



fsi

forensic science ireland



Annual Report
2018



Science
Supporting
Justice

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Excellence Through People 1000:2017



I am very pleased to publish this Annual report and represent the contributions and impact the staff in FSI have had over the course of 2018. I'm impressed at the capabilities and the sustained level of commitment, professionalism and resilience of the staff in FSI. These traits underpin all of the contributions made in case work as well as the progress in some key initiatives.

FSI delivered on some significant results for the criminal justice system in 2018. Case submissions increased by close to 10% overall; including increases of 15% for DNA cases and more than 9% for complex drug cases. FSI delivered on 576 more complex drug reports compared to 2017 and on 500 more DNA cases. This additional work was enabled by process improvements, new instrumentation and some additional staffing. FSI have contributed to high-profile cases over the course of the year – from murders, to significant drug seizures, to aggravated assaults. We have worked closely with An Garda Síochána over the year to prioritise where we can have the most impact and deliver results effectively, with active engagement in the investigation over the life of the case. We have also supported investigations by visiting crime scenes, clandestine labs and grow houses. A sustained focus is required to grow capacity to meet current and future demand. This process started in 2018 and will continue in 2019.

A report on the operation of the DNA Database in 2018, in compliance with the Criminal Justice (Forensic Evidence and DNA Database System) Act 2014, is also included in this publication. Investments made in the DNA database as well as DNA technology are having a growing impact. This has allowed us to identify 5 Missing Persons over the course of the year, and bring much-needed closure to their families and friends. Other advances in DNA technology have allowed us to analyse more complex mixtures from crime scenes and compare individual profiles against the national database. FSI was the first to implement this technology in Europe which has already had an impact in criminal cases. The DNA team in FSI were recognised for this accomplishment with the top prize for innovation in the Civil Service Excellence

and Innovation Awards for 2018. The DNA database continued to grow in size and effectiveness throughout 2018. At the end of 2018, 38.5% of crime stains had a suspect match from the Database (up from 34% in 2017). FSI has added 26,649 profiles to the database by the end of 2018, as well as 5326 unsolved crime stains. FSI successfully validated its technical readiness for DNA profile exchange with other participants of the Prüm Treaty in 2018. This allows for exchange of profile information across participating members in Europe to prevent cross-border crime and terrorism. In 2019 FSI plans to make these exchanges operational and have active exchange with up to 4 countries by the end of the year.

FSI delivered its case reports with a high degree of scientific rigour throughout the year. Operating to international quality standards, critical thinking and peer review processes are cornerstones of the organisation's delivery. We have also participated in cross-organisational best practice and method development workshops across Europe through the European Network of Forensic Service Institutes (ENFSI) and the Association of Forensic Service Providers (AFSP). This will remain a key focus for the organisation, to ensure we are operating to best international standards and driving improvements in quality, productivity and the breadth of services we offer.

With the support of the Department of Justice and Equality, and the Public Appointments Service, FSI ran several recruitment campaigns in 2018. Several new staff joined FSI over the course of the year, with recruitment still on-going. This helps address some of the gap between casework capacity and demand and positions FSI better for some of the challenges ahead.

FSI's people management practices were assessed by the National Standards Authority of Ireland and were awarded a Gold Certificate in its Excellence Through People (ETP) scheme. We will build on this theme in the coming years to make FSI the most compelling place to work for scientific, technical and administrative professionals.

Ground works were completed for FSI's new laboratory facility in Backweston, County Kildare in the first half of 2018. This was a significant milestone towards a much-needed investment serving Ireland's criminal justice system. The tender process for building works was launched on 24th December and we eagerly await the start of construction in Summer 2019. FSI's current facility is not fit-for-purpose and a new forensic laboratory, designed around the work FSI does today and in the future, is an imperative for a robust criminal justice system.

A key focus for 2019 will be to effectively integrate the laboratory functions of the Garda National Technical Bureau within FSI. Staff and Garda members of GNTB bring a wealth of experience and expertise and I look forward to working with them in building a broader integrated forensic service that serves our criminal justice system. We will also focus on adding capacity to key services to meet some of the increasing demand. This will be achieved through a combination of investments in instrumentation, automation, process improvements and staffing.

This report marks the end of FSI's last strategic plan that spanned the timeframe 2015 – 2018. In April of this year we will launch our new strategic plan that will shape the contributions and impact of FSI out to 2022. I look forward to sharing more later this year.



Chris Enright
Director General FSI



Progress of New Facility



Site of new laboratory in Backweston - Pre Enabling Works



Site of new laboratory in Backweston - Post Enabling Works





Introduction

Forensic Science Ireland is an associated office of the Department of Justice and Equality. The 125 people now working at FSI are scientists and analysts trained in forensic testing and reporting techniques, supported by administration professionals. We work together to deliver to best international standards, comprehensive scientific analysis, independent expert opinion, advice and training to support the Irish Criminal Justice system. Originally known as the Forensic Science Laboratory, FSI was established in 1975 to provide a scientific service to the Criminal Justice System by analysing samples submitted from crime scenes and providing expert evidence in criminal trials.

In June 2014, President Higgins extended our scope when he signed into law the Criminal Justice (Forensic Evidence and DNA Database System) Act 2014. Under this act, FSI is named as the custodian of that database and our name was changed our name from Forensic Science Laboratory to Forensic Science Ireland to recognise this broader remit.

FSI is currently based in Garda Headquarters in the Phoenix Park but plans to build a new fit-for-purpose building on the scientific campus at Backweston, Celbridge are well advanced. Plans are also developed to integrate the laboratory-based services of the Garda National Technical Bureau (GNTB), including Fingerprints, Ballistics and Documents & Handwriting into FSI, as a single, cohesive forensic provider for the State.

FSI is a founding member of the European Network of Forensic Science Institutes (ENFSI), as well as the Association of Forensic Service Providers (AFSP). These organisations are focused on developing and sharing best international forensic practices and research within its members. Our staff are active on all the relevant ENFSI and AFSP working groups. This international engagement is important in ensuring that expert evidence presented is grounded in the most recent scientific research and best international practice.

FSI is accredited according to ISO17025 and holds a Gold Excellence through People certification.



Our Management Team



Director General
Chris Enright



**Director of
Corporate Services**
Dr. Tom Hannigan



**Director of
Chemical Analysis**
Dr. Yvonne Kavanagh



Director of DNA
Dr. Geraldine O'Donnell



**Director of
Physical Analysis**
Dr. Dyan Daly



**Director of Science
& Development**
Dr. Sean McDermott

Our Staff

Forensic Science Ireland is a knowledge-based organisation and the expertise of the staff is its most valuable attribute. Its functioning is an excellent example of the practical application of science in Ireland. Our staff are qualified in a range of scientific disciplines, many of them to Masters or Ph.D level. Our staff use science in the investigation of crime. The nature of science results in ongoing change and consequently FSI places a significant emphasis on ongoing education and development. This is vital in ensuring that the Criminal Justice system has the benefit of international best practice.

Our Services

FSI contributes to both the investigation and adjudication of crime within the Irish Criminal Justice System. In broad terms, forensic investigations involve the examination of items recovered from crime scenes and the use of various techniques to link suspects and victims and suspects and scenes. This frequently leads to the elimination of suspects from investigations and there are few major criminal trials that do not feature some contribution from FSI.

The area of most sustained growth is DNA, which is also the discipline of greatest recent developments. In the DNA area, DNA profiles are extracted from submitted items and compared with reference profiles obtained from suspects to assist the investigation of crimes ranging from burglaries to sexual assaults and murder. Blood Pattern Analysis (BPA) and examination of damage to clothing is also carried out.

In the Chemistry area, many types of trace evidence are recovered and compared with reference samples e.g. glass, paint, fibres, firearm residue. Marks and impressions are also examined e.g. footwear impressions left at crime scenes or manufacturing marks on plastic bags. Debris samples from suspicious fires are analysed for accelerants (e.g. petrol) and suspect materials are analysed for explosives. Chemistry contains the greatest variation in types of materials encountered and the discipline where the greatest diversity of knowledge is needed.

The analysis of materials thought to contravene the Misuse of Drugs Acts constitute the highest number of submissions to FSI. Case submissions vary widely in size, drug mix and complexity. These cases often involve new psychoactive substances that pose particular analytical challenges.

The Physical Analysis area is the most recent function within FSI and will host the Fingerprints, Ballistics and Documents & Handwriting disciplines.

The bulk of cases for FSI analysis are submitted by An Garda Síochána but material is also received from Garda Síochána Ombudsman Commission (GSOC), Customs & Excise, and Military Police. Cases are accepted by FSI reception/ case intake staff who ensure that items are safely and securely stored or passed directly to a scientist depending on the situation. In either situation the chain of custody is carefully monitored.

In addition to analysing samples in the laboratory, staff from FSI provide professional advice and training on the appropriate samples to be taken from crime scenes and individuals and in some circumstances attend crime scenes. We also operate an out-of-hours service for situations where investigating Gardaí need access to immediate information or when it is necessary to visit crime scenes, or suspected clandestine laboratories.

We work closely with An Garda Síochána on cases where our findings have the potential to make a difference and provide value for money for the State, by ensuring that our expertise and resources are used in instances where they are more likely to include or exclude suspects rather than provide findings that are neutral.

Staff act as expert witnesses in criminal trials. There is the potential for this to occur in all cases, but court attendance is required from approximately 1% of cases across the laboratory. Some areas of work are more likely to result in court cases than others. Attendance at court can involve robust defence of scientific finding but more often the witness is required to outline routine processes related to continuity or laboratory procedures.

Strategic Pillars

This annual report is organised under four main headings, corresponding to the strategic themes identified in the FSI's strategic plan 2015 – 2018.



The report identifies ways in which FSI delivers a quality forensic science service and continues to grow and develop both science and staff to ensure that we are operating to international standards.



FSI interacts with a range of stakeholders. An Garda Síochána are the main front line customers and the service supplied to them is defined in the service level agreement. The range of services and how we have delivered is outlined in the report.



