Department of Forensic Science

LATENT PRINT
PROCEDURES MANUAL

TABLE OF CONTENTS

1 INTRODUCTION

1.1 EVIDENCE EXAMINATION

Latent Print examinations comprise a wide variety of evidence and examination types. This manual consists of the procedures used to analyze evidence submitted to the Latent Print (LX) Section of the Virginia Department of Forensic Science (the Department, DFS). This manual provides the basis for effective quality management of analyses. The Department's Quality Manual (QM) and Safety Manual provide additional guidelines.

1.1.1 Evidence packaging and item(s) shall be documented and marked as outlined in the QM.

1.1.2 In general, the analysis of items (including the analysis and comparison of friction ridge prints) in a case is limited to the number of items which will yield the most probative information.

1.1.3 Determination of probative evidence will be decided based on a number of factors including the type of case, the evidence collected, the number of victims and perpetrators, etc.

1.1.4 Large evidence submissions will be reviewed by the examiner/supervisor via telephone communication or in-person meetings to identify the most probative evidence for the respective case and analysis / comparisons will be limited to those items.

1.1.5 In the event that additional analysis and comparisons are necessary, communication between the assigned examiner and the investigator will occur and be documented per the QM to facilitate this process.

1.1.6 In cases where an exemplar is submitted for evidentiary purposes in court proceedings, it shall be compared to the exemplar previously used for comparison. Comparing the newly submitted exemplar to the previously compared latent prints is considered a re-exam and requires the Director's approval.

1.1.7 The Department's laboratory facilities provide sufficient environmental conditions to conduct all tests listed in this Procedures Manual with no further consideration required.

1.1.8 Short term storage is used when evidence is in the process of examination. The length of time evidence may remain in short term storage will be sixty (60) days.

1.1.9 Quality Assurance (QA) requirements for equipment and reagents are addressed in the QA section of this Manual.

1.2 EXAMINATION DOCUMENTATION

Examination documentation shall include each examination activity conducted, the sequence of those activities, and the result of each. Activities include the development techniques, quality control (QC) checks, the preservation technique (lifting and/or digitally capturing), database searches conducted including the result, source of exemplars, comparisons conducted, and the conclusions reached. Documentation shall be sufficient such that in the absence of the examiner, another competent examiner could evaluate what was completed and interpret the data.

1.2.1 All examination documentation shall be recorded using the Mideo Caseworks software (hereafter referred to as Mideo).

1.2.2 If the instrument computer network which houses Mideo is unavailable, it is acceptable for examination documentation to be recorded by hand and entered into the system as soon as possible.

1.3 TERMINOLOGY

1.3.1 ACE-V

1.3.1.1 Methodology used in friction ridge print examination

1.3.1.2 Acronym for Analysis - Comparison - Evaluation - Verification

1.3.2 Analysis

1.3.2.1 Interpretation of observed data in a friction ridge print in order to categorize its suitability for comparison

1.3.3 Anatomical region

1.3.3.1 Anatomical region is the designation of the latent print as the tip, side, pattern area, joint, thenar, hypothenar, interdigital or region of the foot

1.3.4 Anatomical source

1.3.4.1 Anatomical source is the designation of the latent print as a fingerprint, palm print, toe print or footprint

1.3.5 Anchor point

1.3.5.1 Delta, core, or the following: distal transverse crease, proximal transverse crease, radial longitudinal crease, a pattern formation present in any anatomical region of the palm, bracelet crease and creases between the joints of the fingers

1.3.6 Comparison

1.3.6.1 Search for and detection of similarities and differences in the observed data between two potentially corresponding friction ridge prints

1.3.7 Complexity

1.3.7.1 Interplay between quality and quantity of observed data and its relation to the decision thresholds; broadly represents how the amount of available information in a print directly impacts the decision-making process

1.3.7.1.1 Observed data could provide an indication of anatomical region or orientation.

1.3.7.1.2 Observed data could include quality and quantity of features, specificity of features, distortion, tolerances, or the presence of pattern forced areas, creases, scars or open fields.

1.3.8 Evaluation

1.3.8.1 Weighting of aggregate strength of the observed similarities and differences between the observed data in the two friction ridge prints in order to formulate a source conclusion

1.3.9 Exclusion

1.3.9.1 Conclusion reached when an examiner determines that there is sufficient observed data in disagreement to conclude that the friction ridge prints did not originate from the same source

1.3.9.2 Reached when in the examiner’s opinion, considering the observed data, the probability that the two prints came from the same source is considered negligible

1.3.10 Friction ridge print

1.3.10.1 Reproduction of an area of friction skin produced on a substrate by contact or transfer

1.3.10.1.1 Includes latent prints and known prints

1.3.11 Identification

1.3.11.1 Conclusion reached when an examiner determines there is sufficient observed data in agreement to conclude that the friction ridge prints originated from the same source

1.3.11.2 Reached when the friction ridge prints have corresponding ridge detail and the examiner would not expect to see the same arrangement of details repeated in a print that came from a different source

1.3.12 Inconclusive

1.3.12.1 Conclusion reached when an examiner determines there is insufficient observed data in agreement or disagreement to conclude that the friction ridge prints did or did not originate from the same source

1.3.12.2 The insufficient observed data could be due to absent or unreliable corresponding areas of friction ridge detail

1.3.12.3 Reached when the observations do not provide a sufficient degree of support for exclusion or identification

1.3.13 Known print

1.3.13.1 Intentional recording of friction ridge skin from a known source

1.3.13.2 Used generally to refer to the print compared to the latent print

1.3.13.3 Used interchangeably with exemplar or ten print

1.3.14 Latent print

1.3.14.1 Unintentional recording of friction ridge skin from an unknown source

1.3.14.2 Used generally to refer to any questioned print or print of unknown source

1.3.15 Lift

1.3.15.1 Used generally to refer to any method of latent print or impression recovery utilizing tape or adhesive material

1.3.16 Non-porous

1.3.16.1 Description of a surface that repels moisture and is generally non-absorbent

1.3.16.2 Latent print residue is on top of the surface of the substrate and is more susceptible to damage

1.3.17 Observed data

1.3.17.1 Any demonstrable information observed within a print that an examiner relies upon to reach a decision, conclusion or opinion; historically referred to as features or minutiae

1.3.18 Porous

1.3.18.1 Description of a surface that is generally absorbent

1.3.18.2 Latent print residue is absorbed into the substrate

1.3.19 Suitability

1.3.19.1 Usefulness of a print for a further step in the examination process; used as “suitable for capture”, “suitable for comparison”, “of value for comparison” and “suitable for database searches”

1.3.20 Target group

1.3.20.1 Combination of two or more ridge path deviations (ending ridge, bifurcation, dot)

1.3.21 Verification

1.3.21.1 Confirmation, through re-examination by another examiner, that a conclusion or opinion conforms and is reproducible

1.3.21.2 Independent application of ACE by a second qualified examiner

2 INVENTORY AND CASE APPROACH

2.1 INTRODUCTION

Every case is unique and must be evaluated by the individual examiner. It is the examiner's responsibility to choose the best analytical approach for each case, particularly for evidence not routinely encountered or for large evidence submissions. It is expected that Supervisors or the Physical Evidence Program Manager (PM) will be consulted for deviations from existing procedures in accordance with the Department's QM.

2.2 ORDER AND SCOPE OF EXAMINATIONS

2.2.1 In general, forensic biology and controlled substances examinations should be completed before latent print examinations.

2.2.2 In general, the most appropriate sequence of examinations for trace evidence and digital media will be determined via consultation.

2.2.3 In general, firearm examinations will be completed following latent print examinations.

2.2.4 If any questions arise as to the proper sequence of examinations between disciplines, consult with a representative from the appropriate section(s).

2.2.5 The following items will not routinely be processed for friction ridge prints: small twist-tie baggie corners, small ziplock baggies (ex. ½" x ½", $^{3}/_{8}$" x $^{3}/_{8}$", etc.) or $^{1}/_{2}$" vials.

2.2.6 General procedures for evidence examination are usually divided into two categories, those for porous and those for non-porous surfaces. Each category contains an enormous variety of materials with individual properties that may enhance or diminish the effectiveness of a particular technique.

2.2.7 It is acceptable to discontinue processing once an identification is effected and verified if agreed to by the investigator. If this approach is taken, the extent of processing and possibilities for future examination shall be clearly communicated in the Certificate of Analysis (CoA).

2.2.8 It is acceptable to discontinue comparisons once an identification is effected. If this approach is taken, it shall be clearly communicated in the CoA that comparisons were discontinued due to the identification and that additional comparisons can be performed if needed.

2.3 INVENTORY

2.3.1 Upon opening the case, an inventory is performed in order to document the item(s) of evidence received and develop the processing plan for item(s).

2.3.2 Documentation

2.3.2.1 All evidence, received or created for latent print examination, will be documented using Mideo.

2.3.2.2 The case folder will be created in Mideo using the FS lab # as the title.

2.3.2.2.1 The containers will be entered separately and described.

2.3.2.2.2 When a containerless item is received for examination, "No Container" will be used as the container.

2.3.2.2.3 The item(s) of evidence shall be created in the Evidence folder.

2.3.2.2.3.1 Basic Information

2.3.2.2.3.1.1 The Item or Sub-Item number is entered in the Name field.

2.3.2.2.3.1.2 The Item Description is entered in the Title field.

2.3.2.2.3.1.3 Further information can be entered in the Description field.

2.3.2.2.3.2 Custom Information

2.3.2.2.3.2.1 Additional documentation can be entered into the three tabs as appropriate.

2.3.2.2.3.2.2 The Item Details tab is used to document the type of evidence and the processing or examination to be completed.

2.3.2.3 Non-manufactured writing or markings on documents shall be recorded via photocopying, digitally scanning or digitally photographing prior to the application of any chemicals. The CoA shall inform the customer that the writing or markings were preserved as part of the examination documentation.

Example: Prior to processing, the writings/markings present on *Item 04* were captured and preserved as part of examination documentation.

2.3.2.3.1 Due to the destructive nature of the chemicals, some inks may be damaged. The writings are captured to preserve them in case of possible damage.

2.3.2.4 If the condition of the item(s) is such that it necessitates a change to the usual processing sequence for the item(s), it shall be discussed with the Section Supervisor prior to processing, be documented on the CoA and within the examination documentation.

2.4 CASE APPROACH

2.4.1 The evidence submitted will dictate the exam sequence. Evidence commonly seen in the section includes: latent lifts, submitted digital media containing images, exemplars for comparison and items to be processed.

2.4.2 Development techniques will be chosen based on the appropriate sequential processing for that item and its properties.

2.4.2.1 Approved development techniques and the associated item(s) properties:

Porous:	Non-Porous:	Adhesive:	Blood:
DFO, IND, IND/Zn, NIN, PD, ORO	CA, Dye Stains, Powder, SPR	GV, SSP, TapeGlo™, WetWop™	Amido Black, Coomassie Blue, LCV, NIN

2.4.3 The following processing sequences are recommended for the items below:

2.4.3.1 Latent lifts: Visual

2.4.3.2 Submitted digital media images: Visual

2.4.3.3 Exemplars for comparison: Visual

2.4.3.4 Porous items: Visual, FSIS, IND or IND/Zn, NIN

2.4.3.5 Porous items (thermal): Visual, FSIS, IND/Zn, NIN (thermal)

2.4.3.6 Porous items (wet or previously wet): Visual, FSIS, ORO and/or PD

2.4.3.7 Non-porous items: Visual, FSIS, CA, FSIS, dye stain

2.4.3.8 Non-porous items (wet or previously wet): Visual, FSIS, SPR

2.4.3.8.1 CA may occur as a part of this sequence.

2.4.3.9 Adhesive items:

2.4.3.9.1 Non-adhesive side processing shall occur before adhesive side processing. The adhesive side should be as protected as possible throughout.

2.4.3.9.2 The non-adhesive side processing should follow a processing sequence suitable for the properties of the non-adhesive side.

2.4.3.9.3 Adhesive side: Visual, FSIS, Adhesive processing

2.4.3.10 Blood-stained items:

2.4.3.10.1 Blood-stained, porous items: Visual, FSIS, IND or DFO, NIN

2.4.3.10.1.1 Amido Black, Coomassie Blue and LCV may occur as part of this sequence.

2.4.3.10.2 Blood-stained, non-porous items: Visual, FSIS, LCV and/or Amido Black

2.4.3.10.2.1 CA may occur as a part of this sequence.

2.4.3.11 Combination items:

2.4.3.11.1 Items that exhibit combinations of different properties should be processed in a manner that allows for the most complete development of friction ridge prints.

2.4.3.12 Unique surfaces:

2.4.3.12.1 Rubber/nitrile/latex gloves: Visual, FSIS, CA, FSIS, dye stain, Wet Powder Suspension

2.4.3.12.2 Glossy paper/cardboard (semi-porous): Visual, FSIS, CA, FSIS, IND, NIN, dye stain

2.4.3.13 Powder may be used in addition to, or in lieu of, dye stain as appropriate.

2.4.3.14 Wet or blood-stained items shall be dried before proceeding with processing.

2.4.3.15 Alternate processing sequences shall be discussed with the Section Supervisor prior to use in casework and documented.

2.4.4 Documentation

2.4.4.1 The case approach for the item(s) is documented in the Item Details tab in the Custom Information section of the item(s).

2.4.4.1.1 The type of item(s) is selected to further document the examination.

2.4.4.1.1.1 Once the item type has been selected, additional fields will be generated to fully document the examination for that evidence type.

2.4.4.1.2 If an item is documented as “Received - not analyzed”, a reason must be provided.

2.4.4.1.3 When items of evidence contain multiple components, the test results for those components will be reported accurately, clearly, and unambiguously in the examination documentation and the CoA.

For example: “firearm, magazine and one cartridge” could be noted as “firearm: NRDD, magazine: RDD, cartridge: NRDD”

3 DIGITAL IMAGING

3.1 INTRODUCTION

3.1.1 The following information shall be included for all DFS captured images of friction ridge prints.

- Scale
- FS lab #
- Examiner initials
- Item / sub-item designation

3.1.2 The evidence shall be marked with the P number when appropriate as part of sequential processing. The P number is the Item number followed by the letter P and the latent number.

3.1.2.1 It is acceptable to shorten the Item number as part of the P number for ease of marking and clarity of documentation. The friction ridge print shall be traceable to the evidence item it originates from.

Examples:
- Latent XXX004XP1 may be shortened to 4XP1
- Latent 1-X-1XP3 may be shortened to 1XP3
- Latent 0004P2 may be shortened to 4P2

3.1.2.2 The reason for not marking the P number on the evidence prior to capture shall be documented.

3.1.2.3 The P number written on the item of evidence is used to identify an area of interest for capture and further analysis; it is not an indication of value.

3.1.3 Images of friction ridge prints shall be captured at a minimum 1000 ppi in the tag image file (TIF) format.

3.1.4 Each friction ridge print shall be captured individually as a separate file, if possible.

3.1.5 Images will be checked for sharpness, contrast, and accurate reproduction of ridge detail.

3.1.5.1 The highest quality image captured at a particular processing technique will be utilized for further analysis and examination.

3.1.5.2 It is not required to preserve the same friction ridge print that was developed with previous techniques if no subsequent improvement is evident.

3.1.6 The files shall be transferred from the camera system or storage device into the Latents folder of Mideo.

3.1.6.1 The file name of the image shall be the FS lab # followed by the P number. Different images of the same latent print may be designated with letters or development technique.

Example: X21-XXXX-1P1 or X21-XXXX-1P1-A or X21-XXXX 1P1-CA

3.1.6.2 The Item number and P number are entered in the Basic Information tab associated with the latent image.

3.1.6.2.1 It is acceptable to document the P number on one image if the same latent print is captured multiple times.

3.1.7 All clarification of images of friction ridge prints shall be accomplished utilizing the options available in Mideo, including Adobe Photoshop.

3.2 PHOTOGRAPHY

3.2.1 Place the scale on the same plane and as close as possible to the friction ridge print without obscuring detail.

3.3 SCANNING

3.3.1 Place the scale on the same plane and as close as possible to the friction ridge print without obscuring detail.

3.3.2 Scan the selected area of interest at 24-bit color or 8-bit grayscale.

3.3.3 Utilize the 500 ppi setting to scan exemplars. Individual fingers may be scanned at 1000 ppi if necessary.

3.4 FULL SPECTRUM IMAGING SYSTEM (FSIS)

3.4.1 Place the scale on the same plane and as close as possible to the friction ridge print without obscuring detail.

3.4.2 Capture the marked friction ridge prints with a scale visible in the image using the FSIS.

3.5 CREATED DIGITAL MEDIA

3.5.1 Digital media (DM), CD or DVD, containing the original images of friction ridge prints in Mideo will be created, treated as evidence and returned to the submitting agency with the evidence. These sub-items shall be added to the Request for Laboratory Examination (RFLE) and created in the Laboratory Information Management System (LIMS).

3.5.1.1 It is not required to include images captured from submitted lift cards or uploaded from submitted digital media on the DM.

3.5.1.2 The first DM created will be designated DM1 and subsequent DMs created, for the same case, will be labeled sequentially (DM1, DM2, DM3, etc.)

3.5.2 The examiner will verify and document in the notes that the appropriate images are on the media prior to returning to the submitting agency.

3.5.3 When friction ridge prints are developed on more than one item, the DM will be returned with the first item on which the friction ridge prints were developed, if possible. The notes and CoA shall document in which container the DM is returned.

3.5.4 The packaging for the digital media shall be sealed and labeled with the FS lab #, examiner's initials and the item numbers from which the friction ridge prints were developed.

4 VISUAL EXAMINATION

4.1 INTRODUCTION

Visual examination of evidence is the first step in any processing procedure and is the mechanism by which development techniques are selected from observation of the residue, item condition, and composition of the item.

4.2 VISUAL EXAMINATION

4.2.1 A thorough examination of evidence is completed using white light.

4.2.2 Additional light sources may be utilized based on the evidence type and suspected residue components.

4.2.3 Visible friction ridge prints shall be photographed prior to the application of any processing techniques.

4.3 FSIS EXAMINATION

4.3.1 The FSIS utilizes short wave UV light in the visual examination of evidence; therefore, it is important to adhere to the safety practices outlined in the user's manual.

4.3.2 The reason for not utilizing the FSIS shall be documented.

4.3.2.1 Some textured surfaces may be unsuitable for this technique.

4.3.3 Evidence items shall be examined with FSIS after the visual examination.

4.3.4 Evidence items shall be examined with FSIS after cyanoacrylate fuming.

5 VISUAL EXAMINATION CASES

5.1 INTRODUCTION

5.1.1 Each submitted image or lift, submitted or created, shall have a unique Item or Sub-Item number.

5.2 LIFTS

5.2.1 Lifts made in the laboratory shall be sub-itemed according to the evidence from which they were removed, (e.g., 1A, 1B, etc.). These sub-items shall be added to the RFLE and created in the LIMS. The date the lifts were created shall be recorded in the examination documentation.

