Engaging criminality – denying criminals use of the roads

PA Consulting Group is a leading management, systems and technology consulting firm, with a unique combination of these capabilities. Established almost 60 years ago, and operating world-wide from over 40 offices in more than 20 countries, PA draws on the knowledge and experience of around 3,300 people, whose skills span the initial generation of ideas and insights all the way through to detailed implementation. PA understands the issues and the challenges shaping government and public service organisations. We help ensure increased benefits from public spending by delivering effective change that respects public service values and accountabilities. PA has worked extensively with the police since 1988. During this time our many assignments have involved, at some point, every police force in the United Kingdom.

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Hazel Blears
Minister of State for Crime Reduction, Policing and Community Safety

Executive summary

Automatic Number Plate Recognition (ANPR) is an established technology that allows vehicles observed by video cameras to have their vehicle registration mark (VRM) 'read' using pattern recognition software. Police have used ANPR systems at strategic points for a number of years, for example at ports, tunnels and as part of the 'ring of steel' around the City of London. With the improvements in ANPR technologies and an overall reduction in IT costs, the police have begun to look to ANPR as a viable tool to help tackle crime.

Nine forces were selected to undertake the pilot of an ANPR-enabled intercept team over a six-month period. PA Consulting Group was commissioned by the Home Office Police Standards Unit to undertake an independent evaluation.

The pilot showed that the majority of ANPR officers' time is spent in the field, either on intercept duties or travelling to and from intercept duties (79%). This is significantly higher than a 'typical' police officer – a recent Home Office report[1] found that on average a police officer spends only 57% of their time away from their police station.

Accepting that there are clear differences between the work undertaken by intercept officers and typical police officers, we conclude that in simplistic terms the operation of ANPR-enabled intercept teams provides for more officer time 'on-street', and hence, more visible policing.

The proportion of time spent on intercept duties stayed broadly the same throughout the pilot period and was more or less similar across the nine forces. Given that forces were sharing/adopting good practices during the pilot in order to improve their efficiency, we conclude that it is unlikely that ANPR-enabled intercept team officers will be able to spend a significantly greater proportion of their time on intercept duties without major changes to work practices (for example, adoption of IT to reduce bureaucracy or dedicated prisoner handling duties).

On average, one vehicle was stopped per officer hour intercepting. This level of performance was maintained throughout the pilot. In overall terms, 39,188 vehicles were stopped during 73,546 staff hours (including administration, prisoner handling and civilian time) – this equates to one vehicle stopped for every two hours staff input.

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[1] *Diary of a Police Officer*, PA Consulting Group (Home Office, Police Research Series Paper 149, 2001)

Feedback from the field suggested that ANPR teams spent little time waiting for hits (dead time) and most of their time investigating vehicle hits – this is supported by the fact that less than 13% of vehicles that actually registered an ANPR hit were stopped (particularly so for CCTV based systems).

While vehicle stops per hour is an interesting metric, it is not a useful indication of efficiency or relative performance. Indeed, it was shown that more vehicles stops per hour corresponds to fewer arrests. Given the Government's desire to narrow the justice gap (bring more offences to justice), we conclude that the most appropriate performance indicator for intercept teams is arrests per 100 vehicle stops. The number of vehicle stops per intercept hour should be monitored as a secondary indicator.

The results from the pilot indicate that **each Police Constable operating as part of an ANPR-enabled intercept team would expect to make approximately 100 arrests per year – 10 times the national average for a Police Constable.**[2] ANPR-enabled intercept teams could therefore make a very significant impact on the Government's narrowing the justice gap target. In addition, on the basis of the average results achieved during the six-month pilot, each Police Constable operating as part of an ANPR-enabled intercept team would **also** expect annually to:

• recover 11 stolen vehicles, with a total value of approximately £68,000

• recover stolen goods on three occasions, with a total value of approximately £23,000

• seize drugs on seven occasions, with a total street value of approximately £3,300

• seize two offensive weapons/firearms

• recovery property on five occasions.

ANPR intercept teams can be disrupted or restricted due to poor weather and darkness. Given that the pilot was conducted in the six months of the year with the poorest weather and light conditions, we conclude that it would not be unreasonable to assume that results achieved over a full year would be as good, if not better than those during the pilot.

[2] Nationally 125,682 full time equivalent Police Officers made 1,264,200 arrests in 2000/2001 – this equates to 10 arrests per officer per annum (Home Office)

There was no evidence from the pilots as to what the optimum number of ANPR-enabled intercept teams and officers was per force area. However given the small proportion of ANPR hits that were stopped and the number of markers/flags on the databases used by the intercept teams, we conclude that the current staffing of intercept teams could be increased considerably.

On this basis we conclude that ANPR-enabled intercept teams have shown to be an extremely effective means of engaging with criminals. Using a range of police intelligence and experience, intercept teams were able to disrupt criminal activity in an efficient and effective manner, achieving arrest rates 10 times the national average.

The pilot identified a number of areas where operations could be improved. Once these have been addressed and given the development of good practice procedures, it would be expected that ANPR would be an even more effective policing tool than was shown in the pilot.

The Home Office and ACPO have recognised the potential of ANPR and in the next stage will expand the number of intercept officers by five-fold within a carefully managed programme across 23 forces. This programme includes a number of workstreams including technical development, Human Resource issues, financing, communications, good practice dissemination and evaluation. Given this, many of the issues raised during the first stage are being addressed.

This evaluation report highlights that the widespread adoption of ANPR-enabled intercept teams could have a very significant impact on the wider criminal justice system, including the courts and prisons and potentially in turn, on crime rates. This evaluation focused on the operational aspects of ANPR-enabled intercept teams. To inform the decision about national roll-out, it will be key to know the outcome of arrests made by intercept teams relative to conventional policing; for example, are cases generated by ANPR roadside stops more or less likely to go to court? Have defendants pleaded guilty or been successfully convicted following trial compared to current caseload? There is anecdotal evidence from the first pilot to suggest this may be the case. We, therefore, recommend that this aspect be evaluated in full as part of the next stage of piloting.

1. Introduction

Background

Automatic Number Plate Recognition (ANPR) is an established technology that allows vehicles observed by video cameras to have their vehicle registration mark (VRM) 'read' using pattern recognition software. When combined with other resources and data, ANPR can be an extremely powerful tool in:

- **road tolling** – for example, the London Congestion Charging Scheme uses ANPR-enabled cameras to identify vehicles passing into/out of the congestion charge zone. This information is subsequently used to levy tolls and to penalise non-payers

- **vehicle tax evasion** – for example, the Driver and Vehicle Licensing Agency (DVLA) uses ANPR as part of a system to ensure that vehicles on the road have current Vehicle Excise Duty (VED)

- **congestion warning** – for example, Trafficmaster uses a national network of ANPR cameras to measure speed between cameras and, from this, identifies areas of the road network that are congested. This is then used to provide information to drivers.

The police have used ANPR systems at strategic points for a number of years, for example at ports, tunnels and in the 'ring of steel' around the City of London as part of counter terrorism measures. With the improvements in ANPR technologies (which has led to increased accuracy of the reading, and the ability to process, a greater volume of images) and an overall reduction in cost, police have begun to look to ANPR as a proactive tool to help address volume crime.

Recognising the potential of ANPR, in 2002 the Home Office provided each police force in England and Wales with a mobile ANPR unit and back office facility. With this equipment, forces came to recognise that the most effective way of exploiting ANPR was to use it with dedicated intercept teams, typically comprising around six police officers operating either on motorcycles or from cars. These officers could then intercept and stop vehicles identified by the ANPR system as worthy of interest, and were thus called an 'ANPR-enabled intercept team'. Only a few forces had previously used ANPR-enabled intercept teams on a small scale, and there had been no formal evaluation of their operation.

Given that the use of ANPR-enabled intercept teams represented a significant development in policing in terms of using technology and intelligence, the Home Office Police Standards Unit and the Association of Chief Police Officers (ACPO) decided to undertake a pilot over a six-month period (30 September 2002 to 30 March 2003).

Nine forces were selected to undertake the pilots, reflecting a cross-section of force types and geographies. These were Greater Manchester, Metropolitan, North Wales, Avon and Somerset, Northamptonshire, Kent, West Yorkshire, Staffordshire and West Midlands (covering the areas shown in Figure 1).

The aim of the pilot was to gather evidence on the operations of ANPR-enabled intercept teams to inform potential national rollout. The specific objectives of the pilot were as follows:

1. To test the concept of dedicated intercept teams using ANPR to target criminality

2. To explore the impact of ANPR teams, including actions taken and arrests made

3. To consider the performance of intercept teams relative to conventional policing methods

4. To identify good practice in the operation of ANPR-enabled intercept teams

5. To make recommendations as to how the effectiveness of the ANPR-enabled intercept teams could be improved and how their use may be rolled out nationally.

Evaluation methodology

PA Consulting Group (PA) was commissioned by the Home Office Police Standards Unit to undertake an independent evaluation of the operations of ANPR-enabled intercept teams. In parallel, a team within the Police Standards Unit was charged with developing the good practice guide. In undertaking the evaluation, PA worked closely with this team to understand practices that worked well in the field. The good practice guide, which has been published within the police service, outlines the technologies and processes involved.

The key elements of the pilot evaluation were:

• preparation of a data collection model to be used by each intercept team. This model was customised for each force

• briefings and field visits to each of the nine pilot areas to ensure that data was collected in a consistent manner and to discuss the operation of ANPR-enabled intercept teams

Figure 1: Map of pilot areas
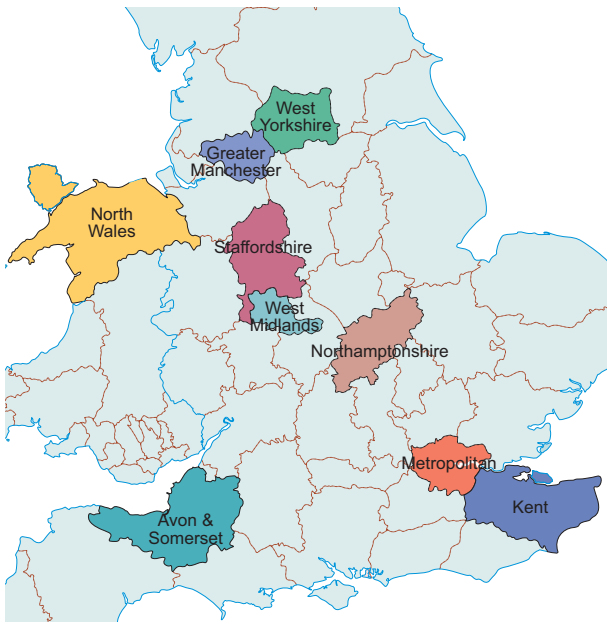
- collation of information recorded by the intercept teams on each stop and officer deployment information

- data cleansing and validation.

This report

This report presents the findings of PA's evaluation of the introduction of ANPR-enabled intercept teams. It contains three further chapters as follows:

- chapter 2 explains the operation of the ANPR-enabled intercept teams

- chapter 3 summarises the evaluation findings

- chapter 4 sets out the conclusions and makes a number of recommendations.

2. The pilot experience

The link between vehicle documentation and general crime

In the UK there is a large volume of vehicle documentation crime, for example:

- there are over 1.76m vehicles on the road that do not have a **valid vehicle excise duty (VED)** (approximately 5.5% of all vehicles on the road). This evasion costs the HM Treasury over £190m per annum[3]

- the DVLA has **no registered keeper information** for approximately 1.9m vehicles on the road. Anecdotal evidence from traffic police suggests that for those vehicles for which there is registered keeper information, the actual keeper is likely to be different to the registered keeper in at least 10% of cases

- as many as 10% of cars do not have a **valid vehicle MOT test certificate**

- the Association of British Insurers estimate that there are at least one million persons driving regularly while **uninsured**, ie about 5% of all drivers.

