Review of the current operations of the Queensland Health Forensic and Scientific Services DNA Analysis Unit

Requested by Commission of Inquiry into Forensic DNA Testing in Queensland

Prepared by Heidi Baker BSc (Hons) and

Rebecca Kogios PSM PhD LLB BSc (Hons)

28 October 2022

Contents

Disclaimer and Declaration of Conflicts of Interest

- This submission is made in a personal capacity and does not represent the official views or position of our respective organisations
- While the authors have used all reasonable endeavours to ensure that the information contained in this report is accurate, the authors do not give any express or implied warranty as to the completeness of the information contained in this report, or that it will be suitable for any purposes other than those specifically agreed in writing by the authors' organisations and the Commission.
- The forensic community is small, therefore some of the staff of QHFSS are known to us
- We note time constraints have meant we have only reviewed a small sample of the casework undertaken by QHFSS.
- The recommendations in this report are targeted specifically at QHFSS based on its unique situation, unless otherwise indicated as a wider recommendation.
- The Institute of Environmental Science and Research Ltd (ESR) has processed samples from the Shandee Blackburn case (Ms Baker has not been involved in the management of the case, the processing of samples, or the interpretation of the DNA profiling results)
- Dr Kogios is a former Technical reviewer at NATA
- Ms Baker is a Technical reviewer at NATA
- ESR owns STRmix Limited (a fully owned subsidiary company) which licenses STRmix software to laboratories around the world, including QHFSS.
- Victoria Police Forensic Services Department (VPFSD) is currently implementing the Forensic Register
- Dr Kogios is a member of the Australian Academy of Forensic Sciences (AAFS) Victorian Chapter Council.
- The conclusions in this report are based on the information provided to Ms Baker and Dr Kogios at a point in time and may change if additional information is provided.

We have, where appropriate, provided references for material on which we have based our findings or opinion. Material not specifically referenced was sourced from documentation (provided by the Commission and/or the laboratory); and from discussions with scientists, both during the onsite visit and virtual meetings. We accept we have reviewed a large amount of material in a relatively short space of time, therefore we are willing to consider alternative opinions should additional information be forthcoming.

Purpose

1 We have been asked by the Commission of Inquiry into Forensic DNA Testing in Queensland (hereafter 'the Commission') to review the current operations of the Queensland Health Forensic and Scientific Services (QHFSS) DNA Analysis Unit, with particular focus on issues raised with the Commission, and determine whether the laboratory is currently operating consistently with international best practice.

2 Specifically, we are instructed to review the current operation of the laboratory with reference to:

a. Written material provided by the Commission, including reports prepared by other experts appointed by the Commission;

b. An in-person visit to the laboratory, conducted during September 2022; and

c. Interviews or meetings with scientists or other staff of the laboratory.

3 A list of our instructions is provided in Appendix 1. We provide our Curriculum Vitae's in Appendix 2 and 3. A list of documents provided by the Commission is presented in Appendix 4. A de-identified list of interviews and meetings conducted is presented in Appendix 5. Information pertaining to our site visit is presented in Appendix 6. A summary of our recommendations is provided in Appendix 7.

Introduction

4 Before detailing our recommendations, we wish to highlight the numerous positive observations made from our engagement with the QHFSS. Specifically, we found the staffing cohort with whom we interacted to be highly skilled, articulate and intelligent; across all levels of the work

force. We note the comprehensive, well-constructed set of standard operating procedures (SOPs) that we reviewed; and the well-designed, fit-for-purpose facilities. Our overarching observation was of a staffing cohort genuinely committed to the integrity of their work, and to providing the best possible service to the State of Queensland.

5 However, we also noted a fragmented work group, divided allegiances and a lack of trust. We note the various attempts made by management over the years to improve culture at QHFSS through the use of external consultancies. We make the observation that negative culture is not conducive to best practice science, insofar as it inhibits free discussion and continual improvement. Conversely, people and science flourish in a collaborative, supportive environment grounded in trust and respect.

6 During the course of our work, we were asked to provide our opinion on whether or not the laboratory was operating in accordance with best practice. We note that there is no recognised international best practice for various aspects we were asked to consider. For example, method selection and laboratory management structure is highly laboratory dependant; operating model selection is highly dependent on the broader ecosystem in which the Forensic Science Provider (FSP) is situated and other matters pertaining to laboratory governance.

7 Further, it should be noted that forensic science, like all science, is constantly evolving, with a growing body of literature setting out what we would consider to be emerging best practice. Transition to emergent best practice involves a steady process of transformation. In Australasia and across the international community, many FSPs are at various stages on their journey toward emergent best practice.

8 Therefore, with a degree of subjectivity, we have adopted the following terminology when offering an opinion:

Finding	**Opinion**
1. Where it is inconsistent with NATA / ISO standard	Below accepted practice
2. Where it is out of step with current practice in Australasian FSPs Or outside established internationally recommended best practice	Below recommended best practice

3. Where it is within the range of what we consider to be best practice	Within the range of best practice
4. Where there is developing knowledge and practice that is not yet fully adopted across the broader forensic community	Yet to adopt emerging best practice

Executive Summary

9 This report sets out our findings in relation to the current operation of the Queensland Health Forensic Scientific Service's DNA Analysis Unit (QHFSS), as requested by the Commission of Inquiry into Forensic DNA Testing in Queensland. During the limited timeframe available to us we conducted a thorough review of laboratory service delivery, scientific process, and culture. We note that QHFSS operates in an area of high service demand in an ever changing and increasingly complex environment. We saw many positive aspects to QHFSS operations and processes, and found the staffing cohort to be deeply committed to their work and to the provision of excellent forensic services to the State of Queensland. We also noted a number of areas where aspects should be improved to strengthen service delivery. We document these throughout our report and make 47 recommendations for consideration of the Commission.

Part A: Service Delivery and Operating Model

10 As organisations delivering results to the criminal justice system, Forensic Science Providers (FSPs) are required to align service delivery and operating models to client needs.

11 There is no single, accepted international best practice service delivery or operating model for the provision of forensic DNA services. Rather, there exists a range of models depending on factors such as the scope of operation and broader ecosystem in which the FSP operates.

12 The approach chosen by a given FSP is informed by governance, policy and management considerations, including threshold selection (informed by organisational risk appetite), cost (informed by available resourcing and funding received) and throughput (informed by service demand and client requirements).

13 FSPs make many decisions throughout the end-to-end forensic process that can impact the quantum and quality of results. The process of triaging is a reality in the forensic workflow, and

there are myriad ways to cap or limit work at the various stages of the forensic examination process. For example:

a. Scene collection - how many items to collect?

b. Item submission - how many items to submit for examination?

c. Sample submission - how many DNA samples to process?

d. Sequential testing – whether to triage samples, select some for testing, review results then review examination strategy?

e. Sample workflow - whether to stop at a certain point?

14 For some FSPs, some of these decisions are informed by Service Level Agreements (SLAs) with external agencies. However, even FSPs without SLAs cap workflows in some manner, due both to the practical impossibility of processing every possible item/ sample in every case and the fact that an exhaustive approach to testing is simply not required for most cases. Some FSPs set case-type dependent rules, such as capping the number of DNA samples submitted, or setting quantification thresholds below which DNA profiling will not proceed. In practice, a range of divergent workflows exist, as evidenced by the Organization of Scientific Area Committees (OSAC)'s Human Forensic DNA Analysis Process Map.[1]

15 While acknowledging that these decisions are a necessary part of operating a forensic service, FSPs should ensure that decisions do not diminish quality and are informed by an appropriate level of case management oversight. FSPs must understand their role as providers of service to a system of administration of criminal justice to be able to do this effectively.

16 Our assessment of the service delivery of QHFSS has been performed through site visit, staff consultations, review of SOPs, and review of approximately 62 casefiles covering Priority 1, 2 and 3 casework. We have taken into account the range of accepted practice within the national and international forensic science community, guidance documents produced by authoritative bodies, and the observations and recommendations made by Commission of Inquiry expert Anna Davey on specific aspects.

[1] OSAC's Human Forensic Biology Subcommittee Develops DNA Analysis Process Map | NIST, capturing details about the various procedures, methods and decision points most frequently encountered in human forensic biology/DNA analysis.

Governance

17 Forensic science straddles the domains of science, law, policy and investigation; FSPs must be cognisant of their existence in this broader ecosystem, and of the interdependence of forensic evidence and decision making throughout the forensic end-to-end process from crime scene to court.[2]

Observations

18 In the State of Queensland, the end-to-end forensic DNA case workflow is shared between Queensland Police Service (QPS) and Queensland Health (QH). Governance of each of these parts of the forensic case workload is therefore also split between the two agencies, with both agencies responsible for the resulting operating model.

19 The DNA Analysis Unit sits within the broader Forensic and Scientistic Services (FSS) Unit within QH. QHFSS supports the Queensland Police Service, the Coronial Court of Queensland and the Office of the Director of Public Prosecutions by providing a range of forensic services including forensic DNA analysis and forensic chemistry analysis of trace evidence, illicit drugs, and clandestine drug laboratories.[3]

20 The majority of QHFSS services are funded through block appropriation from the Department of Health. The DNA Analysis Unit specific funding includes a mixture of:

a. Revenue: Own Source Revenue (cost recovery for processing Person Samples); Queensland Police Service Block funding (specific allocation of $3.1 million to use for processing volume crime samples) and

b. Expenses: Queensland Health provides the laboratory with a budget allocation for labour and non-labour expenses.[4]

[2] Morgan, R. M., Nakhaeizadeh, S., Earwaker, H., Rando, C., Harris, A. J. L. Dror, I. E., (2018) Interpretation of evidence: Cognitive decision making under uncertainty (at every step of the forensic science process). In R. Wortley, A. Sidebottom, G. Laycock, & N. Tilley (Eds.), Handbook of Crime Science (Abingdon: Routledge, 2016), pp 408–420.
[3] COI.0081.0002.0001 Internal analysis of Forensic and Scientific Services, HealthSupport Queensland, 30 July 2021.
[4] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022.

21 We understand that the QHFSS Police Services Stream, of which FSS is a member, has a Budget Savings Target.[5] We further understand QPS Block funding has not been increased or amended since MOU inception in January 2001, and note efforts are underway to update the MOU.[6]

22 QHFSS operates in an area of high service demand in an ever changing and increasingly complex environment. Throughout our site visit we heard many references to police as the client.

Considerations

23 The UK House of Lords report 'Forensic science and the criminal justice system: a blueprint for change' discussed the challenges of fragmented service delivery where different types of analysis are being performed by different agencies, making the observation -

> "*It is clear that there is a need to deliver strategic and accountable leadership that reflects all the main stakeholders to set the vision, strategy, and agenda for forensic science*".[7]

24 Whilst fragmentation in the UK is on a much larger scale, this statement has relevance for the delivery of forensic services in Australia.

25 Whilst QHFSS is funded by QPS and Queensland Health, its output has direct and broad implications for police, the justice system and the Queensland community. Therefore, QHFSS requires a frame of reference that encompasses the broad~~er~~ criminal justice system to which it delivers service. We highlight the importance of a collaborative, trusted relationship between the various agencies delivering service across the end-to-end forensic workflow. We note the particular importance of developing a common reference point through which risk is viewed and understood when those delivering service sit outside of the traditional criminal justice system (i.e. within Health).

26 Therefore, we see benefit in a governance structure that connects the agencies on a strategic and case management level; and enables broad engagement in the setting of policies with implications for testing outcomes, such as the so called 'DNA Insufficient for Further Processing' policy.

27 If provision of forensic services remains within the Department of Health, we are of the view that creation of a form of a Forensic Science Advisory Board could be helpful in bringing

[5] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022.
[6] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022.
[7] 'Forensic science and the criminal justice system: a blueprint for change', Science and Technology Select Committee, 3rd Report of Session 2017-19 - published 1 May 2019 - HL Paper 333.

accountability, transparency and governance from a whole-of-sector perspective. A Board arrangement could be established such that it has the requisite status, influence and authority to develop and maintain QHFSS as a contemporary forensic science service provider for the State of Queensland. We note the existence of such a board in Western Australia (the Forensic Biology Advisory Council), established in a standing capacity to address Recommendation 10 of the 2017 Ross Inquiry.[8]

28 We also note the recent Queensland Audit Office recommendations in relation to cross-agency cooperation and communication, and the implementation of a governance structure to effectively coordinate and provide accountability for managing forensic services across agencies.[9] We understand QHFSS is working with QPS to implement these recommendations and that an Action Plan created in September 2019 includes tasks aligned to implementing a governance structure and improving the prioritisation and timely sharing of case information between agencies.

29 We understand there have been numerous changes in the executive management of QHFSS in recent years[10] and note the challenges this poses through loss of momentum and corporate knowledge. We also acknowledge the impact of the covid-19 pandemic in progressing this work.[11] We see significant benefit in these recommendations and strongly recommend prioritisation of this work.

Recommendation

Recommendation 1.
Consideration be given to the establishment of a Forensic Science Advisory Board to assist with the coordination and accountability for managing forensic services across agencies

Workflow

30 In the State of Queensland, the end-to-end forensic case workflow is shared between Queensland Police Service (QPS) and QHFSS. Broadly, QPS perform the first steps in the forensic workflow (i.e. Collection and Evidence Recovery), and QHFSS the latter (i.e. Analysis, Interpretation and Reporting). Consequently, the development of examination strategy and the

[8] Ross Inquiry into PathWest Laboratory Medicine WA available at: Independent PathWest inquiry completed (health.wa.gov.au).
[9] Queensland Audit Office Report 21: 2018-19 'Delivering Forensic Services'.
[10] Interview with Catherine Allen on 26 September 2022.
[11] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022, para 225.

examination of items is predominantly performed by QPS with 'in tube' sample submission to QHFSS. QHFSS then process samples through analysis, interpretation and reporting, providing results back to QPS for review and consideration of further testing. However, QHFSS do perform evidence recovery for some item types (including items requiring testing for saliva and sexual assault investigation kits (SAIKs)).

31 QHFSS workflows are predominantly paperless and enabled through a laboratory information management system called the 'Forensic Register' (FR).

32 The DNA Analysis Unit categorises samples as Priority (P) 1, 2 or 3 according to urgency (P1) or case type; crimes against the person (P2) and all other crimes (P3).[12] A Memorandum of Understanding (MOU) between QPS and QHFSS covers the TAT for the processing of Person Samples as follows:[13]

a. The QHFSS will provide the DNA Unit with information in relation to any DNA profile matches within forty-eight hours of a match being confirmed

b. The agreed maximum TAT in relation to person samples is ten working days

33 We were not provided evidence as to whether those TATs are currently being met by the laboratory or not.

34 There is no MOU in place for the processing of Crime Scene samples.

35 We understand the 'in tube' model was implemented in 2008 to address large backlogs in evidence recovery at QHFSS.

Observations

36 We have made the following observations of QHFSS' current practices:

a. Cases are not routinely allocated to a dedicated case manager (CM), unless they are P1 (urgent) cases. Individual scientists can elect to assign a case to themselves; however, this is not a requirement and appears to occur on an *ad hoc* basis.

[12] FSS.0001.0012.2584 SOP 34327V2 Sample and Case Prioritisation and Allocation using the Forensic Register.
[13] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022, para 38.

b. Except for sexual assault cases and other limited circumstances, QHFSS is wholly reliant on QPS to determine item prioritisation and sample selection.

c. A 'what we receive we test' approach is followed and seems to apply to all case types and scenarios, including sexual assault cases. Through casefile review we observed numerous instances of separate and simultaneous processing of every sample submitted. Specific examples include:

    i. Sexual assault case [redacted] where all nine SAIK swabs were subjected to separate DNA profiling in addition to samples from a couch, despite no indication of more than one offender, all yielding results of apparent similar probative value.

    ii. Sexual assault case [redacted] where numerous wet and dry penile swabs were separately processed in addition to all five samples from the complainant's SAIK despite no indication of more than one offender, all yielding results of apparent similar probative value.

    iii. Sexual assault case [redacted] where multiple fabric areas from one item that tested positive to a screening test for semen were separately processed despite no indication of more than one offender, yielding results of apparent similar probative value.

d. A "worklist" is used to allocate samples to a scientist for interpretation after evidence recovery and analysis. For many samples, this is the first time a CM makes contact with a case.

e. Reporting of results to QPS is on a sample-by-sample basis, rather than from a 'whole-of-case' perspective. CMs have access to some information regarding sample origin (for example examination notes and bioscreening results) in FR.

f. Whole of case review of results occurs only where a statement is required for court which does not happen in every case (one Senior Scientist estimated this was approximately 10% cases).[14] A CM is then assigned to prepare the statement and reviews the DNA interpretation for all samples in the case. As complex cases involve multiple samples, this means several scientists can be involved in DNA interpretation in a given case. Where the

[14] Advice provided by Senior Scientist, Forensic Reporting and Intelligence Team, QHFSS.

CM assigned to report the case for court forms a differing opinion to the scientist who initially reported the results, results are formally amended.[15]

g. QHFSS applies a quantification threshold across all case types and scenarios where the amount of DNA detected at the quantification step is used to determine whether the sample proceeds for DNA profiling. Until recently, two thresholds were applied: a range of 0.001 to 0.0088 ng/µl between which a sample did not proceed to profiling and was reported as "DNA insufficient for further processing" (DIFP); and a lower limit threshold of 0.001 ng/µl below which a sample did not proceed to profiling and was reported as "No DNA detected". We understand the latter threshold remains in place today. Strict application of thresholds means decision are made purely on quantification values, without consideration of substrate type, preliminary test results, or the broader case context.

h. In some circumstances, DNA results are reported to QPS without reporting scientist involvement:

    i. Currently, where 'no DNA is detected' in a sample at quantification stage (based on the laboratory's threshold), this information is made available to police, without review by a reporting scientist. If all samples in the case fall into this category and a statement not requested for court, a case is effectively closed without review by a reporting scientist.

    ii. Until recently, this scenario also applied to samples in the DIFP range.

i. Reporting scientists appear to be limited in their authority to make some casework decisions. For example:

    i. In some instances, scientists must request permission from the Managing Scientist for sample rework – some staff reported feeling disempowered by this approach and indicated the added time to receive permission acts as a barrier to making the request. It should be noted that we heard of no instance in which the Managing Scientist refused such a request.

    ii. Some reporting scientists appear to have been operating under the understanding that the onus to request rework sits with QPS, not with them,

[15] FSS.0001.0012.2829 SOP 36061 Procedure for Resolving DNA Profile Interpretation Differences of Opinion.

expressing concern with this as they felt the decision should be informed by the science.

iii. Some scientists advised that until recently, quantification thresholds served as 'hard barriers', preventing discretion in decision making regarding sample processing.

j. Where differences of opinion between trained experts occurs, as it can and often does in DNA interpretation, QHFSS's case allocation system means this occurs *after* a result has been reported to QPS. We were advised any change of interpretation 'requires the original result to be made incorrect by a senior scientist (to allow visibility) and new result lines to be added and reviewed'.[16] This occurs by amendment of result with the wording "unintended human error" one of three phrases used to explain the amendment.[17] The relevant SOP states: 'The explanation of a change in a reported result line after further interpretation (clearly identifying the incorrect result)'. Difference of opinion in DNA interpretation is discussed further in Part B.

37 Overall, we noted:

a. Overservicing through routinely processing every swab submitted in a case, producing multiple results of apparent similar probative value, all of which then required interpretation and review. Whilst we accept that an exhaustive approach to sampling is sometimes required, this should be case circumstance dependent and managed through a triaged approach to sample processing. We accept that QPS is responsible for decision making in the majority of casework, however this is not so for sexual assault casework where a triaged approach was not evident on our review.

b. Missed opportunity to harvest all available forensic evidence through:

i. Lack of CM input to examination strategy and triage. This can result in loss of material that could otherwise be preserved for other testing. By the time a CM makes first contact with a case, material may have already been lost. This becomes problematic in cases where the amount and quality of DNA from a

[16] Advice provided by Senior Scientist, Forensic Reporting and Intelligence Team, QHFSS.
[17] FSS.0001.0012.2542 Procedure for Intelligence Reports and Interstate/Interpol Requests in the Forensic Register.

person of interest requires something more than the standard approach to DNA profiling offered by QHFSS (toolkit is discussed further in this section).

ii. Lack of holistic case review. In the absence of request for a Court Statement, QHFSS does not review a case holistically. Where whole-of-case review does occur as part of Statement preparation, it does not include consideration of the results from each item within the context of the case as reporting scientists do not have a holistic overview of the case context. We understand that QHFSS reporting scientists have access to some information regarding the original items examined at QPS, and we note that examination of QPS protocols and workflows was not within our terms of reference. We merely highlight that cross-agency workflows require flow of information and role clarity to safeguard against fragmentation, siloing and disconnect. Where staff in different agencies hold key pieces of information pertinent to a case (e.g. knowledge of substrate-type, presumptive and confirmatory test results, quantification results, indicators of inhibition/ degradation, importance of sample in the broader case context, availability of other samples/ items etc); shared input into decision making and role clarity regarding who is responsible for which decisions is essential to ensure pieces of the puzzle are joined together. Failing that, things can fall between the cracks, resulting in missed evidential opportunity. Here we note the findings of Anna Davey, an expert witness engaged by the Commission of Inquiry:

> "*I am satisfied that there is sufficient feedback with respect to 'hot jobs' and 'major incidents' but none of the material provided suggests that there is a similar formalised process for other active cases. If this formalised review is not present, there is an increase in the risk of further subsampling / testing not being undertaken and information being lost from the investigation*".[18]

iii. Strict application of process (e.g. concentration) and thresholds to all case and sample types, noting QHFSS's technology for DNA profiling is more sensitive than that used in quantification. We note data provided by the Commission of Inquiry showing **10.2%** of the total samples received by QHFSS in January to June 2022

[18] 'Hot jobs' defined as 'contemporary high profile unsolved matters; 'major incidents' defined as homicides, unusual death and serious violence against the person.

fell into the 'DIFP' category. **389** samples reported as 'DIFP' in this timeframe have now undergone further testing, resulting in **23** profiles uploaded to the National Criminal Investigation DNA Database (**NCIDD**). Data for the sample time period shows **6.3%** of total samples fell into the No DNA detected category. **96** 'No DNA detected' samples from this time period have now undergone further testing, resulting in **2** profiles being uploaded to **NCIDD.** We are advised by the Commission of Inquiry that to date, further testing on samples reported as 'DIFP' since 2018 has resulted in 141 samples producing profiles suitable for comparison to a reference DNA sample; and for those reported as 'No DNA' detected since 2018, further testing has resulted in 5 samples producing profiles suitable for comparison to a reference DNA sample. We note that we did not have the opportunity to verify any of this data.

iv. Limitations in the toolkit, discussed later in this section.

c. Missed opportunity to detect contamination or other unexpected results:

i. The UK's Forensic Science Regulator encourages DNA reporting officers to be suspicious of results that do not fit with case circumstances.[19] We note the difficulty for QHFSS reporting scientists to perform this type of check, given their limited whole-of-case visibility. We note a recent instance of QPS contacting QHFSS noting a result seemed strange in the context of the case circumstances.[20] Whilst it is positive that this issue was detected and raised by QPS, we note that broader case visibility on the part of the reporting scientist may have assisted in identifying and correcting this error prior to release of results. We highlight the circumstances that led to the wrongful conviction of Mr Farah Abdukadir Jama in the state of Victoria as evidence of the need for whole-of-case visibility.[21]

d. Loss of trust / relationship damage:

i. Between QPS and QHFSS, with QPS raising concerns with QHFSS management regarding success rates (discussed in section 2) and amendments to results,

[19] Guideline 'The Control and Avoidance of Contamination in Laboratory Activities involving DNA Evidence Recovery Analysis.'
[20] FSS.0001.0002.3626 OQI 54379.
[21] Vincent FHR AO QC, 'Inquiry into the circumstances that led to the conviction of Mr Farah Abdukadir Jama', Victorian Government Printer (May 2010).

particularly in relation to 'the number of results made incorrect' and 'with the results where the interpretation was changed to complex'.[22]

ii. Between reporting scientists and management through lack of perceived autonomy. Culture is discussed more broadly in section 3. Here we deal only with the issue of amendment insofar as it may relate to the operating model. We support the existence of a process by which reports are formally retracted if required and note that this is required under ISO17025 section 7.8.8.[23] However, we question the frequency of result amendment, and consider "unintended human error" inappropriate in the context that it is being used, both from scientific and quality culture perspectives. This is because it is expected that differences of opinion will occur between trained, experienced and skilled scientists. Within casework, it is impossible to know the 'correct' answer regarding a casework opinion, and therefore it is impossible to designate an opinion as 'incorrect'. We do not consider use of the term "unintended human error" in this context appropriate: it provides misleading feedback to QPS implying an error has been made when in fact variation is an expected part of the process. Further, it may act as a deterrent to scientists raising differences of opinion, and it could negatively impact morale. Emerging best practice encourages a differentiation to be made in reports and notifications between situations where there has been a difference of opinion between analysts, where additional information has resulted in a re-evaluation of the evidence and a change of opinion, or where a quality incident has resulted in a retraction.

Considerations

38 Intelligence-led policing requires fast provision of forensic links to support apprehension of offenders and solving of crime. Backlogs in the workflow upstream of upload to the national DNA database are not conducive to fast TAT.

39 The 'in tube' model in place at QPS and QHFSS offers potential for both high throughput and fast TAT. The model also presents risk from loss of CM oversight. If the model isn't actually delivering fast TAT and risk isn't mitigated through appropriate safeguards, benefit is lost and risk persists.

[22] Advice provided by Senior Scientist, Forensic Reporting and Intelligence Team, QHFSS.
[23] ISO 17025, section 7.8.8 Amendments to Reports.

40 Safeguards are particularly important for crimes like sex assault and other complex cases (including cold cases), where maximising evidential value may be more important than a fast TAT.[24] Suitable safeguards for this type of casework could include:

a. CM allocation at point of entry to enable setting of appropriate examination strategies, including triage

b. CM facilitated whole of case review prior to reporting to ensure all relevant testing has been completed and results appear appropriate. This may decrease the frequency of retraction of results, in turn raising confidence of end users in QHFSS services

c. If results are reported prior to preparation of a Statement, use of a flag or caveat to indicate the result is interim and subject to change

d. Discretion in application, or complete removal of, quantification threshold as a factor in determining whether to proceed to DNA testing

e. CM-led decision making on all aspects of casework, including decisions relating to rework.

41 As part of our review, we have examined responses provided to the Commission from other Australasian Government FSPs on the topic of service delivery and operating model. From this we note:

a. The majority of the Australasian FSP's carry out in-house item examination and recovery.

b. Of the four FSPs who directly addressed the question of case allocation, three assign major crime/ complex cases to a scientist at the start to enable holistic case reporting and review. The jurisdiction that does not issues a joint report that contains information relating to the examination of the items and the DNA results;[25]

c. Of the six FSPs who addressed the topic of thresholds:

i. One applies no thresholds

ii. Two apply a threshold for property crime cases only

[24] Noting that the actual importance of forensic evidence to a case depends on the individual case circumstances.
[25] Jurisdictions B, D, F and G, respectively from the deidentified response to interstate laboratory data request.

iii. One applies a threshold for trace samples only

iv. Two apply a threshold for all crime and sample-types.[26]

42 However, where a threshold is applied, it is done so only as a lower limit (i.e. no range which would trigger a DIFP-style approach). Furthermore, where a threshold is applied for major crime cases, scientist discretion exists in terms of their ability to overrule the decision not to proceed on the basis of quantification value alone (noting that one jurisdiction requires Team Leader approval in relation to scientist discretion).

Opinions

Operating model:

43 QPS/ QHFSS's operating model falls within the range of accepted operating models in Australia. It offers the potential for fast TAT to support intelligence-led policing. However, key safeguards required to mitigate risks associated the model appear to be missing. For some cases, this is resulting in suboptimal triage and case review. Processes associated with retraction of results are also of concern. Therefore, we find that the current operating model falls below what we would consider best practice.

44 Given the finding of Anna Davey, rectification requires review of all cases falling outside the 'hot jobs' and 'major incident' categories where checks for the potential for further work have not previously been made.

45 Ultimately, model selection is a decision for the QPS and QH executive. If the model is to be retained, we recommend modification for sexual assault, cold cases and other complex cases[27] to include CM allocation early in the workflow to enable setting of examination strategy, and whole-of-case review prior to release of results. The case review should be done in conjunction with QPS to enable decisions on further testing or alternatively, to ensure that all appropriate testing has been completed.

Unintended human error

46 The use of the term "unintended human error" as an explanation for amending results does not align with emerging best practice in human factor management in forensic science: it provides

[26] Jurisdictions D, C and F, G, A and B, respectively from the deidentified response to interstate laboratory data request.
[27] Which may include cases with multiple exhibits, scenes, offenders or complainants.

misleading feedback to QPS implying an error has been made when in fact variation is an expected part of the process. It may act as a deterrent to scientists raising differences of opinion, and it could negatively impact morale. QHFSS should cease use of the wording "unintended human error" as an explanation for retracting results.

Thresholds

47 QHFSS recent approach to thresholds falls below best practice. Use of lower limit thresholds falls within the range of accepted practice provided thresholds are set through proper validation, and impacts are understood and agreeable to end users. There is evidence before the Commission of neither. This has resulted in misleading reporting of results, indicating the presence of insufficient DNA for further processing or no DNA able to be detected, when neither was technically the case. Rectification requires:

a. Retrospective work to review all samples reported as DIFP for potential re-testing;

b. Validation to accurately determine the limit of detection (LOD) threshold (refer Section 2); and

c. Should the newly validated LOD threshold be significantly lower than the current threshold, retrospective work to review all samples with a quantification value in between the original and newly validated LOD thresholds for potential retesting

48 QHFSS should cease application of the current threshold until LOD has been determined through proper validation and progress all samples for DNA profiling in the interim.

49 QHFSS should review their approach to thresholds considering:

a. Either setting no quantification threshold limit for serious and/ or complex crimes, as is the process in some Australian jurisdictions; or

b. Applying a lower limit threshold only, set at the limit of detection (LOD) as determined through validation, below which routine processing would not apply, and

c. Enabling reporting scientist discretion to overrule the threshold and proceed on the basis of diagnostic information (e.g. quantification result), case and sample context (e.g. if the sample is imperative to the case; the nature of the sample is such that it would have been expected to yield a DNA concentration above threshold).

Cognitive bias

50 It has been suggested that whole of case visibility leads to bias. We acknowledge that Forensic DNA analysis involves the making of decisions throughout critical parts of the workflow that although based on objective data and supported by validation thresholds or guidelines, are vulnerable to being biased by information, processes or organisational factors.[28]

51 Internationally recommended 'gold standard' in DNA analysis sets out a workflow and steps to minimise and mitigate the risk of cognitive bias impacting on the accuracy of the result, whilst also conforming to the requirements of evaluative reporting as the most logical and transparent means of assessing and reporting forensic science opinions. [29]

Stage of workflow	Task	Blinding required
Case assessment and setting of examination strategy	The case information is used to determine the DNA recovery and analysis strategy, and to develop propositions that should be addressed.	Nil – case information is required to form appropriate strategies and propositions
DNA analysis	DNA collection, analysis and plate reading	Analysts should be blinded to case information – in general, only substrate type, body fluid present and type of analysis needed are required.
DNA interpretation	The crime sample must be assessed first, including NOC and suitability for interpretation. If determined appropriate, comparison to the reference sample and statistical evaluation can occur.	Analysts should be blinded to case information – in general, the propositions under which the evidence should be evaluated, the substrate type, body fluid present

[28] Cognitive biases are shortcuts taken by the human brain unconsciously, and in general involve the use of heuristics to simplify the decision step. Two particular forms of bias are relevant for forensic DNA analysis – context and confirmation bias. The first, context bias, occurs when case information not relevant to the task at hand changes or influences the analyst. The second, confirmation bias, occurs when information or processes cause an analyst to unconsciously focus on information that confirms their expectation or hypothesis rather than looking for potentially conflicting evidence. As these biases operate unconsciously, they cannot be trained against, but can only be prevented through processes such as blinding (Forensic Science Regulator. 2020. Guidance: Cognitive Bias Effects Relevant to Forensic Science Examinations. FSR-G-217 Issue 2).

[29] Krane DE et al. (2008). Sequential unmasking: a means of minimizing observer effects in forensic DNA interpretation. Journal of Forensic Sciences 53:1006-1007; Forensic Science Regulator. 2020. Guidance: Cognitive Bias Effects Relevant to Forensic Science Examinations. FSR-G-217 Issue 2; Jeanguenat AM, Budowle B, Dror IE. (2017) Strengthening forensic DNA decision making through a better understanding of the influence of cognitive bias. Science & Justice 57:415-420; Camilleri et al. (2019). A risk-based approach to cognitive bias in forensic science. Science & Justice 59:533-543.

		and assumed contributor profiles are required.
Reporting	A holistic assessment of all DNA results within a case occurs, with consideration of the results from each item within the context of the case and propositions. Where a result is unexpected or does not fit with other results within the case, additional samples may be taken and processed, or a case conference may be required to determine if additional information or considerations are required to evaluate the results.	Minimal blinding should occur – relevant case information is required, in addition to the information provided to that in the analysis and interpretation stages.
Reviewing	Technical checks during the workflow and a holistic case peer review should assess the accuracy/appropriateness of decisions and conclusions.	Reviewer should be blinded to identity of primary analyst and decisions made by primary analyst.

