PREPARED BY THE COURT

STATE OF NEW JERSEY Plaintiff, v. PAUL CANEIRO Defendant.	SUPERIOR COURT OF NEW JERSEY LAW DIVISION: CRIMINAL PART MONMOUTH Ind. No.: 19-02-283 Case No.: 18-4915 **ORDER**

THIS MATTER having been opened to the court on application of defendant Paul Caneiro (Monika Mastellone, Esq., Andy Murray, Esq., Elayna Thompson, Esq., and Tamar Lerer, Esq., appearing), and opposed by Raymond Santiago, Monmouth County Prosecutor (Christopher Decker and Nicole Wallace, Assistant Prosecutors, appearing), and the court having heard arguments of counsel and for good cause shown;

IT IS on this 7th day of AUGUST, 2025;

ORDERED that Defendant's motion to preclude the State's ballistics evidence and firearms toolmark expert's testimony is **DENIED**.

HON. MARC C. LEMIEUX, A.J.S.C.

NOT FOR PUBLICATION WITHOUT THE
APPROVAL OF THE COMMITTEE ON OPINIONS

SUPERIOR COURT OF NEW JERSEY
COUNTY OF MONMOUTH

Ind. No.: 19-02-283
Case No.: 18-4915

Decided: August 7, 2025

STATE OF NEW JERSEY,

v.

PAUL CANEIRO
Defendant.

FINDINGS AND CONCLUSIONS OF THE COURT ON DEFENDANT'S MOTION TO PRECLUDE ARSON EXPERT TESTIMONY

CHRISTOPHER DECKER, ESQ. and NICOLE WALLACE, ESQ., for the State of New Jersey Monmouth County Prosecutor's Office

MONIKA MASTELLONE, ESQ., ANDY MURRAY, ESQ., ELAYNA THOMPSON, ESQ, and TAMAR LERER, ESQ., for Defendant, PAUL CANEIRO

MARC C. LEMIEUX, A.J.S.C.

I. INTRODUCTION

This matter comes before the Court on Defendant Paul Caneiro's motion to preclude, or, in the alternate, to limit, the State's expert testimony and evidence concerning ballistics and firearm toolmark identification. Defendant contends that

the testimony is not the product of a reliably applied methodology, lacks adequate documentation, and is compromised by cognitive and contextual bias. He argues that these flaws render the testimony inadmissible or, at minimum, call for its significant limitation.

The Defendant filed the motion on May 6, 2025. The matter was extensively briefed and supplemented by a multi-day evidentiary hearing, which included live testimony from the State's firearms examiners and Defendant's expert in cognitive bias. The Court also received detailed post-hearing submissions. The State opposes the motion, maintaining that ballistics evidence is grounded in long-standing scientific and legal precedent, and that any shortcomings affect the weight of the evidence rather than its admissibility. The State further asserts that its examiners adhered to protocols consistent with AFTE standards, and that any perceived weaknesses can be addressed through cross-examination rather than categorical exclusion.

For the reasons set forth herein, the Court concludes that it is bound by controlling precedent to find that firearm toolmark analysis constitutes expert testimony and is deemed reliable as a matter of law. At the same time, the Court is mindful of the New Jersey Supreme Court's recent instruction in State v. Olenowski, 253 N.J. 133 (2023), that even well-established forensic techniques must be examined for reliability as applied in each case. The Court further finds that the

State's examiners reliably applied accepted methodological standards in conducting their toolmark analysis. In addition, both State's experts are well-qualified based on their extensive training, experience, and professional credentials. Accordingly, Defendant's motion to preclude expert ballistics testimony is DENIED.

II. RELEVANT PROCEDURAL AND FACTUAL HISTORY

On November 20, 2018, the Monmouth County Prosecutor's Office responded to two fires: one at 15 Willow Brook Road in Colts Neck, where Keith Caneiro and his family were found deceased, and another at 27 Tilton Drive, the Defendant's residence. Investigators recovered seven spent cartridge casings, a live cartridge, and four bullet specimens at Willow Brook Road, as well as additional bullets during autopsies of two victims. From the Tilton Drive residence, police seized multiple firearms, a gun barrel, gun-related parts, and ammunition.

Detective Sergeant (hereinafter, "DSgt") Clayton of the State Police Ballistics Unit conducted the firearms analysis using established microscopic comparison techniques. Clayton authored reports on January 2, 2019; February 4, 2019; February 7, 2019; and February 24, 2020. He test-fired the seized firearms using ammunition matching that found at the scene and compared those results to the recovered specimens. His work included documentation in the form of bench notes, images, and written summaries of his findings. In his reports, Clayton concluded that several

recovered bullets and casings bore toolmarks that were in "sufficient agreement" with those produced by firearms seized from the Defendant.

More than five years later, Defendant's new counsel served an expansive discovery demand requesting all file materials, photographs, electronic data, notes, protocols, review records, proficiency testing results, and communications, including any materials related to bias controls or raw images. The State responded with the available reports, documentation, and protocols. Where materials were missing or unavailable, the State explained those circumstances.

Defendant's initial argument sought preclusion of the ballistics evidence on three primary grounds: (1) inadequate discovery production; (2) insufficient reasoning in the expert reports; and (3) methodological deficiencies that failed to meet New Jersey's standards for scientific reliability. To support this challenge, Defendant submitted the affidavit and curriculum vitae of Dr. Jeff Kukucka, an expert in forensic bias and human decision-making. Notably, Defendant did not produce a competing ballistics expert.

The State, in response, cited controlling New Jersey and federal case law affirming the admissibility of ballistics testimony. It provided additional materials and offered the testimony of two New Jersey State Police (NJSP) examiners during the evidentiary hearing. The State maintained that Clayton's conclusions adhered to

established practices within the field and that the concerns raised by the defense went to the weight of the evidence, not its admissibility.

The Court initially heard oral argument on Defendant's motion to preclude ballistics testimony on June 3, 2025. In response to the Court's inquiry regarding the necessity of a hearing, both the defense and the State opposed a hearing, albeit for different reasons. Nonetheless, the Court determined that a Rule 104 hearing was warranted to gain a fuller understanding of how the New Jersey State Police Ballistics Unit analyzed and evaluated the evidence in this case, as well as how those decisions were subject to review. Because the Court ordered the hearing sua sponte, it concluded once the Court had received all information necessary to resolve Defendant's motion.

DSgt. Clayton testified first. He has nearly 20 years of experience with NJSP, including his current position as assistant unit head of the Ballistics Unit. In 2009, he was accepted into the unit and completed its two-year internal training program based on the Association of Firearm and Tool Mark Examiners (AFTE) standards. Clayton has conducted thousands of bullet and cartridge case comparisons and is a

certified AFTE examiner. 1T 134-3 to 1T 140-6; 1T 150-5 to 11.[1] He has been qualified as an expert in toolmark identification 61 times in both state and federal courts.

In this case, Clayton examined eight firearms. 2T 87-15. He test-fired each for comparison with the bullets recovered from the crime scene. Clayton explained that test-firing multiple rounds may be necessary to produce optimal markings for comparison. He began with identifying class characteristics—such as weight, caliber, number of lands and grooves, and rifling twist—before moving to microscopic comparisons. 2T 102-13.

After excluding seven weapons, Clayton identified two Sig Sauer pistols and one compatible gun barrel that shared the same class characteristics as the recovered bullets. Using a comparison microscope, Clayton examined test-fired bullets and compared them to bullets recovered from the scene. He concluded that five bullets had been fired from the same barrel, based on both class and individual characteristics. 2T 95-18 to 96-10.

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[1] Transcripts from the hearing span multiple days and are cited to using the following legend:

1T: Transcript of Motion Hearing on July 1, 2025;
2T: Transcript of Motion Hearing on July 2, 2025;
3T: Transcript of Motion Hearing on July 3, 2025;
4T: Transcript of Motion Hearing on July 7, 2025.

Clayton testified that he reached this conclusion by evaluating whether the markings on the bullets demonstrated "sufficient agreement," a subjective but guided standard within the field. Although the defense challenged his phrasing and definition, Clayton clarified his understanding of the term. 2T 115-22; 1T 197-25 to 198-12. He reaffirmed his findings in subsequent reports, supported by exhibits S-15, S-16, and S-17.

Clayton acknowledged that while class characteristic analysis can be objective, individual pattern interpretation involves subjectivity informed by training and experience. 2T 132-19 to 133-2. He described the peer review and verification process, including blind verification by a second qualified examiner to minimize bias. 2T 133-18 to 134-3. He compared this method to sequential unmasking used in fingerprint analysis, where class characteristics are documented prior to examining individual ones.