Historically, the police have not focused on these crimes for a number of reasons. Firstly, **the crimes themselves were not seen to be significant**. However, recent evidence suggests that there is a strong correlation between vehicle crime and other, more serious, crimes. A Home Office study[4] demonstrated the link between traffic offending and general criminality. The study found that of those parking illegally in disabled parking bays:

- 21% of vehicles were of immediate police interest

- 33% of keepers of the vehicles had a criminal record

- 49% of the vehicles had a history of traffic violations

- 18% of vehicles were known or suspected of use in a crime

- 11% of vehicles were in breach of traffic law, eg no VED.

These figures are significantly higher than the 'average' vehicle/vehicle driver.

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[3] Vehicle Excise Duty Evasion 2002, (DFT)

[4] *Illegal Parking in Disabled Bays: A Means of Offender Targeting*, by Sylvia Chenery, Chris Henshaw and Ken Pease (1999, Home Office RDS)

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The Home Office has also completed a study of the criminal history of serious traffic offenders.[5] The study examined the extent to which anti-social behaviour on the road is linked to wider criminal activity. It looked specifically at drink drivers, disqualified drivers and dangerous drivers. A key finding was that disqualified drivers showed a similar offending profile to mainstream criminal offenders. Seventy nine percent had a criminal record prior to disqualification (72% for mainstream offenders), and they were equally likely to be convicted again within a year (37% were reconvicted).

Importantly, however, police used prior intelligence in only half of all arrests. This suggested that if the police were able to access intelligence at the road-side, this could help more effectively target resources.

An important point that emerged from the study was that those repeatedly committing serious traffic offences are likely to commit mainstream offences as well. The evidence shows that serious traffic offenders cannot be thought of as otherwise law-abiding members of the public. Even drink drivers (who were less involved in mainstream crime than other serious traffic offenders) were estimated to be twice as likely to have a criminal record as members of the general population. When serious traffic offenders were reconvicted, there was a tendency for repeat serious traffic offending (especially disqualified driving), although this was in a context of more generalised criminal offending.

Vehicle documentation crime has not been a focus due to **significant resource constraints upon traffic police as a result of other policing priorities**, ie those officers who would normally undertake vehicle documentation enforcement. For example, a study published in 2003[6] estimated that less than 6% of police personnel are dedicated to traffic and vehicle duties. In spite of an increase in traffic volume and vehicles, the number of designated road traffic police has fallen by 12% over the last five years. An analysis of activity undertaken by these traffic police officers shows that less than 5% of their time is spent on static vehicle checks and vehicle documentation

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[5] *The Criminal History of Serious Traffic Offenders*, by Gerry Rose (2000, Home Office RDS)

[6] *Roles and responsibilities review Highways Agency/ACPO,* PA Consulting Group, 2003

Figure 2: ANPR intercept process

| Stage 1:
Vehicle passes ANPR camera | Stage 2:
ANPR camera records digital image | Stage 3:
Digital image processed to identify VRM | Stage 4:
VRM checked with relevant databases | Stage 5:
Where appropriate action taken |

Mobile Unit

CCTV

In car system

Matches with relevant databases

PNC, FIS, etc.

ANPR System

Flags up vehicles for action

Vehicle stop and investigation undertaken

Decision to stop vehicle

checks – this equates to approximately 300 full time officers across England and Wales. The figures suggest that relatively little police time is spent undertaking proactive vehicle checks.

Finally, the police have not focused on vehicle documentation crime due to **the sheer volume of traffic on the road.** In the UK there are nearly 30 million vehicles currently registered and over 450 billion vehicle kilometres driven on the road network per year. This presents huge logistical problems in identifying and filtering out vehicles worthy of stopping. With the improvements in ANPR technologies and an overall reduction in IT costs and planned improvements in the issuing and security of vehicle documents by DVLA, it is hoped that ANPR can address these difficulties and become a widely used policing tool. Criminals, like other citizens, need to use the roads and, given the potential of ANPR allied with good police intelligence, when they do so they are vulnerable to detection. ACPO has concluded that ANPR can 'deny criminals the use of the roads' and has adopted this as a strategic aim.

ANPR Intercept teams

ANPR is an established technology that uses pattern recognition to 'read' vehicle number plates from digital images, captured either through in-car systems, Closed Circuit Television Camera (CCTV), or a mobile unit (normally mounted in a vehicle). A key feature of all ANPR systems is their speed and efficiency of analysis – the systems are capable of checking up to 3,600 number plates per hour, on vehicles travelling up to 100 mph. Individual ANPR units can link up to four cameras and cover several lanes/locations at a time.

Older ANPR systems were susceptible to crude manipulation of number plates (for example using black insulation tape to change an 'F' into an 'E'), and functioned badly in poor visibility conditions. Newer infra-red cameras combine the latest software, are much more reliable and are able to accurately read most VRMs – in practice this means ANPR systems are able to correctly read 95 number plates out of 100.

The conversion of an image of a registration plate into text allows this data to be used in a variety of ways, including cross-referencing with databases. This process is performed in a fraction of a second. Within a policing context, ANPR can be used to identify vehicles flagged on the Police National Computer (PNC), local Force Intelligence Systems (FIS) or other related databases (eg DVLA). Where there are support resources, action can then be taken immediately – the police know where a vehicle is and what direction it is travelling. Prior to the introduction of ANPR, the volume of traffic helped to conceal those committing vehicle related crimes. The use of ANPR and dedicated intercept teams can thus allow police to actively engage criminality.

An example of how ANPR can be used is shown in Figure 2. The vehicle passes an ANPR camera (either in-car, CCTV or a mobile unit). This sends image data to the ANPR system, which 'reads' the VRM and crosschecks it against a database; in this case the PNC and a Force Intelligence System. Where a match is found, the ANPR operator is notified and can decide to call for an intercept vehicle. The development and increased use of ANPR technology therefore allows for a more focused approach than was previously available.

It is worth noting that ANPR-enabled intercept teams do not rely solely on ANPR technologies, but also use their training, experience and judgement. Vehicles that are not flagged by the ANPR system, but are being driven suspiciously, can also be stopped.

For the pilots, apart from the use of ANPR with intercept teams, all other aspects of policing and prisoner handling were the same.

3. Summary of findings

Introduction

The findings of the evaluation of ANPR-enabled intercept teams are summarised below in terms of:

- **operational staff inputs**, specifically the staff resource used during the six-month pilot

- **ANPR reads, hits and stops**, that is the number of VRMs read by the ANPR units, the number of times these reads led to a match with an intelligence database and, finally, the number of times vehicles of interest were stopped by the intercept teams

- **database accuracy**, which discusses the extent to which the data leading to a vehicle stop was correct

- **property recovered** by the intercept officers, including stolen vehicles and goods and drugs seized

- **actions taken** by the intercept officers, which may have included verbal warning, issuing a vehicle detect form, issuing a fixed penalty, reporting someone for summons, arresting someone and/or submitting an intelligence log.

In reviewing these findings, a number of points are worth noting:

- while ANPR is an established technology, for many forces the use of ANPR-enabled intercept teams represented a new way of working. As such, operations were, on occasions, interrupted (due to technical issues) and staffing levels changed to reflect feedback from the field. Most forces also used the pilot as an opportunity to develop the way they used ANPR and varied the way they deployed intercept teams in response to operational experience. These evaluation results thus do not cover a 'steady state' period

- two months (week seven) into the pilot, members of the Fire Brigade Union started industrial action. In certain areas staff were diverted from ANPR operations to provide cover for army fire services in the short term. While the industrial action continued for the remainder of the pilot, the longer term impact on ANPR operations seemed minimal

- weeks 13 and 14 covered the Christmas/ New Year period and during this period ANPR operations were much reduced.

The purpose of this evaluation was to explore the effectiveness of ANPR-enabled intercept teams, not to assess relative performance of intercept teams between forces. For this reason results presented below have been aggregated across the nine force areas, except where explicitly stated.

Not all forces used the same equipment or structure of intercept team during the pilot. In terms of deployment, three approaches were used.

- **In-car systems**. This form of deployment is based around individual patrol vehicles fitted with ANPR systems stopping vehicles of interest. It was acknowledged that this was a relatively inefficient means of operation better suited to supplementing routine mobile patrols rather than full time ANPR intercept duties. Hence none of the pilot forces used this as a primary option for deployment.

- **Mobile ANPR vehicle with intercept capability**. The majority of pilot forces involved in the pilot used a static ANPR vehicle, normally a van, operated in conjunction with dedicated marked mobile police resources, most usually marked

motorcycles. The ANPR van was normally parked at the side of the road, in a lay-by, verge or central reservation. Motorcyclists were then deployed to stop vehicles of interest.

- **CCTV**. Two forces (Northamptonshire and Staffordshire) also used ANPR readers linked to existing public space CCTV systems and used dedicated intercept teams to follow-up on vehicles of interest. For this deployment, the CCTV control room (situated on local authority premises for ease of access to the CCTV camera matrix) handles the incoming video source. Number plate details are then sent via a data link to the processor unit within the police control room where the relevant databases are situated so a match can be made. The police controller is informed which vehicle is of interest and the intelligence report that has identified it. An ANPR intercept team is then despatched to vehicles that are identified in this way.

Figure 3: Days worked per week by intercept teams
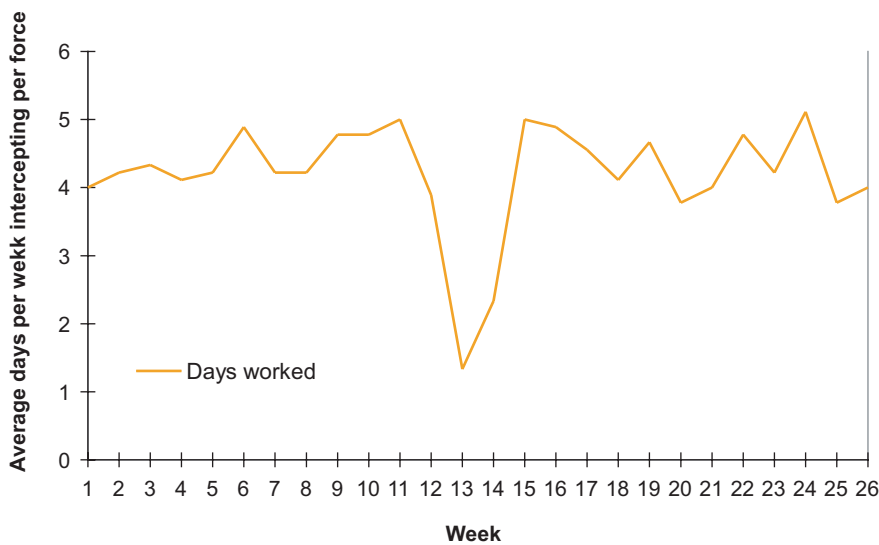
Operational staff inputs

During the six-month pilot, a total of 73,546 hours were spent on 983 days of ANPR operations across the nine forces – this equates to approximately 109 operational days per force with an average of 75 hours per operational day per force. Figure 3 shows the average number of days the ANPR intercept teams were working per force area and the total hours worked per week. Unsurprisingly the average number of days worked and the total hours worked per week were closely related.