This initiative relates to investment in enabling ICT, forensic technologies and laboratory facilities as well as supporting work practices and culture within the organisation. The report outlines progress made in 2018 in the implementation of new IT systems, a fit-for-purpose forensic laboratory, as well as our work practices.



The implementation of the DNA Database is one of the most important crime fighting tools introduced within the State in recent times. The final section of the report outlines how the effectiveness and impact of this system has grown over 2018.





Case Study 1

FSI scientists have developed an improved method for the recovery of DNA from bones, particularly from bones recovered in seas and rivers.

This has led to the successful identification of a number of previously unidentified skeletal remains during 2018. Previously discovered remains from 2001 were positively identified as Aengus (Gussie) Shannon. Remains discovered near Swords in 2014 were identified as Margaret Glennon who disappeared in 1995. Remains discovered in 2002 were identified as James Gallagher who went missing in 1999. FSI also collaborated with international colleagues in helping identifying missing Irish citizens whose remains were discovered abroad. Joseph Brendan Dowley was identified following exhumation from a North Wales graveyard and Paul Shine-Dixon was identified from remains discovered in 2017, having gone missing in Perpignan, France in 2009.

Case Study 2

Alan O'Neill was fatally shot in the driveway of his home in Tallaght on 27 May 2015. A short time later, Warren Nolan was arrested running from a burning vehicle.

CCTV showed this vehicle in the area of Alan O'Neill's home shortly before the shooting. Warren Nolan was taken to Tallaght Garda Station where gloves and clothing were taken from him. FSI scientists gave evidence that they found firearm residue (GSR) on the gloves and petrol on his clothing. On 10 December 2018, Warren Nolan was convicted in the Central Criminal Court of the murder of Alan O'Neill.



Case Study 3

The DNA Database has been in effect since November 2015 and its usefulness in helping solve crime continues to grow each year.

In 2018 there were 867 investigations aided which involved either unsolved crime stain profiles being linked to suspected offenders or previously unlinked cases that became linked through crime stain DNA profiles matching other unsolved crime stain DNA profiles.

One such 'cluster' of 2018 cases involved crimes stains from scenes of burglary, robbery and assault cases that appear to be from a serial offender. When DNA profiles were generated from these 4 cases, they were uploaded onto the Database and it was shown that these cases were linked by one individual. The identity of the offender is as yet unknown. If a DNA sample is taken from him in relation to these or other crime(s) in the future, his DNA reference profile will be uploaded and will link to this cluster of cases.

Another major breakthrough for casework in 2018 came about for two old cases - a burglary that happened in 2014 and a suspicious death/murder case from 2010. DNA profiles had been generated in these cases and the unknown profiles had been uploaded to the DNA Database, and these cases had been linked to each other. It was only when in 2018 a suspected offender's DNA profile had been taken for an unrelated incident and uploaded to the database, he was linked to both the burglary and the murder.

Case Study 4

Gareth Hutch was shot dead as he was getting into his car outside Avondale House flats on North Cumberland Street in Dublin on the morning of May 24th 2016.

A forensic scientist from the DNA Section gave evidence at the murder trial of Jonathan Keogh in the Special Criminal Court. DNA matching the profile of Jonathan Keogh was found on a balaclava, biker's neck warmer and baseball cap seized from a BMW car at the scene of the shooting, and also on latex gloves taken from a dressing gown belonging to a key prosecution witness in the case.

Jonathan Keogh was subsequently found guilty of murder on November 2nd, and sentenced to life in prison.



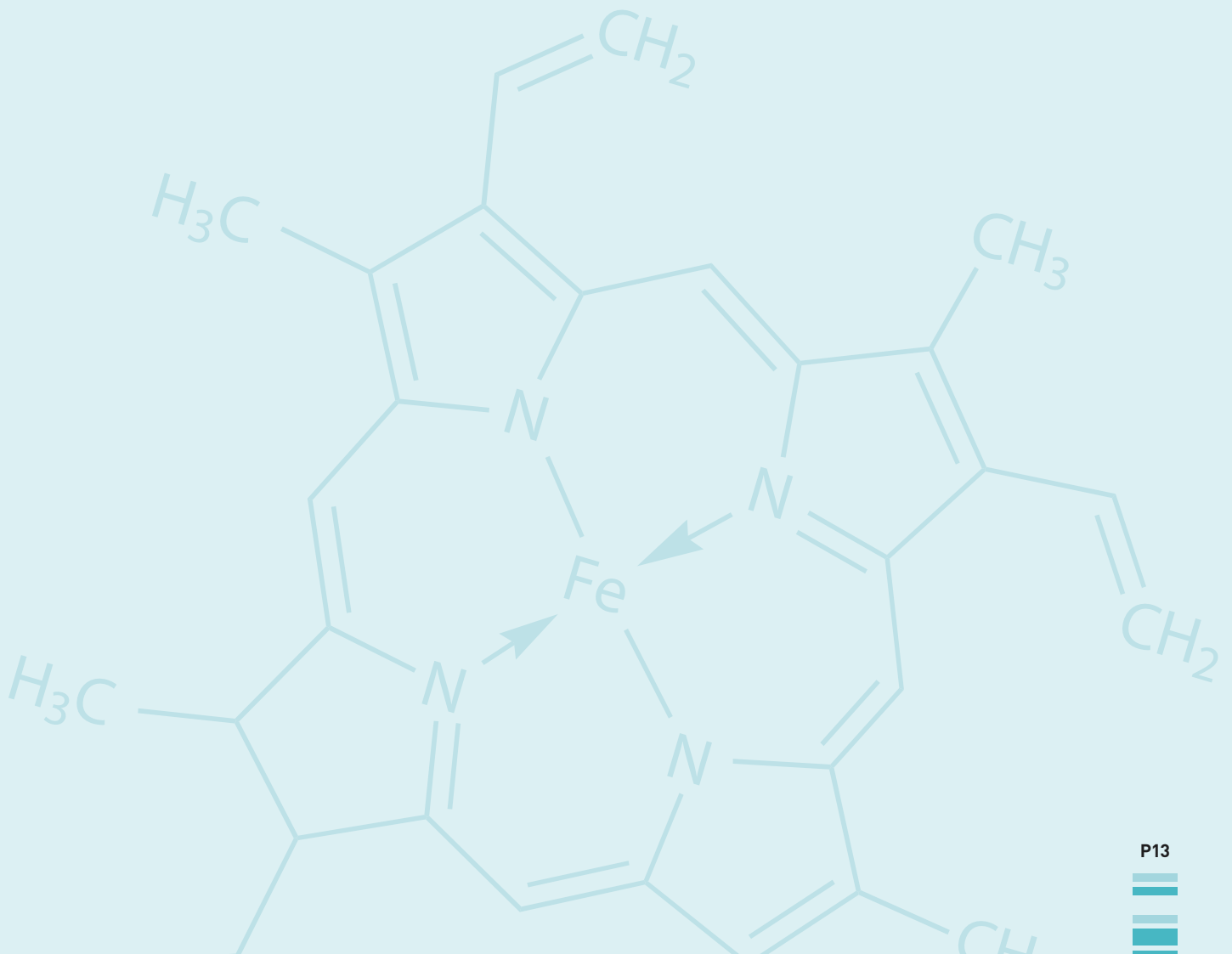
Goal 1

Provide a quality forensic science service

FSI used ISO 17025 throughout the year as a cornerstone of our quality system and continuous improvement process. This involves regular monitoring, control and feedback across disciplines. Four management review meetings were held with senior staff to manage this system in 2018. These meetings recorded the various sources of feedback and follow up activity. The annual assessment by INAB took place over several days in November 2018 with the successful outcome of maintenance of accreditation for our existing scope of services. In addition some very important extensions to our services were accredited based on significant development and validation work:

- Extension of 'STRMix' mixture interpretation software, which allows deconvolution of complex DNA mixtures. This considerably enhances the DNA database intelligence service.
- Extension of an image-capture and comparison system (Trasoscan) for footwear comparison casework.

Some important groundwork was completed in 2018 to prepare FSI for compliance to the new ISO 17025 standards.



Anticipate future technological opportunities and their applications to casework

Several new techniques and processes were implemented in FSI over the year to improve forensic capability and effectiveness. Some of the highlights for 2018 include:

- Introduction & validation of the pedigree tree approach to enhance the service for missing persons cases.
- During 2018 FSI continued to liaise with the Health Research Board and the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) monitoring both national and international novel psychoactive drug trends in relation to FSI drug and toxicology casework. No substances were reported during 2018 - a marked decrease from the 15 such substances reported during 2017.
- Validation of confirmatory screening (using LCMSMS technology) for biological samples in sexual assault cases was introduced during 2018 in addition to the introduction of a fully integrated toxicology report.
- A new High Resolution Liquid Chromatography Mass Spectrometer (HRLCMS) was purchased towards the end of the year. Further development and expansion of the current toxicology service is planned for 2019 in addition to exploring other potential FSI-wide applications.
- FSI staff represented Ireland at the Heads of National Focal Points Expert meeting (EMCDDA, Lisbon, June 2018).
- FSI staff represented Ireland at the New Psychoactive Substance Expert Group meeting (European Commission, Brussels, October 2018).
- FSI staff delivered the keynote address at the All Hazards Forensic Conference (Dr. John Power, Nov 2018. UCC).
- Work was carried out by a DIT student to evaluate the potential practical applications of Raman Spectroscopy within FSI.

Increase support for learning opportunities

- Online journals are available at FSI to support on-going learning in fields of interest. Discipline meetings across FSI also serve to encourage learning and development in that domain.
- Several staff across disciplines have participated in international events through ENFSI or AFSP, with many attending at locations across Europe.
- FSI had 2 staff members participate in a leadership development programme with the Institute of Public Administration. Several others are pursuing the management and leadership development programme organised through the Department of Justice & Equality. Finally, 3 staff members completed Masters and PhD degrees by the end of 2018.

Publications

FSI staff members have contributed to the global forensic knowledge base through the year, with several papers published. These papers are outlined in Appendix 1.

Goal 4 || |||

Ensure that we are operating to best international practice

FSI's active engagement in ENFSI and AFSP networks allows us to stay abreast and contribute to international best practice sharing. FSI contributes to all working groups in these networks. A new working group focused on benchmarking operational measures was active in 2018, with one workshop hosted by Ireland in September.



