operators, security firms, petrol stations, hire car firms, shopping centres, airport corporations) with proper authority.
REQUIRED ABILITY

6. To gather CCTV footage of vehicle movements from local, state and Australian Government CCTV cameras and private sector cameras (e.g. shopping centres, service stations) with proper authority.

7. To access heavy vehicle dealer plates and trailer plates information.

8. To produce reports with required information for other agencies (local and international) that do not have access to the ANPR system (based on memorandums of understanding).

9. To have live access to images that have been taken for target vehicles. Others can be stored and accessed in non-real time.

10. To receive data from various ANPR sources.

11. To have time synchronisation between data sharing.

Assumptions

Requirement 4 assumes that:

• law enforcement and regulatory agencies can share information relating to ANPR sightings

• “all available data” is restricted by legislative, privacy and business needs.

Constraints

To meet the needs of requirement 4, the following constraints will need to be individually addressed (if they arise) to ensure full benefits can be realised:

• Current privacy laws prohibit data being held for any unintended purpose.

• Differing legislation in each state may make a national information sharing model very complicated.

• Commercial and legal constraints may impact on accessing ANPR-related information from non-government sources.

• Stakeholders may decide not to share information with each other.

These constraints are in addition to the key risks and issues already raised in sections 11 and 12.

Success criteria

The criteria for measuring success in fulfilling requirement 4 are:

• ANPR sightings data is available to an authorised user

• the details of each sighted vehicle are available to authorised users, with details of the registered owner/operator available to authorised users in relation to the vehicle sighting

• person of interest information is available to certified users in relation to the vehicle sighting

• information is available only as per a national information sharing agreement and security protocols.
10.2.6 High-level Business Requirement 5

Facilitate national information sharing of all available data among law enforcement and regulatory agencies.

For local and national information sharing to occur between law enforcement and regulatory agencies (and vice versa), the act of information sharing must be protected by strict security, access and availability measures. This will prohibit sensitive data being accessed by unauthorised users, or the data being used for inappropriate purposes.

There are several components contributing to this high-level requirement that need to be addressed in relation to the ability to share information. These include:

- having the correct level of access to the data
- having a valid need to access the data
- having sufficient security measures and controls that prohibit unauthorised access to data gathered by another agency
- creating policies that instruct how users should behave with the data
- having confidence that once data is passed to another agency it will be treated with the security controls of the originating agency, or that appropriate agreement by other users is in place
- having confidence that providing data to another agency does not jeopardise the originating agency in any way.

Requirement 5 is described in step 3 of the process [13.2.4] and is depicted in Figure 4.3. Table 4.13 lists the supporting requirements for requirement 5.

Table 4.13 Supporting requirements for requirement 5

<table>
<thead>
<tr>
<th>REQUIRED ABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To share all data as per a contractual agreement/memorandum of understanding (based on legislative requirements).</td>
</tr>
<tr>
<td>2. To have a determined minimum standard for information sharing.</td>
</tr>
<tr>
<td>3. To have defined user and system access across all agencies to ensure that data can be disseminated to appropriate levels of users [i.e. only share information when authorised].</td>
</tr>
<tr>
<td>4. To hide specific data which will be displayed only to those with appropriate access (e.g. covert alerts).</td>
</tr>
<tr>
<td>5. To send data over an encrypted line across any fixed and/or wireless networks based on state and/or national standards.</td>
</tr>
</tbody>
</table>
Assumption

Requirement 5 assumes that:

- information sharing protocols and agreements will be defined before system availability.

Constraint

To meet the needs of requirement 5, the following constraint will need to be individually addressed (if it arises) to ensure full benefits can be realised:

- Differing legislation, security and communications guidelines and privacy laws (or lack of) in each state may make a national information sharing model complicated.

This constraint is in addition to the key risks and issues already raised in sections 11 and 12.

Success criteria

The criteria for measuring success in fulfilling requirement 5 are:

- sightings data is sent and received by each state as per contractual and security requirements
- supplementary data from each state is received as per the above required security measures
- unauthorised users cannot gain access to or receive any disseminated data.

13.3 Capability 3

Ability to interrogate aggregate national data to aid investigation, intelligence gathering and road use analysis.

13.3.1 DISCUSSION

Capability 1 requires the ability to record and store data each time a vehicle passes an ANPR location. This entails storing the vehicle registration details and other details such as date, time, location of the camera and other nationally agreed datasets. Any associated alerts and actions are also required to be stored with the sightings record. The purpose of this is to enable the immediate and basic functions of a national ANPR system.

Capability 2 requires the ability to share ANPR data sightings, along with other data relating to vehicles and their registrations, and also to share data about people who are registered to the vehicle and their associations. The purpose of this is to enable national information sharing and processing.

Capability 3 requires all of this information to be available for interrogation in order to help with investigations and intelligence gathering, provide statistics on demographics for use in road planning, and help analyse road-related offences [for example, unregistered vehicles, stolen vehicles]. Interrogation covers functions that include searching, querying, analysing and reporting.
The storage and subsequent actions associated with a sighting provide the benefit of knowing that a vehicle of interest has been sighted at a particular location at a known time, whether it is a current sighting (now) or one that occurred in the past.

All of these functions use the stored ANPR data and give further information about patterns, frequency and location in relation to an incident. The ability to obtain aggregated data for road use purposes will give states more ability to detect crimes, and regulatory agencies the ability to increase compliance and better plan for future infrastructure requirements.

13.3.2 DESCRIPTION

Stored ANPR data is required to be able to be used for information purposes. The ability to interrogate ANPR sightings data and its associated supplementary data is a key requirement for business users. This capability will allow users the ability to analyse stored data.

The process of collecting sightings records and detecting vehicles of interest is the core component of the ANPR application. As part of this capability, the application is required to store all sightings data for as long as feasible possible, and not just where a hit has been recorded against the hotspot. This will enable the required analytical, searching and reporting functions.

In relation to storage, the essential difference between capabilities 1, 2 and 3 is the length of time a sightings record is stored. Capability 1 and 2 require temporary or short-term storage of sightings and hit data, whereas capability 3 relies on having analytical access to historical data for a much longer period of time.

13.3.3 DATA ANALYSIS PROCESS

Figure 4.4 shows how ANPR can be used to interrogate aggregate national data.

Figure 4.4  Ability to interrogate aggregate national data to aid investigation, intelligence gathering and road use analysis
13.3.4 PROCESS STEPS

**Prerequisite:** ANPR sightings, actions and alert data are present.

The interrogation process can be depicted by the following steps:

1. An authorised operator gains access to the ANPR application.
2. The user selects the data interrogation method required (report, search, analysis).
3. The user selects the report, search or analytical function they require.
4. The user enters the criteria or parameters the output is required to be based on.
5. The function is executed.
6. The output is created and delivered as per the defined business rules.