On cross-examination, the defense challenged Clayton's documentation practices, the true blindness of the review process, and potential inconsistencies in CTS proficiency testing. Nonetheless, the Court found DSgt Clayton to be a credible, experienced, and technically competent witness. He answered cross-examination questions with clarity and candor, acknowledged limitations, and effectively explained NJSP's adherence to best practices in firearm toolmark examination. He

further provided detailed testimony regarding the protocols he followed, the sources of subjectivity, and the steps taken to mitigate bias.

Detective Sergeant Joshua Smith (hereinafter, "DSgt Smith") testified as the peer reviewer of Clayton's reports. DSgt Smith has served in the NJSP Ballistics Unit since 2014. He completed both NJSP's in-house training and the National Firearms Engineering Academy—an intensive 11-month ATF program with fewer than 300 graduates. 3T 38-9 to 44-24. He conducted the technical review of Clayton's 2019 reports and a microscopic verification of the 2020 report. DSgt Smith testified that his role involved both a documentary review on the first three reports and an independent microscopic analysis of the bullets and casings referenced in Clayton's conclusions on Clayton's last report.

DSgt Smith testified that the NJSP employs a "100 percent blind review" system, in which the verifying examiner does not know the original examiner's conclusions. 3T 68-20 to 23. Although the reviewing examiner may know who conducted the analysis, they do not have access to the examiner's notes or findings. 3T 68-19. DSgt Smith explained that this approach is designed to reduce the risk of confirmation bias while still allowing for practical efficiency within the unit.

Addressing photographic documentation, DSgt Smith explained that examiners are not trained to photograph every comparison because it is redundant and not an effective way to analyze evidence. 3T 63-21 to 65-1. Photos are useful to

illustrate findings to juries or refresh recollections, but they are not a substitute for direct microscopic comparison. 3T 78-12. He testified that while photographs were taken in this case, they were not intended to serve as a full visual record of each identification step, and that the lab's standard operating procedures do not mandate such documentation.

DSgt Smith's testimony confirmed that he and other reviewers reached the same conclusions as Clayton independently, as evidenced by their signatures on the reports. 3T 79-12. The Court found DSgt. Smith to be credible, experienced, and effective in explaining NJSP's internal review procedures.

The Defendant called Dr. Jeff Kukucka, a psychology professor at Towson University and a specialist in cognitive bias. 3T 147-22. Kukucka reviewed the reports, photographs, and NJSP protocols related to this case but did not examine the physical evidence. He criticized the NJSP's approach, stating that the documentation did not demonstrate efforts to minimize cognitive bias or confirm that reviews were conducted blind. 3T 188-10, 191-17. He also noted the absence of linear sequential unmasking procedures, a safeguard increasingly recommended by academic researchers but not yet standardized in firearm analysis labs.

Kukucka also raised concerns about the validity of industry-wide proficiency tests, particularly a 2023 test with a high failure rate and the treatment of "inconclusive" answers. 4T 6-10. On cross, however, he conceded that if blind

review and objective documentation occurred as described by NJSP witnesses, his concerns would be alleviated. He also acknowledged that he is not a trained toolmark examiner and was not qualified to critique the technical content of Clayton's findings. 4T 66-10. Kukucka also agreed that certain safeguards, if properly documented, would address many of the bias-related concerns he raised on direct examination.

The Court found Dr. Kukucka to be credible in his area of expertise of human decision-making and cognitive bias but gives limited weight to his testimony on ballistics protocols. His critique of NJSP's procedures was based on partial documentation and contradicted by the direct, live testimony of NJSP examiners. His proposed reforms, such as linear sequential unmasking, are not yet widely adopted in the ballistics community and do not represent the current professional standard.

At that point, the Court had received all information necessary to resolve Defendant's motion to preclude the ballistics testimony, and the hearing was concluded. The Court directed both parties to submit written summations. The record includes the testimony of all witnesses, all exhibits introduced during the hearing, and all-party submissions, including the parties' post-hearing briefs.

III. SUMMARY OF ARGUMENTS

a. The Defendant's Position

Defendant's central arguments are fourfold.

First, Defendant contends that the State's expert reports fail to satisfy Rule 3:13-3(b)(1)(I) because they do not "adequately explain the factual basis or rationale" for each identification opinion. He asserts that the absence of detailed, high-resolution, or marked-up images, and the lack of sufficient documentation concerning peer review and bias controls, deprives him of the ability to meaningfully challenge or cross-examine the expert. Defendant maintains that these omissions frustrate the fundamental purpose of discovery: to permit informed adversarial testing of expert evidence.

Second, Defendant argues that the expert's conclusion constitutes a "net opinion" under N.J.R.E. 703 and Townsend v. Pierre, 221 N.J. 36 (2015), because it is unsupported by clearly referenced facts or methodology. He asserts that the expert fails to explain how observed physical characteristics translate into a conclusion of identification, rendering the opinion conclusory.

Third, Defendant raises an "as-applied" challenge under N.J.R.E. 702, State v. Olenowski, 253 N.J. 133 (2023) ("Olenowski I"), and State v. Olenowski, 264 N.J. 1 (2024) ("Olenowski II"). He contends that even if firearm toolmark analysis is accepted generally, the documentation and procedures employed in this particular

case were inadequate to demonstrate the reliable application of any accepted methodology. He emphasizes that Olenowski II requires courts to scrutinize both the general acceptance of a method and its reliability as applied in the specific case.

Fourth, Defendant underscores the risk of cognitive bias, both as a general threat to reliability and as a concern in this specific case. He argues that the absence of blinding or any documented bias mitigation procedures further undermines the reliability of the results. In his view, the absence of such safeguards calls into question the objectivity of the examiner's conclusions.

With respect to R. 3:13-3(b)(1)(I), Defendant argues that the State was required, at a "bare minimum," to disclose the facts and opinions the expert would rely upon at trial and to provide a summary of the grounds for each opinion. Def. Br. at 16. In Defendant's view, the expert report fails to identify which facts the examiner relied upon, or how those facts logically support the conclusions. Without that explanation, Defendant asserts, he cannot evaluate or challenge the reliability of the expert's opinion. He further argues that the report does not sufficiently identify the methodology used to draw conclusions from the facts. Because the State did not fully respond to Defendant's comprehensive discovery demand served in February 2025, Defendant contends that the only appropriate remedy is to exclude the expert testimony in its entirety. He asserts that this failure has prejudiced his ability to prepare an effective defense.

Even if the Court finds no discovery violation, Defendant contends that the proposed testimony is a net opinion, in violation of N.J.R.E. 703. In his initial brief, he asserts that the discovery provided by the State lacks essential documentation. For example, he claims that the State produced only "some partial photos" and at such low quality "that distinguishing features cannot be discerned." Def. Br. at 27. He further points to what he describes as a "total lack of information" regarding how the second reviewer reached a conclusion, calling this an additional indicator of unreliability. Id. at 30. He argues that the lack of transparency in the peer review process further undermines confidence in the expert's findings.

At the evidentiary hearing, Defendant asked whether Clayton's documentation was sufficient to allow another examiner to reproduce or verify his conclusions based solely on his report. Clayton responded that any such examiner "would have to look at the physical evidence." 2T 141-7. The Defendant relies on this exchange to support his position that the report fails to satisfy minimum documentation standards and does not permit meaningful replication or review.

Defendant argues that the forensic methodology used in this case fails to satisfy the admissibility standards of N.J.R.E. 702. He asserts that the principles of ballistics were not reliably applied and that the expert lacks the necessary expertise to testify credibly. Even assuming arguendo that ballistics is a generally reliable field, a proposition Defendant does not fully concede, he contends that the

application in this case was flawed due to poor documentation, insufficient transparency, and unreliable protocols. He maintains that these deficiencies are not curable through cross-examination and require exclusion under Olenowski II.

Finally, Defendant argues that the State's ballistics report fails to reflect whether the laboratory employed any procedures to mitigate cognitive bias. Without such safeguards, he contends, the reliability of any forensic conclusion is severely compromised. He characterizes cognitive bias as a pervasive and serious issue across all forensic sciences, requiring active mitigation efforts that were absent here. He cites national studies, including the 2009 NAS report and later publications, in support of this position.

b. The State's Position

The State responds that firearm toolmark analysis is a scientifically reliable discipline with a long-standing history of admissibility in courts throughout the United States. It cites State v. Ghigliotty, 463 N.J. Super. 355 (App. Div. 2020), and State v. McGuire, 419 N.J. Super. 88 (App. Div. 2011), for the proposition that the admissibility of ballistics evidence is well-settled under New Jersey law. The State emphasizes that this precedent remains good law even after Olenowski.