5.2.2 Procedure or Analysis:

5.2.2.1 Review the item(s) for any present friction ridge prints.

5.2.2.2 Capture suitable friction ridge prints for analysis and further examination.

5.2.2.3 The presence of additional ridge detail not suitable for capture shall be documented in the examination documentation.

5.2.2.4 A Supervisor, Group Supervisor or Designee shall review any lifts on which an examiner concludes there are no friction ridge prints suitable for capture on the entire lift.

5.2.2.4.1 The review shall be documented in the examination documentation.

5.2.2.4.2 It is not required to review ridge detail not suitable for capture in a lift that contains a latent print captured for analysis.

5.2.2.4.2.1 A review of the lift is not needed when a captured latent print is later deemed not of value for comparison during Analysis.

5.2.2.4.3 If the review is not completed in the presence of the assigned examiner, an appropriate chain of custody shall be documented per the QM.

5.2.2.4.4 If the review is completed on a captured image of the lift, the image shall be retained and the information included on the CoA.

5.2.2.5 The below are acceptable options for situations when it is presumed that the same latent print is lifted multiple times:

5.2.2.5.1 If the lifts are labeled indicating they are consecutive lifts of the same print or area, capture at least one print and document the reason for not capturing the remaining duplicates.

5.2.2.5.2 If the lifts are not labeled indicating they are consecutive, contact the contributor for clarification.

5.2.2.5.3 Conduct the ACE-V methodology (latent to latent comparison) and report the conclusion.

5.3 SUBMITTED DIGITAL MEDIA

5.3.1 All images on submitted media will be uploaded to Mideo in the Evidence folder.

5.3.1.1 If the submitted media was created by a DFS laboratory, images of friction ridge prints that are to be examined will be imported into the Latents folder and not the Evidence folder.

5.3.2 Each image will be assigned a sub-item number.

5.3.2.1 It is not necessary to create the images as sub-items in LIMS as the purpose of the sub-item number is for ease of reporting.

5.3.2.2 Review the image(s) for the presence of friction ridge prints.

5.3.2.3 Images of friction ridge prints suitable for analysis will be copied or imported into the Latents folder for analysis and further examination.

5.3.2.4 A Supervisor, Group Supervisor or Designee shall review all images when an examiner concludes there are no prints suitable for capture in the entire image.

5.3.2.4.1 The review shall be documented in the examination documentation.

5.3.2.4.2 It is not required to review fragments of ridge detail in an image that contains a latent print determined to be suitable for analysis.

5.3.2.4.3 It is not required to review images that contain no ridge detail (overall images) or duplicate images. The reason for the lack of review shall be documented in the examination documentation by the examiner.

5.4 EXEMPLARS

5.4.1 It is not necessary to import exemplars into Mideo if no comparisons are to be conducted.

5.4.2 Any analysis of friction ridge prints should be completed before any review of the exemplars.

5.4.3 Documentation:

5.4.3.1 Document the FS lab # followed by the item number (if a submitted item) and the name listed on the exemplar in the Name field.

5.4.3.2 If numerous cards are obtained for the same individual, brief descriptors can follow the name.

5.4.3.3 If major case prints encompass numerous cards, brief descriptors should be used for clarity.

5.4.4 Procedure or Analysis:

5.4.4.1 Review the item(s) for suitability for use in comparison.

5.4.4.2 Capture the item(s) suitable for use in comparison and upload to the Evidence folder in Mideo.

5.4.4.2.1 A scale is not required for capture of exemplars.

5.4.4.3 A Supervisor, Group Supervisor or Designee shall review all exemplars when an examiner concludes the item(s) are not suitable for use in comparison.

5.4.4.3.1 The review shall be documented in the examination documentation.

5.4.4.3.2 If the review is not completed in the presence of the assigned examiner, an appropriate chain of custody shall be documented per the QM.

5.4.4.3.3 If the review is completed on a captured image of the exemplar, the image shall be retained and the information included on the CoA.

5.5 DECEASED EXEMPLARS

5.5.1 Common types of deceased exemplars include: fingerprint strips, tape lifts, Mikrosil lifts, photographs and human remains.

5.5.1.1 Obtaining deceased exemplars is covered completely in the Postmortem Recording of Friction Ridge Skin Section.

5.5.2 Documentation:

5.5.2.1 Document the FS lab # followed by the item number.

5.5.2.2 Select the appropriate item type and utilize the associated fieldsets.

5.5.2.3 Examination documentation shall include the method of capture.

5.5.3 Procedure or Analysis:

5.5.3.1 Capture the item(s) and upload in Mideo.

5.5.3.2 For fingerprint strips, select the finger to be compared to the exemplars and save it as a new file in the Latents Folder in Mideo. It is acceptable to upload captures of tape lifts, Mikrosil lifts and photographs directly into the Latents Folder in Mideo.

5.5.3.2.1 The file name of the image shall be the FS lab #, then Item number followed by the finger designation. If the finger designation is unknown utilize a P number.

Example: X21-XXXX-1RT or X21-XXXX 999LI

5.5.3.3 Proceed with analysis and further examination.

6 CHEMICAL PROCESSING METHODS

6.1 USE OF CHEMICAL PROCESSING METHODS

6.1.1 Any of the listed preparations or commercially purchased reagents may be used at the examiner's discretion.

6.1.2 A performance check of methods used shall be completed for each case.

6.1.2.1 The result of the check and the batch number will be included in the examination documentation.

6.1.2.2 The procedure for creating test strips is outlined in the QA section of this manual.

6.1.3 When mixing a stock solution into a working solution, the use of a magnetic stirrer is not recommended. Magnetic stirrers could cause the reagent to fall out of solution in the working solution.

6.2 AMIDO BLACK

Amido Black is used to enhance prints that have been deposited in blood or other protein-based substances on either porous or non-porous items. Caution must be used when applying the methanol-based formula to painted surfaces. The formula may destroy the friction ridge print as well as the surface beneath.

6.2.1 Preparation:

6.2.1.1 Amido Black Methanol Working Solution

Chemicals Required

- 2 g Amido Black
- 100 mL Glacial Acetic Acid
- 900 mL Methanol

Directions

1. Combine the ingredients and stir using a magnetic stirrer for approximately thirty minutes or until Amido Black is dissolved.

6.2.1.2 Amido Black Methanol Rinse Solution

Chemicals Required

- 100 mL Glacial Acetic Acid
- 900 mL Methanol

Directions

1. Combine the ingredients.

6.2.1.3 Amido Black Aqueous Working Solution

Chemicals Required

- 500 mL Reverse Osmosis (R/O) or Deionized (DI) water
- 20 g 5-Sulfosalicylic Acid
- 3 g Amido Black

- 3 g Sodium Carbonate
- 50 mL Formic Acid
- 50 mL Glacial Acetic Acid
- 12.5 mL Surfactant
- R/O or DI water for diluting the solution

Directions

1. Combine the ingredients in the order listed using a magnetic stirrer to mix well.
2. Dilute the solution to 1 L using R/O or DI water.

6.2.2 Instrumentation:

6.2.2.1 None noted.

6.2.3 Minimum Standards and Controls:

6.2.3.1 Amido Black and rinse have an indefinite shelf life.

6.2.3.2 Deposit a test print with a small amount of animal or synthetic blood on a surface similar to the item(s) to be processed. Follow the procedure listed below to process the test print once the blood is dry. If the test print turns blue-black, the working solution can be used to process evidence.

6.2.4 Procedure or Analysis:

6.2.4.1 Ensure the blood is dry before proceeding with application.

6.2.4.2 Amido Black Methanol application:

6.2.4.2.1 Apply the solution to the item(s) by immersion, spraying or squirting.

6.2.4.2.2 Allow the solution between 30 seconds and one minute to set.

6.2.4.2.3 Apply the rinse solution.

6.2.4.2.4 These steps can be repeated to improve contrast.

6.2.4.2.5 Rinse the item(s) with R/O or DI water.

6.2.4.3 Amido Black Aqueous application:

6.2.4.3.1 Apply the solution to the item(s) by dipping or squirting.

6.2.4.3.2 Allow the solution three to five minutes to set.

6.2.4.3.3 Rinse the item(s) with R/O or DI water.

6.2.4.3.4 These steps can be repeated to improve contrast.

6.2.4.4 Review the item(s) for any developed friction ridge prints.

6.2.4.5 Capture friction ridge prints for analysis and further examination.

6.3 ARDROX

Ardrox is a dye stain that can be used undiluted or as part of a solution that enhances friction ridge prints previously developed with cyanoacrylate ester. Ardrox is applied to the object and visually examined utilizing an alternate light source (ALS).

6.3.1 Preparation:

6.3.1.1 Ardrox Working Solution

Chemicals Required

- 2 mL Ardrox
- 10 mL Acetone
- 25 mL Methanol
- 10 mL Isopropyl Alcohol
- 8 mL Acetonitrile
- 945 mL Petroleum Ether

Directions

1. Combine the ingredients in the order listed.

6.3.2 Instrumentation:

6.3.2.1 An ALS is required for visualization of developed friction ridge prints.

6.3.3 Minimum Standards and Controls:

6.3.3.1 Ardrox working solution shall not exceed six months.

6.3.3.2 Follow the procedure listed below to process a test print previously deposited and developed with cyanoacrylate ester. If the test print fluoresces, the working solution can be used to process evidence.

6.3.4 Procedure or Analysis:

6.3.4.1 Undiluted Ardrox application

6.3.4.1.1 Completely cover the item(s) by immersion or squirt bottle.

6.3.4.1.2 Allow the liquid to remain on the item(s) for about ten minutes.

6.3.4.1.3 Rinse the item(s) under R/O or DI water until no yellow color remains.

6.3.4.2 Ardrox Working Solution application.

6.3.4.2.1 Apply the solution to the item(s) by immersion or squirt bottle.

6.3.4.2.2 Allow the solution to remain on the item(s) for several minutes.

6.3.4.2.3 Review the item(s) using an ALS with appropriate goggles without rinsing to evaluate if/how much background staining may have occurred.

6.3.4.2.3.1 If no background staining is noted, proceed to the next step.

6.3.4.2.3.2 If background staining is observed and prevents visualization, subject the item(s) to a light R/O or DI water rinse.

6.3.4.2.4 Allow the item(s) to dry completely.

6.3.4.2.5 Review the item(s) for any developed friction ridge prints using an ALS with appropriate goggles.

6.3.4.2.5.1 Ardrox fluoresces best with blue-green light and can be viewed using yellow barrier filters.

6.3.4.2.6 Capture friction ridge prints for analysis and further examination.

6.4 BASIC YELLOW 40 (BY40)

BY40 is a dye stain that enhances friction ridge prints previously developed with cyanoacrylate ester. BY40 is applied to the object and visually examined utilizing an ALS.

6.4.1 Preparation:

6.4.1.1 BY40 Working Solution

Chemicals Required

- 3 g Basic Yellow powder concentrate
- 1 L Methanol

Directions

1. Combine the ingredients and stir the solution until all of the powder is dissolved.

6.4.2 Instrumentation:

6.4.2.1 An ALS is required for visualization of developed friction ridge prints.

6.4.3 Minimum Standards and Controls:

6.4.3.1 BY40 working solution shall not exceed six months.

6.4.3.2 Follow the procedure listed below to process a test print previously deposited and developed with cyanoacrylate ester. If the test print fluoresces, the working solution can be used to process evidence.

6.4.4 Procedure or Analysis:

6.4.4.1 Apply the solution to the item(s) by immersion, brush, spray canister or squirt bottle.

6.4.4.2 Allow the solution at least one minute to set.

6.4.4.3 Rinse the item(s) thoroughly under running R/O or DI water. It is acceptable to rinse the item(s) with a solution of 200 parts R/O or DI water to one part Surfactant.

6.4.4.4 Allow the item(s) to dry completely.

6.4.4.5 Review the item(s) for any developed friction ridge prints using an ALS with appropriate goggles.

6.4.4.5.1 BY40 fluoresces best with blue light and can be viewed using yellow barrier filters.

6.4.4.6 Capture friction ridge prints for analysis and further examination.

6.5 COOMASSIE BRILLIANT BLUE R250

Coomassie Brilliant Blue R250 is used to enhance prints that have been deposited in blood on either porous or non-porous items.

6.5.1 Preparation:

6.5.1.1 Coomassie Working Solution

Chemicals Required

- 0.96 g Coomassie Brilliant Blue R250
- 84 mL Glacial Acetic Acid
- 410 mL Methanol
- 410 mL R/O or DI water

Directions

1. Dissolve Coomassie Brilliant Blue R250 in Methanol.
2. Add R/O or DI water and Glacial Acetic Acid to the Methanol solution and stir.

6.5.1.2 Coomassie Destaining Solution

Chemicals Required

- 200 mL Methanol
- 200 mL R/O or DI water
- 40 mL Glacial Acetic Acid

Directions

1. Add Methanol to R/O or DI water and stir.
2. Add Glacial Acetic Acid to the Methanol solution and stir.

6.5.2 Instrumentation:

6.5.2.1 None noted.

6.5.3 Minimum Standards and Controls:

6.5.3.1 Coomassie Brilliant Blue R250 and destaining solution have an indefinite shelf life.

6.5.3.2 Deposit a test print with a small amount of animal or synthetic blood on a surface similar to the item(s) to be processed. Follow the procedure listed below to process the test print once the blood is dry. If the test print turns blue-black, the working solution can be used to process evidence.

6.5.4 Procedure or Analysis:

6.5.4.1 Ensure the blood is dry before proceeding with application.

6.5.4.2 Agitate the working solution before application to the item(s).

6.5.4.3 Immersion application:

6.5.4.3.1 Immerse the item(s) in the working solution and agitate for two minutes.

6.5.4.3.2 Immerse the item(s) in the destaining solution for one minute.

6.5.4.3.3 Agitate the solution until background discoloration fades.

6.5.4.3.4 Staining and destaining may be repeated until optimal contrast is achieved.

6.5.4.4 Squirt Bottle application:

6.5.4.4.1 Apply to large surfaces by squirt bottle or pouring for about five minutes or until maximum contrast is achieved.

6.5.4.4.2 Apply the destaining solution by squirt bottle or pouring.

6.5.4.5 Review the item(s) for any developed friction ridge prints.

6.5.4.6 Capture friction ridge prints for analysis and further examination.

6.6 CYANOACRYLATE ESTER FUMING (CA)

Cyanoacrylate esters are the active ingredients in super bond adhesives and, in an atmosphere of relatively high humidity, the molecules are attracted to print residue and polymerize upon the deposit.

6.6.1 Preparations:

6.6.1.1 No specific preparations are needed as the cyanoacrylate materials being used are commercially prepared.

6.6.2 Instrumentation:

6.6.2.1 A CA fuming chamber, either atmospheric or vacuum, is required.

6.6.3 Minimum Standards and Controls:

6.6.3.1 The manufacturer’s shelf-life recommendations shall be followed. In the absence of a manufacturer recommendation, cyanoacrylate ester may be used as long as it remains in a semi-liquid state and has a positive reaction with the test print.

6.6.3.2 Apply a test print to a non-evidentiary item. Follow the procedure listed below to process the test print along with the item(s). Terminate the processing once the test print has reached optimal development.

6.6.4 Procedure or Analysis:

6.6.4.1 Follow the instrument manufacturer’s instructions for optimal processing conditions.

6.6.4.2 Terminate the processing once the test print has reached optimal development.

6.6.4.3 Review the item(s) for any developed friction ridge prints.

6.6.4.4 Capture friction ridge prints for analysis and further examination.

6.7 1,8 DIAZAFLUOREN-9-ONE (DFO)

DFO reacts with amino acids in perspiration, and once the reaction is completed, the developed friction ridge prints will fluoresce using an ALS.

6.7.1 Preparations:

6.7.1.1 DFO Stock Solution

Chemicals Required

- 1 g DFO
- 200 mL Methanol
- 200 mL Ethyl acetate
- 40 mL Glacial acetic acid

Directions

1. Combine the ingredients and stir for approximately 20 minutes or until the DFO is dissolved.

6.7.1.2 DFO Working Solution

Chemicals Required

- 1560 mL Petroleum Ether

Directions

1. Dilute the stock solution to 2L with Petroleum Ether.

6.7.2 Instrumentation:

6.7.2.1 A laboratory oven, dry iron, photographic heat press, or hair dryer is recommended. An ALS is required for visualization of developed friction ridge prints.

6.7.3 Minimum Standards and Controls:

6.7.3.1 DFO stock and working solution shall be stored in a dark bottle and have a shelf life not exceeding six months.

6.7.3.2 Apply a test print to a porous item similar to the evidence being processed or use a test strip. Follow the procedure listed below to process the test print/strip. If the test print/strip fluoresces, the working solution can be used to process evidence.

6.7.4 Procedure or Analysis:

6.7.4.1 Item(s) may be dipped or sprayed.

6.7.4.2 Once processed with DFO, the item(s) must be dried in an oven at approximately 100 degrees C for 20 minutes.

6.7.4.2.1 If an oven is not available, a dry iron may be used.

6.7.4.3 Review the item(s) for any developed friction ridge prints using an ALS with appropriate goggles.

6.7.4.3.1 DFO fluoresces best with blue-green light and can be viewed using orange barrier filters.

6.7.4.4 Capture friction ridge prints for analysis and further examination.

6.8 GENTIAN VIOLET (GV)

GV is a solution that results in a color change when in contact with skin cells or other residues left in the adhesive material.

6.8.1 Preparation:

6.8.1.1 GV Working Solution

Chemicals Required

- 1 g GV
- 1 L R/O or DI water

Directions

1. Combine the ingredients.

6.8.2 Instrumentation:

6.8.2.1 None noted.

6.8.3 Minimum Standards and Controls:

6.8.3.1 GV working solution has an indefinite shelf life.

6.8.3.2 Apply a test print on a surface similar to the evidence being processed. Follow the procedure listed below to process the test print. If the test print turns purple, the working solution can be used to process evidence.

6.8.4 Procedure or Analysis:

6.8.4.1 Immerse the item(s) in the solution for approximately 30 seconds while agitating.

6.8.4.2 Rinse the item(s) with a gentle flow of cold R/O or DI water.

6.8.4.3 These steps can be repeated to improve contrast.

6.8.4.4 Review the item(s) for any developed friction ridge prints.

6.8.4.5 Capture friction ridge prints for analysis and further examination.

6.9 1,2-INDANEDIONE (IND)

IND reacts with amino acids in perspiration, and once the reaction is complete, the developed friction ridge prints will fluoresce using an ALS.

