



WASHINGTON STATE PATROL

Latent Prints Technical Manual

CRIME LABORATORY DIVISION

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1.0 SCOPE

This document defines the technical procedures for the examination of evidence submitted for latent print processing and/or friction ridge analysis and comparison.

Examinations which only include comparisons of known recordings of a person's friction ridge detail are normally the purview of the WSP Identification Section. All requests for this type of examination should be forwarded to the Identification Section, unless case circumstances dictate otherwise.

1.1 GOALS

- Describe methods for developing and preserving friction ridge impressions on various surface types
- Describe a method for friction ridge examinations and the basis for conclusions

1.2 OBJECTIVES

- Establish principles and procedures for the processing of latent print evidence
- Establish principles by which latent print examinations are conducted
- Establish a method for latent print examination
- Establish the conclusions that may result from an examination

2.0 REFERENCES

- AAFS Standards Board (ASB) Friction Ridge Standards
- ADAMS User Manual
- Fingermark Visualization Manual, Home Office, 2014
- International Standard ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories, and ANAB Supplemental Documents, Forensic Science Testing Laboratories Accreditation Requirements
- Processing Guide for Developing Latent Prints, U.S. Department of Justice, FBI, 2000
- Scientific Working Group on Friction Ridge Analysis, Study, & Technology (SWGFAST) Guidelines
- The Organization of Scientific Area Committees (OSAC) for Forensic Science Friction Ridge Subcommittee Best Practice Recommendations and Standards
- The Science of Fingerprints, U.S. Department of Justice, FBI, 1984
- WSP CLD Forensic Services Guide
- WSP CLD LIMS Manual
- WSP CLD Quality-Operations Manual (QOM)
- WSP CLD Safety Manual
- WSP Regulations Manual
- WSP Safety and Wellness Manual

3.0 TERMS AND DEFINITIONS

ABIS

The acronym for Automated Biometrics Identification System, a generic term for a finger/palm print matching, storage, and retrieval system, which may include other biometric data.

ABIS Databases

Various databases available to the Latent Prints discipline for searching friction ridge skin impressions. For example: WIN, CAL-DOJ, and NGI.

ACE-V:

The acronym for Analysis, Comparison, Evaluation, and Verification; an examination methodology.

AFIS

The acronym for Automated Fingerprint Identification System, a generic term for a finger/palm print matching, storage, and retrieval system.

Alternate light source (ALS):

A light source used to excite luminescence of latent prints, body fluids, chemical reagents, etc.

Analysis:

The first step of the ACE-V method. The interpretation of observed data in a friction ridge impression in order to categorize its utility.

Anatomical source:

An area of friction ridge skin from an individual from which an impression originated.

Arch – plain

A pattern type in which the friction ridges enter on one side of the impression and flow, or tend to flow, out the other side with a rise or wave in the center.

Arch – tented

A pattern type that possesses either an angle, an upthrust, or two of the three basic characteristics of the loop.

Artifact

Any information not present in the original object or image, inadvertently introduced by image capture, processing, compressions, transmission, display, or printing.

Bifurcation

The point at which one friction ridge divides into two friction ridges.

Blind verification

A type of verification in which the subsequent scientist(s) has no knowledge of the original scientist's decisions, conclusions or observed data used to support the conclusion.

Bridge

A connecting friction ridge between, and generally at right angles to, parallel running friction ridges.

Candidate:

An individual's finger or palm print record under consideration for comparison to the latent as a result of an ABIS search.

Characteristic:

Distinctive details of the friction ridges (also known as features).

Clarity:

Visual quality of a friction ridge impression.

Cognitive bias:

The effect of perceptual or mental processes on the reliability and validity of one's observations and conclusions.

Comparison:

The second step of the ACE-V method. The search for and detection of similarities and differences in observed data between two potentially corresponding friction ridge impressions.

Competency:

Possessing and demonstrating the requisite knowledge, skills, and abilities to successfully perform a specific task.

Complete friction ridge exemplars:

A systematic recording of all friction ridge detail appearing on the palmar sides of the hands. This includes the extreme sides of the palms, finger segments, tips, and sides of the fingers (also known as major case prints).

Conclusion:

Determination made during the evaluation stage of ACE-V, including source identification, inconclusive, and source exclusion.

Confirmation bias:

The tendency to search for data or interpret information in a manner that supports one's preconceptions.

Conflict:

A condition in which two or more scientists disagree on a suitability decision or source conclusion.

Consensus determination or conclusion:

A type of examination in which a reported decision or conclusion reflects the collective judgement (i.e. majority) of a group of scientists.

Contextual bias:

The effect of information or outside influences on the evaluation and interpretation of data.

Control:

A known standard or preparation for checking or verifying a test reagent.

Core:

1. The approximate center of a fingerprint pattern.
2. A specific formation within a fingerprint pattern, defined by classification systems such as Henry.

Correspondence:

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

Delta:

The point on a friction ridge at or nearest to the point of divergence of two type lines, and located at or directly in front of the point of divergence. Also known as a tri-radius.

Deviation:

1. A change in friction ridge path.
2. An alteration or departure from a documented policy or standard procedure.

Discrepancy:

The presence of friction ridge detail in one impression that does not exist in the corresponding area of another impression.

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.

Dissimilarity:

A difference in appearance between two friction ridge impressions.

Dissociated ridges:

Disrupted, rather than continuous, friction ridges.

Distal Phalanx:

The end segment (furthest from the palm) of a finger or thumb. This segment of the finger or thumb is recorded on a typical fingerprint card.

Distortion:

Variances in the reproduction of friction ridge skin caused by factors such as pressure, movement, force, and contact surface.

Dot:

An isolated friction ridge whose length approximates its width in size.

Edgeoscopy:

1. Study of the morphological characteristics of friction ridges.
2. Contour or shape of the edges of friction ridges.

Elasticity:

The ability of skin to recover from stretching, compression, or distortion

Elimination prints:

Exemplars of friction ridge skin detail of persons known to have had legitimate access to an object or location.

Enclosure:

A single friction ridge that bifurcates and rejoins after a short course and continues as a single friction ridge.

Ending ridge:

A single friction ridge that terminates within the friction ridge structure.

Erroneous exclusion:

The incorrect determination that two areas of friction ridge impressions did not originate from the same source.

Erroneous identification:

The incorrect determination that two areas of friction ridge impressions originated from the same source.

ESSO (External Search System Other):

ABIS databases that are searchable through the WIN system but are not part of the WIN or NGI system.

Evaluation:

The third step of the ACE-V method. The weighting of the 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.

Exclusion:

See source exclusion.

Exemplars:

The prints of an individual, associated with a known or claimed identity, and deliberately recorded electronically, by ink, or by another medium (also known as known prints).

Fingerprint:

An impression of the friction ridges of all or any part of the finger.

Focal Points:

1. In classification, the core(s) and the delta(s) of a fingerprint.
2. Another term for target group.

Forensic light source:

See alternate light source.

Friction ridge:

A raised portion of the epidermis on the palmar or plantar skin.

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.

Furrows:

Valleys or depressions between friction ridges.

Galton details:

Term referring to friction ridge characteristics (also known as minutiae) attributed to the research of English fingerprint pioneer, Sir Francis Galton.

Ground truth:

Definitive knowledge of the actual source of an impression.

Henry classification:

An alpha-numeric system of fingerprint classification named after Sir Edward Richard Henry used for filing, searching, and retrieving tenprint records.

Identification:

See source identification.

Impression:

Friction ridge detail deposited on a surface or the result of ridge detail removing a matrix from a surface.

Incipient ridge:

A friction ridge not fully developed that may appear shorter and thinner than fully developed friction ridges.

Incomplete:

The determination during comparison that the exemplars are inadequate in either quantity or quality.

Inconclusive/Lacking support:

The conclusion that the observations do not provide a sufficient degree of support for one proposition over the other.

Integra ID:

The NEC ABIS software.

Interpretation:

Explanations for the observations and data.

Joint (of the finger):

The hinged area that separates segments of the finger.

Known prints (finger, palm, foot):

The prints of an individual, associated with a known or claimed identity, and deliberately recorded electronically, by ink, or by another medium (also known as exemplars).

Laser

A device that emits high-intensity light at a narrow band of wavelength that is used for detection or viewing of fingerprints, trace evidence, and fluorescing reagents.

Latent Print:

1. Impression of friction ridge detail not readily visible.
2. Generic term used for unintentionally deposited friction ridge detail.

Lift:

An adhesive or other medium used to transfer and retain a friction ridge impression from a substrate.

Live Scan:

Electronic recording of friction ridges.

Loop:

A pattern type in which one or more friction ridges enter upon one side, recurve, touch or pass an imaginary line between delta and core and flow out, or tend to flow out, on the same side the friction ridges entered. Types include left slant loops, in which the pattern flows to the left in the impression; right slant loops, in which the pattern flows to the right in the impression; radial loops, in which the pattern flows in the direction of the radius bone of the forearm (toward the thumb); and ulnar loops, in which the pattern flows in the direction of the ulna bone of the forearm (toward the little finger).

Macroscopic features:

Developmentally stable features of friction ridge skin which can typically be seen without magnification. These features are frequently shared in the population and therefore have low diagnosticity for establishing identity.

Major case print:

See complete friction ridge exemplars.

Mated impressions:

Impressions intentionally collected to originate from the same source, and used for the purpose of measuring error rates.

Matrix:

The substance that is deposited or removed by the friction ridge skin when making an impression.

Medial phalanx:

The middle segment of a finger.

Microscopic features:

Features which tend to display high levels of variation and typically require magnification to be seen. These features are not frequently shared in the population so they typically can be used to distinguish one area of friction ridge skin from another.

Minutiae:

The point where a friction ridge begins, terminates, or splits into two or more ridges.

Missed exclusion:

The failure to make a source exclusion when the data supports that conclusion (includes false positive, non-consensus inconclusive, and non-consensus no value).

Missed identification:

The failure to make a source identification when the data supports that conclusion (includes false negative, non-consensus inconclusive, and non-consensus no value).

Non-consensus determination of no value:

Decisions of no value that conflict with the consensus.

Non-consensus determination of suitability:

When a scientist's determination of suitability does not concur with consensus. Suitability determinations include non-consensus no value, and non-consensus value decisions.

Non-consensus determination of value:

Decisions of value that conflict with the consensus.

Non-consensus exclusion conclusion:

When a scientist reaches a decision of exclusion that conflicts with the consensus, exclusive of false negative errors.

Non-consensus inconclusive conclusion:

When a scientist reaches a decision of inconclusive that conflicts with the consensus, exclusive of false positive and false negative errors.

Non-consensus identification conclusion:

When a scientist reaches a decision of identification that conflicts with the consensus, exclusive of false positive errors.

Non-mated impressions:

Impressions intentionally collected to originate from different sources, and used for the purpose of measuring error rates.

Observed data:

Any demonstrable information observed within an impression that a scientist 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 scientist has access to the original scientist's decisions, conclusions or observed data used to support the conclusion.

Original image:

An accurate replica (pixel for pixel) of the primary image.

Palmprint:

An impression of the friction ridges of all or any part of the palmar surface of the hand.

Patent print:

Friction ridge impression of unknown origin, visible without development.

Pattern classification:

Sub-division of pattern type, defined by classification systems such as Henry or National Crime Information Center (NCIC) classifications.

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.

Pattern type:

Fundamental pattern of the ridge flow: arch, loop, whorl. Arches are subdivided into plain and tented arches; loops are subdivided into left and right loops; whorls are subdivided into plain whorls, double loop whorls, central pocket loop whorls, and accidental whorls.

Phalanx/Phalange:

1. A bone of the finger, thumb, or toe.
2. Segment of a finger or thumb.

Plastic print:

Friction ridge impression of unknown origin that is impressed in a soft substrate to create a three-dimensional impression.

Pores:

Small openings in the skin through which perspiration is released.

Poroscopy:

A study of the size, shape, and arrangement of pores.

Preserved impression:

Casting, photography, lifting, or other method used to capture a latent impression for further examination.

Primary image:

The first recording of an image onto media.