According to the State, DSgt. Clayton's reports, images, notes, and methodology, while not exhaustive or formatted in the manner preferred by the defense, satisfy the disclosure requirements of R. 3:13-3. The State emphasizes that

New Jersey's "open file" approach does not require perfection, only that the expert's conclusions and supporting materials be available for adversarial testing. The State maintains that the materials disclosed, when taken together, are sufficient to allow meaningful cross-examination.

The State argues that concerns about subjectivity and cognitive bias are not issues of admissibility, but rather of weight and credibility, and are therefore appropriate subjects for cross-examination. The State supports its position with references to existing case law and national scientific commentary, and it argues that the expert's subjective judgment does not render the testimony inadmissible. It points out that subjectivity is inherent in many accepted forensic disciplines, including fingerprint and handwriting analysis.

The State also contends that Defendant's broad and belated discovery demands, served more than five years after the initial reports were generated, do not justify exclusion. The State asserts that it responded promptly and in good faith to those requests. It argues that any remaining disputes over disclosure were addressed through supplemental productions and the evidentiary hearing itself.

In addressing broader criticisms of the ballistics field, the State argues that recent commentary, such as the 2016 report by the President's Council of Advisors on Science and Technology (PCAST), did not recommend exclusion of ballistics evidence at trial. Rather, the report urged courts to evaluate methodologies carefully.

The State maintains that the question of admissibility lies with the judiciary and that the courts, both before and after Olenowski, have consistently upheld the admissibility of toolmark identification testimony.

The State also notes that the Supreme Court's shift from the Frye[2] standard to the Daubert-like[3] approach articulated in Olenowski I and Olenowski II was not intended to alter the long-standing admissibility of ballistics testimony. In the absence of new scientific findings undermining the methodology, the State argues, prior precedent should remain intact. It points out that similar arguments were raised before the Appellate Division and were rejected. State Br. at 6. According to the State, Defendant's "as-applied" challenge is merely a repackaged version of previously rejected claims and lacks merit. Id. It emphasizes that Olenowski does not call for wholesale exclusion of an entire field absent a persuasive showing of unreliability in the particular case.

The State also denies that it violated R. 3:13-3. It asserts that it provided Defendant with all ballistic reports, associated notes and photographs, and the relevant standard operating procedures. The State maintains that these documents contain the expert's conclusions and the factual bases for those conclusions, thus satisfying the requirements of the rule. The State further argues that R. 3:13-

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[2] Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).
[3] Daubert v. Merrell Dow Pharms. Inc, 509 U.S. 579 (1993).

3(b)(1)(I) only requires a summary of opinions where no expert report has been prepared. Since detailed reports were provided, no such summary was necessary. Moreover, even assuming some deficiency, the State contends that exclusion is not the appropriate remedy. The State argues that any sanction must be proportionate and tailored to the nature of the alleged discovery violation.

Finally, the State addresses Defendant's cognitive bias argument. It contends that subjectivity is inherent in nearly all forensic disciplines and does not render testimony inadmissible. The State notes that courts have routinely admitted ballistics testimony despite criticisms of subjectivity and that expert judgment when exercised according to established standards and subject to cross-examination is not a disqualifying factor. The State further argues that the defense expert's proposed reforms are policy recommendations, not current legal requirements.

IV. GOVERNING LAW AND LEGAL ANALYSIS

a. Discovery and Expert Reporting: Rule 3:13-3

New Jersey Court Rule 3:13-3(b)(1)(I) requires the State to provide, for each expert witness, the individual's name and address, qualifications, area of testimony, and a copy of the expert's report, if one is prepared. If no report exists, the State must supply a summary of the facts, the opinions, and the grounds for each opinion.

See State v. Washington, 453 N.J. Super. 164, 189–91 (App. Div. 2018); State v. LaBrutto, 114 N.J. 187, 205 (1989).

A laboratory report satisfies the Rule. Failure to particularize or annotate every underlying fact, image, or file does not amount to a violation. The controlling inquiry is whether the defense had a meaningful opportunity to review the material, consult with an expert, and prepare for trial. The "drastic remedy" of exclusion or preclusion is reserved for circumstances involving surprise, prejudice, and bad faith. See State v. Smith, 224 N.J. 36, 48 (2016).

Rule 3:13-3 imposes an affirmative and continuing obligation on the State to make timely disclosure of relevant information to allow the defense to prepare a complete response. Ibid. Where a party fails to meet its discovery obligations, the court may issue appropriate remedial orders. Ibid.

New Jersey adheres to a broad discovery model that reflects a commitment to transparency, in keeping with the principle of "open file" discovery. State v. Morgan, 479 N.J. Super. 420, 429 (App. Div. 2024). A defendant is entitled to access the tools necessary "to impeach the State and sow reasonable doubt." State v. Arteaga, 476 N.J. Super. 36, 63 (App. Div. 2023). Nonetheless, a defendant's entitlement to broad discovery has limits. Courts must ensure that discovery does not devolve into "an unfocused, haphazard search for evidence." Morgan, 479 N.J. Super. at 429.

Where material is not automatically discoverable under R. 3:13-3, but may become relevant depending on trial strategy, a defendant must articulate a "plausible justification" for the requested information and describe it with "reasonable particularity." State v. Desir, 245 N.J. 179, 204–05 (2021). Alternatively, the defendant must demonstrate a "particularized need." State v. Pickett, 466 N.J. Super. 270, 279 (App. Div. 2021). Thus, the Court's role in evaluating such requests is to balance fairness with trial efficiency and avoid turning expert discovery into a burdensome fishing expedition.

When the State fails to disclose relevant information, sanctions may be appropriate. However, "the sanction of preclusion is a drastic remedy and should be applied only after other alternatives are fully explored," and only upon findings of intent to mislead, element of surprise, and resulting prejudice. Washington, 453 N.J. Super. at 190–91. "Prejudice in this context refers not to the impact of the testimony itself, but the aggrieved party's inability to contest the testimony." Id. at 191 (quoting State v. Heisler, 422 N.J. Super. 399, 415 (App. Div. 2011)).

Whether to exclude an expert's testimony under R. 3:13–3(b)(1)(I) lies within the trial court's discretion. LaBrutto, 114 N.J. at 205. The rule governing expert discovery in criminal proceedings parallels the rule applied in civil matters. Ibid. In exercising discretion, courts should consider: (1) the absence of an intent to mislead;

(2) the absence of surprise; and (3) the absence of prejudice. Washington, 453 N.J. Super. at 191 (quoting LaBrutto, 114 N.J. at 205).

Courts recognize that not all situations will fall squarely within the letter of the criminal discovery rules. The guiding purpose of those rules, like the rules of evidence, is to promote fairness. "A defendant is entitled to know the State's case against him within reasonable time to permit the preparation of a defense." State v. Bellamy, 329 N.J. Super. 371, 376 (App. Div. 2000). When the defense requests information not otherwise required under the rule, the court must assess whether that information is necessary and determine whether the expert will testify to it. See Arteaga 476 N.J. Super. at 56; Pickett, 466 N.J. Super. at 279, 246 (requiring a defendant to "demonstrat[e] a particularized need for such discovery").

Exceeding the scope of an expert report at trial does not automatically bar the testimony. Amaru v. Stratton, 209 N.J. Super. 1, 12 (App. Div. 1985). However, testimony based on information that was requested but not disclosed may be excluded. The key inquiry is whether the defendant had sufficient time prior to trial to investigate the probable testimony. Without that opportunity, a defendant's right to discovery and compulsory process "become[s] meaningless." Bellamy, 329 N.J. Super. at 378.

Here, the record reflects that Det. Sgt. Clayton prepared and preserved detailed laboratory reports, including supporting bench notes, comparative documentation,

and photographic images. Although Defendant argues that the State should have produced additional materials—such as every possible image, encoding file, or annotated photograph—the law does not require absolute precision or second-by-second annotation. It requires sufficient, relevant information to enable a defense. As the Appellate Division emphasized in Ghigliotty, the law requires that the defense be given meaningful access to the expert's conclusions and the basis for those conclusions, not that every visual cue be annotated or marked. See Ghigliotty, 463 N.J. Super at 385.

The expert reports identify, for each comparison, the specific evidence analyzed, the observed class and individual characteristics (including land and groove impressions, firing pin impressions, and breach face marks), the basis for identification, and the expert's supporting rationale. These findings are grounded in the expert's training and the features observed in the evidence. See Id. at 362–64 (summarizing comparative methodology in firearms analysis). The conclusions are presented with sufficient clarity to permit Defendant's ability to effective expert consultation and cross-examination.