Figure 3 shows there was:

• an initial increase in staff inputs from the start of the pilot (weeks one to five)

• a stabilisation in resource levels between weeks six and twelve, with a dip around the start of the strike of officers from the Fire Brigade Union (week seven). Discussions with forces identified that there was some short-term diversion of resources to provide cover for the fire dispute

• a significant drop in ANPR resources deployed over the Christmas (weeks 13 and 14)

• a slight and gradual decline in resource levels from week 15 to the end of the pilot. Discussions with forces identified that this could have been due to redirection of ANPR officers onto anti-terrorist duties (associated with the Iraq war), more staff taking holidays (with the end of police leave year in March) and a ramp-down associated with the end of the pilot.

Figure 4: Percentage time spent by operational work area and by staff grade
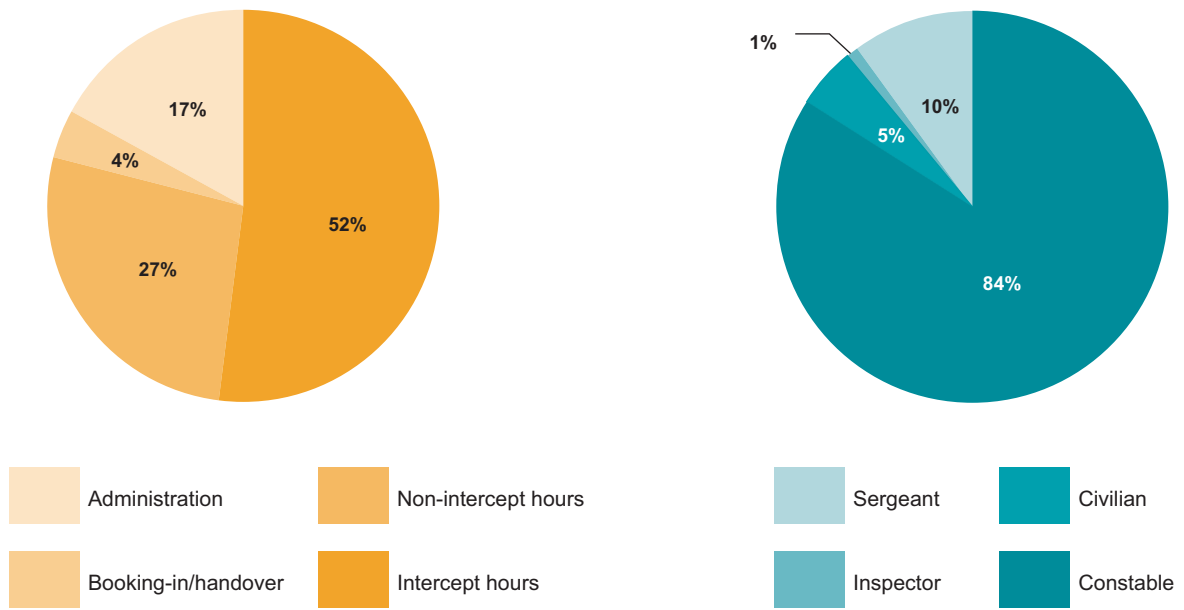
Each of the nine forces taking part in the pilot was asked to identify operational staff inputs by staff grade (Police Inspector, Sergeant, Constable or civilian staff) for each week of the pilot under the following categories:

• time spent on ANPR intercept duties ('intercept hours')

• time spent in the field but not operating ANPR, for example travel time to and from sites or rest periods ('non intercept hours')

• time spent dealing with prisoners up to booking in or handing over ('booking in/handover')

• time spent on ANPR administration, including time collating statistics required for this evaluation ('administration')

Figure 4 shows that the majority of time was spent in the field 'intercepting', with the remainder being spent on travel to sites/breaks (27%), administration (17%), and prisoner handling (4%). The most significant staff input into the pilot was by Police Constables (84% of resource input).

Figure 5: ANPR deployments by staff grade

| | Police | | | | Non police | All staff |
	Inspector	Sergeant	Constable	Total	Civilian	Total
Intercept hours	8	3,366	33,582	36,956	1,299	38,255
Non intercept hours	59	1,997	16,961	19,017	783	19,800
Booking in/handover	—	228	2,914	3,142	9	3,151
Administration	862	1,804	7,835	10,502	1,838	12,340
Total	929	7,395	61,292	69,616	3,930	73,546

Figure 5 summarises the staff inputs for each of the above four work areas by staff grade. The majority of staff input associated with the ANPR pilot related to Police Constables and over 80% of their time was spent in the field, either on intercept duties, travelling to and from intercept sites or rest periods. Civilian support, which accounted for just over 5% of staff input, was primarily used for collating statistics and information. Inspector and Sergeant resource input tended to be associated with project management. On average these inputs equate to approximately one Sergeant, seven Constables and half an administrative assistant per force. Because limited additional funding was available from the Home Office to cover the staff costs associated with the pilot, Chief Officers had to re-allocate resources for the pilot within existing budgetary provisions.

On the basis of standard annualised running costs (including staff overhead costs), the cost of staffing the pilot was approximately £1.3M. This does not include the cost of the ANPR equipment and supporting infrastructure, though the Home Office provided funding to all forces in England and Wales (as part of the Crime Reduction Programme) to purchase one fully compatible mobile ANPR unit and associated back-office facility. Furthermore, each of the nine pilot forces also received an additional £40,000 each towards the costs of implementing the project.

Key finding 1: The average staffing per force for ANPR-enabled intercept teams was one Inspector/Sergeant, seven Constables and half an administrative assistant – this equates to £290,000 per force per annum. On average these staff spent about half their time on intercept duties, 25% of their time travelling to and from ANPR sites or rest periods, and the remainder of their time dealing with administration/prisoner handling.

Figure 6: Proportion of time spent on intercept duties by week
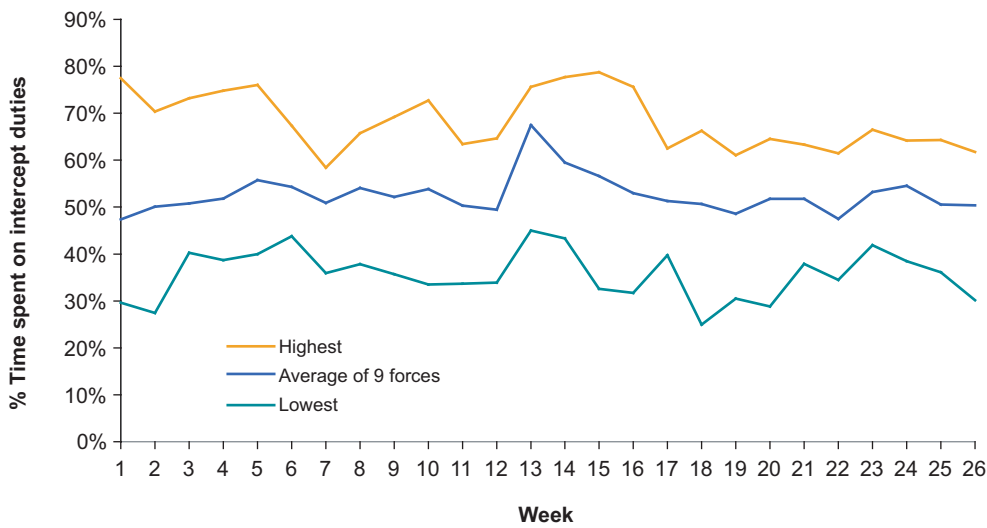
In terms of activity, the proportion of time spent on intercept duties will be a factor in determining the number of arrests and actions taken by the intercept officers. Figure 6 shows the average proportion of time spent on intercept duties across the nine forces. It also shows the most and least time spent on intercept duties of any or all of the nine pilot forces for each week.

It is worth noting that:

• while there was an increase in average time spent on intercept duties during the first five weeks, there was no subsequent (sustained) increase in percentage time on intercept duties

• there was a sharp increase in proportion of time spent on intercept duties over the Christmas period – this does not represent anything significant other than the much reduced activity (15% of the average throughout the pilot)

• in relative terms, no force spent consistently the most or least time on intercept duties. For example, for the first two weeks, West Midlands

spent least time on intercept duties (30% and 27% respectively), while in week three, the Metropolitan Police spent least time, and in week four North Wales Police spent least time on intercept duties.

Key finding 2: The proportion of total time spent on intercept duties stayed broadly the same throughout the pilot and was more or less similar across the nine forces. In any week, the difference between the force spending the most time on intercept duties and the least time remained broadly consistent throughout the pilot (about 30%).

Figure 7: ANPR deployment, hits and stops by force

	Total reads	ANPR hits	% of reads generating hits	Vehicle stops	% of hits stopped
Avon & Somerset	205,423	3,672	1.8%	1,490	40.6%
GMP	256,936	10,020	3.9%	4,408	44.0%
Kent	250,396	11,882	4.7%	4,141	34.9%
Metropolitan	238,781	5,928	2.5%	4,285	72.3%
North Wales	420,921	30,510	7.2%	1,959	6.4%
Northamptonshire	2,097,791	116,030	5.5%	1,591	1.4%
Staffordshire	576,711	22,955	4.0%	1,655	7.2%
West Midlands	329,381	10,185	3.1%	4,121	40.5%
West Yorkshire	806,611	29,478	3.7%	6,961	23.6%
Total	**5,182,951**	**240,660**	**4.6%**	**30,611**	**12.7%**

ANPR reads, hits and stops

During the pilot, the pilot forces' ANPR systems read 5,182,951 VRMs when intercept teams were available. Of these reads, over 240,660 (4.6%) generated hits on PNC, DVLA Vehicle Excise, DVLA Registered Keeper or local force databases. Of these hits, 12.7% (30,611) were stopped by the intercept teams.

Figure 7 shows reads, hits and stops for each force. It is worth noting that these hits, reads and stops are not unique in that a vehicle may pass an ANPR reader on a number of occasions giving rise to multiple hits, reads and (potentially) stops. In addition, the number of ANPR reads (and in turn hits) is a function of the number of ANPR-enabled cameras and the period of time that they are active.

For example, Northamptonshire Police had ANPR linked to an extensive network of CCTV cameras that were switched on for long periods of time (during which there may not have been an intercept capability available); this force had by far the most reads and hits of the pilot forces.

If the results from the two forces with CCTV-enabled ANPR are ignored (Northamptonshire and Staffordshire Police), then the actual percentage of hits stopped by the intercept teams is 27%. For subsequent monitoring purposes, forces (in particular those with CCTV) have been asked to provide the number of reads and hits only for when an intercept team is operating.

Key finding 3: Overall, intercept teams stopped 1 in 200 of all vehicles passing and subject to an ANPR hit. Both the proportion of vehicles that generated ANPR hits and the proportion of ANPR hits that were stopped varied significantly across the nine pilot areas. However those areas that had few ANPR hits stopped a higher proportion of their hits compared to areas with large numbers of hits – as shown in Figure 8.