DNA team at the Civil Service Excellence and Innovations Awards, where they won an award for scientific development in DNA (Strmix). Pictured (L - R) Mr Robert Watt (Department of Public Expenditure and Reform), Dr Geraldine O'Donnell (FSI), Dr Sibéal Waldron (FSI), Dr Alan Magee (FSI), Dr Edward Connolly (FSI), Ms Kristen O'Connor (FSI) and Ms Katherine Licken (Department of Culture, Heritage and the Gaeltacht).



Goal 1

Deliver excellent Customer Service to our clients

The service of FSI is based on a service level agreement signed by the Commissioner of An Garda Síochána and the Director General of FSI. The document highlights the core guiding principles that underpins its service delivery – quality, prioritisation for maximum impact and continuous improvement.

1. **Quality:** FSI ensures that the services will be performed in a professional manner consistent with relevant international industry standards and subject to external validation.
2. **Prioritisation for Maximum Impact:** FSI prioritises cases based on importance to the client, forensic potential and capacity within the system. Throughout 2018 FSI capacity (people, infrastructure and equipment) was insufficient for demand and a collaborative prioritisation approach was used throughout 2018.
3. **Continuous Improvement:** FSI holds an ethos of continuous improvement and will strive to improve the range, quality and throughput of services over time.

A case prioritisation system is in operation as outlined in Figure 1, where the cases of high public interest and where the contribution of science is clear get highest priority and those of low public interest where the contribution of science is neutral get little or no attention.

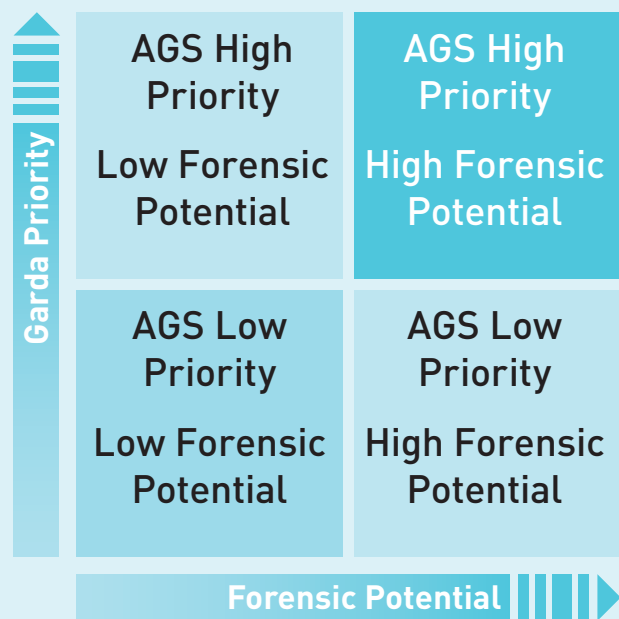


Figure 1. Factors for consideration in case prioritization.

Case numbers

Case numbers reported for 2018, relative to 2017 are shown in Table 1 below.

Service	2017 Case Reports	2018 Case Reports
Drugs	8,456 Total (3,995 complex, 4,461 Section 3)	7,443 Total (4,571 complex, 2,872 Section 3)
Chemistry/Microchemistry	623	675
Toxicology	276	274
DNA Cases	4,000	4,500
DNA Reference Samples	14,000	11,045
Total Cases Reported (excluding reference samples)	13,355	12,892

Table 1

This reported output is based on submissions to FSI of 16,588 in 2018, compared to 15,200 in 2017; an increase of almost 1,400 cases, often with multiple exhibits. This represents an increase in demand of close to 10% overall for FSI; including 15% for DNA and over 9% for complex drug cases. The statistics alone do not represent the variation and complexity of cases received. The case load in 2018 included a number of high profile cases which took considerable resources over several months because of their size and complexity. These include major drug seizures, investigations of clandestine laboratories and grow houses, murder and serious assault investigations, and sexual assault investigations often requiring extensive DNA work. FSI prioritised these most urgent cases and offered a fast, responsive and extensive service to support these investigations.

Based on effective prioritisation, additional staffing and process improvements, FSI delivered on 576 more complex drug case reports in 2018, compared to 2017. This consists of section 15 (possession with intent to supply) and section 17 (cultivation) cases which were deemed to have a significant beneficial impact on the criminal justice sector. This was in addition to the increased contribution in DNA casework, where we delivered 500 more DNA cases compared to 2017.

As in previous years, the demand for case work throughout 2018 significantly exceeded the capacity available. This resulted in backlogs across case types, and especially so in the drugs area. These backlogs were managed in accordance with the Service Level Agreements we have in place with An Garda Síochána. Additional staff were added in 2018 and are now trained and actively contributing to caseloads. Some process improvements were implemented to increase capacity and further work is planned for 2019. Prioritisation of cases will be key and FSI will also focus on sector-level issues to optimise the demands of FSI.



The following graphs illustrate the range of analyses completed in 2018, with some associated trends. The trends in Drug submissions from 2007 to 2018 are shown in Figure 2 below.

Trends in Drug Submissions in ten year period (2007 - 2018)

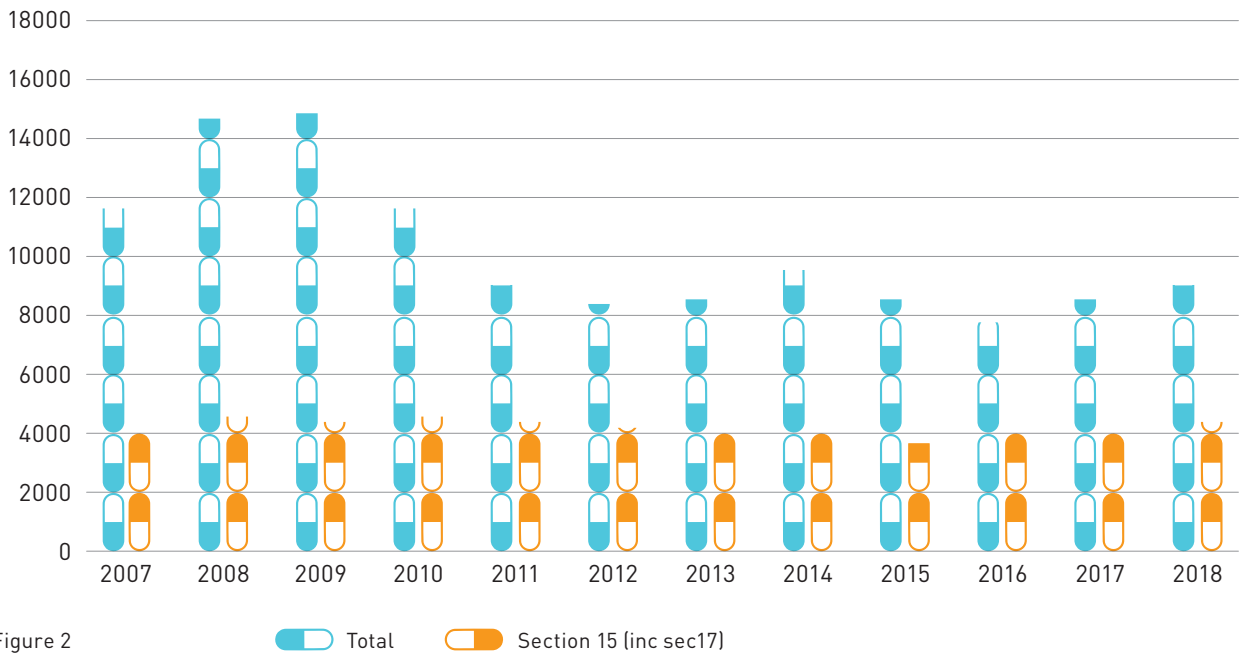


Figure 2

This shows the increase in submissions compared to 2017, coupled with more complex case submissions (section 15 & 17). There has been a significant change in the mix of drug cases over the last 10 years. Complex cases now represent at least 50% of case submissions. This compares with less than 30% 10 years ago and 42% in 2018. The Presumptive Drug Tests, discussed later in this report, have helped influence this trend.

The types of drug analysed in 2018, illustrated in Figure 3 below, remains largely consistent with 2017. The percentage of cases analysed containing cannabis has increased from 38% to 47%, largely due to an initiative mid-year to reduce the backlog of cannabis cases. The relative proportions of non-cannabis cases reported in 2018 are similar to 2017; Powder (usually Cocaine) 26%; Tablets (usually MDMA) 16%; Heroin 11%.

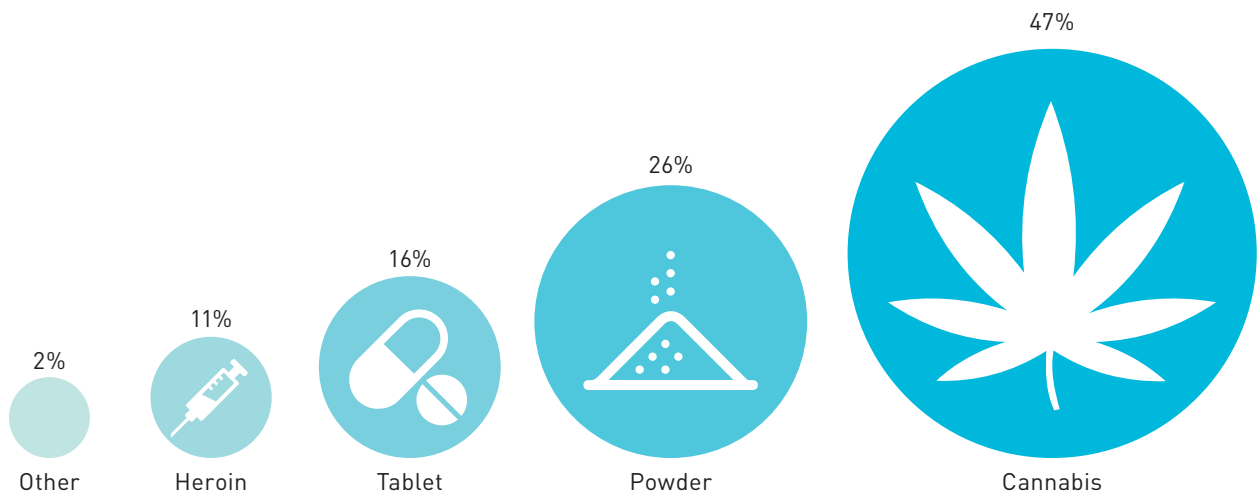


Figure 3

Examples of the types of Chemistry cases examined in 2018 are illustrated in Figure 4 below. This shows the broad range of specialities and case types examined by the Chemistry section.

