

**Fifth Report of the
Independent Investigator
for the
Houston Police Department
Crime Laboratory and Property Room**

**Michael R. Bromwich
Independent Investigator**

Fried, Frank, Harris, Shriver & Jacobson LLP
1001 Pennsylvania Avenue, N.W., Suite 900
Washington, D.C. 20004
202.639.7000

<http://www.hpdlabinvestigation.org>

May 11, 2006

Investigative Team

Independent Investigator

Michael R. Bromwich
Fried, Frank, Harris, Shriver & Jacobson LLP

Fried Frank Team

Tommy P. Beaudreau
Piper M. Hendricks
Beth C. McClain
Jennifer M. Wollenberg
Joshua Cowdery
Michelle Hand-Arevalo
H. Coleman Hinnant
Charmain Ho-A-Lim

Scientific Advisory Board

Margaret C. Kuo
Orange County Sheriff-Coroner's Office (ret.)

Douglas M. Lucas
Centre of Forensic Sciences of the Province of Ontario, Canada (ret.)

Bruce W. Vander Kolk
Illinois State Forensic Sciences Command (ret.)

Forensic Scientists

Robert P. Bianchi
DEA Special Testing and Research Laboratory (ret.)

Roger J. Bolhouse
Michael Sinke
Speckin Forensic Laboratories

Michael A. Evans, Ph.D.
American Institute of Toxicology Laboratories

HPD Crime Lab Independent Investigation

Patricia P. Hamby
International Forensic Science Laboratory & Training Centre

Edward E. Hueske
Arizona Department of Public Safety (ret.)

Karen L. Irish
Forensic Services Section, Baltimore County Police Department (ret.)

Rhonda Roby
Identity Quest, LLC

Mark D. Stolorow
Jeanine Baisch, Ph.D.
Rick W. Staub, Ph.D.
Orchid Cellmark

Theresa F. Spear
California Department of Justice, Bureau of Forensic Services
California Criminalistics Institute (ret.)

Statisticians

Jessica Pollner, Ph.D.
Arthur Baines
Kerri-Ann Cullinan
PricewaterhouseCoopers LLP

Executive Summary

This is the Fifth Report of the Independent Investigator for the Houston Police Department (“HPD”) Crime Laboratory and Property Room. This report, like our previous reports, is intended to advise the City of Houston (the “City”) and the public of our progress in fulfilling the mandate to conduct a comprehensive and independent investigation of the Crime Lab and Property Room.¹

The investigation is divided into two phases. In Phase I, which we completed with the issuance of our Third Report on June 30, 2005, we investigated the historical operations, practices, and management of the Crime Lab and Property Room as well as assessed the scope of the work to be performed during the second phase of the investigation. Phase II, which began with the Houston City Council’s approval of our Phase II Plan on August 24, 2005, centers on the review of hundreds of cases originally analyzed by Crime Lab forensic scientists in seven forensic science disciplines in which the Lab historically performed work -- serology, DNA, trace evidence, controlled substances, firearms, toxicology, and questioned documents.

We have now completed our Phase II case reviews for all of the forensic science disciplines with the exceptions of serology and firearms. Since our last report, we also have conducted detailed interviews of three former members of the DNA/Serology Section about specific cases with which they were involved as well as about technical practices and issues we have identified through the case reviews. Unfortunately, our further attempts to secure the cooperation of Donald Krueger, the former head of the Crime Lab; Christy Kim, a longtime analyst in the Crime Lab’s Serology and DNA Sections; and James R. Bolding, the former head of the DNA/Serology Section, have not been successful. This is particularly unfortunate because Ms. Kim and Mr. Bolding personally performed the analytical work in many of the most problematic cases we have reviewed. Therefore, our inability to gather information from them in connection with our case reviews has hampered our ability to determine whether any of the most troubling cases we have found were the product of intentional scientific fraud.

This report provides additional detail about the results of our case reviews and the major and minor issues we have identified with respect to the work

¹ Our reports are posted on our Web site at www.hpdlabinvestigation.org.

performed during the relevant time periods in each of the sections of the Crime Lab. We have continued to find that many of the Crime Lab's forensic scientists performed high quality technical work and accurately reported their results. This is especially true for the Firearms, Toxicology, and Questioned Documents Sections. Even in the areas in which the Crime Lab performed consistently reliable work, however, certain fundamental practices -- for example, thorough documentation of all analytical work, up-to-date standard operating procedures ("SOPs"), quality assurance and quality control, technical reviews, training, and outside inspections -- were either inconsistently applied or completely absent from the Lab during the periods we are reviewing.

Since our last report, we have continued to uncover major issues in the serology and DNA cases analyzed by the Crime Lab, dating back to 1980 in the area of serology. Thus far, our investigation has identified a total of 43 DNA cases and 50 serology cases analyzed by the Crime Lab that we have determined to have major issues, which we have defined to mean problems that raise significant doubt as to the reliability of the work performed, the validity of the analytical results, or the correctness of the analysts' conclusions. Many of the problems we have observed in the serology cases infected the Crime Lab's DNA profiling operations as DNA testing gradually supplanted serology in the early 1990s. This is unfortunate, but not surprising, since many of the Crime Lab's serologists, such as Mr. Bolding and Ms. Kim, became DNA analysts. In addition, although the technology for analyzing biological evidence changed with the advent of DNA profiling, the Crime Lab's flawed management and practices -- as well as the inadequate level of support and attention the Lab received from HPD -- did not.

A. Serology

In our initial serology case reviews last fall, we identified severe problems with the Crime Lab's serology work performed during the period 1987 to 1990. As a result, in December 2005, we recommended to the Stakeholders Committee and HPD that we modify the scope of the serology case reviews as follows. First, we recommended that the time period of our case reviews be expanded to cover the years 1980 through 1993 in order to include the entire period in which Mr. Bolding performed serology at HPD as well as a short period prior to his involvement. Second, we recommended changing the basis of our case selection in serology from random sampling, which is designed to provide a cross section of the work performed by the Crime Lab, in order to concentrate our efforts on systematically attempting to identify cases in which flawed serology work by the Lab may have played a role in a criminal conviction, either by guilty plea or as a

result of a trial verdict. These recommended changes reflect the fact that our initial serology case reviews revealed such a high percentage of major issues and other problems that it made sense to focus on those cases in which there was the potential to identify specific miscarriages of justice rather than to continue using a random sampling technique, which almost surely would have continued to show an unacceptably high rate of similar analytical problems.

HPD and the Stakeholders Committee approved our recommended changes in the selection criteria for our serology case reviews, and we implemented the revised methodology in January 2006. We have faced significant logistical challenges in identifying serology cases that might be related to actual convictions of individual defendants, particularly cases from the early 1980s that pre-dated the Crime Lab's use of an electronic case tracking system. HPD has been fully supportive of our efforts and has devoted significant investigative resources to assisting us in identifying serology conviction cases dating back to 1980. Nevertheless, progress in identifying these cases has been slow.²

We have now completed reviews of 336 serology cases performed by the Crime Lab between 1980 and 1993, which includes the 80 substantive cases covered in our Fourth Report and 256 cases related to convictions by guilty plea or trial verdict that we have reviewed since January 1, 2006. We have identified a total of 50 serology cases involving major issues.

Although we continue to observe all of the same serious deficiencies that we discussed in our Fourth Report, we focus in this report on the following significant problems with the serology work performed in the Crime Lab during the 1980s and early 1990s:

² We recently received the approval of HPD and the Stakeholders Committee to focus our ongoing review of serology cases on those cases analyzed by the Crime Lab during the period 1980 through 1993 that might have played a role in the conviction of a person who currently remains incarcerated. Because many defendants who were convicted during this period, either by guilty plea or at trial, have already served their sentences, this will significantly reduce the number of serology cases that we need to identify and review. We will consult with the City Council, the Stakeholders Committee, and HPD as to whether to expand this review to include all serology conviction cases whether or not the defendant remains incarcerated.

- Failing to perform potentially probative, inculpatory or exculpatory, ABO typing in a large number of cases, particularly sexual assault cases.
- Failing to report probative ABO typing results due to an apparent reluctance to report exclusions, findings of blood types not consistent with those of victims or known suspects, and findings indicating the presence of relatively rare ABO type AB factors.
- Misinterpreting and inaccurately reporting ABO typing results.
- Reporting test results that are unsupported by documented analysis.
- Engaging in poor forensic scientific practices, such as misapplying substrate controls, reporting ABO typing results indicating no ABO activity as “inconclusive,” and producing incorrect typing results due to poor training or technique.

In this report, we discuss in detail the case of Derrick Leon Jackson, a capital murder case, in which an initial failure to report ABO typing results was reversed when a new suspect was learned to have the very ABO blood type found -- and not reported -- at the time of the original analysis.³ In 1988, Mr. Bolding obtained ABO typing results from a bloodstain sample taken from the scene of a grisly double homicide that indicated it was foreign to both the victims and the individual who was then suspected of the killings. At the time, however, Mr. Bolding reported these results as “inconclusive.” The investigation languished until 1995 when Mr. Jackson became the prime suspect. Mr. Jackson’s ABO type was consistent with the foreign ABO factor Mr. Bolding had detected in tests he described as “inconclusive” in 1988. Without performing any additional testing, Mr. Bolding altered his worksheets to include previously absent conclusive interpretations of his original typing results performed in 1988 and issued a new report stating that ABO activity consistent with Mr. Jackson’s ABO type was found in two bloodstain samples recovered from the crime scene.

B. DNA

In light of the seriousness and pervasiveness of the major issues we found in our case reviews in 2005, we recommended to the Stakeholders Committee

³ *Texas v. Jackson*, Cause No. 748752 (Harris County, Tx.).

and HPD that we focus the case reviews on the 69 DNA cases that were part of the DNA re-test project previously undertaken by HPD in conjunction with the Harris County District Attorney's Office. The re-test project was intended to identify all cases in which DNA analysis performed by the Crime Lab might have played a role in a conviction, either by guilty plea or after trial. The 69 cases were ones in which either (a) evidence had not yet been tested by outside laboratories or (b) re-testing by outside laboratories had failed to confirm the Crime Lab's original DNA testing results. We suggested this approach in order to focus resources on reviewing the cases in which there had been a conviction and outside testing had not confirmed the Crime Lab's original results. We believed that these cases posed the greatest risk for potential injustice related to flawed DNA profiling work performed by the Crime Lab. The Stakeholders Committee and HPD approved our recommendations, and we changed the focus of our DNA case reviews accordingly.

We have completed our review of all 69 of these DNA conviction cases in which either the evidence has yet to be re-tested or the Crime Lab's original DNA results have not been confirmed through re-testing. We have identified major issues in 25 -- or approximately 36% -- of these cases. In total, we have reviewed 135 DNA cases analyzed by the Crime Lab from the entire period in which the Lab performed DNA analysis and have identified major issues in 43 of them, which is approximately 32% of the cases we have reviewed.

Many of the major issues we have identified in the cases we have reviewed since our Fourth Report are similar to those we discussed in that report, including the failure to report probative, even potentially exculpatory, results; poor technical work and potential contamination; questionable interpretation of results; and misleading reporting of the statistical significance of DNA profiling results in mixture cases.

Similar to what we have found in many serology cases, we have found further evidence of a pattern of reluctance on the part of the Crime Lab's DNA analysts to report typing results inconsistent with the known profile of either a victim or a suspect. With the ability of DNA profiling to generate powerful analytical results that point to, or away from, a suspect, the Crime Lab's practice of failing to report probative, and in some cases potentially exculpatory, DNA typing results became all the more disturbing.

It is not clear whether this pattern and practice of avoiding the reporting of DNA typing results that were not consistent with a victim or known suspect is attributable to the DNA analysts' lack of confidence in their ability to obtain

reliable results or to a more sinister manipulation of analytical results. It is apparent, however, that DNA analysts in many cases tended toward reporting only those results that, from their perspective, were “safe” in the sense that they were consistent with other evidence in the case or with the investigators’ expectations. This sometimes meant that analysts suppressed potentially exculpatory RFLP results in favor of reporting less reliable or less discriminating PCR-based typing results that appeared to reflect an association between the suspect and evidence in the case. When such selective reporting was coupled with the Crime Lab’s systematic overstatement of the statistical significance of these weaker PCR results, a very significant potential for injustice was created.

C. Trace Evidence

We identified 223 cases as having been opened by the Trace Evidence Section during the period covered by our review. We have completed our review of all 223 of these trace evidence cases, and we found that 129 involved the type of substantive analysis by the Trace Evidence Section that was within the scope of our review. We found that 5 cases (4% of the substantive sample) had major issues and that 44 cases (34% of the substantive sample) had minor issues. All of these issues were described in detail in our Fourth Report; no new types of deficiencies were identified during the remainder of our review of trace evidence cases.

We also selected 40 serology and DNA cases to determine (a) whether any trace evidence was examined in connection with those cases and (b) if so, whether there were any problems with that work. We selected these 40 cases because they involved either death penalty or other high profile convictions.⁴ We identified no major issues in these 40 cases, although 5 cases (12.5%) involved minor issues. These minor issues primarily related to documentation, which is consistent with our findings with respect to the general sample of 223 trace evidence cases.

D. Controlled Substances

We reviewed three separate Controlled Substances Section case samples during the Phase II review -- one comprised of general controlled substances

⁴ It is not uncommon for serology and DNA cases to contain trace evidence components. Cases such as homicides and sexual assaults in which there may be biological evidence (for example, blood or semen) may also involve evidence, such as hairs, that could be subjected to trace evidence examination and comparison.

cases,⁵ a second sample of cases analyzed by Vipul Patel, and a third sample of cases analyzed by James Price. We established separate samples for Mr. Price and Mr. Patel because they are former Controlled Substances Section analysts associated with apparent fabrication of scientific findings. We also reviewed an additional 50 files to evaluate how the Crime Lab handled and analyzed “bulk” or “bulky” cases, which, as the terms suggest, are cases involving large quantities of evidence. We have completed our review of the bulk controlled substances cases, as well as all three Controlled Substances Section case file samples.

1. Results of the General Controlled Substances Case Reviews

We identified over 200 cases in the general controlled substances sample that contained minor issues, and we consistently noted that most of those issues should have been detected through administrative and/or technical reviews. Major issues were identified in 116 (nearly 23%) of the 513 cases in the general controlled substances sample. In particular, we found the following types of deficiencies:

- Analysts in the Controlled Substances Section, as a matter of custom and practice, reported the *quantity* of a controlled substance in a liquid or tablet as if it had been determined through analytical testing, when in fact the analysts established quantitations based solely on presumption, Crime Lab protocol, or visual (also referred to as “physical” or “pharmaceutical”) identification.
- Similarly, analysts often reported the *identity* of a controlled substance sample based only on physical or visual inspections and failed to acknowledge in those reports that chemical tests were not conducted to identify the substance. Instead, samples were identified by merely comparing tablet markings, imprints, etc. to those found in reference sources, such as the Physician’s Desk Reference.
- We identified two cases in which analysts did not report the presence of a controlled substance and therefore failed to report a probative finding.

⁵ The general controlled substances sample does not include cases handled by Mr. Patel or Mr. Price.

- Two other cases involved types of errors in the recording of lab data that could seriously affect the prosecution of a defendant. In each of those cases, however, the ultimate outcomes for the defendants were not affected by the errors.
- Finally, one major issue case from the general controlled substances sample involved an unexplained test result change. Due to the poor documentation in the case file, we could not determine if the change was made because the original analyst misinterpreted the tests or if the substance was tested a second time and produced different results.

2. Results of the Bulk Evidence Case Reviews

We reviewed 50 bulk evidence cases; 2 contained deficiencies characterized as major issues, and 42 involved minor issues. The major issues involved the same issues relating to reporting liquid quantitations without performing quantitative analyses.

A number of the minor issues identified in the bulk evidence case review involved documentation deficiencies and the failure to follow generally accepted forensic science practices. Analysts regularly failed to follow SOPs that specifically related to the handling of bulk evidence. Moreover, the Crime Lab's SOPs and other manuals offered little guidance regarding which cases were to be classified as bulk cases.

3. Results of the Patel Case Reviews

We have completed our review of the 366 cases in the Patel sample; 18 cases involved major issues, and most (14) of those cases were described in our Fourth Report. The 4 new major issue cases that we identified involved the following deficiencies:

- Mr. Patel reported an undocumented finding in a case involving evidence identified as LSD. Although preliminary tests indicated that LSD was indeed present in the sample and we concluded that it is likely that the substance was correctly identified, the documentation in the case file relating to confirmatory gas chromatography/mass spectrometry ("GC/MS") testing did not adequately support that conclusion.
- In three other cases in the sample, Mr. Patel failed to clearly report that sample identifications were based on visual or physical comparisons,

rather than on analytical testing. As discussed above, we characterize such an identification as a major issue because it is potentially misleading.

4. Results of the Price Case Reviews

We have reviewed all 342 cases in the Price sample. We identified major issues in 11 of those cases; 7 were previously described in our Fourth Report. Two of the 4 newly-identified major issue cases involved the identification of dihydrocodeinone (Vicodin) based on a comparison of the mass spectrum of the evidence to the mass spectrum of a standard that did not show the principal peaks and ions necessary to identify the substance. Identification based on an inadequate standard is not consistent with generally accepted forensic laboratory practices.

In a third case, Mr. Price failed to perform a critical examination when identifying evidence. Finally, Mr. Price reported the identity of a tablet or capsule after performing a physical identification, without reporting that the identification was based only on visual or physical testing.

E. Toxicology

We have completed our review of the toxicology case file sample. Of the total 396 files selected in the samples, only about half (213) involved actual toxicology casework. Although we made adjustments in our search criteria to isolate true toxicology cases, our reviews showed that most of the remaining 183 cases in the combined samples involved analysis associated with controlled substances casework, rather than toxicology.

We consulted PricewaterhouseCoopers LLP ("PwC") to determine whether the scope of our review was sufficient under statistical standards to establish confidence in the results of our toxicology case file review. PwC confirmed that, in light of the very conservative parameters that were used to establish the sample, the results maintained a high level of statistical precision and that we did not need to conduct additional sampling of toxicology case files.

We identified only one major issue case in our review of the 213 toxicology cases, and that case was discussed in detail in our Fourth Report.⁶ We

⁶ We identified only one major issue in the toxicology sample, which involved the identification of three drugs in a blood sample -- heroin, cocaine, and PCP -- without the use of a confirmatory test. Our review showed that some aspects of the test results were

found that 86 of the 213 toxicology files that we reviewed (40%) had minor deficiencies. Most involved situations in which:

- (1) drugs were identified on the basis of only one independent test,
- (2) there were indications of potential sample contamination, or
- (3) case files did not contain adequate documentation of all the work that may have been performed.

In all of these cases, other controlled substances or drugs of abuse were properly identified, and we therefore concluded that these minor issues would not have had a significant impact on the cases.

F. Firearms

We have reviewed 94 firearms cases since the publication of our Fourth Report, for a total of 184 firearms case reviews during Phase II of our investigation. Overall, most cases in the Firearms Section were properly examined and reported in a timely manner. We have identified only minor issues, primarily involving slight deficiencies in documentation, deviations from Crime Lab policies, and deviations from generally accepted forensic science practices. We noted that the examinations of the vast majority of the cases are technically correct and that most issues are of an administrative nature. We found that HPD firearms examiners operated with an impressive level of skill and diligence in performing their examinations and correctly making identifications.

Conclusion

This report summarizes the results of the case reviews we have conducted thus far in Phase II of this independent investigation of the Crime Lab and Property Room. Over the past eight months, we have reviewed nearly 2,300 cases analyzed by the Crime Lab in the forensic science disciplines of serology, DNA profiling, trace evidence, controlled substances, firearms, toxicology, and

Footnote continued from previous page

pharmacologically unlikely and indicated possible sample contamination. Because of these questionable results, the possibility of contamination, and the absence of a second confirmatory test, we concluded that the work performed by Crime Lab analysts in this case was inconsistent with generally accepted forensic science practices.

questioned documents. Our case reviews now are complete in all of these areas except for firearms and serology, which --- in light of the serious and pervasive problems we have identified with the Crime Lab's serology work -- has been expanded to include cases dating back to 1980. We are continuing to work with HPD to identify convictions in the 1980s and early 1990s in which serology performed by the Crime Lab might have played a role and then to review those cases to evaluate the reliability of the serologists' analysis. Unfortunately, the process is not one that can be completed quickly because of the inherent difficulties in identifying the relevant cases.

The case reviews we have completed since our last report continue to reveal widespread problems with the Crime Lab's analysis of biological evidence -- beginning with serology and continuing after the advent of DNA profiling -- during the entire period of our review from 1980 through 2002. In the cases we have reviewed since the publication of our Fourth Report in January 2006, we have found additional examples of serologists and DNA analysts failing to report probative results -- results that might have helped identify and convict the guilty as well as results that might have exonerated the innocent. We have found a clear and troubling pattern of reluctance in the Serology and DNA Sections to report typing results that were not consistent with the blood types or DNA profiles of either the victim or a known suspect; in many such cases, the serology or DNA results were reported as inconclusive. We have also seen persistent problems with analysts' techniques, the interpretation of results, and the failure to address potential sample contamination. The Crime Lab *never* issued written reports containing the statistical significance of its serology typing results, and the frequency estimates presented by DNA analysts in cases involving mixtures of body fluids were often overstated by orders of magnitude. We have found no semblance of an effective technical review program or quality assurance regime to detect and correct these problems. As a result, they continued unabated.

We have identified 50 serology cases and 43 DNA cases in which work performed by the Crime Lab was unreliable or the reported results were misleading. The names of each of the suspects or defendants involved with these cases are listed in Appendices B and C to this report. We will continue to provide information about each of these cases to the Innocence Project and affiliated organizations so that these cases can be reviewed and evaluated to identify prisoners who may have been wrongfully convicted.

We still have significant work ahead of us in completing this investigation. In the coming months, we will review the current operations of

both the Crime Lab and the Property Room and formulate recommendations regarding the forensic science work performed by HPD. The shared goal of the City of Houston, HPD, the Stakeholders Committee, and our investigative team is not only to produce a comprehensive accounting of the Crime Lab's historical problems but also to help develop a blueprint for ensuring that the Lab generates sound, well-documented, and reliable forensic scientific results for use in the criminal justice system.