6.9.1 Preparation:

6.9.1.1 IND Working Solution

Chemicals Required

- 2 g IND
- 70 mL Ethyl Acetate
- 930 mL Petroleum Ether

Directions

1. Dissolve 2 g IND in 70 mL Ethyl Acetate.
2. Add Ethyl Acetate solution to Petroleum Ether.
3. Stir until the solution is homogeneous.
    a. It is acceptable to filter the solution.

6.9.1.2 IND (Thermal Paper) Working Solution

Chemicals Required

- 2 g IND
- 70 mL Ethyl Acetate
- 930 mL HFE 7100

Directions

1. Dissolve 2 g IND in 70 mL Ethyl Acetate.
2. Add Ethyl Acetate solution to HFE 7100.
3. Stir until the solution is homogeneous.
    a. It is acceptable to filter the solution.

6.9.2 Instrumentation:

6.9.2.1 A laboratory oven, dry iron, photographic heat press, heat/humidity chamber or hair dryer is recommended.

6.9.2.2 An ALS is required for visualization of developed friction ridge prints.

6.9.3 Minimum Standards and Controls:

6.9.3.1 IND working solutions shall not exceed six months.

6.9.3.2 Apply a test print to a porous item similar to the evidence being processed or use a test strip.

6.9.3.3 Follow the procedure listed below to process the test print/strip. If the test print/strip fluoresces, the working solution can be used to process evidence.

6.9.4 Procedure or Analysis:

6.9.4.1 Item(s) may be dipped, sprayed or washed with solution to saturate the item.

6.9.4.2 Allow the item(s) to dry.

6.9.4.3 Apply heat to item(s) using a photographic mounting press, laboratory oven, heat/humidity chamber, hair dryer or iron. The addition of humidity can improve the results.

6.9.4.4 Check the item(s) periodically to monitor the print development and avoid saturating the item with water vapor if adding humidity.

6.9.4.5 After a minimum of 12 hours, review the item(s) and document any additional prints that have developed.

6.9.4.5.1 If using a heat/humidity chamber, it is not necessary to wait 12 hours.

6.9.4.6 Review the item(s) for any developed friction ridge prints using an ALS with appropriate goggles.

6.9.4.6.1 IND fluoresces best with green light and can be viewed using dark orange or red barrier filters.

6.9.4.7 Capture friction ridge prints for analysis and further examination.

6.10 1,2-INDANEDIONE/ZINC (IND/Zn)

IND/Zn reacts with amino acids in perspiration, and once the reaction is complete, the developed friction ridge prints will fluoresce using an ALS. IND/Zn can be used for all paper types but is recommended for use on thermal paper.

6.10.1 Preparation:

6.10.1.1 IND/Zn Stock Solution

Chemicals Required

- 1.5 g IND
- 0.04 g Zinc Chloride
- 1 mL Ethanol
- 30 mL Dichloromethane
- 70 mL Ethyl Acetate

Directions

1. Combine ingredients into a beaker and place on a magnetic stirrer until all of the powder has dissolved.

6.10.1.2 IND/Zn Working Solution

Chemicals Required

- 25 mL IND/Zn stock solution
- 225 mL HFE 7100

Directions

1. Combine ingredients in the order listed.

6.10.2 Instrumentation:

6.10.2.1 For all non-thermal porous substrates, a laboratory oven, dry iron, photographic heat press, heat/humidity chamber or hair dryer is recommended.

6.10.2.2 An ALS is required for visualization of developed friction ridge prints.

6.10.3 Minimum Standards and Controls:

6.10.3.1 IND/Zn stock and working solutions shall be stored in dark bottles and have a shelf life not exceeding six months.

6.10.3.2 Apply a test print to a porous item similar to the evidence being processed or use a test strip. Follow the procedure listed below to process the test print/strip. If the test print/strip fluoresces, the working solution can be used to process evidence.

6.10.4 Procedure or Analysis:

6.10.4.1 Item(s) may be dipped, sprayed or washed with solution to saturate the item.

6.10.4.2 Allow the item(s) to dry.

6.10.4.3 If using on non-thermal paper, apply heat to item(s) using a photographic mounting press, laboratory oven, heat/humidity chamber, hair dryer or iron. The addition of humidity can improve the results.

6.10.4.4 If no prints develop at the 24 hour mark, continue to let develop for an additional 24 hours. If using a heat/humidity chamber, it is not necessary to wait the 24 hours.

6.10.4.5 Review the item(s) for any developed friction ridge prints using an ALS with appropriate goggles.

6.10.4.5.1 IND/Zn fluoresces best with green light and can be viewed using dark orange or red barrier filters.

6.10.4.6 Capture friction ridge prints for analysis and further examination.

6.11 LEUCOCRYSTAL VIOLET (LCV)

LCV is used to enhance prints that have been deposited in blood substances on either porous or non-porous items.

6.11.1 Preparation:

6.11.1.1 LCV Solution #1: Stock Solution A

Chemicals Required

- 10 g 5-Sulfosalicylic Acid
- 100 mL R/O or DI water

Directions

1. Dissolve 5-Sulfosalicylic acid in R/O or DI water.

6.11.1.2 LCV Solution #1: Stock Solution B

Chemicals Required

- Stock Solution A
- 400 mL 3% Hydrogen Peroxide

Directions

1. Add Stock Solution A to Hydrogen Peroxide.

6.11.1.3 LCV Solution #1: Working Solution

Chemicals Required

- 0.75 g LCV
- Stock Solution B

Directions

1. Add LCV to Stock Solution B and stir the solution vigorously.

6.11.1.4 LCV Solution #2: Working Solution

Chemicals Required

- 10 g 5-Sulfosalicylic Acid
- 500 mL 3% Hydrogen Peroxide
- 3.7 g Sodium Acetate
- 1 g LCV

Directions

1. Dissolve 5-Sulfosalicylic acid in 3% Hydrogen Peroxide.
2. Dissolve Sodium Acetate and LCV in 3% Hydrogen Peroxide solution.
3. Stir the solution vigorously.

6.11.2 Instrumentation:

6.11.2.1 None noted.

6.11.3 Minimum Standards and Controls:

6.11.3.1 LCV stock solutions shall not exceed one year.

6.11.3.2 LCV working solutions shall not exceed thirty days.

6.11.3.3 Deposit a test print with a small amount of animal or synthetic blood on a surface similar to the item(s) to be processed. Follow the procedure listed below to process the test print once the blood is dry. If the test print turns violet, the working solution can be used to process evidence.

6.11.4 Procedure or Analysis:

6.11.4.1 Ensure the blood is dry before proceeding with application.

6.11.4.2 Apply the solution to the item(s) by spraying, immersion or washing the solution over the item(s).

6.11.4.3 Review the item(s) for any developed friction ridge prints.

6.11.4.4 Capture friction ridge prints for analysis and further examination.

6.12 7-(P-METHOXYBENZYLAMINO-4-NITROBENZ-2-OXA-1,3-DIAZOLE) (MBD)

MBD is a dye stain that enhances friction ridge prints previously developed with CA. MBD is applied to the object and visually examined utilizing an ALS.

6.12.1 Preparation:

6.12.1.1 MBD Solution #1: Working Solution

Chemicals Required

- 0.12 g MBD
- 4 L Methanol

Directions

1. Combine the ingredients and continue to stir the solution until all powder is dissolved.

6.12.1.2 MBD Solution #2: Stock Solution

Chemicals Required

- 1 g MBD
- 1 L Acetone

Directions

1. Combine the ingredients and continue to stir the solution until all powder is dissolved.

6.12.1.3 MBD Solution #2: Working Solution

Chemicals Required

- 10 mL MBD Stock Solution
- 30 mL Methanol
- 10 mL Isopropyl Alcohol
- 950 mL Petroleum Ether

Directions

1. Combine the ingredients in the order listed. Do not place on a magnetic stirrer.

6.12.2 Instrumentation:

6.12.2.1 An ALS is required for visualization of developed friction ridge prints.

6.12.3 Minimum Standards and Controls:

6.12.3.1 MBD stock solution has an indefinite shelf life.

6.12.3.2 MBD working solutions shall not exceed six months.

6.12.3.3 Follow the procedure listed below to process a test print previously deposited and developed with cyanoacrylate ester. If the test print fluoresces, the working solution can be used to process evidence.

6.12.4 Procedure or Analysis:

6.12.4.1 Apply the solution to the item(s) by immersion, spray canister or squirt bottle.

6.12.4.2 Allow the item(s) to dry completely.

6.12.4.3 Review the item(s) for any developed friction ridge prints using an ALS with appropriate goggles.

6.12.4.3.1 MBD fluoresces best with blue to green light and can be viewed using orange or red barrier filters.

6.12.4.4 Capture friction ridge prints for analysis and further examination.

6.13 MRM 10

MRM 10 is a combination dye stain that enhances friction ridge prints previously developed with CA. MRM 10 is applied to the object and visually examined utilizing an ALS at various wavelengths.

6.13.1 Preparation:

6.13.1.1 R6G Stock Solution

Chemicals Required

- 1 g R6G
- 1 L Methanol

Directions

1. Combine the ingredients.

6.13.1.2 BY40 Stock Solution

Chemicals Required

- 2 g BY40
- 1 L Methanol

Directions

1. Combine the ingredients.

6.13.1.3 MBD Stock Solution

Chemicals Required

- 1 g MBD
- 1 L Acetone

Directions

1. Combine the ingredients.

6.13.1.4 MRM 10 Working Solution

Chemicals Required

- 3 mL R6G Stock Solution
- 3 mL BY40 Stock Solution
- 7 mL MBD Stock Solution
- 20 mL Methanol
- 10 mL Isopropyl Alcohol
- 8 mL Acetonitrile
- 950 mL Petroleum Ether

Directions

1. Combine the ingredients in the order listed.

6.13.2 Instrumentation:

6.13.2.1 An ALS is required for visualization of developed friction ridge prints.

6.13.3 Minimum Standards and Controls:

6.13.3.1 The stock solutions have indefinite shelf lives.

6.13.3.2 MRM 10 working solution shall not exceed six months.

6.13.3.3 Follow the procedure listed below to process a test print previously deposited and developed with cyanoacrylate ester. If the test print fluoresces, the working solution can be used to process evidence.

6.13.4 Procedure or Analysis:

6.13.4.1 Apply the solution to the item(s) by immersion, spray canister or squirt bottle.

6.13.4.2 Allow the item(s) to dry completely.

6.13.4.3 Review the item(s) for any developed friction ridge prints using an ALS with appropriate goggles.

6.13.4.3.1 MRM 10 fluoresces within the same range as its component dye stains and can be viewed using the appropriate barrier filters.

6.13.4.4 Capture friction ridge prints for analysis and further examination.

6.14 NINHYDRIN (NIN)

NIN, or triketo-hydrindene hydrate, is an extremely sensitive indicator of alpha-amino acids, proteins, peptides and polypeptides. The reaction produces a violet to blue-violet coloring of these substances and is effective even with older deposits and/or minute amounts of amino acids. NIN processing is normally confined to porous items which are not water-soaked and do not contain inherent animal proteins. NIN coloration is not permanent, and while some prints have remained visible for years, others have faded in a matter of days.

6.14.1 Recommended Preparations (0.5% concentration):

6.14.1.1 Petroleum Ether Solution

Chemicals Required

- 10 g NIN
- 60 mL Methanol
- 80 mL Isopropyl Alcohol
- 1860 mL Petroleum Ether

Directions

1. Dissolve NIN crystals in Methanol.
2. Add Isopropyl Alcohol to NIN/Methanol solution and stir.
3. Add NIN/ Methanol/Isopropyl Alcohol solution to Petroleum Ether and stir.

6.14.1.2 Acetone Solution

Chemicals Required

- 25 g NIN
- 4 L of Acetone

Directions

1. Dissolve NIN crystals in Acetone.

6.14.1.3 Heptane Solution

Chemicals Required

- 33 g NIN
- 220 mL Ethyl Alcohol (use Absolute Ethanol, DO NOT use Denatured Ethanol)
- 4 L Heptane

Directions

1. Dissolve NIN in Ethyl alcohol.
2. Remove 220 mL of Heptane from bottle and set aside.
3. Add NIN/Ethyl Alcohol solution to Heptane bottle and stir.

6.14.1.4 Commercially prepared NIN, including those formulations for use on thermal paper, may be used on thermal paper in addition to all porous items; no specific preparation is needed.

6.14.2 Instrumentation:

6.14.2.1 A humidity chamber or a steam iron may be used to control the heat and relative humidity to accelerate the development of friction ridge prints after processing.

6.14.2.1.1 If using a humidity chamber, the chamber should be set at no greater than 80 degrees Celsius/176 degrees Fahrenheit and between 60% and 80% relative humidity.

6.14.3 Minimum Standards and Controls:

6.14.3.1 NIN shall be stored in a dark bottle and have a shelf life not exceeding one year.

6.14.3.2 Apply a test print to a porous item similar to the evidence being processed or use a test strip. Follow the procedure listed below to process the test print/strip. If the test print/strip turns purple, the working solution can be used to process evidence.

6.14.4 Procedure or Analysis:

6.14.4.1 Direct application:

6.14.4.1.1 Item(s) may be dipped, sprayed or washed.

6.14.4.1.2 Allow the item(s) to dry.

6.14.4.1.3 Place the item(s) in the heat/humidity chamber or the item may be steam ironed.

6.14.4.2 Check the item(s) periodically to monitor the print development and to avoid saturating the item with water vapor.

6.14.4.3 After a minimum of 12 hours, review the item(s) and document any additional prints that developed.

6.14.4.3.1 If using a heat/humidity chamber to achieve optimal development, it is not necessary to wait 12 hours.

6.14.4.4 Capture friction ridge prints for analysis and further examination.

6.15 OIL RED O (ORO)

ORO is a fat-soluble dye that is sensitive to the lipid component of latent print residue. Staining with ORO will produce a dark red to brown coloring of lipids and fats on porous surfaces. ORO is insoluble in water, as are the lipids it stains, enabling it to be used on porous items that have been wet.

6.15.1 Preparation:

6.15.1.1 ORO Working Solution

Chemicals Required

- 1.54 g ORO powder
- 770 mL Methanol
- 9.2 g Sodium Hydroxide
- 230 mL R/O or DI water

Directions:

1. Dissolve ORO powder in Methanol and stir.
2. Dissolve Sodium Hydroxide in water and stir.
3. Add Sodium Hydroxide solution to ORO solution and stir.
4. Filter combined solution.

6.15.2 Instrumentation:

6.15.2.1 A shaker table is recommended during staining to ensure the entire item remains immersed.

6.15.3 Minimum Standards and Controls:

6.15.3.1 ORO shall be stored in a dark bottle and have a shelf life not exceeding one year.

6.15.3.2 Apply a test print using natural sebaceous residue to a porous item similar to the evidence being processed. Follow the procedure listed below to process the test print. If the test print turns red to brown in color, the working solution can be used to process evidence.

6.15.4 Procedure or Analysis:

6.15.4.1 Immerse each item(s) to be processed in the ORO staining solution. friction ridge prints generally develop between five and ninety minutes, depending on the lipid content.

6.15.4.1.1 Place the tray with the staining solution and item(s) on a shaker table to ensure immersion.

6.15.4.2 Remove the item(s) from the ORO staining solution and drain.

6.15.4.3 Immerse the item(s) in a tray of continuously running DI water to neutralize the pH of the porous substrate.

6.15.4.4 Remove the item(s) from the water and dry completely.

6.15.4.5 Review the item(s) for any developed friction ridge prints.

6.15.4.6 Capture friction ridge prints for analysis and further examination.

6.16 PHYSICAL DEVELOPER (PD)

PD is reactive with the lipid content of the latent print residue and is specifically for the examination of wet or water soaked porous items. Friction ridge prints appear as dark gray images which increase in contrast. This technique utilizes sensitive reactions that precipitate silver to the non-sebaceous material present in the latent print residue.

6.16.1 Preparations:

6.16.1.1 Maleic Acid Pre-wash Solution

Chemicals Required:

- 1 L R/O or DI water
- 25 g Maleic Acid

Directions

1. Add Maleic Acid to R/O or DI water.
2. Stir until dissolved with a magnetic stir bar previously rinsed with R/O or DI water.

6.16.1.2 Detergent Stock Solution

Chemicals Required

- 1 L R/O or DI water
- 3 g n-Dodecylamine Acetate
- 3 mL Surfactant

Directions

1. Add n-Dodecylamine Acetate to R/O or DI water and stir with a magnetic stir bar previously rinsed with R/O or DI water. If some of the n-Dodecylamine Acetate sticks to the weigh boat, the weigh boat can be immersed in the solution.
2. Add 3 mL Surfactant to the n-Dodecylamine Acetate solution. Place the weigh boat in the solution as the surfactant will adhere to the weigh boat.
3. Stir for thirty minutes.
4. Remove the weigh boat(s).
5. This solution must not be used for at least 24 hours. If solids are present after 24 hours, discard and remix.

6.16.1.3 Buffered Ferrous/Ferric Redox Solution

Chemicals Required

- 1000 mL R/O or DI water
- 30 g Ferric Nitrate
- 80 g Ferrous Ammonium Sulfate
- 20 g Citric Acid

Directions

1. Pour 1000 mL of R/O or DI water into a beaker and stir with a magnetic stir bar previously rinsed with R/O or DI water.
2. Add Ferric Nitrate to R/O or DI water and stir until dissolved.
3. When Ferric Nitrate has fully dissolved, add Ferrous Ammonium Sulfate and stir until dissolved.
4. When Ferrous Ammonium Sulfate has fully dissolved, add Citric Acid and stir until dissolved.
5. Stir until the Citric Acid is fully dissolved, and then stir for an additional five minutes.

6.16.1.4 Silver Nitrate Solution

Chemicals Required

- 50 mL R/O or DI water
- 10 g Silver Nitrate

Directions

1. Add Silver Nitrate to R/O or DI water and stir until dissolved.

6.16.1.5 Physical Developer Combined Working Solution

Chemicals Required

- 40 mL Stock Detergent Solution
- Buffered Ferrous/Ferric Redox Solution
- Silver Nitrate Solution

Directions

1. Add Stock Detergent Solution to Redox Solution and stir.
2. Examine Silver Nitrate solution to ensure all solid material has dissolved. Stir as needed.
3. Add Silver Nitrate solution to Redox/Stock Detergent solution and stir for two minutes.

