Final Research Report

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Project Title: The Viability of Virtual Peer Review and Microscopic Verification versus Traditional On-site Review

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Abstract

Statement of Problem

The proposed study was developed to address a research gap. A previous study was completed by the Maryland State Police, which compared and correlated traditional comparison microscopy to modern instruments that incorporated a digital component to examinations. There were three limitations of the study: the inter-lab aspect of virtual peer review processes was not explored, the machines were not placed in remote locations to evaluate efficacy of real-time comparisons over a computer network, and the practicability of remote NIBIN hit confirmation for laboratories without access to this system through the IBIS/NIBIN interface capabilities of digital comparison microscopes.

Purpose of the Study

Through this study, the Washington State Patrol Crime Laboratory Division (WSPCLD) sought to evaluate existing laboratory protocols of on-site peer review and verification by answering the research question: is remote collaboration using digital comparison microscopes an accurate, efficient, and cost-effective method to accomplish peer review and verification of forensic firearm/toolmark (FT) identification casework and IBIS/NIBIN leads?

Goals and Objectives

Goal 1: Compare efficacy/accuracy of peer review/verification completed using live digital microscopic comparison images to traditional microscope comparisons.

Objectives: A) purchase four digital comparison microscopes, such as the VisionX, and place in the WSPCLD FT laboratories (ultimately Seattle, Tacoma, Vancouver, and Cheney); and B) Fund the time of four WSPCLD personnel to use digital comparison microscopes for virtual verification and peer review of controlled sample FT cases.

Goal 2: Compare efficiency of peer review/verification completed using live digital microscopic comparison images to traditional microscope comparisons.

Objectives: A) purchase four digital comparison microscopes, such as the VisionX, and place in the WSPCLD FT laboratories (ultimately Seattle, Tacoma, Vancouver, and Cheney/ Spokane); B) Fund the time of four WSPCLD personnel to record examiner time spent completing technical verification and peer review using both traditional and digital comparison microscopes; and C) Fund the time and travel costs of the Principal Investigator required for on-site verification and general research oversight.

Goal 3: Compare efficacy of remote evaluation of IBIS/NIBIN images from digital comparison microscopes to traditional comparison microscopes.

Objectives: A) purchase four digital comparison microscopes, such as the VisionX, and place in the WSPCLD FT laboratories (ultimately Seattle, Tacoma, Vancouver and Cheney/ Spokane); and B) Fund the time of four WSPCLD personnel to use digital comparison microscopes for remote evaluation of IBIS/NIBIN images between laboratories where one or more does not have access to IBIS/NIBIN using traditional microscopy

Summary of Results

It was the consensus of all examiners involved (investigators and other firearm examiner scientists) that the Vision-X system can remotely provide adequate microscopic information for which to draw conclusions related to microscopic verification/peer review of ballistic evidence. A vast majority of the conclusions made during virtual review were later confirmed by traditional, in-person comparisons. Based on the interface and mechanics of the Vision-X system, a majority of the examinations were on cartridge cases, with bullet examinations being generally challenging and time consuming. Bullet and toolmark examinations often required manipulation of the primary examiner to assist the verifier in visualization of identifying marks required for adequate examination. The technology used for remote evaluation of IBIS/NIB~~I~~N images was discontinued by Forensic Technologies on 12/31/22.

Policy and Practice Implications

The intent of this study was to inform the forensic community of best practices through the evaluation of existing peer review/verification protocols for the FT identification discipline. Evaluating the practicability of utilizing virtual peer review and verification through the use of a digital comparison microscope was an important next step to shift the current forensic practice paradigms of the firearm/toolmark identification discipline by implementing innovative methodology into forensic crime laboratories across the nation; a step that could increase the quality and turnaround time of forensic FT casework, and reduce the costs associated with traditional peer review.

Introduction

Statement of Problem

The proposed study was developed to address a research gap. A previous study was completed by the Maryland State Police, which compared and correlated traditional comparison microscopy to modern instruments that incorporated a digital component to examinations. There were three limitations of the study: the inter-lab aspect of virtual peer review processes was not explored, the machines were not placed in remote locations to evaluate efficacy of real-time comparisons over a computer network, and the practicability of remote NIBIN hit confirmation for laboratories without access to this system through the IBIS/NIBIN interface capabilities of digital comparison microscopes.

The Washington State Patrol Crime Laboratory Division (WSPCLD) offers forensic services for 7.4 million citizens covering 71,000 square miles. Currently, all crime related forensic firearms/toolmarks examination is served by four crime laboratories in Seattle, Tacoma, Vancouver, and Cheney. Since the beginning of the data collection period, the staffing was restructured. The intention of this study was to also include a solo examiner employed by the Yakima Police Department (YPD), however this position was vacated and not filled. The

instrument was temporarily placed in the Seattle laboratory, and installed in the Vancouver laboratory toward the end of the data collection period.

The current combined staffing levels of the four firearm laboratories consist of four full-time firearms examiners, two part-time examiners, three supervisors (who perform part time examinations), and five trainees. In 2022, the WSPCLD FT laboratories received approximately 568 laboratory requests for firearms analysis and 2,115 IBIS/NIBIN requests.

WSPCLD houses three NIBIN/IBIS systems throughout Washington State, and assists with the NIBIN system maintained by the Kennewick Washington Police Department. The National Integrated Ballistic Information Network (NIBIN) is a national network of linked Integrated Ballistic Identification Systems (IBIS), which digitally captures the unique marks on cartridge cases left at crime scenes and cartridges test-fired in FT laboratories. The Bureau of Alcohol, Tobacco, Firearms, and Explosives (BATF) is the owner and custodian of the entire IBIS/NIBIN system. For many publicly funded laboratories, these IBIS/NIBIN systems are not readily accessible to FT examiners or easily compared using traditional comparison microscopy. The proprietary format by which the 3DHD images are saved in the IBIS/NIBIN system does not allow for export to any external visualization formats.

Like many publicly funded laboratories, the WSPCLD requires 100% microscopic verification and technical peer review for all firearm comparison cases (see Appendices 5 and 6). This is a valuable quality process, but not a cost-effective or efficient use of FT examiner time and limited laboratory resources. As is the situation in many laboratories across the country, sparse staffing creates the need for FT examiners to travel across the state to complete the required on-site verifications and inter-laboratory reviews.

The four FT laboratories are located across Washington: a large and geographically diverse region with a significant mountain pass dividing eastern and western parts of the state. Seasonal geographic barriers can significantly delay peer review and verification, in turn increasing the turnaround time of firearms casework and IBIS/NIBIN leads. The cost of travel

and personnel associated with the travel required to complete on-site inter-laboratory reviews is approximately $15,000 a year per traveling examiner. However, travel restrictions associated with the COVID-19 pandemic impacted travel requirements from 2020 to 2021.

Recent advances in comparison microscope technology with IBIS/NIBIN interface capabilities could allow for remote verification/peer review using virtual, real time collaboration. This new verification method would significantly reduce the costs and examiner time associated with traditional verification. Additionally, emerging new universal file formats, compatible with digital comparison microscopes, could increase the availability for comparison. Universal file sharing of 3DHD images would increase the turnaround time of NIBIN leads that are critical for transforming raw intelligence into a corroborated, actionable intelligence product.

Rationale for Research

The intent of this study was to inform the forensic community of best practices through the evaluation of existing peer review/verification protocols for the FT identification discipline. Evaluating the practicability of utilizing virtual peer review and verification through the use of a digital comparison microscope was an important next step to shift the current forensic practice paradigms of the FT identification discipline by implementing innovative methodology into forensic crime laboratories across the nation; a step that could increase the quality and turnaround time of forensic FT casework, and reduce the costs associated with traditional peer review.

Digital comparison microscopes were installed in each of the four WSPCLD FT Laboratories located in Seattle, Tacoma, Cheney, and Vancouver. With digital comparison microscopes installed in the four laboratories, the microscopes were linked using a secure network to transfer images and remotely control the microscopes; making real time, inter-laboratory verification and peer review possible. Prior to the new instrumentation being used for analysis and interpretation of physical evidence, the digital comparison microscopes were performance checked with NIST traceable measuring devices as stated in the WSPCLD

Firearms and Toolmark Technical Manual. Efficacy and efficiency data was collected from the virtual peer reviews done using the comparison microscopes over a 24 month period.

1) Reduce turnaround time for FT casework and IBIS/NIBIN leads.

The cooperative environment made possible by real time digital collaboration has the potential to accelerate the lead generation process and increase collaboration across county and state borders through a reduction in the time evidence and examiners spend traveling between laboratories/agencies. The travel required of examiners to complete traditional peer review reduces the time they are able to spend completing casework. This is also true for the staff involved in the transfer/shipping of evidence (e.g. Property and Evidence Custodians). Furthermore, the time examiners spend waiting for evidence to be processed and shipped reduces the turnaround time of casework and IBIS/NIBIN leads, critical for active investigations.

2) Reduce the cost of forensic FT peer review and verification.

Like WSPCLD, many publically funded laboratories operate multiple FT laboratories or employ only one FT examiner. This situation leads to significant costs associated with completing peer reviews and IBIS/NIBIN verification using traditional on-site review. Traditional peer review incurs significant costs including salary, travel/lodging, shipping and transfer of evidence, and time away from assigned duty station.

3) Increase the quality and quality control of FT examinations.

The capabilities and features of new comparison microscopy technology produce higher-quality images using 3DHD image capture and multi-layered focus. The quality of these images allow examiners to more easily and accurately make comparisons, especially in cases with complicated or time intensive toolmarks. As a result of increased image quality, usage of this technology is expected to correlate with fewer inconclusive results in comparisons performed,

an increase in the number of identifications and eliminations determined, and improved turnaround time of FT casework.

4) Improve the standard practices and methodologies of the forensic FT discipline.

Incorporating virtual verification into the methodologies and standard practices of forensic FT examination could yield impacts felt by all portions of the criminal justice system. The image quality and technological features of virtual peer review/verification could make it easier for FT examiners to illustrate comparisons for attorneys, judges, and juries. By allowing non-experts to more clearly see and evaluate the comparisons made by firearms examiners, this technology would improve the standard practices and methodologies of not only the FT identification discipline, but the criminal justice system as a whole. Additionally, virtual collaboration for verification and peer review would foster an unprecedented level of inter-laboratory communication in the FT identification discipline; spanning county, state, and even international borders.

Key Personnel

The following individuals were involved in the project:

Principal Investigator: Wyant, Rick – WSPCLD FS5 Firearms/Toolmark Supervisor

Key Personnel: Smelser, Brian – WSPCLD FS4, Firearms/Toolmark Technical Lead

Bromberg-Martin, Brett – WSPCLD FS5, Firearms/Toolmark Supervisor

Walsh, Brenda – WSPCLD FS5, Firearms/Toolmark Supervisor

Schoeman, Johan – WSPCLD FS3, Firearms/Toolmark

No other organizations have been involved as partners. YPD was originally a partner, but was removed as a partner and site location during the first reporting period (01/01/20 to 12/31/20). See *Changes in approach* section for details.

Methods

Study Design

The intent of this project was to compare traditional onsite microscopic comparison protocols with digital off-site methods in hopes of informing the forensic community of evolving best practices through the comparison of existing laboratory verification and peer review protocols to emerging methods using digital microscopy.

This was achieved by installing digital comparison microscopes in each of the four WSPCLD FT laboratories located in Seattle, Tacoma, Cheney, and Vancouver. The microscopes were linked using a secure network to transfer images and remotely control the microscopes; making real time, inter-laboratory verification and peer review possible. Prior to the new instrumentation being used for analysis and interpretation of physical evidence, the digital comparison microscopes were performance checked with NIST traceable measuring devices as stated in the WSPCLD Firearms and Toolmark Technical Manual.

One examiner in each location acted as a Site Investigator, while the WSPCLD Seattle Firearms Section Supervisor served as the Principal Investigator. Site Investigators completed verifications and peer reviews of forensic FT casework using digital and traditional comparison microscopes. To minimize disruption to the mission of the WSPCLD, no more than 10% of firearm or toolmark comparison cases were included in this study. The Principal Investigator monitored the percentage of cases being included in the study. A fulltime examiner typically completes 10 cases a month or 120 per year, which equated to approximately 5 cases per month included in the study. The verifying examiner would first conduct the remote review using a remote link with the digital microscope and form conclusions based on those microscopic examinations. The same examiner then verified and peer reviewed the case traditionally, using the microscope of the examiner's choice or convenience, with an onsite examination. The onsite examination involved travel to the site or shipping of evidence to the examiner's home laboratory.

Site Investigators collected data related to these virtual and traditional comparisons using predetermined electronic spreadsheets (see Appendix 1). The Principal Investigator provided oversight and project management for the duration of the 24 month study.

During development of the study, Key Personnel reviewed the market and available literature to identify the most appropriate instrument for the virtual peer review and verifications to be completed in this study. The study completed by the Maryland State Police (see References) used the Leica and the VisionX in their comparison of traditional to digital comparison microscopy. Key Personnel determined that the Projectina VisionX comparison microscope was the best option for this study.

Aside from its use in the Maryland State Police study, the VisionX has unique, state-of-the-art remote collaboration and networking capabilities. The VisionX has the ability to combine a comparison microscope system with ballistic identification technology, which makes it the most appropriate digital comparison microscope for the proposed study.

Study Methods and Validation

To appraise the validity of utilizing remotely connected comparison microscopes for verification of ballistic evidence, specific procedures were applied to employ consistency and repeatability. Scientist performing remote verification were given guidelines for the examination to ensure accuracy and efficacy.

To begin the remote exam, the primary examiner and verifier communicate via telephone landline at the time of the project. Video conferencing through the Vision-X software was not available. The primary examiner communicates the number of samples and the sample type that will be examined, and then marks the evidence (often with a carbide tipped scribe) with an identifier (typically the item number and initials). If the sample is too small, the evidence packaging will suffice.

As the remote verification begins, the primary examiner orients the sample on the live image so the verifier can confirm the item number examined. Once the two samples are placed

on the microscope for intercomparison, the verifier will remotely control the stages, focus, and other functions to perform their examination. When areas of interest are located, a photo is taken of the comparison area as a reference and included in the study documents. Steps are taken to minimize any manipulation of the sample from the primary examiner with the intention of the examination being as objective as possible. It is required that the verifier perform some manipulation of the microscope to examine different areas at different magnifications and focal lengths. Conclusions drawn from static images were not permitted for the purposes of this study.

Conclusions made by the verifier are communicated to the primary examiner after the examination over the phone and any opinion differences are discussed. If an onsite examination by the verifier is not feasible, the evidence is repackaged, sealed and shipped to the verifier for onsite review. The verification is documented in the case file using standard practices outlined by WSPCLD procedures.

The relevant case data, type and number of items examined, conclusions, time spent, etc. are recorded on the study spreadsheets (see Appendix 2) and sorted on a network drive under a folder with the designated month and year. If there were discrepancies between conclusions determined remotely versus the in-person examination were clearly noted on the spreadsheet.

Materials and Data Collection Procedures

The sample for the study was initially intended to include active criminal cases currently in the WSPCLD or YPD backlog selected at random based on minimum number of evidence items with an approximate proportionate breakdown: 30% bullet comparison, 50% cartridge case comparison, and 20% toolmark comparison. Each case review had at least three evidence items or areas of interest for comparison.

For bullet examinations, some routine measurements (caliber, land and grooves, ricochet angle) were recorded during the project, both traditionally (in-person) and digitally

(remote). For the remote verification of any bullets, an image of a cast from one land and one groove of the barrel of the firearm was the minimum required for evaluation of subclass. The data points collected were evaluated for accuracy and consistency.

For cartridge case examinations, data recorded during traditional peer review was documented during remote review, including evaluation of subclass characteristics. For the remote verification of fired cartridge cases, there was enough information in the breech face marks and firing pin impression for the evaluation of subclass influence. At any time, the remote reviewer could request additional images for that purpose.

Data was collected and recorded using predetermined Microsoft Excel spreadsheets (see Appendix 2). Using these spreadsheets, Site Investigators documented the time spent completing each traditional and virtual review. As with the Maryland study, Site Investigator time was correlated to years of experience. This data assists in evaluating the efficiency of virtual versus traditional peer review/verification methodology. The Principal Investigator used the data collected to determine the total cost per verification or peer review (both traditional and virtual). This data assisted in evaluating the cost-effectiveness of virtual versus traditional peer review/verification methodology. Collecting data to demonstrate the expenses associated with traditional on-site peer review was a critical part of identifying the most efficient and cost-effective method for forensic FT verification and peer review. The time and costs associated with the travel required for traditional on-site review were collected by the traveling Site/Principal Investigator.

While multiple data points related to efficiency and cost-effectiveness of current policy were collected as part of the study, the accuracy, quality, and reliability of the results obtained from traditional verification/peer review versus those using the digital microscopes was the main data point collected, evaluated, and scrutinized. As with any comparison or verification, the evaluation of the accuracy, quality, and reliability of the results is subjective. However, when

there were Conclusion Variances, these were scrutinized as those were the instances where the traditional versus digital verification merits or deficiencies were most clearly highlighted.

Instances in which the conclusions reached after traditional verification/peer review differed from the virtual verification/peer review, were considered a “Conclusion Variance.” These cases were flagged for a re-evaluation by a secondary investigator. Root cause analysis was employed to determine the reason for the difference in conclusions. Such instances were explored and documented in the project spreadsheet.

Changes in Approach

During the first reporting period (01/01/20 to 06/30/20), YPD (YPD) was removed as a partner and site location for the study, because the only YPD Firearms Analyst (and Key Personnel of the study) ended her employment with YPD. This did not change the goals of this research project because, during the second reporting period (07/01/20 to 12/30/20), the comparison microscope located in the YPD laboratory was moved to the WSP Seattle Crime Laboratory.

During the fourth reporting period (07/01/21 to 12/31/21), the opportunity to expand the project’s approach through the addition of an additional testing site was identified. The WSPCLD opened a new Firearms/Toolmarks section in the WSP Vancouver Crime Laboratory. The scope of the project was expanded to include this laboratory and add a site investigator, as well as support the cost of moving the grant-funded microscope previously located in the YPD laboratory.

During the fifth reporting period (01/01/22 to 06/30/22), an opportunity to disseminate preliminary findings to communities of interest presented itself. In May 2022, the Principal Investigator attended the annual Association of Firearms and Toolmark Examiner (AFTE) Training Seminar to present preliminary findings of this project. To view the slides from this presentation, refer to Appendix 3.

Data Analysis

During the evaluation period August 2020 through November 2022, the WSPCLD LIMS management database logged a total of 1,245 firearm comparison cases submitted to the WSP laboratory system; though many of these cases would not encompass a dataset suitable for remote verification. During the COVID-19 pandemic, WSPCLD laboratories saw a dramatic increase in NIBIN only submission and a decrease in toolmark case submissions across the state.

Over 530 pieces of evidence from 78 cases were examined as a part of this study. Due to case demands and the proportion of submissions related to bullets and cartridge cases, a majority of the examinations for remote verification were fired cartridge cases.

Findings

The Principal Investigator met with all four investigators several times remotely and twice in-person to gather information and impressions of the efficacy of the Vision-X microscopes and the potential adoption of remote verification state-wide. The Vision-X microscope system in its current configuration was able to connect to other Vision-X microscopes and functioned a majority of the time to allow timely remote verifications between laboratories. The system for remote verification was useful and efficient for most fired cartridge case examinations, but proved problematic and inefficient for most bullet and toolmark examinations due to required sample manipulation by the primary examiner, inability to change lighting profile of sample remotely, and the non-traditional remote microscope interface.

The remote manipulation of the microscopic stages for examination must occur using a traditional computer mouse and multiple incremental clicks instead of traditional hands-on operation/movement of the stages. Often there was frustrating lag-time over the network between inputs from the microscope interface and output to facilitate instrument movement.

The Vision-X microscope are equipped with a “space-mice”, which is a unique interface that allows ergonomic interaction with the 3D stages in X,Y,Z axes. Although not intuitive to traditional comparison microscope stage manipulation, it has many features when learned.

Space-mice usage is currently not available during the remote operation, which adds time to the examination, particularly with multi-surface curved objects such as bullets and toolmarks. For those examiners who utilize the Vision-X for their traditional microscopic examinations using the Space-mice or other stage controls (such as the joy sticks) the remote interface is entirely different and requires practice to use efficiently. The differing controls proved frustrating for the investigators and other examiners attempting the practice, particularly for those examiners whose primary microscope for their casework is not a Vision-X.

Despite multiple attempts, the NIBIN interface with the Vision-X microscopes was not authorized due to restrictions placed by the BATF, and therefore was not included in this study. While there was much hope for this to be available for future evaluation, Forensic Technology discontinued this capability on 12/31/22.

Limitations and Challenges

The COVID-19 pandemic created unique challenges related to the data collection and completion of this study. Equipment delivery and installation was significantly delayed due to the travel restrictions and other laboratory safety requirements. The four microscopes were not in place and ready for data collection until August of 2020. Then the laboratories were faced with staffing challenges related to teleworking, rotating and off-setting schedules, temporary layoffs, and ill or quarantined staff members. Agency submissions for laboratory examination changed as a result of social distancing and travel restrictions, which caused laboratory priorities to be restructured in order to meet evolving casework demands.

Shortly after data collection began it was learned that YPD was no longer able to participate in the study and plans were required to relocate the instrument.

During the evaluation period, the Spokane Vision-X instrument had continual hardware and software failures which lead to significant downtime of the instrument awaiting parts; delivery of which was most certainly delayed by the COVID-19 pandemic.

Conclusions and Recommendations

This resource was prepared by the author(s) using Federal funds provided by the U.S. Department of Justice. Opinions or points of view expressed are those of the author(s) and do not necessarily reflect the official position or policies of the U.S. Department of Justice.

Based on the data collected and feedback received from the investigators, conclusions from remote review were consistent with traditional review, with less than 1% of discrepancies over the course of the study. The differing results were determined to be an inconclusive result during virtual review, then later identified during traditional microscopic examination. This was simply attributed to the resolution of the virtual image and the manipulation interface of the scope controls. The remotely connected microscopes were found to be useful in verifying conclusions without the need of in-person review; saving costs and increasing case production, which ultimately permitted more rapid results for investigators. The remote interface of manipulating microscope controls was a limitation of the technology as this made remote peer reviews less efficient and practical than traditional peer reviews for most challenging ballistic comparisons (such as damaged bullets or toolmarks). However, the vendor is working to add "space mice" to the remote control based on feedback from this study.