TABLE OF CONTENTS

	Page
Executive Summary	1
Introduction	1
The Investigative Team.....	2
Status of the Investigation	5
I. The Case Reviews	5
II. Interviews.....	8
III. The Innocence Project.....	8
Results of Phase II Case Reviews.....	9
I. Process for Reviewing Cases	9
A. Definitions of Major and Minor Issues	10
1. Major Issues	10
2. Minor Issues.....	10
B. Quality Assurance Review	11
II. Serology	11
A. Status of the Serology Case Reviews.....	14
B. Serious Problems Identified in Serology Cases	20
1. Systemic Failure to Perform Potentially Probative ABO Typing in Cases Involving Known Suspects	21
2. Failure to Report Probative Findings	23
a. Serology in the Derrick L. Jackson Case	24

	Page
b. Additional Examples of the Crime Lab’s Failure to Report Probative Findings	28
3. Misinterpretation and Inaccurate Reporting of Results.....	31
4. Reported Findings Unsupported by Documented Analysis	33
5. Other Examples of Poor Forensic Science Practices.....	34
III. DNA.....	36
A. Status of the DNA Case Reviews.....	38
B. Serious Problems Identified in DNA Cases	40
1. Failure to Report Potentially Exculpatory Results.....	41
2. Failure to Mathematically Confirm RFLP Results.....	43
3. Poor Quality PCR Analysis	47
a. Problems with D1S80 Analysis	48
b. Questionable Interpretation of PCR Results.....	51
4. Problems with Interpretation of STR Results	53
5. Routine Misreporting of the Statistical Significance of DNA Profiling Results.....	55
IV. Trace Evidence.....	58
A. Status of the Trace Evidence Review	58
B. Findings.....	59
1. The Trace Evidence Sample.....	59

	Page
2. Review of Selected Serology and DNA Cases	60
V. Controlled Substances	61
A. Results of the General Controlled Substances Case Reviews.....	62
1. Major Issues	62
a. Reports Based on Visual or Physical Identifications Without Analytical Testing	62
b. Presumptive Quantitation of Liquids and Tablets	63
c. Failure to Report Probative Findings	64
d. Mistakes and Inaccuracies in Reports	64
e. Unexplained Test Result Change	65
2. Minor Issues Identified in the General Controlled Substances Sample.....	65
a. Inadequate Documentation	66
b. Failure to Follow Generally Accepted Forensic Science Practices	66
c. Failure to Follow Crime Lab Standard Operating Procedures.....	68
3. Handling and Labeling of Evidence.....	68
B. Results of the Patel Case Reviews	69
1. Reporting an Undocumented Finding.....	69
2. Reports Based on Visual or Physical Identifications Without Analytical Testing	70
3. Inadequate Documentation	70

	Page
4. Failure to Follow Generally Accepted Forensic Science Practices	70
5. Failure to Follow Standard Operating Procedures.....	71
C. Results of the Price Case Reviews	71
1. Major Issues	71
2. Minor Issues.....	72
a. Failure to Follow Generally Accepted Forensic Science Practices	72
b. Failure to Follow Standard Operating Procedures.....	72
c. Insufficient Documentation and Administrative Errors	73
D. Results of Bulk Case Reviews	73
E. Lack of Consistent Technical Reviews	74
VI. Firearms.....	74
A. Method Related to Firearms Examinations.....	75
B. Documentation of Examinations	76
C. Inefficient or Inappropriate Deviations from Generally Accepted Laboratory Practices	77
D. Other Issues	79
VII. Toxicology.....	79
A. The Toxicology Case Sample.....	80
1. Confirming Initial Results With A Second Independent Test	81
2. Indications of Sample Contamination	82

	Page
3. Documentation Issues	82
Conclusion	83
Appendix A Stakeholders Committee Members	
Appendix B Serology Major Issue Cases	
Appendix C DNA Major Issue Cases	
Appendix D Acronyms	

Introduction

This is the Fifth Report of the Independent Investigator for the Houston Police Department (“HPD”) Crime Laboratory and Property Room. This report, like our previous reports, is intended to advise the City of Houston (the “City”) and the public of our progress in fulfilling the mandate to conduct a comprehensive and independent investigation of the Crime Lab and Property Room.¹

The investigation is divided into two phases. In Phase I, which we completed with the issuance of our Third Report on June 30, 2005, we investigated the historical operations, practices, and management of the Crime Lab and Property Room as well as assessed the scope of the work to be performed during the second phase of the investigation. Phase II, which began with the Houston City Council’s approval of our Phase II Plan on August 24, 2005, centers on the review of hundreds of cases originally analyzed by Crime Lab forensic scientists in seven forensic science disciplines in which the Lab historically performed work -- serology, DNA, trace evidence, controlled substances, firearms, toxicology, and questioned documents.

We have now completed our Phase II case reviews for all of the forensic science disciplines with the exceptions of serology and firearms. Since our last report, we also have conducted detailed interviews of three former members of the DNA/Serology Section about specific cases with which they were involved as well as about technical practices and issues we identified through the case reviews. Unfortunately, our further attempts to secure the cooperation of Donald Krueger, the former head of the Crime Lab; Christy Kim, a longtime analyst in the Crime Lab’s Serology and DNA Sections; and James R. Bolding, the former head of the DNA/Serology Section, have not been successful. This is particularly unfortunate because Ms. Kim and Mr. Bolding personally performed the analytical work in many of the most problematic cases we have reviewed. Therefore, our inability to gather information from them in connection with our case reviews has hampered our ability to determine whether any of the most troubling cases we have found were the product of intentional scientific fraud.

This report provides additional detail about the results of our case reviews and the major and minor issues we have identified with respect to the work

¹ Our reports are posted on our Web site at www.hpdlabinvestigation.org.

performed during the relevant time periods in each of the sections of the Crime Lab. We continue to find that many of the Crime Lab's forensic scientists performed high quality technical work and accurately reported their results. This is especially true for the Firearms, Toxicology, and Questioned Documents Sections. Even in the areas in which the Crime Lab performed consistently reliable work, however, certain fundamental practices -- for example, thorough documentation of all analytical work, up-to-date standard operating procedures ("SOPs"), quality assurance and quality control, technical reviews, training, and outside inspections -- were either inconsistently applied or completely absent from the Lab during the periods we are reviewing.

Since our last report, we have continued to uncover major issues in the serology and DNA cases analyzed by the Crime Lab, dating back to 1980 in the area of serology. Thus far, our investigation has identified a total of 43 DNA cases and 50 serology cases analyzed by the Crime Lab that have major issues, which we have defined to mean problems that raise significant doubt as to the reliability of the work performed, the validity of the analytical results, or the correctness of the analysts' conclusions. Many of the problems we have observed in the serology cases infected the Crime Lab's DNA profiling operations as DNA testing gradually supplanted serology in the early 1990s. This is unfortunate, but not surprising, because many of the Crime Lab's serologists, such as Mr. Bolding and Ms. Kim, became DNA analysts. In addition, although the technology for analyzing biological evidence changed with the advent of DNA profiling, the Crime Lab's flawed management and practices -- as well as the inadequate level of support and attention the Lab received from HPD -- did not.

The Investigative Team

We have assembled a highly experienced team of lawyers and forensic scientists for the Crime Lab investigation. Our team is led by Michael R. Bromwich, who is a partner in the Washington, D.C. and New York offices of Fried, Frank, Harris, Shriver and Jacobson LLP ("Fried Frank") and heads the Firm's internal investigations, compliance, and monitoring practice group. Mr. Bromwich is a former federal prosecutor and, from 1994 to 1999, served as Inspector General of United States Department of Justice. Mr. Bromwich is supported by a team of Fried Frank lawyers and legal assistants.

Our Scientific Advisory Board, comprised of three renowned forensic scientists who are experienced crime laboratory managers, has worked closely on

the investigation throughout Phases I and II.² Each member of the Scientific Advisory Board has visited the Crime Lab and Property Room, participated in interviews, and conducted quality control and quality assurance reviews of the work performed by our team. In addition, throughout Phases I and II we have consulted -- and will continue to consult -- with the Scientific Advisory Board in order to discuss the status of the investigation and to receive the members' input and guidance. The members of the Scientific Advisory Board are:

Margaret Kuo retired as Deputy Director of Forensic Science Services after 27 years with the Orange County Sheriff-Coroner's Office. Among other things, Ms. Kuo has participated in or led approximately 30 crime laboratory inspections or audits.

Douglas M. Lucas is the retired Director of the Centre of Forensic Sciences of the Province of Ontario, Canada. Among his many leadership positions in the forensic science community, Dr. Lucas is a past president of the American Society of Crime Laboratory Directors ("ASCLD") and has led approximately 13 accreditation inspections performed by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board ("ASCLD/LAB"), as well as audits of 12 other crime laboratories.

Bruce W. Vander Kolk retired in 2001 as the Commander of the Illinois State Forensic Sciences Command, where he oversaw the operations of eight regional forensic science laboratories and a research and development laboratory. During his career, Mr. Vander Kolk has, among other things, served on the strategic planning committee as well as the Board of Directors of ASCLD.

Our team includes a Scientific Coordinator, **Roger J. Bolhouse**, who is responsible for overseeing and coordinating the case reviews performed by our forensic scientists. Mr. Bolhouse also is our primary expert in trace evidence examination. He was an officer with the Michigan State Police ("MSP") for 26 years, including 22 years in the MSP's crime laboratory system. He retired in 2000 as Director of the MSP's Grand Rapids Laboratory and currently is a forensic scientist with Speckin Forensic Laboratories in Okemos, Michigan.

The following forensic scientists involved with the investigation have been drawn from across North America and are experts in their respective fields.

² The *curricula vitae* for each of the members of the Scientific Advisory Board and the forensic scientist members of our investigative team are posted on our Web site.

These scientists are responsible for conducting the case reviews during Phase II of the investigation.

Jeanine M. Baisch, Ph.D., is the Director of the Research and Development Laboratory, Orchid Identity Genomics in Dallas, Texas.

Robert P. Bianchi is the former Director of the Drug Enforcement Administration Special Testing and Research Laboratory in McLean, Virginia.

Michael A. Evans, Ph.D., is the President and Chief Executive Officer of the American Institute of Toxicology Laboratories located in Indianapolis, Indiana.

Patricia P. Hamby has over 30 years of experience in forensic serology and has been a criminalist in several law enforcement crime laboratories.

Edward E. Hueske is a firearms and toolmark expert who retired as the Supervising Criminalist for the Arizona Department of Public Safety in 1996.

Karen L. Irish retired in 2003 as the Director of the Forensic Services Section of the Baltimore County Police Department.

Rhonda Roby is the founder and Chief Executive Officer of Identity Quest, LLC. Among other things, she is a former Technical Leader of the Mitochondrial DNA Section with the Department of Defense DNA Registry, Armed Forces DNA Identification Laboratory.

Michael Sinke spent 20 years as a forensic scientist with the Michigan State Police Crime Laboratory and is a questioned documents examiner with Speckin Forensic Laboratories

Theresa F. Spear has over 25 years of experience as a criminalist and recently retired from the California Department of Justice, Bureau of Forensic Services, where, among other things, she was a supervisor in the California Criminalistics Institute's Biology Program.

Rick W. Staub, Ph.D., has a doctorate in genetics and is a Senior Manager for Forensics and Laboratory Director at Orchid Cellmark.

Mark D. Stolorow is the Executive Director for Forensic Science at Orchid Cellmark and has been a forensic serologist for over 30 years.

Status of the Investigation

I. The Case Reviews

Pursuant to our agreement with the City and HPD, our investigation into the management, operations, and performance of the Crime Lab and Property Room is divided into two phases.

During Phase I, we investigated the current and historical operations and practices of the Crime Lab and Property Room. Among other things, this phase of the investigation was designed to lead, in consultation with HPD, to the development of a detailed plan for the second phase of the investigation. We provided our Phase II Plan to HPD on July 6, 2005.³

The second phase of our investigation involves reviewing samples of cases analyzed by the Crime Lab during defined time periods. The samples have been drawn from the seven forensic science disciplines applied in the Crime Lab -- serology, DNA, controlled substances, toxicology, trace evidence, questioned documents, and firearms. These cases are being reviewed by our team of forensic scientists and evaluated with reference to the Crime Lab's SOPs in place at the time, as well as applicable standards and practices generally accepted within the forensic science community during the time the Lab conducted its examination of the cases.

During Phase I of the investigation, we reviewed the methodology by which HPD arrived at its suggested sample size of 1,966 cases. We determined that it would be prudent to consult with expert statisticians to develop our sample populations. After advising HPD and gaining the approval of the Stakeholders Committee, which oversees our investigation, we retained and consulted with statisticians from PricewaterhouseCoopers LLP ("PwC"), including PwC partners Dr. Jessica Pollner and Arthur Baines. With PwC's guidance, we developed appropriate sample sizes for the case reviews to be performed by our forensic scientists in each of the following forensic science disciplines:

- Serology
- DNA
- Trace Evidence
- Controlled Substances
- Firearms
- Toxicology

³ The Phase II Plan is posted on our Web site.

For the last discipline, Questioned Documents, because of the relatively small number of cases examined, we decided to review all of HPD's questioned documents cases since 1998. We also selected separate statistically-based sample populations of the controlled substances cases analyzed by former HPD Criminalists Vipul Patel and James Price, both of whom were involved in instances of drylabbing in the Controlled Substances Section.

In light of the pervasive and serious problems in the serology and DNA cases we reviewed last fall, in December 2005 we recommended to the Stakeholders Committee and to HPD that we modify the scope and focus of our case reviews in both of these areas.

With respect to serology, we suggested that (a) the relevant time period for the reviews be extended earlier in time to January 1980, prior to when Mr. Bolding began analyzing biological evidence in the Crime Lab, and (b) the statistical sampling be abandoned in favor of reviewing every serology case related to a conviction, either by guilty plea or trial verdict, from 1980 through the early 1990s.

With respect to DNA, we also recommended against completing the review of all the cases in the statistical sample as originally drawn in favor of focusing on the cases identified by HPD and the Harris County District Attorney's Office for re-testing that either (a) had not yet been re-tested by an outside laboratory or (b) had been re-tested and the Crime Lab's original DNA findings could not be confirmed. As we discussed in our previous reports, the re-test project was designed to identify all cases in which DNA analysis was performed and a conviction resulted, either by guilty plea or after trial.

These recommended changes reflect the fact that our initial serology and DNA case reviews revealed such a high percentage of major issues and problems that it made sense to focus on those cases that may have resulted in miscarriages of justice rather than to continue using a random sampling technique, which almost surely would have continued to show an unacceptably high rate of analytical errors. The Stakeholders Committee and HPD approved both of these recommendations, and, beginning in January 2006, we adjusted our selection of serology and DNA case for review accordingly.

We have now completed all of the case reviews in the nine categories of cases, with the exceptions of firearms and serology. The following chart summarizes the information relating to our case reviews.

Category of Cases	Completed Reviews	Total Number of Cases	Percentage of Reviews Completed
DNA ⁴	135	135	100%
Serology ⁵	336	n/a	n/a
Controlled Substances ⁶	513	513	100%
James Price	342	342	100%
Vipul Patel	366	366	100%
Toxicology	396	396	100%
Trace Evidence ⁷	223	223	100%
Firearms	222	364	61%
Questioned Documents ⁸	91	91	100%
Total Cases (excl. serology)	2,288	2,430	94%

Finally, we have begun the process of formulating recommendations for HPD and the Crime Lab. In order to provide the most relevant and helpful recommendations tailored specifically to the Crime Lab as it functions now, we

⁴ The DNA case reviews include all 18 death penalty cases involving DNA testing by the Crime Lab.

⁵ As discussed in detail in the serology section of this report, we have been working with HPD since January 2006 to identify all serology cases related to a conviction, by guilty plea or trial verdict, during the years 1980 through 1993. To date, we have identified a total of 899 serology conviction cases and have reviewed 256 of them. However, we have only completed the process of identifying serology convictions for 1980 and 1987. Accordingly, we cannot report a total number of serology cases to be reviewed. As more fully discussed below, our review of serology cases now will focus on those cases related to convictions involving defendants who currently remain incarcerated.

⁶ This figure includes 150 cases from our original controlled substances sample and 363 cases from a reconfigured sample that we prepared, in consultation with PwC, to target substances analyzed in the Crime Lab other than marijuana and cocaine. In addition to the samples, we also reviewed 50 “bulk” controlled substances cases, not reflected in the above chart, in order to evaluate how the Crime Lab and Property Room handle bulk seizures of controlled substances.

⁷ In addition to these 223 trace evidence cases, our trace evidence expert reviewed the trace evidence component of 40 cases identified as serology or DNA cases.

⁸ In our Phase II Plan, we estimated that the total number of Questioned Documents Section cases that we would review was approximately 200. This estimate was based on the total number of cases identified on the Questioned Documents Section case log. Once we began our case review, it became clear that only 91 of the cases on the Questioned Documents Section case log involved substantive work that we could review.

need to review the Lab's current operations. The Crime Lab is now accredited in most areas, with the significant exceptions of DNA analysis and trace evidence examination. In addition, HPD and the Crime Lab have taken a number of other steps since December 2002 to improve the quality of the forensic scientific work performed in the Lab. Indeed, HPD expects that the Crime Lab will receive accreditation and be approved to resume DNA testing in the near future. Our review of current operations and our recommendations will be designed to help the Crime Lab make the most of its fresh start and to solidify and build upon the improvements it already has made.

II. Interviews

As the case reviews have progressed, we have learned a great deal about the operations of the Crime Lab and about the various problems experienced in each of the sections of the Lab. We have periodically met with and interviewed current Crime Lab personnel who worked in the Lab during the relevant time periods to get answers to our questions and to obtain perspective on issues relating to the Lab's operations and work product. Current Crime Lab personnel have been extremely cooperative with and helpful to this investigation.

However, we continue to experience difficulty obtaining the cooperation of certain critical former Crime Lab personnel, including Mr. Krueger and Ms. Kim. Mr. Bolding agreed to be interviewed twice during the first phase of the investigation, but declined our most recent requests to speak with him. In January 2006, Representative Kevin Bailey, the Chairman of the General Investigating and Ethics Committee of the Texas House of Representatives, generously offered us the use of the Committee's subpoena power to compel recalcitrant former Crime Lab employees to cooperate with this investigation. This appeared to be the most promising vehicle for us to obtain information from witnesses whose testimony has been unavailable. A number of discussions took place over the course of the past several months; however, it now appears that the Committee is not willing to provide us with its subpoena authority to assist in our investigation of the Crime Lab. We very much appreciate Chairman Bailey's efforts to assist us in our investigation and regret that obstacles of various kinds, the details of which have not been communicated to us, are likely to prevent that from happening.

III. The Innocence Project

From the outset of this investigation, we have been concerned about whether any action will be taken to explore legal remedies for individuals who may have been victims of inadequate or flawed work by the Crime Lab's

serologists and DNA analysts, including, in particular, persons currently serving jail terms or on death row. That concern is shared by the City Council, the Stakeholders Committee, and many members of the public. In February 2006, we received a request from the Innocence Project that we provide information about each of the major issue serology and DNA cases identified by our investigation to the Innocence Project, the Texas Innocence Network, and the Texas Center for Actual Innocence. HPD and the Stakeholders Committee approved our doing so, and, in April 2006, we forwarded information to these organizations about each of the 25 major issue DNA cases and 18 major issue serology cases referred to in our Fourth Report. We will update the case information we have provided to the Innocence Project and affiliated organizations to include the additional major issue DNA and serology cases we have identified since the issuance of our Fourth Report.⁹

Results of Phase II Case Reviews

I. Process for Reviewing Cases

We have not altered the basic process for reviewing Crime Lab cases from what we described in our Fourth Report. The investigative team performs many tasks on site at the Crime Lab in HPD headquarters. We have had access to Crime Lab staff, documents, and raw data, including autoradiographs and photographs of DNA test strips. When necessary, we have reviewed available underlying evidence¹⁰ to assess the reasonableness of the Crime Lab's original forensic science work. The Fried Frank legal team continues to work extensively

⁹ Not all of the major issue DNA and serology cases we have identified during the course of our investigation may be appropriate for review by the Innocence Project and its affiliates. For example, in some of the cases in which we identified unreliable forensic science work, there was no known suspect or the suspect was not charged. In other cases, the defendant has been released from prison or has passed away.

¹⁰ Consistent with the scope of our mandate, we have not re-tested any evidence. We reviewed underlying evidence only in cases where information and documentation in the Crime Lab file -- such as photographs, narrative descriptions of the evidence and the analyses conducted, and laboratory notes -- are inadequate to permit us to assess the reasonableness of the original forensic science work.

with the forensic scientists and has managed the legal, technical, and administrative aspects of the Phase II review.¹¹

A. Definitions of Major and Minor Issues

Our primary method of distinguishing between deficiencies identified during our case reviews is to characterize them as “major issues” or “minor issues.” These are defined terms that were developed at the beginning of the case review process in consultation with our team of forensic experts.¹²

1. Major Issues

Major issues are matters that raise significant doubt as to the reliability of the work performed, the validity of the analytical results, or the correctness of the analyst’s conclusions. They can include significant errors in the testing, evaluation, or handling of evidence or in the reporting of results; serious omissions where an analyst failed to perform a critical examination or analysis; or analytical work that was undocumented or insufficiently documented to permit an outside reviewer to assess the basis of the analyst’s conclusions.¹³

2. Minor Issues

Minor issues are matters that involve deviations from generally accepted forensic science practices or from the Crime Lab’s SOPs, but do not appear to raise significant doubt as to the reliability of the work performed, the validity of the analytical results, or the correctness of the analyst’s conclusions. Some deficiencies, though significant, are categorized as minor issues if we conclude that they would not have had a material impact on the results of the forensic scientific work in the case.

¹¹ For a more detailed discussion of the Phase II case review process, *see* Fourth Report at pages 8-11.

¹² Examples of deficiencies that would be characterized as major and minor issues can be found in our Fourth Report at pages 10-11.

¹³ In general, with respect to the prosecutions of any individual discussed in this report, our investigation is limited to reviews of the original forensic scientific work performed by the Crime Lab and the presentation of analysts’ findings in any related criminal proceedings. We have not reviewed or considered other evidence, such as eyewitness testimony or confessions, that might be available in such cases. We also make no assessment as to the likely guilt or innocence of any of the suspects or defendants, or the appropriateness of any punishment, discussed in this report.

B. Quality Assurance Review

Distinctions between major and minor issues are sometimes subtle and involve case-specific judgments. We have developed a quality assurance (“QA”) process that enables the forensic scientists on the investigative team to confer about such matters and reach consensus before any final determinations are made regarding the appropriate classification for a particular deficiency. QA reviews are performed in each forensic science area by members of the Scientific Advisory Board. We perform a QA review for every case that has been preliminarily identified as involving a major or minor issue. We also review randomly-selected files from the case sample to confirm that cases are being assessed consistently and in accordance with our review standards.

In the following sections, we present the findings of our case reviews conducted subsequent to those described in our Fourth Report. We discuss the case reviews in the following order: (1) serology, (2) DNA, (3) trace evidence, (4) controlled substances, (5) firearms, and (6) toxicology.¹⁴

II. Serology

The term serology refers to the study of blood and other body fluids, particularly blood group interactions. The forensic serology practiced in the Crime Lab during the 1980s and early 1990s primarily involved genetic marker typing relating to the four nominal blood types -- A, B, AB, and O.¹⁵ For example, if a bloodstain on an item of evidence is determined through ABO typing to contain ABO type A factors, and a suspect is determined to be ABO type A, then the suspect is included in the population of potential contributors to the evidence. On the other hand, if the suspect is determined to be ABO type B, then he or she is excluded as a potential donor of the evidence. Until it was replaced by the growing use of DNA profiling technology in the early 1990s, the typing tests used in forensic serology were the only techniques available to

¹⁴ Because our case reviews related to the Questioned Documents Section were completed last fall and are discussed in detail in our Fourth Report, no additional discussion regarding the Crime Lab’s examination of questioned documents is included in this report.

¹⁵ As discussed in our Fourth Report, from the 1960s on, forensic serology also included the identification of other biochemical genetic markers present in body fluids such as certain polymorphic enzymes and proteins. Our case reviews suggest that the Crime Lab only rarely used such enzyme testing results to associate or disassociate evidence stains with respect to a victim or suspect. *See* Fourth Report at 14.

forensic scientists to develop information as to whether specific individuals might be associated with biological evidence -- such as blood, semen, or saliva -- related to crimes, particularly homicides and sexual assaults.¹⁶

ABO typing is not limited to blood samples. In many people, ABO factors also are present in other body fluids, such as semen, saliva, and vaginal secretions. The population is divided into two groups with respect to the presence or absence of ABO factors in body fluids other than blood. Approximately 80% of the population has detectable levels of their ABO type in their other body fluids and are known as ABO "secretors." The remaining 20% of the population lacks normally detectable levels of their ABO factors in their secretions; these people are known as ABO "non-secretors." Although useful in the investigation of homicides and other crimes, ABO testing of body fluid secretions was particularly valuable in the analysis of biological evidence related to sexual assaults.

The first step in forensic serology is to determine through presumptive testing whether biological material is present on evidence items collected from a crime scene, a victim, or a suspect. This examination is conducted using various presumptive tests that can indicate whether a stain is likely to contain blood or semen and therefore be susceptible to genetic marker typing. The Crime Lab typically would screen suspected bloodstains by applying a color test using the chemical phenolphthalein, which reacts to the protein hemoglobin found in blood.¹⁷ The Crime Lab also commonly used a confirmatory test for blood known as the Takayama test, which is a micro-crystalline test also directed at detecting the presence of hemoglobin. If these tests resulted in positive readings, the stain would be confirmed to contain blood.

The Crime Lab generally used three types of tests to detect the presence of semen in evidence related to suspected sexual assaults. First, a serologist would use a microscope to attempt to visually confirm the presence of sperm cells

¹⁶ For ease of reference and to provide helpful background for the discussion of significant issues we have identified in the serology work performed by the Crime Lab, we include in this section a brief general description of serology and certain common testing methods. For a more detailed discussion of technical aspects of serology, please refer to Appendix B of our Fourth Report, "Discussion of Serology Techniques Used by the Crime Lab."

¹⁷ Hemoglobin is a protein found in red blood cells that is responsible for transporting oxygen and carbon dioxide in the bloodstream. Hemoglobin gives blood its red coloring.

extracted from an evidence sample and applied to a microscope slide. Second, the serologist might use a presumptive color test on a cutting from an evidence stain to detect the presence of acid phosphatase ("AP"), which is an enzyme secreted by the prostate gland into seminal fluid. Finally, Crime Lab serologists also used testing techniques to determine the presence or absence of a prostatic protein called p30, which is unique to seminal plasma.