13.3.5 HIGH-LEVEL BUSINESS REQUIREMENT 6

**Ability to search and query all available aggregated national data.**

Two functions for interrogating data are the ability to search and query data stored within the database.

A search is defined as the act of looking for something. The input is semi-defined and parameters are usually entered by the user, and the output is semi-structured. A search is usually performed when trying to locate information. A search can also be executed according to predefined criteria. Searches can be performed on live or historical data:

- Live data is information that results from actions occurring in the present, for example, live tracking of a vehicle as it passes by multiple ANPR locations could be plotted on a map in real time.
- Historical data is ANPR information that has been captured in the past or represents a past event.

There are two types of searches:

- **Parametrised search**, which is required to allow the user to gather or gain information in relation to the sighting of a vehicle, and subsequent information. The user accesses a pre-written search and inputs values into the displayed fields (parameters). The search is then executed and the search results displayed. Parameters are required to be entered on a partial basis for wildcard searches on data.
- **Predefined search**, which is required to allow the user to gather or gain information in relation to sightings and related information. These searches are pre-written and the user simply executes the search and the results are displayed. This type of search does not require any user input and may be included in a batch for sequential generation at designated intervals.
A query is a request to a data source to return a set of information that is true to the requested criteria. The output of a query is usually non-structured and results are displayed in a format that can be used in another application or in standard applications for data manipulation. A query is usually used to obtain a block of data that is then going to be used elsewhere.

The types of queries required include:

- **Predefined queries**, which are similar or the same in nature of execution to the search requirement in terms of the ability for the user to input data items as parameters to query the database. However, the output is in a data format that is useful only for secondary purposes, for example, to import to an analyst application or for data sorting.

- **Ad hoc queries**, which are queries that are not pre-formatted with parameters or have predetermined structures. They are usually written by a programmer in response to a requirement to extract data from the database that cannot be achieved through the search function or by using the pre-defined query options.

Requirement 6 is described in steps 1–6 of the process [13.3.4] and is depicted in Figure 4.4. Table 4.14 lists the supporting requirements for requirement 6.

**Table 4.14 Supporting requirements for requirement 6**

<table>
<thead>
<tr>
<th>REQUIRED ABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To perform parameterised searches on all available [based on security rights/legislation/ etc] national and local data.</td>
</tr>
<tr>
<td>2. To perform wildcard [partial] searches on national sightings data.</td>
</tr>
<tr>
<td>3. To perform live searches using real-time current sightings data.</td>
</tr>
<tr>
<td>4. To use sightings data to track vehicle movements in real time.</td>
</tr>
<tr>
<td>5. To save and reuse queries and their data as a result of executing a standard query.</td>
</tr>
<tr>
<td>6. To extract data from the ANPR system into a universal data format.</td>
</tr>
</tbody>
</table>

**Assumptions**

Requirement 6 assumes that:

- ad hoc queries will be authored and quality checked by suitably qualified individuals (e.g. programmers) in an effort to ensure optimal execution

- all standard delivered queries and searches will have mandatory fields to limit large database searches

- sufficient infrastructure will be deployed to allow sufficient vehicle movement data within and across states to be captured

- appropriate access and authorisation controls will be in place.

**Constraints**

To meet the needs of requirement 6, the following constraints will need to be individually addressed (if they arise) to ensure full benefits can be realised:
• The volume of data requires the writing, compilation and execution of searches and queries in a structured way using subsets and serial requirements.

• The extraction of data in a modifiable format from the ANPR system (requirement 6) may expose a risk in terms of the security of the data and its ability to be misused. For example, if the data can be extracted and saved onto a mass storage device, it can be removed from an agency's premises.

These constraints are in addition to the key risks and issues already raised in sections 11 and 12.

Success criteria
The criteria for measuring success in fulfilling requirement 6 are:
• requested data is available in the desired format
• output is delivered in the requested format in an acceptable time frame.

13.3.6 HIGH-LEVEL BUSINESS REQUIREMENT 7

Ability to analyse all available aggregated national data.

Analysis is the examination and evaluation of the information to help select the best course of action from various alternatives. This can be demonstrated through an example of location time analysis. Where an incident has occurred, investigating officers may choose to view the ANPR data to ascertain the registration details of all vehicles that passed the location in close time proximity. This may give the officers proof that a vehicle was in the area or they may be able to locate further witnesses to the incident by getting the personal information relating to other vehicles that passed the location of interest.

The following types of analysis are required to create intelligent information from data that is already stored:

• Location time analysis is required to enable users of the ANPR system to compare vehicle number plates in a particular location with time. This type of analysis will help detect duplicate plates as vehicle sighting time and location can be compared. It can also be used to confirm that a vehicle was in the vicinity at a given time.

• Vehicle pattern analysis is required to enable users of the ANPR system to extract ANPR data relating to a specific vehicle or groups of vehicles of interest, with particular emphasis on identifying patterns of movement. For example, if a criminal is known to use a certain travel path, this function would produce a list of potential suspect vehicles that use that travel path for further investigation.

• Post-incident analysis is required to enable users of the ANPR system to obtain vehicle details in relation to an ANPR location at a particular time. For example, if a bank robbery occurred close to an ANPR camera, a list of vehicles in the area at the time of the bank robbery can be obtained. This may enhance investigation and provide law enforcement agencies with a list of potential suspects and witnesses.

• Point-to-point analysis is required to enable users of the ANPR system to accurately determine factors relating to a vehicle passing by two different ANPR locations (points). This analysis function is required to determine the time and speed a vehicle has travelled from point A to point B. This would help with a national heavy vehicle management program and
give motorists average time estimations to their destinations. The information could also be useful for search and rescue authorities. For example, if a dangerous goods vehicle operator alerts authorities of their travel path but fails to meet their destination at the estimated time, an alert could be generated and search parties distributed around the last sighting location.

- **Convoy analysis** is required to enable users of the ANPR system to gather more intelligence about movements of vehicles travelling in relation to a vehicle of interest. Examples of where this analysis could potentially be beneficial are to determine any vehicles that may have followed a rape victim, or determine associates of drug couriers who may travel with them. Convey analysis may also help law enforcement and national security agencies carry out counter-intelligence analysis.

- **Sequential pattern analysis** is required to enable users of the ANPR system to determine the travel pattern of a vehicle of interest. For example, analysis can be performed on a known drug courier’s vehicle to determine their most frequent travel path to help hypothesis where the drug warehouse may be located.