6.16.1.6 Photofix Rinse Solutions

6.16.1.6.1 Rinse 1

Chemicals Required

- Four or five drops Polymax Fixer per L of R/O or DI water
- R/O or DI water

Directions

1. Add Polymax Fixer to R/O or DI water in a glass or plastic tray.

6.16.1.6.2 Rinse 2

Chemicals Required

- One part Photographic Fixer
- Nine parts R/O or DI water

Directions

1. Add Photographic Fixer to R/O or DI water in a glass or plastic tray.

6.16.1.7 Bleach Solution

Chemicals Required

- One part Bleach
- One part R/O or DI water

Directions

1. Combine bleach and R/O or DI water.

6.16.2 Instrumentation:

6.16.2.1 All glassware and utensils must be dedicated to the technique to avoid reagent contamination.

6.16.2.2 Certain rubber products and glove types may cause contamination and should not be used and/or come in contact with the item(s) of evidence after the pre-wash.

6.16.2.3 Plastic rinse trays may be used but must be clean.

6.16.2.4 Plastic or bamboo tongs without serrated edges are recommended for item handling.

6.16.3 Minimum Standards and Controls:

6.16.3.1 The stock solution has a one year shelf life.

6.16.3.2 The PD combined working solution is unstable and shall be discarded after use.

6.16.3.3 Apply a test print to a porous item similar to the evidence being processed. Follow the procedure listed below to process the test print. If the test print turns dark gray, the working solution can be used to process evidence.

6.16.4 Procedure or Analysis:

6.16.4.1 Immerse item(s) in Maleic Acid pre-wash solution in a glass tray for five to ten minutes or until bubbles are no longer given off.

6.16.4.1.1 Pre-wash is necessary to avoid reagent contamination.

6.16.4.2 Immerse item(s) in the PD working solution and gently rock the tray.

6.16.4.2.1 Latent print development time will vary and can be as little as one minute or up to twenty minutes.

6.16.4.2.2 Keep the item(s) separated and be careful not to crease or extensively handle the item(s). Monitor development closely to avoid over processing.

6.16.4.3 Remove the item(s) when optimum contrast is observed.

6.16.4.4 Rinse the item(s) of evidence using either the water rinse or two-step Photofix rinse.

6.16.4.4.1 Water rinse

6.16.4.4.1.1 Immerse item(s) of evidence in a tray with continuous gentle running R/O or DI water.

6.16.4.4.2 Photofix rinse

6.16.4.4.2.1 Immerse item(s) of evidence in the Photofix Rinse 1 solution for 30 seconds.

6.16.4.4.2.2 Transfer the item(s) of evidence into Photofix Rinse 2 solution for three minutes.

6.16.4.4.2.3 Wash the item(s) in running water for three to five minutes.

6.16.4.5 Allow the item(s) of evidence to dry while lying flat.

6.16.4.5.1 The item(s) can be blotted carefully with blotter paper to speed the drying process if the item(s) are not fragile.

6.16.4.6 If needed, a bleach rinse may be used to improve the contrast of darker friction ridge prints.

6.16.4.6.1 All friction ridge prints should be photographed before proceeding with this step.

6.16.4.6.2 Immerse item(s) of evidence in the bleach solution for two to three minutes.

6.16.4.6.3 Rinse item(s) of evidence in running R/O or DI water for two to three minutes.

6.16.4.7 Review the item(s) for any developed friction ridge prints.

6.16.4.8 Capture friction ridge prints for analysis and further examination.

6.17 RHODAMINE 6G-ARDROX-MBD (RAM)

RAM is a combination dye stain that enhances friction ridge prints previously developed with CA. RAM is applied to the object and visually examined utilizing an ALS at various wavelengths.

6.17.1 Preparation:

6.17.1.1 R6G Stock Solution

Chemicals Required

- 1 g R6G
- 1 L Methanol

Directions

1. Combine the ingredients in the order listed.

6.17.1.2 MBD Stock Solution

Chemicals Required

- 1 g MBD
- 1 L Acetone

Directions

1. Combine the ingredients in the order listed.

6.17.1.3 RAM Working Solution

Chemicals Required

- 3 mL R6G Stock Solution
- 2 mL Ardrox
- 7 mL MBD Stock Solution
- 20 mL Methanol
- 10 mL Isopropyl Alcohol
- 8 mL Acetonitrile
- 950 mL Petroleum Ether

Directions

1. Combine the ingredients in the order listed.

6.17.2 Instrumentation:

6.17.2.1 An ALS is required for visualization of developed friction ridge prints.

6.17.3 Minimum Standards and Controls:

6.17.3.1 The stock solutions have an indefinite shelf life.

6.17.3.2 RAM working solution shall not exceed six months. RAM working solution may separate after 30 days; if after stirring or shaking the solution it still separates, discard the solution.

6.17.3.3 Follow the procedure listed below to process a test print previously deposited and developed with cyanoacrylate ester. If the test print fluoresces, the working solution can be used to process evidence.

6.17.4 Procedure or Analysis:

6.17.4.1 Apply the solution to the item(s) by immersion, spray canister or squirt bottle.

6.17.4.2 Allow the item(s) to dry completely.

6.17.4.3 Review the item(s) for any developed friction ridge prints using an ALS with appropriate goggles.

6.17.4.3.1 RAM fluoresces within the same range as its component dye stains and viewed using the appropriate barrier filters.

6.17.4.4 Capture friction ridge prints for analysis and further examination.

6.18 RHODAMINE 6G (R6G)

R6G is a dye stain that enhances friction ridge prints previously developed with CA. R6G is applied to the object and visually examined utilizing an ALS.

6.18.1 Preparation:

6.18.1.1 R6G Methanol Solution #1

Chemicals Required

- 0.0048 g R6G
- 1 L Methanol

Directions

1. Combine the ingredients and stir the solution until all of the powder is dissolved.

6.18.1.2 R6G Methanol Solution #2: Stock Solution

Chemicals Required

- 0.48 g R6G
- 1 L Methanol

Directions

1. Combine the ingredients and stir the solution until all of the powder is dissolved.

6.18.1.3 R6G Methanol Solution #2: Working Solution

Chemicals Required

- 10 mL R6G Stock Solution
- 1 L Methanol

Directions

1. Combine the ingredients.

6.18.1.4 R6G Aqueous Solution #1

Chemicals Required

- 0.0048 g R6G
- 1 L R/O or DI water
- 3 - 6 drops Surfactant

Directions

1. Combine the ingredients and continue to stir the solution until all powder is dissolved.

6.18.1.5 R6G Aqueous Solution #2: Stock Solution

Chemicals Required

- 0.48 g R6G
- 1 L R/O or DI water

Directions

1. Combine the ingredients and continue to stir the solution until all powder is dissolved.

6.18.1.6 R6G Aqueous Solution #2: Working Solution

Chemicals Required

- 10 mL R6G Aqueous Stock Solution
- 1 L R/O or DI water
- 3 - 6 drops Surfactant

Directions

1. Combine the ingredients.

6.18.2 Instrumentation:

6.18.2.1 An ALS is required for visualization of developed friction ridge prints.

6.18.3 Minimum Standards and Controls:

6.18.3.1 The R6G stock solutions have an indefinite shelf life.

6.18.3.2 The R6G working solutions shelf life shall not exceed six months.

6.18.3.3 Follow the procedure listed below to process a test print previously deposited and developed with cyanoacrylate ester. If the test print fluoresces, the working solution can be used to process evidence.

6.18.4 Procedure or Analysis:

6.18.4.1 Apply the solution to the item(s) by immersion, spray canister or squirt bottle.

6.18.4.2 Allow the item(s) to dry completely.

6.18.4.3 Review the item(s) for any developed friction ridge prints using an ALS with appropriate goggles.

6.18.4.3.1 R6G fluoresces best with blue-green to green light and can be viewed using orange or red barrier filters.

6.18.4.4 Capture friction ridge prints for analysis and further examination.

6.19 TAPEGLO™

TapeGlo™ is a fluorescent dye stain that develops friction ridge prints on the adhesive side of tape.

6.19.1 Preparation:

6.19.1.1 Follow manufacturer's recommendations for any preparation.

6.19.2 Instrumentation:

6.19.2.1 A soft-bristle brush may be used for application.

6.19.3 Minimum Standards and Controls:

6.19.3.1 The manufacturer's shelf-life recommendations shall be followed.

6.19.3.2 Apply a test print to a non-porous item similar to the evidence being processed. Follow the procedure listed below to process the test print. If the test print fluoresces, the solution can be used to process evidence.

6.19.4 Procedure or Analysis:

6.19.4.1 Immerse, spray or brush the item(s) with the solution to completely cover the surface.

6.19.4.2 Allow the suspension to remain on the item(s) for 10 to 15 seconds.

6.19.4.3 Gently rinse with R/O or DI water.

6.19.4.4 Review the item(s) for any developed friction ridge prints using an ALS with appropriate goggles.

6.19.4.4.1 TapeGlo™ fluoresces best with blue light and can be viewed using orange barrier filters.

6.19.4.5 Capture friction ridge prints for analysis and further examination.

7 PHYSICAL PROCESSING METHODS

7.1 USE OF PHYSICAL PROCESSING METHODS

7.1.1 Any of the listed preparations may be used at the examiner's discretion.

7.2 POWDER, FLUORESCENT

Powdering is the application of applying finely ground, colored powder to an item to make latent prints visible. The powder binds to moisture, oil, and other residues. Fluorescent powders were developed specifically to be luminescent, excited by light sources emitting blue-green light.

7.2.1 Preparations:

7.2.1.1 No specific preparations are needed as the powders are commercially prepared.

7.2.2 Instrumentation:

7.2.2.1 Brushes are required for application of the powder.

7.2.2.2 An ALS is required for visualization of developed friction ridge prints.

7.2.3 Minimum Standards and Controls:

7.2.3.1 Fluorescent powder has an indeterminable shelf life; however, if clumping of the powder is observed, it shall be discarded.

7.2.3.2 Fluorescent powder should not be exposed to high humidity or moisture as this may cause clumping of the powder. Store fluorescent powder in a manner that minimizes this exposure.

7.2.4 Procedure or Analysis:

7.2.4.1 Coat the ends of the brush bristles with powder and gently tap several times to remove excess powder.

7.2.4.2 With the brush handle in a nearly perpendicular position to the surface, lightly and delicately move the bristle ends over the surface. Friction ridge prints will develop in contrast with each light pass until no further development can be observed.

7.2.4.3 Excessive powder will cause a fill between the ridges. This fill can be removed with continued brush strokes until the print is as free of extraneous powder as possible.

7.2.4.4 Extraneous residue on the surface may cause a general painting effect which can obscure friction ridge detail. A lift of the area can sometimes remove the extraneous residue and permit a second, higher quality application of powder that may offer better contrast between the latent print and the background.

7.2.4.5 Review the item(s) for any developed friction ridge prints using an ALS with appropriate goggles.

7.2.4.6 Capture friction ridge prints for analysis and further examination.

7.2.4.6.1 If lifting is required, process with standard powder prior to lifting.

7.3 POWDER, MAGNETIC

Powdering is the application of finely ground, colored powder to an item to make latent prints visible. The powder binds to moisture, oil, and other residues. Magnetic powders are powder-coated, fine iron filings subject to magnetic attraction.

7.3.1 Preparations:

7.3.1.1 No specific preparations are needed as the powders are commercially prepared.

7.3.2 Instrumentation:

7.3.2.1 Magnetic applicators are required for application of the powder.

7.3.3 Minimum Standards and Controls:

7.3.3.1 Magnetic powder has an indeterminable shelf life; however, if clumping of the powder is observed, it shall be discarded.

7.3.3.2 Magnetic powder should not be exposed to high humidity or moisture as this may cause clumping of the powder. Store magnetic powder in a manner that minimizes this exposure.

7.3.4 Procedure or Analysis:

7.3.4.1 Pick up the magnetic powder with the end of the magnetic applicator

7.3.4.2 Without touching the surface with the applicator, lightly and delicately move the powder over the surface. Friction ridge prints will develop in contrast with each light pass until no further development can be observed.

7.3.4.3 Excessive powder can sometimes be removed by passing the magnetic applicator, without powder, near the surface to pick up the extra powder.

7.3.4.4 Review the item(s) for any developed friction ridge prints.

7.3.4.5 Capture friction ridge prints for analysis and further examination.

7.4 POWDER, STANDARD

Powdering is the application of finely ground, colored powder to an item to make latent prints visible. The powder binds to moisture, oil, and other residues.

7.4.1 Preparations:

7.4.1.1 No specific preparations are needed as the powders are commercially prepared.

7.4.2 Instrumentation:

7.4.2.1 Brushes are required for application of the powder.

7.4.3 Minimum Standards and Controls:

7.4.3.1 Standard powder has an indeterminable shelf life; however, if clumping of the powder is observed, it shall be discarded.

7.4.3.2 Standard powder should not be exposed to high humidity or moisture as this may cause clumping of the powder. Store standard powder in a manner that minimizes this exposure.

7.4.4 Procedure or Analysis:

7.4.4.1 Coat the ends of the brush bristles with powder and gently tap several times to remove excess powder.

7.4.4.2 With the brush handle in a nearly perpendicular position to the surface, lightly and delicately move the bristle ends over the surface. Friction ridge prints will develop in contrast with each light pass until no further development can be observed.

7.4.4.3 Excessive powder will cause a fill between the ridges. This fill can be removed with continued brush strokes until the print is as free of extraneous powder as possible.

7.4.4.4 Extraneous residue on the surface may cause a general painting effect which can obscure friction ridge detail. A lift of the area can sometimes remove the extraneous residue and permit a second, higher quality application of powder that may offer better contrast between the latent print and the background.

7.4.4.5 Review the item(s) for any developed friction ridge prints.

7.4.4.6 Capture friction ridge prints for analysis and further examination.

7.5 SMALL PARTICLE REAGENT (SPR)

SPR contains molybdenum disulfide, which is sensitive to lipids that may be present in latent print residue. Processing with SPR is effective on non-porous items that were previously wet and as a secondary treatment of cyanoacrylate ester processed items.

7.5.1 Preparations:

7.5.1.1 Follow the manufacturer's instructions for pre-mixed solutions.

7.5.1.2 Surfactant Stock Solution

Chemicals Required

- 8 mL Surfactant such as Photo-Flo or an equivalent
- 500 mL R/O or DI water

Directions

1. Dissolve Surfactant into R/O or DI water

7.5.1.3 SPR Suspension Working Solution

Chemicals Required

- 10 g Molybdenum Disulfide
- 50 mL Surfactant Stock Solution
- 900 mL R/O or DI water

Directions

1. Add Molybdenum Disulfide to Surfactant Stock Solution slowly and stir continuously. A mixture that is creamy and free of dry powder is ideal.
2. While stirring continuously, add the Disulfide mixture to R/O or DI water.

7.5.2 Instrumentation:

7.5.2.1 None noted.

7.5.3 Minimum Standards and Controls:

7.5.3.1 SPR Suspension working solution shall have a shelf life not exceeding one year or, for commercially available products, the manufacturer's shelf life recommendations.

7.5.3.2 Apply a test print to a non-porous item similar to the evidence being processed. Follow the procedure listed below to process the test print. If the test print develops, the working solution can be used to process evidence.

7.5.4 Procedure or Analysis:

7.5.4.1 Immersion Application

7.5.4.1.1 Shake the working solution well and place it in a shallow tray that will allow for the item(s) to be completely submerged in the solution.

7.5.4.1.2 Stir the solution again before each item(s) is placed into the solution.

7.5.4.1.3 Place the item(s) in the solution as flat as possible in the tray.

7.5.4.1.4 Allow the item(s) to remain in the suspension for approximately 30 seconds. The molybdenum particles will settle on the item(s).

7.5.4.1.5 Turn the item(s) over and allow it to remain in the suspension for approximately 30 seconds.

7.5.4.1.6 Repeat procedure until all item(s) surfaces have been exposed to the solution.

7.5.4.1.7 Place the item(s) in a tray of water and rock the tray or flow water through the tray to remove excess SPR.

7.5.4.2 Wash Bottle Application

7.5.4.2.1 Spray a flow of SPR over the surface of the item(s).

7.5.4.2.2 Wash the surface of the item(s) with a light to moderate flow of water.

7.5.4.3 Allow the item(s) to dry.

7.5.4.4 Review the item(s) for any developed friction ridge prints.

7.5.4.4.1 Faint prints may benefit from re-processing.

7.5.4.5 Capture friction ridge prints for analysis and further examination.

7.5.4.5.1 SPR lifts easily from dried, processed, non-porous surfaces.

7.6 STICKY SIDE POWDER (SSP)

7.6.1 SSP consists of powder in suspension that binds to moisture, oil, and other residues. The suspension provides an effective delivery system for the powder.

Preparation:

7.6.1.1 SSP Working Solution

Chemicals Required

- Photo-Flo 200 or Surfactant
- R/O or DI water
- Sticky Side or other powder

Directions

1. Combine the Surfactant and R/O or DI water at a ratio of 1:1.
2. Add Sticky Side or other powder to the solution and stir until the mixture is a consistency of thin paint.

7.6.2 Instrumentation:

7.6.2.1 A soft-bristle brush could be used for application.

7.6.3 Minimum Standards and Controls:

7.6.3.1 SSP should be prepared as needed.

7.6.3.2 Apply a test print on a surface similar to the evidence being processed. Follow the procedure listed below to process the test print. If the test print develops, the working solution can be used to process evidence.

7.6.4 Procedure or Analysis:

7.6.4.1 Immerse the item(s) in the suspension or paint the suspension on the sticky side of the tape using a soft bristled brush.

7.6.4.2 Allow the suspension to remain on the item(s) for approximately 10 seconds.

7.6.4.3 Remove the item(s) from the suspension and rinse excess suspension from the item(s) with a gentle flow of cold R/O or DI water.

7.6.4.4 These steps can be repeated to improve contrast.

7.6.4.5 Review the item(s) for any developed friction ridge prints.

7.6.4.6 Capture friction ridge prints for analysis and further examination.

7.7 WETWOP™ / Wet Powder Suspension

WetWop™ consists of powder in suspension that binds to moisture, oil, and other residues. The suspension provides an effective delivery system for the powder.

Preparation:

7.7.1 Follow manufacturer's recommendations for any preparation.

7.7.2 Instrumentation:

7.7.2.1 A soft-bristle brush may be used for application.

7.7.3 Minimum Standards and Controls:

7.7.3.1 The manufacturer's shelf-life recommendations shall be followed.

7.7.3.2 Apply a test print on a surface similar to the evidence being processed. Follow the procedure listed below to process the test print. If the test print develops, the working solution can be used to process evidence.

7.7.4 Procedure or Analysis:

7.7.4.1 Immerse the item(s) in the suspension or paint the suspension on the sticky side of the tape using a soft bristled brush.