Different types of Analysis reported by Chemistry Section in 2018

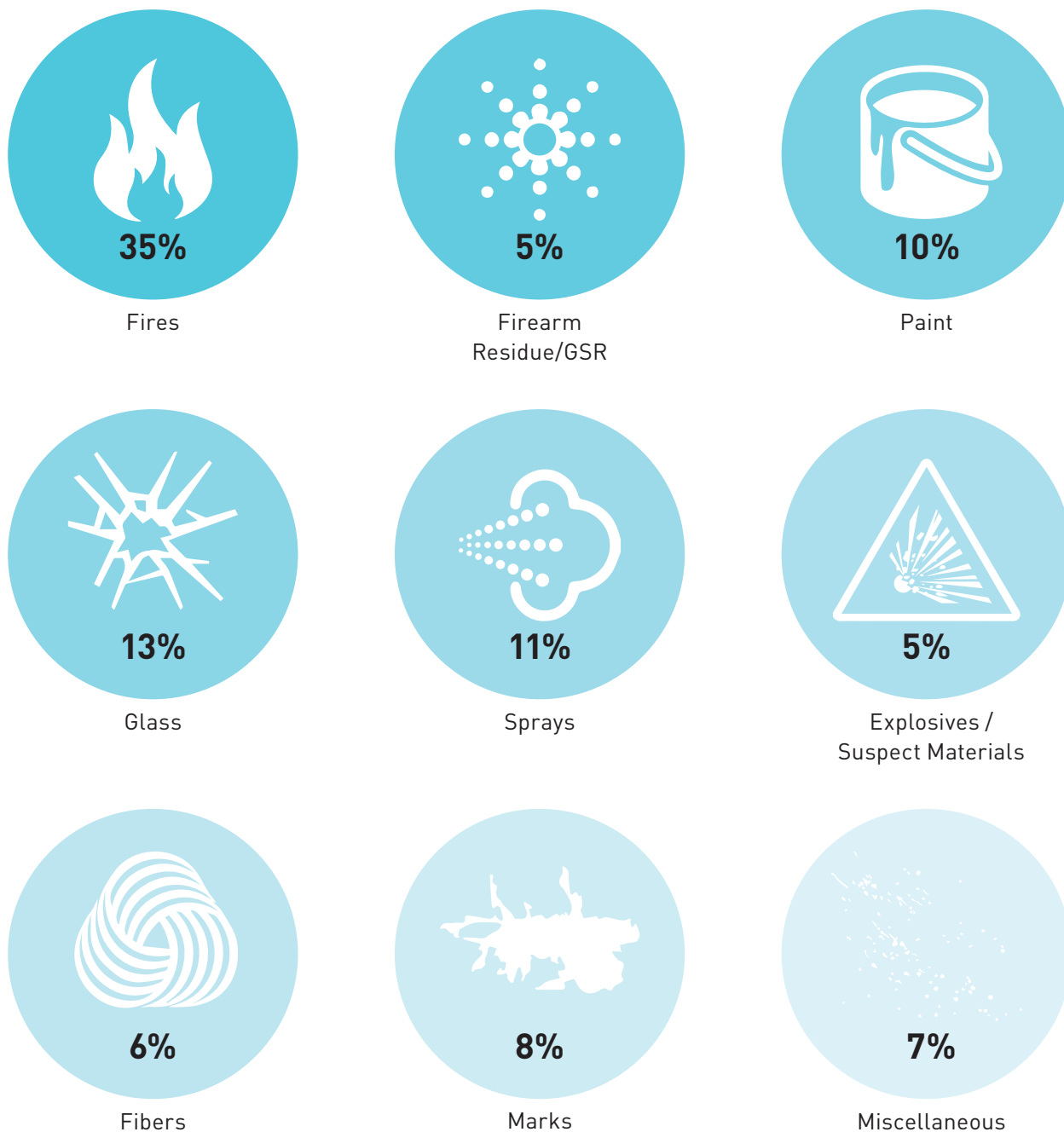
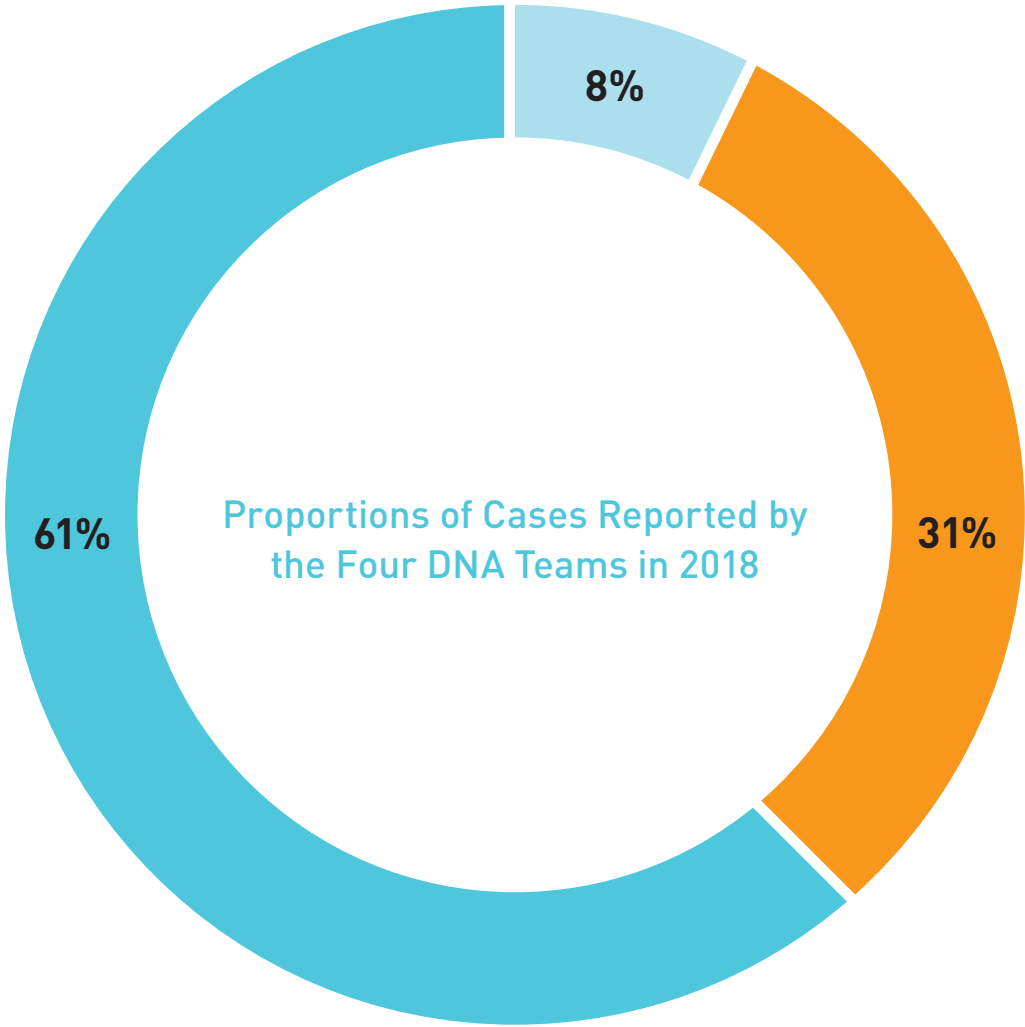


Figure 4



Figure 5 shows the different types of cases reported by the DNA section in 2018 (and proportions). The team structures reflect the wide range of cases where DNA is useful. The sexual assault team work on cases involving a sexual assault. The Database team work on volume crime cases – these include burglaries, unauthorised takings and cases where only 1-2 exhibits are submitted. As the name implies the serious teams work on cases involving injury to people- these include murders, gangland killings and assaults.



- Database Team
- Serious DNA Teams
- Sexual Assault Team

Figure 5



Court cases

A percentage of the cases examined result in court attendances each year. Frequently these court cases relate to reports issued in earlier years. Staff from FSI attended court as expert witnesses on 85 occasions in 2018 (50 for DNA; 28 for Chemistry; 5 for Drugs; 2 for Toxicology) and as witnesses for continuity of evidence on 11 other occasions. The types of cases involved are varied as casework itself and range from armed robbery, burglary, explosives and firearms as well as murders, sexual assaults and drugs. In all cases, scientific evidence was presented professionally and objectively and subjected to the rigour of cross-examination.

Defence visits

Various scientists employed by the defence visited FSI on 37 occasions (20 for DNA in 2018; 11 for Drugs; 6 for Chemistry in 2018) in 2018. The majority of these visits related to the re-examination of DNA evidence and on occasion, involved FSI re-profiling the samples at the request of the defence. Chemistry cases examined involved fibres, explosives and glass. FSI also facilitated visits related to the re-examination of drugs seizures. No issues arose in subsequent court cases arising from these examinations.

Goal 2

Promote the practice of presumptive testing of Section 3 Cannabis and Cocaine cases by An Garda Síochána

Presumptive Drug Testing (PDT) was introduced by Garda Circular 23/11 in 2011. It is a system, widely used in the UK and other countries, whereby a trained Garda carries out a chemical test, using a commercially available test kit, to confirm that a suspect material is a specific controlled drug. The drugs covered by Circular 23/11 are cannabis (herb or resin) and cocaine. PDT applies only to offences under Section 3 of the Misuse of Drugs Acts (personal possession). Gardai carrying out the tests are trained by FSI (approximately 350 have been trained to date) and the kits used were evaluated by FSI before being chosen. The scheme was introduced to reduce the number of Section 3 cases being submitted to FSI to

allow us to focus our resources on the more serious Section 15 (dealing) and Section 17 (cultivation) cases. The resultant fall off in submissions can be seen from 2010 in Figure 2. In 2018, 4515 Section 3 cases were submitted compared with 4282 in 2017. FSI and the Department of Justice and Equality are evaluating the viability of putting the use of PDTs on a statutory basis, similar to the legislation developed for the Road Traffic Act.