52 Therefore, CM allocation at start (to form appropriate strategies and propositions) and end (to ensure holistic assessment of the case) of the end-to-end workflow conforms with international best practice, provided steps are taken to ensure blinding in between. The QHFSS organisational structure with dedicated teams for Evidence Recovery, Analysis and Reporting is ideally suited to this. However, changes to FR would be required to fully align with emergent best practice (refer recommendation 24).

Recommendations

Recommendation 2.

QPS/ QHFSS to retrospectively review all sexual assault and complex cases falling outside the 'hot jobs' and 'major incident' categories:

a. QPS to check for potential for further DNA testing from a case context perspective
b. Then QHFSS to facilitate progression of further testing as required

Recommendation 3.

QHFSS to establish fit-for-purpose, work streams for the different types of casework received. This should comprise:

a. Implementing a separate work stream for sexual assault and other complex cases (including cold cases)
b. For sexual assault and other complex cases (including cold cases):
    i. Allocating a case manager to devise a fit-for-purpose examination strategy at point of receipt
    ii. Ensuring examination strategies are triage-based where appropriate
    iii. Enabling reporting scientists to make decisions relating to any aspect of the case prior to the release of results; including rework and requesting additional samples are submitted for testing
    iv. Reviewing cases holistically, prior to reporting of results

Note: QHFSS will require support from QPS in order to successfully implement this recommendation. Specifically, QPS must ensure provision of all relevant information to enable development of a fit-for-purpose examination strategy and holistic case review.

Recommendation 4.

QPS/ QHFSS to retrospectively review all samples reported as 'DNA Insufficient for Processing' for potential re-testing:

a. QPS to check for potential for further DNA testing from a case context perspective
b. Then QHFSS to facilitate progression of further testing as required

Note: Review should not be limited to consideration for standard DNA testing only.

Recommendation 5.

QHFSS to prioritise determination of LOD through appropriate validation.

Recommendation 6.

QHFSS to consider the need for retrospective review of samples reported as 'No DNA detected' once LOD has been determined through appropriate validation. If further testing is required:

a. QPS to check for potential for further DNA testing from a case context perspective
b. Then, QHFSS to facilitate progression of further testing as required

Note: Review should not be limited to consideration for standard DNA testing only.

Recommendation 7.

QHFSS to cease application of current (0.001ng/µl) threshold and progress all samples until such a time as recommendation 5 has been actioned.

Recommendation 8.

QHFSS, should they wish to apply a quantification threshold below which routine DNA profiling does not occur, must ensure that:

a. It can be overruled on a sample-by-sample basis at the discretion of the reporting scientist, based on diagnostic information, case and sample context, and availability of alternative DNA profiling techniques
b. The existence and impact of such a threshold must be conveyed to the end user of the product
c. The approach should be socialised with relevant stakeholders prior to implementation

Recommendation 9.

QHFSS to cease use of the wording "unintended human error" as an explanation for retracting result.

Success Rates

53 We understand QHFSS has been criticised for low success rates in terms of its ability to obtain DNA results from testing. It is without question that QHFSS's use of thresholds (i.e. the 'DIFP' threshold in place between 2018 to June 2022 and the 'No DNA detected' threshold currently in place) to inform decision making on whether to proceed to DNA profiling will have impacted the laboratory's ability to obtain a DNA result. It is widely accepted that DNA profiles of value can be obtained from samples in the low quantification range.

Observations

54 QHFSS does not routinely collate data re success rates. We have heard that there is a time and cost barrier to gaining access to FR data that would be used to monitor trends.

55 We have reviewed information provided by other Australian and New Zealand government FSPs in response to a request from the Commission. From this, it appears to be common practice to collate data relating to contamination events, but not necessarily more broadly and routinely on

success rates. We conclude that the dataset is too small, with too many unknowns/ variables to permit meaningful comparisons.

56 That aside, we have considered the question of success rates insofar as it pertains to a FSP's ability to obtain meaningful DNA information.

Considerations

57 It is not unsurprising that success rates differ between FSPs. Differences can be due to numerous factors such as the types of samples submitted for testing, the procedures applied and the parameters used to collate the data. Notably, where non-confirmatory bioscreening testing has been performed, it follows that it has not been possible to confirm the presence of a human body fluid in a submitted stain; therefore it is possible that (using blood as an example):

a. The stain was not blood despite it potentially having appeared to be blood

b. If there was blood present, the blood was not human; or

c. If human blood was present, it was present in extremely small quantities, or was extremely diluted; or

d. If human blood was present, it was extremely degraded

Opinion

58 Caution should be exercised when attempting to measure success rates based on DNA profiling results in isolation, particularly in the absence of an agreed parameters used to collate the data.

Recommendation

Recommendation 10.
If DNA profiling results are to be used as a measure of success, QHFSS and QPS should work together to develop a robust framework encompassing agreed parameters across the whole end-to-end forensic workflow.

Reporting

59 This section deals with the reporting of results by QHFSS for use by QPS and other criminal justice stakeholders.

60 Results are reported in one of three ways: via result lines (information provided electronically to QPS at the individual sample level via the Forensic Register (FR); via a Statement of Witness for court; and via an Intelligence report/ letter. Statements are accompanied by an appendix, which provides detail on the role of the Forensic Biologist, examinations, chain of custody, accreditation, DNA profiling, statistical analysis of DNA profiles, datasets used in statistical analyses and other information relating to biological testing.

Observations

61 We examined the SOP 'Explanations of Exhibit Results for Forensic Register'[30] and the case files of 62 cases covering a range of offence types, including homicide, sexual assault, property crime and DVI events; this enabled review of numerous examples of reporting in Statement of Witness format. We made numerous positive observations in relation to reporting practice. We noted some opportunity for improvement. We outline both below:

a. We note the automatic generation of some report lines by the completion of specific fields within the FR. This occurs for both result and examination process reporting. We see benefit in this approach from the dual perspectives of consistency and minimisation of transcription error.

b. We note existence of a comprehensive set of 'exhibit result lines' available for automatic generation of DNA result reporting, reflecting the range of results encountered in casework. Exhibit result lines expand to full paragraphs, explaining the meaning of the line provided. The relevant SOP contains numerous paragraphs offering different wording, reflecting the type of DNA profile obtained (partial, full, mixture etc), the nature of the result (non-exclusion or exclusion), and the weight of evidence (magnitude of the LR obtained). We noted over 100 different paragraphs, each aligned to a specific profile/ result type. Again, we see benefit in the automatic generation approach from the dual perspectives of consistency and minimisation of transcription error; and that this is particularly helpful in high throughput laboratories. However, we question whether the large number of paragraph options available might increase the potential for mistake. Further, we question the need for so many reporting brackets, particularly in the absence of use of a verbal equivalence scale. Finally, we query the difference in bracket options

[30] FSS.0001.0012.2140 SOP 34229V3 'Explanations of Exhibit Results for Forensic Register'.

for four-person as compared to two- and three- person mixtures. We see no scientific basis for this approach.

c. We note the absence of tables for presenting DNA results in statements. This can lead to lengthy statements for complex cases and impact comprehension.

d. We note the use of an evaluative reporting framework incorporating likelihood ratios (LRs).[31] Evaluative reporting is a formalised thought process that enables the evaluation of scientific findings given two opposing (or competing) propositions. It is a way of providing a strength of the findings of an examination given those alternative propositions.[32] We consider this to constitute contemporary best practice in DNA reporting.

e. We note the existence of a comprehensive, easy to read appendix to the Statement of Witness, used to convey information pertaining to DNA Analysis, in lay terms, to the Court. We note inclusion in the appendix of information relating to scientific testing and reporting, including: limitations associated with particular aspects of DNA Analysis Unit work, (for example, presumptive testing being unable to confirm the presence of a particular type of biological material) and assumptions made (for example, assuming the presence of a particular DNA contributor when interpreting a DNA profiling result). We find use of such an appendix to be consistent with the principle of transparent reporting which we consider to be best practice.

f. We note the Appendix covers information relating to the service delivery model in addition to the science. For example, it outlines the aspects of the workflow for which QPS is responsible; it highlights a standard policy of not testing the epithelial fraction in sex offences cases (unless requested). We find these to be helpful inclusions, but insofar as they relate to QHFSS policy not to conduct certain testing unless requested, we note this should not be the only mechanism by which such information is provided to the user/ client/ QPS and court. This is particularly important given the Appendix is only used where a statement is requested/ produced, noting one Senior Scientist estimated statements to be produced in only 10% of QHFSS cases.[33] Finally, we understand the Appendix is not a controlled document, and that it can be edited. For example, QHFSS staff can elect to

[31] SWGDAM Interpretation Guidelines for Autosomal STR Typing by Forensic DNA Testing Laboratories, 2021.
[32] An introductory guide to Evaluative Reporting, National Institute of Forensic Science Australia New Zealand https://www.anzpaa.org.au.
[33] Advice provided by Senior Scientist, Forensic Reporting and Intelligence Team, QHFSS.

utilise only sections of the Appendix relevant to their case. Accordingly, there is a risk that key information is not provided to the client, potentially resulting in misunderstanding and misapplication of the evidence to the case.

g. In cases where contributions of DNA detected in case samples do not correspond to any reference DNA samples that may have been submitted, the donor of such DNA is referred to as 'unknown'. We observed inconsistency in how reporting scientists convey information about 'unknown' DNA contributors in statements. It is not always clear whether the 'unknown' DNA contributions across a range of samples in a case could have come from the same person, or different people. Furthermore, it is not clear if these 'unknown' contributions of DNA are suitable for meaningful comparison, should additional reference DNA samples be submitted.

Considerations

Verbal equivalents

62 The use of verbal qualifiers to express the significance of a LR (so called verbal equivalents) is an approach favoured by some FSPs. The verbal qualifier is used to express the degree of support for a specified proposition relative to an alternative proposition. It is intended to add a qualitative dimension to the expert's opinion and should not be communicated without a numerical value for the likelihood ratio. The use of verbal equivalents is endorsed by a number of leading groups, including the Scientific Working Group DNA Analysis Methods SWGDAM[34] and the European Network of Forensic Science Institutes (ENFSI).[35] This is because they provide a framework to promote consistency among laboratories in reporting the results of direct comparisons of evidentiary and reference profiles. ANZPAA NIFS's Biological Specialist Advisory Group (BSAG) has also endorsed a verbal scale developed for use in Australia and New Zealand, where laboratories choose to quote a verbal equivalent.

63 SWGDAM makes recommendations for the likelihood ratio ranges and terms provided below if a qualitative statement is reported in conjunction with the likelihood ratio:[36]

[34] Recommendations of the SWGDAM Ad Hoc Working Group on Genotype Results Reported as Likelihood Ratios, available on the SWGDAM Publications Page.
[35] ENFSI Guideline for Evaluative Reporting in Forensic Science 'Strengthening the Evaluation of Forensic Results across Europe (STEOFRAE)'.
[36] Recommendations of the SWGDAM Ad Hoc Working Group on Genotype Results Reported as Likelihood Ratios, available on the SWGDAM Publications Page.

Likelihood Ratio	Verbal Equivalent
1	Uninformative
2-99	Limited Support
100-9,999	Moderate Support
10,000 – 999,999	Strong Support
> or equal to 1,000,000	Very-Strong Support

64 The Biological Scientific Advisory Group (BSAG)[37] recommends a slightly different approach, including breaking the 2-99 bracket into two categories (slight support for 2-10 and moderate support for 10 to 100) and using some changes in wording.

65 We acknowledge QHFSS's limited use of a verbal equivalent (i.e. for the LR 2 – 100 range only) and use of the verbal descriptor of "low support" for the stated proposition which is slightly misaligned to both the BSAG and SWGDAM approach. Whilst use of verbal equivalents is not considered mandatory, we recommend if using in a manner that departs from a nationally agreed position, rationale should be provided in the relevant SOP. However, we do encourage QHFSS to consider broader use of verbal equivalents, potentially including this information in the Appendix. Finally, we see scope to pare back the number of categories used in reporting to align with the BSAG categories. This would result in a smaller number of paragraph options from which to select when reporting results.

Transparent reporting

66 Best practice requires reporting procedures to ensure that evidentiary strength is not being overstated, and that known assumptions, limitations and error rates are disclosed.[38] Contextualising a result with qualifying statements that highlight the limits of the result is an important safeguard to ensure evidence is not over/ understated or overlooked. This is vital where testing has not proceeded on the basis of a result. Reporting must be done in a way that ensures the end user understands the weight of evidence and has clarity on the actions they could/ should take based on information provided.

[37] One of Australia New Zealand Policing Advisory Agency's National institute of Forensic Science's Specialist Advisory Groups.
[38] Ballantyne, KN and Wilson-Wilde, L 2020 Assessing the reliability and validity of forensic science – an industry perspective.

a. From the police perspective, this could include: charging a suspect, investigating a new lead, submitting further items for testing, requesting further testing of samples not fully tested.

b. From a court's perspective, this could also include requesting further work, as well as assessing admissibility and ensuring evidentiary strength is not overstated.

67 Therefore, whilst QHFSS uses some helpful content in terms of transparent reporting, the approach could be strengthened. We also encourage engagement across the criminal justice system to ensure reporting products are fit-for-purpose and produced as required.

Source level reporting

68 Source level reporting is an approach followed by some Australasian FSPs. Some use a combination of sample type, bioscreening and DNA profiling results (including quantification). In some instances, this is supplemented by RNA based testing. Best practice in this field involves using a range of different technologies (e.g. RNA, epigenetic and bacterial markers),[39] and evaluative methods such as Bayesian Nets,[40] for both source and activity level reporting; the latter being another area of emergent best practice. Currently, the Australasian FSP's are at various stages of review and adoption of these techniques. It is vital that QHFSS is not left behind in this developing field.

69 Where DNA profiling results are not linked to biological source and sampling location, this leaves the end user(s) to form their own opinion without the nuance of scientific expertise in this area. In some circumstances, particularly in crimes against the person, the source of the biological material (i.e. body fluid or cell origin) can be just as important a consideration as the identity of the DNA donor. Contextualising the results of any biological source testing with the results of the DNA analysis is therefore important to ensure that results are not misinterpreted or misunderstand. This is particularly important when the screening tests used for biological source experience false positive reactions (i.e. signalling a positive result when the body fluid is not present), or when a mixture of DNA from at least two people is obtained, as it can never be certain that all the DNA originated from the body fluid indicated. To maximise the use of all information on a sample, and to reduce the chance of misinterpretation, we would encourage

[39] Sijen T, Harbison S. On the Identification of Body Fluids and Tissues: A Crucial Link in the Investigation and Solution of Crime. Genes (Basel). 2021 Oct 28;12(11):1728. doi: 10.3390/genes12111728. PMID: 34828334; PMCID: PMC8617621.

[40] Schaapveld, TEM, Opperman, SL, Harbison, S. Bayesian networks for the interpretation of biological evidence. *WIREs Forensic Sci*. 2019; 1:e1325. https://doi.org/10.1002/wfs2.1325.

QHFSS and QPS to develop a means of sharing information regarding the body fluid identification and DNA results, for these results to be reviewed and interpreted holistically within the case context, and to be reported to the court in a manner that balances the scientific limits of source level reporting and the need for clarity for the end user of this testing information.

Opinions

70 Many elements of the QHFSS approach to reporting are within the range of best practice. However, to fully align with best practice QHFSS should strengthen their approach through:

a. Collaborating with clients and all relevant stakeholders in the development of qualifying statements to accompany results that effectively communicate the meaning of the result and any associated limitations.

b. Using these qualifying statements to accompany results in all communications and reports to stakeholders.

71 This approach should provide clarity on the weight of the result and on any actions the end user could/ should take based on information provided.

72 Finally, we encourage QHFSS to consider the following aspects which may be of assistance to the end user of reports:

a. Standardising the reporting of 'unknown' DNA profiles to inform the end users of how many unknown DNA profiles were obtained, indication of biological sex if possible, and whether or not the DNA contribution of this unknown person is suitable for meaningful comparison purposes.

b. Paring back the number of categories used in reporting to align with the BSAG categories.

c. Use of tables to present DNA results.

d. Broader use of verbal equivalents aligned to the BSAG scale.

e. Provision of a visual aid to assist in the comprehension of a likelihood ratio.

f. Collaborative review of attribution of bodyfluids to DNA results with QPS, to determine circumstances when this is/isn't possible; and where possible who is best placed to report such an opinion.

Recommendations

Recommendation 11.

QHFSS to strengthen reporting practices to ensure provision of reports in a manner that is readily understood by the end users of the information through:

a. Collaborating with clients and all relevant stakeholders in the development of qualifying statements to accompany results that effectively communicate the meaning of the result and any associated limitations.
b. Using these qualifying statements to accompany results in all communications and reports to stakeholders

Recommendation 12.

QHFSS, in conjunction with relevant stakeholders, should consider:

a. Standardising the reporting of 'unknown' DNA profiles to inform the end users of how many unknown DNA profiles were obtained, indication of biological sex if possible, and whether or not the DNA contribution of this unknown person is suitable for meaningful comparison purposes.
b. Paring back the number of categories used in reporting to align with the BSAG categories.
c. Use of tables to present DNA results.
d. Broader use of verbal equivalents aligned to the BSAG scale.
e. Provision of a visual aid to assist in the comprehension of a likelihood ratio.
f. Collaborative review of attribution of bodyfluids to DNA results with QPS, to determine circumstances when this is/isn't possible; and where possible who is best placed to report such an opinion.

Toolkit

73 There is no universally agreed international best practice 'toolkit' for DNA forensic service provision. Rapid developments in forensic DNA have significantly expanded the FSP toolkit in recent years, with this trajectory set to continue. Some FSPs choose to validate a suite of forensic DNA profiling techniques to accommodate and optimise for the broad range of sample types encountered in forensic casework. Others follow an outsource model, particularly where demand for service doesn't justify the cost of providing an in-house service, or where other factors limit options (i.e constraints in infrastructure or expertise).

Observations

74 QHFSS offers standard DNA testing only, performed using the PowerPlex® 21 System.[41] QHFSS does not offer Y-STR testing. Similarly, the lab does not currently have DNA mixture matching capability, enhanced detection methods (including Low Template DNA Analysis),[42] or tests optimised for degraded and/or inhibited samples (AmpFlSTR® MiniFiler™),[43] or the ability to interpret 5-person mixtures. Sub-contracting of samples to other FSPs for specialist forensic techniques also appears to be used very sparingly.

75 We note Y-STR testing is routinely used in almost all Australasian forensic laboratories, but the validation and implementation of Y-STR at QHFSS is still ongoing after many years. This technique would be particularly beneficial to cases involving sexual assault where low levels of male DNA can be detected using Y-STR, which would otherwise not be detected using standard DNA testing.

76 In contrast to some other Australasian government FSPs, QHFSS has no dedicated research development and innovation capability (staff or funding). This makes it incredibly difficult to maintain a suitably extensive suite of contemporary forensic capabilities and keep pace with developments nationally and internationally. We return to this point in other sections of our report.

Considerations

77 The limitations in QHFSS' toolbox are potentially of most significant consequence for those Queenslanders who experience sexual assault. Forensic testing can provide invaluable support in such cases, however this requires routine access to techniques over and above the standard DNA testing offered by QHFSS. Ready access to in-house Y-STR testing would significantly improve QHFSS sexual assault investigation capabilities.

78 We note the report of Commission expert Clint Cochrane stating that:

[41] Promega PowerPlex® 21 System https://worldwide.promega.com/products/forensic-dna-analysis-ce/str-amplification/powerplex-21-system/?catNum=DC8902.
[42] Scientific Working Group on DNA Analysis Methods Guidelines for STR Enhanced Detection Methods http://media.wix.com/ugd/4344b0_29feed748e3742a5a7112467cccec8dd.pdf.
[43] Life Technologies AmpFlSTR® MiniFiler™ PCR Amplification Kit https://tools.thermofisher.com/content/sfs/manuals/cms_042748.pdf.

a. Testing all potential semen samples upfront with a differential extraction protocol is not best practice for sexual assault cases where sperm in not detected

b. Y-STR testing has been used in forensic DNA testing for over a decade so casework examination workflows should have been designed to consider preserving samples and/or using efficient extraction methods for Y-STR typing.

79 This is of particular importance when noting that many sexual assaults do not involve the deposit of semen.

Opinions

80 The lack of Y-STR capability places QHFSS outside of best practice in terms of provision of service. We accept it is not feasible for all FSPs to offer a full range of forensic services and that outsourcing is entirely acceptable; however, we note that in Queensland, outsourcing of Y-STR appears to have occurred sparingly. This has potentially resulted in missed opportunity to obtain DNA results of likely probative value. We understand the remaining techniques discussed in this section are not considered part of a typical toolkit for Australasian FSPs; tests optimised for degraded and/or inhibited samples would likely be considered desirable for FSPs conducting DNA analysis on compromised bone samples.

81 Rectification requires retrospective work to review all samples that could benefit from Y-STR profiling across a period of time to be determined, noting most Australian FSPs have offered Y-STR as part of their standard toolkit for the last 5 years.

82 Given the size of QHFSS and the volume of sexual offence casework, we urge QHFSS to finalise implementation of Y-STR for implementation into casework as a priority.

Recommendations

Recommendation 13.
QHFSS to prioritise the validation and implementation of Y-STR profiling to enhance the ability to recover male DNA in sexual assault casework.

Recommendation 14.

QHFSS to implement routine sub-contracting of samples that would benefit from Y-STR testing to another accredited provider, until such a time as in house capability is implemented into casework.

Recommendation 15.

QPS/ QHFSS to retrospectively review all sexual assault casework to identify cases with samples suitable for Y-STR testing:

a. QPS to check for potential for further DNA testing from a case context perspective
b. Then, QHFSS to facilitate progression of further testing as required

Part B: Scientific Processes

83 This section relates to the reliability of results produced by QHFSS. It includes particular scientific process aspects we were instructed to review, as well as matters of general interest to the topic.

Reliability of results - overview

84 Forensic Science Providers (**FSPs**), as organisations delivering results to the criminal justice system, must ensure their methods are empirically validated and applied in line with scientific standards and validated SOPs. Demonstrating reliability requires two overarching postulates to be satisfied. First, the underlying method utilized should be valid and second, it should be applied in a reliable way by a competent expert.[44] All methods should be based on scientifically valid principles and utilize procedures that are repeatable and reproducible.[45] Finally, methods should be fit-for-purpose (i.e. applied in the right way for the casework in question).

[44] President's Council of Advisors on Science and Technology. (2016) Forensic science in criminal courts: Ensuring scientific validity of feature-comparison methods. Executive Office of the President's Council of Advisors on Science and Technology, Washington DC; ANZPAA NIFS. (2016) A guideline to forensic fundamentals: identifying the underpinning science of human-based forensic science disciplines [accessed 2020 Jan 8].

[45] Ballantyne KN and Wilson-Wilde L. (2020) Assessing the reliability and validity of forensic science – an industry perspective. Aust J Forensic Science 52:275-281; SWGDAM (2016). Validation guidelines for DNA analysis methods. https://www.swgdam.org/_files/ugd/4344b0_813b241e8944497e99b9c45b163b76bd.pdf.

85 There is no single recognised international best practice for a specific methodology that should be applied across the lifecycle of DNA forensic casework, with protocols and methodology highly laboratory dependant. The approach chosen by a given FSP is likely dependent on a number of factors including:

a. Scientific considerations, including method selection (informed by general acceptance and publishing in a peer-reviewed journal and fit-for-purpose methodology confirmed through validation/verification), the range of biological material type (e.g. blood, semen, trace) and substrate type (e.g. clothing, swab, tape lift) received for serious and/or complex cases; and

b. Policy/management considerations, including threshold selection (informed by organisational risk appetite), cost (informed by available resourcing and funding received) and throughput (informed by service demand and client requirement).

86 Our assessment of the scientific health of QHFSS has been performed through a site visit, staff consultations, review of SOPs, and review of approximately 62 casefiles covering Priority 1, 2 and 3 casework. We have taken into account the range of accepted methodologies within the national and international forensic science community, guidance documents produced by authoritative bodies, and the observations and recommendations made by Professor Linzi Wilson-Wilde, Dr Duncan Taylor, Mr Clint Cochrane, Dr Bruce Budowle and Associate Professor Kathy Kramer on specific aspects.

87 We note time constraints have meant we have only reviewed a small sample of the casework undertaken by QHFSS. Furthermore, the case files received did not contain all the material associated with DNA mixture interpretation (i.e. STRmix reports); therefore it was not possible to assess alignment of the QHFSS DNA interpretation with all relevant SOPs and with best practice. We make a specific recommendation relating to this later in Part B.

Validation

88 Validation involves performing laboratory tests to verify that a particular instrument, software program, or measurement technique is working appropriately for the task designated. These validation experiments typically examine precision, accuracy, and sensitivity, which all play a factor on the '3 Rs' of measurements: reliability, reproducibility, and robustness.[46] Validations

[46] Butler JM. (2005) Forensic DNA Typing: Biology, Technology, and Genetics of STR Markers, 2nd edition, Chapter 16 "Laboratory Validation", pp. 389-412.

studies should be designed in a way that establishes the operating limits of techniques (i.e. when the technique should and should not be used under the conditions tested). There are two types of validation required to implement or modify technologies for forensic DNA analysis – developmental and internal. Developmental validations are normally performed by the manufacturer. Where technologies from outside the forensic domain are adopted, developmental validation studies in other fields may sufficiently address forensic applications.[47] Following confirmation via developmental validation that a methodology works in principle, each laboratory should, in line with ISO 17025 section 7.2.1.5 and good practice standards, perform an internal validation study for each method in operation to confirm that the method is performing to specification and with acceptable performance under their specific conditions.[48]

89 When changes are made to a validated method, the influence of such changes must be determined across the whole system.[49] Specifically, processes both upstream and downstream of a new method must be considered. For example, a change to an amplification method may impact on sampling decisions and methodologies, on electrophoresis protocols, and genotyping and interpretation guidelines and models, and therefore the entire workflow process must be considered, the impacts documented, and any actions required must be performed *prior* to implementation of the change.

Observations

90 We have made the following observations of QHFSS's current practices:

a. QHFSS methods are based on scientifically valid principles.

[47] SWGDAM Validation Guidelines for DNA Analysis Methods.
[48] ISO 17025 section 7.2.1.5; see also ANSI/ASB Standard 020: Standards for Validation Studies of DNA Mixtures, and Development and Verification of a Laboratory's Mixture Interpretation Protocol, 1st Edition (2018); ENFSI: Recommended Minimum Criteria for the Validation of Various Aspects of the DNA Profiling Process, 1st Edition (2010) Available: enfsi.eu/wp-content/uploads/2016/09/minimum_validation_guidelines_in_dna_profiling_-_v2010_0.pdf; ENFSI: Guidelines for the single laboratory Validation of Instrumental and Human Based Methods in Forensic Science (2014) Available: enfsi.eu/wp-content/uploads/2017/06/Guidelines-for-the-single-laboratory-Validation-of-Instrumental-and-Human-Based-Methods-in-Forensic-Sciene_2014-version-2.0.pdf; President's Council of Advisors on Science and Technology, Report to the President: Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods, 2016; SWGDAM Validation Guidelines for Forensic DNA Analysis Methods 4344b0_813b241e8944497e99b9c45b163b76bd.pdf (swgdam.org); SWGDAM Guidelines for the Validation of Probabilistic Genotyping Systems 4344b0_22776006b67c4a32a5ffc04fe3b56515.pdf (swgdam.org); Forensic Science Regulator. 2020. Guidance: Validation. FSR-G-201 Issue 2 Validation Guidance (publishing.service.gov.uk).
[49] ISO 17025 section 7.2.2.

b. QHFSS performs validation of equipment and technical procedures according to a framework captured across a number of SOPs.[50]

c. We have reviewed the work of Dr Duncan Taylor, engaged by the Commission to review 15 validation reports relating to QHFSS instrumentation and methodology.[51] We note Dr Taylor's finding that validations have consistently demonstrated a lack of best practice with respect to the type of statistical techniques used and the way in which data is represented. However, with two exceptions he found the validation conducted was sufficient to enable ongoing use of the instrumentation and methodology. The two exceptions to this involve determination of the Limit of Detection (**LOD**) as part of the validation of the Quant Trio and Quant Studio 5 and validation of the Proflex thermocyclers. We note Dr Taylor made a number of recommendations that would improve the way QHFSS conducts validations. Our approach has been to incorporate key aspects of these into our recommendations.

d. We understand introduction of the 3500 genetic analysers did not trigger a review of quantitation thresholds.

Considerations

91 We note and endorse the following comments by Professor Linzi Wilson-Wilde in a report prepared for the Commission:[52]

a. The use of a DNA concentration step after the DNA extraction process can result in further DNA loss; and

b. It is feasible for a high throughput laboratory to optimise and validate its extraction protocols without the need for a routine DNA concentration step.

92 We have examined responses provided to the Commission from four Australasian FSPs on the use of microcon. None of the four FSPs routinely concentrate in response to DNA quantitation

[50] FSS.0001.0012.0247 22871 Procedure for Change Management in Forensic DNA Analysis; FSS.0001.0012.0262 22872 Project Risk Assessment for Change Management in Forensic, FSS.0001.0012.0264 23401 Forensic DNA Analysis Validation and Verification Guidelines, FSS.0001.0012.0269 23402 Writing Guidelines for Validation and Change Management Reports.

[51] Dr Duncan Taylor, Review of the validation material from the Queensland Health Forensic and Scientific Services (QH) (7 October 2022). Add to reference: EXP.0003.0001.0001.

52 EXP.0002.0005.0001, Professor Linzi Wilson-Wilde OAM PhD, Report: Opinion as to the appropriateness of process by which scientists are not performing micro-concentration where quantification is between 0.001 ng/µL and 0.0088 ng/µL (7 August 2022).

values prior to amplification.[53] We note that when microcon is selected as a rework option (to c35µl rather than to 15µl/full), these samples are being re-quantified prior to re-amplification. As these samples have already been determined to have low levels of DNA from the original quantification, we consider that using an additional 2µl to requantify the sample is wasting valuable sample for little probative value.

93 Further, we note that QHFSS use both the DNA Investigator and DNA IQ extraction methods and elute to 90-100µl. For the DNA Investigator kit on the QIAsymphony instrument, this is within the range seen in the literature for reference or high quantity DNA samples (e.g. FTA cards or large blood/saliva samples).[54] However, it is outside the range utilised in publications validating the extraction method for casework samples containing limited DNA (30-60µl).[55] [56]The manufacturers recommended protocol does not specify a single elution volume but allows users to modify the volume depending on the samples being processed (between 30-200µl).[57] For DNA IQ, the 100µl volume is within the range specified by the manufacturer.[58] However, both the manufacturers technical manuals and published scientific validations[59] utilise lower elution volumes than currently in place for the extraction protocol in use at QHFSS. Therefore, it appears that the extraction protocols in use are optimised for samples with high quantities of DNA but

53 Jurisdictions A, B, D and G from deidentified responses to interstate laboratory data request.
54 Gehrig C, Kummer D, Castella V. (2009). Automated DNA Extraction using the QIAsymphony platform: Estimation of DNA recovery from simulated forensic stains. Forensic Science International: Genetics Supplement Series 2:85-86; Stangegaard M et al. (2013). Evaluation of four automated protocols for extraction of DNA from FTA cards. Journal of Laboratory Automation 18:404-410; Scherer M et al. (2013). Processing challenging forensic casework samples with new protocols for the Qiasymphony SP/AS. Forensic Science International Supplement Series 4:e352-353.
55 Stanegaard M et al. (2013). Automated extraction of DNA from biological stains on fabrics from crime cases. A comparison of a manual and three automated methods. Forensic Science International: Genetics 7:384-388; Gehrig C, Kummer D, Castella V. (2009). Automated DNA Extraction using the QIAsymphony platform: Estimation of DNA recovery from simulated forensic stains. Forensic Science International: Genetics Supplement Series 2:85-86; Scherer M et al. (2013). Processing challenging forensic casework samples with new protocols for the Qiasymphony SP/AS. Forensic Science International Supplement Series 4:e352-353;
56 SCY Ip, S Lin, K Lai (2015) An evaluation of the performance of five extraction methods: Chelex® 100, QIAamp® DNA Blood Mini Kit, QIAamp® DNA Investigator Kit, QIAsymphony® DNA Investigator® Kit and DNA IQ™, Science & Justice, 55:200-208.
57 QIAGEN, QIAsymphony SP/AS User Manual – General Description, Version 3.1 (May 2013).
58 The Promega technical manual (small sample casework protocol) states that elution can be performed in 25-100ul, with the caveat that a lower elution volume ensures a higher final concentration of DNA. DNA IQ(TM) System—Small Sample Casework Protocol Technical Bulletin #TB296 (promega.com.au).
59 Frégeau CJ, Lett CM, Fourney RM. (2010) Validation of a DNA IQ™-based extraction method for TECAN robotic liquid handling workstations for processing casework, Forensic Science International: Genetics, 4:292-304; Komonski DI et al. (2004) Validation of the DNA IQ™ System for use in the DNA Extraction of High Volume Forensic Casework, Canadian Society of Forensic Science Journal, 37:103-109; Bogas V et al. (2014) Methods enhancement for improved recovery of human DNA from forensic blood samples on different fabrics using the DNA IQ System, Australian Journal of Forensic Sciences, 46:204-215; Greenspoon SA, et al. (2004) Application of the BioMek® 2000 laboratory automation workstation and the DNA IQ™ system to the extraction of forensic casework samples. Journal of Forensic Sciences 49: 29-39.

are not in line with manufacturer or external validations for lower quantity samples. Consideration should therefore be given to revalidating the extraction procedure in line with the approach followed by the manufacturer and published data. If, after an optimised, smaller elution volume extraction step, quantification indicates the concentration of the DNA is low, a concentration step could be used to potentially increase the chance of obtaining an informative DNA profile. However, the decision to do so should be dependent on the sample type (blood, semen, trace), case type (volume or serious offence, including whether other samples are available) and quantification result; and should be implemented at the reporting scientist's discretion. Furthermore, we do not see the benefit of requantifying a sample post-microcon and are concerned that when done, valuable concentrated DNA is used up for little or no benefit.