Probability:

Probability is an expression of the chance that a particular event occurs. For the purposes of this manual, probability is subjective – the degree of belief or confidence placed in the occurrence of an event by the professional judgement of an individual based on the available evidence.

Proficiency:

The ongoing demonstration of competency.

Proximal phalanx:

The segment of a finger or thumb attached to the palm.

Quality:

The clarity of information contained within a friction ridge impression.

Quantity:

The amount of information contained within a friction ridge impression.

Rarity (of a feature type):

The frequency that a 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.

Reagent:

Substance used in a chemical reaction to detect, examine, measure, or produce other substances.

Relative Position:

Proximity of characteristics to each other.

Ridge flow:

The direction of the friction ridges. May lack a classifiable pattern.

Ridge path:

The course of a single friction ridge.

Ridgeology:

The study of the uniqueness of friction ridge skin and its use for personal identification.

Segment (of the finger):

The proximal, medial, or distal section of the finger.

Short ridge:

A single friction ridge beginning, traveling a short distance, and then ending.

Simultaneous impression:

Two or more friction ridge impressions from the same hand or foot deposited concurrently.

Source:

An area of friction ridge skin on an individual from which an impression originated.

Source conclusions:

Findings or statements expressed as opinion and made by a scientist after interpretation of observed data. They may offer support for one proposition over another. The following source

conclusions are used by the WSP Latent Prints Section: source exclusion, inconclusive/lacking support, or source identification.

Source exclusion:

The conclusion that the observed data provide substantially stronger support that the two impressions originated from different sources rather than from the same source. There is a strong disagreement present such that the scientist would not expect to see that level of disagreement in an impression from the same source.

This may also be referred to as exclusion.

Source identification:

The conclusion that the observed data provides substantially stronger support that the two impressions originated from the same source rather than different sources. There is strong correspondence present such that the scientist would not expect to see the same arrangement of details repeated in an impression from another source.

This may also be referred to as identification.

Spur:

A bifurcation with one short friction ridge branching off a longer friction ridge.

Stand-alone:

A segment of a simultaneous impression that has sufficient information to arrive at a conclusion of identification independent of other impressions within the aggregate.

Stock solution:

Concentrated solution diluted to prepare a working solution.

Strength of the evidence:

A means of describing the weight of support the evidence lends to one source proposition over the other.

Substrate:

The surface upon which a friction ridge impression is deposited.

Sufficiency:

The product of the quality and quantity of the objective data under observation (e.g., friction ridge, crease, and scar features).

Sufficient:

The determination that there is sufficiency in a comparison to reach a conclusion at the evaluation stage.

Suitable:

A decision made by a scientist as to whether or not an impression will proceed to the next step in the examination process.

Suitable for comparison:

A decision is made by a scientist 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 "of value for comparison".

Target group:

A set of friction ridge features selected as a starting point during comparison.

Tenprint:

1. A generic reference to examinations performed on intentionally recorded friction ridge impressions.
2. A controlled recording of an individual's available fingers using ink, electronic imaging, or other medium.

TLI:

Tenprint-to-Latent Inquiry. ABIS function that searches a tenprint card against the finger portion of the Unsolved Latent Database.

TLIP:

Tenprint-to-Latent Inquiry – Palm. ABIS function that searches a palm print card against the palm portion of the Unsolved Latent Database.

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 within the expected variability are said to be "within tolerance" while two impressions that are outside are said to be "out of tolerance".

Trifurcation:

The point at which one friction ridge divides into three friction ridges.

Type lines:

The two innermost friction ridges associated with a delta that parallel, diverge, and surround or tend to surround the pattern area.

Universal Latent Workstation (ULW):

FBI software used to format searches and review search results from the NGI system.

Unstable features

Acquired features that are temporarily present in the skin as a result of wound healing or disease.

Utility

The usefulness of an impression for a further step in the examination process, such as comparison or database entry.

Verification:

The confirmation by another scientist that a conclusion or opinion conforms to specified requirements and is reproducible.

Whorl – accidental:

1. A pattern type consisting of the combination of two different types of patterns (excluding the plain arch) with two or more deltas.
2. A pattern type that possesses some of the requirements for two or more different types of patterns.
3. A pattern type that conforms to none of the definitions of a pattern.

Whorl – central pocket loop:

A pattern type that has two deltas and at least one friction ridge that makes, or tends to make, one complete circuit, which may be spiral, oval, circular, or any variant of a circle. An imaginary line drawn between the two deltas must not touch or cross any recurving friction ridges within the inner pattern area.

Whorl – double loop:

A pattern type that consists of two separate loop formations with two separate and distinct sets of shoulders and two deltas.

Whorl – plain:

A fingerprint pattern type that consists of one or more friction ridges that make, or tends to make, a complete circuit, with two deltas, between which, when an imaginary line is drawn, at least one recurving friction ridge within the inner pattern area is cut or touched.

Working solution:

Solution at the proper dilution for processing.

4.0 PHYSICAL EVIDENCE EXAMINATION

The primary purpose of these procedures is to ensure quality and efficiency by establishing examination, documentation, and collection procedures.

Latent print processing is a qualitative method and uncertainty of measurement does not apply.

4.1 SAFETY

All personnel shall utilize appropriate safe work practices when handling chemicals and solvents.

Safe work practices include:

- Wearing personal protective equipment such as gloves, laboratory coat, eye protection, etc. when handling any chemicals
- Making sure that all engineering controls such as ventilation hoods, chemical storage cabinets, etc. are used properly
- Utilizing clean work habits such as washing hands after the preparation of chemical solutions (even though gloved), no eating or drinking in chemical processing areas, etc. during daily work procedures

When using the laser, all persons in the room must be wearing argon goggles and a sign shall be posted on all access doors indicating the laser is in use.

Specific safety practices regarding personal protective equipment and work practice controls are outlined within each processing technique described in section 5 of this manual.

Safety practices regarding engineering controls, biohazards, the disposal of chemicals, etc. are outlined in the local laboratory policies, WSP Safety and Wellness Manual, CLD Safety Manual, and/or the WSP CLD MSDS or SDS library(s).

All evidence shall be considered potentially hazardous and shall be handled accordingly.

4.2 EVIDENCE EXAMINATION

The assigned scientist is primarily responsible for the detection and preservation of friction ridge skin impressions. The scientist must also remain cognizant of, and possibly collect, other probative evidence.

These procedures do not address each and every situation or type of evidence encountered. Flexibility to determine an appropriate course of action is necessary; therefore, these procedures are designed to accommodate the majority of evidence encountered.

Any discussion with a scientist from another section regarding evidence examination on a specific case will be described in the case record, including the name and date.

Each item of evidence will be visually examined prior to any testing and after each technique employed.

Some techniques require the use of an alternate light source for examination; however, the scientist may examine the evidence with an alternate light source at any time during the examination.

The following should be considered when determining the processing sequence for an item:

- The impact of the examination for other forensic analyses which may be required.
- The invasiveness of the technique. Generally, processing should start with the least invasive technique and move to the most invasive technique.
- The surface type of the item (porous, semi-porous, or non-porous).
- The color of the surface to determine which technique will provide suitable contrast for the detection of impressions.
- The texture of the surface to determine whether developed impressions will require imaging for preservation. In such a case, use a technique that will provide the best contrast.
- Which matrix (sweat, blood, dirt, oil, amino acids, lipids, etc.) may have been deposited or will best be developed on the surface of the item.

The aforementioned considerations will work in conjunction with the following general processing sequence guidelines to allow the scientist the flexibility to determine the best course of action:

Porous Surfaces

1. Visual examination
2. DFO
3. Ninhydrin
4. Physical Developer

Semi-Porous Surfaces

1. Visual examination
2. Cyanoacrylate
 - If targeting latent prints in blood, it is best to not fume the item with cyanoacrylate.
3. Powder processing
4. DFO
5. Ninhydrin
6. If targeting latent prints in blood: Acid Yellow or Amido Black

Non-Porous Surfaces

1. Visual examination
2. Cyanoacrylate
 - If targeting latent prints in blood, it is best to not fume the item with cyanoacrylate.
3. Powder processing and/or dye stain (not necessarily in order)
4. If targeting latent prints in blood: Acid Yellow or Amido Black

Adhesive Surfaces

1. Visual examination
2. Powder suspension

Once an impression that is potentially suitable for comparison has been detected or developed, it shall be preserved. If the quality of the impression is improved by subsequent development techniques, the impression shall be preserved again.

Developed impressions may be preserved either by imaging, lifting, or casting.

The scientist may, at any time, determine that an item has been tested to its full potential.

4.2.1 CONTROLS

A positive control must be obtained either prior to use each day or concurrent to evidence processing for all reagents.

If a control test is negative, re-test the reagent a second time. If the negative test is repeated, the reagent will be labeled as 'Out of Service,' set aside without use, and the supervisor shall be notified.

If a control test that was processed concurrently with evidence is negative, but additional observations indicate that the processing reagent functioned properly, then the scientist will document the observations and may proceed with the examination.

4.2.2 ITEMS WITH ADDITIONAL REQUESTS FOR DNA OR BIOCHEMICAL EXAMINATION

Evidence items which include (or may include) a request for DNA and/or biochemical examination shall be handled in a manner to prevent loss, alteration, contamination, or mixing. Examination areas shall be cleaned thoroughly using 10% bleach or another appropriate laboratory cleaner before commencing examinations. Each separate item shall be examined on a clean surface (e.g. bench paper, labmat, etc.), and caution should be taken to avoid placing exterior packaging on examination surfaces designated for evidence items.

Scientists will wear lab coat, gloves, and mask or plexiglass shield while handling evidence items that may be forwarded for DNA and/or biological examinations both to preserve the integrity of the evidence and for personal protection. Gloves will at least be changed between handling evidence items, between handling tools/equipment and evidence items, and when moving from one examination room to another. Bleaching/cleaning of gloves may be employed during the examination (e.g. when switching between item handling, taking notes, or photography) in addition to changing gloves. Lab coats shall be changed if they become soiled or contact evidence. Lab coats shall be routinely laundered (contaminated lab coats shall be placed in a laundry receptacle). Disposable lab coats may be utilized and will be disposed of after use. Masks should be changed daily and anytime they become soiled.

All items and equipment must be sufficiently cleaned prior to coming into contact with evidence to prevent DNA cross contamination. Tools such as scissors, scalpels, forceps, and binder clips must be cleaned before use and thereafter between uses on each subsequent item of evidence. Fuming chambers shall have been decontaminated with UV lights before use. Ovens shall be cleaned before use.

In general, evidence may be visually examined, fumed with cyanoacrylate (or fluorescent cyanoacrylate), and dusted with a clean powder (utilizing a clean or single use brush) prior to forwarding the evidence to the DNA section. If an impression will be preserved, it should be photographed, but may be lifted if necessary.

Extreme caution should be practiced when examining and imaging evidence for friction ridge skin impressions due to the close proximity of the scientist's face with the evidence.

If needed, consult with the appropriate regional DNA section.

Collecting a portion of the item

If the entire item will not be sent for examination by a DNA scientist, a portion of the item may be removed. This method is preferred if it is necessary to preserve a stain pattern on a large item. A large enough area around the stain/pattern should be taken to avoid having the cutting instrument come in close contact with the biological material.

Removing the biological material from the item

Visible staining: If the item (or a portion of the item) will not be sent for DNA examination, the visible stain may be transferred off the object by swabbing(s) or scraping.

- Swabbing: Moisten a DNA free cotton swab with clean water (not dripping wet, just moist enough to dissolve the stain) and rub the stain. If the stain is small, collect it on a small area of the swab. Collect larger stains on as many swabs as necessary. Use a dry swab afterward to collect any remaining residue. If a moistened swab(s) is used, let it air dry.
- Scraping: If the body fluid can be easily flaked off a surface, use a new/sterile scalpel or razor blade and scrape it onto a clean piece of paper. If more than one stain is to be collected, use a new/sterile blade for each scraping. Present day testing is so sensitive that contamination of the blade from the previous stain may be detected. Fold and tape the paper closed.

Non-visible biological material: If the item (or a portion of the item) will not be sent for DNA examination, but a non-visible stain or cellular/contact material is suspected to be present, the area may be swabbed.