Figure 8: Percentage of ANPR read hits by percentage of hits stopped
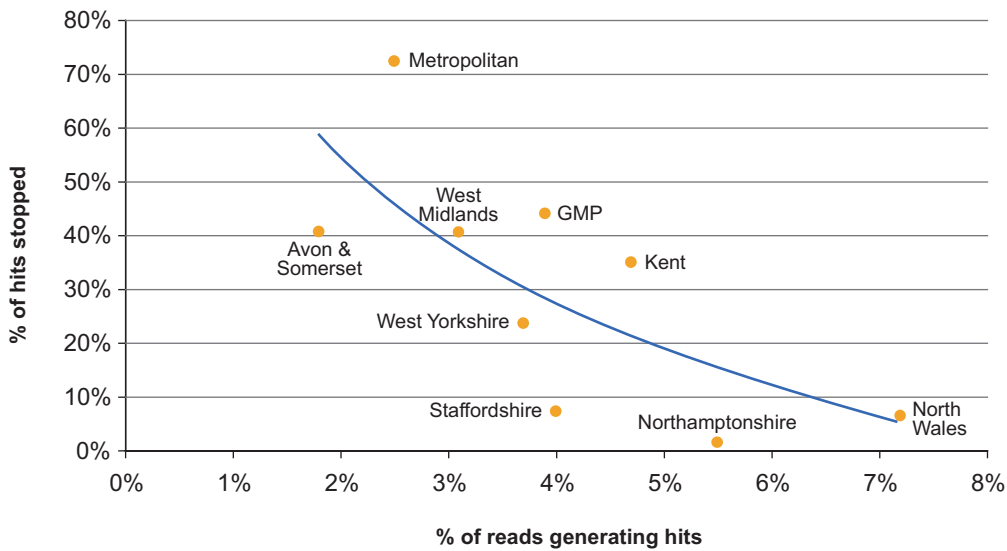
Figure note: The line shows the average relationship between % of reads generating hits and % of hits stopped.

Intercept teams did not rely entirely on the ANPR technologies. The intercept teams also stopped vehicles, as they passed through, by observing behaviours – this led to an additional 8,577 vehicle stops that did not originate directly from ANPR hits. Figure 9 below shows the number of stops per force and the reason for the stops.

The largest single reason (50% of stops) for stopping a vehicle on the basis of an observation was 'other'. Discussions with forces suggested that the majority of these cases related to vehicles/occupants who appeared suspicious to the intercept officers but were not known to them – for example, vehicles taking evasive action. The next largest category related to failing to display a valid VED (29% of observation stops). DVLA's database excluded those vehicles that were taxed but were not displaying their tax disc (an offence). Intercept officers were thus able to stop these vehicles on the basis of observation.

Key finding 4: ANPR and the data associated with it allows vehicles to be stopped on the basis of prior intelligence. All ANPR-enabled intercept teams also took the opportunity to stop vehicles on the basis of observation. This confirms that the greatest benefits will be realised through using experienced intercept officers allied with new technology.

Figure 9: Vehicle stops as a result of observation only

	Mobile phone offence	No seatbelt	Vehicle Excise Duty	Vehicle defect	Driving manner	Known person/ vehicle	Other	Total
Avon & Somerset	41	52	50	128	55	6	403	**667**
GMP	36	31	341	23	39	0	485	**915**
Kent	32	29	84	68	35	9	270	**499**
Metropolitan	52	62	108	102	73	13	119	**515**
North Wales	41	40	106	49	52	31	677	**974**
Northamptonshire	15	11	197	10	86	54	267	**630**
Staffordshire	9	11	71	17	24	13	261	**400**
West Midlands	93	85	874	23	18	5	602	**1,651**
West Yorkshire	51	190	690	144	185	39	1,180	**2,326**
Total	**370**	**511**	**2,521**	**564**	**567**	**170**	**4,264**	**8,577**

Figure 10 shows the total number of ANPR and observation generated stops by force during the six-month pilot.

In total, 39,188 vehicles were stopped as part of the pilot, with 78% being stopped as a result of an ANPR hit and 22% as the result of an officer observation. Two forces, Kent and the Metropolitan Police, had a much higher proportion of vehicles stops originating from ANPR (89% of all stops), while North Wales and Avon and Somerset had the smallest proportion of vehicles stops originating from ANPR (67% and 69% respectively). It could be argued that this may be a reflection of the differing volume of traffic in areas (higher traffic volumes making
it less likely to spot vehicles through observation). The majority of vehicle stops arising from observation were for vehicles/occupants who were suspicious but were not known to the police, failure to display VED and driving type offences (using a mobile phone, no seatbelt, driving manner and vehicle defect).

Figure 10 shows that West Yorkshire Police stopped the most vehicles during the pilot, though in terms of police resources West Yorkshire deployed nearly twice as many officers (in terms of officer hours). Figure 11 shows the total number of vehicle stops per intercept team officer hour, for each of the nine forces.

Overall, one in eight hits resulted in a vehicle being stopped. At first sight this proportion seems low, but of course while a vehicle is stopped and passengers questioned or further searches made, intercept officers are unavailable to make further stops on new hits. Feedback from the field suggest that there is relatively little 'dead' time once intercept duties start. Officers also prioritise the 'hits' and target the most serious offences.

Figure 11 shows that each intercept team officer stopped approximately one vehicle for each hour they were in the field. It is important to note that while vehicle stops per hour is an interesting metric, it is not an indication of efficiency or relative performance – stopping more vehicles per hour is not necessarily better than stopping fewer. This is because stopping a vehicle and taking an

Figure 10: Total number of ANPR stops by force
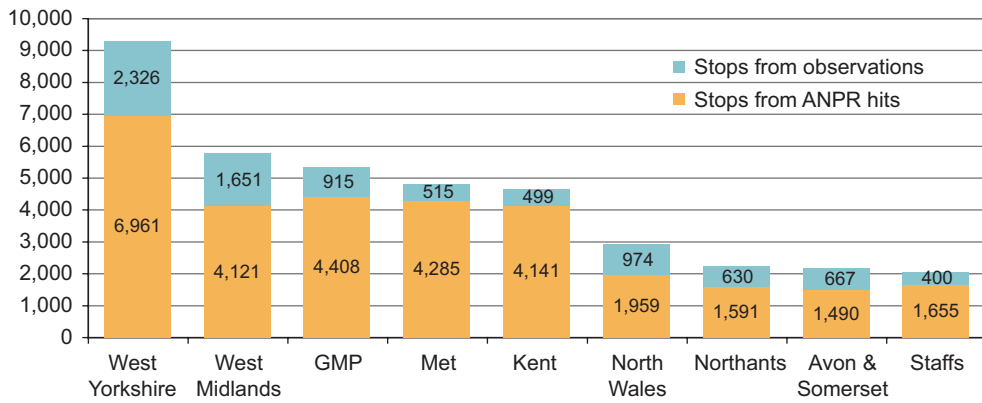
Figure 11: Total number of vehicle stops by force

	Total vehicle stops	Hours police intercepting	Stops per hour
Avon & Somerset	2,157	2,105	1.02
GMP	5,323	3,131	1.70
Kent	4,640	3,240	1.43
Metropolitan	4,800	5,199	0.92
North Wales	2,933	1,948	1.51
Northamptonshire	2,221	4,879	0.46
Staffordshire	2,055	2,600	0.79
West Midlands	5,772	4,688	1.23
West Yorkshire	9,287	9,168	1.01
Total	**39,188**	**36,956**	**1.06**

Figure 12: Vehicle stops per hour on intercept duties by week
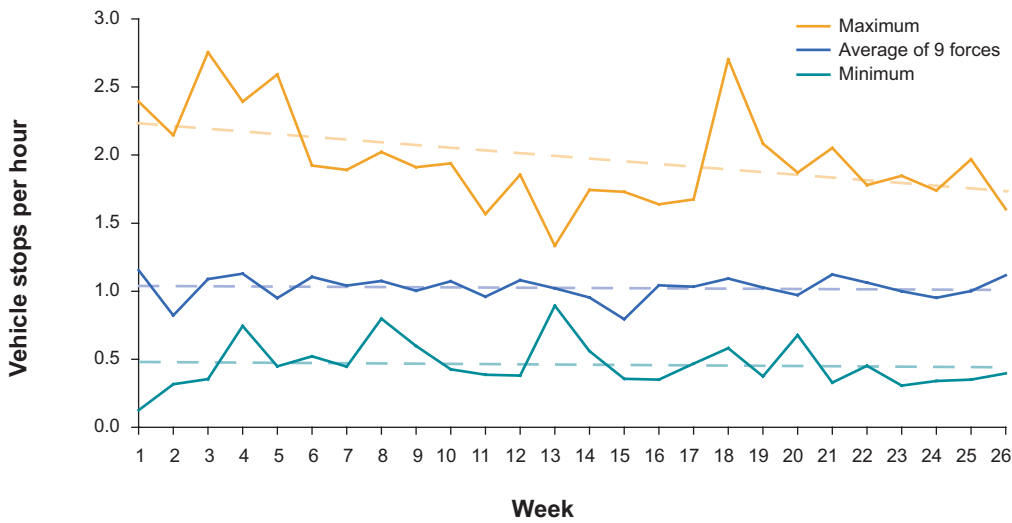
Figure note: The solid lines show the actual data, while the dotted lines show the trend.

action (for example arresting the vehicle driver or issuing a fixed penalty) will normally require more time than taking than no action – this is explored further below (see Figure 13). On this basis, stopping large numbers of vehicles per officer hour could be seen as an indication of failing to engage criminals effectively during the stop. In this context, Figure 12 shows the maximum, minimum and average number of vehicle stops achieved per hour for the nine pilot forces.

Interestingly the minimum and average vehicle stops achieved per hour stayed broadly constant throughout the pilot, while the maximum vehicle stops per hour achieved by any one force actually decreased. These results may seem counter-intuitive – with more experience it may be expected that officers become more efficient at stopping vehicles and the average number of vehicles stopped per hour increases. However, what actually seems to have happened is that officers came to understand that it is not the quantity of vehicle stops that is key, rather it is the quality of questioning and searching (where appropriate) that is crucial.

It would, however, have been useful to have further quantitative information on the tasks undertaken by officers during vehicle stops, specifically what activities were undertaken (questioning the driver, PNC checks, form filling, etc) and what proportion of time was spent with each activity.

Key finding 5: On average, one vehicle was stopped per officer hour intercepting – this level of performance was maintained throughout the pilot. In overall terms, 39,188 vehicles were stopped during 73,546 staff hours (including administration, prisoner handling and civilian time) – this equates to one vehicle stopped for every two hours staff input. Feedback from the field suggested that ANPR teams spent little time waiting for hits (dead time) and most of their time investigating vehicle hits – this is supported by the fact that less than 13% of vehicles that registered an ANPR hit were actually stopped, suggesting officers are often too busy to stop every vehicle registering a database hit, or are prioritising stops.

Figure 13: Vehicles stops generated by database
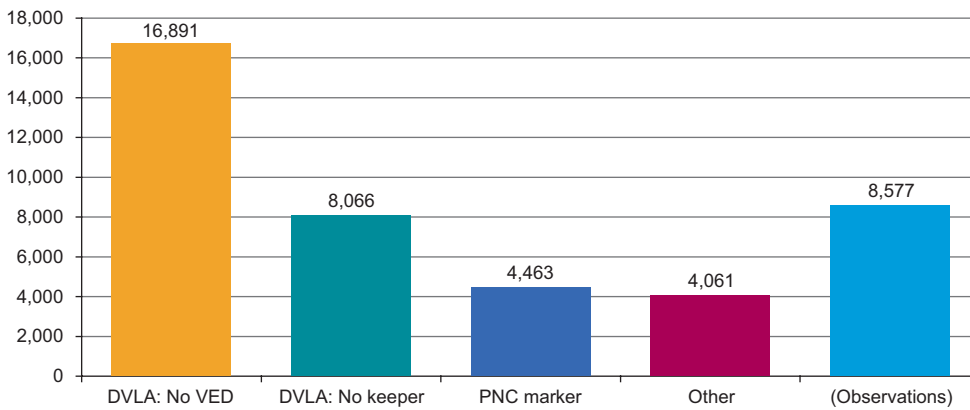
Source of stop

During the pilot, intercept officers recorded which database generated each ANPR hit. This included PNC, No Current VED, No Current Keeper or Other force database. During the pilot, a total of 30,611 vehicles were stopped as a result of ANPR hits, ie matches against one or more of these intelligence databases. The source of the hits is shown in Figure 13 together with the number of observation-generated vehicle stops.[7] It should be noted that on a few occasions (about 8% of hits), a vehicle hit was triggered by more than one database, for example a vehicle appeared on both PNC and DVLA's VED database. Overall the two DVLA databases (No current VED and No Current Keeper details) accounted for nearly 75% of ANPR hits.