Opinions

94 We note Dr Taylor's finding that the statistical techniques used are not the best tests that could have been chosen. We note Dr Taylor's assessment that the validation of the Quant Trio and Quant Studio 5 was not adequate to appropriately calculate a limit of detection (LOD) and that some additional work is required to calculate this LOD according to best practice. We further note Dr Taylor's findings that the ProFlex validation has not been carried out according to best practice, due to its inadequate experimental design. We are advised by the Commission that QHFSS is already working to implement an interim measure recommended by Dr Taylor in relation to the Model Maker settings for STRMix, so that profiles may continue to be interpreted (in accordance with Dr Taylor's recommendations) while the full the validation issue insofar as it pertains to the ProFlex thermocyclers is resolved.[60] The results of the full validation should inform any decision regarding the need for potential retrospective action.

95 QHFSS should prioritise the work required to rectify the issue with the LOD raised in the report of Dr Taylor. The results of this validation should inform any decision regarding the need for potential retrospective action, including case review and stakeholder engagement. If the true limit of detection is found to be below 0.001 ng/µl, we recommend the laboratory reviews all samples reported as 'No DNA detected' with a quantification between the two thresholds. Thresholds are discussed more broadly in Part A.

96 The lack of review of the quantification threshold upon the introduction of the 3500 cannot be considered acceptable practice as per ISO 17025 section 7.2.2.3. This is significant given QHFSS'

[60] TRA.500.011.0064- TRA.500.011.0065. Transcript, 14 October 2022, p1465.36-1466.30.

use of quantification thresholds to cease processing samples in the low quantitation range. Consequence and actions required to rectify are discussed in Part A.

97 The current approach of 90-100µl extraction volume and auto-concentrating samples within low quantitation range is not outside the manufacturer's guidelines. However, auto-concentration, post quantification, is out of step with other Australasian FSPs and therefore it falls below best practice. We believe better case outcomes, more efficient workflows, and lower processing cost could be achieved through a different approach. Broader lack of scientist autonomy is discussed further in Part C.

98 On the subject of experimental design and statistics, we note that not all FSPs have these capabilities in-house, and it is acceptable to refer to published guidelines (such as the SWGDAM Validation Guidelines for DNA Analysis Methods) and reach out for assistance and advice from the broader community. However, ideally, QHFSS would have an in-house R,D & I capability comprising scientists with expertise in experimental design. This would enable QHFSS to operationalize new capabilities in a timely manner, maintaining pace with other Australasian FSPs in the delivery of a contemporary service.

Recommendations

Recommendation 16.
QHFSS to ensure any change to casework process, equipment or methodology is appropriately validated, and that the impact of the change on the entire system is considered holistically and documented.

Recommendation 5. (reproduced from Part A)
QHFSS to prioritise determination of LOD through appropriate validation.

Recommendation 17.
QHFSS to investigate use of a lower elution volume through revalidation of DNA IQ and DNA Investigator.

Recommendation 18.
QHFSS to cease the practice of requantifying a sample post-microcon.

Bone casework

99 QHFSS carries out testing on bones and teeth relating to recent and historic criminal casework, Disaster Victim Identification (**DVI**) events and the identification of human remains, potentially from missing persons. Bone casework fluctuates year on year, with no specific trends.

Observations

100 We have made the following observations of QHFSS's current practices:

a. We are aware of concerns raised by QHFSS staff in relation to the presence of mixed DNA results from bones encountered in casework over a period of years, initially identified in late 2020. These concerns include a change to the general laboratory cleaning regime and its potential impact on bone processing equipment. Bone work includes specific equipment that is prone to pitting/damage and rusting during the process. These factors can impact downstream DNA testing and interpretation.

b. From the report of Dr Taylor, we note that he considered the validation of the cleaning protocol for bone crusher vials (Project #148) appeared to be appropriately performed, with sound conclusions and no evidence that unreliable results are being produced. However, we note that this review did not specifically consider the application of the protocol to other equipment used in bone casework.

c. The change in cleaning protocol on 5 July 2019 for other bone equipment (e.g. chisels, saws) relied on a retrospective verification of cleaning reagents called Project #153 (final report dated April 2015) to verify the use of Trigene Advance / bleach and 70% ethanol. Project #153 designed an experiment whereby blood was deposited on petri dishes and cleaned off using a range of cleaning reagents. Project #153 did not consider the application of the cleaning protocol on equipment used in bone casework, nor the cleaning of bone powder residue.[61] We also note this work utilised the DNA IQ extraction method on the Maxwell®16 platform, Quantifiler as the quantification method and the samples were run on a 3130xl genetic analyzer.

d. Furthermore, we heard concerns that a change in extraction process (in 2018) to the DNA Investigator kit on the QIAsymphony platform has delivered a sub-optimal extraction

[61] FSS.0205.0001.0001, Project#153 – Verification of Cleaning Reagents (Trigene Advance, Viraclean, Virkon, Pyroneg, Decon, Cavicide, F10SC) for use in Forensic DNA Analysis (April 2015).

process for compromised bone and teeth samples, though we note no significant concerns were raised in Dr Taylor's report regarding how this validation was carried out.

e. We noted in casefiles evidence of excellent communication between QHFSS staff and key stakeholders for cases involving DVI events and the discovery of human remains.

f. Where mixed DNA profiles were obtained, it was sometimes possible to defer to single source results from other samples from the same bone; or resolve a major DNA contributor from the mixture and use this for comparison. However, this was not always the case. We commend QHFSS staff on their tenacity to obtain usable profiles from such samples, and proactively reaching out for support, including outsourcing of bone work, to other service providers when needed.

Considerations

101 Bone casework is highly specialised, with each case offering up unique challenges. A highly skilled and experienced workforce is needed, with active engagement in any procedural changes that impact on the process. FSPs performing bone work should encourage relevant staff outside of the FSP (for example mortuary staff) to be represented on the laboratory's elimination database (ED) to enable searching of any unexpected results.

102 Any changes to practice, including to cleaning regimes, should be properly assessed via a validation study prior to implementation in a casework setting. This is particularly important given the unique set of equipment used for bone work and the challenge of cleaning bone powder residue.

103 We encourage QHFSS to connect into other service providers to understand the prevalence, potential sources and impact of extraneous peaks being detected in some bone case samples. The National DNA Program for Unidentified and Missing Persons has substantial experience and expertise in the recovery of DNA from challenging bone samples and should be approached to provide advice and guidance on the most appropriate methods and cleaning protocols.

104 Finally, we note that while given specific instructions regarding bone work, these considerations apply to all forms of DNA evidence recovery, performed both by QPS and QHFSS. Skilled and trained staff are needed to ensure that the methodology is being performed reliably, and regular review of the current scientific knowledge and best recommended practice should occur. All

equipment and processes should be validated, including collection tools, cleaning methodologies, and the interpretation of results.

Opinions

105 Reliance on the retrospective work of Project #153 (final report April 2015) to change the cleaning protocol for bone equipment to Trigene / bleach and 70% ethanol in 2019, when Project #153 did not consider bone equipment or the cleaning of bone powder residue, and the extraction methodology and quantification test had changed for bone samples since Project #153 was finalised, was not ideal. This is because a method is being used outside of the validated parameters.

106 The limited bone equipment-specific validation for cleaning, whilst not ideal, likely has had limited impact on the final results reported to QPS or coronial services. This is because scientists have been able to identify the main source of DNA in most samples. We make a recommendation regarding retrospective review for those cases where it was not possible to obtain a DNA profile suitable for comparison from bone and teeth samples.

107 The current bone extraction method is appropriate for casework and has been properly validated. However, we heard concerns it may not be optimised for compromised samples and this appeared to be the case from our review of bone case work.

Recommendations

Recommendation 19:

QHFSS should cease bone case work until such a time as the protocol for cleaning bone equipment is validated on the specific equipment utilised, and with the current workflow methodology, to assess suitability. Once bone casework is reinstated, an investigation of the long-term impact of the cleaning method on such tools should be conducted.

Recommendation 20:

QHFSS should review sampling, extraction and amplification methods to ensure the highest quality results from the widest range of bone and teeth samples. After this, an optimal suite of methods should be validated and implemented for use in bone casework.

Recommendation 21:

QPS/ QHFSS (and Coronial Family Services if appropriate) to retrospectively review bone and teeth cases where it was not possible to obtain a DNA profile suitable for comparison.

a. QPS to check for potential for further DNA testing from a case context perspective
b. Then, QHFSS to facilitate progression of further testing as required

Note: Review should not be limited to consideration for standard DNA testing only.

Contamination Management

108 DNA casework is prone to contamination and requires fit-for-purpose facilities and environmental conditions. FSPs should ensure infrastructure and protocols are designed to minimise contamination. Specifically, contamination prevention can be achieved through application of SOPs designed to reduce contamination risk through segregation and process flow, and contamination detection through a range of factors including the use of controls, staff elimination databases (**EDs**) and environmental monitoring.

Observations

109 We have made the following observations of QHFSS's current practices:

a. QHFSS DNA Analysis laboratories are purpose built and consistent with the requirements for NATA accreditation under ISO 17025[62].

b. Examination spaces appear to be readily cleanable, lighting sufficient, and air pressure controlled to prevent DNA contamination. Process flow is managed through controlling access to DNA clean areas via designated areas for donning and doffing personal protective equipment.

c. Two main areas exist and are linked by an air bridge, with DNA analytics and reporting on one side, and the remaining groups on the other. Whilst not ideal, we appreciate it is difficult to find sufficient space to house a full forensic DNA Unit in one space.

d. Contamination risk is minimised through automated processing (i.e. use of robotic handling devices), although the use of microcon is a notable exception.

[62] NATA. Specific Application Criteria ISO/IEC 17025 Application Document Legal (including Forensic Science) – Appendix. July 2018; section 6.3.4.

e. SOPs are designed to minimise contamination risk.

f. Segregation is supported through the use of dedicated spaces, equipment and personnel for casework and reference material, and for pre-PCR and post-PCR material.

g. Contamination detection is achieved through a range of factors including the use of positive and negative controls, staff elimination databases and an environmental monitoring program.

h. Negative controls are used at each step in the workflow but are not always run through the system end-to-end as per ISO 17025 Specific Accreditation Criteria section 7.7.1. Whilst the approach of subjecting reagent blanks/ negative controls to the same degree of testing as casework samples is current practice for 'first pass' DNA testing, it is not applied to samples undergoing upgrade to a different STR kit or undergoing concentration (microcon). This presents the risk that DNA information attributed to the case sample after such an upgrade or concentration process may in fact be present as a result of contamination. Without assessing the status of the negative control under the new testing regime, any potential contamination cannot be detected. We have attached as Appendix 7 a memorandum we provided to the Commissioner, Walter Sofronoff KC, on 26th September 2022 on this topic.

i. Relevant procedures did not appear to require segregation between high yield (e.g. Sexual Assault Examination Kits (**SAIKs**) and low yield (for example, 'touch' or trace DNA) items, by use of separate examination areas and batching at extraction.[63] This approach is deemed beneficial to safeguard against within-laboratory contamination.

j. Evidence recovery techniques include a scraping method. Other suitable methods exist for recovery of biological material and would be preferable from a health and safety and contamination minimisation perspective.

k. We noted an OQI surfacing a variety of issues regarding access to the Forensic DNA Unit. Minimising and recording access is imperative to ensure only those with a specific need are allowed access, and such access is recorded and discoverable as per ISO 17025 Specific Accreditation Criteria section 6.3.4. At QHFSS, visitors are recorded when entering the QH

[63] FSS.0001.0053.1279 Anti-contamination Procedure; FSS.0001.0012.1384 Examination of Sexual Cases; FSS.0001.0012.1416 Examination of Items; FSS.0001.0012.2518 Examination of post-mortem and associated samples from deceased persons.

building, but not specifically within the Forensic DNA Unit or at the Property Point. This could hamper investigation of contamination events if/ when they occur. We understand the Property Point are instigating such a record.[64]

l. We noted the requirement for those entering the DNA laboratories to provide reference DNA samples to enable elimination checks in the event of unusual DNA results being obtained.

m. We were instructed to review a specific issue relating to an observed reduction in sample volume post PCR, impacting mostly on samples in the corner wells of the plate. The 2020 investigation postulated that these wells were more prone to evaporation while on the PCR instrument hot block, due to less robust sealing of the plate in these corners. The laboratory noted this issue persisted regardless of the plate seal lot number and whether sealed by hand or using the automated platform. The laboratory report stated the Hamilton/BioStrategy had manufactured a new amplification plate mount for the automated plate sealers to improve the sealing on the PCR plates. According to the report this new plate mount had been shipped but was delayed due to COVID-19.

n. We have been asked to investigate whether it was appropriate that the 'Proof of concept for routine Maxwell extraction rework strategy for Differential Lysis samples' was progressed as a minor change instead of a major project. The relevant QHFSS SOP is 22871 Procedure for Change Management in Forensic DNA Analysis. This procedure applies to "all process changes or projects that require staff training to be implemented/ significantly alter workflow procedures". The SOP states:

- Minor Projects are defined as projects that have a duration of <6 weeks and a budget of <$5,000. These projects have a minor impact on sample processing/reporting.

- Major Project: are generally defined as projects that have a duration of >6 weeks and/or a budget of >$5,000. Major projects require significant planning and detailed consideration of project impacts and implementation procedures

- Any project which major impact on workflow or sample reporting should be considered under major projects.

[64] Information provided during site visit on 23 September 2022.

- In some circumstances a small amount of experimental data may be included within a minor change –where the data is used for decision making purposes.

110 The 'Proof of concept for routine Maxwell extraction rework strategy for Differential Lysis samples' was a proposal to introduce an additional step as part of a rework strategy. The project referenced published literature and a study conducted at an Australian FSP. An experiment was designed involving ground truth samples (positive controls) and casework samples. The samples were tested using current methodology. A criteria for accepting or otherwise the procedure was outlined, as was a workflow including clarity on decision making. Results were assessed with reference to the paper. The proposal was accepted, with actions relating to updating SOPs, and a plan to monitor the process change for a period of several months.

Considerations

111 NATA's Specific Accreditation Criteria details a number of requirements relating to the DNA laboratory environment. The UK Forensic Science Regulator (**FSR**)'s guidance document 'The Control and Avoidance of Contamination in Laboratory Activities involving DNA Evidence Recovery Analysis' serves as a useful reference point for outlining best practice.[65]

112 Noting several recent instances of contamination evident through QHFSS' environmental monitoring program,[66] we draw attention to the approach outlined by the UK FSR that where a workspace has been affected by a contamination incident, and the contamination may still present an issue, processing of material within the affected workspace shall cease until it has been subject to the decontamination regimes and demonstrated to have been effective through environmental monitoring.[67]

113 Reduction in sample volume post PCR is not unique to QHFSS and the most likely cause of such evaporation events relates to the seal.

114 The 'Proof of concept for routine Maxwell extraction rework strategy for Differential Lysis samples' project meets the criteria for Minor Project in terms of budget and duration. However, as no guidance is provided on what constitutes a major impact on workflow or sample reporting,

[65] UK Forensic Science Regulator Guidance document 'The Control and Avoidance of Contamination in Laboratory Activities involving DNA Evidence Recovery Analysis' FSR-G-208; Issue 2 2020.
[66] Management Review records indicate 13 staff matches to environmental monitoring samples recorded in Q3 and Q4 of 2021.
[67] UK Forensic Science Regulator Guidance document 'The Control and Avoidance of Contamination in Laboratory Activities involving DNA Evidence Recovery Analysis' FSR-G-208; Issue 2 2020.

it is not possible to definitively state whether the project should have progressed as a major project. The important question is whether appropriate work was performed to demonstrate the principle and application of the method. Results showed that this additional step could provide further information of value in sexual assault cases. Broadly, experimental design was sound: the research was conducted appropriately with inclusion of ground truth known samples, consideration of workflows and acknowledgement of limitations. However, use of high quality and quantity samples limits the applicability of the validation to low level casework. Whilst QHFSS has demonstrated this technique works in principle, the efficacy on low level samples is not determined through this study but may have been through post implementation review. This change would not decrease quality and was aimed at providing additional information rather than changing the original workflow. Therefore, use of post implementation review to determine applicability to low level case samples is not inappropriate in the circumstances. QHFSS should be commended for focusing on quality over efficiency with this work.

Opinions

115 QHFSS purpose-built laboratory environment and facilities are well designed and fit-for-purpose. However, we note the lack of a suitable biohazard safety cabinet in the Evidence Recovery area, meaning if large, bloodstained items are required to be examined, this occurs in a biohazard safety cabinet in the extraction suite. Whilst this is acceptable from a health and safety perspective, the lack of a suitable cabinet in the Evidence Recovery area was raised in an internal audit in 2021.[68] Whilst QHFSS does not perform many examinations of this type, if it is within their scope of item examination work then they must provide suitable facilities within the evidence recovery area.

116 QHFSS management of contamination risk is broadly within the range of accepted practice. However QHFSS' approach to extraction negative controls as outlined above does not comply with ISO 17025 Specific Accreditation Criteria section7.7.1 therefore is below accepted practice.

117 We acknowledge the likelihood of failure to detect contamination through this practice is low and there are acceptable reasons to deviate from the standard (e.g. exhaustion of the original negative control). However, workflow inefficiency would not be acceptable grounds.

118 Several further areas would fall below best practice when compared to other Australasian FSPs:

[68] FSS.0001.0080.4250, 28996 Facilities and Environmental Conditions.

a. Separation of high from low yield items: we acknowledge that QHFSS performs limited examination of high yield items and has a raft of other suitable contamination minimisation and detection measures in place.

b. Scraping method for DNA recovery: as above, we acknowledge QHFSS performs limited item examination and has a raft of other suitable contamination minimisation and detection measures in place.

119 Therefore we do not believe these three matters above warrant retrospective casework review.

120 The recommendation regarding extraction negative controls has the potential for retrospective review. Where conflict arises through more than one type of retesting being considered (e.g. microcon and Y-STR) and both cannot be accommodated due to the likelihood of sample exhaustion, we recommend prioritisation of Y-STR testing (refer to Part A).

121 We consider the approach taken by the laboratory relating to reduced volume post PCR to be broadly acceptable, however no mention was made of taking the relevant PCR machine out of action and cleaning it when these events occurred, in the unlikely event of contamination of the equipment. Consideration could also be given to not using the impacted wells of the plate.

Recommendations

Recommendation 22.

In relation to extraction negative controls, QHFSS should:

a. Retrospectively review the extraction negative controls where the associated case sample has undergone additional testing.
b. In future, ensure extraction negative controls undergo the same testing as the corresponding case samples, at the same time, unless the control sample has been exhausted.

Recommendation 23.

QHFSS to strengthen contamination minimisation prevention and detection through:

a. Documenting the requirement to segregate likely high yield from likely low yield items and implementing a workflow to achieve this.
b. Exploring alternate procedures to the scraping method for recovery of biological material.
c. Minimising and recording all visitors to the DNA Analysis Unit and Property Point.

d. Installing a biohazard safety cabinet in the Evidence Recovery laboratory if receiving large bloodstained items.
e. If reduction in volume post PCR is still occurring, the machine should be removed from action and cleaned prior to being re-used; and consideration should be given to not using the impacted wells of the plate.

DNA interpretation

122 A FSP should provide guidance for case managers on the interpretation of DNA profiles to promote consistency and uniformity among all scientists. The Scientific Working Group DNA Analysis Methods (**SWGDAM**),[69] provides the core elements to support a laboratory in setting its DNA interpretation guidelines. NATA's Standard Application Criteria (**SAC**) also provides guidance, specifying that DNA profiling data must be typed independently by two authorised scientists, who must then agree on the DNA typing results to be reported.[70] Alternatively, a validated expert system and one authorised scientist can be used.

123 In the absence of a validated expert system, FSPs can meet these standards through ensuring:

a. Genotyping and profile interpretation are separately performed by two scientists, following assessment regarding the suitability of the profile for interpretation; and

b. Comparison to reference samples and assessment of weight of evidence (LR) occur after a profile has been interpreted and is deemed suitable for meaningful comparison.

124 Emerging best practice requires the second scientist to be fully blinded to the first scientist's work to manage bias.[71] Where disagreement ensues, and biological options such as rework are exhausted, this should be referred to a third scientist for review.

125 Results should be reported in a way that addresses uncertainty, outlining the decision made and the impact of such decisions. This is particularly important for disagreements on the number of contributors (**NOC**) as the impact of incorrect assignment of NOC includes potential false inclusions (evidence providing support for contribution when the individual is not present) and false exclusions (evidence providing support for non-contribution when the individual is

[69] SWGDAM Interpretation Guidelines for Autosomal STR Typing by Forensic DNA Testing Laboratories, 2021.
[70] NATA Specific Accreditation Criteria ISO/IEC 17025 Application Document Legal (including Forensic Science) – Appendix.
[71] Krane DE et al. (2008). Sequential unmasking: a means of minimizing observer effects in forensic DNA interpretation. Journal of Forensic Sciences 53:1006-1007.

present). In reality, it is simply not possible to determine the actual NOC. Rather, the scientist should form an opinion on the basis of the information available to them and report that opinion with suitable caveats.

Observations

126 We made the following observations of QHFSS' current practices:

a. At QHFSS, all reporting scientists are trained to perform DNA interpretation according to standardised procedures.[72] DNA interpretation occurs through consideration of the DNA profile obtained, then if appropriate, comparison to reference samples and weight of evidence calculations are performed by reporting officers. This is consistent with SWGDAM guidelines. The SOP for DNA profile interpretation is highly prescriptive and relies upon the setting of thresholds (for example analytical, reporting, stochastic, stutter and peak height ratio thresholds) based on sound validation.

b. QHFSS uses GeneMapper ID-X Software. The Manufacturer Product Overview states:[73]

   i. This software was designed to fulfill the requirements of both Expert System and Expert Assistant software.

   ii. However, despite its capabilities to automate and streamline the analysis of single source samples (*likely those in a reference DNA or databank sample stream*), an Expert System is unable to make the final analysis decision for most forensic casework samples and, in particular, for those containing mixtures of DNA. *Words in italics are our own words.*

c. QHFSS workflows involve GeneMapper ID-X Software[74] to perform the first 'typing/ plate reading' of the DNA result and an authorised scientist from the Analysis or Reporting Team (depending on who is rostered) to perform the second 'typing/ plate reading'. The sample profile is designated 'simple', 'mixed' or complex', then allocated to a worklist for a reporting scientist to interpret the sample-specific DNA result. We noted the following discrepancies in this last step:

[72] FSS.0001.0012.0147 Basics of DNA Profile Interpretation.
[73] GeneMapper ID-X Software Product Overview available at https://www.thermofisher.com, accessed on 20th October 2022, indicating software contains features such as the Analysis Requirements check, Allelic Ladder Quality Assessment, Improved Quality Value System, and Analysis Summary.
[74] Thermo Fisher Scientific Thermo Fisher Scientific - AU.

i. Firstly, we understand that whilst most reporting officers are trained in plate reading and rostered to do so, some are not.

ii. Secondly, we understand some reporting scientists rely on the electropherogram (full and zoom, both in pdf form) whereas others review the results in the original software which provides more useful information and improved ability to perform quality assessments. This variation becomes important if GeneMapper-IDX is not considered a validated expert system.

d. The Forensic Register does not readily support sequential unmasking of results and considerations that informed the interpretation of a DNA profile. This has two impacts:

i. First, some case information, potentially including biasing information, is viewable by analysts performing plate reading and profile interpretation.

ii. Second, during peer review, the results of the first scientist's work, including the opinions reached, are viewable by the second scientist.[75] We consider this problematic from the perspective of independent, unbiased, interpretation and review.

e. We are aware of instances where interpretation reasoning is recorded outside of the FR and therefore outside of the official case record as an *aide memoir*. Whilst this approach supports blind review DNA interpretation (a functionality not currently delivered by the Forensic Register), we are concerned that this information is not discoverable (e.g. to reviewers (after blind review), auditors, or defence scientists).

f. As experienced in many FSPs, differences of opinion in DNA profile interpretation do occur. QHFSS has a SOP relating to differences of opinion at the initial result reporting and statement writing stages.[76]

g. We note from the casefile review that some statements reported results that were referred to as 'below the reporting threshold'; and considered that this could be a source of confusion for the end users without additional clarification.

[75] Krane DE et al. 2008. Sequential unmasking: a means of minimizing observer effects in forensic DNA interpretation. J Forensic Sci 53:1006-1007.
[76] FSS.0001.0012.2829 Procedure for Resolving DNA Profile Interpretation Differences of Opinion.

h. We heard of a lack of consistency and uniformity in relation to stutter interpretation.[77] Stutter products result from strand slippage during DNA synthesis, and can vary across profiles, loci or alleles. Laboratories use stutter filters based on internal validation, however those analysing and/or reporting DNA results are required to make decisions as to whether a component could be stutter or allelic. These decisions can become more complex when low levels of DNA are present in mixed DNA profiles. In these situations stutter peaks can appear in the same height range as minor alleles. The DNA interpretation SOP references -2 repeat stutters (also known as double back stutter), stating that these should be removed at plate reading stage. Furthermore, this SOP states that QHFSS has implemented locus specific -2 repeat stutter thresholds based on national data and data from the validation of the PowerPlex®21 kit. We note several inaccuracies in section 16.5 of this SOP, the first being it states that STRmix™ cannot model -2 repeat stutter peaks. This is incorrect as STRmix has had this capability since version 2.6. QHFSS is currently using version 2.8.0.[78] QHFSS have not modelled -2 repeat stutter in their current version of STRmix, however this capability exists should they decide to. Other inaccuracies in this section of the SOP include statements made about +1 repeat stutter and composite stutter.

Considerations

127 As part of our review, we have examined responses provided to the Commission from other Australasian FSPs on the approach to DNA interpretation. From this we note:

a. None appear to utilise a fully blinded system; some apply blinding at some steps (for example, reading the electropherogram, assigning the number of contributors present in a profile, determining suitability for STRmix).

b. All have a process for resolving disagreements.

c. Four FSPs using GeneMapper-IDX require two readers for crime samples. Based on the responses provided, no Australasian FSP relies on GeneMapper-IDX and one authorised scientist alone for crime samples (which is the case at QHFSS).

[77] WIT.0004.1224.0001 Statement of Emma Caunt dated 6 October 2022.
[78] FSS.0001.0012.2852 How to Use STRmix v2.8.0 – data entry training.

128 Where low level DNA is encountered (i.e. one or two peaks on an electropherogram), a number of approaches can be followed:

a. Some FSPs choose not to interpret the DNA result as it is deemed not suitable for meaningful comparison. In this instance the report must detail the reason(s) why the profile is deemed not suitable for meaningful comparison.

b. Some FSPs invoke a threshold and only report the result where it would give rise to evidence above a certain weight.

c. Some FSPs report these results despite a low LR, leaving determination of probative value to a court to determine. This is the approach in use at QHFSS. With this approach, care must be taken to convey the limited evidential weight of the result to ensure the end user is able to make an informed judgement as to the probative value of the result in the wider case context.

Opinions

129 Broadly, QHFSS practice falls within the range of best practice. However this is not the case for some aspects:

a. DNA Analysis:

i. Where both Analytical Team and Reporting Team scientists are authorised in plate reading, QHFSS workflows can be considered to fall within range of best practice. We note the divergent practice used by Reporting Team scientists and support the latter approach (i.e. use of GeneMapper-IDX Software for DNA interpretation) to ensure all available information is considered.

ii. Where only the Analytical Team scientist is authorised in plate reading, we do not consider this to fall within the realm of acceptable practice.[79] QHFSS should rectify this situation through ensuring genotyping and profile interpretation is performed by two authorised scientists.

b. DNA Interpretation: The recording of rationale for DNA interpretation decisions outside of the formal case record falls below the range of acceptable practice. Rather, the

[79] ISO 17025 section 6.2.6.

rationale relied upon in the interpretation of a DNA result should be documented in the official case record.[80]

130 We see three further opportunities to align with emergent best practice:

a. We encourage transition to a blinded DNA interpretation model to align with emergent best practice (noting that this will require changes to the Forensic Register).

b. We see opportunity to strengthen reporting practices where low-level DNA is encountered to ensure the end user is able to make an informed judgement as to the probative value of the result in the wider case context. This is discussed further in Part A.

c. We are concerned about the process whereby results are retracted on the basis of disagreement and reported as being due to "unintended human error". This is discussed in detail in Part A.

131 QHFSS should review and update the DNA interpretation SOP.

132 Finally, we note the importance of ongoing mentoring to increase the experience and confidence of the reporting officer and wider team discussions on profiles which were challenging to interpret, as part of a healthy, continuous development approach to DNA interpretation.

Recommendations

Recommendation 24.
QHFSS to ensure genotyping and profile interpretation are performed by two authorised scientists independently, ideally, blinded to each other's work.

Recommendation 25.
QHFSS to work with bDNA to facilitate changes to the Forensic Register to enable blind peer review of DNA interpretation.

Recommendation 26.
QHFSS to ensure recording of rationale for decision making is made in the official case record.

[80] NATA Specific Application Criteria ISO/IEC 17025 Application Document Legal (including Forensic Science) – Appendix. July 2018; section 7.5.

Disclaimer

133 The following further issues were raised in relation to the topic of DNA interpretation.

134 We have heard of instances where some staff invoke an additional contributor of DNA for mathematical modelling purposes in situations where the only indication of an additional DNA contributor is stutter above the laboratory's guideline and/or allelic imbalance.[81]

135 It is important this claim is verified, as there are certain situations where the potential harm of such a decision far outweighs any perceived benefit to the mathematical model. An example of this is invoking an additional DNA contributor in the sperm fraction of a high vaginal swab in a sexual assault case. To an end user, this could imply an individual has had an additional sexual partner than any disclosed, causing serious harm to the individual complainant and their credibility.

136 We understand there is divergent practice amongst reporting scientists regarding double back stutter and composite stutter. It is important this claim is verified through STRmix review, and any impact assessed.

137 There was also evidence of scientists dropping more than one loci in STRMix and of disagreement among the reporting team as to the circumstances in which that may be done.[82]

138 A question was also raised about the "stratification" of populations in STRMix to determine likelihood ratios: Instruction, 13.

139 However, as we were not provided the STRmix reports and associated material for the casefiles we reviewed in sufficient time for these reports to be reviewed, we are unable to address these concerns. We do, however, note the importance of carrying out this scientific review. Therefore, we make this recommendation:

Recommendation

Recommendation 27.

QH should facilitate an external review of the use of STRmix covering:

a. Alignment of use to in house validation and SOPs;

[81] WIT.0043.0001.0001, Statement of Rhys Parry (28 September 2022), [34] – [42]; TRA.500.009.027 – TRA.500.009.028, Transcript Day 9, p1148.12-1149.38.; WIT.0004.1224.0001, Statement of Emma Caunt dated 6 October 2022

[82] WIT.0004.1224.0001, Statement of Emma Caunt dated 6 October 2022, [16] – [15].

b. Alignment of use to STRmix recommendations.
c. Investigation of whether QHFSS' use of dropping loci in STRmix is fit for purpose;
d. Investigation of whether QHFSS' use of the STRmix diagnostic data is fit for purpose; and
e. Investigation of whether the assignment of the number of contributors is fit for purpose, both for STRmix and the implications for the wider case.
f. Investigation of the appropriate "stratification" of populations in STRMix to determine likelihood ratios

Peer review

140 Forensic biology laboratories conduct case record reviews (technical and administrative reviews) as part of an overall quality management system as per ISO 17025 Specific Application Criteria section 7.7.2.