With the feedback received from colleagues within the organization and that received after the presentation at the AFTE training conference, the WSPCLD firearm and toolmark functional area made the decision to include the option of remote verification to the WSPCLD protocols. The proposed procedure manual change is as follows:

> *"All evidentiary identifications, inconclusives and eliminations (to include differences in class characteristics) must be verified by another qualified firearms examiner with initials and date on the examination worksheet prior to a report being issued. Remote verification (RV) by use of the VISION-X microscopes can be performed for comparisons approved by the section Supervisor of the primary examiner. RV and supervisor approval must be notated on verification line of the examination worksheet along with initials and date of the verification. Protocols for RV will be described, including required photo micrographs, in the WSPCLD technical procedures manual. The verifier has*

ultimate discretion if the sample is suitable for RV or if a traditional verification is required."

Furthermore, the Vision-X microscopes were determined to be a significant training resource. The WSPCLD will have eight examiners in a training program by summer of 2023, nearly doubling the staff of forensic firearms examiners state-wide. Each of the four laboratories will have two trainees, emphasizing the need for consistent and accountable training across the division. Moving forward, the intent of the Vision-X comparison microscopes is to utilize the remote feature for the trainees to demonstrate proficiency to off-site trainers as well as trainers having the ability to perform real-time microscope training to multiple sites. Data will be collected of the methods of remote microscope training as well collating feedback from the trainers and trainees and is intended to be presented at a professional forensic meeting.

WSPCLD had hoped to enable the interface the Vision-X microscopes to the NIBIN hit viewer in the future to explore the efficacy of that feature if the (BATF granted access. However, this capability was discontinued by Forensic Technology on 12/31/22 (the conclusion of this project).

Dissemination of Research Findings

In May 2022, the Principal Investigator (PI) attended the annual AFTE Training Seminar in Atlanta, GA to present preliminary findings of this project and our intent to adopt remote verification state-wide as a result of the data collected from this study. See Appendix 3 for presentation slides. It was well received by the over 450 attendees and several AFTE members inquired after the presentation about initiating a similar program in their laboratory system.

References

1) Dreyfuss, M., Katz, D., Suber, T., and Kim, S. (2019, February). *A Comparison of VisionX and Leica® UFM4 Comparison Microscopes and Validation of the VisionX Comparison*

Microscope for Intra- and Inter-Laboratory Examination. Presented at the 71st AAFS Annual Scientific Meeting. Baltimore, MD.

2) Washington State Patrol. (November 2022). *Washington State Patrol Crime Laboratory Division Quality Operations Manual Revision 6.*

3) Washington State Patrol. (December 2022). *Firearm/Toolmark Technical Procedure's Manual Version 14.*

List of Appendices

Appendix 1: Data Collection - Predetermined Electronic Spreadsheets

Appendix 2: Data Collection – Completed Spreadsheets Compiled

Appendix 3: AFTE Training Seminar Presentation Slides

Appendix 4: Investigator Interview Form

Appendix 5: Washington State Patrol Crime Laboratory Division Quality Operations Manual (10.6.3 Technical Review [Review of Casework]), Revision 6: November 18, 2022

Appendix 6: Washington State Patrol Crime Laboratory Division Firearms/Toolmarks Technical Procedures Manual (sections 1.1, 1.2, 1.6.8, 1.21, 1.22, 1.23, and 1.31), Revision 14: December 29, 2022

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Examiner Worksheet

Month-Year

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
xxx-xxx	mm/dd/yyyy	last or initials	VPR or In-person/scope name	Firearms/Toolmark/etc.		bullet/cartridge/etc.			

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Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
CC Comp.																			
xxx-xxx	last or initials	last or initials	x to select	x to select	mm/dd/yyyy				y/n/na	y/n/na	y/n/na	y/n/na	y/n/na	y/n/na	y/n/na	y/n/na	y/n/na	ID/ELMIS	y/n/na

Bullet Comp.

Month-Year

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
xxx-xxx	last or initials	last or initials	x to select	x to select	mm/dd/yyyy															

Conclusion Variance

Month-Year	Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time	Totals	Comments
	xxx-xxx	mm/dd/yyyy		last or initials	last or initials	last or initials	ID/ELIM	Y/N	ID/ELIM				

Verification Cost Tracking

Month-Year

Lab number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals
xxx-xxx	last or initials	last or initials	x to select	x to select	mm/dd/yyyy						

Verification Travel Cost

Month-Year

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
xxx-xxx	last or initials	last or initials	mm/dd/yyyy			air/car				

2020 Examiner Worksheets

Aug-20

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
119-2926 (1,2)	8/12/2020	BBM	Remote/ VisionX Carrot	CC Exam	3	CC	42.5	1.25	53.13
218-0987	8/12/2020	Smelser	Remote/ VisionX Xena	CC Exam	4	CC	42.5	1.25	53.13
218-1171	8/12/2020	Smelser	Remote/ VisionX Xena	Bullet/CC Exam	9	Bullet/CC	42.5	2.75	116.88
218-0987	8/25/2020	Smelser	Traditional/Vision X Xena	CC Exam	4	CC	42.5	0.5	21.25
218-1171	8/25/2020	Smelser	Traditional/Vision X Xena	Bullet/CC Exam	9	Bullet/CC	42.5	1	42.50
119-2926	8/24/2020	Hudson	Traditional/Vision X Xena	CC Exam	3	CC	42.5	0.25	10.63
320-0141	8/26/2020	BBM	Remote/ VisionX Carrot	CC Exam	3	CC	42.5	1	42.50
220-2094	8/26/2020	Walsh	Remote/ VisionX Eris	Bullet/CC Exam	4	Bullet/CC	42.5	2.5	106.25
219-1244	8/28/2020	Walsh	Remote/ VisionX Eris	CC Exam	6	CC	42.5	1.5	63.75
219-1244	9/8/2020	Walsh	Traditional/Leica Curly	CC Exam	6	CC	42.5	0.42	17.85
220-2094	9/8/2020	Walsh	Traditional/Leica Curly	Bullet/CC Exam	4	Bullet/CC	42.5	0.42	17.85

Sep-20

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
309-1178	9/15/2020	Smelser	Remote/ VisionX Xena	Bullet	2	bullet	42.5	1	42.50
309-1178	9/16/2020	Smelser	Traditional/ VisionX Ephesto	Bullet	2	bullet	42.5	0.5	21.25
419-0639	9/15/2020	Coric	Remote/ VisionX Ephesto	Bullet/CC Exam	4	Bullet/CC	42.5	2	85.00
419-0639	9/16/2020	Coric	Traditional/ Xena	Bullet/CC Exam	4	Bullet/CC	42.5	0.5	21.25
220-0802	9/16/2020	BBM	Remote/ VisionX Ephesto	CC Exam	4	CC	42.5	1.66	70.55
220-0802	9/23/2020	BBM	Traditional/ VisionX Carrot	CC Exam	4	CC	42.5	0.75	31.88
220-1823	9/22/2020	Smelser	Remote/ VisionX Carrot	CC Exam	10	CC	42.5	1.5	63.75
220-1823	10/12/2020	Smelser	Traditional/ Ephesto	CC Exam	10	CC	42.5	1.25	53.13
320-1040	9/30/2020	BBM	Remote/VisionX Eris	CC Exam	1	CC	42.5	0.75	31.88
320-1040	10/5/2020	BBM	Traditional/ VisionX Carrot	CC Exam	1	CC	42.5	0.25	10.63

Oct-20

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
220-2014	10/6/2020	Smelser	Remote/ VisionX Carrot	TM	6	tool marks	42.5	1.5	63.75
120-3299	10/6/2020	BBM	Remote/ VisionX Xena	TM	6	tool marks	42.5		0.00
120-3732	10/6/2020	BBM	Remote/ Vision Ephesto	Firearms	2	bullets	42.5	1.3	55.25
120-3732	10/14/2020	BBM	Traditional/ VisionX Carrot	Firearms	2	bullets	43.5	0.5	21.75
120-3299	10/16/2020	Renee	Traditional/ VisionX Xena	TM	6	tool marks	42.5	0.3	12.75
119-3915	10/21/2020	Smelser	Remote/ VisionX Ephesto	Firearms	2	bullets	42.5	1.25	53.13
119-3915	10/21/2020	Smelser	Traditional/ VisionX Ephesto	Firearms	2	bullets	42.5	0.5	21.25
220-2014	10/26/2020	Smelser	Traditional/ VisionX Ephesto	TM	6	tool marks	42.5	0.6	25.50
720-0689	10/27/2020	Smelser	Remote/VisionX Eris	Firearms	4	fired cc	42.5	1	42.50
720-0689	10/27/2020	Smelser	Traditional/ VisionX Ephesto	Firearms	4	fired cc	42.5	0.5	21.25

Nov-20

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
220-2751	11/9/2020	walsh	Remote/VisionX Carrot	Bullet (GRC)	1	bullet	42.5	0.5	21.25
220-2823	11/30/2020	Smelser	Remote/VisionX Carrot	Fired cc	4	cartridge cases	42.5	0.3	12.75
220-2630	11/30/2020	Hudson	Remote/VisionX Carrot	Bullet (GRC)	1	bullet	42.5	0.25	10.63
220-2823	11/30/2020	Smelser	Remote/VisionX Carrot	Fired cc	4	cartridge cases	42.5	0.33	14.03

Dec-20

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
220-635	11/30/2020	Smelser	Remote/VisionX Carrot	FCC Micro	5	FCC (TF+4EX)	42.5	0.33	14.03
220-635	12/3/2020	Smelser	Remote/VisionX Carrot	FCC micro	23	FCC (TF+17EX)	42.5	1.33	56.53
220-635	12/3/2020	Smelser	Remote/VisionX Carrot	FB micro	6	FB (TF+2EX)	42.5	1.66	70.55
119-2289	12/3/2020	BBM	Remote/VisionX Xena	FCC micro	9	FCC (3TF+6EX)	42.5	0.83	35.42
119-2289	12/3/2020	BBM	Remote/VisionX Xena	FB micro	3	FB (2TF+1EX)	42.5	0.83	35.42

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2020 CC Comp.

Aug-20

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
119-2926	Smelser	BBM		X	8/12/2020	3	FP/BF	Glock Type	Yes	Yes	Yes FP	Yes	Not viewed	Yes	Yes	Yes	Yes	ID	Not evaluated
218-0987	BBM	Smelser		X	8/12/2020	4	FP/BF	Circular	Yes	Yes	Yes FP	Yes	Yes	Yes	Yes	Yes	Yes	ID	Not evaluated
218-1171	BBM	Smelser		X	8/12/2020	7	FP/BF	Circular	Yes	Yes	Yes FP	Yes	Yes	Yes	Yes	Yes	Yes	ID	Not evaluated
119-2926	Smelser	Hudson	X		8/12/2020	3	FP/BF	Glock Type	Yes	Yes	Yes FP	Yes	Not viewed	Yes	Yes	Yes	Yes	ID	Not evaluated
320-0141	Walsh	BBM		X	8/26/2020	3	FP/BF	Circular	Yes	Yes	Yes FP	Yes	Not viewed	Not viewed	Not viewed	Yes	Yes	ID	FP (M&P)
220-2094	BBM	Walsh		X	8/26/2020	3	FP/BF	Circular	Yes	Yes	Yes FP	Yes	Not viewed	Not viewed	Yes - cut out	Yes	Yes	ID	Not evaluated
219-1244	BBM	Walsh		X	8/28/2020	6	FP/BF	Circular	Yes	No	Yes FP	Yes (drag)	Not viewed	Not viewed	Not viewed	Yes	Yes	ID	Not evaluated
219-1244	BBM	Walsh	X		9/8/2020	6	FP/BF	Circular	Yes	No	Yes FP	Yes	Yes	Not viewed	Not viewed	Yes	Yes	ID	Not evaluated
220-2094	BBM	Walsh	X		9/8/2020	3	FP/BF	Circular	Yes	No	Yes FP	Yes (drag)	Not viewed	Not viewed	Yes - cut out	Yes	Yes	ID	Not evaluated

Sep-20

9/16/2020	4	FP/BF/CM	Circular	Yes	Yes	Yes	BF	Yes (dra	Yes	No	No	Yes	Yes	ID	No				
9/23/2020	4	FP/BF/CM	Circular	Yes	Yes	Yes	BF	Yes (dra	Yes	No	No	Yes	Yes	ID	No				
9/15/2020	2	FP/BF/CM	Circular	Yes	Yes	Yes	BF	Yes (dra	Yes	No	No	Yes	Yes	ID	No				
9/16/2020	2	FP/BF/CM	Circular	Yes	Yes	Yes	BF	Yes (dra	Yes	No	No	Yes	Yes	ID	No				
9/22/2020	2	FP/BF	Circular	Yes	Yes	Yes	FPI	No	No	No	No	Yes	Yes	ELIM	No				
9/22/2020	2	FP/BF	Glock	Yes	Yes	Yes	FPI	No	No	No	No	Yes	No	ID	No				
9/22/2020	4	FP/BF/EJR	Circular	No	Yes	Yes	FPI/EJF	Yes (she	No	Yes	No	Yes	Yes	ID 3x	No				
9/22/2020	3	FP/BF/EJR	Circular	No	Yes	Yes	FPI/EJF	Yes (she	No	Yes	No	Yes	Yes	ID 2x/Elim	No				
10/12/2020	2	FP/BF	Circular	Yes	Yes	Yes	FPI	No	No	No	No	Yes	Yes	ELIM	No				
10/12/2020	2	FP/BF	Glock	Yes	Yes	Yes	FPI	No	No	No	No	Yes	No	ID	No				
10/12/2020	4	FP/BF/EJR	Circular	No	Yes	Yes	FPI/EJF	Yes (she	No	Yes	No	Yes	Yes	ID 3x	No				
10/12/2020	3	FP/BF/EJR	Circular	No	Yes	Yes	FPI/EJF	Yes (she	No	Yes	No	Yes	Yes	ID 2x/Elim	No				
9/30/2020	1	FP/BF	Glock	Yes	Yes	Yes	FP	Yes (dra	Not examine	No	No	Yes	Yes	ID	No				
10/5/2020	1	FP/BF	Glock	Yes	Yes	Yes	FP	Yes (dra	Not examine	No	No	Yes	Yes	ID	No				

Oct-20

720-0689	Brits	Smelser		x	10/27/2020	4		Circle (new G	yes	yes	yes	yes	yes			yes	yes	ID	
720-0689	Brits	Smelser	x		10/27/2020	4		Circle (new G	yes	yes	yes	yes	yes			yes	yes	ID	

Nov-20

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
220-2823	BBM	Smelser		x	11/30/2020	4		Glock	yes	yes	yes	yes	no	no	no	yes	yes	ID	no

Dec-20

220-635	BBM	Smelser		x	11/30/2020	5	BF/FPAS	circular	y	y	y	y	n/a	n/a	n/a	y	y	ID	n
220-635	BBM	Smelser		x	12/3/2020	13	BF/FPAS	elliptical	y	y	y	y	n/a	n/a	n/a	y	y	ID	n
220-635	BBM	Smelser		x	12/3/2020	5	BF/FPAS	circular	y	y	y	y	n/a	n/a	n/a	y	y	ID	n
220-635	BBM	Smelser		x	12/3/2020	5	BF/FPD	circular	y	n	y	y	n/a	n/a	n/a	y	y	ID	n
119-2289	Smelser	BBM		x	12/3/2020	5													
119-2289	Smelser	BBM		x	12/3/2020	4	BF/FP/F	ed (eliminations)										ELIMS	

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2020 Bullet Comp.

Aug-20

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
218-1171	BBM	Smelser		X	8/12/2020		Yes	No	No	FMJ	6	R	Not done	Not done	5	No	YES	ID		Not evaluated
218-1171	BBM	Smelser	X		8/25/2020		Yes	No	No	FMJ	6	R	Not done	Not done	5	No	YES	ID		Not evaluated
220-2094	BBM	Walsh		X	8/26/2020	37	Yes	Yes	Yes (shallow)	FMJ	6	R	0.077"	0.100"	6	No	YES	ID	Yes	Yes
220-2094	BBM	Walsh		X	8/26/2020	63	Yes	Yes	No	FMJ	6	R	0.076"	0.100"	5	No	YES	ID	Yes	Yes
220-2094	BBM	Walsh	X		9/8/2020	37	Yes	Yes	Yes (shallow)	FMJ	6	R	.078"	.101"	6	No	YES	ID	Yes	Yes
220-2094	BBM	Walsh	X		9/8/2020	63	Yes	Yes	No	FMJ	6	R	.077"'	.100"	5	No	YES	ID	Yes	Yes

Sep-20

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
309-1178	Hudson	Smelser		X	9/15/2020	SC-05	Yes	No	No	HP	6	R	Not done	Not done	6	No	Yes	ID	No	Yes
	Hudson	Smelser		X	9/15/2020	SC-17	Yes	No	No	HP	6	R	Not done	Not done	6	No	No	ID	No	Yes
	Hudson	Smelser	X		9/16/2020	SC-05	Yes	No	No	HP	6	R	Not done	Not done	6	No	Yes	ID	No	Yes
	Hudson	Smelser	X		9/16/2020	SC-017	Yes	No	No	HP	6	R	Not done	Not done	6	No	No	ID	No	Yes
419-0639	Smelser	Coric		X	9/15/2020	7	Yes	No	No	FMJ	6	R	Not done	Not done	6	No	Yes	ID	No	Yes
	Smelser	Coric		X	9/15/2020	37	Yes	Yes	No	HP	6	R	Not done	Not done	6	No	No	INC	No	Yes
	Smelser	Coric	X		9/15/2020	7	Yes	No	No	FMJ	6	R	Not done	Not done	6	No	Yes	ID	No	Yes
	Smelser	Coric	X		9/15/2020	37	Yes	Yes	No	HP	6	R	Not done	Not done	6	No	No	ID	No	Yes

Oct-20

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
120-3732	Smelser	BBM		x	10/6/2020	935	yes	yes	yes	TMJ?	6	R	.065"	.115"	3	no	no	INC	No	Yes
120-3732	Smelser	BBM		x	10/6/2020	936	yes	yes	yes	TMJ?	6	R	.065"	.115"	3	no	no	INC	No	Yes
119-3915	Dijana	Smelser		x	10/21/2020	86033-1	yes	expanded	no	CHP	5	R				no	yes	ID	no	
119-3915	Dijana	Smelser		x	10/21/2020	85830-1	yes	expanded	no	CHP	5	R				no	no	INC	no	
119-3915	Dijana	Smelser	x		10/21/2020	86033-1	yes	expanded	no	CHP	5	R				no	yes	ID	no	
119-3915	Dijana	Smelser	x		10/21/2020	85830-1	yes	expanded	no	CHP	5	R				no	no	INC	no	

Nov-20

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
220-2751	BBM	Brenda		x	11/9/2020	2	yes	yes	no	TMJ	6	n/d	~0.080 (VPR OK)	~0.155 (VPR OK)	no comparison	n/a	n/a	n/a	n.a	n/a
220-2630	BBM	Hudson		x	11/30/2020	1	yes	yes	no	FMJ	6	R	~0.080" (.080" VPR)	~0.101" (.100" VPR)	no comparison	n/a	na	n/a	n.a	n/a

Dec-20

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
220-635	BBM	Smelser		x	12/3/2020	CU0930	y	y	low angle	fmj	6	r								
220-635	BBM	Smelser		x	12/3/2020	CU01003	y	y	n	jhp	6	r								
119-2289	Smelser	BBM		x	12/3/2020	193417-1	y				6	r								

2020 Conclusion Variance

Aug-20

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review		Time	Totals	Comments
119-2926(1,2)	8/12/2020	ZRZ-06 t v t	Smelser	ID	BBM	ID	none	ID	Hudson	ID	1	#VALUE!	
		ZRZ-06 t v MLT-7	Smelser	ID	BBM	ID	none	ID	Hudson	ID			
		ZRZ-06 t v ZRZ-121	Smelser	ID	BBM	ID	none	ID	Hudson	ID			
218-0987	8/12/2020	017 t v t	BBM	ID	Smelser	ID	none	ID	Smelser	ID			Spent more time on test to test
		017 t v 003	BBM	ID	Smelser	ID	none	ID	Smelser	ID			Learning curve on lighting and set up
		017 t v 004	BBM	ID	Smelser	ID	none	ID	Smelser	ID			Tried to use ring light as much as possible
		017 t v 005	BBM	ID	Smelser	ID	none	ID	Smelser	ID			About half the time to do TPR than VPR
218-1171	8/12/2020	10989 cc t v t	BBM	ID	Smelser	ID	none	ID	Smelser	ID			Spent more time on test to test
		10989 cc t v 10991	BBM	ID	Smelser	ID	none	ID	Smelser	ID			Learning curve on lighting and set up
		10989 cc t v 10992	BBM	ID	Smelser	ID	none	ID	Smelser	ID			Tried to use ring light as much as possible
		10989 cc t v 10993	BBM	ID	Smelser	ID	none	ID	Smelser	ID			About half the time to do TPR than VPR
		10989 cc t v 10994	BBM	ID	Smelser	ID	none	ID	Smelser	ID			
		10989 cc t v 10995	BBM	ID	Smelser	ID	none	ID	Smelser	ID			
		10989 cc t v 10996	BBM	ID	Smelser	ID	none	ID	Smelser	ID			
		10989 b t v t	BBM	ID	Smelser	ID	none	ID	Smelser	ID			
		10989 b t v 10990	BBM	ID	Smelser	ID	none	ID	Smelser	ID			
320-0141	8/26/2020	t to t	Walsh	ID	BBM	ID							
		t t 1A	Walsh	ID	BBM	ID							
		t to 2	Walsh	ID	BBM	ID							
220-2094	8/26/2020	t to t (CC)	BBM	ID	Walsh	ID	none	ID	Walsh	ID			
		t to 001 (CC)	BBM	ID	Walsh	ID	none	ID	Walsh	ID			
		t to 011 (CC)	BBM	ID	Walsh	ID	none	ID	Walsh	ID			
		t to t (FB)	BBM	ID	Walsh	ID	none	ID	Walsh	ID			Took 10 minutes on bullets TPR vs 2+ hours VPR.
		t to 037 (FB)	BBM	ID	Walsh	ID	none	ID	Walsh	ID			Damaged bullet very difficult to manipulate and light- BBM adjusted position and light manually otherwise would have taken many hours
		t to 063 (FB)	BBM	ID	Walsh	ID	none	ID	Walsh	ID			Damaged bullet jacket very difficult to manipulate and light- BBM adjusted position and light manually otherwise would have taken many hours
219-1244	8/28/2020	t to t	BBM	ID	Walsh	ID	none	ID	Walsh	ID			
		t to 013	BBM	ID	Walsh	ID	none	ID	Walsh	ID			
		t to 004A	BBM	ID	Walsh	ID	none	ID	Walsh	ID			
		t to 004B	BBM	ID	Walsh	ID	none	ID	Walsh	ID			
		t to 004C	BBM	ID	Walsh	ID	none	ID	Walsh	ID			
		t to 004D	BBM	ID	Walsh	ID	none	ID	Walsh	ID			