Property recovered

As a result of questioning the vehicle driver or passenger, the intercept officers may have identified that the vehicle was stolen, or that it contained stolen goods or drugs. Figure 14 shows that the ANPR teams recovered 328 stolen vehicles and stolen goods on 101 occasions, and seized drugs on 211 occasions during the pilot. In addition to the stolen vehicles recovered, eight vehicles recorded as stolen were recorded by ANPR-enabled cameras but were unable to be stopped due to intercept officers dealing with other vehicles at the time.

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[7] No information was collated on the triggering database for those 210,049 vehicles that generated a hit but were not stopped.

[8] Note that a vehicle can give rise to multiple hits, eg on PNC and DVLA No current VED databases.

Figure 14: Goods recovered or seized by force

	Stolen vehicles recovered		Stolen goods recovered		Drugs seized	
	Occasions	Value	Occasions	Value	Occasions	Value
Avon & Somerset	29	£95,500	5	£5,940	8	£210
GMP	20	161,645	9	£22	4	£45
Kent	20	£150,000	10	£1,229	21	£16,966
Metropolitan	62	£481,000	8	£5,940	26	£13,800
North Wales	13	£84,350	10	£122	57	£34,138
Northamptonshire	52	£234,650	27	£509,023	16	£1,810
Staffordshire	12	£47,950	9	£74,470	6	£590
West Midlands	49	£511,900	1	£105,750	52	£20,910
West Yorkshire	71	£304,450	22	£4,169	21	£13,710
Total	328	**£2,071,445**	101	**£715,275**	211	**£102,179**

Officers were also asked to give an estimate of the value of the stolen vehicles/goods recovered and/or the street value of any drugs seized. Figure 14 shows that nearly £2.75M of vehicles/goods were recovered and over £100,000 of drugs seized. In addition to the above, the intercept teams recovered eight firearms, 42 offensive weapons, and stolen property was recovered on a further 145 occasions.

Key finding 6: Extrapolating the average results achieved during the six-month pilot, each Police Constable operating as part of an ANPR-enabled intercept team would annually expect to:

• arrest over 100 people/year

• recover 11 stolen vehicles, with a total value of approximately £68,000

• recover stolen goods on three occasions, with a total value of approximately £23,000

• seize drugs on seven occasions, with a total street value of approximately £3,300

• seize two offensive weapons/firearms

• recover property on five occasions.

In terms of triggering the source databases, Figure 15 shows which databases led to property being recovered.

Key finding 7: Perhaps not surprisingly, PNC was the most successful originating database in terms of goods recovered/seized; for example 66% of stolen vehicles recovered originated from PNC. However the other databases, and indeed observations, also proved an effective tool for generating actions. In particular, it is worth highlighting the two firearms that were recovered from vehicles triggered from the DVLA databases.

Actions taken

Following questioning of the vehicle driver or passenger and any inspection of the vehicle, the intercept officers may have taken a number of actions as follows:

• **Arrest** – whereby an officer arrests an individual in relation to an offence

• **Reported for summons –** where an individual was reported to appear in court in relation to minor offences (normally motoring) where a fixed

Figure 15: Goods recovered or seized by originating database[9]

	Stolen vehicles	Stolen goods	Firearms	Drugs found	Offensive weapon(s)	Other property	Total
PNC flag	218	14	1	32	8	17	**290**
DVLA: No VED	23	39	1	35	15	69	**182**
DVLA: No keeper	9	4	1	13	3	7	**37**
Local databases	14	19	4	57	8	20	**122**
Observation	64	24	3	74	9	32	**206**
Total	**328**	**101**	**8**	**211**	**42**	**145**	**835**

penalty was not appropriate or the offence was too serious (for example four tyres with insufficient tread)

- **Issuing a fixed penalty ticket** – these can be issued for a variety of vehicle/driving offences, such as contravening directional signs, driving without wearing a seatbelt or using a mobile phone while driving. The recipient is issued with a ticket which requires them to pay a fine and where appropriate provide their driving licence for endorsement

- **Issuing a note requiring follow-up action –** these include:
  - HO/RT – which requires a driver to present their driving licence and motor insurance details to a local police station within seven days
  - CLE2/6 and CLE2/7 – No current excise offence report to DVLA used for all vehicles
  - CLE2/8 and V62 – No current vehicle excise offence combined with failing to notify current keeper offence. V62 is application for registration document only

  - VDRS – Vehicle Defect Rectification Scheme (notice to offender to carry out repairs to defect within 14 days and have repair certified or face court proceedings)
  - PG9 – Vehicle prohibition notice, prohibiting the use of a vehicle on the road due to its defective state and requiring a full MOT to be undertaken prior to reuse on a road

- **Intelligence log** – an officer may decide that during a vehicle stop they have uncovered intelligence that may ultimately lead to evidence of criminal activity. In this case the officer completes an intelligence form and sends it to the local force intelligence officer

- **No action taken** – where no offence has been committed or the police consider there is insufficient evidence to prosecute or that an informal warning may be sufficient.

9 Because on a few occasions more than one database gave rise to a vehicle hit, where property was recovered, it has been apportioned across the appropriate databases. For example, if a hit originated from No VED and PNC and a stolen vehicle was recovered, half a vehicle has been allocated to PNC and half to No VED. This avoids doubled counting and has been used throughout this report when comparing source database. For these tables column totals may differ slightly from the total displayed due to rounding.

Figure 16: Reason for arrest
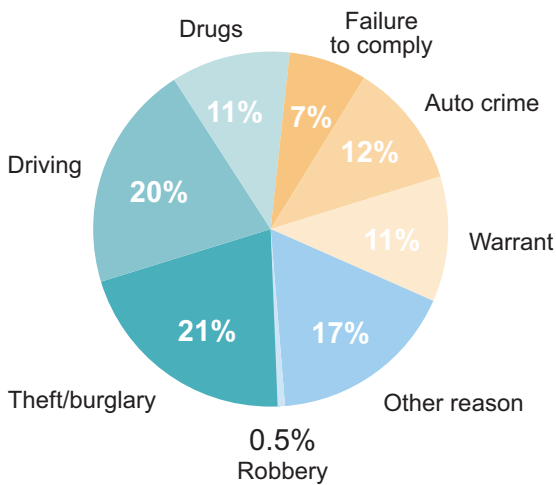
The ANPR-enabled intercept officers arrested a total of 3,071 persons. Figure 16 shows the reason for arrest.[10] Note that if a person was arrested for more than one offence then only the most serious arrest was recorded, as opposed to recording each arrest made.

Key finding 8: ANPR-enabled intercept officers arrested someone on average once every twelve vehicle stops. Only 20% of arrests related to driving offences, ie the vast majority of arrests were for non-driving matters. On the basis of the staffing inputs identified, each full time intercept officer equivalent would expect to make over 100 arrests per year.

Again due to space limitations on the data collection pro forma used by the intercept officers, only broad arrest headings were used and it is therefore not possible to categorise the above arrest figure further. As part of the on-going monitoring and evaluation work, it is recommended that further information on arrest types should be collected.

In terms of originating databases, Figure 17 shows the arrests made, by reason for each stop. While the largest proportion of the arrests (30%) originated from vehicles being stopped as a result of officer observation, 33% of arrests came from the two DVLA databases.

Key finding 9: In spite of data quality issues, a large proportion of arrests came from the two DVLA databases. These results validate previous research that established a link between vehicle documentation crime and more serious crimes.

In terms of how arrest levels varied during the course of the pilot, Figure 18 shows the number of arrests per 100 hours of total staff input and the arrests per 100 vehicles stopped.

Key finding 10: Arrests per 100 hours of staff input and per 100 vehicle stops were very closely matched. While Figure 12 showed that officers were stopping the same number of vehicles per hour at the start of the pilot as they were at the end, Figure 18 shows that the overall trend during the pilot was for an increase in arrests per 100 vehicles stopped/100 hours of staff input. This indicates that results improved over time as officers became more experienced.

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[10] Section 25 arrests include offences that could normally be dealt with by means of a fixed penalty or a report for summons, however the offender has a history of failing to pay or appear at Court.

Figure 17: Arrests by originating database

	Robbery	Theft/ burglary	Driving	Drugs	Failure to comply	Auto crime	Warrant	Other reason	Total arrests
PNC flag	9	184	67	47	30	196	63	82	**676**
DVLA: No VED	1	207	185	53	73	46	101	145	**812**
DVLA: No Keeper	—	23	53	20	14	10	27	44	**190**
Local databases	—	77	115	96	32	17	53	90	**480**
Observation	11	158	209	114	74	85	105	159	**914**
Total	**21**	**648**	**629**	**329**	**222**	**354**	**348**	**520**	**3,071**

Figure 18: Arrests by week per 100 hours of staff input and per 100 vehicles stopped

Figure note: The solid lines show the actual data, while the dotted lines show the trend.

Figure 19: Arrests made per 100 vehicles by indicative first year of registration[11]
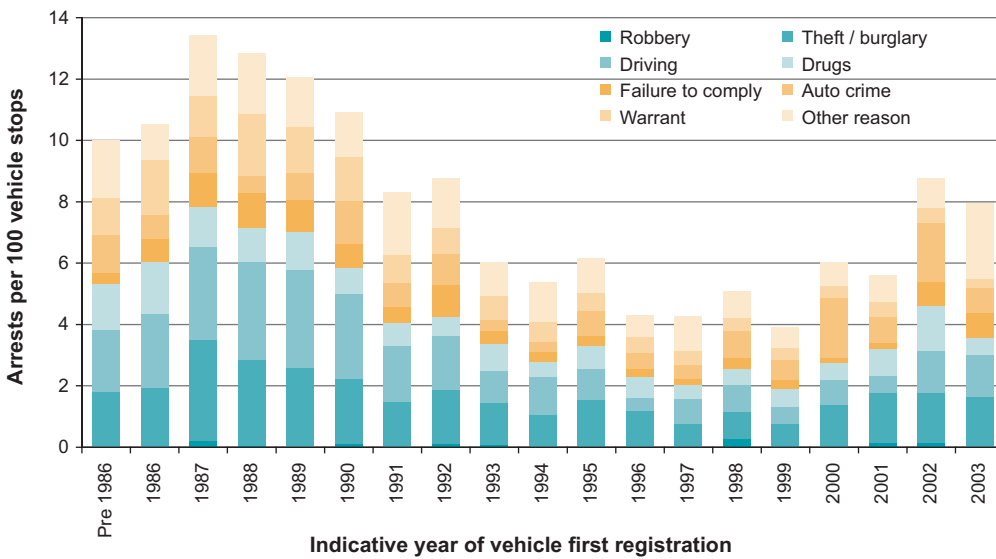
The VRM of each vehicle stopped by officers was recorded. From this it was possible to estimate when a vehicle was first registered, accepting that in a small number of cases, (eg cherished/ personalised number plate), a VRM may be transferred from an older to newer vehicles. Figure 19 shows the number of arrests made and arrest types per 100 vehicles by indicative year of vehicle first registration.