While Defendant seeks greater specificity in DSgt. Clayton's examination and review, the Court notes that discovery rules do not require the State to produce materials or documentation that do not exist. The applicable rules mandate disclosure of all reports, notes, and underlying data actually generated in the course

of the expert's analysis. See R. 3:13-3(b)(1)(I). Here, the written discovery provided by the State, in conjunction with the testimony elicited during the Rule 104 hearing, fully satisfies the State's discovery obligations. The record reflects that DSgt. Clayton's methodology and conclusions were appropriately disclosed and subject to cross-examination. The hearing provided an additional opportunity to test the reliability of those conclusions and assess the scope of any missing or supplemental documentation.

In instances where materials could not be produced—either because they did not exist, were not preserved at the time, or fell outside standard practices—the State appropriately communicated that information. Delay or partial nonproduction of requested materials, especially where the requests extended beyond what was standard or required, does not warrant exclusion. See Washington, 453 N.J. Super. at 191. There is no evidence in this record of surprise, bad faith, or actual prejudice to the Defendant's ability to prepare for trial. The record also undermines any suggestion that the defense lacked adequate notice or opportunity to prepare. While the State did not formally identify DSgt. Clayton as a testifying expert until closer to the Rule 104 hearing, it is evident from defense counsel's detailed and technically sophisticated cross-examination that the defense was well aware of both the anticipated subject matter and the scope of Clayton's opinions. The questions posed reflected a high degree of familiarity with AFTE protocols, laboratory procedures,

and the contents of Clayton's reports. Moreover, the defense had access to the ballistics reports and related documentation for more than six years prior to the hearing. On this record, the Court cannot credit any claim of unfair surprise or insufficient opportunity to contest the State's expert evidence.

As emphasized in Arteaga and Pickett, a defendant may seek supplemental or underlying data that exceeds the baseline requirements of Rule 3:13-3. However, as the Appellate Division made clear in Ghigliotty, such a request must rest on a rational and articulated basis, it is not a vehicle for speculative or overly broad demands.

Here, the Court finds that the State has satisfied its discovery obligations under R. 3:13-3 by producing all expert reports and supporting materials relevant to DSgt. Clayton's firearm toolmark analysis. Moreover, in an abundance of caution and to ensure the fairness of the proceedings, the Court conducted a Rule 104 hearing at which DSgt. Clayton testified in detail and was subject to full cross-examination. This hearing afforded Defendant an additional opportunity to explore the expert's methodology, conclusions, and scope of testimony. In this way, the hearing also served to mitigate any potential prejudice from earlier delays in discovery or incomplete documentation.

There is no indication of undue surprise or prejudice to the defense. The Rule 104 hearing concluded approximately sixty days prior to trial, providing ample time for

Defendant to retain an expert, consult on the testimony presented, and otherwise prepare. In addition, the ballistics reports have been available to the defense for more than six years. On this record, the Court finds no discovery violation and no basis to conclude that the Defendant was deprived of a fair opportunity to challenge the State's expert evidence. Accordingly, preclusion is not warranted.

b. Reliability of Scientific Evidence: N.J.R.E. 702 and Olenowski

N.J.R.E. 702 sets the standard for the admissibility of expert testimony. The Rule provides: "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify thereto in the form of an opinion or otherwise." N.J.R.E. 702.

To admit expert testimony under this Rule, the proponent must establish three elements: (1) The subject matter of the testimony must be "beyond the ken of the average juror"; (2) The field of inquiry must be "at a state of the art such that an expert's testimony could be sufficiently reliable"; and (3) The witness must possess the necessary qualifications to offer that opinion. Olenowski I, 253 N.J. at 143 (quoting State v. J.L.G., 234 N.J. 265, 280 (2018)).

The trial court serves a critical gatekeeping function to ensure that expert testimony is both fair and reliable. As the Supreme Court has made clear, "[t]he

Judiciary must ensure that proceedings are fair to both the accused and the victim. Trial judges partly fulfill that responsibility by serving as a gatekeeper. In that role, they must assess whether expert testimony is sufficiently reliable before it can be presented to a jury." J.L.G., 234 N.J. at 307–08.

Although courts must evaluate reliability, Rule 702 favors admissibility. These requirements "are construed liberally in light of Rule 702's tilt in favor of the admissibility of expert testimony." State v. Jenewicz, 193 N.J. 440, 454 (2008). The standard does not demand infallibility. Rather, it asks whether the testimony has a "substantial degree of reliability" and whether it "would be 'an aid to the court or jury in determining the question in issue.'" State v. Wanczyk, 196 N.J. Super. 397, 402 (Law Div. 1984) (quoting State v. Cavallo, 88 N.J. 508, 517 (1982)). Put simply, the key inquiry is whether the expert's testimony will assist the trier of fact. See State v. Berry, 140 N.J. 280, 290 (1995).

New Jersey courts have consistently emphasized that Rule 702 does not require a flawless expert or unassailable methodology; it requires that the proffered opinion be reasonably grounded in a reliable field and capable of helping the jury understand material facts.

i. The Court Finds that Firearms Toolmark Analysis is Beyond the Ken of the Average Juror

As the gatekeeper, the trial judge must make a preliminary determination that the proposed expert testimony satisfies the threshold requirement that the subject

matter lies beyond the understanding of the average juror. Olenowski I, 253 N.J. at 143. The decision to admit such testimony rests within the trial court's sound discretion, including the decision whether to conduct a Rule 104 hearing. See State ex rel. C.D., 354 N.J. Super. 457, 466 (App. Div. 2002). Expert testimony is not required to explain the obvious or to resolve issues that jurors can determine without specialized assistance. State v. Simms, 224 N.J. 393, 403 (2016).

In this case, both the State and the Defendant agree that ballistics—and specifically, firearms toolmark identification analysis—involves subject matter beyond the ken of the average juror. The level of training and experience required to conduct the type of comparative analysis at issue and offer a reliable opinion clearly exceeds the knowledge possessed by the typical layperson. Accordingly, the Court finds that the first prong of N.J.R.E. 702 is satisfied.

ii. The Court Finds Firearms Toolmark Analysis is Reliable as a Matter of Law, and the Methodology was Reliably Applied in This Case

The second prong of N.J.R.E. 702 requires that expert testimony be both reliable and based on reliable information to be admissible at trial. For an expert opinion to satisfy this prong, the methodology employed must have "a sufficient scientific basis to produce uniform and reasonably reliable results so as to contribute materially to the ascertainment of the truth." State v. Kelly, 97 N.J. 178, 210 (1984).

"Methodology, in all its parts, is the focus of the reliability assessment, not outcome." In re Accutane Litig., 234 N.J. 340, 397 (2018). The proponent of expert

testimony bears the burden of clearly establishing its reliability. See State v. Cassidy, 235 N.J. 482, 492 (2018) (stating "[t]he proponent of the technique has the burden to 'clearly establish' general acceptance" under the Frye standard); Olenowski I, 253 N.J. at 618 (Pierre-Louis, J., dissenting) (noting that under the Daubert-type standard, the proponent still "must carry the burden to 'clearly establish' that the testimony is sufficiently reliable under N.J.R.E. 702"); State v. Shabazz, 400 N.J. Super. 203, 210 (App. Div. 2005) (proponent bears "the burden to 'clearly establish' reliability of the evidence").

An expert must rely on a technique or analysis grounded in "a sufficient scientific basis to produce uniform and reasonably reliable results so as to contribute materially to the ascertainment of the truth." State v. J.R., 227 N.J. 393, 409 (2017) (quoting Kelly, 97 N.J. at 210). Absolute certainty is not required if the method is derived from the scientific method and appropriately validated. In re Accutane Litig., 234 N.J. at 383. An expert's opinion must be supported by a reliable foundation in the knowledge and experience of the relevant discipline. Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 592 (1993).

The New Jersey Supreme Court has endorsed four non-exclusive, flexible *Daubert* factors to guide reliability determinations. Olenowski II, 255 N.J. at 584–85. These factors are: "(A) adequacy of standards; (B) publication and peer review; (C) testability and error rate; and (D) general acceptance." Id. at 585.

However, the Court cautioned that these factors are most useful when assessing novel methodologies. Courts must be careful not to invite continuous relitigating of well-established forensic techniques. As Olenowski II explained, "[i]t would be dysfunctional to have the admissibility of [ballistics] opinions depend upon how individual trial judges assess the reliability of their methodologies under the Daubert factors, based on varying presentations by varied counsel, and require appellate courts to defer to those varying and potentially conflicting rulings." Id. at 581. The gatekeeping inquiry must instead focus on new developments or material departures from established methods.

Although Defendant challenges the reliability of the proposed testimony under the second and third prongs of N.J.R.E. 702, his challenge to prong two as it concerns the state of the art in ballistics and toolmark identification fails.