If the stain is not visible, or to collect cellular/contact material from an item, moisten a DNA free cotton swab with clean water (not dripping wet) and swab the area on the item. Use a dry swab afterward to collect any remaining residue. This technique is referred to as the "wet/dry technique". If a moistened swab(s) is used, let it air dry.

Cuttings and swabs will be packaged in clean boxes or envelopes. Swab boxes can be packaged together as one item. The collected items will be documented in the case notes and described in the report. The items will be given a unique identifier and entered into the chain of custody.

4.3 DEVELOPING LATENT PRINTS ON HUMAN SKIN

4.3.1 LIFT TRANSFER METHOD

For live victims, a piece of black plastic or RC photo paper developed as black can be held against areas suspected as possibly bearing latent prints. Other nonporous surfaces such as a mirror, glass, or metal plate may be used instead of photo paper. A sponge or soft pad should be placed between the scientist's hand and the photo paper to improve contact with the victim's skin.

Hold the transfer surface against the skin for 15 to 20 seconds. The nonporous transfer surface should then be cyanoacrylate fumed to develop latent prints which may have transferred. Condensation on the body is acceptable as any water in the latent print residue will aid polymerization with cyanoacrylate fumes.

After cyanoacrylate fuming, further development of the nonporous transfer surface should include luminescent dye stain, alternate light source excitation, and (lastly) powder rubbing.

For deceased victims, the body's skin surface should be between 72°F and 80°F for optimal fatty/waxy impression transfer. Warm the lift card or other transfer medium with a portable hair dryer just before lifting (warming it to above 86°F has been suggested by some researchers).

4.3.2 CYANOACRYLATE FUMING CADAVERS

Ideally the body should not be refrigerated prior to fuming because moisture can destroy impressions that might otherwise be developed. If already refrigerated, permit all condensation moisture to evaporate upon removing the body from the cold locker/drawer.

An airtight plastic tent can be assembled over the body and fumed with cyanoacrylate. A small, battery powered fan may be used to help with fume distribution.

After fuming, dust the body using a contrasting color powder. Developed impressions shall be imaged for preservation.

4.4 DOCUMENTATION

All digital images, photographs, and latent lifts, whether submitted or lab-generated, must be assigned a unique identifier and shall be documented in the case notes. Digital file names or lift numbers previously assigned by the submitting agency should be used as identifiers when provided.

Every lift and printed image must be labeled with the unique lift or image number, the laboratory case number, and the scientist's initials.

A legible copy of all lifts (scanned or imaged) or images containing impressions suitable for comparison shall be retained in the case record.

All relevant observations, such as conditions that may affect friction ridge impression recovery, shall be recorded in the case notes. If other types of potentially probative evidence is observed, notes shall indicate what was observed and any subsequent action taken. Digital images can supplement notes.

Case notes will include each examination activity, the date, and the results, if applicable, of each step of the examination process. Examination activities include but are not limited to: processing/development techniques, digital imaging, lifts, ABIS searches, retrieval of exemplars, and analysis and comparison of impressions.

Each positive control, including the source (natural oils, reference pads, blood) for each control and the substrate used, must be documented.

Lifts and digital images generated in the laboratory must contain sufficient documentation to indicate where the lift or image originated and to properly orient it; documentation may be in the form of any combination of written notes, sketches, and photographs.

Evidence items generated during casework will be handled in accordance with the QOM and the LIMS Manual. A new parent evidence item should be used in the following circumstances: lifts or evidentiary digital images are generated; trace, biological material, or any other item is removed from multiple evidence items. A new child evidence item should be created when trace, biological material, or any other item is removed from a single evidence item.

5.0 PROCESSING TECHNIQUES AND FORMULARIES

Exact measurements and proportions when preparing chemical solutions are desirable for consistent quality, but successful results in developing latent fingerprints are not dependent upon unequivocal accuracy. Recipes may be scaled as appropriate without changing the ratios.

5.1 LATENT PRINT PROCESSING TECHNIQUES

5.1.1 ACID YELLOW 7

Acid Yellow 7 is a fluorescent dye that stains blood to give a yellow colored product. This technique is used to develop latent prints in blood on dark, non-porous surfaces.

CONTROL TEST

Deposit blood onto a dark non-porous substrate and process with Acid Yellow. A positive test will result in a developed control print in contrast to the background color when viewed with the alternate light source.

PROCEDURE

The prints must be fixed prior to staining by using a blood fixative. Hold a dry piece of absorbent paper over the print area and drop one edge to the surface of the solution. Working from the wet edge, progressively wet the paper while smoothing onto the substrate. When completely covered, leave the wet paper on for at least three minutes and then remove it. Apply the staining solution directly on the item using a pipette or immersion. Leave the staining solution in contact with the print area for one-three minutes, then wash with the wash solution.

Examine the evidence under the alternate light source at 400nm-495nm using a yellow or light orange filter.

PRESERVATION METHOD

Photography - Developed impressions shall be imaged for preservation within a couple of hours after processing as they will become blurry over time.

REAGENT PREPARATION

Equipment

Balance, beakers, graduated cylinder, magnetic stirrer and stirring bar or other stirring device, clear or dark storage bottles. An Erlenmeyer flask is preferred for the preparation of the Acid Yellow 7 Staining Solution.

Reagents

- **Acid Yellow 7 Staining Solution:**

- 1g Acid Yellow 7
- 50mL Acetic Acid (Glacial, 98%)
- 250mL Ethanol (98% or higher)
- 700mL demineralized or distilled water

Add water first and dissolve the Acid Yellow 7 powder in the water by swirling the flask or using a magnetic stirrer and stir bar. The powder will dissolve quickly. Then add ethanol and acetic acid (order not important).

- **Blood Fixative:**

- 20g 5-Sulfosalicyclic acid, dihydride
- 1000mL demineralized or distilled water

Add components to a beaker/flask of sufficient size and mix until complete dissolution, using a magnetic stirrer.

- **Wash Solution**

50mL Acetic Acid (Glacial, 98%)
250mL Ethanol (98% or higher)
700mL demineralized or distilled water

STORAGE

Clear or dark bottles

SHELF LIFE

Twelve months

5.1.2 AMIDO BLACK

Amido Black, also known as naphthol blue-black, is a dye that stains proteins present in blood to give a blue-black product and is used to develop or enhance latent prints that have been left in blood on both porous and non-porous surfaces.

CONTROL TEST

Deposit blood onto a light colored substrate and process with Amido Black. A positive test will result in the development of a blue/black print.

PROCEDURE

Methanol Based

Methanol based Amido Black can be used on both porous and non-porous surfaces, and is preferred for painted surfaces. Be certain that the blood is completely dry prior to application. The developer solution can be applied by immersion or using a sprayer or squirt bottle. After 30 to 90 seconds, rinse with the de-staining solution. Apply a final rinse of distilled water (or tap water if necessary) as needed. Allow the item to air dry.

Water Based

Water based Amido Black can be used on both porous and non-porous surfaces, but is not recommended for painted surfaces. Apply the blood fixative solution and allow it to remain on the surface for five minutes. The developer solution can be applied by immersion or using a sprayer or squirt bottle. Allow the developer solution to remain on the surface for three minutes. De-stain with the citric acid stock solution. Additionally rinse with distilled water (or tap water if necessary) as needed. Allow the item to air dry.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Equipment

Balance, beakers, graduated cylinder, magnetic stirrer and stirring bar or other stirring device, clear or dark storage bottles.

Reagents

Methanol Based

- **Developer Solution:**

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2 g Naphthol Blue Black
100 mL Glacial Acetic Acid
900 mL Methanol

Combine the above and mix on a stir plate until all the Naphthol Blue Black is dissolved (approximately 30 minutes).

- **De-staining solution:**

100 mL Glacial Acetic Acid
900 mL Methanol

Water Based

- **Blood fixative:**

20 g 5-Sulphosalicyclic Acid
1000 mL distilled water

Combine the above and mix on a stir plate until the acid is dissolved.

- **Citric Acid Stock Solution:**

38 g Citric Acid
2 L distilled water

Combine the above and mix on a stir plate until the citric acid is dissolved.

- **Developer Solution:**

1 L Citric Acid stock solution
2 g Naphthol Blue Black
2 mL Kodak Photo Flo 200 Solution

While stirring the citric acid stock solution, slowly add 2 grams of Naphthol blue black and stir for approximately 30 minutes. Add the Photo Flo 200 and stir lightly.

STORAGE

Clear or dark bottles

SHELF LIFE

Indefinite

5.1.3 BASIC YELLOW 40

Basic Yellow 40 is a fluorescent dye stain used for latent print luminescence in conjunction with alternate light sources and cyanoacrylate fuming on non-porous surfaces. The dye stain does not develop friction ridge skin detail; it merely improves the contrast of cyanoacrylate enhanced prints.

CONTROL TEST

Utilize a positive test from cyanoacrylate processing or use a fumed sebaceous control print on a medium of choice and process with Basic Yellow. A positive test will result in a developed control print in contrast to the background color when viewed with the alternate light source.

PROCEDURE

It is recommended that the evidence be under-fumed, rather than over-fumed. Test a small section of the surface with Basic Yellow before applying to the entire surface. If the section completely fluoresces after rinsing and drying, do not use Basic Yellow to process that surface.

Apply the Basic Yellow solution by submerging the evidence in a tray or container. Washing the solution over the surface using a wash bottle may also be done; however, do not spray the solution. Leave the Basic Yellow on the surface for about one minute then rinse with running tap water. Allow the evidence to air dry.

Examine the evidence under the alternate light source at 450nm-480nm using an orange filter.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Safety

Basic Yellow is a harmful irritant.

Equipment

Balance, beakers, graduated cylinder, magnetic stirrer and stirring bar or other stirring device, clear or dark storage bottles

Reagents

Basic Yellow can be mixed as either ethanol based or water based. The ethanol based formulation is the most effective for visualization after cyanoacrylate fuming. The water based dye may be used in situations where there is excessive dye take-up by the substrate.

Ethanol Based

2g Basic Yellow 40
1L Ethanol

Mix until Basic Yellow is dissolved.

Water Based

1g Basis Yellow 40
1L Water
2mL Photo-Flo

Mix until Basic Yellow is dissolved.

STORAGE

Clear or dark bottles

SHELF LIFE

Twelve months

5.1.4 CYANOACRYLATE ESTER (SUPERGLUE) FUMING

Fuming with cyanoacrylate will cause latent print residue on non-porous and some semi-porous surfaces to appear white in color. Latent prints developed this way are not easily damaged.

CONTROL TEST

Deposit a sebaceous rich print onto a non-porous substrate of choice and place it in the fuming chamber concurrent with the item(s) being tested. A positive test will result in a cyanoacrylate developed control print.

MVC™ CYANOACRYLATE FUMING CHAMBER PROCEDURE

Procedures are described in the Cyanoacrylate Fuming Chamber User Guide, which will be retained in the Equipment Log at each laboratory.

CYVAC™ FUMING CHAMBER PROCEDURE

Procedures are described in the "Updated instructions (10-20-2000) to the Cyvac Operation Manual," which will be retained in the Olympia Equipment Log.

AD HOC FUMING CHAMBER

An alternative chamber may be used or created for fuming with cyanoacrylate. The chamber should be air tight, or near air tight in a well ventilated area. Hot water should be placed within the chamber to increase the humidity. If using liquid cyanoacrylate, it should be placed in a disposable container on a heating source within the chamber. Alternatively, a fuming wand may be used to emit cyanoacrylate fumes. Fuming time will vary, depending on the size of the chamber, humidity, amount and means of glue fumes being emitted, and the evidence item(s) being fumed. The control and the evidence should be watched carefully to avoid over fuming. The fumes should be safely and thoroughly evacuated from the chamber prior to examining the evidence.

PRESERVATION METHOD

Photography

STORAGE

Cyanoacrylate will be stored in its original container in a refrigerator.

SHELF LIFE

No data available

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

DFO is a fluorescent reagent used to develop latent prints on paper and other porous surfaces. It excels in the development of latent prints on white and most pastel colored papers and glassine envelopes and packets. DFO reacts to the amino acids present in perspiration and should be used prior to Ninhydrin.