Sep-20

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review		Time	Totals	Comments
309-1178	9/15/2020	SC-05 t v t	Hudson	ID	Smelser	ID	none	ID	Smelser	ID	1	#VALUE!	Spent more time on test to test
		SC-05 t v SC-17	Hudson	ID	Smelser	ID	none	ID	Smelser	ID	0.5		
220-0802	9/23/2020	5 t to t	Smelser	ID	BBM	ID	none	ID	BBM	ID	0.75		VPR - more time on t to t
		5 t to 2	Smelser	ID	BBM	ID	none	ID	BBM	ID	0.5		more time spent on item 2 CM due to case wall damage, damage makes VPR tricky (trad verification straightforward)
		5 t to 24a	Smelser	ID	BBM	ID	none	ID	BBM	ID	0.25		
320-1040	9/30/2020	4 to t	Walsh	ID	BBM	ID	none	ID	BBM	ID	0.66		
	10/5/2020	4 to t	Walsh	ID	BBM	ID	none	ID	BBM	ID	0.25		Glock TFs and one EX, straightforward comparison
419-0639	9/15/2020	7 t v t (cc)	Smelser	ID	Coric	ID	none	ID	Coric	ID	0.3		
		7 t v 3 (cc)	Smelser	ID	Coric	ID	none	ID	Coric	ID	0.4		
		7 t v t (bullet)	Smelser	ID	Coric	ID	none	ID	Coric	ID	0.3		
		7 t v 37 (bullet)	Smelser	ID	Coric	INC	Yes	ID	Coric	ID	1.5		VPR was difficult/inconclusive: TPR easier ID
220-1823	9/15/2020	6 t v t (cc)	BBM	ID	Smelser	ID	none	ID	Smelser	ID	0.5		VPR was easy due to several elim and distinct features
		6 t v 5 (cc)	BBM	Elim	Smelser	Elim	none	Elim	Smelser	Elim	0.15		
		4 v 53 (cc)	BBM	ID	Smelser	ID	none	ID	Smelser	ID	0.5		
		1 t v t (cc)	BBM	ID	Smelser	ID	none	ID	Smelser	ID	0.5		
		1 t v 22, 23, 24	BBM	ID	Smelser	ID	none	ID	Smelser	ID	0.5		
		1 t v 11	BBM	Elim	Smelser	Elim	none	Elim	Smelser	Elim	0.15		
		12 v 13	BBM	ID	Smelser	ID	none	ID	Smelser	ID	0.3		
		11 v 12	BBM	Elim	Smelser	Elim	none	Elim	Smelser	Elim	0.15		

Oct-20

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review		Time	Totals	Comments
220-2014	10/6/2020	tool t v t	BBM	ID	Smelser	ID	none	ID			0.5		Tool Mark proficiency
		tool t v 1	BBM	ID	Smelser	ID	none	ID			0.3		
		tool t v 3	BBM	ID	Smelser	ID	none	ID			0.3		
		2 v 4	BBM	ID	Smelser	ID	none	ID			0.3		
		tool t v 2,4	BBM	Elim	Smelser	Elim	none	Elim			0.1		
	10/6,16/2020	tool t v t	Smelser	ID	BBM/Hudsor	ID	none	ID			0.2		Tool Mark proficiency
		tool t v 1	Smelser	ID	BBM/Hudsor	ID	none	ID			0.1		
		tool t v 3	Smelser	ID	BBM/Hudsor	ID	none	ID			0.1		
		2 v 4	Smelser	ID	BBM/Hudsor	ID	none	ID			0.1		
		tool t v 2,4	Smelser	Elim	BBM/Hudsor	Elim	none	Elim			0.1		TPR was much easier due to adjusting tool mark position by hand.
120-3732	10/6/2020	935 v 936	Smelser	INC	BBM	INC	none	INC					TPR much faster than VPR (0.5 hrs vs 1.3 hrs.)
	10/21/2020	86033-1 t v t	Dijana	ID	Smelser	ID	none	ID			0.6		
		86033-1 t v 85830-1	Dijana	INC	Smelser	INC	none	INC			1.1		
	10/27/2020	6906T1 v T3	Brits	ID	Smelser	ID	none	ID			0.3		
		6906T1 v 5107	Brits	ID	Smelser	ID	none	ID			0.4		
		6906T1 v 5108	Brits	ID	Smelser	ID	none	ID			0.4		
		6906T1 v 5109	Brits	ID	Smelser	ID	none	ID			0.4		

Nov-20

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review		Time	Totals	Comments
220-2751	11/9/2020	2	BBM	(GRC only)	Brenda	(GRC only)	none						
220-2630	11/30/2020	1	BBM	(GRC only)	Hudson	(GRC only)	none		not done on the bullet		0.3		
220-2823	11/30/2020	12, 13, 14	BBM	ID	Smelser	ID	none				0.33		

Dec-20

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review		Time	Totals	Comments
220-635	11/30/2020	tbbm964 to 8	bbm	elim	smelser								
220-635	11/30/2020	CU0948 to 8	bbm	elim	smelser								
220-635	11/30/2020	tbbm964 to CU0948	bbm	id	smelser								
220-635	12/3/2020	bbm964 to CU0962+94	bbm	id	smelser								
220-635	12/3/2020	972 to CU0936, 939-94	bbm	id	smelser								
220-635	12/3/2020	bbm987 to CU0933-93	bbm	id	smelser								
220-635	12/3/2020	tbbm964 to CU0930	bbm	id	smelser								
220-635	12/3/2020	tbbm987 to CU1003	bbm	id	smelser								
119-2289	12/3/2020	192729-1 t to 192729-!	smelser		bbm								
119-2289	12/3/2020	192718-4 t to 192729-!	smelser		bbm								
119-2289	12/3/2020	193278-1 t to 192729-!	smelser		bbm								
119-2289	12/3/2020	726-1 t to 192718-1A,	smelser		bbm								
119-2289	12/3/2020	192726-1 t to 193417-	smelser		bbm								

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2020 Verification Cost Tracking

Lab number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidenc	Hourly rate of verifier	Time	Totals
Aug-20											
219-1244	BBM	Walsh		X	8/28/2020	Firearms	6	CC	$42.50	1.50	$63.75
220-2094	BBM	Walsh		X	8/26/2020	Firearms	6	Bullets/CC	$42.50	2.50	$106.25
320-0141	Walsh	BBM		X	8/26/2020	Firearms	3	CC	$42.50	1.00	$42.50
119-2926	Smelser	BBM		X	8/12/2020	Firearms	3	CC	$50.00	1.25	$62.50
218-0987	BBM	Smelser		X	8/12/2020	Firearms	4	CC	$42.50	1.25	$53.13
218-1171	BBM	Smelser		X	8/12/2020	Firearms	9	Bullets/CC	$50.00	2.45	$122.50
218-0987	BBM	Smelser	X		8/25/2020	Firearms	4	CC	$42.50	0.50	$21.25
218-1171	BBM	Smelser	X		8/25/2020	Firearms	9	Bullets/CC	$50.00	1.00	$50.00
119-2926	Smelser	Hudson	X		8/24/2020	Firearms	3	CC	$50.00	0.25	$12.50
220-2094	BBM	Walsh		X	8/26/2020	Firearms	4	Bullets/CC	$42.50	2.45	$104.13
220-2094	BBM	Walsh		X	8/28/2020	Firearms	2	Bullet L/G meas	$42.50	0.50	$21.25
219-1244	BBM	Walsh		X	8/28/2020	Firearms	5	CC	$42.50	1.00	$42.50
219-1244	BBM	Walsh	X		9/8/2020	Firearms	5	CC	$42.50	0.42	$17.85
220-2094	BBM	Walsh	X		9/8/2020	Firearms	4	Bullets/CC	$42.50	0.42	$17.85
Sep-20											
220-0802	BBM	Smelser		X	9/16/2020	Firearms	4	CC	$42.50	1.66	#REF!
220-0802	BBM	Smelser	X		9/23/2020	Firearms	4	CC	$42.50	0.75	#REF!
320-1040	Walsh	BBM		X	9/30/2020	Firearms	1	CC	$42.50	0.75	#REF!
320-1040	Walsh	BBM	x		10/5/2020	Firearms	1	CC	$42.50	0.25	#REF!
309-1178	Hudson	Smelser		X	9/15/2020	Firearms	2	Bullet	$42.50	1.00	#REF!
309-1178	Hudson	Smelser	X		9/16/2020	Firearms	2	Bullet	$42.50	0.50	#REF!
419-0639	Smelser	Coric		X	9/15/2020	Firearms	4	Bullet/CC	$42.50	2.00	#REF!
419-0639	Smelser	Coric	X		9/16/2020	Firearms	4	Bullet/CC	$42.50	0.50	#REF!
220-1823	BBM	Smelser		X	9/15/2020	Firearms	11	CC	$42.50	1.50	#REF!
220-1823	BBM	Smelser		X	9/15/2020	Firearms	11	CC	$42.50	1.25	#REF!
Oct-20											
220-2014	BBM	Smelser		x	10/6/2020	Tool Marks (prof)	5	tool/cuts	$42.50	1.50	#REF!
120-3299	Smelser	BBM		x	10/6/2020	Tool Marks (prof)	5	tool/cuts	$42.50		#REF!
120-3732	Smelser	BBM		x	10/6/2020	Firearms	2	bullets	$42.50	1.30	#REF!
120-3732	Smelser	BBM	x		10/14/2020	Firearms	3	bullets	$42.50	0.50	#REF!
119-3915	Dijana	Smelser		x	10/21/2020	Firearms	2	bullets	$42.50	1.30	
119-3915	Dijana	Smelser	x		10/21/2020	Firearms	2	bullets	$42.50	0.40	
720-0689	Brits	Smelser		x	10/27/2020	Firearms	4	fired cc	$42.50	1.00	
720-0689	Brits	Smelser	x		10/27/2020	Firearms	4	fired cc	$42.50	0.50	
Nov-20											
220-2751	BBM	Brenda		x	11/9/2020	GRC	1	bullet	$42.50	0.50	#REF!
220-2823	BBM	Smelser		x	11/30/2020	Firerarms	4	fired cc	$42.50	0.30	#REF!
220-2630	BBM	Hudson		x	11/30/2020	GRC	1	bullet		0.30	#REF!
Dec-20											
220-635	bbm	smelser		x	12/3/2020	micro comp		FBs, FCCs	$42.50	3.33	#REF!
119-2289	smelser	bbm		x	12/3/2020	micro comp		FBs, FCCs	$42.50	1.66	#REF!

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2020 Verification Travel Cost

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
OCT										191.25
720-0689	Brits	Smelser	10/27/2020	42.5	Tacoma/Seattle	car	$0.00	$0.00	4.50	0.00
										0.00
										0.00
										0.00
										#VALUE!

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2021 Examiner Worksheets

Jan-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
220-3211r3	1/19/2021	BJS	VPR- Carrot	Firearms	7	fired cc	42.5	1.25	53.13
220-2225r2	1/29/2021	Walsh	VPR- Carrot	Firearms	14	fired cc	42.5	1.83	77.78
220-2225r2	2/3/2021	Walsh	TPR - Curly	Firearms	14	fired cc	42.5	0.50	21.25

Feb-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
220-2225r2	2/3/2021	Walsh	TPR - Curly	Firearms	14	fired cc	42.5	0.50	21.25
221-0034(1)	2/8/2021	Coric	VPR - Carrot	Firearms	4	fired cc	42.5	0.60	25.50
120-0256	2/8/2021	BBM	VPR - Ephesto	Firearms	12	fired cc/bullets	42.5	1.50	63.75
219-3186	2/8/2021	Smelser	VPR - Carrot	Firearms	12	fired cc/bullets	42.5	0.30	12.75
120-0256	2/9/2021	BBM	VPR - Xena	Firearms	8	fired cc/bullets	42.5	2.00	85.00
220-2348	2/11/2021	BBM	VPR - Carrot	Firearms	9	fired cc/bullets	42.5	1.00	42.50
220-2930	2/18/2021	Smelser	VPR - Carrot	FIrearms	8	fired cc	42.5	1.00	42.50
220-0498	2/22/2021	Schoeman	VPR - Carrot	Firearms	4	fired cc	42.5	0.50	21.25
220-1765	2/26/2021	Walsh	VPR - Carrot	No-Gun	1	Fired Bullet	42.5	0.50	21.25

Mar-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
221-0294(1)	3/2/2021	Walsh	Remote/Carrot	Firearms	2	Fired CC/Fired Bul	42.5	2.50	106.25
219-2656(1,2)	3/3/2021	Smelser	Remote/Carrot	Firearms	5	Fired CCs	42.5	0.50	21.25
219-2522	3/23/2021	Schoeman	Remote/Carrot		10	Fired CC/Fired Bul	42.5	2.00	85.00
21-0294(1)	3/8/2021	Walsh	Traditional/Curly	Firearms	2	Fired CC/Fired Bul	42.5	0.50	21.25
220-1765(2)	3/8/2021	Walsh	Traditional/Curly	No-Gun	1	Fired Bullet	42.5	0.25	10.63

Apr-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
221-652 (proficiency)	4/14/2021	B Smelser	VPR/Carrot	Micro proficienc	10	Fired bullets	42.5	2.75	116.88
221-487	4/15/2021	B Smelser	VPR/Carrot	No-Gun/FCCs	14	Fired bullets and F	42.5	2.00	85.00
220-651	4/20/2021	B Smelser	VPR/Carrot	Firearms	3	Fired bullets and F	42.5	1.25	53.13
221-652 (proficiency)	4/21/2021	B Smelser	TPR/Ephesto	Micro proficienc	10	Fired bullets	42.5	0.75	31.88
221-487	4/21/2021	B Smelser	VPR/Carrot	No-Gun/FCCs	14	Fired bullets and F	42.5	2.00	85.00

May-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals

Jun-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
220-1077	6/1/2021	BJS	VPR/Carrot	Firearms	2	FB/FCC	42.5	0.75	31.88
520-600	6/1/2021	BJS	VPR/Carrot	Firearms	1	FB	42.5	0.84	35.70
221-1252	6/2/2021	BJS	VPR/Carrot	Firearms	3	FCC	42.5	1.00	42.50
220-2724	6/3/2021	BJS	VPR/Carrot	Firearms	19	FCC	42.5	1.00	42.50
220-2724	6/3/2021	BJS	VPR/Carrot	Firearms	13	FCC/FB (1frag)	42.5	1.00	42.50

Jul-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
221-958	7/1/2021	BJS	VPR/Carrot	Firearms	5	FCC	42.5	1.00	

Aug-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
216-1840	8/3/2021	BJS	VPR/Carrot	Firearms	13	FCC/Bullets	42.5	2.66	113.05
215-2067	8/5/2021	RH	VPR/Carrot	Firearms	12	FCC/Bullets	42.5	1.75	74.38
221-1449	8/10/2021	BJS	VPR/Carrot	Firearms	10	FCC/Bullets	42.5	1.50	63.75
216-2157	8/11/2021	BW	VPR/Carrot	Firearms	11	FCC/Bullets	42.5	2.00	85.00
216-299	8/26/2021	RH	VPR/Carrot	Firearms	6	FCC/Bullets	42.5	2.50	106.25

Sep-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals

Oct-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals

Nov-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals

Dec-21

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
218-1222r1	12/1/2021	Renee	VPR - Carrot	Firearms	6	fired cc		1.30	
221-2009 X 221-2010	12/10/2021	Renee	VPR - Carrot	Firearms	13	FCCs		2.00	
221-2009 X 221-2010	12/10/2021	Renee	VPR - Carrot	Firearms	4	FB		0.50	

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Dec-21 continued.

121-108	12/30/2021	Brian	VPR - Xena	Firearms	3	FCCS	0.80
720-0580	12/22/2021	Brian	VPR - Xena	Firearms	4	FCCs	1.00
720-0580	12/22/2021	Brian	VPR - Xena	Firearms	3	FB	0.60
720-0580	1/3/2022	Brian	TPR - Ephesto	Firearms	4	FCCs	0.50
720-0580	1/3/2022	Brian	TPR - Ephesto	Firearms	3	FB	0.50
121-1749	12/22/2021	RTW	VPR- Xena	Firearms	4	FCCS	0.75

2021 CC Comp

Jan-21

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
220-3211r3	BBM	Smelser		Y	1/19/2021	7		Circular	Y	Y	Y	Y	N	Y	N	Y	Y	ID	N
220-2225r2	BBM	Walsh		Y	1/29/2021	12		elliptical	y	y	y	y	n	n	n	y	y	ID	n
220-2225r2	BBM	Walsh		Y	1/29/2021	1		circular	y	y	y	y	n	n	n	y	y	ELIM	n
220-2225r2	BBM	Walsh		Y	1/29/2021	1		circular	y	y	y	y	n	n	n	y	y	ELIM	n

Feb-21

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
221-0034(1)	MFM	Coric		Y	2/8/2021	4		Circular	Y	Y	Y	Y	N	N	N	Y	Y	ID	N
120-0256	Smelser	BBM		X	2/8/2021	9		Rectangular	Y	N	Y	Y	N	Y	N	Y	Y	ID	N
219-3186	BBM	Smelser		X	2/8/2021	9		Circular/Elipti	Y	Y	Y	Y	N	N	N	Y	Y	ELIM	N
120-0256	Smelser	BBM		X	2/9/2021	7		Rectangular	Y	N	Y	Y	N	Y	N	Y	Y	ID	N
220-2348	BBM	Smelser		X	2/11/2021	4		Circular	n	n	y	n	n	n	n	y	y	ID	Y
220-2930	BBM	Smelser		X	2/18/2021	6		circular	n	n	y	n	n	n	n	y	n	ID	n
220-2930	BBM	Smelser		X	2/18/2021	2		circular	y	y	y	y	n	n	n	y	n	ID	n
220-0498	MFM	Schoeman		Y	2/22/2021	4		Circular	y	y	y	y	n	n	n	y	y	ID	n

Mar-21

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
221-0294(1)	MFM	Walsh		y	3/2/2021	3		Circular	y	n	y	n	n	n	n	y	y	ID	n
219-2656(1,2)	MFM	Smelser	n	y	3/3/2021	5		Glock-type	y	y	y	y	n	n	n	y	n	ID	n
219-2522	BBM	Schoeman		y	3/24/2021	3	FPI/CM	rimefire recta	n	n	y	y	y	y	y	y	n	ID	n
219-2522	BBM	Schoeman		y	3/24/2021	5	BFI/FPI	circular	n	n	y	n	n	n	n	y	y	ID	n
221-0294(1)	MFM	Walsh	Y		3/8/2021	3	BFI/FPI	Circular	Y	N	Y	N	N	N	N	Y	Y	ID	N

Apr-21

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
221-000487	MFM	BJS		x	4/15/2021	7		Glock-type	y	y	y	y							
221-000487	MFM	BJS		x	4/15/2021	3		Circular	y		y	y	y	Y					
221-000651	MFM	BJS		x	4/20/2021	1		Circular	n	n	y	y	y	y			y		
221-000487	MFM	BJS	x		4/21/2021	7		Glock-type	y	y	y	y							
221-000487	MFM	BJS	x		4/21/2021	3		Circular	y		y	y	y	Y					

May-21

Jun-21

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
220-1077	MFM	BJS	n	y	6/1/2021	1		Circular	n	n	y	y	y	n	n	y	y	ID	
221-1252	bbm	BJS		y	6/2/2021	3		Elliptical	y	y	y	y	y	y	n	y	y	ID	
220-2724	bbm	BJS		y	6/2/2021	3		circular	y	y	y	y	n	y	n	y	n	ID	
220-2724	bbm	BJS		y	6/2/2021	19		circular	y	n	y	n	n	n	n	y	n	ID	
220-2724	bbm	BJS		y	6/3/2021	13		circular	y	n	y	n	n	n	n	y	n	ID	

Jul-21

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
221-958	bbm	BJS	n	y	7/1/2021	5		rimfire - rect.			y		y			y	y	ID	

Aug-21

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
216-1840	MFM	BJS	x	x	8/3/2021	10		Circle	N	N	y		y	n	y	y	n	ID	
215-2067	MFM	RH	x	x	8/5/2021	10		Glock-type	Y	Y	Y	Y	n	y	y	y	n	ID	
221-1449	MFM	BJS	x	x	8/10/2021	3		Circle	y	y	y	y	n	y	n	y	n	INC	
221-1449	MFM	BJS	x	x	8/10/2021	2		Circle	n	n	y	n	n	y	n	y	y	ID	
221-1449	MFM	BJS	x	x	8/10/2021	2		Glock-type	y	y	y	y	n	y	n	y	y	ID	
221-1449	MFM	BJS	x	x	8/10/2021	2		Glock-type	y	y	y	y	n	y	n	y	n	ID	
216-2157	MFM	BW	x	x	8/11/2021	10		Circle	n	n	y	y	y	n	y	y	n	ID	
216-299	MFM	RH	x	x	8/26/2021	2		Circle	n	n	y	n	y	n	y	y	y	ID	
216-299	MFM	RH	x	x	8/26/2021	3		Glock-type	y	y	y	y	n	n	n	y	n	ID	