141 QHFSS performs peer review at various stages of the workflow. All DNA sample result lines are reviewed prior to release. Where the DNA quantitation value is below the 'No DNA detected' threshold, peer review is performed by a second scientist in the Analytical Team. Where DNA profile information has been obtained, peer review is by a second reporting scientist. All statements are peer reviewed in full, prior to release. A SOP exists in relation to resolving differences of opinion.[83]

142 Note: aspects of peer review relating solely to DNA interpretation are covered in the previous section.

Observations

143 Overall, we noted a strong understanding among QHFSS of the importance of peer review as a key pillar of the Quality Management System (**QMS**) and note that QHFSS' automated processes are likely to reduce the risk of transcription and typographical errors. However, we observed several areas where peer review could be strengthened, as follows:

a. During our visit to QHFSS, an Evidence Recovery Team staff member advised that it was not standard practice for a second scientist to confirm the presence of spermatozoa on a low count slide. We consider peer checking of critical findings an important element in peer review.

[83] FSS.0001.0012.2829 Procedure for Resolving DNA Profile Interpretation Differences of Opinion.

b. We heard concerns of a tendency for staff, when selecting casefiles to review, to avoid case managed by particular individuals.[84] We consider random assignment of reviewers to be more conducive to a healthy quality environment.

Considerations

144 As noted by the Ross Inquiry and Ballantyne et al, there has been very little research conducted on the structure, function and effectiveness of peer review of case files and reports in forensic science.[85] However, ANZPAA NIFS's Case Record Review provides a useful guide.[86] It:

a. Outlines components of the standard forensic biology workflow that may be considered for review, including:

i. checking the items received (chain of custody, integrity, condition, examinations not performed);

ii. reviewing the examinations performed (procedures, samples collected, records);

iii. ensuring that legislative requirements have been met;

iv. reviewing the DNA analysis processes;

v. reviewing the DNA results assessment (number of contributors and STRmix™ output);

vi. checking the statistical analysis;

vii. ensuring quality checks have been performed (process controls, elimination database checks);

viii. reviewing the interpretation of results and opinions expressed;

[84] Interview with two reporting scientists on 21 September 2022.
[85] A Ross, "Ross Inquiry into PathWest Laboratory Medicine WA," 2017, http://ww2.health.wa.gov.au/Reports-and-publications/Independent-PathWest-inquiry-completed - accessed 11 October 2022; Ballantyne KN, Edmond G and Found B. (2017) Peer review in forensic science; Review Article, Forensic Science International 277: 66–76.
[86] Case Record Review in Forensic Biology, 2019 ANZPAA NIFS, accessible at https://anzpaa.org.au/forensic-science/our-work/products/publications.

ix. reviewing the spelling and grammar; ensuring that records are signed, dated and pages numbered where required;

x. checking the case related correspondence is present; and

xi. ensuring that the format of the report is consistent with laboratory and accreditation requirements.

b. References use of a rostering system to allow for the random allocation of reviewers to reduce the potential for an analyst to 'shop' for a reviewer that is likely to agree.

145 Emerging best practice also recommends that procedures and processes should be in place to limit practitioner exposure to potentially biasing information irrelevant to the specific method and to address any potential cognitive bias.[87] Jeanguenat et al (2017) provide useful guidance for forensic DNA laboratories wishing to address blinding in peer review.[88]

Opinions

146 QHFSS peer review practice falls within the range of best practice with one exception: the lack of peer checking of spermatozoa on a slide.

147 Further, the lack of random assignment of reviewers does not align to emergent best practice.

148 We encourage QHFSS to work towards full blinding in proficiency testing in line with emergent best practice.

Recommendation

Recommendation 28.

QHFSS to strengthen its peer review process through:

a. Implementation of peer checking of spermatozoa on slides in evidence recovery

b. Random allocation of peer reviewer (where possible).

[87] ANZPAA NIFS. A guideline to forensic fundamentals: identifying the underpinning science of human-based forensic science disciplines; 2016; Kassin S, Dror I, Kukucka J. (2013) The forensic confirmation bias: problems, perspectives, and proposed solutions. J Appl Res Mem Cogn. 2(1):42–52.

[88] Jeangueat AM, Budowle B, Dror IE. (2017) Strengthening forensic DNA decision making through a better understanding of cognitive bias. Sci and Justice 57:415-420.

Competency/Proficiency Testing

149 FSPs should ensure staff are trained to a level of demonstrable competency and expertise. Even if a method has strong empirical support for validity and a laboratory can demonstrate that systems are in place to ensure valid application and reporting, errors may still arise if the individual practitioner is not able to perform the analysis and interpretation in a correct manner.[89]

150 NATA's SAC[90] states that assessment of competency can be determined in a number of ways including through:

a. participation in proficiency testing and collaborative trials;

b. review of results of Quality Control (**QC**) samples and standards in test batches;

c. direct observation of routine work procedures;

d. evaluation of staff knowledge and understanding;

e. independent assessment of work undertaken;

f. court testimony monitoring;

g. peer review of case files; and

h. client feedback.

151 Where proficiency testing meets the needs of the facility, participation is mandatory and at least one test per skill set must be undertaken annually, where available. A facility must complete all proficiency tests for which it is enrolled as per ISO 17025 Specific Application Criteria section 6.2.5.

Observations

152 We made the following observations of QHFSS' current practices:

[89] Ballantyne KN and Wilson-Wilde L. (2020) Assessing the reliability and validity of forensic science – an industry perspective. Aust J Forensic Science 52:275-281.
[90] NATA Specific Accreditation Criteria ISO/IEC 17025 Application Document Legal (including Forensic Science) Section 6.2.5.

a. QHFSS employs a competency-based training and assessment framework, detailing pathways to competency for different roles. New staff undergo induction facilitated by the FSS Scientific Skills Development Unit (**SSDU**), followed by local induction within QHFSS delivered by the line manager. During induction, the training coordinator or line manager will have a discussion outlining the learning pathway. The Forensic DNA Analysis Capability Development Program outlines the training required specific to each role. Appropriately experienced, trained and knowledgeable staff members can be deemed as 'Competent to Train' in a specific procedure and be authorised by their line manager to provide training against a specific training module. Training records detail competency attained in line with the framework. In general, we found QHFSS' staffing cohort appear to be highly skilled and well trained.

b. QHFSS utilises a similar proficiency testing regime to that of other Australasian FSPs to assess ongoing competency; samples are either single source or mixtures of DNA from two people. This situation is not unique to QHFSS, however, we have addressed this in the considerations below. At QHFSS, proficiency test samples are flagged in FR and sorted to worklists under the worklist model.

c. We noted that whilst most reporting scientists are trained in plate reading and rostered to do so, some are not. Those who are not trained and rostered to plate read are still able to access software to assist in DNA interpretation.

d. We note that application of the CTS proficiency testing regime at QHFSS does not cover all aspects of each scientist's role as scientists in the Analytical Team are not individually tested. Rather, the Analysis stage is tested holistically, from an overarching, whole of system perspective. While this is consistent with the requirements for NATA accreditation under ISO 17025[91], the Specific Application Criteria also states that staff competency must be reviewed, with a range of mechanisms proposed.[92] Within the forensic community, the review of competency is most commonly performed by ensuring that each scientist undergoes proficiency testing (internal or externally facilitated) in their full range of duties on a regular (annual or biannual) basis. This should include plate readers, whether in the Analytical or Reporting team, and inclusion of this skillset in their annual proficiency.

[91] NATA. Specific Application Criteria ISO/IEC 17025 Application Document Legal (including Forensic Science) – Appendix. July 2018; section 7.7.2.
[92] NATA. Specific Application Criteria ISO/IEC 17025 Application Document Legal (including Forensic Science) – Appendix. July 2018; section 6.2.5.

e. We did not see evidence of court monitoring of scientists. Monitoring competence is a requirement for accreditation per ISO 17025 Special Accreditation Criteria section 6.2.5.[93]

Considerations

153 QHFSS could implement de-identified proficiency tests, such that tests are not distinguishable from cases within Forensic Register. Other proficiency test providers could be explored, and QHFSS could consider bespoke proficiency testing (on offer from at least one provider) if they feel, for example, testing using more complex mixtures of DNA is needed. In this regard it is worth noting that the UK Forensic Science Regulator has specified that tests should contain poor-quality, mixed, and potentially uninterpretable samples to test challenging yet frequently encountered factors.[94] Such tests are, at present, difficult to obtain from commercial providers. As such, although external proficiency tests are valuable in demonstrating performance on non-complex items and samples that require a baseline level of expertise, they are not testing the limits of systems or analysts – either regarding low level samples or highly complex mixtures. This was also specifically noted by the NIST Scientific Foundation review on DNA Mixture Interpretation.[95] This review found that current proficiency tests, even for mixture tests, consist of simple mixtures with high-quality and high-quantity DNA. This report recommended that tests should include mixtures with low-template components and samples with more than two contributors. It is important that proficiency test results should not be extrapolated to infer either validity or competency on challenging sample types when they have not been included in test designs.[96]

Opinions

154 QHFSS' approach to competency testing falls within the range of best practice with one exception, namely that some staff involved in plate reading do not hold authorisations in the

[93] NATA. Specific Application Criteria ISO/IEC 17025 Application Document Legal (including Forensic Science) – Appendix. July 2018; section 6.2.5.
[94] Forensic Science Regulator. *Proficiency Testing Guidance: DNA Mixture Analysis and Interpretation.* 2020. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/894598/G224_DNA_Mix_PT_Guidelines__Issue1_2020.pdf].
[95] Butler JM, Iyer H, Press R, Taylor MK, Vallone PM, Willis S. (2021). DNA Mixture Interpretation: A NIST Scientific Foundation Review. NISTIR 8351-Draft.
[96] Personal communication Dr Kaye Ballantyne, Chief Forensic Scientists, Victoria Forensic Services Department.

relevant competency. This is inconsistent with ISO 17025 6.2.6 and therefore deemed not acceptable.

155 While QHFSS' approach to proficiency testing meets ISO 17025 Specific Accreditation Criteria section 7.2.2 in that the facility is tested annually on each skill set, emergent best practice would expand this testing for all individuals. Therefore, we encourage QHFSS to strengthen their approach to ensure all staff involved in plate reading are subjected to individual proficiency testing.

156 If indeed QHFSS does not have a court monitoring program, this is inconsistent with ISO 17025 Specific Application Criteria section 6.2.5 and therefore below accepted practice.

157 Like all Australian FSPs, QHFSS should maintain a watching brief on developments in the international forensic community relating to fully blinded peer review and proficiency testing to ensure they keep pace with emergent best practice.

Recommendations

Recommendation 29.
QHFSS should ensure all staff involved in plate reading have authorisations in the relevant competency and are rostered to perform the task regularly.

Recommendation 30.
QHFSS should ensure all court reporting staff participate in a court monitoring program.

Recommendation 31.
QHFSS should consider subjecting all staff involved in plate reading to individual proficiency testing.

Sexual Assault casework (SAIKs)

158 QHFSS make up Sexual Assault Investigation Kits (**SAIKs**) and supply them to the QPS, who in turn supply them to multiple Hospital and Health Services (**HHS**) across Queensland. In addition, QHFSS make up 'Just In Case' (**JIC**) kits and supply them to Pathology Queensland laboratories. The latter kit is used for a sexual assault complainant who does not, at the time of presentation to a Queensland Health facility, wish to make a police complaint. This kit enables

a forensic examination to be completed in case the complainant decides to proceed with a police complaint in the 12 months following the forensic examination (after which time the stored kits are destroyed).

159 We were asked to consider a number of aspects of SAIK design, based on concerns raised with the Commission.[97]

Observations

160 Based on our observations of sexual assault casework at QHFSS, including being shown an unused SAIK, and on further information provided to us by the Commission, we note that:

a. The current SAIK does not contain equipment or any receptacle to collect fingernail scrapings or clippings.

b. The current SAIK has six swabs.

c. SAIK swabs are unlabelled, with no indication of the sites required for sampling.

d. The current swabs have cotton tips with wooden stems.

e. The SAIK is not sealed (as produced).

f. SAIKs do not currently contain the consumables for taking an 'FTA' style reference sample.

g. SAIKs do not currently contain the consumables required for preparing slides at the point of collection. Such slides provide more accurate assessments of the presence of semen; and can be used for DNA testing using Laser Micro Dissection (**LMD**), though we appreciate QHFSS does not offer this methodology.

h. Swab casings are intact when returned to the laboratory for testing. This has the potential to create conditions for sample degradation if the sample is not dry before sealing.

i. The document we reviewed in SAIK casefiles[98], that is completed at the time of the SAIK collection, provides the opportunity for sufficient information to inform the scientists conducting the DNA process to set examination strategy and assist in interpreting DNA

[97] Instructions provided by the Commission of Inquiry.
[98] Medical Examination Information form QIS31281.

results. We note this is reliant on all relevant sections being completed. Regular review of such documents by key stakeholders supports continual improvement.

Considerations

161 There is no universally accepted standard relating to the composition of SAIKs. We have not been provided with information on the design and content of SAIKs across Australasian FSPs. We envisage a degree of variation may exist. Recovery of sperm from swabs may be impacted by swab type and recovery method. We are aware of a paper from the Netherlands Forensic Institute indicating the use of nylon flocked swabs for vaginal sampling improves microscopic analysis and DNA typing in the medical forensic investigation of sexual assault cases as compared to cotton.[99] However this does not invalidate the use of other swab-head types. We note wooden sticks may break when used, potentially causing injury.

162 We have reviewed the report of Anna Davey dated 15th October 2022[100] and note her finding that the assembly of the SAIKs is not compliant with ISO18385:2016 'Minimizing the risk of human DNA contamination in products used to collect, store and analyze biological material for forensic purposes — Requirements', the relevant standard for the assembly of DNA collection kits. We are not aware of the current status of compliance around Australia with the use of ISO18385 compliant SAIKs. However, it is acknowledged that for some laboratory consumables there are no vendors accredited to the required standard, or the cost of such consumables may be too high for laboratories to accommodate.

163 We were asked to consider a scenario where a physician or nurse collects more samples using additional swabs than that included in the SAIK, taking multiple samples from a single location and submits all swabs to the laboratory for testing. We consider each case to be unique. Furthermore, a fully trained practitioner engaging with the patient and collecting the samples is best placed to decide which areas to sample and how many samples are required from each area, based on the information they have available to them at the time.

164 We have considered the findings of Mr Clint Cochrane, engaged by the Commission to determine whether the laboratory's testing process in respect of sperm microscopy is scientifically sound

[99] Benschop et al., Forensic Science International: Genetics 4 (2010) 115–12.
[100] EXP.0005.0002.0001 Katherine Anna Davey, Amended Report prepared for the Commission of Inquiry into Forensic DNA Testing in Queensland: Review of QPS processes (15 October 2022).

and conducted in accordance with international best practice.[101] We have identified the following key points from his review, and incorporated these findings into our recommendations:

a. The methodology utilised at QHFSS for sperm microscopy is fit-for-purposes. However, SAIKs are routinely submitted without inclusion of a slide made at point of collection, which falls below best practice. This may limit QHFSS ability to confirm the presence of spermatozoa, where present at the time of collection of the SAIK.

b. The lack of routine use of Y-STR testing in sexual assault cases at QHFSS in 2022 is of concern and falls below best practice. This limits QHFSS ability to detect and profile male DNA in the SAIK, where present. In particular, Y-STR testing can be valuable in obtaining male DNA profiles in the case of digital penetration, where there has not been ejaculation, and when males are azoospermic – cases where the standard techniques have lower success rates. We respond to this in Section A.

c. The practice of processing all SAIK samples through routine differential lysis is of concern which falls below best practice. This results in overservicing for some SAIKs and could limit QHFSS' ability to retain sample for other, more appropriate testing (e.g. Y-STR testing). Rather, a staggered/ triaged testing regime would be more appropriate. We respond to this in Section A.

165 We have reviewed the report of Associate Professor Kathy Kramer dated 16th October 2022 on this topic[102]. We note and fundamentally agree with her comments that patient-centred, trauma-informed, culturally-safe care must underpin the practice of a medical and forensic examination. Our own recommendations support those detailed by Associate Professor Kramer.

166 We acknowledge in some instances, it may not be appropriate to collect a DNA reference sample from a complainant (for example, in a scenario involving potential oral sexual assault). However, where possible, we encourage the inclusion of the necessary consumables to enable contemporaneous collection. We understand there is a concern regarding a potential

[101] EXP.0004.0001.0001 Clint Cochrane, Reporting concerning the provision of expert advice concerning Sperm Microscopy at QHFSS (10 October 2022).
[102] EXP.0005.0003.0001 Associate Professor Kathy Kramer, Report prepared for the Commission of Inquiry into Forensic DNA Testing in Queensland (October 2022).

compromise of the SAIK if a reference sample is removed at the Property Point of QHFSS.[103] We do not consider this concern to be insurmountable. We also encourage inclusion of consumables to enable collection of fingernail scrapings.

167 Whilst SAIKs are stored in freezers at QHFSS which should minimise degradation, storage conditions upstream of laboratory submissions may not always be ideal. The cutting of swab heads post collection enables moist swab heads to dry, providing a safeguard against loss of DNA where storage conditions are not optimal. However, this was beyond the scope of our instructions and we note the finding of Anna Davey that the methods, systems and processes for transporting a SAIK to QHFSS are appropriate.

168 We see benefit in establishing feedback loops with those collecting samples for DNA analysis upstream of a DNA FSP. This is true for health practitioners and crime scene examiners. Feedback loops can result in improved practice and can highlight systemic concerns. We did not see evidence of such practice at QHFSS but accept that such processes may occur in practice. We see benefit in the establishment of an interagency group to review the process as a whole, and specifically the contents of SAIK and JIC kits; optimising kits, documentation and methodology based on obtaining high quality forensic results and minimising harm to the complainant.

169 A 'minor change' we were tasked to review related to investigating which swabs could be used in SAIK's and JIC's **if** the current swabs were unable to be sourced, due to extraordinary supply chain delays. Factors such as shaft and tip construction, sterility, use in other forensic contexts and price were described. Two alternate swabs were proposed. Whilst consideration could have been given to safety concerns regarding wooden shafts (we refer to this above under the heading Sexual Assault casework (SAIKs)), and the ability to recover DNA (including sperm) from different swab head materials; this change focused on ensuring a constant supply of swabs for these kits, rather than trying to optimise the performance of the swabs. As such, we consider using a 'minor change' process to be appropriate.

Opinions

170 QHFSS should ensure provision of feedback to individuals engaged in the business of DNA collection.

[103] WIT.0019.0015.0001 Statement of Catherine Allen dated 11 October 2022.

171 Consideration should be given to exploring options for procuring SAIKs from an accredited provider. Failing that, if QHFSS is to continue to assemble SAIKs for use in the criminal justice system, we recommend consideration be given to attaining accreditation to the relevant standard.

172 SAIKs content should be designed through engagement with health practitioners to ensure inclusion of an appropriate range of consumables to enable optimal sampling of biological material. This should include a mechanism to collect fingernail scraping, consumables to enable the collection of a reference sample, consumables to enable creation of a microscope slide at point of collection, sufficient swabs and instructions on optimal sampling technique. Swab selection should be based on contemporary literature. Through codesign with health practitioners, an agreed number of sterile swabs can be set, aligned to the most frequently encountered scenario. Health practitioners should have access to additional sterile swabs where case circumstance requires more exhaustive collection. Where a practitioner deems it necessary to take multiple swabs from the same area, labelling must indicate the order in which the swabs were collected. This enables the laboratory to target the swab most likely to yield a useful DNA result. SAIK documentation should be revisited and codesigned to reflect this.

173 We note that QHFSS will require support from other stakeholders across the criminal justice system in order to successfully implement these recommendations. Therefore, whilst out of scope in terms of our instructions, we make a recommendation for an interagency group focused on best practice in relation to sexual assault.

Recommendations

Recommendation 32:
QHFSS to ensure provision of feedback to health practitioners involved in the collection of SAIKs to drive best practice in DNA collection.

Recommendation 33:
QHFSS, if continuing to provide SAIKs to the criminal justice system, to consider attaining accreditation to relevant standard.

Recommendation 34:

QHFSS to research optimal kit composition inclusive of swab type, number of swabs, and consumables to enable collection of a reference sample and slide at point of collection, where appropriate to do so.

Recommendation 35.

Establishment of an interagency group focused on best practice in relation to sexual assault.

Part C: Laboratory Management and Culture

Organisational structure

174 QHFSS supports the Queensland Police Service (QPS), the Coronial Court of Queensland and the Office of the Director of Public Prosecutions by providing forensic DNA analysis and forensic chemistry analysis of trace evidence, illicit drugs, and clandestine drug laboratories. The Police Services laboratories report to the Managing Scientist, Police Services, who reports to the Executive Director, FSS. The Managing Scientist is therefore responsible for forensic DNA and chemistry services, a total of approximately 100 FTE's.[104]

175 The Managing Scientist has one direct report from Chemistry Service and two from the DNA Analysis Unit; namely the Team Leader of Evidence Recovery and Quality, and the Team Leader of Forensic Reporting and Intelligence (FRIT). Within the DNA Analysis Unit, work groupings align with function and process flow, with sub-teams dedicated to the workflow steps of Evidence Recovery, Analysis, Reporting (two sub-teams, presumably due to the number of staff performing the Reporting function) and Intelligence. The remaining sub-team is aligned to the Quality and Projects function and the reference sample workflow. The Forensic DNA Analysis Team Chart is depicted below:

[104] COI.0082.0002.0001 'Internal Analysis of Forensic and Scientific Services', 30 July 2021, Version 1.04.

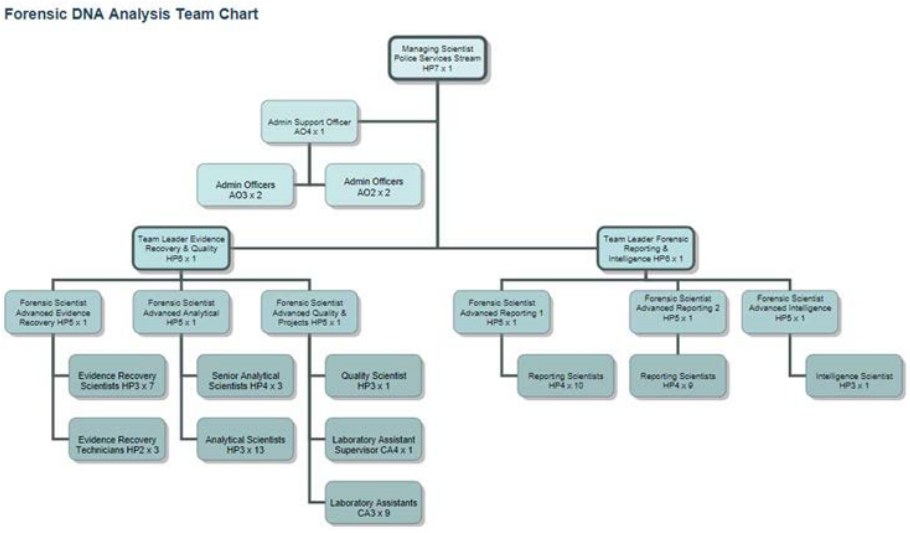


Figure 1 DNA Analysis organisational structure.[105]

176 The DNA Analysis Unit management team is a team of eight, consisting of:

a. The Managing Scientist

b. The Team Leaders for Evidence Recovery and Quality and FRIT

c. Their direct reports, who are the Senior Scientists of the respective sub-teams

177 The Managing Scientist's duty statement indicates broad responsibility for strategic direction, operational management and development of people and facilities, asset management, financial management and policy within Forensic DNA Analysis and Forensic Chemistry.

Observations

178 We note the breadth of responsibility currently sitting with the Managing Scientist. In addition to the broad responsibilities outlined above across both Chemistry and DNA Services, we note the absence of a single role with sole responsibility for management of the DNA Services. This appears to result in issues being escalated to the Managing Scientist that could otherwise be managed within the DNA Analysis Unit. We note that the Managing Scientist also plays an active role in engaging with QPS regarding forensic DNA casework.

[105] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022, Exhibit CA-10.

Consideration

179 There is no one accepted 'best practice' model for management roles and accountability for a Forensic Science Provider (FSP) delivering forensic DNA services. Rather, a variety of models exist depending on the scope and function of the FSP. Noting the complexities associated with forensic DNA work, some DNA providers are choosing to spilt responsibility for managing the scientific health of the system away from other management responsibilities. This approach is designed to ensure sufficient autonomy and bandwidth to focus on best scientific practice, as distinct from day-to-day management responsibilities. We consider this approach would be helpful for the QHFSS DNA Analysis Unit. Appointing a Technical Lead with authority to set and drive practice around the science will address the current condition where decision making by consensus with a quorum is challenging. Under this model, process-based decisions would be made by the Technical Lead; and policy-based business-decisions (like capping workflows) made by the Managing Scientist and senior executives, after socialising with relevant stakeholder groups across the broader criminal justice system. This approach provides clarity to staff on how, and by whom, decisions are made.

180 Similarly, there is no one accepted 'best practice' model, in terms of the organisation of work units within a FSP. Traditionally, it was common for a forensic scientist to work across the entire case lifecycle, from evidence collection through to analysis, interpretation and reporting (a so called 'crime scene to court' model). Like QHFSS, many providers have moved away from that model, aligning sub-teams to specific steps. This approach provides a mechanism for managing types of bias (refer to Section 1 for further information on managing bias in a FSP).

181 We are supportive of such a structure, provided the reporting scientist has visibility over the 'front end' of the forensic casework process. We point to the Victorian case of Farah Jama as evidence of support for whole-of-case visibility and context at the reporting stage.[106] It should however be noted that this segmented task model, while useful for both efficiency and contextual information management, can create an additional risk in terms of segmented knowledge. It is important that all scientists involved in the process (including QPS staff involved in evidence collection) understand the upstream and downstream sections of the process and have an appreciation of the consequences of their actions on the overall process. This can be

[106] Report: Inquiry into the circumstances that led to the conviction of Mr Farah Abdulkadir Jama, March 2010, Hon F H R Vincent AO QC.

achieved through the use of shadowing/mentoring programs, or through ongoing training and communication.

Opinion

182 QHFSS DNA Analysis Unit organisational structure falls within the range of accepted practice. However, given the challenges facing this particular laboratory, we recommend QHFSS establish a management role with sole responsibility for forensic DNA service delivery (including resourcing of staff and equipment, budget and strategy) and also establish a separate Technical Lead role, at equivalent level to the Manager, to serve as custodian of scientific health, ensuring best science-led decision making across the end-to-end forensic biology workflow. This role should:

a. Set policy to drive practice

b. Remain connected to casework to ensure contemporary knowledge

c. Be distinct from the management line to ensure sufficient autonomy and bandwidth to focus on best scientific practice, as distinct from management

d. Be empowered to lead research, development and innovation aligned to emergent best practice

e. Be connected to the broader Australasian forensic community, in part through membership of relevant national groups (i.e. ANZPAA NIFS RIAC)

f. Have responsibility for signing off all SOPs that impact any aspect of processing and reporting of casework

Recommendation

Recommendation 36.

QHFSS to make changes to the DNA Analysis Unit organisation structure to:

a. Establish a management role with sole responsibility for forensic DNA service delivery (including resourcing of staff and equipment, budget and strategy)
b. Establish a separate Technical Lead role, at equivalent level to the Manager, to serve as custodian of scientific health, ensuring best science-led decision making across the end-to-end forensic biology workflow.

Roles, responsibilities and development

183 DNA Analysis Unit Staff have detailed role descriptions covering key responsibilities, competencies and qualifications. There are also detailed duty statements specific to the Managing Scientist, Administration, Reporting/Intelligence Team and the Evidence Recovery/Quality Team. A Forensic and Scientific Services Learning and Development (L&D) Framework describes access to learning and development activities for staff members, supported through a professional development allowance (time and funding). This includes provision for Career Success Plans (CSPs). Furthermore, a process exists by which staff can apply for flexible working and/or a change in Full Time Equivalent (FTE) status.

Observations

184 We note several staff indicated they have *ad hoc* Career Success Plan (CSP) meetings; but do not have a structured, regular performance review system including specific Key Performance Indicators (KPIs). We heard some staff reporting they felt under pressure to deliver results in a short timeframe due to a strong focus on turnaround times (TATs), including weekly emails indicating how many interpretations and reviews each scientist should aim to achieve. Some staff also indicated that perceived pressure to meet TAT acts as a barrier to request reworking of samples or addressing differences of opinion with respect to interpretation of DNA profiling results.

185 We query whether the apparent lack of differentiation of TAT based on sample complexity may be causing additional pressure for staff. We are concerned that this may contribute to conditions that may increase the potential for error, or cherry picking of less complex DNA results from the worklist. It is important that staff are given time to appropriately analyse and interpret complex samples.

186 We note the findings of recent reviews of relevance to the topic of KPIs:

a. A report by the Queensland Audit Office (QAO) recommending QPS and QH implement a governance structure to effectively coordinate and provide accountability for managing forensic services across agencies, including through implementing a performance framework to measure and report on the effectiveness and efficiency of forensic services, ensuring each agency has appropriate performance targets.[107] We understand QHFSS has

[107] Queensland Audit Office Report 21: 2018-19 'Delivering Forensic Services'.

been working with QPS to implement QAO recommendations.[108] We understand this involves establishing a MOU for each service offering, with measurable KPIs and mechanisms for feedback and collaboration.

b. An Internal Analysis of FSS dated July 2021 stated "Many areas of FSS lack effective performance measures, management reporting and appropriate controls, leading to duplication, inefficiency and a lack of transparency. There is limited evidence that performance goals are cascaded down to teams or that consistent measurements are rolled up to senior management. In the absence of having a bank of relevant Key Performance Indicators (KPIs) and management measures, it is difficult to see how leaders can know that they are meeting their objectives and customer expectations. Developing, capturing and reporting consistent performance measures would assist transparency, improve collaboration and reduce duplication".[109]

Considerations

187 Compliance and reward systems tied to *how* someone performs their role in addition to *what* they achieve can be highly effective in signalling to staff what is valued by an organisation. Quality, continuous improvement, professionalism, health, wellbeing and safety are examples of aspects that are everyone's responsibility, whereas TATs and backlogs sit at the strategic level. We note the importance of measuring FSP success through the lens of quality as well as timeliness, and we highlight the need for wide buy-in from the sector that the principles of 'best science' and 'fast service' won't always align. Indeed, we recommend performance metrics should flow from a shared understanding of what constitutes 'success', in turn informed by a common risk appetite.

188 It is appropriate that staff are responsible for delivery, but this should be done in a way that promotes teamwork, recognises quality as a primary driver, and takes into account the varying degrees of complexity associated with the different types of casework performed by Australasian FSPs. We suggest KPIs aligned to this framework would be highly beneficial for QHFSS. Certainly, QHFSS is not alone amongst Australasian FSPs in not having such a framework. However, given what has emerged through the Commission hearings, in terms of a fractured workplace and long-standing cultural issues, and the need for this work group to come back together and move forward in a positive direction post the Commission, we strongly recommend such a model going

[108] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022.
[109] 'Internal Analysis of Forensic and Scientific Services', HealthSupport Queensland, 30 July 2021, Version 1.04.

forward. We acknowledge QHFSS's Quality Commitment and suggest this too could provide guidance for the development of suitable individual KPIs.[110]

189 Therefore, we encourage QHFSS to ensure structured, regular performance and development reviews, including, but not limited to: setting, reviewing and measuring individual and team goals (including KPI's); receiving and providing feedback, access to resources to enable professional growth and development, and career progression. We encourage QHFSS to ensure the performance of all QHFSS staff is measured (with equal weighting) based on *what* the person does and *how* they do it. And we encourage consideration of setting KPI's at the individual and team level to drive a values-based culture.

Recommendation

Recommendation 37.
QH to consider implementing Team and Individual Performance and Development KPIs within QHFSS to drive a values-based culture

Flexible work

190 We understand the Commission has heard evidence relating to concerns around access to flexible work arrangements at QHFSS.[111] Most forensic DNA laboratories are located in major cities, with associated higher housing costs and longer commuting times for staff. We note it is common in such laboratories to have a workforce that is predominantly female; and also to consist of many staff with familial care responsibilities. QHFSS is no different in these aspects.

191 We note reports of varied experience with requests for flexible working and/or a change in FTE status; with some granted in full, some granted with compromises and some refused. In most circumstances we were told of the need to frequently revisit/reapply for the working arrangement.

Considerations

192 On the topic of flexible work, we acknowledge QHFSS managers are informed by organisational policies and must ensure the meeting of business need. However, in order to attract and retain

[110] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022, Exhibit CA-17.
[111] TRA.500.007.0047, Transcript, 10 October 2022, p 910.21-911.27, evidence of Alicia Quartermain. TRA.500.013.0001, Transcript, 18 October 2022, p1635.1-47, evidence of Theresa O'Connor.

the highly skilled and experienced workforce required to operate a successful forensic DNA laboratory, we stress the importance of genuinely exploring flexible work options tailored to the individual and their circumstances, that can be balanced with operational demands and service delivery requirements. Specific options could include, but not be limited to, flexible working hours, condensed hours, options for a range of FTE roles and remote working, depending upon organisational polices, health, wellbeing, safety, and security considerations.

General culture & communication

Observations

193 We observed a strained culture, the existence of factions and differences of opinion regarding what constitutes best science practice. We heard of uncertainty from staff regarding decision making, who may have made the decision and on what basis the decision was made; particularly where changes to practice have occurred outside of the Procedure for Change Management in Forensic DNA Analysis.[112]

194 We note evidence before the Commission of a fractured work group, with claims of a toxic culture arising from longstanding issues. We further heard reports of a lack of support from Human Resources (HR) as a barrier to timely resolution of issues.