Goal 3

Provide “at scene” attendance and out of hours service for major or urgent cases

The system to facilitate an out of hour’s service continued in 2018. Each scientist carries an on-call phone for a week at a time and a smaller group of 20 persons are available to attend scenes or to carry out necessary urgent laboratory work. This service was availed of on 29 occasions over the course of 2018 –

covering the full gamut of case types. FSI attended 20 crime scenes to provide specialist knowledge, particularly for murder investigations and clandestine drug laboratories.

Goal 4

Contribute to Cold Case reviews so that maximum benefit is obtained from modern scientific techniques

FSI participated in the Cold Case investigation team, managed by An Garda Síochána, throughout 2018. DNA techniques were involved in the solving of five missing person cases in 2018.

Two of the identifications, those of Margaret Glennon and James Gallagher, were ‘Cold Hits’ where there was no prior indication who the remains were from and they were identified by comparison with DNA samples submitted by relatives to the National DNA Missing Person Database.

The other three body identifications, those of Aengus (Gussie) Shanahan, Joseph Dowley and Paul Shine Dixon, were more targeted, where there was some

indication from other sources who the person was and this was confirmed by FSI by comparison with DNA samples from relatives.

In these cases, DNA techniques have helped bring closure to families experiencing a very difficult loss. FSI also participated in the National Missing Persons Day at Kings’ Inn in December, to present on how DNA can assist in these cases, and to gather volunteer DNA samples from family members. FSI will continue to focus on this in 2019.



Goal 1

To improve our Information and Communication Technology (ICT) system and facilities

A number of important IT integration projects were progressed through 2018. Data exchange from the Garda exhibit management system was automated with FSI's Laboratory Information Management System (LIMS). This reduces the number of manual entries and allows for more efficient information flow across organisations. This system is now operational and being stabilised. Automated reporting of DNA profile exchange was also progressed through the year, and will go live in 2019, supporting efficient reporting of DNA match data.

FSI has engaged with the definition of the Criminal Justice Hub, which aims to connect and integrate data from many nodes within the sector in a single platform. There is great potential in this platform to enhance the effectiveness and efficiency of FSI in the future.

Significant further investment in ICT will be required in FSI in the coming years. We will be extending LIMS across new disciplines and improving how we capture and store information to make our processes more efficient. We recruited a business analyst during 2018 to help define new processes and the ICT systems necessary to make them efficient and effective.

Goal 2

Purpose built facilities suitable for a 21st century forensic science institute

FSI's current facilities are wholly inadequate for the work we do today. As more and more sensitive and capable forensic technologies come into use and more extensive data exchange is expected across countries, the limitations of FSI's current facilities are even more stark. While risks are being currently mitigated by operational measures, the risk to the criminal justice system needs to be addressed more robustly with a purpose-built laboratory designed around modern forensic work.

With the support of the Minister for Justice and Equality, funding was awarded to complete preparatory ground works for a new purpose-built facility at Backweston, County Kildare in 2018. This green-field site was chosen so that infrastructure and services could be shared across The Department of Agriculture Laboratories and The State Laboratory, also based at Backweston.

We expect build contracts to be awarded this year and for construction to start in the Summer of 2019.

Goal 3

Facilitate a culture that supports the achievement of best HR practice and professional development

A new workforce plan has been drafted for FSI, with some good progress made throughout 2018. We have expanded the senior management team to reflect the new functions and new challenges ahead. We have created new positions in both Health and Safety Management and Information Systems Management to give increased focus and coordination to these important areas within FSI. We have also created several recruitment panels and are actively hiring scientists, analysts and administrative professionals. This will position us better to absorb some of the increases in demand and address gaps within the organisation.

Our people and business management process were audited this year as part of the National Standards Authority of Ireland (NSAI) Excellence Through People programme. This gives us some external validation of how good FSI's practices are, and how they measure up to similar organisations. This year we were awarded with a Gold Certification. It's an endorsement of the commitment of our staff and management, a belief in FSI's purpose and a desire for continuous improvement. We'll continue to use this and other models to ensure FSI remains progressive.



Goal 4

Enhance our relationships with all key stakeholders

FSI has engaged with all stakeholders within the criminal justice sector and beyond throughout 2018. This interaction has been at an operational and strategic level, and included several sections within the Department of Justice & Equality, An Garda Síochána, Sexual Assault Treatment Units (SATUs) and other Government departments.

A small example of some of the engagements over 2018 include:

- A presentation at Missing Persons Day, where FSI also helped collect family DNA profiles.
- Engagement with the Department of Justice & Equality on workforce planning and planning of the new building.
- Frequent meetings with the National Forensic Coordination Office within An Garda Síochána which acts as the link between FSI and AGS in relation to all matters relating to the national DNA Database.
- FSI also supported training courses and the Commissioner's conference and attended the regional senior managers' conferences.
- Supported Sexual Assault Treatment Units (SATU) staff training courses. FSI are members of the SATU Liaison group and the National Guidelines group.
- FSI attended a workshop facilitated by the Department of Health - 'The health sector's response to sexual assault' as part of a review of the SATU clinics.
- FSI staff also participated in a number of media activities, as well as university lectures on the relevance and application of forensic techniques.

Since September, staff members in FSI started the process of gathering feedback and insights across a broad range of stakeholders to help shape FSI's new strategy. This included extensive interviews as well as surveys with Garda members and management. Our new strategic plan is due for launch in April 2019.





DNA Database

The DNA Database commenced operation on the 20th November 2015 and its implementation is one of the most important crime fighting tools introduced within the State in recent times.

Using the database, information is supplied to the Gardaí about links between people and unsolved crimes. These crimes have ranged from burglary/criminal damage to crimes against the person, sexual assaults and suspicious deaths. The power of the database as an investigative tool is that it is providing Gardaí with investigative leads in previously unsolved serious crimes. The database can replace more traditional and time consuming police investigative methods and provide more focus to a criminal investigation. It is now also possible to retain samples from relatives of missing persons to aid in the investigation of unknown remains.

Number of persons' profiles added to the DNA Database System

Figure 6 shows the number of profiles from persons uploaded to the DNA Database from the date of commencement. In total 26,649 profiles were added by the end of December 2018.

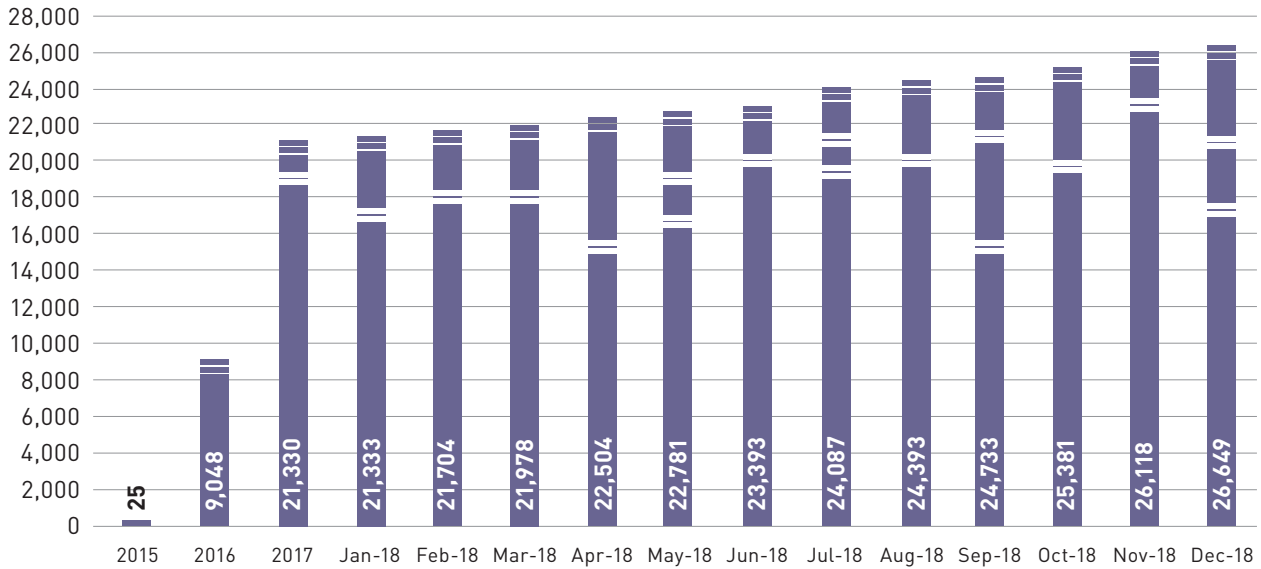
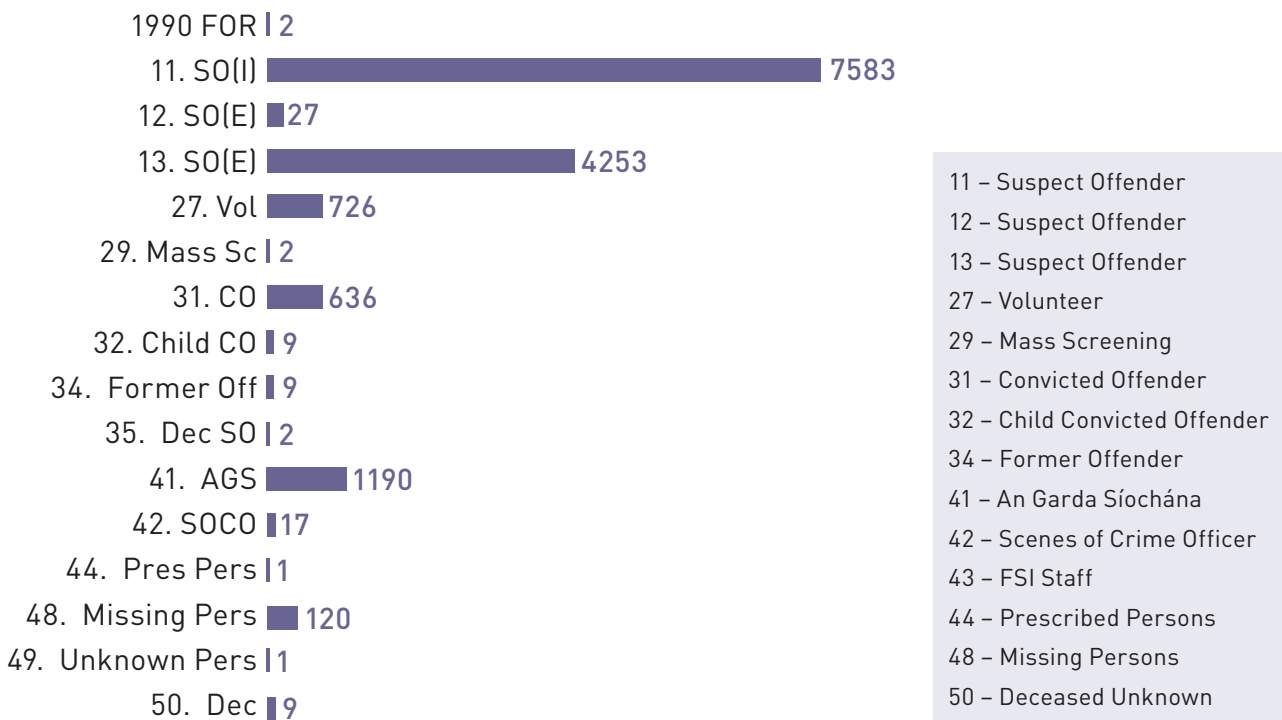