7.7.4.2 Allow the suspension to remain on the item(s) for approximately 10 seconds.

7.7.4.3 Remove the item(s) from the suspension and rinse excess suspension from the item(s) with a gentle flow of cold R/O or DI water.

7.7.4.4 These steps can be repeated to improve contrast.

7.7.4.5 Review the item(s) for any developed friction ridge prints.

7.7.4.6 Capture friction ridge prints for analysis and further examination.

8 FRICTION RIDGE EXAMINATION

8.1 INTRODUCTION

Friction ridge print examinations are conducted using the Analysis, Comparison, Evaluation and Verification (ACE-V) methodology, utilizing both qualitative and quantitative analysis. This process is applied regardless of the combination of print types (i.e., unknown versus known, known versus known, or unknown versus unknown).

8.1.1 Friction ridge print examinations are conducted utilizing images that represent the evidence accurately.

8.1.2 The examination documentation shall include the results of the analysis of all designated friction ridge prints and the results of all comparisons, as applicable.

8.1.3 It is acceptable to not analyze every latent captured or imported into the Latents folder in Mideo.

8.1.4 Consultation is a discussion between examiners, generally related to the determination of value or a source conclusion.

8.1.4.1 Consultations between examiners shall be documented and include the specific print(s) reviewed, the nature, results and date of the consultation and the name or initials of the consulting examiner.

8.1.5 Verifications must be completed prior to communicating the source conclusions to the submitting agency, either verbally or in writing.

8.2 ANALYSIS

Analysis is the overall observation and interpretation of data present in the latent print, which is documented using Mideo and completed prior to moving on to the Comparison. Clarification techniques may be used to achieve better visualization of the data present in the print.

8.2.1 Analysis is the interpretation of observed data in a latent print to determine suitability for use in comparison.

8.2.2 Observed data may include:

8.2.2.1 Substrate (porous, non-porous, semi-porous, smooth, rough, corrugated, pliable, textured, etc.)

8.2.2.2 Suspected residue components (sweat, blood, paint, dirt, oil, grease, etc.)

8.2.2.3 Development method (illumination techniques, physical processing, chemical processing, etc.)

8.2.2.4 Preservation method (photography, lifting, live-scan, ink, etc.)

8.2.2.5 Anatomical source

8.2.2.5.1 Anatomical source is the designation of the latent print as a fingerprint, palm print, toe print or footprint.

8.2.2.6 Anatomical region

8.2.2.6.1 Anatomical region is the designation of the latent print as the tip, side, pattern area, joint, thenar, hypothenar, interdigital or region of the foot.

8.2.2.7 Orientation

8.2.2.8 Overall ridge flow (level one detail)

8.2.2.8.1 Includes the general morphology, pattern type, presence of incipient ridges and overall size of the latent print.

8.2.2.9 Individual ridge path (level two detail)

8.2.2.9.1 Includes presence or absence of ridge path deviations and the morphology of the ridge paths.

8.2.2.10 Structure of individual ridges (level three detail)

8.2.2.10.1 Includes the shape of the ridges and relative pore positions.

8.2.2.11 Spatial relationships (ridge counts, distances, directions, angles between features, etc.)

8.2.2.12 Additional information (creases, scars, etc.)

8.2.2.13 Presence or absence of an anchor point

8.2.2.13.1 An anchor point is a delta, core, or the following: distal transverse crease, proximal transverse crease, radial longitudinal crease, a pattern formation present in any anatomical region of the palm, bracelet creases and creases between the joints of the fingers.

8.2.2.14 Mechanics of touch

8.2.2.15 Distortion (pressure, movement, rotation, double-tap, etc.)

8.2.3 Documentation of the observed data

8.2.3.1 Indicate the orientation of the latent print with a line, curved or straight, at the top of the print or indicate the orientation using the fieldsets in Mideo.

8.2.3.2 Required for all friction ridge prints prior to comparison: Document observed data to determine if the latent is suitable for comparison.

8.2.3.2.1 The GYRO method shall be used to document level two detail.

8.2.3.2.1.1 Green: high degree of confidence the observed data will appear in the same position, shape and type in the known print.

8.2.3.2.1.2 Yellow: medium degree of confidence the observed data will appear in the same position, shape and type in the known print.

8.2.3.2.1.3 Red: very low level of confidence the observed data will appear similarly in the known print.

8.2.3.2.1.4 Orange: reserved for use in comparison; marks observed data not considered during analysis and noted first in the exemplar.

8.2.3.2.1.4.1 It is not necessary for observed data simply not marked during analysis, but specifically for observed data first seen in the exemplar to allow for transparent documentation and to allow the examiner to apply the proper weight of a feature.

8.2.4 Determination of suitability for comparison

8.2.4.1 The latent print is suitable for use in comparison ("of value for comparison") due to adequate quality and quantity of observed data.

8.2.4.1.1 A latent print that is suitable for comparison may result in any of the three source conclusions outlined in Evaluation.

8.2.4.2 The latent print is not suitable for use in comparison ("not of value for comparison") due to the lack of adequate quality and quantity of observed data.

8.2.4.2.1 A Supervisor, Group Supervisor or Designee shall review all captured prints that the examiner deemed to be not suitable for comparison. The review shall be documented in Mideo by completing the Consult/Reviewer field in the Analysis Information tab.

8.2.4.2.2 If the suitability for comparison determination is not in agreement, the Difference of Opinion procedure shall be followed.

8.2.5 Determination of complexity

8.2.5.1 Complexity is the interplay between quality and quantity of observed data and its relation to the decision thresholds. It broadly represents how the amount of available information in a print directly impacts the decision-making process.

8.2.5.1.1 Two types of information are considered when determining complexity:

8.2.5.1.1.1 Observed data could provide an indication of the anatomical region or orientation.

8.2.5.1.1.2 Observed data could include quality and quantity of features, specificity of features, distortion, tolerances, or the presence of pattern forced areas, creases, scars or open fields..

8.2.5.2 Four complexity levels are possible for latent prints of value for comparison:

8.2.5.2.1 Complexity Level I: a latent print where the observed data does not provide an indication of anatomical region or orientation and any or all of the following factors are present: low specificity of features, low quantity of features, significant distortion (e.g. rotational movement, multiple tap, superimposed impression, extreme pressure leading to tonal reversal, and slippage), high tolerances, and pattern forced area.

8.2.5.2.1.1 This level of complexity requires the additional QA measures outlined in the Database Searching section of this manual.

8.2.5.2.2 Complexity Level II: a latent print where the observed data provides an indication of the anatomical region and orientation and any or all of the following factors are present: low specificity of features, low quantity of features, significant distortion (e.g. rotational movement, multiple tap,

superimposed impression, extreme pressure leading to tonal reversal, and slippage), high tolerances, and pattern forced area.

8.2.5.2.2.1 This level of complexity requires the additional QA measures outlined in the Database Searching section of this manual.

8.2.5.2.3 Complexity Level III: a latent print where the observed data does provide an indication of anatomical region but no anchor point is present and with any or all of the following factors present: high specificity of features, high quantity of features, presence of creases, scars, limited distortion, and open fields.

8.2.5.2.4 Non-Complex: a latent print where the observed data provides strong indication of the anatomical region and orientation with an anchor point and with any or all of the following factors present: high specificity of features, high quantity of features, presence of creases, scars, limited distortion, and open fields.

8.3 COMPARISON

Comparison builds on the data observed during Analysis by utilizing that data to search for similarities and differences between the latent print and the known print. Target groups can be useful in progressing through this search by providing focal points.

8.3.1 Comparison is the search for and detection of similarities and differences in observed data, to include consideration of spatial relationships of features, between two prints.

8.3.1.1 The search for similarities and differences generally consists of selecting a target group in the latent print and then searching for that target group in the known print. Data is observed and documented throughout this search process.

8.3.1.1.1 A target group is a combination of two or more ridge path deviations.

8.3.1.2 Observed data used to reach a conclusion that were not considered during Analysis shall be marked with an orange annotation.

8.3.1.2.1 The use of orange indicates the characteristic was not considered in Analysis but was used in the Comparison in order to assign the appropriate weight during the Evaluation.

8.4 EVALUATION

Evaluation is the step of ACE-V method wherein an examiner assesses the value of the details observed during the analysis and the comparison steps and reaches a source conclusion.

8.4.1 Evaluation is the weighing of the strength of the observed similarities and differences between the data in two prints to reach a source conclusion.

8.4.1.1 Three source conclusions can be reached:

8.4.1.1.1 Identification

8.4.1.1.1.1 Conclusion reached when an examiner determines there is sufficient observed data in agreement to conclude that the friction ridge prints originated from the same source.

8.4.1.1.2 Exclusion

8.4.1.1.2.1 Conclusion reached when an examiner determines that there is sufficient observed data in disagreement to conclude that the friction ridge prints did not originate from the same source.

8.4.1.1.2.2 In order to effect a source conclusion of exclusion, an anchor point and a minimum of two target groups are required.

8.4.1.1.3 Inconclusive

8.4.1.1.3.1 Conclusion reached when an examiner determines that there is insufficient observed data in agreement or disagreement to conclude that the friction ridge prints did or did not originate from the same source. The insufficient observed data could be due to absent or unreliable corresponding areas of friction ridge detail.

8.4.1.1.3.2 When a source conclusion of identification or exclusion cannot be reached, the CoA shall clearly communicate the reason.

8.4.1.1.3.2.1 The reason may include a lack of anchor point, lack of reliable observed data in the latent or known prints, incomplete known prints, or a combination of these reasons.

8.4.2 The definitions for the source conclusion shall be included on every CoA below the signature line.

8.4.3 Following the completion of Evaluation, the “Case Status” fieldset associated with the Case Folder will be completed by the examiner.

8.4.3.1 It is not necessary to complete the “Case Status” fieldset if no comparisons were completed, for deceased identification and other exemplar to exemplar cases.

8.4.3.2 Completing the “Case Status” fieldset determines which category of Verification will be utilized.

8.5 VERIFICATION

Verifications are divided into two categories: Verification and Blind Verification. In a Verification, the results are not blinded to the verifying examiner. In a Blind Verification, the blind verifying examiner does not have access to the source conclusion(s) rendered by the original examiner.

8.5.1 Verification is the independent application of the Analysis, Comparison and Evaluation steps.

8.5.1.1 All conclusions shall be verified.

8.5.1.2 The verification shall not be conducted by an examiner that has been solicited for consultation regarding source conclusions.

8.5.1.3 If possible, the verification will not be conducted by the technical reviewer.

8.5.1.4 Mideo will randomly select cases for Blind Verification. The examiner will be notified of the category of Verification after completing the “Case Status” fieldset associated with the Case Folder.

8.5.1.4.1 If the response is “Proceed with verification / review as necessary”, the examiner will proceed with Verification.

8.5.1.4.2 If the response is “Selected for Blind Verification - Contact Supervisor”, the examiner will proceed with the Blind Verification.

8.5.1.5 Verification

8.5.1.5.1 Following the completion of the Evaluation and associated documentation, the original examiner will place copies of the original image(s) of the latent print(s) to be verified in the Verification folder within Mideo and provide the case number to the verifying examiner.

8.5.1.5.2 A cropped/calibrated submitted digital image is considered an original image for the purpose of verification.

8.5.1.5.3 The verifying examiner will conduct and document the Analysis, Comparison and Evaluation steps for the case and notify the original examiner upon completion.

8.5.1.5.4 If the source conclusions are not in agreement, the Difference of Opinion procedure shall be followed.

8.5.1.6 Blind Verification (BV)

8.5.1.6.1 It is acceptable for an examiner to choose to send the case to BV as an additional QA measure.

8.5.1.6.2 It is acceptable for the Section Supervisor, after consultation with the PM or Director of Technical Services, to override the requirement for BV if extenuating circumstances exist.

8.5.1.6.3 Following the completion of the Evaluation and associated documentation, the original examiner will place copies of the original images in the Verification folder within Mideo and provide the case number to the Section Supervisor or designee.

8.5.1.6.4 The Section Supervisor or designee will provide the case number to the blind verifier.

8.5.1.6.4.1 If possible, blind verifications will be completed by an examiner located in a different laboratory.

8.5.1.6.5 Using their blind verification Mideo account, the blind verifying examiner will conduct and document the Analysis, Comparison and Evaluation steps for the case and notify the Section Supervisor or designee if a consultation is needed or upon completion.

8.5.1.6.5.1 If a consultation is needed, the Section Supervisor or designee will coordinate the assignment of a consulting examiner.

8.5.1.6.6 The Section Supervisor, Group Supervisor or Designee will review the source conclusions reached by both examiners.

8.5.1.6.6.1 If the source conclusions are in agreement, the reviewer shall add “results in agreement,” their initials and the date of the review in the Notes field associated with the Case Folder.

8.5.1.6.6.2 If the source conclusions are not in agreement, the Difference of Opinion procedure shall be followed.

8.6 LATENTSLEUTH

LatentSleuth is software designed for searching latent fingerprints against known prints. The benefit of using the software is to minimize the amount of time an examiner spends searching for the corresponding area during Comparison.

8.6.1 LatentSleuth shall not be utilized for latent palm prints, joints of the fingers or when the corresponding areas of friction ridge skin are not represented in the exemplars.

8.6.1.1 A consultation shall occur if LatentSleuth is not utilized due to the exemplars.

8.6.2 The system shall be utilized by the assigned examiner when an initial comparison conclusion of exclusion or inconclusive is reached and the latent print meets one or both conditions: .

8.6.2.1 the latent print lacks an anchor point

8.6.2.2 the latent print has an unknown orientation

8.6.3 It is acceptable for both the assigned examiner and verifying examiner to utilize the system at any time during comparison.

8.7 EXAMINATION DOCUMENTATION

8.7.1 Analysis shall be documented using the Analysis Notes and clarified images within Mideo.

8.7.1.1 For friction ridge prints that were analyzed, original and clarified images shall be included in the case file.

8.7.1.2 The verifying examiner shall include Verification Analysis Notes and clarified images in their examination documentation.

8.7.2 Copies of exemplars used for comparison shall be retained as examination documentation.

8.7.3 Evaluation shall be documented via the Latent Notes and associated visual representation of the observed data used to reach the source conclusion.

8.7.3.1 If a source conclusion of identification is rendered, a comparison workspace shall be included in the case file.

8.7.3.1.1 The file name of the comparison workspace will include the FS lab #, P number and the source information.

For example: X21-XXXX 1P1 ID John Doe RI

8.7.3.2 If a source conclusion of exclusion is rendered, an Exclusion - Clarified/Annotated Image documenting the anchor point and target groups shall be included in the case file.

8.7.3.2.1 The file name of the Exclusion - Clarified/Annotated Image will include the FS lab #, P number and EXC or Exclusion.

For example: X21-XXXX 1P1 EXC

8.7.3.3 If a source conclusion of inconclusive is rendered, it is not necessary to save a comparison or exclusion workspace.

8.7.4 Verification shall be documented via the Verification Analysis Notes, Verification Latent Notes as well as Exclusion - Clarified/Annotated Image, Clarified/Annotated Image and appropriate Comparison Workspaces.

8.7.4.1 When naming the files, "_V" and "_BV" will be used to differentiate the documentation.

For example: X21-XXXX 1P1 ID John Doe RI_V

For example: X21-XXXX 1P1 EXC_V or X21-XXXX 1P1 EXC_BV

8.7.4.2 Examination documentation created by the verifying examiner will be initialed by both the original and verifying examiner.

8.7.5 LatentSleuth

8.7.5.1 When the system is utilized, the following documentation shall be included in the case file:

8.7.5.1.1 Printed copies of the edited versions of the friction ridge prints searched.

8.7.5.1.2 Printed copies of the prioritized list reviewed.

8.7.6 Consultations shall be documented using the appropriate consult field within Mideo.

8.7.6.1 Examination documentation created by the consulting examiner will be initialed by both the original and consulting examiner and included in the case file.

8.8 DIFFERENCE OF OPINION

8.8.1 Difference regarding suitability determinations

8.8.1.1 The examiners shall discuss the basis for their determination when a difference regarding suitability occurs. The discussion will result in 1) consensus the latent print is suitable for comparison or 2) consensus the latent print is not suitable for comparison.

8.8.1.2 When changes to the value determination are made and/or additional analysis is conducted following a review, the examination documentation shall include the reason for the change of opinion and/or additional analysis.

8.8.2 Difference regarding source conclusions

8.8.2.1 The original and verifying examiners shall discuss the basis for their conclusion when a difference regarding source conclusions occurs.

8.8.2.1.1 The Section Supervisor, Group Supervisor or Designee will notify the examiners of the need for discussion of a difference in a blind verification.

8.8.2.2 When changes to the evaluation conclusions are made following a consultation between the examiners, the notes shall include the reason for the change of opinion and this information shall be conveyed to the Section Supervisor and the Physical Evidence PM.

8.8.2.2.1 The Section Supervisor and the Physical Evidence PM shall be notified when the evaluation conclusions differ, but not when the reasons for the inconclusive differ.

8.8.2.2.2 The examination documentation shall include documentation of the notification of the Section Supervisor and the Physical Evidence PM.

8.8.2.3 If consensus is not reached, an inconclusive source conclusion shall be reported on the CoA per the QM Section 15 using the following language.

The comparison of latent *1P1* and *Item 2* is being reported as inconclusive due to lack of concordant results of duplicate analysis.

8.8.2.4 If consensus is not reached, the Physical Evidence PM and/or Director of Technical Services shall assign an examiner to evaluate the evidence to provide a quality assessment of the evidence items compared. The purpose of the evaluation is to provide a recommendation to the PM and/or Director of Technical Services as to the appropriateness of the non-consensus opinions and if both conclusions are sound.

9 DATABASE SEARCHING

9.1 INTRODUCTION

The Automated Fingerprint Identification System (AFIS) is a laboratory instrument that is used to perform searches of the Virginia state database of known finger and palm prints, referred to as the Central Criminal Records Exchange (CCRE). The system is housed and maintained by the Virginia State Police (VSP).

The Next Generation Identification (NGI) system is the FBI's AFIS (formerly IAFIS, Integrated Automated Fingerprint Identification System).

Both AFIS and NGI are Individual Characteristic Databases (ICDs). The Department's Latent Print Section does not maintain an ICD.

9.2 MINIMUM STANDARDS AND CONTROLS

9.2.1 To ensure that the databases are working properly, a benchmark print shall be run within seven business days prior to searching a latent print from casework. The benchmark print will be searched without editing. The split screen printout of the latent print and candidate lists demonstrating the hit will be retained in a binder located in the AFIS room/area for the assessment cycle.

9.2.2 If the known candidate is not on the candidate list, an additional search will be initiated. If the known candidate does not appear on the second candidate list, a service call will be made to the appropriate help desk.