If these tests indicated that an evidence specimen in fact contained blood or semen, then the serologist could attempt ABO genetic marker testing on the evidence. Absorption elution ("AE"), a form of direct ABO typing, is the generally accepted forensic serology testing method for determining the ABO factors present in bloodstain evidence.¹⁸ Serologists sometimes used AE testing of bloodstains in conjunction with a reverse blood typing technique called the "Lattes Crust" test.¹⁹ Serologists often used Lattes testing to obtain ABO typing results from scrapings of dried blood crust collected from hard surfaces, such as glass or a weapon (hence the term "Lattes Crust" test).²⁰ Absorption inhibition ("AI") was the generally accepted forensic serology method for determining ABO factors expressed in stains related to body fluids other than blood -- such as semen, saliva, vaginal secretions, perspiration, nasal mucous, or mixtures of these fluids. AI, unlike AE, is an indirect method for the detection of ABO antigens.²¹

¹⁸ AE is known as a "direct" ABO test because the agglutination observed as a result of the antigen-antibody interaction in AE testing directly indicates which ABO antigenic factors, if any, are present in the sample. In other words, in AE testing, the presence of a specific ABO factor is indicated by observation of agglutination in the test well for that ABO factor.

¹⁹ The Lattes Crust test is known as a reverse typing test because it detects the presence of naturally occurring ABO antibodies in the plasma or serum portion of a bloodstain. The ABO antibodies in a person's serum are complementary to his or her ABO antigens present on the person's red blood cells. Thus, the detection of ABO antibodies through a Lattes Crust test can assist the forensic serologist to infer the ABO type of the donor of a bloodstain.

²⁰ The Lattes Crust test, however, is less sensitive than AE. Consequently, more bloodstain material must be consumed to conduct a Lattes Crust test than the amount needed for AE.

²¹ AI is referred to as an indirect test because the presence of an ABO factor in an evidence stain is determined by observation of a diminished level or absence of agglutination in the test solution related to that particular ABO factor. AI also is used to test known reference saliva standards obtained from a victim or suspect to determine whether he or

If an evidence stain tested positive for the presence of blood, semen, or other body fluid, it was generally possible to determine the genetic characteristics (e.g., ABO type) reflected in the evidence sample. The serologist then could compare the genetic types of the evidence sample with those of known reference standards. A known reference standard is a sample of blood or saliva collected from a victim or a suspect who is potentially associated with an evidence stain. Depending on the nature of the crime under investigation and whether the evidence includes secretion stains, a crime laboratory might subject known reference standards both to ABO testing, in order to determine the victim's or suspect's ABO blood type, and to Lewis blood group testing, which is helpful to predict or confirm whether the donor can be expected to be a secretor whose ABO type is expressed in body fluids other than blood.²²

During the 1980s and early 1990s, the Crime Lab compared the ABO types of victims and suspects with ABO activity detected in evidence samples to establish associations -- or exclusions -- between individuals and biological evidence in only a small proportion of the cases sent to the Lab for analysis. As discussed in detail below, we have found that the Crime Lab performed ABO typing and comparisons in only a small percentage of "serology" cases. This was true even where presumptive screening indicated the presence of blood or semen in evidence stains *and* where there was a known suspect against whom ABO typing results related to such evidence could and should have been compared. The Crime Lab's chronic failure to perform ABO typing and comparisons in cases where the serology may have produced probative or even exculpatory results is extremely disturbing.

A. Status of the Serology Case Reviews

Our original sampling of serology cases was drawn from cases assigned to analysts working in the Serology Section of the Crime Lab from 1987 through 1990. Based on our initial serology case reviews, we found that the Crime Lab continued to perform ABO typing well into 1993, even after the Lab had established its DNA analysis capability. We also found that our original sample of serology cases, which was derived from the Crime Lab's ledger of cases

Footnote continued from previous page

she is a "secretor" -- i.e., a person whose ABO type is expressed in body fluid other than blood.

²² Lewis genes are related to an individual's ABO secretor status. Lewis testing of a person's known reference blood sample may be used to infer one's ABO secretor status.

assigned to analysts in the DNA/Serology Section during the relevant time period, included a large proportion of cases that did not involve any substantive forensic science work by the Lab and, therefore, would not provide a basis to assess the quality of the Lab's serology work. For example, we found that, upon receiving a sexual assault kit, the Crime Lab would assign a Lab number and generate a Lab file. However, if no suspect was identified or no samples were provided for comparison with the evidence in the sexual assault kit, the Crime Lab typically would only inventory the contents of the sexual assault kit and would not analyze the evidence.

In late 2005, in order to identify cases involving substantive analytical work, such as ABO typing, performed by the Crime Lab's serologists, we developed a database of cases derived from raw data records that the Lab preserved and we reconfigured our sample based on that database.²³ As of our Fourth Report, we had completed reviews of 80 of these substantive serology cases. We identified major issues in 18 -- or approximately 22.5% -- of these cases.

The case reviews we performed last fall revealed a number of serious problems with the serology work performed by the Crime Lab. The five most significant issues we found were:

- The absence in the serologists' reports of genetic profile frequency statistics or any discussion of the significance of the statement that a suspect could not be excluded as a potential donor of evidence samples;
- The failure of serologists to use substrate controls and positive and negative controls in their ABO typing;
- The routine and common failure to report the results of testing and probative findings;
- The lack of any documentation of administrative or technical reviews of the serologists' work; and

²³ The Crime Lab has not been able to locate and provide us with raw data related to the work performed by all of the serologists employed by the Lab during the relevant period. Most of the serology raw data records that have been preserved are those originally maintained by Ms. Kim dating back only to 1989.

- The absence of generally accepted documentation and evidence control procedures -- such as assignment of unique identification numbers to items of evidence, descriptions of evidence, and preparation of complete tables of testing results -- and errors by analysts in transferring their test results to worksheets.

We also identified two very troubling cases -- related to defendants Dwight H. Riser and Charles E. Hodge -- in which the Crime Lab reported incorrect conclusions that were inconsistent with the actual ABO testing performed by the analysts.²⁴

In our initial serology case reviews last fall, we identified severe problems with the Crime Lab's serology work performed during the period 1987 to 1990. As a result, in December 2005, we recommended to the Stakeholders Committee and HPD that we modify the scope of the serology case reviews as follows. First, because of the number of major issue serology cases we identified in which Mr. Bolding was the responsible serologist, we recommended that the time period of our case reviews be expanded to cover the years 1980 through 1993 in order to include the entire period in which Mr. Bolding performed serology at HPD as well as a short period prior to his involvement.²⁵ Second, we suggested that our reviews be limited to cases in which the Crime Lab's serology work related to a suspect who was convicted of the crime under investigation, either by guilty plea or as a result of a trial verdict. We suggested changing the basis of our case selection in serology from random sampling, which is designed to provide a cross section of the work performed by the Crime Lab to permit assessments of its overall quality, in order to concentrate our efforts on systematically attempting to identify cases in which flawed serology work by the Lab may have played a role in a criminal conviction. In short, because the original serology work we reviewed appeared to be so deeply and pervasively flawed, we believed that continuing with the random sample would have simply further confirmed the conclusions that we had already reached.

²⁴ Detailed discussions of the major issues we identified last fall, including the Riser and Hodge cases, appear in our Fourth Report at pages 15-29.

²⁵ Based on interviews with Mr. Bolding and his employment file with HPD, we estimated that he probably began performing serology casework in the Crime Lab in approximately the spring of 1981. *See* Third Report at 16. Our review of serology cases from the early 1980s has shown that Mr. Bolding actually began issuing serology reports in October 1980. Mr. Bolding did not attend a formal outside training program in bloodstain analysis until the summer of 1982.

HPD and the Stakeholders Committee approved our recommended changes in the selection criteria for our serology case reviews, and we implemented the revised approach in January 2006. We have faced significant logistical challenges involved in identifying serology cases that might be related to actual convictions of individual defendants, particularly in cases from the early 1980s that pre-dated the Crime Lab's use of an electronic case tracking system. HPD has been fully supportive of our efforts and has devoted significant investigative resources to assist us in identifying serology conviction cases. Nevertheless, progress in identifying these cases has been slow.²⁶

As of April 10, 2006, the only years for which we have completed the identification of all serology conviction cases are 1980 and 1987.²⁷ In 1980, there were 408 convictions that can be tied to a Crime Lab serology case. For 1987, we have identified 383 such cases. The status of our serology conviction case reviews for each year during the period 1980 through 1991 is reflected in the chart below.

²⁶ We recently received the approval of HPD and the Stakeholders Committee to focus our ongoing review of serology cases on those cases analyzed by the Crime Lab during the period 1980 through 1993 that might have played a role in the conviction of a person who currently remains incarcerated. Because many defendants who were convicted during this period, either by guilty plea or at trial, have already served their sentences, this will significantly reduce the number of serology cases that we need to identify and review. We will consult with the City Council, the Stakeholders Committee, and HPD as to whether to expand this review to include all serology conviction cases whether or not the defendant remains incarcerated.

²⁷ We selected 1980 as one of the first years for which we would identify serology conviction cases in order to make an assessment as to whether to recommend that the review of serology cases be extended even further back in time. We selected 1987 as a second year with which to start this process because it is the earliest year for which we already had processed electronic case tracking data maintained by the Crime Lab in order to create a database of potential serology cases.

Status of Serology Convictions Case Reviews 1980 - 1991²⁸

Year	Serology Conviction Cases Identified	Reviews Complete	Cases With Major Issues
1980	408	92	2
1981 - 1985	--	--	--
1986	2	2	0
1987	383	77	9
1988	26	26	5
1989	22	22	9
1990	57	37	11
1991	1	0	--
Totals	899	256	36

Our review of serology cases related to convicted suspects is limited by the lack of documentation contained in the Crime Lab’s files. In most of the cases from the 1980s, it is not possible to evaluate the serologists’ interpretation of the ABO testing results they obtained because the laboratory notes and worksheets contained in the file record only the analysts’ conclusions about the ABO factors detected and provide no information about the raw test data that would indicate, for example, the relative intensity of the agglutination upon which the analysts’ conclusions were based. Also, with the exception of several notebooks kept by Ms. Kim beginning in 1989 and the 1990 p30 test log maintained by serologist Grace Daz, there are no logs or other records reflecting the raw data related to testing performed by the Crime Lab’s serologists, apart from the raw data record occasionally present in the case file.²⁹

²⁸ To date, 1980 and 1987 are the only years for which all convictions where there is a related Crime Lab serology case have been identified.

²⁹ Because the raw data notebooks that we have obtained were prepared primarily by Ms. Kim, we are able to evaluate the serology results she reported much more thoroughly and effectively during the period for which we have such raw data than we are able to with other analysts. Also, we have found that Ms. Kim was an extremely prolific analyst and handled more cases than any other serologist in the Crime Lab, including Mr. Bolding. For these reasons -- the volume of her casework and our ability to more effectively review her results --many of the major issue cases we have identified were analyzed by Ms. Kim. However, the problems we have observed with the Crime Lab’s serology work, including the major issues, are endemic to the Serology Section as a

Finally, for cases analyzed during the early 1980s, Crime Lab serologists did not report conclusions as to whether, based on ABO typing of evidence and comparison to reference samples, a suspect was included (or excluded) as a potential contributor to the evidence sample. Typically during this period, the Crime Lab report only presented the results of ABO typing -- i.e., which ABO factors, if any, were detected -- and included no interpretation with respect to inclusions or exclusions. Therefore, in such cases it is not possible to evaluate whether the serologist correctly expressed the significance of his or her ABO typing results. Essentially, for most of the serology cases performed in the 1980s, even in the relatively few cases where ABO typing actually was performed and the results were reported, no conclusions were reported as to inclusion or exclusion; consequently, we are able to evaluate only whether the serologist accurately reported the test results recorded in the analysts' worksheets.

This combination of factors -- the relatively few cases in which genetic marker testing was performed, a paucity of documentation in the analysts' worksheets, the absence of raw data records, and the lack of reported statements regarding inclusions or exclusions based on ABO testing results -- likely explains the relatively small number of cases involving major issues (only 4) that we have identified among the 92 serology conviction cases from 1980 that we have reviewed thus far.³⁰ In other words, the data in the files is so sparse that there is insufficient information on which to base a thorough analysis. However, the small number of major issues we have identified among the 1980 cases should not be understood to mean that the work performed was more proficient than in later years; it is simply a reflection of the fact that the analytical paper trail is so thin that it precludes reaching such judgments.

Footnote continued from previous page

whole, and there is no reason to conclude that Ms. Kim's performance as a serologist was uniquely deficient.

³⁰ In adopting our recommendation to expand the relevant time period of our serology case reviews to 1980, HPD and the Stakeholders Committee left open the possibility of expanding our serology case reviews even further to pre-1980 cases. Based on the lack of documentation contained in the case files from the early 1980s, and our expectation that documentation would only deteriorate the further back in time we search, we do not believe it would be fruitful to review pre-1980 serology cases. Accordingly, we have recommended to HPD that we not embark on a review of serology conviction cases prior to 1980, despite our profound reservations about the overall quality of the forensic serology work that might have been performed in those cases.

We have now completed reviews of 336 serology cases performed by the Crime Lab between 1980 and 1993. These include the 80 substantive serology cases on which we reported in our Fourth Report and the 256 serology cases related to investigations that resulted in a conviction by guilty plea or trial verdict that we have reviewed since January 1, 2006.³¹ We have identified a total of 50 serology cases involving major issues.³²

B. Serious Problems Identified in Serology Cases

Our case reviews since January 2006 have reinforced our previous finding of pervasive and serious problems with the quality of work performed by serologists in the Crime Lab as well as with the presentation of the ABO grouping results obtained by Lab analysts using various serology testing methods. These problems are present in virtually every serology case we have reviewed, even in those cases that we determined did not contain major issues. Moreover, these very significant deficiencies are not the result of mistakes or interpretive errors made by individual serologists. Rather, they are the product of defective procedures employed in the Serology Section throughout the relevant time period -- from 1980 through the early 1990s -- as well as the Crime Lab's systematic failure to adequately train and supervise its serologists.

We continue to observe the same serious deficiencies that we discussed in our Fourth Report. In order to provide additional detail and illustrative examples of the most significant problems with the serology work performed in the Crime Lab during the 1980s and early 1990s, in this report we focus on the following issues: (1) failing to perform potentially probative, or even exculpatory, ABO typing in a large number of cases, particularly sexual assaults; (2) failing to report probative ABO typing results due to an apparent reluctance to report exclusions, findings of blood types not consistent with those of victims or known suspects, and findings indicating the presence of the relatively rare

³¹ Because we are no longer basing our review of serology cases on a statistically-based sampling methodology, it is not appropriate to report a major issue rate in terms of a percentage of the cases we have reviewed. Moreover, a significant majority of the 256 serology conviction cases we have reviewed since January 1, 2006 did not involve any ABO typing work performed by the Crime Lab. Because most of these cases involved either no analysis by the Crime Lab or only presumptive screening for blood or semen, they were very unlikely to contain any major issues.

³² In Appendix B to this report, "Serology Major Issue Cases," we include the names of the suspects and defendants related to each of the 50 cases we have identified thus far as involving major issues.

ABO type AB factors; (3) misinterpreting and inaccurately reporting ABO typing results; (4) reporting test results that are unsupported by documented analysis; and (5) generally poor forensic scientific practices, such as misapplying substrate controls, reporting ABO typing results indicating no ABO activity as “inconclusive,” and poor training or technique producing incorrect typing results.

1. Systemic Failure to Perform Potentially Probative ABO Typing in Cases Involving Known Suspects

Since changing the methodology for our serology case reviews to focus on serology cases handled by the Crime Lab in which there was a known suspect who was convicted of a crime, we have completed, in conjunction with HPD, the process of identifying such serology conviction cases for the years 1980 and 1987. In 1980, there were 408 serology conviction cases, of which we have reviewed 92. We have reviewed 77 of the 383 serology conviction cases identified for 1987.

Early in our review of the 1980 and 1987 serology conviction cases, we found that the Crime Lab performed genetic marker analysis and comparison of ABO blood type factors detected in evidence, on the one hand, with the ABO types of victims and known suspects, on the other, in an alarmingly small proportion of the cases. This is troubling because each of these cases, by definition, involved a known suspect (whose name is reflected in the Crime Lab report) who eventually was convicted of an offense related to the crime for which evidence was sent to the Lab for analysis. We have categorized each of the serology conviction cases from 1980 and 1987 that we have reviewed based on the type of analysis applied.

**Type of Analysis Performed in Serology Conviction Cases
1980 and 1987**

Category	Type of Analysis Performed	1980	1987
1	Inventory of Evidence Only	9 (9.8%)	10 (13%)
2A	Screening for Blood or Semen Results Positive	36 (39.1%)	26 (33.8%)
2B	Screening for Blood or Semen Results Negative	30 (32.6%)	13 (16.9%)
3	ABO Typing of Evidence Only	15 (16.3%)	5 (6.5%)
4	Comparison of Results of ABO Typing of Evidence with Known Reference Samples	2 (2.2%)	23 (29.9%)
5	Evidence Sent Out for DNA Analysis	0	0

As reflected in the above chart, it appears that the Crime Lab performed the full typing and comparison serology analysis necessary to develop probative information as to whether a known suspect could be included -- or excluded -- as a potential contributor to biological evidence in only a small fraction of the cases where such analysis was possible. The Crime Lab’s failure to perform genetic marker testing of evidence, such as bloodstains or swabs from a sexual assault victim, is particularly disturbing in Category 2A above where presumptive screening of evidence showed that body fluids, such as blood or semen, were present in the evidence. In 30% to 40% of both the 1980 and 1987 serology conviction cases we have reviewed, presumptive tests for blood or semen were positive and there was a known suspect for comparison, and yet no genetic marker analysis was performed. In a significant number of cases, ABO testing was performed on evidence, and yet no testing to determine the victim’s or suspect’s ABO type was performed so that a comparison to the evidence could be made.

The Crime Lab’s failure to generate potentially probative ABO testing results in cases where it was possible to conduct such testing and comparisons to known reference samples were possible is very troubling. This failure has implications both for ensuring that the guilty are convicted and that the innocent are exonerated. From the perspective of making sure the guilty are convicted, this data indicates that the Crime Lab routinely failed to develop information that potentially could have guided investigators and strengthened the ability of the investigators and prosecutors to associate suspects with evidence in the case. From the perspective of making sure the innocent are exonerated, the Crime Lab failed to perform genetic marker analyses that, in some cases, might have excluded an individual suspect as a potential donor of evidence, such as semen

stains related to a sexual assault. Particularly in light of a 1995 Federal Bureau of Investigation (“FBI”) study which found that, between 1989 and 1995, suspects were excluded by DNA testing in approximately 23% of cases,³³ it is entirely possible that properly performed ABO testing would have established a scientific basis for excluding individual suspects in some percentage of these untested cases.³⁴

The Crime Lab’s chronic failure to conduct potentially probative genetic marker analysis on available evidence in these major crimes against persons reflects a troubling failure to fully and properly use the available tools of forensic serology in the criminal justice system during the 1980s and early 1990s, thus undermining the ability of the system to properly serve victims, suspects, and the public.

2. Failure to Report Probative Findings

Twenty of the major issue serology cases we have identified involve the serologist’s failure to report the potentially probative ABO typing results that the analyst in fact obtained, as reflected in raw data or in the analyst’s laboratory notes or worksheets. We found in these cases an apparent reluctance on the part of Crime Lab serologists to report typing results obtained from evidence that were not consistent with the known ABO type of either a victim or a suspect. Ethical standards in the practice of forensic science require full disclosure of all relevant analytical test results without regard for the potential impact on an investigation or prosecution. Our serology case reviews reflect many instances of failure to report analytical results that would have weakened the prosecution’s case or strengthened the case for exonerating the defendant.

Without speaking to the Crime Lab’s two central serologists active during the 1980s and early 1990s -- Mr. Bolding and Ms. Kim -- about these cases, it is

³³ See *Convicted by Juries, Exonerated by Science: Case Studies in the Use of DNA Evidence to Establish Innocence After Trial*, United States Department of Justice, Office of Justice Programs, National Institute of Justice (June 1996), at 20.

³⁴ Obviously, the discriminatory power of ABO genetic marker testing is much weaker than that of DNA analysis. Nevertheless, ABO typing can result in the exclusion of an individual suspect where, for example, based on ABO blood typing of evidence and comparison to the victim’s and suspect’s known blood types, the suspect can be eliminated as a potential contributor because an ABO factor present in evidence is foreign to both the victim and suspect, thereby indicating that a third person contributed to the evidence sample.

difficult to determine whether this pervasive pattern of avoiding the reporting of results inconsistent with the victim or a known suspect is attributable to the analyst's lack of confidence in his or her ability to obtain reliable ABO typing results or to scientific fraud of the most pernicious kind with the motive to secure convictions rather than do justice. Regardless of the individual serologist's state of mind, however, such practices are intolerable in a forensic science laboratory and undermine confidence in the integrity of the criminal justice system.

Below, we discuss examples of cases in which the Crime Lab obtained potentially probative ABO typing results but did not report them.

a. Serology in the Derrick L. Jackson Case³⁵

Forrest Henderson was a singer with the Houston Grand Opera. His friend, Richard Wrotenbury, was an elementary school music teacher and also participated in the Houston Grand Opera. After Mr. Wrotenbury failed to appear for work at the school on Monday, September 12, 1988, the manager of the building in which Mr. Henderson and Mr. Wrotenbury shared an apartment entered the apartment and discovered the men had been brutally murdered. Both men had been beaten and stabbed, and there were bloodstains throughout the apartment. Mr. Bolding accompanied HPD investigators to the crime scene and personally collected blood samples from the apartment in order to perform serological tests on the evidence.

According to entries in his worksheets, between September 15 and September 23, 1988, Mr. Bolding performed ABO genetic marker tests on over 30 blood samples taken from various spots at the crime scene. He also typed known reference samples from the victims and Calvin Dorne, HPD's initial suspect in the killings. Mr. Bolding found that both of the victims were ABO type A and that Mr. Dorne was ABO type O. Mr. Bolding's worksheets from September 1988 indicate that he failed to observe any agglutination as a result of AE testing of 13 of the bloodstains.³⁶ The worksheets also reflect, however, that

³⁵ *Texas v. Jackson*, Cause No. 748752 (Harris County, Tx.).

³⁶ Mr. Bolding's reported failure to observe agglutination in 13 of the bloodstain samples he tested is suspect. In light of the quantity of bloodstain evidence in the apartment and the relative freshness of the stains when Mr. Bolding tested them, it seems highly unlikely that he would have failed to obtain interpretable results with respect to so many samples. Indeed, bloodstains on three of these items of evidence actually yielded results when subjected to RFLP DNA testing eight years later in 1996. Since RFLP testing requires a much larger and higher-quality sample to yield results than does ABO testing, we

he was in fact able to obtain results indicating ABO type A activity, consistent with the ABO blood type of both Mr. Henderson and Mr. Wrotenbury, in certain samples taken from the bedrooms and bathroom in the apartment. In his Crime Lab report dated March 15, 1989, Mr. Bolding reported that he detected "type 'A' human blood" in these samples.

Mr. Bolding's September 20, 1988 worksheet also indicates that he obtained strong Lattes results indicating ABO type O in a sample taken from the "North Bedroom Door."³⁷ A separate AE test indicated ABO type B activity in this sample. In his March 15, 1989 Crime Lab Report, Mr. Bolding correctly reported the combined Lattes and AE results for this sample as "inconclusive." Mr. Bolding's September 23, 1988 worksheet records that he also obtained an AE result indicating ABO type B activity on a "Swab of N. Bedroom Door." In the March 15, 1989 Crime Lab report, however, Mr. Bolding failed to report that he had found ABO type B activity in this swab sample from the north bedroom door in the apartment. Instead, Mr. Bolding reported that "human blood having inconclusive grouping activity was detected on samples from . . . bedroom door." The unreported ABO type B activity results that Mr. Bolding obtained from the swab sample taken from the apartment's north bedroom door were clearly probative because ABO type B was foreign to both of the victims and to HPD's initial suspect, Mr. Dorne.

HPD's investigation of the opera singers' killings went cold. A break in the case came in 1995 when the Harris County Sheriff's Department acquired the capability to use the Automated Fingerprint Identification System ("AFIS"), which enables law enforcement agencies to compare unknown latent fingerprints with a database of known prints. In April 1995, HPD submitted a latent fingerprint taken over six years earlier from Mr. Henderson and Mr. Wrotenbury's apartment to the Sheriff's Office to run through AFIS. Using AFIS, the Sheriff's Office obtained a match for the unknown fingerprint, and

Footnote continued from previous page

question whether the absence of agglutination recorded for these samples is either (a) a product of poor analytical technique on the part of Mr. Bolding or (b) an instance of drylabbing where Mr. Bolding may have recorded "no agg." without having actually performed ABO testing on the evidence.