- **Geo-fencing** is required to enable users of the ANPR system to track and detect vehicle movement in relation to a geographic area. For example, the vehicles of all registered sex offenders are placed on the hotlist and an alert or a periodic report can be generated and forwarded to the case officer (based on business processes) if the vehicles are detected by ANPR cameras located in school zones. This could also be used for other categories of persons of interest (associated to vehicles) whose movements may be subject to bail conditions or court orders.

In many cases, images of a vehicle taken during a sighting can be used as additional proof that the person (suspect) was driving the vehicle at the time and location. Some enforcement activities, such as identifying unlicensed drivers, require an image of the driver in order to prove an offence has occurred without an interception.

Requirement 7 is described in steps 1–6 of the process [13.3.6] and is depicted in Figure 4.4. Table 4.15 lists the supporting requirements for requirement 7.

**Table 4.15 Supporting requirements for requirement 7**

<table>
<thead>
<tr>
<th>REQUIRED ABILITY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To perform all seven types of analysis stated above.</td>
<td></td>
</tr>
<tr>
<td>2. To determine the time it takes for a vehicle to travel a defined route (origin/destination surveys).</td>
<td></td>
</tr>
<tr>
<td>3. To have standard analysis functions without requiring raw data to be exported outside the system for analysis.</td>
<td></td>
</tr>
<tr>
<td>4. To use ANPR data to count the number of vehicles that travel past an ANPR camera or between two or more cameras.</td>
<td></td>
</tr>
<tr>
<td>5. To identify patterns in data automatically using behavioural analysis, and create holistic items.</td>
<td></td>
</tr>
<tr>
<td>6. To extract data from the ANPR system for further analysis outside the ANPR system.</td>
<td></td>
</tr>
<tr>
<td>7. To display analysed data in a graphical format.</td>
<td></td>
</tr>
</tbody>
</table>
Assumptions

Requirement 7 assumes that:

- current analytical tools being used are not affected by ANPR data analysis
- cameras are placed in appropriate locations to enable such analysis and monitoring
- appropriate controls are in place to prevent the unauthorised access and use of the ANPR data
- handling of extracted ANPR data will be subject to appropriate controls.

Constraints

To meet the needs of requirement 7, the following constraints will need to be individually addressed (if they arise) to ensure full benefits can be realised:

- Analysis functions rely on all sightings data being stored, not just sightings where a hit was made against the hitlist.
- Extracting data from the ANPR system in a common format with the intention of importing this into another analytical application may expose a risk surrounding security of the data.
- If short-term only storage of the data is adopted, this will adversely affect the ability to meet this requirement.
- Current privacy laws may prevent taking images of the driver for an unintended purpose in some states.
- Current privacy laws may prevent storing images of the driver for any time frame in some states.

These constraints are in addition to the key risks and issues already raised in sections 11 and 12.

Success criterion

The criterion for measuring success in fulfilling requirement 7 is that:

- required output is derived from data sets stored within the ANPR data store using various analytical modes.

13.3.7 HIGH-LEVEL BUSINESS REQUIREMENT 8

Ability to report on all available aggregated national data.

A report is a document or data output characterised by information or other content reflective of an inquiry or investigation, which is tailored to the context of a given situation and audience. The purpose of a report is usually to inform or provide information to the person executing the request. A report is usually in a pre-defined format or template with standard headers, columns and rows.

A variety of reports are required to give information to the user in terms of ANPR data (sightings and supplementary data). The reporting requirement at a high level can be broken into two distinctive groups:
1. Periodic reports (including batch reports)

- Periodic reports are requests for information that are executed and delivered at the same time each period or event using the same report definition, with each new report based on a new variable. For example, a report that calculates the usage of a stretch of road may contain the constant data of the location of the cameras, but the date may increment by one. So this periodic report will inform the reader of the number of vehicles that travel past a camera or set of cameras, with the frequency of the report being daily.

- A batch report is a data output that is automatically generated at a predetermined time. The execution of the report may be completed in one stage and then the running or processing may occur some time later (usually using non-peak times). For example, the above report may be programmed to execute daily, weekly or monthly, or be triggered by an event.

2. Ad hoc parameterised reports

- Ad hoc reports comprise the formatted output of a one-off request for information that is executed at a time that suits the user. Parameters (data items) are entered into a user interface and the report is executed either in real time or processed as part of a batch process. For example, the Minister for Transport requests to know how many unregistered vehicles used the M5 in February 2006. Ad hoc parameters would include the date range (February 2006), road location (M5) and count of unregistered vehicles.

- Report handling is required to be defined as per the needs of the business to avoid peaks and troughs using both local and national processing resources. Report contents and definitions are required to be further developed to enable clear and concise extraction of data for reporting purposes.

Any reporting functionality that is delivered will be required to be flexible enough to suit the changing needs of the agencies.

Requirement 8 is described in steps 1–6 of the process (13.3.4) and is depicted in Figure 4.4. Table 4.16 lists the supporting requirements for requirement 8.

Table 4.16 Supporting requirements for requirement 8

<table>
<thead>
<tr>
<th>REQUIRED ABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To have report wizards that allow the user to configure their own reports and save them for later use.</td>
</tr>
<tr>
<td>2. To have standardised periodic/batch reports that are automatically created and delivered to pre-defined recipients.</td>
</tr>
<tr>
<td>3. To perform ad hoc reporting using parameters (not from a pre-defined list).</td>
</tr>
<tr>
<td>4. To use standard ANPR reports (track vehicle, vehicle counts, vehicles stopped, number of alerts, etc).</td>
</tr>
<tr>
<td>5. To access reports in real time.</td>
</tr>
<tr>
<td>6. To produce hard copy evidence reports or print sufficient information from the ANPR system that can be used as evidence.</td>
</tr>
<tr>
<td>7. To report on alerts (the number of, the number of alerts by severity/priority, acted on, not acted on etc).</td>
</tr>
</tbody>
</table>
Assumption

Requirement 8 assumes that:

- efficient computing resources exist for required reporting functions to be provided.

Constraint

To meet the needs of requirement 8, the following constraint will need to be individually addressed (if it arises) to ensure full benefits can be realised:

- The capacity to process reports in terms of the computing resources required.

This constraint is in addition to the key risks and issues already raised in sections 11 and 12.

Success criterion

The criterion for measuring success in fulfilling requirement 8 is that:

- data is presented to the user, either online or in a printed format, based on the criteria defined at a time that has been requested and distributed as per the business rules.
Non-functional requirements are the constraints or quality components required to support delivery of the capabilities.