9.2.2.1 The terminal will be marked as being "Out of Service" to include the date and this will be recorded in the Latent Print Section General Maintenance Log.

9.2.2.2 Database searches conducted since the last positive control may need to be researched depending on the identified problem.

9.2.3 Known fingerprints or palm prints produced from ICDs are treated as examination documentation in accordance with the QM.

9.2.3.1 These hard copies may be received from the CCRE, FBI, or local law enforcement agencies and are uniquely identified by the State Identification (SID) number, FBI number, or local "Originating Agency's Case (OCA) number" in conjunction with the local "Originating Agency's Identification (ORI) number".

9.2.3.2 They may be in the form of printouts from archived files (digital media) or facsimiles, photographic copies or photographs from CCRE, FBI or local law enforcement agencies' record files.

9.3 DETERMINING SUITABILITY FOR DATABASE SEARCHING

9.3.1 Determination of which prints are suitable for database searching is made by the examiner. If a database search is not conducted, the reason as to why shall be documented in the examination documentation.

9.3.1.1 AFIS quality or suitability is a separate determination from the complexity and analysis decisions and shall be documented separately.

9.3.1.2 The terminus statement of the CoA shall convey if any friction ridge prints were not searched.

9.3.1.3 The abbreviation/definition key shall be included on the CoA, below the signature line.

9.3.2 Prior to conducting a database search of a Complexity Level I or Level II friction ridge print, the examiner shall consult with another examiner. The consult will result in 1) agreement the print can be

searched and vulnerable areas are documented (i.e. lack of specificity, distortion) or 2) agreement the print should not be searched or 3) the print is not searched due to lack of consensus. The consultation shall be documented.

9.3.2.1 A consultation is not required if a Complexity Level I or Level II latent print is not searched in a database.

9.3.2.2 A consultation is not required if a Complexity Level III or a Non-Complex latent print is searched in a database.

9.3.2.3 If a Complexity Level I or Level II latent print is identified to an exemplar retrieved as the result of a database search, the examiner shall participate in a consultation regarding the comparison conclusion.

9.3.2.4 It is acceptable for the consultations prior to database searching and following comparison to be conducted by the same examiner due to a potential advantage of the examiner being aware of the complexity issues discussed prior to searching in the database. The comparison shall be verified by an examiner not involved in the consultations.

9.3.3 If a friction ridge print is not searched due to it originating from the same source as another latent print then it is necessary to compare the friction ridge prints to each other, reach a conclusion of identification and have the conclusion verified.

9.3.4 Images exported for database searching may contain clarification techniques but not annotations of observed data.

9.3.5 Images exported for database searching shall be calibrated prior to being exported from Mideo.

9.4 REVIEWING DATABASE SEARCH RESULTS

9.4.1 Database search parameters must be set to return a minimum of ten candidates.

9.4.2 All returned candidates shall be reviewed.

9.4.3 If further review and examination is required, the exemplar shall be imported into Mideo and the ACE-V method outlined in Friction Ridge Examination shall be followed.

9.4.3.1 If the comparison conclusion is inconclusive or exclusion, the identifying information on the exemplar shall not be included on the CoA.

9.4.4 Evaluation results will not be reached by solely viewing the candidates in the database; a copy of the known prints must be utilized for this purpose and the subsequent verification.

9.4.4.1 If a copy of the known prints is not available in AFIS or NGI for comparison and verification, the name and/or other identifying information (i.e., SID and/or FBI numbers) shall be redacted from the case file.

9.4.5 If a hit does not occur in one database, the other database shall be searched.

9.4.6 Friction ridge prints entered into AFIS/NGI that do not result in an identification may be registered in the unsolved latent database.

9.4.6.1 If a latent is registered in the database, it shall be documented on the CoA.

9.5 EXAMINATION DOCUMENTATION

9.5.1 Database searches shall be documented via the Latent Notes and include the database searched, search results and registration of the latent if applicable.

9.5.2 The following will be retained as examination documentation for each latent print searched:

9.5.2.1 Printout showing the minutiae, core, axis, delta(s) for each latent print, when possible

9.5.2.2 Printouts of the list of candidates that were reviewed.

9.5.2.3 Results of all searches.

9.5.3 Results for all searches, including which databases were searched, shall be documented on the CoA.

9.6 REVIEWING REGISTERED LATENT SEARCH RESULTS (TLI/ULM)

9.6.1 When a registered latent is presented with a potential exemplar, the case examiner will review the results.

9.6.1.1 If it is a potential identification, the results will be reviewed by another examiner. It is acceptable to perform this review on the AFIS or NGI system.

9.6.1.2 The TLI/ULM report will be printed, initialed and dated by both the examiner and the reviewer and retained as examination documentation.

9.6.1.3 A CoA will be issued communicating the potential identification. The candidate's name shall not appear on the CoA.

9.6.1.4 The transaction and/or the latent shall be removed from AFIS and/or NGI when the CoA is issued. The CoA shall contain a statement informing the agency that the latent print has been removed from the database(s).

9.6.1.4.1 If the subsequent comparison result is exclusion or inconclusive, a new AFIS or NGI search shall be conducted with the latent print image.

9.6.1.5 If the original evidence is returned to confirm the potential identification and the latent is a Complexity Level I or Complexity Level II, the examiner shall participate in a consultation regarding the comparison conclusion. The comparison shall be verified by an examiner not involved in the required consultation.

10 POSTMORTEM RECORDING OF FRICTION RIDGE SKIN

10.1 INTRODUCTION

These procedures are provided to assist in the recording of friction ridge prints from deceased individuals. The obtained recorded finger/palm/foot prints will be given to the Medical Examiner or law enforcement personnel for submission to the laboratory.

10.1.1 Document all communication, including but not limited to the request for assistance and information pertaining to the verified result, with the Medical Examiner staff regarding consultations.

10.1.2 Treat all human remains as infectious material and follow all appropriate Standard Precautions as defined in the Safety Manual. Upon acceptance, the examiner will ensure that biohazard labels are on the containers.

10.1.3 Human remains must be stored in the refrigerator until appropriate friction ridges are obtained.

10.1.4 Database searches may be impacted by the human remains if the skin is gloved (larger than attached skin) or charred (smaller than attached skin).

10.1.5 While working with individual fingers, organization is important to maintain proper documentation of the finger being processed.

10.1.6 Individual fingers and toes may be stored in individual containers to facilitate this organization.

10.2 INSTRUMENTATION

10.2.1 Equipment that may be used includes: acetate, casting material, cylinder tube, fingerprint brush (small, short bristled), fingerprint cards, fingerprint ink, fingerprint powders, fingerprint spoon, fingerprint strips, handi-print, inking pad, inking roller, Kinderprint, latex gloves, rubber lifts (white), transparent lifting tape, scalpels, sponge, paper.

10.2.2 Reagents that may be used include: acetone, alcohol, preservative (such as Metaflow or equivalent), soap.

10.2.3 Equipment and reagents chosen for use depend on the condition of the human remains.

10.3 PROPERLY RECORDED FRICTION RIDGE SKIN

10.3.1 The minimum standards and controls for the recording of postmortem prints requires the visual examination of each area recorded to determine if the detail present is a clear and accurate depiction of the area that is being recorded.

10.3.2 It is appropriate to discuss the intended use of the postmortem prints with the investigator, whether it is strictly for identification purposes or for investigative purposes of a law enforcement agency. If the purpose is investigative, major case prints recording all of the available friction ridge skin shall be obtained.

10.4 PROCEDURE

10.4.1 Visually examine the human remains to determine the appropriate methods of obtaining prints.

10.4.1.1 For macerated human remains, swelling and broadening of the friction ridges may occur. Separation of the epidermis from the dermis (gloving) may also be noted.

10.4.1.2 For burned or charred human remains, clenching of hands may preserve ridge detail.

10.4.2 Once a method is chosen, assemble the appropriate tools and prepare to process one digit at a time.

10.4.3 If it is necessary, individual fingers may be removed from the hands using a rib cutter.

10.4.4 Basic Approach:

10.4.4.1 Apply fingerprint ink to the finger using direct roller application or using a detached glass plate previously coated with ink.

10.4.4.2 Using a spatula or spoon, record the friction ridge skin with fingerprint strips or a folded standard fingerprint card.

10.4.4.2.1 The fingerprint strips or folded fingerprint card can also be directly applied to the friction ridge skin and supported and guided from the back by the recorder's hand.

10.4.5 Human Remains in Good Condition:

10.4.5.1 Gently clean the remains using a brush and warm water or alcohol.

10.4.5.2 Air dry the friction ridges or blot with paper towels before attempting to print.

10.4.5.3 Record the friction ridge skin using one of these options:

10.4.5.3.1 Apply ink to the fingers and record on a fingerprint card.

10.4.5.3.2 Apply ink to the palm and record by rolling the palm onto paper.

10.4.5.3.3 Apply ink to the palm and press the palm onto a glove covered sponge. Lift recording from glove using lifting tape and white paper or similar equipment.

10.4.5.3.4 Apply powder to finger or palm and roll onto a piece of lifting tape. Place on a backer.

10.4.6 Human Remains in a State of Rigor:

10.4.6.1 Make a deep cut at the joint with a scalpel to straighten.

10.4.6.1.1 Breaking the finger may destroy friction ridge skin.

10.4.6.2 Record the friction ridge skin using one of these options:

10.4.6.2.1 Photograph the friction ridge skin detail.

10.4.6.2.2 Apply ink to the fingers and record on a fingerprint card.

10.4.6.2.3 Apply ink to the palm and record by rolling the palm onto paper.

10.4.6.2.4 Apply ink to the palm and press the palm onto a glove covered sponge. Lift recording from glove using lifting tape and place on white paper.

10.4.6.2.5 Apply powder to finger or palm and roll onto a piece of lifting tape or similar equipment. Place on a backer.

10.4.6.2.6 Apply powder to finger or palm and roll onto a piece of lifting tape. Place on a backer.

10.4.7 Human Remains with No Epidermal Layer Ridges and Depressed Dermal Layer Ridges (Moisture Loss):

10.4.7.1 Heat and rehydration often elevate the existing ridge detail.

10.4.7.2 Air dry the friction ridges or blot with paper towels before attempting to print.

10.4.7.3 Record the friction ridge skin using one of these options:

10.4.7.3.1 Apply ink to the fingers and record on a fingerprint card.

10.4.7.3.2 Apply ink to the palm and record by rolling the palm onto paper.

10.4.7.3.3 Apply ink to the palm and press the palm onto a glove covered sponge. Lift recording from glove using lifting tape and white paper or similar equipment.

10.4.8 Desiccated Human Remains:

10.4.8.1 Soak the remains in plain or soapy warm water or in a solution with a ratio of 1 part softener (Restorative or equivalent) to 1 part preservative (Metaflow or equivalent).

10.4.8.1.1 Removal of the skin may facilitate the softening of the skin.

10.4.9 If necessary to restore approximate natural size and shape and remove wrinkles, inject the friction ridge skin with tissue builder using a disposable syringe.

10.4.10 Air dry the friction ridges or blot with paper towels before attempting to print.

10.4.11 Record the friction ridge skin using one of these options:

10.4.11.1 Apply ink to the fingers and record on a fingerprint card.

10.4.11.2 Apply ink to the palm and record by rolling the palm onto paper.

10.4.11.3 Apply ink to the palm and press the palm onto a glove covered sponge. Lift recording from glove using lifting tape and place on white paper.

10.4.11.4 Apply powder to finger or palm and roll onto a piece of lifting tape or similar equipment. Place on a backer.

10.4.11.5 Apply a casting material (Mikrosil or equivalent) to the finger or palm and follow the manufacturer’s recommendations for application of the casting material.

10.4.11.6 Photograph the friction ridge skin.

10.4.12 Macerated Human Remains:

10.4.12.1 Gently clean the remains using a brush and warm water or alcohol.

10.4.12.2 Air dry the friction ridges, blot with paper towels, or dry with alcohol or acetone before attempting to print.

10.4.12.3 Record the friction ridge skin using one of these options:

10.4.12.3.1 Apply ink to the fingers and record on a fingerprint card.

10.4.12.3.2 Apply ink to the palm and record by rolling the palm onto paper.

10.4.12.3.3 Apply ink to the palm and press the palm onto a glove covered sponge. Lift recording from glove using lifting tape and place on white paper.

10.4.12.3.4 Apply powder to finger or palm and roll onto a piece of lifting tape (or equivalent equipment such as Kinderprint). Place on a backer.

10.4.12.3.5 Apply a casting material (Mikrosil or equivalent) to the finger or palm and follow the manufacturer's recommendations for application of the casting material.

10.4.12.3.6 Photograph the friction ridge skin.

10.4.12.3.7 For gloved skin, slip the skin over the examiner's gloved finger, apply ink or powder and then roll onto the appropriate backer.

10.4.12.3.7.1 If printing the underneath of the epidermis, the print will be in a reverse position.

10.4.13 Burned or Charred Human Remains:

10.4.13.1 Remove hardened or partially loose skin by gently twisting.

10.4.13.2 Examine the underside of the skin for friction ridge detail.

10.4.13.3 Gently clean the remains using a brush and warm water or alcohol.

10.4.13.4 Air dry the friction ridges, blot with paper towels, or dry with alcohol or acetone before attempting to print.

10.4.13.5 Record the friction ridge skin using one of these options:

10.4.13.5.1 Photograph the friction skin ridge detail.

10.4.13.5.2 Apply ink to the fingers and record on a fingerprint card.

10.4.13.5.3 Apply ink to the palm and record by rolling the palm onto paper.

10.4.13.5.4 Apply ink to the palm and press the palm onto a glove covered sponge. Lift recording from glove using lifting tape and place on white paper.

10.4.13.5.5 Apply powder to finger or palm and roll onto a piece of lifting tape. Place on a backer.

10.4.13.5.6 Apply a casting material (Mikrosil or equivalent) to the finger or palm and follow the manufacturer's recommendations for application of the casting material.

10.4.13.5.7 Photograph the friction ridge skin.

10.4.13.6 Note destroyed friction ridge skin on the fingerprint card as appropriate.

10.4.14 Evaluate collected friction ridge skin recording for quality.

10.4.15 Record again as necessary.

10.4.16 Properly label collected samples with examiner's signature/initials, case number and digit.

11 QUALITY ASSURANCE

11.1 INTRODUCTION

The purpose of this section is to provide a uniform Quality Assurance Program for the Latent Print Section of the Department. It is to establish a baseline or reference point of reliability and system performance. It is expected that the examiner will report any unacceptable or anomalous behavior of any of our analytical systems immediately to their Section Supervisor.

11.2 REAGENTS

11.2.1 Utilize at least Certified Analytical Reagent ACS grade chemicals, if available, and reverse osmosis (R/O) or deionized (DI) water.

11.2.2 Reagents shall be labeled according to the QM and documented in the Reagent Preparation Log.

11.2.3 For each batch created, a performance check ensuring the reagent is working as intended, shall be performed and appropriately documented in the Reagent Preparation Log prior to use on evidence.

11.2.3.1 Batch numbers assigned in the Reagent Preparation Log are established by month/day/year (010121). The batch number must be placed on the original and working containers.

11.2.3.1.1 If multiple batches are created on the same day, an alpha character will be added to the batch number for clarity.

11.2.4 Commercially manufactured reagents are an approved alternative to laboratory prepared reagents. However, they still must meet the minimum standards and controls requirements for that particular reagent. The manufacturer's shelf-life recommendations for commercially available products shall be followed.

11.3 TEST STRIP PREPARATION

11.3.1 Dissolve 1 gram of Norleucine in 100 mL of warm DI or R/O water. Saturate paper with solution. Allow paper to air dry and then cut into strips.

11.3.2 The test strips shall be stored in a dark bottle and have a shelf life not exceeding two years.

11.4 POWDERS

11.4.1 The date the powder container is opened is to be used as the batch number, established by month/day/year (010121). The batch number shall be placed on the original and working container.

11.4.1.1 If additional containers are opened on the same day, an alpha character will be added to the batch number for clarity.

11.4.2 Utilize powders that are of a homogenous mixture, free of clumps and foreign debris. Contaminated powders shall not be returned to stock containers.

11.4.3 Utilize a dedicated brush for different colors or types of powder.

11.5 EQUIPMENT

11.5.1 Balances

11.5.1.1 Balances shall be calibrated by an outside vendor annually that is accredited to ISO/IEC 17025 and whose scope of accreditation covers the calibration performed. New balances shall be calibrated prior to placing into service. The Section Supervisor, Group Supervisor, or designee shall evaluate calibration certificates prior to placing the balance into service.

11.5.1.2 All balances shall be performance checked quarterly for accuracy using Class F or ASTM Class 1 weights.

11.5.1.2.1 Weights used to check balance accuracy shall be recertified every three years by an ISO/IEC 17025 accredited vendor whose scope of accreditation covers the certification performed.

11.5.1.3 Record the weight displayed on the balance using the Latent Print Balance Log 241-F104.

11.5.1.4 If the accuracy of a weight is outside the acceptable range listed in the below table, ensure the balance is level and clean prior to rechecking. If, after these actions the weight check is still outside the acceptable range it shall be taken out of service and labeled as such until maintenance and/or calibration is performed by a qualified vendor.

BALANCE TYPE	BALANCE EXAMPLES	CHECK WEIGHTS
Toploading (± 0.01) gram	Mettler PE 1600 Mettler PB302 Ohaus Scout Pro SP202 Sartorius BP21005	1.00 (± 0.02) gram, 10.00 (± 0.05) grams 100.00 (± 0.05) grams
Toploading (± 0.001) gram	Ohaus Explorer Mettler PB303	0.100 (± 0.002) gram 1.000 (± 0.002) gram 100.000 (± 0.005) grams
Toploading (± 0.0002) gram	Analytical Mettler-Toledo XPR204S	1.000 (± 0.0003) gram 20.000 (± 0.0005) grams

11.5.1.5 Records of calibration and performance check shall be maintained in the equipment maintenance log.

11.5.2 Cyanoacrylate fuming chambers

11.5.2.1 Follow the manufacturers' instructions and user manuals to obtain optimum results.

11.5.3 Humidity Chambers

11.5.3.1 Follow the manufacturer's specification for maintenance of the humidity chamber.

11.5.4 Alternate Light Source

11.5.4.1 Follow the manufacturer's specification for maintenance of the ALS.

11.5.5 Resolution Testing

11.5.5.1 The following procedures shall be done annually for each piece of equipment utilized to capture images of friction ridge prints.

11.5.5.2 Complete the Resolution Test workflow in Qualtrax for each piece of equipment tested, upload the original non-calibrated TIFF image. Once the original image files are uploaded to Qualtrax they can be removed from the location where they were initially stored.