³⁷ Mr. Bolding's original worksheets from September 1988 do not assign identifying numbers to individual items of evidence. Rather, the worksheets identify individual items of evidence only by Mr. Bolding's descriptions of where the sample was taken from the apartment.

Derrick Leon Jackson was identified as a suspect in the killings of Mr. Henderson and Mr. Wrotenbury.

On April 26, 1995, HPD investigators submitted a blood sample taken from Mr. Jackson to the Crime Lab for analysis. Mr. Bolding analyzed the reference sample and determined that Mr. Jackson was ABO type B. At some point, Mr. Bolding revisited the ABO typing work he had performed over six years earlier. Without performing any additional ABO testing on the evidence samples and without dating his changes to the raw data worksheets, Mr. Bolding wrote the finding of "'B' act" on the September 20, 1988 and September 23, 1988 worksheets under the columns related to the two samples taken from the north bedroom door.³⁸ Mr. Bolding previously reported his results with respect to both of these samples as "inconclusive" in the March 15, 1989 Crime Lab report. On June 28, 1995, Mr. Bolding issued another Crime Lab report in which he stated: "Derrick Jackson was determined to have type 'B' blood" and "human blood having type 'B' activity was present on two samples taken from the north bedroom door."

In March 1998, Mr. Jackson was tried for capital murder in connection with the slayings of Mr. Henderson and Mr. Wrotenbury. On March 11, 1998, Mr. Bolding testified about his serology work. On cross examination, there was the following exchange between Mr. Bolding and defense counsel regarding Mr. Bolding's ABO typing results related to samples from the north bedroom door:

Q: But you did specifically say that in direct examination that you found Type B blood on the door, is that correct, on the north bedroom door?

A: Yes, sir.

Q: On your original report generated in 1988 –

³⁸ We have located copies of both the original worksheets prepared in September 1988 and the worksheets that were altered to include new conclusions about Mr. Bolding's original ABO testing results. The original worksheets were obtained from microfilmed archives of the Crime Lab file related to the serology work performed in 1988. The amended worksheets were found in the paper file related to the DNA analysis that was performed by the Crime Lab in 1996 after Mr. Jackson was identified as a suspect. The DNA analysis in Mr. Jackson's case is discussed in the DNA section of this report.

A. Yes, sir.

Q: -- do you show that anywhere?

A. No, sir, I don't.

Q: So you took those samples - and this report was generated at the time you evaluated those samples; is that correct?

A: Yes, sir.

Q: And, so, at the time you generated those samples, you were inconclusive about that; is that correct?

A: Yes, sir.

Q: So, now nine years later, you're saying Type B; is that correct?

A: The Type B activity is basically what I'm saying.³⁹

Although Mr. Bolding testified about changing his conclusions with respect to his ABO typing results of the evidence samples taken from the north bedroom door, defense counsel did not question Mr. Bolding as to why he reported his original findings as "inconclusive" or the basis for his amended findings. Although we cannot draw any firm conclusions about Mr. Bolding's motivations based on the information currently available to us, the most obvious explanation is that Mr. Bolding decided not to report his original ABO typing result finding ABO type B activity in the swab sample from the north bedroom door because that result was not consistent with either the ABO types of the victims or Mr. Dorne, HPD's initial suspect. Rather than report his serology work suggesting that someone other than the victims or Mr. Dorne bled in the room, Mr. Bolding reported these findings as inconclusive. Over six years later, after Mr. Jackson was identified as the suspect in the killings and his blood ABO blood type was determined to be consistent with Mr. Bolding's earlier unreported findings, Mr. Bolding amended his worksheets and issued a supplemental report to reflect a consistency between the evidence and HPD's current suspect. This case is a troubling example of the head of the Crime Lab's

³⁹ Jackson Tr., Vol. 23, at 181:15-182:11.

Serology Section seemingly tailoring his reported results to fit with investigators' pre-existing expectations.⁴⁰

b. Additional Examples of the Crime Lab's Failure to Report Probative Findings

As discussed above, the failure of Crime Lab serologists to report potentially probative findings is not isolated to a few cases or to a single rogue analyst. We have identified 18 cases in which it appears that serologists failed to report seemingly reliable results obtained from ABO typing or other genetic marker analysis. These cases indicate a disturbing pattern of selective reporting and disregard for scientific integrity in the Crime Lab's Serology Section.

In 1990, Ms. Kim performed serological analysis, involving ABO typing as well as enzyme analysis,⁴¹ in connection with the investigation of the sexual assault and murder of Norma Torres. Ms. Kim received reference samples from Ms. Torres, Ms. Torres's boyfriend, and the suspect, Roland Salazar. Ms. Kim determined that the victim, boyfriend, and suspect were all ABO type A with EsD and PGM 1 enzyme markers.⁴² Ms. Kim also determined through Lewis testing that the boyfriend and Mr. Salazar were both secretors whose ABO type could be expected to be expressed in body fluids such as semen.

In her November 15, 1990 report, the only typing results that Ms. Kim reported with respect to the evidence samples she tested was that "human blood having 'A' activity was detected on the bedspread, and yellow/purple shirt." The ABO type A activity detected in these bloodstains was consistent with the ABO type of the victim and both the boyfriend and Mr. Salazar.

⁴⁰ On March 12, 1998, Mr. Jackson was convicted of capital murder, and he is currently on death row. Our review does not question the reliability of Mr. Bolding's original serology tests that determined ABO type B activity to be present on the north bedroom door of the crime scene. Rather, the issues illustrated by this case are selective reporting by Mr. Bolding and his failure to disclose results that potentially exonerated HPD's initial suspect, Mr. Dorne, when Mr. Bolding originally obtained them.

⁴¹ As discussed in our Fourth Report, although the Crime Lab has retained electrophoresis logs reflecting the results of enzyme testing, serologists in the Lab rarely reported the results of this testing. This case is an exception.

⁴² PGM (phosphoglucomatase) and EsD (esterase D1) are enzyme proteins found in blood. Because these and other enzymes and proteins are polymorphic, meaning they exist in different forms, serologists found the analysis of these enzymes useful in distinguishing between the blood of different individuals.

Ms. Kim also reported that “semen was detected on the vaginal and rectal swabs, fitted bed sheet, top bed sheet, peach colored rag and blue striped towel.” She did not report any typing results related to the semen stains she found on these items of evidence. However, her raw data logbook and worksheets indicate that Ms. Kim detected the presence of ABO types A and B activity on the stains from the fitted bed sheet, peach colored wash rag, and blue striped towel. The unreported ABO type B activity that Ms. Kim detected in these items of evidence was probative, and potentially exculpatory, because it was foreign to the victim and to both the boyfriend and Mr. Salazar. In other words, Ms. Kim failed to report serology findings indicating that, if there were a sole semen donor, the semen stains on these three items of evidence could not have originated from either of the two men.⁴³

After Ms. Kim completed her serology work, HPD sent eleven samples related to this case to the Kleberg laboratory at the Baylor College of Medicine for DNA testing. On October 17, 1991, the Kleberg laboratory reported that the DNA pattern obtained from the semen stain on the peach colored wash rag “is not consistent with the DNA pattern from either the suspect Roland Salazar or from” the boyfriend.⁴⁴ These DNA typing results were consistent with Ms. Kim’s *unreported* ABO typing results, indicating that someone other than Mr. Salazar or the boyfriend contributed to the semen stain on the wash rag.⁴⁵

In a 1986 sexual assault case in which the original serology work was performed by Crime Lab analyst David Coffman, we found another example of the Crime Lab obtaining a potentially probative ABO typing result but failing to report it. Mr. Coffman’s original serology work in this case was performed before any suspect had been identified. In his October 20, 1986 report, Mr. Coffman reported only the results of his presumptive screening for blood

⁴³ Ms. Kim’s unreported finding of ABO type B activity could not exclude Mr. Salazar or the boyfriend because ABO type A activity, common to both men (as well as the victim, if she is determined to be a secretor), also was detected. At a minimum, however, Ms. Kim’s unreported results indicate that there was a contributor to the stains on the fitted sheet, wash rag, and towel other than the victim, the boyfriend, or Mr. Salazar.

⁴⁴ The Kleberg laboratory was not able to perform DNA testing on samples from the fitted bed sheet or blue striped towel because either no DNA could be extracted from the samples or the DNA was degraded.

⁴⁵ Although the homicide happened over fifteen years ago, the Harris County criminal case tracking system indicates that Mr. Salazar was arrested on March 30, 2005 in connection with the murder of Ms. Torres and that he is currently awaiting trial.

and semen on various items of evidence, including the detection of human blood on a pair of white tennis shoes belonging to the victim. Mr. Coffman did not report that, according to his worksheet dated July 21, 1986, he determined through an AE test that the bloodstain on the victim's tennis shoes contained ABO types A and O activity, which indicated an ABO type A donor. Mr. Coffman also failed to report that he had detected ABO type O activity on the vaginal swab contained in the sexual assault kit.

On March 11, 1987, a worksheet prepared by Ms. Kim indicated that she performed ABO testing on reference samples obtained from the two suspects who by then had been identified as Leonard N. Francis and Benjamin Silma Mao, a reference sample from the victim, and the vaginal swab from the rape kit. Ms. Kim found that the victim was an ABO type O secretor, Mr. Francis was ABO type B, and Mr. Mao was ABO type O. Ms. Kim also detected ABO type O activity on the vaginal swab, which was consistent with the results of Mr. Coffman's analysis.

In her February 9, 1988 report, however, Ms. Kim reported only that Mr. Francis was ABO type B, that Mr. Mao was ABO type O, and that "type 'O' secretor activity was detected on the vaginal swab previously submitted." Ms. Kim did not report that the victim was an ABO type O secretor and that, therefore, no ABO factors foreign to her were detected on the vaginal swab. Accordingly, because no ABO factors foreign to the victim were detected on the swab, no semen donor in the male population could be excluded as a contributor of the semen on the swab -- a fact Ms. Kim did not report. Even more significantly, neither Mr. Coffman nor Ms. Kim reported the type A activity Mr. Coffman detected in the bloodstain on the tennis shoes, which was foreign to the victim and to both of the suspects, Mr. Francis and Mr. Mao.⁴⁶ The unreported ABO type found on the tennis shoe certainly was probative in that it suggests that an individual other than Mr. Francis or Mr. Mao could have been involved in the assault.

⁴⁶ On March 23, 1987, Mr. Mao pleaded guilty to aggravated robbery and was sentenced to 45 years in prison. The kidnapping and sexual assault charges against him were dismissed. Similarly, Mr. Francis pleaded guilty to aggravated robbery on April 9, 1987, and the rape, kidnapping, and sexual assault charges against him were dismissed. Mr. Francis was sentenced to life in prison. Curiously, Ms. Kim's Crime Lab report is dated February 9, 1988, nearly a year after these guilty pleas.

3. Misinterpretation and Inaccurate Reporting of Results

We have reviewed 17 cases that contain major issues related to the misinterpretation of serology test results and the inaccurate recording and reporting of results. These errors include mistakes in transferring data from test run logbooks to worksheets and from worksheets to Crime Lab reports. These are the types of errors in interpretation, documentation, and presentation that would have been detected, and presumably corrected, if there had been an effective supervisory control and quality assurance system in the Serology Section. As discussed in our earlier reports, however, it is clear that neither Mr. Bolding nor anyone else routinely reviewed the work performed by the Serology Section in order to identify technical issues related to testing and interpretation of results or, for administrative purposes, to ensure that work performed was adequately and accurately documented. The cases discussed below are illustrative examples of the errors that went unchecked in the Crime Lab as a result of the absence of such supervisory and quality controls.

In the 1990 sexual assault case involving a suspect named Jose Luna, the victim reported that a man she later identified in a lineup as Mr. Luna broke into her motel room and raped her. Ms. Kim determined that the victim was an ABO type O secretor and that Mr. Luna was an ABO type O non-secretor, meaning that his ABO type is not expressed in his body fluids such as semen. Ms. Kim performed ABO typing on various items of evidence, including a vaginal swab from the victim's sexual assault kit, two stains on the motel bed sheets, and a white towel. The chart below compares the results Ms. Kim obtained through ABO testing on these items of evidence, as reflected in her raw data logbook, with the results she recorded in her worksheets and with the results she reported in her December 3, 1990 Crime Lab report.

Evidence Sample	Kim’s Logbook ⁴⁷	Case Worksheet	December 3, 1990 Report
Vaginal Swab	A and O activity	Weak A activity	No activity
Sheet Stain #2	A and B activity	A activity	A activity
Sheet Stain #3	A and B activity	A activity	A activity
Towel	A activity	A and O activity	A and O activity

Ms. Kim’s reporting of the vaginal swab as “no activity” is particularly troubling because the actual results recorded by Ms. Kim in her logbook are particularly probative with respect to the investigation of Mr. Luna. The ABO type A activity that the raw data shows Ms. Kim detected on the vaginal swab is foreign to the victim. Therefore, if the case involved only one possible semen donor (i.e., only one assailant and no recent consensual partners), then Mr. Luna would be excluded as a potential contributor to the sample on the vaginal swab since the assailant would be ABO type A.⁴⁸ Although this is clearly a case of misreporting the results of ABO testing, we cannot determine on the basis of currently available information whether the errors are the result of unintentional mistakes in recording the results reflected in raw data or, as appears more likely, selective reporting of serology results. At a minimum, however, HPD lacked an effective quality control regime to detect and correct the inaccurate reporting of results illustrated by the Luna case.⁴⁹

In the 1989 sexual assault case involving a suspect named Roy Anthony Qualls, we observed another instance in which the reported ABO typing results were not consistent with the results reflected in the serologist’s raw data notes.

In his July 15, 1989 report, Mr. Bolding reported both the victim and Mr. Qualls as being ABO type A secretors. However, Mr. Bolding’s July 6, 1989 raw data worksheet reflects that Mr. Qualls was an ABO type B secretor. Mr. Bolding also reported that “semen was detected on the vaginal swab and

⁴⁷ The results reflected in this column of the chart are our interpretation of the ABO agglutination intensities recorded by Ms. Kim in her raw data logbook.

⁴⁸ If there were the possibility of more than one assailant or a recent consensual sexual partner, then Mr. Luna could not be eliminated by the ABO typing results related to the vaginal swab simply on the basis of his non-secretor status; however, he could not be the sole contributor of the semen detected on the evidence sample..

⁴⁹ Mr. Luna pleaded guilty to burglary on May 1, 1991, and the original sexual assault charge against him was dismissed. He was sentenced to twelve years in prison.

smear” from the sexual assault kit and that “the vaginal swab examined contained type ‘A’ grouping activity.” This statement in the report also is contradicted by the typing results reflected on Mr. Bolding’s raw data worksheets. The raw data shows that Mr. Bolding’s AI test results relating to the vaginal swab were negative for ABO type A and type H [O]⁵⁰ activity and that the results for type B activity were uninterpretable due to lysis (rupture of the cell wall) of the type B indicator cells. The bottom line is that Mr. Bolding’s reported ABO typing results, which suggested a potential association between Mr. Qualls and genetic material on the vaginal swab, were unsupported and contradicted by his recorded ABO test results. In fact, the raw data demonstrates that the results of Mr. Bolding’s ABO tests were inconclusive as to whether Mr. Qualls was a potential contributor to the semen sample on the vaginal swab.⁵¹

4. Reported Findings Unsupported by Documented Analysis

We also have reviewed 5 serology cases where the findings reported by the Crime Lab analyst were not supported by documented analytical work reflected in the case file. In such cases, the absence of documented work supporting conclusions reported by Crime Lab serologists is a gross deviation from generally accepted forensic science practices. If the reported conclusions in fact were not supported by analytical work, then those findings are the product of scientific fraud.

In the 1987 sexual assault case in which Patrick Dewayne Tyler was the suspect, the Crime Lab reported results that were not supported by documented analysis. In a report dated March 17, 1987, Ms. Kim stated that “semen was detected on the vaginal smear” contained in the sexual assault kit. According to a worksheet in the case file, this conclusion was based on a microscopic examination of the vaginal smear that found sperm cells. The worksheet does

⁵⁰ There is no common human antibody against ABO type O blood cells. Therefore, in AI testing, serologists use an extract from gorse seeds, *Ulex Europeus*, to cause type O cells to agglutinate. The seed extract, called lectin, agglutinates the H antigen found on all ABO cells, but the agglutination occurs in much higher concentration in the presence of type O cells. Therefore, the reaction to lectin observed in AI testing indicates type H antigenic activity, from which ABO type O activity is inferred.

⁵¹ Mr. Qualls pleaded guilty to the lesser offense of assault and was sentenced to five months in prison.

not reflect that an AP or p30 screening test for semen was performed on the vaginal swab submitted to the Crime Lab.⁵²

On July 13, 1987, upon a motion made by Mr. Tyler, the court ordered that genetic marker analysis be performed on the evidence and compared to a known reference sample provided by Mr. Tyler. The Crime Lab, however, never performed ABO testing on the vaginal swab.⁵³ On September 24, 1987, Ms. Kim issued a second report stating that “[n]o semen was detected on the vaginal swab.” There is no documentation in the case file indicating that Ms. Kim performed any work to arrive at the conclusion that no semen was present on the vaginal swab. Nor does the report or documentation in the file provide any explanation as to why an AP or p30 test for semen was not attempted on the vaginal swab. It is not clear whether this is a case where work was performed, but not documented, or whether it is an example of drylabbing⁵⁴ that effectively denied a defendant the genetic marker testing for which he had petitioned and that the court had ordered.⁵⁵

5. Other Examples of Poor Forensic Science Practices

Our serology case reviews also have revealed cases involving specific flawed scientific practices that -- while consistent with an overall culture characterized by unreliable reporting of serology results and the absence of any effective quality control regime -- we have not observed to be present across multiple cases. Examples of such poor scientific practices are misapplication of substrate controls, misunderstanding the significance of a “no activity” finding in serological analysis, and incorrect results that can be directly attributed to poor training in serology analytical techniques.

⁵² The worksheet does indicate, however, that an AP test for semen was performed on a pair of undergarments submitted to the Crime Lab and that the test was negative.

⁵³ The vaginal smear slide Ms. Kim observed microscopically to contain sperm cells likely was made from the same vaginal swab she later reported as negative for semen. The inconsistency between these reported results is difficult to reconcile.

⁵⁴ “Drylabbing” is a colloquial term for a form of egregious scientific fraud involving the fabrication and reporting of scientific results for tests that actually never were conducted.

⁵⁵ Mr. Tyler had been charged with indecency with a child. On October 23, 1987, he pleaded guilty to burglary and was sentenced to eight years in prison.

In our Fourth Report we discussed our finding that Crime Lab serologists generally failed to run substrate⁵⁶ controls in connection with AE and AI tests for ABO activity, which is a significant departure from generally accepted forensic science practices.⁵⁷ A forensic serologist must use substrate controls to determine whether the ABO factors detected in the questioned stain were part of the background material -- i.e., were contained in the substrate before the questioned stain was deposited on the substrate material -- rather than present in the body fluid evidence being tested. If background ABO factors are detected in the substrate control, the significance of the presence of those same factors in the questioned stain must be taken into consideration in the interpretation of the ABO factors detected. The appropriate response to a failure of the substrate control usually is to report the failure, avoid interpreting the results of the initial test, and repeat the test whenever possible.

In a 1989 sexual assault case involving a suspect named Porfino Ayarzagotia, we found a rare instance in which the Crime Lab serologist, in this case Ms. Kim, actually used a substrate control. However, Ms. Kim failed to properly apply the control. The substrate control run by Ms. Kim exhibited ABO type A activity. In light of this failure of the control, the results of the AI test should not have been reported. Nevertheless, Ms. Kim did not report the failed substrate control from the A, B, and H[O] activity detected in the stain and chose not to repeat the AI test. Instead, she simply did a subtraction and reported the ABO types B and O activity on the stain without disclosing the detection of the type A activity in the substrate control and the evidence stain. This represents an egregious violation of principles of AI interpretation and alone would raise significant doubt about Ms. Kim's competence as a serologist.⁵⁸

We have seen two cases in which serology was attempted by a DNA analyst who was not trained in the interpretation of serology results. One is a 1992 sexual assault case analyzed by Joseph Chu. Mr. Chu determined that the

⁵⁶ Substrate material is the fabric or surface upon which the questioned stain was deposited.

⁵⁷ See Fourth Report at 20.

⁵⁸ Another major issue in this case is that Ms. Kim erroneously reported finding "no activity" on the vaginal swab. This finding is contradicted by Ms. Kim's raw data, which indicates that she detected ABO type A activity on the vaginal swab, which is foreign to both the victim and Mr. Ayarzagotia who were both ABO type O secretors. These results would have eliminated Mr. Ayarzagotia as a sole contributor to the semen detected on the vaginal swab.

victim was an ABO type O non-secretor and that the suspect was an ABO type A secretor. Mr. Chu's ABO testing found no antigenic activity on the vaginal swab contained in the sexual assault kit. Mr. Chu, who was trained as a DNA analyst and not a serologist, appears not to have understood that a "no activity" result is significant in ABO typing. For example, in this case, where the victim was a non-secretor and the suspect was a secretor, a "no activity" result would be consistent with the absence of any foreign ABO activity on the swab and would either eliminate the suspect as a potential contributor of the semen or, if the semen in fact originated from a secretor (such as the suspect in this case), indicate that semen was present in an amount below the detectable level. Mr. Chu, however, incorrectly interpreted the absence of antigenic activity on the vaginal swab as an "inconclusive" test result.⁵⁹

We also found a 1993 case in which Baldev Sharma, a DNA analyst, attempted to perform ABO typing on a bloodstain located on a shirt worn by a man suspected of robbing and beating the victim with a tire iron. Although no serology report was issued in this case, Dr. Sharma's worksheet reflects that his ABO typing results would have excluded the victim as the source of the bloodstain on the suspect's shirt and, therefore, would have failed to establish a potential association between the shirt worn by the suspect and the victim. Subsequent DNA testing, however, concluded that the blood on the suspect's shirt matched the victim's DNA profile. It appears that Dr. Sharma, who was not formally trained as a serologist, failed to obtain reliable ABO typing results.

III. DNA

Similar to the serology techniques that preceded it, forensic DNA profiling of evidence samples involves the analysis of genetic markers to ascertain associations among suspects, victims, and evidence. The uniqueness and durability of DNA make it ideal for use by forensic scientists, and DNA profiling has many advantages over earlier conventional serology procedures. In addition to the immensely improved discriminatory power of DNA profiling, the DNA molecule itself is a particularly robust test target compared to the less stable genetic markers involved with serology. Another significant advantage of DNA testing is the ability to use a technique called differential extraction by which the sperm (male) components of a mixture can be separated from the epithelial (female) components. Differential extraction is, therefore, extremely useful in

⁵⁹ Testing by an outside laboratory in 1993 found no DNA foreign to the victim on the vaginal swab.

typing DNA evidence in sexual assault cases because it is frequently capable of producing two separate DNA extracts that can be used to produce profiles that represent the DNA types of the female and male contributors to a mixed sample.⁶⁰

The first step in DNA analysis is to determine whether a body fluid stain, potentially containing DNA, is present on the evidence items. Forensic scientists perform preliminary screening tests to determine what type of body fluids are present. After a sample is identified as blood or semen, several techniques may be used to extract DNA from the evidentiary sample. With mixed specimens such as those typically found in sexual assault cases, a differential extraction procedure is used to separate the “male” from the “female” components of the mixture, which are then purified and analyzed separately.

Restriction fragment length polymorphisms (“RFLP”) analysis was used in crime laboratories until the mid-1990s. The RFLP analysis process, while very discriminating, is time consuming and requires a relatively large amount of non-degraded, high molecular weight DNA.

DNA profiling technology made a major advance in the late 1980s with the development of a technique known as polymerase chain reaction (“PCR”), which is an amplification process designed to copy or multiply specific segments of DNA. Development of the PCR process gave forensic scientists the ability to analyze much smaller quantities of DNA and made DNA profiling possible in some cases involving sample amounts too small or too degraded for effective RFLP analysis. The early PCR-based methods used in the Crime Lab were known as DQ Alpha, Polymarker, and D1S80.