195 We heard of multiple instances where staff were discouraged or prevented from sense checking or seeking advice from the wider forensic community. Existing in a vacuum is not healthy for a forensic laboratory or its staff; and the forensic community benefits greatly from connectivity, shared experience and support. The FSP should provide connections for all staff at all levels to ensure regular engagement, sense checking and best practice discussions are readily available to support the laboratory.

196 We heard instances of the inability to resolve differences in opinion, culminating in cases being reallocated, or reviewers replaced. We note that high rates of disagreement between examiners and reviewers may be indicative of issues with the application of the method or in the interpretation of evidence. Separately we heard that there is insufficient communication regarding project work.

[112] FSS.0001.0012.0247 SOP 22871, Procedure for Change Management in Forensic DNA Analysis.

197 We observed instances where we believe the cultural problems at QHFSS have negatively impacted the science. For example, we heard of different 'camps' amongst reporting scientists with respect to their approach to DNA interpretation. We also heard of some staff avoiding specific peer reviews based on who wrote the statement.[113]

Considerations

198 Organisational culture consists of an organisation's shared values, symbols, behaviours and assumptions.[114] It's "the way we do things around here".[115]

199 A healthy workplace culture supports best science, in part by encouraging innovation and probative inquiry; and also through encouraging staff to invest in their professional development, to grow and learn. A healthy workplace culture can be vital in supporting staff to come forward with concerns without fear of punishment. Conversely, an unhealthy workplace culture does not support best science. We heard of examples of such a culture at QHFSS, including staff being reluctant to raise concerns about scientific processes and decisions due to fear of retribution.[116]

200 A healthy workplace is supported by a values-based culture encompassing health and wellbeing; safe, adaptable and sustainable ways of working; proactivity in quality; science-led decision making; continuous professional development, supporting and recognising peers, external and cross business relationship building and collaboration, and future-focused leadership and support (for example, through research, innovation, forensic trends and impact management).

201 Appreciating the challenging times staff are going through, we feel regular team and unit meetings offer an opportunity to come together, perhaps in a facilitated capacity initially, to look forward. Such meetings, with minutes taken and actions documented; ensure transparency, promote positive communication and allow a space for people to feel heard. Regular meetings are a sign of good culture and we encourage QHFSS to ensure regular team and unit meetings are held.

202 We understand QHFSS to be well connected to the Australasian FSP community at management levels through the Australian and New Zealand Forensic Executive Committee (ANZFEC) and the

[113] Interview with two reporting scientists on 21 September 2022.
[114] E H Schein, 1992, Organisational Culture and Leadership, 2nd edn, Jossey-Bass, San Fransisco.
[115] T E Deal and AA Kennedy, 1988, Corporate Cultures: The Rites and Rituals of Corporate Life, Perseus Books, New York.
[116] Interview with two reporting scientists on 21 September2022.

Biology and Quality Special Advisory Groups (BSAG and QSAG). We encourage QHFSS managers to foster a culture where practitioners feel able to engage with their counterparts at all levels.

Quality culture

Quality roles

203 All staff within Forensic DNA Analysis have responsibilities with respect to quality, as detailed in staff role descriptions and promoted in the QHFSS Quality commitment.[117] Two staff within the DNA Analysis Unit have additional responsibilities relating to quality: the Senior Scientist Quality and Projects and the Scientist Quality and Projects. The Senior Scientist Quality and Projects role involves co-ordinating and providing advice regarding the quality system within Forensic DNA Analysis. This role is classified Health Practitioner Level 5 and reports to the Team Leader of Evidence Recovery and Quality, who in turn reports to the DNA Analysis Unit's Managing Scientist. This role holds managerial responsibility for the Clinical Assistant cohort, for service delivery for processing reference DNA samples and for quality and projects.

204 In addition, QHFSS employs a 'Scientific Support Manager' (SSM) with a quality and compliance function across all three QHFSS work streams (namely, the coronial stream, police stream and public and environmental health stream). The role description for this position shows the title 'Quality Manager' (QM) and the classification Health Practitioner Level 6.[118] This position is external to the DNA Analysis Unit in the QHFSS organisational structure, reporting directly to the Executive Director (ED). In addition to holding the QM capability across "the complex fields of Public Health Science and Forensic Science", this role also holds management responsibility for the Scientific Skills Development Unit, Information and Research Services, Forensic Property Point, Public Health Property Point and Scientific Services Liaison Unit.[119]

Observations

205 We note neither the SSM nor Senior Scientist Quality and Projects role is dedicated solely to forensic quality management. The former holds a broad portfolio covering a range of functions across public health and forensic; the latter holds responsibility for quality, projects, casework service delivery (reference samples) and people management (Clinical Assistants). This reduces time for quality-related work.

[117] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022, Exhibit CA-17.
[118] FSS.0001.0083.4445 FSS Quality Manager Role Description.
[119] FSS.0001.0083.4445 FSS Quality Manager Role Description.

206 Whilst the SSM is independent to casework, the role is perceived to be more advisory than managerial in terms of quality. The SSM described her role as advisory in nature, with limited influence on quality in forensic DNA as the group is very self-sufficient.[120] Whilst the SSM has high level visibility of quality issues through regular reporting, she has no formal role in investigation of quality issues within the DNA Analysis Unit and doesn't review the adverse events log to ensure issues are being raised as OQIs per protocol.[121] We note that SSM is the QHFSS representative on the ANZPAA NIFS Quality Specialist Advisory Group.

207 The Senior Scientist Quality and Projects is embedded within the casework group and as such is limited in the capacity for independent oversight. The occupant of this role described being the contact point for provision of advice on adverse events or when something unexpected happens and detailed how she encourages all staff to raise quality issues. However, she also:[122]

a. Described having limited ability to enforce standards pertaining to quality, particularly insofar as they related to 'at level'/ senior staff

b. Described being more involved than other DNA Analysis Unit managers/ leaders in quality-related investigations, but not involved in all investigations. From this it is apparent she has no formal role in signoff of quality-issue resolution outside of those assigned to her

c. Described being hamstrung in her ability to be proactive in terms of quality issues due to the volume of routine tasks for which she is responsible

d. Advised she is not a member of the ANZPAA NIFS Quality Specialist Advisory Group.

208 We note many QHFSS staff referencing a 'quality is everyone's responsibility' mindset and displaying positive behaviours in relation to quality. However, we also heard of barriers to raising quality issues, concerns about the length of time taken to resolve quality issues and concerns regarding a lack of commitment to quality on the part of some members of the DNA Analysis Unit.

[120] Interview with Helen Gregg on 23 September 2022.
[121] Interview with Helen Gregg on 23 September 2022.
[122] FSS.0001.0011.5388 Witness Statement of Kirsten Scott dated 22 July 2022 and Interview with Kirsten Scott on 23 September 2022.

Considerations

209 As a general principle, responsibility should align with authority, and so it follows that quality roles should have power to influence practice. Furthermore, a robust quality management system is one in which there is independent oversight. Ideally, resourcing is sufficient to provide capacity for proactive, enabling ways of work to be future focused as well as reactive. The forensic quality lead should have connectivity to the broader forensic quality community, maintain awareness of emergent best practice and actively drive implementation as appropriate.

210 Based on our observations, we are concerned that the current arrangements do not sufficiently empower the Senior Scientist Quality and Projects to set/ enforce practice in relation to quality standards and to keep abreast of emergent best practice in the broader forensic community. We are concerned that the SSM role is too broad, and too far removed from the DNA Analysis Unit to perform this function. We are concerned that there may be insufficient resources dedicated to the quality function, given the challenges facing the QHFSS, the complexity of DNA work and its importance in the criminal justice system.

211 The DNA Analysis Unit would be better supported by an organisation structure that included a Quality Manager dedicated to forensics, sitting outside of the casework function with a direct line to the ED, providing both authority and independence. Connectivity to the casework team could be achieved through embedding a quality lead within each of the sub teams to drive activity at the local level and ensure policy is aligned to contemporary casework need.

Opinion

212 QHFSS organisational approach to quality falls within the range of best practice but could be strengthened to ensure a culture of proactive, continual improvement where key personnel are empowered to set and drive best practice. At QHFSS, this could be achieved through establishing a Quality Manager role, dedicated solely to forensic casework and a Quality Lead role within each of the DNA Analysis Unit teams.

213 Ideally, the Quality Manager role should: report directly to the ED QHFSS; be separate to the DNA Analysis Unit in the organisational structure to ensure independence from casework activity; be responsible for setting policy to drive best practice in relation to quality in forensic casework; oversee issue identification to ensure proper processes are followed and investigations undertaken to a suitable standard; be responsible for reporting to the ED QHFSS on high severity quality issues and on quality trends; work proactively to drive a quality culture

that supports scientific best practice; be connected to the DNA Unit's Evidence Recovery, Analysis and Reporting Quality Leads and advocate on their behalf to ensure alignment of practice to policy, if required; and be connected to the broader Australasian forensic quality community, in part through membership of relevant national groups (i.e. ANZPAA NIFS QSAG).[123]

214 Ideally, the Quality Lead role within each of the DNA Analysis Unit teams should: remain sufficiently connected to casework to maintain contemporary knowledge; support the Team to align practice to policy insofar as it pertains to quality; be connected to the Quality Manager and escalate matters if required; and provide mentorship to junior staff on quality issues and promote the quality culture.

Recommendation

Recommendation 38.
QH to strengthen quality culture through establishing a Quality Manager role, dedicated solely to forensic casework and a Quality Lead role within each of the DNA Analysis Unit teams

Issues and resolution

215 ISO 17025 Sections 7.10 'Nonconforming work' and 8.7 'Corrective action' set the requirements for evaluating non-conformances to determine whether they reach the level requiring a corrective action, noting a corrective action is a step or set of steps that are taken to address the non-conformity and prevent it from recurring. QHFSS utilises a variety of pathways to manage quality issues, including recording information in 'batch results', identifying and progressing as an adverse event,[124] raising an Opportunity for Quality Improvement (OQI) with an investigation,[125] and progressing as a project. Staff members are assigned responsibility for progressing investigations; OQI approval is usually by the line manager (usually HP5).[126] Targets are set for OQI completion (75% within 90 days; 0 open > 1 year) and reviewed along with other aspects of quality management at the DNA Analysis Unit Management Review

[123] Australia and New Zealand Policing Advisory Agency National Institute of Forensic Science Quality Specialist Advisory Groups.
[124] FSS.0001.0012.677 Investigating Adverse Events in Forensic DNA Analysis.
[125] FSS.0001.001.5440 Opportunity for Quality Improvement Management Procedure.
[126] Interview with Kirsten Scott on 23 September 2022.

meetings.[127] Formal reporting of quality issues to the QHFSS executive management occurs through Forensic & Scientific Services level Management Review.

Observations

216 We heard the adverse events log was created to record minor issues that may not have otherwise been captured, as the OQI process was viewed by some staff as cumbersome.[128] We note the OQI SOP is a 'Health Support Queensland' document and is not specific to the forensic environment. This suggests opportunity exists to streamline the OQI process, and to further examine ways to incentivise staff to report quality issues.

217 We were advised it was a 'grey area' in terms of whether an OQI should be raised in relation to a particular issue, and that there was no formal requirement for an assessment of risk in determining the appropriate pathway for issue progression. We note guidance is provided in relevant SOPs, for example: "Significant adverse events, or adverse events for which corrective action is needed will require an investigation to be completed (an OQI may also be required) in addition to the sample notations"; "Raising an OQI should be considered, particularly in instances of a significant or reoccurring adverse event". [129],[130] The Senior Scientist Quality and Projects expressed a view that if an issue could impact results, it should be progressed as an OQI. We see opportunity to make this clearer for staff.

218 We noted six of eight OQIs reviewed at recent internal meetings were classified as 'unintended Human Error', and a further five separate OQIs arising from client complaints all classified as 'human error'.[131] This raises the possibility that current methods of investigation may not be adequately surfacing root cause, and if so, that overuse of 'unintended human error' could serve as a counter to a 'no blame' culture.

219 The Senior Scientist Quality and Projects reported being limited in her ability to conduct deep analysis of quality issue trends through lack of time and lack of access to data in the Forensic

[127] Review includes: the number of OQIs generated across the relevant time period, their source and identified root cause; results of environmental monitoring; audit and proficiency testing outcomes and document review
[128] Interview with Kirsten Scott on 23 September 2022.
[129] FSS.0001.0012.677 Investigating Adverse Events in Forensic DNA Analysis.
[130] We note OQI SOP does specify scenarios where OQIs must be raised (for example, external client complaints, conditions identified during external audits, where continuity of evidence has been compromised, significant deviation from documented process, non-compliances identified during internal audits (OQI SOP WIT.0019.0012.0428).
[131] Documentation sighted during lab visit – hardcopy provided by Kirsten Scott.

Register. We note FSS may request enhancements to the Forensic Register to measure specific statistics, and that the agreement in place for the Forensic Register is executed through QPS.[132]

220 We noted apparent regular review of quality issues at the Management Review meetings, however, the Senior Scientist Quality and Projects advised these meetings were more information sharing, than decision-making in nature. We see benefit in adopting more of a decision-making approach, ensuring decisions are made in relation to quality and periodically reviewed and progress tracked throughout the year as per the Management Review Procedure – Health Support Queensland.[133] An Action Register could assist in this regard.[134]

221 We also heard the following comments about the use of projects during our discussions with staff:

a. Projects are used as a tool to justify management decisions rather than being truly exploratory in nature

b. Project scope is often ill defined at the outset, requiring scope expansion

c. Projects take too long (for example Y-STR implementation commenced in 2015 and is ongoing; project 181 re sperm microscopy took in excess of four years).[135]

d. Change management methodology requires approval by consensus which contributes to lengthy timeframes

e. There is insufficient communication regarding project work

f. There is a lack of agreed formal project methodology, which may be contributing to identified issues.

Considerations

222 We see clear evidence of QHFSS attempting to encourage reporting of quality events. However, we believe QHFSS could strengthen their approach through:

[132] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022.
[133] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022, CA-17.
[134] SOP 28801 Forensic DNA Analysis Management Review Agenda. Note that version 5 of this SOP issued 14/7/22 appears to have removed the Action Register that was present in version 4.
[135] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022.

a. Capturing all quality issues in one location to support trend analysis and systems thinking around the impact of issues on other casework.[136]

b. Provision of clear advice to staff on which pathway to use in progressing quality events, with application of a formal risk-based assessment forming part of the evaluation decision.

c. Broader application of more in-depth root cause analysis, particularly where human error is a contributing factor. We note the existence of generic and forensic-specific quality tools to assist in this regard (e.g. the 5 Whys and the UK Forensic Science Regulator Guidance document 'The Control and Avoidance of Contamination in Laboratory Activities involving DNA Evidence Recovery Analysis', the latter is particularly helpful in surfacing root cause for quality issues involving contamination). Where human error is identified as a contributing factor, this should be further explored to understand the underlying cause and how the systems and processes allowed the human error to occur.[137] A human factor lens should be applied to issues regarding human performance and error, with a focus on how the system develops, maintains, and supports expertise, both from a knowledge and skill perspective but also from a workflow, culture and environment perspective.

d. Enabling access to information in Forensic Register to assist with trend analysis

223 On this point we note the lack of a national quality management framework utilising such a tiered approach, informed by risk. We believe such a framework would be of significant benefit in driving consistency aligned to best practice across the broader Australasian forensic community.

224 We note the apparent use of projects as both a means to progress quality issues and to operationalise new capabilities. This may lead to a lack of clarity for staff about the nature, extent, and urgency of the project. Specifically, a validation can (but shouldn't) go on for a while. A project to rectify a serious deficiency in process must be prioritised and completed quickly. Furthermore, decision-making for quality issues relating to science should not be by consensus. Different names and methodology should be used for the different types of project work, and this should be enshrined in policy and made clear to the staff. Where projects are used as a

[136] Here we note the recent paper of *Busey et al*, 'Stressors in forensic organizations: Risks and solutions', Forensic Science International: Synergy, Volume 4, 2022. https://www.sciencedirect.com/science/article/pii/S2589871X21000681).
[137] J. Reason, BMJ 2000;320:768-70 Human error: models and management (nih.gov).

mechanism to address quality concerns, we note the benefits of adopting formal project methodology to ensure scope is defined, issues/risks are identified/mitigated, milestones are tracked and communications provided to the relevant stakeholder.

225 Finally, we note that emergent best practice is evidenced in the approach of Netherlands Forensic Institute (NFI) as detailed in the 2014 paper of Kloosterman et al 2014.[138] This approach involves transparent reporting of error rates and their impact, as part of an open research culture that promotes public trust. We are not aware of broader adoption of this approach. However, it is recommended that QHFSS, like all Australasian FSP', follow developments in this field.

Opinion

226 QHFSS issue management has withstood scrutiny through accreditation assessment. However, because of the observations set out above, it does not appear to be optimally managing risk in the forensic context according to what would be considered best practice.

227 We note the lack of a national forensic quality management framework informed by risk. We believe such a framework would be of significant benefit in driving consistency aligned to best practice across the broader Australasian forensic community.

Recommendations

Recommendation 39.

QHFSS to propose to ANZPAA NIFS, through the QSAG, that a national QM framework, utilising a tiered approach informed by risk, is developed for quality issue investigation.

Recommendation 40.

In the interim, QH strengthen its approach to quality issue management by:

a. Capturing all issues in a single log providing full visibility for trend analysis
b. Applying formal risk assessment to classify issues on the basis of risk/ impact and likelihood of occurrence
c. Progressing issues via a timely, fit-for-purpose process, based on classification
d. Progressing issue investigation with in-depth root cause analysis for all issues that might impact results

[138] Kloosterman et al 2014, Error rates in forensic DNA analysis: Definition, numbers, impact and communication. FSIG 12: 77-85.

e. Establishing Quality Manager oversight through QM review to ensure the correct issue identification and resolution process has been followed; and the investigation has been undertaken to a suitable standard to ensure proper processes are followed and investigations undertaken to a suitable standard
f. Communicating information regarding all quality issues identified and associated remedies to relevant staff
g. Reporting to senior management on high severity/ high risk issues and on overarching trends.

Recommendation 41.

QHFSS to adopt a standardised, contemporary approach to project methodology, provide training to staff engaged in project-related work and employ specific skill sets such as statistics expertise in project work, as and when required.

Document control

228 QHFSS conducts periodic review of SOP's by assigned staff, apparently based on distributing responsibility for ensuring SOPs remain contemporaneous and fit-for-purpose across a number of people. Annually, or as required by a change in process, a SOP will be reviewed, amended if required, and placed for review with other staff members. Feedback from staff members may be taken onboard in the course of the process. Once consensus is achieved amongst the reviewers of the SOP, the Managing Scientist role approves the SOP, and the designated staff member with updating responsibility then publishes the document. Staff can also enter a comment against a SOP at any time if they feel that the SOP could be improved or should be amended. Assessment of the feedback is made and may be included in future versions of the SOP.[139] Changes to the Standard Operating Procedure are detailed within the Amendment History table of each version.

Observations

229 We observed a range of comments on SOPs; from minor edits, suggested wording for reports and more in-depth comments relating to proposed changes to process. Furthermore, we heard there can be a substantial time lag between comments being added and the SOP being reviewed.

[139] WIT.0019.0012.0001 Witness Statement of Catherine Allen dated 16 September 2022, CA-64, Document Management Procedure.doc (Section 6.1) and CA-65, QIS2 User Manual - Documents.doc (Section 5.12-5.17).

Furthermore, communication around why a particular comment hasn't been incorporated into an updated SOP is lacking at times.

Considerations

230 We acknowledge and support QHFSS's emphasis on the importance of document control in a forensic laboratory as per ISO 17025 section 8.3. Assigning updating responsibility to specific people across the SOPs is helpful to spread the load and ensure quality is everyone's responsibility. We are concerned by the wide range of comments being added to SOPs and the time taken to address them. Having a single person approving any changes to SOP's ensures a holistic overview and consistency, however we encourage QHFSS to consider who is best placed to be the focal point for approvals.

Opinion

231 QHFSS's current approach to document management falls within best practice as per ISO 17025 section 8.3. However, it could be strengthened through proactive oversight of comments added to SOPs, triaging those that can await the SOP's annual review, and action the review and feedback process for those that require more timely attention. This role could be adopted by the Quality Manager or Quality Lead, should QHFSS implement recommendation 38.

Recommendation

Recommendation 42.

QH to proactively triage SOP comments to ensure actioning of amendments in an appropriate timeframe

Accreditation

232 One way to demonstrate commitment to a culture of quality can be evidenced through accreditation. QHFSS is accredited by the National Association of Testing Authorities (NATA) to the International Standard ISO/IEC 17025. As an accredited laboratory, QHFSS must undergo regular assessments to monitor compliance with relevant standards in scope for the NATA Accreditation Criteria (NAC), conducted every few years. Ongoing requirements associated with accreditation with which QHFSS complies include maintaining an overarching quality management system, ensuring scientific and technical staff undergo regular proficiency testing, conducting peer review, internal auditing and exercising document control.

Observations

233 We inspected the NATA assessment report from 2022, 2020 and 2018, all of which showed a very high rate of compliance with the criteria against which QHFSS was assessed.

Considerations

234 NATA also offers assessment against the requirements of the following four Australian Standards, in addition to the criteria included in the NAC:

a. AS 5388.1 Forensic Analysis, Part 1: Recognition, recording, recovery, transport and storage of material

b. AS 5388.2 Forensic Analysis, Part 2: Analysis and examination of material

c. AS 5388.3 Forensic Analysis, Part 3: Interpretation

d. AS 5388.4 Forensic Analysis, Part 4: Reporting

235 We are unsure whether QHFSS has requested assessment against the above Australian Standards. If not, we encourage this request is made to NATA. This elevated level of assessment would be beneficial going forward.

236 We note the UK House of Lords report 'Forensic science and the criminal justice system: a blueprint for change' which stated "ISO 17020 and ISO 17025 are international standards for accrediting the processes undertaken by a provider when analysing evidence. They do not confer accreditation on individuals working within an accredited organisation and, while they go some way to ensuring consistency in analytical processes, they cannot ensure the accuracy of every result of any given examination of forensic material.[140] We also note the recent paper by *Ross and Neuteboom* which describes the notion of 'quality' in the forensic community having become almost synonymous with 'accreditation based on the ISO standards'.[141] The authors argue that this notion is too limited, and "it is now clear that the forensic community should broaden its view beyond ISO-accreditation in order to improve its functioning and overall QM performance". We agree and advocate for a broader, proactive quality approach.

[140] UK House of Lords report 'Forensic science and the criminal justice system: a blueprint for change' (https://publications.parliament.uk/pa/ld201719/ldselect/ldsctech/333/333.pdf).
[141] Ross A, Neuteboom W. 2020 ISO-accreditation - is that all there is for forensic science? Australian Journal of Forensic Sciences, Vol 54 Issue 1 (https://doi.org/10.1080/00450618.2020.1819414).

Opinion

237 QHFSS accreditation falls within the range of best practice for the Australasian environment. However, noting the recent development of Australian standards, we recommend a broadening of scope to include assessment against those standards in future.

Recommendation

Recommendation 43.
QHFSS to consider broadening their scope of accreditation to be assessed against the four Australian Standards

Internal Audit

238 Internal audits review actual practice against a set of standards and should be performed by auditors independent from the function being audited if practicable; auditors should maintain objectivity throughout the audit process to ensure that the audit findings and conclusions are based only on the audit evidence. [142] Best practice holds that audits follow a risk-based approach that considers risks and opportunities. The risk-based approach should substantively influence the planning, conducting and reporting of audits in order to ensure that audits are focused on matters that are significant for the audit client, and for achieving the audit programme objectives.[143]

239 QHFSS conducts on average 10 internal audits within the DNA Analysis Unit each year, covering discrete topics based on ISO 17025 and the laboratories SOPs. QHFSS ensures staff conducting audits have received training and do not audit their own areas. QHFSS attempts to use trained auditors from elsewhere in QH, although this is not always possible.[144]

Observations

240 Examination of internal audit records from 2020-2022 revealed good overall compliance, with ISO 17025 section 8.8 with helpful recommendations provided in the final reports covering areas for improvement that fell short of an OQI being raised. The audits covered topics such as training records, adherence to SOPs, outcomes of OQIs, equipment maintenance and calibration.

[142] ISO19011:2018 Section 4 principles of auditing.
[143] ISO19011:2018 Section 4 principles of auditing.
[144] Interview with Kirsten Scott on 23 September 2022.

241 Furthermore, we noted several OQIs instigated as an outcome for non-compliance, as expected.[145]

Considerations

242 It did not appear that a 'whole of casefile' review was a part of these internal audits. Reviewing a case from start to finish is a helpful way of capturing any issues and spotting trends, such as differences in interpretation or reporting style between scientists. How this is done would be laboratory dependant. For example, an internal audit could select a topic (for example sexual assault casework) and review a selection of those recent cases. Furthermore, given the non-compliance raised in the 2021 internal audit focusing on access to Forensic DNA Unit Facilities, we encourage including this topic in the next internal audit to ensure adequate resolution and ongoing compliance.

Opinion

243 QHFSS's internal audit program falls within the range of best practice. We recommend consideration of inclusion of 'whole of casefile' review and revisiting areas flagged as non-compliant in prior audits.

Recommendation

Recommendation 44.

QHFSS to strengthen its internal audit process through including full casefile review; and revisiting areas of non-compliance from prior audits

Research, Development & Innovation (R,D & I)

244 Developing, implementing and maintaining demonstrably valid, best science-led practices requires resources and support from the laboratory leadership. A dedicated research, development and innovation (R,D & I) capability ensures that: the FSP is aware of and keeps pace with national and international developments in the field; validations and evaluations are conducted in line with standard research methodology, and to ensure that validations and scientific issues are simply another task to be done when casework is completed, but is a dedicated focus for specialist staff with the requisite skills. We note the 2019 UK House of Lords

[145] For example, in response to the Proflex process being implemented without current service reports; and inappropriate access to Forensic DNA Unit facilities.

report 'Forensic science and the criminal justice system: a blueprint for change', which highlighted the critical need for investment in funding for forensic science research.[146]

Observations

245 We note the absence of a dedicated R,D & I capability at QHFSS. This can be contrasted with the existence of a dedicated R,D & I capability within a number of government FSPs in New Zealand and Australia. While R,D & I can in some situations be successfully incorporated into existing teams, it is recommended that a separate R,D & I team is set up within QHFSS to enable the best outcomes.

246 We understand DNA Analysis Unit staff are able to apply for funding for research through QH, where they compete with other work groups for a pool of available funds.

247 We note an apparent lack of connectivity to tertiary education providers, their science programmes and research capabilities.

248 We note some staff have highlighted significant voids in expertise, for example in statistics and experimental design, which impacts on the overall quality of validation. The flow-on effect of some of these voids in expertise is noted in the report of Dr Taylor.

Considerations

249 We are concerned that the lack of a dedicated R,D & I capability is a significant factor preventing QH from rapidly operationalising new capabilities. Sole reliance on staff with casework roles to deliver R,D & I will inevitably result in delays where demand for forensic service provision is constantly high. Given both the complexity of forensic service provision, and the rapidly changing science and technology overlay inherent in forensic DNA testing, sustained investment in R,D & I is vital to ensure QHFSS can maintain pace.

250 The results of internal validations directly impact forensic science service delivery. It is therefore imperative that such work has sound experimental design.

251 Forensic Science is a popular topic to study at tertiary level, offering the potential to collaborate on research and emerging methodology, and typically provides a pool of high-quality candidates

[146] UK House of Lords report 'Forensic science and the criminal justice system: a blueprint for change' (https://publications.parliament.uk/pa/ld201719/ldselect/ldsctech/333/333.pdf).

to fill laboratory vacancies. We see potential for strong connections to tertiary education providers as exist with some other Australasian government FSPs. We encourage QHFSS to engage with relevant tertiary education providers and discuss common ground in the research and expertise space.

Opinion

252 The lack of dedicated R,D & I capability at QHFSS appears to have impacted on the ability to operationalise new capabilities in a timely way. Whilst not all Australasian FSPs have dedicated in-house RD & I, given the challenges facing this particularly laboratory at this time, we recommend dedicated investment in R,D & I, including the areas of experimental design and statistics.

Recommendations

Recommendation 45.
QH to resource a dedicated Research, Development and Innovation capability to support proactive access to an up to date, fit for purpose suite of forensic techniques and ensure QHFSS remains contemporary in terms of scientifically valid service delivery.

Recommendation 46.
We encourage QHFSS to engage with relevant tertiary education providers and discuss common ground in the research and expertise space.

Criminal Justice System interactions

253 As discussed in section 1, the DNA Analysis Unit sits within the broader Forensic and Scientific Services Unit with the Queensland Department of Health. FSS supports the Queensland Police Service, the Coronial Court of Queensland and the Office of the Director of Public Prosecutions by providing forensic DNA analysis and forensic chemistry analysis of trace evidence, illicit drugs, and clandestine drug laboratories.[147]

254 We would encourage QHFSS to continue to look for opportunities to continue to build relationships across the broader criminal justice system, specifically the Judiciary, Office of the Director of Public Prosecution (ODPP), Legal Aid Queensland, Aboriginal and Torres Strait

[147] COI.0081.0002.0001 'Internal Analysis of Forensic and Scientific Services', Health Support Queensland, 30 July 2021, Version 1.04.

Islander Legal Service (ATSILS) and criminal defence solicitors and barristers. This should be at both executive and practitioner level. At the casework level, we would encourage regular case conferencing, particular for urgent or large, complex matters heavily dependent on DNA analysis results. We note opportunity exists to co-contribute to continuous professional development across the sector, for example through cross training of new counsel and forensic reporting scientists with respect to forensic expert evidence; or through discussion around forensic trends and emerging technologies.

255 We note the existence of the Australian Academy of Forensic Sciences (AAFS), a learned body dedicated to the advancement of forensic science.[148] The Academy is unique in bringing together persons of professional standing from the legal, medical and scientific professions and aims in part to encourage the study, improve the practice and advance the knowledge of forensic science. AAFS is currently active in New South Wales, Victoria, the Australian Capital Territory, with South Australia currently in the process of establishing a chapter. Notably, the Victorian Chapter was revitalised in the wake of the wrongful convictions of Farrah Jama and Tomas Klamo; the particular focus of the Victorian Chapter is the proper provision and receipt of expert evidence that is valid, reliable and comprehensible.[149] We see benefit in the establishment of a Queensland Chapter of the AAFS; and note that this would require a concerted effort and engagement from the broader CJS sector.

256 We note that Queensland Health and the Queensland Aboriginal and Islander Health Council (QAIHC) states they are placing First Nations peoples and voices at the centre of healthcare service design and delivery through Making Tracks Together - Queensland's Aboriginal and Torres Strait Islander Health Equity Framework.[150] However, we noted a void in the representation of Indigenous perspectives in the forensic DNA space. The role of forensic DNA testing in the Criminal Justice System raises many considerations for Australian indigenous peoples; including identity, cultural protocols, data sovereignty, equity and roles in research to name a few. We encourage the broader Australian forensic community to provide allyship and ensure indigenous voices and aspirations are represented in forensic practise, including research. As a starting point, we encourage QHFSS to engage with the Queensland Aboriginal and Islander Health Council (QAIHC), to review its practises with an indigenous lens; referencing

[148] See https://forensicacademy.com.au.
[149] See https://forensicacademy.com.au/chapter/vic-chapter/.
[150] See https://www.health.qld.gov.au/public-health/groups/atsihealth/making-tracks-together-queenslands-atsi-health-equity-framework.

the existing body of research and statutes of relevant agencies including the Australian Human Rights Commission (ARHC) and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

Opinion

257 QHFSS, like all FSPs need to work collaboratively with all criminal justice stakeholders utilising forensic DNA results. Strengthening of relationships and development of a whole-of-justice approach to forensic science services would be highly beneficial. Establishment of a Queensland Chapter of AAFS would assist in this regard.

Recommendations

Recommendation 47.

QHFSS to work together with QPS and other relevant stakeholders to strengthen relationships and develop a whole-of-justice approach to provision of forensic science services for the State of Queensland

Closing remarks

258 QHFSS's DNA Analysis Unit has been under considerable pressure for a sustained period of time. It is currently in a state of flux, whilst still operational and with key leadership roles currently filled in an acting capacity. The recommendations contained in this report, and other recommendations pertaining to the Commission, are extensive. Revisiting validations, retesting samples, addressing fractured relationships and cultural issues are significant endeavours which cannot be achieved in isolation. The forensic community benefits greatly from connectivity, shared experience and support. We call on the broader Australasian forensic community to support QHFSS as it transitions beyond the Commission phase, whether through provision of expertise in statistics, technical support, mentoring, allyship or advice on implementation of any accepted recommendations. To that end, it is vital that Queensland Health provide ongoing investment in development of new capability in order to ensure the enduring provision of fit-for-purpose forensic services to the State of Queensland.

259 We acknowledge the staff of the QHFSS. They are highly experienced professionals, many of whom have dedicated their entire careers to forensic science service provision. We call for wrap around support to the staff during the transition phase, with a strong focus on health and wellbeing.