14.1 Accessibility

In the context of this part of the scoping study report, accessibility is used to describe the degree of 'direct access' given to the users of the ANPR system and equipment. It is required to define the levels of access and availability for the ANPR system to ensure that optimal efficiencies are realised.

Table 4.17 Accessibility requirements

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. For the ANPR system to be available 24/7 with 24/7 IT support.</td>
</tr>
<tr>
<td>2. For remote sites, mobile units and country areas to receive alerts and have access to all data in real time, the same as in city/metropolitan areas (network connectivity).</td>
</tr>
<tr>
<td>3. For agencies to be notified when unauthorised access is detected which uses their data.</td>
</tr>
<tr>
<td>4. For the system to work remotely, i.e. independent of network connection.</td>
</tr>
</tbody>
</table>
14.2 Interoperability

Interoperability is a system property that refers to the ability to work together or interoperate. The ANPR system is required to be interoperable with other core agency applications. Each state indicated a strong desire not to have another application to log in to, navigate around and find results. Instead, the ANPR application and its data should be integrated with current IT solutions.

Table 4.10 Interoperability requirements

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To couple ANPR technology with other detection devices, e.g. speed, school speed, red light, sound, smoke.</td>
</tr>
<tr>
<td>2. For the system to not duplicate data in two systems, but work efficiently together to obtain the necessary data required from each system.</td>
</tr>
<tr>
<td>3. To integrate with other input devices (other than CCTV):</td>
</tr>
<tr>
<td>• standard digital video</td>
</tr>
<tr>
<td>• digital speed cameras</td>
</tr>
<tr>
<td>• digital red light cameras</td>
</tr>
<tr>
<td>4. For the ANPR system to be fully integrated with the in-car computer system and not be another system due to the restrictions of space in the car, and be suitable for single officer operation.</td>
</tr>
<tr>
<td>5. To flexibly integrate with current core stakeholder applications.</td>
</tr>
<tr>
<td>6. To align the ANPR system with current and future business processes and design.</td>
</tr>
<tr>
<td>7. To use CrimTrac and each stakeholder’s interoperability guidelines to ensure the system can interact with current complex systems already in place, with responses back in an acceptable time frame.</td>
</tr>
<tr>
<td>8. For the system to be upgradable and interoperable with new technology without affecting the overall ability of the system.</td>
</tr>
<tr>
<td>9. To integrate ANPR image data with facial recognition software and potentially also with licence photos of other government agencies.</td>
</tr>
<tr>
<td>10. For in-car cameras and the system to connect via current equipment and consume low amounts of power.</td>
</tr>
</tbody>
</table>
14.3 Scalability

Scalability is the ability to either handle growing amounts of work in a graceful manner, or to be readily enlarged. It can refer to the capability of a system to increase total throughput under an increased load when resources (typically hardware) are added. For example, when there is an increase or decrease in the number of cameras operating as part of the ANPR system, the system will continue to perform at the agreed standard. Another example is the ability of the ANPR system to interact with other vehicle detection/tracking initiatives such as GPS tracking, the Intelligent Access Program and radio frequency identification tracking.

Table 4.19 Scalability requirements

<table>
<thead>
<tr>
<th>REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. For the ANPR application to be scalable to accept future additions of ANPR equipment and new related initiatives.</td>
</tr>
</tbody>
</table>

14.4 Security

The requirement for security in relation to ANPR is made up of the following four distinct needs:

1. physical security of the ANPR equipment
2. access level controls for users of ANPR data
3. appropriate protection of the privacy value of sightings and other data
4. communication security.

14.4.1 PHYSICAL SECURITY OF ANPR EQUIPMENT

Previous deployments of camera equipment have been subject to vandalism and require physical security to protect them from damage. Within Australia, vandalism of fixed site camera infrastructure has occurred and it is crucial to provide physical protection for ANPR units, roadside servers, and communications equipment. Physical security may include using CCTV cameras to film the ANPR camera, or encasing the equipment to make it harder for vandals to damage and/or destroy.

14.4.2 ACCESS LEVEL CONTROLS FOR USERS

This form of security is a combination of software and physical barrier systems to ensure maximum protection of ANPR data. This mitigation strategy will reduce the likelihood that data may be misused or fall into the wrong hands. Securing the data and access to it will act as a major mitigating factor to greatly reduce this risk.

All ANPR data is required to be secured using measures such as the following:

- Passwords to protect the system against unauthorised access. Passwords are required to be based on the current business process and procedure for granting access to core applications within each agency in each state.
14.4.3 APPROPRIATE PROTECTION OF THE PRIVACY VALUE

It is important to protect the privacy value of the sightings and other data at all times. Whether the function is to perform a search on stored data or take an image of a person within a vehicle, each function needs to ensure the privacy value is maintained.

14.4.4 COMMUNICATION SECURITY

The encryption of the data transferred across various networks.

Table 4.20 Security requirements

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To configure and establish user groups and assign access based on current business processes.</td>
</tr>
<tr>
<td>2. To define and maintain user access within the system to ensure security of all components of the ANPR system.</td>
</tr>
<tr>
<td>3. To allow and deny access to functionality based on the user’s security group/profile.</td>
</tr>
<tr>
<td>4. To provide secure access through firewalls and have the ability to access existing data/systems using current firewalls.</td>
</tr>
<tr>
<td>5. To use the same username and password as current systems (i.e. one login to get into main system, which will give the appropriate access to the ANPR system) for the system login/ authentication process.</td>
</tr>
<tr>
<td>6. To physically secure ANPR cameras and associated equipment.</td>
</tr>
</tbody>
</table>

14.5 Auditability

Auditability provides traceability of actions performed within the ANPR system. All transactions are required to be audited for the following types of transactions:

- viewing a record
- adding a record
- updating a record
- deleting a record.
Table 4.21 Auditability requirements

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To allow auditable records of viewing, addition, updates and deletions to the system data, including when an unauthorised attempt is made.</td>
</tr>
<tr>
<td>2. For an operator to record a correction, or misread or inaccurate read. Audit trail will be updated with this change.</td>
</tr>
</tbody>
</table>

14.6 Performance criteria

The ANPR system is required to meet a minimum agreed national performance standard. Many participants agreed that performance would need to be better than it currently is. Currently data is not issued in real time and there could be delays of many days before receiving some data.

The ability to access data in real time:
- for hotlist data – available nationally as soon as the entry is made
- for matching – the ability to match a sighting record of a vehicle passing the camera in real time to the hotlist and have a result available immediately
- for alerts – to be generated and disseminated within seconds of the match occurring.
- implies 24/7 availability of the system.