The most common form of DNA typing used today is a form of PCR-based typing based on markers known as STRs (“short tandem repeats”). STRs are regions of human DNA that contain a series of short repeated units. The forensic science community in the United States has standardized DNA typing using a set of 13 core STR loci. This set of 13 core STR loci is used for

⁶⁰ For ease of reference and to provide helpful background for the discussion of significant issues we have identified in the DNA work performed by the Crime Lab, we include in this section a brief, general description of certain forms of DNA testing. For a more detailed discussion of the technical aspects of DNA profiling, please refer to Appendix C of our Fourth Report, “Discussion of DNA Profiling Technology and Techniques Used by the Crime Lab.”

entry into the national DNA profiling database known as the Combined DNA Index System (“CODIS”),⁶¹ which is managed by the FBI.

DNA profiles obtained from biological evidence samples can inculcate a suspect associated with that evidence with a high degree of scientific certainty. The statistical meaning of comparisons between DNA profiles developed from known reference samples and the DNA profiles developed from evidence items must be properly calculated and routinely reported in the laboratory reports prepared by DNA analysts. The true significance of a DNA “match” cannot be properly conveyed without an appropriate estimate of how rare that profile is in the human population. Because the frequency of occurrence of the DNA profile conveys the weight of this evidence, it must be presented accurately and clearly by the DNA analyst.

A. Status of the DNA Case Reviews

We originally drew our sample of DNA cases to be reviewed during Phase II from cases analyzed in the Crime Lab from 1991 through the closure of the DNA Section in 2002. Similar to our experience with serology cases, we found that our original sample of DNA cases included a large number of cases that did not involve substantive forensic scientific work by the Crime Lab and, therefore, would not provide a basis to assess the quality of DNA analysis performed in the Lab. In order to identify cases involving substantive analytical work, we developed a database of cases derived from raw data records maintained by the Crime Lab; then, with the assistance of PwC, we modified our sample based on that database. Through this process, we identified a total of 1,288 “substantive” DNA cases, from which PwC developed a sample of 296 DNA cases.⁶² Last fall, we also began reviewing all 18 death penalty cases that

⁶¹ CODIS is a system that “enables federal, state, and local crime labs to exchange and compare DNA profiles electronically, thereby linking crimes to each other and to convicted offenders.” CODIS is a hierarchical database with three tiers -- the National DNA Index System (NDIS) is the highest tier, with state (SDIS) and local (LDIS) databases flowing into it. See www.fbi.gov/hq/lab/codis/brochure.pdf.

⁶² As described in the Phase II Plan, the original sample size PwC developed for DNA cases (which was derived from a population including both substantive and administrative cases) totaled 358 DNA cases.

involved DNA analysis by the Crime Lab as well as cases that have not yet been confirmed through the post-conviction re-testing process.⁶³

At the time of our last report, we had completed reviews of 67 DNA cases, including all 18 of the DNA death penalty cases except for the case of Derrick L. Jackson.⁶⁴ We identified major issues in 27 of these cases, or approximately 40% of the DNA cases we had reviewed prior to the publication of our Fourth Report. Three death penalty cases were identified as having major issues.⁶⁵ The most significant and pervasive issues we identified in the DNA cases we summarized in our Fourth Report were:

- Failure to report typing results, including potentially exculpatory results.
- Prevalence of low quality analytical results, particularly with respect to PCR-based DQ Alpha, Polymarker, and D1S80 testing, likely attributable to some combination of poor technique on the part of the Crime Lab's DNA analysts and contamination.
- Misleading reporting of the statistical significance of the Crime Lab's DNA profiling results, particularly in cases involving mixture evidence.
- Failure to use and show proper regard for scientific controls, especially negative controls in PCR testing, and failure to compare typing results at

⁶³ In early 2003, the District Attorney's Office and HPD began a process designed to re-test all cases that resulted in a conviction -- whether at trial or through a guilty plea -- in which DNA evidence analyzed by the Crime Lab may have played a role. The central purpose of the re-testing program has been to identify any cases in which the results of DNA analysis performed by the Crime Lab cannot be confirmed. As of December 22, 2005, re-testing had been ordered for 416 cases.

⁶⁴ We were unable to complete our review of the Derrick Jackson death penalty case last fall because the original RFLP autorads related to that case were missing from the Crime Lab's raw data records. On February 3, 2006, the Crime Lab produced a recently-discovered box containing, among other things, case notes, raw data materials such as RFLP autorads and DQ Alpha test strips, and tubes of DNA extracts. The missing autorads related to the Derrick Jackson case were in the box.

⁶⁵ The three death penalty cases involving major issues that we discussed in our Fourth Report relate to death row inmates Franklin Dewayne Alix, Juan Carlos Alvarez, and Gilmar Alex Guevara. In this report, we discuss the Crime Lab's work in the case of Derrick Jackson, a fourth death penalty case in which we identified major issues related to the DNA analysis (as well as the serological testing) performed by the Lab.

the redundant loci when two STR reagent kits were used to type the same evidence samples.

- Failure to perform and document meaningful technical and administrative reviews of the work performed by DNA analysts.
- Absence of a system assigning a unique identifier to track evidence samples from submission through analysis to reporting.

In light of the seriousness and pervasiveness of the major issues we found in our case reviews last fall, we recommended to the Stakeholders Committee and HPD that we focus the case reviews on the 69 DNA re-test cases which either (a) had not yet been tested by outside laboratories or (b) re-testing by outside laboratories had failed to confirm the Crime Lab's original DNA testing results. We suggested this approach in order to focus resources on reviewing the cases in which there had been a conviction and outside testing had not confirmed the Crime Lab's original results. These cases pose the greatest risk for potential injustice related to flawed DNA profiling work performed by the Crime Lab. The Stakeholders Committee and HPD approved our recommendations, and we changed the focus of our DNA case reviews accordingly.

We have completed our review of all 69 of these DNA conviction cases in which either the evidence has yet to be re-tested or the Crime Lab's original DNA results have not been confirmed through re-testing. We identified major issues in 25 -- or approximately 36% -- of these cases. In total, we have reviewed 135 DNA cases analyzed by the Crime Lab from across the entire period in which the Lab performed DNA analysis and have identified major issues in 43 -- or approximately 32% -- of these cases.⁶⁶ However, it is important to note that, because we are no longer basing our review of DNA cases exclusively on a statistically-based sampling methodology, this rate of occurrence of major issues is not easily extrapolated to the set of all DNA cases analyzed by the Crime Lab.

B. Serious Problems Identified in DNA Cases

Many of the major issues we have identified in the cases we have reviewed since our Fourth Report are similar to those we have discussed previously, including the failure to report probative, even potentially

⁶⁶ There are 45 suspects or defendants involved in the 43 major issue DNA cases we have identified. Each of these individuals is identified in Appendix C, "DNA Major Issue Cases."

exculpatory, results; poor technical work and potential contamination; questionable interpretation of results; and misleading reporting of the statistical significance of DNA profiling results in mixture cases. In this report, we expand on these and other major issues, as well as discuss additional troubling cases involving seriously flawed or unreliable DNA work performed in the Crime Lab.

1. Failure to Report Potentially Exculpatory Results

As discussed in the previous section, we found a disturbing number of instances where the Crime Lab's serologists appeared to be unwilling to report typing results that were inconsistent with the known ABO type of either a victim or a suspect. This indefensible practice continued into the DNA era as many of the same criminalists who had been serologists, including Mr. Bolding and Ms. Kim, became the Crime Lab's senior DNA analysts. With the exponentially-improved discriminatory power of DNA profiling over serology, the Crime Lab's practice of failing to report probative, and in some cases potentially exculpatory, DNA typing results became even more egregious.

As with serology, it is not clear whether this pattern and practice of avoiding the reporting of DNA typing results that were not consistent with a victim or known suspect is attributable to the DNA analysts' lack of confidence in their ability to obtain reliable results or to fraudulent reporting designed to maximize the chances of convictions and avoid the consequences of potentially exculpatory results. It is apparent, however, that DNA analysts in many cases tended toward reporting only those results that, from their perspective, were "safe" in the sense that they were consistent with other evidence in the case or with the investigators' expectations. As in the cases of Franklin Dewayne Alix and Garland Davis discussed in our Fourth Report and Michael Mingo discussed below, this sometimes meant that analysts failed to report potentially exculpatory RFLP results in favor of reporting less definitive or less powerful PCR-based typing results that appeared to reflect an association between the suspect and evidence in the case. When such selective reporting was coupled with the Crime Lab's systematic exaggeration of the statistical significance of these weaker PCR results, a very significant risk of injustice was created.

Mr. Mingo's case related to the investigation of a suspected sexual assault on a 12-year-old girl that took place on December 30, 1996. A sexual assault examination was performed on the girl the following day. She told the examiners that she had had vaginal intercourse for the first time with a 25-year-old man named Mingo and that the intercourse occurred with the use of a condom. She also told the examiners that she had showered prior to the

examination. In December 1997, a reference sample taken from Mr. Mingo was submitted to the Crime Lab for DNA analysis and comparison to genetic material on the vaginal swab included in the victim's sexual assault kit.

In January 1998, DNA analyst Raynard Cockrell performed RFLP testing on extracts taken from the vaginal swab. He initially ran two RFLP probes. He exposed the first probe for two hours and then extended the exposure overnight, and exposed the second probe for one and a half hours. Neither of these RFLP tests on the vaginal swab included a profile consistent with Mr. Mingo. A telephone log in the Crime Lab file reflects that, on January 21, 1998, Mr. Cockrell told a prosecutor in the District Attorney's Office that the "suspect could not be ruled out" and that "PCR analysis might be able to give a conclusive result." On January 23, 1998, Mr. Cockrell informed a second prosecutor that "her suspect could not be ruled out" and that "PCR analysis [is] needed." He also noted that "SUSPECT is in jail" and that the trial currently was scheduled for the following Monday.

On February 5, 1998, Mr. Cockrell ran a third RFLP probe on the extract from the vaginal swab. After relatively short exposure times of only two hours and then four hours, faint bands consistent with the victim's DNA profile were apparent on the RFLP autoradiograph ("autorad"). Also visible on the autorad were two very faint bands suggesting the presence of a DNA profile that was consistent with neither the victim nor Mr. Mingo. In other words, this third autorad indicated a potential unknown contributor to the sample from the vaginal swab. In light of these faint results, the appropriate action would have been for Mr. Cockrell to subject the third probe to a longer exposure time in order to further develop this DNA profile related to an unknown suspect potentially present on the vaginal swab. Instead, Mr. Cockrell prematurely terminated the third probe, thus never permitting these faint bands to develop.

On February 19, 1998, Mr. Cockrell and DNA analyst Joseph Chu advised the prosecutor that "RFLP results are inconclusive" and that Mr. Chu would perform PCR analysis. The results of Mr. Cockrell's RFLP testing, including the potentially exculpatory bands detected by the third RFLP probe suggesting the presence of the victim's and an unknown person's DNA profiles, were never reported.

Mr. Chu then performed PCR-based tests -- specifically, D1S80, Polymarker, and DQ Alpha tests -- on the evidence sample. In his February 26, 1998 report, Mr. Chu reported that "the DNA type detected on the vaginal swab matches the DNA type of Michael Mingo." Consistent with the DNA Section's

flawed and misleading practice of reporting statistical calculations of the suspect's reference sample rather than the statistical calculations of the profile detected in the mixture sample, Mr. Chu reported that "the DNA type of Michael Mingo can be expected to occur in 1 out of 300,000 people among the American Black population."⁶⁷ We calculated the relevant frequency estimate, based on Mr. Chu's PCR-based results, to be 1 in 1,022 for the African American population, 1 in 157 for the Caucasian population, and 1 in 135 for the Hispanic population.⁶⁸

The case against Mr. Mingo went to trial in June 1998. On June 18, 1998, after the trial began but before a jury verdict was rendered, Mr. Mingo pleaded guilty to aggravated sexual assault of a child. He was sentenced to ten years in prison.⁶⁹

2. Failure to Mathematically Confirm RFLP Results

The results of RFLP testing are visualized as x-ray film images known as autorads and appear as translucent films with dark bands on them. These bands reflect the presence of RFLP alleles detected in the evidence and known reference samples. The DNA analyst determines the size of each band through comparison with known sizing standards. The size of the evidence bands reflected on the autorad is then compared with the sizes of the known reference sample bands. If the size of the evidence bands falls within an appropriate "match window," the evidence and reference samples are said to "match."

⁶⁷ This statement by Mr. Chu is completely irrelevant to the significance of the association -- reported as a "match" -- between Mr. Mingo and the evidence based on Mr. Chu's PCR testing. The Crime Lab's consistent practice of including misleading statistical calculations in mixture cases is the most pervasive of the major issues we have identified in the Lab's DNA cases. This issue is discussed further below.

⁶⁸ As discussed further below, forensic DNA analysts express the strength of the association of an individual with a specific sample of biological evidence through the calculation of a frequency estimate called a "random match probability." That estimate quantifies the likelihood that a person randomly drawn from the population could be the source of the genetic profile detected in the evidence sample. A proper presentation of frequency estimates includes calculations for all significant populations because it is inappropriate to assume that a contributor to the evidence was from the same racial population as the suspect against whom the DNA profile comparison was made.

⁶⁹ The outside laboratory that re-tested the vaginal swab in Mr. Mingo's case was able to develop a partial DNA profile. The outside laboratory calculated a frequency estimate of 1 in 59 unrelated individuals in the African American population.

Initially, this comparison between the bands related to evidence samples with the bands related to the victim's and suspect's known reference samples is performed visually by the DNA analyst. Allelic bands in evidence samples that appear to line up at approximately the same positions as bands in victim or suspect reference samples can be said to be visual matches, indicating common alleles may be present in the evidence sample and the matching reference sample.

The Crime Lab's SOP regarding "Procedures for the Detection of Restriction Fragment Length Polymorphisms in Human DNA" ("RFLP SOP"), dated 1991, required that "[v]isual matches must be confirmed or rejected through application of the appropriate mathematical procedures."⁷⁰ The RFLP SOP prescribed a mathematical confirmation procedure under which the DNA analyst was required to calculate "match windows" with a range of 2.5% of the base pair size for the DNA fragments related to the known specimen and evidence sample that had been determined to be visual matches. If the sizes of the known and evidence specimen bands fall within 2.5% of one another, then the visual match was confirmed. The SOP stated that, "[i]f the ranges do not overlap, the presumptive equality of the fragment sizes is either inconclusive or exclusionary" -- in other words, there would be no valid DNA profile match between the reference and evidence samples being compared when the 2.5% match window is exceeded.

The death penalty case of Derrick Jackson is unusual because the passage of time between the murders in 1988 and the identification of Mr. Jackson as a suspect in 1995 spanned the technological transition in the Crime Lab from serology to DNA profiling. In the Jackson case, the Crime Lab performed ABO typing, RFLP DNA analysis, and PCR-based DNA analysis.⁷¹ The reported results of the RFLP testing in Mr. Jackson's case, which was performed by DNA analyst Mary Childs-Henry, were flawed because Ms. Childs-Henry failed to follow the Crime Lab's RFLP SOP guidelines regarding mathematical confirmation of presumed matches.

From July to September 1996, Ms. Childs-Henry performed RFLP testing on various evidence items recovered from the apartment in which the two victims, Mr. Henderson and Mr. Wrotenbury, had been murdered eight years

⁷⁰ RFLP SOP at 19.

⁷¹ The major issues we identified with respect to Mr. Bolding's serological analysis in the Derrick Jackson case are discussed in the previous section.

earlier. Ms. Childs-Henry obtained RFLP results related to samples extracted from a beige towel and a red towel found in at the crime scene. Based on these RFLP results, a report issued by the Crime Lab, dated March 14, 1997, stated “[t]he DNA type detected on the beige towel (item 26) and the red towel (item 27) matches the DNA type of Derrick Jackson.” Regarding the significance of the match between Mr. Jackson’s DNA profile and the DNA profiles from bloodstains on the towels, the Crime Lab reported that “[t]he DNA type of Derrick Jackson can be expected to occur in 1 out of 5.8 million among the American Black population (based on RFLP results).”⁷²

On March 10, 1998, the second day of Mr. Jackson’s capital murder trial, defense counsel requested a hearing to challenge the admissibility of evidence related to the DNA analysis performed by the Crime Lab on the grounds that the Lab’s DNA testing was unreliable.⁷³ Specifically, the defense sought to challenge, through the testimony of its expert Dr. Elizabeth Johnson, whether the “match windows” related to the Crime Lab’s RFLP testing were properly calculated.⁷⁴ After hearing briefly from Dr. Johnson, the court declined to hold a pre-admissibility hearing regarding the validity of the Crime Lab’s DNA analysis techniques and permitted the State to introduce the DNA testing results.⁷⁵

⁷² This statement is not a proper presentation of a frequency estimate relating to the DNA profile detected on the towels, which more appropriately should have been expressed as random match probabilities with respect to at least the three most significant North American racial populations --African American, Caucasian, and Hispanic. However, because the bloodstains involved were not mixtures, these statistics are less problematic and misleading than the statistics the Crime Lab routinely calculated based on suspects’ known reference samples in cases involving mixed body fluid samples from more than one donor.

⁷³ Under the principles established in United States Supreme Court case *Daubert v. Merrill-Dow Pharmaceuticals*, 509 U.S. 579 (1993), and its Texas state court analog, *Kelly v. State*, 824 S.W.2d 568 (Tex. Crim. App. 1992), the trial judge must perform a “gatekeeping” function with respect to the admission of scientific testimony to ensure that such evidence is premised on valid scientific theory and is reliable.

⁷⁴ Jackson Tr., Vol. 22, at 9:11-9:23; 31:8-22.

⁷⁵ On appeal, the Texas Court of Criminal Appeals agreed with Mr. Jackson that the trial court “abandoned its ‘gatekeeping’ function” in refusing to hold a *Daubert/Kelly* hearing, but held that “in this case the error was harmless because the State’s DNA evidence was in fact reliable.” *Jackson v. Texas*, No. 73,081 (Tex. Ct. Crim. App. May 17, 2000). This Court of Criminal Appeals ruling is surprising and difficult to square with the fact that, as discussed below, at trial the State and Ms. Childs-Henry admitted that she had in fact miscalculated the RFLP match windows.

That evening, the prosecution advised Mr. Jackson's counsel that the statistics related to the Crime Lab's RFLP results had been recalculated and that, rather than a frequency estimate of 1 in 5.8 million in the African American population, the Lab's revised statistical calculation was 1 in 224.⁷⁶ The following day, on March 11, 1998, Ms. Childs-Henry acknowledged on the witness stand that the RFLP results of two of the four autorads related to DNA tests on the towels fell outside the appropriate match windows and, therefore, could not be used in the statistical calculation. Accordingly, the results relating to those two autorads were disregarded and the frequency estimate recalculated, with the effect of reducing the Crime Lab's reported 1 in 5.8 million African Americans frequency estimate to 1 in 224.⁷⁷ The next day, Mr. Jackson was convicted of capital murder.⁷⁸

Standing alone, the Crime Lab's failure in Mr. Jackson's case to follow its own established procedures for mathematically confirming DNA profile "matches" between evidence samples and the suspect's reference sample is troubling. However, this case also illustrates the broad failure of the Crime Lab to have any semblance of a quality assurance program in the DNA Section to detect and remedy errors. We have found no evidence that routine and competent technical reviews of DNA analysts' work were ever performed in the Crime Lab, even in capital murder cases such as this case. It is precisely errors such as those reflected in the Derrick Jackson case that should be detected and remedied through an effective quality assurance program.⁷⁹

⁷⁶ Jackson Tr., Vol. 23, at 137:4-138:9.

⁷⁷ *Id.* 252:11-254:8.

⁷⁸ On August 13, 2003, upon a motion filed by Mr. Jackson's counsel, the court ordered that the stains on the two towels be subjected to DNA re-tests performed by LabCorp Laboratory, an outside laboratory retained by the defense. After attempting to contact Mr. Jackson's current counsel, Steven Rosen, by telephone, on January 31, 2006, we sent Mr. Rosen a letter requesting raw data relating to testing in Mr. Jackson's case, including the results of LabCorp's re-testing of evidence in this case. We have received no response from Mr. Rosen.

⁷⁹ The DNA analysis in the Derrick Jackson case was performed after Dr. Baldev Sharma had been removed as the Criminalist III supervisor in the DNA Section and placed in a Quality Assurance/Quality Control position for the entire Crime Lab in August 1996 following the Lynn Jones scandal. *See* Third Report at 21. Neither Dr. Sharma nor Mr. Bolding, the head of the DNA Section, appeared to have appreciated the important role of a quality assurance program in producing reliable DNA profiling results.

3. Poor Quality PCR Analysis

In our Fourth Report, we discussed the alarming frequency with which PCR-based testing -- D1S80, Polymarker, and DQ Alpha -- performed by the Crime Lab generated multiple DNA profiles that were matched to a suspect and the victim, plus one or more unknown donors. The analysts' failure to recognize that this abundance of alleles was unreasonable is an indicator that they were not adequately trained to be aware of and alert for the potential for contamination in any PCR-based analysis.

Indeed, it appears that at some point the Crime Lab became concerned about PCR contamination. In Mr. Bolding's files, we found a memorandum from Mr. Bolding dated March 2, 2001 and addressed to Mr. Chu, a prolific PCR analyst. In the memorandum Mr. Bolding wrote:

ON [sic] February 21, 2001, we spoke about contamination in the PCR Process, I requested a [sic] documentation of the contamination and what steps you took to alleviate the problem. To date I have not received that document.

The corrections for contamination problems, via formal document are due in my hands on Monday Mar. 5, 2001 by 10 a.m. This document should be in a form that can be presented to defense experts.

Mr. Chu could not recall whether a specific incident or event gave rise to Mr. Bolding's directive that he document and address contamination problems related to the PCR process. Mr. Chu told us that he believed the Mr. Bolding's memorandum related to concerns about contamination at the DNA extraction stage, before evidence was transferred to the DNA analysts for testing. He also could not recall what action, if any, he took in response to this memorandum., and we have found no evidence of any response to Mr. Bolding's directive that contamination in the PCR process be investigated.

Below, we describe the problems we have observed in the PCR-based typing performed by the Crime Lab in several cases. We use the Reginald Jackson case as an illustrative example to show the results of a combination of poor analytical technique and possible contamination in the Crime Lab's use of D1S80, a PCR-based test.

a. Problems with D1S80 Analysis

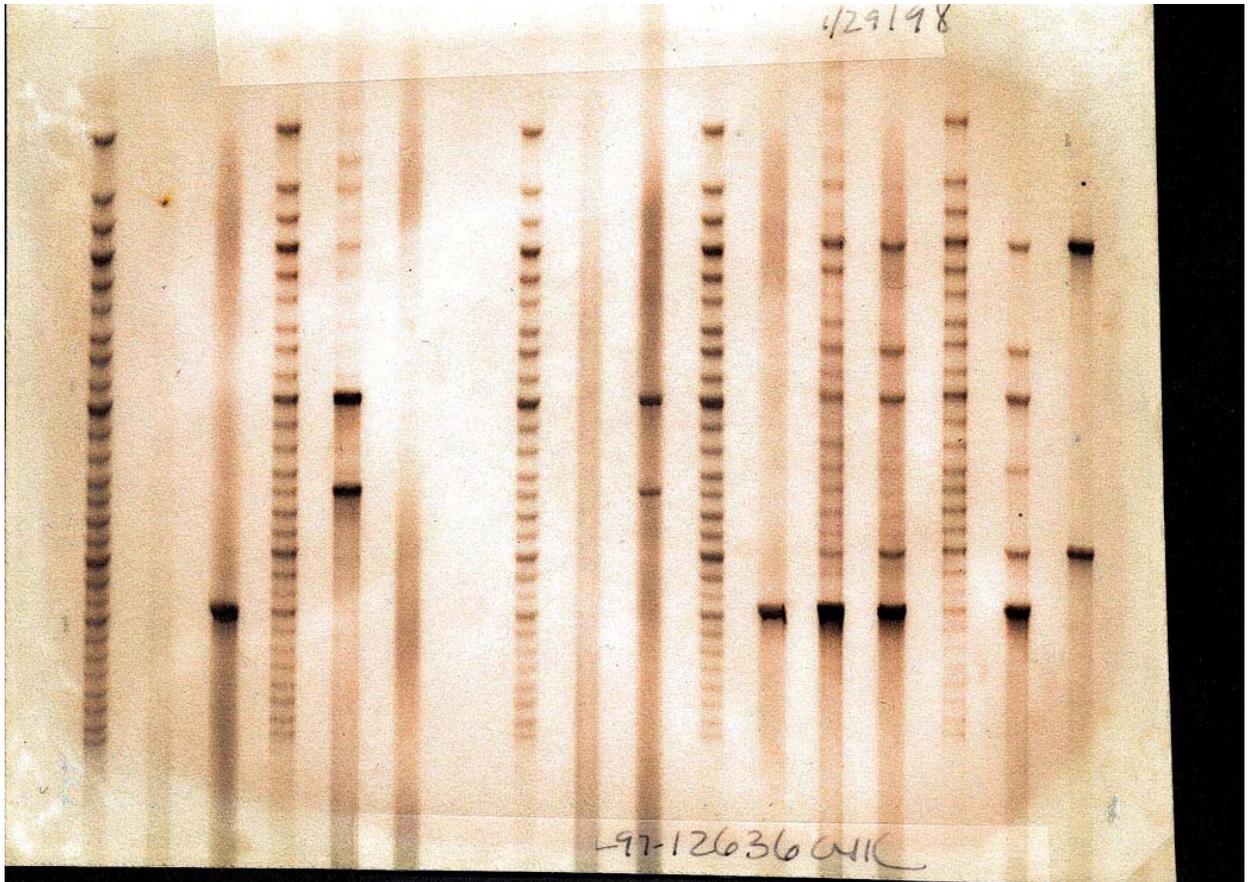
D1S80 is an early form of PCR-based testing related to the D1S80 locus, which is found on human chromosome number 1. The D1S80 locus was attractive to forensic DNA analysts because it exhibits a very high degree of polymorphism, or variability, between individuals. D1S80 typing tests involve electrophoresis of D1S80 products through a gel to determine the number of tandem repeats present in evidence or reference samples. After the D1S80 product is loaded and run on the gel, the D1S80 allelic bands are visualized to produce gel image similar in appearance to an RFLP autorad. Sizing ladders are run in the gel along with the evidence and known reference samples in order to permit the DNA analyst to interpret the allelic bands produced through the electrophoretic process. Each individual has a maximum of two alleles at the D1S80 locus (homozygous persons have only one type of allele). An individual's D1S80 type is expressed as the combination of these alleles. For example, one person might be typed for D1S80 as a type "18, 24" and another person as D1S80 type "22, 31."