CONTROL TEST

Deposit an amino acid rich print onto a porous surface, process with DFO, and place into a NINcha Forensic Climate Chamber or oven. A positive test will result in a developed print in contrast to the background color when viewed with the alternate light source or laser.

PROCEDURE

Application of DFO may be accomplished through spraying, brushing, or dipping (although it is possible to spray DFO, it is not recommended). After treating the evidence with the DFO, allow it to dry at room temperature.

NINcha Forensic Climate Chamber

Procedures are described in the NINcha Forensic Climate Chamber User Manual, which will be retained in the Equipment Log at each laboratory.

Oven

Place the item in a chemical processing oven between ~80-100°C for twenty minutes.

The DFO developed prints may be visible to the naked eye with white light but should be viewed under an alternate light source or laser. Latent prints will develop in a pale purple/red color that generally luminesces between 495nm-590nm using an orange or red filter.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Equipment

Balance, graduated cylinder, magnetic stirrer and stirring bar or other stirring device, dark storage bottles.

Reagent

0.25g DFO
40mL Methanol
20mL Acetic Acid
940mL HFE-7100

Dissolve the DFO in the methanol and acetic acid using a magnetic stirrer and stir bar. Then add the HFE-700 and stir until mixed.

STORAGE

Store in a dark bottle in a refrigerator.

SHELF LIFE

Six months

5.1.6 GUN BLUE/ACIDIFIED HYDROGEN PEROXIDE

Gun bluing is a process that is used to develop latent prints on brass cartridges and cartridge cases. The reaction occurs on areas of metal unprotected by sebaceous latent print residue, creating a dark-colored coating on these areas.

CONTROL TEST

Deposit a sebaceous rich print onto a clean brass item and process with the Gun Bluing solution. A positive test will result in a developed control print.

PROCEDURE

Light cyanoacrylate fuming (not in a fuming chamber) has been shown to be beneficial prior to testing with gun bluing solution. Ideally, no other processing prior to using this solution should be conducted.

Immerse the evidence in the Gun Bluing solution for several seconds and closely monitor for the development of latent prints. Halt the development by rinsing with tap water and air dry.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Equipment

Beakers, magnetic stirrer, stir bar, clear or dark storage bottles.

Reagents

- **Formula 44/40 (Instant Gun Blue)**

1 part reagent (Birchwood Casey Super Blue was used)
80 parts distilled water

- **Outer's Gun Blue**

1 part Outer's Gun Blue
40 parts distilled water

- **Acidified Hydrogen Peroxide**

14.1mL of 5% household vinegar
20.0mL of 3% household hydrogen peroxide

STORAGE

Clear or dark bottles

SHELF LIFE

Twelve months

5.1.7 1,2-INDANEDIONE AND 1,2-INDANEDIONE+ZINC CHLORIDE

1,2-indanedione (IND) is used to develop latent prints on paper and other porous surfaces. IND reacts to amino acid residue in latent prints to produce a pink-red color that also fluoresces.

CONTROL TEST

Deposit an amino acid rich print onto a porous surface, treat with IND, and place into a forensic climate chamber or oven. A positive test will result in a developed print in contrast to the background color when viewed with the alternate light source or laser.

PROCEDURE

Whether using 1,2-indanedione or 1,2-indanedione+zinc chloride, dip the evidence item in the reagent, air dry in the fume hood, and repeat both steps.

NINcha Forensic Climate Chamber

Procedures are described in the NINcha Forensic Climate Chamber User Manual, which will be retained in the Equipment Log at each laboratory.

Oven

Place the item in the oven at ~100°C for ten to twenty minutes.

Examine the evidence under the alternate light source or laser at 515nm-570nm using an orange or red filter.

PRESERVATION METHOD

Photography

REAGENT PREPARATION**Equipment**

Balance, beakers, graduated cylinder, magnetic stirrer and stir bar, dark storage bottles.

Reagents

- **1,2-Indanedione Solution**

2g 1,2-Indanedione
70mL Ethyl Acetate

930mL HFE-7100

Dissolve the Indanedione in the ethyl acetate, then mix in the HFE-7100.

- **Zinc Chloride Solution**

0.4g Zinc Chloride
10mL Ethanol
1mL Ethyl Acetate
190mL HFE-7100

Dissolve the zinc chloride in the ethanol. Mix in the ethyl acetate. Then mix in the HFE-7100.

- **1,2-Indanedione + Zinc Chloride**

2mL Zinc Chloride solution
100mL 1,2-Indanedione solution

Add the zinc chloride solution to the IND solution and mix well.

STORAGE

Dark bottles

SHELF LIFE

Twelve months

5.1.8 IODINE CRYSTALS

When attempting to chemically develop latent prints on thermal and carbonless specialty papers with standard reagents, these papers often darken due to the applied heat. This may obscure or obliterate latent prints and any writing on the papers. Iodine crystals react to the oils and fats in latent print residues and will develop latent prints without any darkening of the paper. Iodine developed latent prints may produce higher contrast and be made permanent by the application of black magnetic powder.

Iodine crystals have no apparent effect on the quantity of DNA recovered.

CONTROL TEST

Deposit a sebaceous rich print onto thermal or carbonless paper and place it within a plastic re-sealable bag concurrent with the items being tested. A positive test will result in a brown colored reaction in the area the print was placed.

PROCEDURE

Select a re-sealable bag that is large enough for the evidence and the control test. Put the evidence item(s), control, and iodine crystals from the ampoule into the re-sealable bag. Hold the bag horizontally and shake the crystals back and forth over the contents. Keep the crystals moving; if they remain stationary they can cause small burns on the paper. While shaking the bag, watch for latent print development; this usually occurs within three minutes. Once you have developed ridge detail, or when the background of the item begins to develop, remove the contents of the bag. If desired for improved contrast, the papers can be dusted with black magnetic fingerprint powder. Impressions should be photographed immediately after development with either iodine or iodine and powder.

Iodine crystals are single use. When processing is completed, the crystals shall be kept in the re-sealable bag with the control. The bag should be placed in a glass container specified for iodine waste.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Equipment

Re-sealable bag, black magnetic fingerprint powder, magnetic fingerprint brush

Reagent

Iodine crystals

STORAGE

Iodine crystals shall be stored in their original containers in a dark dry place, at ambient and consistent temperature.

SHELF LIFE

Refer to the original container.

5.1.9 LUMICYANO

Lumicyano is a fluorescent cyanoacrylate. Lumicyano will cause latent print residue on non-porous and some semi-porous surfaces to appear white in color under white light and to fluoresce under blue/green light. Latent prints developed this way are not easily damaged.

Lumicyano has no detrimental effect on the recovery of DNA or on subsequent DNA profiles.

CONTROL TEST

Deposit a sebaceous rich print onto a non-porous substrate of choice and place it within the fuming chamber concurrent with the items being tested. A positive test will result in a cyanoacrylate developed control print. A second positive test will result in the fluorescence of the control print when examining it with an alternate light source or laser as directed in the Procedure. The results for each lighting condition shall be documented in the scientist's notes.

PROCEDURE

A 5-8% concentration of powder to solution is recommended. Other variables such as fuming time, relative humidity, and size of fuming chamber may be adjusted as needed to ensure a positive reaction to glue fuming. Examine the evidence both with and without an alternate light source or laser. Fluorescence examination shall be completed within 24 hours of fuming using an alternate light source or laser at 450-532nm with an orange viewing filter.

If the developed control print does not adequately fluoresce, the evidence will still be examined with the alternate light source as directed above and the failed control will be included in the report. The evidence items may be subsequently processed with powders and/or chemicals.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Equipment

Aluminum fuming dish, balance

Reagent

Lumicyano Powder

Lumicyano Solution

Amount of powder and solution depends on the size of the fuming chamber being used and the desired solution (5-8%). Refer to the chart provided by CST to determine necessary amounts of each.

Just prior to fuming, add the necessary amount of powder to the aluminum fuming dish. Add in the necessary amount of solution to the same fuming dish. The powder will dissolve in the solution; the fuming chamber can be started prior to the powder becoming completely dissolved in the solution.

STORAGE

Lumicyano Powder and Lumicyano Solution shall be stored in their original containers in a dark dry place, at ambient and consistent temperature.

SHELF LIFE

Refer to the original container.

5.1.10NINHYDRIN

Ninhydrin is a chemical method for developing latent prints on porous surfaces and absorbent materials such as paper, cardboard, and smooth raw wood. This method is based on the reaction of the Ninhydrin and the amino acids, proteins, and peptides that are present in the latent print residue.

CONTROL TEST

Deposit an amino acid rich print onto a porous surface, process with Ninhydrin, and place into a forensic climate chamber or humidified oven. A positive test will result in a purple-colored print.

PROCEDURE

Application of the Ninhydrin solution may be accomplished through spraying, brushing, or dipping. After treating the evidence with the Ninhydrin solution, allow it to dry at room temperature. A 24-hour development period is recommended. Subjecting the item to a combination of heat and humidity (in a forensic climate chamber or oven) can accelerate the reaction.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Equipment

Balance, beakers, graduated cylinder, magnetic stirrer and stir bar, dark storage bottles.

Reagents

- **0.8% Ninhydrin Solution (Petroleum Ether Carrier)**

4g Ninhydrin
20mL Methanol
480mL Petroleum Ether

Dissolve the ninhydrin crystals in the methanol. Combine with the petroleum ether. The petroleum ether will not mix with the methanol. The top layer is your working solution; pour it off and save. The small amount of liquid that is left behind will be disposed of.

- **0.5% Ninhydrin Solution (Petroleum Ether Carrier)**

5g Ninhydrin
30mL Methanol

40mL Isopropyl Alcohol
930mL Petroleum Ether

Dissolve the ninhydrin crystals in the methanol. Add the isopropyl alcohol and mix. Add the petroleum ether and mix.

- **0.6% Ninhydrin Solution (Acetone Carrier)**

This solution shall not be used on items containing either mechanical or handwritten inks.

6g Ninhydrin
1000mL Acetone

The ninhydrin crystals will dissolve readily in acetone. Minimal stirring is required.

- **0.5% Ninhydrin Solution (HFE-7100 Carrier)**

5g Ninhydrin
45mL Ethanol
2mL Ethyl Acetate
5mL Acetic Acid
1L HFE-7100

Dissolve the ninhydrin in the ethanol. Mix in the ethyl acetate and acetic acid. Mix in the HFE-7100. The “oily” aspect of the solution should be removed via laboratory separatory funnel.

Normal working concentrations for Ninhydrin are 0.5% to 1.0% (w/v). Other concentrations are warranted on special surfaces when test impressions or a scientist's personal experience indicate that a stronger or weaker solution is appropriate. Percentage concentration tables for weight/volume and weight/weight mixtures of Ninhydrin follow.

Ninhydrin solution concentration formulas

	Weight of Ninhydrin in Grams/Volume of Solution						
Volume	0.2%	0.4%	0.5%	0.6%	0.75%	1.0%	1.5%
100 mL	0.2g	0.4g	0.5g	0.6g	0.75g	1.0g	1.5g
1 pint	0.94g	1.88g	2.35g	2.82g	3.52g	4.73g	7.08g
1 quart	1.89g	3.78g	4.73g	5.67g	7.09g	9.46g	14.19g
1 liter	2.0g	4.0g	5.0g	6.0g	7.5g	10.0g	15.0g
1 gallon	7.57g	15.14g	18.92g	22.71g	28.38g	37.85g	56.77g

	Weight of Ninhydrin in Grams/Weight of Ethyl Ether						
Weight	0.2%	0.4%	0.5%	0.6%	0.75%	1.0%	1.5%
1 lb	0.90g	1.81g	2.26g	2.71g	3.39g	4.53g	6.79g
2 lbs	1.81g	3.62g	4.53g	5.44g	6.80g	9.07g	13.60g
3 lbs	2.72g	5.44g	6.80g	8.16g	10.20g	13.60g	20.40g
4 lbs	3.62g	7.25g	9.07g	10.88g	13.60g	18.14g	27.21g
5 lbs	4.53g	9.06g	11.33g	13.60g	17.00g	22.67g	34.00g

STORAGE

Dark bottles. When ethyl ether is used as the solvent, the solution should be stored in a refrigerator.