Key finding 11: The indicative age of a vehicle, as determined from the VRM, was a strong indicator as to the number of arrests per 100 vehicle stops. For example, vehicles first registered in 1987 were 3.5 more likely to yield an arrest than vehicles registered in 1999. The nature of this relationship was not linear, more U-shaped. In terms of arrest type, there was a significant variation by vehicle age. For example, arrests for theft and burglary were most likely to originate from older vehicles, while drugs and auto crime arrests were most likely to originate from very recently registered vehicles.

Figure 20 shows the total number of arrests made by arrest type for each force area, while Figure 21 shows the proportion of arrests made by type for each force area.

Key inter-force differences were as follows:

• the percentage of people arrested for theft/burglary varied between forces – North Wales had the fewest arrests (6%) while West Midlands had the largest proportion (30%)

• the proportion of arrests for driving-related matters was broadly consistent across the forces

• 28% of the arrests made by North Wales were for drug-related offences, while only 2% of Greater Manchester's arrests were for drug offences

• West Yorkshire and North Wales arrested the largest proportion of people (over 10%) under Section 25

• 26% of the arrests made by Avon and Somerset were for auto crime and a further 26% were arrests relating to warrants.

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[11] For ease of presentation, indicative year of first registration is presented as single calendar year, though for pre-2000 registered vehicles the period of possible registration runs from 1st August to 31st July.

Figure 20: Arrest types (total number) by force

	Robbery	Theft/ burglary	Driving	Drugs	Failure to comply	Auto crime	Warrant	Other reason	Total arrests
Avon & Somerset	—	16	35	9	4	41	41	11	**157**
GMP	—	40	61	4	16	18	28	54	**221**
Kent	—	54	57	26	11	14	16	36	**214**
Metropolitan	7	84	71	47	19	52	29	110	**419**
North Wales	6	14	59	65	25	23	20	20	**232**
Northamptonshire	1	87	84	28	3	66	89	53	**411**
Staffordshire	—	26	54	6	15	9	36	31	**177**
West Midlands	5	232	118	103	73	74	49	115	**769**
West Yorkshire	2	95	90	41	56	57	40	90	**471**
Total	**21**	**648**	**629**	**329**	**222**	**354**	**348**	**520**	**3,071**

Figure 21: Proportion of arrests by type by force
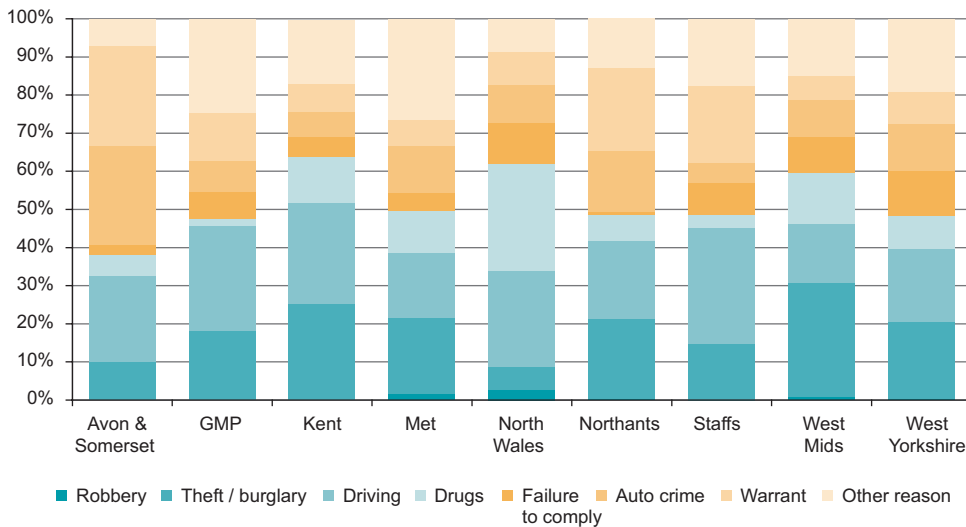
Figure 22: Projected arrest types by force per intercept Full Time Equivalent (FTE)

Legend: ■ Robbery ■ Theft / burglary ■ Driving ■ Drugs ■ Failure to comply ■ Auto crime ■ Warrant ■ Other reason
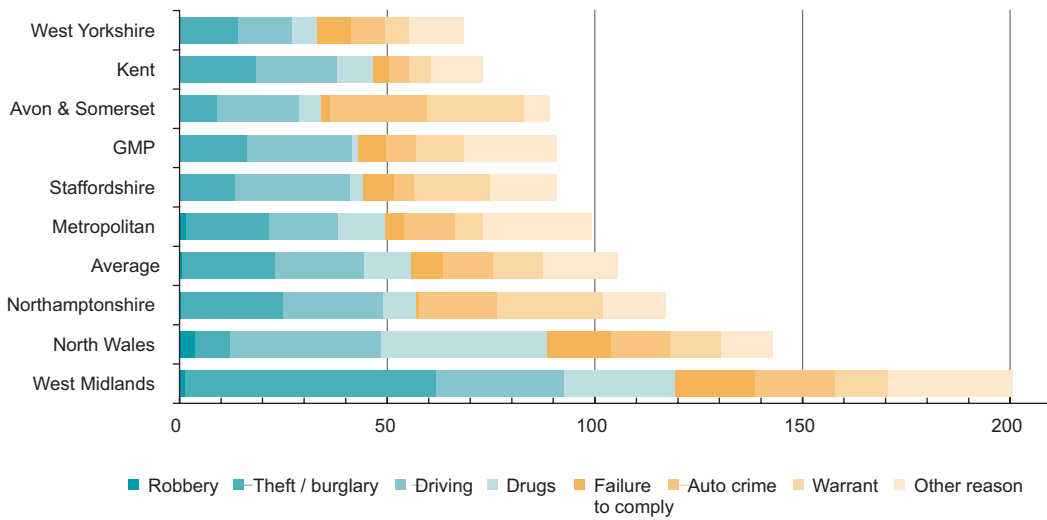
On the basis of the pilot data, Figure 22 shows the projected annual number of arrests by type for each force area. While all force intercept teams were projected to make a significant number of arrests (in particular, relative to the national benchmark of 10 per Full Time Equivalent {FTE}), Northamptonshire, North Wales and West Midlands all had projected arrest rates well over 100 per annum per officer.

In terms of where arrests originated from, Figure 23 shows that the majority (41%) originated from a mobile ANPR vehicle with intercept capability, approximately a quarter came from observations (28%) and in-car systems (22%) and only a small proportion came from CCTV systems (8%) and fixed sites (1%). In terms of overall comparison, this does not imply that one system is better than another, for example the mobile ANPR vans were more widely used and more so than the CCTV systems, and it would be expected that this form of deployment should result in more arrests.

Figure 24 shows the proportion of arrests made by where vehicle hits originated. While it varied between where hits were triggered from and the

Figure 23: Proportion of arrests made by deployment source

types of arrests that were subsequently made, it is not apparent that any one system produces a significantly different profile of arrests. In terms of efficiency, however, because in-car systems do not have a team of dedicated intercept officers to support their operation, a smaller proportion of hits are followed up.
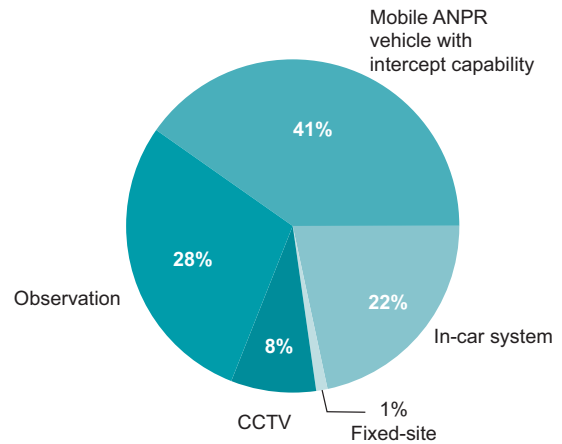
Figure 24: Arrests by originating database

	Robbery	Theft/ burglary	Driving	Drugs	Failure to comply	Auto crime	Warrant	Other reason	Total arrests
CCTV	0.0%	18.3%	27.2%	2.7%	3.9%	17.5%	19.1%	11.3%	**257**
Fixed-site	0.0%	25.0%	20.0%	12.5%	5.0%	17.5%	0.0%	20.0%	**40**
In-car system	0.0%	21.8%	22.7%	6.8%	9.2%	8.6%	13.5%	17.4%	**661**
Observation	0.9%	16.8%	23.0%	12.6%	8.5%	9.4%	11.7%	17.3%	**875**
Mobile ANPR vehicle	1.1%	24.2%	16.2%	13.1%	6.1%	13.2%	8.7%	17.5%	**1,238**
Average	**0.7%**	**21.1%**	**20.5%**	**10.7%**	**7.2%**	**11.5%**	**11.3%**	**16.9%**	**3,071**

While the above arrest analysis show the quantities of arrests, they do not give any indication as to the nature of the arrest. By way of example, a number of case studies provided by the ANPR-enabled intercept teams are outlined below, from a variety of originating databases and from observations:

• **observation** – a motorcycle officer saw a vehicle they recognised as one used in a crime. The three occupants were searched, £1,500 of stolen goods were found, and the individuals were subsequently arrested

• **observation** – an ANPR officer saw a vehicle without current VED. The vehicle was stopped and the driver questioned. The officer then examined the vehicle, found that the vehicle chassis number had been tampered with and the car had false registration plates. The true VRM identified that the vehicle had been recently stolen. The driver was therefore arrested

• **PNC** – a PNC hit identified the vehicle keeper as being involved in drugs. A stop and search uncovered bankcards in several different names. On arrest, a drugs search was carried out. Heroin to the value of £1,000 was recovered and

£600 in cash. Enquiries revealed that the driver had eight aliases, one of which had been wanted on warrant for two years, while a search of their home found a variety of drugs paraphernalia

• **PNC** – a PNC hit led to a driver being detained and arrested on suspicion of a murder in Jamaica and an armed robbery in London. He was subsequently deported

• **local database (disqualified driver)** – a local database hit led to a vehicle being stopped where the keeper was disqualified from driving. The stop and subsequent enquiries showed that the driver had warrants outstanding for failing to appear at courts for offences of assault and theft. The driver was subsequently charged with disqualified driving, associated document offences and remanded in custody

• **local database (disqualified driver)** – a local database hit led to a vehicle being stopped where the keeper was disqualified from driving. The driver was not the named target, however, as the new owner was also subject to driving disqualification. A search of the vehicle revealed 2.5 kilos of cannabis

- **local database** – a local database hit led to a vehicle being stopped and searched. Upon further examination and telephone enquiries the vehicle was identified as an outstanding stolen vehicle from a neighbouring force area

- **no VED** – following a no VED hit, a vehicle was stopped and the driver questioned and subsequently searched. The driver was found to be in possession of £8,500, which had come from an armed robbery that occurred 50 minutes prior to the stop

- **no VED** – a no VED hit led to a vehicle being flagged down. As the officers tried to stop the vehicle they were concerned at its manner of driving and requested that the driver undertake a roadside field impairment test, which the driver subsequently failed. They were arrested for driving whilst unfit through drugs and taken to custody where the Police surgeon agreed that the prisoner was displaying the symptoms of drug use

- **no VED** – a no VED hit led to a vehicle being stopped and the driver questioned. When talking to the driver the officers became suspicious of driver's identity. In custody, the driver was finally identified and found to be a disqualified driver who was also wanted on two separate occasions for failing to appear at court, again for disqualified driving.

