OKLAHOMA STATE BUREAU OF INVESTIGATION

LATENT EVIDENCE UNIT

QUALITY MANUAL &

PROCEDURES

TABLE OF CONTENTS

Friction Ridge Impression Examination Standard Operating Procedures

I. Scope
II. References
III. Terms and Definitions
IV. Documentation
V. Known Print Retrieval
VI. Latent Print Examinations
VII. Consultations
VIII. Conflict Resolution
IX. Known Print Examinations
X. Individual Characteristic Database (ICD) Search
XI. Digital Image Procedures
LP-18: Digital Enhancement & Documentation

Footwear Collection and Examination Standard Operating Procedures

I. Scope
II. References
III. Collection Procedures
Reference to LP-17: Lab Photography
Reference to LP-22: Crime Scene Photography
LP-19: Electrostatic Lifting Device
LP-20: Lifting 2-Dimensional Impression Evidence
LP-21: Casting 3-Dimensional Impression Evidence
IV. Footwear Impression Examination and Documentation

Crime Scene and Morgue Requests Standard Operating Procedures

I. Scope
II. Procedures
LP-22: Crime Scene Photography
LP-23: Collection of Postmortem Impressions

Approval

History

Attachments

- OSBI LEU QPA 1 – Sequential Processing Workflow
- OSBI LEU QPA 2 – Crime Scene Checklist
- OSBI LEU QPA 3 – DCS5 Photography Guide
- OSBI LEU QPA 4 – Instructions for Creating Digital Transparencies
- OSBI LEU QPA 5 – Nonconforming Work Form
- OSBI LEU QPA 6 – Instructions for Unidentified Person Requests
- OSBI LEU QPA 7 – Instructions for Missing Person Requests

- OSBI LEU QPA 8 – Change to Conclusion Form
- RS&A Instructions for Correcting Perspective, Leveling, and Image Calibration for Footwear Casework
- West Technology Forensics VMD Application Guide
- VMD Maintenance Log
- RECOVER Maintenance Log

LATENT EVIDENCE UNIT QUALITY MANUAL

I. Scope

The Latent Evidence Unit of the Oklahoma State Bureau of Investigation is part of an accredited, full-service laboratory system and tasked with the responsibility of providing quality forensic science services in a timely manner to the criminal justice community.

The goal of all criminalists involved in impression evidence development/comparison is to provide the most accurate and timely analyses possible. This Quality Manual has been established to assist LEU Criminalists in attaining this goal by delineating important practices throughout the Latent Evidence Unit.

If any portion(s) of the Latent Evidence Unit Quality Manual or Standard Operating Procedures is/are unclear or if a circumstance arises outside the scope of this document, it is the responsibility of each individual to notify the LEU Technical Manager to seek clarification/guidance and obtain approval BEFORE proceeding. Disagreement with specific requirements or knowledge of changes causing deviation from the procedures should be discussed with the LEU Technical Manager before further work is completed. Laboratory personnel are encouraged to comment on the manual and make recommendations for more efficient procedures. The latest revision of the manual is the applicable rule.

NOTE: Attachment maintenance (removal, addition, or correction of attachments) shall not constitute a new document revision.

II. Facility and Environmental Conditions

Specific environmental conditions which could impact results as described in 6.3.2 in the OSBI CSD Quality Manual are described in LP-15 RECOVER procedure.

III. Equipment

It is the examiner's responsibility to ensure all equipment is in proper working order before use in casework. Any unresolvable malfunctions of equipment should be reported as soon as practical to the LEU Supervisor and Technical Manager.

If equipment is taken out of service, an "out of service" sign shall be placed on the equipment to prevent use until it is placed back into service. An entry will be made in the Maintenance Log including the 'out of service' date and again the 'in service' date. A function verification shall be successfully completed and documented in the Maintenance Log prior to putting the equipment back in service.

Equipment manuals for the LEU laboratory equipment are located in QMS.

Documentation for safety checks performed on eye washes, showers, fume hoods, fire extinguishers, and laboratory phones are located \\vm-fsc-files\Common\Safety\Safety Maintenance Records\LEU

Maintenance of the LEU Refrigerators follow the guidelines in QP 6.4 and QP 8.1. The Temperature Logs for the LEU refrigerators are located on the refrigerators themselves and archived once full in the following folder: \\vm-fsc-files\Common\Latents\LEU_Supervisor\Archive Evidence Room Refrigerator Temps

A. Function Verification of Oven

A function verification of the LEU laboratory oven shall be conducted annually or when service is performed to ensure proper function of the oven, which is used to heat items of evidence according to the Indanedione policy.

Supplies

Thermometer for monitoring temperature in degrees Celsius. A traceable thermometer is unnecessary due to the LEU's non-exact temperature need for the oven.

Individual Steps

1. Set the oven to 100 degrees Celsius and allow sufficient time for the thermometer to stabilize.
2. Observe the measured temperature, and document in logbook. The logbook will be stored in the lab next to the oven.
3. If the oven fails to heat to 100 degrees Celsius (+/- 10 degrees), cease use, mark out of service, document in logbook, and notify the Supervisor and Technical Manager.
4. When the oven is returned to service, document in logbook as "in service" and date.

B. Function Verification of Balance

The LEU laboratory balance is used to measure dry chemicals for latent print processing reagents. A function verification shall be conducted every 6 months or when service is performed to ensure accuracy.

Supplies

Known standard weights: 100 g, 50 g, 20 g, 10 g, 5 g, 2 g, and 1 g. Due to the general nature of latent print reagent chemistry, a traceable weight set is unnecessary.

Individual Steps

1. Place known weights on the balance and document the results in the logbook. The logbook will be stored next to the balance in the drawer labeled "Balance".
2. The Balance should weigh within ± 1% of the known weights to be acceptable.

3. If the balance fails to perform within the acceptable range, cease use, mark out of service, document in the logbook, and notify the Supervisor and Technical Manager.

4. When the balance is returned to service, document in logbook as “in service” and date.

IV. Calibration of Equipment

The LEU does not have equipment that requires a calibration as described in QP24.

V. Externally Provided Products and Services

The only externally provided service utilized by the LEU is external proficiency tests. The requirements for the provider of external proficiency tests are described in QP30.

VI. Critical Reagents

The LEU does not use critical reagents as described in QP9-Evaluation of Suppliers. A function verification is completed on reagents prior to use on evidence.

VII. Uncertainty of Measurement

The LEU does not report quantitative results; therefore, there is no method of evaluation of measurement uncertainty.

VIII. Approved Abbreviations List

∅ ορ ΙΔ	Identification
~ or Approx	Approximately
→	Containing
ACE-V	Analysis, Comparison, Evaluation, & Verification
aka	Also Known As
ALS	Alternate Light Source
AFIS	Automated Fingerprint Identification System
BPS	Brown Paper Sack
CA	Cyanoacrylate
CCW	Counter Clockwise
CD	Compact Disc
CDS	Controlled Dangerous Substance
CE	Coin Envelope
CF	Case File
Co	County

Cpb	Clear Plastic Bag
Cpzb	Clear Plastic Ziplock Bag
CSM	Crime Scene Memorandum
CSU	Cylindrical Surface Un-wrapper
CW	Clockwise
Czb	Clear Ziplock Bag
DA	Digital Archive
DI	Digital Image
DTF	Drug Task Force
Dup(s)	Duplicate(s)
DVD	Digital Video Disc
E	Envelope
EE	Evidence Envelope
FBI	Federal Bureau of Investigation
FCS	Forensic Comparison Software
FLS	Forensic Light Source
FP	Fingerprints
FS	Flap Sealed
g	Gram
gls	Green Leafy Substance
GCV	Gentian Crystal Violet
GV	Gentian Violet
HS	Heat Sealed
ICD	Individual Characteristic Database
IND or 1,2-IND	Indanedione or 1,2-Indanedione
Ident	Identification
IR	Infrared
IRR	Image Request Response
IRQ	Image Request
IV	Image Vault
JPEG or JPG	Joint Photographic Experts Group
lb	Pound
L	Liter
LCV	Leuco Crystal Violet
LEU	Latent Evidence Unit
Lg	Large
Mag	Magnetic
ME	Manila Envelope
mfr	Manufacture
misc	Miscellaneous

ml	Milliliter
NGI	Next Generation Identification
nm	Nanometers
Neg	Negative
Nin	Ninhydrin
Non-ident.	No identification
Non ∅	No identification
NF	Note Form
NFD	No further development/enhancement
NR	Negative Results
NTF	Narcotics Task Force
NV	No value
OCPD	Oklahoma City Police Department
OV	Of Value
Oz	Ounce
PB	Plastic Bag
PD	Police Department
PLT	Polarized Light Tunnel
Poss	Possession
POV	Prints of value
Pow	Powder
PP	Palm Prints
PR	Property Room
Qt	Quart
RACs	Randomly Acquired Characteristics
Rec'd	Received
Res	Residue
Retd or Ret'd	Returned
RFLE	Request For Laboratory Examination
R-IR	Reflective Infrared
R-UV	Reflected Ultraviolet
SA Kit	Sexual Assault kit
SA	Special Agent
S/B	Silver Black
SID	State Identification
SN	Serial Number
SO	Sheriff's Office
SPR	Small Particle Reagent
SSP	Sticky-side Powder
TIFF	Tagged Image File Format

TS	Tape Sealed
UCN	Universal Control Number
ULD	Unsolved Latent Delete
ULF	Unsolved Latent File
ULW	Universal Latent Workstation
ULM	Unsolved Latent Match
UV	Ultra Violet
VE	Visual Exam
Vis	Visual
VMD	Vacuum Metal Deposition
w/	With
WE	White Envelope
WPS	White Powdery Substance
Wt	Weight
Zlb	Ziplock Bag

IX. Start/Stop Date of Analysis

The date that analysis begins on an individual case/report will be documented in the header of the laboratory case notes. The date that analysis ends will be documented as the date the analyst signs the case assignment in the BEAST indicating that an Administrative Review has been conducted and the case assignment is locked from changes.

X. Derivative Evidence

Items that are collected or created during examination shall be treated as evidence and require the same chain of custody documentation. These items include photographs of developed latent prints, lifts of developed latent prints, debris removed from casts, and known impressions of shoes.

Individual Characteristic Database samples are <u>not</u> considered evidence. They are treated as reference samples and will be referred to by their SID, OCPD, or FBI numbers.

XI. Partial Analysis

In an effort to increase the efficiency of latent print casework, there are specific case circumstances in which analysis will stop and not all of the items submitted will be analyzed. The report shall list the items analyzed and their results. The report shall also list what items were not analyzed and the potential for additional analysis upon request.

XII. Recommended Report Wording for Latent Print Processing and Analysis

LEU report language will conform to policy QP28-Report Writing. To provide clear and unambiguous results, the report shall include a result for each item examined. Blanket statements used to communicate results shall include the item(s) the statement refers to.

The LEU report template for latent print examinations includes the definition for Identification which qualifies the significance of the association.

The LEU report template for latent print examinations includes the definition for Exclusion which communicates the significance of the elimination.

When results are inconclusive, the report shall clearly communicate why no definitive result can be made.

When an identification is made on a submitted latent lift card, the analyst will report the lift location documented on the lift card.

A. **Latent Print Comparisons:** The report should include all items received, what items were examined/compared and the results of the examination/comparison. Comparison conclusion definitions are included in the latent print report template and include qualitative statements to qualify the significance of associations and disassociations.

The following examples are for illustration only:

1. If latent impressions are identified:
    a. Document the item number the latent came from and the lift location, if applicable.
    b. Use the word “identified”.
    c. Show to what person by name, including SID Number, FBI Number, OCPD Person ID Number, or Item Number if applicable.

    Example: One latent print developed on item 1 was identified with John SMITH (SID# 1234567).

2. If latent impressions are excluded:
    a. Show the item number the latent came from.
    b. Use the word “excluded”.
    c. Show to what person by name, including SID Number, FBI Number, OCPD Person ID Number, or Item Number if applicable.
    d. Examiner will indicate whether latent prints are suitable for automated searching.
    e. If latent prints are searched through automated databases, state which databases.
        i. Do not use abbreviations for AFIS, OCPD or NGI prior to spelling them out in the report.
        ii. Include a statement in the report if a latent print was retained in an unsolved latent file.

Example: One latent fingerprint from item 1 was compared with John SMITH (SID# 1234567) and was excluded. The latent print was searched through the OSBI Automated Fingerprint Identification System (AFIS), the FBI Next Generation Identification (NGI), and the Oklahoma City Police Department (OCPD) Automated Fingerprint Identification System (AFIS) with no identification. The latent print was entered into the OCPD, OSBI, and FBI unsolved latent databases. Latent prints in the unsolved latent database are automatically compared to new records as they are entered into the known database. In the event an automated search generates an identification in the future, an additional report will be generated at that time.

Example: One latent palm print from item 1 was compared with John SMITH (Item 2) and was excluded. The latent print was not suitable for an automated search.

3. If latent impressions are inconclusively compared
   a. Show the item number the latent came from.
   b. Use the words "inconclusive" or "inconclusively compared"
   c. Show to what person by name, including SID Number, FBI Number, OCPD Person ID Number, or Item Number if applicable.
   d. Examiner will indicate the reason for the inconclusive decision. If more extensive or better-quality known prints are needed the examiner will indicate what additional prints are needed, i.e., palm prints, major case prints, tips/joints/sides; better quality prints. The analyst may request victim elimination prints if not furnished.

Example: One latent fingerprint from item 1 was compared to John SMITH (FBI# ABC1234567); however, the comparison was inconclusive due to the amount of distortion observed in the latent print.

Example: One latent fingerprint from item 1 was compared to John SMITH (FBI# ABC1234567); however, due to the amount of distortion observed and lack of specificity of the minutiae present, the comparison was inconclusive.

Example: One latent fingerprint from item 1 was compared to John SMITH (FBI# ABC1234567). Similarities were observed with the #1 finger (right thumb) of SMITH; however, due to the amount of distortion observed and lack of specificity of the minutiae present, the comparison was inconclusive.

Example: One latent fingerprint from item 1 was compared to John SMITH (FBI# ABC1234567). The comparison was inconclusive due to the lack of detail in the extreme tips of the fingers of the known prints. Please submit additional known prints that include the extreme tips of the fingers.

Example: One latent fingerprint from item 1 was inconclusively compared to John SMITH (FBI# ABC1234567) due to the lack of detail in the extreme tips of the fingers of the known prints. Please submit additional known prints that include the extreme tips of the fingers.

Example: One latent print from item 1 was compared to John SMITH (FBI# ABC1234567); however, the comparison was inconclusive. The anatomical source of the latent

print is unknown and therefore could not be completely compared to John SMITH because the known impressions lacked joints of the fingers and palm prints. Please submit additional known prints that include the joints of the fingers and palm prints.

4. If latent impressions are determined to be not suitable for comparison:

   Example: Item 1 was examined and no latent prints of comparison quality were observed.

5. If no latent impressions are observed:

   Example: Items 1A-1B were examined and no latent prints were observed.

6. If comparison to a subject is conducted as a result of an AFIS Reverse Search, OCPD Reverse Search, and/or FBI ULM in which no evidence was re-submitted to perform the comparison, the report should reference the original report and indicate that no evidence was submitted for this subsequent report and the original disposition of evidence may be included.

   Example: For previous analyses performed in this case, please refer to OSBI Criminalistics Examination Report # X, dated MMDDYYYY.

   No evidence was received or analyzed for this case at this time; however, the unidentified latent print from item X that was entered into the OSBI unsolved latent database generated a new record search with the following results:

   Item X – One latent fingerprint was identified to Joe BOB (SID# 1236589).

   Item X was returned to the submitting agency on MMDDYYY.

   Example: See OSBI Criminalistics Examination Report # X, dated MMDDYYYY for original submittal, analyses, and disposition information.

   The unidentified latent print from item X that was entered into the OSBI Automated Fingerprint Identification System (AFIS) unsolved latent database which generated a new record search with the following results:

   Item X – One latent fingerprint was identified to Joe BOB (SID# 1236589).

7. If comparison to a subject is conducted as a result of a CODIS Hit in which no evidence was re-submitted to perform the comparison, the report should reference both the original biology report and the original latent report, and indicate that no evidence was submitted for this subsequent report

   Example: For previous analyses performed in this case, please refer to OSBI Criminalistics Examination Reports #X, dated MMDDYYYY and #X, dated MMDDYYYY.

   No evidence was received or analyzed for this case at this time; however, as a result of a Combined DNA Index System (CODIS) potential match, the

unidentified latent print from item X was compared to Joe BOB (SID# 1236589) and was excluded.

Example: See OSBI Criminalistics Examination Reports #X, dated MMDDYYYY and #X, dated MMDDYYY for original submittal, analyses, and disposition information.

As a result of a Combined DNA Index System (CODIS) potential match, the unidentified latent print from item X was compared to Joe BOB (SID# 1236589) and was identified.

B. Latent Print Processing: The report should include all items received, what items were processed, and the results of the processing. If items are collected or created during processing, those items and the disposition shall be included in the report. When reports include both latent print processing and latent print analysis results, the use of headers to denote the specific examination conducted is recommended. The following examples are for illustration only:

1. Processing case in which latent prints are developed and preserved and the analysis will be reported in a subsequent assignment:

Example: Item 1 was processed for latent prints and latent prints were developed and preserved via digital photography (Item 1A).

Item 1 will be returned to the submitting agency. The digital photographs of item 1 (1A) will be retained by the OSBI Latent Evidence Unit for examination on a future date. An additional report will follow.

Example: Item 1 was processed for latent prints and one latent print was developed and preserved via digital photography (1A).

Item 1 will be returned to the submitting agency. Item 1A will be retained by the OSBI Latent Evidence Unit for future analysis. An additional report will follow.

Example: Item 1 was processed for latent prints and latent prints were developed and preserved via latent lifts (1A-1D).

Item 1 will be returned to the submitting agency. The latent lifts (1A-1D) will be forwarded to a latent print examiner for examination on a future date. An additional report will follow.

Example: Item 1 was processed for latent prints and one latent print was developed and preserved via latent lift (Item 1A).

Item 1 will be returned to the submitting agency. The latent lift from item 1 (Item 1A) will be retained by the OSBI Latent Evidence Unit for future analysis. An additional report will follow.

Example: Item 1 was processed for latent prints. Latent prints were developed and preserved via digital photography (Item 1A) and latent lifts (Items 1B-1E).

Item 1 will be returned to the submitting agency. The digital photographs (Item 1A) and latent lifts (Items 1B-1E) from item 1 will retained by the OSBI Latent Evidence Unit for future analysis. An additional report will follow.

Example: Item 1 was processed for latent prints. One latent print was developed and preserved via digital photography (1A) and latent lift (1B).

Item 1 will be returned to the submitting agency. Items 1A-1B will be retained by the OSBI Latent Evidence Unit for analysis on a future date. An additional report will follow.

2. If latent prints are developed, but they are not of value for comparison purposes and were not preserved:

   Example: Item 1 was processed for latent prints; however, no latent prints of comparison quality were developed.

   Example: Item 1 was processed for latent prints. Latent prints were developed; however, they did not contain sufficient detail for comparison and were not preserved.

3. If no latent prints are developed:

   Example: Item 1 was processed for latent prints with negative results.

   Example: Item 1 was processed for latent prints. No latent prints were developed.

4. Processing case in which latent prints are developed and preserved and subsequently examined:

   Example: **Latent Print Processing**
   Item 1 was processed for latent prints and latent prints were developed and preserved via digital photography (1A) and latent lifts (1B-1D).

   Latent Print Analysis
   The developed latent prints from item 1 (1A-1D) were examined and no latent prints of comparison quality were observed.

   Disposition of Evidence
   Item 1 and the latent lifts (1B-1C) will be returned to the submitting agency. The digital photographs of item 1 (1A) will be retained by the OSBI Latent Evidence Unit.

   Example: **Analysis of Evidence:**
   Item 1 was processed for latent prints and one latent print was developed and

preserved via digital photography (1A) and latent lift (1B). The latent print was examined and is not suitable for comparison.

Disposition of Evidence:
Item 1 and the latent lift 1B will be returned to the submitting agency. The digital photograph of item 1 (1A) will be retained by the OSBI Latent Evidence Unit.

Example: **Latent Print Processing**
Item 1 was processed for latent prints and latent prints were developed and preserved via digital photography (1A) and latent lifts (1B-1C).

Latent Print Analysis
Items 1A-1C were examined and no latent prints of comparison quality were observed.

Disposition of Evidence
Item 1 and the latent lifts (1B-1C) will be returned to the submitting agency. The digital photographs of item 1 (1A) will be retained by the OSBI Latent Evidence Unit.

Example: Item 1 was processed for latent prints and one latent print was developed and preserved via digital photography (1A) and latent lift (1B). The latent fingerprint was examined and is suitable for comparison. Known fingerprints of XXXXX were not available for comparison. The latent print was not suitable for an automated search.

Disposition of Evidence
Item 1 and the latent lift (1B) will be returned to the submitting agency. The digital photographs of item 1 (1A) will be retained by the OSBI Latent Evidence Unit.

If comparisons are desired, please submit known fingerprints of XXXXX for comparison.

5. Processing case in which footwear impressions are developed and preserved:

Example: Item 1 was processed for latent prints. No latent prints were developed; however, possible footwear impressions were observed and/or developed and preserved via digital photography (item 1A). The impressions were not analyzed at this time. If analysis and comparisons are desired, please submit known shoes of any individuals.

Example: Item 1 was processed for latent prints. Latent prints and possible footwear impressions were developed and preserved via digital photography (item 1A). Item 1A will be retained by the OSBI Latent Evidence Unit. The latent prints from item 1A will be analyzed at a later time and an additional report will follow. The possible footwear impressions from item 1A will not be

analyzed. If analysis of the footwear impressions is desired, please submit known shoes of any individuals for comparison.

Example: Item 1 was processed for latent prints with the following results:

- Latent prints were developed; however, they did not contain sufficient detail for comparison and were not preserved.
- Possible footwear impressions were developed and preserved via digital photography (item 1A).

Item 1A will not be analyzed and will be retained by the OSBI Latent Evidence Unit. If analysis of the footwear impressions preserved in item 1A is desired, please submit known shoes of any individuals for comparison.

C. **Partial Analysis:** The report should include what items were received, what items were examined, the results of the examination, what items were not analyzed, and the reasoning. The following examples are for illustration only:

1. If the statute of limitations is expired:

   Example: As a result of a FBI Next Generation Identification (NGI) Unsolved Latent Match (ULM), the unidentified latent fingerprint from item 1A was identified to John SMITH (FBI# ABC1234567). Due to the expiration of the statute of limitations, no further comparisons of the unidentified latent prints from items 1B-1D will be conducted.

2. Officer contamination of evidence:

   Example: Due to the identification of the requesting officer on item 1D, the evidence is considered contaminated. Therefore, no further latent print analysis was conducted on items 1A-1C. In the future, please ensure that the evidence is collected while wearing gloves to prevent contamination.

3. Identification to the listed subject:

   Example: One latent print from item 4 was identified to Joe BOB (SID# 1236589). Due to the identification of the listed subject on this item, analysis of the remaining latent prints developed from item 4 was not conducted at this time. If additional analysis and comparison of the remaining latent prints developed is desired, please contact the OSBI Latent Evidence Unit with your request.

4. AFIS/NGI Identification of a potential subject:

   Example: One latent print from item 1A was searched through the OSBI Automated Fingerprint Identification System (AFIS) and identified to Joe BOB (SID# 1236589). Due to the identification of a potential subject, analysis of items 1B-1F was not conducted at this time. If additional analysis is desired, please contact the OSBI Latent Evidence Unit with your request.

5. No documentation on latent lift cards:

   Example: Items 1A-1G do not contain documentation and will therefore not be analyzed. For future submittals, please include proper documentation of all latent lift cards including the officer's initials, the date the lift was made, and a description of the location or item the prints were lifted from. Please understand that we require such documentation to protect the integrity of your evidence and its value to the court. Properly documented evidence may be re-submitted for analysis.

6. Improper photography of latent impressions or footwear impressions:

   Example: The images from item 1 do not contain a scale and are in jpeg format. To ensure a complete analysis can be conducted on latent print evidence captured by photography, the following conditions should be met. The photograph should include a scale on the same plane as the impression. The photograph should be taken at a 90° angle from the impression. The photograph should be taken as close up to the impression by filling the frame of the photo with the impression and the scale. This ensures a high-resolution photograph. The photograph should be taken in a lossless image file format (RAW, BMP, PNG) which does not compress the image and ensures that the highest quality image is available for analysis.

XIII. Administrative and Technical Review Procedures

All LEU casework, with the exception of BEAST generated no analysis communication, will be administratively and technically reviewed concurrently by an authorized analyst in accordance with QP31 and the following procedure, prior to being released to an outside agency.

Technical records are documentation generated in the analysis of casework. This includes reports, examination records, quality control results, etc. The following technical records, if applicable, will be retained in the case record for LEU casework:

- Report
- Case Note Form detailing the analysis of evidence and the results
- Reagent Function Verification
- Digital photographs collected during the processing of evidence
- Digital images of all impressions deemed comparable (applies to latent prints and footwear)
- Digital images of all known impressions used in comparison (applies to latent prints and footwear)
- Individual Characteristic Database Identification Documentation
- Crime Scene Memo
- Crime Scene Checklist (LEU QPA 2)

A. A review of the development and preservation techniques used.
    1. Processing techniques utilized are appropriate for the substrate of the evidence and matrix of the impressions.
    2. Results entered for the initial Visual Exam and subsequent processing sequences.
    3. Appropriate preservation techniques utilized.
    4. Sub-items given to photos/lifts and listed in the report.
    5. Correct labeling of photos/lifts.
    6. Controls entered and passed according to policy.
    7. Chain of Custody record correct for evidence and sub-items created.
    8. For cases processed by a cross-trainer, the reviewer shall examine the evidence.
    9. For cases processed by a latent print examiner, the reviewer may also examine the evidence.

B. All impressions will be re-evaluated for suitability determinations.
    1. Analysis layer is included for all comparable impressions.
    2. Lift location is documented on the note form and report, if applicable.

C. All comparisons will be re-evaluated with appropriate known impressions.
    1. Latent/question impression(s) are available in the BEAST Image Vault and documented according to protocol.
    2. Known impression(s) are available in the BEAST Image Vault and documented according to protocol.
    3. Note form with the verifier's signature is uploaded to the BEAST Image Vault.
    4. Verifier documented in the BEAST

D. The Technical Reviewer will review the ICD Case Information for ICD searches conducted.
    1. Suitable latent impressions were searched.
    2. Appropriate databases were searched (local, state, federal).
    3. Appropriate search parameters were utilized (finger/palm, orientation vertical/any).
    4. Appropriate minutiae markings.
    5. High quality latent prints retained in the unsolved latent databases.
    6. Note form and report document the ICD searches conducted and the results.
    7. Documentation of all identifications made as a result of ICD searches is uploaded to the Image Vault.
    8. Administrative documentation of any identifications made from ICD searches are on the "Hit List".
    9. New names generated as a result of ICD searches are entered into the Names tab in the BEAST as "Other".

E. Reported results are accurate and supported by the data in the case record.

F. Appropriate additional evidence is requested for future comparisons, if applicable.

G. Disposition of evidence is documented on the report for all items received and items collected or created and preserved for future testing.

H. If the report is from work conducted outside of the laboratory check the following:
    1. Verify that the Accreditation Symbol is not on the report for work conducted outside the laboratory.
    2. Verify that a crime scene memo has been sent to the Lab Director and LIMS Administrator and is uploaded to the BEAST Image Vault according to QP27.
    3. For Crime Scenes verify that the Crime Scene Checklist (LEU QPA 2) is filled out and uploaded to the BEAST Image Vault.
    4. If photographs were taken, check that they were properly submitted, uploaded to the BEAST Image Vault, are the appropriate file type, are clear and fill the frame, a scale is present, a photo log is uploaded to the BEAST Image Vault, and that the chain of custody is correct.

I. If an original paper record is captured electronically and uploaded to the BEAST, the analyst and reviewer shall ensure that the electronic record is complete prior to destruction of the original record. (Examples include: RFLE, case note form, crime scene notes).

J. Cases requiring correction will be routed in the BEAST to the appropriate analyst for correction. All changes made to technical records during or after the review process shall be documented. The documentation shall be clear as to who made the changes, what the changes were, and when the changes were made. The original file(s) shall also be retained in the case record.

XIV. Nonconforming Work (NCW)

Instances of Nonconforming Work that are identified during a verification or technical review will be handled according to QP13 and the following procedure:

A. Class I Nonconforming Work: The Verifier/Technical Reviewer will route the analyst for corrections documenting what changes are needed. The analyst will correct the nonconforming work and document the correction using the routing function in the BEAST. The Verifier/Technical Reviewer will ensure the correction is made and documented in the case record. Approval of the correction will be made by the Technical Reviewer and documented as approved by signing the Technical Review Form.

B. For Nonconforming Work that rises above a Class I, the OSBI LEU QPA 5 - LEU Nonconforming Work Form will be utilized to document the incident.

    1. Section I will be completed by the individual who identified the NCW. This will typically be a verifier/reviewer of a case but could also be any individual that discovers NCW. Once section I is completed, the form will be forwarded to the analyst involved in the NCW, the Technical Manager, and the Supervisor.

    2. Section II will be completed by the individual who conducted the NCW and includes the following:

        a. Scope of the Nonconforming Work - This section is dedicated to evaluating the scope of the nonconforming work. Is the nonconformance limited to one case or are other cases effected?

        b. Significance of the Nonconforming Work – This section is dedicated to evaluating the significance of the nonconforming work. Is the error Administrative or Technical? Are results effected by the nonconformance?

c. Cause of the Nonconforming Work

d. Correction of the Nonconforming Work – Possible remedial action to correct the nonconforming work.

3. Once section II is completed, the form will be forwarded to the Technical Manager (or designee) and the Supervisor.

4. Section III of the form will be completed by the Technical Manager (or designee) prior to the technical review being approved and the report being issued. Section III consists of the following:

    a. Evaluation of Acceptability – In this section the Technical Manager (or designee) will document if the nonconforming work is:

        1) Acceptable without correction
        2) Acceptable following correction
        3) Not Acceptable and cannot be corrected

    b. Class Level Assignment – At times it may be challenging to determine the most appropriate class at which to address and document nonconforming work. In this section, the Technical Manager (or designee) will assess the scope, significance, cause, and frequency of the nonconforming work to determine and document the appropriate level of nonconforming work.

        1) If it is determined that the nonconforming work is a Class I, QP13 will be followed.
        2) If it is determined that the nonconforming work is a Class II, QP14.1 will be followed.
        3) If the Technical Manager (or designee) has a question regarding the class of Nonconforming Work, the Quality Manager, Criminalistics Administrator, and the CSD Director shall be consulted. This will be documented in Section III.
        4) If the Quality Manager/Criminalistics Administrator/CSD Director determine that the nonconforming work rises to a Class III then QP14.2 will be followed.
        5) If the Quality Manager/CSD Director/Criminalistics Administrator determine that the nonconforming work rises to a Class IV then QP14.3 will be followed.

5. Depending on the NCW identified, this form will be archived in the appropriate location to document approval of the correction by the Technical Manager (or designee). If the NCW involves a case, the form will be uploaded to the BEAST case Image Vault.

6. Any corrections/changes made to a case record due to the NCW will be documented utilizing the routing function in the BEAST.

7. Due to the subjective nature of comparative sciences, instances in which there is disagreement regarding suitability determinations and comparison conclusions, the Verifier/Technical Reviewer will utilize the routing code RQC (Route for Question or Comment) to communicate the disagreement. This will initiate step 1 of the Conflict

Resolution Policy (See FRICTION RIDGE IMPRESSION EXAMINATIONS Section VIII. Conflict Resolution)

8. If an examiner is unsure if they have encountered Nonconforming Work, the examiner shall notify the Technical Manager (or designee) and Supervisor of the incident via the LEU Nonconforming Work Form. The Technical Manager will assess the information provided in the form, seeking assistance from the Supervisor when necessary, and will provide guidance.

C. Examples of Class II Nonconforming Work may include but are not limited to:

1. Changes to Comparison Conclusions
2. Changes to Suitability Determinations
3. Evidence Processing Errors
4. Evidence Preservation Errors
5. Evidence Integrity Errors
6. Chain of Custody Errors
7. Errors in Quality Control procedures
8. Non-administrative Errors or Administrative Errors that could affect results

D. Examples of Class III & Class IV Nonconforming Work may include but are not limited to:

1. Erroneous Exclusions discovered after approval of the report
2. Erroneous Identifications
3. Inconsistent results in a Proficiency Test
4. Systemic quality issues
5. Incorrect results reported

LATENT PRINT PROCESSING STANDARD OPERATING PROCEDURES

I. SCOPE

Processing evidence for latent impressions can include using physical and/or chemical reagent methods. When processing items of evidence, the examiner will utilize OSBI approved processing methods and will adhere to the steps of the appropriate protocol. The examiner should be cognizant of the importance of each item of evidence and should make every attempt to process each item with the most appropriate method(s). The following factors should be considered when choosing the most appropriate method(s):

- Type of latent print residue present
- Type of surface
- Environmental conditions at the time and after the latent print deposit
- Manner of collection and packaging
- Consequences of any destructive processing methods employed
- Subsequent forensic examinations to be performed

When more than one processing method is used, the correct sequence must be followed. If the wrong method is used first, it could damage latent prints, which may have been developed using another method. The approved chemical/physical processing techniques react/bond/adhere to various constituents of latent prints. Therefore, if one method does not yield positive results, another method may. The recommended sequence of processing techniques listed in LEU QPA 1 – Sequential Processing Workflow may help in identifying the most appropriate method to use for an item of evidence, as well as the sequence in which to use those methods.