SHELF LIFE

When HFE-7100 is the solvent, the solution is stable between 32°-95°.

All solutions of ninhydrin have a shelf life of twelve months.

5.1.11 NINHYDRIN HT

When attempting to chemically develop latent prints on thermal and carbonless specialty papers with standard Ninhydrin reagent, the papers often darken, possibly obliterating latent prints and any writing on the papers. Ninhydrin HT develops latent prints on these papers without turning them black.

CONTROL TEST

Deposit an amino acid rich print onto paper and process with Ninhydrin HT. A positive test will result in a purple print.

PROCEDURE

Spray or briefly immerse the specialty paper in the solution, remove, and dry. Place the treated paper in the dark, at room temperature for 36-48 hours. Heat should be avoided. Each page of carbonless paper should be processed individually.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Reagent

Ninhydrin HT is purchased ready to use.

STORAGE

Store in original container.

SHELF LIFE

Twelve months

5.1.12 OIL RED O

Oil Red O is used on porous surfaces, including those that have been previously wet. Oil Red O is a hydrophobic dye which targets lipids in fingerprint deposits. Oil Red O should be used on dry or wet porous surfaces.

The effectiveness of the process is known to decrease noticeably for latent prints older than four weeks.

CONTROL TEST

Place a sebaceous-rich print on a porous surface, such as clean white paper. Process with Oil Red O. A positive control will give a red colored print.

PROCEDURE

First, immerse the evidence item in the stain solution and shake gently for 60 to 90 minutes. Usually, strong fingerprints will give good results after only 5-10 minutes. Remove the item from the stain solution and drain. Immerse the item in the buffer solution to adjust the pH. Remove the item from the solution and let dry.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Safety

Hazardous in case of ingestion. Irritant/slightly hazardous in case of skin contact, eye contact, or inhalation. May be combustible at high temperature.

Equipment

Balance, beakers, graduated cylinders, flasks, magnetic stirrer and stir bar, dark storage bottles.

Reagents

- **Stain Solution**

1.54g Oil Red O
770mL Methanol
9.2g Sodium Hydroxide
230mL Distilled Water

Dissolve the Oil Red O in the methanol. Dissolve the sodium hydroxide in the distilled water. Add the sodium hydroxide/water solution to the Oil Red O/methanol solution, mix, and filter.

- **Buffer Solution**

101.55g Sodium Phosphate Monobasic Monohydrate
338.79g Sodium Phosphate Dibasic Heptahydrate
2L Distilled Water

Add the sodium phosphate monobasic monohydrate to 1L distilled water and shake or stir until dissolved. Add the sodium phosphate dibasic heptahydrate to 1L distilled water and shake or stir until dissolved; application of low heat will speed this dissolving process. Mix the two solutions together. Add enough distilled water to increase the total volume to 4L.

STORAGE

Dark bottles.

SHELF LIFE

Twelve months.

5.1.13PHYSICAL DEVELOPER

Physical developer is used on porous and semi-porous evidence and is effective on paper bags, currency, and items that have been subjected to moisture. Physical developer reacts with fats, oils, and waxes present in perspiration or on the skin surface.

CONTROL TEST

Deposit a sebaceous rich latent print onto a clean white paper or medium of choice and process with physical developer. A positive test will result in a gray/black print.

PROCEDURE

Multiple items can be processed simultaneously as long as they do not overlap or become folded in the processing trays.

The rinse in the Maleic Acid Solution can be omitted for wood and fragile papers (i.e. tissue or charred paper).

Immerse the evidence in the Maleic Acid Solution and leave for 10 minutes or until no bubbles are coming from the paper (whichever is longer). Combine Solutions A and B to form a Working Solution, then immerse the evidence in the Working Solution. Gently rock the dish until the latent prints develop into dark gray images (5-15 minutes; time will need to be increased as the number of items being processed is increased). Remove the evidence when the background appears significantly darker. Immerse the item in distilled water and gently rock for 3-5 minutes. If the

solutions are not rinsed from the evidence, then when the evidence is dried, it will become brittle and may be easily damaged or destroyed. Thoroughly dry the evidence.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Safety

The solutions consist of several strongly irritating and corrosive chemicals. Ferric nitrate and silver nitrate are both oxidizers and will cause burns and irritation upon contact. Pay close attention to label warnings and wear long cuffed nitrile, butyl, viton, or neoprene gloves to avoid skin contact

Equipment

Beakers, graduated cylinder, magnetic stirrer and stir bar, balance, dark storage bottles.

All equipment should be completely clean. If the glassware is dirty, silver will deposit in those areas and not on the evidence.

Reagents

- **Maleic Acid Solution**

1L Distilled Water
25g Maleic Acid

Add the maleic acid to the distilled water while stirring with a magnetic stirrer.

- **Working Solution**

5mL Solution A (20% Silver Nitrate Solution)
90mL Solution B (Reductant Solution)

Combine the two solutions and stir for 1 minute just prior to use. The amounts listed can be scaled up as necessary to ensure the items will be completely submerged in the solution.

STORAGE

Solutions A & B: Store in original bottles. Keep out of sunlight.

Working Solution: Store in a dark bottle at room temperature. Keep out of sunlight.

SHELF LIFE

Solution A: Six months

Solution B: Six months

Working Solution: Five days

5.1.14POWDER PROCESSING

Powder processing is used to develop friction ridge skin impressions on non-porous and semi-porous items. Powder development makes surface ridge detail visible and improves the contrast of already visible detail.

The type of powder selected for processing will depend upon:

- The contrast with the surface on which impressions are to be developed.
- The nature of the surfaces to be processed.

- Any special application attributes of the powders available.
- The anticipated means of preservation (photography or lifting).

When there is any doubt as to the suitability of a powder for processing a surface, a test print can be made on a surface similar to the evidence.

CONTROL TEST

A control test is not necessary when processing evidence with powders.

PROCEDURE

With a small amount of powder on a brush, use a smooth motion to guide the brush over the surface.

The “breath technique” shall not be utilized if DNA testing will be pursued.

An alternate light source or laser will be required to examine areas that have been processed with fluorescent powders.

PRESERVATION METHOD

Photography and/or lifting

When used, lift cards shall be marked with the following:

- Date of lift
- Laboratory case number
- Location of lift
- Name or initials of person making the lift
- Unique lift number
- A diagram of the lift location on the object is recommended. An arrow indicating the direction of the lift is also valuable for determining the orientation of the impression(s) and how an object was touched or handled.

Any impressions inadvertently deposited by the individual making the lift, shall be crossed-out and initialed.

REAGENT INFORMATION

Safety

Dusting with powder should occur in a fume hood or in a well-ventilated area. A dust mask or face mask should be employed to prevent inhalation of powder.

Equipment

Fingerprint powder; fingerprint brushes; lift tape; lift cards;

STORAGE

Sealed containers, out of excessively humid conditions.

SHELF LIFE

Indefinite

5.1.15 POWDER SUSPENSION (STICKY-SIDE, WETWOP™)

Powder suspension is used to process the adhesive side of tapes, labels and other adhesive items for latent prints. The Wetwop™ solution can be used on various types of tapes, labels, Post-It® notes, stamps, bandages, rubber gloves (i.e. latex and nitrile), the non-adhesive side of various types of tape, and on Tyvek®.

CONTROL TEST

Deposit a print on a test medium of similar type and color as the evidence and process with the appropriate powder suspension technique. A positive test will result in a developed print in contrast to the background color.

PROCEDURES

Powder Suspension and Sticky-Side Powder

Use a brush to apply the liquid mixture onto the adhesive surface. Leave the liquid on the tape for no more than 10 seconds, and then gently rinse it off with water. The tape can be rinsed under running water, but the preferred method is to gently agitate it in a bowl of water. Allow the tape to dry at room temperature.

Wetwop™

Wetwop is available in both black and white. Black can be used to process light colored, clear adhesive, and non-adhesive surfaces. White can be used to process dark colored and clear adhesive and non-adhesive surfaces. In some instances, both black and white solutions can be used in sequence to present contrast for better visualization of prints.

Remove and collect any foreign material from the item. If the adhesive substrate is wadded or stuck on another surface, attempt to remove and expose the adhesive surface. Shake the Wetwop™ bottle thoroughly and pour a small amount into a clean beaker or dish. Apply Wetwop™ with an appropriately sized brush, using a painting motion to completely cover the surface. Allow the Wetwop™ solution to stand on the adhesive or non-adhesive surface for 15-30 seconds, and then rinse the solution off with a gentle stream of tap water. For glove processing, rinse the Wetwop™ solution quickly to avoid background staining. Allow the evidence to dry.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Equipment

Small tray, camel hair or paint brush

Reagents

Powder Suspension

1.5g Molybdenum Disulfide or Fingerprint Powder
5mL Photo-Flow or Liquid Dish Soap
5mL Distilled Water

Place molybdenum disulfide or fingerprint powder in a shallow jar. Place water and Photo-Flo in a dropper bottle and shake well. Using the dropper, add the Photo-Flo solution to the powder in the jar until the consistency reaches that of thin paint.

Sticky-Side Powder

1tsp Sticky-Side Powder
5mL Water
5mL part Photo-Flo

Place Sticky-Side Powder in a shallow jar. Place water and Photo-Flo in a dropper bottle and shake well. Using the dropper, add the Photo-Flo solution to the powder in the jar until the consistency reaches that of thin paint.

Wetwop

Ready to use as purchased.

STORAGE

Store in original containers

SHELF LIFE

Powder Suspension

Pre-Mix: Twelve months

Working Solution: Single use

Sticky-Side Powder

Pre-Mix: Twelve months

Working Solution: Single use

Wetwop

Indefinite

5.1.16R.A.M.

RAM is a combination of the dye stains Rhodamine 6G, Ardrex-133D, and M.B.D. It is a fluorescent dye stain used for latent print luminescence in conjunction with alternate light sources (or a laser) and cyanoacrylate fuming on non-porous evidence. The dye stain does not develop friction ridge skin detail; it merely improves the contrast of cyanoacrylate enhanced prints.

CONTROL TEST

Utilize positive test from cyanoacrylate processing or use a fumed sebaceous control print on a medium of choice and process with RAM. A positive test will result in a developed control print in contrast to the background color when viewed with the alternate light source or laser.

PROCEDURE

After the evidence has been processed by cyanoacrylate fuming, apply RAM by dipping, washing, or using a spray bottle. Allow the evidence to air dry.

Examine the evidence with the alternate light source or laser at 415nm-535nm using an orange filter.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Safety

Wash bottle type rinsing should be used in lieu of aerosol mist. Use butyl rubber gloves to protect against the components of this mixture.

Equipment

Balance, beakers, graduated cylinder, magnetic stirrer and stir bar, dark storage bottles.

Reagents

- **R6G Stock Solution**

1g Rhodamine 6G

1L Methanol

Mix until the Rhodamine 6G is dissolved.

- **MBD Stock Solution**

1g MBD
1L Acetone

Mix until the MBD is dissolved.

- **Working Solution**

3mL R6G Stock Solution
7mL MBD Stock Solution
2mL Ardrex P-133D
20mL Methanol
10mL 2-Propanol
8mL Acetonitrile
950mL Petroleum Ether

Combine the ingredients in the order listed and store in a dark bottle.

STORAGE

Ardrex shall be stored in its original container. All other chemicals will be stored in dark bottles.

SHELF LIFE

R6G Stock Solution: Indefinite

Ardrex: Indefinite

MBD Stock Solution: Indefinite

RAM Working Solution: Six months; shake the solution vigorously every 30 days.

5.1.17RHODAMINE 6G

Rhodamine 6G is a fluorescent dye stain used for latent print luminescence in conjunction with alternate light sources (or a laser) and cyanoacrylate fuming on non-porous evidence. The dye stain does not develop friction ridge skin detail; it merely improves the contrast of cyanoacrylate enhanced prints.

CONTROL TEST

Utilize a positive test from cyanoacrylate processing or use a fumed sebaceous control print on a medium of choice and process with Rhodamine 6G. A positive test will result in a developed control print in contrast to the background color when viewed with the alternate light source or laser.