Figure 6: Cumulative number of profiles uploaded to the database each month to the end of 2018

Figure 7 shows the various acts under which the samples from persons were taken.



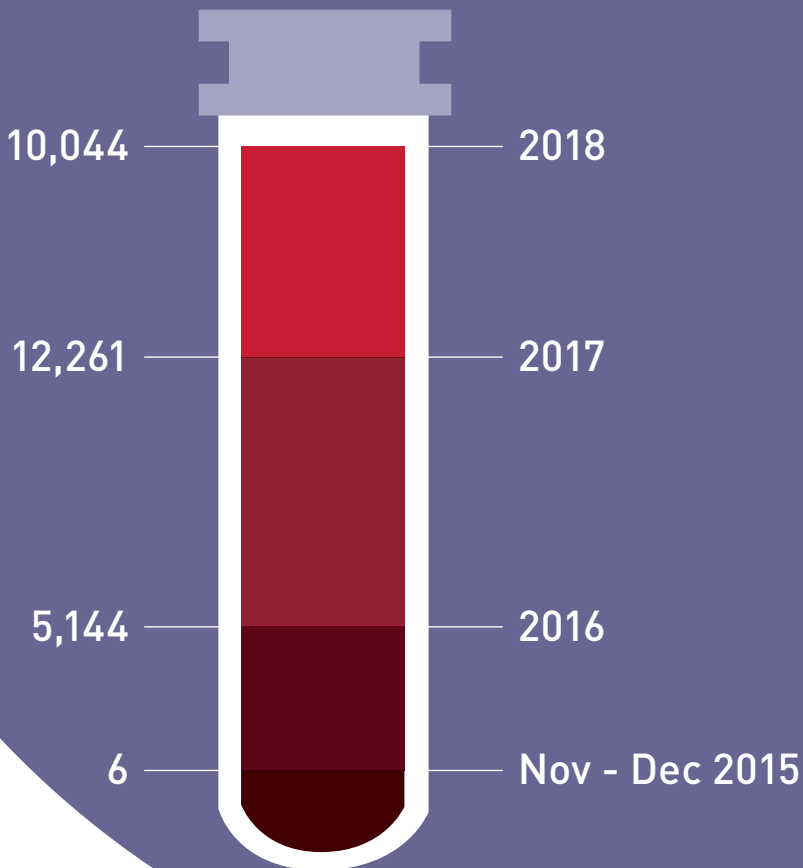
Number of unsolved crime stains added to the DNA Database System

Since commencement of the Database 5,326 unsolved crime stains were added to the crime stain index (as of the end of December 2018).

Increase in Profiles on Crime Scene Index



Figure 8: Cumulative number of crime stains uploaded to the Database to the end of 2018



Sample destruction and profiles removal from the DNA Database System

FSI is responsible for the destruction/retention of samples and removal of DNA profiles from the DNA Database as requested by the Commissioner of An Garda Síochána and in accordance with Part 10 of the Criminal Justice (Forensic Evidence and DNA Database System) Act 2014.

27,455 Samples were destroyed up to 31st December 2018

In 2018, 6996 profiles were removed from the database

Figure 9: Number of samples destroyed since commencement of the DNA Database

Profiles removed from Database

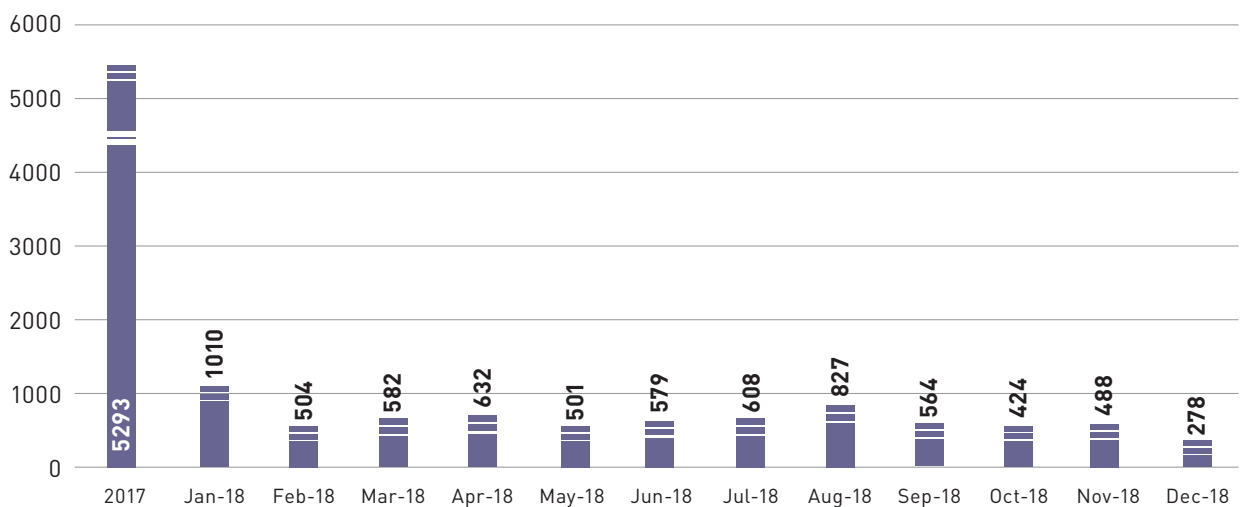


Figure 10: Number of profiles removed from the DNA Database system in 2018



Investigative links:

Two potential matches can occur when an additional profile is added to the Database – a crime stain can match another crime stain suggesting a link between crimes or the crime stain can match to a person suggesting a link between the person and the crime. Overall, the DNA Database identified 649 hits in 2018 which assisted 867 cases. The types of hits are detailed below:

(a) Crime scene samples linked to other crime scene samples

This type of match occurred 50 times in 2018. In 41 such cases, a case to case match was reported while in the other 9 cases, there were clusters of cases associated with each other. Overall this resulted in 112 investigative links ('hits') between unsolved crime stains - see Figure 11 below

Case Type	Number
Burglary	60
Criminal Damage	20
Unlawful taking of vehicle	2
Robbery/Theft	13
Sexual Assault	2
Murder	2
Explosives	1
Drugs	2
Other	10
Total	112

Figure 11: Unsolved stain to stain matches in 2018 (112 investigations)