Some items of evidence may consist of more than one substrate (porous/non-porous) and/or matrix (sweat/sebaceous oil/blood). In those situations, application of processing techniques in sequence appropriate for the different substrate and/or matrix should be conducted in a manner that does not negatively impact the other areas of the evidence.

If a question arises regarding the best method to be used, a Criminalist III or IV should be consulted. Consultations shall be routed in the BEAST utilizing routing codes CONS (Route for Consultation) and CONCOM (Consultation Complete) and documented in the case record.

II. DOCUMENTATION

Each chemical/physical processing technique performed will be listed in chronological order in the case note form.

A visual exam will be conducted on the evidence before and after every chemical/physical processing technique. The visual exam will be listed as the first process on the case note form. The result of this exam will be documented in the case note form. If latent prints are observed that contain sufficient detail to preserve at this step, they should be digitally photographed before the application of a processing technique. It will then be inferred that a visual exam was conducted after each sequence of chemical/physical processing.

When processing live ammunition and fired cartridge cases, the Cylindrical Surface Un-wrapper (CSU) and the Polarized Light Tunnel (PLT) utilizing white light and infrared light will be used to conduct the visual exam before and after every chemical/physical processing technique. If latent prints are observed that contain sufficient detail to preserve at this step, they should be digitally photographed before the application of a processing technique. It will then be inferred that a visual exam utilizing the CSU and PLT was conducted after each sequence of chemical/physical processing.

Latent Prints developed as the result of a processing technique should be digitally photographed per LP-17 or lifted before the application of a sequential processing technique. LEU QPA 3 – DCS5 Latent Print Photography Guide may help in identifying the most appropriate lighting technique to utilize when photographing latent prints with the DCS5 System.

The results of each processing sequence will be documented in the case note form. Examples of a sequence are (Cyanoacrylate→Dye Stain→Laser Light Source) or (Cyanoacrylate→Black Powder).

Results of Chemical/Physical Processing will be documented as:

- **Negative (Neg)** – No visible ridge detail or impressions were developed/observed.
- **No Value (NV)** – Ridge detail was developed/observed but contained insufficient detail for comparison and was not preserved by lifting or photography.
- **Detail** – Ridge detail and/or impressions were developed/observed that possibly contained sufficient detail for comparison and will be preserved by lifting and/or photography.
- **No further development/enhancement (NFD)** – Ridge detail and/or impressions were developed and preserved at a previous step; however, further/additional processing did not result in any further development of previously preserved latent prints/impressions or the development of any additional latent prints/impressions that contain sufficient detail for preservation.

When the same impression is preserved through multiple photographs and/or lifts, the duplicate images/lifts shall be documented in the case note form.

III. QUALITY CONTROL

Quality Control procedures for each chemical/physical processing technique are listed in their respective protocol. If a control does not give the expected results, the reagent will be discarded and new reagent will be made and documented in Chem Inventory.

The Lot number listed on reagents prepared by OSBI staff is the date the reagent is made.

The specific control, the date of the control, and the result of the control will be documented in the Latent Print Reagent Control Panel in the BEAST. The following exceptions to this are Powders and Fluorescent Dye Stains.

- Powders – Upon initial opening of a container of fingerprint powder, a control print will be used to ensure proper function of the powder. Initials and date on the container will indicate

that the control was positive. Performing a control prior to each use of the powder is not required.

- Fluorescent Dye Stains - The proper function of the reagent will be tested by staining an object that has been processed with Cyanoacrylate, and examining it with the forensic light source or laser light source. This will be done upon preparation of the reagent and documented in Chem Inventory. Performing a control prior to each use of the reagent is not required.

IV. REAGENT PREPARATION

All reagents prepared in the laboratory will be prepared in a fume hood with applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.

The following information will be recorded in the BEAST Chemical Inventory when reagents are prepared and their function is verified:

1. Name of reagent
2. Lot number
3. Expiration date
4. Name, amount, supplier, lot number, and expiration date of each component
5. Brief narrative detailing method for preparation
6. Identity of individual preparing the reagent
7. Date of preparation
8. Procedure used to verify the function of the reagent
9. Indication whether the reagent was acceptable or not
10. Identity of individual verifying the reagent
11. Date verification conducted and/or reagent approved for use

Containers with prepared reagents will be labeled with the contents, preparer's initials, lot number, and expiration date.

V. EVIDENCE LABELING

Items of evidence should be marked with the case number, item number, examiner's initials, and date after processing to eliminate the possibility of damaging potential evidence.

Items of evidence that have been processed shall remain in the analyst's custody or in the vault under temporary seal until the completion of a technical review to ensure the evidence is available for review or additional testing.

VI. PROCESSING PROCEDURES

LP-01: Cyanoacrylate Fuming
LP-02: Powders
LP-03: Fluorescent Dye Stains
LP-04: Forensic Light Source
LP-05: 1,2-Indanedione
LP-06: Ninhydrin
LP-07: Sticky Side Powder

LP-08: WETWOP
LP-09: Gentian Crystal Violet
LP-10: Leuco Crystal Violet
LP-11: Amido Black
LP-12: Acid Yellow 7
LP-13: Sudan Black
LP-14: Small Particle Reagent
LP-15: RECOVER LFT
LP-16: Vacuum Metal Deposition (VMD)
LP-17: Lab Photography

LP-01: CYANOACRYLATE FUMING

I. SCOPE:

Cyanoacrylate produces fumes when heated. These fumes will polymerize with the sweat secretions from friction ridge skin. When exposed to Cyanoacrylate fumes, latent impressions will show as dusty-white deposits on non-porous surfaces.

II. REFERENCES:

1. Cowger, JF. Friction Ridge Skin. New York: Elsevier Science Publishing Co. Inc. 1983.
2. FBI, editor. The Science of Fingerprints. Washington, DC: United States Government Printing Office, 1984.
3. Kent, T., editor. Manual of Development Techniques. London: Home Office, Scientific Research and Development Branch, 1986.
4. Lee, H. and Gaensslen, RE. Advances in Fingerprint Technology. New York: Elsevier Science Publishing Co., Inc. 1991.
5. Margo, P. and Lennard, C. Fingerprint Detection Techniques. Lausanne: Institut de Police Scientific et de Criminologie. 1994.
6. Olsen, RD, Sr. Scott's Fingerprint Mechanics. Springfield: Charles C. Thomas. 1978.
7. Sirchie Fingerprint Labs. Technical brochure #T13123 R4/EN0186. 1995.

III. TYPES OF ITEMS TESTED:

Any nonporous/semi-porous item suspected of bearing latent prints.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Cyanoacrylate liquid
3. Development dishes – aluminum weigh boats
4. Container of Warm Water
5. Evidence suspension materials – string/wire/rod, clothes pins/binder clips
6. Fuming Chamber
7. Heating Element
8. Ventilation
9. Digital SLR Camera
10. DCS5 Camera System
11. DCS5 Crime-lite 8x4 MK4
12. Crime-lite 82S UV

V. CONTROL STANDARDS:

Place a test print on the inside of the chamber where it can be observed during development. After the chamber has purged, check if the control can be wiped away. If so, wait until the control print has set prior to subsequent processing techniques.

A control must be performed each time Cyanoacrylate fuming is performed and documented in the Latent Print Reagent Control Panel in the BEAST case record.

VI. DESCRIPTION OF PROCEDURES:

Prior to processing with Cyanoacrylate, visually examine the evidence under appropriate lighting conditions for visible ridge detail and preserve (if applicable) with digital photography. Document the results in the case record then proceed to Cyanoacrylate.

The OSBI Latent Evidence Unit has multiple Fuming Chambers available for use in casework. Instructions for each are listed below.

A. Built-In Fuming Chambers
   1. Arrange item(s) in the fuming chamber such that maximum exposure to all sides is achieved.
   2. Place a test print inside the fuming chamber.
   3. Pour a small amount of Cyanoacrylate liquid into a development dish.
   4. Place the development dish on the heating element.
   5. Add humidity by placing a container of warm water into the chamber.
   6. Close the chamber door.
   7. Close the venting damper on the chamber being utilized.
   8. Open the venting dampers on the empty connected chambers.
   9. Plug the heating element in to begin the fuming process.
   10. Fume the item(s) for approximately 10-15 minutes in the small chambers and approximately 25 minutes in the large chambers.
   11. Visually examine the items and control periodically during the fuming process as fuming times may vary.
   12. Once maximum development is achieved, unplug the heating element to stop the fuming process.
   13. Open the venting damper on the chamber being utilized.
   14. Close the venting dampers on the empty connected chambers.
   15. Allow approximately 10 minutes to ventilate the small chambers and approximately 15 minutes to ventilate the large chambers.
   16. Open the chamber door and remove the item(s).
   17. **WARNING:** If you can smell fumes when opening the chamber door, close-it immediately and continue ventilating the chamber.

B. Mason Vactron Fuming Chamber
   1. Press the Power Button
   2. The chamber will enter a Purge cycle for 5 minutes.
   3. After the purge is complete, open the door and arrange item(s) in the fuming chamber such that maximum exposure to all sides is achieved.
   4. Place a test print inside the fuming chamber.
   5. Pour a small amount of Cyanoacrylate liquid into a development dish.
   6. Place the development dish on the heating element.

7. Add deionized water to the water tank in the chamber ensuring it is full.
8. Close the chamber door.
9. Select the Auto Cycle to start the fuming process.
10. The chamber will automatically begin the humidity cycle which will last 15 minutes.
11. Once complete, the chamber will automatically move into the fuming cycle which is defaulted to 15 minutes.
12. Visually examine the items and control periodically during the fuming cycle as fuming times may vary.
13. If maximum development is achieved prior to the end of the 15-minute fuming cycle, select the purge cycle to end the fuming and start the ventilation of fumes.
14. The chamber will automatically move into the purging cycle once the 15-minute fuming cycle is complete.
15. The purging cycle will last 20 minutes and the chamber door cannot be opened until the purging cycle is complete.
16. Once the purging cycle is complete, open the chamber door and remove the item(s).
17. Log each fuming cycle in the Use and Maintenance log book located on top of the chamber.
18. The charcoal filter and humidifier wick will be changed after 100 fuming cycles. All maintenance on the chamber will be documented in the log book.
19. Additional information regarding the fuming chamber can be found in the manufacturer's manual located in QMS and on top of the chamber.

C. Misonix Fuming Chamber
1. Turn the power on.
2. Open the door and arrange item(s) in the fuming chamber such that maximum exposure to all sides is achieved.
3. Place a test print inside the fuming chamber.
4. Pour a small amount of Cyanoacrylate liquid into a development dish.
5. Place the development dish on the heating element and close the small door.
6. Close the chamber door.
7. Check the water level in the humidifier and fill with deionized water if needed.
8. Start the humidity cycle on the chamber by pressing the **START CYCLE** button.
9. Once the humidity has reached the set point of 70%, the chamber will automatically begin the fuming cycle.
10. The fuming cycle is defaulted to 20 minutes.
11. Visually examine the items and control periodically during the fuming process as fuming times may vary.
12. If maximum development is achieved prior to the end of the 20-minute fuming cycle, select the Purge cycle to end the fuming and start the ventilation of fumes.
13. The chamber will automatically move into the purging cycle once the 20-minute fuming cycle is complete.
14. The purging cycle takes 10 minutes to complete.
15. **WARNING:** Do not open the chamber door until the purging cycle is complete.

16. Once the chamber has indicated that the purging cycle is complete, open the chamber door and remove the item(s).
17. Additional information regarding the fuming chamber can be found in the manufacturer's manual located in QMS and attached to the side of the chamber.

D. Visualization and Preservation
    1. Visually examine the item under appropriate lighting conditions and preserve with digital photography or continue with sequential processing techniques.
    2. Optional examination: Examine the item under Reflected-UV and preserve with digital photography utilizing the DCS5 Camera system.

E. Sequential Processing Techniques
    1. Follow with appropriate fluorescent dye stain.
    2. Follow with appropriate powder.

F. Safety
    1. Do not breathe cyanoacrylate fumes.
    2. Do not allow cyanoacrylate fumes to come in contact with your eyes.
    3. Do not allow cyanoacrylate liquid to come into contact with your skin.

G. Storage
    1. Follow the manufacturer's guidelines for storage of the Cyanoacrylate liquid.
        a. Sirchie: Store the bottle in a plastic bag in the refrigerator. Dispense the Cyanolacrylate liquid into small dispenser bottles and store next to the fuming chambers.

LP-02: POWDERS

I. SCOPE:

When a surface suspected of bearing latent prints is lightly dusted with fingerprint powder, the powder will adhere to the traces of contaminants giving a visible impression of the ridge detail. The developed print can be photographed and then lifted by means of clear adhesive tape and preserved by mounting on an index card or other suitable contrasting background. This is referred to as a latent lift.

II. REFERENCES:

1 Kent T., Editor. Manual of Development Techniques. London. Home Office, Scientific Research and Development Branch. 1986.
2. Lee H. and Gaensslen RE. Advances in Fingerprint Technology. New York. Elsevier Science Publishing Co., Inc. 1991.
3. Cowger JR. Friction Ridge Skin. New York. Elsevier Science Publishing Co., Inc. 1983.
4. FBI, editor. The Science of Fingerprints. Washington. US Government Printing Office. 1984.
5. Olsen RD, Sr. Scott's Fingerprint Mechanics. Springfield. Charles C. Thomas. 1978.

III. TYPES OF ITEMS TESTED:

Any non-porous/semi-porous item suspected of bearing latent prints.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Black Powder
3. Magnetic Powder
4. Dual-Tone/Bi-Chromatic
5. *fp*Natural 1 Powder
6. *fp*Natural 2 Powder
7. Ventilation
8. Fingerprint Powder Brushes
    a. Fiberglass Brush
    b. Magnetic Brush
    c. Feather Duster
    d. Camel Hair Brush
9. Lifting Devices
    a. Clear transparent commercial lifting tape
    b. Gel lifters, hinge lifters or similar device
    c. Transparent Polyethylene lifting tape
    d. DIFF-Lift Tape
    e. Mikrosil
    f. AccuTrans
10. Backing Material

a. Index cards or lift cards
b. Plain white paper/cardstock

11. Digital SLR Camera
12. DCS5 Camera System
13. DCS5 Crime-lite 8x4 MK4

V. CONTROL STANDARDS:

Upon initial opening of a container of fingerprint powder, a control print will be used to ensure proper function of the powder. Initials and date on the container will indicate that the control passed. Performing a control prior to each use of fingerprint powder is not required.

VI. DESCRIPTION OF PROCEDURES:

In the laboratory, evidence should be processed with Cyanoacrylate prior to processing with powder. This often results in more latent print development and better-quality latent prints.

In circumstances in which damage to the item of evidence should be minimized, it is acceptable to perform powder processing without the application of Cyanoacrylate. The reason should be documented in the case record.

Latent prints developed with powders can be powdered and lifted multiple times to achieve better quality/contrast. When the same latent print(s) are lifted multiple times, the duplicate lifts shall be documented in the case note form.

The OSBI Latent Evidence Unit has multiple powders approved for use in casework. Instructions for each are listed below.

A. **Heavy black** or **Silk black** powder is recommended for glass or metal articles, and is applied utilizing an appropriate brush (fiberglass, camel hair brush, or feather duster):
    1. Brush lightly over area, scattering powder and watching for developing ridge detail.
    2. To obtain maximum clarity and contrast, you may “dress” the latent print by brushing parallel to the ridges.

B. **Magnetic** powder is recommended for plastics (soft-drink bottles, storage bags, PVC or hard plastic articles, etc.) and is applied with a magnetic wand:
    1. Brush lightly over area, scattering powder and watching for developing ridge detail.
    2. To obtain maximum clarity and contrast, you may “dress” the latent print by brushing parallel to the ridges.

C. **Dual-tone** or **Bi-Chromatic** powder has the advantage of appearing light on a dark background and dark on a light background. It is particularly useful on surfaces where the background changes color frequently. It is applied utilizing an appropriate brush (fiberglass, camel hair brush, or feather duster):
    1. Brush lightly over area, scattering powder and watching for developing ridge detail.
    2. To obtain maximum clarity and contrast, you may “dress” the latent print by brushing parallel to the ridges.

D. ***fp*Natural 1** and ***fp*Natural 2** are infrared fluorescent powders that when photographed with

infrared lighting can remove background interference. These powders are useful on multi-colored and densely patterned backgrounds, reflective surfaces, and substrates that fluoresce at the same wavelengths as fluorescent dye stains Ardrox and Rhodamine 6G.

1. Dust area as with heavy or silk black powder.
2. *fp*Natural 1 – Illuminate with blue light (420-470nm) or red light (600-660nm) using the DCS5 Crime-lite 8x4 MK4 and filters GG495, RG715, RG780, and RG850.
3. *fp*Natural 2 – Illuminate with red light (600-660nm) or near infrared light (780nm) using the DCS5 Crime-lite 8x4 MK4 and filters RG715, RG780, RG850, and 900.
4. Photograph developed latent prints utilizing the DCS5 Camera System.

The OSBI Latent Evidence Unit has multiple preservation methods approved for use in casework. Instructions for each are listed below.

E. Photographing developed latent prints prior to lifting is optional. If there is risk that the developed latent prints would be damaged during the lifting activity, a photograph should be taken under appropriate lighting conditions.

F. Reflective Infrared Lighting may remove background noise from impressions processed with Heavy Black, Silk Black, Magnetic, Dual-Tone, and Bi-Chromatic powders. Photograph developed latent prints utilizing the DCS5 Camera System per LEU QPA 3 and LP-17.

G. Latent prints developed with ***fp*Natural 1** and ***fp*Natural 2** must be photographed utilizing the DCS5 Camera System per LEU QPA3 and LP-17.

H. **Clear Transparent Commercial Lifting Tape** is recommended for lifting developed latent prints from flat surfaces.

1. Unroll a length of clear transparent lifting tape sufficient to cover the latent print(s) with some to spare.
2. Press tape firmly down onto latent print.
3. Rub across latent print several times pressing down firmly.
4. Lift tape away from surface – latent print comes up with the tape.
5. Mount the tape on a lifting card, sheet of paper, or other suitable contrasting background.
6. Mark lift with item description and/or item number, case number, initials, and date.
7. Indicate where on the item the latent print was found and how it was oriented (examiner's discretion). This can be done in a narrative, a simple sketch, or both.

I. **Polyethylene Tape** is recommended for lifting developed latent prints from curved or irregular surfaces (e.g., Door knobs, light bulbs, etc.).

1. Unroll a length of transparent polyethylene lifting tape sufficient to cover the latent print(s) with some to spare.
2. Press tape firmly down onto latent print.
3. Working from the center of the latent out, rub across the latent pressing down firmly.
4. Lift tape away from surface – latent print comes up with the tape.
5. Mount the tape on a lifting card, sheet of paper, or other suitable contrasting background.
6. Mark lift with item description and/or item number, case number, initials, and date.
7. Indicate where on the item the latent print was found and how it was oriented (examiner's discretion). This can be done in a narrative, a simple sketch, or both.

J. **Mikrosil (white)** is recommended for lifting developed latent prints from curved or irregular surfaces (e.g., Door knobs, light bulbs, etc.) and textured surfaces (e.g., pebble grained plastics, wood, car dashes, etc.).
    1. Squeeze out equal lengths of Mikrosil and hardener.
    2. Using a mixing stick, thoroughly mix until a uniform color is achieved.
    3. Carefully smooth or spread the Mikrosil across the surface bearing the latent print(s), taking care not to impact the surface.
    4. Mark a piece of paper or lift card with item description and/or item number, case number, initials, and date.
    5. Place the documented paper on the corner of the wet Mikrosil.
    6. Allow the Mikrosil to set. Setting times: 5-8 minutes at 68 degrees Fahrenheit, 12-15 minutes at 14 degrees Fahrenheit.
    7. Once the Mikrosil has set, remove it from the surface.
    8. Indicate where on the item the latent print was found and how it was oriented (examiner's discretion). This can be done in a narrative, a simple sketch, or both.
    9. **When photographing/scanning the results of the Mikrosil, it must be noted that the print is in reverse orientation (or position reversed). The image must be reversed**.

K. **AccuTrans (white or transparent)** is recommended for lifting developed latent prints from curved or irregular surfaces (e.g., Door knobs, light bulbs, etc.) and textured surfaces (e.g., pebble grained plastics, wood, car dashes, etc.).
    1. Use the AccuTrans gun to dispense the AccuTrans over the developed latent print(s). The amount should be large enough to adequately cover the latent print(s).
    2. Carefully smooth or spread the AccuTrans across the surface bearing the latent, taking care not to impact the surface.
    3. Mark a piece of paper or lift card with item description and/or item number, case number, initials, and date.
    4. Place the documented paper on the corner of the wet AccuTrans.
    5. Allow the AccuTrans to set for approximately 5 minutes.
    6. Once the AccuTrans has set, remove it from the surface.
    7. Indicate where on the item the latent print was found and how it was oriented (examiner's discretion). This can be done in a narrative, a simple sketch, or both.
    8. **When photographing/scanning the results of white AccuTrans, it must be noted that the print is in reverse orientation (or position reversed). The image must be reversed**.
    9. **If using <u>transparent</u> AccuTrans, the impression will be position correct.**

L. **DIFF-Lift lifting tape** is recommended for lifting developed latent prints from textured surfaces (e.g. pebble grained plastics, wood, car dashes):
    1. Unroll a length of DIFF-Lift lifting tape sufficient to cover the latent print(s) with some to spare (the tape is thick and will need to be cut with scissors or a blade).
    2. Press tape firmly down onto latent print.
    3. Using a circular motion, rub across the latent pressing down firmly.
    4. Lift tape away from surface – latent print comes up with the tape.
    5. Mount the tape on a lifting card, sheet of paper, or other suitable contrasting background.
    6. Mark lift with item description and/or item number, case number, initials, and date.
    7. Indicate where on the item the latent print was found and how it was oriented (examiner's

discretion). This can be done in a narrative, a simple sketch, or both.

M. **Gel Lifter (white):**
   1. Cut a sufficient amount of the gel lifter to cover the latent print(s) with some to spare.
   2. Remove the plastic cover from the gel lifter.
   3. Place the lifter adhesive-side down over the impression.
   4. Press out any bubbles, folds, or creases in the lifter.
   5. Pull up the lifter.
   6. Cover the lifted impression with the plastic cover.
   7. Mark the lift with item description and/or item number, case number, initials, and date.
   8. Indicate where on the item the latent print was found and how it was oriented (examiner's discretion). This can be done in a narrative, a simple sketch, or both.
   9. The lifted impression will be **position reversed.**

N. Sequential Processing Techniques
   1. Multiple powders may be used in sequence.
   2. Powders may be applied before or after the application of fluorescent dye stains.
   3. Refer to the QPA 1 - Sequential Processing Workflow for specifics.

O. Safety
   1. In the laboratory, application should take place in fume hoods.
   2. At a crime scene, application should be conducted in a well-ventilated area. An Air Purifying Respirator should be used if powdering for an extended period of time, ≤ 5 hours.

LP-03: FLUORESCENT DYE STAINS

I. SCOPE:

Fluorescent dye stains adhere to Cyanoacrylate developed latent prints and significantly enhance their visibility through fluorescence utilizing alternate light sources.

II. REFERENCES:

1. FBI Latent Print Section. Chemical Formulas for Latent Print Development. Date of publication unknown.
2. Lee, H. and Gaensslen, RE. Advances in Fingerprint Technology. Elsevier Science Publishing co., Inc. New York. 1991.
3. McCarthy, MM. Evaluation of Ardrox as a Luminescent Stain for Cyanoacrylate Processed Latent Impressions. Illinois State Police, Bureau of Forensic Sciences, Joliet, IL. Journal of Forensic Ident. 40 (2), 1990\75.
4. Mayo, P., Leonard, C. Fingerprint Detection Techniques. Lausanne: Institute de Police Scientifique et de Criminologie. 1994.

III. TYPES OF ITEMS TESTED:

Any non-porous/semi-porous item previously processed with Cyanoacrylate.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Ardrox
3. Rhodamine 6G
4. Methanol
5. Deionized Water
6. Balance or scales
7. Glassware
8. Magnetic stirrer
9. Storage bottles
10. Wash bottle
11. Fume hood
12. Forensic Light Source
    a. Rofin Polilight
    b. TracER Laser
    c. BrightBeam Blue/Green Laser
    d. DCS5 Crime-lite 8x4/Mk2
13. Viewing goggles.
14. Digital SLR Camera with filters
15. DCS5 Camera System with filters.

V. REAGENT PREPARATION:

The OSBI Latent Evidence Unit has three fluorescent dye stains approved for use in casework. Instructions for the preparation of each are listed below.

A. Ardrox
   1. In a beaker add 2 ml of Ardrox and 100 ml of methanol and stir.
   2. Store in an appropriate container and label with contents, preparer's initials, lot number, and expiration date.

B. Rhodamine 6G Methanol solution
   1. Stock Solution
      a. Add 1 g of Rhodamine 6G to 500 ml of methanol and stir.
      b. Shelf life is indefinite.
      c. Store in a dark glass container and label with contents, preparer's initials, lot number, and expiration date.
   2. Working Solution
      a. Add 5 ml of stock solution to 500 ml of methanol and stir.
      b. Shelf life of six months.
      c. Store in a dark glass container and label with contents, preparer's initials, lot number, and expiration date.

C. Rhodamine 6G Aqueous solution
   1. Stock Solution
      a. Add 250 mg of Rhodamine 6G to 2.5 L deionized water
      b. Shelf life is indefinite.
      c. Store in a dark glass container and label with contents, preparer's initials, lot number, and expiration date.
   2. Working Solution
      a. Add 10 ml stock solution to 500 ml deionized water.
      b. Shelf life of six months.
      c. Store in a dark glass container and label with contents, preparer's initials, lot number, and expiration date.

VI. CONTROL STANDARDS:

Stain an item with a control latent print that has been processed with Cyanoacrylate and examine under the appropriate light source.

A control will be conducted upon preparation of the reagent and documented in the BEAST Chemical Inventory.

Performing a control prior to each use of the reagent is not required.

VII. DESCRIPTION OF PROCEDURES:

Ardrox and Rhodamine 6G Methanol Solution will remove writing in ink, marker, and some surface finishes. Rhodamine 6G Aqueous Solution should be used when the use of a Methanol solvent would be detrimental to the evidence.

If the item of evidence exhibits background fluorescence under alternate light source, choose the dye stain that would provide the best contrast.

A. Ardrox
    1. Apply solution to the entire item either by submersion or use of a wash bottle.
    2. Rinse excess stain off with Deionized Water.
    3. Allow evidence to dry.
    4. Examine using either:
        a. Rofin Polilight, with yellow goggles, at various wavelengths to achieve optimum fluorescence. 315 nm to 450 nm typically produces the best results. Photograph fluorescent prints using a yellow filter following Protocol LP-17.
        b. BrightBeam Blue/Green Laser on the blue light setting (445 nm), with orange goggles. Photograph fluorescent prints using orange filter following Protocol LP-17.
        c. DCS5 Crime-lite 8x4/Mk2 on the blue light setting (445 nm), with yellow goggles. Photograph fluorescent prints using filter GG495 following Protocol LP-17.

B. Rhodamine 6G (Methanol or Aqueous)
    1. Apply working solution to the entire item either by submersion or use of a wash bottle.
    2. Rinse excess stain off with Deionized Water.
    3. Allow evidence to dry.
    4. Examine using either:
        a. Rofin Polilight, with orange goggles, at various wavelengths to achieve optimum fluorescence. 505 nm to 550 nm typically produces the best results. Photograph fluorescent prints using an orange filter following Protocol LP-17.
        b. TracER Laser (532 nm), with orange goggles. Photograph fluorescent prints using orange filter following Protocol LP-17.
        c. BrightBeam Blue/Green Laser on the green light setting (532 nm), with orange goggles. Photograph fluorescent prints using orange filter following Protocol LP-17.
        d. DCS5 Crime-lite 8x4/Mk2 on the green light setting (520 nm), with orange goggles. Photograph fluorescent prints using filter OG550 following Protocol LP-17.

C. Sequential Processing Techniques
    1. Powders may be applied before or after the application of fluorescent dye stains.
    2. Refer to the QPA 1 - Sequential Processing Workflow for specifics.

D. Safety
    1. Application should take place in fume hoods utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.

2. Ardrox and Rhodamine 6G solutions CANNOT be poured down the drain. The solutions should be applied in designated glassware/plasticware and allowed to evaporate in the fume hood. The remaining residue will be rinsed with Methanol and the excess will be added to its designated Chemical Waste bottle. Once a Chemical Waste bottle is full it will be moved downstairs to Chemical Destruction.

LP-04: FORENSIC LIGHT SOURCE

I. SCOPE:

Latent/patent impressions can often be better observed and/or photographed under conditions of controlled lighting. A forensic light source can facilitate viewing latent impressions, especially with use of a Fluorescent Dye Stain, Indanedione, and Acid Yellow 7. A forensic light source may be used to search crime scenes for impression, trace, biological, or other types of evidence.

The OSBI Latent Evidence Unit has multiple forensic light sources approved for use in casework. Instructions for each are listed below.

II. REFERENCES:

1. Cowger, JF. Friction Ridge Skin. New York: Elsevier Science Publishing Co., Inc. 1983.
2. FBI, editor. The Science of Fingerprints. Washington, DC: United States Government Printing Office, 1984.
3. Kent, T. et al. Manual of Fingerprint Development Techniques. London: Home Office, Scientific Research and Development Branch, 1986.
4. Lee, H., Gaensslen, RE. Advances in Fingerprint Technology. New York: Elsevier Science Publishing Co., Inc. 1991.
5. Margo, P., Leonard C. Fingerprint Detection Techniques. Lausanne: Institut de Police Scientifique et de Criminologie, 1994.
6. Olsen, RD, Sr. Scott's Fingerprint Mechanics. Springfield: Charles C. Thomas, 1978.
7. Stoilovic, M. A Modern Approach to Latent Fingerprint Development. Australian Federal Police, 1994.

III. TYPES OF ITEMS TESTED:

Any item suspected of bearing latent prints, trace evidence, or biological evidence.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Viewing goggles (UV-protective in clear, red, orange, and yellow)
3. Rofin Polilight
4. TracER Laser
5. BrightBeam Blue/Green Laser
6. Crime-lite 82S UV
7. DCS5 Crime-lite 8x4/Mk2 and filters
8. DCS5 Crime-lite 8x4/Mk4 and filters
9. Darkroom or darkened viewing area

V. DESCRIPTION OF PROCEDURES:

A. Place article on viewing table.
B. Darken area.
C. Put on the appropriate protective eyewear for the specific forensic light source
    1. TracER Laser Light
        a. Green (532 nm) – Orange Goggles
    2. BrightBeam Blue/Green Laser
        a. Blue (445 nm) – Orange Goggles
        b. Green (532 nm) – Orange Goggles
    3. Rofin Polilight
        a. (UV 350) – Clear, Yellow, Orange, or Red Goggles
        b. (415 nm) – Yellow or Orange Goggles
        c. (450 nm) – Orange Goggles
        d. (470 nm) – Orange Goggles
        e. (490 nm) – Orange Goggles
        f. (505 nm) – Orange or Red Goggles
        g. (530 nm) – Red Goggles
        h. (555 nm) – Red Goggles
        i. (590 nm) – Red Goggles
        j. (620 nm) – Red Goggles
        k. (650 nm) – Red Goggles
    4. Crime-lite 82S UV
        a. Clear UV Goggles
    5. DCS5 Crime-lite 8x4/Mk2
        a. Must use a safe viewing filter and examine through the camera view finder or on the computer screen in the DCS5 Software. Attach the bellow at the bottom of the Crime-lite to protect your eyes and skin from exposure to the light.

Crime-lite®8x4/Mk2: Fluorescence examination (Filter selection: Longpass filters)

Control button	Colour	Nominal wavelength (nm)		Safe fluorescence viewing filters
		Bandwidth (10%)	Peak	Schott filter glass
365nm GG420	Ultraviolet	350 – 380	365	GG420
410nm GG455	Violet	395 – 425	410	GG455
445nm GG495	Blue	420 – 470	445	GG495
475nm OG550	Blue-Green	445 – 510	475	OG550
520nm OG590	Green	480 – 560	520	OG590
590nm RG645	Orange	570 – 610	590	RG645

⚠ Observe safe work practices. ⚠ Use of correct viewing filters is mandatory during any fluorescence examination ⚠ Scattered excitation light constitutes an eye hazard to all unprotected observers. ⚠ Do not use damaged or unlabelled filters.

6. DCS5 Crime-lite 8x4/Mk4
    a. Must use a safe viewing filter and examine through the camera view finder or on the computer screen in the DCS5 Software. Attach the bellow at the bottom of the Crime-lite to protect your eyes and skin from exposure to the light.