Key finding 12: The ANPR-enabled intercept teams made a number of significant arrests. Arrests were not just for vehicle documentation crime but were also for more serious crime. It is not possible to quantify the quality of these arrests, however, the case studies give some indication as to the value of ANPR in addressing serious crime.

In addition to arrests, ANPR-enabled intercept officers were able to report individuals for summons, issue a fixed penalty, issue a note requiring follow-up action, give some verbal advice and/or prepare an intelligence log.

Key finding 13: Of the 39,188 vehicle stops, in 23,731 cases (61%) the intercept officers took some form of action as a result of the stop. Analysis showed that the proportion of stops resulting in some form of action stayed broadly the same over the 26-week pilot.

Figure 25 shows the total number of actions taken during the pilot. It should be noted that officers were able to take multiple actions – for example a vehicle stop could lead to an non-endorsable fixed penalty, the driver being issued with a request to provide their vehicle documentation at a police station (HO/RT1) and an intelligence log being created.

Key finding 14: Overall, intercept officers took 48,833 actions with respect to 23,731 vehicle stops where an action was taken, ie approximately 2.1 actions per vehicle where an action was taken. Analysis showed that while arrests per 100 vehicles stopped increased over the 26-week pilot, the number of other forms of action taken per 100 vehicles stopped stayed broadly the same.

Figure 26 shows the actions taken by intercept officers' source of stop, while Figure 27 shows the actions taken by intercept officers per 100 vehicles stopped by force.

Figure 25: Actions taken by intercept officers
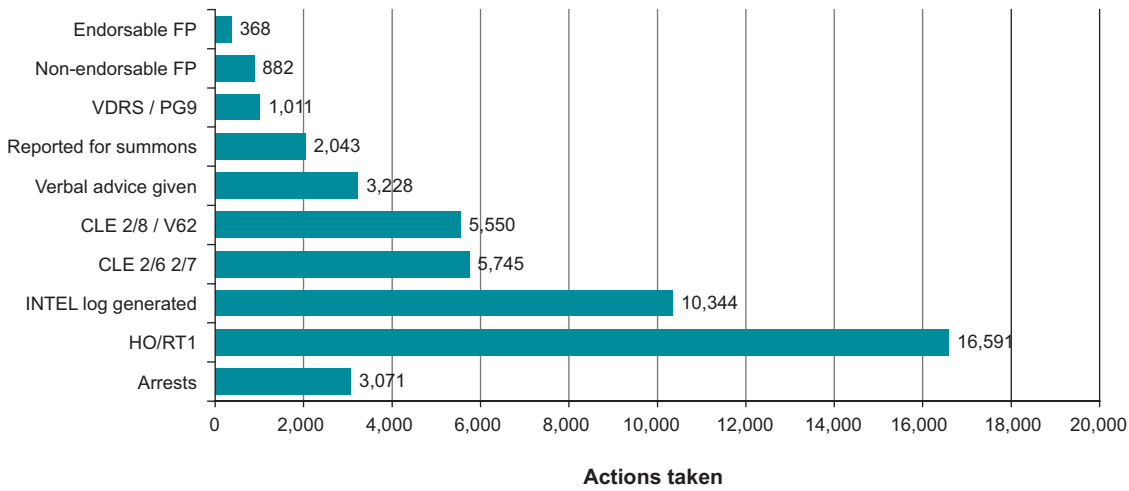
Figure 26: Actions taken by source of vehicle stop

Actions taken by source of vehicle stop												
Source database		HO/RT1	CLE 2/6 2/7	CLE 2/8 V62	VDRS / PG9	NEFPN	EFPN	Reported for summons	INTEL log generated	Verbal advice given	No action taken	Occasion action taken (%)	Vehicles stopped
PNC flag	676	2,065	376	308	123	84	60	228	1,794	332	1,531	66%	4,463
DVLA: No VED	812	6,193	3,457	2,564	238	88	41	1,007	2,393	942	8,391	50%	16,891
DVLA: No keeper	190	2,942	438	2,044	122	141	110	209	2,191	622	3,967	51%	8,066
Local database	480	2,075	298	229	124	85	51	223	2,167	278	983	76%	4,168
Observation	914	4,670	1,740	1,093	474	505	119	615	2,518	1,299	1,849	79%	8,769
Total	**3,071**	**16,591**	**5,745**	**5,550**	**1,011**	**882**	**368**	**2,043**	**10,344**	**3,228**	**15,457**	**61%**	**39,188**

Per 100 vehicles stopped												
Source database		HO/RT1	CLE 2/6 2/7	CLE 2/8 V62	VDRS / PG9	NEFPN	EFPN	Reported for summons	INTEL log generated	Verbal advice given	No action taken	Occasion action taken (%)	Vehicles stopped
PNC flag	15.1	46.3	8.4	6.9	2.8	1.9	1.3	5.1	40.2	7.4	34.3	66%	4,463
DVLA: No VED	4.8	36.7	20.5	15.2	1.4	0.5	0.2	6.0	14.2	5.6	49.7	50%	16,891
DVLA: No keeper	2.4	36.5	5.4	25.3	1.5	1.7	1.4	2.6	27.2	7.7	49.2	51%	8,066
Local database	11.5	49.8	7.1	5.5	3.0	2.0	1.2	5.4	52.0	6.7	23.6	76%	4,168
Observation	10.4	53.3	19.8	12.5	5.4	5.8	1.4	7.0	28.7	14.8	21.1	79%	8,769
Total	**7.8**	**42.3**	**14.7**	**14.2**	**2.6**	**2.3**	**0.9**	**5.2**	**26.4**	**8.2**	**39.4**	**61%**	**39,188**

Figure 27: Actions taken by force per 100 vehicles stopped

	Arrests	HO/RT1	CLE 2/6 2/7	CLE 2/8 V62	VDRS / PG9	NEFPN	EFPN	Reported for summons	INTEL log generated	Verbal advice given	No action taken	Occasion action taken (%)	Vehicles stopped
Avon & Somerset	7.3	42.3	6.3	14.6	4.6	2.5	1.2	0.8	10.5	24.0	29.1	71%	2,157
GMP	4.2	39.5	4.9	26.7	0.9	0.9	0.0	6.4	4.5	5.5	49.7	50%	5,323
Kent	4.6	13.1	16.8	9.2	2.3	1.1	0.3	3.8	6.9	7.9	58.0	42%	4,640
Metropolitan	8.7	69.9	7.8	31.0	5.5	7.1	4.7	6.6	79.8	4.0	16.7	83%	4,800
North Wales	7.9	27.0	2.6	17.1	2.9	2.3	0.5	5.2	19.7	7.5	41.4	59%	2,933
Northamptonshire	18.5	47.9	28.7	1.4	1.9	0.3	0.7	4.5	31.1	13.4	28.2	72%	2,221
Staffordshire	8.6	41.6	25.6	7.8	1.8	0.8	0.3	18.0	27.4	6.8	36.6	63%	2,055
West Midlands	13.3	57.6	31.6	1.1	2.9	0.2	0.1	2.6	41.6	1.9	35.6	64%	5,772
West Yorkshire	5.1	38.6	12.2	12.3	1.8	3.1	0.7	4.6	16.1	11.8	43.6	56%	9,287
Total	**7.8**	**42.3**	**14.7**	**14.2**	**2.6**	**2.3**	**0.9**	**5.2**	**26.4**	**8.2**	**39.4**	**61%**	**39,188**

Key finding 15: Analysing the effectiveness of the source databases:

• PNC was the most effective in terms of arrests per 100 vehicle stops

• because intercept officers were unable to check all vehicle details at the roadside, in particular, whether a vehicle had a valid MOT certificate (where appropriate) and whether the driver had insurance, producer document requests (HO/RT1) were issued for a large proportion of stops – 42% of all stops and 70% of all stops where an action was taken.

Intercept officers were asked to make a record if those vehicles stopped contained anyone identified as having a criminal record. 21% of vehicle drivers stopped as part of the pilot had a criminal record, however 65% of arrests came from vehicles where the driver or passengers already had a criminal record.

Key finding 16: Vehicles stopped containing persons with previous criminal records were seven times more likely to yield an arrest than vehicles without.

It is interesting to note that Northamptonshire Police, who consistently stopped fewer vehicles per hour than other forces, had the highest number of arrests per vehicle stop of any force. Conversely, Greater Manchester had among the highest stop rates but had lowest number of arrests per vehicle stop of any force. This relationship is illustrated in Figure 28.

Key finding 17: There is a strong inverse relationship between arrests per 100 vehicle stops and vehicle stops per hour. Intuitively this seems correct, as a vehicle stop involving an arrest will require more time than one that does not.

A total of 10,344 intelligence logs were created as part of the pilot. Given that these intelligence logs may be used by officers who are not part of the intercept team, and potentially over a number of years, it is extremely difficult to quantify their value at this stage.

Key finding 18: The ANPR-enabled intercept teams generated a significant number of intelligence logs that will be of value to the wider police network.

Figure 28: Arrests per 100 vehicles stops by stops per officer hour
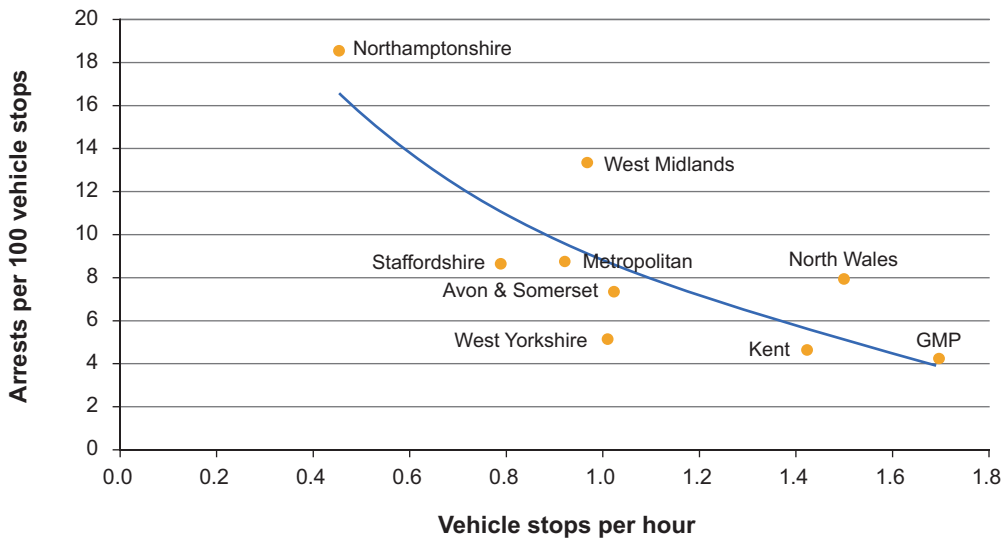
4. Conclusions and recommendations

Key findings

The key findings that emerged from analysis of the data were as follows:

KF1. The average staffing per force for ANPR-enabled intercept teams was one Inspector/Sergeant, seven Constables and half an administrative assistant – this equates to £290,000 per force per annum. On average these staff spent about half their time on intercept duties, 25% of their time travelling to and from ANPR sites or rest periods, and the remainder of their time dealing with administration/prisoner handling.