In the Reginald Jackson case, the Crime Lab was asked by investigators to analyze evidence relating to a stabbing that occurred in 1997. Investigators submitted four items of evidence to the Crime Lab: (1) blood from a steak knife, (2) blood taken from a walkway in a parking lot, (3) blood from a foyer floor, and (4) a bloodstain from an article of clothing alternately described as "jeans" or "pants" in difference Lab documents. The Crime Lab also received reference samples from the victim and the suspect, Mr. Jackson. Ms. Kim performed DQ Alpha, Polymarker, and D1S80 testing on the evidence and reference samples.⁸⁰

Below is an image of the original gel reflecting a set of results obtained by Ms. Kim through D1S80 testing in the Reginald Jackson case. Each lane is labeled to reflect the sample, sizing ladder, or control placed in that lane.

⁸⁰ Ms. Kim's February 6, 1998 report indicates that "DNA extracted from the . . . evidence except for 4 microliters was transferred from Criminalist C. Kim to R. Cockrell for DNA (RFLP) analysis." Mr. Cockrell never reported any results related to the evidence in this case. A "Post-it" note attached to one of Mr. Cockrell's RFLP data sheets indicated: "No results on unknowns."

D1S80 Gel in the Reginald Jackson Case



Allelic Ladder
 Negative Control
 Knife
 Allelic Ladder
 Reginald Jackson
 Negative Control
 Negative Control
 Allelic Ladder
 Negative Control
 Pants/Jeans
 Allelic Ladder
 Foyer Floor
 Walkway
 Victim
 Allelic Ladder
 Victim
 Positive Control

The above gel image reflects that Ms. Kim obtained a strong homozygous D1S80 type “34” allele in the “knife” sample. This 34 allele also is present in the foyer floor, walkway, and victim’s reference samples. The walkway and victim’s reference samples, however, also reflect the presence of numerous other alleles. The profile indicated for Mr. Jackson appears to be D1S80 type “24,28,” although several extraneous bands are apparent in his reference sample as well.⁸¹ The

⁸¹ A “24,28” profile is consistent with the profile developed for the jeans/pants evidence sample.

unexplained presence of these extraneous alleles in both the victim's and suspect's reference samples illustrates some of the problems we have observed generally with the Crime Lab's PCR-based DNA testing.

First, in addition to the 34 allele, the victim's reference sample contains five other D1S80 alleles: 18, 22, 24, 27, and 31. At most, an individual has only 2 alleles at a particular locus such as D1S80. The fact that Ms. Kim detected a total of six alleles in the victim's reference sample, which should be a pristine, single-source sample, is extremely troubling. This result indicates that the victim's reference sample was contaminated at some point in the handling of this sample. It is theoretically possible for a victim's reference sample to have become contaminated at the medical examiner's or coroner's office. In this case, however, subsequent to the D1S80 testing, Mr. Cockrell performed RFLP typing on the victim's reference sample and obtained a single donor profile. Moreover, the outside laboratory that later performed a DNA re-test was able to obtain a single donor profile for the victim sample using the original DNA extract prepared in the Crime Lab. This suggests that, if the result reflected on the D1S80 gel for the victim reference sample is the product of contamination, the contamination occurred after extraction, most likely at the PCR amplification stage.

It is possible that Ms. Kim added too much DNA from the evidence and reference samples during the PCR amplification phase of the testing process, which could have led to over-amplification and the presence of multiple extraneous bands in the reference and evidence samples. When we asked Mr. Chu to discuss what he believed accounted for the extraneous alleles in several of the evidence and reference samples reflected on the Reginald Jackson gel, he mentioned overloading and over-amplification. In light of the band pattern observed for the victim's reference sample, overloading or over-amplification seem like unlikely explanations for the multiple bands seen in the victim's reference sample.

Extraneous alleles also are visible in Reginald Jackson's reference sample and the walkway sample and could involve crossover or contamination from the allelic ladder. If the sizing ladder were overloaded in the gel, it is possible that it could carry over into an adjacent lane. In this case, however, while the Reginald Jackson reference sample is adjacent to an allelic ladder lane, the walkway sample is not. The walkway sample appears to be an example of mixing the allelic ladder with an evidence sample prior to loading it into the gel. Overloading and over-amplification is another theoretical possibility to explain

this “laddering” phenomenon when a specimen seems to exhibit all the bands just as an allelic ladder does.

Regardless of the cause of the serious problems with the D1S80 testing in this case, Ms. Kim was unable to resolve the issues. Ultimately, Ms. Kim only reported that “the DNA type detected from the knife is not consistent with that of Reginald Jackson.” Although the victim reference sample shared a strong 34 allele with the knife sample, it appears Ms. Kim was unwilling to interpret the mixed profile she obtained in the victim’s reference sample. Ironically, in several cases, including the Carlos Segura case discussed below, where the Crime Lab has obtained questionable multiple profiles in evidence samples, analysts either selectively reported profiles consistent with a suspect’s or victim’s known profile or reported out multiple profiles, including matches with known reference samples from the victim and suspect(s) as well as one or more “unknown” individuals.

b. Questionable Interpretation of PCR Results

In a 1998 homicide case involving three suspects -- Carlos Segura, Mark Zavala, and Francisco Zapata -- we observed Ms. Kim’s flawed interpretation of PCR-based results in a mixture case. This case involved a stabbing in which blood was identified on a knife and on several samples from the crime scene, including a blood trail leading away from the victim’s body. Ms. Kim performed PCR-based testing on the blood trail samples, a sample from the knife, reference samples from the three suspects, and a sample described as “white tissue/blue diaper” that appears to contain the victim’s DNA profile.⁸²

In her July 7, 1999 report, Ms. Kim stated that “[t]he DNA pattern from the blood trail samples . . . is consistent with that of Francisco Zapata.” She also reported finding “[a] mixture of DNA type [sic] consistent with DNA type [sic] of Francisco Zapata, Carlos Segura, and Mark Zavala and the donor of the blood trail sample and white tissue/blue diaper was detected on the back handle, the

⁸² Ms. Kim’s analysis in this case is further confused by the fact that there is no clear profiling data related to a reference sample from the victim. It appears that Ms. Kim was not able to obtain DNA typing results on the blood obtained from the victim’s autopsy. However, the Crime Lab obtained results from the “white tissue/blue diaper” sample, which was labeled as “DNA extract from white tissue/blue diaper -- Moises Ayala [the victim]” when the sample was sent to an outside laboratory for DNA testing in 1999. This indicates that the “white tissue/blue diaper” sample contained the victim’s DNA profile.

bolster and handle of the knife.” Ms. Kim reported finding four DNA profiles on the knife -- all three suspects and a fourth person whose profile is consistent with the DNA profile obtained from “white tissue/blue diaper” and who actually is the victim.

The raw data reflecting the results of Ms. Kim’s PCR-based testing, and the results of her DQ Alpha testing in particular, strongly indicate that her interpretation of the DNA testing results to include all three suspects and a fourth profile (the victim) is flawed and misleading. Unfortunately, the suspects and victim share several common DQ Alpha and D1S80 alleles, which made elimination of a suspect as a possible contributor to the evidence on the knife sample difficult. However, a reasonable interpretation of the raw DQ Alpha results would be consistent with a mixture of the victim and Mr. Zapata only. Such an interpretation certainly would be more reasonable than Ms. Kim’s finding that all three suspects and the victim bled on the knife. At a minimum, Ms. Kim should have tabulated the allelic findings in her report and explained that she could not eliminate Mr. Zavala or Mr. Segura as potential contributors due to the common alleles they shared with either the victim or Mr. Zapata. Instead, she issued a report that was extremely muddled and confusing to the point of being nearly incomprehensible.

In 1999, the evidence in this case was sent to an outside laboratory for STR testing. In a report dated August 25, 1999, the outside laboratory concluded that “both [the victim] and Francisco Zapata are included as potential contributors to the stains on the knife and sheath. Both Carlos Segura and Mark Zavala are excluded as contributors to the stains on the knife and sheath.”⁸³ These STR results are consistent with the raw data related to Ms. Kim’s PCR-based testing. However, Ms. Kim interpreted and reported her data to include all three suspects as well as a fourth contributor, whom she failed to identify as the victim. Her interpretive error was exacerbated when she presented misleading frequency estimates, calculated based on the suspects’ reference profiles, that suggested strong associations between Mr. Segura (1 in 11,300) and Mr. Zavala (1 in 758,000) and the DNA evidence from bloodstains on the knife.⁸⁴

⁸³ HPD has acknowledged that re-testing by an outside laboratory in this case has reversed the Crime Lab’s original DNA typing results as to Mr. Segura and Mr. Zavala.

⁸⁴ We calculated the frequency estimate, based on Ms. Kim’s typing results for the bloodstains on the knife, to be 1 in 48 for the Hispanic population.

4. Problems with Interpretation of STR Results

Errors by Crime Lab DNA analysts in the interpretation of raw data related to DNA tests were not limited to early PCR-based testing. Similar interpretative errors continued into the STR testing era. As discussed in our Fourth Report, a critical control in the STR system used by the Crime Lab is confirmation that the alleles detected at the redundant D3 and D7 loci⁸⁵ in the COfiler and Profiler reagent kits are in concordance.⁸⁶ We have identified several cases in which DNA analysts reported STR results and developed profiles despite discordance between COfiler and Profiler typing results at these redundant loci.

The presence of these redundant loci in the COfiler and Profiler reagent kits used by the Crime Lab for STR testing is a built-in quality control feature designed to detect possible sample mix-ups. This feature also is a tool to ensure that both kits are working properly. If the alleles detected with the COfiler reagent kit for D3, D7 and amelogenin markers are not in concordance with those detected using the Profiler reagent kit, it is a warning that there is a problem, including the possibility that the sample is of poor quality. If the allele identifications at the redundant loci are not the same for the same samples, it is imperative that the problem be resolved by re-analyzing the original samples. The Crime Lab's SOPs specifically required that the D3 and D7 loci for the COfiler and Profiler systems must agree in each sample run through the STR process.⁸⁷

The case of Ronald Cantrell presents an example of questionable interpretation and reporting of STR results in the face of COfiler and Profiler discordance at the redundant D3 and D7 loci. This case involved a reported sexual assault on an 8-year-old girl. According to the sexual assault examination form prepared on December 12, 2001, the victim reported that a suspect named "Ronny" forced the victim to perform oral sex, resulting in a "semen" stain on her shirt. On December 17, 2001, the Crime Lab received several articles of clothing from the victim, including a blouse.

⁸⁵ "D3" is shorthand for the D3S1358 locus and "D7" is shorthand for the D7S820 locus.

⁸⁶ Fourth Report at 46-48.

⁸⁷ The Crime Lab's SOPs, however, provide no guidance as to what procedures the DNA analyst should follow with respect to sample tests where the D3 and D7 loci are not in concordance.

On February 8, 2002, Crime Lab analyst Audrey Tims reported that “semen was detected on the blouse.” Ms. Tims’s identification of semen on the blouse is questionable. It does not appear that she performed a microscopic examination to detect the presence of sperm cells on the blouse. Ms. Tims’s worksheet, dated December 17, 2001, reflects that the AP screening tests for semen were negative when she tested stains on the blouse. She also ran a p30 Abacard test for semen on the blouse, the results of which she recorded as “POS weak.” Based on the limitations of the p30 Abacard test system and the negative AP test for semen, this weak positive result probably was not a sufficient basis to support a finding that semen was present. Nevertheless, a differential extraction from the blouse’s stain was performed, and the extracts were forwarded to Ms. Kim and Mr. Cockrell for DNA analysis.

Mr. Cockrell performed the STR analysis of the DNA extract from the blouse. On August 30, 2002, Mr. Cockrell reported that “[a] mixture of DNA types was detected on the blouse.” He also reported that “[the victim], Ronald Cantrell, and at least two other donors are included in this mixture.” Mr. Cockrell reported these results despite a clear discordance between COfiler and Profiler typing results at the D3 and D7 loci. The following chart reflects alleles Mr. Cockrell obtained at the D3 and D7 loci as shown by his original STR electropherogram. The alleles in bold are those that appear on the electropherogram below the 150 rfu threshold necessary under the Crime Lab’s SOPs in order for an allele to be interpreted as present in the sample.

Locus	Locus and Sample	COfiler	Profiler
D3	Epithelial Fraction	14, 15, 16, 17, 18	14, 15, 16, 17, 18
D3	Sperm Fraction	15, 18	15, 16 , 18
D7	Epithelial Fraction	8 , 9, 10, 11, 12	10, 12
D7	Sperm Fraction	10, 12	9, 10

As shown, there is general concordance of the typing results between COfiler and Profiler at the D3 locus. Profiler, despite being less sensitive than COfiler, detected a weak 16 allele in the sperm fraction, but it was below the 150 rfu threshold. There is, however, significant discordance of the typing results at the D7 locus. With respect to the epithelial fraction, COfiler results show the 9 and 11 alleles above the 150 rfu threshold and an 8 allele below the threshold that was not detected by Profiler. Although this is a significant discordance, the slightly greater sensitivity of CoFiler might explain the extra alleles detected by that system and does not necessarily indicate that the control failed and the test must be disregarded. However, the discordance in the sperm

fraction at the D7 locus cannot be explained by the greater sensitivity of COfiler. With respect to that sample, Profiler detected weak 9 and 10 alleles, and COfiler (the more sensitive system) failed to detect the 9 allele at all. This discordance at the D7 locus cannot be reconciled and should have invalidated the results and caused Mr. Cockrell to re-perform the analysis.⁸⁸

Re-testing by outside laboratories has failed to confirm the original results reported by Mr. Cockrell. HPD reported that the “raw evidence” stain on the victim’s blouse had been consumed.⁸⁹ Therefore the re-testing laboratory had to use the DNA extracts prepared by the Crime Lab. A report issued by an outside laboratory on May 2, 2003 stated that “[a] mixture of male and female DNA profiles was obtained from the epithelial fraction of the extracted DNA from the blouse” and that “Ronald Cantrell is excluded as being a potential donor to the mixture.” The outside laboratory reported that “[n]o DNA was obtained from the sperm fraction of the extracted DNA from the blouse.” A review by the same outside laboratory of the Crime Lab’s original testing in this case questioned whether any semen was present in the stain on the victim’s blouse. The outside laboratory concluded that “the evidentiary value of an inclusion [of Mr. Cantrell is] extremely limited, and makes it impossible to accurately assess the statistical significance of the conclusion that the suspect could not be excluded from the mixture.”⁹⁰

5. Routine Misreporting of the Statistical Significance of DNA Profiling Results

The most pervasive major issue we have identified in our review of the Crime Lab’s serology cases is the routine and systemic misreporting of the statistical significances of “matches” reported by the Crime Lab in cases

⁸⁸ Also, there is no evidence that the crime Lab ran a substrate control with respect to the stain on the blouse. A substrate control would have been helpful in determining whether the alleles detected by the STR tests pertained to the suspected semen stain or to substrate material on the blouse.

⁸⁹ It is unclear what the size of the purported semen stain might have been because the Crime Lab file did not contain a description of the stain. Good laboratory practice calls for the routine retention of a portion of an evidence specimen to be properly preserved for possible additional testing in the future. Since the STR system is a sensitive test that requires only a small amount of DNA, it would be unnecessary and problematic to consume an entire specimen.

⁹⁰ On August 19, 2002, Mr. Cantrell pleaded guilty to aggravated sexual assault and was sentenced to six years in prison.

involving evidence samples comprised of body fluid mixtures containing more than one DNA profile. Indeed, 23 of the 43 major issue DNA cases we have identified -- or approximately 53.5% of the major issue DNA cases -- involve reported statistics that are misleading because the Crime Lab calculated them based on the profile of the suspect's known reference sample, rather than the profiles identified in the evidence sample.⁹¹

We have prepared the chart below to demonstrate the sometimes exponential difference between the statistics reported by the Crime Lab and our calculation of the correct frequency estimates for the interpretable DNA typing results originally obtained by the Crime Lab.⁹² In many cases, the disparities are staggering.

⁹¹ In our Fourth Report, we provided a detailed discussion regarding the meaning of random match probabilities in describing the significance of associations between an individual and a specific sample of biological evidence. It is clear that Crime Lab analysts, including Mr. Bolding, the head of the DNA Section, failed to grasp the scientific basis of calculating frequency estimates related to DNA profiles obtained from evidence samples. *See* Fourth Report at 43-46.

⁹² The Crime Lab's convention, which was inappropriate, was to report only the statistics related to the racial population with which the suspect is identified. Properly reported frequency estimates include calculations for the three most significant ethnic populations in North America -- African American, Caucasian, and Hispanic. It is not appropriate in the calculation and reporting of random match probabilities to assume that a contributor to the evidence sample is from the same racial demographic as the suspect.

**Comparison of Statistics Reported by the Crime Lab
with Properly Calculated Frequency Estimates**

Suspect's Name	HPD Reported Stats (1 in ___)	Recalculated Stats (1 in ___)
Alix, Franklin	81,000	11
Boudreaux, Raymon	11,200	37
Carter, Harold ⁹³	9%	75%
Emory, Gregory	13,000	23
Guevara, Luis/Fernandez, Sixto ⁹⁴	663 million/61 trillion	5,900/9,100
Harris, Erskin	158,000	8 and 6
House, Dillard	2,773	83
Johnson, Arthur	11 million	113
Lawson, David	1.8 million	55
Lopez, Segundo	1.7 million	400
Meza, Alfredo	2.6 million	9
Pineda, Johnny	110,000	110
Napper, Laurence ⁹⁵	statistical match	232,000
Parra, Carlos	146,00	119
Rayson, Carl Lee	1.8 million	145
Segura, Carlos/Zavala, Mark ⁹⁶	11,300/758,000	48
Southern, Ronnie	6.3 million	30
Sutton, Josiah	694,000	14
Valdez, Richard	15,000	50
Vanzandt, Lonnie	15	2
Vaughn, Artice	988	42% (~1 in 2)
Ware, Marshall	2.9 million	22% (~1 in 5)
Washington, Dedrick	1,800	428

⁹³ In this case, HPD presented its statistics in terms of the percentage of the relevant population that that could be expected to have a DNA profile in common with the suspect's reference sample. For the sake of comparison with HPD's presentation in this case, we have re-calculated the frequency estimate related to the evidence in terms of a percentage of the relevant population that could provide a random match.

⁹⁴ The re-calculated frequency estimate for Sixto Fernandez is based on the results of a re-test performed by an outside laboratory rather than the original DNA profile developed by the Crime Lab.

⁹⁵ The re-test performed by an outside laboratory of the evidence in the Napper case developed a partial suspect profile. The outside laboratory calculated a frequency estimate of 1 in 255 in the African American population based on that partial profile.

⁹⁶ There is only one re-calculated frequency estimate in this case because the properly re-calculated frequency estimate is based on the DNA profiles developed in the mixed evidence sample, as opposed to HPD's method of calculating statistics not based on the DNA profile developed from the individual suspect's known reference sample.

This failure to properly calculate frequency estimates exacerbated the poor quality of the Crime Lab's technical work in developing DNA profiles from evidence samples. As discussed above, Crime Lab analysts often developed and reported DNA profiles reflecting multiple donors, which frequently were reported as including the suspect and one or more "unknown donors." As reflected in the above chart, often the Crime Lab then went on to grossly exaggerate the significance of finding the suspect's DNA profile among the other DNA profiles from the evidence sample by calculating and reporting frequency estimates based on a suspect's known reference sample.

IV. Trace Evidence

Trace evidence can consist of many different types of material found at a crime scene, on the victim of a crime, on a suspect, or in places visited by a victim or suspect. Fibers, hairs, paint, glass, and fire debris are some of the most common types of trace evidence examined in forensic labs. Forensic scientists examine trace evidence to determine the physical and chemical properties of the material, to compare these properties with those of known samples so that possible common origins can be identified, and to provide investigative leads.

The Crime Lab currently is not performing trace evidence examinations, although it did handle this type of evidence until October 2003. When the Trace Evidence Section was operating, it was normally staffed with two analysts and a supervisor. The Crime Lab stopped performing trace evidence examinations after the section supervisor was appointed the Quality Assurance/Quality Control Leader for the Crime Lab in late 2003. Since then, trace evidence collected by HPD has been examined by the Texas Department of Public Safety Crime Lab.

A. Status of the Trace Evidence Review

We identified 223 cases as having been logged in by the Trace Evidence Section during the period covered by our review. We initially selected a sample of 141 trace evidence cases for our review. However, for reasons explained in more detail in our Fourth Report,⁹⁷ many of those cases did not involve any substantive trace evidence examinations. As a result, we expanded the scope of our trace evidence review to include all 223 trace evidence cases, as well as certain DNA and serology cases that may have included a trace evidence

⁹⁷ See Fourth Report at 52.

component. We have completed our review of all 223 of these trace evidence cases, as well as 40 DNA and serology cases, some of which involved trace evidence casework.

B. Findings

1. The Trace Evidence Sample

From the total universe of 223 cases that were logged in by the Trace Evidence Section during the period of our review, 129 involved the type of substantive analysis by the Trace Evidence Section that was the focus of our review.⁹⁸ We identified 5 cases (4% of the substantive sample) with “major issues” and 44 cases (34% of the substantive sample) with “minor issues.”

We found the following four primary types of issues in the trace evidence sample:

- Lengthy delays and lack of follow-up that occurred at several points in the Crime Lab’s trace evidence examination process;
- Minimal or non-existent attempts to examine evidence that could have generated useful investigative leads;
- Failure to follow generally accepted laboratory procedures involving the documentation and use of controls, including reagent blanks that are used to ensure that test results are not influenced by variations in the reagents; and
- Sparse documentation in many trace evidence case files.

These issues were discussed in additional detail in our Fourth Report.⁹⁹

Additionally, a few files lacked documentation of any technical or administrative review in cases in which the notes indicate that no trace evidence

⁹⁸ Cases involving the examination of fire debris and latent fingerprints were not within the scope of our trace evidence review.

⁹⁹ See Fourth Report at 53-54.

examinations were performed. The Crime Lab's SOPs require such reviews in all cases, whether or not an examination was actually performed.¹⁰⁰

2. Review of Selected Serology and DNA Cases

Some cases handled by the Crime Lab involve examinations in more than one area of forensic science; this is especially true in cases involving violent crime. We selected 40 serology and DNA case files to determine (a) whether any trace evidence was examined in connection with those cases and (b) if so, whether there were any issues with that work. These cases were selected because they involved either death penalty or other high profile convictions.¹⁰¹

We did not identify any major issues with respect to trace evidence examinations in the selected 40 serology and DNA cases. We identified minor issues in 5 (12.5%) of these cases. These minor issues primarily involved documentation problems that are consistent with those previously identified and reported in the general trace evidence sample.