260 Finally, we acknowledge that as a result of some of our recommendations, there may be retrospective DNA testing of some samples in some cases. We are mindful of the impact such testing will have on those people whose lives have been and continue to be impacted by the events these cases relate to. We have done our best to keep you front and centre of our review.

261 The findings in this report are based on the information provided to Ms Baker and Dr Kogios at a point in time and may change if additional information is provided. This report was completed on 28 October 2022 and describes the opinions and conclusions of the undersigned.

_____

Heidi Baker

_____

Dr Rebecca Kogios

List of appendices

Appendix 1 - Instructions to experts

19 October 2022

Dr Rebecca Kogios and Ms Heidi Baker

Background

The Commission of Inquiry into DNA testing in Queensland was announced by the Queensland Premier on 6 June 2022 and commenced on 13 June 2022.

The Commission was prompted by a number of issues that were raised regarding the adequacy of testing undertaken at the Queensland Health Forensic and Scientific Services (QHFSS).

The Commission's Terms of Reference are included in the brief as document 2.

Overview of engagement

Dr Kogios and Ms Baker are engaged to review the current operations of the laboratory, with particular focus on issues raised with the Commission, and determine whether is the laboratory is currently operating consistently with international best practice. The experts are to provide a joint written report to the Commission.

Instructions

1 Dr Kogios and Ms Baker are to review the current operation of the Queensland forensic DNA laboratory by reference to:
   a. Written material provided by the Commission;
   b. An in-person visit to the laboratory at a time to be arranged;
   c. A report relating to validations relating to current instruments and processes prepared by Dr Duncan Taylor;
   d. Interviews or meetings with scientists or other staff of the laboratory.
2 Dr Kogios and Ms Baker are to advise the Commission, jointly:
   a. Whether, and why, the current operation of the Queensland forensic DNA laboratory is scientifically sound and consistent with international best practice, with particular consideration given to issues raised below; and
   b. To what extent, if any, any deficiency in the current operation of the laboratory could have or did have an impact on:
      i. Whether the methods, systems and processes for forensic DNA testing and analysis in place at the laboratory were or are reliable;

ii. Whether the methods, systems and processes for forensic DNA testing and analysis in place at the laboratory would or have resulted in accurate reporting of results and accurate matching.

c. If any deficiency in the current operation of the laboratory is identified, the steps necessary to rectify that issue.

These instructions do not require consideration of past processes, with the exception of the concentration process which should be considered for the period 6 June 2022 to 19 August 2022, as well as the current (post 19 August) process. Instruction 2(b) requires advice as to the impact a current process may have had since it has been implemented.

3 To provide that advice, please:

a. Review the briefed material;

b. Discuss with Counsel Assisting the Commission the adequacy of the instructions and brief to be able to provide advice sought;

c. Provide a draft report for discussion with Counsel Assisting the Commission, Legal Officers by **Monday, 17 October 2022**; and

d. Provide the final report no later than **Tuesday, 25 October 2022**.

Particular issues to consider

The following potential issues should be verified and considered as part of the review and advice:

1. The efficiency or inefficiency of the system by which scientists (called "case managers") are allocated work to interpret profiles (by which those scientists are allocated a sample from a "work list" containing a list of all samples that are ready for interpretation and which appear merely in the order in which the analytical scientists have entered results of their work and without any scientist having command of any case as a whole or detailed knowledge of the circumstances of the case. In particular:

    a. A sample in the work list has minimal case context and samples are not linked or grouped in any way. A scientist in the reporting team will only see the data behind a sample and any notes recorded by the Queensland Police Service (QPS) in relation to the sample.

    b. The reporting scientist will interpret a sample on the work list as an abstract task.

c. Prior to the introduction of the work list system, a reporting scientist was given a case to work on. This meant that they had the context of the case and knowledge of all the available samples and would be able to make forensic decisions based on that information.

d. To address some of the difficulties that the work list system presents, the team members in the reporting team keep their eye out for Priority 1 cases and/or large cases and allocate all of the samples related to that case to an individual staff member. This is an informal arrangement.

2. The efficiency or inefficiency of the same system as that described in the preceding paragraph being used to allocate work to scientists who peer review the interpretation of case managers. In particular:

    a. Scientists can choose which interpretation (profile data analysis) they wish to review. The name of the original reporter is available in the forensic register and as a result, the reviews are not truly independent.

    b. It has been suggested that this results in a lack of scrutiny as friends and/or scientists with similar opinions choose to review each other's work.

3. The efficiency or inefficiency of the same system as that described in the preceding two paragraphs being used to allocate work to a scientist who is to write a sworn statement for court use but who has not interpreted any or some of the samples concerned nor reviewed the original profiler's interpretations, having instead either to accept their work unexamined or having to examine the profiles afresh. In particular:

    a. The way the current system operates is that if a statement is requested, there can be up to four different scientists providing an opinion on the results:

        i. the initial reporting scientist;

        ii. the initial reviewing scientist;

        iii. the scientist that writes the statement; and

        iv. the scientist that reviews the statement.

    b. While members of the reporting team try to allocate statements to the scientist who was heavily involved in the initial reporting of the samples, there is no system that addresses this.

    c. It has been suggested that this can lead to changes in results. When a statement is requested, it is usually the first time a scientist is required to look

at all of the samples in the case with the case context. This can lead to requests for a rework, different decisions and different opinions about the interpretation of profiles.

4. The validity of the internal validation of Quant Trio, Quant Studio 5, QIASymphony, Proflex, Cleaning of bone instrument methods, Hamilton Starlet A, 3500 Genetic Analyser, as reported on by Dr Duncan Taylor.

5. Whether there are adequate scientists in the laboratory with formal qualifications and experience in experimental design and statistics and, if not, whether that is a desirable state of affairs having regard to the work done in the laboratory, particularly in relation to internal validation.

6. Whether the quantitation procedures constitute best practice, in particular whether there should be separate targets for “small” and “large” pieces of DNA and consideration of all results.

7. Between early 2018 and early June 2022, specifying in the manual of Explanations of Exhibit Results for Forensic Register, in the case of any sample that returned a quantification of DNA between 0.001ng/µL and 0.0088ng/µL on a single quantification run, that the Queensland Police Service be informed, by means of a post on the Forensic Register, that there was “DNA insufficient for further processing” and that the “sample was submitted for DNA analysis; however the amount of DNA detected at the quantification stage indicated the sample was insufficient for further processing (due to the limitations of current analytical and interpretational techniques). No further processing was conducted on this item. Please contact Forensic DNA Analysis if further information is required”.

   Since the implementation of the threshold, there has been advancements to the QHFSS instruments and software (for example, the implementation of the 3500) and so it has been suggested that the threshold should be reconsidered in light of the current operational capabilities of the laboratory.

8. On about 6 June 2022, the laboratory abandoned the practice described in the preceding paragraph, instead causing samples with a quantitation between 0.001 ng/µL and 0.0088 ng/µL in every case to be amplified, analysed and profiled but without first concentrating the sample. Please consider whether:

   a. having regard to the loss of part of a low quant sample by an amplification that led to an unusable profile, there are likely to be any ramifications for the

quality of results if a decision is made subsequently to engage in micro-concentration of the remaining portion of the sample;

b. whether there is any justification in known scientific practice or theory for adopting such a fixed practice. In particular:

i. Samples in the low quant range usually benefit from concentration.

ii. No proper validation or investigation was conducted before changing the process on 6 June 2022.

iii. Differing views have been offered about what should instead be the process, namely:

- All samples in the 0.001 ng/µL to 0.0088 ng/µL should be automatically concentrated before amplification.
- All samples in the range should be concentrated, but there should be reporting scientist discretion as to whether they are concentrated to full (15 µL) or standard (35 µL).
- A reporting scientist should exercise a discretion as to whether a particular sample should be concentrated before amplification, and if so, to what degree.

Please consider the reports of Dr Budowle (Concentration) and Dr Wilson-Wilde (Concentration and Options Paper[1]) and if you are content to adopt their findings or opinions, please do so. If you wish to add findings or opinions, please do so.

9. The laboratory specifies in the manual of Explanations of Exhibit Results for Forensic Register, in the case of any sample that returned a quantification of DNA below 0.001ng/µL on a single quantification run, that the QPS be informed, by means of a post on the Forensic Register, that "No DNA detected" and that the sample "was submitted for DNA analysis; however no DNA was detected above the limit of detection at the quantitation stage. No further processing was conducted on this item." In particular:

a. Reporting scientists have conducted concentration and amplification on samples originally reported as 'No DNA detected' and, particularly in the case of internal DNA sample swabs, proceeded to obtain usable DNA profiles

[1] To be provided to experts once finalized on 21 September 2022.

b. When no DNA is detected from the quantification, the profile is automatically assigned to a manager to validate the result. The validator of these results may not view or have knowledge of the context of the profile (whether it has come from something “bloodstained” or with sperm seen on ER or analytical slides) when making the decision to validate no DNA being detected.

c. Using the quantification value as a strict rule for determining whether a sample is not further processed, particularly for samples where sperm is sighted on ER or analytical slides, is a risk.

10. The absence of any system or procedure whereby analysts and case managers are able readily to consult with police about a case. In particular:

    a. That scientists at QHFSS cannot easily (and do not regularly) communicate with investigators or other relevant police officers about samples they receive and have little or no knowledge about the origin or importance of the profile.

    b. Case conferences are rarely held between scientists and police officers.

11. The apparent absence of discretion in scientists when engaging in their duties, such as making a decision whether a sample should be reworked. In particular:

    a. Scientists at QHFSS that they have little autonomy in their work and many actions need to be approved by management before they proceed.

    b. For example in Priority 3 (volume crime) cases, a scientist needs permission from the Managing Scientist to concentrate a sample or re-amplify the sample.

12. The appropriateness of a scientist who is not working in interpretation of profiles making the decision whether or not a sample should undergo concentration or any other further processing, and making that decision upon the basis of a pre-determined quant. In particular:

    a. At QHFSS, a sample is received by the lab and processed by the analytical team. Early in that process, the quant value is measured:
        i. if the quant value is below the threshold of 0.001 the sample is given a reported result of ‘no DNA detected’.
        ii. If the quant value is above the threshold of 0.001 the sample moves to the reporting team’s work list in the Forensic Register.

    b. The report of ‘no DNA detected’ is made on the quant value alone, whether the result is 0.000 or 0.0009ng/µl. There is no assessment of the context of the sample or case when making this report.

13. The use of “stratification” of populations in STRMix to determine likelihood ratios.

14. The appropriateness of requiring scientists who interpret profiles to ask permission of the Managing Scientist at QHFSS before being able to order a rework of a sample. In particular:

    a. Scientists must submit a ‘request’ form to the Managing Scientist and await approval before reworking any samples that have been finalised in their reporting line. Examples of final reporting lines for samples include where a ‘3-person mixed’ DNA profile is reported, or ‘Mixed profile unsuitable for interpretation’ profile is reported.

    b. It is understood that this has not always been the procedure at QHFSS.

    c. The initial reporting of a sample by the analytical team as ‘no DNA detected’ or ‘DNA insufficient for further processing’ (pre June 2022) is an ‘interim’ reporting line, and therefore, scientists do not require permission from the Managing Scientist to rework the sample.

    d. The Managing Scientist is three management levels above the scientists asking for permission.

    e. It has been suggested that this process is time consuming and acts as a deterrent for scientists to request reworks.

    f. There are no reports of the Managing Scientist refusing a request for rework.

15. Whether there are any impediments or discouragement to a scientist changing previously reported results and, if so, the nature of such impediments. In particular:

    a. The QPS have previously raised complaints with management of QHFSS regarding changes to results. This led to an ‘incorrect result preventions report’ to attempt to address the issues with changes in results.

    b. It has been suggested that the response by management was to attempt to reduce the results being changed rather than addressing the differences of opinion and approaches to work to attempt to obtain the correct result at first instance.

    c. It has been said that management are prescriptive as to what information can be entered into the “intelligence report” which explains the change in result to the QPS.

16. The appropriateness of the conceptual model where police are seen as the “client” of the laboratory, and involved in making decisions about scientific processes, such as quantitation thresholds.

17. The efficiency of the Forensic Register and whether it lacks features that would be useful and desirable and, in particular, whether it can be used by scientists within FSS to gather data in order to better inform their work. In particular:

    a. The Forensic Register was created by a QPS officer and it has been suggested that it was created to suit the QPS needs and there are limitations on the service it provides to QHFSS.

    b. Scientists are not able to ‘data mine’ the Forensic Register to conduct analysis or research.

    c. Any request for data must go through management and then be approved by Bdna, the software company, which operates the Forensic Register.

    d. It has been suggested that information of the Forensic Register cannot be consolidated for the purpose of Disaster Victim Identification (DVI).

    e. The Forensic Register does not automatically populate witness statements or the appendix with the results of DNA analysis or the relevant parts of the appendix, and so reporting scientists must spend time in manually entering results and choosing appendix sections.

18. The availability and suitability of any professional development programs of opportunities, further education opportunities, availability of easy access to professional literature, adequate time for scientists to consider their own quality of work practices and to consider the practices of colleagues in laboratories in other jurisdiction, the availability of funding for such purposes, the availability of leadership and guidance by management in these areas and, if not, whether there ought to be and whether those leaders have considered these issues. In particular:

    a. Scientists at QHFSS are not encouraged or rewarded for participating in professional development and staff feel they do not have time to do so outside of their duties.

    b. Scientists’ skills have become specialised and deskilled, in part because of the separation between the analytical and reporting teams at the laboratory.

c. It has been suggested that professional development plans of staff at QHFSS are performed irregularly and inadequately by management.

d. Further, it has been suggested that secondments and development programs are regularly denied and ultimatums given for staff wishing to undertake such activities.

19. Whether it is consistent with best practice that the laboratory is unable to perform interpretation of 4+ person mixtures, Minifiler, LCN, YSTR analysis and other methods of analysis and interpretation used by other similar laboratories.

    a. The Commission understands that when a test of this type is to be performed on a sample, it must be sent interstate or overseas.

    b. The Commission understands there have been efforts to validate Y-STR, but that has not yet been achieved.

20. Whether there is adequate guidance, instruction or standard operating procedures offered to case managers for the interpretation of profiles so that there is consistency and uniformity among all scientists in using best practices. In particular:

    a. Guidelines for interpretation are not followed by all staff or enforced by management, leading to interpretation disparities between scientists.

    b. In particular there has been issues with the acceptance of “double stutter” as a scientific phenomenon.

    c. Guidelines are made rather than standard operating procedures, leaving scientists able to disagree and not follow guidelines.

    d. No guidance or instruction has been given regarding the recent removal of the Microcon process in the low quant range, resulting in scientists interpreting profiles differently. It has been suggested that the laboratory is not familiar with interpreting low-level profiles without this process.

21. The adequacy of the number of plate readers for GeneMapper data. In particular:

    a. It was decided some time ago that the GeneMapper was an ‘expert system’ and only needed one plate reader to interpret artifacts as the second ‘expert’. The second plate reader then became the reporting scientist (case manager).

    b. Reporting scientists do not have individual licenses for the GeneMapper program; the system is only on certain manager’s computers and a bank of computers which are slow and inefficient.

c. The Commission understands that NATA accreditation requires two plate readers.

d. It has been suggested that reporting scientists find mistakes made (artifacts still present, peaks still labelled) because the plate reader has not been checked.

22. The apparent prevalence of mixed contributor profiles generated by bone samples. In particular:

    a. It has been reported that recent DNA analysis of bone samples has produced regularly produced mixed profiles.

    b. There has been a change between 2019 (when bone samples were routinely returning single source profiles) and later years when many mixed profiles have been obtained.

    c. It is not clear why this is occurring, but it has been suggested that the following matters have changed in that period and may have had an effect:

        i. The cleaning regime of the instruments used for bones has not been validated for bone equipment and may not be suitable.

        ii. The extraction method for bone samples has changed from organic extraction to extraction using the QIAsymphony.

        iii. The 3500 Genetic Analyzer was implemented for use on bone samples in February 2021.

23. The inability of the proficiency testing undertaken to truly test the performance of the lab, in particular because of the awareness of scientists as to when they are subject to a proficiency test. In particular:

    a. The proficiency tests are conducted by CTS.

    b. The scientists are told a few weeks in advance by email from the Quality Manager that it is their turn for a proficiency test.

    c. The scientists know that it is a proficiency test when they come to do any analytical or reporting function on the sample because the test is differently identified in the Forensic Register than samples from the police, in particular because it does not have a “QP number”.

    d. The scientists know that a CTS proficiency test will be either a single source or a two person mixture.

e. The CTS proficiency test results rely only on the profile obtained on the electropherogram, and so are effectively a test of the analytical part of the laboratory and not the reporting section.

24. The inability of the quality management systems at the laboratory to identify, investigate and correct issues that arise. In particular:

    a. There is a process by which management must approve an OQI being raised and so some issues are not raised;

    b. Those investigating and approving the closure of OQIs do not have sufficient skills or qualifications to do so.

    c. Matters which should be raised as an OQI or adverse event are dealt with as a project which means there is no root cause analysis and the rectification of the issue takes longer.

25. The statistics in the article by Dr Krosch “Variation in forensic DNA profiling success among sampled items and collection methods: a Queensland perspective” and whether those statistics indicate some deficiency in the testing and analysis undertaken by the laboratory. The article indicates that:

    a. about 52% of penile swab samples submitted to FSS returned a result of “No DNA detected” (as that term is defined by Dr Krosch);

    b. about 32% of high vaginal swab samples submitted to FSS returned a result of "No DNA detected";

    c. about 82% of semen swab samples submitted to FSS returned a result of “No DNA detected”;

    d. about 39% of saliva swab samples submitted to FSS returned a result of “No DNA detected”;

    e. about 23% of swabs (blood) samples submitted to FSS returned a result of "No DNA detected".

    f. about 35% of “oral” sexual assault-related samples submitted to FSS returned a result of “No DNA detected”

    g. (Note, data will be requested from Queensland Health to verify these statistics).

26. In the SOP ‘Procedure for Case Management’ (17117V21), on page 32, a problem was identified with four wells (A01, A012, H01, H012) whereby there was an

observed reduction in volume post-PCR and the rework strategy was to consider a re-quantification or re-amplification if a suboptimal amplification was obtained due to reduced amp volumes.

   a. Is this an appropriate response to address the problem identified with the instrument?

27. In September 2022, the following 3 minor change processes were approved and implemented:

   a. Minor Process Change – Proof of concept for routine Maxwell extraction rework strategy for Differential Lysis samples; and

   b. Minor Process Change – SAIKs and Just In Case sexual assault kits.

   Were these Minor Process changes sufficiently investigated, appropriate to be implemented as minor changes (as opposed to a formal project or validation) and according to best practice?

28. Sexual Assault Investigation Kits (**SAIKs**) and the FSS response to sexual assault cases. See attached documents in Folder 1 of the Brief:

   a. 'Supplementary Instructions (SAIKs)'; and

   b. 'Further Supplementary Instructions (SAIKs)'.

29. Any other issue which indicates a failure to act consistently with best practice in the laboratory's operations.

Appendix 2

CURRICULUM VITAE

Heidi Baker BSc. (Hons)

Profile

A highly motivated molecular biologist combining extensive experience in many forensic disciplines with exceptional flexibility, positivity and attention to detail. A successful team player, leader and motivator, supported by excellent communication and organisational skills.

Key Skills

- Experienced forensic case manager
- Maintains high standards of work and timely outcomes under pressure.
- Confident and effective communicator at all levels.
- Proactive, flexible, and receptive to new situations.

Relevant Qualification

BSc. (Hons) Genetics **University of York, U.K. 1993 – 1996**

Career and Achievements To Date

Forensic Senior Scientist, ESR, New Zealand (2006 to present)

- Currently based in the Forensic Research and Development Team, providing technical assistance for genomics research and social systems projects.
- DNA analysis, interpretation (including STRmix™), preparation of statements, technical reviewing and providing expert evidence at court
- Providing technical advice and training to forensic colleagues, and external clients including Police, legal counsel and international forensic colleagues.
- Service Centre Case Manager including crime scene attendance and DVI work.
- Technical assessor for internal audits in a range of forensic disciplines.
- NATA Technical Assessor
- Providing training in ethics, professional development and expert witness court skills for colleagues within and external to ESR
- Awarded the Canterbury Citation for DVI work
- Lectured at the University of Canterbury in forensic genetics
- Co-supervised MSc regarding background levels of DNA

Senior Forensic Scientist, FSS, London (1999-2006), Forensic Scientist (1997–1999)

- Defining the needs of the customer, responding to changing needs and providing timely feedback on case progress.
- Assessment, evidence recovery and interpretation of forensic casework in bioscreening, DNA testing, blood pattern analysis, damage, physical fits, footwear, paint, glass, fibres, hairs and toolmark comparisons (including photography).
- Providing a strategic service to fulfil customer and court requirements in a cost effective and timely manner.
- Peer checking casework to ensure quality standards are maintained and constructive feedback provided to colleagues.
- Achieving a high level of personal expertise and professional behaviour through a proactive approach and up-to-date knowledge.

- Providing well-communicated reports and evidence at court.
- Awarded two Commendations from the Metropolitan Police Service (2001 and 2006) for my professionalism as a forensic case manager.
- Lectured at London Metropolitan University on forensic biology.

Training and Mentoring role

- Prepared and implemented the training of fifteen forensic technicians in the screening for biological evidence.
- Planned and implemented reporting training and mentoring for 18 senior scientists
- Expert witness trainer and assessor for senior scientists, service centre technicians and DNA analysts.
- Trainer and mentor on DNA mixtures analysis and interpretation course.
- Provided training for a range of external customers, including International Police Commanders, Forensic Medical Examiners, Scene of Crime Officers, Crown Law and the Judiciary.

Conference Presentations:

- Oral presentation on 'The Ethical Use of DNA Testing' at **'**Ethics in Public Life', Austria, 2009
- Two oral presentations at EAFS, Netherlands, 2012 on 'Implementation of mRNA Based Bodyfluid Identification in Forensic Casework', and 'The Use of DNA Testing in Disaster Victim Identification'
- Oral presentation on 'mRNA Based Bodyfluid Identification for Forensic Casework', and two poster presentations on 'Linking Interpretation and Forensic Evidence' and 'Initial Validation and Investigation into Promega's PowerPlex® Y23 System' at ISHI, USA, 2014.
- Co-led a workshop at ANZFSS 2016 on 'A Practitioners Guide to Y STR Analysis in Forensic Casework', and presented a poster on 'A Review of mRNA Based Bodyfluid Identification at ESR'.

Publications:

- Lead author of forensic chapter in 'Scientific Sleuthing – Chemical Discoveries Made in New Zealand. Clerestory Press, July 2017.

Professional Memberships:

- ANZFSS Australian & New Zealand Forensic Science Society

Appendix 3

CURRICULUM VITAE

Rebecca J Kogios PSM PhD, GAICD

PROFILE

A recognised industry leader of a state-of-the-art forensic laboratory with a track record of best practice, multi-disciplinary service delivery in support of law enforcement and community safety..

Holds a PhD in Molecular Biology and Bachelor degrees in both Science and Law. A graduate of the Australian Institute of Company Director's flagship *Company Directors Course* and a recent recipient of a 2019 Queens Birthday Honours Award for outstanding services in forensic science and public administration. Extensive experience as a forensic practitioner in both the public and private sectors, in Australia and the United Kingdom.

POSITIONS HELD *(see 'Professional Experience Detailed' for further information)*

Victoria Police Forensic Services Department

- Executive Director – Forensic Services Department **2019 - current**
- Director – Forensic Operations **2016 - 2019**
- Acting Assistant Director – Biometric Services Division **2015 – 2016**
- Project Manager, Service Delivery Enhancement Program **Apr – Jul 2015**
- Scientific Advisor, Forensic Operations Organisational Review **2012 – 2015**
- Manager, Biological Examinations Branch **2007 – 2012**
- Team Leader & Senior Forensic Scientist **2004 – 2007**
- Forensic Scientist **1998 – 2002**

Forensic Alliance Pty Ltd, United Kingdom

- Deputy Team Leader and Senior Forensic Scientist **2002 - 2003**

GOVERNANCE/ REGULATORY ROLES

ANZFEC	**Australia New Zealand Forensic Executive Committee** Jurisdictional representative (2019 – current)
DocSAG	**Document Examination Specialist Advisory Group** ANZFEC mentor (2019 – current)

AAFS	**Australian Academy of Forensic Sciences (Vic Chapter)** Chapter Council Member (2014 - current) Secretary (2015)
ANZFSS	**Australian & New Zealand Forensic Science Society (Vic Branch)** President (2003 – 2005) Committee member (1999 – 2002)
Victoria Police	**Police Procurement Board** Member, appointed by the Chief Commissioner of Police (2019 – current)
	Road Policing Command Roadside Drug Testing Sustain Project Steering Committee Committee member (2017 - current)
VPFSD	**Victoria Police Forensic Services Department** **Diversity & inclusion Committee; Health, Safety & Wellbeing Committee** Executive sponsor (2019 – current)
	Risk Management Committee Member (2016 – current);
	Contamination Minimisation Committee; Group Managers Committee Chair (2016 – 2018)
	Security Committee; Human Resources and Finance Committee; Local Professional Standards Committee Member (2016 – 2018)
NATA	**National Association of Testing Authorities, Australia** Technical Assessor (2009 –2019)

AWARDS

2019	**Queen's Birthday Honours, Public Service Medal** Awarded for outstanding public service to forensic science and public administration in support of community safety in Victoria.

QUALIFICATIONS

2018	**Graduate - Australian Institute of Company Directors (GAICD)** Company Director Course Australian Institute of Company Directors, Melbourne, Australia
2009	**Bachelor of Laws (LLB)** La Trobe University, Melbourne Australia

1998	**Doctor of Philosophy (PhD)** Department of Medicine Melbourne University, Melbourne Australia *Anti-Cancer Council of Victoria Postgraduate Research Scholarship Holder*
1993	**Bachelor of Science (Degree with First Class Honours)** Department of Biochemistry Melbourne University, Melbourne Australia

COURSES

2016	**Advanced Leadership Program (Scholarship Position)** Australian Institute of Management, Melbourne, Australia
2014	**LEAN Active: Business Improvement Training**, SAI Global **LEAN Active: Statistical Thinking Training**, SAI Global **LEAN Executive Alignment**, Complete Lean Solutions **LEAN Training**, SAI Global **Get LEAN for Summer**, Ernst & Young
2011	**The Colloquium, The Cranlana Programme** Melbourne Australia
2010	**Senior Management Leadership Development Program** Airlie Leadership Development Centre, Victoria Police, Melbourne, Australia
2008	**Negotiation** La Trobe Law School, La Trobe University, Melbourne Australia
2006	**Dispute Resolution** La Trobe Law School, La Trobe University, Melbourne Australia
2004	**Statistics and Population Genetics for Forensic Science** Distance Education Graduate Course, North Carolina State University, United States of America

PROFESSIONAL MEMBERSHIPS

AAFS	**Australian Academy of Forensic Sciences (Vic Chapter)**
ANZFSS	**Australian & New Zealand Forensic Science Society (Vic Branch)**

PROFESSIONAL EXPERIENCE DETAILED (last 5 years)

Organisation: **VICTORIA POLICE FORENSIC SERVICES DEPARTMENT** ***2019- current***

Role: **Executive Director**

The Victoria Police Forensic Services Department (VPFSD) is Australia's largest integrated forensic laboratory and provides critical service delivery to Victoria Police and the community of Victoria. As Executive Director my principal duties involve:

- Providing strategic leadership and ensuring continuous improvement in the effective management of financial, human resources, systems, infrastructure, regulatory and governance frameworks.
- Responsibility for delivery of forensic services to the community of Victoria, ensuring operational plans align with best practice and managing risk.
- Maximising return on forensic investment by ensuring fit-for-purpose, contemporary forensic workflows designed for impact.
- Ensuring Victoria Police's commitment to the health, safety and wellbeing of all employees remains at the forefront of people related strategies.
- Keeping abreast of domestic and international issues and trends in forensics; advising on and operationalizing new capabilities, techniques and technologies.
- Effectively representing Victoria Police at the highest levels of government, the public sector and with other external bodies through building strategic partnerships and relationships that support efficient delivery of services to the Victorian Community.

Organisation: **VICTORIA POLICE FORENSIC SERVICES DEPARTMENT** ***2016-2019***

Role: **Director – Forensic Operations**

Responsible for leading a portfolio of divisions, providing crime scene, ballistic, fingerprint, DNA, serology, blood pattern analysis, facial recognition, gunshot residue, digital, drug, clandestine laboratory, collision reconstruction, hazardous material and exhibit management services to Victoria Police and the broader Criminal Justice System. As Director, Forensic Operations my principal duties involved:

- Overseeing divisional functions, initiatives, budget and resources.
- Leading the development and implementation of departmental strategies, frameworks, professional standards and innovative solutions.
- Ensuring alignment of practice and policy with the organisational business model.
- Providing high level advice to the Executive Director, stakeholders and customers.
- Providing leadership by modelling organisational values, behaviours and attributes.