Crime-lite® 8x4/Mk4: Fluorescence examination (Filter selection: Longpass filters)

Control button	Colour	Nominal wavelength (nm)		Safe fluorescence viewing filters
		Bandwidth (10%)	Peak	Schott filter glass
445nm GG495	Blue	420 – 470	445	GG495
640nm RG715	Red	600 – 660	640	RG715
780nm RG850	Infrared	730 – 800	780	RG850

⚠ Use of correct viewing filters is mandatory during any fluorescence examination ⚠ Scattered excitation light constitutes an eye hazard to all unprotected observers. ⚠ Do not operate the equipment without using safe viewing protection. ⚠ Do not operate the equipment in the vicinity of unprotected personnel

D. Operate the specific light source according to the manufacturer's manual located in QMS.
E. View the evidence item under the appropriate wavelength of light while examining for impression evidence, trace evidence, or biological evidence.
F. The Rofin Polilight white light can be used for side lighting or reflected lighting.
G. Photograph developed impressions per Protocol LP-17.
H. Safety
    1. Protective eye wear must be worn at all times. Do not have direct eye contact with the light beam.
    2. Avoid prolonged skin exposure. To minimize exposure, it is advisable to wear a lab coat or long sleeves while utilizing a Forensic Light Source.

LP-05: 1,2-INDANEDIONE

I. SCOPE:

1, 2-Indanedione (1, 2-IND or Indanedione) is a chemical that reacts with amino acids. Amino acids are present in perspiration, which comprises latent print residues and can be developed by the application of 1, 2-IND. The technique is intended for application to porous items such as paper, wood, cardboard, etc. Latent impressions may appear as a pink color when the process is complete and then will fluoresce under a green light when viewed through an orange filter.

1, 2-IND has also been found to be successful in developing latent prints on thermal receipts without causing the receipt to turn black.

1, 2-IND has also been found to be successful in developing faint or latent impressions in blood.

II. REFERENCES:

1. BVDA Product Information 1, 2-IND; Catalogue No. B-78100
2. Dalrymple, B., & Norman, J. (2011). *Finding Latent Evidence With Chemistry & Light*, Ron Smith & Associates
3. Wiesner, S., Springer, E., Sasson, Y., Almog, J., "Chemical Development of Latent Fingerprints: 1, 2-Indanedione has Come of Age", Journal of Forensic Sciences 2001, Vol. 46, No. 5, pp. 1082-1084
4. Kasper, S.P., Minnillo, D.J., Rockhold, A.M., "Validating IND (1, 2-Indanedione)" Forensic Science Communications, 2002, Vol. 4, No. 4, October 2002
5. Parasram, L., "Finger Tips: Processing Thermal Paper with 1, 2-Indanedione/ Zinc Choride – A Novel Technique", Identification Canada, March 2011, pp 15 - 22

III. TYPES OF ITEMS TESTED:

Any porous/semi-porous item suspected of bearing latent prints or impressions in blood.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. 1,2-Indanedione
3. Ethyl Acetate
4. Glacial Acetic Acid
5. Ethanol (preferably Absolute Alcohol)
6. Zinc Chloride
7. HFE-100
8. Tongs or hemostats
9. Weigh boats
10. Fume hood
11. Clamps and hanging line for drying
12. Iron

13. Glassware
14. Magnetic stirrer
15. Balance
16. Oven
17. Forensic Light Source
    a. Rofin Polilight
    b. TracER Laser
    c. BrightBeam Blue/Green Laser
    d. DCS5 Crime-lite 8x4/Mk2
18. Digital SLR Camera with filters
19. DCS5 Camera System with filters.

V. REAGENT PREPARATION:

A. Zinc Chloride Stock Solution: A stock solution of Zinc Chloride is prepared first as it is a component of the 1, 2-Indanedione stock solution.
    1. Add 1 g of Zinc Chloride to 25 ml of Ethanol and stir until dissolved.
    2. Store in dark brown screw cap storage bottle and label with contents, preparer's initials, lot number, and expiration date.
    3. Expiration is undetermined.

B. 1, 2-Indanedione Stock Solution
    1. Add 2 g of 1, 2-Indanedione to 225 ml Ethyl Acetate and stir until dissolved.
    2. Add 25 ml of Glacial Acetic Acid
    3. Add 2.5 ml of the Zinc Chloride Stock Solution
    4. Store in a dark brown screw cap storage bottle and label with contents, preparing analyst's initials, lot number, and expiration date.
    5. Expiration date is undetermined.

C. 1, 2-Indanedione Working Solution containing Zinc Chloride
    1. For 100 ml of Working Solution: Add 10 ml of 1, 2-IND Stock Solution to 90 ml of HFE 7100 and stir.
    2. Store in dark brown screw cap storage bottle and label with contents, preparer's initials, lot number, and expiration date.
    3. Expiration date is undetermined.
    4. Multiply as necessary if larger quantities of working solution are needed.

VI. CONTROL STANDARDS:

If the working solution has an oily layer, discard and make fresh working solution.

Latent Print Control: If processing for latent prints, place a control latent print onto a porous/semi-

porous item and process with Indanedione following the procedures outlined below.

Blood Print Control: If processing for prints in blood, place a control blood print onto a porous/semi-porous item and process with Indanedione following the procedures outlined below.

A control must be performed by each analyst prior to processing evidence. The analyst only needs to perform one control per day of the specific lot of reagent being used.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

VII. DESCRIPTION OF PROCEDURES:

After the application of Indanedione, allow seven days for optimum development. Development time may be longer on some surfaces.

A. Application Method 1 is used for most porous items. For thermal paper refer to Application Method 2.
    1. Apply Indanedione working solution to the item in a designated glassware/plasticware in a fume hood, ensuring that the entire item has been in contact with the reagent. This can be accomplished by:
        a. Submerging the item in the reagent.
        b. Using a pipette to saturate the item.
        c. Brushing the reagent on the item.
    2. Hang the item to dry in the fume hood. Allow the item to completely dry prior to proceeding.
    3. Use an iron to accelerate the development.
        a. The iron should be set to the middle temperature setting.
        b. The steam function should be turned off.
        c. Lay the treated item flat on a surface in between pieces of paper.
        d. Place the iron in contact with the paper and move it over the item for approximately ten to twenty seconds.
    4. Results should be immediate; however, development will continue over time.
    5. Examine the item under a Forensic Light Source.
        a. Rofin Polilight under green light (about 530 nm) with orange goggles. Fine tune the Polilight until the best contrast is achieved. Photograph fluorescent prints using an orange filter following Protocol LP-17.
        b. TracER Laser (532 nm) with orange goggles. Photograph fluorescent prints using an orange filter or curved orange filter stacked with the FF-1.0 forensic filter (for faint impressions), following Protocol LP-17.
        c. BrighBeam Blue/Green Laser on the green setting (532 nm) with orange goggles. Photograph fluorescent prints using an orange filter or curved orange filter stacked with the FF-1.0 forensic filter (for faint impressions), following Protocol LP-17.
        d. DCS5 Crime-lite 8x4/Mk2 on the blue-green light setting (475 nm), with orange goggles. Photograph fluorescent prints using filter OG550 following Protocol LP-17.

e. DCS5 Crime-lite 8x4/Mk2 on the green light setting (520 nm), with orange goggles. Photograph fluorescent prints using filter OG550 following Protocol LP-17.

B. Application Method 2 is used for thermal paper so the reagent contact and heat does not turn the thermal paper black.
   1. Dip two filter papers into 1, 2-Indanedione working solution.
   2. Allow the filter papers to dry, then re-dip and dry.
   3. "Sandwich" the thermal paper between the two treated filter papers, then place in a zip-lock bag.
   4. Place the zip-lock bag firmly between two additional items—just as one would do to press flowers. This will force the required contact between the treated sheets and the evidence item.
   5. Allow 48 hours for development, then examine under a Forensic Light Source.
      a. Rofin Polilight under green light (about 530 nm) with orange goggles. Fine tune the Polilight until the best contrast is achieved. Photograph fluorescent prints using an orange filter following Protocol LP-17.
      b. TracER Laser (532 nm) with orange goggles. Photograph fluorescent prints using an orange filter or curved orange filter stacked with the FF-1.0 forensic filter (for faint impressions), following Protocol LP-17.
      c. BrighBeam Blue/Green Laser on the green setting (532 nm) with orange goggles. Photograph fluorescent prints using an orange filter or curved orange filter stacked with the FF-1.0 forensic filter (for faint impressions), following Protocol LP-17.
      d. DCS5 Crime-lite 8x4/Mk2 on the blue-green light setting (475 nm), with orange goggles. Photograph fluorescent prints using filter OG550 following Protocol LP-17.
      e. DCS5 Crime-lite 8x4/Mk2 on the green light setting (520 nm), with orange goggles. Photograph fluorescent prints using filter OG550 following Protocol LP-17.
   6. **This technique has been shown to develop latent prints on the thermal side of the paper without turning it black.**
   7. If impressions are visibly faint, re-dip the filter papers and allow more time to develop, checking periodically (every 24 hours).
   8. After optimum development is achieved, photograph the developed latent prints.
   9. To develop latent prints on the non-thermal side, place the item back into the sandwich and the zip-lock bag.
   10. Place the zip-lock bag into a 60° C laboratory oven for 15 minutes. **This technique may turn the thermal side black, but it will develop latent prints on the non-thermal side.**
   11. Examine under a Forensic Light Source (refer to step 5 above).

C. Application Method 3 is used for processing an item suspected of bearing impressions in blood.
   1. 1, 2-Indanedione processing should not be performed on items with wet blood.
   2. Blood may be fixed by heating the item in a 100° C oven for approximately 30 minutes or by allowing the item to dry for at least 14 days.
   3. Apply Indanedione working solution to the item in a designated glassware/plasticware in a fume hood, ensuring that the entire item has been in contact with the reagent. This can be accomplished by:

a. Submerging the item in the reagent.
b. Using a pipette to saturate the item.
c. Brushing the reagent on the item.

4. Hang the item to dry in the fume hood. Allow the item to completely dry prior to proceeding.
5. Use an iron to accelerate the development.
    a. The iron should be set to the middle temperature setting.
    b. The steam function should be turned off.
    c. Lay the treated item flat on a surface in between pieces of paper.
    d. Place the iron in contact with the paper and move it over the item for approximately ten to twenty seconds.
6. Results should be immediate; however, development will continue over time.
7. Examine the item under a Forensic Light Source.
    a. Rofin Polilight under green light (about 530 nm) with orange goggles. Fine tune the Polilight until the best contrast is achieved. Photograph fluorescent prints using an orange filter following Protocol LP-17.
    b. TracER Laser (532 nm) with orange goggles. Photograph fluorescent prints using an orange filter or curved orange filter stacked with the FF-1.0 forensic filter (for faint impressions), following Protocol LP-17.
    c. BrighBeam Blue/Green Laser on the green setting (532 nm) with orange goggles. Photograph fluorescent prints using an orange filter or curved orange filter stacked with the FF-1.0 forensic filter (for faint impressions), following Protocol LP-17.
    d. DCS5 Crime-lite 8x4/Mk2 on the blue-green light setting (475 nm), with orange goggles. Photograph fluorescent prints using filter OG550 following Protocol LP-17.
    e. DCS5 Crime-lite 8x4/Mk2 on the green light setting (520 nm), with orange goggles. Photograph fluorescent prints using filter OG550 following Protocol LP-17.

D. Sequential Processing Techniques
    1. A steam iron may be applied if no/faint development is observed after 48 hours.
    2. Ninhydrin can be used after Indanedione.
    3. Refer to the QPA 1 - Sequential Processing Workflow for specifics.

E. Safety
    1. Application should take place in a fume hood utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
    2. Indanedione CANNOT be poured down the drain. The solution should be applied in designated glassware/plasticware and allowed to evaporate in the fume hood. The remaining residue will be rinsed with Methanol and the excess will be added to its designated Chemical Waste bottle. Once a Chemical Waste bottle is full it will be moved downstairs to Chemical Destruction.

LP-06: NINHYDRIN

I. SCOPE:

Ninhydrin (Triketohydrindene Hydrate) is a reagent used to indicate the presence of amino acids. Amino acids are present in perspiration, which comprises latent print residue and can be developed by the application of Ninhydrin. Prints developed with Ninhydrin can vary from a bluish purple (Rhuemann's purple) to almost red in color.

Ninhydrin is also a reagent that may be used to develop faint or latent impressions in blood.

II. REFERENCES:

1. Kent, T. et al. Manual of Fingerprint Development Techniques. London: Home Office, Scientific Research and Development Branch. 1986.
2. Lee, H and Gaensslen, RE. Advances in Fingerprint Technology. New York: Elsevier Science Publishing Co., Inc. 1991.
3. Margo, P and Lennard, C. Fingerprint Detection Techniques. Lausanne: Institut de Police Scientifique et de Crimonologie. 1994.
4. Cowger, JF. Friction Ridge Skin. New York: Elsevier. 1983.
5. FBI Latent Print Section. Chemical Formulas for Latent Print Development.

III. TYPES OF ITEMS TESTED:

Any porous/semi-porous item suspected of bearing latent prints or impressions in blood.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Ninhydrin crystals
3. Acetone
4. Methanol
5. Isopropyl Alcohol
6. Petroleum Ether
7. Ethyl Acetate
8. Acetic Acid
9. HFE 7100
10. Tongs or hemostats
11. Weigh boats
12. Fume hood
13. Clamps and hanging line for drying
14. Steam iron
15. Glassware
16. Magnetic stirrer
17. Balance
18. Digital SLR Camera

V. REAGENT PREPARATION:

The OSBI Latent Evidence Unit has three solutions of Ninhydrin approved for use in casework. Instructions for the preparation of each are listed below.

A. Acetone Solution

1. Pour 1L of acetone into a beaker
2. Weigh out and add 6g of Ninhydrin crystals.
3. Stir approximately 5 minutes or until crystals are completely dissolved.
4. Store in screw cap storage bottle and label with contents, preparer's initials, lot number, and expiration date.
5. Shelf life is 6 months.
6. Formula may be multiplied as necessary.

B. Petroleum Ether Solution

1. Dissolve 5 g of Ninhydrin crystals into 30 ml of methanol using a magnetic stirrer.
2. Add 40 ml of isopropyl alcohol and stir.
3. Pour solution from step b. into a large beaker and add 930 ml of petroleum ether. Stir until solution is fully dissolved.
4. Store in screw cap storage bottle and label with contents, preparer's initials, lot number, and expiration date.
5. Shelf life is 1 year.
6. Formula may be multiplied as necessary.

C. HFE 7100 Solution

1. Dissolve 5 g of Ninhydrin crystals into 45 ml of methanol using a magnetic stirrer.
2. Add 2 ml of ethyl acetate and 5 ml of acetic acid and stir.
3. Add 1000 ml of HFE 7100 stir and store. If a thin oily film forms on top surface, remove by use of a separatory funnel, or pipette, or transfer to a squirt bottle and maintain level of oil above base of straw.
4. Store in screw cap storage bottle and label with contents, preparer's initials, lot number, and expiration date.
5. Shelf life is 6 months.
6. Formula may be multiplied as necessary.

VI. CONTROL STANDARDS:

Latent Print Control: If processing for latent prints, place a control latent print onto a porous/semi-porous item and process with Ninhydrin following the procedures outlined below.

Blood Print Control: If processing for prints in blood, place a control blood print onto a porous/semi-porous item and process with Ninhydrin following the procedures outlined below.

A control must be performed by each analyst prior to processing evidence. The analyst only needs to perform one control per day of the specific lot of reagent being used.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

VII. DESCRIPTION OF PROCEDURES:

Ninhydrin can be used after Indanedione.
The Acetone solution of Ninhydrin will smear/run ink. The Petroleum Ether or HFE solutions should be used when there is ink of the evidence item.

After the application of Ninhydrin, allow seven days for optimum development. Development time may be longer on some surfaces (e.g., cardboard, wood, etc.).

A. Application Method 1 is used for most porous items. For thermal paper refer to Application Method 2.
    1. Apply Ninhydrin to the item in a designated glassware/plasticware in a fume hood, ensuring that the entire item has been in contact with the reagent. This can be accomplished by:
        a. Submerging the item in the reagent.
        b. Using a pipette to saturate the item.
        c. Brushing the reagent on the item.
    2. Hang the item to dry in the fume hood. Allow the item to completely dry prior to proceeding.
    3. Use a steam iron to accelerate the development.
        a. Place water in the iron.
        b. The steam function should be turned on.
        c. Lay the treated item flat on a surface in between pieces of paper towel.
        d. Lightly steam the article with the iron taking care not to allow water to drip onto the item.
    4. Results should be immediate; however, development will continue over time.
    5. Visually examine the item and photograph developed latent prints following Protocol LP-17. The use of a green filter may assist with contrast.

B. Application Method 2 is used for thermal paper so the reagent contact and heat does not turn the thermal paper black.
    1. Dip two filter papers into Ninhydrin Pet Ether or Ninhydrin HFE 7100.
    2. Allow the filter papers to dry, then re-dip and dry.
    3. “Sandwich” the thermal paper between the two treated filter papers, then place in a zip-lock bag.
    4. Place the zip-lock bag firmly between two additional items—just as one would do to press flowers. This will force the required contact between the treated sheets and the evidence item.
    5. Allow 48 hours for development, then examine the item.
    6. If impressions are visibly faint, re-dip the filter papers and allow more time to develop, checking periodically (every 24 hours).
    7. After optimum development is achieved, photograph developed latent prints following Protocol LP-17. The use of a green filter may assist with contrast.
    8. Do not apply heat.

C. Application Method 3 is used for processing an item suspected of bearing impressions in blood.
    1. Ninhydrin processing should not be performed on items with wet blood.
    2. Blood may be fixed by heating the item in a 100° C oven for approximately 30 minutes or by allowing the item to dry for at least 14 days.
    3. Apply Ninhydrin to the item in a designated glassware/plasticware in a fume hood, ensuring that the entire item has been in contact with the reagent. This can be accomplished by:
        a. Submerging the item in the reagent.
        b. Using a pipette to saturate the item.
        c. Brushing the reagent on the item.
    4. Hang the item to dry in the fume hood. Allow the item to completely dry prior to proceeding.
    5. Results should be immediate.
    6. Visually examine the item and photograph developed latent prints following Protocol LP-17. The use of a green filter may assist with contrast.

D. Sequential Processing Techniques
    1. Ninhydrin should be utilized after Indanedione.
    2. VMD can be used after Ninhydrin.
    3. Refer to the QPA 1 - Sequential Processing Workflow for specifics.

E. Safety
    1. Application should take place in a fume hood utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
    2. Ninhydrin CANNOT be poured down the drain. The solution should be applied in designated glassware/plasticware and allowed to evaporate in the fume hood. The remaining residue will be rinsed with Methanol and the excess will be added to its designated Chemical Waste bottle. Once a Chemical Waste bottle is full it will be moved downstairs to Chemical Destruction.

LP-07: STICKY SIDE POWDER

I. SCOPE:

Sticky-Side Powder is used for the development of latent prints on the sticky side of adhesive tapes or other adhesive surfaces.

II. REFERENCES:

1. Saviers, KD. Sticky-side Powder. Technical Note No. 1-2721. Lightning Powder Company, Inc., Salem, Oregon 1993.
2. Burns, DS. Sticky-side Powder: The Japanese Solution Technical Report. Journal of Forensic Identification Vol. 44, No. 2. March/April 1994.

III. TYPES OF ITEMS TESTED:

Evidence consisting of adhesive tapes and labels suspected of possessing fingerprint ridge detail on the adhesive surface.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Sticky-side Powder
3. Kodak Photo-Flo® detergent
4. Small paintbrush
5. Glassware and/or bowl
6. Balance
7. Weigh boats
8. Fume hood
9. Digital SLR Camera

V. SOLUTION PREPARATION:

Sticky-Side Powder solution must be made fresh with each usage.

1. Add approximately 1 g of Sticky-Side Powder into a beaker, cup or bowl.
2. Mix equal parts Photo-Flo and tap water with the powder until a consistency similar to thin paint is achieved.

VI. CONTROL STANDARDS:

Place a control print on a similar adhesive surface, if feasible, and process with Sticky-Side Powder solution following the procedures outlined below.

A control must be performed by each analyst prior to processing evidence. The analyst only needs to perform one control per day of the specific lot of solution being used.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

VII. DESCRIPTION OF PROCEDURES:

A. Apply Sticky-Side Powder solution to the adhesive surface of an item with a paintbrush or submerge adhesive surface in the solution.
B. Leave the solution on the adhesive surface for 10 to 15 seconds.
C. Gently rinse the adhesive surface under tap water or swish around in a bowl of water.
D. Allow the surface to air dry.
E. Photograph any developed prints according to Protocol LP-17.
F. If developed prints are visibly faint, another application of Sticky-Side Powder solution may increase contrast.
G. Re-Photograph any developed prints in which further contrast is achieved.
H. Further preservation of developed latent prints may be achieved by either method below:
    1. Place clean, clear tape over the developed latent print (sticky side up) and affix to a suitable backing surface.
    2. Place the adhesive surface of the evidence on clear transparency film. Then further affix it to the transparency film by putting clear tape over the non-adhesive side of the item.
I. Sequential Processing Techniques
    1. Cyanoacrylate may be used prior to Sticky-Side Powder to preserve latent prints on the non-adhesive surface.
    2. Wetwop can be used after Sticky-Side Powder
    3. VMD can be used after Sticky-Side Powder.
    4. Refer to the QPA 1 - Sequential Processing Workflow for specifics.
J. Safety
    1. Application should take place in a fume hood utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.

LP-08: WETWOP

I. SCOPE:

Wetwop is a pre-mixed liquid that can be used to develop latent prints on any adhesive surface, such as masking, duct, clear, cellophane, brown packaging, and nylon reinforced strapping tapes. No mixing is required when using Wetwop and it is available in white and black.

II. REFERENCES:

1. Saviers, KD. Sticky-side Powder. Technical Note No. 1-2721. Lightning Powder Company, Inc., Salem, Oregon 1993.
2. Burns, DS. Sticky-side Powder: The Japanese Solution Technical Report. Journal of Forensic Identification Vol. 44, No. 2. March/April 1994.

III. TYPES OF ITEMS TESTED:

Evidence consisting of adhesive tapes and labels suspected of possessing fingerprint ridge detail on the adhesive surface.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Wetwop – Black
3. Wetwop – White
4. Small paintbrush
5. Glassware and/or bowl
6. Fume hood
7. Digital SLR Camera

V. CONTROL STANDARDS:

Place a control print on a similar adhesive surface, if feasible, and process with Wetwop following the procedures outlined below.

A control must be performed by each analyst prior to processing evidence. The analyst only needs to perform one control per day of the specific lot of solution being used.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

VI. DESCRIPTION OF PROCEDURES:

The OSBI Latent Evidence Unit has two solutions of Wetwop approved for use in casework: Wetwop – Black and Wetwop – White

Choose the color of Wetwop that will provide the best contrast with the item.

A. Shake the container of Wetwop well before application.
B. Pour a small amount of Wetwop into a bowl.
C. Apply Wetwop to the adhesive surface of an item with a paintbrush.
D. Leave the solution on the adhesive surface for 10 to 15 seconds.
E. Gently rinse the adhesive surface under tap water.
F. Allow the surface to air dry.
G. Photograph any developed prints according to Protocol LP-17.
H. If developed prints are visibly faint, another application of Wetwop may increase contrast.
I. Re-Photograph any developed prints in which further contrast is achieved.
J. Further preservation of developed latent prints may be achieved by either method below:
    1. Place clean, clear tape over the developed latent print (sticky side up) and affix to a suitable backing surface.
    2. Place the adhesive surface of the evidence on clear transparency film. Then further affix it to the transparency film by putting clear tape over the non-adhesive side of the item.
K. Sequential Processing Techniques
    1. Cyanoacrylate may be used prior to Wetwop to preserve latent prints on the non-adhesive surface.
    2. VMD can be used after Wetwop.
    3. Refer to the QPA 1 - Sequential Processing Workflow for specifics.
L. Safety
    1. Application should take place in a fume hood utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.

LP-09: GENTIAN CRYSTAL VIOLET

I. SCOPE:

Gentian Crystal Violet (GCV) is a protein stain that reacts with fatty acids in human sweat, producing a vivid purple image of fingerprint ridges. It is most effective when used on the adhesive surface of various tapes, labels, etc. It can also be used to stain Cyanoacrylate fumed latent prints, or undeveloped latent prints in grease or oil.

II. REFERENCES:

1. FBI Latent Print Section. Chemical Formulas for Latent Print Development. Date of publication unknown.
2. Lee, H. and, Gaensslen, RE. Advances in Fingerprint Technology. New York: Elsevier Science Publishing Co., Inc. 1991.
3. Margot, P. and Lennard, C. Fingerprint Detection Techniques. Lausanne: Institut de Police Scientifique et de Criminologie, 1994.

III. TYPES OF ITEMS TESTED:

Any adhesive surface suspected of bearing latent prints, any Cyanoacrylate fumed latent prints, or patent prints in heavy concentrations of grease or oil.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Gentian Crystal Violet powder
3. Deionized Water
4. Glassware
5. Tongs or hemostats
6. Syringe or pipette
7. Balance
8. Weigh boats
9. Fume Hood
10. Digital SLR Camera

V. REAGENT PREPARATION:

1. Weigh out approximately 1 g of Gentian Crystal Violet.
2. Add approximately 100 ml of deionized water. Stir until dissolved.
3. Store in screw cap storage bottle and label with contents, preparer's initials, lot number, and expiration date.
4. Shelf life is indefinite.

VI. CONTROL STANDARDS:

A. Adhesive Surfaces: Place a control latent print on an adhesive surface. Process with Gentian Crystal Violet following the procedures outlined below.

B. Cyanoacrylate Prints: Place a control latent print on a non-porous surface and process with Cyanoacrylate. Then process with Gentian Crystal Violet following the procedures outlined below.

C. Grease or Oil Prints: Place a control patent print in grease or oil on a non-porous surface. Process with Gentian Crystal Violet following the procedures outlined below.

A control must be performed by each analyst prior to processing evidence. The analyst only needs to perform one control per day of the specific lot of reagent being used.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

If a gold-colored film develops on the surface of the Gentian Crystal Violet solution, discard and prepare fresh.

VII. DESCRIPTION OF PROCEDURES:

A. Pour Gentian Crystal Violet solution in a glass bowl.
B. Apply Gentian Crystal Violet solution to the item. This can be accomplished by:
    1. Submerging the item, adhesive surface down, in the solution
    2. Applying the GCV solution with the use of a pipette
    3. Applying the GCV solution with the use of a squeeze bottle
    4. Applying the GCV solution with a paintbrush
C. Leave the solution on the surface for up to one minute.
D. Gently rinse the surface under tap water.
E. Allow the surface to air dry.
F. Photograph any developed prints according to Protocol LP-17.
G. If developed prints are visibly faint, another application of GCV solution may increase contrast.
H. Re-Photograph any developed prints in which further contrast is achieved.
I. Further preservation of developed latent prints may be achieved by either method below:
    1. Place clean, clear tape over the developed latent print (sticky side up) and affix to a suitable backing surface.
    2. Place the adhesive surface of the evidence on clear transparency film. Then further affix it to the transparency film by putting clear tape over the non-adhesive side of the item.
J. Sequential Processing Techniques
    1. Cyanoacrylate may be used prior to Gentian Crystal Violet to preserve latent prints on the non-adhesive surface.
    2. VMD can be used after Gentian Crystal Violet.
    3. Refer to the QPA 1 - Sequential Processing Workflow for specifics.
K. Safety
    1. Application should take place in a fume hood utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.

LP-10: LEUCO CRYSTAL VIOLET

I. SCOPE:

Leuco Crystal Violet (LCV), a colorless and completely reduced form of Crystal Violet, is a protein dye stain. When Leuco Crystal Violet and Hydrogen Peroxide come into contact with the hemoglobin in blood, a catalytic reaction occurs and the clear solution turns to a purple/violet color.

II. REFERENCES:

1. Bodziak, WJ. The Use of Leuco Crystal Violet to Enhance Shoe Prints in Blood.
2. Spence, L. and Asmussen G. Spectral Enhancement of Leuco Crystal Violet Treated Footwear Impression Evidence in Blood. Journal of Forensic Science International, Vol. 132, Issue 2, Pages 117-124

III. TYPES OF ITEMS TESTED:

Any item or substrate suspected of bearing latent or patent impressions in blood.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. 5-Sulphosalicylic Acid
3. Sodium Acetate
4. Leuco Crystal Violet
5. 3% Hydrogen Peroxide
6. Glassware
7. Pressurized aerosol device or pump spray device
8. Balance
9. Stirring device
10. Fume Hood or Ventilation
11. Digital SLR Camera

V. REAGENT PREPARATION:

1. Dissolve 10 g of 5-Sulphosalicylic Acid in 500 ml of 3% Hydrogen Peroxide.
2. Add and dissolve 3.7 g of Sodium Acetate. Stir, do not shake.
3. Add and dissolve 1 g of Leuco Crystal Violet crystals.
   a. If the Leuco Crystal Violet crystals become yellow instead of white, discard and obtain fresh
4. Store in screw cap storage bottle and label with contents, preparer's initials, lot number, and expiration date. Refrigerate or store in dark colored bottle.
5. Shelf-life varies.

VI. CONTROL STANDARDS:

Place a control print in blood on a suitable surface and process with Leuco Crystal Violet following the procedures outlined below.

A control must be performed by each analyst prior to processing evidence. The analyst only needs to perform one control per day of the specific lot of reagent being used.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

If bubbling occurs upon application, discard reagent and prepare fresh.

VII. DESCRIPTION OF PROCEDURES:

Leuco Crystal Violet contains the fixing agent, 5-Sulphosalicylic Acid, which precludes the need to fix the impressions prior to application.

A. Utilizing a pressurized aerosol device or pump spray device, lightly spray the evidence with Leuco Crystal Violet solution.

B. Alternatively, the item may be immersed in the Leuco Crystal Violet solution.

C. Instant visualization will occur with the impression turning to a purple/violet color.

D. Developed impressions should be photographed promptly because impressions will fade.

E. Photograph developed impressions following Protocol LP-17.

F. Faded impressions may be restored or intensified if sprayed with or immersed in water.

G. Sequential Processing Techniques
   1. Leuco Crystal Violet can be followed by Amido Black or Acid Yellow 7.
   2. VMD can be used after Leuco Crystal Violet.
   3. Refer to the QPA 1 - Sequential Processing Workflow for specifics.

H. Safety
   1. In the laboratory, application should take place in a fume hood utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
   2. At a crime scene, application should be conducted while wearing an Air Purifying Respirator utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
   3. Leuco Crystal Violet CANNOT be poured down the drain. The solution should be applied in designated glassware/plasticware and allowed to evaporate in the fume hood. The remaining residue will be rinsed with Methanol and the excess will be added to its designated Chemical Waste bottle. Once a Chemical Waste bottle is full it will be moved downstairs to Chemical Destruction.

LP-11: AMIDO BLACK

I. SCOPE:

Amido Black is a dye, which stains proteins present in the blood to yield visible impressions of a blue/black color. It will not react with normal components of latent prints therefore it is appropriate for use only on items contaminated with blood. It can be used to develop latent impressions, or to enhance patent impressions in blood.

II. REFERENCES:

1. Kent, T. et al, ed. Manual of Development Techniques. British Home Office, London, 1986.
2. Lee, HC and Gaensslen, RE. Advances in Fingerprint Technology. CRC Pres, Boca Raton, Florida, 1994.
3. Margot, P. and Lennard, C. Fingerprint Detection Techniques. University de Lausanne, 1994.
4. FBI, ed. Chemical Formulas and Processing Guide for Developing Latent Prints. FBI Laboratory Division, Latent Print Section. Washington D.C. No date supplied.
5. Robertson J., Lennard C., Stoilovic M. The Forensic Light Source Training Programme, Vol. 2 CD-ROM produced by Rofin, Ltd., Dingley, Victoria, Australia 1996.
6. Dalrymple, B.; Norman, J., Finding Latent Evidence With Chemistry & Light, Ron Smith & Associates, 2011.
7. SWGTREAD - Scientific Working Group for Shoeprint and Tire Tread Evidence - Guide for the Chemical Enhancement of Bloody Footwear and Tire Impressions, Final 9/2008.
8. Bodziak, W. J., Footwear Impression Evidence, 2nd ed.; CRC Press: Boca Raton, FL, 2000.
9. James, S. H.; Kish, P. E.; Sutton, T. P., Principles of Bloodstain Pattern Analysis: Theory and Practice; CRC Press: Boca Raton, FL, 2005.
10. Trozzi, T. A.; Schwartz, R. L.; Hollars, M. L., Processing Guide for Developing Latent Prints, Forensic Science Communications, January 2001, Vol. 3, No. 1.

III. TYPES OF ITEMS TESTED:

Any non-porous/semi-porous item or substrate suspected of bearing latent or patent impressions in blood.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Naphthol Blue Black (Amido Black)
3. Glacial Acetic Acid
4. Methanol
5. Deionized Water
6. 5-Sulfosalicylic Acid
7. Sodium Carbonate
8. Formic Acid
9. Acetic Acid
10. Kodak Photo-Flo solution
11. Glassware
12. Balance
13. Magnetic stirring device

14. Fume Hood or Ventilation
15. Wash bottles
16. Tongs or hemostats
17. Digital SLR Camera

V. REAGENT PREPARATION:

The OSBI Latent Evidence Unit has two solutions of Amido Black approved for use in casework: Amido Black Methanol and Amido Black Aqueous. A blood fixative solution is required prior to the use of the Amido Black Methanol solution. Instructions for the preparation of each are listed below.

A. Blood Fixative:
   1. Dissolve 20 g of 5-Sulfosalicylic Acid in 1000 ml of deionized water.
   2. Store in an appropriate glass container and label with contents, preparer's initials, lot number, and expiration date.
   3. Shelf life is indefinite.

