Latent Print Section

ACE-V Methodology for Friction Ridge, Footwear and Tire Tracks

1. Scope

This policy details the examination of friction ridge skin, footwear, and tire impressions performed by the Latent Print Section of the Maine State Police Crime Laboratory.

2. Quality Assurance

2.1 The Section Supervisor will ensure that all personnel performing these examinations are fully trained latent print examiners and they follow the appropriate Laboratory and Section Protocols.

2.2 Evidence examinations vary from case to case due to the evidence received, the condition of that evidence and the very nature of this evidence. It is the responsibility of the Examiner, the Technical Reviewer and the Section Supervisor to ensure that proper methods and policies are followed.

2.3 Deviations from protocols are sometimes necessary and this will be evaluated on a case-by-case basis. Any deviations from protocol will be recorded in the case notes and approved by the Section Supervisor.

3. ACE-V Methodology

3.1 The Latent Print Section uses a reoccurring application of the Analysis, Comparison, Evaluation, and Verification ("ACE-V") Methodology in the examination of friction ridge skin, footwear, and tire impressions.

3.2 The ACE-V Methodology includes both qualitative and quantitative aspects of impression evidence.

3.3 ACE-V is synonymous with hypothesis testing and is used in all aspects of casework as part of the examination and decision-making process.

3.4 The Latent Print Section subscribes to the position embraced by the general comparative sciences community which states there is no scientific support for the use of a fixed threshold value for the establishment of a conclusion of identification.

4. Friction Ridge, Footwear and Tire Impression Examination

4.1 **Analysis** is the interpretation of observed data in an impression to categorize its utility for comparison. The analysis phase is the examination of all variables influencing the impression in question and applies to both unknown and known (exemplar) impressions.

4.1.1 The observable data in the questioned impression shall be analyzed and documented prior to comparison with an exemplar impression.

4.1.2 The quality of the data in the impression should be considered during the analysis. The quality is influenced by factors such as deposition pressure, distortion, and the matrix. The examiner is encouraged, but not required, to use a color-coding scheme to show variabilities in the quality of the impression.

4.1.3 The features and related observable data that should be considered during the analysis include, but are not limited to:

- Residue/Matrix of the impression
- Deposition pressure
- Distortion
- Surface/Substrate
- Environmental conditions
- Development medium
- Preservation method
- Outsole/Tread design of Unknown and Known
- Class Characteristics of Unknown and Known
- Mold Characteristics of Known
- Wear and Random defects in Unknown and Known
- Time Since collection of Known Exemplars
- Classification pattern
- Ridge flow
- Minutiae
- Creases or wrinkles, and scars
- Other attributes, such as type, location, orientation, shape, texture, and morphology

4.1.4 At a minimum, features shall be included to support the examiner's utility decision (e.g., minutiae, ridge flow, pattern, apparent wear, other apparent damage, or anomaly, etc.).

4.1.5 Documentation of the analysis will be included in the case file.

4.1.6 Unknown impressions that are deemed suitable for comparison will be given a unique identifier. For example: R1 (ridge detail), F1 (footwear impression), T1 (tire impression).

4.1.6.1 Suitability is a subjective determination by a latent print examiner that the impression contains sufficient observed data to be utilized for comparison and a Source Conclusion can potentially be reached.

4.1.6.2 Suitability determinations are formulated in consideration of the quality and quantity of the observed data in the impression.

4.1.6.3 Due to the nature of impressions, the determination of the utility of an impression can change after further analysis, after the commencement of comparisons, or during the evaluation phase of ACE.

4.2 **Comparison** is the search for, and detection of, similarities and differences in observed data between two potentially corresponding impressions.

4.2.1 An exemplar impression shall be selected to compare against the questioned impression. Selection of an exemplar impression for comparison should take into consideration:

4.2.1.1 Apparent similarity of the exemplar impression to the questioned impression. NOTE: Similarity can be determined by visual observation or automated comparison algorithms.