PUBLICATIONS: (last 5 years)

Cordner, S, Bruenisholz, E, Catoggio, D, Chadwick, P, Champion, J, Davey, A, **Kogios, R**, Williams, M and Woodford, N. The uniform evidence Act and Australian judges' ability to assess properly the validity and reliability of expert evidence. *Australian Journal of Forensic Sciences*,52 (3) 243-245, 2020

Wilson-Wilde, L, **Kogios, RJ** Morgan, R and Poy A. DNA profiling in criminal investigations, In *Expert Evidence*, ed. I. Freckelton and H. Selby, Ch. 80. Australia: Thompson Reuters. 2017

Guest editor:

Special Issue: invited Papers – In Australia the jury decides; The validity and reliability of expert evidence. *Australian Academy of Forensic Sciences (Victorian Chapter) Summit*, November 2019

Papers Presented at Scientific Meetings (last 5 years):

Ballantyne, KN Quinn, C and **Kogios RJ**. Tansparency in Forensic Science – An Enhanced Reporting Paradigm for Victoria, *ANZFSS 25th International Symposium on the Forensic Sciences,* 2022

Kogios, RJ, Doherty, J, Quinn, C, Scheffer, J, Wilson, R , Mason, B. Implementation of Contemporary Business Improvement Methodology in a Large Forensic Science Laboratory to Drive Continuous Improvement, *ANZFSS 24th International Symposium on the Forensic Sciences,* 2018

Appendix 4: Material provided by the Commission

Table One: Material provided by Commission

No.	Document description	Date	Doc ID
Instructions and Terms of Reference			
	Commission of Inquiry Terms of Reference	10.06.2022	COI.9999.0025.0001
	Letter from Commissioner to FSS about expert lab visit	19.07.2022	COI.9999.0017.0001
	Background timeline of events	05.09.2022	COI.9999.0014.0001
	Table of experts briefed in the Commission	08.09.2022	COI.9999.0015.0001
	Instructions to experts	05.09.2022	COI.9999.0019.0001
		08.09.2022	COI.9999.0020.0001
		20.09.2022	COI.9999.0021.0001
		05.10.2022	COI.9999.0022.0001
	Supplementary Instructions (SAIKs)	05.10.2022	COI.9999.0018.0001
	Further Supplementary Instructions (SAIKs)	12.10.2022	COI.9999.0016.0001
	Memorandum to Kogios and Baker regarding cleaning instruments for bones	12.10.2022	COI.9999.0024.0001
	Final amended instructions to experts	20.10.2022	Appendix 1
Queensland Health organisational charts (12)			
	Organisational Chart for DNA Analysis	27.06.2022	FSS.0001.0002.3976
	FSS and QH Organisational Chart	19.07.2018	FSS.0001.0081.7379
	Qld Health Organisational Structure	05.09.2022	FSS.0001.0081.7381
	Senior Responsible Officers	01.01.2017	FSS.0001.0082.2021
	FSS and QH Organisational Chart	05.09.2022	FSS.0001.0081.7380
Memorandum of understanding with QPS			
	Memorandum from Queensland Health regarding FSS and QPS service agreements	Undated	FSS.0001.0081.7365
	Bundle of legal documents regarding MOU	Various	FSS.0001.0081.7366
Queensland Health role descriptions and duty statements			
	Administration Officer AO2	Undated	FSS.0001.0010.8757

	Administration Support Officer AO4	Undated	FSS.0001.0010.8764
	Administration Officer AO3	Undated	FSS.0001.0010.8769
	Laboratory Assistant CA3	Undated	FSS.0001.0010.8777
	Operational Staff Supervisor OO4	Undated	FSS.0001.0010.8782
	Forensic Scientist Advanced HP	Undated	FSS.0001.0010.8789
	Managing Scientist HP7	Undated	FSS.0001.0010.8795
	Forensic Scientist Advanced HP5	Undated	FSS.0001.0010.8802
	Team Leader HP6	Undated	FSS.0001.0010.8807
	Analytical Senior Scientist HP4	Undated	FSS.0001.0010.8813
	Forensic Scientist HP3	Undated	FSS.0001.0010.8819
	Forensic Technician HP2	Undated	FSS.0001.0010.8825
	Quality Manager HP6	Undated	FSS.0001.0083.4445
	Reporting Scientist HP4	Undated	FSS.0001.0010.8837
	Forensic Scientist HP3	Undated	FSS.0001.0010.8831
Qualifications of current Queensland Health staff qualifications			
	List of qualifications of current staff	Undated	FSS.0001.0025.2785
	Assessment information document: Staff	15.07.2018	FSS.0001.0025.2785
Register of staff training and guidelines			
	FSS Police Services Forensic DNA Analysis Orientation and Induction Checklist	25.10.2021	FSS.0001.0010.8300
	Quality Management System Guide	15.12.2021	FSS.0001.0010.8305
	Forensic DNA Analysis Induction	Undated	FSS.0001.0010.8322
	Guide to writing a statement of competence	07.12.2015	FSS.0001.0010.8371
	Management of professional development and training records in QIS2	30.06.2020	FSS.0001.0010.8375
	Forensic DNA Analysis Team Chat register of staff training	Undated	FSS.0001.0010.8379
International standards			
	Equipment assurance, in-house calibration and equipment verification	01.05.2019	FSS.0001.0057.3137
	ISO/IEC 17025 Appendix	01.10.2019	FSS.0001.0057.3145

	ISO/IEC 17025 General Requirements for the competence of testing and calibration laboratories	11.12.2017	FSS.0001.0057.3163
	ISO/IEC 17025 Standard Application Document	01.04.2018	FSS.0001.0057.3202
	Metrological Traceability Policy	01.12.2020	FSS.0001.0057.3214
	Proficiency Testing	01.12.2021	FSS.0001.0057.3238
Current methods and instruments			
	Current methods	11.08.2022	FSS.0001.0056.7837 All
	Instruments, Equipment, and software	16.08.2022	WIT.0019.0012.0882
Standard Operating Procedures and comments			
	Current List of Standard Operating Procedures Refer to Appendix 5 for full list of SOPs provided.	30.06.2022	FSS.0001.0012.0001
	SOP Comments for 34006	Various	FSS.0001.0077.3108 to FSS.0001.0077.3112
	SOP Comments for 34229	Various	FSS.0001.0077.3115 to FSS.0001.0077.3117
	SOP Comments for 17119	Various	FSS.0001.0077.3124 to FSS.0001.0077.3129
Equipment manuals			
	Maxwell FSC:		
	DNA IQ Casework Kit	01.08.2021	FSS.0001.0001.0987
	Instrument Operating Manual	03.2022	FSS.0001.0001.1003
	PowerPlex 21	07.2021	FSS.0001.0001.1096
	Quantifiler HP and Trio	04.2017	FSS.0001.0001.1259
	QuantStudio 5	15.06.2017	FSS.0001.0001.1179
	STRmix	20.10.2020	FSS.0001.0001.2697
	ABI 3500Xl:		
	3500/3500xL User Guide	06.2010	FSS.0001.0027.1460
	3500 Series Data Collection Software User Manual	28.08.2019	FSS.0001.0056.7926

	ABI GeneMapper ID-X:		
	GeneMapper User Guide v 1.2	12.2009	FSS.0001.0056.8453
	GeneMapper User Guide v 1.4	Undate	FSS.0001.0056.8615
	GeneMapper User Bulletin v1.6	Undated	FSS.0001.0069.3920
	ABI ProFlex PCR	22.06.2016	FSS.0001.0050.6790
	ARTEL MVS:		
	MVS Procedure Guide	08.2015	FSS.0001.0056.7968
	MVS Quick Start Guide	Undated	FSS.0001.0056.8092
	ARTEL Pippette Tracker	08.2011	FSS.0001.0056.8119
	BSD Studio	02.2020	FSS.0001.0056.8377
	Eppendorf ThermoMixer	01.01.2020	FSS.0001.0056.8719
	QIAsymphony	05.2013	FSS.0001.0042.9085
	STARlet VENUS:		
	Venus Three Operator's Manual	01.01.2013	FSS.0001.0045.2409
	Venus Three Software Programmer's Manual	Undated	FSS.0001.0045.2674
	STORstar	21.11.2006	FSS.0001.0056.8677
	Hamilton StARlet Operator's Manual	Undated	FSS.0001.0079.6359
	Hamilton STARlet Programmer's Manual	Undated	FSS.0001.0079.6624
	Biohazard Cabinet – Response from QHFSS regarding absence of biohazard cabinet in Evidence Recovery section	17.10.2022	FSS.0207.0001.0001
Validation documentation			
	All material provided to Dr Duncan Taylor as outlined in Appendix 1 to the Report of Dr Taylor dated 7 October 2022	Various	EXP.0003.0001.0001
NATA Assessment and Surveillance reports			
	List of NATA Audits	Undated	FSS.0001.0011.3192
	2018		
	NATA Assessment November 2018	11.2018	FSS.0001.0011.4971
	NATA Report on Assessment November 2018	11.2018	FSS.0001.0011.4955
	Correspondence from Kirsten Scott to Staff 20 December 2018	20.12.2018	FSS.0001.0011.4968
	NATA Reassessment July 2018	07.2018	FSS.0001.0057.3061
	NATA Accreditation 18 December 2018	18.12.2018	FSS.0001.0011.4953

	2020		
	NATA Report on Assessment 14 December 2020	14.12.2020	FSS.0001.0011.5012
	NATA Report on Assessment 14 December 2020	14.12.2020	FSS.0001.0011.5004
	NATA Assessment Information Document December 2019	12.2019	FSS.0001.0057.3026
	2021		
	Correspondence from Helen Gregg to Kirsten Scott 17 March 2021	17.03.2021	FSS.0001.0057.3086
	Correspondence from Helen Gregg to Mark Stephenson and Kirsten Scott 24 February 2021	24.02.2021	FSS.0001.0011.4999
	Correspondence from Helen Gregg to Kirsty Putsey 25 February 2021	25.02.2021	FSS.0001.0011.5003
	NATA Report on Assessment 14 December 2020	14.12.2020	FSS.0001.0011.4984
	NATA Accreditation 16 December 2020	16.12.2020	FSS.0001.0011.4997
	NATA Accreditation 15 March 2021	15.03.2021	FSS.0001.0011.4993
	NATA Acceptance of Final Report 3 March 2021	03.03.2021	FSS.0001.0011.4996
	2022		
	Correspondence from Helen Gregg to Commission of Inquiry 10 August 2022	10.08.2022	FSS.0001.0057.3343
	NATA Interim Report on Assessment	28.07.2022	FSS.0001.0056.7809
	NATA Final Report	23.08.2022	FSS.0081.0004.0001
	Correspondence from Kirsten Scott to Staff 1 September 2022	01.09.2022	FSS.0081.0001.0001
	Bundle of documents received from NATA	Various	COI.0294.0001.0001
Proficiency tests and results			
	Proficiency Tests 2017-2022	2017-2022	(material provided in response to Notice 37 Item 6)
Internal audit documentation			
	Bundle of internal audit documentation 2019-2022	2019-2022	COI.0294.0004.0001
External audit documentation			
	FSS Internal analysis report	30.07.2021	COI.0081.0002.0001

	2017 - April Review of SOPs regarding examination and testing of sexual assault items by ESR	04.2017	FSS.0001.0024.1529
	Queensland Audit Office: 'Delivering forensic services: Report 21 (2018-19)'	27.06.2019	FSS.0001.0024.2815
OQIs, adverse events and projects			
	OQI log/documentation	2003-2022	FSS.0001.0002.1723
	Adverse events log	Various	FSS.0001.0002.3887
	List of proposed and undertaken projects	Various	FSS.0001.0013.4340
	Project#153 – Verification of Cleaning Reagents (Trigene Advance, Viraclean, Virkon, Pyroneg, Decon, Cavicade, F10SC) for use in Forensic DNA Analysis	04.2015	FSS.0205.0001.0001
	Adverse Event 682:		
	Adverse Event Log	19.02.2021	FSS.0001.0080.6479
	QIS Report	19.02.2021	FSS.0001.0080.6480
	Correspondence from Kirsten Scott to Queensland Health staff	01.03.2021	FSS.0001.0080.6483
	Correspondence from Kylie Rika to Queensland Health staff	01.03.2021	FSS.0001.0080.6484
	Adverse Event 720:		
	Adverse Event Log	21.07.2021	FSS.0001.0080.6485
	Incorrect Reference Update	27.07.2021	FSS.0001.0080.6486
	Reference Update Process	27.07.2021	FSS.0001.0080.6488
	QIS Report	15.07.2021	FSS.0001.0080.6489
	OQI53692:		
	QIS Report	01.10.2020	FSS.0001.0080.6354
	Audit Report	22.09.2020 – 1 October 2020	FSS.0001.0080.6358
	ER Training Module Audit	Undated	FSS.0001.0080.6360
	QIS Audit Report	01.10.2020	FSS.0001.0080.6361
	OQI53717:		
	QIS Report	08.10.2020	FSS.0001.0080.6473
	Reference Sample (1)	08.02.2012	FSS.0001.0080.6477

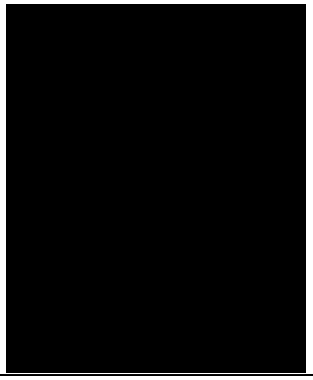
	Reference Sample (2)	13.02.2012	FSS.0001.0080.6478
	OQI54012:		
	QIS Report	17.11.2020	FSS.0001.0080.6333
	Audit Report	17.11.2020	FSS.0001.0080.3535
	Findings from Reporting Team 1 Audit	Undated	FSS.0001.0080.6344
	Spreadsheet of names	Undated	FSS.0001.0080.6349
	OQI54156:		
	QIS Report	23.12.2020	FSS.0001.0080.6422
	Analytical Procedural Changes Discussion	08.01.2021	FSS.0001.0080.6434
	Azure Card	Undated	FSS.0001.0080.6436
	Correspondence from Justin Howes to David Neville	23.12.2020	FSS.0001.0080.6438
	Correspondence from Justin Howes to Stephan Foxover	12.02.2021	FSS.0001.0080.6441
	Extraction Batch Transposition Table	23.12.2020	FSS.0001.0080.6445
	Investigation Draft	23.12.2020	FSS.0001.0080.6446
	Investigation Draft	23.12.2020	FSS.0001.0080.6454
	OQI Report	23.12.2020	FSS.0001.0080.6463
	Sample Notation	15.12.2020 10.02.2021	FSS.0001.0080.6472
	OQI54379:		
	QIS Report	28.09.2022	FSS.0001.00806492
	OQI54485:		
	QIS 17137V14	15.09.2010	FSS.0001.0080.6368

	QIS Report	23.03.2021	FSS.0001.0080.6419
	OQI55008:		
	QIS Report	03.08.2021	FSS.0001.0080.6364
	Screenshot of Forensic Register	Undated	FSS.0001.0080.6367
	Test No. 21-5781: Body Fluid Identification	10.05.2021	FSS.0001.0018.6052
	Scenario and Item Description (s) for Test 21-5781: Body Fluid Identification	23.03.2021	FSS.0001.0018.6069
	Body Fluid Identification Test No. 21-5781 Summary Report	30.06.2021	FSS.0001.0018.5902
Data provided from FSS DNA Analysis Unit			
	NO DNA Detected data for each of the previous 5 financial years	29.09.2022	FSS.0001.0082.2911 FSS.0001.0083.3732
	DIFP data for each of the previous 5 financial years	29.09.2022	FSS.0001.0082.2918
	Bones data for each of the previous 5 financial years including: '2022-00132-13 – Additional Information.xlsx'	29.09.2022	FSS.0001.0082.1720 FSS.0001.0083.3730
	Data (general) for each of the previous 5 financial years	30.09.2022	FSS.0001.0083.0069 FSS.0001.0083.3731
	Data for blood, semen, saliva and high vaginal swab for each of the previous 5 financial years	29.09.2022	FSS.0001.0082.2022
	List of samples sent away for further testing	Undated	FSS.0001.0080.2453 FSS.0001.0080.2452
	Information from Paula Brisotto regarding request for data collected in the last 10 years regarding success rate (of obtaining an interpretable profile from a sample)	Undated	FSS.0001.0080.3321
	ANZFSS Poster 6 September 2022 CJA, ARM Comments	06.09.2022	FSS.0001.0080.3319

	ANZFSS Poster 6 September 2022	06.09.2022	FSS.0001.0080.3318
	ANZFSS Poster 7 September 2022	07.09.2022	FSS.0001.0080.3320
	ANZFSS Poster Final Version 8 September 2022	08.09.2022	FSS.0001.0080.3322
	Stats for ANZFSS Symposium Poster 20 July 2022	20.07.2022	FSS.0001.0080.3324
	Stats for ANZFSS Symposium Poster 31 August 2022	31.08.2022	FSS.0001.0080.3323
	SAIKS for ANZFSS Poster 2022 v1	Undated	FSS.0001.0080.3325
	SAIKS for ANZFSS Poster 2022 v2	Undated	FSS.0001.0080.3326
	SAIKS for ANZFSS Poster 2022 v3	Undated	FSS.0001.0080.3327
	SAIKS for ANZFSS Poster 2022 v4	Undated	FSS.0001.0080.3328
	SAIKS for ANZFSS Poster 2022 v5	Undated	FSS.0001.0080.3329
	SAIKS for ANZFSS Poster 2022 v6	Undated	FSS.0001.0080.3330
Witness statements / submissions			
	Statement of Kirsten Scott (22 July 2022) Exhibits KS-1 to KS-37	22.07.2022	FSS.0001.0011.5388 FSS.0001.0011.5404 to FSS.0001.0011.5767
	State of Kirsten Scott (7 October 2022) Exhibits KS-00 to KS-56	07.10.2022	WIT.0013.0007.0001 WIT.0013.0008.0001 to WIT.0013.0064.0001
	Statement of Cathie Allen (16 September 2022) Exhibits CA-1 to CA-152	16.09.2022	WIT.0019.0012.0001

	Statement of Cathie Allen (19 September 2022) Exhibits CA-1 to CA-91	19.09.2022	WIT.0019.0013.0001
	Statement of Cathie Allen (11 October 2022) Exhibits CA-1 to CA-121	11.10.2022	WIT.0019.0016.0001
	Statement of Cathie Allen (20 October 2022) Exhibits: CA-1 to CA-96	20.10.2022	WIT.0019.0040.0001 WIT.0019.0041.0001 to WIT.0019.0041.3908
	Statement of Justin Howes (16 August 2022) Exhibits: JH-1 to JH-72	16.08.2022	WIT.0016.0001.0001 WIT.0016.0002.0001 to WIT.0016.0073.0001
	Statement of Justin Howes (16 September 2022) Exhibits: JH-1 to JH-125	16.09.2022	WIT.0016.0185.0001
	Statement of Justin Howes (6 October 2022) Exhibits: JH-1 to JH-79	06.10.2022	WIT.0016.0188.0001
	Statement of Paula Brisotto (17 October 2022)	17.10.2022	WIT.0014.0152.0001
	Statement of Paula Brisotto (18 October 2022) and exhibit PB150	18.10.2022	WIT.0014.0150.0001 WIT.0014.0151.0001
	Submission of Sharon Johnstone (7 September 2022) Exhibits: SJ-01 to SJ-09	07.09.2022	WIT.0015.0004.0001
	Statement of Emma Caunt Exhibits: EC-01 to EC-09	16.09.2022	WIT.0004.1193.0001 WIT.0004.1194.0001 to WIT.0004.1202.0001
	Statement of Kylie Rika Exhibits: KR-01 to KR-19	16.09.2022	WIT.0006.0095.0001 WIT.0006.0096.0001 to WIT.0006.0121.0001
	Statement of Alicia Quartermain	21.09.2022	WIT.0012.0025.0001

	Exhibits: AQ-01 to AQ-07		WIT.0012.0026.0001
	Statement of Rhys Parry Exhibits: RP-01 to RP-11	28.09.2022	WIT.0043.0001.0001_R WIT.0043.0002.0001_R to WIT.0043.0004.0001_R
	Statement of Angelina Keller Exhibits: AK-01 to AK-41	06.10.2022	WIT.0003.0435.0001 WIT.0003.0436.0001 to WIT.0003.0476.0001
	Statement of Emma Caunt Exhibits: EC-01 to EC-18	06.10.2022	WIT.0004.1224.0001 WIT.0004.125.0001 to WIT.0004.1244.0001
	Statement of Kylie Rika Exhibits: KR-01 to KR-14	06.10.2022	WIT.0006.0145.0001 WIT.0006.0146.0001 to WIT.0006.0164.0001
	Statement of David Neville including exhibits	09.08.2022	WIT.0020.0007.0001
	Statement of David Neville including exhibits	26.08.2022	WIT.0020.0001.0001
	Statement of David Neville including exhibits	14.09.2022	WIT.0020.0008.0001
	Statement of Lara Keller Exhibits: LK-01 to LK-105	20.09.2022	WIT.0017.0003.0001 WIT.0017.0004.0001 to WIT.0017.0202.0001
	Statement of Shaun Drummond Exhibits: SD-1 to SD-10	21.09.2022	WIT.0039.0002.0001_R WIT.0039.0003.0001_R to WIT.0039.0020.0001_R
	Statement of Helen Gregg Exhibit Index and Exhibits: HG-01 to HG48	16.09.2022	WIT.0032.0002.0001 WIT.0032.0001.0001 WIT.0032.0003.0001 to WIT.0032.0050.0001
	Statement of David Rosengren	16.09.2022	QHE.0106.0001.0001

	Exhibits DR-00 to DR-38		QHE.0106.0002.0001 to QHE.0106.0034.0001
	Statement of Matthew Rigby Exhibits: MR-00 to MR-28	19.09.2022	WIT.0038.0001.0001 WIT.0038.0002.0001 to WIT.0038.0055.0001
	Statement of Darren Pobar (QPS) and exhibits	15.09.2022	QPS.0147.0001.0001
	Statement of Allan McNevin Exhibits: ARM-1 to ARM-15	21.09.2022	WIT.0040.0001.0001 WIT.0040.0002.0001 to WIT.0040.0017.000
	Statement of Allan McNevin Exhibits: ARM-01 to ARM-33	10.10.2022	WIT.0040.0018.0001 WIT.0040.0019.0001 to WIT.0040.0076.0001
	Statement of Allan McNevin Exhibits: ARM-01 to ARM-119	13.10.2022	WIT.0040.0077.0001
	Statement of Alanna Darmanin	21.10.2022	WIT.0052.0001.0001
	Statement of Luke Ryan	21.10.2022	WIT.0018.0012.0001
DNA Analysis Unit internal material			
	Spreadsheet of Reporting Scientist and Reviewing Scientist for profile reviews between 1/03/2022 and 01/08/2022	01.03.2022 – 01.08.2022	FSS.0001.0083.0068
	Spreadsheet of Reporting Scientist and Reviewing Scientist for further processed profile reviews between 1/03/2022 and 01/08/2022	01.03.2022 – 01.08.2022	FSS.0001.0083.3008
	Bundle of casefile material (witness statements and intelligence reports) for the following cases which contain a change in result: 	Various	COI.9999.0031.0001

	[redacted]		
	Bundle of complete casefiles for the following cases where results were made incorrect due to difference of opinion: [redacted]	Various	COI.999.0032.0001
	Response from FSS regarding all workflow tasks that presently require approval	19.09.2022	FSS.0001.0079.5882
	MS Teams 'DNA Rework Authorisations' form	As at 19.09.2022	FSS.0001.0079.5880
	Draft 'Procedure for Case Management' SOP 17117v21.6 under review	As at 19.09.2022	FSS.0001.0079.5840
	Bundle of documents regarding 'Incorrect result preventions report' including: • Final version of the report • Draft versions of the report • Feedback provided on the report	Various	COI.9999.0030.0001
	Minor Process Change (Stage 2): Forensic DNA Analysis compiles Sexual Assault Investigation Kits and Just in Case sexual assault kits	05.09.2022	WIT.0005.1469.0001
	Minor Process Change (Stage 2): Proof of concept for routine Maxwell extraction rework strategy for Differential Lysis samples	29.04.2022	WIT.0005.1473.0001
	Minor Process Change (Stage 2): Pre-PCR STARlet computer upgrade to WIN10 and Venus 4 software	23.08.2022	WIT.0005.1468.0001
	QHFSS internal email chain provided by Kylie Rika to COI re "Minor changes signed off today"	19.09.2022	WIT.0006.0122.0001

	QHFSS internal email chains provided by Josie Entwistle to COI re "Minor Changes signed off today"	09.09.2022	WIT.0005.1472.0001 WIT.0005.1467.0001
	Email chain between Kylie Rika and Paula Brisotto about case management and rework strategy	16.05.2022 – 24.06.2022	WIT.0004.1114.0001
	Bundle of documents regarding internal quality management, including: • Quality reports prepared by Senior Scientist (Quality) or Quality Manager (FSS) • Submissions of quality data to DNA Management Review or FSS Management Review • Directions or instructions provided by Quality Manager (FSS) to Managing Scientist or Quality Team	Various	COI.9999.0033.0001
	Email from Rhys Parry to COI re "Clarification wrt Section 14.5 of Review by Duncan Taylor"	10.10.2022	WIT.0009.0022.0001
	Email from Emma Caunt to COI re "Report of Dr Duncan Taylor"	11.10.2022	WIT.0004.1245.0001
	Doc 24765T9 Observed Reduction in Volume Post-PCR (May 2020)	05.2020	FSS.0001.0079.2297
FSS meeting minutes			
	Agenda Forensic DNA Analysis Management Reviewing Meeting 3 October 2019	03.10.2019	FSS.0001.0025.3261
	Minutes Forensic DNA Analysis Management Review Meeting 3 October 2019	03.10.2019	FSS.0001.0025.3265
	Agenda Forensic DNA Analysis Management Review Meeting 4 April 2019	04.04.2019	FSS.0001.0025.3189
	Minutes Forensic DNA Analysis Management Review Meeting 4 April 2019	04.04.2019	FSS.0001.0025.3193
	Agenda Forensic DNA Analysis Management Review Meeting 5 February 2020	05.02.2020	FSS.0001.0025.3346

	Agenda Forensic DNA Analysis Management Review Meeting 17 September 2020	17.09.2020	FSS.0001.0025.3446
	Minutes Forensic DNA Analysis Management Review Meeting 17 September 2020	17.09.2020	FSS.0001.0025.3450
	Minutes Forensic DNA Analysis Management Review Meeting 19 March 2020	19.03.2020	FSS.0001.0025.3350
	Minutes Forensic DNA Analysis Management Review Meeting 17 September 2020	17.09.2020	FSS.0001.0081.7382
	Minutes Forensic DNA Analysis Management Review Meeting 25 March 2021	25.03.2021	FSS.0001.0081.7388
	Minutes Forensic DNA Analysis Management Review Meeting 9 September 2021	09.09.2021	FSS.0001.0081.7394
	Correspondences from Kirsten Scott to Multiple Staff 11 March 2022	11.03.2022	FSS.0001.0081.7403
	Forensic DNA Analysis Management Team Management Review 2022: Q1 & Q2 – Agenda 17 August 2022	17.08.2022	FSS.0001.0081.7400
	Forensic DNA Analysis Management Team Management Review– Minutes 10 March 2022	10.03.2022	FSS.0001.0082.2915
	Forensic DNA Analysis Management Team Management Review– Minutes 10 March 2022	10.03.2022	FSS.0001.0082.2912
Bones documentation			
	List of bone samples 2018-2022	2018-2022	FSS.0001.0057.3025
	Full casefile for [redacted]	Various	FSS.0001.0057.0001
	Full casefile for [redacted]	Various	FSS.0001.0057.0061
	Full casefile for [redacted]	Various	FSS.0001.0057.0565
	Full casefile for [redacted]	Various	FSS.0001.0057.0744

	Full casefile for [redacted]	Various	FSS.0001.0057.0779
	Full casefile for [redacted]	Various	FSS.0001.0057.0832
	Full casefile for [redacted]	Various	FSS.0001.0057.0917
	Full casefile for [redacted]	Various	FSS.0001.0057.0975
	Full casefile for [redacted]	Various	FSS.0001.0057.1050
	Full casefile for [redacted]	Various	FSS.0001.0057.1121
	Full casefile for [redacted]	Various	FSS.0001.0057.1573
	Full casefile for [redacted]	Various	FSS.0001.0057.1610
	Full casefile for [redacted]	Various	FSS.0001.0057.1680
	Full casefile for [redacted]	Various	FSS.0001.0057.1768
	Full casefile for [redacted]	Various	FSS.0001.0057.1841
	Full casefile for [redacted]	Various	FSS.0001.0057.1956
	Full casefile for [redacted]	Various	FSS.0001.0057.2047
	Full casefile for [redacted]	Various	FSS.0001.0057.6182
	Full casefile for [redacted]	Various	FSS.0001.0057.6361
	Full casefile for [redacted]	Various	FSS.0001.0057.7066
	Full casefile for [redacted]	Various	FSS.0001.0066.4991
	Full casefile for [redacted]	Various	FSS.0001.0066.5035
	Full casefile for [redacted]	Various	FSS.0001.0066.5126

	Full casefile for [redacted]	Various	FSS.0001.0066.5177
	Full casefile for [redacted]	Various	FSS.0001.0066.5188
	Full casefile for [redacted]	Various	FSS.0001.0066.5201
	Full casefile for [redacted]	Various	FSS.0001.0066.5221
	Full casefile for [redacted]	Various	FSS.0001.0066.5250
	Full casefile for [redacted]	Various	FSS.0001.0066.5383
	Full casefile for [redacted]	Various	FSS.0001.0066.7350
	Full casefile for [redacted]	Various	FSS.0001.0066.7389
	Full casefile for [redacted]	Various	FSS.0001.0066.7461
	Full casefile for [redacted]	Various	FSS.0001.0066.7639
	Full casefile for [redacted]	Various	FSS.0001.0066.7699
	Email chain between Allan McNevin, Paula Brisotto and Kirsten Scott re Tergazyme	14.06.2019 – 18.06.2019	FSS.0001.0056.8817
	Email chain between Allan McNevin and Paula Brisotto re changes to cleaning protocol in Bone Room	18.06.2019 – 21.06.2019	FSS.0001.0056.8823
	Email from Allan McNevin to Management about Tergazyme and Proposal #153	21.06.2019	FSS.0001.0056.8821
Sexual Assault Investigation Kit documentation			
	Doc 1.1 QHFSS Configuration of SAIKS SOP 17151v14	26.05.2022	FSS.0001.0076.7442
	Doc 1.2 Medical Examination information form SOP 31282v8	13.12.2021	FSS.0001.0077.1665
	Doc 2 Queensland Health Sexual Offences Medical Protocol (confidential)	Undated	FSS.0001.0019.1201
	Doc 3. Queensland Health Guideline: Guideline for the Management of care for people 14 years and over disclosing Sexual Assault	Undated	FSS.0001.0078.9289

	Doc 4.1 Statement of Dr Adam Griffin	06.09.2022	WIT.0027.0001.0001
	Doc 4.2 Statement of Dr Cathy Lincoln	26.09.2022	WIT.0043.0136.0001
	Doc 4.3 For Laboratory: Potential forensic evidence "Just in Case" Forensic Examination document	Undated	WIT.0043.0100.0001
	Doc 4.4 Statement of Jan Connors	Undated	WIT.0026.0001.0001
	Journal of Forensic and Legal Medicine, "New oral cut-off time limits in NSW" (22 September 2016)	22.09.2016	COI.9999.0027.0001
	Journal of Forensic and Legal Medicine, "Preparing semen slides in cases of sexual assault: Do they who smear first smear best?" (3 February 2021)	03.02.2021	COI.9999.0026.0001
QPS material			
	List of material and information provided by QPS when submitting SAIK, reference, crime scene and whole exhibit samples	Undated	FSS.0001.0079.5887
	Bundle of example material/information submitted by QPS for the following sample types: a. SAIK sample b. Reference sample c. Crime scene sample d. Whole exhibit sample -	Various	COI.9999.0028.0001
	Matt Krosh 'Variation in Forensic DNA profiling success among sampled items and collection methods: a Queensland perspective'	05.05.2020	WIT.0001.0082.0001
	Requests from QPS to Forensic DNA Analysis for 'further processing" etc between 2018 – 2022	2018 - 2022	FSS.0001.0081.0656
	QPS data establishing number of 'DIFP' samples that underwent further processing at the request of QPS between 2018 - 2022	2018 - 2022	(material provided in response to Notice 245 Item 1 and 2)

DNA Analysis Unit professional development			
	Forensic and Scientific Services Learning and Development (L&D) Framework (QIS23651V11)	10.06.2021	FSS.0001.0079.7890
	Queensland Health: Career Success Plan Guide	11.2018	FSS.0001.0079.7901
	Queensland Health: Identifying Development Opportunities Framework	11.2018	FSS.0001.0079.7903
	Queensland Government: Performance Development Framework	Undated	FSS.0001.0079.7905
	Queensland Health: Career Success Plan for Managers	Undated	FSS.0001.0079.7907
	Bundle of performance/professional development plans for all current scientific staff	Various	COI.0294.0008.0001
	Bundle of formal correspondence requesting professional development	Various	COI.0294.0002.0001
Example casefiles			
	Full casefile for [redacted]	Various	FSS.0001.0081.7410
	Full casefile for [redacted]	Various	FSS.0001.0081.7479
	Full casefile for [redacted]	Various	FSS.0001.0081.7623
	Full casefile for [redacted]	Various	FSS.0001.0081.7723
	Full casefile for [redacted]	Various	FSS.0001.0081.7856
	Full casefile for [redacted]	Various	FSS.0001.0081.7971
	Bundle of P1 example casefile Quant Batch Results	Various	COI.0294.0005.0001
	Bundle of P1 example casefiles STRmix Reports	Various	(material provided in response to Notice 258 Item 1)
	Full casefile for [redacted] (P2 – SAIK)	Various	FSS.0001.0081.8087
	Full casefile for [redacted] (P2 – SAIK)	Various	FSS.0001.0081.8267

	Full casefile for [redacted] (P2 – SAIK)	Various	FSS.0001.0081.8366
	Full casefile for [redacted] (P2 – SAIK)	Various	FSS.0001.0081.8526
	Full casefile for [redacted] (P2 – SAIK)	Various	FSS.0001.0081.8621
	Full casefile for [redacted] (P2 – SAIK)	Various	FSS.0001.0081.8716
	Full casefile for [redacted] (P2 – SAIK)	Various	FSS.0001.0081.8820
	Full casefile for [redacted] (P2 – SAIK)	Various	FSS.0001.0081.8994
	Full casefile for [redacted] (P2 – SAIK)	Various	FSS.0001.0081.9077
	Full casefile for [redacted] (P2 – SAIK)	Various	FSS.0001.0081.9237
	Bundle of additional testing results for [redacted]	Various	(material provided in response to Notice 261 Items 2 and 3)
	Bundle of P2 - SAIK example casefile Quant Batch Results	Various	COI.0294.0007.0001
	Bundle of P2 - SAIK example casefiles STRmix Reports	Various	(material provided in response to Notice 258 Item 2)
	Full casefile for [redacted] (P2 – Murder)	Various	FSS.0001.0082.0001
	Full casefile for [redacted] (P2 – Murder)	Various	FSS.0001.0082.0271
	Full casefile for [redacted] (P2 – Murder)	Various	FSS.0001.0082.0386
	Bundle of P2 - Murder example casefile Quant Batch Results	Various	COI.0294.0007.0001
	Bundle of P2 - Murder example casefiles STRmix Reports	Various	(material provided in response to Notice 258 Item 3)
	Full casefile for [redacted] (P3)	Various	FSS.0001.0082.0489
	Quant Batch Results for [redacted] (P3)	Various	FSS.0001.0083.2081 FSS.0001.0083.2103

	STRmix Reports for [redacted] (P3)	Various	(material provided in response to Notice 258 Item 4)
	Full casefile for [redacted] (Intel)	Various	FSS.0001.0082.0512
	Full casefile for [redacted] (Intel)	Various	FSS.0001.0082.0744
	Full casefile for [redacted] (Intel)	Various	FSS.0001.0082.1015
	Full casefile for [redacted] (Intel)	Various	FSS.0001.0082.1123
	Full casefile for [redacted] (Intel)	Various	FSS.0001.0082.1354
	Full casefile for [redacted] (Intel)	Various	FSS.0001.0082.1512
	Full casefile for [redacted] (Intel)	Various	FSS.0001.0082.1592
	Bundle of Intel example casefile Quant Batch Results	Various	COI.0294.0003.0001
	Bundle of Intel example casefiles STRmix Reports	Various	(material provided in response to Notice 258 Item 5)
Expert opinions			
	Report by Professor Linzi Wilson-Wilde on accuracy of reporting 'DIFP' results in statements	31.07.2022	EXP.0002.0002.0001
	Report by Professor Linzi Wilson-Wilde on accuracy of reporting 'No DNA detected' results in statements	25.08.2022	EXP.0002.0004.0001
	Report by Professor Linzi Wilson-Wilde on concentration	07.08.2022	EXP.0002.0003.0001
	Report by Professor Linzi Wilson-Wilde on Options Paper	20.09.2022	EXP.0002.0001.0001
	Report by Dr Bruce Budowle on accuracy of reporting 'No DNA detected' results in statements	05.09.2022	EXP.0001.0003.0001
	Report by Dr Bruce Budowle on Options Paper	19.09.2022	EXP.0001.0002.0001
	Report by Dr Bruce Budowle on concentration	13.09.2022	EXP.0001.0001.0001
	Instructions to Clint Cochrane on OQI Log	Undated	COI.9999.0012.0001
	Report by Clint Cochrane on OQI Log	Undated	COI.9999.0010.0001
	Instructions to Dr Duncan Taylor about validations	Undated	COI.9999.0013.0001
	Final report by Dr Duncan Taylor about validations	07.10.2022	EXP.0003.0001.0001