Table 4.22 Performance criteria requirements

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. For the system to conform to agreed performance standard in terms of the time required to process and return alerts, searches and analysis results.</td>
</tr>
<tr>
<td>2. To have hotlist data, sightings data and alerts in real time.</td>
</tr>
</tbody>
</table>

14.7 Maintenance

Maintenance refers to inspecting the condition of ANPR hardware components and adding (or changing) expendable parts or materials. Regular maintenance is critical to ensuring the longevity and safety of cameras. ANPR hardware is required to be maintained to a minimum nationally agreed standard and as per manufacturer standards by suitably qualified resources.

Table 4.23 Maintenance requirements

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To have an alarm status that identifies when a camera is fully operational, or not. Warnings to be generated and issued if ANPR equipment is not operational or requires attention.</td>
</tr>
<tr>
<td>2. To service and maintain all ANPR equipment to the appropriate evidentiary required standards.</td>
</tr>
</tbody>
</table>
14.8 Retention period

ANPR data is required to be retained according to the needs of the organisation and the legislative requirements governing data storage. Data is required to be stored based on business rules that are yet to be defined.

ANPR data required to be retained is defined as a:

- sighting record
- image
- plate patch.

The requirement to store data is as follows:

- **Capability 1** - Data (sighting record and plate patch) needs to be retained long enough for an immediate detection of an offence, or vehicle of interest, or to perform short-term analytical functions (such as point-to-point). If detection is associated with an offence, data is required to be stored as per the legal requirements of the business.

- **Capability 2** - ANPR data (sighting record and image) needs to be stored long enough to determine if the sighted vehicle is of interest across the state. If a match occurs, data is required to be stored to allow notification and analysis by any interested parties.

- **Capability 3** - ANPR data (sighting record and image) is required to be stored for as long as feasibly possible to allow for intelligence and/or post-incident analysis.

Once the record has exceeded its storage tolerance, it is required to be archived. However, the text string is required to be available indefinitely.

**Table 4.24 Retention period requirements**

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To stagger storage for different business uses, e.g. 12 months for traffic offences and 5 years for vehicle sightings associated with a person of interest.</td>
</tr>
<tr>
<td>2. To store all sighting data. Period to be defined based on feasibility of volume, record keeping laws and statute of limitations regulations and the business requirement.</td>
</tr>
<tr>
<td>3. To store data electronically as per the current state and national legislation (unless this changes).</td>
</tr>
<tr>
<td>4. To store text indefinitely, including historical driver information at the point the alert was created.</td>
</tr>
<tr>
<td>5. To have archival facilities for data that is no longer online.</td>
</tr>
<tr>
<td>6. To have sufficient storage to handle large volumes of intended data and images (both for live and archived) based on business and legislative requirements.</td>
</tr>
<tr>
<td>7. To have an enterprise data warehouse with secure storage and centralised data management.</td>
</tr>
<tr>
<td>8. To access data using a national storage solution that is accessible by all states.</td>
</tr>
<tr>
<td>9. To have backup and recovery capability for the centralised ANPR database/system.</td>
</tr>
</tbody>
</table>
14.9 Standards/legal
The ANPR system must conform to various nationally agreed standards.

Table 4.25 Standards/legal requirements

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To measure and certify the ANPR system nationally (i.e. test it to ensure it has correctly implemented national standards).</td>
</tr>
<tr>
<td>2. To ensure system and shared data adheres to state and national evidentiary data standards based on the business requirement.</td>
</tr>
<tr>
<td>3. To meet national standards for:</td>
</tr>
<tr>
<td>• capturing data</td>
</tr>
<tr>
<td>• sharing data</td>
</tr>
<tr>
<td>• storing data.</td>
</tr>
<tr>
<td>4. To develop standards, policies and procedural rules for using, handling, retaining and managing ANPR data, information and system based on each state’s policies, procedures, quality control and legislative requirements. Assurance programs used to audit the system to be developed.</td>
</tr>
<tr>
<td>5. To certify all ANPR equipment to ensure evidentiary standards are met.</td>
</tr>
</tbody>
</table>

14.10 Resources
Due to the significant volume of data being captured, there is a requirement to have additional and dedicated resources to manage the additional work.

Resources are classified as:
• human – dedicated human resources that will operate and maintain the ANPR system
• hardware – additional processing capability and dissemination ability, including the hardware required to use ANPR-enabled vehicles (including in-car computer systems)
• software to manipulate data for analytical and informative purposes.

Table 4.26 Resource requirements

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To have dedicated ANPR-trained resources to operate 24/7 for combine with existing command centre functions which will enter hotlist items, perform searches, monitor vehicle movements, and manage the application and any complaints that may arise from using the system.</td>
</tr>
<tr>
<td>2. To have the implementation, ongoing support, training and maintenance costs associated with implementing ANPR sponsored and funded by the Australian Government.</td>
</tr>
</tbody>
</table>
14.11 Usability

Usability refers to the ease with which people can employ the system in order to achieve a particular goal. It usually refers to the elegance and clarity with which the interaction with a computer program is designed.

In terms of usability:

- any front-end application deployed must be intuitive to the user and be user-friendly
- all users must receive full training, not just in terms of how to execute particular tasks, but also on how to get the maximum result from such an application
- ANPR is required to be integrated into current applications so that it appears seamless to the user in terms of using the application.

Table 4.27 Usability requirements

<table>
<thead>
<tr>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. For the system, when delivered, to be easy to use and cost-effective. Units fitted into cars must integrate with current standard fit-out.</td>
</tr>
<tr>
<td>2. For the system to be flexible and customisable enough to meet various business strategic goals.</td>
</tr>
<tr>
<td>3. For the system, when delivered, to be coupled with appropriate level of training for users.</td>
</tr>
</tbody>
</table>

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CRIMTRAC
Responsive • Innovative • Accountable

Released by the CrimTrac Agency under the Freedom of Information Act 1982
This part of the CrimTrac Automated Number Plate Recognition (ANPR) scoping study report combines the findings from Parts 3 and 4 to determine the gap between current and future ANPR infrastructure and functional requirements needed to deliver a national ANPR capability in Australia. This information was then used to create the technical options and infrastructure costings outlined in Parts 6 and 11 of this scoping study report.
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Released by the CrimTrac Agency under the Freedom of Information Act 1982
CrimTrac analysed the results of a survey sent to all stakeholders to determine the ANPR infrastructure requirements for an optimal national ANPR coverage against the business requirements identified in Part 4 of this scoping study report.