B. Amido Black Methanol Solution:
   1. Stain Solution:
      a. Dissolve 2 g of Naphthol Blue Black (Amido Black) in 100 ml of Glacial Acetic Acid and 900 ml of Methanol, stir well.
      b. Store in screw cap storage bottles and label with contents, preparer's initials, lot number, and expiration date.
      c. Shelf life is indefinite.

   2. De-stain solution #1
      a. Combine 100 ml of Glacial Acetic Acid and 900 ml of Methanol, stir well.
      b. Store in screw cap storage bottles and label with contents, preparer's initials, lot number, and expiration date.
      c. Shelf life is indefinite.

   3. De-stain solution #2 (Optional):
      a. Combine 50 ml of Glacial Acetic Acid and 950 ml of deionized water, stir well.
      b. Store in screw cap storage bottles and label with contents, preparer's initials, lot number, and expiration date.
      c. Shelf life is indefinite.

C. Amido Black Aqueous Solution:
   1. Prepare by stirring and combining the ingredients in the following order:
      a. 500 ml of deionized water
      b. 20 g of 5-Sulfosalicylic Acid
      c. 3 g of Naphthol Blue Black (Amido Black)
      d. 3 g of Sodium Carbonate
      e. 50 ml of Formic Acid
      f. 50 ml of Glacial Acetic Acid
      g. 12.5 ml Kodak Photo-Flo
   2. Dilute this mixture to 1 L using deionized water.
   3. Although this mixture will be ready to use following dilution, allow the mixture to stand for

several days prior to use for best results.
4. Store in screw cap storage bottles and label with contents, preparer's initials, lot number, and expiration date.
5. Shelf life of solution is indefinite.

VI. CONTROL STANDARDS:

Place a control print in blood on a suitable surface and process with Amido Black following the procedures outlined below.

A control must be performed by each analyst prior to processing evidence. The analyst only needs to perform one control per day of the specific lot of reagent being used.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

VII. DESCRIPTION OF PROCEDURES:

Methanol may dissolve any painted or coated surface. The aqueous solution should be used in these circumstances.

A. Amido Black Methanol Solution
1. Fix bloody impressions by applying the blood fixative to the item.
2. Apply stain solution to item either by dipping in tray or with a wash bottle.
3. Allow item to remain in stain solution for up to 3 minutes.
4. Apply de-stain solution to item either by dipping in tray or with a wash bottle until maximum contrast is observed.
5. Wash item with deionized water if needed, then allow to dry.
6. These steps can be repeated for the desired contrast.
7. Solutions CANNOT be reused. Once used, discard solution and replenish from stock.
8. Preserve developed impressions according to Protocol LP-17.
9. Optionally, developed impressions may be lifted with lifting tape/gel lifters; however, the tape lift may not lift the print sufficiently. Always preserve via photography prior to lifting.

The aqueous solution is a one-step process that includes a blood fixative. The sensitivity and color intensity of the process are similar to that of the Amido Black Methanol solution. This solution should be utilized when processing in the field.

The aqueous solution works well on semi-porous light-colored backgrounds.

B. Amido Black Aqueous Solution
1. Apply stain solution to item either by dipping in tray or with a wash bottle.
2. Allow item to remain in stain solution for 3 to 5 minutes.
3. Gently rinse the item using tap water.
4. These steps can be repeated for the desired contrast.
5. Solutions CANNOT be reused. Once used, discard solution and replenish from stock.
6. Preserve developed impressions according to Protocol LP-17.
7. Optionally, developed impressions may be lifted with lifting tape/gel lifters; however, the tape lift may not lift the print sufficiently. Always preserve via photography prior to lifting.

C. Sequential Processing Techniques
    1. Amido Black may be used after Leuco Crystal Violet and Acid Yellow 7.
    2. Cyanoacrylate fuming is detrimental to the Aqueous Solution of Amido Black. If processing evidence for both latent impressions and impressions in blood, the Methanol Solution of Amido Black should be used.
    3. VMD can be used after Amido Black.
    4. Refer to the QPA 1 - Sequential Processing Workflow for specifics.

D. Safety
    1. In the laboratory, application should take place in a fume hood utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
    2. At a crime scene, application should be conducted while wearing an Air Purifying Respirator utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
    3. Amido Black solutions CANNOT be poured down the drain. The solution should be applied in designated glassware/plasticware and allowed to evaporate in the fume hood. The remaining residue will be rinsed with Methanol and the excess will be added to its designated Chemical Waste bottle. Once a Chemical Waste bottle is full it will be moved downstairs to Chemical Destruction.

LP-12: ACID YELLOW 7

I. SCOPE:

Acid Yellow 7 is a chemical dye stain that reacts with protein molecules in blood. Acid Yellow 7 is used for the enhancement of any impression evidence in blood. The prints will fluoresce under blue/green light creating good contrast with dark surfaces. The stain works best on non-porous surfaces.

II. REFERENCES:

1. Atkins, Amanda. United States Army Criminal Investigation Laboratory. Development of Bloody Latent Prints on Dark Surfaces. IAI presentation. July 2007.
2. www.bvda.com

III. TYPES OF ITEMS TESTED:

Any non-porous/semi-porous item or substrate suspected of bearing latent or patent impressions in blood.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. 5-Sulphosalicylic Acid
3. Acid Yellow 7
4. Glacial Acetic Acid
5. Ethanol (98% or higher)
6. Deionized Water
7. Glassware
8. Wash Bottles
9. Balance
10. Stirring device
11. Fume Hood
12. Forensic Light Source
    a. Rofin Polilight
    b. BrightBeam Blue/Green Laser
    c. DCS5 Crime-lite 8x4/Mk2
13. Viewing goggles.
14. Digital SLR Camera with filters
15. DCS5 Camera System with filters.

V. REAGENT PREPARATION:

A blood fixative solution is required prior to the use of the Acid Yellow 7 staining solution. A De-stain solution is required after the use of the Acid Yellow 7 staining solution. Instructions for the preparation of each are listed below.

A. Blood Fixative:
    1. Dissolve 20 g of 5-Sulfosalicylic Acid in 1000 ml of deionized water.
    2. Store in an appropriate glass container and label with contents, preparer's initials, lot number, and expiration date.
    3. Shelf life is indefinite.

B. Acid Yellow 7 Staining Solution:
    1. Weigh out 1 g of Acid Yellow 7.
    2. Add 700 ml of deionized water, stir.
    3. Add 250 ml of Ethanol, stir.
    4. Carefully add 50 ml of Glacial Acetic Acid while stirring.
    5. Store in an appropriate glass container and label with contents, preparer's initials, lot number, and expiration date.
    6. Shelf life varies.

C. De-staining Solution:
    1. Measure 700 ml of deionized water.
    2. Add 250 ml of Ethanol.
    3. Carefully add 50 ml of Glacial Acetic Acid while stirring.
    4. Store in an appropriate glass container and label with contents, preparer's initials, lot number, and expiration date.
    5. Shelf life is indefinite.

VI. CONTROL STANDARDS:

Place a control print in blood on a suitable surface and process with Acid Yellow 7 following the procedures outlined below.

A control must be performed by each analyst prior to processing evidence. The analyst only needs to perform one control per day of the specific lot of reagent being used.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

VII. DESCRIPTION OF PROCEDURES:

A. Fix bloody impressions by applying the blood fixative to the item.
B. Apply Acid Yellow 7 Stain solution to the item by:
    1. Using wash bottles.
    2. Pouring the stain in a bowl and immersing the item in it.
    3. Placing Kimwipes on the item and saturating them with the stain.
C. Allow the item to remain in the stain solution for approximately 3 minutes.
D. Apply de-stain solution to item either by dipping in tray/bowl or with a wash bottle, until maximum contrast is observed.
E. Remove and allow to dry.
F. Examine the evidence using either:
    1. Rofin Polilight, with yellow or orange goggles, at various wavelengths for optimum fluorescence. 400-490 nm typically provides the best results. Photograph fluorescent prints using yellow or orange filter following Protocol LP-17.

2. BrightBeam Blue/Green Laser on the blue light setting (445 nm), with orange goggles. Photograph fluorescent prints using orange filter following Protocol LP-17.
3. DCS5 Crime-lite 8x4/Mk2 on the blue light setting (445 nm), with yellow goggles. Photograph fluorescent prints using filter GG495 following Protocol LP-17.
    a. Filters OG515 and OG530 may also be utilized.
    b. Choose the filter that provides the greatest contrast.

G. To eliminate background fluorescence, lift the impressions with a white gel lifter.
1. The area should be completely dry before attempting to lift.
2. Apply the white gel lifter to the area for a maximum of 1 minute.
3. Remove the lift.
4. Examine the gel lift with either:
    a. Rofin Polilight at (400-490 nm), with yellow or orange goggles. Photograph fluorescent prints using yellow or orange filter following Protocol LP-17.
    b. BrightBeam Blue/Green Laser on the blue light setting (445 nm), with orange goggles. Photograph fluorescent prints using yellow or orange filter following Protocol LP-17.
    c. DCS5 Crime-lite 8x4/Mk2 on the blue light setting (445 nm), with yellow goggles. Photograph fluorescent prints using yellow or orange filter following Protocol LP-17.
        i. Filters OG515 and OG530 may also be utilized.
        ii. Choose the filter that provides the greatest contrast.
5. Photograph the lifted impressions within a couple of hours as the stain will diffuse into the surface of the lifter and therefore “blur” the impression.
6. The impression will be **position reversed.**

H. Sequential Processing Techniques
1. Cyanoacrylate does not seem to have an effect on the performance of Acid Yellow 7.
2. Acid Yellow 7 may be followed by Amido Black.
3. VMD can be used after Acid Yellow 7.
4. Refer to the QPA 1 - Sequential Processing Workflow for specifics.

I. Safety
1. Application should take place in a fume hood utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Acid Yellow 7 CANNOT be poured down the drain. The solution should be applied in designated glassware/plasticware and allowed to evaporate in the fume hood. The remaining residue will be rinsed with Methanol and the excess will be added to its designated Chemical Waste bottle. Once a Chemical Waste bottle is full it will be moved downstairs to Chemical Destruction.

LP-13: SUDAN BLACK

I. SCOPE:

Sudan Black is a dye that stains fatty components of sebaceous sweat to produce a blue-black impression. It is less sensitive than some other processes for latent print development, but is of particular use on surfaces which are contaminated with grease, foodstuffs, dried deposits of soft drinks, etc. It will also enhance Cyanoacrylate fumed prints. It is not appropriate for use on porous items and will not give good contrast on dark-colored items.

II. REFERENCES:

1. Kent, T, ed. Manual of Development Techniques. British Home Office, London, 1986.
2. Technical Note #1-0034, Sudan Black, Lightning Powder Company, Inc., Salem, Oregon.

III. TYPES OF ITEMS TESTED:

Any non-porous item processed with Cyanoacrylate fumes or contaminated with grease, foodstuffs, dried deposits of soft drinks, etc.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Sudan Black
3. Methanol or Ethanol
4. Deionized water
5. Glassware
6. Wash Bottles
7. Balance
8. Stirring Device
9. Fume Hood
10. Tongs or Hemostats
11. Digital SLR Camera with filters
12. Forensic Light Source
    a. Rofin Polilight
    b. TracER Laser
    c. BrightBeam Blue/Green Laser

V. REAGENT PREPARATION:

1. Dissolve 15 g of Sudan Black in 1 L of methanol or ethanol.
2. Add 500 ml of deionized water and stir well.
3. A black working solution will be produced: Not all Sudan Black will dissolve; some particles will be in suspension or as sediment. This is normal and does not adversely affect the reagent.
4. Store in screw cap storage bottle and label with contents, preparer's initials, lot number, and expiration date.
5. Shelf life of reagent is indefinite.

VI. CONTROL STANDARDS:

A. Cyanoacrylate Prints
   1. Place a control latent print on a smooth non-porous surface and fume with Cyanoacrylate. Process the item with Sudan Black following the procedures outlined below.

B. Contaminant Prints
   1. Place a control print in grease, foodstuffs, dried deposits of soft drinks, etc on a non-porous surface. Process the item with Sudan Black following the procedures outlined below.

A control must be performed by each analyst prior to processing evidence. The analyst only needs to perform one control per day of the specific lot of reagent being used.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

VII. DESCRIPTION OF PROCEDURES:

A. Shake the bottle containing Sudan Black to suspend the sediment.
B. Apply Sudan Black solution to the item by:
   1. Using wash bottles.
   2. Pouring the solution in a bowl and immersing the item in it.
   3. Placing Kimwipes on the item and saturating them with the solution.
C. Allow the item to remain in the Sudan Black solution for approximately 2 minutes.
D. Rinse the item gently under cold running tap water
E. Observe background and contrast.
F. Allow the item to dry in fume hood.
G. Examine the item visually and photograph developed latent prints following Protocol LP-17.
H. Contrast may be improved by viewing the item utilizing a Forensic Light Source.
   1. Rofin Polilight, with orange goggles, at 530 nm and 590nm. Photograph prints using an orange filter following Protocol LP-17.
   2. TracER Laser (532 nm), with orange goggles. Photograph prints using an orange filter following Protocol LP-17.
   3. BrightBeam Blue/Green Laser on the green light setting (532 nm), with orange goggles. Photograph prints using an orange filter following Protocol LP-17.

I. Optionally, developed impressions may be lifted with lifting tape; however, the tape lift may not lift the print sufficiently. Always preserve via photography prior to lifting.

J. Safety
   1. Application should take place in a fume hood utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.

LP-14: SMALL PARTICLE REAGENT

I. SCOPE:

Small Particle Reagent (SPR) is a commercially provided solution that is composed of finely ground particles suspended in a detergent solution. These particles adhere to the fatty constituents of latent fingerprints to form a visible deposit. SPR is an effective procedure for processing wet surfaces.

II. REFERENCES:

1. Bowman V. (Ed). *Manual of Fingerprint Development Techniques*. London. Home Office, Scientific Research and Development Branch. 1986.
2. Lee H. and Gaensslen RE. *Advances in Fingerprint Technology*. New York. Elsevier Science Publishing Co., Inc. 1991.

III. TYPES OF ITEMS TESTED:

Any wet, non-porous item suspected of bearing latent prints.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. SPR100 (dark)
3. SPR200 (white)
4. Water
5. Wash Bottles
6. Glassware and/or Bowl
7. Fume Hood or Ventilation
8. Digital SLR Camera
9. Lifting Devices
    a. Clear transparent commercial lifting tape
    b. Gel lifters, hinge lifters or similar device
    c. Transparent Polyethylene lifting tape
    d. DIFF-Lift Tape
    e. Mikrosil
    f. AccuTrans
10. Backing Material
    a. Index cards or lift cards
    b. Plain white paper/cardstock

V. CONTROL STANDARDS:

Place a control latent print on a non-porous surface and wet the surface. Process the item with Small Particle Reagent following the procedures outlined below.

A control must be performed by each analyst prior to processing evidence. The analyst only needs to perform one control per day of the specific lot of reagent being used.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

VI. DESCRIPTION OF PROCEDURES:

The OSBI Latent Evidence Unit has two solutions of Small Particle Reagent approved for use in casework:

SPR100 (dark) – This reagent contains molybdenum disulfide particles. Latent prints will appear a dark gray color, and it should be used on light surfaces.

SPR200 (white) – This reagent contains titanium dioxide particles. Latent prints will develop into a white color, and it should be used on dark surfaces.

Choose the color of Small Particle Reagent that will provide the best contrast with the item.

A. Shake the bottle containing the solution vigorously.
B. Apply Small Particle Reagent to the item by:
    1. Spraying the item with the SPR solution.
        a. Remove the standard bottle cap and replace it with the provided spray head.
        b. Rotate the nozzle to permit a conical spray, not a steady stream.
        c. Spray the item starting at the top and working down.
        d. If developed prints appear, continue spraying immediately above the area of development until there is no more buildup of reagent.
    2. Immersing the item in the SPR solution.
        a. Pour out a sufficient amount of SPR in a container to cover the item.
        b. Immerse the item in the SPR and gently rock the container to mix the solution thoroughly.
        c. Allow the item to remain in the solution for approximately 30 seconds.
        d. Repeat treatment on the other side of the item if necessary.
C. If application of SPR is being conducted at a crime scene and it is raining, protect the area from direct rainfall.
D. Rinse the item gently under running water utilizing the tap, wash bottle, or spray bottle.
E. Do Not allow the flowing water to come into direct contact with any developed latent prints.
F. Allow the item to dry.
G. Examine the item visually and photograph developed latent prints following Protocol LP-17.
H. If developed prints are visibly faint, another application of SPR may increase contrast.
I. Re-Photograph any developed prints in which further contrast is achieved.
J. Optionally, developed impressions may be lifted following Protocol LP-02.
K. Safety
    1. In the laboratory, application should take place in a fume hood utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
    2. At a crime scene, application should be conducted while wearing an Air Purifying Respirator utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
L. Storage
    1. After use with the spray head, remove and store the SPR solution with the standard cap.

LP-15: RECOVER LFT

I. SCOPE:

RECOVER Latent Fingerprint Technology (LFT) is a chemical vapor fuming process to develop friction ridge impressions on a range of difficult surfaces including those that have been exposed to extreme heat (discharged bullet casings, for example) and items that have been washed 'clean' in an attempt to prevent identification. It has been successful in developing latent prints from metallic items that have been exposed to extreme heat, rusted or corroded, been submerged, and been folded or deformed.

II. REFERENCES:

1. S.M. Bleay, et al., Science & Justice, https://doi.org/10.1016/j.scijus.2019.06.011
2. Wilkinson D., Hockey D., Power C., Walls R., & Cole J., (2020). Recovery of Fingermarks from Fired Ammunition and Detonated Improvised Explosive Devices using S2N2 A Proof of Concept Study. Journal of Forensic Identification, Volume 70 (Issue 1), 59.

III. TYPES OF ITEMS TESTED:

Any metallic surface suspected of bearing latent prints. RECOVER is especially useful on fired cartridge cases.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. DEVELOP vials R1, R2, R3, R4
3. Foster & Freeman RECOVER LFT Chamber
4. Foster & Freeman Fume Hood
5. DCS5 Camera System
6. Cylindrical Surface Unwrapper (CSU)
7. Polarized Light Tunnel
8. Butanol
9. Acetone
10. Alcohol Wipes

V. CONTROL STANDARDS:

Place a control latent print on a similar type of metal as the evidence. Process the control print in the RECOVER chamber where it can be observed during development, following the procedures outlined below.

A control must be performed each time RECOVER fuming is performed.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

VI. ENVIRONMENTAL CONDITIONS:

A. High humidity conditions may cause the RECOVER system to error when running the chamber

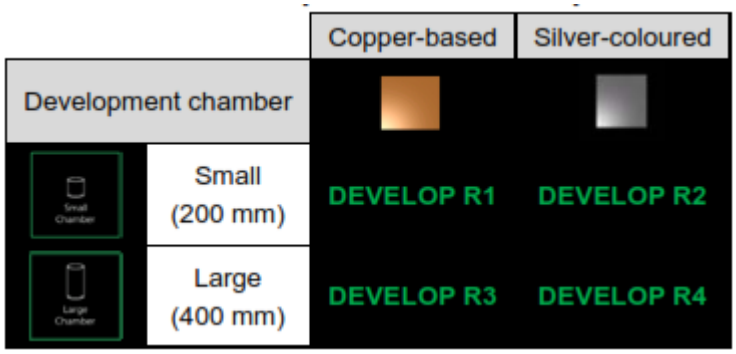
conditioning. If an error occurs check the item for moisture and check the environmental humidity.

B. A hygrometer used to measure the humidity of the LEU laboratory is located next to the RECOVER chamber.
C. It is recommended that the environmental humidity be 55% or below when operating RECOVER.
D. If the environmental humidity is near 65%, consecutive runs are not recommended.
E. Do not run RECOVER if the environmental humidity is 70% or above.

VII. DESCRIPTION OF PROCEDURES:

A. Calibrate the Optional Filter Saturation Alarm on the Foster & Freeman Fume Hood that houses RECOVER. See User Manual available in QMS.
    1. When not in use the fume hood should be turned off.
    2. When the fume hood is turned on, it will need to be calibrated.
    3. Hold the power button and the mute button at the same time.
    4. Don't release the mute button until the touchscreen turns on.
    5. Then release the mute button.
    6. The red and green arrows will alternate between ON and OFF to indicate that the saturation alarm is in Calibration mode.
    7. Leave the alarm to remain in calibration mode for 15 minutes.
    8. This will allow the chemical sensor to reach operating temperature and full sensitivity.
    9. After 15 minutes, press the mute button again.
    10. The red and green arrows will stop alternating and the green arrows will become steady indicating it is ready for use.

B. Perform a RECOVER Cycle
    1. When not in use, the RECOVER system will be connected to a main power supply and the Control Screen will revert to standby mode.
    2. Touch the standby screen to display the control screen.
    3. Select the Play button to start the selection process.
    4. Select the Metal based on the evidence type you are processing.
    a. Copper-Based metals include Copper, Brass, Bronze, etc.
    b. Silver-Coloured metals include Aluminum, Stainless Steel, Nickel, etc.
    5. Do not use a combination of copper-based and silver-colored metals in a single treatment cycle. Over/under development of fingermarks will occur.
    6. Select the Chamber size based on the size of your evidence.
    a. Small Chamber – Height 200mm
    b. Large Chamber – Height 400mm
    7. The start screen will appear which summarizes the selections made. Review for accuracy.
    8. The DEVELOP vial required for the treatment cycle is determined by the chamber and metal selections.
    9. Optimum results are obtained only by using the recommended DEVELOP vial.



10. Remove the cap from the required DEVELOP vial and place it in position on the chamber base.
11. Apply a fine layer of French chalk to the upper and lower rim surfaces of the selected development chamber.
    a. This prevents the glass from bonding to the seals on the lid and base. Damage would be likely to occur as a result.
12. Ensure that all seal faces are free from debris, damage or indentations before placement of development chamber.
13. Place the development chamber over the black seal on the chamber base.
    a. Ensure that the chamber is located symmetrically on the seal before starting the treatment cycle.
14. Load items of evidence onto the evidence rack.
15. Place the evidence rack in the development chamber.
    a. Ensure that items are not touching each other or obstructing the open top of the DEVELOP vial.
    b. The evidence rack must not touch the walls of the development chamber during the treatment cycle.
16. Lower the lid onto the development chamber.
    a. The lid must be fully lowered before a treatment cycle can be started.
17. Select the Play button.
    a. The play button is greyed out unless the lid has been fully lowered.
18. The system will perform initializing checks.
19. The system will then perform chamber conditioning in which it will automatically reach suitable vacuum conditions.
    a. This will take approximately 20-30 minutes to complete.
20. When the system is ready to start the fuming process, “Ready to Fume” will be displayed with a Play button.
    a. The fume hood must be calibrated and ready for use before continuing.
21. Start the fuming process by pressing the Play button.
22. Watch the evidence for the desired level of development.
    a. Brass items - Development time can range between 3-9 minutes.
    b. Silver items - Development time can range between 1-3 hours.
        1) Silver items may be fumed for over 3 hours as there is no risk of over-development.
23. Once the desired level of development has been reached press “End Fuming”, then “Yes”.
24. The chamber will automatically start purging.
25. As the development chamber is purging, the lid will be raised slightly to allow the purge fans to operate.

26. When the purge is complete, the motorized lid will be fully extended.
    a. The purge cycle is approximately 10 minutes.
27. The development chamber can be accessed when the “Remove Evidence” message is displayed.
28. Remove the evidence rack from the development chamber.
29. Examine the evidence and photograph developed latent prints according to LP-17 and LEU QPA 3 - DCS5 Latent Print Photography Guide.
    a. Use the Cylindrical Surface Unwrapper (CSU) with the Polarized Light Tunnel (PLT) in the DCS5 Camera System, to photograph latent prints on small cylindrical surfaces.
        1) The CSU uniformly rotates items of evidence while the DCS5 captures, stitches, and blends a series of images together to create a single 2D image of the impression.
30. Examine the evidence again after 24 hours for optimal development prior to sequential processing.
31. If additional development is observed, re-photograph as necessary.

C. Sequential Processing Techniques
    1. Items that have been previously labeled or previously processed for latent prints may be cleaned with acetone or butanol prior to processing with RECOVER to remove any contaminants.
    2. Cyanoacrylate fuming has a negative effect on the ability of RECOVER to develop latent prints. Items should not be processed with Cyanoacrylate prior to RECOVER.
    3. VMD should be utilized after RECOVER in which latent prints were developed on the item.
    4. Refer to the QPA 1 - Sequential Processing Workflow for specifics.

D. Cleaning
    1. Chamber Base, Chamber, and Lid
        a. During each treatment cycle, a fine film of non-toxic residue accumulates on the internal surfaces of the development chamber.
        b. The following cleaning steps should be completed after each treatment cycle to maintain optimum performance and minimize outgassing.
        c. Alcohol wipes can be used for cleaning the internal surfaces, chamber, and lid.
        d. The use of Sani-Cloths may be used to remove stubborn residues.
        e. Do not use abrasive cleaning agents.
        f. The areas should be wiped clean until no residue is visible.
        g. Care should be taken to avoid dislodging the rubber seal from the chamber base and the lid.
            1) Ensure when cleaning the area over the seal that an even, downwards pressure is used.
            2) Avoid a pulling or dragging motion, as this may cause the rubber seal to lift from the recess.
        h. All parts must be allowed to dry fully before reassembling and resuming use.
        i. Any moisture that is left in the chamber may cause further treatment cycles to fail.

2. Evidence Rack and Mounting Clips
    a. Evidence Racks and mounting clips are not required to be cleaned after each treatment cycle; however, they should be cleaned frequently to remove excess residue.
    b. Use alcohol wipes or sani-cloths to remove excess residue.
    c. Do not use abrasive cleaning agents.
    d. Allow to dry fully before resuming use.

3. External Surfaces
    a. A soft dry microfiber cloth or paper tissues can be used to remove dust and deposits from external surfaces.

E. Storage
    1. When RECOVER is not in use it should remain powered on and will go into sleep mode.
    2. The fume hood should be turned off.
    3. The glass chamber and lid should be removed and placed to the side on the padded mat.
    4. The RECOVER cover should be placed over the fuming chamber.

F. Maintenance and Trouble-shooting
    1. All maintenance conducted on RECOVER will be documented on the RECOVER Maintenance Log located by RECOVER.
    2. For instructions on replacing the filter unit and gasket seals, refer to the RECOVER User Manual located in QMS.
    3. For trouble-shooting and emergency procedures, refer to the RECOVER User Manual located in QMS.

G. Safety
    1. Application should take place in a fume hood utilizing all applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
    2. The contents of the used DEVELOP vial can be discarded with general waste.
    3. The DEVELOP vial is single-use and should be discarded with glass waste.

LP-16: VACUUM METAL DEPOSITION (VMD)

I. SCOPE:

Vacuum Metal Deposition (VMD) is a non-invasive latent print processing technique that can be used on a variety of porous, semi-porous, and non-porous surfaces such as paper, plastic, glass, fabric, firearms, ammunition, etc. It has been successful in developing latent prints from evidence that is 20 years old.

VMD is a "line of sight" process, whereby the evaporated metal will only deposit on the surface of the exhibit in direct line of sight with the metal evaporation boats. Therefore, exhibits that have a multi-faceted surface or are highly curved will need to be processed multiple times to cover the entire surface.

II. REFERENCES:

1. AfterWords Article, Metal Deposition for Latent Print Development, Journal of Forensic Identification, 48 (2) 1998 / 165.
2. Suzuki, Shinichi, Yasuhiro Suzuki and Hikoto Ohta Detection of Latent Fingerprints on Newly Developed Substances Using the Vacuum Metal Deposition Method Journal of Forensic Identification, 52:5 (2002)
3. Jones, N., Kelly, M., Stoilovic, M., Lennard, C., Roux, C., "The Development of Latent Fingerprints on Polymer Banknotes". Journal of Forensic Identification, 50 / 53 (1), 2003.
4. Philipson, David, and Stephen Bleay Alternative Metal Processes for Vacuum Metal Deposition. Journal of Forensic Identification, 57(2):252-273 2007
5. Nic Daéid, Niamh; Stephanie Carter and Kenny Laing Comparison of Vacuum Metal Deposition and Powder Suspension for Recovery of Fingerprints on Wetted Nonporous Surfaces Journal of Forensic Identification, 58:5 (2008)

III. TYPES OF ITEMS TESTED:

Any porous, semi-porous, or nonporous item suspected of bearing latent prints.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. West Technology Vacuum Metal Deposition Chamber, VMD360
3. Metals
    a. Gold wire
    b. Silver wire
    c. Sterling Silver wire
    d. Zinc pellets
4. Evaporation Boats for each metal
    a. Gold
    b. Silver
    c. Sterling Silver
    d. Zinc
5. Metal Trays

6. Magnets
7. Tweezers
8. Digital SLR Camera

V. CONTROL STANDARDS:

Place a control latent print on the inside of the chamber or an item placed inside the chamber. Process the control print with Vacuum Metal Deposition where it can be observed during development with the evidence, following the procedures outlined below.

A control must be performed each time VMD is performed.

The control will be documented in the Latent Print Reagent Control Panel in the BEAST case record.

VI. DESCRIPTION OF PROCEDURES:

The OSBI Latent Evidence Unit has multiple metals approved for use in the VMD chamber: Gold, Silver, Sterling Silver, and Zinc.

Refer to the **West Technology Forensic VMD Application Guide** for guidance on the VMD process and what metal(s) to use per substrate type.

A. When not in use, the VMD Chamber will be placed under vacuum before the system is shut down.
B. Turn on the VMD Chamber.
    1. Switch on the ELECTRICAL POWER SWITCH, located on the right-hand side panel of the system.
    2. Press the ON/OFF BUTTON located on the front of the system (just below the control screen). The button will illuminate (blue light) to indicate the system is on.
    3. After approximately 15 seconds the WELCOME screen will be displayed.
    4. Press anywhere on the WELCOME screen to go to the HOME screen.
    5. Press the SYSTEM START button to start the system. The system goes through an automatic warm up sequence and the SYSTEM START button turns green.
    6. The DOOR ACCESS button will be red and the door will not open because the chamber is under vacuum.
    7. Press the DOOR ACCESS button. A pop-up message will appear. Press the green check mark to admit air to the chamber to return it to atmospheric pressure.
    8. Once complete the DOOR ACCESS button will be green and the door can be opened.
    9. Do not open the chamber door until you are ready to load your evidence. This will help to have a shorter pump down time.
C. Mount the evidence on the evidence holder.
    1. The VMD360 is supplied with two evidence holders - a semi-cylindrical one and a flat plate - to mount evidence for processing.
    2. Evidence should be dry and free of contamination, where possible, prior to processing.
    3. Items with trapped air or liquids will need to be prepared prior to processing.
        a. Release the air and contents of plastic bags (e.g. chips, zip-lock bags, etc.) and remove caps and liquids from bottles.

b. Allow the bottles to dry.

4. Process similar items together in a run.
5. Place the chosen evidence holder upside down on a bench and attach the evidence.
    a. Magnets can be used to attach 2D evidence (e.g. flexible plastic, money, paper, etc.) to the surface of the holder. Flat 2D evidence materials should be fixed to the holder as smoothly as possible to aid in uniform processing.
    b. Evidence with more complex, 3D geometric shapes (e.g. firearms, bottles etc.) should be carefully suspended from the holder using hook magnets and suitable suspension materials e.g. thin fishing line.
6. Place your control on the evidence holder.
7. Slide the evidence holder into the chamber.

D. Place the appropriate metal in the evaporation boats.
    1. Two evaporation sources are located at the bottom of the chamber.
    2. Each evaporation source has a vessel, known as the evaporation boat, where the metal is placed to be evaporated.
    3. The Source 1 boat is used for the evaporation of gold, silver and sterling silver.
    4. The Source 2 boat is used for the evaporation of zinc.
    5. Do not mix metals in the boats.
        a. For example, once gold is used in a boat, it becomes the boat for gold use only.
        b. All evaporation boats have a finite life, becoming brittle with use and will need to be replaced from time to time.
        c. See the User's Manual located in QMS and next to the VMD chamber for instructions on changing the evaporation boats.
    6. The amount of metal required to develop fingerprints varies from exhibit to exhibit. The table below gives recommendations for the types of metal to be used for forensic VMD processing.

Metal	Purity	Form	Amount Needed
Gold (Au)	>99.9%	0.25 mm diameter, wire ~4mm in length.	1 piece required for a standard process.
Zinc (Zn)	>99.9%	1 pellet ~3.2mm x 3.2mm.	1 pellet typically lasts 5-20 process runs, depending on the substrate.
Silver (Ag)	>99.9%	0.5 mm diameter wire x ~5mm in length.	2-3 pieces of wire to start a process, adding more silver as/when needed.
Sterling Silver (S. Ag)	92.5%	0.5 mm diameter wire x ~5mm in length.	2-3 pieces of wire to start a process, adding more sterling silver as/when needed.

    7. Load the appropriate boats with the metals associated with the VMD process you will run.
    8. Close the chamber door.

E. Evacuate the Air in the Chamber.
    1. From the HOME screen, press the PROCESS button which will start the automatic chamber evacuation sequence.