Two death penalty case files had trace evidence deficiencies that we determined were minor. In the first case, the work notes contained insufficient documentation of the hair comparison that was performed. In the second case, hair samples were collected, but the case file contained no Trace Evidence Section report.

The trace evidence examinations performed in a third, non-death penalty case were classified as involving minor issues because of discrepancies between the thoroughness of the work notes relating to the known and questioned samples.¹⁰² The work notes in this case, which involved hair comparisons, contained appropriately detailed observations of the microscopic characteristics

¹⁰⁰ It might be appropriate for the Crime Lab to review the application of this policy to cases in which no examinations are performed.

¹⁰¹ It is not uncommon for there to be a trace evidence component to serology and DNA cases. Cases such as homicides and sexual assaults in which there may be biological evidence (for example, blood or semen) may also involve evidence, such as hairs, that could be subjected to trace evidence examination and comparison.

¹⁰² As was noted in our Fourth Report, examinations performed by the Trace Evidence Section typically involve the comparison of "known" and "questioned" samples. "Questioned" samples may involve evidence from an unknown source that is collected at the crime scene. The "known" sample is collected from an identified source, often the suspect or the victim.

of the known hairs. However, there was no detailed description of the questioned hairs other than that they were “microscopically consistent” with the known hairs. We reviewed the transcript of the examiner’s trial testimony in this case, and it appropriately reflected the limits of the observations that were made and their interpretation.¹⁰³

Similar issues were identified in a fourth case, in which numerous hair associations were made linking questioned hairs to the victim. The victim’s hair characteristics were well described, but the questioned hairs were not described in sufficient detail to document the association.

In the fifth minor issue case, we found that the file contained no information regarding the source of some items of evidence and that some descriptions in the notes and report are too vague to be informative. As a result, it is not possible to interpret the significance of the findings that are documented in this file. Finally, the work notes indicate that several items were examined, but those items are not referred to in the report.

V. Controlled Substances

The Controlled Substances Section analyzed the majority of the cases in the Crime Lab, handled a variety of controlled and non-controlled substances, and employed more analysts than any other section in the Lab.¹⁰⁴ Our review was designed to take into consideration the large numbers of cases, substances, and analysts involved. HPD and the City also requested a review specifically focusing on cases analyzed by Vipul Patel and James Price, two former Controlled Substances Section analysts associated with drylabbing incidents.¹⁰⁵ At the outset of Phase II, we therefore established three separate samples of controlled substances cases -- one comprised of general controlled substances cases,¹⁰⁶ a second sample comprised of cases analyzed by Mr. Patel, and a third sample comprised of cases analyzed by Mr. Price.

¹⁰³ This was the highly publicized case involving George Rodriguez.

¹⁰⁴ See Fourth Report at 56-58 for a description of the techniques and instruments used to identify controlled substances.

¹⁰⁵ The Price and Patel drylabbing incidents are described in detail in our Second and Third Reports.

¹⁰⁶ The general controlled substances sample does not include cases handled by Messrs. Patel and Price.

Our initial review of the general controlled substances sample revealed that most cases handled by this section involved basic marijuana and cocaine identifications. We adjusted the general controlled substances sample to include cases involving more complex and challenging analyses, and we ultimately reviewed 513 general controlled substances case files.¹⁰⁷ Our review of Mr. Patel's sample included 366 cases, and our review of Mr. Price's sample included 342 cases. Finally, we also reviewed an additional 50 files to evaluate how the Crime Lab handled and analyzed "bulk" or "bulky" cases, which, as the terms suggest, are cases involving large quantities of evidence. We have completed our review of all three controlled substances case samples, as well as the "bulky" controlled substances cases.

A. Results of the General Controlled Substances Case Reviews

1. Major Issues

We identified major issues in 116 (nearly 23%) of the 513 cases in the general controlled substances sample after the sample was reconfigured to focus on more challenging cases. In our Fourth Report, we discussed four major issue cases. In one of those cases, the analyst reported a finding without having made a definitive identification of the substance. Three of those cases involved the reporting of quantitative results for a liquid substance, even though quantitative analyses were not performed. We identified numerous cases with deficiencies similar to these two categories of major issues in the remainder of the general controlled substances sample.

a. Reports Based on Visual or Physical Identifications Without Analytical Testing

During this stage of our review, we identified 72 major issue cases related to scientifically unsound policies and procedures.¹⁰⁸ These practices were first noted in our Fourth Report discussion of issues identified in the Price and Patel samples. The Crime Lab allowed analysts to identify unknown tablets by using a reference source, such as the Physician's Desk Reference ("PDR") or the Drug Enforcement Administration's Logo Index ("Logo Index"). These results were

¹⁰⁷ There were 383 cases in the original general controlled substances sample.

¹⁰⁸ In a few of these cases, we identified more than one major issue. Therefore, the total number of times that our review identified a particular type of major issue is greater than the total number of cases containing one or more major issues.

sometimes reported as if the identity of the tablets was established or confirmed through actual analytical testing. While it is conditionally acceptable to identify tablets by comparing their physical characteristics to the description provided by a reference source,¹⁰⁹ it is unacceptable to report such results without acknowledging that analytical procedures were not used to identify the substance. If the reports had stated, for example, that the items were “physically identified as” a particular substance, they would have been marginally acceptable.¹¹⁰ However, in these 72 cases the report did not provide any indication that no analytical testing had been performed on the tablet.

b. Presumptive Quantitation of Liquids and Tablets

It also appears to have been customary practice in the Controlled Substances Section to presume that liquid codeine cough syrup would not have a concentration greater than 200 mg of codeine per 100 mL of liquid. Although this might generally be the case, it might not always be true because it is possible for higher concentrations of codeine to be present in a solution. Since the issuance of our Fourth Report, we have identified an additional 36 cases that involved this type of “presumptive” quantitation of liquid samples.

We identified similar issues in cases in which identifications and quantitations were based merely on the visual inspection of tablets. Two cases involved the reporting of quantitative results based on the quantitation given in the Logo Index. In both of those cases, the analyst compared the physical

¹⁰⁹ This process is also referred to as “visual” or “pharmaceutical” identification.

¹¹⁰ In contrast, some cases contained clear disclosures that no analytical testing was performed, such as the following: “Pharmaceutical identification only. No chemical analysis performed. If analysis is required for prosecution purposes, please contact this laboratory at least one week prior to trial date.” Because this is a marginally acceptable practice, we classified such cases as involving minor issues. Although these cases contain better disclosure of the limited work performed by the analysts, they remain deficient because they involve the identification of substances without analytical testing. Tablets are easily counterfeited, and an analyst can only be certain of the identity of a substance by delving deeper than its surface physical appearance. In fact, the Crime Lab changed its policy to require analytical confirmation of visual identifications after members of the District Attorney’s Office and the Lab expressed concerns about the risk of incorrect identifications of counterfeit drugs. Controlled Substances Section meeting notes reflect that, starting in April 2004, analysts were instructed to perform a full analysis on any tablet that is reported and not retained. Once again, we note that it is important for the Crime Lab to consolidate its policies and procedures so that analysts have clear guidance regarding the Lab’s current policies.

appearances of a tablet -- such as its color, shape, and markings -- to those of known tablets listed in the Logo Index. After physically identifying the tablet as dihydrocodeinone (Vicodin) in this manner, the analyst reported the quantitation associated with that tablet based on information in the Logo Index.

By reporting the liquid and tablet quantitations in this manner, analysts implied that quantitative analyses were actually performed. At the very least, the reports should have clearly stated that quantitative results were based on Crime Lab protocol permitting presumptive quantitation or pharmaceutical identification, and not on the performance of actual analyses.¹¹¹ However, standard forensic laboratory practice is to perform analytical testing to determine the quantity of the controlled substance in a sample before reporting quantitative results, especially when the sample is a liquid found in containers such as baby and soda bottles, rather than sealed pharmaceutical containers.

c. Failure to Report Probative Findings

We identified two cases in which analysts did not report the presence of a controlled substance and, therefore, failed to report a probative finding. The GC/MS testing performed in both cases showed the presence of heroin and two non-controlled substances, papaverine and noscapine. In addition, the physical appearance of the samples suggested that the substances were either black tar heroin or opium. The analysts reported that there were no controlled substances present, perhaps because the heroin peak on the GC/MS printout was not as strong as those of the two non-controlled substances. However, the heroin peak was strong enough in both cases to support reporting its presence in the substance.

d. Mistakes and Inaccuracies in Reports

In two cases, we discovered documentation or transcription errors that had the potential to have seriously affected the prosecution of a defendant. In

¹¹¹ We understand that the Crime Lab might still be following this policy when reporting quantitative results for certain substances. The Crime Lab's current SOPs, which were updated in 2004, rarely require analysts to report quantitative results. For example, HPD analysts no longer routinely report quantitative results for cocaine, heroin, and methamphetamine. However, analysts should report quantitative results for certain controlled substances (such as codeine, dihydrocodienone, dihydrocodeine, and morphine) in order to establish the applicable penalty group under Texas law. *See* Texas Controlled Substances Act §§ 481.102-481.105.

one, the weight of cocaine was reported incorrectly in terms of grams, rather than in milligrams, thus overstating the amount. This mistake did not ultimately affect the defendant's prosecution because he pleaded guilty to aggravated robbery.

The second case involved two marijuana samples and two defendants. The HPD analyst made an error when transferring information from a worksheet to a supplemental report and misreported the weights of both marijuana samples. As a result, the marijuana sample that weighed less than one ounce was reported as weighing more than fifteen ounces. This could have affected either defendant's sentence (if one sample of marijuana was attributed to each defendant) because possession of the smaller amount of marijuana is a misdemeanor under Texas law, while possession of fifteen ounces of marijuana is a felony.¹¹² Both defendants were ultimately found guilty of charges relating to their possession and delivery of cocaine, not marijuana.

e. Unexplained Test Result Change

The final major issue case identified in the general controlled substances sample involved unexplained changes to test results. The analyst recorded that 43 Ruybal color tests exhibited a negative finding for a controlled substance. Based on our handwriting comparison, it appears that someone other than the original analyst changed the results recorded on the worksheet from "negative" to "pos blue," thus indicating the presence of methaqualone, a controlled substance. There are no initials or other markings indicating who made the change, when it was made, or why the change was made. We could not even determine if the change was made because the original analyst misinterpreted the color tests or if the substance was tested a second time and produced different results.

2. Minor Issues Identified in the General Controlled Substances Sample

In addition to the major issues described above, we identified over 200 cases that contained minor issues in the general controlled substances sample. We consistently found that most minor issues should have been detected through administrative and/or technical reviews.

¹¹² Texas Controlled Substances Act § 481.121.

a. Inadequate Documentation

In a large number of cases, we found that case documentation lacks detail. This problem alone made it sometimes difficult to review controlled substances case files because we were unable to determine what processes the analysts employed when analyzing the cases and reporting results.

The documentation issues that we discovered included reference spectra that were mislabeled. For example, we found cases in which the spectrum for codeine was labeled incorrectly with the promethazine label, "stdprometh.Sms." In some cases, documentation was lacking regarding standards and blank runs. Additionally, incorrect case numbers and dates were recorded on instrument printouts and in other sections of the reports. In other cases, analysts failed to record complete quantitation calculations.

Documentation issues were also apparent in the many discrepancies we noted in instrument printouts, worksheets, and reports regarding the number of pieces of evidence being evaluated. Case files often lacked complete descriptions of the physical appearance of evidence; descriptions of the extraction and preparation processes; initials, dates, and notations to indicate who, when, and why changes were made to a report. Some amended reports carried the same dates as the original reports, and analysts failed to maintain both the amended and original reports in the files.

b. Failure to Follow Generally Accepted Forensic Science Practices

We found pervasive evidence in the general controlled substances sample that section analysts did not follow generally accepted forensic science practices. For example, analysts sometimes used sample sizes that were too small when conducting quantitative analyses. Section analysts sometimes reported results based on inadequate instrument runs, poor instrument standards, and poor matches between the standard and the sample. Other examples of deviations from generally accepted forensic science practices include the following:

- Analysts used samples extracted for UV testing for GC/MS and FTIR testing rather than preparing separate samples.
- Supplemental reports did not contain enough detail when analysts reported that a controlled substance was found but did not specify which particular item of evidence contained the substance.

- Analysts routinely modified the submitting officer's description of evidence on the Property Record by adding to, deleting from, and completely altering the description.
- Analysts held evidence in their custody for excessively long periods of time.
- An analyst conducted the technical review of his or her own report.¹¹³

Our case reviews showed that, in a number of circumstances, analysts failed to conduct additional testing that was warranted. For example, further testing should have been performed when minor peaks indicated the possible presence of another controlled substance. Additional testing also should have been performed to confirm the identity of a substance in cases for which only non-confirmatory testing was performed. Finally, we noted cases in which further testing should have been done to determine whether a cigar or cigarette contained a controlled substance other than marijuana.

In cases handled by several different analysts involving various drugs, we found the use of inadequate instrument-generated reference standards.¹¹⁴ Some laboratory instruments conduct a library search and provide a list of results for the standard that most closely matches that of the unknown substance. In the Crime Lab, some instruments consistently provided reference standards that were inadequate because the standards lacked sensitivity, provided incomplete ion patterns, and even, at times, provided standards that lacked major ions.

Because the Crime Lab's libraries of instrument-generated reference standards were often inadequate, analysts should have compared sample results to standards provided in forensic literature. Alternatively, if the analysts were going to rely on the instruments' libraries, Controlled Substances Section supervisors should have ensured that the library standards were accurate by providing technical review of the standards, comparing them to standards in forensic literature, and purging and adding standards to the library as needed.

¹¹³ A "technical review" is review by another qualified person of an examiner's notes, data, and other documents that formed the basis for the examiner's conclusions. While an analyst may administratively review his or her own work for mistakes in spelling and transposing information, an analyst should not conduct his or her own technical review.

¹¹⁴ "Standards" are the analytical results of known substances. An analyst can compare the instrument run readout of an evidence sample to that of a standard to determine if the sample is the same as the known substance.

The Crime Lab's use of instrument-generated standards seems to be improving, but supervisors and analysts should be aware of this issue and be alert for any standard that appears to be inadequate.

c. Failure to Follow Crime Lab Standard Operating Procedures

We classified a number of cases as involving minor issues because the analysts failed to follow the Crime Lab's SOPs that were in place at the time that the analyses were performed. For example, some case files were missing information required under the SOPs, such as the analysts' initials and evidence that an administrative review was performed. In others, the analysts did not include all three of the following required items in the case file: the notice of modification, original supplement, and modified supplement. We also found that examination sheets were sometimes not numbered correctly.

Some case files were deficient because analysts performed testing adequate to identify the substance but did not perform all of the SOP-required testing. In others, results of microcrystalline testing were not peer-reviewed.

3. Handling and Labeling of Evidence

It has been extremely difficult to track evidence in controlled substances cases involving more than one item of evidence because analysts often identified items differently at each stage of the process -- on the officer's report, on the Crime Lab's worksheet, and on the Lab's supplemental report. Because we had difficulty tracking items of evidence, we suspect that officers, attorneys, and defense experts might well have experienced similar problems in attempting to match test results to particular pieces of evidence. This is especially important when certain items of evidence are attributed to a suspect, but others are not. Accepted forensic science practice is to assign a unique identifier to each item of evidence that is used throughout the investigation.

Our review of the general controlled substances sample raised additional concerns regarding HPD's general procedures for submitting evidence to the Crime Lab. In particular, we will look further at the following: (1) the process of submitting evidence via after-hours drop boxes; (2) the training given to officers regarding the proper packaging of evidence; and (3) the security precautions used to ensure the integrity of evidence. These and other issues relating to Central Evidence Receiving, the Property Room, and evidence handling will be addressed in our final report.

B. Results of the Patel Case Reviews

We have completed our review of the 366 cases in the Patel sample, and 18 of these cases involved major issues. We reported on 14 of those cases in our Fourth Report, which included discussion of another potential drylabbing incident.¹¹⁵

1. Reporting an Undocumented Finding

In the Patel sample, we observed the reporting of an undocumented finding, which we classified as a major issue. Mr. Patel reported that the evidence, two paper squares, contained lysergic acid diethylamide (LSD). His preliminary testing of the evidence, which was done through color, UV, and thin-layer chromatography (“TLC”) testing, indicated the presence of LSD. However, Mr. Patel failed to properly document the results of the GC/MS test he ran as a confirmatory test. The case file contains a reference standard for lysergic acid methylpropylamide (LAMPA), a compound that is closely related to LSD. The case file documentation indicates that the library on the GC/MS instrument automatically matched the mass spectrum for the evidence with that of LAMPA, and not LSD. While the LAMPA reference standard is of poor quality and we believe that the mass spectrum test results indeed indicated the presence of LSD, the only documentation for the mass spectrum portion of the GC/MS testing is the LAMPA reference standard found in the file.

Moreover, although the GC peak in this case matched that of LSD in the gas chromatography portion of the GC/MS run, there is no GC reference standard for LSD in the case file. Despite the lack of reference standards showing that the GC/MS spectrum of the evidence matched known samples of LSD, Mr. Patel recorded “pos LSD” in the GC/MS block on the worksheet for this case. While there is little doubt that the evidence is indeed LSD, because the preliminary tests indicated LSD and both portions of the GC/MS run match standards for LSD, it is unclear -- based on the documentation in the case file -- how Mr. Patel came to and could ultimately support that conclusion if challenged.

¹¹⁵ Discussion of our previous reviews of Mr. Patel’s casework can be found in our Fourth Report at pages 61-64.

2. Reports Based on Visual or Physical Identifications Without Analytical Testing

In three of Mr. Patel's cases, he reported the identity of a tablet or capsule after performing a physical identification, but he did not clearly report that the identification was based on a physical/pharmaceutical comparison, and not on analytical testing. As with our general controlled substances sample, we classified such an identification as a major issue because it is potentially misleading.

3. Inadequate Documentation

As described in our last report, Mr. Patel's work contained numerous documentation deficiencies. We identified a number of cases with minor documentation issues similar to those noted in the general controlled substances sample. In one case, Mr. Patel failed to document and explain a discrepancy between the weight he recorded for the evidence and the weight recorded by the officer. A second case with deficient documentation concerned when and why second tests were run or reanalysis was conducted on evidence. In a third case, Mr. Patel failed to report the net weight of the evidence. In a few multiple evidence item cases, Mr. Patel failed to give any indication, either by item number or description of item, as to which item of evidence was being analyzed on a particular GC run.

4. Failure to Follow Generally Accepted Forensic Science Practices

In addition to documentation deficiencies, we also noted a number of other minor issues with Mr. Patel's cases. For example, we have reviewed cases in which Mr. Patel departed from generally accepted forensic science practices when he modified officers' descriptions of evidence and entered new descriptions on property records.¹¹⁶ He consistently failed to initial corrections and additional notations on worksheets, and he also held evidence for months at a time.

Mr. Patel failed to conduct further testing, such as GC/MS testing, to confirm that evidence was indeed negative for controlled substances after receiving negative results on UV tests. When performing GC/MS testing,

¹¹⁶ The Controlled Substances Section's SOPs instructed analysts to modify the property records in this manner. This SOP deviates from generally accepted forensic science practice.

Mr. Patel reported only cocaine on the worksheet, while the GC/MS identified both cocaine and procaine. He used poor quality reference standards, which had incomplete ion patterns, lacked sensitivity, and/or were missing major ions.¹¹⁷ Finally, he failed to identify minor peaks on GC and GC/MS results, which may have led to the identification of other substances found in the evidence.

5. Failure to Follow Standard Operating Procedures

In a number of cases, Mr. Patel's work did not comply with the SOPs for the Controlled Substances Section. For example, he

- Failed to document the performance of macroscopic analyses of marijuana.
- Failed to perform quantitative analysis on pipe residue.
- Failed to perform all of the required tests.
- Failed to have microcrystalline testing verified by another analyst.
- Failed to record weights and dates as required.

C. Results of the Price Case Reviews

We have reviewed all 342 cases in the Price sample. We have identified major issues in 11 of those cases, 7 of which were previously described in our Fourth Report.

1. Major Issues

Two of the newly-identified major issue cases involved the identification of dihydrocodeinone (Vicodin) based on a comparison of the mass spectrum of the evidence to a mass spectrum of a standard. The standard was of poor quality and did not show the principal peaks and ions necessary to identify the substance. Mr. Price's identification was based on an inadequate standard that was missing necessary major ions and was not consistent with generally accepted forensic laboratory practices. However, we concluded that the substance likely was dihydrocodeinone because the sample spectra in the cases were of good quality and matched the spectrum for dihydrocodeinone found in forensic literature.

¹¹⁷ As discussed in greater detail above, the use of poor standards was a section-wide problem.

In a third case, Mr. Price failed to perform a critical examination when analyzing evidence. Mr. Price identified evidence as benzocaine, a non-controlled substance, based only on presumptive testing. Mr. Price should have conducted definitive testing on the chunk substance in order to determine that controlled substances were not present.

Finally, Mr. Price reported the identity of a tablet or capsule after performing a physical identification, and he neglected to report that his identification was based only on physical/pharmaceutical testing. As described above within our discussion of the general controlled substances sample, we determined that such identifications constitute major issues.

2. Minor Issues

a. Failure to Follow Generally Accepted Forensic Science Practices

Numerous cases analyzed by Mr. Price contained minor issues, most of which were also found in the general controlled substances sample. For example, Mr. Price did not follow generally accepted forensic science practices when he kept evidence in his custody for months at a time, failed to initial his corrections, and modified the submitting officers' descriptions of evidence. We also found that, after screening evidence for marijuana, he frequently did not screen it for other possible substances.

Mr. Price incorrectly used reference samples by using poor reference or standard samples,¹¹⁸ comparing a mass spectrum of the sample to that from another case rather than a laboratory standard, and using a poorly resolved spectrum to make an identification. Moreover, he failed to identify extra peaks on GC results after identifying one controlled substance.

b. Failure to Follow Standard Operating Procedures

Mr. Price also failed to follow the Controlled Substances Section's SOPs that were in place at the time of his analyses. In some cases, for example, he failed to document that he had conducted a macroscopic analysis on marijuana evidence. In others, Mr. Price did not record the reagents used for microcrystalline testing or the amount of sample used for quantitation, and he did not perform a UV analysis on residue evidence. Additionally, many of Mr. Price's cases failed to comply with the required SOPs because they did not

¹¹⁸ This issue is discussed above with regard to the general controlled substances sample.

receive technical review. Finally, in a bulk case, a supervisor had not initialed the weights on the worksheets or the backs of the photographs, and the measuring device used in photographs was unreadable.

c. Insufficient Documentation and Administrative Errors

We found insufficient documentation and administrative errors in several cases in the Price sample. For example, in some of Mr. Price's cases, we observed that he entered incorrect dates on instrument printouts.¹¹⁹ We also found that Mr. Price recorded an incorrect incident number in one case; in others, he inaccurately numbered worksheet pages and recorded results in the wrong boxes on the worksheets. We also observed that neither Mr. Price nor a supervisor initialed entries or corrections on the worksheets. Finally, Mr. Price failed to include the original and revised supplemental reports in the case files.

D. Results of Bulk Case Reviews

We reviewed 50 bulk evidence cases; 2 contained deficiencies characterized as major issues, and 42 involved minor issues. The major issues involved the reporting of liquid quantitations without performing quantitative analyses, an issue that is described in greater detail above.

We found a number of minor issues that involved documentation deficiencies and the failure to follow generally accepted forensic science practices. Analysts regularly failed to follow SOPs that specifically targeted the handling of bulk evidence. Moreover, the Crime Lab's SOPs and other manuals offered little guidance regarding which cases were to be classified as bulk cases.¹²⁰

Even when analysts did attempt to follow SOPs for bulk cases, we noted a number of deficiencies. For example, the supervisor's initials, analyst's initials, and Crime Lab number are not present on photographs of the evidence. A supervisor neither observed the weighing of evidence nor initialed the recorded weight. Photographs of bulk evidence were not taken at close enough range to

¹¹⁹ As was noted in our Fourth Report, the Controlled Substances Section supervisors allowed one GC/MS machine in the Crime Lab to consistently print incorrect dates, rather than have the machine repaired.