KF2. The proportion of total time spent on intercept duties stayed broadly the same throughout the pilot and was more or less similar across the nine forces. In any week, the difference between the force spending the most time on intercept duties and the least time remained broadly consistent throughout the pilot (about 30%).

KF3. Overall, intercept teams stopped 1 in 200 of all vehicles passing and subject to an ANPR hit. Both the proportion of vehicles that generated ANPR hits and the proportion of ANPR hits that were stopped varied significantly across the nine pilot areas. However those areas that had few ANPR hits stopped a higher proportion of their hits compared to areas with large numbers of hits.

KF4. ANPR and the data associated with it allows vehicles to be stopped on the basis of prior intelligence. All ANPR-enabled intercept teams also took the opportunity to stop vehicles on the basis of observation. This confirms that the greatest benefits will be realised through using experienced intercept officers allied with new technology.

KF5. On average, one vehicle was stopped per officer hour intercepting – this level of performance was maintained throughout the pilot. In overall terms, 39,188 vehicles were stopped during 73,546 staff hours (including administration, prisoner handling and civilian time) – this equates to one vehicle stopped for every two hours staff input. Feedback from the field suggested that ANPR teams spent little time waiting for hits (dead time)

and most of their time investigating vehicle hits – less than 13% of vehicles that registered an ANPR hit were actually stopped, suggesting officers are often too busy to stop every vehicle registering a database hit, or are prioritising stops.

KF6. Extrapolating the average results achieved during the six month pilot, each Police Constable operating as part of an ANPR-enabled intercept team would annually expect to:

- arrest over 100 people per year

- recover 11 stolen vehicles, with a total value of approximately £68,000

- recover stolen goods on three occasions, with a total value of approximately £23,000

- seize drugs on seven occasions, with a total street value of approx. £3,300

- seize two offensive weapons/firearms

- recover property on five occasions.

KF7. Perhaps not surprisingly, PNC was the most successful originating database in terms of goods recovered/seized; for example 66% of stolen vehicles recovered originated from PNC. However the other databases, and indeed observations, also proved an effective tool for generating actions. In particular, it is worth highlighting the two firearms that were recovered from vehicles triggered from the DVLA databases.

KF8. ANPR-enabled intercept officers arrested someone on average once every twelve vehicle stops. Only 20% of arrests related to driving offences, ie the vast majority of arrests were for non-driving matters. On the basis of the staffing inputs identified, each full time officer operating as part of an ANPR-enabled intercept team would expect to make over 100 arrests per year.

KF9. In spite of data quality issues, a large proportion of arrests came from the two DVLA databases. These results validate previous research that established a link between vehicle documentation crime and more serious crimes.

KF10. Arrests per 100 hours of staff input and per 100 vehicle stops were very closely matched. In general, officers were stopping the same number of vehicles per hour at the start of the pilot as they were at the end, The overall trend during the pilot was for an increase in arrests per 100 vehicles stopped/100 hours of staff input. This indicates that results improved over time as officers became more experienced.

KF11. The indicative age of a vehicle, as determined from the VRM, was a strong indicator as to the number of arrests per 100 vehicle stops. For example, vehicles first registered in 1987 were 3.5 more likely to yield an arrest than vehicles registered in 1999. In terms of arrest type, there was a significant variation by vehicle age. For example, arrests for theft and burglary were most likely to originate from older vehicles, while drugs and auto crime arrests were most likely to originate from very recently registered vehicles.

KF12. The ANPR-enabled intercept teams made a number of significant arrests. Arrests were not just for vehicle documentation crime but were also for more serious crime. It is not possible to quantify the quality of these arrests, however, the case studies give some indication as to the value of ANPR in addressing serious crime.

KF13. Of the 39,188 vehicle stops, in 23,731 cases (61%) the intercept officers took some form of action as a result of the stop. Analysis showed that the proportion of stops resulting in some form of action stayed broadly the same over the 26-week pilot.

KF14. Overall, intercept officers took 48,833 actions with respect to 23,731 vehicle stops where an action was taken, ie approximately 2.1 actions per vehicle where an action was taken. Analysis showed that while arrests per 100 vehicles stopped increased over the 26-week pilot, the number of other forms of action taken per 100 vehicles stopped stayed broadly the same.

KF15. In terms of the source databases:

- PNC was the most effective database in terms of arrests per 100 vehicle stops

- because intercept officers were unable to check all vehicle details at the roadside, in particular whether a vehicle had a valid MOT certificate (where appropriate) and whether the driver had insurance, producer document requests (HO/RT1) were issued for a large proportion of stops – 42% of all stops and 70% of all stops where an action was taken.

KF16. Vehicles stopped containing persons with previous criminal records were seven times more likely to yield an arrest than vehicles without.

KF17. There is a strong inverse relationship between arrests per 100 vehicle stops and vehicle stops per hour. Intuitively this seems correct, as a vehicle stop involving an arrest will require more time than one that does not.

KF18. The ANPR-enabled intercept teams generated significant number of intelligence logs that will be of value to the wider police network.

Conclusions

On the basis of the review findings, the following conclusions have been made:

C1. The pilot showed that the majority of ANPR officers time is spent in the field, either on intercept duties or travelling to and from intercept duties (79%). This is significantly higher than a 'typical' police officer – a recent Home Office report[12] found that on average, a police officer spends only 57% of their time away from their police station. Accepting that there are clear differences between the work undertaken by intercept officers and typical police officers, in operational terms, ANPR-enabled intercept teams provide for more visible policing. Because intercept teams tended to locate on and around trunk roads, and intercept officers operated from marked vehicles, the concept of ANPR-enabled intercept teams will address the general public's desire to see more 'officers on the street'.

C2. The proportion of time spent on intercept duties stayed broadly the same throughout the pilot period and was more or less similar across the nine forces. Given that forces were sharing/adopting good practices during the pilot in order to improve their efficiency, we conclude that it is unlikely that intercept officers will be able to spend a significantly greater proportion of their time on intercept duties without major changes to work practices (for example, adoption of IT to reduce bureaucracy or dedicated prisoner handling teams). It would, however, have been useful to have quantitative information on the tasks undertaken by officers during the vehicle stops, specifically what activities were undertaken (eg questioning the driver, PNC checks, form filling etc) and what proportion of time was spent on each activity.

C3. There was no evidence from the pilots as to the optimum number of ANPR-enabled intercept teams and officers per force area. However given the small proportion of ANPR hits that were stopped (less than 13%) and the number of markers/flags on the databases used by the intercept teams, we conclude that the current staffing of intercept teams could be increased considerably across forces without the introduction of significant dead time (waiting for hits).

C4. We conclude that allowing officers to stop vehicles on the basis of observation was an important aspect to the success of ANPR-enabled intercept teams. Not only did this recognise the benefits of using experienced officers, it also allowed for a visual check of vehicles (for a VED tax disc) before they were stopped, and prevented an over-reliance on technology.

C5. While vehicle stops per hour is an interesting metric, it is not a useful indication of efficiency or relative performance. Indeed as was shown in Figure 28, more vehicles stops per hour corresponds to fewer arrests. Given the Government's desire to narrow the justice gap, we conclude that one of the key performance indicators for intercept teams is arrests per 100 vehicle stops. The number of vehicle stops per intercept hour should be monitored as a secondary indicator.

C6. While the pilot focused on the use of ANPR, 22% of vehicle stops originated from officer observation. In terms of outcome, these were as effective as hits generated from ANPR. Officer observation will never generate the volume of vehicle hits that ANPR can, however it shows the value of having pro-active, dedicated intercept teams.

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[12] *Diary of a Police Officer,* PA Consulting Group (Home Office, Police Research Series Paper 149, 2001)

C7. The results from the pilot indicate that each Police Constable operating as part of an ANPR-enabled intercept team would expect to make over 100 arrests per year – 10 times the national average for a Police Constable.[13] On this basis, diverting just 1% onto ANPR-enabled intercept teams could see a 10% increase in the number of arrests (although there may be diminishing returns.) ANPR-enabled intercept teams could therefore make a very significant impact on the Government's narrowing the justice gap target. (The number of offenders brought to justice will be examined as part of the next phase.)

C8. ANPR-enabled intercept teams operate outdoors and, as such, operations can be disrupted or restricted due to poor weather and darkness. Given that the pilot was conducted in the six months of the year with the poorest weather and light conditions, we conclude that it would not be unreasonable to assume that, all other things being equal (in particular operational hours), results achieved over a full year would be better than those during the pilot. This is because it would be easier to spot known drivers in better light conditions and officers will be less affected by poor weather/light conditions during summer months.

C9. Counter to this potential improvement in performance, it is worth acknowledging some of the qualitative feedback from some intercept officers regarding the intensity of the operations. Specifically it was suggested that the levels of performance achieved during the pilot could not be sustained in the medium term as officers' motivation may deteriorate. There was no statistical evidence to support this, however this does seem reasonable. In addition, we do not yet know what the long-term effects would be on criminal activity.

On this basis we conclude that ANPR-enabled intercept teams have shown to be an extremely effective means of engaging with criminals. Using a range of police intelligence and experience, intercept teams were able to disrupt criminal activity in an efficient and effective manner, achieving arrest rates 10 times the national average. The pilot identified a number of areas where operations could be improved (in particular, regarding data). Once these have been addressed and given the development of a good practice manual, it would be expected that ANPR would be an even more effective policing tool than was shown in the pilot.

The Home Office and ACPO have recognised the potential of ANPR and in the next stage will expand the number of intercept officers by five-fold within a carefully managed programme across 23 forces. This programme includes a number of workstreams including technical development, HR issues, financing, communications, good practice dissemination and evaluation. Given this, many of the issues raised during the first stage pilot are already being addressed.

This evaluation report highlighted that the widespread adoption of ANPR-enabled intercept teams could have a very significant impact on the wider criminal justice system, including the courts and prisons. This evaluation focused on the operational aspects of ANPR-enabled intercept teams. To inform the decision about national roll-out, it will be essential to know the outcome of arrests made by intercept teams relative to conventional policing, for example are cases generated by ANPR roadside stops more or less likely to go to court? Have defendants pleaded guilty, proceeded to trial and had a successful outcome compared to current caseload? There is anecdotal evidence from the first pilot to suggest this may be the case. We, therefore, recommend that this aspect be evaluated in full as part of the next stage of piloting.

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[13] Nationally 125,682 full time equivalent Police Officers made 1,264,200 arrests – this equates to 10 arrests per officer per annum.

The Home Office is the Government department responsible for internal affairs in England and Wales. Their aim is to build a safe, just and tolerant society, to enhance opportunities for all, and to ensure that the protection and security of the public are maintained and enhanced. Within the Home Office, the Police Standards Unit exists to deliver the Government's commitment to raise standards and improve operational performance in the police and in crime reduction generally and to maintain and enhance public satisfaction with policing in their area. Its core objective is to identify and disseminate best practice in the prevention and detection of crime in all forces, in order to reduce crime and disorder as well as the fear of crime

The Association of Chief Police Officers (ACPO) was set up over 50 years ago so that work in developing policing policies could be undertaken in one place, on behalf of the Service as a whole, rather than in 44 forces separately. ACPO supports the philosophy of strong local policing, and believes that this must be maintained within the tripartite framework of policing which brings together the local Chief Constable, the local Police Authority and the Home Secretary. The nature of modern crime, however, with an increasingly national and international dimension, and the ever present need to use public resources to best effect, places a voluntary duty on forces to work together, employing common policies, strategies and methods wherever possible.

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