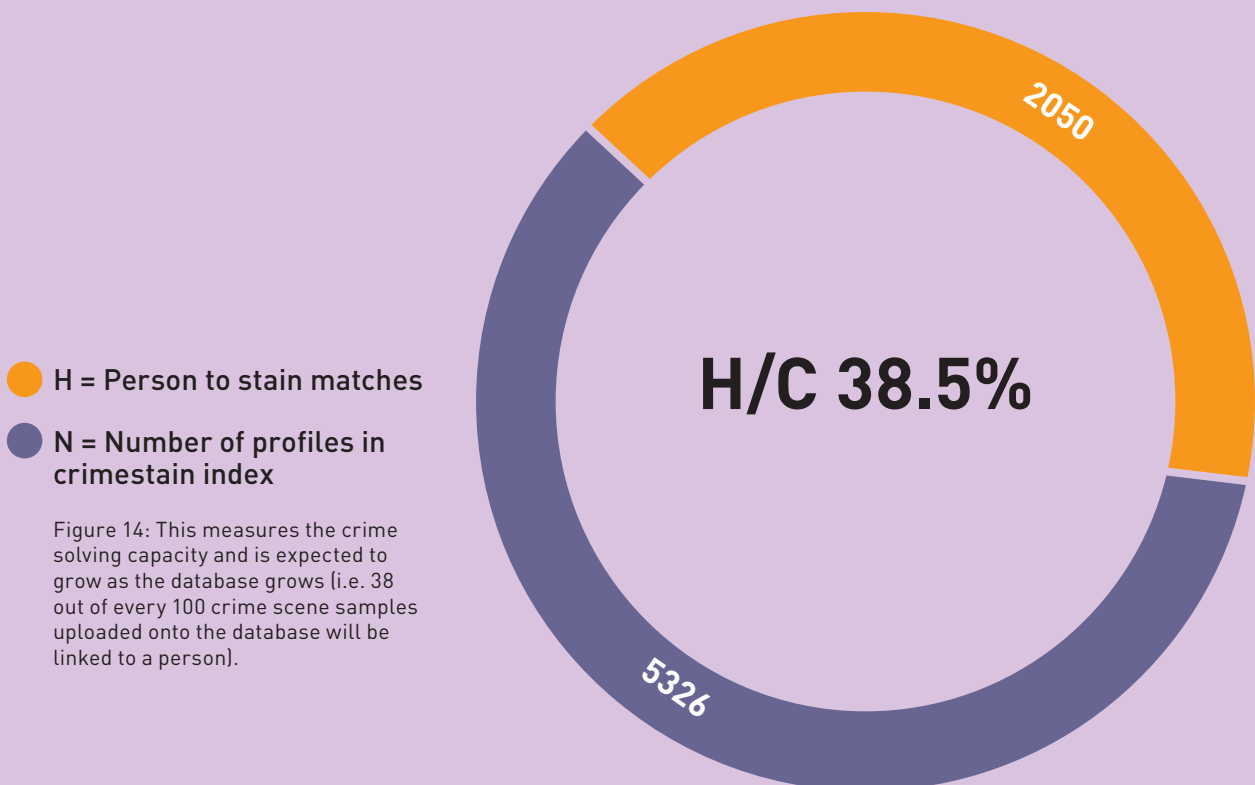
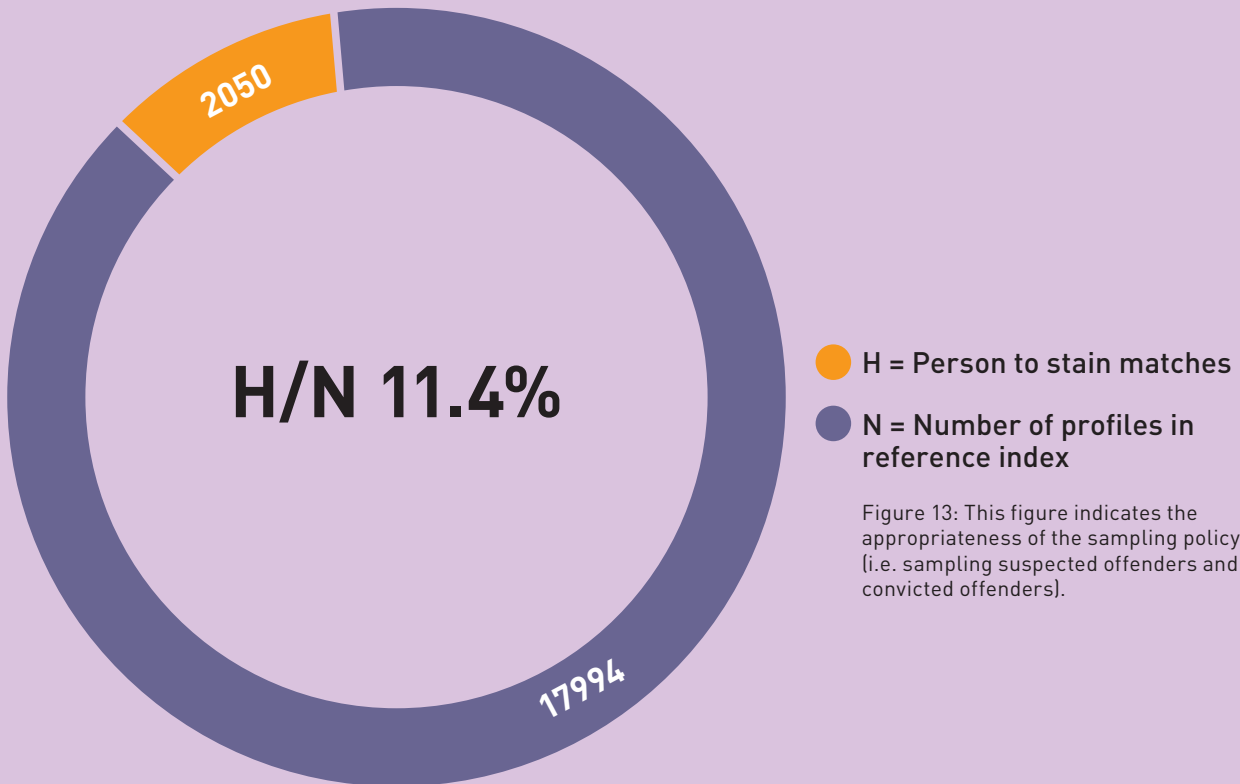
(b) Persons linked to crime stains

There were 596 person-to-stain matches in 2018 - 407 of these were person to single case matches providing assistance to 393 investigations while in 189 cases the person was linked to multiple case matches providing assistance to 362 investigations. In total 755 cases have been aided by the operation of the DNA Database in 2018. The details of the cases involving person to stain matches is available on Fig 12. 82% of the profiles that matched stains originated from samples taken from suspects while 18% originated from convicted offenders.

Case Type	Number
Burglary	367
Sexual Assault	19
Criminal Damage	96
Unlawful Taking of Vehicle	48
Robbery/Theft	98
Armed Robbery	3
Murder/ Attempted	9
Drugs	17
Assaults	19
Other	79
Total	755

Figure 12 - Person to Stain Matches (Types of Investigations and the number of each involved in 2018)

Metrics used internationally to assess the effectiveness of databases are available in Figures 13 and 14. These figures were as of the end of December 2018 and they are well within the norms of functioning databases and are indicative that the database is performing well.





Case Study 5

On January 25th 2018, Gardai from the Crumlin Drugs Unit raided a premises in Walkinstown being used for the suspected manufacture of methamphetamine.

The scene was attended by a forensic scientist from the Drugs Section, who gave on-site guidance and advice to Gardai in securing evidence and identifying toxic materials present. Drugs and precursor chemicals were seized, along with other lab paraphernalia.

A 50-year-old Czech national was arrested at the scene and subsequently charged.

Case Study 6

David 'Daithi' Douglas was shot to death in a shop where he worked on Bridgefoot Street, Dublin on July 1st 2016, as part of the Kinahan-Hutch feud.

In August 2018, Freddie Thompson received a mandatory life sentence after being found guilty of his murder. While Mr Thompson did not pull the trigger, he was found to have been directly involved in the operation.

Garda evidence centred around CCTV footage and forensic evidence found in cars used in the murder. A forensic scientist from the DNA Section told the Special Criminal Court that DNA matching Mr Thompson's DNA was found on an inhaler in a Mitsubishi car. DNA matching Mr Thompson's was also found on an air freshener and on hand sanitiser found in a Ford Fiesta.



Case Study 7

On June 1st 2013, baby Joshua Sussbier Tighe died while in the care of his father, John Tighe, at his home in Co Mayo.

When speaking to emergency services, Mr Tighe said that he was changing the baby's nappy, went to the toilet and when he returned the child was choking and had gone blue. Mr Tighe was charged with murder, and was brought to trial in March 2018.

Forensic scientists from FSI examined a wad of tissue taken from Joshua's throat during the post-mortem, and told the Central Criminal Court that the paper consisted of two different types that were crumpled together. These matched to two different tissue boxes, rather than from a baby wipe. Blood samples/stains on Mr Tighe's pyjama bottoms, a babygrow, and baby vest also matched Joshua's blood, as did samples taken from stains found on the floor of the sitting room and a wall. John Tighe was found guilty of murder, and sentenced to life in prison.

Case Study 8

In November 2018, Paul Wells Snr was found guilty of murdering Kenneth O'Brien by shooting him in the back of the head before dismembering him with the victim's chainsaw and dumping his body parts in the Grand Canal.

Mr Wells had admitted shooting Kenneth O'Brien, but claimed that it was self-defence and that he dismembered the body in the panic that followed, and had pleaded not guilty to murder.

Initial DNA identification of Kenneth O'Brien's body parts had been carried out by Forensic Science Ireland. During the course of the trial, a scientist from the DNA section also gave evidence that DNA extracted from blood found in Mr Well's shed and car, and tissue on part of a chainsaw found in the canal, matched Mr O' Brien's. DNA found on the chainsaw's starter rope also matched Mr Wells.



Corporate Governance

FSI confirms its compliance with the relevant requirements of the Code of Practice for the Governance of State Bodies. In particular, FSI confirms that:

1. The Oversight Agreement for 2018 has been reached with the Department of Justice and Equality and that, as a non-statutory body without a Board, FSI is compliant with the relevant requirements of the Code of Practice for the Governance of State Bodies.
2. FSI is adhering to the relevant aspects of the Public Spending Code.
3. FSI has implemented a risk management system which identifies and reports key risks and the management actions being taken to address and, to the extent possible, to mitigate those risks. A risk register is in place which identifies the key risks facing FSI and these have been identified, evaluated and graded according to their significance. The principal risks identified for FSI in 2018, and associated mitigation strategies are summarised below.
 - a. Service disruption risk based on status of laboratory spaces and offices. Partially mitigated by interim facilities management, more robust mitigation required.
 - b. Contamination risks based on building/facility design is being mitigated through contamination control and workflow processes. The new building design offers a robust mitigation of this risk.
 - c. Demand and capacity are not matched across multiple disciplines within FSI, risking incomplete, erroneous or late reporting of cases for court. This risk is being managed currently through a prioritisation process agreed with An Garda Síochána and reflected in the Service Level Agreement between both organisations. Requirements for increased capacity through additional resources and instrumentation are planned for 2019.

Statement of Internal Control

Scope of Responsibility

On behalf of Forensic Science Ireland, I acknowledge responsibility for ensuring that an effective system of internal control is maintained and operated. This responsibility takes account of the requirements of the Code of Practice for the Governance of State Bodies (2016).

Purpose of the System of Internal Control

The system of internal control is designed to manage risk to a tolerable level rather than to eliminate it. The system can therefore only provide reasonable and not absolute assurance that assets are safeguarded, transactions are authorised and properly recorded and that material errors or irregularities are either prevented or detected in a timely way.

The system of internal control, which accords with guidance issued by the Department of Public Expenditure and Reform has been in place in Forensic Science Ireland for the year ended 31 December 2018.