2. The progress of the chamber evacuation is indicated by changing colors of the bar graph behind the pressure reading.
    a. All segments are initially red to show that the chamber is not at the correct pressure for processing.
    b. The segments gradually turn to green as the chamber nears the correct processing pressure (3.0×10^{-4} mbar).
3. The time period to evacuate the process chamber will be influenced by a number of factors such as:
    a. Size of evidence – Large items take longer than small items
    b. Type of substrate – Non-porous will be quicker than semi-porous/porous
    c. Geometry of substrate – The more complex the shape the longer it takes (*e.g*. a firearm vs. a plastic sheet).
4. Once the chamber is pumped to the correct pressure, the display will automatically change to the SOURCES screen.

F. Evaporation of Metals
1. Each of the source buttons (labeled 1 and 2) have green outer circles to indicate that they are available for use.
2. If the outer circle is brown for either source, it is likely that the chamber pressure is out of range for that particular source.
3. Pressure range for Source 1 is better than *i.e*. lower than 3.0 x 10-mbar.
4. Pressure range for Source 2 is between 3.0 to 5.0 x 10-mbar.
5. Select Source 1 (containing gold, silver, or sterling silver wire) by pressing the circular button with the '1'.
6. The whole button will change to green to indicate that the source is selected.
7. The green circle around the Source 2 will change to red/brown to indicate that this source is not available.
8. If the chamber is at the correct pressure the evaporation boat on the SOURCES screen will glow red to show it is active.
9. The DEVELOPMENT CONTROL dial regulates the amount of electrical current fed to the evaporation sources and is located below the control screen. The dial must be in the off position (fully counterclockwise) for the system to work.

G. Gold/Zinc Process
1. Evaporation of Metal 1 (Gold) – As the development dial is turned, it increases the evaporation current to the metal boat source 1. The development dial is marked with a dash. Turn the development control dial clockwise till the dash on the dial is lined up with the “1” on the chamber. Then slowly turn the dial until the gold evaporation boats start to glow a dull orange color. Do not apply power to the source too rapidly, as the thermal shock can cause the gold wire to 'jump' out of the evaporation boat.
2. Hold the dial at this point until the gold wire starts to melt and lose its shape. Once the gold has melted, continue to slowly increase the evaporation current until the boat glows at a white heat.

3. Do not look directly at the source 1 boat when increasing current to white heat as this may cause discomfort to your eyes. Please wear the tinted safety glasses provided with the system and instruct any bystanders to look away.
4. There is no need to monitor the evidence during gold evaporation, as this is a priming stage for zinc development. After 2 - 3 seconds at white heat, turn off the current by turning the development control dial fully counterclockwise. Important: Do not hold the source at white heat for more than 3 seconds.
5. With the chamber lights on, check the surface of the evaporation boat for residual gold. If any gold is present, then repeat the previous step.
6. Press the Source 1 button to deactivate it. The gold deposition process is now complete.
7. Evaporation of Metal 2 (Zinc) – Select Source 2 by pressing the circular button with the '2'. The whole button will change to green to indicate that the source is selected. The chamber pressure is automatically adjusted between 3.0 - 5.0 x 10^{-4} mbar and once it is within the range, the Source 2 evaporation boat will glow red to show it is active.
8. The development dial is marked with a dash. Turn the development control dial clockwise till the dash on the dial is lined up with the “2” on the chamber. Then slowly turn the development control dial clockwise to increase the evaporation current to Source 2 (zinc) till it glows a dull orange color. Whilst doing this continually watch the positive control (and the evidence) for signs of development.
9. The zinc boat only needs to have sufficient power to just glow a dull orange color.
10. Do not apply power to the source too rapidly, as thermal shock can cause the zinc metal to 'jump' out of the evaporation boat.
11. The zinc will now slowly begin to deposit on to the surface of the evidence and as the zinc layer thickness gradually increases, any fingerprints will slowly become visible.
12. Once the optimum fingerprint development has been achieved, turn off Source 2 by turning the development control dial fully counterclockwise.
13. Press the Source 2 button to deactivate it. The zinc deposition process is now complete.
14. Run a Boat Clean to remove (by evaporation) any zinc contamination on the surface of the Source 1 boat that may have occurred during the zinc evaporation phase of the process.
15. Press the BOAT CLEAN button to activate Source 1. A pop-up message will appear asking for confirmation that you want to activate the boat clean function. Press the green check mark.
16. Select the Source 1 by pressing the circular button with the '1'. The button will change to green and the evaporation boat will glow red to indicate that the source is active for use. Please Note: The Source 1 is only active for 10 seconds.
17. Turn the development control dial clockwise to increase the evaporation current until the Metal 1 evaporation boat glows to orange heat.
18. Do not look directly at the source 1 boat when increasing current to white heat as this may cause discomfort to your eyes. Please wear the tinted safety glasses provided with the system and instruct any bystanders to look away.
19. Hold at orange heat for a few seconds and then turn off the current by turning the development control dial fully counterclockwise. The boat clean is now complete.

20. Press the HOME button to return to the HOME screen to admit air to the chamber. Press the DOOR ACCESS button. A pop-up message will appear. Press the green check mark to admit air to the chamber to return it to atmospheric pressure. Once complete the DOOR ACCESS button will be green and the door can be opened.
21. Remove the evidence holder from the chamber.

H. Silver/Sterling Silver Process

1. Evaporation of Metal 1 (Silver/sterling silver) – With Source 1 boat selected, turn the development control dial clockwise till the dash on the dial is lined up with the "1" on the chamber. Then slowly turn the development control dial clockwise to increase the evaporation current, until the evaporation boat starts to glow a dull orange color. Do not apply power to the source too rapidly, as the thermal shock can cause the wire to 'jump' out of the evaporation boat.
2. Carefully watch for the wire to melt and become a ball of liquid. After approximately 10 seconds, the liquid silver/sterling silver should be gently bubbling. If it isn't, then gradually increase the evaporation current until the silver/sterling silver gently bubbles.
3. At this point the evidence should be continually watched for signs of development. The silver/sterling silver will slowly begin to deposit on to the surface of the evidence. As the silver/sterling silver layer gradually increases in thickness, any fingerprints will slowly become visible.
    a. Stage 1: Initially, the substrate will turn a yellow color – generally fingerprints are only just visible at this stage.
    b. Stage 2: Following stage one the substrate gradually changes to an orange/pink color, which is when fingerprint development starts to become readily visible to the operator.
    c. Stage 3: Following this, with continued deposition of silver/sterling silver, the substrate will turn a pink/purple color, which is when fingerprints become easily observable with the best contrast for imaging. Fingerprint ridges will appear yellow and the furrows/substrate will be a darker pink/purple color.
    d. On dark substrates, the silver/sterling silver process can give a blue/green background and furrows with the ridges remaining a similar color to the original substrate color.
4. The time taken to visualize fingerprint detail using silver/sterling silver depends on the substrate type and the rate of deposition.
5. Once the optimum fingerprint development has been achieved, turn off the current by turning the development control dial fully counterclockwise. Press the Source 1 button to deactivate it. The silver/sterling silver deposition process is now complete.
6. Press the HOME button to return to the HOME screen to admit air to the chamber. Press the DOOR ACCESS button. A pop-up message will appear. Press the green check mark to admit air to the chamber to return it to atmospheric pressure. Once complete the DOOR ACCESS button will be green and the door can be opened.
7. Remove the evidence holder from the chamber.

I. Silver/Sterling Silver + Zinc Process

1. Evaporation of Metal 1 (Silver/Sterling Silver) – With Source 1 boat selected, turn the development control dial clockwise till the dash on the dial is lined up with the “1” on the chamber. Then slowly turn the development control dial clockwise to increase the evaporation current, until the evaporation boat starts to glow a dull orange color. Please Note: Do not apply power to the source too rapidly, as the thermal shock can cause the wire to 'jump' out of the evaporation boat.
2. Carefully watch for the wire to melt and become a ball of liquid. After approximately 10 seconds, the liquid silver/sterling silver should be gently bubbling. If it isn't, then gradually increase the evaporation current until the silver/sterling silver gently bubbles.
3. Carefully monitor the exhibit through the chamber window, until silver/sterling silver deposition reaches at least Stage 1 and ideally early Stage 2 development.
    a. Stage 1: Initially, the substrate will turn a yellow color – generally fingerprints are only just visible at this stage.
    b. Stage 2: Following stage one the substrate gradually changes to an orange/pink color, which is when fingerprint development starts to become readily visible to the operator.
4. The time taken to reach Stages 1-2 depends on the substrate type and the rate of deposition.
5. Once Stage 2 development is achieved, turn off the current by turning the development control dial fully counterclockwise. Press the Source 1 button to deactivate it. The silver/sterling silver deposition process is now complete.
6. Evaporation of Metal 2 (Zinc) – Select Source 2 by pressing the circular button with the '2'. The whole button will change to green to indicate that the source is selected. The chamber pressure is automatically adjusted between 3.0 - 5.0 x 10^{-4} mbar and once it is within the range, the Source 2 evaporation boat will glow red to show it is active.
7. The development dial is marked with a dash. Turn the development control dial clockwise till the dash on the dial is lined up with the “2” on the chamber. Then slowly turn the development control dial clockwise to increase the evaporation current to Source 2 (zinc) till it glows a dull orange color. Whilst doing this continually watch the positive control (and the evidence) for signs of development.
    a. The zinc boat only needs to have sufficient power to just glow a dull orange color.
    b. Do not apply power to the source too rapidly, as thermal shock can cause the zinc metal to 'jump' out of the evaporation boat.
8. Once the optimum fingerprint development has been achieved, turn off Source 2 by turning the development control dial fully counterclockwise. Press the Source 2 button to deactivate it. The zinc deposition process is now complete.
9. Run a Boat Clean to remove (by evaporation) any zinc contamination on the surface of the Source 1 boat that may have occurred during the zinc evaporation phase of the process.
10. Press the BOAT CLEAN button to activate Source 1. A pop-up message will appear asking for confirmation that you want to activate the boat clean function. Press the green check mark.

11. Select the Source 1 by pressing the circular button with the '1'. The button will change to green and the evaporation boat will glow red to indicate that the source is active for use. Please Note: The Source 1 is only active for 10 seconds.
12. Turn the development control dial clockwise to increase the evaporation current until the Metal 1 evaporation boat glows to orange heat.
13. Do not look directly at the source 1 boat when increasing current to white heat as this may cause discomfort to your eyes. Please wear the tinted safety glasses provided with the system and instruct any bystanders to look away.
14. Hold at orange heat for a few seconds and then turn off the current by turning the development control dial fully counterclockwise. The boat clean is now complete.
15. Press the HOME button to return to the HOME screen to admit air to the chamber. Press the DOOR ACCESS button. A pop-up message will appear. Press the green check mark to admit air to the chamber to return it to atmospheric pressure. Once complete the DOOR ACCESS button will be green and the door can be opened.
16. Remove the evidence holder from the chamber.

J. Examination
    1. Remove the evidence from the holder and examine it.
    2. Photograph developed latent prints according to LP-17.
    3. Developed latent prints may not be visible under ambient light.
        a. The use of different lighting and magnification may enhance the ability to see detail that was not immediately visible.
        b. It is recommended items processed with VMD are viewed and/or photographed using various lighting techniques after each step for best contrast/results.

K. Further VMD Processing
    1. Forensic VMD is a “line of sight” process, whereby the evaporated metal will only deposit on the surface of the exhibit in direct line of sight with the metal evaporation boats.
    2. Exhibits that have a multi-faceted surface or are highly curved will need to be processed multiple times to cover the entire surface.

L. Shutting the System Down
    1. The chamber must be placed under vacuum before the system is shut down.
    2. Close the chamber door.
    3. From the HOME screen, press the PROCESS button and the system will start the automatic chamber evacuation sequence.
    4. Pump down to approximately 5 green bars then press the HOME button.
    5. Press the SYSTEM START button and a pop-up message will appear, “Stop System?”.
    6. Press the green check mark and a pop-up message will appear when the system has shutdown.
    7. After approximately 30 seconds switch the system off by pressing the 'SYSTEM ON/OFF' button.
    8. Switch off the ELECTRICAL POWER SWITCH, located on the right-hand side panel of the system.

VII. CLEANING/MAINTENANCE:

It is important to regularly clean the internal surfaces of the process chamber because a buildup of zinc will slow down the evacuation and could also make it more difficult to observe development of fingerprints. Large deposits of zinc on the evaporation sources could potentially cause electrical shorting.

A. The important surfaces to keep clean are:
    1. The evidence holders.
    2. The chamber walls and evaporation sources.
    3. The chamber window and LED lights.

B. Use the Sprint V2 cleaner supplied with the system. Alternatively, a weak (5-10%) solution of acetic acid can be used.
    1. Never spray the cleaner directly into the process chamber or on to the LED lights or chamber window.
    2. Always spray the cleaner on to a piece of soft tissue paper and use this to clean the evidence holder, chamber window and surfaces etc.

C. Evidence holder: Recommend cleaning after every 2-3 runs.

D. LED lighting strips, chamber window, rubber seal on door: Recommend cleaning after visible contamination is observed on the chamber window. Typically, cleaning is recommended weekly

E. After cleaning the LED lights, chamber window, and the rubber seal on the door, a fine layer of high vacuum grease must be applied to the surfaces.
    1. Place a small amount, approximately 5 mm diameter, of high vacuum grease on a gloved finger.
    2. Dab it at intervals across the entire surface area of the window or light.
    3. Gently rub the grease over the surface using a piece of soft tissue paper until there is a thin layer of invisible grease covering the complete surface area.

F. It is recommended to check the oil sight glass of the vacuum pump weekly.
    1. Check the level of the oil.
    2. Check the condition of the oil.
    3. Replenish as necessary.

G. Cleaning/Maintenance conducted on the VMD chamber will be documented on the VMD Maintenance Log located by the VMD Chamber.

H. For additional information regarding care and maintenance, refer to the VMD User Manual located in QMS.

VIII. SEQUENTIAL PROCESSING

A. VMD should be utilized as the first processing technique in sequential processing when attempting to develop latent prints on thermal paper, fabrics, and metal objects that may have been washed or submerged in water.

B. VMD should be utilized sequentially on fired cartridge cases in which the processing results were Detail after RECOVER.
C. VMD should be utilized on cold case items that have been previously processed with traditional latent print processing techniques that will fit in the VMD chamber.
D. VMD should be utilized after traditional latent print processing techniques on Violent cases as defined as the following:
    1. Deaths (Homicide, Suicide, Suspicious Death, etc)
    2. Assault
    3. Sexual Assault
    4. Kidnapping
    5. Missing Person
E. VMD may be utilized in other case types based on case circumstances and examiner discretion.
F. Refer to the QPA 1 - Sequential Processing Workflow for specifics.

LP-17: LAB PHOTOGRAPHY

I. SCOPE:

Photography using a digital SLR camera is an excellent method of documenting impression evidence. Latent Evidence Unit Analysts of the OSBI will utilize various photographic techniques when documenting and preserving latent prints developed in the laboratory.

II. REFERENCES:

1. SWGIT. "Best Practices for Maintaining the Integrity of Digital Images and Digital Video", Version 1.0,6/4/2007.
2. SWGFAST. "Standard For Friction Ridge Digital Imaging (Latent/Tenprint)", Version 1.1, 9/14/2009.
3. Redsicker DR. "The Practical Methodology of Forensic Photography." New York: Elsevier, 1991.
4. Kent, T. et al. Manual of Fingerprint Development Techniques. London: Home Office, Scientific Research and Development Branch, 1986.
5. ANSI/ASTM E3235-21 Standard Practice for Latent Print Evidence Imaging Resolution, 6/7/2022

III. TYPES OF ITEMS TESTED:

Any item bearing latent prints.

IV. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Digital SLR Camera
    a. Minimum of 2 mega pixel digital camera with detachable memory storage modules.
    b. Must be capable of close-up photography, using either a macro function or macro lens.
    c. Must be able to perform long exposures and function well in low light situations.
    d. Option of using an external flash and/or remote shutter release is desirable.
    e. Camera with proprietary image formats is preferred, but not required.
    f. Camera should have the option of a lossless compression format.
    g. Camera should have a means to efficiently transfer files to a laptop or desktop computer, such as USB or Firewire.
3. Computer
    a. Capable to run capture and enhancement software at a practical speed.
4. Tripod with attachment for hanging camera underneath center post, MP4, or equivalent camera/copy stand.
5. Scale(s) for 1:1 reproduction of photographs.
6. Colored Filters.
7. Appropriate light source (Flashlight, Forensic Light Source, or Laser Light Source).
8. DCS5 Camera System

V. DESCRIPTION OF PROCEDURES:

A. Category 1 – Category One images are used to demonstrate what the photographer or recording device witnessed but are not analyzed by subject matter experts. These images may be captured and stored in JPEG format. These can include, but are not limited, to the following:
    1. Evidence packaging
    2. Overall images of evidence
B. Category 2 – Subject matter experts use Category Two images for scientific analysis. These can include, but are not limited, to the following:
    1. Latent prints
    2. Impression evidence
    3. Patterned evidence
    4. Category 1 images to be subjected to analysis
C. When using the Digital SLR cameras, Category 2 images shall be captured and stored in RAW format.
D. When using the DCS5 Camera System, Category 2 images shall be captured and stored in TIFF format.
E. Category 1 images collected in the laboratory should include the case #, item #, analyst initials, and date the photo is taken within the image whenever practical. If not practical, this information should be included in the image label.
F. Category 2 images collected in the laboratory shall include a scale and the case #, item #, analyst initials, and date the photo is taken within the image.
    1. Exception - At times it is difficult to include a scale when photographing decedent fingers/skin. Due to this, a scale may be absent when photographing decedent fingers/skin; however, attempts should be made to include the above information.
        a. If the information from section F above is missing from the image, it shall be included in the image label.
        b. If the images need to be searched through AFIS they can be calibrated by utilizing the ridge count tool.
    2. Exception – When utilizing the Cylindrical Surface Un-Wrapper (CSU) of the DCS5 Camera System a scale cannot be placed on the device.
        a. The information from section F above shall be included in the image label.
        b. The camera system uses a fixed focus lens that is calibrated to ensure that the images are 1:1.
G. To ensure a high-resolution image for analysis, the analyst should fill the frame with the impression and scale. The minimum resolution of the image shall be 1000 ppi.
H. To ensure proper focus, exposure, and contrast, the analyst should adjust the following camera settings:
    1. In the Nikon Capture Software with the Digital SLR cameras
        a. White Balance
            1) Preset 1 – Used when utilizing white light from a Forensic Light Source.
            2) Preset 2 – Used when utilizing the flood lamps attached to the MP4 stand.
            3) Fluorescent – Used for fluorescent photography.
            4) Auto – Used for ambient light conditions.

b. Aperture
    1) F8 – Used for flat surfaces
    2) Increase the aperture for curved surfaces to increase the depth of field. This ensures that the entire photo is in focus.
c. Shutter-speed
    1) Adjust the shutter-speed so the exposure histogram is set to zero.
    2) View the image and adjust the shutter-speed as needed to improve exposure.
d. ISO is set to 400 and does not need to be adjusted.

2. Refer to LEU QPA3 - DCS5 Photography Guide for camera settings when utilizing the DCS5 Camera System.

I. The images should be labeled with the case number, sub-item number, image number, and any other appropriate information (See section F above).

J. Category 2 images taken in the lab are downloaded to a secure network server.

K. Category 2 images shall be treated as evidence:

1. All category 2 images shall be created as a sub-item on the Items tab in the BEAST at the time of creation.
2. All category 2 images shall be placed into an "Item" container in the BEAST.
3. All category 2 images shall be uploaded from the secure network server to the BEAST Image Vault.
4. The chain of custody for the category 2 images shall be updated at that time.

VI. IMAGE INTEGRITY

A. Digital SLR Cameras

1. The category 2 images collected in the laboratory are downloaded to a secure network server.
2. The images are renamed to include the unique case identifier, the sub-item number, and the image number.
3. A primary image is the result of the first recording of an image onto media. An original image is an accurate replica (bit-for-bit value) of the primary image.
4. Each original image of Category 2 images shall be captured and stored in RAW format which permits authentication.
5. The original images will be uploaded to the BEAST Image Vault of the appropriate case.

B. DCS5 Camera System

1. Prior to capturing category 2 images with the DCS5 Camera System, the images are labeled with the unique case identifier, the sub-item number, and the image number.
2. The category 2 images are downloaded to a secure hard drive on the DCS5 Computer.
3. The original image is protected against tampering by encryption software using an invisible image identifier. This process is known as validating the image.
4. Images collected in this way are archived as validated images which are the equivalent to photographic 'negatives'.
5. Validated images remain available for subsequent verification as original, unaltered images which can be traced back to their originator.

6. The verification process clearly shows any regions of the image, at the single pixel level, which have been changed.
7. Original images will not include a suffix at the end of the filename.
8. Copies of the original images will include the addition of the suffix .00 in the file name to denote that it is a copy of the original image.
9. Subsequent copies will be numbered .01, .02, and so forth.

10. The original images are moved to the secure network server.
11. The original images will be uploaded to the BEAST Image Vault of the appropriate case.

FRICTION RIDGE IMPRESSION EXAMINATION STANDARD OPERATING PROCEDURES

I. SCOPE

Friction ridge skin is a complex, highly discriminating, and persistent morphological structure.

Research and practical application have shown that the combination of the details present in friction ridge skin are highly variable between different sources. Research and practice have also shown that, barring injury or disease, the essential structure and ridge arrangements of this detail remain unchanged (except for growth) over the life of an individual. These aspects of friction ridge skin (discriminability and persistence) help make friction ridge impressions an effective means of identification.

An entire complement of a particular anatomical source of friction ridge skin is highly discriminating. However, it is less certain at what point a subset of the skin's features, imperfectly reproduced as an impression, are no longer discriminating enough to distinguish between similar sources. Furthermore, while research has demonstrated that some configurations of friction ridge details are highly discriminating, others, particularly in pattern force areas, are less so. Since impressions are often incomplete or indiscernible in part, their degree of discriminability must be considered at all stages of the examination.

An impression, or recording, of the features of friction ridge skin can result when contact is made with a receptive surface.

Contact with a surface can result in an impression, or recording, of the friction ridge skin. The resulting impression is not a perfect recording of the skin, as it is subject to distortions and environmental effects. Each impression from the same area of friction ridge skin will reproduce a subset of that skin's features that will vary in appearance from other impressions of the same source skin. This is true of both questioned and known impressions.

The term *latent print* is generally used to describe any type of *developed* print found at the scene of a crime or on evidence associated with a crime.

II. REFERENCES

1. OSAC Best Practice Recommendation for Verification in Friction Ridge Examination, Version 1.0
2. OSAC Standard for Consultation During Friction Ridge Examination, Version 1.0
3. ANSI/ASB Standard 145, Standard for Consultation during Friction Ridge Examination, 1st Edition, 2023
4. OSAC Best Practice Recommendation for the Resolution of Conflicts in Friction Ridge Examination, Version 1.0
5. ANSI/ASB Best Practice Recommendations 142, Best Practice Recommendations for the Resolution of Conflicts in Friction Ridge Examination, 2022
6. OSAC Standard for Examining Friction Ridge Impressions, Version 1.0

7. OSAC Best Practice Recommendation for Analysis of Friction Ridge Impressions, Version 1.0
8. OSAC Best Practice Recommendation for Comparison and Evaluation of Friction Ridge Impressions, Version 1.0
9. OSAC Guideline for Articulation of the Decision-Making Process Leading to an Expert Opinion of Source Identification in Friction Ridge Examinations, Version 1.0
10. OSAC Best Practice Recommendation for Technical Review in Friction Ridge Identification
11. OSAC Standard for Reporting Results from Friction Ridge Examinations, Version 1.0
12. Michele Triplett's Fingerprint Terms, fprints.nwlean.net
13. SWGFAST Standards for Examining Friction Ridge Impressions and Resulting Conclusions, Version 2.0
14. OSAC 2022-S-0038 Standard for Feature Selection in Friction Ridge Examination, Version 1.0
15. ANAB ISO/IEC 17025:2017 – Forensic Science Testing Laboratories Accreditation Requirements (AR3125)

III. TERMS AND DEFINITIONS

Blind Verification: A type of verification in which the subsequent examiner(s) has no knowledge of any other examiner's decisions, conclusions, or observed data used to support the conclusion.

Complexion: The general aspect or character of something. In latent prints, this typically means tone (dark or light), color, or texture of the ridges and/or background which can affect the quality, clarity and contrast of an impression.

Connective Ambiguity: The inability to determine the specific minutiae type due to distortion or lack of clarity (as with a bifurcation or a ridge ending). Although the minutiae itself may be ambiguous, its existence can be determined by the features of the surrounding ridges. Minutiae with connective ambiguity will be given less weight than clearly visible minutiae.

Conflict: A condition in which two or more examiners disagree on a suitability decision or source conclusion.

Consensus Review: A type of examination in which a reported decision or conclusion is determined that reflects the collective judgement of a group of examiners.

Consultation: A discussion or interaction initiated by an examiner seeking guidance for the purpose of interpreting an image or comparison.

Correspondence: An observation of friction ridge details and other information in agreement in terms of their type, orientation, and relative spatial relationship to each other; an accumulation of similarities between two impressions resulting in an overall conformity or agreement.

Discriminability: The degree to which information in an impression can be used to reliably distinguish between impressions made by different sources. The discriminability of an impression encompasses its features' quantity, spatial arrangement, clarity, and rarity. A more discriminating impression is less likely to have its features repeated in impressions made by different sources.

- Highly discriminating features/areas tend to be more randomly developed and can include short ridges, crossovers, areas above the core, scars, etc.

- Low discriminating features/areas tend to be more common and can include bifurcations, ridge endings, pattern force areas, etc.

Friction Ridge Detail/Features: The combination of ridge flow, ridge characteristics, and ridge structure of friction ridge skin, as observed and reproduced in an impression. A large subset of the observed data used to compare and interpret similarity or dissimilarity between two impressions.

Individual Characteristic Database (ICD): A computerized, searchable collection of features, generated from samples of known origin from which individual characteristic information originates (*e.g.,* DNA profiles, friction ridge data, or firearm bullet/cartridge case images).

Matrix: The formative part of a fingerprint; the substance that is actually deposited by the finger and eventually developed, i.e., sweat, foreign material, sebaceous oils, blood, etc.

Minutiae: The point where a friction ridge begins, terminates, or splits into two or more ridges. A subset of the friction ridge detail/features traditionally consisting of ridge endings, bifurcations, and dots/short ridges used to compare and interpret similarity and dissimilarity between two impressions.

Observed Data: Any demonstrable information observed within an impression that an examiner relies upon to reach a decision, conclusion, or opinion. This has historically been expressed as "features" or "minutiae," but the use of the broader term "observed data" is inclusive of other types of data that may be considered beyond minutiae, such as quality, scars, creases, edge shapes, pore structure, and other friction ridge features.

Open (non-blind) Verification: A type of verification in which the subsequent examiner knows the identity of the other examiner(s) and has access to their decisions, conclusions or observed data used to support their conclusion.

Pattern Force Area: A region of friction ridge skin in which minutiae of a particular type are forced to form due to the flow of the ridges. For example, underneath the core of a whorl or in the outflow of a loop. Because the pattern forces these minutiae to form predictably and their configurations are more common and less random, they are properly assigned less weight than more randomly distributed minutiae toward an association between two impressions.

Quality (of an impression): The clarity of observed data contained in an impression. A high quality impression is one where the observed data is unambiguous and self-evident due to high clarity and/or quantity. A low-quality impression is one where the observed data is ambiguous and low clarity and/or quantity.

Rarity (of a feature type): Rarity of a type of feature of friction ridge skin refers to how frequently that type of feature is encountered in a group of people (its prevalence), either in isolation or in conjunction with other information about its local context. For instance, the prevalence of a type of feature could be affected by its proximity to a pattern force area, the finger number or palmar region on which it is located, or the pattern type in which it is located.

Similarity: An observation that two impressions share a general likeness of details; not to be confused with correspondence.

Substrate: The surface or material on which a latent print is deposited.

Suitability for Comparison Decision: A decision made by an examiner that a friction ridge impression contains sufficient observed data to be utilized for comparison and a Source Conclusion can potentially be reached. This designation may also be referred to as "suitable for comparison", "comparison quality", or "of value for comparison".

Suitability for Database Search Decision: A decision made by an examiner that a friction ridge impression contains sufficient observed data to be utilized for comparison and has sufficient observed data to conduct an automated search through an Individual Characteristic Database.

Suitability for Exclusion Comparison Decision: A decision made by an examiner that a friction ridge impression contains sufficient observed data to be utilized for comparison in which a Source Conclusion could not be reached; however, a comparison conclusion of Exclusion or Inconclusive could potentially be reached. This designation may also be referred to as "suitable for exclusion", "of value for exclusion", or "exclusion only".

Target group: A cluster of features or an area in the questioned print that can be "targeted" (searched for) in the exemplar prints. Ideal target groups are consistently recorded, may include a delta or a core, and are highly discriminating (easy to recognize).

Tolerance: A means of expressing the variation that is allowable in two impressions originating from the same source due to the elasticity of the skin and differences in deposition and lateral pressure, twist, substrate, matrix, development medium, environmental factors, or post deposition damage. Two impressions are said to be "in tolerance" when the range of expected (normal) variability in appearance of a characteristic is attributable to distortion. Two impressions are said to be "out of tolerance" when the variation in appearance/position is so great, that you would not attribute the differences to distortion but instead is a discrepancy (i.e. the prints are from two different sources).

Verification: Independent examination by one or more examiners to ascertain if a decision, conclusion, or opinion is reproduced or is in conflict with the decision, conclusion, or opinion of another examiner.

NOTE 1 Verification may be implemented in multiple ways including blind, open, and consensus. The general term verification is inclusive of these various types.

NOTE 2 Verification is a quality assurance measure for friction ridge examination.

NOTE 3 The use of the term "independent" indicates an autonomous examination but not necessarily one without knowledge of a prior decision, conclusion or opinion.

IV. DOCUMENTATION

A. Friction ridge impression examinations are conducted using the Analysis, Comparison, Evaluation and Verification (ACE-V) methodology, utilizing both qualitative and quantitative information.

B. All latent impressions shall be analyzed and the suitability determination made prior to comparison to one or more known impression(s).

C. Each latent impression determined to be suitable for exclusion comparison, shall be reviewed by the Technical Manager and approved prior to comparison to one of more known impression(s).
   1. This will be documented in the case record.

D. Each latent impression determined to be suitable for comparison/suitable for exclusion comparison will be numbered sequentially (e.g., L1, L2, etc.), on the latent lifts, photographs, in the digital images, or in the file name.

E. Analysis documentation of latent prints deemed suitable for comparison/suitable for exclusion comparison will be maintained in the case note form and will include the following:
   1. Item #
   2. Location of the latent print, if legible on a submitted lift card
   3. Latent #
   4. Anatomical Source
   5. Fingerprint Pattern Type, if applicable
   6. Area of Palm, if applicable
   7. Left or Right Hand, if applicable
   8. Orientation

F. A digital image of every latent print deemed suitable for comparison/suitable for exclusion comparison shall be maintained in the case record. This image shall include documentation of the observed data used by the analyst to make the suitability determination.
   1. The Analysis documentation will be on layers created in Adobe Photoshop and not on the background of the image.
   2. The amount of documentation will be dependent on the quality/quantity of information present in the latent impression.
   3. An analyst may document the quality of minutiae observed, distortions observed, tracings, etc. When this is done, the documentation should be done with different colors and/or layers. The different colors and/or layers shall be labeled or documented in the case record so that it is clear to an external examiner what the documentation is.

G. All transactions associated with a particular latent impression (e.g., not compared, compared, results of comparison, Individual Characteristic Database (ICD) searches, AFIS closed searches, FCS searches, etc.) will be documented on the note form, in the order in which they were conducted.

H. Duplicate lifts and/or images shall be noted in the case record. When the same latent print is preserved through multiple latent lifts and/or digital images, the highest quality latent print will be marked with the L# and the duplicate latent print(s) will be noted in the case record. This can be accomplished by adding documentation to the note form, adding documentation to the digital image(s), adding documentation to the file name(s), or annotating L#-Dup on the latent lift card.

I. When annotations are made on latent lift cards, a legible copy of the annotation(s) and latent print(s) shall be maintained in the case record.

J. Digital images of known impressions used during examination shall be maintained in the case

record.

K. All identifications shall include documentation of the level two detail found in correspondence on digital images of the latent and known impressions.
   1. The Comparison documentation will be on layers created in Adobe Photoshop and not on the background of the image.
   2. The amount of documentation will be dependent on the quality/quantity of corresponding information present in the latent impression and known impression.
   3. An analyst may document the quality of minutiae observed, distortions observed, tracings, etc. When this is done, the documentation should be done with different colors and/or layers. The different colors and/or layers shall be labeled or documented in the case record so that it is clear to an external examiner what the documentation is.