Sep-21

Oct-21

Nov-21

Dec-21

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
221-1222r1	BBM	Renee		Y	12/1/2021	6		rectangular rimf	n	n	y	n	n	y	n	y	y	ID	n
221-2009 X 221-	BBM	Renee		Y	12/10/2021	5			y	y	y	y	n	y	n	y	n	ID	n
221-2009 X 221-	BBM	Renee		Y	12/10/2021	8			y	y	y	y	n	n	n	y	y	ID	n
121-108	Renee	BJS		Y	12/30/2021	3		Eliptical (Gloc	Y	Y	Y	Y	N	N	N	Y	Y	ID	N
121-108	Renee	BJS	Y		12/30/2021	3		Eliptical (Gloc	Y	Y	Y	Y	N	N	N	Y	Y	ID	N
720-580	RTW	BJS		Y	12/22/2021	4		Circular	Y	Y	Y	Y	N	N	N	Y	Y	ID	N
121-1749	BJS	RTW	Y	Y	12/22/2021	4													
720-580	RTW	BJS	y		12/22/2021	4		Circular	Y	Y	Y	Y	N	N	N	Y	Y	ID	N

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2021 Bullet Comp

Jan-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

Feb-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
219-3186	BBM	Smelser		X	2/8/2021	WSP3, 4, 6 (3	Y	Y	N	Poly	6	R	NA	NA	NA	N	Y	ELIM (class)	N	N
120-0256	Smelser	BBM		x	2/9/2021	7tf3 +7tf1	y	n	n	Conv.	6	R	na	na	na	n	y	ID	n	n
220-2348	BBM	Smelser		x	2/11/2021	TFs CY2095	y	n	n	Conv.	5	r	n	n	n	n	y	ID	N	n
220-2348	BBM	Smelser		x	2/11/2021	cy2084	y	y	n	poly	8	r	na	na	na	n	n	ELIM (class)	n	n
220-2348	BBM	Smelser		x	2/11/2021	cy2085	y	y	y	Conv.	5	r	na	na	na	n	n	ID	n	n
220-2348	BBM	Smelser		x	2/11/2021	cy2086	y	y	n	poly	8	r	na	na	na	n	n	ELIM (class)	n	n
220-1765	MFM	Walsh		x	2/26/2021	3	y	y	n	Conv.	6	r	NA	NA	y	n	n	GRC	n	n

Mar-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
221-0294(1)	MFM	Walsh		y	3/2/2021	41	y	y	n	Conv	6	r	N/A	N/A	y	n	Y	ID	N	N
219-2522	BBM	Schoeman		y	3/23/2021	19EPE0639	y	y	n	conv	7	L	n/a	n/a	y	n	n	INC	n	n
219-2522	BBM	Schoeman		y	3/23/2021	19EPE0640	y	y	n	Conv	7	L	n/a	n/a	y	n	n	INC	n	n
221-0294(1)	MFM	Walsh	Y		3/8/2021	41	Y	Y	N	Conv	6	R	N/A	N/A	Y	N	Y	ID	N	N
220-1765(2)	MFM	Walsh	Y		3/8/2021	3	Y	Y	N	Conv.	6	R	.096-.099"	.105-.110"	Y	N	N	GRC	N	N

Apr-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
221-652	BBM	B Smelser		Carrot	4/14/2021	A (known x3)	yes	no	no	FMJ	6	L			6		yes	ID		
221-652	BBM	B Smelser		Carrot	4/14/2021	B (known x3)	yes	no	no	FMJ	6	L			6		yes	ID		
221-652	BBM	B Smelser		Carrot	4/14/2021	1	yes	no	no	FMJ	6	L			6		yes	ID		
221-652	BBM	B Smelser		Carrot	4/14/2021	2	yes	no	no	FMJ	6	L			6		yes	ELIM		
221-652	BBM	B Smelser		Carrot	4/14/2021	3	yes	no	no	FMJ	6	L			6		yes	ID		
221-652	BBM	B Smelser		Carrot	4/14/2021	4	yes	no	no	FMJ	6	L			6		yes	ID		
221-487	MFM	B Smelser		Carrot	4/15/2021	2	yes	y	y	FMJ	4 visible	R								
221-487	MFM	B Smelser		Carrot	4/15/2021	3,4,9	yes	y	no	TMJ/FMJ	8	R								
220-651	MFM	B Smelser		Carrot	4/20/2021	80	yes	y	no	FMJ	6	r			6		yes			
221-652	BBM	B Smelser	Ephesto		4/21/2021	A (known x3)	yes	no	no	FMJ	6	L			6		yes	ID		
221-652	BBM	B Smelser	Ephesto		4/21/2021	B (known x3)	yes	no	no	FMJ	6	L			6		yes	ID		
221-652	BBM	B Smelser	Ephesto		4/21/2021	1	yes	no	no	FMJ	6	L			6		yes	ID		
221-652	BBM	B Smelser	Ephesto		4/21/2021	2	yes	no	no	FMJ	6	L			6		yes	ELIM		
221-652	BBM	B Smelser	Ephesto		4/21/2021	3	yes	no	no	FMJ	6	L			6		yes	ID		
221-652	BBM	B Smelser	Ephesto		4/21/2021	4	yes	no	no	FMJ	6	L			6		yes	ID		

May-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

Jun-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
220-1077	MFM	BJS	n	y	6/1/2021	877254	y	n	n	LDRN	16	R	n	n	16	n	y	INC	N	
520-600	MFM	BJS	n	y	6/1/2021	16	y	n	n	JHP	5	R	n	n	5	n	y	INC	N	
220-2724	bbm	BJS		y	6/3/2021	3	y	y	n	acket fra	2/1 visible	r?	y	y	2	n	y	INC	N	

Jul-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

Aug-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
216-1840	MFM	BJS	y	y	8/3/2021	"08"	y	y		Jacket Fragm	7 L, 6 G visible	L			7	n	n			
		BJS	y	y	8/3/2021	37	y	y		FMJ	9	L			9	n	n			
		BJS	y	y	8/3/2021	38	y	y		FMJ	9	L			9	n	n			
215-2067	MFM	RH	y	y	8/5/2021	E-20	y			FMJ	6	R	Poly	Poly	6	n	n			
			y	y	8/5/2021	E-22	y			Flexlock	6	R	Poly	Poly	6	n	n			
221-1449	MFM	BJS	y	y	8/10/2021	CZ9096	n	y		Lead Core	N/A	N/A	N/A	N/A	N/A	N/A	n	Unsuitable		
			y	y	8/10/2021	CZ9103	n	y		Lead Core	N/A	N/A	N/A	N/A	N/A	N/A	n	Unsuitable		
			y	y	8/10/2021	CZ9104	n	y		Lead Core	N/A	N/A	N/A	N/A	N/A	N/A	n	Unsuitable		
216-2157	MFM	BW	y	y	8/11/2021	37	y	y		Copper Coated	4 L, 3 G visible	R	y	y	y	N/A	n	GRC only		
216-299	MFM	RH	y	y	8/26/2021	123	y	y		JHP	6	R	Poly	Poly	6	n	n	INC		
						124	y	y		JHP	6	R	Poly	Poly	6	n	n	INC		
						125	y	y		JHP	6	R	Poly	Poly	6	n	n	INC		

Sep-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

Oct-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

Nov-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

Dec-21

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
221-2009 X 221-	BBM	Renee		Y	12/10/2021	16	y	y		jacket frag	6	left					n	CLASS ELIM		
221-2009 X 221-	BBM	Renee		Y	12/10/2021	55	y	y		FB	8	right poly	n/a	n/a	6		y	INC		
720-580	RTW	Brian	Y		12/22/2021	TEST JMD 21	y	N	N	FB	6	right	n/a	n/a	6	n	y	ID		
720-580	RTW	Brian	Y		12/22/2021	BA01	y	y	n	FB	6	right	n/a	n/a	6	n	y	INC		
720-580	RTW	Brian	Y		12/22/2021	JMD19	Y	Y	Y	acket frag	6	right	n/a	n/a	3	n	Y	INC		
720-580	RTW	Brian	Y		1/3/2022	TEST JMD 21	y	N	N	FB	6	right	n/a	n/a	6	n	y	ID		
720-580	RTW	Brian	y		1/3/2022	BA01	y	y	n	FB	6	right	n/a	n/a	6	n	y	ID		
720-580	RTW	Brian	Y		1/3/2022	JMD19	Y	Y	Y	acket frag	6	right	n/a	n/a	3	n	Y	ID		

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2021 Conclusion Variance

Jan-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review			Time Totals	Comments
220-3211r3	1/19/2021	10 t v t	BBM	ID	Smelser	ID	none					0.6	
220-3211r3	1/19/2021	10 t v 8	BBM	ID	Smelser	ID	none					0.15	
220-3211r3	1/19/2021	10 t v 4-1	BBM	ID	Smelser	ID	none					0.1	
220-3211r3	1/19/2021	10 t v 4-2	BBM	ID	Smelser	ID	none					0.1	
220-3211r3	1/19/2021	10 t v 4-3	BBM	ID	Smelser	ID	none					0.1	
220-3211r3	1/19/2021	10 t v 4-4	BBM	ID	Smelser	ID	none					0.1	
220-3211r3	1/19/2021	10 t v 4-5	BBM	ID	Smelser	ID	none					0.1	
	1/29/2021	013 t to t	BBM	ID	Walsh	ID	none					0.25	
	1/29/2021	013 t v 001	BBM	ID	Walsh	ID	none					0.25	
	1/29/2021	013 t v 003	BBM	ID	Walsh	ID	none					0.25	
	1/29/2021	013 t v 004	BBM	ID	Walsh	ID	none					0.08	
	1/29/2021	013 t v 005	BBM	ID	Walsh	ID	none					0.15	
	1/29/2021	013 t v 006	BBM	ID	Walsh	ID	none					0.08	
	1/29/2021	013 t v 007	BBM	ID	Walsh	ID	none					0.08	
	1/29/2021	013 t v 008	BBM	ID	Walsh	ID	none					0.15	
	1/29/2021	013 t v 009	BBM	ID	Walsh	ID	none					0.1	
	1/29/2021	013 t v 015	BBM	ELIM	Walsh	ELIM	none					0.01	
	1/29/2021	013 t v 016	BBM	ID	Walsh	ID	none					0.08	
	1/29/2021	013 t v 017	BBM	ID	Walsh	ID	none					0.08	
	1/29/2021	014 t to 015	BBM	ELIM	Walsh	ELIM	none					0.15	

Feb-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review			Time Totals	Comments
221-0034r1	2/8/2021	005 t v t	MFM	ID	Coric		none					0.20	
	2/8/2021	005 v 004-A	MFM	ID	Coric		none					0.20	
	2/8/2021	005 v 004-B	MFM	ID	Coric		none					0.20	
120-0256	2/8/2021	7 t v t	Smelser	ID	BBM	ID	none					0.30	
	2/8/2021	8 t v t	Smelser	ID	BBM	ID	none					0.30	
	2/8/2021	10 t v t	Smelser	ID	BBM	ID	none					0.30	
	2/8/2021	27 v 8t	Smelser	ELIM	BBM	INC	none					0.30	
	2/8/2021	7t v 27	Smelser	ID	BBM	ID	none					0.30	
	2/9/2021	28 v 27	Smelser	ID	BBM	ID	none					0.30	
	2/9/2021	28 v 29	Smelser	ID	BBM	ID	none					0.15	
	2/9/2021	28 v 30	Smelser	ID	BBM	ID	none					0.15	
	2/9/2021	28 v 31	Smelser	ID	BBM	ID	none					0.15	
	2/9/2021	28 v 50	Smelser	ID	BBM	ID	none					0.20	
	2/9/2021	7tf3 v 7tf1	Smelser	ID	BBM	ID	none					0.50	
219-3186	2/8/2021	B7 t v CS1	BBM	ELIM	Smelser	ELIM	none	ELIM (class)				0.02	
	2/8/2021	B7 t v CS2	BBM	ELIM	Smelser	ELIM	none	ELIM (class)				0.02	
	2/8/2021	B7 t v CS3	BBM	ELIM	Smelser	ELIM	none	ELIM (class)				0.02	
	2/8/2021	B7 t v CS4	BBM	ELIM	Smelser	ELIM	none	ELIM (class)				0.02	
	2/8/2021	B7 t v CS5	BBM	ELIM	Smelser	ELIM	none	ELIM (class)				0.02	
	2/8/2021	B7 t v CS6	BBM	ELIM	Smelser	ELIM	none	ELIM (class)				0.02	
	2/8/2021	B7 t v CS7	BBM	ELIM	Smelser	ELIM	none	ELIM (class)				0.02	
	2/8/2021	B7 t v WSP5	BBM	ELIM	Smelser	ELIM	none	ELIM (class)				0.02	
	2/8/2021	B7 t v WSP3	BBM	ELIM	Smelser	ELIM	none	ELIM (class)				0.02	
	2/8/2021	B7 t v WSP4	BBM	ELIM	Smelser	ELIM	none	ELIM (class)				0.02	
	2/8/2021	B7 t v WSP6	BBM	ELIM	Smelser	ELIM	none	ELIM (class)				0.02	
220-2348	2/11/2021	TBBM2095 t v t	BBM	ID	Smelser	ID	none					0.20	
	2/11/2021	TBBM2095 t v CY2088	BBM	ID	Smelser	ID	none					0.20	
	2/11/2021	TBBM2095 t v CY2087	BBM	ID	Smelser	ID	none					0.15	
	2/11/2021	TBBM2095 t v t	BBM	ID	Smelser	ID	none					0.15	
	2/11/2021	TBBM2095 t v CY2084	BBM	ELIM	Smelser	ELIM	none					0.10	
	2/11/2021	TBBM2095 t v CY2086	BBM	ELIM	Smelser	ELIM	none					0.05	
	2/11/2021	TBBM2095 t v CY2085	BBM	ID	Smelser	ID	none					0.15	
220-2930	2/18/2021	12 v 13	BBM	ID	Smelser	ID	none					0.25	
	2/18/2021	12 v 14	BBM	ID	Smelser	ID	none					0.15	
	2/18/2021	12 v 15	BBM	ID	Smelser	ID	none					0.05	
	2/18/2021	12 v 16	BBM	ID	Smelser	ID	none					0.05	
	2/18/2021	12 v 17	BBM	ID	Smelser	ID	none					0.10	
	2/18/2021	7A v 9	BBM	ID	Smelser	ID	none					0.30	

Mar-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review			Time Totals	Comments
221-0034r1	2/8/2021	005 t v t	MFM	ID	Coric		none					0.20	
	2/8/2021	005 v 004-A	MFM	ID	Coric		none					0.20	
	2/8/2021	005 v 004-B	MFM	ID	Coric		none					0.20	
120-0256	2/8/2021	7 t v t	Smelser	ID	BBM	ID	none					0.30	
	2/8/2021	8 t v t	Smelser	ID	BBM	ID	none					0.30	
	2/8/2021	10 t v t	Smelser	ID	BBM	ID	none					0.30	
	2/8/2021	27 v 8t	Smelser	ELIM	BBM	INC	none					0.30	
	2/8/2021	7t v 27	Smelser	ID	BBM	ID	none					0.30	
221-0294	3/2/2021	41	MFM	ID	Walsh	INC	none	ID	Walsh	ID	0.5 hours	2.50	Inc due to images VPR. ID traditional.
219-2522	3/23/2021	721 to 646	BBM	ID	Schoeman	ID	none					0.50	
219-2522	3/23/2021	721 to 644	BBM	ID	Schoeman	ID	none					0.17	
219-2522	3/23/2021	645 to 643	BBM	ID	Schoeman	ID	none					0.17	
219-2522	3/23/2021	645 to 642	BBM	ID	Schoeman	ID	none					0.33	
219-2522	3/23/2021	645 to 720test	BBM	ID	Schoeman	ID	none					0.05	
219-2522	3/23/2021	720test to 720test	BBM	ID	Schoeman	ID	none					0.03	
219-2522	3/23/2021	643 to 720test	BBM	ID	Schoeman	ID	none					0.38	
219-2522	3/23/2021	639 to 640	BBM	INC	Schoeman	INC	none					0.17	

Apr-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review			Time Totals	Comments
221-652	4/14/2021	Known A to A	BBM	ID	B Smelser	ID	None	ID				0.30	
221-652	4/14/2021	Known B to B	BBM	ID	B Smelser	ID	None	ID				0.20	
221-652	4/14/2021	Known B to Q 1	BBM	ID	B Smelser	ID	None	ID				0.18	
221-652	4/14/2021	Known B to Q 2	BBM	ELIM	B Smelser	ELIM	None	ELIM				0.55	
221-652	4/14/2021	Known B to Q 3	BBM	ID	B Smelser	ID	None	ID				0.53	
221-652	4/14/2021	Known B to Q 4	BBM	ID	B Smelser	ID	None	ID				0.28	
221-652	4/14/2021	Known A to Q 2	BBM	ELIM	B Smelser	ELIM	None	ELIM				0.12	
221-0487	4/15/2021	Item 001 A-G	MFM	ID	B Smelser	ID	None	ID				0.60	
221-0487	4/15/2021	Item 005, 006, 008	MFM	ID	B Smelser	ID	None	ID				0.30	

May-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review			Time Totals	Comments

Jun-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review			Time Totals	Comments
220-2724	6/2/2021	CY2462 v TBBM9042D	BBM	ID	BJS	ID	None					0.17	
220-2724	6/2/2021	380 001-1 v 001-2	BBM	ID	BJS	ID	None					0.17	
		380 001-3 v 001-2	BBM	ID	BJS	ID	None					0.08	
		40 001-10 v 001-11	BBM	ID	BJS	ID	None					0.20	
		40 001-10 v 001-12	BBM	ID	BJS	ID	None					0.03	
		40 001-10 v 001-13	BBM	ID	BJS	ID	None					0.05	
		40 001-10 v 001-14	BBM	ID	BJS	ID	None					0.07	

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		40 001-10 v 001-15	BBM	ID	BJS	ID	None				0.03
		40 001-10 v 001-16	BBM	ID	BJS	ID	None				0.07
		40 001-10 v 001-17	BBM	ID	BJS	ID	None				0.03
		40 001-10 v 002-3	BBM	ID	BJS	ID	None				0.03
		40 001-10 v 002-7	BBM	ID	BJS	ID	None				0.05
		40 001-10 v 003-2	BBM	ID	BJS	ID	None				0.05
		40 001-10 v 003-1	BBM	ID	BJS	ID	None				0.03
		40 001-10 v 004-5	BBM	ID	BJS	ID	None				0.03
		40 001-10 v 006-6	BBM	ID	BJS	ID	None				0.03
		40 001-10 v 006-8	BBM	ID	BJS	ID	None				0.03
		40 001-10 v 006-4	BBM	ID	BJS	ID	None				0.03
220-2724	6/3/2021	9mm 004 v TBBM001	bbm	ELIM (class)	BJS	ELIM (class)	None				0.02
		9mm 004 v 001-1	bbm	ID	BJS	ID	None				0.25
		9mm 004 v 001-2	bbm	ID	BJS	ID	None				0.03
		9mm 004 v 001-3	bbm	ID	BJS	ID	None				0.10
		9mm 004 v 001-4	bbm	ID	BJS	ID	None				0.03
		9mm 004 v 001-5	bbm	ID	BJS	ID	None				0.03
		9mm 004 v 001-6	bbm	ID	BJS	ID	None				0.07
		9mm 004 v 001-7	bbm	ID	BJS	ID	None				0.08
		9mm 004 v 001-8	bbm	ID	BJS	ID	None				0.03
		9mm 004 v 001-9	bbm	ID	BJS	ID	None				0.05
		9mm TBBM001 v 003	bbm	INC	BJS	INC	None				0.33

Jul-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time Totals	Comments
221-958	7/1/2021	031 v 032	bbm	ID	BJS	ID	None			0.25	
		031 v 033	bbm	ID	BJS	ID	None			0.25	
		026TFC v 033	bbm	ID	BJS	ID	None			0.25	
		026TFC v 026TFB	bbm	ID	BJS	ID	None			0.25	

Aug-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time Totals	Comments
216-1840	8/3/2021	24 through 33	MFM	ID	BJS	ID	None			0.25	
		08 v 37	MFM	INC	BJS	INC	None			0.25	
		08 v 38	MFM	INC	BJS	INC	None			0.25	
		37 v 38	MFM	INC	BJS	INC	None			0.25	
216-2067	8/5/2021	E-1 through E-10	MFM	ID	RH	ID	None				
		E-20 v E-22	MFM	INC	RH	INC	None				
221-1449	8/10/2021	CZ9114 t v t	MFM	ID	BJS	ID	None				
		CZ9113 t v t	MFM	ID	BJS	ID	None				
		CZ9113 t v CZ9092	MFM	ELIM	BJS	ELIM	None				
		CZ9113 t v CZ9093	MFM	ELIM	BJS	ELIM	None				
		CZ9114 t v CZ9094	MFM	ID	BJS	ID	None				
		CZ9113 t v CZ9095	MFM	ELIM	BJS	ELIM	None				
		CZ9114 t v CZ9105	MFM	ID	BJS	ID	None				
		CZ9092 v CZ9093	MFM	INC	BJS	INC	None				
		CZ9095 v CZ9093	MFM	INC	BJS	INC	None				
		CZ9095 v CZ9092	MFM	INC	BJS	INC	None				
		CZ9096, CZ9103, and CZ9	MFM	Unsuitable	BJS	Unsuitable	None				
216-2157	8/11/2021	3-1 v 3-2	MFM	ID	BW	ID	None				
		3-1 v 3-3	MFM	ID	BW	ID	None				
		3-1 v 3-4	MFM	ID	BW	ID	None				
		3-1 v 3-5	MFM	ID	BW	ID	None				
		3-1 v 3-6	MFM	ID	BW	INC	None				
		3-1 v 3-7	MFM	ID	BW	INC	None				
		3-1 v 3-8	MFM	ID	BW	ID	None				
		3-1 v 3-9	MFM	ID	BW	ID	None				
		3-1 v 3-10	MFM	ID	BW	ID	None				
216-299	8/26/2021	130 (pistol) v 109	MFM	ID	RH	ID	None				
		130 (pistol) v 110	MFM	ID	RH	ID	None				
		86 v 89 v 90	MFM	ID	RH	ID	None				
		123 v 124 v 125	MFM	INC	RH	INC	None				