New Jersey precedent firmly establishes the foundational reliability of firearms toolmark examination and related fields. See Ghigliotty, 463 N.J. Super. at 362. ("The science of firearm and toolmark identification is well-established, spanning over 100 years in the United States."); State v. Noel, 157 N.J. 141 (1999) (affirming the reliability of chemical spectroscopy for matching bullets to manufacturing lots); State v. McGuire, 419 N.J. Super. 88, 130 (App. Div. 2011) (toolmark analysis is "not a newcomer to the courtroom"). As Ghigliotty noted, "[n]either the underlying principles nor the methodology has changed significantly

during the last 100 years." 463 N.J. Super. at 362. Such issues, though relevant for cross-examination, do not displace the judiciary's settled conclusion that this methodology is generally reliable.

Firearms toolmark analysis typically involves comparing markings on bullets recovered from a crime scene with those produced by a suspect firearm. This technique has long been accepted as a proper subject of expert testimony. See State v. Metalski, 116 N.J.L. 543, 546 (1936) (no error in admitting testimony that recovered bullet "bore the same marks as those on a test bullet"). Firearms identification is a specialized subfield of toolmark identification that focuses on the working surfaces of firearm mechanisms. Ghigliotty, 463 N.J. Super. at 360. Toolmarks are categorized as either "class characteristics," manufacturer-determined features shared by many weapons, or "individual characteristics," random microscopic markings unique to a particular firearm. Id. at 361–62.

While toolmark analysis is generally unreliable on soft tissue, its use on hard surfaces enjoys broad acceptance across jurisdictions. McGuire, 419 N.J. Super. at 131 (citing Ramirez v. State, 810 So. 2d 836, 851–52 (Fla. 2001)). The 2009 National Academy of Sciences report noted that toolmark analysis "can be helpful in identifying a class of tools, or even a particular tool, that could have left distinctive marks on an object." McGuire, 419 N.J. Super. at 132. The report did not classify toolmark analysis as "junk science," and courts in New Jersey have consistently

admitted such testimony. Id. at 130. Moreover, more recent commentary, such as the 2021 NIST and CSAFE reports, have recommended improvements in transparency and documentation but have not called for wholesale exclusion of this technique.

Some courts in other jurisdictions have excluded ballistics evidence where the government failed to adhere to established standards regarding peer review and documentation. See, e.g., U.S. v. Monteiro, 407 F. Supp. 2d 351, 375 (D. Mass. 2006). Others have raised broader concerns about the discretion afforded to individual examiners. See United States v. Adams, 444 F. Supp. 3d 1248, 1262 (D. Utah 2020) (critiquing the AFTE theory of identification as a "tautology"); State v. Adams, ___ P.3d ____, 340 Or. App. 661 (2025) (adopting similar reasoning in a related case); but see Ghigliotty, 463 N.J. Super. at 380 (finding no issue with the AFTE theory, though rejecting a novel software program pending further hearing).

The fact that experts must exercise judgment based on training and experience does not undermine the reliability of the method. As Ghigliotty explained, "[a]ll technical fields which require the testimony of expert witnesses engender some degree of subjectivity requiring the expert to employ his or her individual judgment, which is based on specialized training, education, and relevant work experience." 463 N.J. Super. at 365.

In Ghigliotty, the Appellate Division affirmed the trial court's decision to hold a Frye hearing—not because the traditional comparison microscope methodology was unreliable, but because the experts incorporated a novel, untested software imaging program. Id. at 360. Since the experts could not form conclusions until using the 3D modeling software, the court found that the method materially departed from standard practice. Ibid.

Importantly, Ghigliotty did not express any doubt as to the reliability of traditional toolmark analysis using a comparison microscope. Id. at 363. In fact, the court noted that "the error rate in 'proficiency testing data . . . is approximately 1.0%[.]'" Id. at 365.

Although the court did not explicitly decide the issue, it also observed a potential deviation from standard peer review practice: that the peer reviewer who "is not supposed to be involved" in the initial investigation participated in implementing the new software technology. Id. at 370 n.8.

Taken together, the decisions in Ghigliotty, McGuire, and Metalski affirm that the science of firearms toolmark identification is reliable. Absent new scientific developments or improper application of methodology, the field continues to meet the standards of N.J.R.E. 702. The subjective component inherent in expert judgment does not bar admissibility. Ghigliotty, 463 N.J. Super. at 380.

This Court is bound by controlling precedent to find, as a matter of law, that the field of ballistics and toolmark examination satisfies the reliability requirements of Olenowski I and Olenowski II. As the Supreme Court emphasized, "[m]any categories of experts who testify frequently in criminal cases—such as ballistics experts, fingerprint experts, DNA analysts, coroners, serologists, toxicologists, accident reconstruction experts, cell tower experts, and so on—use the same methodologies repetitively." Olenowski II, 255 N.J. at 581. Constantly re-litigating the foundational reliability of such expert methodologies would be a "colossal undertaking" and is not required absent new research "that calls into question the wisdom of such precedent." Id. at 582. In the absence of such new research, the Court has no discretion to disregard settled authority.

Defendant's arguments raise two specific concerns previously acknowledged in *Ghigliotty*: (1) that the actual error rate in proficiency testing may be higher than 1%, and (2) that the verification process used in this case may not have been truly blind. See Ghigliotty, 463 N.J. Super. at 365, 370 n.8. Defendant's cognitive bias expert elaborates on why this second concern, in particular, could compromise the objectivity of the findings. The Court addresses these issues further in its discussion of the third prong of N.J.R.E. 702. However, the record in this case, including testimony from the verifying examiner, confirms that the NJSP procedure employed

a form of blind review consistent with its internal protocols, and the hearing afforded the defense an opportunity to probe that claim.

iii. Proficiency Testing

While Ghigliotty, published in 2020, reported that the error rate in proficiency tests was "close to 1%," more recent proficiency test results have cast doubt on that figure and warrant closer examination. Defendant has specifically highlighted the 2023 proficiency exam administered by Collaborative Testing Services, Inc., which, according to Defendant, reflected an unusually high error rate. See Exhibits D-33, D-41, D-42, D-43.

Proficiency exams are structured around a primary test item (item 1) and a series of comparison items (items 2 through n). The task requires the examinee to assess whether each comparison item was marked by the same tool as item 1, selecting "yes," "no," or "inconclusive" for each. Responses marked as "inconclusive" are not automatically deemed incorrect; however, they must be supported by an articulated rationale from the examinee. This structure is designed to simulate the practical judgment required in actual casework, where the option to issue an "inconclusive" determination may be both scientifically valid and ethically necessary.

To briefly summarize the historical proficiency testing data discussed at the hearing:

- 2014's exam included 381 participants and 4 items to be compared to the test item (labeled "item 1"), with a respective error rate for each item of: 0% for item 2, 1.6% for item 3, 1.6% for item 4, and 1.6% for item 5.
- 2016's exam included 376 participants and 4 items to be compared to the test item, with a respective error rate for each item of: 1.0%, 0%, 0%, and 0.3%.
- 2017's exam included 400 participants and 4 items to be compared to the test item, with a respective error rate for each item of: 0%, 0%, 0.3%, and 0.3%
- 2018's exam did not involve firearms. 2019 and 2020 exams were not provided to the court. 2021's exam did not involve firearms.
- 2022's exam included 316 participants and 4 items to be compared to the test item, with a respective error rate for each item of: 0.3%, 0%. 0.6%, and 0%.
- 2023's exam included 280 participants, with 4 items to be compared to the test item, with a respective error rate for each item of: 20.4%, 18.2%, 0.4%, and 18.9%.
- 2024's exam included 367 participants with 4 items to be compared to the test item, with a respective error rate for each item of: 0.3%, 0.3%, 0%, and 0%.

In light of the significant increase in incorrect responses on the 2023 exam, the Association of Firearm and Toolmark Examiners (AFTE) formed an ad hoc committee to investigate the unusually high number of false-positive and "inconclusive" results. See Exhibit D-6. The committee's report provides both a

rationale for not treating "inconclusive" responses as incorrect and essential context for understanding the elevated error rate associated with the 2023 proficiency test. This response underscores the field's ongoing commitment to self-assessment and methodological transparency.

The State, the Defendant, and the testifying experts all agree that the items presented in the 2023 exam were materially more challenging than those typically used in proficiency testing. The State characterizes the difficulty as unreasonable, while the Defendant contends that the 2023 exam more accurately replicated real-world casework than any prior or subsequent test. The ad hoc committee itself concluded that the test items lacked sufficiently clear individual characteristics to permit meaningful comparisons.

For the reasons discussed below, the Court finds that the 2023 error rate was appropriately calculated to exclude "inconclusive" responses. Only false positives constitute true errors for the purpose of evaluating examiner performance.