¹²⁰ The definition found in three different SOPs, including the January 2006 SOP, gives only the following guidance: "A bulky case is defined as any controlled substance case for which a representative sample must be taken and preserved."

show markings on evidence or the officer's identifying marks, and the ruler or marker used for establishing size and scale in photographs was either missing or unreadable. In some cases, items that were unrelated to the case were not hidden from view and were shown in the photographs with the bulk evidence.

E. Lack of Consistent Technical Reviews

The nature of the pervasive problems that we discuss above strongly indicates that many of the issues we have identified should have been detected by Controlled Substances Section supervisors during administrative or technical reviews. The technical review process is what enabled section supervisors to identify the four drylabbing episodes involving Price and Patel that were described in our Second and Third Reports. However, the deficiencies identified during Phase II lead us to question the effectiveness and completeness of the administrative and technical reviews completed in the Controlled Substances Section during the period of our review.¹²¹

In particular, it appears that in many cases section supervisors merely went through the motions of conducting technical reviews. Even more disturbing, it appears that supervisors sometimes conducted this lackluster review *after* the analyst issued the report. These poor practices sent a message to the entire Controlled Substances Section that sloppy work would be tolerated and accounts for many of the issues identified in our review.

Despite all of the issues we have found as a result of our review of hundreds of cases, we believe that the Controlled Substances Section generally performed good work and that the quality of its work has improved over time. The section has taken steps recently to improve some of its policies. For example, we reviewed the current Controlled Substances Section SOPs that describe procedures for analyzing controlled substances and dangerous drugs, and those materials are clearly written and contain the essential information.

VI. Firearms

The forensic examination of firearms evidence involves, among other things, microscopic bullet, cartridge casing, and shot shell comparisons. The Crime Lab's Firearms Section also currently performs test firing, trigger pull determinations, serial number restorations, and muzzle-to-target distance

¹²¹ Unlike the DNA Section for much of its history, the Controlled Substances Section had a full complement of three Criminalist III supervisors to perform such technical reviews.

determinations. These examinations can be used to match ammunition components to the weapon that fired them, link different crimes committed with the same weapon, and provide investigative leads.

We have reviewed 94 firearms cases since the issuance of our Fourth Report, for a total of 184 firearms case reviews completed during Phase II of our investigation. With the cooperation of the Crime Lab and the Harris County District Attorney's Office, we are working to obtain evidence related to several firearms cases in which the evidence was previously released to courts for use at trial. We are progressing steadily through the variety of firearms cases selected for our sample.

Overall, we have found that in the vast majority of cases processed in the Firearms Section during the relevant time period -- 1998 through 2004 -- analysts conducted proper examinations and reported their findings in a timely manner. We have identified only minor issues, generally involving slight deficiencies in documentation, deviations from Crime Lab policies, and deviations from generally accepted forensic science practices. We found that the examinations of the vast majority of the cases are technically correct and that most issues are of an administrative nature. Several of the 94 cases reviewed since our Fourth Report included an extensive number of components and required careful analysis. We found that HPD firearms examiners operated with an impressive level of skill and diligence in performing their examinations and correctly making identifications.

In our Fourth Report, we noted a tendency in the Firearms Section to avoid reporting results as inconclusive, even when this would have been the most appropriate conclusion. Though none of the cases in which examiners failed to report their results as inconclusive involved identifications or eliminations, we were troubled by examiners' apparent reluctance to report less than definitive results. This issue was not present in any of the cases reviewed since our Fourth Report.

A. Method Related to Firearms Examinations

The examinations required in firearms cases vary greatly depending upon the types of evidence involved. Fired bullets, cartridge casings, and shot shells are examined with a comparison microscope, which enables the examiner to

view side-by-side images of the ammunition components. Proper use of the comparison microscope requires a great deal of time, patience, and experience.¹²²

Where documentation in the Crime Lab's case files was not sufficient to permit us to evaluate the reported conclusions, we reviewed evidence to assess the original work performed by the Lab's Firearms Section examiners. This has been particularly necessary in comparison and identification cases because, prior to 2004, the Crime Lab's SOPs did not require Firearms Section examiners to take photographs, make drawings, or otherwise document their observations that form the basis for their conclusions in such cases. Some cases we reviewed contained multiple bullets or cartridge casings, and thus a single case involving fired ammunition components may take considerable time to review. Other cases -- such as trigger pull examinations, serial number restorations, and test fires -- generally can be reviewed based on the documentation contained in the Crime Lab file and, therefore, are less time consuming.

To date, our review of firearms cases has progressed smoothly, and we still have identified no major issues through our case reviews. The minor issues we have identified include insufficient documentation of examinations and inefficient or inappropriate deviations from generally accepted forensic laboratory practices.

B. Documentation of Examinations

In our Fourth Report, we noted that that Firearms Section examiners did not consistently document all of the necessary information required by generally accepted forensic laboratory practices. We have identified fewer documentation issues in the cases that have been reviewed since then, but we continue to observe some deficiencies in this area.

Crime Lab examiners occasionally perform serial number restorations on firearms when the number, which can track previous ownership of the firearm, has been altered or obliterated. Most members of the forensic science community document serial number restorations photographically in order to create a record of what may be a transitory restoration. It is currently not the policy of the Firearms Section to make a photographic record of serial number restorations. Since our Fourth Report, we have found five additional cases in which serial number restorations were not documented. Of the five types of

¹²² See Fourth Report at 67-68 for a more detailed summary of the methods used in firearms examinations.

documentation deficiencies discussed in our Fourth Report, this was the only deficiency of which we found further examples.

In four other cases, we found that Firearms Section examiners did not thoroughly document the results of the examinations they performed. For example, an examiner in one case provided inadequate notes regarding a shot shell comparison. In another case, the examiner was able to predict a weapon based on general rifling characteristics (“GRCs”), but failed to include notes in the case file regarding the lands and grooves studied during the examination. We confirmed that the identifications in both of these cases were correct, but we were concerned not to find more detail in the examiners’ notes. As discussed in our Fourth Report, the Firearms Section was not accredited before 2004. The Firearms Section’s current SOPs require more thorough documentation.

We found two cases in which information that was documented in an examiner’s notes was not included in the final reports of those cases. In other words, the examiner performed and documented the necessary analysis but did not include the results in the report that reached the investigators. In one of these instances, the examination involved cross-comparisons to evidence from other cases. While the examiner’s notes show an elimination (meaning that the evidence from a second case did not match that of the first), the elimination was not reflected in the final report of the first case. This failure to include examination results in final reports may have caused investigators to use their time ineffectively.

Lastly, in one case, we found that the final report contained different results than the notes related to the examination would suggest. Even though the notes state that the firearm’s “feeding is difficult,” the report states that the firearm “functioned as designed.” While it is possible that initial difficulties with the firearm were resolved, examiners should document all steps of their examinations, including changes in the functioning of the firearm.

C. Inefficient or Inappropriate Deviations from Generally Accepted Laboratory Practices

We have identified several departures from generally accepted laboratory procedures and documentation practices. These departures included:

- Using correction fluid or tape on worksheets;

- Failing to examine cartridge casings and shot shells found inside the chambers of submitted weapons;¹²³ and
- Performing a trigger pull examination on every firearm submitted to the Crime Lab for examination.¹²⁴

In the 94 cases reviewed since the Fourth Report, we found 7 additional instances in which an examiner used correction fluid on a worksheet. The generally accepted laboratory practice is to mark through errors in work notes with the single stroke of a pen, write the correct information to the side, and initial the correction. In the cases examined since our Fourth Report, we found five instances in which an examiner wrote on top of the error, instead of to the side, and five instances in which an examiner made a correction without signing his or her initials. Without initials, one cannot determine whether the original examiner or a subsequent reviewer made the correction.

A similar concern arose when we found 9 cases that lacked reviewer information. These nine cases did not contain “date reviewed” or “reviewed by” entries, meaning that examiners may have reviewed their own examinations. While there is no evidence to suggest that the review was not performed by a

¹²³ The Crime Lab has had a long-standing practice of not examining ammunition components that are contained in the chambers of submitted firearms. The practice apparently is based on the assumption that the cartridge casing or shot shell found in a submitted weapon must have been fired from that weapon. While typically this assumption is correct, failing to examine ammunition components in such instances prevents the Crime Lab from detecting staged events in which, for example, ammunition from another weapon is placed in a weapon at a crime scene. This possibility may appear remote, but most laboratories would examine these cartridge casings and shot shells for markings that might help identify bullets fired from the same firearm. Although examining more cartridge casings and shot shells obviously requires the examiner to spend additional time on a case, doing so may lead to useful evidence and would be consistent with standard laboratory practice.

¹²⁴ The Firearms Section performed trigger pull determinations on every firearm submitted to the Crime Lab. The time spent on these determinations would, in our view, have been better used comparing ammunition components received within the chambers of submitted firearms and, where appropriate, performing muzzle-to-target distance determinations. Where there is no issue regarding unintentional firing, an examiner does not gain useful data by conducting a trigger pull examination. Furthermore, in the course of test firing, an examiner can readily recognize weapons that appear to have extremely light trigger pulls. We believe that examiners’ time would be better spent if trigger pull examinations are performed only where there is a question regarding unintentional firing or where the test firing identifies a light trigger pull.

second examiner, the lack of “date reviewed” or “reviewed by” documentation is a departure from generally accepted laboratory practices.

D. Other Issues

As noted in our Fourth Report, we identified cases involving delays in the reporting results of firearms examinations. While the SOPs required that requests for analysis be performed in a “timely fashion,” two case files revealed delays in reporting. In one case, fourteen months passed from the completion of the examination until a report was issued. In the other case, eight months passed from the time the case was received to the issuance of the report. Neither of the case files documented a reason for the delay.

We also found several instances of minor typographical errors and oversights. In addition to two cases in which an examiner did not sign a supplemental report, we noted two instances in which an examiner did not include the case number or date of submission on a supplemental report. We also found five examples of minor typographical errors in reports. In two such cases, the examiner also failed to include a printout of weapon possibilities (also known as a CLIS file search) with the report. However, the results of the searches were included in the supplemental report.

Lastly, as noted in our Fourth Report, Firearms Section examiners did not perform muzzle-to-target distance determinations in any of the cases that we reviewed. None of the cases reviewed since our Fourth Report included this type of examination.

VII. Toxicology

Forensic toxicology involves the analysis of body fluids and other tissues for the presence of potential toxins, including alcohol and other drugs. At the Crime Lab, most toxicology cases historically involved the analysis of urine and, less frequently, blood to identify controlled substances and drugs of abuse. However, after the Section supervisor’s performance on a competency test in October 2003 was found to be unsatisfactory, the Crime Lab suspended all work in the Toxicology Section.

In May 2005, the Crime Lab was accredited by ASCLD/LAB to perform blood alcohol analysis only. It now has three analysts performing blood alcohol testing, but still does not perform analyses for other drugs. Analysts from the Toxicology Section also maintain and calibrate HPD’s breath alcohol analysis equipment.

A. The Toxicology Case Sample

In our Fourth Report, we discussed the selection of the toxicology case sample from a universe of 1,555 potential toxicology cases handled by the Crime Lab between 1998 and 2004. However, based on an initial review of 101 cases, we determined that a significant number of the files that were identified as potential toxicology cases actually involved other forms of analysis, particularly controlled substances analysis.¹²⁵ We developed new search criteria based on the Crime Lab's system for coding toxicology and controlled substances cases, and PwC used these criteria to generate a new sample of 308 cases.

We have now completed our review of the toxicology case sample. Of the 396 cases¹²⁶ comprising the first and second toxicology samples, only about half (213) involved actual toxicology casework. Despite the adjustments that were made in the search criteria, most of the remaining 183 cases in the combined samples involved analysis associated with controlled substances casework, rather than toxicology.

Our review of the 213 toxicology cases that were in the sample yielded consistent results, and the deficiencies that we identified tended to fall into the three primary categories described below. PwC evaluated both the scope and the findings of our toxicology case reviews and determined that, in light of the conservative parameters used to define the samples and the consistency of our findings, the sample maintained a reliable level of statistical precision. Therefore, no additional sampling of toxicology cases was necessary.

B. Results of the Toxicology Case Review

We identified only one major issue case in our review of the 213 toxicology cases, which was discussed in detail in our Fourth Report.¹²⁷

¹²⁵ Our initial sample was selected based in part on the identity of the analyst performing the casework. We discovered that some of these analysts worked, at various points in time, in both the Controlled Substances and Toxicology Sections of the Crime Lab.

¹²⁶ Our first sample was comprised of 101 cases and the second contained 308 cases, but the total was reduced to 396 after duplicate cases (cases that appeared in both the first and second samples) were eliminated from the total figure.

¹²⁷ The only "major issue" identified in the toxicology sample involved the identification of three drugs in a blood sample -- heroin, cocaine, and PCP -- without the use of a confirmatory test. Moreover, some aspects of the test results were pharmacologically unlikely and indicated possible sample contamination. These questionable results, the possibility of contamination, and the absence of a second confirmatory test led us to

Eighty-six of the 213 toxicology cases reviewed (40%) had deficiencies that we identified as minor issues. Most involved situations in which:

- (1) drugs were identified on the basis of only one independent test;
- (2) we found indications of potential sample contamination; or
- (3) case files did not contain adequate documentation of all the work that may have been performed.

In all of these minor issue cases, other controlled substances or drugs of abuse were properly identified, and we therefore concluded that these minor issues would not have had a significant impact on the case.

1. Confirming Initial Results With A Second Independent Test

As we discussed in greater detail in our Fourth Report, generally accepted forensic toxicology practices require two levels of testing, with initial screening tests followed by independent confirmatory analyses. Screening tests commonly used by the Toxicology Section included fluorescence polarization immunoassay ("FPIA") and TLC. At the Crime Lab, confirmatory tests were normally performed using gas chromatography and mass spectrometry.

In the remainder of the toxicology file sample, we continued to find cases in which a drug (or metabolite) was reported as present in the sample, but the identification was based on a single GC/MS analysis -- i.e., there was no documentation in the file of a second independent test. In other cases, the GC/MS matches for some drugs were weak. Finally, one case involving blood alcohol analysis was deficient because of the method of reporting the results. In this case, the HPD analyst performed the analysis properly and in triplicate. The reported result, however, was the average rather than the lowest of the three results. The more generally accepted practice in forensic science is to report the lowest result obtained. The difference was not significant in this case.

Footnote continued from previous page

conclude that the work performed by Crime Lab analysts in this case was inconsistent with generally accepted forensic science practices.

2. Indications of Sample Contamination

We identified potential sample contamination in 5 cases analyzed by the Toxicology Section in 1998 and 1999. In each of these cases, the sample tested positive for cocaine, but no cocaine metabolites were detected. Cocaine metabolites are chemical substances that are rapidly produced by the human body when it metabolizes, or processes, cocaine. When test results are positive for cocaine but none of the several possible metabolites are detected, this is a strong indication that the presence of cocaine is due to sample contamination rather than ingestion of the drug.

It is important to note that, in each of these cases, the Crime Lab analyst appropriately did not report the presence of cocaine in the samples. However, in the face of such results, the proper practice would be to seek the cause of the contamination and correct it. Because these problems appear to have occurred during a limited time frame, it is possible that some corrective action was taken by the Crime Lab, but there was no documentation in these files indicating what, if any, remedial actions were taken. We have been told that there were times when the Toxicology and Controlled Substances Sections shared equipment. If so, this is one very likely potential source of contamination because of the frequency with which cocaine is analyzed in the Controlled Substances Section.

3. Documentation Issues

We also identified documentation deficiencies in some of the cases reviewed. A number of toxicology case files did not contain adequate documentation of work that may have been performed by the Crime Lab. In some cases, the analyst's summary sheet noted positive TLC tests for cannabinoids or cocaine metabolites, but there was no other documentation (e.g., a copy of the chromatogram) in the case file. In others, the analyst's summary sheet indicated that more than one type of analysis had been run, but there was no documentation of the additional results.

During our review, we also found instances of the obvious mislabeling of chromatograms in a case file. The mislabeling was apparently not identified by the individual who performed the original analysis or by the person who performed the technical review of the file, raising some concern about the thoroughness of that review.

Despite the above observations, the work that was documented in the files we reviewed was generally satisfactory. Except for the issues that are noted above, the files were well organized, the reviews were properly documented, and the range of analytical procedures used was appropriate.

Conclusion

This report summarizes the results of the case reviews we have conducted thus far in Phase II of this independent investigation of the Crime Lab and Property Room. Over the past eight months, we have reviewed nearly 2,300 cases analyzed by the Crime Lab in the forensic science disciplines of serology, DNA profiling, trace evidence, controlled substances, firearms, toxicology, and questioned documents. Our case reviews now are complete in all of these areas except for firearms and serology, which -- in light of the serious and pervasive problems we have identified with the Crime Lab's serology work -- has been expanded to include cases dating back to 1980. We are continuing to work with HPD to identify convictions in the 1980s and early 1990s in which serology performed by the Crime Lab might have played a role and then to review those cases to evaluate the reliability of the serologists' analyses. Unfortunately, the process is not one that can be completed quickly because of the inherent difficulties in identifying the relevant cases.

The case reviews we have completed since our last report continue to reveal widespread problems with the Crime Lab's analysis of biological evidence -- beginning with serology and continuing after the advent of DNA profiling -- during the entire period of our review from 1980 through 2002. In the cases we have reviewed since the publication of our Fourth Report in January 2006, we have found additional examples of serologists and DNA analysts failing to report probative results -- results that might have helped identify and convict the guilty as well as results that might have exonerated the innocent. We have found a clear and troubling pattern of reluctance in the Serology and DNA Sections to report typing results that were not consistent with the blood types or DNA profiles of either the victim or a known suspect; in many such cases, the serology or DNA results were reported as inconclusive. We have also seen persistent problems with analysts' techniques, the interpretation of results, and the failure to address potential sample contamination. The Crime Lab *never* issued written reports containing the statistical significance of its serology typing results, and the frequency estimates presented by DNA analysts in cases involving mixtures of body fluids were often overstated by orders of magnitude. We have found no semblance of an effective technical review program or quality assurance regime to detect and correct these problems. As a result, they continued unabated.

We have identified 50 serology cases and 43 DNA cases in which work performed by the Crime Lab was unreliable or the reported results were

misleading. The names of each of the suspects or defendants involved with these cases are listed in Appendices B and C to this report. We will continue to provide information about each of these cases to the Innocence Project and affiliated organizations so that these cases can be reviewed and evaluated to identify prisoners who may have been wrongfully convicted.

We still have significant work ahead of us in completing this investigation. In the coming months, we will review the current operations of both the Crime Lab and the Property Room and formulate recommendations regarding the forensic science work performed by HPD. The shared goal of the City of Houston, HPD, the Stakeholders Committee, and our investigative team is not only to produce a comprehensive accounting of the Crime Lab's historical problems but also to help develop a blueprint for ensuring that the Lab generates sound, well-documented, and reliable forensic scientific results for use in the criminal justice system.



Michael R. Bromwich
Independent Investigator

Fried, Frank, Harris, Shriver & Jacobson LLP

May 11, 2006

Stakeholders Committee Members

Adrian Garcia
Houston City Council

Fran Gentry
National Association for the Advancement of Colored People

Sylvia Gonzalez
League of United Latin American Citizens

Rusty Hardin, Esq.
Rusty Hardin & Associates

Richard Li, Ph.D.
Sam Houston State University

Ashraf Mozayani, PharmD., Ph.D., D-ABFT
Harris County Medical Examiner Office

Frank Parish, Esq.
Justice for All and Parents of Murdered Children

Annise Parker
Houston City Controller

Wayne Riley, M.D.
Baylor College of Medicine

Benjamin Roa, Ph.D.
Baylor College of Medicine

Kent W. "Rocky" Robinson, Esq.
Houston Bar Association
Andrews Kurth LLP

Richard Ward, Ph.D.
Sam Houston State University

Anthony Woods, Ph.D.
Texas Southern University

Serology Major Issue Cases

Aparicio, Jesus, L87-06849	Martinez, Guellermo, L90-08288
Authorlee, Carlos Miguel, L90-06462	Mays, Sammie, L89-07713
Ayarzagoitia, Porfiro, L89-04353	Miller, Roy Michael, L80-05462
Barton, Willie, L87-02871	Pacholsky, Charles, L89-04795
Block, Gerald, L86-01480	Phillips, Michael/Walker, Robert, L88-02292
Brown, Robert/Richard, Tony, L87-02402	Qualls, Roy Anthony, L89-07064
Bruno, Howard Joseph, L90-09806	Randall, Paul, L80-04956
Burkett, Harold, L89-01678	Riser, Dwight, L87-07602
Cosmi, Traian Daniel, L88-05490	Rodriguez, George, L87-02120
Garcia, Clemente, L80-05005	Salazar, Roland, L90-08015
Garcia, Eleazar, L80-04725	Salinas, Miguel, L90-07636
Gomez, Fermin Diaz, L89-09747	Sanchez, Joe, L87-03227
Gonzales, Frank, L90-09804	Stokes, Forrest, L90-05132
Guerra, Armand, L87-06353	Strom, Arling Michael, L88-08249
Hairrell, Gordon, L86-09235	Thomas, Earl, L93-04349
Hodge, Charles, L86-10546	Thomas, James, L92-00499
Ireland, Charles Franklin, L88-06846	Tyler, Patrick D., L87-00752
Jackson, Derrick, L88-08130	Unknown, L88-01139
Jackson, Norman, L89-06057	Unknown, L88-04309
Jackson, Willie Gerard, L89-05545	Unknown, L89-01224
Leblanc, Perry, L89-10423	Unknown, L89-06435
Luna, Jose, L90-02094	Unknown, L89-09783
Mangis, Troy Wayne, L87-02602	Unknown, L90-09703
Mao, Benjamin/Francis, Leonard, L86-06801	Williams, Joseph, L80-01135
Martin, Steve, L87-07876	Wyatt, Clarence/Chatman, Ray, L88-00099

DNA Major Issue Cases

Alix, Franklin , L97-12163	Meza, Alfredo , L95-10460
Alvarez, Juan Carlos , L98-07378	Mingo, Michael , L97-13990
Boudreaux, Raymon , L97-00568	Napper, Laurence , L01-02205
Cantrell, Ronald , L01-17322	Nugent, Hermann , L93-12224
Carter, Harold , L94-02461	Parra, Carlos , L97-05353
Davis, Garland , L93-10985	Pineda, Johnny , L94-06976
Emory, Gregory , L96-05918	Preston, Terrance , L00-01952
Garcia, Luis , L98-09736	Rayson, Carl Lee , L96-13604
Gonzales, Jose James , L93-12489	Samuels, Michael , L95-13955
Guevara, Gilmar , L00-08053	Segura, Carlos/Zavala, Mark , L98-11877
Guevara, Luis/Fernandez, Sixto , L00-13216	Shields, Robert , L94-10028
Harris, Erskin , L95-08229	Smith, Charles Leon , L84-08387
Hayden, Robert , L94-01695	Southern, Ronnie , L95-03891
House, Dillard , L00-02780	Sutton, Josiah , L98-13476
Jackson, Derrick , L88-08130	Valdez, Richard , L96-05919
Jackson, Reginald , L97-12636	Vanzandt, Lonnie , L94-12745
James, Leon , L94-05670	Vaughn, Artice , L94-11539
Johnson, Arthur , L97-00479	Ware, Cory , L02-04949
Lawson, David , L96-03366	Ware, Marshall , L95-05151
Lewis, Leroy , L91-00532	Washington, Dedrick , L95-00745
Lewis, Roger , L93-02191	Zelaya, Alberto , L95-08103
Lopez, Segundo , L97-12346	

Acronyms

AE	absorption elution
AFIS	Automated Fingerprint Identification System
AI	absorption inhibition
AP	acid phosphatase
ASCLD	American Society of Crime Laboratory Directors
ASCLD/LAB	American Society of Crime Laboratory Directors/Laboratory Accreditation Board
City	The City of Houston, Texas
CODIS	Combined DNA Index System
DNA	deoxyribonucleic acid
FBI	Federal Bureau of Investigation
FPIA	fluorescence polarization immunoassay
FTIR	Fourier Transform Infrared
GC	gas chromatography
GRC	general rifling characteristic
HPD	Houston Police Department
LAMPA	lysergic acid methylpropylamide
LSD	lysergic acid diethylamide
MS	mass spectrometry
PCR	polymerase chain reaction
PDR	Physician's Desk Reference
PGM	phosphoglucomatase
PwC	PricewaterhouseCoopers LLP
QA	quality assurance
RFLP	restriction fragment length polymorphisms
SOP	standard operating procedure
STR	short tandem repeats
TLC	thin-layer chromatography
UV	ultraviolet