Sep-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time Totals	Comments

Oct-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time Totals	Comments

Nov-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time Totals	Comments

Dec-21

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time Totals	Comments
221-1222r1	12/1/2021	TF B v TF C	BBM	ID	Renee					0.50	
	12/1/2021	EX 10 v TF C	BBM	ID	Renee					0.20	
	12/1/2021	EX 11 v TF C	BBM	ID	Renee					0.20	
	12/1/2021	EX 12 v TF C	BBM	ID	Renee					0.15	
	12/1/2021	EX 10 v TF C	BBM	ID	Renee					0.15	
	12/1/2021	TF B v TF C	BBM	ID	Renee					0.10	
221-2009 X 221-	12/10/2021	TF D v TF C	BBM	ID	Renee					0.20	
		TF D v 8	BBM	CLASS ELIM	Renee					0.01	
		TF D v 14	BBM	CLASS ELIM	Renee					0.01	
		TF D v 5	BBM	CLASS ELIM	Renee					0.01	
		TF D v 12	BBM	CLASS ELIM	Renee					0.01	
		TF D v 7	BBM	CLASS ELIM	Renee					0.01	
		TF D v EX 6	BBM		Renee					0.13	
		EX 10 v EX 6	BBM	ID	Renee					0.20	
		EX 13 v EX 6	BBM	ID	Renee					0.17	
		EX 19 v EX 6	BBM	ID	Renee					0.08	
		EX 4 v EX 6	BBM	ID	Renee					0.13	
		EX 11 v EX 6	BBM	ID	Renee					0.13	
		TF F v EX 6	BBM		Renee					0.13	
		TF C v EX 6	BBM	ELIM	Renee					0.08	
		TF C v TF D	BBM	ID	Renee					0.08	
		TF F v EX 16 (bullets)	BBM	CLASS ELIM	Renee					0.01	
		EX 5 v 7	BBM	ID	Renee					0.18	
		EX 8 v 7	BBM	ID	Renee					0.12	
		EX 12 v 7	BBM	ID	Renee					0.17	
		EX 14 v 7	BBM	ID	Renee					0.12	
		TF F v TF E (bullets)	BBM	ID	Renee					0.25	
		TF F v EX 055	BBM	INC	Renee					0.17	
121-0108	12/30/2021	21M0828 TF v TF	Renee	ID	BJS	ID	None	ID	ID	0.40	

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		21M0828 TF v 212-1#1	Renee	ID	BJS	ID	None	ID	ID	0.20
		21M0828 TF v 157-1A	Renee	ID	BJS	ID	None	ID	ID	0.20
720-580	12/22/2021	JMD 21 t v t	RTW	ID	BJS	ID	None	ID	ID	0.40
		JMD 21 t v 10	RTW	ID	BJS	ID	None	ID	ID	0.20
		JMD 21 t v 11	RTW	ID	BJS	ID	None	ID	ID	0.10
		JMD 21 t v 17	RTW	ID	BJS	ID	None	ID	ID	0.10
		JMD 21 t v t Fired bulle	RTW	ID	BJS	ID	None	ID	ID	0.50
		JMD 21 t v BA01	RTW	ID	BJS	INC	Yes	ID	ID	0.70
		JMD 19 v BA01	RTW	ID	BJS	INC	Yes	ID	ID	0.60

Verification Cost Tracking

Jan-21

Lab number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidenc	Hourly rate of verifier	Time	Totals
220-3211r3	BBM	Smelser		x	1/19/2021	Firearms	7	fired cc	$42.50	1.25	$53.13
220-2225r2	BBM	Walsh		x	1/29/2021	Firearms	14	fired cc	$42.50	1.90	$80.75
Feb-21											
221-0034r1	MFM	Coric		x	2/8/2021	Firearms	4	Fired CC	$42.50	1.20	$51.00
120-0256	BJS	BBM		x	2/8/2021	Firearms	8	Fired CC/Bullets	$42.50	1.50	$63.75
219-3186	BBM	BJS		X	2/8/2021	Firearms	12	Fired CC/Bullets	$42.50	0.30	$12.75
120-0256	BJS	BBM		x	2/9/2021	Firearms	8	Fired CC/Bullets	$42.50	2.00	$85.00
220-2348	BBM	BJS		X	2/11/2021	Firearms	9	Fired CC/Bullets	$42.50	1.00	$42.50
220-2930	BBM	BJS		x	2/18/2021	Firearms	8	Fired CC	$42.50	1.00	$42.50
220-0498	MFM	Schoeman		x	2/22/2021	Firearms	4	Fired CC	$42.50	0.50	$21.25
220-1765(2)	MFM	Walsh		x	2/26/2021	No-Gun	1	Fired Bullet	$42.50	0.50	$21.25
Mar-21											
221-0294(1)	MFM	Walsh		x	3/2/2021	Firearms	4	Fired CC/Fired E	$42.50	2.50	$106.25
221-2656(1,2)	MFM	Smelser		x	3/3/2021	Firearms	5	Fired CCs	$42.50	0.50	$21.25
219-2522	BBM	Schoeman		x	3/23/2021	Firearms	10	Fired CC/Fired E	$42.50	2.00	$85.00
221-0294(1)	MFM	Walsh	x		3/8/2021	Firearms	4	Fired CC/Fired E	$42.50	0.50	$21.25
220-1765(2)	MFM	Walsh	x		3/8/2021	No-Gun	1	Fired Bullet	$42.50	0.25	$10.63
Apr-21											
221-652	BBM	B Smelser		Carrot	4/14/2021	Proficiency (micro)	10	Fired bullets	$42.50	2.75	$116.88
221-487	MFM	B Smelser		Carrot	4/15/2021	Firearms	10	Fired bullets an	$42.50	2.00	$85.00
220-651	MFM	B Smelser		Carrot	4/20/2021	Firearms	3	Fired bullets an	$42.50	1.25	$53.13
221-652	BBM	B Smelser	Ephesto		4/14/2021	Proficiency (micro)	10	Fired bullets	$42.50	1.00	$42.50
May-21											
Jun-21											
220-1077	MFM	BJS	BBM	y	6/1/2021	Firearms	2	FB/FCC	$42.50	0.75	$31.88
	MFM	BJS	BBM	y	6/1/2021	Firearms	1	FB	$42.50	0.84	$35.70
221-1252	bbm	BJS		y	6/2/2021	Firearms	3	FCC	$42.50	1.00	$42.50
220-2724	bbm	BJS		y	6/2/2021	Firearms	19	FCC	$42.50	1.00	$42.50
220-2724	bbm	BJS		y	6/3/2021	Firearms	13	FCC/FB (1 frag)	$42.50	1.00	$42.50
Jul-21											
221-958	bbm	BJS		y	7/1/2021	Firearms	5	FCC	$42.50	1.00	$42.50
Aug-21											
216-1840	MFM	BJS	y	y	8/3/2021	Firearms	13	FCC/FB	$42.50	2.66	$113.05
215-2067	MFM	RH	n	y	8/5/2021	Firearms	12	FCC/FB	$42.50	1.75	$74.38
221-1449	MFM	BJS	y	y	8/10/2021	Firearms	10	FCC/FB	$42.50	1.50	$63.75
216-2157	MFM	BW	y	y	8/11/2021	Firearms	11	FCC/FB	$42.50	2.00	$85.00
215-2067	MFM	RH	y	n	8/13/2021	Firearms	12	FCC/FB	$42.50	0.58	$24.65
216-299	MFM	RH	n	y	8/26/2021	Firearms	6	FCC/FB	$42.50	2.50	$106.25
Sep-21											
Oct-21											
Nov-21											
Dec-21											
218-1222r1	BBM	Renee		Y	12/1/2021	Firearms	6	FCC		1.30	
221-2009 X 221	BBM	Renee		Y	12/10/2021	Firearms	13	FCC		2.50	
121-108	Renee	BJS		Y	12/30/2021	Firearms	3	FCC		0.60	
121-108	Renee	BJS	Y		12/30/2021	Firearms	3	FCC		0.20	
720-580	RTW	BJS		Y	12/22/2021	Firearms	4	FCC		1.00	
720-580	RTW	BJS	Y		1/3/2022	Firearms	4	FCC		0.50	
720-580	RTW	BJS		Y	12/22/2021	Firearms	3	FB		0.60	
720-580	RTW	BJS	Y		1/3/2022	Firearms	3	FB		0.50	

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2021 Verification Travel Cost

21-Jan

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals

21-Feb

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals

21-Mar

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals

21-Apr

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals

21-May

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals

21-Jun

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals

21-Jul

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals

21-Aug

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										#REF!

Sep-21

#REF!

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										#REF!

Oct-21

#REF!

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										#REF!

Nov-21

#REF!

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										#REF!

Dec-21

#REF!

lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals

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2022 Examiner Worksheets

Jan-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
320-2390	1/25/2022	BJS	VPR/	Firearms	2	Fired cc			0.20
320-2390	1/25/2022	Theunis	TPR/	Firearms	2	Fired cc			0.10
221-878	1/27/2022	BJS	VPR/	Firearms	7	Fired bullets			0.20

Feb-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
220-001973(1)	2/14/2022	BJS	VPR/Carrot	Firearms	2	FCC			0.83
220-001973(1)	2/28/2022	BJS	TPR/Ephesto	Firearms	2	FCC			0.80
218-1258	2/15/2022	BJS	VPR/Carrot	Firearms	11	10 FCC/1 bullet			0.75
218-1258	3/2/2022	BJS	TPR/Ephesto	Firearms	11	10 FCC/1 bullet			0.50

Mar-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
121-1685	3/1/2022	BJS	VPR/Xena	Firearms	2	FCC			0.15
121-1685	3/1/2022	BJS	TPR/Ephesto	Firearms	2	FCC			0.10
121-2346	3/1/2022	BJS	VPR/Xena	Firearms	5	FCC			0.60
121-2346	3/1/2022	BJS	VPR/Xena	Firearms	5	FCC			0.40

Apr-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
121-02351	4/20,4/22/22	Walsh	VPR/Zena	Bunter/Feed	2	Cart cases			2.00
221-1813(5,6)	4/26/2022	RH	VPR/Carrot	Firearms	18	FCC			2.50

May-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
122-0736	5/11/2022	Schoeman	RV- Ephesto	FCCs	3	9mm FCCs			1.00
220-1623	5/16/2022	RH	VPR - Carrot	Firearms	3	FCCs			0.54
222-280	5/16/2022	RH	VPR - Carrot	Firearms	4	FBs			0.77

Jun-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals

Jul-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals

Aug-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
220-2757	8/16/2022	BJS	VPR/Carrot	Firearms	2	Bullet			0.50
122-1369	8/16/2022	MFM	VPR/Xena	Firearms	2	FCC			1.00
122-1369	8/22/2022	MFM	In-Person/Vimes	Firearms	2	FCC			0.50
522-000064	8/2/2022	TJB	VPR/Ephesto	Firearms	1	FCC			0.50
521-000930	8/2/2022	TJB	VPR/Ephesto	Firearms	1	FCC			0.50
					1	Bullet			0.50
721-000415	4/2/2022		VPR/Ephesto	Firearms	3	FCC			1.00

Sept-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals

Oct-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
221-2014	10/13/2022	JES	VPR/Carrot	Firearms	4	FCCs			0.50
522-40		MFM	VPR/Ephesto	Firearms	2	UFCs			0.75
522-417		MFM	VPR/Ephesto	Firearms	2	FCCs			0.75
522-811	10/27/2022	MFM	VPR/Ephesto	Toolmarks (Proficiency	5	Toolmarks			0.75
220-3247	10/25/2022	RTW	VPR/Carrot	Firearms	4	FCCs and FBs			1.50
522-417	11/1/2022	MFM	In-Person/Vimes	Firearms	2	FCCs			0.50
522-40	11/3/2022	MFM	In-Person/Vimes	Firearms	2	UFCs			2.00
522-811	11/14/2022	MFM	In-Person/Vimes	Toolmarks (Proficiency	5	Toolmarks			0.16

Nov-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
122-610	11/4/2022	MFM	VPR/Xena	Firearms	2	FCCs			0.33

Dec-22

Lab number	Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals

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2022 CC Comp.

Jan-22

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
320-2390	Brenda	Brian		Y	1/25/2022	2		Circle	Y	Y	Y	Y	N	N	N	Y	N	ID	N
320-2390	Brenda	Theunis	Y		1/25/2022	2	Circle		Y	Y	Y	Y	N	N	N	Y	N	ID	N

Feb-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
220-001973(1)	MFM	BJS		x	2/14/2022	2		Circle	N	N	Y	N	N	N	N	Y	Y	ID	
220-001973(1)	MFM	BJS		x	2/14/2022	1	Circle		N	N	Y	N	N	N	N	Y	N	ID	
220-001973(1)	MFM	BJS	x		2/28/2022	2		Circle	N	N	Y	N	N	N	N	Y	Y	ID	
220-001973(1)	MFM	BJS	x		2/28/2022	1	Circle		N	N	Y	N	N	N	N	Y	N	ID	
218-001258	MFM	BJS		x	2/15/2022	9	Circle		Y	N	Y	Y	N	Y	Y	Y	N	ID	
218-001258	MFM	BJS		x	2/15/2022	1	Circle		Y	N	Y	Y	N	Y	Y	Y	N	ELIM	
218-001258	MFM	BJS	x		3/2/2022	9	Circle		Y	N	Y	Y	N	Y	Y	Y	N	ID	
218-001258	MFM	BJS	x		3/2/2022	1	Circle		Y	N	Y	Y	N	Y	Y	Y	N	ELIM	

Mar-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
121-1685	RH	BJS		X	3/1/2022	2		Circle	y	y	y	y	n	y	y	y	N	ID	
121-1685	RH	BJS	X		3/1/2022	2		Circle	y	y	y	y	n	y	y	y	N	ID	
121-2346	RH	BJS		X	3/1/2022	2	Circle		Y	y	y	Y	N	Y	Y	Y	Y	ID	
121-2346	RH	BJS		X	3/1/2022	1	Circle		Y	y	y	Y	N	Y	Y	Y	Y	ID	
121-2346	RH	BJS	X		3/1/2022	2	Circle		Y	y	y	Y	N	Y	Y	Y	Y	ID	
121-2346	RH	BJS	X		3/1/2022	1	Circle		Y	y	y	Y	N	Y	Y	Y	Y	ID	

Apr-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
121-2351	wyant	Walsh		yes	4/20-4/22/22	2		Circle	yes		Bunter	Feed ramp	Yes	n/a	n/a	yes	n/a	ID	no
221-1813	MFM	RH		yes	4/26/2022	4	Circle		n	n	FPI	N	N/A	N/A	N/A	yes	y	ID	no
221-1813	MFM	RH		yes	4/26/2022	4	Circle		yes	y	FPI	FPAS	N/A	N/A	N/A	yes	y	ID	no
221-1813	MFM	RH		yes	4/26/2022	17	Circle		n	n	FPI	N	N/A	n/a	n/a	yes	n	ID	no
221-1813	MFM	RH		yes	4/26/2022	1	Circle		yes	y	FPI	FPAS	N/A	n/a	n/a	yes	n	ID	no

May-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
220-1623	MFM	RH		x	5/16/2022	2		Circle	Y	Y	Y	Y	N	N	N	Y	Y	ID	
	MFM	RH		x	5/16/2022	2	Circle		Y	Y	Y	Y	N	N	N	Y	Y	ID	

Jun-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?

Jul-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?

Aug-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
122-1369	BJS	MFM		x	8/16/2022	2		Elliptical	Y	Y	Y	Y	Y	N	N	Y	Y	ID	
						1	Elliptical		Y	Y	Y	Y	Y	N	N	Y	Y	ID	
122-1369	BJS	MFM	x		8/22/2022	2		Elliptical	Y	Y	Y	Y	Y	N	N	Y	Y	ID	
						1	Elliptical		Y	Y	Y	Y	Y	N	N	Y	Y	ID	

Sept-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?

Oct-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
221-2014	MFM	JES		x	10/13/2022	2		Circle	n	n	y	n	y	y	n	y	y	ID	
221-2014	MFM	JES		x	10/13/2022	2		Elliptical	n	y	y	n	y	y	n	y	y	ID	
221-2014	MFM	JES		x	10/13/2022	1		Circle	n	n	y	n	y	y	n	y	n	ID	
221-2014	MFM	JES		x	10/13/2022	1		Elliptical	n	y	y	n	y	y	n	y	n	ID	
522-40	JES	MFM		x	10/13/2022	2		N/A	n	n	n	y	n	y	y	n	n	INC	
522-417	JES	MFM		x	10/13/2022	2		Elliptical	y	y	y	y	y	n	n	y	y	ID	
522-417	JES	MFM		x	10/13/2022	1		Elliptical	y	y	y	y	y	n	n	INC	n	INC	
220-3247	MFM	RTW		x	10/28/2022	2		Circle	n	n	y	n	n	n	n	ID	y	ID	
522-417	JES	MFM	x		11/1/2022	2		Elliptical	y	y	y	y	y	n	n	y	y	ID	
522-417	JES	MFM	x		11/1/2022	1		Elliptical	y	y	y	y	y	n	n	INC	n	INC	
522-40	JES	MFM	x		11/3/2022	2		N/A	n	n	n	y	n	y	y	n	n	INC	

Nov-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?
122-610	RTW	MFM		x	11/4/2022	2		Elliptical	Y	Y	Y	Y	Y	Y	N	Y	N	ID	N

Dec-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Sheer	Impressed	Striated marks	Chamber Marks	Ejector	Extractor	Reproducible	TF	Results	Sub Class?

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2022 Bullet Comp

Jan-22

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
221-878	BBM	BJS		X	1/27/2022	8	yes	no		fmj	6	r			6		y	ELIM		n/a

Feb-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
218-1258	MFM	BJS		X	2/15/2022	E-18	Y	Y	N	HP	6	R	.076"	.158"	6	N	N	N	N	N
218-1258	MFM	BJS	X		2/15/2022	E-18	Y	Y	N	HP	6	R	.072"	.156"	6	N	N	N	N	N

Mar-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

Apr-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

May-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
222-280	MFM	RH		x	5/16/2022	22SP-0553	Y	Y	N	FMJ	6	R	y	y	6	n	n	ID		
	MFM	RH		x	5/16/2022	22SP-0357	Y	y	N	FMJ	6	R	y	y	6	n	n	ID		
	MFM	RH		x	5/16/2022	22SP-0224	Y	N	N	HP	6	R	n	n	6	n	y	ID		
	MFM	RH		x	5/16/2022	22SP-0365	Y	Y	N	Jacketed	6	R	n	n	6	N	n	INC		

Jun-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

Jul-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

Aug-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
	MFM	BJS		x	8/16/2022	P-5661	y	n	n	SP	4	R	n	n	y	n	y	ID		
				x	8/16/2022	P-5659	y	y	n	Jacketed	4	R	n	n	y	n	n	ID		

Sept-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

Oct-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class
MFM	RTW			x	10/28/2022	008	y	n	N/D	FMJ	6	r	n	n	6		n	y	ID		
						031	y	y	N/D	FMJ	N/D	r	n	n	l undamaged bearing surface	n	n	ID		

Nov-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

Dec-22

Lab number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove	Twist	Measurement Lands	Measurement Groove	USABLE LANDS	CMS	TEST FIRES	Results	Cast?	Evaluated for sub class

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2022 Conclusion Variance

Jan-22

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review			Time	Totals	Comments
320-2390	1/25/2022	MC 1 v 2	Brenda	ID	BJS	ID	None	ID	Theunis	ID	No change	0.30		
221-878	1/27/2022	26 v 008	BBM	ELIM	BJS	ELIM	none	ELIM						
221-878	1/27/2022	29 v 008	BBM	ELIM	BJS	ELIM	none	ELIM						
221-878	1/27/2022	14 v 008	BBM	ELIM	BJS	ELIM	none	ELIM						
221-878	1/27/2022	41 v 008	BBM	ELIM	BJS	ELIM	none	ELIM						
221-878	1/27/2022	28 v 008	BBM	ELIM	BJS	ELIM	none	ELIM						
221-878	1/27/2022	15 v 008	BBM	ELIM	BJS	ELIM	none	ELIM						

Feb-22

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time	Totals	Comments
220-001973(1)	2/14/2022	Item 1 t v t	MFM	ID	BJS	ID		ID	0.40	0.50	0.9	
		Item 1 v Item 2	MFM	ID	BJS	INC	Yes	ID	0.40	0.33	0.73	variance due to difficulty with lighting surface detail during VPR.
218-1258	2/15/2022	Item E-1 v E-2	MFM	ELIM	BJS	ELIM	No	ID	0.05	0.05	0.1	
		E-2 v E-3, E5, E6, E7, E8, E9, E10, E11	MFM	ID	BJS	ID	No	ID	0.4	0.60	1	
		E-18	MFM	Suitable	BJS	Suitable	No	Suitable	0.1	0.10	0.2	

Mar-22

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time	Totals	Comments
121-1685	3/1/2022	215971(6) v 208853-6	RH	ID	BJS	ID	None	ID	0.15	0.15	0.3	NIBIN HIT confirmation
121-2346	3/1/2022	4 t v t	RH	ID	BJS	ID	None	ID	0.1	0.15	0.25	
121-2346	3/1/2022	5 t v t	RH	ID	BJS	ID	None	ID	0.1	0.15	0.25	
121-2346	3/1/2022	5 t v 220682-1A	RH	ID	BJS	ID	None	ID	0.05	0.10	0.15	
121-2346	3/1/2022	5 t v 220682-1B	RH	ID	BJS	ID	None	ID	0.05	0.10	0.15	
121-2346	3/1/2022	4 t v 220682-2	RH	ID	BJS	ID	None	ID	0.1	0.10	0.2	