Further analysis of the participant responses, segregated by the accreditation status of the examinees' laboratories, yields important insights. See Exhibit D-6 at 5–7, Tables 2–5. Group A consisted of laboratories that opted, prior to receiving results, to submit their performance to accreditation bodies such as ANAB or

A2LA.[4] Group A achieved a 91.6% "no erroneous response" rate. Group B, comprised of laboratories that did not submit their scores for accreditation, yielded a 65.8% "no erroneous response" rate. This group may have included tests used for training purposes. *See* Exhibit D-6 at 6. Group C, in contrast, posted a 36% "no erroneous response" rate and included participants whose accreditation status was unknown (such as solo practitioners, non-practitioners, or any individual who purchased a test for independent scoring).

Viewed in that context, the 2023 error rate, though high, no longer appears as catastrophic as it initially seemed. The ad hoc committee further noted that the reasoning provided by participants for their "inconclusive" responses highlighted the unique challenges presented by the test. Several examiners described quality issues with the sample bullets, including water tank damage and indistinct markings. One examiner stated during a post-examination interview that, had the test been casework with access to the suspect firearm, "more test bullets would have been fired," an option unavailable during the exam. See Exhibit D-6 at 11. Others observed that the markings on the item 1 bullets lacked reproducibility. See Exhibit D-6 at 8. Such limitations are particularly significant given that real-world casework

[4] The NJSP Ballistics Unit has the same accreditation.

often allows for repeated testing and corroborative analysis, conditions absent in the one-time proficiency exam format.

Another point of contention was the marked increase in "inconclusive" responses compared to previous years. The Defendant repeatedly argued, both in briefing and on direct and cross-examination, that allowing "inconclusive" as a response without counting it as incorrect undermines the exam's reliability. Counsel analogized this to permitting a law school applicant to answer only four questions on the LSAT, leave the remainder blank, and still receive a perfect score. However, this analogy disregards the varying incentives and objectives built into different testing formats.

The ad hoc committee rejected this comparison. It reported that many of the bullets labeled items 2, 3, and 5 were fired from a firearm of the same make and model as the firearm that fired item 1, resulting in shared class characteristics. Many laboratories, as a matter of policy, prohibit examiners from concluding elimination when class characteristics agree—since such agreement renders elimination scientifically untenable. *See* Exhibit D-6 at 4.

CTS's approach to evaluating "inconclusive" responses aligns with how responsible laboratories expect their examiners to behave in actual casework. If a test imposes no penalty for incorrect answers, examinees are incentivized to guess when unsure. If incorrect answers carry negative consequences, examinees are

incentivized to respond only when confident. And if unanswered questions are excluded from scoring altogether, the incentive becomes even stronger to respond only when absolutely certain. The relevant question is which model best suits the forensic context.

In the field of toolmark examination, it is more appropriate to instill a cautious approach—where responses are submitted only when the examiner possesses sufficient certainty. An "inconclusive" response is preferable to erroneously implicating an innocent individual. Contrary to the Defendant's suggestion, "inconclusive" responses are not automatically treated as correct. In the 2023 test, CTS made clear that such responses "should not always be accepted without question. Laboratories must evaluate the inconclusive results and determine whether or not they are appropriate . . . in consideration of laboratory protocols." Exhibit D-6 at 21.

Accordingly, the Court finds that the handling of inconclusive responses in the 2023 exam was consistent with professional standards and does not undermine the foundational reliability of the methodology or the qualifications of the NJSP Ballistics Unit.

c. The Net Opinion Rule and N.J.R.E. 703

N.J.R.E. 703 governs the basis for expert opinion testimony as follows:

> The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to the expert at or before the proceeding. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence. [N.J.R.E. 703.]

Under New Jersey law, N.J.R.E. 703 requires that expert opinion testimony be based on "facts or data derived from (1) the expert's personal observations, or (2) evidence admitted at the trial, or (3) data relied upon by the expert which is not necessarily admissible in evidence but which is the type of data normally relied upon by experts." Townsend v. Pierre, 221 N.J. 36, 53 (2015) (quoting Polzo v. County of Essex, 196 N.J. 569, 583 (2008)). The relevant inquiry is not whether the court finds the underlying data independently admissible, but whether experts in the relevant field reasonably rely on such data. Rubanick v. Witco Chem. Corp., 125 N.J. 421, 445 (1991).

An expert may not offer a conclusion that lacks factual explanation or methodological support. While the law does not require the expert to exhaustively list every factor considered or every alternative rejected, it does require that the expert explain the "why and wherefore" of the opinion—providing a factual basis and a description of the methodology sufficient for meaningful review and cross-examination. Townsend, 221 N.J. at 53–55; State v. Burney, 255 N.J. 1, 23 (2023).

The net opinion doctrine, a corollary to N.J.R.E. 703, "forbids the admission into evidence of an expert's conclusions that are not supported by factual evidence or other data." Townsend, 221 N.J. at 53–54. An expert must provide the reasons supporting the opinion, rather than merely stating a conclusion. Id. at 54. Opinions based solely on personal views, as opposed to objective facts or reproducible methods, are inadmissible under this doctrine. Burney, 255 N.J. at 23, 25.

Importantly, the net opinion rule is "not a standard of perfection." Townsend, 221 N.J. at 54. Experts are not required to frame or support their opinions in the particular manner preferred by opposing counsel. Rather, they must be able to identify the factual bases for their conclusions, explain their methodology, and demonstrate that both the underlying facts and the methods used are scientifically reliable. Id. at 54–55 (quoting Landrigan v. Celotex Corp., 127 N.J. 404, 417 (1992)). The failure to consider one particular condition or fact does not justify exclusion of expert testimony, so long as the expert otherwise articulates sufficient support for the opinion. Townsend, 221 N.J. at 55.

However, it is appropriate to exclude expert testimony that references statistics or factual data not contained in the expert's report and not otherwise disclosed in discovery. Mauro v. Owens-Corning Fiberglas Corp., 225 N.J. Super. 196 (App. Div. 1988), aff'd sub nom. Mauro v. Raymark Indus., Inc., 116 N.J. 126 (1989).

This Court finds that the proffered expert reports and anticipated testimony do not constitute "net opinions" prohibited by N.J.R.E. 703 or Townsend. Clayton's reports specify, for each item, the specimens that were compared, the observed features that agreed, and the features or markings that formed the basis of each identification or inconclusive determination. These reports contain adequate factual recitation and specific reference to observed features, consistent with the accepted practices of the field. See Ghigliotty, 463 N.J. Super. at 360–65. The absence of annotated or high-resolution images for every comparison mark goes to the weight of the evidence and is appropriate for cross-examination, but it does not preclude admissibility. The reports include sufficient representative photographs to meet the threshold requirement. Moreover, the methodology and conclusion were explained and tested during the Rule 104 hearing, where Clayton's explanations were subject to detailed cross-examination.

The New Jersey Supreme Court has expressly declined to require perfection in expert reporting, instead emphasizing the necessity for experts to "identify the factual bases for their conclusions, explain their methodology, and demonstrate that both the factual bases and the methodology are scientifically reliable." Townsend, 221 N.J. at 54–55. Clayton's testimony and documentation satisfy that standard. Defendant remains free to highlight any perceived shortcomings through cross-examination, retain alternate experts, or raise such concerns in summation. These

are the mechanisms the law envisions to test the credibility and reliability of expert testimony.

d. Blind Verification and Cognitive Bias

The Defendant has submitted the opinion of Dr. Jeff Kukucka, an academic expert in cognitive bias and human factors, for the Court's consideration. Dr. Kukucka's affidavit and publications outline the background risk of cognitive bias in subjective forensic comparisons, advocate for best practices, and recommend documentation and blinding as methods of control. However, under both New Jersey and national legal precedent, such concerns relate to matters of cross-examination, evidentiary weight, and, where appropriate, limiting instructions, not to baseline admissibility.

In the present matter, Detectives Clayton and Smith, qualified experts, testified that the methodology employed and the data relied upon in this case conform to the standards in their field. Defendant has offered no expert opinion to dispute that conclusion. Instead, Defendant presents a critique from a qualified academic in a related but tangential field.

While Dr. Kukucka is well-credentialed and experienced in the psychology of decision-making, his critique is directed at the broader discipline of toolmark analysis rather than the specific examination conducted in this case. He offers no

substantive analysis of the methodology or procedures used by the examiner in this matter, and his affidavit presents only cursory impressions of what "appeared" or "seemed" to have occurred. Moreover, Dr. Kukucka acknowledged during cross-examination that he was not trained in toolmark comparison and that he had not examined any of the physical evidence in this case.