11.5.5.3 Resolution Testing: Digital Camera

11.5.5.3.1 A nominal resolution of 1000 ppi corresponds to an achievable resolution of approximately 9.8-13 cycles per millimeter. A test target within this range would be sufficient for use in this procedure.

11.5.5.3.2 Every camera and lens configuration used to capture latent print images shall be evaluated utilizing this procedure prior to it being put into use for casework.

11.5.5.3.3 Consult the manufacturer's specifications to determine the effective pixels for the camera and the field of view necessary to achieve a minimum of 1000 ppi.

For Example:

Large = 7360 x 4912 pixels

Medium = 5520 x 3680 pixels

Small = 3680 x 2456 pixels

11.5.5.3.4 Divide the pixel resolution by 1000 to determine the area of coverage in which the camera should be capable of capturing at 1000 ppi.

For Example:

Large = 7.36 inches x 4.91 inches

Medium = 5.52 inches x 3.68 inches

Small = 3.68 inches x 2.45 inches

11.5.5.3.5 Use a template (or frame) to the exact dimension of this area of coverage.

11.5.5.3.6 Place the template on a flat surface with a flat scale inside the area bounded by the template.

11.5.5.3.7 Mount the camera on a tripod or copy stand above the template. Ensure the camera focal plane is parallel with the template.

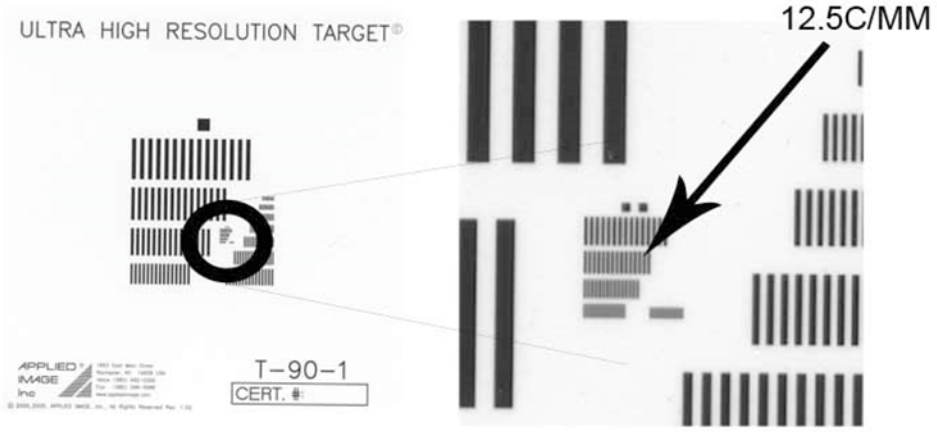
11.5.5.3.8 While looking through the viewfinder, adjust the height of the camera to fill the frame with the template, while keeping the image in sharp focus with the camera set to manual focus and manual exposure. If focus cannot be accomplished for this lens, then the 1000 ppi standard cannot be met and the test should be terminated for that lens.

11.5.5.3.9 The height between the camera and the subject is the maximum distance to provide 1000 ppi resolution.

11.5.5.3.10 Place the Ultra High Resolution Target and a scale on the template. Ensure the tests bars are in a vertical orientation and the scale is visible.

11.5.5.3.11 Capture an image using the file format used for latent print image capture, TIFF.

11.5.5.3.12 Open, calibrate and view the image in Mideo, verify the image is 1000 ppi or greater.



11.5.5.3.13 Zoom in on the image so that individual pixels are visible. If the camera has accurately captured 12.5 cycles per mm, it will be possible to distinguish the dark and light line pairs in this region.

11.5.5.3.14 If the 15 dark and 14 light lines can be visually verified (counted), without post image clarification, the camera is suitable for use.

11.5.5.3.15 If line count numbers do not match, then the camera system is not acceptable for latent print capture.

11.5.5.3.16 Rotate the chart 90 degrees to measure the horizontal resolution, following the same steps listed above.

11.5.5.4 Resolution Testing: Scanner

11.5.5.4.1 A nominal resolution of 1000 ppi corresponds to an achievable resolution of approximately 9.8-13 cycles per millimeter. A test target within this range would be sufficient for use in this procedure.

11.5.5.4.2 Set the scanner to capture at 1000 ppi 24 bit color or Gray Scale 8 bit.

11.5.5.4.3 Place the Ultra High Resolution Target on the scanner platen with the top of the target at the top of the scanning region. This will allow the user to measure the resolution in the horizontal aspect.

11.5.5.4.4 Save the file as a TIFF, open with Mideo.

11.5.5.4.5 Zoom in on the region that depicts 12.5 cycles per mm so that individual pixels are visible. If the scanner has accurately captured 12.5 cycles per mm, then it should be possible to distinguish the dark and light lines pairs in this region.

11.5.5.4.6 If the 15 dark and 14 light lines can be visually verified (counted), without post clarification techniques applied, then the scanner can sample at 12.5 cycles per mm in the horizontal direction and meets or exceeds the 1000 ppi standard.

11.5.5.4.7 Rotate the chart 90 degrees and repeat to verify the scanner's vertical resolution of 12.5 cycles per millimeter and that it meets or exceeds the 1000 ppi standard.

11.5.5.5 Resolution Testing: Full Spectrum Imaging System (FSIS)

11.5.5.5.1 Place the USAF 1951 test target and a scale on a flat surface.

11.5.5.5.2 Follow the manufacturer's instructions and user manuals to obtain optimum results.

11.5.5.5.3 Hold the UV light at approximately a 45 degree angle, slowly tilt and rotate the light until the target is sufficiently illuminated to see the lines on the monitor. It may be necessary to create a hotspot in the corner of the target to achieve the desired illumination.

11.5.5.5.4 Capture and save the image using the TIF format.

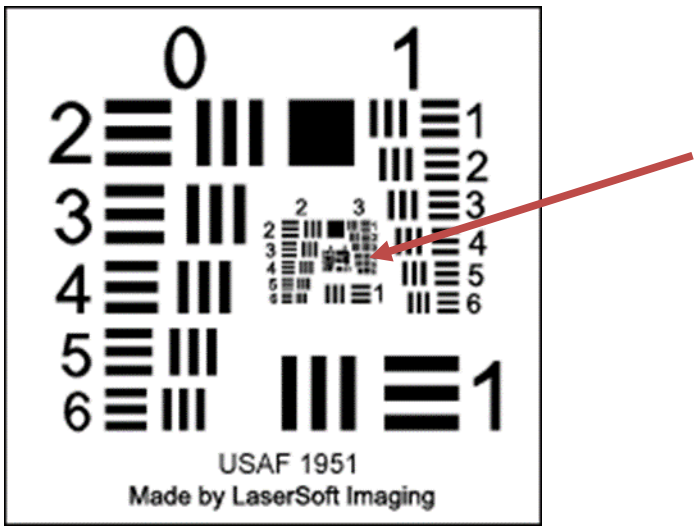
11.5.5.5.5 Open and calibrate the image in Mideo, verify the image is 1000 ppi or greater.

11.5.5.5.6 Zoom in until pixels are visible. Locate Group 3, Element 5 in the image and determine if the lines can be distinguished in the area.

11.5.5.5.7 Resolving the lines in this area indicates the camera meets the 12.7 cycles per mm requirement.

11.5.5.5.8 Rotate the chart 90 degrees to measure the horizontal resolution, following the same steps listed above.

11.5.5.5.9 Utilizing the Ultra High Resolution Target complete the same steps without the 254nm filter in place and utilize white light instead of UV light.



12 EXAMINATION DOCUMENTATION

12.1 INTRODUCTION

Mideo is designed to capture and/or generate all necessary examination documentation associated with latent print casework electronically. Mideo is housed on a network that allows for examiners to perform consultations or verifications for an examiner in a different lab site.

12.2 ACCESS

12.2.1 Each examiner is assigned two password protected accounts to access the system. One account is for general casework use, and the second is used to perform blind verifications.

12.2.2 Every examiner has the capability to access every active case and all associated images and notes.

12.3 DATA ENTRY

12.3.1 Information is recorded in Mideo via fieldsets associated with each file.

12.3.2 Each file name must be unique to allow it to be saved.

12.3.3 The case history log documents actions taken on each folder and file and by whom.

12.3.4 It is acceptable to make changes to files once the Case Status has been changed as the changes will be tracked in the case history log.

12.3.5 The FS lab # shall be included in the file name for all files which contain an image (i.e., friction ridge prints, lift cards, exemplars).

12.4 REMOVAL OF COPIES

12.4.1 The original examiner will remove the case folder from Mideo after the case has been technically and administratively reviewed.

12.4.1.1 Each file needs to be removed from each folder before the folder can be deleted.

12.4.1.2 Each folder needs to be removed from the Case folder before the Case folder can be deleted.

12.5 DOCUMENTATION

12.5.1 It is not necessary to generate a note page if it is not relevant to the case.

12.5.2 At a minimum, Inventory Notes and Caseworks Object History Report will be generated at the conclusion of each case.

12.5.2.1 It is preferable to create a PDF of the Caseworks Object History Report, burn it to a CD/DVD and attach it to the case file.

12.5.3 A case documentation CD/DVD containing all original and clarified images in the Latents folder and the Caseworks Object History Report shall be made and attached to the case file.

12.5.3.1 Create the disc utilizing CD/DVD burner options that Close and Verify after burning is complete.

12.6 CLEARING SIGNATURE AND DATA FIELDS

12.6.1 If necessary, the Case Status, reviewer and consultant fields may be cleared if inadvertently selected. This action is tracked in the case folder history log.

12.6.1.1 To clear the Case Status, right click on the Case Folder, select Tools then Clear Folder Data and check the Case Status box.

12.6.1.2 To clear the Consult/Reviewer field, right click on the file (image), select Tools then Clear File Data and check the Consult/Review box.

13 REPORT WORDING

13.1 INTRODUCTION

13.1.1 The following report formats will be used to the extent possible when reporting results to ensure consistency within the section.

13.1.2 When drafting report wording for evidence types not listed or when specific examples do not appear for a particular type of evidence, look first to existing wording that may be applied to the current situation. If a situation is so unusual that appropriate report wording is not available in the manual, it is expected that the Section Supervisor shall consult with other Section Supervisors for wording that may have been previously applied to the situation, as well as with the Physical Evidence PM and/or the Director of Technical Services.

13.1.3 Per the QM, deviations from a test method shall be included on the CoA.

13.1.3.1 Not updating the Case Status in Mideo does not need to be reported as a deviation.

13.1.4 The Results and Interpretation portion of the CoA is a summary of the pertinent information relating to the examination, analysis and conclusions of items listed. The Result and Interpretation section of the CoA will be sub-sectioned into the following parts, as appropriate for the case at hand:

13.1.4.1 **COMPARISON RESULT OVERVIEW**: This section contains the below chart summarizing the comparison conclusions.

13.1.4.2 All chart blocks are to be filled. Use N/A or ---, but no blank boxes.

Name	Identification (Total/Item)	Exclusion (Total/Item)	Inconclusive (Total/Item)

13.1.4.3 **PROCESSING AND EXAMINATION**: This section details the processing examinations (e.g., visual, chemical and/or physical) and results for each item. The results shall include the number of friction ridge prints recovered from each item.

13.1.4.4 **ANALYSIS**: This section provides details related to the analysis of friction ridge prints.

13.1.4.5 **AFIS:** This section provides details related to database searches of friction ridge prints.

13.1.4.6 **EXEMPLARS**: This section contains the below chart with details about the exemplars.

13.1.4.7 All chart blocks are to be filled. Use N/A or ---, but no blank boxes.

The following exemplars, bearing the listed names, were visually examined and preserved:

Name	Obtained from	DOB	SID/FBI	Exemplar type

13.1.4.8 **COMPARISON RESULTS**: This section details the comparisons and evaluations of the friction ridge prints designated as value for comparison in the Analysis section. This section will be sub-sectioned, as applicable, into: Identification, Exclusion and Inconclusive.

13.1.4.9 **TERMINUS STATEMENTS:** This section contains applicable statements regarding information pertinent to the submitting agency.

13.1.4.10 **ABBREVIATION/DEFINITION KEY**: This section will be added to every CoA below the signature line.

ABBREVIATION/DEFINITION KEY:
AFIS: Automated Fingerprint Identification System; generic term; applies to VA-AFIS and NGI at DFS
VA-AFIS: Virginia AFIS database
NGI: Next Generation Identification (FBI database)
Identification: Conclusion reached when an examiner determines there is sufficient observed data in agreement to conclude that the friction ridge prints originated from the same source.
Exclusion: Conclusion reached when an examiner determines that there is sufficient observed data in disagreement to conclude that the friction ridge prints did not originate from the same source.
Inconclusive: Conclusion reached when an examiner determines there is insufficient observed data in agreement or disagreement to conclude that the friction ridge prints did or did not originate from the same source. The insufficient observed data could be the result of absent or unreliable areas of the friction ridge print, the exemplars or both.

13.2 WORDING EXAMPLES

13.2.1 These examples are meant to provide guidance and should be adapted to the case at hand as appropriate.

13.2.2 **PROCESSING AND EXAMINATION:** Statements of the processing performed on the item(s) and the results of those processing techniques.

13.2.2.1 The below can be used when a variety of results are obtained.

Items 01, 02, 03, 13B1,and 13B2 were visually examined, chemically processed, and viewed with alternate light sources.

Item 01: Three latent prints were captured.
Item 02: One latent print was captured on the *magazine*. No latent prints were observed or developed on the *firearm and three cartridges*. No latent prints suitable for capture were observed or developed on *four cartridges*.
Item 03: No latent prints were observed or developed.
Item 13B1: One latent print was captured from the *metal spoon*. No latent prints suitable for capture were observed or developed on the *plastic spoon* and the *two sifters*.
Item 13B2: No latent prints were observed or developed.

13.2.2.2 The below can be used for an item that was determined not to be suitable for processing:

Item 1 was visually examined and determined not to be suitable for processing *due to XXX*.

13.2.2.3 The below can be used for a submitted lift card or item when only a visual exam was conducted:

All items were visually examined.

Item 1: Two latent prints were captured.

Items 2, 4 and 6: One latent print was captured from each item.

Items 3 and 5: No latent prints suitable for capture or further analysis were observed.

13.2.2.4 The below can be used for resubmitted Digital Media (DM):

Item DM1 contains the following latent prints, which were previously reported to be of value for comparison:

Item 1C Two latent prints (1CP1 and 1CP2)
Item 1D One latent print (1DP3)

13.2.2.5 The below can be used for submitted digital media:

Item 1 contains *five* images, which were preserved and designated as *Items 1A - 1E.*

Item 1A did not contain any latent prints suitable for further analysis.

Item 1B contains two latent prints, which were preserved.

13.2.2.6 The below can be used for deceased exemplars:

Item 1 was visually examined and *preserved.* One *fingerprint* was *captured*.

13.2.3 **ANALYSIS:** Result statement for the analysis performed on each latent preserved and documented in the PROCESSING AND EXAMINATION RESULTS section.

13.2.3.1 The below can be used when ridge detail is determined to be of value for comparison:

Item 1: *Two* latent prints of value for comparison were designated *1P1 and 1P2*.
Item 2: *One* latent print of value for comparison was designated *2P1*.
Item 4: *One* latent print of value for comparison was designated *4P1*.
Item 6: *One* latent print of value for comparison was designated *6P1*.

13.2.3.2 The below can be used when ridge detail from an exemplar or deceased exemplar is determined to be of value for comparison:

Item 5 One fingerprint is of value for comparison and has been designated *5LT*.

13.2.3.3 The below can be used when captured friction ridge prints were determined not to be of value for comparison:

Item 5 The latent prints captured were analyzed and determined not to be of value for comparison.

If multiple items have friction ridge prints that are not of value for comparison it is acceptable to use the below format:

The remaining captured latent prints were analyzed and determined not to be of value for comparison.

13.2.4 **COMPARISON RESULTS:** Statements related to the comparison results. This section may be divided into three sub-sections, identification, exclusion and inconclusive, as needed. Each subsection will include a listing of the latent prints that correspond to that heading.

IDENTIFICATION(S):
01P1 and 01P3 were identified to an exemplar bearing the name *Jane Doe*.
04P1 and 04P3 were identified to an exemplar bearing the name *John Doe*.

EXCLUSION(S):
15P1 was excluded to exemplars bearing the names *John Doe and Jane Doe*.

INCONCLUSIVE(S):
01P2 was inconclusive (due to the exemplars) to exemplars bearing the names *John Doe and Jane Doe*.
02P1 and 15P2 were inconclusive (due to the latent prints) to an exemplar *John Doe*.
02P1 and 15P2 were inconclusive (due to the latent prints and the exemplar) to an exemplar *Jane Doe*.

13.2.5 **AFIS:** The specific latent(s), those previously designated with numbers and described to be of value for comparison in the ANALYSIS SECTION, searched shall be included in this section.

13.2.5.1 When a search of a Complexity Level III or a Non-Complex latent print results in an exemplar being obtained for comparison, the below can be used:

Searches of the state and federal databases were conducted with latent *prints 1P2 and 2P3*. As a result of both *state database* searches, a fingerprint card bearing the name *John Doe was retrieved.*

13.2.5.2 When a search of a Complexity Level I or Level II latent print results in an exemplar being obtained for comparison, the below shall be used:

Due to the nature of latent print *1P2* and given the higher chance of a coincidental match in a large database, similar corresponding characteristics could be observed in the friction ridge skin of a different person.

13.2.5.3 When a search does not result in an exemplar being obtained for comparison, the below can be used:

Searches of the state and federal databases were conducted with latent prints *1P5, 1P6, 1P7, 1P8 and 1P10*. No potential candidates were developed; however, searches will be conducted automatically as new fingerprints/palm prints are entered into the state and federal databases.

13.2.5.3.1 The statement regarding future searches shall only be used when prints are registered. It is necessary to indicate in which database the prints are registered.

13.2.5.4 When a situation as described in Section 9.4.4.1 of this manual occurs, utilize the below language.

Due to the unavailability of the known exemplars, the result of the *state database* search cannot be verified or reported.

13.2.5.5 When the situation as described in Section 9.4.3.1 of this manual occurs, utilize the appropriate inconclusive or exclusion statements listed above.

13.2.5.6 When an unsolved latent results in a potential identification, the below can be used

A subsequent search of the *state/federal database(s*) was conducted with a latent print from *Item 1*, and as a result, a potential identification exists. Please contact the examiner listed below for assistance in facilitating the resubmission of evidence if confirmation of this potential identification is necessary. The latent print was removed from the *state/federal* database(s) and will no longer be subjected to automatic searches.