The gap analysis identified two main capabilities required to achieve the national ANPR capability outlined in Part 4:

1. national ability to capture vehicle sightings and detect vehicles of interest.
2. national ability to analyse and report on all available data.

Each capability requires two components – physical infrastructure and functional processes.

The CrimTrac survey of infrastructure requirements revealed that the optimal base level national ANPR coverage would require the following, strategically located:

- 1349 fixed ANPR sites
- 128 portable ANPR units for mobile speed vans
- 88 portable units
- 1326 in-vehicle units.

All ANPR infrastructure is required to be available 24/7 and networked within and across agency boundaries to capture and share all sightings data in near real time. This will create a heavy reliance on both wireless and fixed communication channels as it is estimated that 10 billion sightings will be captured and evaluated each year.

These sightings will need to be stored in a database that has the ability to relate vehicle and owner details to sightings data, alerts and hothits. The data is required to be accessible to all users 24/7 to interrogate, query, search, analyse and report. As these storage and functional requirements cannot be met by any existing agency system, a new system will need to be built to meet the above requirements. Current agency systems will then need to be upgraded to complement the new system and its agreed standards.
2 METHODOLOGY

To identify and substantiate current and future infrastructure and functional requirements, CrimTrac analysed the stocktake and business requirements (Parts 3 and 4). It then developed a survey to identify state infrastructure requirements needed to provide the optimal baseline national ANPR coverage for road safety, law enforcement and national security. Stakeholders included state and Commonwealth law enforcement and regulatory agencies.

2.1 Survey methodology

To help stakeholders estimate the optimal amount of ANPR infrastructure required, and the traffic volumes for various road types, guidelines were defined and accepted by the ANPR Sponsoring Group.

Based on these guidelines, an infrastructure requirements survey was distributed to stakeholders to identify future ANPR infrastructure requirements based on four categories:

1. New fixed sites and ANPR cameras required to provide optimal coverage of all national, state and local roads.
2. Current ANPR-compatible fixed sites and mobile units that can be upgraded to supplement national ANPR infrastructure.
3. Current agency fleet vehicles that require mobile or in-vehicle ANPR capability.
4. Fixed sites and ANPR cameras required to provide optimal coverage of all state and Commonwealth, or privately owned or operated, critical infrastructure.

A number of states were unable to forecast their future ANPR infrastructure requirements due to policy considerations, so CrimTrac estimated the requirements using the responses of similar sized states. When the collated infrastructure requirements were presented to the ANPR Sponsoring Group, it asked for the numbers to be moderated. Accordingly, CrimTrac moderated the figures using the following technique:

1. The number of new gantries and poles were limited to the number of new fixed sites identified.
2. Sufficient fixed sites and ANPR cameras required to provide optimal coverage of critical infrastructure owned or regulated by the Commonwealth were included.
3. The number of fixed sites and ANPR cameras required for covering critical infrastructure owned or regulated by the Commonwealth was doubled to provide optimal coverage of state-owned critical infrastructure.
4. All current ANPR-compatible fixed and mobile units were included for upgrade.
5. In-vehicle and mobile ANPR capability requirements included 25% of all agency vehicles.

6. All new red-light and fixed speed camera sites were excluded.

These moderated numbers were also used to determine the cost of the future ANPR implementation (see Part 1).

2.2 Analysis methodology

Section 5.1 shows the current and future desired business processes and functional requirements needed to obtain a national ANPR capability. The results were obtained by analysing the stocktake and business requirements (in Parts 3 and 4).

The stocktake also identified large disparities between stakeholder ANPR capabilities. For the purpose of the gap analysis, the extent of the disparity has been generalised. For agency-based evaluation of their ANPR capability, see Part 3.

The gap was analysed using the two main capabilities identified as being required to achieve the national ANPR capability:

1. National ability to capture vehicle sightings and detect vehicles of interest, which describes what is required to capture sightings data and evaluate it against hotlists to detect vehicles of interest. It includes the ability to create national hotlists, create and send alerts nationally, and to access additional information required to manually adjudicate alerts.

2. National ability to analyse and report on all available data, which describes what is required to collate all sightings data to allow intelligent interrogation of the data.

These capabilities encapsulate all three main business requirement capabilities, including the underlying capability to share information nationally.

Each capability was analysed in terms of its infrastructure (hardware) and functional (software) requirements (see Part 4 for more information about the business requirements).
3 NATIONAL SIGHTINGS CAPTURE AND VEHICLE DETECTION

This describes the national ability to capture sightings and evaluate these sightings against the national hotlist in real time, which requires ANPR capture devices (infrastructure) and software logic (functional).

3.1 Infrastructure requirements

Each agency with an ANPR capability owns and maintains its infrastructure to meet its business needs in accordance with state legislative and privacy requirements. Generally, the systems and sightings data collected are confined to local sites and networked only to the agency system. The only exception is the Safe-T-Cam network of fixed sites that monitor heavy vehicle traffic between New South Wales and South Australia. ANPR coverage is generally poor and does not provide full-time coverage of highways, state, local and regional roads, or around critical infrastructure sites.

The future national ANPR capability described in the business requirements needs:

1. Real-time, 24/7 national ANPR coverage strategically located to cover all highways, state, local and regional roads and all critical infrastructure.

2. A variety of ANPR infrastructure to be provided to both state and Commonwealth agencies for road safety, law enforcement and national security.

3. All ANPR infrastructure to be securely networked for real-time updates and data sharing between and across agency boundaries.

4. All ANPR infrastructure to be certified to meet evidentiary standards and adverse environmental conditions.

Table 5.1 summarises moderated stakeholder survey responses on the level of ANPR infrastructure required to achieve the first and second requirement. The estimated annual sightings figure was determined by multiplying the number of new sites, mobile and in-vehicle units with the average annual daily road traffic volume. Section 5.2 contains a detailed breakdown of infrastructure requirements, by state, and section 5.3 contains information on the average annual road traffic volume.
Table 5.1 National ANPR Infrastructure requirements

<table>
<thead>
<tr>
<th>ANPR CAPTURE POINTS</th>
<th>GAP</th>
<th>TOTAL ANPR CAPTURE POINTS</th>
<th>ESTIMATED ANNUAL SIGHTINGS (BILLION)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UPGRADES</td>
<td>NEW</td>
<td></td>
</tr>
<tr>
<td>National</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed</td>
<td>818</td>
<td>731</td>
<td>1349</td>
</tr>
<tr>
<td>Mobile for speed vans</td>
<td>89</td>
<td>43</td>
<td>128</td>
</tr>
<tr>
<td>Portable</td>
<td>0</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>In-vehicle</td>
<td>0</td>
<td>1326</td>
<td>1326</td>
</tr>
</tbody>
</table>

Table 5.2 represents the portion of the new ANPR sites represented in Table 5.1 that are dedicated to covering state and Commonwealth owned and operated critical infrastructure, national highways, freeways, regional roads, state and local roads.