	Instructions to Clint Cochrane about Sperm Microscopy	Undated	COI.9999.0011.0001
	Report by Clint Cochrane about Sperm Microscopy	10.10.2022	EXP.0004.0001.0001
	Report by Katherine Anne Davey about QPS processes	15.10.2022	EXP.0005.0002.0001
	Report by Associate Professor Kathy Kramer about SAIK processes	Undated	EXP.0005.0003.0001
	Report by Professor Linzi Wilson-Wilde on DNA IQ contamination	20.10.2022	EXP.0002.0005.0001
De-identified interstate laboratory data			
	De-identified data and information received in response to COI request from laboratory in Jurisdiction B	Various	COI.9999.0051.0001 to COI.9999.0072.0001
	De-identified data and information received in response to COI request from laboratory in Jurisdiction C	Various	COI.9999.0036.0001 COI.9999.0037.0001 COI.9999.0038.0001 COI.9999.0039.0001 COI.9999.0040.0001
	De-identified data and information received in response to COI request from laboratory in Jurisdiction D	Various	COI.9999.0041.0001 COI.9999.0042.0001 COI.9999.0043.0001 COI.9999.0044.0001 COI.9999.0045.0001
	De-identified data and information received in response to COI request from laboratory in Jurisdiction E	Various	COI.9999.0046.0001
	De-identified data and information received in response to COI request from laboratory in Jurisdiction F	Various	COI.9999.0047.0001 COI.9999.0048.0001 COI.9999.0049.0001
	De-identified data and information received in response to COI request from laboratory in Jurisdiction G	Various	COI.9999.0050.0001
	Summary of interstate responses about thresholds prepared by COI	Various	COI.9999.0034.0001
	Summary of interstate data responses about number of cases, items, tests and FTEs prepared by COI	17.10.2022	COI.9999.0035.0001

	Amended Summary of interstate data responses about number of cases, items, tests and FTEs prepared by COI	20.10.2022	-
Interview notes and hearing transcripts			
	File note: Interview with Kirsten Scott (prepared by COI)	31.08.2022	COI.9999.0023.0001
	Transcript of interview with Kirsten Scott	31.08.2022	TRA.9999.0002.0001
	Transcript Day 1	26.09.2022	TRA.500.001.0001
	Transcript Day 2	27.09.2022	TRA.500.002.0001
	Transcript Day 3	28.09.2022	TRA.500.003.0001
	Transcript Day 5	30.09.2022	TRA.500.005.0001
	Transcript Day 6	04.10.2022	TRA.500.006.0001
	Transcript Day 7	10.10.2022	TRA.500.007.0001
	Transcript Day 8	11.10.2022	TRA.500.008.0001

Table Two: QHFSS Standard Operating Procedures (SOPs) provided by Commission

Document no.	Document title	Date effective	Doc ID
16004v7	AUSLAB Users Manual – Forensic DNA Analysis	06.01.2015	FSS.0001.0012.0015
16006v10	Walk in Cold Room & Freezer – General Use & Safety	27.06.2022	FSS.0001.0012.0028
17091v18	Organisation and Management of Forensic DNA Analysis	19.04.2022	FSS.0001.0012.0032
17103v10	Guideline for Subcontracting of Work	28.07.2021	FSS.0001.0019.0036
17117v21	Procedure for Case Management	08.03.2021	FSS.0001.0019.0877
17125v12	Processing of FTA Reference Samples Training Module	27.01.2021	FSS.0001.0012.0074
17146v15	Internal Security and Access to Forensic DNA Analysis	11.03.2022	FSS.0001.0012.0086
17149v13	Procedure for Waste Disposal in Forensic DNA Analysis	03.12.2021	FSS.0001.0012.0090
17151v14	Configuration of SAIKS	26.05.2022	FSS.0001.0012.0093
17152v22	Reference Sample Destructions	28.05.2021	FSS.0001.0012.0106
17154v20	Procedure for Quality Practice in Forensic DNA Analysis	24.05.2021	FSS.0001.0012.0136
17168v14	Basics of DNA profile interpretation	13.07.2020	FSS.0001.0012.0147
17185v12	Detection of Azoospermic Semen in Casework Samples	12.08.2021	FSS.0001.0012.0181
17186v15	The Acid Phosphatase screening test for seminal stains	27.06.2022	FSS.0001.0012.0195
17189v17	Examination For & Of Spermatozoa	21.03.2022	FSS.0001.0012.0205

17190v13	Tetramethylbenzidine Screening Test for Blood	18.07.2022	FSS.0001.0012.0219
17190v12	Tetramethylbenzidine Screening Test for Blood	22.12.2017	FSS.0001.0086.0001
17195v13	Spill Control	16.12.2021	FSS.0001.0012.0225
20966v12	Training Module - NucleoSpin Extraction	17.01.2022	FSS.0001.0012.0228
22857v12	Anti-contamination Procedure	20.07.2022	FSS.0001.0053.1279
22871v17	Procedure for Change Management in Forensic DNA Analysis	19.04.2022	FSS.0001.0012.0247
22872v11	Project Risk Assessment for Change Management in Forensic DNA Analysis	04.08.2021	FSS.0001.0012.0262
23401v8	Forensic DNA Analysis Validation and Verification Guidelines	08.04.2022	FSS.0001.0012.0264
23402v10	Writing Guidelines for Validation and Change Management Reports	18.08.2021	FSS.0001.0012.0269
23849v14	Common Forensic DNA Analysis Terms and Acronyms	08.04.2022	FSS.0001.0012.0281
23922v10	Procedure for the Use and Calibration of the pH Testr 30 pH Meter	26.10.2021	FSS.0001.0012.0289
23945v8	Workplace Health and Safety in DNA Analysis	21.01.2022	FSS.0001.0012.0296
23955v7	Disaster Victim Identification DNA Reports	22.06.2018	FSS.0001.0012.0300
23959v11	Storage Guidelines for Forensic DNA Analysis	06.10.2021	FSS.0001.0012.0313
23968v11	Forensic DNA Analysis Communications Procedure	20.01.2022	FSS.0001.0012.0330
24126v11	Forensic DNA Analysis Administrative Officer Case Management (AUSLAB)	01.10.2020	FSS.0001.0053.1076
24126v12	Forensic DNA Analysis Administrative Officer Case Management (AUSLAB)	21.07.2022	FSS.0001.0012.0343
24138v6	Ordering System Procedures- Forensic DNA Analysis	27.03.2022	FSS.0001.0012.0382
25049v8	Miscellaneous Duties for Laboratory Assistants	07.10.2020	FSS.0001.0053.1235
25049v9	Miscellaneous Duties for Laboratory Assistants	13.07.2022	FSS.0001.0012.0392
25303v12	Statistical Analysis for Paired Kinship and Paternity Trio Missing Child Scenarios	30.07.2021	FSS.0001.0012.0407
25368v8	Kinship Software- Genotype Frequency Module	24.02.2022	FSS.0001.0012.0450
25369v3	Sub-threshold Search Record	21.05.2015	FSS.0001.0012.0466
25581v6	Kinship Software- Paired Kinship and Paternity Trio Missing Child Modules	18.05.2020	FSS.0001.0012.0467
25583v9	Procedure for the use of the DNA Analysis Database Interface (DADI)	07.08.2020	FSS.0001.0012.0490

25747v6	Use and routine care of compound optical and stereo microscopes	12.08.2021	FSS.0001.0012.0503
26196v5	Kinship User Manual	05.12.2019	FSS.0001.0012.0511
26283v5	DNA Analysis Database Interface User Manual	15.09.2021	FSS.0001.0012.0611
28801v4	DNA Analysis Unit Management Review template	05.04.2018	FSS.0001.0025.5513
28801v5	DNA Analysis Unit Management Review template	14.07.2022	FSS.0001.0012.0673
30800v8	Investigating Adverse Events in Forensic DNA Analysis	11.04.2022	FSS.0001.0012.0677
30888v10	Forensic DNA Analysis Administrative Peer Review for AUSLAB Cases	28.06.2022	FSS.0001.0012.0725
30889v10	Forensic DNA Analysis Peer Review (FBPR1) (AUSLAB)	28.06.2022	FSS.0001.0012.0746
30890v9	Forensic DNA Analysis Forwarding Statements and Evidentiary Certificates for Cases within AUSLAB	26.02.2021	FSS.0001.0012.0756
30917v8	Forensic DNA Analysis- Procedure for external transfer of samples and subsamples	28.04.2022	FSS.0001.0012.0770
31213v5	Evidence Recovery system downtime procedures	05.07.2022	FSS.0001.0053.1254
31213v5	Evidence Recovery system downtime procedures	05.07.2022	FSS.0001.0012.0776
31214v6	Forensic DNA Analysis workflow and FTA downtime procedures	14.09.2021	FSS.0001.0012.0787
31281v8	Medical Examination Information form-DNA	13.12.2021	FSS.0001.0012.0811
31543v6	Initial Request Form for Change Management in Forensic DNA Analysis	11.04.2022	FSS.0001.0012.0184
31548v6	Minor Process Change Form for Change Management in Forensic DNA Analysis	04.08.2021	FSS.0001.0012.0815
31702v6	BMS monitoring and storage of refrigerator and freezer temperature data in Forensic DNA Analysis	01.09.2021	FSS.0001.0012.0816
32215v5	QPS Request Form to Transfer Samples from Forensic DNA Analysis to External Testing Facilities	14.07.2022	FSS.0001.0053.1234
33177v4	Intel Team Processes - Summary for Reporting Scientists	19.08.2021	FSS.0001.0012.0827
33183v5	Overview of Training and Introduction to GeneMapper ID-X (Presentation 1)	18.10.2021	FSS.0001.0012.0838
33184v5	Analysis Anomalies and Comments (Presentation 2)	18.10.2021	FSS.0001.0012.0879
33185v5	Genemapper IDX- Editing a Profile (Presentation 3)	18.10.2021	FSS.0001.0012.0950
33188	Introduction to DNA profile interpretation	10.06.2020	FSS.0001.0012.0986

33193v6	Paternity Presentation	24.03.2022	FSS.0001.0012.1044
33315v5	Procedure for Verification and Maintenance of Equipment	02.09.2021	FSS.0001.0053.1266
33315v6	Procedure for Verification and Maintenance of Equipment	14.07.2022	FSS.0001.0012.1074
33333v3	Participant Information and Consent Form (PICF)- Common Biological Samples	25.08.2021	FSS.0001.0012.1088
33334v3	Participant Information and Consent Form (PICF)- Semen Samples	25.08.2021	FSS.0001.0012.1092
33335v3	Participant Information and Consent Form (PICF)- Staff Vaginal Samples	25.08.2021	FSS.0001.0012.1095
33344v4	Appointment of Analysts for Police Services Stream	13.12.2019	FSS.0001.0012.1098
33538v4	Powerplex21 Case Management Presentation - Single Source and Complex Mixed DNA profiles	21.02.2022	FSS.0001.0012.1108
33539v3	PowerPlex21 Case Management Presentation- Mixed DNA profiles	07.07.2020	FSS.0001.0012.1173
33733v4	Reference Blood Processing in Forensic Register	17.12.2020	FSS.0001.0012.1211
33756v6	Operation and Maintenance of the QIAsymphony SP and AS modules	10.03.2022	FSS.0001.0012.1224
33771v7	Examination of in-tube samples	26.05.2022	FSS.0001.0012.1242
33773v3	Procedure for Profile Data using the Forensic Register	10.03.2022	FSS.0001.0012.1278
33798v8	Examination of Sexual Cases	17.05.2022	FSS.0001.0012.1384
33800v7	Examination of Items	17.05.2022	FSS.0001.0012.1416
33998v7	Phadebas test for saliva	17.05.2022	FSS.0001.0012.1457
34006v3	Procedure for the Release Using the Forensic Register	09.04.2021	FSS.0001.0002.1477
34006v4	Procedure for the Release Using the Forensic Register	22.07.2022	FSS.0001.0012.1468
34034v6	Forensic DNA Analysis Workflow Procedure	28.04.2022	FSS.0001.0012.1591
34035v6	Forensic Register FTA Processing	10.01.2022	FSS.0001.0012.1636
34040v4	Concentration of DNA Extracts using Microcon Centrifugal Filter Devices	18.02.2021	FSS.0001.0012.1685
34041v4	NucleoSpin method for DNA extraction and clean-up of DNA extracts	12.07.2021	FSS.0001.0012.1697
34042v4	Forensic Register procedure for automated sequence checking using the STORstar	27.10.2021	FSS.0001.0012.1710
34044v5	DNA IQ Extraction using the Maxwell 16	10.03.2022	FSS.0001.0012.1719
34045v7	Quantification of Extracted DNA using the Quantifiler Trio DNA Quantification Kit	03.05.2022	FSS.0001.0012.1753

34050v5	Operation and Maintenance of the Microlab STARlet and LabElite Integrated I.D. Capper	17.01.2022	FSS.0001.0012.1788
34052v6	Amplification of Extracted DNA Using the PowerPlex21 System	10.01.2022	FSS.0001.0012.1809
34054v4	Microlab STARlet and LabElite Integrated I.D. Capper Training Module	10.03.2022	FSS.0001.0012.1845
34055v3	Training Delivery Plan Microlab STARlet and LabElite Integrated I.D. Capper	24.02.2022	FSS.0001.0012.1856
34062v5	Capillary Electrophoresis Setup	15.02.2021	FSS.0001.0012.1861
34063v3	Preparation & Testing of Extraction Quality Controls and Testing of Extraction Reagents	07.12.2021	FSS.0001.0012.1889
34064v3	Miscellaneous Analytical Procedures and Tasks	15.12.2020	FSS.0001.0012.1903
34103v5	Receipt, Storage and Preparation of Chemicals, Reagents and Kits in Forensic Register	10.02.2022	FSS.0001.0012.1926
34112v7	STR Fragment Analysis of PowerPlex21 profiles using GeneMapper ID-X software-FR	12.02.2021	FSS.0001.0012.1971
34114v6	Proficiency Testing in Forensic DNA Analysis-FR	17.05.2021	FSS.0001.0012.2041
34131v4	Capillary Electrophoresis Quality (CEQ) Check- Forensic Register	15.02.2021	FSS.0001.0012.2067
34132v6	DNA Extraction and Quantification of Samples using the QIAsymphony SP and AS-FR	10.05.2021	FSS.0001.0012.2091
34229v3	Explanations of Exhibit Results for FR	12.07.2021	FSS.0001.0012.2140
34245v4	Reference Sample Result Management	09.02.2022	FSS.0001.0012.2210
34246v5	Uploading and Actioning on NCIDD-FR	26.04.2022	FSS.0001.0012.2249
34247v5	Creating and Reviewing Links-FR	09.02.2022	FSS.0001.0012.2284
34248v7	Administrative Team- Case File related duties using the Forensic Register	28.06.2022	FSS.0001.0012.2367
34249v6	Forwarding Statements and Evidentiary Certificates for Cases within the Forensic Register	28.06.2022	FSS.0001.0012.2447
34280v4	Environmental Monitoring	24.02.2022	FSS.0001.0012.2473
34281v6	Procedure for the Use and Maintenance of the Forensic DNA Analysis Elimination Databases	03.12.2021	FSS.0001.0012.2491
34298v4	Validation of Examinations	30.05.2022	FSS.0001.0012.2504
34300v3	Examination of post mortem and associated samples from deceased persons	10.11.2020	FSS.0001.0053.1054

34300v4	Examination of post mortem and associated samples from deceased persons	14.07.2022	FSS.0001.0012.2518
34307v2	Forensic DNA Analysis - Case File Particulars	15.03.2022	FSS.0001.0012.2541
34308v3	Procedure for Intelligence Reports and Interstate Interpol Requests in the Forensic Register	30.04.2021	FSS.0001.0012.2542
34312v3	Operation and Maintenance of the Applied Biosystems 3500xL Genetic Analyzer	31.05.2021	FSS.0001.0012.2560
34322v3	Technical and Administrative Review of Records Created in the Forensic Register	08.12.2020	FSS.0001.0053.1250
34322v4	Technical and Administrative Review of Records Created in the Forensic Register	19.07.2022	FSS.0001.0012.2580
34327v2	Sample and Case Prioritisation and Allocation using the Forensic Register	01.02.2022	FSS.0001.0012.2584
34514v5	Preparation & Testing of Quantification Standards, In-house Controls, Quantification Kits and Amplification Kits	07.06.2022	FSS.0001.0012.2630
34610v3	Basic Programming for Microlab STARlet and LabElite Integrated I.D Capper using Venus Software	08.11.2021	FSS.0001.0012.2669
35007v4	Use of STRmix Software	06.09.2021	FSS.0001.0012.2714
35028v4	Operation and Maintenance of the AB Quant Studio RT-PCR Instrument	26.05.2022	FSS.0001.0012.2733
35093v2	Operation and Maintenance of the Direct-Q 3 UV-R system	12.07.2021	FSS.0001.0012.2743
35605v2	DNA IQ Extraction Using the Maxwell FSC	10.03.2022	FSS.0001.0012.2756
35692v1	BSD600 Ascent A2 Operator Manual	12.11.2020	FSS.0001.0053.1034
35692v2	BSD600 Ascent A2 Operator Manual	05.07.2022	FSS.0001.0012.2790
35998v1	NIFA for Familial, DVI and Missing Persons searching	13.04.2022	FSS.0001.0012.2812
36061v1	Procedure for Resolving DNA Profile Interpretation Differences of Opinion	10.09.2021	FSS.0001.0012.2829
36067v1	Forensic DNA Analysis Newsletter	16.09.2021	FSS.0001.0012.2843
36070v1	Delivery of the gradual exposure checklist	07.10.2021	FSS.0001.0012.2845
36187v1	Maintenance of the ProFlex PCR System & ProFlex Server	22.02.2022	FSS.0001.0012.2847
36275v1	How to use STRmix v2.8.0 data entry training	07.06.2022	FSS.0001.0012.2852

Appendix 5 – De-identified list of interviews and meetings conducted

Date	Position
21.09.2022	Reporting Scientist
	Reporting Scientist
	Reporting Scientist
	Reporting Senior Scientist
23.09.2022	Reporting Scientist
	Reporting Scientist
	Senior Scientist – Quality and Projects
	Quality Manager (FSS)
	Reporting Scientist
	Reporting Senior Scientist
26.09.2022	Reporting Scientist
	Reporting Scientist
	Team Leader – Evidence Recovery and Quality
	Executive Director (FSS)
	Team Leader – Reporting and Intelligence
	Managing Scientist
27.09.2022	Evidence Recovery
29.09.2022	Reporting Scientist
4.10.2022	Reporting Senior Scientist
6.10.2022	Reporting Scientist
7.10.2022	Analytical Senior Scientist
14.10.2022	Reporting Scientist

Appendix 6 – Information pertaining to site visit

Date	Event
21.09.2022	Introductory meeting with all staff of Forensic DNA analysis
	Introductory meeting with Managing Scientist and Team Leaders
	Tour of FSS DNA Analysis Unit campus including Evidence Recovery laboratory, Analytical laboratory, working areas for management, Administrative staff, Quality, Evidence Recovery, Analytical and Reporting scientists
	Interviews with FSS staff
	Demonstration of Forensic Register and validating results with analytical scientist
23.09.2022	Inspection of Property Point
	Interviews with FSS staff
	Discussion with analytical scientists about Forensic Register interface and plate reading computers (including demonstration)
26.09.2022	Interviews with FSS staff
	Informal discussions with scientists working in analytical and reporting sections
	Review of recent casefiles
27.09.2022	Interviews with FSS staff
	Review of recent casefiles

Appendix 7

OFFICIAL: Sensitive

Justice Walter Sofronoff KC, Commission of the Inquiry into DNA Testing in Queensland

Following on from our recent discussion, we propose prompt attention and action on the following point.

Current practice in the Queensland Health Forensic and Scientific Services DNA Analysis Unit is that when samples are retested using an updated platform (STR kit), only the sample is subjected to this retesting. Similarly, when a sample is subjected to a rework technique such as a microcon, again it is only the sample subjected to this rework.

Reagent blanks (also called extraction negative controls) are routinely processed with samples to give an indication of the health of the system. It is imperative that these blanks undergo the same testing (reagents, process etc) as the case samples themselves.

Whilst this approach (i.e. subjecting reagent blanks to the same degree of testing) is current practice for 'first pass' DNA testing at QHFSS, it is not currently part of the process for samples undergoing upgrade or concentration (microcon).

The consequence of this is that DNA information attributed to the case sample after such an upgrade or concentration process **may** in fact be present as a result of contamination. Without assessing the health of the reagent blank under the new testing regime (concentration or different STR kit), any potential contamination would not be detected.

We appreciate the likelihood of this event is low, however any occurrence could have serious consequences. For example, a person could be incorrectly excluded as the source of the biological material if a differing (contaminant) profile is detected in the case sample. Alternatively, if this contaminant profile relates to a different case sample, the (contaminant) profile could be loaded to the database and provide an erroneous link to Police.

The findings contained in this memo are based on the information available to Heidi Baker and Rebecca Kogios as of the date of the memo. If additional information becomes available these findings may be subject to revision.

The findings contained in this memo are made in a personal capacity and do not represent the official views or position of either the Institute of Environmental Science and Research Limited (ESR) or Victoria Police.

This report was completed on 26th September 2022 and describes the opinions and conclusions of the undersigned

Heidi Baker BSc (Hons) Genetics and Rebecca Kogios PhD, BSc (Hons), LLB

Appendix 8: Summary of recommendations

Recommendation 1.

Consideration be given to the establishment of a Forensic Science Advisory Board to assist with the coordination and accountability for managing forensic services across agencies

Recommendation 2.

QPS/ QHFSS to retrospectively review all sexual assault and complex cases falling outside the 'hot jobs' and 'major incident' categories:

a. QPS to check for potential for further DNA testing from a case context perspective
b. Then QHFSS to facilitate progression of further testing as required

Recommendation 3.

QHFSS to establish fit-for-purpose, work streams for the different types of casework received. This should comprise:

a. Implementing a separate work stream for sexual assault and other complex cases (including cold cases)
b. For sexual assault and other complex cases (including cold cases):
    i. Allocating a case manager to devise a fit-for-purpose examination strategy at point of receipt
    ii. Ensuring examination strategies are triage-based where appropriate
    iii. Enabling reporting scientists to make decisions relating to any aspect of the case prior to the release of results; including rework and requesting additional samples are submitted for testing
    iv. Reviewing cases holistically, prior to reporting of results

Note: QHFSS will require support from QPS in order to successfully implement this recommendation. Specifically, QPS must ensure provision of all relevant information to enable development of a fit-for-purpose examination strategy and holistic case review.

Recommendation 4.

QPS/ QHFSS to retrospectively review all samples reported as 'DNA Insufficient for Processing' for potential re-testing:

a. QPS to check for potential for further DNA testing from a case context perspective

b. Then QHFSS to facilitate progression of further testing as required

Note: Review should not be limited to consideration for standard DNA testing only.

Recommendation 5.

QHFSS to prioritise determination of LOD through appropriate validation.

Recommendation 6.

QHFSS to consider the need for retrospective review of samples reported as 'No DNA detected' once LOD has been determined through appropriate validation. If further testing is required:

a. QPS to check for potential for further DNA testing from a case context perspective

b. Then, QHFSS to facilitate progression of further testing as required

Note: Review should not be limited to consideration for standard DNA testing only.

Recommendation 7.

QHFSS to cease application of current (0.001ng/µl) threshold and progress all samples until such a time as recommendation 5 has been actioned.

Recommendation 8.

QHFSS, should they wish to apply a quantification threshold below which routine DNA profiling does not occur, must ensure that:

a. It can be overruled on a sample-by-sample basis at the discretion of the reporting scientist, based on diagnostic information, case and sample context, and availability of alternative DNA profiling techniques

b. The existence and impact of such a threshold must be conveyed to the end user of the product

c. The approach should be socialised with relevant stakeholders prior to implementation

Recommendation 9.

QHFSS to cease use of the wording "unintended human error" as an explanation for retracting result.

Recommendation 10.

If DNA profiling results are to be used as a measure of success, QHFSS and QPS should work together to develop a robust framework encompassing agreed parameters across the whole end-to-end forensic workflow.

Recommendation 11.

QHFSS to strengthen reporting practices to ensure provision of reports in a manner that is readily understood by the end users of the information through:

a. Collaborating with clients and all relevant stakeholders in the development of qualifying statements to accompany results that effectively communicate the meaning of the result and any associated limitations.

b. Using these qualifying statements to accompany results in all communications and reports to stakeholders

Recommendation 12.

QHFSS, in conjunction with relevant stakeholders, should consider:

a. Standardising the reporting of 'unknown' DNA profiles to inform the end users of how many unknown DNA profiles were obtained, indication of biological sex if possible, and whether or not the DNA contribution of this unknown person is suitable for meaningful comparison purposes.

b. Paring back the number of categories used in reporting to align with the BSAG categories.

c. Use of tables to present DNA results.

d. Broader use of verbal equivalents aligned to the BSAG scale.

e. Provision of a visual aid to assist in the comprehension of a likelihood ratio.

f. Collaborative review of attribution of bodyfluids to DNA results with QPS, to determine circumstances when this is/isn't possible; and where possible who is best placed to report such an opinion.

Recommendation 13.

QHFSS to prioritise the validation and implementation of Y-STR profiling to enhance the ability to recover male DNA in sexual assault casework.

Recommendation 14.

QHFSS to implement routine sub-contracting of samples that would benefit from Y-STR testing to another accredited provider, until such a time as in house capability is implemented into casework.

Recommendation 15.

QPS/ QHFSS to retrospectively review all sexual assault casework to identify cases with samples suitable for Y-STR testing:

a. QPS to check for potential for further DNA testing from a case context perspective

b. Then, QHFSS to facilitate progression of further testing as required

Recommendation 16.

QHFSS to ensure any change to casework process, equipment or methodology is appropriately validated, and that the impact of the change on the entire system is considered holistically and documented.

Recommendation 17.

QHFSS to investigate use of a lower elution volume through revalidation of DNA IQ and DNA Investigator.

Recommendation 18.

QHFSS to cease the practice of requantifying a sample post-microcon.

Recommendation 19:

QHFSS should cease bone case work until such a time as the protocol for cleaning bone equipment is validated on the specific equipment utilised, and with the current workflow methodology, to assess suitability. Once bone casework is reinstated, an investigation of the long-term impact of the cleaning method on such tools should be conducted.

Recommendation 20:

QHFSS should review sampling, extraction and amplification methods to ensure the highest quality results from the widest range of bone and teeth samples. After this, an optimal suite of methods should be validated and implemented for use in bone casework.

Recommendation 21:

QPS/ QHFSS (and Coronial Family Services if appropriate) to retrospectively review bone and teeth cases where it was not possible to obtain a DNA profile suitable for comparison.

a. QPS to check for potential for further DNA testing from a case context perspective

b. Then, QHFSS to facilitate progression of further testing as required

Note: Review should not be limited to consideration for standard DNA testing only.

Recommendation 22.

In relation to extraction negative controls, QHFSS should:

a. Retrospectively review the extraction negative controls where the associated case sample has undergone additional testing.

b. In future, ensure extraction negative controls undergo the same testing as the corresponding case samples, at the same time, unless the control sample has been exhausted.

Recommendation 23.

QHFSS to strengthen contamination minimisation prevention and detection through:

a. Documenting the requirement to segregate likely high yield from likely low yield items and implementing a workflow to achieve this.

b. Exploring alternate procedures to the scraping method for recovery of biological material.

c. Minimising and recording all visitors to the DNA Analysis Unit and Property Point.

d. Installing a biohazard safety cabinet in the Evidence Recovery laboratory if receiving large bloodstained items.

e. If reduction in volume post PCR is still occurring, the machine should be removed from action and cleaned prior to being re-used; and consideration should be given to not using the impacted wells of the plate.

Recommendation 24.

QHFSS to ensure genotyping and profile interpretation are performed by two authorised scientists independently, ideally, blinded to each other's work.

Recommendation 25.

QHFSS to work with bDNA to facilitate changes to the Forensic Register to enable blind peer review of DNA interpretation.

Recommendation 26.

QHFSS to ensure recording of rationale for decision making is made in the official case record.

Recommendation 27.

QH should facilitate an external review of the use of STRmix covering:

a. Alignment of use to in house validation and SOPs;

b. Alignment of use to STRmix recommendations.

c. Investigation of whether QHFSS' use of dropping loci in STRmix is fit for purpose;

d. Investigation of whether QHFSS' use of the STRmix diagnostic data is fit for purpose; and

e. Investigation of whether the assignment of the number of contributors is fit for purpose, both for STRmix and the implications for the wider case.

f. Investigation of the appropriate "stratification" of populations in STRMix to determine likelihood ratios

Recommendation 28.

QHFSS to strengthen its peer review process through:

a. Implementation of peer checking of spermatozoa on slides in evidence recovery

b. Random allocation of peer reviewer (where possible).

Recommendation 29.

QHFSS should ensure all staff involved in plate reading have authorisations in the relevant competency and are rostered to perform the task regularly.

Recommendation 30.

QHFSS should ensure all court reporting staff participate in a court monitoring program.

Recommendation 31.

QHFSS should consider subjecting all staff involved in plate reading to individual proficiency testing.

Recommendation 32:

QHFSS to ensure provision of feedback to health practitioners involved in the collection of SAIKs to drive best practice in DNA collection.

Recommendation 33:

QHFSS, if continuing to provide SAIKs to the criminal justice system, to consider attaining accreditation to relevant standard.

Recommendation 34:

QHFSS to research optimal kit composition inclusive of swab type, number of swabs, and consumables to enable collection of a reference sample and slide at point of collection, where appropriate to do so.

Recommendation 35.

Establishment of an interagency group focused on best practice in relation to sexual assault.

Recommendation 36.

QHFSS to make changes to the DNA Analysis Unit organisation structure to:

a. Establish a management role with sole responsibility for forensic DNA service delivery (including resourcing of staff and equipment, budget and strategy)

b. Establish a separate Technical Lead role, at equivalent level to the Manager, to serve as custodian of scientific health, ensuring best science-led decision making across the end-to-end forensic biology workflow.

Recommendation 37.

QH to consider implementing Team and Individual Performance and Development KPIs within QHFSS to drive a values-based culture

Recommendation 38.

QH to strengthen quality culture through establishing a Quality Manager role, dedicated solely to forensic casework and a Quality Lead role within each of the DNA Analysis Unit teams

Recommendation 39.

QHFSS to propose to ANZPAA NIFS, through the QSAG, that a national QM framework, utilising a tiered approach informed by risk, is developed for quality issue investigation.

Recommendation 40.

In the interim, QH strengthen its approach to quality issue management by:

a. Capturing all issues in a single log providing full visibility for trend analysis

b. Applying formal risk assessment to classify issues on the basis of risk/ impact and likelihood of occurrence

c. Progressing issues via a timely, fit-for-purpose process, based on classification

d. Progressing issue investigation with in-depth root cause analysis for all issues that might impact results

e. Establishing Quality Manager oversight through QM review to ensure the correct issue identification and resolution process has been followed; and the investigation has been undertaken to a suitable standard to ensure proper processes are followed and investigations undertaken to a suitable standard

f. Communicating information regarding all quality issues identified and associated remedies to relevant staff

g. Reporting to senior management on high severity/ high risk issues and on overarching trends.

Recommendation 41.

QHFSS to adopt a standardised, contemporary approach to project methodology, provide training to staff engaged in project-related work and employ specific skill sets such as statistics expertise in project work, as and when required.

Recommendation 42.

QH to proactively triage SOP comments to ensure actioning of amendments in an appropriate timeframe

Recommendation 43.

QHFSS to consider broadening their scope of accreditation to be assessed against the four Australian Standards

Recommendation 44.

QHFSS to strengthen its internal audit process through including full casefile review; and revisiting areas of non-compliance from prior audits

Recommendation 45.

QH to resource a dedicated Research, Development and Innovation capability to support proactive access to an up to date, fit for purpose suite of forensic techniques and ensure QHFSS remains contemporary in terms of scientifically valid service delivery.

Recommendation 46.

We encourage QHFSS to engage with relevant tertiary education providers and discuss common ground in the research and expertise space.

Recommendation 47.

QHFSS to work together with QPS and other relevant stakeholders to strengthen relationships and develop a whole-of-justice approach to provision of forensic science services for the State of Queensland