PROCEDURE

After the evidence has been processed by cyanoacrylate fuming, apply the Rhodamine 6G working solution by dipping or by using a spray device or squirt bottle. Allow the evidence to dry.

Examine the evidence with the alternate light source or laser at 495nm-540nm using an orange filter.

PRESERVATION METHOD

Photography

REAGENT PREPARATION

Safety

Wash bottle type rinsing should be used in lieu of aerosol mist. Use butyl rubber gloves to protect against the components of this mixture.

Equipment

Balance, beakers, graduated cylinder, magnetic stirrer and stir bar, dark storage bottles.

Reagents

- **R6G Stock Solution**

1g Rhodamine 6G
1L Methanol

Combine on a stirring device and stir until all of the R6G is thoroughly dissolved.

- **R6G Working Solution**

5mL R6G Stock Solution
500mL Methanol

Combine on a stirring device and stir until thoroughly mixed.

STORAGE

Dark bottles

SHELF LIFE

R6G Stock Solution: Indefinite

R6G Working Solution: Six months

5.1.18SMALL PARTICLE REAGENT

Small Particle Reagent (SPR) is a suspension of fine Molybdenum Disulfide particles in detergent solution. This process can be used on wet, non-porous surfaces. SPR adheres to fatty constituents of latent prints to form a visible deposit.

CONTROL TEST

Deposit a sebaceous rich print onto a non-porous substrate that reflects the color of the surface of the evidence item. Choose the color of SPR that is contrasting to the evidence item and process with SPR. A positive test will result in a visible deposit in contrast to the background color.

PROCEDURE

Bath method

Vigorously shake the container of SPR and pour enough of the solution into a tray or tank to cover the evidence to be processed. Stir the solution thoroughly to ensure that all powder is suspended in the liquid and immerse the evidence immediately. Keep the evidence stationary at the bottom of the dish for approximately 30 seconds and then remove it carefully. A thick film will be seen coating the evidence item's surface. Invert the evidence and gently draw it across the surface of tap water in a second tray or tank of similar size. Agitate the evidence gently. The film should wash off, revealing developed latent print detail. Allow the evidence to dry at room temperature.

Spray method

If being used outside during rain, shelter the area to be treated from direct rainfall.

Vigorously shake the container of SPR in a spray bottle. Spray the area to be examined starting at the top and working downwards. If signs of latent print development appear, continue spraying just above the relevant area until there is no further buildup of deposit. If it is necessary to remove excess powder from developed prints or the background, spray or squirt water gently above developed prints. Allow the surface to dry.

PRESERVATION METHOD

Photography
Lifting

REAGENT PREPARATION

Equipment

Beakers, glass trays, funnel, garden spray bottles, graduated cylinder

Reagent

30g Molybdenum Disulfide
1L Distilled Water
2drops Photo-Flo

Combine ingredients until well mixed.

STORAGE

Lab mixed: Labeled spray bottles
Commercial reagent: Store in its original container

SHELF LIFE

Lab mixed: Day of use
Commercial Reagent: Refer to the original container

6.0 DIGITAL IMAGING

Digital imaging technology is used for preservation and documentation.

6.1 IMAGE CAPTURE AND STORAGE

Digital image files produced for the purpose of documentation and orientation may be captured in a compressed or uncompressed format and shall be handled in accordance with the CLD QOM.

Images of impressions taken for analysis should include a scale on the same plane as the impression.

Digital images captured for friction ridge impression preservation and analysis are considered evidence and shall be captured in uncompressed formats; the images will be captured at a minimum calibrated resolution of 1000ppi unless documented circumstances prevent capturing the image at that resolution. The unaltered images shall be saved to a CD-R or DVD-R (as well as in ADAMS) in the same format in which they were captured and are considered the original images. The media will be marked with the date it was created, the CLD case number, scientist's initials, and the image numbers.

Digital images generated to preserve impressions on lifts or photographs from submitted evidence, in and of themselves are not considered evidence. These images will also be captured at a minimum calibrated resolution of 1000ppi unless documented circumstances prevent doing so.

When preserving submitted digital images, the unaltered preserved images will be saved in ADAMS.

Digital images generated to maintain legible copies of lifts and photographs will also be captured at a minimum calibrated resolution of 1000ppi unless documented circumstances prevent capturing the image at that resolution.

All printed copies of digital images are considered working copies.

6.2 IMAGE PROCESSING

No processing shall be done on an original image, only on a copy of an original image.

Image processing techniques employed by a scientist must be explainable and within the scope of their training.

Digital image processing techniques applied to digital images (scans or photographs) containing a friction ridge impression for analysis will be documented in the case record. The documentation shall be sufficient to enable evaluation or replication of the image processing and the resultant processed image will be retained in ADAMS.

- Processing specifically for the purpose of formatting an image for ABIS entry (i.e. image size and cropping) do not need to be recorded, and the resultant image does not need to be retained.

7.0 FRICTION RIDGE IMPRESSION EXAMINATIONS

Friction ridge impression examinations are conducted by scientists using the Analysis, Comparison, Evaluation, and Verification (ACE-V) methodology, which includes both qualitative and quantitative aspects. ACE is not generally applied as a strictly linear process because it may include a return to any previous phase. The application of ACE-V includes observations, measurements, assessments, decision-making, and documentation supported by the education, training, skill, and experience of the scientist.

The examination of friction ridge impressions and the resulting conclusions are based on the macroscopic and microscopic features of the friction ridge skin (ridge flow and ridge paths; the location, direction, and spatial relationships of minutiae; and ridge structure). Analysis is the assessment of an impression to determine suitability for comparison. Comparison is the assessment of the relationship between the data in a latent print and the data in a set of exemplar prints (or a second latent print) to determine whether they share similarities or differences. Evaluation is the formulation of a conclusion based upon analysis and comparison of the latent print to an exemplar print (or second latent print). These conclusions are based on the following premises:

- Friction ridge skin is an extremely complex, unique, and persistent morphological structure.
- Notwithstanding the pliability of friction ridge skin, the contingencies of touching a surface and the nature of the matrix, an impression of friction ridge skin structure may be left following contact with a surface.
- An impression may display features of varying quality and specificity.
- The unique aspects of friction ridge skin contain highly discriminative features.
- An impression that contains sufficient quality and quantity of friction ridge features can be identified to, or excluded from, a source.
- The use of a fixed number of friction ridge features as a threshold for the establishment of an identification is not scientifically supported.

The application of the ACE-V methodology to casework requires scientist competency as established through the Latent Prints Training Manual and Crime Laboratory Division QOM.

7.1 FACTORS AFFECTING EXAMINATIONS

The following factors affect the qualitative and quantitative aspects of friction ridge impressions. A competent scientist will understand these factors, recognize that they occur in friction ridge impressions, and understand how they influence friction ridge impression reproducibility. Failure to properly assess the occurrence and influence of these factors could result in misinterpretation. When applicable, the following factors must be considered in all steps of the ACE-V methodology:

- Anatomical aspects – the condition of the skin (e.g., scars and warts) and the morphology of the hand and foot relative to the shape and contour of the substrate.
- Transfer conditions – pressure applied during transfer, slippage or twisting, sequence of deposition (i.e., double taps and overlays), and an understanding of the limitations of friction ridge pliability.
- Matrix – bodily secretions and contaminants (e.g., sweat, blood, paint, dirt, oil, grease).

- Detection techniques – may be one or more of the following: optical (i.e., light sources and illumination techniques), physical, or chemical processing techniques.
- Recording or preservation techniques, such as photography, lifting, live-scan, and ink.
- Substrate (e.g., porous, non-porous, semi-porous, smooth, rough, corrugated, pliable, or textured surfaces).
- Environmental conditions (e.g., protected, unprotected, wet, dry, cold, or hot).

7.2 FEATURES OF FRICTION RIDGE IMPRESSIONS FOR EXAMINATIONS

The ACE-V methodology of friction ridge impression examination utilizes a qualitative and quantitative assessment of both the macroscopic and microscopic features in an impression. The features and related observable data that should be considered during the analysis includes ridge flow, minutiae, creases or wrinkles, and scars, as well as the individual attributes of these features, such as type, location, orientation, shape, texture, and morphology.

7.3 PROCEDURE FOR FRICTION RIDGE IMPRESSION EXAMINATIONS (ACE-V METHODOLOGY)

7.3.1 ANALYSIS

An impression which has been assessed as having observable data and potential utility is selected. The observable data shall be analyzed considering all potential features and their individual attributes. This assessment also includes the possible anatomical origin and orientation of the impression. Analysis determines if the impression is suitable for comparison and for database searches.

Quality is the assessment of the clarity of ridge features. Generally, as quality increases so does the discernibility and reliability of the ridge features. It is recognized that quality is not necessarily constant throughout an impression. The quality of the features and related observable data should be analyzed and documented.

The complexity of the friction ridge impression is assessed, taking into account both the quality of the features (including related observable data) and the quantity of features present. An impression may be classified as either complex or non-complex.

- An impression with fewer than 8 high confidence features shall be classified as complex.
- An impression with 8 or more high confidence features should be classified as non-complex.
- An impression with 8 or more high confidence features should be classified as complex if the following modifying factors are present: low specificity of features, significant distortion (e.g., multiple tap, superimposed impression, extreme pressure leading to tonal reversal, and slippage), or high tolerances.

The use of 8 minutiae is an administrative decision and does not endorse the use of minutiae counts as the sole criteria for a decision threshold.

7.3.1.1 DETERMINATION OF SUITABILITY

The friction ridge impression is analyzed for its overall utility expressed as its suitability for comparison; the utility of an impression is an operational decision.

Suitability for comparison is the decision by a scientist that a friction ridge impression contains sufficient observed data to be utilized for comparison and a source conclusion can potentially be reached.

7.3.1.2 SIMULTANEOUS IMPRESSION

When determining if friction ridge impressions are part of a simultaneous impression, the following factors must be considered and documented:

- Substrate
 - If the aggregate of the friction ridge impressions is consistent with the surface(s) on which it appears
- Orientation
 - If the orientation is consistent between:
 - Friction ridge impressions within the aggregate
 - Each friction ridge impression and the hand or foot morphology
 - The hand or foot morphology and the source object
- Spatial relationship
 - If each friction ridge impression within the aggregate is within anatomical spatial tolerances of the hand or foot and the substrate
- Friction ridge skin features and anatomical features
 - If the friction ridge skin features (ridge width, ridge flow, creases) and anatomical features (finger height, toe span, and impression size) are consistent with simultaneity
- Processing technique and matrix
 - If each friction ridge impression within the aggregate has similar and consistent appearance for the matrix or processing technique(s) used to visualize it
- Distortion
 - If the friction ridge impressions have consistent appearance with regards to deposition pressure, lateral pressure, and rotational distortion

The analysis of the above factors will support or refute simultaneity.

Any impressions meeting the criteria described may be considered simultaneous. If they do not meet the criteria, then each impression that is sufficient to stand alone shall be considered independently.

7.3.2 COMPARISON

A ridge-to-ridge comparison between two side-by-side impressions determines whether or not there are corresponding or non-corresponding features. 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.

The exemplar is analyzed and assessed for its complexity and utility for comparison.

7.3.3 EVALUATION

A scientist considers, based upon knowledge and experience, the probability of encountering the observed corresponding (non-corresponding) features in two impressions made by the same source against the probability of observing the same correspondence (non-correspondence) between the unknown impression and an impression from a different source. The probability is considered by the scientist factoring in the strength of the evidence and the degree to which support for one proposition outweighs support for the conflicting proposition.

A quantifiable probability cannot be assigned to the likelihood of these events without the use of a statistical model (no statistical model is validated for use by the Latent Prints Section).

7.3.3.1 SOURCE IDENTIFICATION

Source identification is the conclusion that the observed data provides substantially stronger support that the two impressions originated from the same source rather than different sources. There is strong correspondence present such that the scientist would not expect to see the same arrangement of details repeated in an impression from another source.

In order to support the proposition that the two impressions were made by the same source, a scientist must find discriminability in the corresponding features to outweigh any support for the proposition that the two impressions were made by different sources.

When evaluating a simultaneous impression, and subsequently determining identification, the details contained within all the friction ridge impressions must be in agreement across all corresponding impressions.