To the extent that Dr. Kukucka's opinion raises concerns regarding potential cognitive bias in DSgt Clayton's examination, the testimonial record squarely addresses and dispels those concerns. DSgts Clayton and Smith testified credibly and consistently about the protocols employed by the New Jersey State Police (NJSP) Ballistics Unit to mitigate bias and insulate examiners from suggestive influences. DSgt. Smith offered a detailed explanation of how those protocols are designed and implemented, with a specific focus on procedures aimed at reducing the risk of cognitive and contextual bias. Their testimony was supported by the State's written submissions and extensive documentation of the NJSP's internal quality assurance and peer review processes.

According to the testimony, the NJSP Ballistics Unit adheres to standard operating procedures that incorporate principles of blind verification, independent analysis, and quality assurance review. These protocols are not only consistent with the AFTE, but also align with methods used by other accredited forensic laboratories conducting comparable analyses. DSgt. Smith testified that blind verification occurs

without knowledge of the original examiner's conclusions, maintaining the integrity of the review process. As both a technical reviewer and microscopic reviewer, DSgt. Smith emphasized the importance of conducting examinations and peer reviews in a manner that preserves examiner independence and minimizes the risk of influence. The Court finds this testimony both credible and persuasive.

The Defendant remains free to present expert testimony concerning cognitive bias, or to cross-examine the State's witnesses about the adequacy of their procedures. However, such cross-examination or contrary opinion does not render the State's expert testimony inadmissible. Challenges of this nature affect the weight of the evidence, not its admissibility.

This Court further finds that Defendant has not introduced any novel scientific research, expert analysis, or authoritative development that undermines the well-established foundation supporting the admissibility of firearms and toolmark identification evidence. There is no testimony from a competing expert, no binding precedent, and no newly accepted scientific study that calls into question the reliability or general acceptance of the methodology used in this case. Indeed, no forensic toolmark examiner testified on behalf of the defense, nor did any defense expert conduct a technical review of Clayton's conclusions or propose an alternative interpretation of the comparison results. The Court is mindful that cross-disciplinary critiques are not substitutes for discipline-specific rebuttal evidence.

Although Defendant initially cited the 2016 report of the President's Council of Advisors on Science and Technology (PCAST) in support of the claim that firearm toolmark analysis is "not foundationally valid," the Defendant ultimately conceded that such a broad challenge exceeds the scope of the present motion. The Court notes that even if such an argument were properly before it, the characterization of the PCAST report is misplaced. As courts and scholars have repeatedly recognized, the PCAST report does not amount to binding legal authority, nor does it reflect a consensus within the relevant scientific community. See James Agar, The Admissibility of Firearms and Toolmarks Expert Testimony in the Shadow of PCAST, 74 Baylor L. Rev. 94, 158–74 (2022) (discussing post-PCAST empirical research and judicial response). Moreover, even courts that have acknowledged PCAST's critiques have generally declined to exclude ballistics testimony on foundational validity grounds.

To the extent that Defendant's arguments amount to a generalized critique of the field of firearms identification, rather than a case-specific challenge to the methods or conclusions used in this matter, those arguments fall outside the scope of Rule 104 and warrant no further discussion at this stage.

Finally, the Court notes that no controlling legal, scientific, or regulatory authority mandates the use of additional blinding, sequencing, or bias-mitigation procedures beyond those already employed by the NJSP Ballistics Unit. While Dr.

Kukucka recommends more extensive safeguards, including more comprehensive documentation and procedural blinding, his recommendations exceed the current standards accepted by courts and professional bodies alike. The mere existence of a more rigorous alternative does not render the prevailing protocols legally or scientifically deficient. Concerns about subjectivity or cognitive bias, though appropriate for cross-examination or rebuttal, bear on the scope and weight of the expert testimony, not on its admissibility. This is particularly true where, as here, the procedures employed were explained under oath, subject to cross-examination, and consistent with national forensic laboratory practice.

e. Standard Operating Procedures – (Expert's Principles and Methodology)

A trial judge must focus on the expert's principles and methodology, not on the conclusions they generate. The critical inquiry is "whether comparable experts accept the soundness of the methodology, including the reasonableness of relying on [the] type of underlying data and information." Carl v. Johnson & Johnson, 464 N.J. Super. 446, 453 (App. Div. 2020) (quoting In re Accutane Litig., 234 N.J. at 384, 390).

At the outset, the Court notes the important distinction between a *standard* and a *guideline*, a difference that was occasionally conflated in the parties' submissions and during the hearing. A *standard* establishes a mandatory

requirement that must be followed; a *guideline* recommends best practices and is instructive but not binding. Consistent with this Court's prior opinion regarding the admissibility of DNA evidence, compliance with guidelines is not a prerequisite for reliability, although such compliance is relevant to the overall inquiry. See March 6, 2025, Opinion and Order at 36, 117–29. Similarly, the Court reaffirms that standards do not lose their validity merely because they incorporate examiner discretion. The Court further recognizes that discretion within a standardized framework is not only unavoidable in comparative forensic disciplines, but expressly contemplated by their governing standards.

f. Methodology and Protocols

The Court finds that the standards contained within the New Jersey State Police Forensic & Technical Services Section Manual, constitute relevant and reliable protocols. See Exhibit S-10. These include the requirement of microscopic comparison to associate a fired bullet with a firearm, as well as permitting comparison between two unknown items. Id. at 54. The standard also sets out preliminary steps, such as preparing at least two test bullets, while allowing examiner discretion to conduct additional test fires "as deemed necessary." Id. at 55. The Court further notes that these standards re broadly consistent with the practices

described in the AFTE training materials and publications, which are widely accepted in the forensic science community.

Much of the non-mandatory language challenged by Defendant reflects the reality that forensic toolmark examination cannot be reduced to rigid formulas. For example, the manual notes it is generally best to align right-twisting bullets pointing to the right for optimal illumination but allows deviation when examiners find alternative methods more effective. Id. at 56. At the same time, the SOPs impose non-discretionary obligations: once individual characteristic agreement is observed, "**representative** photographs shall be taken of those specific areas to document the areas of sufficient agreement to make that conclusion." Id. at 57 (emphasis in original). This combination of procedural flexibility and core requirements is consistent with the nature of the toolmark examination, which often requires individualized examiner judgment based on variable physical characteristics.

The mere presence of words such as "may," "should," or "can" does not undermine the objectivity of a method or render it unreliable. The competent and consistent testimony of DSgt Clayton and DSgt Smith demonstrates that the NJSP laboratory followed internal protocols and adhered to generally accepted practices in the forensic community. Indeed, most permissive language in the NJSP manual addresses variability in observed class or individual characteristics. For instance, breech face marks "typically" appear compressed but "can" be striated depending

on the manufacturing process. Id. at 59. DSgt. Clayton testified that he followed these SOPs in this case, including preparation of multiple test bullets, alignment procedures, and photographic documentation where individual agreement was observed.

The NJSP SOPs also set out objective prerequisites for reaching particular conclusions. A determination of "Identification" requires that all discernable class characteristics match, combined with a subjective, but guided, judgment that individual characteristics are in sufficient agreement. Id. at 62. Similarly, a finding of "Inconclusive" also demands agreement among all class characteristics. Any class characteristic discrepancy categorically precludes an identification or inconclusive result; the only permissible outcomes are elimination or unsuitability for analysis.

The Defendant further contends that the AFTE definition of "sufficient agreement" lacks clarity and invites unreliable conclusions. The Court finds this argument unpersuasive. The AFTE definition, adopted by the New Jersey State Police and employed by DSgt Clayton, is articulated in the training manual entered into evidence and provides a clear, objective framework: sufficient agreement requires that the compared surface contours "exceed the best agreement demonstrated between two toolmarks known to have been produced by different tools." Id. at 63. While individual examiners may calibrate this benchmark based on personal experience with known non-matches, the underlying principle remains

standardized and measurable. The process is far more structured than a mere "looks good to me" judgment. Moreover, the Court finds that this practice aligns with precedent that has long upheld the admissibility of firearm and toolmark identification in New Jersey courts. See McGuire, 419 N.J. Super. at 130–32; Ghigliotty, 463 N.J. Super. at 362–64. This calibration-based approach has been endorsed in other jurisdictions and has not been deemed unreliable merely because it allows for professional discretion.