Apr-22

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time	Totals	Comments
121-2351	4/22/2022	46	Wyant	ID	Walsh	ID	none	ID				
121-2351	4/22/2022	52	Wyant	ID	Walsh	ID	none	ID				
221-1813	4/26/2022	40 t v t	MFM	ID	RH	ID	none	ID		0.16		
		89 t v t	MFM	ID	RH	ID	none	ID		0.10		
		89 t v 6	MFM	ELIM	RH	ELIM	none	ELIM		0.02		
		40 t v 6	MFM	ELIM	RH	ELIM	none	ELIM		0.02		
		40 t v 7	MFM	ID	RH	ID	none	ID		0.28		
		40 t v 8	MFM	ID	RH	ID	none	ID		0.12		
		40 t v 9	MFM	ID	RH	ID	none	ID		0.08		
		40 t v 11	MFM	ID	RH	ID	none	ID		0.07		
		40 t v 12	MFM	ID	RH	ID	none	ID		0.17		
		40 t v 13	MFM	ID	RH	ID	none	ID		0.05		
		40 t v 14	MFM	ID	RH	ID	none	ID		0.05		
		40 t v 15	MFM	ID	RH	ID	none	ID		0.08		
		40 t v 16	MFM	ID	RH	ID	none	ID		0.05		
		40 t v 17	MFM	ID	RH	ID	none	ID		0.13		
		40 t v 18	MFM	ID	RH	ID	none	ID		0.07		
		40 t v 19	MFM	ID	RH	ID	none	ID		0.07		
		40 t v 22	MFM	ELIM	RH	ELIM	none	ELIM		0.02		
		89 t v 22	MFM	ID	RH	ID	none	ID		0.23		
		89 t v 23	MFM	ELIM	RH	ELIM	none	ELIM		0.02		
		40 t v 23	MFM	ID	RH	ID	none	ID		0.10		
		40 t v 24	MFM	ID	RH	ID	none	ID		0.07		
		40 t v 26	MFM	ID	RH	ID	none	ID		0.18		
		40 t v 28	MFM	ID	RH	ID	none	ID		0.25		Chose to move on at first due to difficulty/scope fatigue, then came back to later
		40 t v 30	MFM	ID	RH	ID	none	ID		0.08		

May-22

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time	Totals	Comments
220-1623	5/16/2022	13266 t v t	MFM	ID	RH	ID	None			0.18		
		13266 t v 13073	MFM	ID	RH	ID	None			0.26		
		13266 t v 13076 and 13073 v 13076	MFM	ID	RH	ID	None			0.10		
22-280	5/16/2022	22SP-0553 v 22SP-0357	MFM	ID	RH	ID	None			0.18		
		L/G and base measurements of above								0.18		
		22SP-0224 t v t	MFM	ID	RH	ID	None			0.26		
		22SP-0224 t v 22SP-0365	MFM	INC	RH	INC	None			0.15		

Jun-22

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time	Totals	Comments

Jul-22

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time	Totals	Comments

Aug-22

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time	Totals	Comments
220-2757	8/16/2022	P-5661 t v t	MFM	ID	BJS	ID	None	ID		0.25		
		P-5661 t v P-5659	MFM	ID	BJS	ID	None	ID		0.25		
122-1369	8/16/2022	ANA-1 t v t	BJS	ID	MFM	ID	None	ID		0.75		
		ANA-1 t v 79-2	BJS	ID	MFM	ID				0.25		

Sept-22

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time	Totals	Comments

Oct-22

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time	Totals	Comments
221-2014	10/13/2022	Item 005 t v t	MFM	ID	JES	ID	None	ID		0.15		
		Item 006 t v t	MFM	ID	JES	ID	None	ID		0.11		
		Item 028 v Item 006 t	MFM	ELIM	JES	ELIM	None	ELIM		0.01		
		Item 037 v Item 006 t	MFM	ID	JES	ID	None	ID		0.13		
		Item 028 v Item 005 t	MFM	ID	JES	ID	None	ID		0.05		
522-40	10/13/2022	Item JS1 v KS11	JES	INC	MFM	INC	None	INC		0.75		In-Person performed in Nov
522-417	10/13/2022	Item 1/3 t v t	JES	ID	MFM	ID	None	ID		0.25		In-person performed in Nov; in-person, it was decided more tests should be made using WMA ammunition and adding a Glock 43 slide lock which may account for marking variances
		Item 1/3 v 4	JES	INC	MFM	INC	None	INC		0.50		
522-811	10/27/2022	Suspect Tool t v t	JES	ID	MFM	ID	None	ID		0.25		
		Item 2 v Suspect Tool	JES	ID	MFM	ID	None	ID		0.08		
		Item 3 v Suspect Tool	JES	ID	MFM	ID	None	ID		0.05		
		Item 1 v Item 4	JES	ID	MFM	ID	None	ID		0.05		
		Item 1 v Suspect Tool	JES	ELIM	MFM	ELIM	None	ELIM		0.03		
220-3247	10/28/2022	Item 008 FB t v t	MFM	ID	RTW	ID	None	ID		0.15		
		Item 031 v Item 008 FB t	MFM	ID	RTW	ID	None	ID		0.52		
		Item 008 FCC t v t	MFM	ID	RTW	ID	None	ID		0.20		
		Item 059 v Item 008 FB t	MFM	ID	RTW	ID	None	ID		0.03		
		Item 061 v Item 008 FB t	MFM	ID	RTW	ID	None	ID		0.45		

Nov-22

Lab number	Date	Item #	Examiner	Conclusion	Verifier	Conclusion	Variance	Final	Secondary Review	Time	Totals	Comments
221-2014	10/13/2022	Item 005 t v t	MFM	ID	JES	ID	None	ID		0.15		

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	122-610	11/4/2022	22524-4 v 22533-1	RTW	ID	MFM	ID	None	ID			0.33	Longer than normal lag time on HP RemoteView for controlling scope; verified in-person in Seattle
Dec-22													
	Lab number	**Date**	**Item #**	**Examiner**	**Conclusion**	**Verifier**	**Conclusion**	**Variance**	**Final**	**Secondary Review**		**Time**	**Totals**	**Comments**

Verification Cost Tracking

Jan-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals
320-2390	Brenda	BJS		Y	1/25/2022	Firearms	2	Fired cc			0.20
320-2390	Brenda	Theunis	Y		1/25/2022	Firearms	2	Fired cc			0.10
221-878	BBM	BJS		Y	1/27/2022	Firearms	7	Fired bullet			0.20

Feb-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals
220-001973(1)	MFM	BJS		x	2/14/2022	Firearms	2	FCC			0.83
220-001973(1)	MFM	BJS	x		2/28/2022	Firearms	2	FCC			0.80
218-1258	MFM	BJS		x	2/15/2022	Firearms	10	FCC			0.70
218-1258	MFM	BJS		x	2/15/2022	Firearms	1	Bullet			0.05
218-1258	MFM	BJS	x		3/2/2022	Firearms	10	FCC			0.45
218-1258	MFM	BJS	x		3/2/2022	Firearms	1	Bullet			0.05

Mar-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals
121-1685	RH	BJS		X	3/1/2022	Firearms	2	FCC			0.15
121-1685	RH	BJS	X		3/1/2022	Firearms	2	FCC			0.15
121-2346	RH	BJS		X	3/1/2022	Firearms	5	FCC			0.60
121-2346	RH	BJS	X		3/1/2022	Firearms	5	FCC			0.40

Apr-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals
121-2351	Wyant	Walsh		yes	4/22/2022	Bunter/Cycling	2	cart case, unfired cart		90 mins	
221-1813	MFM	RH		Yes	4/26/2022	Firearms	18	FCC			2.50

May-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals
220-1623	MFM	RH		x	5/16/2022	Firearms	3	FCCs			0.54
222-280	MFM	RH		x	5/16/2022	Firearms	4	FBs			0.77

Jun-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals

Jul-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals

Aug-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals
220-2757	MFM	BJS		x	8/16/2022	Firearms	2	Bullet			0.50
122-1369	BJS	MFM		x	8/16/2022	Firearms	2	FCC	$38.16		1.00
122-1369	BJS	MFM	x		8/22/2022	Firearms	2	FCC	$38.16		0.50

Sept-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals

Oct-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals
221-2014	MFM	JES		x	10/13/2022	Firearms	4	FCC			0.50
522-40	JES	MFM		x	10/13/2022	Firearms	2	UFCs			0.75
522-417	JES	MFM		x	10/13/2022	Firearms	2	FCCs			0.75
522-811	JES	MFM		x	10/27/2022	Toolmark (Proficienc	5	Toolmarks			0.75
220-3247	MFM	RTW		x	10/28/2022	Firearms	4	FCCs/FBs			1.50
522-417	JES	MFM	x		11/1/2022	Firearms	2	FCCs			0.50
522-40	JES	MFM	x		11/3/2022	Firearms	2	UFCs			2.00
522-811	JES	MFM	x		11/14/2022	Toolmark (Proficienc	5	Toolmarks			0.16

Nov-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals
122-610	RTW	MFM		x	11/4/2022	Firearms	2	FCC			0.33

Dec-22

Lab Number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evidence	Hourly rate of verifier	Time	Totals

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Verification Travel Cost

Jan-22										
Lab Number	**Case Agent**	**Verifier**	**Date**	**Hourly rate**	**Travel location**	**Mode of Transport**	**Hotel cost**	**Cost of travel air/gas**	**Travel Time**	**Totals**
										0.00
Feb-22										
Lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										0.00
Mar-22										
Lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										0.00
Apr-22										
Lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										0.00
May-22										
Lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										0.00
Jun-22										
Lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										0.00
Jul-22										
Lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										0.00
Aug-22										
Lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										0.00
Sept-22										
Lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										0.00
Oct-22										
Lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										0.00
Nov-22										
Lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										0.00
Dec-22										
Lab Number	Case Agent	Verifier	Date	Hourly rate	Travel location	Mode of Transport	Hotel cost	Cost of travel air/gas	Travel Time	Totals
										0.00

Virtual Peer Review:
The Realities of Remote Verification

53rd Annual AFTE Training Conference, Atlanta, GA

R.T. Wyant, M.S., Brian Smelser
Washington State Patrol Crime Laboratory- Seattle

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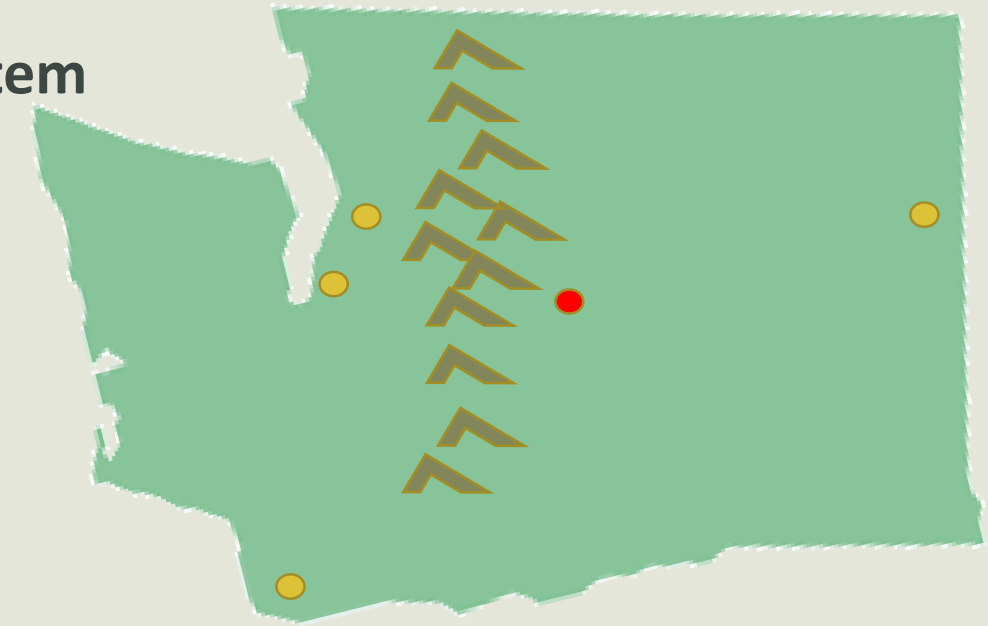
Firearms Laboratories in Washington State

- **Over 71,000 square miles, over 300 police agencies**
- **4 firearms labs under one crime lab system**
- **Seattle, Tacoma, Spokane, Vancouver**
- **Originally Yakima Police Dept. was included in project**



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WSP Peer Review / Verification Policy

4.2 QUALITY ASSURANCE

Examiners are reminded of the importance of quality assurance as discussed in the "Introduction" of this manual and the CLD QOM. It is the responsibility of the firearms examiner that all microscopic examinations be verified.

69. Verification

The procedure used to evaluate and confirm the validity of a test result/opinion reached by re-performing the comparison between the unknown and the known by a different person. Also: provision of objective evidence that a given item fulfills specified requirements.

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WSP Peer Review / Verification Policy

The technical reviewer will ensure:

- o Examinations conducted are appropriate to satisfy the request made by the customer
- o Conformance with test methods and applicable policies and procedures
- o If an analysis was not conducted, the reason is supported by established laboratory policy
- o Communications and phone notes are present if applicable
- o All procedures, data, results, conclusions, opinions and interpretations are documented
- o Results, conclusions, opinions and interpretations are accurate, properly qualified and supported by the examination documentation
- o Conclusions are reasonable and stated unambiguously, neither overstating the significance of the findings nor omitting any reasonable conclusion
- o Opinions and interpretations are clearly identified as such, are accurate and properly qualified
- o All relevant case information is included
- o Descriptions of evidence and evidence packaging are complete
- o All calculations and data transfers are verified for accuracy
- o Appropriate procedures were used and test parameters (for example, instrument operating parameters) were appropriate for the examination.
- o Any deviations from established procedures are recorded in the case file, technically justified, authorized, and accepted by the customer.
- o Actions taken when discrepancies are found are described
- o Appropriate standards and controls are used when necessary and documented
- o Other items of evidence received by the analyst but not examined are referenced (if applicable)
- o Generation and disposition of new evidence items such as trace collections, substrate controls, etc., is documented
- o All strikeouts or insertions are noted with the examiner's initials. Overwrites must be struck-through, rewritten, and initialed. No obliterations should be present.
- o All pages of examination documentation are labeled with the case number, dates, examiner's handwritten initials, and page number. The total number of pages of notes is documented on the first page.
- o The draft report is clear, concise, and initialed and dated
- o The answer sheet for proficiency tests has been fully completed and is free of errors
- o Excessive errors or insufficient data to support the conclusion are brought to the attention of the supervisor
- o Discipline-specific requirements for technical review are met.

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Verification Challenges

- **Staffing (1 examiner in Spokane for over a decade)**
  - **Now 1 examiner in Vancouver**
- **Travel time between labs, off bench**
- **Cost and time of evidence transfers**
- **Distance and terrain**

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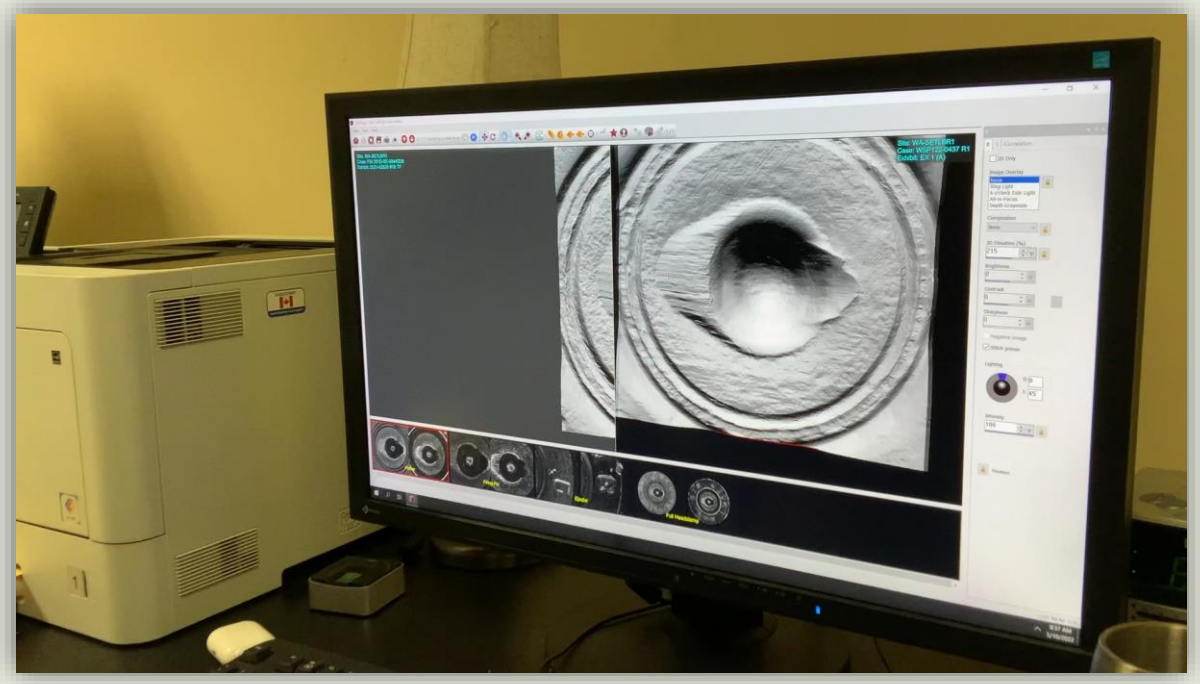
Are we already doing a form of Remote Verification?

- Images are regularly used in IBIS-Matchpoint for active 3D side-by side comparison



- How about photos for remote verification?

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WSP Peer Review / Verification Policy

1.23 DOCUMENTATION OF CONCLUSIONS

A photo will be taken to document an identification along with notes describing how the identification was made.

It is recognized that photos are not used to make identifications or comparisons, but are for recording purposes and generally document selected portions of an identification.

Photos are not used to make verifications of comparisons and are for notes/documentation purposes only because:

- A photograph is a two-dimensional image of an object that is three-dimensional.
- Photographs often contain insignificant detail and could be misinterpreted by those not trained in microscopic comparison.
- A photograph is a still. An actual comparison is very dynamic, and continuous movement of the samples is an integral part of the examination.

For unsuitable for examination, inconclusive, and elimination conclusions, detailed descriptions will be used to document class characteristics and describe why the sample is unsuitable for examination, inconclusive, or an elimination.

In lieu of 3DHD instruments- would live virtual exams suffice for lack of resolution with 2D imaging?

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Proposal for DOJ grant

- Purchase microscopes for each lab that can network together
- Control scope remotely, live imaging comparison
  - 2D, but can look at multiple depths and areas independently
- Compare costs of remote vs. traditional verification
- Compare time of remote vs. traditional verification
- Evaluate equipment for possible implementation
- Draft remote verification (RV) policy

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2019 DOJ, NIJ Grant Application

U.S. Department of Justice

Office of Justice Programs

National Institute of Justice

Award Number: 2019-DU-BX-0001

The Viability of Virtual Peer Review and Microscopic Verification versus Traditional Onsite Review

Virtual Peer Review Grant Goals

Goal 1: Compare the efficacy/accuracy of peer review/verification completed using digital comparison microscopes to traditional comparison microscopes

Goal 2: Compare efficiency of peer review/verification completed using digital comparison microscopes to traditional comparison microscopes.

Goal 3: Compare efficacy of remote evaluation of IBIS/NIBIN images from digital comparison microscopes to traditional comparison microscopes.

Objective A) Purchase four digital comparison microscopes and place in the three WSP firearms/toolmark laboratories and the Yakima Police Department (YPD) firearm/toolmark laboratory.

Objective B) Fund the time of four Washington State Patrol Crime Lab Division (WSPCLD) personnel to use digital comparison microscopes for remote evaluation of IBIS/NIBIN images between laboratories where one or more does not have access to IBIS/NIBIN using traditional microscopy.

Objective C) Fund the time and travel costs of the Principal Investigator required for on-site verification and general research oversight.