Table 5.2 Site breakdown

<table>
<thead>
<tr>
<th>STATE</th>
<th>CRITICAL INFRA-STRUCTURE</th>
<th>NATIONAL HIGHWAYS</th>
<th>STATE ROADS</th>
<th>LOCAL ROADS</th>
<th>FREeways</th>
<th>REGIONAL ROADS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT</td>
<td>65</td>
<td>13</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NSW</td>
<td>57</td>
<td>35</td>
<td>20</td>
<td>15</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NT</td>
<td>36</td>
<td>57</td>
<td>12</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>QLD</td>
<td>16</td>
<td>25</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SA</td>
<td>39</td>
<td>35</td>
<td>30</td>
<td>0</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Tas</td>
<td>4</td>
<td>12</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>VIC</td>
<td>10</td>
<td>52</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>WA</td>
<td>33</td>
<td>18</td>
<td>13</td>
<td>28</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>260</td>
<td>247</td>
<td>116</td>
<td>46</td>
<td>43</td>
<td>19</td>
</tr>
</tbody>
</table>

It is envisaged that for all the sites, a fixed pole with three ANPR cameras will provide sufficient coverage. The three cameras could be configured to monitor three lanes, or two lanes with the spare placed at a different site. Site location is anticipated to be more condensed within high-population and high-volume traffic areas and around critical infrastructure, and less dense towards regional areas.

National highways include the AusLink network, which covers 22,500 kilometres of roads across Australia and is used by the community to primarily travel across state borders. It is envisaged that placing fixed gantry sites at these locations will enhance the ability to monitor vehicle movements across borders. This would complement current initiatives such as managing heavy vehicles, driver fatigue and cross-border criminal activity. At each of the 12 state border crossings, a fixed gantry
site with four ANPR cameras has been allocated to cover both directions, up to four lanes. Section 5.4 contains a map of the AusLink network.

To satisfy requirement 3 and 4 above, each fixed site, mobile and in-vehicle unit identified in Table 5.1 will require near real-time network connection to agency systems to allow the national sharing of sightings data, hotlist information and alerts. To achieve this, portable and mobile devices will require wireless connectivity and fixed sites will require the installation of network cabling or wireless connectivity. ANPR capture systems must have the capacity to store all sightings data and images if the network is congested with high volume or is down, or the unit is disconnected. A nationally agreed minimum data set is also required to be defined for sightings, hotlists and alerts, and adhered to by all agencies. Engineering and road works to install the required physical infrastructure at each fixed site will also need to be scheduled with the regulatory agencies to ensure the safety of drivers and construction crews and that the effect on traffic is minimised.

3.2 Functional requirements

Functionally, the processes required for mobile roadside and in-vehicle units compared to fixed sites is significantly different, most noticeably in the requirement for instant evaluation and alert generation when a vehicle of interest is detected. These two processes are fundamentally different as law enforcement agencies, the main users of mobile and in-vehicle units, are generally required to investigate the alert immediately, while regulatory agencies, the main users of fixed sites, do not. These two processes are described below.

Currently, within a mobile operation, hotlists are manually downloaded to laptops at the beginning of a mobile intercept operation. Hotlists usually target stolen vehicles, vehicles associated with a person of interest (such as an unlicensed driver or person with a warrant) and unregistered vehicles. Every vehicle passing the ANPR camera is captured and immediately evaluated against the hotlist. If an alert is generated, it is manually communicated for investigation. Within this process, hotlists are not updated in real time, and may not be current when used for evaluation. Sightings text and alerts may be kept for statistical purposes but are not shared with other agencies.

Currently, only the NSW Roads Traffic Authority's fixed sites are networked to the agency systems and receive hotlist information in near real time. Hotlists usually contain vehicles of interest to law enforcement agencies. They may also contain a white list of permitted vehicles, as in the case of bus lane camera networks. Every vehicle passing the ANPR camera is captured and immediately evaluated against the hotlist. However, sightings data is only sent to the agency system for manual adjudication when an alert is raised. If an offence is detected, then supporting data is stored for evidentiary purposes. Sightings information is not regularly shared among agencies except in the case of heavy vehicle management between NSW and South Australia. However, where it is stored, law enforcement agencies may manually request the data from regulatory agencies.

The future national ANPR capability described in the business requirements needs:

1. The ability to capture all sightings to the agreed national standard, including the originating state of the vehicle.
2. Optical character recognition (OCR) capability to automatically identify the sightings data and exclude null or poor sightings from evaluation.
3. The ability to perform automatic real-time evaluation of sightings with the most current hotlists.
5. The ability to allow for manual adjudication and updates to an alert, for mobile and in-vehicle units.

6. The ability to share all sightings, hotlists and alerts in real time within and across agency boundaries.

Current OCR technology is unable to meet the first requirement to capture the originating state identifier on a number plate. This requirement would be beneficial for a national ANPR capability and would require either advances in camera and OCR technology or a national approach to number plate design. It is also important to note that cameras work best when covering one lane, but in the United Kingdom one camera can cover two lanes with a high sightings success rate. The privacy impact of capturing all sightings data is discussed in Part 7 of this scoping study report.

Requirements 2-4 are standard capabilities of any current ANPR system, but will require each ANPR camera to be configured by expert vendors, to obtain the best image for each site environment. Requirement 5 is an improvement to additional functionality to allow adjudication and the action taken in response to an alert to be saved with the original alert data. Requirement 6 has been addressed by the infrastructure requirements.
4 NATIONAL ANALYSIS AND REPORTING

National analysis and reporting describes the national ability to store all relevant vehicle and person of interest details, sightings, hotlists and alerts to allow analysis and reporting to be performed. To achieve this, the national ANPR solution requires the appropriate infrastructure and functions outlined below.

4.1 Infrastructure requirements

Currently, agency-based ANPR systems work in isolation from other agency systems and operate satisfactorily to meet agency data storage and use. All agencies currently have minimal storage capacity requirements as law enforcement agencies at most, only store text data of sightings, while regulatory agencies only store text and images of the sightings when a confirmed offence has been detected. These systems provide minimal analysis and reporting capability and are usually required to respond only to single processing requests when data is required to be interrogated. Each agency manages the scalability, interoperability, security, maintenance, backup and recovery of its system.