4.2.1.2 Completeness of the recording of the impression.

4.2.2 The exemplar impression should be analyzed and assessed for its utility for comparison.

4.2.3 Comparison of features shall proceed from the lower quality impression to the higher quality impression.

4.2.3.1 If the lower quality impression is determined to be the exemplar impression, an analysis shall be conducted on the exemplar prior to comparison.

4.2.4 The target group in the lower quality impression identified during Analysis or another target group should be selected for comparison with the higher quality impression.

4.2.5 Features of the two impressions shall be assessed for correspondence or noncorrespondence in a side-by-side comparison, and/or superimposition comparison in footwear and tire mark impressions.

4.2.6 Features assessed as corresponding shall be documented and be evaluated for a source conclusion. Features assessed as noncorresponding may be documented.

4.2.6.1 Documentation should be preserved digitally. The annotations may be done manually by the examiner or with the assistance of automated comparison software.

4.2.6.2 Documentation shall occur contemporaneously during the side-by-side comparison and should be done in a non-destructive manner on a digital image copy of each friction ridge impression.

4.2.6.3 Documentation should continue until an accumulation of features supports a source conclusion.

4.2.6.4 Documentation shall distinguish between features initially interpreted during analysis and features interpreted during comparison (prior to side-by-side or superimposition comparison). Documentation can take the form of using different layers in Photoshop (i.e., an Analysis layer and a Comparison layer) or by using a new mark-up file.

4.3 **Evaluation** is the weighting of the aggregate strength of the observed similarities and differences between the observed data in the two impressions in order to formulate a source conclusion.

4.3.1 Source conclusions for friction ridge comparisons in the Latent Print Section are expressed in the following terms:

4.3.1.1 **Exclusion:** This conclusion is used when there is sufficient quality and quantity of detail in disagreement to conclude that two friction ridge impressions did not originate from the same source.

4.3.1.2 **Identification:** This conclusion is used when there is sufficient quality and quantity of detail in agreement to conclude that there would not be this level of agreement with a known impression from a different source.

4.3.1.3 **Inconclusive:** This non-definitive conclusion may be used after a comparison has been conducted without sufficient agreement or disagreement being observed. This may be due to the following reasons: 1) illegible known prints, 2) incomplete known prints, 3) when corresponding friction ridge detail was not located, 4) when corresponding friction ridge detail was located, but is insufficient for identification, 5) any other reason that does not allow for a definitive conclusion. When using this non-definitive conclusion, the examiner must provide a reason in the worksheet or case notes, and in the report.

4.3.2 Source conclusions for footwear and tire impression comparisons in the Latent Print Section are expressed in the following terms:

4.3.2.1 **Exclusion:** This is the highest degree of non-association expressed in footwear and tire impression examinations. Sufficient differences were noted in the comparison of class and/or randomly acquired characteristics between the questioned impression and the known footwear or tire. The known footwear or tire was not the source of, and did not make, the impression.

4.3.2.2 **Indications of Non-association:** The questioned impression exhibits dissimilarities when compared to the known footwear or tire; however, the impression lacks sufficient quality or clarity to permit an elimination.

4.3.2.3 **Limited Association of Class Characteristics:** Some similar class characteristics were present; however, there are significant limiting factors in the either impression that do not permit a stronger association between the questioned impression and the known footwear or tire. These factors may include but are not limited to: insufficient detail, lack of scale, improper position of scale, improper photographic techniques, distortion or significant lengths of time between the date of the occurrence and when the footwear or tires were recovered resulting in a different degree of wear.

No confirmable differences were observed that could exclude the footwear or tire. Other footwear and tires with the same class characteristics observed in the impression are included in the population of possible sources.

4.3.2.4 **Association of Class Characteristics:** Both the design and physical size correspond in the questioned impression and known footwear or tire. There may also be correspondence of general wear.