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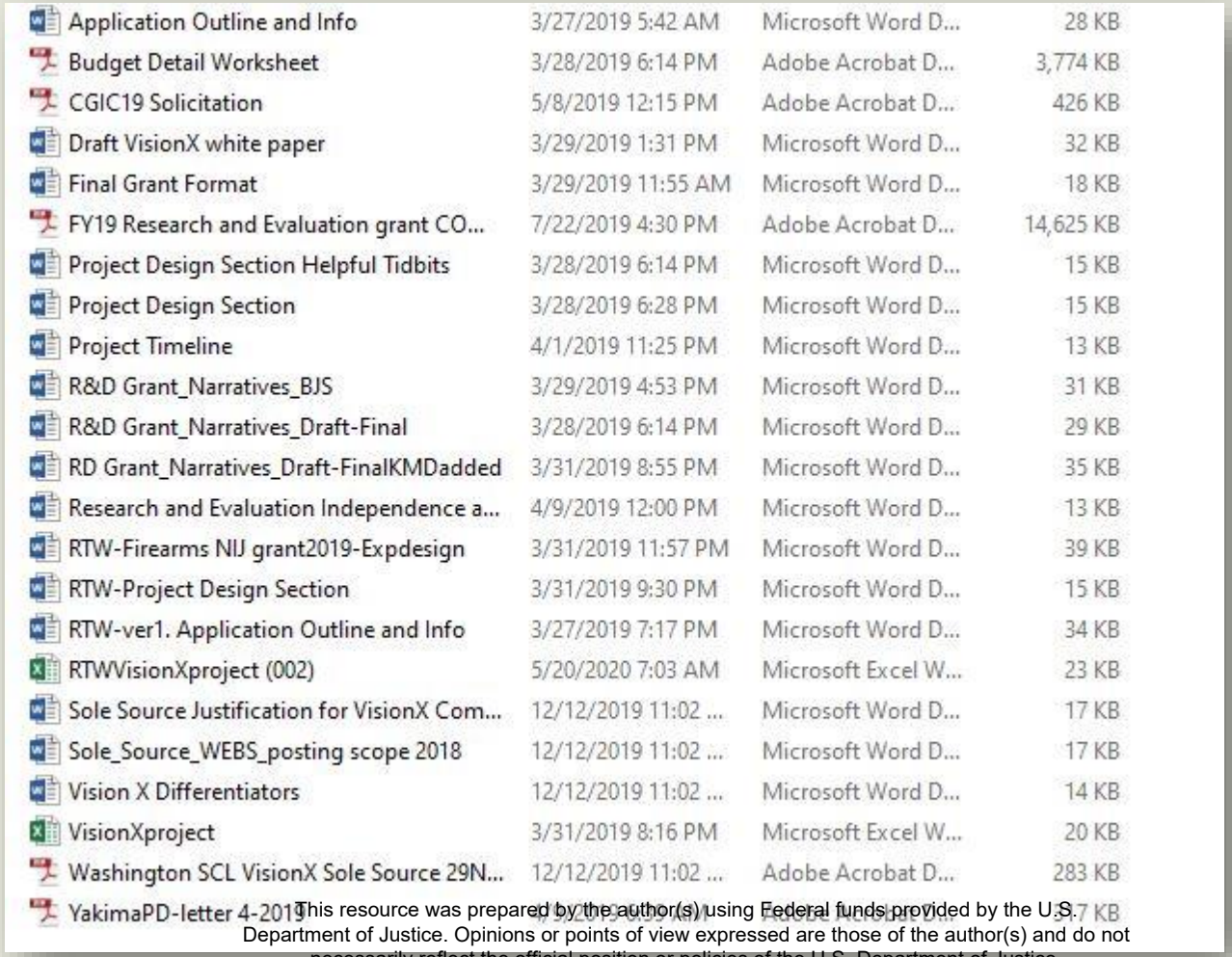
A Few Grant Documents



Application Outline and Info	3/27/2019 5:42 AM	Microsoft Word D...	28 KB
Budget Detail Worksheet	3/28/2019 6:14 PM	Adobe Acrobat D...	3,774 KB
CGIC19 Solicitation	5/8/2019 12:15 PM	Adobe Acrobat D...	426 KB
Draft VisionX white paper	3/29/2019 1:31 PM	Microsoft Word D...	32 KB
Final Grant Format	3/29/2019 11:55 AM	Microsoft Word D...	18 KB
FY19 Research and Evaluation grant CO...	7/22/2019 4:30 PM	Adobe Acrobat D...	14,625 KB
Project Design Section Helpful Tidbits	3/28/2019 6:14 PM	Microsoft Word D...	15 KB
Project Design Section	3/28/2019 6:28 PM	Microsoft Word D...	15 KB
Project Timeline	4/1/2019 11:25 PM	Microsoft Word D...	13 KB
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R&D Grant_Narratives_Draft-Final	3/28/2019 6:14 PM	Microsoft Word D...	29 KB
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Research and Evaluation Independence a...	4/9/2019 12:00 PM	Microsoft Word D...	13 KB
RTW-Firearms NIJ grant2019-Expdesign	3/31/2019 11:57 PM	Microsoft Word D...	39 KB
RTW-Project Design Section	3/31/2019 9:30 PM	Microsoft Word D...	15 KB
RTW-ver1. Application Outline and Info	3/27/2019 7:17 PM	Microsoft Word D...	34 KB
RTWVisionXproject (002)	5/20/2020 7:03 AM	Microsoft Excel W...	23 KB
Sole Source Justification for VisionX Com...	12/12/2019 11:02 ...	Microsoft Word D...	17 KB
Sole_Source_WEBS_posting scope 2018	12/12/2019 11:02 ...	Microsoft Word D...	17 KB
Vision X Differentiators	12/12/2019 11:02 ...	Microsoft Word D...	14 KB
VisionXproject	3/31/2019 8:16 PM	Microsoft Excel W...	20 KB
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YakimaPD-letter 4-2019	[illegible]	[illegible]	7 KB

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Budget

Budget Category	
A. Personnel	
B. Fringe Benefits	
C. Travel	
D. Equipment	
E. Supplies	
F. Construction	
G. Consultants/Contracts	
H. Other	
Total Direct Costs	
I. Indirect Costs	
TOTAL PROJECT COSTS	

Approx $400K for scopes - remaining OT and travel

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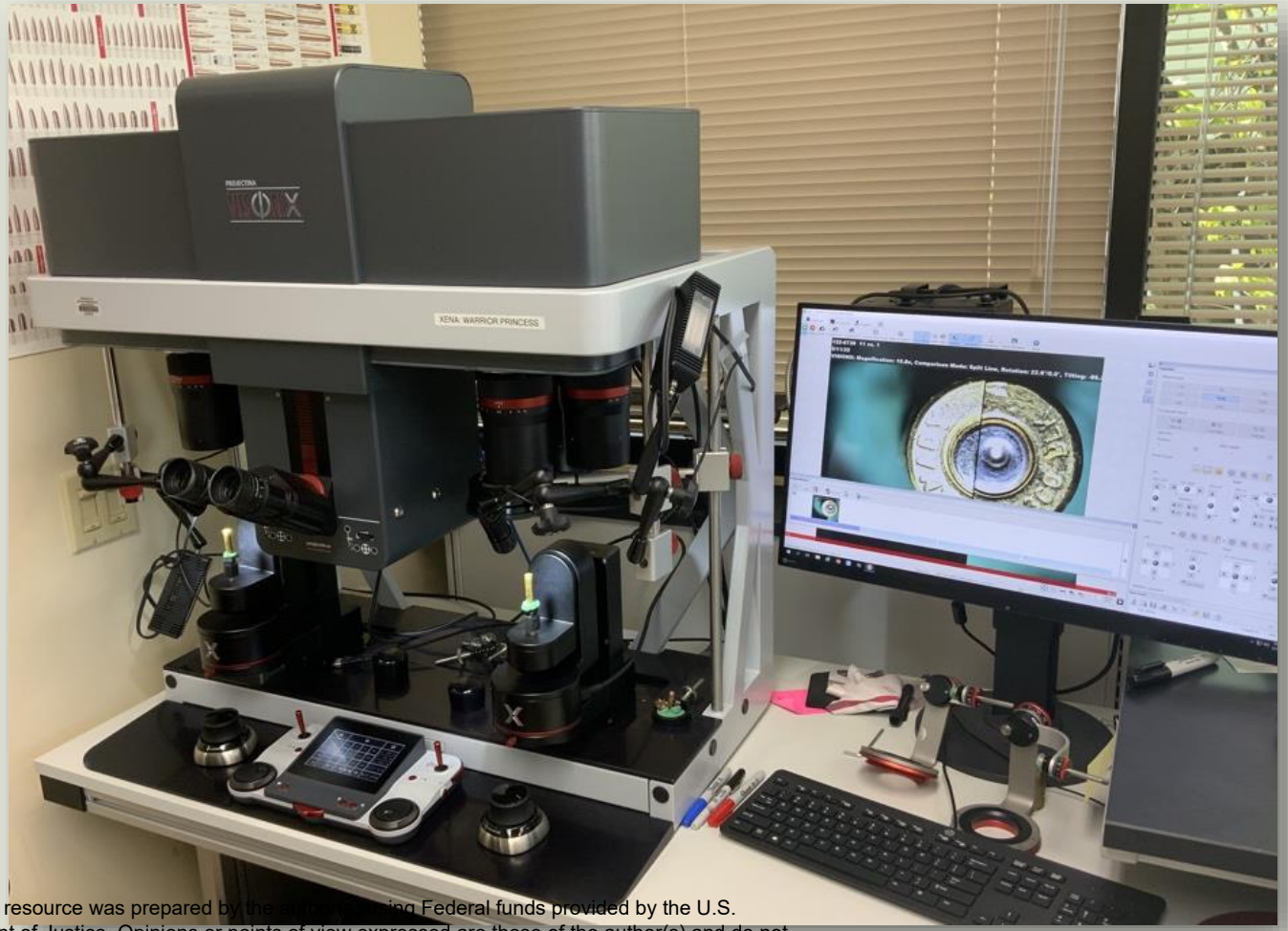
Scopes

- Funding for 4 Vision-X scopes
- sole source



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4 Vision-X scopes purchased for RV statewide

- XENA- WSP Seattle

- CARROT- WSP Spokane

- EPHESTO – Yakima PD

  → WSP Vancouver

- ERIS– WSP Tacoma

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Enhanced features of Vision-X

- Space mice and motorized 3D bullet holders

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RV Capabilities

- Login to any of the 4 scopes on the network
- Control all movement functions of scope remotely
- Capture images, screen recording of scope manipulation
- HDR documentation of comparison areas are saved to shared drive for access anywhere
- Collaboration without shipping of evidence- scientist time
- Live 2D imaging ‘close’ to 3D

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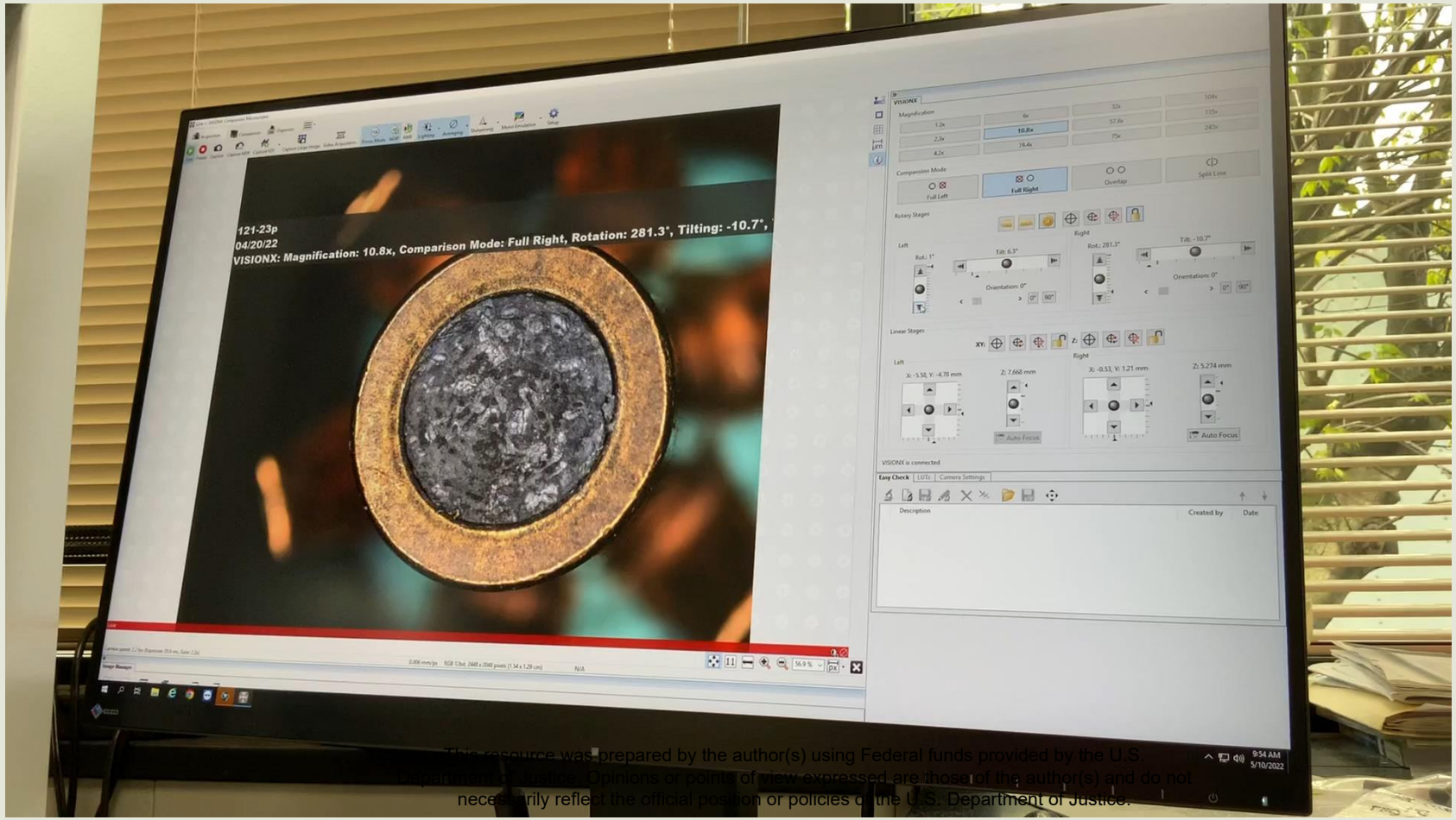
Remote Verification (RV)

- Windows based remote driver of microscope-NOT traditional controls



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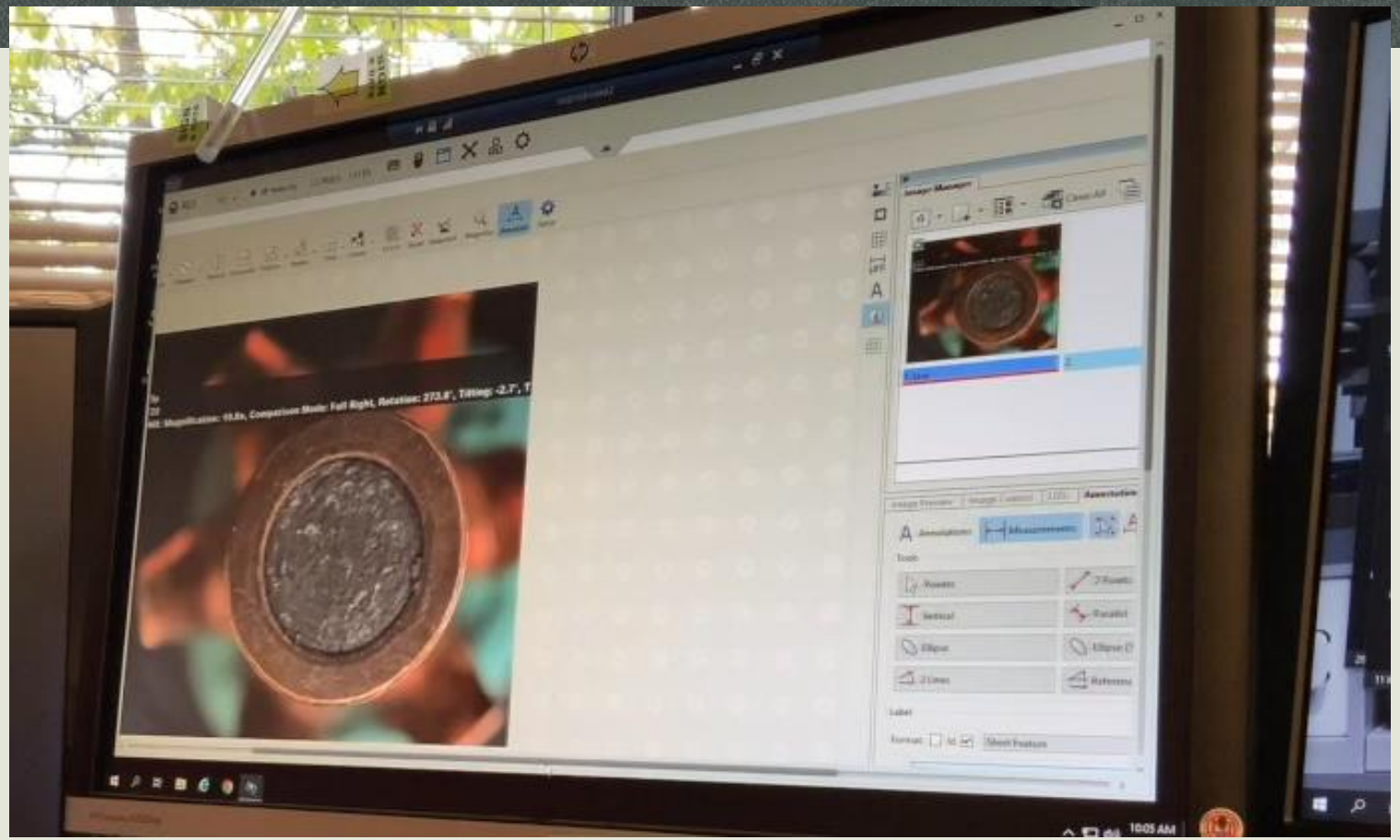
Remote manipulation---even measurements from laptop



- Doesn’t require you sitting at another scope
- Real time, remote measurements

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Remote Verification (RV)

- Vision-X scopes added to WSP network as instrument computer
- Use – remote interface to access and control
- Goal of 10% of comparison cases reviewed for study
- RV and traditional for each case
- Time and cost logged for both methods
- Comparison of conclusions
- All examiners encouraged to attempt RV
- Spreadsheet of results, participants

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RV Protocols

- Strive for objective reviews
- Show scribe, item # to camera
- Phone call for live during review (video/zoom affects frame rate)
  - Adjust lights for sample, other manipulation if needed
- Set samples up to require remote manipulation for comparison
- Minimal manipulation from scope side of comparison
- After virtual, same examiner performs traditional, compare conclusions

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Spreadsheets completed by Study Investigators

Verifier	Traditiona	Remote	Date	# of CC	POF	FP shape	Drag	FP AP Shee	Impressed	Striated marks	Chamber Mar	Ejector
		x	11/30/2020	4		Glock	yes	yes	yes	yes	no	no

Date	Verifier	Method/Scope	Type	Items	Type of evidence	Hourly rate	Time	Totals
10/6/2020		Traditional/ VisionX Xena	TM	6	tool marks	42.5	0.3	12.75
10/6/2020		Remote/ VisionX Ephesto	Firearms	2	bullets	42.5	1.25	53.13
10/14/2020		Traditional/ VisionX Ephesto	Firearms	2	bullets	42.5	0.5	21.25
10/16/2020								
10/21/2020								
10/21/2020								
10/26/2020								
10/27/2020								
10/27/2020								

Lab Number	Case Agent	Verifier	Traditional	Remote	Date	Item#	Of value	Damaged	Ricochet <	TYPE	Land /Groove
220-2751				x	11/9/2020	2	yes	yes	no	TMJ	6
220-2630				x	11/30/2020	1	yes	yes	no	FMJ	6

Nov-20	Lab number	Date	Item #	Examiner Conclusion	Verifier	Conclusion	Variance	Final	Secondary
	220-2751	11/9/2020	2			(GRC only)	none		
	220-2630	11/30/2020	1			(GRC only)	none		not done c
	220-2823	11/30/2020	12, 13, 14			ID	none		

Verification Cost Tracking

Lab number	Case Agent	Verifier	In Person	Remote	Date	Type of request	Items	Type of evide	Hourly rate of verifier	Time
220-2751				x	11/9/2020	GRC	1	bullet	$42.50	0.50
220-2823				x	11/30/2020	Firearms	4	fired cc	$42.50	0.30
220-2630				x	11/30/2020	GRC	1	bullet		0.30

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The DATA

- Investigators from each lab
- Spread sheets from data collected from August 2020 ⟹ May 2022
- Evaluation of fired cartridge cases, fired bullets, and tool marks

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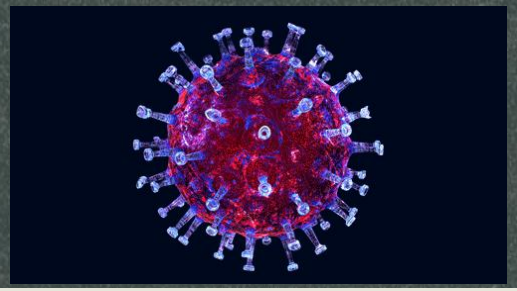
COVID-19 Challenges



- Delay obtaining equipment and installation
- Less comparison case submissions---more NIBIN
- Limited staffing from 2020-2021
  - Scientists
  - Detectives
  - Property custodians
- Varying work schedules
- Travel limited, more shipping of evidence
- Some cases too emergent for delay related to RV
- **LAG TIME** on network Zooms throughout agency

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RESULTS

of evidence items RV to date:
410 fired cartridge cases
89 fired bullets
12 tool mark items

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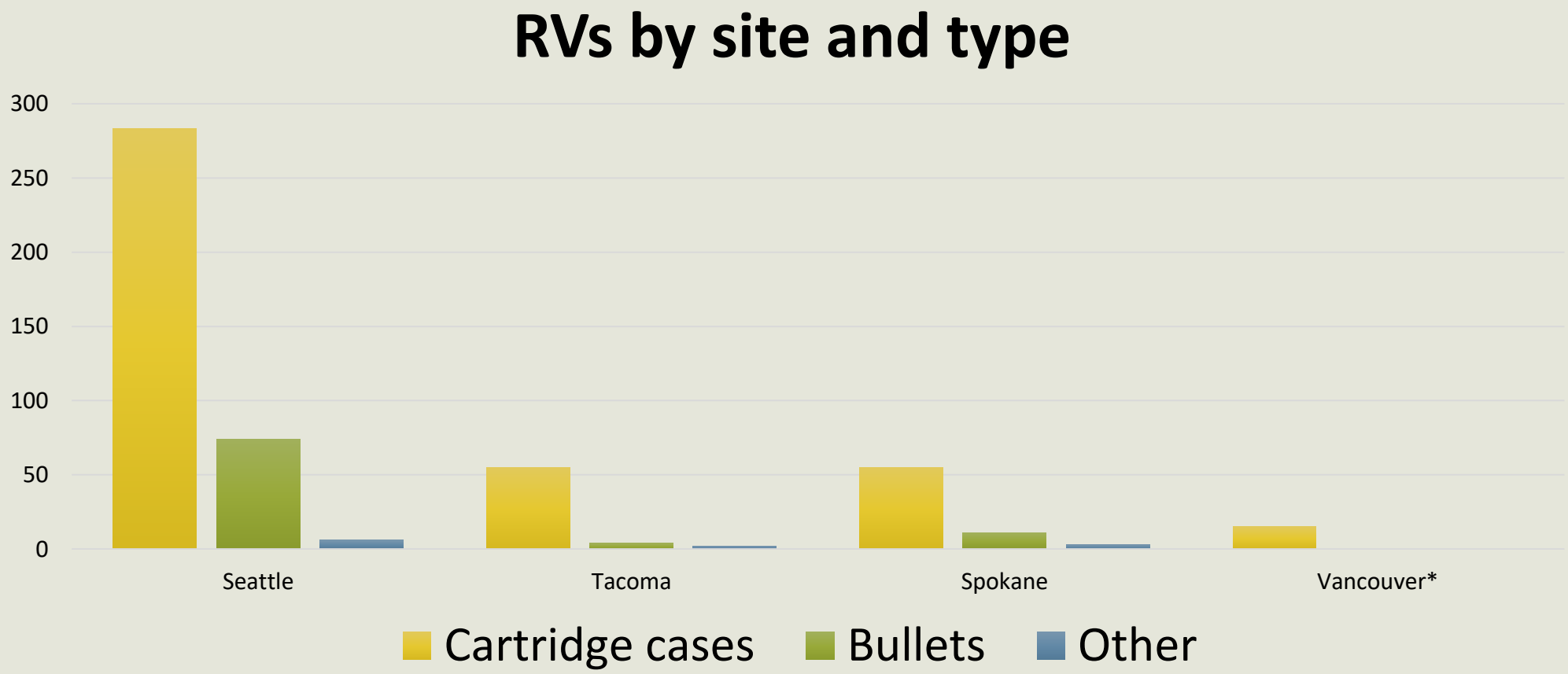
Preliminary Numbers By Lab (not analyst)



*Scope installed April 2022

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RV Limitations- PI impressions

- Normal controls (space-mice, standard panel) will not work remotely
  - **Need scope time on normal casework to be efficient**
- On screen windows based controls-
  - Death by 1000 clicks
- Lights (orientation and lux) cannot be controlled remotely
- RV of bullets difficult, requires hands-on manipulation in most cases bullet exams
  - Not sufficient image resolution in most cases
- Lag time due to band width
- RVs require babysitting and roughly 5x longer than traditional

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Costs of 100% in-Person Verification Between Labs

- Travel cost to Spokane-

  Flying: $200 ticket, $130 hotel, 3 hours travel time for scientist

  Driving: 266 miles roundtrip, 9 hours travel time for scientist

- Shipping evidence to Spokane-

  Evidence custodian time: 3 hours per case (1.5 each lab)---receiving and shipping x2

  Shipping costs: $25-100 per case (both labs)

  Scientist time: opening and resealing evidence (1-5 hours)

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Matchpoint Viewer Feature For Vision-X

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Project Participant Interviews

Washington State Patrol Crime Laboratory Division

Virtual Peer Review Project- Interview

WSP LABORATORY Seattle VISION-X NAME **Xena** DATE

SCIENTIST DATA SPREAD SHEET UP TO DATE? ☐YES ☒NO

APPROX NUMBER OF Total RV's	SET-UP TIME	PROS	CONS	ADOPT?
APPROX NUMBER OF Cartridge Case exams	APPROX NUMBER OF Bullet exams	APPROX NUMBER OF Tool mark exams	APPROX NUMBER OF Other exams	APPROX NUMBER OF Conflicting Conclusions to Traditional
EASE OF INTERFACE	EASE OF COMMUNICATION	RELIABILITY OF EQUIPMENT	RECOMMENDED IMPROVEMENTS	ISSUES TO BE ADDRESSED
COMMENTS				

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Issues, Concerns, General Gripes

- Work needed for objectivity in exams
- Lighting has to be manipulated onsite
- No space mice, no traditional controls
- Baud rate a significant issue—LAGTIME
- Cartridge cases with same class features (diff firearms) bullets, and tool marks are difficult: rotation, off-axis, constant manipulating
  - Discouraging to scientists
- Matchpoint hit viewer not available at the time of this writing- future exploration?