Once an impression is identified, comparison of the identified impression to additional subjects is not necessary. This is an administrative policy meant to reduce the time necessary to complete a case. Additional comparisons may be completed upon receipt of an additional request or at the discretion of the scientist.

7.3.3.2 INCONCLUSIVE/LACKING SUPPORT

Inconclusive/lacking support is the conclusion that the observations do not provide a sufficient degree of support for one proposition over the other.

Inconclusive evaluations may be the result of uncertainty in the distal orientation or anatomical source of an unknown impression or upon determination in comparison that the detail in an unknown impression is insufficient to either identify or exclude a subject.

To reach an inconclusive decision, the scientist has determined that additional exemplars will not permit a definitive conclusion.

7.3.3.3 SOURCE EXCLUSION

Source exclusion is the conclusion that the observed data provide substantially stronger support that the two impressions originated from different sources rather than the same source. There is a strong disagreement present such that the scientist would not expect to see that level of disagreement in an impression from the same source.

Source exclusion of a subject can only be concluded if the relevant anatomical areas are represented and legible in the known exemplars. In addition, an anchor point must be present and used in conjunction with the observed features for a source exclusion to be concluded. An anchor point may be one of the following: core, delta, or a characteristic ridge flow/pattern. A

portion of a palm with enough ridge detail to reliably determine the source location may also be used in lieu of an anchor point.

Ridge morphology, incipient ridges, and unstable features cannot be the sole factors for source exclusion.

7.3.3.4 INCOMPLETE

An incomplete comparison will occur when the exemplars are inadequate (quantity or quality). The latent print may or may not have limited detail in agreement with the exemplars. Additional exemplars of the friction ridge skin will be required and may permit the scientist to reach a source conclusion.

7.3.3.5 NOT COMPARED

If a latent print contains an anatomical region that is not recorded in the exemplar prints, or there are no exemplar prints available, no comparisons are possible.

7.3.4 VERIFICATION

Verification is the confirmation by another scientist that a conclusion or opinion conforms to specified requirements and is reproducible.

All source identifications shall be verified by two scientists. All source exclusions need only be verified by one scientist. If an impression is identified, any exclusions to the impression do not need to be verified unless requested by the case scientist so it can be specified in the report.

All conclusion changes will be reported to the scientist's supervisor when verification is complete.

7.3.4.1 BLIND VERIFICATIONS

Blind verifications will be conducted for all cases with a single source identification resulting from an ABIS search and for any simultaneous impression where none of the impressions within the simultaneous impression stands alone. Other blind verifications will be assigned so that the number of cases with at least one blind verification accounts for approximately 5% of completed cases.

The blind verifications will be completed in the following manner:

- The supervisor (or designee) will:
 - Prepare the latent and exemplar images.
 - Assign a blind verification number.
 - Assign the blind verification to a verifier.
- The verifier will:
 - Analyze and compare (as necessary) the latent(s) and provide documentation (worksheet and image markups) according to the requirements of this manual.
 - Save generated documentation (include initials, date, and blind control number) to the blind folder.
 - Notify the supervisor that the blind verification has been completed.
- The supervisor (or designee) will:
 - Inform the verifier of the laboratory case number.
 - Compare the conclusions of the verifier to those of the original scientist.
 - The verifier will be notified of any differences in conclusions, and further documentation may be obtained if necessary.
 - Notify the case scientist that the blind is complete and provide them the blind control number.

- The case scientist will:
 - Upload all documentation from the blind folder to ADAMS.
 - Add all documentation from the blind folder to the case file.

If the conclusions of the blind verifier and the case scientist are different, then the supervisor (or designee) will inform both parties of the differences (refer to section 8.2 Conflict).

7.4 DOCUMENTATION OF FRICTION RIDGE IMPRESSION EXAMINATIONS

7.4.1 ANALYSIS

The presence of impressions that are not suitable for comparison shall be documented in the case notes. No further documentation of the assessment is required.

The documentation requirements outlined below refer to impressions that are determined to be suitable for comparison.

Documentation shall be such that another qualified scientist can evaluate what was done and interpret the data. Documentation shall be made at the time of the examination. The friction ridge impression alone is not sufficient documentation. A legible copy shall be annotated and/or have accompanying notes in the form of narratives, worksheets, sketches, database search records, or any combination of these methods.

An unannotated digital copy of each impression shall be retained in the case record. Impressions from lifts will be retained at a minimum resolution of 1000ppi; impressions in images will be retained at the resolution in which they were taken.

The unique identifier for each impression determined to be suitable for comparison, distinct from unique image and lift identifiers, will be marked in close proximity to the impression on copies of the lift or printed image retained in the case file. It is also recommended that the unique impression identifiers be marked on lifts, printed images, or within generated digital images returned to submitting agencies.

The complexity of the impression shall be noted as either complex or non-complex. The complexity level of the impression will dictate the extent of the documentation:

- Documentation of non-complex impressions will include the following, if known:
 - Anatomical source (e.g., fingerprint, palm print)
 - Anatomical orientation (e.g., distal direction)
 - Suitability for database searches
- Documentation of complex impressions will include the following, either through narrative or image mark-up:
 - Non-complex impression requirements
 - The location of sufficient features to reach a conclusion of source identification or exclusion
 - Additional factors which may affect subsequent comparison, such as distortion or other macroscopic features

Documentation must clearly indicate all areas of friction ridge detail being considered as a simultaneous impression.

Image mark-ups shall be clear in their intent. Color-coded image mark-ups should adhere to the following schema:

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Red: Low level of confidence that the feature exists.

Yellow: Medium level of confidence that the feature exists.

Green: High level of confidence that the feature exists.

If a different color scheme is used, it shall be documented in the case notes.

Analysis documentation of an impression that is suitable for comparison shall be completed prior to comparison.

7.4.2 COMPARISON

All exemplars that are used for comparison will be retained in ADAMS. Exemplars submitted as evidence that are used for comparison shall be scanned (or imaged) into ADAMS at a minimum resolution of 500ppi and a copy retained in the case file. The origin of all exemplars will be documented in the case notes.

The scientist will document any deficiencies in the exemplar that adversely affect the comparison.

For comparisons of complex friction ridge impressions which result in a source identification, a comparison markup demonstrating the comparison conclusion shall be recorded. Any significant differences in features observed during analysis and those relied upon during comparison and providing the basis for a conclusion shall be noted and discussed in the notes.

Color-coded comparison markups will be clear in intent. Features in agreement between the latent and the exemplar should be marked in the same color used in analysis. Features that were not noted in analysis but are used in comparison should be marked with a new color.

If additional features and/or observed data is noted during comparison that results with a reassignment of complexity or utility of the impression, then supplemental notes shall be added and dated. The notes must also reflect any comparisons attempted prior to a change in utility.

Any friction ridge impression suitable for comparison that was not compared must be acknowledged and a reason given.

7.4.3 EVALUATION

All comparison results shall be documented and will include the unique impression identifier(s), name on the exemplars and/or unique identifier (as appropriate), anatomical source(s) identified or excluded (if applicable), initials of the scientist, and the date the conclusion was reached. The reason for each inconclusive or incomplete comparison shall also be documented.

Documentation to support the conclusion shall be such that another competent scientist could evaluate what was done and interpret the conclusion. The documentation must be sufficient to demonstrate the basis upon which the conclusion was based.

7.4.4 VERIFICATION

7.4.4.1 BLIND VERIFICATIONS

Blind verifications must include the same documentation required for the original analysis, comparison, and evaluation described in Sections 7.4.1-7.4.3.

7.4.4.2 NON-BLIND VERIFICATIONS

Verifications will be documented to include the verifiers' initials, date the verification was performed, and the results of the verification. Any exemplars used for verification that were not provided by the case scientist will be provided to the case scientist for inclusion in the case file.

If the verifier comes to a different conclusion than the case scientist, then they provide sufficient documentation to support their own independent observations and conclusions.

8.0 CONSULTATION AND CONFLICT

8.1 CONSULTATION

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

The following consultation interactions shall be documented:

- Assessment of the utility of the friction ridge impression for comparison value.
- Presence or absence of specific friction ridge features during the analysis or comparison phases.
- Assessment of a friction ridge impression for database searching.
- Simultaneity of impressions.

A consultant who has viewed both known and unknown friction ridge samples shall not be used as the verifier or technical reviewer for that examination.

If there is doubt whether a discussion has risen to the level of a consultation, it should be treated as a consultation.

Documenting Consultations

A consultation must be documented with the specific impression(s) discussed, the nature and result of the consultation, date(s) of the consultation, and the consultant.

8.2 CONFLICT

Conflict may be resolved through a consultation among the conflicting scientists. They should attempt to resolve the conflicting suitability decisions or source conclusions via consultation with an attempt to arrive at a mutually agreed upon decision or conclusion that is best supported by the observed data.

If agreement is achieved, then the conflict resolution process concludes.

If agreement is not achieved, the disagreements shall be recorded in the case notes. The case file, including documentation from each scientist supporting their opinion, will be brought to the attention of a supervisor for mediation. If mediation occurs during an inter-lab review, then both supervisors will be involved.

If agreement cannot be reached during mediation with the supervisor(s), then the issue will be referred to the Technical Lead (unless the Technical Lead is involved in the conflict, in which case it would be referred to a supervisor who will select a scientist to act in the Technical Lead position for this conflict resolution procedure).

When a conflict is referred to the Technical Lead, they will gather additional data. If blind verification or a blind consensus panel is used, the scientists selected should be, to the extent possible, unaware of the people involved and the questioned result. All available FS3s not currently involved in the conflict resolution process will be brought in for the blind consensus panel.

The scientist(s) involved in the process will perform an analysis on the latent in question. If a scientist determines the impression is suitable for comparison, then they will be given the exemplars involved in the case (or a SID/FBI number) to perform their comparison and reach a conclusion.

The Technical Lead will review the issue in accordance with the CLD QOM (Technical Difference of Opinion).

All documentation generated during the conflict process will be retained in the case notes.

9.0 FRICTION RIDGE SKIN DATABASE SEARCHES

The WSP utilizes two computer software systems to facilitate the search of friction ridge skin impression databases – the Automated Biometric Identification System (ABIS) and the Universal Latent Workstation (ULW). These systems are used in the Latent Print discipline primarily to search suitable unidentified impressions against on-file records. Both systems return a list of candidate exemplar images for review.

WSP is a member of the Western Identification Network (WIN), a consortium of multiple western states, referred to as central sites, sharing a common database. WSP contracts with WIN to operate the ABIS database and software. In addition to the central site members, access may be provided to other state and local databases through the WIN ABIS (e.g. California DOJ, and the FBI's NGI).

The FBI NGI database may also be accessed through the Universal Latent Workstation (ULW) software.

ABIS and NGI are password protected. Forensic Scientists assigned to the latent prints functional area are allowed access to these databases.

9.1 REFERENCES

The current software instructions, vendor training materials, and guidelines can be consulted for system operating instruction and best practices as necessary. These documents are located on the Western Identification Network System Training internet page (<https://www.winid.org/login/>).

The IBW Latent User Guide is located on the ABIS computer terminals.

ULW operating guides are available within the ULW software.

9.2 DATABASE SEARCHING

Impressions are searched through databases as described in the respective system user guides.

The criteria used to determine if impressions contain sufficient quality to be considered for search of friction ridge skin impression databases are described in the respective user guides. At a minimum, impressions containing the following criteria may be searched:

- The approximate core and axis of a fingerprint, or distal orientation for a palm print, can be determined.
- There are a minimum of 8 encodable minutiae.

The scientist will examine no fewer than the top ten candidates generated for each search, unless one of the candidates is identified as the source of the impression.

A negative result means that no matching print was located in the searched database; it does not mean that no matching print exists in the database. Negative results are not verified.

Impressions searched with negative results are registered as follows:

For cases involving person crime – impressions shall be registered into the WIN and NGI unidentified latent databases

For routine cases – impressions shall be registered into the WIN unidentified latent database and may be registered into the NGI database.

ABIS/NGI searches may be deferred based on case circumstances. Justification of deferral must be documented in the case notes.