The guidelines Defendant cites in support of his challenge to Clayton's methodology, including those found in Exhibit D-7 at 7, are not binding standards but may be presented at trial to argue that superior methods exist. During the evidentiary hearing, Defendant's counsel questioned why Clayton did not follow the procedures in the ATF Laboratory Services' Firearms and Toolmarks management system documents. See 2T 189-10; Exhibit D-8. Clayton explained that ATF's procedures apply only to ATF laboratories, and that each laboratory maintains its own protocols. See 2T 179-4, 189-12. The ATF manual itself expressly states that its procedures "are used only in ATF laboratories and not published with the intent of setting a policy or analysis standard for other laboratories." Exhibit D-8 at 1. Variability among laboratories, so long as it remains within the accepted margin of reliability adopted by the field, does not invalidate the resulting analysis. The evidentiary hearing record supports the conclusion that DSgt Clayton's methodology

is not only consistent with NJSP SOPs, but also aligns with practices accepted by accredited laboratories in other jurisdictions.

The Defendant's challenge to Clayton's methodology, while procedurally appropriate, is not supported by the record. The steps undertaken by DSgt. Clayton—side-by-side microscopic comparison of class and individual characteristics, photographic documentation of concordant areas, and review confirmation—are consistent with methods accepted in this and other jurisdictions. See McGuire, 419 N.J. Super. at 130–32; Ghigliotty, 463 N.J. Super. at 362–64. There is no evidence that the expert's conclusions were based on speculation or unscientific intuition.

For these reasons, the Court finds that the NJSP protocols, while flexible in application, adhere to the rigor and structure expected of forensic methodologies and provide a sufficient framework to satisfy N.J.R.E. 702.

g. Qualifications of DSgt Clayton and DSgt Smith

With respect to Defendant's argument that DSgt. Clayton is unqualified due to the absence of undergraduate coursework in physics or general chemistry; the Court again emphasizes the difference between a *standard* and a *guideline*. Defendant relies on ANSI/ASB Standard 105 to argue that Clayton does not meet

the requisite qualifications but misstates the content and applicability of that standard.

While the 2021 version of Standard 105 requires new examiner trainees to hold a bachelor's degree and have completed coursework in physics, general statistics, and general chemistry, it expressly states that these requirements apply prospectively and "do not apply to previously trained and qualified firearm and toolmark examiners." Id. at 1. The 2024 version retains this language. AFTE's certification policy also makes clear that "[a]lthough it is desirable that the candidate has had major coursework in physical science, natural science, forensic science, criminalistics, criminal justice, police science, industrial technology, or related fields of study, possession of a baccalaureate degree in any subject will meet the basic requirement." AFTE Certification Policies and Procedures, available at https://afte.org/certification/certification-policies-procedures/ (last visited July 21, 2025) (emphasis added).

DSgt. Clayton holds a baccalaureate degree and completed a two-year internal training program with the New Jersey State Police Ballistics Unit, which included structured instruction, supervised casework, competency assessments, and proficiency testing. He has since conducted thousands of comparisons, received continuing education through AFTE, and been qualified as an expert over sixty times in state and federal court. No evidence in the record suggests that he has failed any

external proficiency examination or deviated from accepted protocols in his prior testimony.

In context, the prevailing industry standards demonstrate that while science coursework is desirable for new entrants, extensive experience, professional training, and applied competency are widely accepted as sufficient for qualification. Clayton met the applicable standards at the time he began his career in firearms examination and continues to meet them today. His skill, education, training, and experience are more than sufficient to meet the standard for qualification. See Jenewicz, 193 N.J. at 454.

Finally, Defendant's argument that Clayton lacks sufficient exposure to firearms because he has not personally examined a "meaningful percentage" of the 400–500 million firearms in the United States merits no serious consideration. There exists no standard—scientific, legal, or practical—that defines expertise by reference to a percentage of total national firearms viewed. This Court is unaware of any examiner who could meet such a requirement and finds the argument devoid of merit.

The rationale applies to DSgt Smith, who completed a rigorous 11-month training program at the ATF's National Firearms Examiner Academy and has served as both a technical and microscopic peer reviewer. DSgt Smith's training,

certifications, and role within the NJSP Ballistics Unit further support the reliability of the verification process employed in this case.

V. The Evidence Is Admissible Under N.J.R.E. 401 and 403

Finally, the proposed ballistics evidence is clearly relevant under N.J.R.E. 401. It bears directly on issues of identity, motive, means, and causation in connection with the murder and the gun charges. Defendant has not shown that the probative value of this evidence is "substantially outweighed" by any danger of unfair prejudice, confusion of the issues, or undue consumption of time. See N.J.R.E. 403.

That forensic evidence may appear technical or involve expert interpretation is not, standing alone, a basis for exclusion. Concerns of that nature are properly addressed through cross-examination, the presentation of competing expert testimony, and appropriate jury instructions. See Olenowski II, 255 N.J. at 609.

Courts in New Jersey have consistently held that complexity or juror unfamiliarity with scientific techniques does not justify excluding otherwise admissible expert evidence. See State v. Harvey, 151 N.J. 117, 170-71 (1997) (the jury is presumed capable of understanding and weighing expert testimony with the aid of instruction from the court). The evidence at issue here directly supports the

State's theory of the case and satisfies the minimal threshold for relevance under N.J.R.E. 401.

VI. CONCLUSION

After reviewing the papers submitted, conducting a multi-day evidentiary hearing, and thoroughly considering the testimony, evidence, and oral argument, this Court finds that Detective Sergeant Clayton satisfies all requirements for admissibility as an expert in firearms and toolmark analysis. Clayton's qualifications meet the standards accepted in the field, and his investigation adhered to established best practices. The State has presented clear and convincing evidence that Clayton's conclusions were subjected to a sufficiently impartial and blinded review process, and that this process was contemporaneously documented. The safeguards against cognitive bias in place at the New Jersey State Police laboratory meet industry standards, even if some laboratories have begun implementing more stringent protocols. DSgt Clayton's testimony will assist the trier of fact in understanding the evidence and determining the facts in dispute.

The Defendant's critique of firearm and toolmark identification is robust, comprehensive, and reflects current national debates. However, this motion is not the proper forum for revisiting the broader scientific foundations of ballistics. New Jersey precedent, the sufficiency of documentation provided, and the jury's role in

assessing expert testimony all weigh in favor of admissibility. The record reveals no deficiency in results or documentation, nor any evidence of bias or error that would justify exclusion. The State has met its burden of proving, by clear and convincing evidence, that the examinations in this case complied with the accepted scientific standards of the field. This conclusion is further supported by the absence of a rebuttal expert or alternative analysis offered by the defense. The defense has laid ample groundwork for a vigorous cross-examination. While its argument that the state of the art may be shifting has previously been considered and rejected by New Jersey courts, that argument as it applies to the evidence in this case remains a matter for the jury to evaluate.

Defendant alternatively requests that the expert be limited to opining only on class characteristics, or that his conclusions be confined to the language that the recovered bullets "cannot be excluded" as having been fired by the firearm in question. While some out-of-state decisions have imposed such limitations, such restrictions are not warranted here. This Court's gatekeeping function does not extend to prejudging the weight or persuasive force of reliable expert evidence, nor does it permit the imposition of a heightened standard beyond what is accepted in the field. The focus under N.J.R.E. 702 is on the reliability of the methodology employed, not on the expert's conclusion.

Although an element of subjectivity is inherent in firearm and toolmark comparison, that subjectivity is not disqualifying. It reflects the nature of the physical evidence and the limitations of scientific certainty. Stochastic effects preclude definitive identification of a firearm; it is neither feasible nor scientifically required to test every firearm in existence. Moreover, no two bullets are microscopically identical even before they are fired. Scientific reliability does not demand infallibility. Even in disciplines regarded as objective, margins of error are accepted.

Firearms analysis involves objective criteria, such as the number of lands and grooves; measurable but variable data, such as impression depths; and components subject to examiner discretion. That discretion is bounded by accepted standards, reinforced through rigorous recertification processes that prioritize conservative identification practices, and safeguarded by verification procedures in which a second examiner independently applies their expertise. For over a century, these measures have produced results far more reliable than random chance. While perfect certainty is unattainable, the presentation of reliable evidence to a jury, subjected to adversarial testing, remains the most effective safeguard for the truth. The Court is satisfied that the procedures followed here are consistent with those accepted by the national forensic science community and that any residual uncertainty is appropriately explored through cross-examination and jury evaluation.

In sum, the State has fulfilled its discovery obligations. The defense has not been deprived of the opportunity to consult an expert or meaningfully challenge the State's case through cross-examination. The expert's opinions are supported by adequate factual detail and reasoning. The methodology is sound, and the proffered evidence is reliable under New Jersey law. Defendant's remaining criticisms are appropriate for trial, not for exclusion.

For all the foregoing reasons, and based on the full record before it, this Court finds that the firearm and toolmark testimony of DSgt Clayton is admissible under N.J.R.E. 702, 703, 401, and 403. Defendant's motion to preclude the ballistics evidence is therefore **DENIED.**