The known footwear or tire is one possible source of the questioned impression and could have produced the impression. Other footwear or tires with the same class characteristics observed in the impression are included in the population of possible sources.

4.3.2.5 **High Degree of Association:** The questioned impression and known footwear or tire must correspond in the class characteristics of design,

physical size, and general wear if present. For this degree of association there must also exist wear that, by virtue of its specific location, degree and orientation (specific location of wear) make it unusual and/or one or more individual characteristics. The characteristics observed exhibit strong associations between the questioned impression and known footwear or tire; however, the quality and/or quantity were insufficient for identification.

Other footwear or tires with the same class characteristics observed in the impression are included in the population of possible sources only if they display the same wear and/or randomly acquired characteristics observed in the questioned impression.

4.3.2.6 **Identification:** This is the highest degree of association expressed in footwear and tire impression examinations. This opinion means that the questioned impression and known footwear or tire share agreement of class and randomly acquired characteristics of sufficient quality and quantity. The known footwear or tire was the source of and made the questioned impression.

4.4 **Verification** is confirmation, through either re-examination or review of documented data by another examiner, that a conclusion or opinion conforms to specified requirements and is reproducible. NOTE: "Specified requirements" are the Latent Print Section's policies and procedures relating to Analysis, Comparison and Evaluation of impressions.

4.4.1 Verification is a quality control measure and applies to all source and suitability conclusions formulated by the Latent Print Section. See LP-P001 Quality Assurance for the Examination of Friction Ridge, Footwear, and Tire Tracks document for the Latent Print Section verification policy.

4.5 Simultaneous Impressions

4.5.1 A simultaneous impression is when two or more friction ridge impressions were deposited on an object as a single touch from the same hand or foot.

4.5.2 Two or more friction ridge impressions from the same hand which are consistent with simultaneity can be used in the aggregate and considered a single impression when conducting examinations.

4.5.3 If a conclusion of identification, inconclusive or exclusion can be derived without invoking simultaneity, or if the issue of simultaneity itself is not relevant, then this process does not apply.

5. Resource Material

5.1 The TreadTyper in the SWGTREAD forum at TREADFORENSICS.com can be used to query other footwear examiners around the world to assist in identifying make and manufacturer of unidentified footwear impressions found at a scene. See the TreadTyper forum for instructions on submitting a query.

5.2 The Laboratory receives the Tire Guide annually which can be searched to assist in determining the manufacturer of a tire impression as well.

5.3 Other sources are available to help determine the manufacture of footwear and tire. Online resources may be utilized.

5.4 TreadTyper, the Tire Guides and other resources are used as an investigative tool only and may aid the investigator in finding the source of these impressions.

6. For Consultations, Technical Review, Verification, and Conflict Resolution policies and procedures see LP-P001 Quality Assurance for the Examination of Friction Ridge, Footwear, and Tire Tracks.

7. References:

- Friction Ridge Subcommittee of the Organization of Scientific Area Committees (OSAC) *Forensic Science Best Practice Recommendation for Analysis of Friction Ridge Impressions* (ver. 1.0 Sept 2020)
- *Best Practice Recommendation for Comparison and Evaluation of Friction Ridge Impressions* (ver. 1.0 Sept 2020)
- *Best Practice Recommendation for Verification in Friction Ridge Examination* (ver. 1.0 Sept 2019)
- *Standard for Examining Friction Ridge Impressions* (ver. 1.0 Sept 2020)
- Ron Smith and Associates *Policy and Procedures Manual* (Doc ID 1152, Rev 8)
- Houston Forensic Science Center *Latent Print Section Standard Operating Procedures Analysis, Comparison, Evaluation and Verification Methodology* (April 28, 2016)

- SWGTREAD *Standard Terminology for Expressing Conclusions of Forensic Footwear and Tire Impression Examinations* (3/2006)
- SWGTREAD *Guide for Casework Documentation* (9/2008)