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Variance in Conclusions?

- Of the examined items, no significant deviations in conclusions between remote verification and traditional verification
- Some inconclusive results during RV were later identified during traditional review-----less than 5 evidence items
- More difficult examinations require more involvement (lighting, manipulation of sample) of the primary examiner during RV
- The time expended during complex difficult examinations (damaged bullets) significantly increased in RV vs. Traditional

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Adoption?

- Efficient and accurate for ‘Flat’ evidence-—fired cartridge cases
  - NIBIN lead confirmation, rush/emergent cases, remote measurements
- Consensus of PIs--preferred for full implementation:
  - Remote space mice control, more traditional microscope manipulation
  - Improved response from input to output
  - 3D imaging similar to IBIS better for remote verification
- Baud rate an issue—no live video conferencing- phone
- Bullets are difficult on 2D, rotation, off-axis, lighting, constant manipulating
  - Discouraging to scientists due to time consumption
- Matchpoint hit viewer not available at the time of this writing

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Questions?

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Virtual Peer Review Project- Interview

WSP LABORATORY _____ VISION-X NAME _____ DATE _____

SCIENTIST _____DATA SPREAD SHEET UP TO DATE? ☐YES ☐NO

APPROX NUMBER OF Total RV's	SET-UP TIME	PROS	CONS	**ADOPT?**
APPROX NUMBER OF Cartridge Case exams	APPROX NUMBER OF Bullet exams	APPROX NUMBER OF Tool mark exams	APPROX NUMBER OF Other exams	APPROX NUMBER OF Conflicting Conclusions to Traditional
EASE OF INTERFACE	EASE OF COMMUNICATION	RELIABILITY OF EQUIPMENT	RECOMMENDED IMPROVEMENTS	ISSUES TO BE ADDRESSED
COMMENTS				

R.T. Wyant, PI

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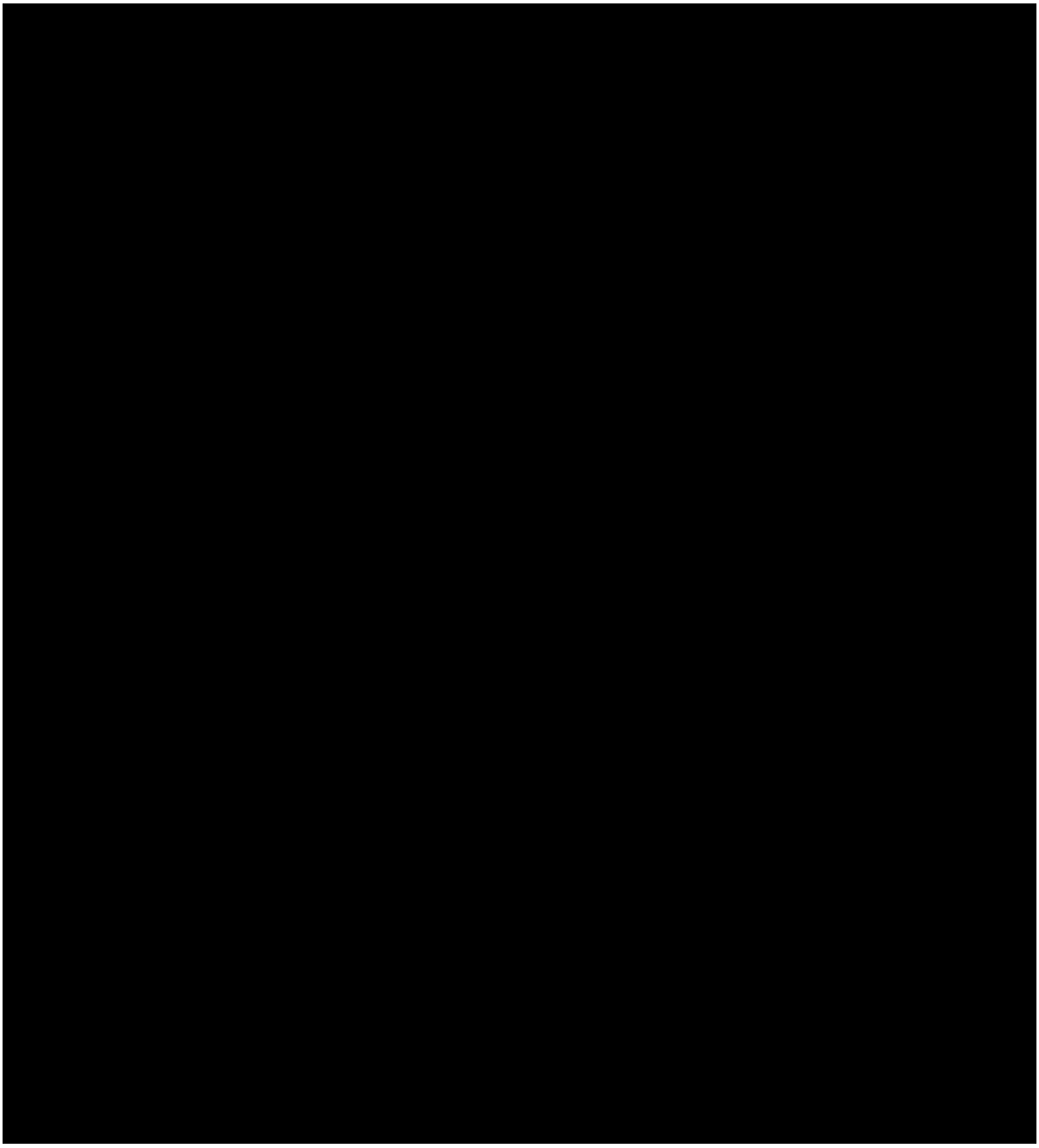

10.6.3 Technical Review

- Technical review will be conducted on all cases before release of written and verbal/email reports. This is to ensure that the results, opinions, interpretations and conclusions stated in the draft report are properly qualified and supported by the case record. The technical review is also performed to ensure examination documentation is complete and accurate and that the final report will be free of omissions and errors. Technical review is a normal job function of all scientists qualified to perform that function, and will therefore be subject to documentation and evaluation by

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supervisors. While the final responsibility for the scientific findings in the report rests with the analyst, the technical reviewer is equally responsible for the quality of the report and both will be held accountable.

- Assignment of cases for technical review is the responsibility of section supervisors. Technical review is to be conducted by authorized individuals who have been competency tested in the testing being reviewed and who are currently performing casework or have completed proficiency tests in that category of testing within the last four years. For technical review of DNA cases, the technical reviewer must be current with their proficiency testing. Technical reviews shall not be conducted by the author or co-author(s) of the examination documentation or draft report under review.
- The technical review process should be undertaken as soon as practical after the case is completed. Complex or difficult cases may require more time in order to do a thorough review. Supervisors are responsible for ensuring that cases are reviewed in a timely manner.
- The technical reviewer will ensure:
    - Examinations conducted are appropriate to satisfy the request made by the customer
    - Conformance with test methods and applicable policies and procedures
    - If an analysis was not conducted, the reason is supported by established laboratory policy
    - Communications and phone notes are present if applicable
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    - All calculations and data transfers are verified for accuracy
    - Appropriate procedures were used and test parameters (for example, instrument operating parameters) were appropriate for the examination.
    - Any deviations from established procedures are recorded in the case file, technically justified, authorized, and accepted by the customer.
    - Actions taken when discrepancies are found are described

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- Appropriate standards and controls are used when necessary and documented
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- Excessive errors or insufficient data to support the conclusion are brought to the attention of the supervisor
- Discipline-specific requirements for technical review are met.

An approved discipline specific technical review checklist will be used to facilitate the review process and be retained in the case record as administrative documentation. If during the technical review process, an observation, data, calculation or test result is rejected, the reason, the identity of the individual(s) taking the action, changes made, and the date shall be tracked by recording in the technical record. Tracking can be accomplished in a variety of ways, including but not limited to noting the changes on the technical review checklist or examination documentation and through document track change functions.
The analyst must address all the observations and recommended corrections of the technical reviewer.

10.6.3.1 Technical Review Issues

If during the technical review process, there are significant concerns regarding technical or quality issues, such as those listed below, the case file must be turned over to the supervisor.

- The examination documentation does not support the conclusions stated in the report
- The examination documentation is not clear in content, intent, or purpose
- The examination documentation contains procedural errors
- The examination documentation or report exhibits numerous errors not appropriate for the complexity of the case
- The examination documentation contains inappropriate strikeouts, obliterations or overwrite or cut-and-paste errors

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- Issues or discrepancies are not successfully resolved

The supervisor will evaluate the concerns and, if appropriate, notify the Laboratory Manager and the Standards and Accountability Manager. If the case involves DNA analysis, the DNA Technical Leader will also be notified (see also the section on Nonconforming Work and Corrective Actions). Substantive nonconformities or recurring nonconformities discovered during technical reviews are to be brought to the attention of the SAS Manager and Quality Assurance Manager through the chain of command as soon as possible. The Corrective Action process will be followed.

Errors discovered after the technical review process may be addressed by Corrective Actions and will involve both the originating scientist/author and the technical reviewer.

10.6.3.2 Documenting Technical Review

Technical Reviews will be documented with the reviewer's initials and date on each page of the final draft report, and in LIMS. (For the CODIS Laboratory, the reviewer's initials and date are on the first page of the case file). The presence of the reviewer's initials indicates that the bench notes, data, spectra, photographs, and other documentation found in the case file clearly support the conclusions stated in the report.

Any alterations made to the final draft report bearing the analyst and technical reviewer initials/signature shall be crossed out, not erased, made illegible or deleted, and the correct value entered alongside. All such alterations, including adding information, shall be signed or initialed and dated by the analyst. The technical reviewer shall also document approval of any technical alterations by initialing the alterations on the final draft report, by updating the review date on the review checklist, or by updating the Technical Review milestone in LIMS. The final report must reflect these alterations. If the analyst disagrees with the changes indicated on the altered draft, the report cannot be released and the analyst will need to contact the technical reviewer and resolve the disagreement or follow the mediation procedures described below in section on Resolution of Technical Differences of Opinion.

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WASHINGTON STATE PATROL

CRIME LABORATORY DIVISION

Firearms/Tool Marks Technical Procedures Manual

December 2022

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1 FIREARM EXAMINATION PROCEDURES

1.1 INTRODUCTION

The procedures in this section require the skills of a trained firearm examiner. To be deemed fully trained, an examiner must have completed an appropriate and approved training program. For each procedure, a fully trained examiner must confirm that the training was completed and that the trainee is able to perform the procedure properly.

To ensure the accuracy and completeness of case documentation, the AFTE Glossary should be used for appropriate definitions and appropriate manufacturers' nomenclature should be used for describing firearms parts.

Forms/worksheets should be used to ensure inclusion of all pertinent facts pertaining to the submitted evidence. These forms/worksheets will be posted on the FLSB Portal.

The standard method for associating suspect firearms with fired ammunition components is comparison microscopy, using a microscope specifically designed for firearm/tool mark comparison.

Case files must document the start and end dates of examination. The start date is designated as the date the evidence is first examined as reflected in the case notes. The end date is designated as the date the report is signed by the examiner.

1.2 QUALITY ASSURANCE

Examiners are reminded of the importance of quality assurance as discussed in the "Introduction" of this manual and the CLD QOM. It is the responsibility of the firearms examiner to ensure that all microscopic examinations are verified by another qualified firearms examiner. Firearm examiners will follow performance check procedures and chemical logs as specified in the CLD QOM. When critical measurements are made by the examiner, it is the responsibility of the examiner to ensure that the device used to make the critical measurements has been calibrated.

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1.6.8 COMPARISON MICROSCOPE

1. Definition:

   An optical instrument that is essentially two compound microscopes connected to an optical bridge that allows the viewer to observe two objects simultaneously with the same degree of magnification.

2. Performance Check:

   A WSP contractor services the firearms section microscopes. Preventative maintenance is recommended to be performed at an interval of not more than three years (see the CLD QOM). Service may be required at other times if the microscope is not functioning appropriately or becomes damaged. A sticker providing the information regarding maintenance of the microscope is located on each microscope. Each objective through which measurements are taken will be performance checked. A calibrated measuring object (ruler, calipers, etc.) should be placed on each stage of the comparison microscope and viewed through the eyepieces.

   The examiner will ensure that a chosen length (for example .125") lines up appropriately when viewed through the eyepieces. If the lengths on both sides line up appropriately when viewed through the eyepieces, the microscope system is calibrated and working properly. If the lengths on both sides do not line up appropriately when viewed through the eyepieces, the system is not working properly and needs to be adjusted or serviced.

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1.21 MICROSCOPIC COMPARISONS

Microscopic comparisons are generally performed on fired ammunition components such as bullets, cartridge cases, and wadding. The examiner should follow these basic procedural techniques in order to facilitate microscopic examinations:

ENSURE THAT THE COMPARISON MICROSCOPE IS PROPERLY ADJUSTED FOR EQUAL MAGNIFICATION AT BOTH STAGES.

Directly illuminate the land impressions of bullets during the initial examination. Usually oblique lighting is preferred.

Compare the test-fired components to ensure reproducibility of class and individual characteristics prior to comparing them to the evidence components. Evaluate the possibility of subclass characteristics on the test-fired components as well as the evidence components.

Adopt a consistent procedure for the handling and documentation of comparison evidence.

During the comparison, documentation of the phase orientation of test-fired and evidence components is recommended. The conclusions reached by an examiner during a microscopic comparison are made based on the Association of Firearm and Tool Mark Examiners (AFTE) Theory of Identification, listed below.

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1. The theory of identification as it pertains to the comparison of toolmarks enables opinions of common origin to be made when the unique surface contours of two toolmarks are in "sufficient agreement".
2. This "sufficient agreement" is related to the significant duplication of random toolmarks as evidence by the correspondence of a pattern or combination of patterns of surface contours. Significance is determined by the comparative examination of two or more sets of surface contour patterns comprised of individual peaks, ridges and furrows. Specifically, the relative height or depth, width, curvature and spatial relationship of the individual peaks, ridges and furrows within one set of surface contours are defined and compared to the corresponding features in the second set of surface contours. Agreement is significant when the agreement in individual characteristics exceeds the best agreement demonstrated between toolmarks known to have been produced by different tools and is consistent with agreement demonstrated by toolmarks known to have been produced by the same tool. The statement that "sufficient agreement" exists between two toolmarks means that the agreement of individual characteristics is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility.
3. Currently the interpretation of individualization/identification is subjective in nature, founded on scientific principles and based on the examiner's training and experience.

All evidentiary identifications, inconclusives and eliminations (to include differences in class characteristics) must be verified by another qualified firearms examiner with initials and date on the notes page prior to the report being issued.

1.22 RANGE OF CONCLUSIONS

Examiners will use one of the four following conclusions in the final report when describing the conclusions reached during the examination. Examiners can use the below Glossary definitions to properly qualify the conclusion stated in the Results and Conclusions section of the report.

1.22.1 IDENTIFICATION –

Agreement of a combination of individual characteristics and all discernible class characteristics where the extent of agreement exceeds that which can occur in the comparison of tool marks made by different tools and is consistent with the agreement demonstrated by tool marks known to have been produced by the same tool. Example: "… was identified as having been…"

1.22.2 INCONCLUSIVE –

Some agreement of individual characteristics and all discernible class characteristics, but insufficient for an identification.

Agreement of all discernible class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency, or lack of reproducibility.

Agreement of all discernible class characteristics and disagreement of individual characteristics, but insufficient for an elimination. Example: "…was inconclusive due to…" or "…could not conclusively be identified or eliminated due to…"

1.22.3 ELIMINATION –

Class characteristics disagree.

Class characteristics agree and there is a documentable and discernible difference in individual characteristics, then an elimination can be made. Example: "…was eliminated as having been…"

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1.22.4 UNSUITABLE –

Unsuitable for examination. Suitability is at examiner discretion and must be verified by another qualified examiner. Example: "…was unsuitable for analysis due to…"

1.22.5 GLOSSARY

Examiners can use one or more of the four following glossary conclusion definitions in the final report to properly qualify the conclusions reached during the examination and reported in the Results and Conclusions section of the report.

Identification: The opinion of a qualified examiner that there is sufficient agreement of features and microscopic detail (class and individual characteristics) to conclude that two (or more) tool marks originated from the same source.

Elimination: The opinion of a qualified examiner that there is sufficient disagreement of features and microscopic detail (class and/or individual characteristics) to conclude that two (or more) tool marks originated from different sources.

Inconclusive: The opinion of a qualified examiner that there is not sufficient agreement or disagreement of features and microscopic detail (class and/or individual characteristics) to conclude that two (or more) tool marks originated from the same source or from different sources.

Unsuitable: The opinion of a qualified examiner that there is not sufficient microscopic detail or features for comparison.

1.23 DOCUMENTATION OF CONCLUSIONS

A photo will be taken to document an identification along with notes describing how the identification was made.

It is recognized that photos are not used to make identifications or comparisons, but are for recording purposes and generally document selected portions of an identification.

Photos are not used to make verifications of comparisons and are for notes/documentation purposes only because:

- A photograph is a two-dimensional image of an object that is three-dimensional.
- Photographs often contain insignificant detail and could be misinterpreted by those not trained in microscopic comparison.
- A photograph is a still. An actual comparison is very dynamic, and continuous movement of the samples is an integral part of the examination.

For unsuitable for examination, inconclusive, and elimination conclusions, detailed descriptions will be used to document class characteristics and describe why the sample is unsuitable for examination, inconclusive, or an elimination.

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1.31 LAND AND GROOVE MEASUREMENTS

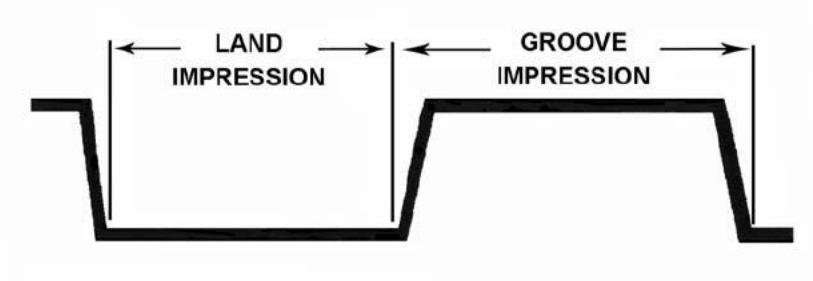
One of the class characteristics used for bullet identification is land and groove impression measurements. Land and groove impression measurements should be taken as close as possible to the base of the bullet to eliminate errors in measurement that may occur due to slippage that can result from the bullet engaging the rifling in areas closer to the nose of the bullet.

Several instruments are available for making such measurements, and the technique of measurement is approximately the same in each. The critical parameters are the points used for beginning and end of a measurement. Use one or more of the methods listed below:

1.31.1 AIR GAP METHOD

See AFTE Newsletter, No. 4, December 1969, pp. 28-34.

1.31.2 MICROSCOPE WITH PERFORMANCE CHECKED MEASURING EYEPIECE, RULE, OR MICROMETER.



Measure land impression and groove impression as shown above.

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