V. KNOWN PRINT RETRIEVAL

To retrieve the best quality available known impressions for comparison the following procedure will be followed. A Computerized Criminal History (CCH) search and/or Interstate Identification Index (III) search will be conducted on all listed victims and subjects in a case. If known impressions are available, they can then be retrieved from the following sources:

1. The OSBI BIOSP - Fingerprints and palm prints from livescan records submitted after 1/1/2014 and all records received after the OSBI AFIS upgrade in 2017.
   a. The quality of these images is the better than option 3 and known impressions should be retrieved from this database if available.
2. The OSBI Laserfiche - Livescan fingerprints and scans of hard cards from ten print jackets.
   a. The quality of these images is the better than option 3 and known impressions should be retrieved from this database if option 1 is not available.
3. The OSBI Automated Fingerprint Identification System (AFIS) - Migrated composite records prior to the OSBI AFIS upgrade in 2017, palm prints collected prior to 2014, and new records from 2017-present.
4. The OSBI Identification Unit - Hard card records not available in Laserfiche
5. The OCPD AFIS – Oklahoma City Police Department records.
   a. When submitting an IRQ (Image Request) for an OCPD record as a result of an AFIS search, use the first set of numbers associated with the respondent.
6. The FBI NGI – Out of state criminal and civil records.
   a. IRQ's (Image Request) sent through ULW (Universal Latent Workstation) provide a better-quality image than IRQ's sent through AFIS.
   b. For multiple fingerprint incidents requests, contact the FBI at latentsupport@leo.gov for all BSI (Biometric Set Identifier) numbers associated with a particular FBI#/UCN.
   c. For palm print requests, contact the FBI at palm_prints@fbi.gov for the BSI (Biometric Set Identifier) numbers associated with the palm prints of a particular FBI#/UCN.

Known impressions retrieved from the OCPD, OSBI, or the FBI will not be considered evidence. The impressions will be considered reference samples and will be referred to by their OCPD Person ID, SID, or FBI numbers.

VI. LATENT PRINT EXAMINATIONS

ANALYSIS:

Analysis is the interpretation of observed information in an impression in order to determine the suitability for comparison. If the impression is not suitable for comparison the examination will stop at the analysis phase and will be reported as such. If the impression is suitable, the analysis will be documented in the case notes.

An impression's suitability for comparison is based on the levels of friction ridge detail observed in the print, the complexion and/or quality of the print, the clarity of the features in the print, the anatomical source and orientation of the print, and the discriminability of the features observed.

A. Levels of Friction Ridge Impression Detail for Examinations
   1. Level one detail refers to the overall ridge flow, general morphology (e.g., presence of incipient ridges, overall size), pattern interpretation, anatomical source, and orientation.
   2. Level two detail refers to the individual friction ridge paths, friction ridge events (e.g., bifurcations, ridge endings, dots, and continuous ridges) and their relative arrangements.
   3. Level three detail refers to the structure of individual ridges (e.g. shape of the ridge and relative pore position) and their relative arrangements.
   4. First, second, and third levels of detail can also describe other features (e.g., creases, scars, incipient ridges, and other imperfections in an impression).

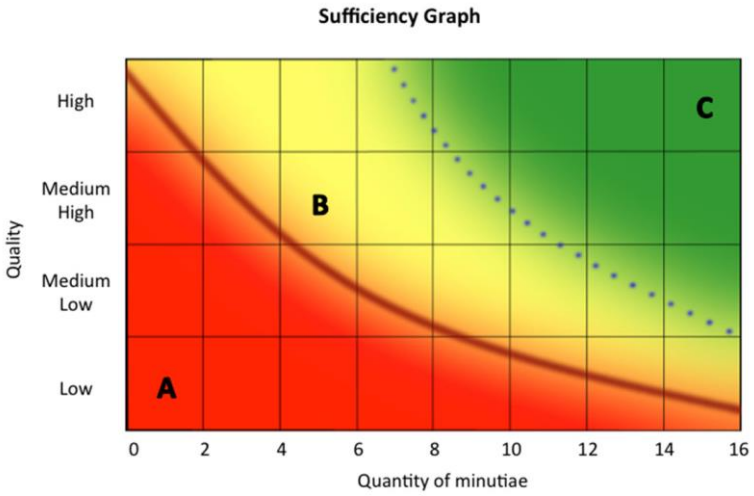
B. Complexion/quality of an impression can be impacted by:
   1. Composition of the residue on the skin
   2. Distribution of the residue on the skin
   3. Contact with the surface
   4. Movement of the skin on the surface (redistributes the residue)
   5. Surface (contaminants, color, or texture)
   6. Time and environmental conditions
   7. Processing technique

C. Quality is the assessment of the clarity of ridge features.
   1. Generally, as quality increases so does the discernibility and reliability of the ridge features.
   2. Reliability refers to the confidence assigned by the examiner to the observed ridge features in terms of existence, location, and shape the examiner would expect to be reproduced on the corresponding print, should it be made available.
   3. It is recognized that quality is not necessarily constant throughout an impression. The assessment of quality may represent just the areas of highest quality, a range of qualities, or a map or rating system of quality of various regions in a single impression.
   4. High clarity features are definitive and unambiguous. The presence, absence and location of the features are definitive, self-evident, and reliable.
   5. Medium clarity features are debatable or ambiguous. The features may be marked, but their

presence, absence, and location are debatable.

6. Low clarity features are not discernable or not reliable. The features should not be marked and/or ignored if present.

D. Sufficiency is a product of the quality and quantity of the objective information under observation. As the quality of an impression increases the need for quantity of friction ridge features decreases, as well as the inverse. The SWGFAST Sufficiency Graph may be helpful when determining suitability. Its purpose is to illustrate a part of the process dealing with the analysis of the impression for sufficient quality and quantity of detail to proceed with the comparison effort.
   1. The solid curve in the graph defines the lower limit of the sufficiency of friction ridge details. Impressions in area A may not be suitable for comparison. The dotted curve indicates the boundary between impressions that are likely suitable for comparison and those that may or may not be. Impressions in area B may warrant moving to comparison if the quality of the impression and clarity of the features are within tolerance, and the features are discriminating. Impressions in area marked C, warrant moving to comparison if the features are discriminating.
   2. Quantity is meaningless in the absence of quality. Suitability for Comparison cannot be achieved on quantitative considerations alone.
   3. This graph does not suggest or endorse the use of minutiae counts as the sole criteria for a decision threshold.



E. Things to consider when determining the suitability of an impression:
   1. Distortion
   2. Discriminability and/or the number of the features
   3. Pattern force areas (i.e. less discriminating areas such as an outflow of a loop with only ending ridges or a delta area)
   4. Anatomical source of the impression
   5. Orientation of the impression
   6. Additional features such as creases, scars, deltas, recurves, etc. that will assist in the determination of the anatomical location and orientation.

COMPARISON:

Comparison is the search for and detection of similarities and differences in the observed data between two potentially corresponding friction ridge impressions.

A ridge-to-ridge comparison between two side-by-side impressions determines whether or not there are corresponding features within tolerance. Correspondence is judged with respect to the features and their spatial relationships. Because every recording of friction ridge skin is different, the ground truth of whether a particular feature actually exists and its true appearance can only be known by examining the source skin. Thus, when comparing any two impressions, correspondence is not exact, but takes into account tolerances that are influenced by distortion factors and other environmental effects.

A. If the analysis phase provides indicators as to the probable anatomical area, a comparison with the appropriate area of the known print is conducted. In the absence of indicators, all areas of available known impressions must be compared.

B. Comparison begins with the determination of dissimilarity or similarity between two impressions at Level one detail. If similarity is determined within tolerance at Level one, a target group is selected from the features observed during the analysis phase and is then searched within the selected area of the other impression. When similarity with the target group exists, additional contiguous arrangements of features are compared between impressions in a cyclical or recurring process from the unknown to the known impression to evaluate the degree of correspondence between the impressions. The process can be extended to comparing features in the known with features in the unknown that were reanalyzed during the comparison phase. If the initial target group is not found, alternative target groups may be selected and compared. Comparison of features shall account for all of the features interpreted during Analysis. If dissimilarities are observed in the latent print between the analysis phase and comparison phase, the analyst should consider if the dissimilarities are within tolerance for the quality and clarity of the impression.

C. Things to consider during comparison:

    1. As the number of corresponding features increases, the probability of observing these same features (due to random chance or coincidence) in a friction ridge skin impression from a different source decreases. With sufficient corresponding features, this probability becomes extremely low.

    2. The quantity of corresponding features is important; however, so are their clarity and rarity. Not all features carry the same weight. Features that are clearer allow the examiner to have more confidence that they are accurate representations of the friction ridge skin. Features that are rarer allow the examiner to better discriminate between two sources.

    3. Quantity, clarity, and rarity combined make up the discriminability of the impression. A more discriminating impression is less likely to have its features repeated in impressions made by different sources. The interpretation of the discriminability of the observed features is based upon an examiner's training and experience.

    4. Issues with the known impressions

        a. Quality/complexion issues (i.e. Stitching errors from Livescan records and pressure distortion in inked impressions)
        b. Lack of scars or other injuries due to the time difference between the collection of the known impressions and the date of offense

c. Differences in the appearance of incipient ridges. Incipient ridges do not always show up in known impressions. As time progresses incipient ridges can become more prominent.
d. Lower clarity features in the known impression than the latent impression. Look for all available known records for comparison and use the best quality record.

5. Orientation

a. Use the orientation clues to determine the direction of the impression, such as creases, placement of deltas on a finger, ridge flow, etc.

i. Is there sufficient information in the impression to know the orientation or direction is correct?

ii. Is it reasonable to believe an impression could have any other orientation? If applicable, has the print been compared at all rotations? 360°?

6. Anatomical source

a. Is it reasonable to believe the impression could be from more than one anatomical source?
b. Do you have known impressions for all possible anatomical sources?
c. Have you compared the latent impression against all possible anatomical sources?

7. Target groups

a. Is there a clear target group or multiple target groups?
b. Does the impression have an anchor point that can aid the examiner in their search such as a delta, flexion crease, core of a pattern, etc?
c. Is there any distortion?
d. Was the skin tolerance taken into consideration for searching?
e. A second target group is a good quality assurance measure to diminish bias and confirm results for determining area, orientation, and clarity.
f. The condition of the exemplar prints may dictate which target group(s) is most appropriate or how many target groups should be searched.
g. Be aware that target features may not record as expected.

8. Position Correct

a. Could the impression be position reversed? This is when the impression is a mirror image from the standard position. This occurs when examining gel lifts and mikrosil/accutrans lifts. This can also occur when impressions are transferred with tape and plastics.

9. Tonally Correct

a. Could the impression be tonally reversed? This is when the ridges of the impression are light and the furrows of the impression are dark which is opposite of how impressions are traditionally deposited.

10. Distortion

a. Is there distortion or movement that may lead to a different conclusion? For example, a latent print may appear to be one pattern type due to distortion and/or movement.
b. Consider the substrate on which the impression was deposited.
c. Consider the matrix in which the impression was deposited.

D. Observation of agreement or disagreement between the impressions initiates the evaluation phase.

EVALUATION:

Evaluation is the weighing of aggregate strength of the observed similarities and differences between the observed data in the two friction ridge impressions in order to formulate a source conclusion.

A. An examiner considers, based upon knowledge and experience, the probability of encountering the observed corresponding features in two impressions made by the same source against the probability of observing the same correspondence between the unknown impression and an impression from a different source. In order to support the proposition that the two impressions were made by the same source, an examiner must find discriminability in the corresponding features to outweigh any support for the proposition that the two impressions were made by different sources. The degree to which support for a proposition of same source outweighs support for a proposition of different source is the strength of the evidence.

B. Because no two recordings of friction ridge skin are identical to one another or to the source skin, comparisons of any two friction ridge skin impressions will exhibit differences. The examiner must determine whether or not the differences observed are normal variations within tolerance expected from multiple recordings of the same source skin. Differences beyond these normal variations give support to the proposition that the two impressions are from different sources.

C. Discriminability allows the examiner to evaluate the degree of support for the different source proposition. The different source proposition considers the probability that the observed features would also be observed in an impression from a different source. If the corresponding features are highly discriminating, the probability that they would also be found in an impression from a different source is very low.

D. The similarities and differences shall be evaluated to formulate one of the following three conclusions:

1. **Exclusion** - Exclusion is an examiner's conclusion that two friction ridge skin impressions originated from different sources. This conclusion is an examiner's opinion that the observed friction ridge skin features are in sufficient disagreement to conclude that the impressions came from different sources.

2. **Identification** - Identification is an examiner's conclusion that two friction ridge skin impressions originated from the same source. This conclusion is an examiner's opinion that the observed friction ridge skin features are in sufficient correspondence such that the examiner would not expect to see the same arrangement of features repeated in an impression that came from a different source and has found insufficient friction ridge skin features in disagreement to conclude that the impressions came from different sources.

3. **Inconclusive** - Inconclusive is an examiner's conclusion that there is insufficient quantity and/or clarity of corresponding friction ridge skin features between two impressions such that the examiner is unable to identify or exclude the two impressions as originating from the same source. This conclusion is an examiner's opinion that an identification or exclusion cannot be made due to insufficient information in either of the two impressions examined. Inconclusive decisions may be reached for the following reasons:

    a. There is insufficient quality and quantity of corresponding information between the two impressions.

b. There is an absence of complete and legible known prints (e.g., poor quality known impressions and lack of comparable areas). This means that comparisons were made to the extent possible; however, additional clear and completely recorded exemplars, to include the required anatomical areas, are needed for re-examination.

The reasons for reaching inconclusive decisions shall be documented in the case notes and included in the report.

E. Things to consider during the evaluation phase:

1. Do you have all of the proper known impressions?
   a. What is the degree of correspondence between the questioned impression and the known impression?
   b. Could additional known impressions assist in the decision?

2. How similar/dissimilar are the two impressions?
   a. Are the differences due to distortion?
      i. How different can images look when coming from the Same Source?
      ii. Is the distortion explainable? Ex: movement, slippage, pressure, etc.
   b. Are the similarities coincidental?
      i. How similar can images look when coming from Different Sources?
   c. Are the features in tolerance for the given clarity?
   d. Are the features in tolerance for the recognized distortion?

3. How discriminating is this arrangement of features?
   a. Are the features in a pattern force area (delta, outflow of a loop, area below a whorl)?
   b. What is the chance (risk) that someone else could also share that arrangement of features?

VERIFICATION:

Verification is the independent application of the Analysis, Comparison, and Evaluation methodology to a friction ridge impression by another examiner to either support or refute the conclusion of the original examiner.

A. Suitability determinations:

1. All suitability determinations shall be verified by an authorized examiner as part of the Technical Review.

2. If there is disagreement between the original examiner and the reviewing examiner, the steps in the Conflict Resolution section will be followed.

B. Comparison Conclusions:
   1. All comparison conclusions shall be verified by an authorized examiner in the form of an open (non-blind) verification as part of the Technical Review.
   2. If there is disagreement between the original examiner and the reviewing examiner, the steps in the Conflict Resolution section will be followed.
   3. Enhanced verification by the use of an additional authorized verifier in the form of an open (non-blind) verification **shall** be utilized in the following circumstances:
      a. Single Identification generated through FBI NGI searches to a particular individual.

b. Single Inconclusive with Similarities decision to a particular individual.
c. Inconclusive due to the quality/quantity of information available in the latent print.
d. Complex impression/comparison defined as meeting one or more of the following criteria:
    i. No strong indication of the anatomical source of the latent print.
    ii. No strong indication of the orientation of the latent print.
    iii. No anchor observed in the latent print (Examples: delta, flexion crease, core of a pattern)
    iv. Majority of observed minutiae is in a pattern-forced area.
    v. Quality/Quantity of observed minutiae is low. Areas A and B in the Sufficiency Graph (See Analysis Sections D and E).

4. Request for enhanced verification shall be routed in the BEAST utilizing routing codes V (Route for Verification) and VC (Verification Complete) and documented in the case record. The documentation **shall** include:
    a. Specific friction ridge impression
    b. Specific known impression
    c. Conclusion
    d. Examiner involved
    e. Date of verification
5. It is recommended that any additional set of notes, annotations, or images generated by the verifier be added to the case record.

C. Notification of comparison conclusions:

1. Analysts shall not inform outside parties of comparison conclusions until their conclusions have been verified by following the above Verification policy. This includes ALL comparison conclusions, not just identifications.
2. The verification(s) must be documented in the case record prior to notification and must include:
    a. Specific friction ridge impression
    b. Specific known impression
    c. Conclusion
    d. Examiner(s) involved
    e. Date of verification

VII. CONSULTATIONS

As in any scientific endeavor, an examiner may need to interact with another analyst regarding an examination. This is generally referred to as a “consultation”. Consultations are an inherent part of the scientific process. Consultations are supported as part of the examination process and shall be documented. Consultations may occur at any stage of the examination process (Analysis, Comparison, Evaluation, and Verification). Consultants should be a Criminalist III or IV.

A consultation shall occur only after the examiner has recorded their preliminary observations in the case record. To avoid any potential bias from the examiner, these observations shall not be provided to the consultant until after the consultant has completed their observations.

NOTE Preliminary observations refers to the data being observed not to the conclusions being considered. For example, when considering suitability, preliminary observations include minutia markings and indication of possible anatomical orientation.

A. Consultation consists of varying levels of discussion between examiners. Not all discussions rise to the level of a consultation that requires documentation. At a minimum, the consultation shall be documented when the interaction concerns one or more of the following:
    1. Suitability for comparison
    2. Presence of significant distortions impacting the analysis or comparison
    3. Presence or absence of specific features during the analysis or comparison
    4. Suitability for an automated search
    5. Comparison conclusions
    6. Latent print development techniques

B. If there is doubt whether an interaction has risen to the level requiring documentation, it should be documented. Documentation of in-depth interactions involving the following should be considered:

    1. Automated search parameters such as anatomical source, orientation, and pattern type
    2. Searching efficiency such as target groups, anchor points, etc.
    3. Anatomical origin
    4. Orientation

C. Each consultant involved in a consultation shall document their findings independently of the original examiner, including the markups of the friction ridge impression, if applicable.

D. Consultations shall be routed in the BEAST utilizing routing codes CONS (Route for Consultation) and CONCOM (Consultation Complete) and documented in the case record (including any additional set of notes, annotations, or images generated by the consultant).

E. The documentation shall include:

    1. Specific friction ridge impression(s) reviewed, if applicable
    2. The topic and result of the consultation
    3. Examiner(s) involved
    4. Date(s) of the consultation
    5. Consultant documented images, if applicable

F. A consultant who has viewed both the known and unknown friction ridge impressions shall not be used as the verifier or technical reviewer.

VIII. CONFLICT RESOLUTION

Conflict is the condition in which two or more examiners disagree on a suitability decision or source conclusion during the verification or technical review process. The potential for differing suitability decisions or source conclusions is an inevitable result of the subjective interpretation of friction ridge impressions, particularly for those impressions where the quantity and quality of observed data are low and require more subjective interpretation.

No examiner shall be forced or coerced into agreeing with an opinion or conclusion with which they do not agree. If an examiner feels that they are being coerced into rendering a conclusion that they are

not comfortable with, they should notify the Technical Manager. If the concern is with the Technical Manager, the LEU Supervisor and LEU Administrator should be notified.

When conflict occurs, the following actions will be taken to address the conflict:

A. Remediating Interaction

The conflicting opinion shall be recorded in the BEAST utilizing the routing code RQC (Route for Question or Comment) by the verifier/technical reviewer. The original examiner and the second examiner (verifier/technical reviewer) should attempt to resolve the conflicting suitability decision(s) or source conclusion(s) via substantive discussion with an attempt to arrive at a mutually agreed upon decision or conclusion that is best supported by the observed data. **This discussion shall occur in private as to shield other examiners from any biasing information if the conflict resolution needs to rise to the level of Managerial Review.**

1. If agreement is achieved, the conflict resolution process concludes and shall be documented utilizing the routing function in the case record.
    a. If images were documented during the discussion, those shall be uploaded to the case record.
    b. If the resolution results in a change to a suitability determination or comparison conclusion, the Technical Manager shall be informed via OSBI LEU QPA8 – Change to Conclusion Form. The form will be reviewed and approved by the Technical Manager (or designee) and uploaded to the case record.
2. If agreement is not achieved, the disagreements shall be documented utilizing the routing function in the case record and the Technical Manager notified. If the conflicting opinion involves the Technical Manager, then the Supervisor will be notified.
3. Any images documented during the discussion shall be uploaded to the case record. The conflict resolution process will proceed to section B.

B. Managerial Review

If agreement between two examiners cannot be reached through remediating interactions, the conflict resolution should elevate to managerial review. The Technical Manager (or Supervisor if the Technical Manager is involved in the conflict) shall be informed of the conflict and will determine the next steps to resolve the conflict from the following options:

1. Blind Verification - A third examiner authorized to conduct verifications/technical reviews will examine the friction ridge impressions in question and document their decision and conclusion in the case record.
    a. In blind verification, the third examiner should be shielded from the decisions, conclusions and documented data of the other two examiners and from any other task-irrelevant information (information that is not needed to interpret the impressions).
    b. The three decisions or conclusions (original examiner, second examiner, and third examiner) will be reviewed by the Technical Manager (or Supervisor, if applicable) to determine if two agree and how the case should proceed.
    c. If the third examiner wishes to confer with either the original or second examiner, they should have their decisions or conclusion documented first and that interaction should be recorded in the case record.
    d. If the third examiner agrees with the suitability decision or source conclusion of the original examiner, the original examiner should retain the case.

e. If the third examiner agrees with the suitability decision or source conclusion of the second examiner, the relevant examination shall be transferred to the second examiner and this transfer shall be documented in the case record.

2. Consensus Review – A consensus panel of three examiners authorized to conduct verifications/technical reviews will be created by the Technical Manager (or Supervisor, if applicable).
   a. Each examiner will independently, without prior knowledge of case circumstances or opinions and conclusions, examine the friction ridge impressions in question and document their observed data, opinion and conclusion.
   b. The examiners' conclusions will be documented in the case record and their documented images will be uploaded to the case record.
   c. The collective majority opinion shall be reported and the report shall state that the conclusion was a result of a consensus panel.
   d. If the collective majority opinion agrees with the suitability decision or source conclusion of the original examiner, the original examiner should retain the case.
   e. If the collective majority opinion agrees with the suitability decision or source conclusion of the second examiner, the relevant examination shall be transferred to the second examiner and this transfer shall be documented in the case record.
   f. If there is no consensus conclusion reached, all source conclusions should be recorded in the case record, and the report shall state that a consensus suitability or source conclusion could not be reached.

C. All changes made to suitability determinations and/or source conclusions as a result of verification/technical review shall be documented in the case record and forwarded to the Technical Manager via OSBI LEU QPA8 – Change to Conclusion Form. The original observations and conclusions shall be retained in the case record. The changes shall include the date of the change, what was changed, and the individual responsible for the change.

IX. KNOWN PRINT EXAMINATIONS

A. Analysis of known impressions will be performed utilizing the ACE (Analysis, Comparison, & Evaluation) methodology, to determine whether the information in two impressions is in agreement or disagreement based upon features, sequences, and spatial relationship.

B. Case note documentation for known impression analysis will **not** be the same as required for latent print analysis documentation. The impressions do not require individual numbering, and may be referred to by the appropriately assigned evidence item number.

C. Case notes will document all transactions associated with the particular impression(s).

D. Digital images of the impressions shall be retained in the case record.

E. Digital images of any known impressions used in comparison shall be retained in the case record.

F. Verification is conducted and documented during the Technical Review.

G. When a decedent is identified to an OK SID record or an FBI record, the reporting analyst shall complete a Death Notice. A copy of the Death Notice will be forwarded to the OSBI Information Services Division and maintained in the case record.

X. INDIVIDUAL CHARACTERISTIC DATABASE (ICD) SEARCH

A. The OSBI LEU has access to search the following ICD's:

1. Oklahoma State Bureau of Investigation Automated Fingerprint Identification System (OSBI AFIS)
2. Oklahoma City Police Department Automated Fingerprint Identification System (OCPD AFIS)
3. Federal Bureau of Investigation Next Generation Identification (FBI NGI)

B. ICD Entry Instructions - Entry format and procedures are set by the ICD manufacturer and the Universal Latent Workstation (ULW) manufacturer. Searches will be performed utilizing the entry formats provided by the manufacturers.

1. The MorphoBis entry procedures are located in QMS. Searches through the OCPD, OSBI, and FBI databases can be made using the MorphoBis System.
2. The ULW entry procedures are located in the ULW Transaction Manager software under the tab "Getting Started". Searches through the FBI database can be made using ULW.

C. Database Search Strategy:

1. In OSBI AFIS, add the latent print and select auto-encode (no lassoing or clean up necessary), submit the search to the OSBI database requesting 1 respondent and selecting No for retaining the latent.
2. If no identification is made with the first search, clean up the auto-encode and submit the search to the OSBI database with the following criteria for # of respondents (5=property crimes, 10=violent crimes) and select Yes for retaining the latent (if quality is sufficient).
3. If no identification is made with the second search in the OSBI database, select the transaction with the examiner edited encoding and submit to the OCPD and NGI databases with 5 respondents and Yes for retaining the latent (if quality is sufficient).
4. Examiners may conduct additional searches and/or request more respondents at their discretion.
5. When conducting database searches do not limit the searches to a specific finger or hand.
6. Consider all the anatomical areas that a latent print could originate from and conduct searches accordingly.
7. Consider all the possible orientations that the latent print could be. Rotations set to "Vertical" will only search the print with a rotation of ± 30°. Select Rotations "Any" to conduct a 360° search of the latent print.

D. Closed Search:

1. A search to a specific individual(s) may be conducted in the OSBI database. This is referred to as a Closed Search because the entire database is not being searched.
2. As an efficiency tool, analysts may choose to conduct a closed search against a listed victim or subject in the case prior to manual comparisons.
3. Or, as a quality assurance tool, analysts may choose to conduct a closed search against a listed victim or subject in the case after manual comparisons have been conducted.
4. Analysts will determine if and when they utilize the closed search function.

5. The closed search will be documented in the case note form in the order in which it is utilized.

E. Suitability Determination and Risk Assessment
    1. Due to the increasing size of fingerprint databases, the risk of finding similarities between impressions from different sources also increases.
    2. Therefore, it is an accepted fact that not all latent prints are suitable for automated searches through Individual Characteristic Databases.
    3. Determination of suitability for database search is originally at the discretion of each examiner.
    4. An examiner may deem a latent print not suitable for a database search for one or more of the following reasons:
        a. Distortion
        b. Low quality/clarity of the minutiae
        c. Pattern force area (i.e. less discriminating areas such as an outflow of a loop with only ending ridges or a delta area)
        d. Lack of clear/distinguishable target group
        e. Small surface area in which the minutiae is tightly grouped instead of spread out
        f. Minimal number of minutiae
    5. When impressions which include some of the issues noted above are searched, the examiner may encounter a close non-match in the respondent list and the risk of making an erroneous identification is heightened.
    6. When reviewing the database search respondent list, consider the following:
        a. Look at the score separation between candidates. If all of the scores are similar, the features may not be very discriminating.
        b. How discriminating are the features?
        c. Don't use less discriminating minutiae or areas for an identification unless you have other areas of higher discriminating minutiae for support of an identification.
        d. Are the features away from pattern force areas or over a large area?
        e. Look at other features besides the ones you plotted.
        f. Be mindful of differences observed and the level of tolerance you assign to those differences.
    7. Some latent prints may be suitable to search through a database, but not suitable to retain in the unsolved latent database. However, every effort should be made to retain high quality latent prints for future searches.
    8. When latent prints are retained in an unsolved latent database, a statement will be included in the report that includes which items the latent prints are from and that any future identification will be reported. (See Recommended Report Wording)
    9. If there are conflicting opinions between the original examiner and the technical reviewer regarding the suitability determination for database searching and/or retention in the unsolved latent database, the conflict resolution policy shall be followed.

F. Reverse Search/Unsolved Latent Match:
    1. As new records are entered into an individual characteristic database, they are searched against the latent prints retained in the unsolved latent database. This is referred to as a Reverse Search. The FBI refers to these transactions as a Unsolved Latent Match (ULM).
    2. The reverse search score threshold for the OSBI database was set based on data collected over time for identifications made through the database.
    3. The reverse search threshold score for fingerprints is 2100. Thus, any transactions with scores of 2100 or higher, will be placed in the Reverse Search queue to be reviewed.
    4. The reverse search threshold score for palm print searches is 2200. Thus, any transactions with scores of 2200 or higher, will be placed in the Reverse Search queue to be reviewed.
    5. Threshold scores for the OCPD and FBI reverse searches are not set by the OSBI.
    6. Reverse search transactions are the last step in the Tenprint/Palm Print AFIS workflow. Therefore, to ensure that the Tenprint/Palm Print transactions are completed in a timely manner, analysts shall review their reverse searches within a week's time frame.
    7. Non-retained known records will cascade searches against the unsolved latent databases. If there is a potential identification as a result of a Reverse Search/ULM, the known print record shall be retrieved prior to the completion of the transaction. If the known print record is not retrieved prior to the completion of the transaction, the images will not be available for comparison.

G. Documentation:
    1. When an identification is made as a result of an ICD search (forward open/closed and reverse); the following documentation will be maintained in the case record:
        a. A screen shot of the latent verification page that includes the associated case #, the latent print, the known print, the associated OCPD#/SID#/FBI#, the respondent #, and the score.
    2. For administrative purposes, the name and identifiers of the individual will be added to the Names tab in the BEAST as "Other".

H. Unsolved Latent File (ULF) Maintenance:
    1. Latent prints retained in the OSBI ULF will automatically be removed once the statute of limitations for the crime type has expired. This is based on the information inputted during the case creation.
    2. Latent prints retained in the OCPD and FBI ULF's will need to be manually removed once the statute of limitations for the crime type has expired.
    3. When latent prints are removed from a ULF, notification to the customer is not required. (See QMA 1.1)
    4. When latent prints are removed from a ULF due to the expiration of the statute of limitations, no case documentation is required to document the removal.
    5. When latent prints are removed from a ULF due to other reasons (quality issues, partial analysis, identifications made, etc.), this shall be documented in the case record.
    6. Latent prints can be removed from the OSBI ULF utilizing "Find Latent" in AFIS Database Maintenance.

7. Latent prints can be removed from the OCPD ULF utilizing the Unsolved Latent Delete (ULD) transaction in AFIS.
    a. From the App Bar select FIND, then select IRQ/ULD.
    b. Click on the OCPD-ULD tab.
    c. Enter your initials in the Attention Indicator (Must be a minimum of 3 characters).
    d. Enter the latent print identifier. Ex: OSBI-OBI2023000824-001-01-02a
    e. Click on Submit.
8. Latent prints can be removed from the FBI ULF utilizing the ULD transaction in AFIS.
    a. From the App Bar select FIND, then select IRQ/ULD.
    b. Click on the FBI-ULD tab.
    c. Enter your initials in the Attention Indicator (Must be a minimum of 3 characters).
    d. Click on Contributor Case Identifier Number.
    e. Enter the latent print identifier. Ex: OBI2023000824-001-01-02a
    f. Click on Submit.

I. Image Request (IRQ)

1. Known prints can be retrieved from the OCPD database using the IRQ transaction in AFIS.
    a. From the App Bar select FIND, then select IRQ/ULD.
    b. Click on the OCPD-Fingerprint Image Request tab.
    c. Enter the OCPD Booking ID Number. This is the first set of numbers in the OCPD individual response.
    d. Enter your initials in the Attention Indicator (Must be a minimum of 3 characters).
    e. Click on Submit.
    f. The Image Request Response (IRR) will return on the Other tab on the Home Page.
    g. Click on the IRR transaction and select Export Tenprint.
    h. Select the File Type PDF and save to a network location.

2. Known prints can be retrieved from the FBI database using the IRQ transaction in AFIS; however, these are lower quality then conducting an IRQ utilizing ULW.
    a. From the App Bar select FIND, then select IRQ/ULD.
    b. Click on the FBI-IRQ tab.
    c. Enter the FBI/UCN Number.
    d. For a specific incident record, enter the BSI Number.
    e. Select the Biometric Type: Fingerprint, Palm Print, Facial
    f. Enter your initials in the Attention Indicator (Must be a minimum of 3 characters).
    g. Click on Submit.
    h. The Image Request Response (IRR) will return on the Other tab on the Home Page.
    i. Click on the IRR transaction and select Export Tenprint.
    j. Select the File Type PDF and save to a network location.

XI. DIGITAL IMAGE PROCEDURES

LP-18: Digital Enhancement and Documentation

LP-18: DIGITAL ENHANCEMENT & DOCUMENTATION

I. SCOPE:

Enhancing a digital image is a highly useful tool to maximize the detail visible to the naked eye. Once a digital image is captured, enhancement techniques similar to traditional photography can be used to improve image quality, but in a fraction of the time.

Digital image enhancement software is a useful tool to document the observed data in impressions.

II. REFERENCES:

1. SWGIT. "Best Practices for Maintaining the Integrity of Digital Images and Digital Video", Version 1.0,6/4/2007.
2. SWGIT. "Best Practices for Documenting Image Enhancement", Version 1.3,1/15/2010.
3. SWGFAST. "Standard For Friction Ridge Digital Imaging (Latent/Tenprint)", Version 1.1, 9/14/2009.
4. Reis, G. Photoshop CS3 for Forensics Professionals. Wiley Publishing, 2007.
5. ANSI/ASTM E3235-21 Standard Practice for Latent Print Evidence Imaging Resolution, 6/7/2022
6. SWGDE 16-M-003-3.0: Digital Image Compression and File Format Guidelines

III. TYPES OF ITEMS TESTED:

Latent lift cards and digital photographs of latent impressions.

IV. EQUIPMENT AND SUPPLIES:

1. Digital Scanner.
    a. Scanner should have sufficient resolution to capture detail necessary for the required examination.
    b. A transparency adapter may be useful to allow the scanning of film negatives for possible enhancement.
2. Computer capable to run enhancement software at a practical speed.
3. Enhancement software.
    a. Adobe Photoshop CS3 or later version, or equivalent.
    b. Appropriate plug-ins, such as Fast Fourier Transform filters (FFT's).
    c. DCS5 Fingerprint Enhancement System

V. DESCRIPTION OF PROCEDURES:

A. Scanning impressions
    1. Digital images of latent prints captured from lifts or from conventional photographs or negatives shall not replace the lift, negative, or photograph as original images.
    2. These images will be considered examination documentation.
    3. These images may be captured using a flat-bed scanner.