The future national ANPR capability described in the business requirements needs:

1. Storage of approximately 18 billion sightings yearly, images associated with sightings, hotlists and alerts that meet national record management retention periods.

2. Storage of other relevant vehicle and person of interest details (such as vehicle registration, owner details, warnings associated with the owner).

3. High-speed processing capability to process multiple requests to search and interrogate all available data with real-time response.

4. Physical infrastructure to comply with national scalability, interoperability, security, maintenance, backup and recovery requirements.

5. Real-time, 24/7 connectivity to agency systems and other relevant databases.

6. Real-time, 24/7 accessibility to the system.

Requirements 1 and 2 require a large storage capacity to hold all relevant data. This database is required to organise and structure data to allow sightings data to be associated with vehicle registration, owner details, or other required data such as warnings associated with the owner. This ability is usually found in relational database management systems that gather and store data centrally. Record management retention periods will need to be defined and will require legislative guidelines (see Part 8 for information on legislative impacts).
To satisfy requirement 3, the system performing the search and interrogation will require high processing power to cater for multiple processing requests from various users. These requests may occur simultaneously, with the expectation that results will be provided instantly. This would also suggest that the system is required to allow multiple sessions/instances of each function to occur.

Requirement 4 contains standard compliance requirements to ensure that the infrastructure chosen can grow to meet future requirements. New technology may emerge such as radio frequency identification, which may complement future ANPR capability. Physical security of ANPR infrastructure is required to ensure the safety and integrity of the data, system and communication, while backup and recovery is required to help recover data if the system crashes or is corrupted.

Requirements 5 and 6 are needed to continuously benefit from a national ANPR capability. ANPR is a proven technology to aid road safety, law enforcement and national security, which operate 24/7 nationally. Stakeholders require access to the system 24/7 to complement their operational hours.

A new system needs to be built to meet the above requirements and current agency systems upgraded to complement the new system and standards.

### 4.2 Functional requirements

Functionally, each agency system is unique. Hotlists and alerts have varied content and may exist in multiple formats. They are produced and maintained manually from data sources that are often external to agencies, and therefore may become inconsistent with updated source information. All systems have minimal search, query, analysis and reporting capabilities and standard analysis and reporting tools are not provided. Any results from interrogating data may be exported, but are not regularly shared among agencies. Each agency manages the accessibility, interoperability, scalability, security, performance criteria, auditability, quality control, data retention, backup and recovery, maintenance and the usability standards of its system and conducts its own user training.

Video footage taken from non-ANPR-enabled cameras would require manual intervention to process the footage through an OCR engine in order to perform automatic number plate recognition, and must be manually viewed to determine suspect vehicles.

The future national ANPR capability described in the business requirements needs:

1. Hotlist and alert management.
2. Ability to perform ad hoc searches and queries on all available data.
3. Ability to interrogate and analyse all available data using ad hoc and standard analysis tools.
4. Standard analysis tools to include post-incident analysis, geo-fencing capability, location time analysis, vehicle pattern analysis, point-to-point analysis, convoy analysis and sequential pattern analysis.
5. Ability to create ad hoc reports or utilise reporting wizards to create reports.
6. Ability to share all available data within and across system boundaries.
7. Ability to input and utilise OCR capability to generate a list of vehicles from video footage taken from non-ANPR cameras.

The above requirements create the intelligence of the national ANPR capability. It allows all available data to be easily analysed, interrogated and reported to create useful information that incorporates all relevant data required to make informed decisions.
The future national ANPR capability described in the business requirements will also need the following supporting requirements:

1. Direct, real time, 24/7 access to the system.
2. The ANPR system to be interoperable with other core agency systems.
3. The ability for the ANPR application to be scalable to accept future additions of ANPR equipment and new related initiatives.
4. Security of system data and communication channels.
5. Audit logs that provide traceability of actions performed within the system.
6. High accessibility and availability of the system to meet national performance standards.
7. The ability to be easily maintained.
8. The ability to manage retention of ANPR data according to the needs of the organisation and the legislative requirements.
9. Backup and recovery processes and supporting hardware.
10. User training that is specific to the tools and audience.

The above requirements have been substantiated in the previous section based on their relevance to infrastructure requirements. The relevance of these requirements in terms of the future national ANPR capability to functionally be capable of analysing and reporting all available data is the same.

Currently all requirements cannot be met by any agency system. A new system is required to be built to meet the above requirements and current agency systems upgraded to be interoperable with the new system and standards. All agency systems and the new system need to be networked, and agencies need to collectively provide input, support and agree to standard file formats and procedures for managing, updating and administering data. Detailed requirements for system security, analysis functionality and reporting capability, need to be considered, and the content and management of data capture, hotlists, alerts and actions need to be defined. Quality assurance measures, system standards and service-level agreements will need to be administered nationally.
5.1 Detailed Gap Analysis

Table 5.3 National capture and evaluation

<table>
<thead>
<tr>
<th>NOW</th>
<th>FUTURE</th>
<th>GAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Vehicle number plate and image is captured and interrogated by ANPR recognition software.</td>
<td>• Vehicle number plate, state identifier and image needs to be captured and immediately interrogated by ANPR recognition software.</td>
<td>• A nationally agreed data set for capture needs to be defined and adopted by all agencies.</td>
</tr>
<tr>
<td>• Many, but not all systems, exclude null or poor sightings records from evaluation.</td>
<td>• All null or poor sightings records are flagged as not to be used in evaluation against hotlists.</td>
<td>• Infrastructure that captures the state identifier needs to be implemented.</td>
</tr>
<tr>
<td>• Law enforcement agencies disconnected mobile units utilise a laptop. Hotlist and sightings data is usually uploaded and downloaded via USB key.</td>
<td>• Cameras optionally evaluate sightings locally and upload sightings for central evaluation.</td>
<td>• Agency systems must record null or poor sightings and exclude them from evaluation against hotlists.</td>
</tr>
<tr>
<td>• Fixed Road Traffic Authority ANPR cameras upload and match against hotlists locally. Alerts are transferred in near real time to the agency system for adjudication.</td>
<td>• For disconnected use, the uploading of sightings data should occur as soon as a network connection is present.</td>
<td>• National standards for confidence levels need to be defined.</td>
</tr>
<tr>
<td></td>
<td>• Agency networks (both fixed and mobile) need to be upgraded to enable uploading of sightings and images for central evaluation.</td>
<td>• Capture systems need to be upgraded to send standard sightings in file formats.</td>
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</tbody>
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