13.2.6 **TERMINUS STATEMENTS:** All reports shall conclude with an applicable statement listed in each of the below sections. Refer to the QM for reporting deviations.

13.2.6.1 The following statement shall be included on all reports:

Date(s) of Testing: mm/dd/yyyy – mm/dd/yyyy

Supporting examination documentation is maintained in the case file. The above listed methods are those approved for use at the time of analysis. Current methods can be found in the Latent Print Procedures Manual, which can be found at www.dfs.virginia.gov/documentation-publications/manuals/.

13.2.6.2 Statement regarding the status of all latent prints developed/preserved in the case.

One or more of the following statements, most appropriate for the situation, may be used:

All latent prints of value have been identified.

Item DM1 and additional known prints, *including palms*, must be submitted if additional comparisons are required at a later date.

Latent prints exist that are not AFIS quality but are of value for comparison. Please submit fingerprints, if available, for comparison.

Additional latent prints exist that were not analyzed, compared or searched in a database.

Comparisons to *John Doe* were discontinued due to the listed identification. Additional latent prints exist but were not compared. If additional comparisons are required please contact the below listed examiner.

Database searches were discontinued. If additional searches or comparisons are required please contact the below listed examiner.

13.2.6.3 Statements regarding Digital Media (DM) and latent lift cards generated by the Department's Latent Print Section.

The below statements can be used:

The returned digital media, Item *DM1*, contains images of latent prints captured. This item of evidence is being returned in *container 5* and should be retained. Should further comparisons be required, Item *DM1* must be resubmitted.

Lift cards are being returned in *container 6* and should be retained. Should further comparisons be required the original lift cards and/or Item DM1 must be resubmitted.

13.2.6.4 The following statement shall be used when friction ridge examination results, analysis and/or comparison conclusions were rendered from examination documentation when the original evidence was not available.

Copies of evidentiary images, which existed as examination documentation, were used in the reported results.

13.2.6.5 Disposition of evidence: document in the CoA according to Section 16 of the QM.

14 COMMONLY USED ABBREVIATIONS

The following is a list of abbreviations commonly used by examiners in the Latent Print Section. This list has been generated to assist in the interpretation of case file notes and is not exhaustive. The abbreviations are appropriate written in either lower or upper case and they are appropriate with or without punctuation such as periods. Common chemical formulas, chemical, mathematical and shorthand abbreviations are equally acceptable and will not be listed here.

Definitions	Abbreviations
Also known as (Alias)	AKA
Alternate Light Source	ALS
Analysis, Comparison, Evaluation - Verification	ACE-V
Amido Black	AB
Area of Interest	AOI
Automated Fingerprint Identification System	AFIS
Basic Yellow 40 dye stain	BY40
Bearing the Name	BTN
Believed to be	BTB
Black Powder	BP, blk. pdr.
Blind Verification	BV
Brown	Brn
Central Laboratory	C or CL
Central Record Criminal Records Exchange	CCRE
Compared	Comp.
Comparison(s)	Comp(s)
Commassie Blue	CB
Container	Cont./C
Crimescope	CS
Designated	Desig.
Developed	Dev.
1, 8-Diazafluoren-9-one	DFO
Digital	Dig.
Disposition	Dispo.
Digital Media	DM
Drugs	DX
Elimination	Elim.
Envelope	Env.
Evidence	Evid.
Evidence Bag Containing	EBC
Evidence Receiving	ER
Examination Documentation	ED
Excluded	Exc., EX, EXC
Facsimile	Fax
Federal Bureau of Investigation	FBI
Fingerprint(s)	Fp(s), Fgpt., Fpts
Fingerprint Card	FPC

Firearms Section	FX
Five Times Enlargement	5X
Fluorescent Powder	FLP
Forensic Advantage, Case and Evidence	FACE, FA
Full Spectrum Imaging System	FSIS
Gentian Violet	GV
Humidity Chamber/Cabinet	HC
Identification	Ø, ID.
Inconclusive	Inc.
1,2-indanedione	IND
Large Evidence Envelope Containing	LEEC
Latent(s)	Lat(s)
Latent Inquiry	LI
Latent Lift Card	LLC
Latent Print(s)	LP(s)
Latent Prints Section	LX
Latent Re-inquiry	LRI
LatentSleuth	LS
Left Thumb	LT
Left Index	LI
Left Middle	LM
Left Ring	LR
Left Little	LL
Lower Joint(s)	Lj(s), Lwr. Jt(s).
Limited Ridge Detail Detected	LRDD
Luma-Lite	LL
Magnetic	Mag.
Magnetic powder	MP
Manila	Man.
Match Notification	ULM
Medium Evidence Envelope Containing	MEEC
7-(p-Methoxybenzylamino)-4-Nitro-2,1,3-Benzoxadiazole	MBD
Negative(s)	Neg(s)
Next Generation Identification	NGI
Ninhydrin	Nin, NIN
No Ridge Detail Detected	NRDD
No Value	NV
Northern Laboratory	NL, NOVA
Of Value	OV
One-to-One	1:1
Palm Print(s)	PP(s), Plm(s), PPC
Petroleum Ether	PE
Physical Developer	PD
Personal Pick-up	PPU
Pick-up	PU

Possible	Poss.
Present	Pres.
Previous	Prev.
Print(s)	Prt(s).
Processed	Proc.
Presumed to be	PTB
Quality/Quantity	Q/Q, qual/quant
Dye stain containing - Rhodamine 6G, Ardrox and MBD 10	RAM
Rhodamine 6G dye stain	R6G
Received	Rec.
Registered	Reg.
Remaining	Rem.
Reported	Rept'd.
Retained	Retn'd.
Returned	Ret'd.
Reverse	Rev.
Reverse position	Rev. pos.
Reverse color	Rev. col.
Ridge Detail Detected	RDD
Right Thumb	RT
Right Index	RI
Right Middle	RM
Right Ring	RR
Right Little	RL
Sealed Envelope	SE
Sealed paper bag	SPB
Sealed Brown Box	SBB
Sealed brown paper bag	SBPB
Sealed Manila Envelope	SME
Sealed Plastic Bag	SPLB
Sealed White Box	SWBX
Sealed yellow envelope	SYE, SYEN
See Other Photo	SOP
Separate	Sep
Serial Number	SN
Serology/Forensic Biology Section	SX
State Identification Number	SID#
Signed and Sealed	S&S
Silver Nitrate	SN
Small Particle Reagent	SPR
Small Evidence Envelope Containing	SEEC
Sticky Side Powder	SSP
Submitted	Sub.
Superglue (Cyanoacrylate)	SG, Cyano, CA
Suspect	S or Susp.

Tenprint latent inquiry	TLI
Tidewater/Eastern Laboratory	TL, EL
Trace	TE
Turned-over-to	TOT
Universal Control Number	UCN
Universal Latent Workstation	ULW
Victim	V or Vic.
Visible	Vis.
Visual exam	VE
Western Laboratory	WL

APPENDIX A REFERENCES

Arima, T. (1981). Development of Latent Fingerprints on Sticky Surfaces by Dye Staining or Fluorescent Brightening. *Identification News*. February.

Beaudoin, A. (2004) New Technique for Revealing latent Fingerprints on Wet Porous Surfaces: Oil Red O. *Journal of Forensic Identification. 54*(4). pp. 413-421.

Beaudoin, A. (2011). Oil Red O: Fingerprint Development on a 21-Year Old Cold Case. *Journal of Forensic Identification. 61*(1). pp. 51-59.

Beaudoin, A. (2012). Fingerprint Staining Technique on Dark and Wetted Porous Surfaces: Oil Red O and Rhodamine 6G. *Journal of Forensic Identification. 62*(4). pp. 315-329.

Bryan, W. (2005) Validation Study of Basic Yellow #40 in the Development of Latent Prints. Virginia Department of Forensic Science Internal Publication.

Champod, C., Lennard, C.J., Margot, P., & Stoilovich, M. (2016). *Fingerprints and Other Ridge Skin Impressions*. Boca Raton, FL: CRC Press. pp. 116-117.

Cowger, J. (1993). *Friction Ridge Skin Comparison and Identification of Fingerprints*. Boca Raton, FL: CRC Press.

FBI Standard Operating Procedures for Processes Used to Develop Latent Prints

Gaensslen, R., & Lee, H. (2001). *Advances in Fingerprint Technology*. New York, NY: Elsevier.

Gray, M.L. (1996). Sticky-side Powder Versus Gentian Violet: The Search for the Superior Method for Processing the Sticky Side of Adhesive Tape. *Journal of Forensic Identification. 46*(3). pp. 268-272.

Guigui, K., & Beaudoin, A. (2007). The Use of Oil Red O in Sequence with Other Methods of Fingerprint Development. *Journal of Forensic Identification. 57*(4). pp. 550-581.

Hazen, R.J. (1999) Field Disaster Identification, preparation-Organization-Procedures, Problems and Practices in Fingerprinting the Dead. FBI Law Enforcement Bulletin. Washington, D.C. :U.S. Government Printing Office.

Hewlett, D.F., & Sears, V.G. (1997). Replacement for CFC113 in Ninhydrin Process. *Journal of Forensic Identification. 4*(3). p. 287.

Horton, R.A., & Shaver, L.C. (2000). The Effects of Latent Print Processing on Ballpoint Pen Inks. *American Society of Questioned Document Examiners*. *3*(2). p. 70.

International Organization for Standardization and International Electrotechnical Commission. (2005). General Requirements for the Competence of Testing and Calibration Laboratories. (Standard No. ISO/IEC 17025: 2005).

Kasper, S.P., Minnillo, D.J., & Rockhold, A.M. (2002). Validating IND (1,2-indandiaone). *Forensic Science Communications 4*(4). Retrieved from https://archives.fbi.gov/archives/about-us/lab/forensic-science-communications/fsc/oct2002/kasper.htm

Kent, T. (Ed.). (1993). *Fingerprint Development Techniques*. Derbyshire, England: Heanor Gate Publisher.

Kimble, G.W. (1996). Powder Suspension Processing. *Journal of Forensic Identification. 46*(3). pp. 273-280.

Lee, H.C., & Gaensslen, R.E. (1984). Cyanoacrylate Fuming. *Identification News. 34*(3). pp. 8-14.

Lennard, C.J., & Margot, P. (1988). Sequencing of Reagents for the Improved Visualization of Latent Fingerprints. *Journal of Forensic Identification. 38*(5). pp. 197-210.

Masters, N.E. (1990) Rhodamine 6G: Taming the Beast. *Journal of Forensic Identification. 40*(5). pp. 265-270.

McCarthy, M.M., & Grieve, D.L. (1989) Preprocessing with Cyanoacrylate Ester Fuming for Fingerprint Impressions in Blood. *Journal of Forensic Identification. 39*(1). pp. 23-32.

McCarthy, M.M. (1990) Evaluation of Ardrox as a Luminescent Stain for Cyanoacrylate Processed Latent Impressions. *Journal of Forensic Identification. 40*(2). pp. 75-80.

Menzel, E. (1980). *Fingerprint Detection with Lasers*. New York, NY: Marcel Dekker, Inc.

Menzel, E. (1983). A guide to Laser Latent Fingerprint Development Procedures. *Identification News*. September.

Menzel, E. (1989). Detection of Latent Fingerprints by Laser-excited Luminescence. *Analytical Chemistry. 61*(8). pp. 557A-561A.

Murmbarger, M., & Zaccagnini, L. (1990) Latent Impressions. *Journal of Forensic Identification. 40*(2). pp. 75-80.

Murmbarger, M., & Zaccagnini, L. (1997) Substitute for Freon-Ardrox Formula. Illinois State Police Internal Publication.

Norkus, P., & Noppinger, K. (1986). New reagent for the Enhancement of Blood Prints. *Identification News. 26*(4). pp. 5 & 15.

Olsen, Sr., R. (1978). *Scott's Fingerprint Mechanics*. Springfield, IL: Charles C Thomas.

Onstwedder, J, III., & Gamboe, T. (1989). Small Particle Reagent: Developing Latent Prints on Water-Soaked Firearms and Effect on Firearms Analysis. *Journal of Forensic Sciences. 34*(2). pp. 321-327.

Phillips, C. E., Cole, D.O., & Jones, G.W. (1990). Physical Developer: A Practical and productive Latent Print Developer. *Journal of Forensic Identification. 40*(3). pp. 135-147.

Police Scientific Development Branch. (1998). *Manual of Fingerprint Development Techniques*. Sandridge, England: Digital Images Ltd.

Pounds, C.A., & Jones, R.J. (1983) Physiochemical Techniques in the Development of Latent Fingerprints. *Trends in Analytical Chemistry*. *2*(8). pp. 180-183.

Rawji, A., & Beaudoin, A. (2006) Oil Red O versus Physical Developer on Wet Papers: A Comparative Study. *Journal of Forensic Identification. 58*(2). pp. 33-54.

Salama, J., Aumeer-Donovan, S., Lennard, C., Roux, C. (2008). Evaluation of the Fingermark Reagent Oil Red O as a Possible Replacement for Physical Developer. *Journal of Forensic Identification. 58*(2). 203-237.

Scientific Working Group on Friction Ridge Analysis, Study, and Technology. (2012). *Standard for the Documentation of Analysis, Comparison, Evaluation, and Verification (ACE-V) (Latent*). http://clpex.com/swgfast/documents/documentation/121124_Standard-Documentation-ACE-V_2.0.pdf

Scientific Working Group on Friction Ridge Analysis, Study, and Technology. (2013). *Standards for Examining Friction Ridge Impressions and Resulting Conclusions*. *(Latent/ Tenprint)*. http://clpex.com/swgfast/documents/examinations-conclusions/130427_Examinations-Conclusions_2.0.pdf

Sirchie Fingerprint Laboratories, Inc. (2003). Technical Information Basic yellow Fluorescent Enhancement Dye Catalog nos. LV507, LVS500. Youngsville, NC: SIRCHIE.

United States Department of Justice. (Rev 12-84). *The Science of Fingerprints*. Washington, D.C.: U.S. Government Printing Office.

United States Department of Justice. (2000). FBI Processing Guide for Developing Latent Prints. http://onin.com/fp/fbi_2000_lp_guide.pdf

United States Department of Justice. (2011). *The Fingerprint Sourcebook*. Washington, D.C.: U.S. Government Printing Office.

Vachori, G., & Sorel, J. (1987). New Fingerprint Development Process. Proceedings of the International Symposium on Latent Prints. Washington, D.C.: United States Government Printing Office.

Waldoch, T. (1993). The Flame method of Soot Deposition for the Development of Latent Prints on Non-porous Surfaces. *Journal of Forensic Identification. 43*(5). pp. 463-465.

Watling, W.J., & Smith, K.O. (1993). Heptane, and Alternative to the Freon Ninhydrin Mixture. *Journal of Forensic Identification. 43*(2). p. 131.

APPENDIX B CoA EXAMPLE

Item 01	Plastic sheeting
Item 02	One firearm with a magazine and seven cartridges
Item 03	One sifter
Item DM1	Digital media containing images from Item 01, 02 and 03 created at the Northern Laboratory

RESULTS AND INTERPRETATIONS:

COMPARISON RESULTS OVERVIEW:

Name	**Identification (Total/Item)**	**Exclusion (Total/Item)**	**Inconclusive (Total/Item)**
John Doe	1 / Item 02	N/A	1 / Item 01
Jane Doe	2 / Item 01	N/A	1 / Item 01

PROCESSING AND EXAMINATION:

Items 01, 02 and 03 were visually examined, chemically processed, and viewed with alternate light sources.
Item 01: Three latent prints were captured.
Item 02: One latent print was captured on the magazine. No latent prints were observed or developed on the firearm and three cartridges. No latent prints suitable for capture were observed or developed on four cartridges.
Item 03: Two latent prints were captured.

ANALYSIS:

Item 01: Three latent prints of value for comparison were designated 01P1, 01P2 and 01P3.
Item 02: One latent print of value for comparison was designated 02P1
Item 03: One latent print of value for comparison was designated 03P1.

The remaining captured latent prints were analyzed and determined not to be of value for comparison.

AFIS:

Searches of the state and federal databases were conducted with latent print 01P1. As a result of the searches, a fingerprint card bearing the name Jane Doe was retrieved.

Searches of the state and federal databases were conducted with latent print 02P1. As a result of the searches, a fingerprint card bearing the name John Doe was retrieved.

Due to the nature of 01P1 and given the higher chance of a coincidental match in a large database, similar corresponding characteristics could be observed in the friction ridge skin of a different person.

EXEMPLARS:

The following exemplars, bearing the listed names, were visually examined and preserved:

Name	**Obtained from**	**DOB**	**SID/FBI**	**Exemplar Type**
John Doe	CCRE	1/1/1991	VA123A456B	Fingerprint
Jane Doe	FBI	N/A	456789XYZ01	Fingerprint

COMPARISON RESULTS:

IDENTIFICATION(S):
01P1 and 01P3 were identified to an exemplar bearing the Jane Doe.
02P1 was identified to an exemplar bearing the name John Doe.

INCONCLUSIVE(S):
01P2 was inconclusive (due to the latent print and exemplars) to exemplars bearing the name John Doe and Jane Doe.

TERMINUS STATEMENTS:

Item DM1 contains images of latent prints captured from Items 01, 02 and 03. This item of evidence is being returned in Container 1 and should be retained. Should further comparisons be required, Item DM1 must be resubmitted.

A latent print exists that is not of AFIS quality but is of value for comparison. Please submit known fingerprints, if available, for comparison.

Date(s) of testing: 8/19/2023 - 08/26/2023

Supporting examination documentation is maintained in the case file. The below listed methods are those approved for use at the time of analysis. Current methods can be found in the Latent Print Procedures Manual, which can be found at www.dfs.virginia.gov/documentation-publications/manuals/.

The submitted evidence is available for pickup at the Northern Laboratory.

Attest:

I certify that I performed the above analysis or examination as an employee of the Department of Forensic Science and that the above is an accurate record of the results and interpretations of that analysis or examination.

_____
**
Forensic Scientist

**

ABBREVIATION/DEFINITION KEY:
AFIS: Automated Fingerprint Identification System; generic term; applies to VA-AFIS and NGI at DFS
VA-AFIS: Virginia AFIS database
NGI: Next Generation Identification (FBI database)
Identification: Conclusion reached when an examiner determines there is sufficient observed data in agreement to conclude that the friction ridge prints originated from the same source.
Exclusion: Conclusion reached when an examiner determines that there is sufficient observed data in disagreement to conclude that the friction ridge prints did not originate from the same source.
Inconclusive: Conclusion reached when an examiner determines there is insufficient observed data in agreement or disagreement to conclude that the friction ridge prints did or did not originate from the same source