4. When utilizing a flat-bed scanner, a scale is not required because the image is scanned 1:1 an no calibration is needed.
5. Scanned images of latent lifts, photographs or negatives of latent prints for examination documentation shall be scanned at 1000ppi, include the Case number, Item number, and examiner's initials, and saved as a TIFF.
6. Scanned images of lifts, photographs or negatives of footwear impressions for examination documentation shall be scanned at 500ppi, include the Case number, Item number, and examiner's initials, and saved as a TIFF or Photoshop PDF.
7. Scanned images of known prints for examination documentation shall be scanned at 500ppi, include the Case number, Item number, and examiner's initials, and saved as a pdf.
8. Large overall images of latent lift cards should be saved in Photoshop PDF format to reduce the file size of the image.
9. Scans of lift cards that only include documentation (i.e. the back of a lift card) and <u>not</u> impressions, should be scanned at 300ppi and saved as a pdf to reduce the file size.

B. Labeling images
    1. Scanned images will be labeled using the appropriate case number, item number, image number, and any other appropriate information.
    2. Images submitted via email, disc, etc. will be labeled using the appropriate case number, item number, and the original file name.
    3. Enhanced/documented images will keep the original label along with additional labeling indicating the image is a copy.

C. Image Integrity
    1. Image enhancement and documentation shall only be conducted on working copies of the original image.
    2. Working copies of latent prints used in examination shall be calibrated to 1000ppi and saved as a separate copy in TIFF format and shall not replace the original image.
    3. Working copies of footwear impressions used in examination shall be calibrated to 500ppi and saved as a separate copy in TIFF or Photoshop PDF format and shall not replace the original image.
    4. All original images and enhanced images shall be uploaded to the secure LIMS Image Vault for the respective case.

D. Image Calibration
    1. Inch Scale
        a. Open your digital image in Photoshop.
        b. Use the scale in the image to calibrate the image to the correct size. Do this by selecting the "ruler tool".
        c. Change your scale at the top of the image to pixels.
        d. Use the ruler tool to measure how many pixels there are in 1 inch. This will be the L1 number at the top.
        e. Then right click at the top of the image and select Image Size. Make sure that under "Document Size" the width, height, and resolution is in inches.
        f. Put in the L1 number as the Resolution. Make sure that "Resample Image" is **<u>not</u>**

checked.

g. Confirm you did it correctly by changing your scale at the top of the image to inches.
h. Use the ruler tool to measure 1 inch in the scale in the image. The L1 number at the top should be "1" if done correctly.
i. To make the image 1000ppi go back into Image Size.
j. Check the "Resample Image" box.
k. Type in 1000ppi in the resolution box. Make sure that the height & width under Document Size do not change. Click OK.
l. Confirm you did it correctly by using the ruler tool to measure an inch in the scale of the image. Make sure that the image size (height & width) did not change.

2. Centimeter Scale
    a. Open your digital image in Photoshop.
    b. Use the scale in the image to calibrate the image to the correct size. Do this by selecting the "ruler tool".
    c. Change your scale at the top of the image to pixels.
    d. Use the ruler tool to measure how many pixels there are in 1 centimeter. This will be the L1 number at the top.
    e. Then right click at the top of the image and select Image Size. Make sure that under "Document Size" the width, height, and resolution is in centimeters.
    f. Put in the L1 number as the Resolution. Make sure that "Resample Image" is **not** checked.
    g. Confirm you did it correctly by changing your scale at the top of the image to centimeters.
    h. Use the ruler tool to measure 1 centimeter in the scale in the image. The L1 number at the top should be "1" if done correctly.
    i. To make the image 1000ppi go back into Image Size.
    j. Change the width, height, and resolution under "Document Size" to inches.
    k. Check the "Resample Image" box.
    l. Type in 1000ppi in the resolution box. Make sure that the height & width under Document Size do not change. Click OK.
    m. Confirm you did it correctly by using the ruler tool to measure a centimeter in the scale of the image. Make sure that the image size (height & width) did not change.

E. Adobe Photoshop Enhancement:
    1. If enhancements are necessary, make a copy of the original image (working image).
    2. Calibrate the image to 1000ppi if not already calibrated.
    3. Perform desired enhancements on the **working image** only and use the layer function in Adobe Photoshop for each enhancement.
    4. Basic image enhancement techniques are those used to improve the overall appearance of the image. These techniques can be applied over an entire image and in localized areas in an image. They include, but are not limited, to the following:
        a. Brightness and contrast adjustment, including dodging and burning
        b. Resizing (file interpolation)
        c. Cropping
        d. Positive or negative inversion
        e. Conversion to grayscale

f. White balance
g. Color balancing and/or color correction

5. Advanced image enhancement techniques may also be applied to improve the overall appearance. They are often used to suppress the information that interferes with the visualization of the image. The techniques include, but are not limited, to the following:
    a. Fourier Analysis (including the use of FFT)
    b. Deblur
    c. Noise reduction
    d. Color channel selection and subtraction
    e. Advanced sharpening tools, such as unsharp mask

6. No enhancements may be used on the background of the image which add new information to the image. Examples of these enhancements include, but are not limited, to the following:
    a. Clone stamp tool
    b. Airbrush tool
    c. Paint bucket tool
    d. Eraser tool
    e. Blur tool

7. After the working image is processed, save the processed image in TIFF format.

8. Label the image with the appropriate case number, item number, image number, an indicator that it is a copy, and any other appropriate information.

9. Examiners may be called upon to duplicate enhancements performed on digital images. Enhancements are recorded by image processing software designed to record enhancements performed on images (Ex. Adobe Photoshop CS3 or later version).

10. Before conducting enhancements, make sure that the History Log function in Adobe Photoshop CS3 or later version is turned on. To do this, go to Edit →Preferences→ General. The History Log should be checked and Save Log Items to "Metadata" and Edit Log Items "Detailed" should be selected.

11. If needed, the examiner may refer to the image processing software instructions, or other enhancement guide.

F. Adobe Photoshop Subtraction Technique: The purpose of this technique is to remove background interference. An original photograph of the impression with background is taken, then the impressions is removed and another photograph is taken of the background. Following this technique allows for the background to be completely eliminated leaving only the impression.
    1. Take primary image on digital camera, ensuring that:
        a. Image sharp in focus
        b. Subject plane is parallel to image plane
        c. Lighting is optimum

    2. After primary image is recorded, <u>nothing</u> must change:
        a. Camera position
        b. Subject position
        c. Lighting

d. Camera settings

3. As long as #2 is adhered to, the following may be attempted:
    a. Electrostatic lifting or Stat-Lift may be done on dust prints following Protocol LP-23.
    b. Lab samples may be taken if it is a blood print.

4. Remove the impression.

5. Make sure that the surface is completely clean and dry.

6. Take the secondary image at the same settings as the primary image.

7. Subtract the two images in Photoshop.
    a. In Photoshop, open two images to be subtracted.
    b. File→Scripts→Load files into stack
    c. Click on "Add Open Files", check "Attempt to Automatically Align Source Images"→OK
    d. Image → Calculations
    e. Under Blending use the drop-down menu to select Subtract.
    f. Make sure Source 1 is the merged untitled document and Source 2 is the image of the background you wish to subtract.
    g. Place a "check mark" in both "Invert" boxes for each image
    h. Try all of the different channels to find out which one is best for both of your image (same channel must be used for both images). The Green channel tends to give the best result because it is the Intensity Channel.
    i. Under Result use the drop-down menu to select "New Document".

8. To save your Subtracted Image:
    a. Image → Mode → Grayscale
    b. Image → Mode → RGB Color
    c. File → Save as → .TIF in desired location

G. Adobe Photoshop Fast Fourier Transfer (FFT) Filter: The purpose of this technique is to remove background interference that has a repeating pattern.

1. Open your image in PhotoShop and crop it to where only the fingerprint is in the image.

2. Make a duplicate layer (Ctrl + J)

3. Go to the FFT plug-in and choose the FFT filter (Filter > Fourier Transform > FFT)

4. Go to the Channels palette. If you look at each individual channel, you'll notice that two of them will be solid, and one, the Green, will have a center star-burst and some surrounding lines and stars. Click on the Green channel to select it. The texture in different photos will have a different regular pattern, therefore the "stars" and lines will be different. But no matter the pattern, the concept is the same. With the Brush tool selected and black as your foreground color, black out the stars.

5. It is important to never place dots on the center area of the image because this area contains a lot of the low frequency in the image (the impression) that you will want to retain.
6. The frequency dots are mirrored in diagonally opposing quadrants. If you place a black dot in one quadrant, place one in the mirrored quadrant as well.
7. Reselect the RGB channel. This is important, as the next step of the process won't work if still only in a single channel. Save your image before the next step.
8. Back to the Filter menu, select Fourier Transform, again, but this time, select IFFT, or Inverse Fourier Transform.
9. Under the Layers menu open the "Create new fill or adjustment layer" down at the bottom to darken the print or to make sure the background does not have a pattern, (Black and White or Levels option seems to work the best).

H. Useful Shortcuts in Adobe Photoshop:

1. Adobe Photoshop has built in shortcuts to assist with efficiency of choosing different tools while enhancing images. Below is a list of common tools utilized and their shortcuts.

   B = Brush Tool

   E = Eraser Tool

   [= Brush size decreases

   ] = Brush size increases

   I = Ruler Tool

   H = Hand Tool

   R = Rotate Tool

   T = Type Tool

   Z = Zoom Tool

   C = Crop Tool

   L = Lasso Tool

   M = Marquee Tool

   Ctrl + Z = Undo last step

2. Shortcuts can also be created in Adobe Photoshop for other tools that are commonly used. To create a shortcut, go to Edit→Keyboard Shortcuts. From there you would select the menu where the tool is located. The following are useful tools that would benefit from having shortcuts made.

a. Under Window→click on the application tool→enter a shortcut (shortcuts must include Ctrl and/or an F-key).
    1) Tile All Vertically
    2) Match Zoom
b. Under Edit→click on the application tool→enter a shortcut (shortcuts must include Ctrl and/or an F-key).
    1) Rotate 180°
    2) Rotate 90° CW
    3) Rotate 90° CCW
    4) Flip Horizontal
    5) Arbitrary Rotate
c. Under Image→click on the application tool→enter a shortcut (shortcuts must include Ctrl and/or an F-key).
    1) RGB Color

I. DCS5 Fingerprint Enhancement:
    1. The DCS Software offers customized image processing toolboxes which have been carefully tailored to produce optimum enhancement of images of fingerprints treated in specific ways.
    2. There are also customized advanced imaging modules for Fast Fourier Transforms, Digital Filters, Background Subtraction, Large Spectral Filters, Image Maths, and Image Stitching.
    3. Original images are automatically protected using image validation software.
    4. Subsequent image enhancement which may be required to improve the clarity of images prior to comparison is applied only to working copies of this original image and are sequentially logged in an audit trail. The DCS system is tamper proof and guarantees the integrity of images used as evidence.
    5. For a list of enhancement toolboxes and instructions on how to use them, refer to the DCS5 User Manual located in QMS.

J. ImageJ Fast Fourier Transfer (FFT) Filter:
    1. Open your image in ImageJ.
    2. Display the power spectrum by choosing Process > FFT > FFT.
    3. The power spectrum opens as a new window.
    4. Select the paintbrush tool and place black dots on the white spots in the power spectrum that represent the repeating pattern.
    5. It is important to never place dots on the center area of the image because this area contains a lot of the low frequency in the image (the impression) that you will want to retain.
    6. The frequency dots are mirrored in diagonally opposing quadrants. If you place a black dot in one quadrant, place one in the mirrored quadrant as well.
    7. After placing the black dots, choose Process > FFT > Inverse FFT and a new image will be opened that is the processed image.

K. MorphoBis Fast Fourier Transfer (FFT) Filter: The purpose of this technique is to remove background interference that has a repeating pattern.

1. Import your image into MorphoBis Latent Expert.
2. Under Filters, choose the Periodic Artifacts Filter.
3. A red box will appear on screen.
4. Place the red box in the center of the pattern you are trying to remove and then unclick the box.
5. This should remove the pattern that was selected.
6. Do not place the red box on ridges of the impression.
7. If multiple patterns are in the image, repeat the process as necessary to remove each pattern.

FOOTWEAR COLLECTION AND EXAMINATION STANDARD OPERATING PROCEDURES

I. SCOPE

Forensic footwear examination is a forensic discipline that attempts to identify, exclude, or determine the degree of association/non-association between an item of footwear and a questioned impression.

LEU report language will conform to policy QP28-Report Writing. To provide clear and unambiguous results, the report shall include a result for each item examined. Blanket statements used to communicate results shall include the item(s) the statement refers to.

The LEU report template for footwear examinations includes the definition for each conclusion which qualifies the significance of exclusions, non-associations, associations, and identifications.

II. REFERENCES

1. Bodziak, WJ., Footwear Impression Evidence: Detection, Recovery and Examination. 2nd ed.; CRC Press: Boca Raton, FL, 2000.
2. Bodziak, WJ., Forensic Footwear Evidence: Detection, 3rd ed.; CRC Press: Boca Raton, FL, 2016.
3. Cassidy, MJ., Footwear Identification. RCMP, Ottawa, Canada: 1984.
4. Hildebrand, D.S., Footwear, The Missed Evidence, 3rd ed.; Staggs Publishing, Wildomar, CA, 2013.
5. SWGTREAD – Scientific Working Group for Shoeprint and Tire Tread Evidence, "Range of Conclusions Standard for Footwear and Tire Impression Examinations", (03/2013)
6. SWGTREAD – Scientific Working Group for Shoeprint and Tire Tread Evidence, "Guide for the Examination of Footwear and Tire Impression Evidence", (03/2006)
7. SWGTREAD – Scientific Working Group for Shoeprint and Tire Tread Evidence, "Guide for Casework Documentation",(03/2008)
8. ASB Technical Report 097, "Terminology Used for Forensic Footwear and Tire Evidence", 2019
9. ANSI/ASB Best Practice Recommendation 021, "Best Practices for the Preparation of Test Impressions from Footwear and Tires", 2019
10. ANSI/ASB Best Practice Recommendation 126, "Best Practice Recommendation for Casting Footwear and Tire Impression Evidence at the Crime Scene", 2022
11. ANSI/ASB Best Practice Recommendation 049, "Best Practice Recommendation for Lifting of Footwear and Tire Impressions", 2020
12. ANSI/ASB Best Practice Recommendation 050, "Best Practice Recommendation for Photographic Documentation of Footwear and Tire Impression Evidence", 2022
13. ANSI/ASB Best Practice Recommendation 052, "Best Practice Recommendation for the Detection and Collection of Footwear and Tire Impression Evidence", 2022
14. ANSI/ASB Standard 137, "Standard for Examination and Documentation of Footwear and Tire Impression Evidence", 2023
15. SWGDE – Scientific Working Group on Digital Evidence, "Guidelines for Digital Imaging of Footwear and Tire Impressions", 2018

III. COLLECTION PROCEDURES

Photography of footwear impressions at a crime scene, see LP-22: Crime Scene Photography

Photography of footwear impressions in the laboratory, see LP-17: Lab Photography

LP-19: Electrostatic Dust Lifting Device

LP-20: Lifting 2-Dimensional Impression Evidence

LP-21: Casting 3-Dimensional Impression Evidence

LP-19: ELECTROSTATIC LIFTING DEVICE

I. SCOPE:

Footwear impressions can be recovered from virtually any surface, both porous and nonporous with an electrostatic lifting device. The device works best on dry dust/residue footwear impressions on surfaces that are relatively clean. If the impressions were wet when they were made or if they become wet or damp prior to lifting, the electrostatic lifting device will work poorly or not at all.

The electrostatic lifting device may be used to lift latent/patent impressions from surfaces where it is suspected footwear impressions may be present. It is an excellent crime scene tool with which to make a "blind search" of areas where it is likely that a suspect walked.

II. REFERENCES:

1. Bodziak, WJ. Footwear Impression Evidence. Boca Raton, FL: CRC Press, 1995.
2. Instruction Manual for Sirchie ESP 900 Kit (Available in QMS)
3. Instruction Manual for Pathfinder Kit (Available in QMS)
4. ANSI/ASB Best Practice Recommendation 049, First Edition 2020, "Best Practice Recommendation for Lifting of Footwear and Tire Impressions"
5. ANSI/ASB Best Practice Recommendation 050, First Edition 2021, "Best Practice Recommendation for Photographic Documentation of Footwear and Tire Impression Evidence"
6. ANSI/ASB Best Practice Recommendation 052, First Edition 2022, "Best Practice Recommendation for the Detection and Collection of Footwear and Tire Impression Evidence"

III. EQUIPMENT AND SUPPLIES:

1. Sirchie ESP 900
2. Pathfinder SOC002
3. Lifting Mat
4. Box or similar device for storage and preservation of lift

IV. DESCRIPTION OF PROCEDURES:

A. Photograph all visible impressions following LP-17/LP-22 prior to lifting.

B. Both the Sirchie ESP 900 and the Pathfinder SOC002 operate in basically the same manner. See instruction manuals (Available in QMS) provided in each kit for specific instructions.

1. Select the area where dust prints are visible or suspected.
2. Place lifting mat over the impression with the black side down. The mat must be placed over the area very carefully as to avoid distorting the impression.
3. Do not slide or move the mats on the surface. The slightest movement of the mats can distort or destroy any impressions that may be present.
4. Place the metal earth plate within 2" of the lifting mat.
5. Make sure the power is in the "OFF" position.
6. Insert 9-volt battery into the battery compartment.
7. Place the 2 earth electrodes onto the metal earth plate and the 1 high voltage electrode onto the lifting mat.
8. Turn the power ON (green light should illuminate).

9. Adjust the voltage knob clockwise until maximum voltage is achieved. If arcing or sparks are observed, then reduce the voltage output.
10. Wait approximately 30 seconds for the film to adhere to the surface.
11. If air bubbles remain, remove any trapped air bubbles with a roller.
12. Turn OFF the power and remove from the earth plate and lifting mat.
13. **CAUTION: The High Voltage electrode will remain charged for about 20 seconds.**

C. Notes
    1. If the impression is on a vertical surface, secure lifting mat and earth plate with tape.
    2. If the impression is on a metallic surface, insert the plastic insulator under the earth plate.
    3. Attempts to lift residue impressions on a dirty surface that itself contains loose residue will result in both the impression and the background residue being lifted together.
    4. Humid conditions may prevent the device from operating properly.

D. The electrostatic dust lift will be treated as evidence, given a sub-item number, and the chain of custody will be tracked in LIMS.

E. Photograph the lifted impressions following Protocol LP-17. Lifted impressions will be **position reversed** (mirror image) of the actual pattern.

F. Preserve the electrostatic dust lift.
    1. The dust print must be protected from damage on the print side of the mat.
    2. It should be stored in a box or similar type of enclosure with the dust print facing up.
    3. Nothing should be placed on top of the dust print.
    4. Only the portion of the mat with the impression needs to be preserved; the lifting mats can be cut to a smaller size to make storage easier.

G. Gelatin lifts, Stat Lifts, and Tape Lifts can be utilized after Electrostatic Dust Lifts.

LP-20: LIFTING 2-DIMENSIONAL IMPRESSION EVIDENCE

I. SCOPE:

2-Dimensional footwear impressions in dry dust/dirt can be recovered from virtually any surface, both porous and nonporous, using a Stat-Lift, which is an alternative to the electrostatic lifting device.

2-Dimensional footwear impressions left in dust, dirt, mud, residue, etc.; developed with black powder; or developed blood impressions can be lifted from nonporous surfaces utilizing Gelatin Lifts, Tape Lifts, or silicone casting material such as Mikrosil and Accutrans.

II. REFERENCES:

1. Bodziak, WJ. Footwear Impression Evidence. Boca Raton, FL: CRC Press, 1995.
2. LeMay, J., Adams, S., & Stephen, A. (2011). Validation of Vinyl Static Cling Film for the Collection and Preservation of Dust Impressions. *Journal of Forensic Identification, 61*(4), 317-332.
3. ANSI/ASB Best Practice Recommendation 049, First Edition 2020, "Best Practice Recommendation for Lifting of Footwear and Tire Impressions"
4. ANSI/ASB Best Practice Recommendation 050, First Edition 2021, "Best Practice Recommendation for Photographic Documentation of Footwear and Tire Impression Evidence"
5. ANSI/ASB Best Practice Recommendation 052, First Edition 2022, "Best Practice Recommendation for the Detection and Collection of Footwear and Tire Impression Evidence"

III. EQUIPMENT AND SUPPLIES:

1. Stat-Lift
2. Gelatin Lifter
3. Lifting Tape
4. Backing Card/Paper
5. Mikrosil
6. Accutrans

IV. DESCRIPTION OF PROCEDURES:

A. Photograph all visible impressions following LP-17/LP-22 prior to lifting.

B. The lifting material used should be determined by considering the substrate, matrix of the impression, and environmental conditions.

C. Lifting Materials

1. Stat-Lift – good for patent impressions in dust.
    a. Photograph impression before attempting to lift.
    b. Remove white cover from Stat-Lift.
    c. Place lift black matte-side down over impression. Press out any bubbles, folds, or creases in lift.
    d. Pull up lift.
    e. Photograph impression on lift. The lifted impression will be **position reversed.**

2. Gelatin Lifts – White gelatin lifters are good for patent impressions in blood, oil, grease, etc. or impressions developed with powder. Black gelatin lifters are good for patent impressions in dust.

a. Photograph impression before attempting to lift.
b. Remove plastic cover from gelatin lifter.
c. Place lifter adhesive-side down over impression. Press out any bubbles, folds, or creases in lifter.
d. Pull up lifter.
e. Photograph impression on lift. The lifted impression will be **position reversed.**
f. Cover lifted impression with plastic cover.

3. Tape Lifts - good for impressions developed with powder.
    a. Photograph impression before attempting to lift.
    b. Lift the impression with appropriate lifting tape (Clear Transparent Commercial Lifting Tape, Polyethylene Tape, DIFF-Lift Tape) following LP-02.

4. Mikrosil/AccuTrans - good for impressions on textured surfaces.
    a. Photograph impression before attempting to lift.
    b. Lift the impression with Mikrosil or AccuTrans following LP-02.

LP-21: CASTING 3-DIMENSIONAL IMPRESSION EVIDENCE

I. SCOPE:

3-Dimensional Impression evidence can be left in dirt, mud, snow, etc. at crime scenes. These 3-dimensional impressions can be preserved through casting the impression utilizing Dental Stone.

II. REFERENCES:

1. Bodziak, WJ. Footwear Impression Evidence. Boca Raton, FL: CRC Press, 1995.
2. Cassidy, MJ. Footwear Identification. RCMP, Ottawa, Canada: 1984.
3. McDonald, P. Tire Imprint Evidence. Boca Raton, FL: CRC Press, 1993.
4. ANSI/ASB Best Practice Recommendation 126, First Edition 2020, "Best Practice Recommendation for Casting Footwear and Tire Impression Evidence at the Crime Scene"
5. ANSI/ASB Best Practice Recommendation 050, First Edition 2021, "Best Practice Recommendation for Photographic Documentation of Footwear and Tire Impression Evidence"
6. ANSI/ASB Best Practice Recommendation 052, First Edition 2022, "Best Practice Recommendation for the Detection and Collection of Footwear and Tire Impression Evidence"

III. EQUIPMENT AND SUPPLIES:

1. Dental Stone
2. Water
3. Snow Print Wax
4. Hairspray
5. Spray paint for contrast
6. Casting frames

IV. DESCRIPTION OF PROCEDURES:

A. Debris that is part of the impression or that was present when the impression was made should not be removed.

B. Photograph all visible impressions following LP-22: Crime Scene Photography prior to casting.

C. After photography, debris that has clearly fallen into the impression after it was made may be carefully removed and the impression re-photographed.

D. When casting, care should be exercised as to minimize any potential damage to the impression. For fragile impressions observed in fine substrates (flour, sand, soil, etc.) an aerosol hairspray may be applied by misting over the impression and allowing the hairspray to fall into the impression.

E. Prepare the casting material:
   1. Add approximately 5 to 8 oz of water to 1.5 to 2 lbs of dental stone and mix thoroughly.
   2. More may be needed for larger impressions.
   3. Mixture should be similar to thin pancake batter for most impressions.
   4. For fragile impressions, a thinner mix may be required.
   5. For impressions on an angle, a thicker mix may be required.
   6. Adjust consistency by adding dental stone or water as needed.

F. Pour the cast
    1. Carefully pour the casting material outside the perimeter of the impression and direct the flow into the impression.
    2. Use a spoon, tongue depressor or similar device to keep dental stone from falling directly onto tread detail.
    3. Ensure the impression is completely filled and/or covered evenly. If the casting material does not flow completely into the impression, the top surface of the casting material can be carefully agitated to help it flow.
    4. Casts should be of sufficient thickness to avoid breakage. If necessary, additional casting material may be poured over the top of the original cast to complete the cast and/or add thickness.
    5. Allow casting material to flow into impression rather than directly onto it.
    6. Use a spoon, tongue depressor or similar device to keep dental stone from falling directly onto tread detail.
    7. Pour immediately or the mixture will set.

G. Allow the cast to harden
    1. It takes approximately 30 minutes to harden in warm/dry weather.
    2. It takes approximately an hour or more to harden in cold/wet weather.
    3. Casts should be cool to the touch before attempting removal.

H. After cast has hardened, mark the cast with pertinent case information (identifier numbers which link the casts to diagrams and/or photographs, date and initials, any case # if provided) prior to lifting from the substrate.

I. Carefully lift the cast up around the edges, and allow the soil to come up with the cast. Package in paper sack or wrap in paper.
    1. Do not clean the cast on-site, clean in the lab.
    2. Allow the cast to air dry for at least 48 hours before examination.

V. SPECIAL CONSIDERATIONS:

A. Casting an impression in snow:
    1. Protect the snow impression from direct sunlight if possible.
    2. Photograph the impression following LP-22: Crime Scene Photography.
    3. A highlight spray such as Snow Print Wax®, spray paint, or similar product can be applied to increase contrast.
    4. Apply thin coats obliquely, 8 inches to 12 inches away from the impression.
    5. Allow to dry for a few seconds.
    6. Photograph the impression again prior to casting.
    7. Approximately six layers of aerosol wax should be applied prior to casting
    8. Mix dental stone a little thinner than usual, add snow to mixture to lower temperature.
    9. Pour mixture carefully into waxed impression.

B. Casting an impression containing water or under water:
    1. Place a casting frame or similar apparatus around the impression. If possible, the top of the frame should rise above the water line.
    2. Lightly sift a thin layer of dry dental stone directly into impression.
    3. Add layers until water has been absorbed.

4. Cast the remainder of impression as usual.
5. The cast should be allowed to set for at least 60 minutes.

C. Casting an impression in loose sand or very soft material:
    1. Photograph the impression following LP-22: Crime Scene Photography.
    2. Apply aerosol hairspray to the impression. Do not spray directly into the impression.
        a. Apply by misting over the impression and allowing the hairspray to fall into the impression, or
        b. use a baffle to avoid spraying directly into impression.
    3. Cast the impression as usual.

IV. FOOTWEAR IMPRESSION EXAMINATIONS

TERMS AND DEFINITIONS

Please refer to ASB Technical Report 097, Terminology Used for Forensic Footwear and Tire Evidence, First Edition, 2019 for a comprehensive listing of detailed general footwear and tire definitions.

Analysis: Consists of the assessment and documentation of the quality and quantity of the observed class characteristics and characteristics of use of an unknown impression and known footwear or tire.

Characteristics of Use: Consists of both wear and randomly acquired characteristics (RAC).

Comparison: Consists of an examination of correspondence or non-correspondence between items, unknown and known.

Evaluation: Consists of the consideration of data observed in the comparison and the weight of the correspondence and/or non-correspondence between two items, unknown and known.

Suitability: Consists of a determination reached during the analysis phase after considering the quality, quantity, and specificity of features observed; to include class characteristics, characteristics of use, and limiting factors in an unknown impression in order to proceed with the examination process.

DOCUMENTATION

Examinations, relevant observations, and results shall be documented. The examination notes must include a complete record of observations to support conclusions reached. These notes should include, but are not limited to, the following:

1. Initial description, condition of evidence, and packaging
2. Photographs, images or diagrams of evidence as appropriate
3. Relevant observations of similarities or differences

Note: At various points in these procedures, if differences in class characteristics are present or if an impression is lacking in quality or comparability, then the examiner may discontinue or limit the procedure(s). The reasons for such a decision shall be documented and reported accordingly.

EXAMINATION

A. Condition of Evidence

Record and document the initial condition of the submitted evidence.

B. Preparation of questioned impression evidence

1. Casts – Casts must be handled with care. If possible, allow 48 hours from the time the cast is poured, before examination. Gently remove the soil and debris, taking care not to brush out any tread detail, or add any additional markings. The soil and debris shall be preserved and treated as derivative evidence prior to cleaning. Casts can then be

gently cleaned of any residual soil and debris by using water and a soft brush. Allow the cast to dry prior to examination. Photograph the cast using ambient light as well as side lighting from multiple angles following LP-17.

2. Lifts
    a. Examine electrostatic dust lifts in total darkness with an oblique light source.
    b. Remove the cover of the gelatin lift and examine under appropriate lighting conditions. Oblique lighting may be beneficial.
    c. Examine adhesive lifts under appropriate lighting conditions. Oblique lighting may be beneficial.
    d. Lifts will be photographed following LP-17 or scanned with a flat-bed scanner with a minimum resolution of 500ppi and saved as a TIFF or Photoshop PDF following LP-18.

3. Digital Images – Rename the images by adding the Case# and Item# in front of the original file name. Upload these images to the Image Vault.
    a. Analysis and comparison documentation will be conducted on copies of the original images.
    b. The working copies shall be calibrated to a minimum of 500ppi and saved as a TIFF or Photoshop PDF.
    c. The documented working copies shall be uploaded to the LIMS Image Vault.
    d. Occasionally submitted photos will contain footwear impressions which were captured out of perspective (not at 90°). The perspective may be corrected in Adobe Photoshop following the guidelines in attachment: RS&A – Correcting Perspective, Leveling, and Image Calibration in Footwear

4. Evidence bearing impressions – Photograph any item bearing questioned impressions prior to examination following LP-17.
    a. Visually examine the item to determine its suitability for chemical or physical enhancement to improve the clarity of the impression.
    b. If appropriate, continue with chemical or physical enhancement and document in the case record.
    c. If a photograph and/or lift is collected it will be treated as evidence, given a sub-item number, and the chain of custody will be tracked in LIMS.

C. Analysis of questioned impression evidence

1. Analyze the questioned impression for quality, clarity, and comparative potential.
    a. If there is insufficient detail and clarity observed in the questioned impression, document in the case record, discontinue these procedures and report accordingly.

2. Examine for class characteristics: A feature that is shared by two or more items of footwear. The footwear outsole and the physical size features of a footwear outsole are two common manufactured class characteristics. General wear of the outsole is also a class characteristic.

a. If no class characteristics are present, document in the case record, discontinue analysis, and report accordingly.

b. If class characteristics are present, document the class characteristics observed on an image of the impression and assign a Q# to the questioned impression. Q#'s will be assigned sequentially to all questioned impressions that have sufficient class characteristics for comparison to a known footwear.

3. Examine for randomly acquired characteristics: A feature on a footwear outsole resulting from random events including, but not limited to: cuts, scratches, tears, holes, stone holds, abrasions and the acquisition of debris. The position, orientation, size and shape of these characteristics contribute to the uniqueness of a footwear outsole. Randomly acquired characteristics are essential for an identification of a particular item of footwear as the source of an impression. Magnification may enhance visibility. Different forms of lighting may provide a better view of detail. Document the randomly acquired characteristics observed on an image of the impression.

D. Preparation of known evidence

1. Document the relevant information (brand, size, etc.) of the known shoes in the case record.

2. Photograph the original condition of the known shoes and the outsoles following LP-17.

E. Comparison

Conduct a side-by-side comparison of the questioned impression with the known footwear. Comparisons can be conducted utilizing the known footwear, photographs of the known footwear, test impressions of the known footwear, or a combination. Examiners are encouraged to utilize all available evidence when conducting analysis and comparison. Examiners must ensure that the questioned impressions and the known footwear are compared in the correct position and orientation. The items used during comparison shall be documented in the case record.

1. Visually compare the outsole design. **Outsole design** is the specific pattern or arrangement of elements on an outsole typically associated with a manufacturer and having a name and/or style number.

    a. If the design is different, document in the case record, discontinue these procedures and report accordingly.

    b. If the design is similar, document in the case record, prepare test impressions according to section J, and continue with these procedures.

2. Visually compare the specific design and physical size and shape of design. **Specific outsole design** is the precise arrangement of design elements of part or all of a footwear outsole. The precise size/shape and arrangement of design elements in an outsole of one style and manufacturer's size are normally distinguishable from other sizes of the same manufacturer's style. **Physical size** is the dimensions, shapes, spacing and relative positions of the footwear outsole design components.

a. For comparison of physical size of objects (casts, known shoes, etc.), the use of rulers and calipers or transparencies shall be utilized.

b. For comparison of physical size using digital images of a questioned impression and/or known footwear, calibrate the images according to LP-18 prior to comparison.