Capacity to Handle Risk

Forensic Science Ireland reports on all audit matters to the Audit Committee in the Department of Justice and Equality. Forensic Science Ireland's senior management team acts as the Risk Committee for the body. Senior managers from Forensic Science Ireland completed a risk register in 2018 and shared the findings with the Department of Justice and Equality.

The Internal Audit Unit of the Department of Justice and Equality carry out audits on financial and other controls in Forensic Science Ireland. It carries out a programme of audits each year.

Forensic Science Ireland's senior management team has developed a risk management policy which sets out its risk appetite, the risk management processes in place and details the roles and responsibilities of staff in relation to risk. The policy has been issued to all staff who are expected to work within Forensic Science Ireland's risk management policies, to alert management on emerging risks and control weaknesses and assume responsibility for risks and controls within their own area of work.

Risk and Control Framework

Forensic Science Ireland has implemented a risk management system which identifies and reports key risks and the management actions being taken to address and, to the extent possible, to mitigate those risks.

A risk register is in place which identifies the key risks facing Forensic Science Ireland and these have been identified, evaluated and graded according to their significance. The register is reviewed and updated by the senior management team biannually. The outcome of these assessments is used to plan and allocate resources to ensure risks are managed to an acceptable level.

The risk register details the controls and actions needed to mitigate risks and responsibility for operation of controls assigned to specific staff.

I confirm that a control environment containing the following elements is in place:

- procedures for all key business processes have been documented;
- financial responsibilities have been assigned at management level with corresponding accountability;
- there is an appropriate budgeting system with an annual budget which is kept under review by senior management;
- there are systems aimed at ensuring the security of the information and communication technology systems, The ICT division of the Department of Justice and Equality provide Forensic Science Ireland with ICT services. They have provided an assurance statement outlining the control processes in place in 2018 in respect of the controls in place;
- there are systems in place to safeguard Forensic Science Ireland's assets. Control procedures over grant funding to outside agencies ensure adequate control over approval of grants and monitoring and review of grantees to ensure grant funding has been applied for the purpose intended;

- The National Shared Services Office provide Human Resource and Payroll Shared services. The National Shared Services Office provide an annual assurance over the services provided. They are audited under the ISAE 3402 certification processes.

Ongoing Monitoring and Review

Formal procedures have been established for monitoring control processes and control deficiencies are communicated to those responsible for taking corrective action and to management, where relevant, in a timely way. I confirm that the following ongoing monitoring systems are in place:

- key risks and related controls have been identified and processes have been put in place to monitor the operation of those key controls and report any identified deficiencies;
- an annual audit of financial and other controls is carried out by the Department of Justice and Equality's Internal Audit Unit;
- reporting arrangements have been established at all levels where responsibility for financial management has been assigned; and
- there are regular reviews by senior management of periodic and annual performance and financial reports which indicate performance against budgets/forecasts.

Procurement

I confirm that Forensic Science Ireland has procedures in place to ensure compliance with current procurement rules and guidelines and that during 2018 Forensic Science Ireland complied with those procedures.

Review of Effectiveness

I confirm that Forensic Science Ireland has procedures in place to monitor the effectiveness of its risk management and control procedures. Forensic Science Ireland's monitoring and review of the effectiveness of the system of internal financial control is informed by the work of the internal and external auditors, the Audit Committee, and the senior management team. The senior management within Forensic Science Ireland is responsible for the development and maintenance of the internal financial control framework.

I confirm that Forensic Science Ireland conducted an annual review of the effectiveness of the internal controls for 2018. It should be noted that this extended beyond financial controls and examined ICT controls, management practices and other governance processes.

Internal Control Issues

No weaknesses in internal control were identified in relation to 2018 that require disclosure in the financial statements.



Chris Enright
Director General FSI

Forensic Literature Contributions

Gavin McLaughlin, Michael H. Baumann, Pierce V. Kavanagh, John D. Power, Geraldine Dowling, Brendan Twamley, John O'Brien, Gary Hessman, Folker Westphal, Donna Walther, Simon D. Brandt. Synthesis, analytical characterisation and monoamine transporter activity of the new psychoactive substance 4-methylphenmetrazine (4-MPM), with differentiation from its ortho- and meta- positional isomers. *Drug Testing and Analysis*. 2018, 10, 1404-1416. DOI: 10.1002/dta.2396.

Magee AM, Breathnach M, Doak S, Thornton F, Noone C, McKenna LG. Wearer and non-wearer DNA on collars and cuffs of upper garments of worn clothing, *Forensic Science International: Genetics*, Vol 34 (2018) 152-161. <https://www.sciencedirect.com/science/article/pii/S1872497318300991>

Bright JA, Richards R, Kruijver M, Kelly H, McGovern C, Magee AM, et al. Internal validation of STRmix™ – A multi laboratory response to PCAST. *Forensic Science International: Genetics* Vol 34, (2018) 11-24.

P. Gill et al. DNA Commission of the International Society for Forensic Genetics: Assessing the value of forensic biological evidence – guidelines highlighting the importance of propositions. Part I: Evaluation of DNA profiling comparisons given (sub) source propositions. *Forensic Science International. Genetics*. Vol 36 (2018) 189-202

B. Kokshoorn al. Sharing data on DNA transfer, persistence, prevalence and recovery: Arguments for harmonization and standardization. *Forensic Science International: Genetics* Vol 37 (2018) 260 – 269

Clara Boland contributed to the National guidelines on referral and forensic clinical examination in Ireland 4th edition 2018.

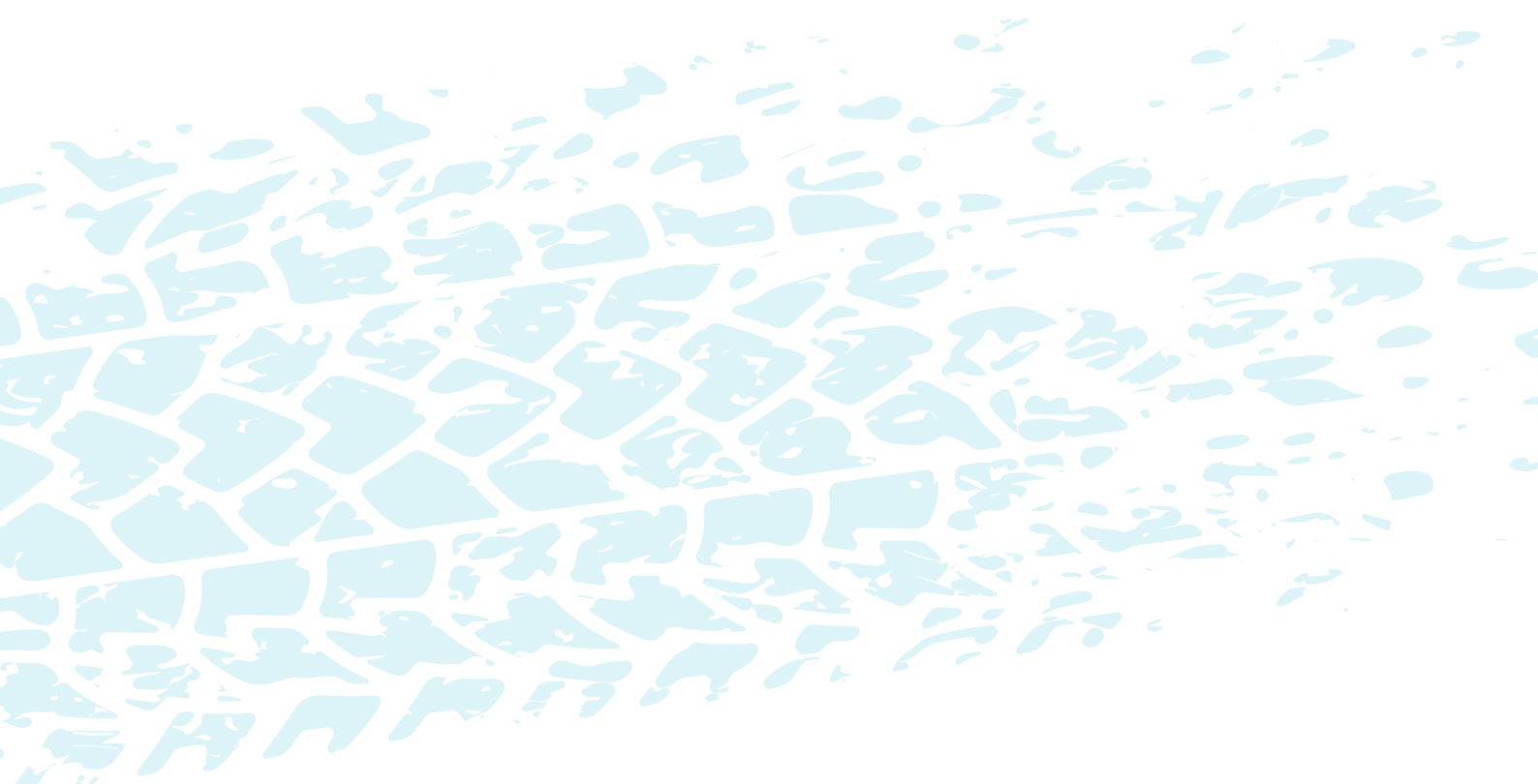
Dr. John Power contributed to the ENFSI Drug Working Group best practice guidelines (due for finalisation in 2019).

The following poster was presented at The International Association of Forensic Toxicology (TIAFT) 2018 annual conference: 'The use of benchtop NMR spectroscopy for the identification of GBL and related compounds- potential for use in alleged DFSA forensic cases', John D. Power et.al.

Presentations by Dr. B. Martina McBride at Annual Conference of the DPP (Dublin), ENSFI Marks Group meeting (Lisbon), International Association of Arson Investigators Irish Branch (Dublin), Eurachem Conference for Institutes of Technology (Letterkenny), Crime Writers meeting (Farmleigh).

Presentations by Dr. Barbara Buchanan at ENSFI Fires Group meeting, (Tallinn) and at Accelerants Interpretation Workshop (The Hague).

Presentation by Ms. Bridget Fleming on Fibre Awareness for new DNA staff.








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