1) The size shall be measured utilizing the ruler tool or digital transparency in Adobe Photoshop.

2) To create a digital transparency, follow the guidelines in attachment OSBI LEU QPA4 – Instructions for Creating a Digital Transparency

c. The method used for comparing physical size shall be documented in the case record.

d. If specific design and/or physical size and shape of design are different, document in the case record, discontinue these procedures and report accordingly.

Note: If physical size is different, consider scaling, perspective and other issues.

e. If specific design and physical size and shape of design correspond, document in the case record and continue with procedure.

3. Wear - Erosion of the surfaces of a footwear outsole during use. Visually compare the wear between the questioned impression and the known footwear.
   a. If the position and degree of wear are different, document in the case record, document the difference on images of the questioned impression and known footwear, and evaluate possible wear changes between the date of crime and the date the shoes were recovered. The examiner must be aware of the date of the crime and the date of the collection of the known footwear. This is of particular significance if a difference in wear is observed between the impression and the known footwear.

   b. If the position and degree of wear corresponds, document in the case record, document the correspondence on images of the questioned impression and known footwear, and continue with procedure.

4. Randomly Acquired Characteristics (RACs) - A feature on a footwear outsole resulting from interaction with an object(s) including, but not limited to: cuts, scratches, tears, holes, stone holds, abrasions and the acquisition of debris.
   a. RACs should be evaluated according to their position, size, shape, orientation and clarity. When sufficient RACs are present in the questioned impression and correspond with respective features in the known footwear, an identification can be effected. Evaluate the RACs, document agreement/disagreement in the case record, document agreement/disagreement observed on images of the questioned impression

and known footwear, and report accordingly.

Note: Due to varying circumstances, not all individual characteristics will reproduce in every impression. Therefore, the absence of an individual characteristic is not a basis for elimination and does not preclude identification.

F. Limitations

1. Some of the factors that may limit the examination of footwear impression evidence include the following:
    a. Poor condition/age of the items.
    b. Prior destructive forensic examinations.
    c. Lack of sufficient detail in the impression.
    d. Lack of a proper scale in impression photographs.
    e. Improper scale placement in impression photographs.
    f. Improper alignment of film plane with impression.
    g. Non-availability of original impression source.

2. All observed limitations to examinations shall be documented in the case record and conveyed to the stakeholder in the report.

G. Conclusions

Examiners shall independently evaluate the comparison of a questioned impression and a known footwear to arrive at one of the conclusions listed below. If an examiner needs a consultation with another examiner, it shall be documented according to section H below.

1. **Lacks sufficient detail** – No comparison was conducted. The examiner determined there were no discernible questioned footwear impressions or features present. This opinion applies when there is insufficient detail to conduct any comparison. In the opinion of the examiner, an impression was either not present or the impression lacked sufficient detail for any comparison.

2. **Exclusion –** This is the highest degree of non-association expressed in footwear examinations. Sufficient differences were noted in the comparison of class and/or randomly acquired characteristics between the questioned impression and the known footwear. In the opinion of the examiner, the particular known footwear was not the source of and did not make, the impression.

3. **Indications of non-association** – The questioned impression exhibits dissimilarities when compared to the known footwear; however, the details or features were not sufficiently clear to permit an exclusion. These dissimilarities may include, but are not limited to, differences in specific tread design, size, wear, etc. In the opinion of the examiner, dissimilarities between the questioned impression and the known footwear indicated non-association; however, the details or features were not sufficient to permit an exclusion.

4. **Limited association of class characteristics** – Some similar class characteristics were present; however, there were significant limiting factors in the questioned impression that did not permit a stronger association between the questioned impression and the known footwear. These factors may include but are not limited to**:** insufficient detail,

lack of scale, improper position of scale, improper photographic techniques, distortion or significant lengths of time between the date of the occurrence and when the footwear were recovered that could account for a different degree of general wear. No confirmable differences were observed that could exclude the footwear. In the opinion of the examiner, factors (such as those listed above) have limited the conclusion to a general association of some class characteristics. Other footwear with the same class characteristics observed in the impression are included in the population of possible sources.

5. **Association of class characteristics –** The class characteristics of both design and physical size must correspond between the questioned impression and the known footwear. Correspondence of general wear may also be present. In the opinion of the examiner, the known footwear is a possible source of the questioned impression and therefore could have produced the impression. Other footwear with the same class characteristics observed in the impression are included in the population of possible sources.

6. **High degree of association –** The questioned impression and known footwear must correspond in the class characteristics of design, physical size, and general wear. For this degree of association there must also exist: (1) wear that, by virtue of its specific location, degree and orientation make it unusual and/or (2) one or more randomly acquired characteristics. In the opinion of the examiner, the characteristics observed exhibit strong associations between the questioned impression and known footwear; however, the quality and/or quantity were insufficient for an identification. Other footwear with the same class characteristics observed in the impression are included in the population of possible sources only if they display the same wear and/or randomly acquired characteristics observed in the questioned impression.

7. **Identification** – This is the highest degree of association expressed by a footwear impression examiner. The questioned impression and the known footwear share agreement of class and randomly acquired characteristics of sufficient quality and quantity. In the opinion of the examiner, the particular known footwear was the source of, and made, the questioned impression. The examiner would not expect to find the same combination of features repeated in another source. This opinion acknowledges that an identification to the exclusion of all others can never be empirically proven.

H. Consultations

1. Consultations are significant interactions between examiners regarding one or more questioned impressions. Consultations may occur at any stage of analysis, comparison, and evaluation, both before and after decisions are made during the examination. Consultations may result in recognition of differences of determinations or conclusions, creating "conflicts". Consultations are used as part of the process to address conflicts, in accordance with quality assurance policies and in lieu of more formal conflict resolution procedures. Consultants should be a Criminalist III or IV.

2. Consultations shall be routed in the BEAST utilizing routing codes CONS (Route for Consultation) and CONCOM (Consultation Complete) and documented in the case record (including any additional set of notes, annotations, or images generated by the consultant).

3. The documentation shall include:
    a. Specific questioned impression(s) reviewed
    b. The topic and result of the consultation
    c. Examiner involved
    d. Date of the consultation
    e. Consultant documented images, if applicable.

I. Verification

1. Verification is the independent analysis, comparison, and evaluation of a questioned impression to a known footwear conducted by another examiner to either support or refute the conclusion of the original examiner.
2. All suitability determinations and conclusions shall be independently verified by an authorized examiner in the form of an open verification during the technical review.
3. The technical reviewer's signature and date will be captured on the technical review form in the BEAST.
4. The reviewer's signature indicates agreement with all listed suitability determinations and comparison conclusions.

J. Conflict Resolution

Conflict is the condition in which two examiners disagree on a suitability decision or source conclusion during the verification/technical review process. The potential for differing suitability decisions or source conclusions is an inevitable result of the subjective interpretation of footwear impressions, particularly for those impressions where the quantity and quality of observed data are low and require more subjective interpretation.

No examiner shall be forced or coerced into agreeing with an opinion or conclusion with which they do not agree. If an examiner feels that they are being coerced into rendering a conclusion that they are not comfortable with, they should notify the Technical Manager. If the concern is with the Technical Manager, the LEU Supervisor and LEU Administrator should be notified.

When conflict occurs, the following actions will be taken to address the conflict:

1. Remediating Interaction
   The conflicting opinion shall be recorded in the BEAST utilizing the routing code RQC (Route for Question or Comment) by the verifier/technical reviewer. The original examiner and the second examiner (verifier/technical reviewer) should attempt to resolve the conflicting suitability decision(s) or source conclusion(s) via substantive discussion with an attempt to arrive at a mutually agreed upon decision or conclusion that is best supported by the observed data.
    a. If agreement is achieved, the conflict resolution process concludes and shall be documented utilizing the routing function in the case record.
        i. If images were documented during the discussion, those shall be uploaded to the case record.
        ii. If the resolution results in a change to a suitability determination or comparison conclusion, the Technical Manager shall be informed via OSBI LEU QPA8 – Change to Conclusion Form. The form will be reviewed

and approved by the Technical Manager (or designee) and uploaded to the case record.

b. If agreement is not achieved, the disagreements shall be documented utilizing the routing function in the case record and the Technical Manager notified. If the conflicting opinion involves the Technical Manager, then the Supervisor will be notified.
c. Any images documented during the discussion shall be uploaded to the case record. The conflict resolution process will proceed to Managerial Review.

2. Managerial Review

If agreement between two examiners cannot be reached through remediating interactions, the conflict resolution should elevate to managerial review. The Technical Manager (or Supervisor if the Technical Manager is involved in the conflict) shall be informed of the conflict and will determine the next steps to resolve the conflict from the following options:

a. Blind Verification – A third examiner shall compare the impressions in question and document their observed data and source conclusion. This shall be done blindly, i.e. the third examiner should be shielded from the decisions, conclusions and documented data of the other two examiners. The third examiner's conclusion will be documented in the case notes and the documented image will be uploaded to the case record. The three source conclusions shall be reviewed by the Technical Manager to determine if two of the source conclusions agree and how the case should proceed.
    1) If the third examiner agrees with the source conclusion of the original examiner, the original examiner should retain the case.
    2) If the third examiner agrees with the source conclusion of the secondary examiner, the case should be transferred to the second examiner and this transfer shall be documented in the case record.
    3) This shall be documented in the case record.

b. The Technical Manager will seek out an external reviewer following QP10. The Technical Manager (or Supervisor if applicable) will evaluate the results of the external reviewer and the internal results of the examiners in determining the final conclusion. This shall be documented in the case record.

K. Test Impressions

1. The purpose of creating test impressions from known footwear is to record the characteristics on the outsole and attempt to reproduce the conditions present when the questioned impression was made.
2. Test impressions should record fine detail with appropriate contrast and/or three-dimensional features of accurate size, shape and clarity.
3. Test impressions will be treated as evidence, given a sub-item number, and the chain of custody will be tracked in LIMS.
4. Relevant identifying information should be recorded on test impressions, which may include but is not limited to case number, item number, make, model, size, etc.
5. When appropriate, test impressions should be made of the entire outsole.
6. Test impressions of specific areas of the outsole may also be made.
7. Replicate test impressions should be made to capture variability among different impressions.

8. Excess dirt should be removed from the outsole with care so as to not damage the outsole or remove any stone holds or other objects present within the design elements before test impressions are made.
9. In some cases, test impressions may be made prior to removal of excess dirt from the outsole.
10. Test impressions should be made by using one of the methods listed below. The examiner should select the method of making test impressions based on the known footwear, case circumstances and products available. Multiple test impression methods may be used if needed.

    a. Inked shoe impressions:
        1) Apply fingerprint ink to shoe outsole and make test impressions on white butcher paper or other suitable transfer medium.
        2) This can be done while wearing the footwear or applying pressure to the footwear with your hands. Wear appropriate PPE (gloves/ booties) when conducting this task.
        3) Clearly mark known impression with relevant information (left/right, item #, case #, initials, and date).
        4) Inked impressions of the shoes can be used to compare with 2-dimensional (lifts, photos) or 3-dimensional (casts) impressions.
        5) Transparencies can be made from the inked impressions and then overlaid on the questioned impression for direct comparison.
        6) Digital transparencies can also be made when conducting on-screen digital comparisons. For instructions see OSBI LEU QPA 4 – Instructions for Creating Digital Transparencies.

    b. Powder shoe impressions:
        1) Apply cooking spray (Ex. PAM) to shoe outsole and make test impressions on white butcher paper or another suitable receiving surface.
        2) This can be done while wearing the footwear or applying pressure to the footwear with your hands. Wear appropriate PPE (gloves/ booties) when conducting this task.
        3) Dust the resulting impression on the butcher paper with magnetic or regular black fingerprint powder.
        4) Black fingerprint powder can be applied directly to the shoe outsole, remove excess powder by gently tapping the shoe, and then lift with clear fingerprint lifting tape or other suitable receiving surface, and place onto a suitable contrasting background. (The impression will be position reversed)
        5) Black fingerprint powder can be applied directly to the shoe outsole, remove excess powder by gently tapping the shoe, and then step on the adhesive side of a white gelatin lifter, and cover the impression with the clear protective cover.

        Mark known impression with relevant information (left/right, item #, case #, initials, and date).

c. Three-dimensional test impressions:

1) Make an impression by pressing the outsole into a three-dimensional substrate (e.g. BIO-FOAM® or sand).
2) This can be done while wearing the footwear or applying pressure to the footwear with your hands. Wear appropriate PPE (gloves/ booties) when conducting this task.
3) Photograph the impression using oblique lighting at multiple angles.
4) The impression may also be cast.

CRIME SCENE AND MORGUE STANDARD OPERATING PROCEDURES

I. SCOPE

Occasionally the LEU is requested to assist in the processing and collection of evidence outside of the laboratory at a crime scene. When analysts of the LEU respond to a crime scene request, the Crime Scene Checklist (LEU QPA 2) shall be taken with them and utilized while at the crime scene.

Occasionally the LEU is requested to assist in the collection of known impressions of deceased individuals at the Medical Examiner's Office, and collection of known impressions from victims and subjects in a case.

A Crime Scene Memo (OSBI CSD QPA 27.1) shall be filled out for all work activities conducted outside of the laboratory according to QP 27.

A crime scene narrative shall be completed for all work activities conducted outside the laboratory. The LEU analyst will select the BEAST Assignment Code "CS" to generate the crime scene narrative. Utilizing the "CS" assignment code ensures the Accreditation Symbol is not included in the report.

II. PROCEDURES

LP-22: Crime Scene Photography
LP-23: Collection of Postmortem Impressions

LP-22: CRIME SCENE PHOTOGRAPHY

I. SCOPE:

Photography using a digital SLR camera is an excellent method of documenting impression evidence. Latent Evidence Unit Analysts of the OSBI will utilize various photographic techniques when documenting and preserving impression evidence at a crime scene.

II. REFERENCES:

1. Redsicker DR. "The Practical Methodology of Forensic Photography." New York: Elsevier, 1991.
2. ANSI/ASTM E3235-21 Standard Practice for Latent Print Evidence Imaging Resolution, 6/7/2022
3. ANSI/ASB Best Practice Recommendation 050, Best Practice Recommendation for Photographic Documentation of Footwear and Tire Impression Evidence. 2021. 1st. Ed. Errata 1, 2022.
4. SWGDE 17-P-003-2.0: Guidelines for Digital Imaging of Footwear and Tire Impressions

III. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.
2. Digital SLR Camera
    a. Minimum of 2 mega pixel digital camera with detachable memory storage modules.
    b. Must be capable of close-up photography, using either a macro function or macro lens.
    c. Must be able to perform long exposures and function well in low light situations.
    d. Option of using an external flash and/or remote shutter release is desirable.
    e. Camera with proprietary image formats is preferred, but not required.
    f. Camera should have the option of a lossless compression format.
    g. Camera should have a means to efficiently transfer files to a laptop or desktop computer, such as USB or Firewire.
3. Tripod/Quadrapod with the ability to mount the camera to allow for capturing photographs at various angles and positions.
4. Macro Lens
5. Regular Lens
6. Portable Flash
7. SD Card
8. Shutter-release Remote
9. Object/material to block sun or bright ambient light
10. Object/material to block reflections
11. Scale(s) for 1:1 reproduction of photographs.
12. L-shaped scale for footwear impressions
13. Rigid tape measure for tire track impressions
14. Appropriate light source (Flashlight, Forensic Light Source).
15. Evidence markers

IV. DESCRIPTION OF PROCEDURES:

A. Category 1 – Category One images are used to demonstrate what the photographer or recording device witnessed but are not analyzed by subject matter experts. These images may be captured and stored in JPEG format. These can include, but are not limited, to the following:
    1. General crime scene or investigative images
    2. Autopsy images
B. Category 2 – Subject matter experts use Category Two images for scientific analysis. These can include, but are not limited, to the following:
    1. Latent prints
    2. Impression evidence
    3. Patterned evidence
    4. Category 1 images to be subjected to analysis
C. Category 1 images may be captured in JPEG format.
D. Category 2 images shall be captured in RAW format.
E. It is recommended that the camera file format be set to RAW + JPEG FINE.
F. It is recommended that a photolog be utilized to document the photographs captured.
G. Capture overall images of the crime scene in-situ before moving evidence or including any photographic evidence markers.
H. Place evidence markers next to visible impressions or evidence to be collected.
I. Capture overall, medium range and close-up images of the impressions/evidence as follows.
    1. Overall images should be captured from at least four different (approximately perpendicular) angles around the perimeter of the scene.
    2. Medium range images should show relationships among fixed items in the scene and other impressions or evidence. To show the spatial relationship between two items, images should be captured perpendicular and mid-point to a straight line that connects the items of interest.
    3. Close-up images should be captured to associate the impression/evidence with the evidence marker. Take midrange photographs of all areas that will be processed for impression evidence or includes evidence that will be collected.
J. Capture examination quality images of **2-Dimensional** impressions as follows.
    1. Ensure the camera is set to RAW format and is in Manual Mode.
    2. Set the camera to an appropriate ISO.
        a. 100-200 Bright/Sunny Day
        b. 400 Indoor/Shade
    3. Set the white balance to Auto.
    4. Position the camera on a tripod or quadrapod with focal plane parallel to the impression plane. This may require the use of an angle finder.
    5. Place an appropriate scale next to the impression on the same plane as the impression.
    6. Include a label that uniquely identifies the impression in each photograph (e.g., impression letter/number, date, photographer's identifier, and an orientation indicator if applicable).
    7. If a zoom lens is used, set the focal length as close as possible to a normal lens (50 mm equivalent on a full frame sensor) to prevent distortion and adjust the tripod or quadrapod height until the viewing frame is filled.

8. Fill the camera frame with the impression and scale.
9. Latent prints should be captured at a minimum resolution of 1000 ppi.
10. Footwear/Tire Track Impressions should be captured at a minimum resolution of 300 ppi.
11. Set the camera f-stop to an appropriate setting to ensure sufficient depth of field to capture the entire impression in focus.
    a. F8 – Used for flat surfaces.
    b. Increase the aperture for curved surfaces to increase the depth of field.
12. Adjust the shutter speed to balance out the exposure.
13. Focus on the mid-plane of the impression.
14. Utilize the remote shutter-release or self-timer when capturing an image to avoid camera shake.
15. View the captured image to ensure the quality and lighting of the images.
16. It may be necessary to utilize an object/material to block bright sun or ambient light from striking the impression.
17. It may be necessary to utilize an object/material to block reflections when photographing glass/mirrored items.
18. The use of oblique lighting may be needed.
19. View the captured images to ensure they are in focus, fill the frame, have proper exposure, and are in RAW format.
20. Re-photograph as necessary.
21. If photographing a large impression, take an overall photo of the impression and then move the camera closer and take additional overlapping photos to achieve a higher resolution.

K. Capture examination quality images of **3-Dimensional** impressions as follows.
1. Ensure the camera is set to RAW format and in Manual Mode.
2. Set the camera to an appropriate ISO.
    a. 100-200 Bright/Sunny Day
    b. 400 Indoor/Shade
3. Set the white balance to Auto.
4. Position the camera on a tripod or quadrapod with focal plane parallel to the impression plane. This may require the use of an angle finder.
5. Place an appropriate scale next to and along the length of the impression on the same plane as the bottom of the impression. Ensure that no part of the scale is on top of the impression.
6. Include a label that uniquely identifies the impression in each photograph (e.g., impression letter/number, date, photographer's identifier, and an orientation indicator if applicable).
7. If a zoom lens is used, set the focal length as close as possible to a normal lens (50 mm equivalent on a full frame sensor) to prevent distortion and adjust the tripod or quadrapod height until the viewing frame is filled.
8. Fill the camera frame with the impression and scale.
9. Latent prints should be captured at a minimum resolution of 1000 ppi.
10. Footwear/Tire Track Impressions should be captured at a minimum resolution of 300 ppi.
11. Set the camera f-stop to the highest Aperture setting on the camera to ensure sufficient

depth of field to capture the entire impression in focus.

12. Adjust the shutter speed to balance out the exposure.
13. Focus on the mid-plane of the impression.
14. Utilize the remote shutter-release or self-timer when capturing an image to avoid camera shake.
15. Capture at least one image with ambient light.
16. Use an object/material to block bright sun or ambient light from striking the impression.
17. Photograph the impression with the light source held at an angle.
    a. The use of angled light is intended to produce shadowing to create contrast in the impression.
    b. A deeper impression will require a higher angle of light and a shallower impression will require a lower angle (oblique lighting).
18. Hold the light source at approximately 4 ft to 5 ft away and direct it at the impression.
19. Capture images with the light source being held at the appropriate angle from at least three different positions around the impression (i.e., toe to heel, side to side, diagonally across the impression).
20. Use highlighting sprays, aerosol wax or aerosol paint for impressions in snow when contrast needs improvement and re-photograph the impression.
21. View the captured images to ensure they are in focus, fill the frame, have proper exposure, and are in RAW format.
22. Re-photograph as necessary.
23. If photographing a large impression, take an overall photo of the impression and then move the camera closer and take additional overlapping photos to achieve a higher resolution.

V. IMAGE INTEGRITY

A. The photographs captured at a crime scene are visually verified on the camera.
B. The images are submitted as evidence to the OSBI Forensic Science Center and remain in the custody of the submitter.
C. Once submitted, the images are downloaded to a secure network server.
D. The images are renamed to include the unique case identifier, the item number, and the image number.
E. The images will be uploaded to the BEAST Image Vault of the appropriate case and the chain of custody record will be updated at that time.
F. Images shall only be removed from the camera's SD card after the images have been uploaded to the BEAST Image Vault.

LP-23: COLLECTION OF POSTMORTEM IMPRESSSIONS

I. SCOPE:

The reasons for collecting impressions from deceased individuals are to establish/confirm the identity of the individual and for purposes of identification/elimination in a criminal investigation. The OSBI Latent Evidence Unit will respond to the Office of the Chief Medical Examiner to collect impressions from deceased individuals. Occasionally, the LEU will collect impressions from deceased individuals at funeral homes. This procedure serves as a guideline for collection of impressions from deceased individuals in varying states of decomposition. At times, due to extensive damage or advanced decomposition, it may be necessary for the fingers/hands to be severed from the deceased individual and submitted to the laboratory for examination.

II. REFERENCES:

1. Federal Bureau of Investigation, Editor. The Science of Fingerprints. Washington, U.S.Government Printing Office. 1984.
2. Cowger, J.F. Friction Ridge Skin. New York. Elsevier Science Publishing Co., Inc. 1983.
3. Olsen, R.D. Sr. Scott's fingerprint mechanics. Springfield. Charles C. Thomas. 1978.
4. Uhle, A.J. and Leas, R.L. The Boiling Technique: A Method for Obtaining Quality Postmortem Impressions from Deteriorating Friction Ridge Skin, Journal of Forensic Identification (2007) 57:358-369
5. Chen, Chun-Chieh, et al. Comparison of Rehydration Techniques for Fingerprinting the Deceased after Mummification. *Journal of Forensic Sciences*, John Wiley & Sons, Ltd (10.1111), 10 Nov. 2016, onlinelibrary.wiley.com/doi/full/10.1111/1556-4029.13237.
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III. EQUIPMENT AND SUPPLIES:

1. All applicable personal protective equipment as per OSBI Policy #121.1, Appendix I.
2. Potassium Hydroxide
3. Sodium Carbonate
4. Ethanol
5. Deionized Water
6. Tongs or hemostats
7. Fume hood
8. Acetone
9. Camera and equipment
10. Casting Material (Mikrosil/Accutrans)
11. Forensic Light Source
12. Black Powder
13. Lifting Tape
14. Printers Ink
15. Ink Roller

16. Fingerprint spoon
17. Fingerprint card/strips
18. White copy paper
19. Hot plate (or equivalent)
20. Transparency Film
21. Tissue Builder
22. Chrome-coat cards
23. Isopropyl Alcohol

IV. REAGENT PREPARATION:

All reagents prepared in the laboratory will be prepared in a fume hood with applicable personal protective equipment as per OSBI Policy 121.1, Appendix I.

The following information will be recorded in the BEAST Chemical Inventory when reagents are prepared and their function is verified:

1. Name of reagent
2. Lot number
3. Expiration date
4. Name, amount, supplier, lot number, and expiration date of each component
5. Brief narrative detailing method for preparation
6. Identity of individual preparing the reagent
7. Date of preparation
8. Procedure used to verify the function of the reagent
9. Indication whether the reagent was acceptable or not
10. Identity of individual verifying the reagent
11. Date verification conducted and/or reagent approved for use

The OSBI Latent Evidence Unit has two reagents approved for use in casework to soften dry/desiccated skin. Instructions for the preparation of each are listed below.

A. Potassium Hydroxide Solution
   1. Dissolve 0.25 g of Potassium Hydroxide in 500 ml in deionized water.
   2. Store in screw cap storage bottle and label with contents, preparer's initials, lot number, and expiration.
   3. Shelf life is undetermined.
   4. A control cannot be performed for this reagent.

B. Sodium Carbonate Solution
   1. Dissolve 10 g of Sodium Carbonate in 684 ml of Deionized Water.
   2. Add 316 ml of Ethanol.
   3. Store in screw cap storage bottle and label with contents, preparer's initials, lot number, and expiration.
   4. Solution should be made fresh with each use and discarded when complete.
   5. A control cannot be performed for this reagent.

V. DESCRIPTION OF PROCEDURES:

A. Collecting Impressions to Confirm Identity:

1. Make sure the hands are clean and dry before inking. If necessary, cleanse the hands with soap and water, and dry thoroughly.
2. If rigor mortis has set in, you will need to "break the rigor". This can be done by holding the hand of the deceased person firmly with one hand and forcing the finger straight with the other hand. Do this with all ten fingers.
3. Apply fingerprint ink to the finger using an ink roller.
4. Place a fingerprint card strip in a fingerprint spoon and gently press the finger down in the appropriate square. The use of the spoon will result in a "rolled" impression without actually rolling the finger.
5. Collect impressions of all ten fingers using this method. If known prints of the individual are available for comparison, you may record as few impressions as necessary from the fingers to effect the identification.

B. Collecting Major Case Impressions for Criminal Investigation:

1. Major Case Impressions are the complete recording of all areas of friction ridge skin on the palmar surface to include the extreme tips, sides, and joints of the fingers and the entire palm area. This will also include collecting the fingerprint strips as described above.
2. Fold pieces of white copy paper into ¼ segments.
3. Apply fingerprint ink to the area of friction ridge skin that will be recorded.
4. Gently press the area of friction ridge skin against the white paper. (Chrome-coat cards may also be used.)
5. Review the inked impression to make sure it was recorded clearly. Mark the paper with the Finger or Palm that is being recorded.
6. Use a clean side of the paper for each finger and palm area being recorded.
7. Continue with this process until all areas of the palmar surface are recorded.
8. At times it may be necessary to collect impressions from the plantar surface as well.

C. Alternative Recording Methods:

1. Advanced Decomposition:
    a. Due to the state of decomposition, the use of fingerprint ink may not be effective at recording friction ridge skin.
    b. An alternative method would be to powder the finger and roll the powdered finger on a piece of lifting tape. To make the impression position correct, affix the lifting tape to a white background with sticky side up. Place another piece of tape over the sticky side. If the sticky side of the lift is placed down on the background, then the impression will be position reversed. The analyst will need to correct the position using digital enhancement software.
    c. Or roll the powdered finger on the sticky side of a mailing label and affix it to a sheet of transparency film.
    d. Mark with the appropriate finger/palm.
    e. If desired results are not obtained using the above procedures, photographs of the skin should be taken following LP-17.

2. Maceration: Occurs when the skin is water soaked and may cause swelling of the skin. It may also cause the separation of the epidermis (outer) skin from the dermis (inner) skin referred to as "gloving".
    a. If the epidermis is separated from the dermis and the epidermis is present, the examiner may slip the skin over their gloved finger/hand.
    b. Then roll the area in ink or powder as described above.
    c. If the skin cannot be placed on the examiner's gloved finger/hand it can be photographed following LP-17.
    d. The use of a casting material (Mikrosil/AccuTrans) may also be useful.
    e. If the epidermis is not present, then the following "Boiling Method" may be applied to the dermal layer. This method reconditions the skin, enhancing and exposing friction ridge detail:
        1) Gently cleanse the fingers/hand.
        2) Fill a microwavable container with enough tap water to completely submerge the finger/hand.
        3) Microwave the water until it starts to boil.
        4) Place the finger/hand into the container of water for 5 seconds.
        5) Remove the finger/hand, and observe whether friction ridge detail is present.
        6) If no detail is visible, place the finger/hand back into the water for another 5 seconds.
        7) This process should not be repeated more than 3 times because prolonged exposure to intense heat will harm the skin.
        8) ***If the friction ridge skin on the hand contains abrasions or cuts, an alternate form of the procedure should be used. Placing the finger/hand that has cuts into boiling water will increase the size of any cuts and may cause further damage to the skin.***
        9) Instead of placing the finger/hand into the boiling water, the examiner may use a pipette to control the flow of boiling water over the finger/hand. This will have the same effect but will allow the examiner more control over the reconditioning process.
        10) After the friction ridge skin has been sufficiently reconditioned, dry the finger/hand using a blow dryer (warm setting) or by pouring isopropyl alcohol on the finger/hand and blotting with towels.
        11) Powder the finger/hand with black fingerprint powder.
        12) Roll the finger/hand over lifting tape or a mailing label.
        13) If using lifting tape, to make the impression position correct, affix it to a white background with sticky side up. Place another piece of tape over the sticky side. If the sticky side of the lift is placed down on the background, then the impression will be position reversed. The analyst will need to correct the position using digital enhancement software.
        14) If using a mailing label, affix to a sheet of transparency paper.
        15) NOTE: Examiners should be aware that recordings of dermal prints will appear different than epidermal prints. Dermal ridges consist of double rows of papillae pegs, which the examiner must follow in dermal impressions to ascertain ridge path for comparison.
        16) If desired results are not obtained using the above procedures, photographs of the skin should be taken following LP-17.

3. Deep Wrinkling/Creasing of the Skin:

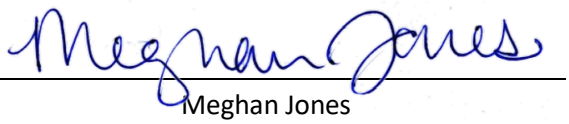
a. If the skin is still flexible this can be overcome by grasping the skin on the back of the finger and pinching to remove the wrinkles.
b. Wrinkles in the palm can be overcome by bending the fingers backward.
c. If this is not effective, then tissue builder may be injected into the finger or palm. This will cause the digit or area of palm to expand, removing the wrinkles and allowing for complete recording of the area.
d. The use of a casting material such as Mikrosil or AccuTrans may also be used to record the friction ridge skin.

4. Desiccated/Mummified hands: If the skin has become hardened or wrinkled, it is sometimes possible to distend or swell the flesh by soaking the finger in a solution of Sodium Carbonate or Potassium Hydroxide. Sodium Carbonate has shown to be faster and develop improved ridge detail in comparisons to Potassium Hydroxide. Sodium Carbonate/Potassium Hydroxide should be used in the following manner:
    a. Soak the finger/hand in a solution of Sodium Carbonate or Potassium Hydroxide.
    b. After the finger/hand has been in the solution for approximately 1 hour, it should be removed and examined in order to note the extent of the swelling and the reaction of the flesh to the solution.
    c. If no material change is noted, the finger/hand is returned to the solution.
    d. There is no set time for this process, and there is a possibility of the skin being damaged. Therefore, the finger/hand should be examined frequently until desired results are obtained. The complete process may take from several hours to as much as 10 days.
    e. Once desired results are obtained, the finger/hand may be too wet to print properly. The finger/hand can be dried by dipping it into acetone for several seconds, removed, and permitted to dry.
    f. Normal collection procedures (photography, ink, or powder) may then be applied.
    g. The use of a casting material such as Mikrosil or AccuTrans may also be used to record the friction ridge skin.

VI. NOTES

A. The wide possible conditions affecting the collection of postmortem impressions precludes predictable results of any method, but with care and patience, adequate friction ridge detail can be obtained.
B. If desired results are not obtained using any of the above procedures, photographs of the skin should be taken.
C. The skin may be removed from the finger to assist in photography/printing.
D. A large cylindrical object can be useful in collecting known palm prints and fingerprints by attaching a piece of paper to the object and rolling it across the palms and the fingers of the hands.
E. If adipocere (a gray-ish white postmortem wax) is on the hands, it can be cleaned off by using methanol.

APPROVAL

LEU Technical Manager  Date 02-08-2024

Meghan Jones

Criminalistics Quality Manager  Date 02/08/2024

Barbara Wells

Criminalistics Division Director  Date 02/08/2024

Janice Joslin

HISTORY

Rev #	Effective Date	History
00	12-31-2023	Reorganized, renumbered, and reformatted entire Manual to combine the LEU Quality Manual and LEU Policies into one document. Added a table of contents and consistent font type/size formatting.
01	02-12-2024	• Removed list of case circumstances from section XI. Partial Analysis. • Added definition of Open Verification. • Revised section VI. Latent Print Examinations_Verification. • Revised section VIII. Conflict Resolution under Latent Examination. • Removed X. Individual Characteristic Database_G. Documentation_2. • Addition of attachment QPA8 – Change to Conclusion Form and references to use form in Latent Print and Footwear Conflict Resolution sections. • Revision of LP-16 VMD section VIII Sequential Processing. • Revised section J. Conflict Resolution under Footwear Examination. See Tracked Changes Document in QMS for Details.