9.3 CASE DESCRIPTION INFORMATION

When entering a new case into the IBW the laboratory case number will be incorporated into the ABIS case number; it will follow the state and originating agency code. The ABIS case number for laboratory case number 555-1234, searched from Olympia, would be WA0155501234; or if searched from Cheney, would be WA1755501234.

When entering a new case into the ULW, the CLD case number must be included.

9.4 DOCUMENTING SEARCHES AND REGISTRATION

The extent of the database searches and the search results must be documented in the case notes. The first page of the IBW Verification Report (documenting the search parameters) or the ULW Comparison Summary Report for each impression searched will be retained in the case notes.

The verification report for each database inquiry will be retained in the case notes.

The comparison and exclusion of obtained exemplars of ABIS candidates are part of the ABIS search results and do not need to be specifically reported. However, obtained exemplars of excluded ABIS candidates will be documented as such and retained in the case record.

The registration of impressions into the WIN and NGI unidentified latent databases must be documented. A reason will be documented in the case notes for an impression searched but not registered (unless identified).

9.5 TENPRINT TO LATENT INQUIRY (TLI)/UNSOLVED LATENT DATABASE

Registered latent print impressions are automatically searched against newly submitted known exemplar records as they are added to the respective databases. Scientists are responsible for periodically reviewing (at least monthly) the electronic TLI notices. If a TLI search produces a possible candidate, the scientist will contact the agency who submitted the previously registered impression to determine if further action is necessary.

Registered impressions may be deleted from the system manually or automatically due to the impression being identified, by agency request, or the case exceeding the statute of limitations.

9.6 WIN ABIS PERFORMANCE CHECK

A WIN/NEC developed performance check will be performed at least semi-annually and whenever a new version is rolled out. The performance check can be conducted on any workstation by the LP Technical Lead, LP supervisor, or a designated individual. This test verifies that the system is delivering the expected results. If the expected result is not delivered, the system will be taken out of service and NEC will be notified.

WIN has prepared three pre-extracted .lff latent files, the .bmp image of the file, and the text file listing the expected results. These .lff files are titled QAR /QAS/QAP and can be accessed for download at the WIN web training site under the Quality Assurance section.

When you have downloaded the .lff files, save them via thumb drive. These files will then be accessible when logged onto LCMS.

The following procedure will be used for performing the performance check:

Create a case in LCMS. On the Latent tab, click Batch Import. Select File and navigate to the thumb drive. Select each of the rolled, slap, and palm .lff files and click Open. Populate the evidence and latent number fields, indicate finger or palm, select a collection method, and click Start Import. The pre-edited .lff files will be loaded into LCMS. Once the case is created with the files imported, it may be re-used for subsequent performance checks. Within each file, click Search and indicate LI or LI-P within the Inquiry screen. Do not use combo/remote searches or register the latent. Open Verify and ensure the search results include the proper result provided by WIN among the top two ranked candidates.

Document the results of the Performance Check on the Latent Print Section ABIS Quality Control Log. The job will then be killed and purged from the IBW job queue.

10.0 RECORDING FRICTION RIDGE EXEMPLARS

Major case exemplars shall consist of recordings of all of the friction ridge skin present on the palmer surfaces of the hands. This includes the extreme sides and bottom of the palms and the extreme tips, sides, and segments of the fingers. If obtaining major case exemplars of the friction ridge skin present on the soles of the feet, then it includes the extreme sides of the bottom of the feet and the extreme tips, sides, and segments of the toes.

Obtaining complete and legible major case exemplars is crucial for subsequent comparisons to latent impressions recovered from crime scenes, for comparison against previous records, or for database searches. It is a necessity to ensure care and determination be exercised when obtaining major case exemplars in order to obtain the best quality, complete, and legible recordings.

10.1 METHODS

Various methods and techniques may be used to facilitate the successful recording and preservation of suspect, victim, elimination, or postmortem exemplars. The condition of the friction ridge skin will dictate the various methods and techniques that should be used to successfully record the friction ridge detail. The following methods should be considered when obtaining major case exemplars and it may be necessary to use more than one method:

The Handiprint system

A type of contact paper, made of plastic that is flexible and slightly elastic. The friction ridge skin is powdered or inked and then the adhesive side of the contact paper is applied to the skin and removed. The paper is placed on a clear plastic backing for preservation.

Tape and powder

The friction ridge skin is powdered and latent lift tape is applied to the skin and removed. The tape is placed on a clear plastic backing for preservation.

AccuTrans

A type of casting silicone material that is applied to the friction ridge skin. Once dried it is removed from the skin and the silicone records the friction ridge detail of the skin it was covering. The silicone may be preserved on its own, or it can be photographed or scanned.

Inking

Fingerprinting ink is applied to the friction ridge skin. The areas of skin are then rolled and/or pressed onto a white card or paper for preservation.

Fingerprint scanner

A device that captures and stores a single fingerprint which can then be uploaded and searched in a database.

Livescan

A digital fingerprinting process that requires the same rolling and/or pressing of the areas of friction ridge skin as used in the inking method.

Photography

Hydration

Soaking the friction ridge skin in sodium, potassium hydroxide, or water to allow hardened skin to become pliable again so that it can be recorded using one of the other methods.

Dehydration

Keeping the friction ridge skin dry is crucial when applying many methods, sometimes alcohol can be applied to the skin to aid in drying.

Injection

Injecting tissue builder, glycerin, or water into the friction ridge skin until the skin plumps or rounds out.

Firming

The friction ridge skin can be soaked in 10% formaldehyde solution to attempt to harden the skin. Also, the skin can be placed in a freezer, have an ice cube applied to it, or have canned air applied to it.

Degloving

Meticulously removing the epidermis layer of skin to be able to record the friction ridge skin better.

10.2 DOCUMENTATION AND REPORTING

The scientists' notes shall indicate what recording method was used to collect the exemplars.

When completed, each page of the exemplars shall be signed and dated by the person recording the exemplar. The source of the exemplars shall also be noted on each page and should be signed by the donor. Exemplars shall be packaged appropriately (including a unique case number, a unique item number, and seals). The item(s) will be turned over to the agency with jurisdiction over the case prior to the scientist returning to the lab.

A report will be issued.

11.0 REPORTING

The Crime Laboratory Report will be written in JusticeTrax LIMS using the analytical module. Refer to the CLD LIMS Operations Manual.

In addition to the requirements outlined in the CLD Quality-Operations Manual, the report must address the following main categories, if applicable:

1. The techniques used in latent print development.
2. Statement that friction ridge impressions were analyzed and resulting utility decisions.
 - a. Impressions suitable for comparison and the item (submitted for processing or submitted lift, photograph, or image) on which they were located. If an impression is located on an agency submitted lift, photograph, or in a digital image, then the agency description of the original item, if given, must be included.
3. Items with friction ridge impressions not suitable for source conclusions.
4. Items where no friction ridge impressions were detected.
5. Statement specifying which images were acquired from the case record (ADAMS), if applicable.
6. Statement that comparisons were done and the resultant conclusions. The name, date of birth, and unique identifier (i.e. the state identification (SID) or FBI number), if known, of all subjects compared must be cited, and the source of the exemplars must be clear.
 - a. When reporting identifications, associate the impression identifier with the name on the exemplar(s) and the anatomical source.
 - b. If the source of an impression is identified, the exclusion of any other subject(s) does not need to be reported. Note: If any exclusion(s) of an impression later identified is reported, the exclusion(s) must be verified.
 - c. If the name on the exemplar does not agree with the name given on the RFLE, then the corresponding aliases or AKA's shall be included in the report.
 - d. Latent to latent identifications are not required to be reported but may be depending on case circumstances.
 - e. If the comparison results in an inconclusive decision, the reason it is inconclusive must be reported.
 - f. If an incomplete comparison is reported, then the report must specify what additional exemplars are needed in order to complete the comparison (i.e. better quality, or the specific area of ridge detail that is needed).
7. Any friction ridge impression suitable for comparison that was not compared or evaluated must be acknowledged and the reason given as to why it was not compared, for example:
 - a. Exemplars for the correct anatomical source of the impression have not been provided or located in the search files.
 - b. The friction ridge impression is not suitable for identification.

8. Database searches of friction ridge impressions including the extent of the search and the results will be reported. Any impressions retained in unsolved latent databases will be reported. ABIS suitability for friction ridge impressions that were not identified and not searched will be reported.
9. Information needed to complete the case.
10. Laboratory generated evidence (digital media with image numbers, latent lift cards, or other evidence).
11. The extent of limited examinations.
12. Assumptions and limitations of any methods or procedures utilized to produce the examination results (e.g., agency processing completed prior to an item being submitted for laboratory processing, ridge detail that looks to be outside the intended lift area).
13. Statement that items submitted for latent print examination were not examined, and why.
14. Statement indicating that a reported conclusion was the result of a conflict resolution process, if the conflict resolution process went beyond mediation involving a supervisor.
15. A glossary section shall be included when the following terms are used in the report:
 - a. Source exclusion or exclusion
 - b. Source identification or identification
 - c. Suitable for comparison

Reports should follow the Latent Prints Report Writing Guide, which includes recommended formatting, terminology, phrasing, and disclaimers which comply with the provisions of this chapter and the CLD Quality-Operations Manual. It is recognized that many unique or complex situations may justify variations for the sake of clarity.

12.0 TECHNICAL REVIEW

The checklist below is provided as a guide during the technical review of points to be considered. The presence of items on the checklist does not imply that they are required. Refer to the WSP QOM for the procedures and requirements of technical review.

- Notes
 - Are the notes legible and proper?
 - Do the notes completely and accurately document the evidence description and evidence packaging?
 - Are the notes properly labeled (case number, date, initials, page number)?
- Processing
 - Have processing techniques been used in accordance with WSP policy?
 - Has reagent and equipment use been documented appropriately?
 - Has the location of developed impressions been clearly documented?
 - Are all digital images captured properly and stored in ADAMS?
 - Has the generation of evidence been appropriately documented?
- Examination of friction ridge impressions
 - Have the examinations been performed according to WSP policy?
 - Have the components of ACE been performed according to WSP policy?
 - Has verification been performed according to WSP policy?
 - Are the conclusions appropriate and properly documented?
- Supporting documentation
 - Are all images used to support conclusions in the case file?
 - Are all images properly labeled?
 - Has the analysis of impressions been documented where appropriate?
 - Have digital copies of suitable impressions been retained in ADAMS?
 - Have all relevant digital images been accounted for?
 - Are copies of all exemplars used for comparison present in the case file and ADAMS?
 - If consultation occurred, has it been clearly documented?
 - If conflict resolution occurred, has it been clearly documented?
- Report
 - Is the report format and wording in accordance with WSP policy?
 - Is the report header accurate?
 - Has the submitted evidence been accurately reported and its disposition included, if appropriate?
 - Have the requested examinations been addressed?
 - Are the results properly transcribed and clearly communicated?
 - Have appropriate additional exemplars been requested, if needed?
 - Have submitted items that were not examined been addressed?
 - Is a glossary included as appropriate?

Technical review may be conducted simultaneous to or subsequent to verification.

13.0 APPENDIX A– SUPPLIES & EQUIPMENT

13.1 SUPPLIES

13.1.1 BRUSHES

A wide variety of types, shapes and sizes of brushes are available for processing evidence with powders. The total supply of different kinds of brushes required in a Latent Print discipline depends on the types of brushes and colors of powders used. An ample number of appropriate brushes will help to preclude cross-contamination of powders and brushes.

Brushes may be cleaned with mild detergent and water. Blow drying will help (especially with camel hair brushes) to prevent matting after washing with the soapy solution. Dirty or contaminated brushes cannot always be cleaned to alleviate stiff bristles. Brushes that have been cleaned and still have stiff bristles should not be used for dusting latent prints.

Feather Brush

Generally used for fluorescent powder applications and delicate processing purposes involving the removal of excess powder or soot.

Fiberglass Brush

Consists of fine fiberglass bristles and is used by many scientists as an all-purpose brush in lieu of several other sizes and types. The primary advantage is the ability to process a large area with considerably less "re-powdering" of the brush than other types. These brushes are more expensive than hair or feather brushes but often last longer than either type.

Hair Brush

These brushes should be very soft and pliable and are appropriate for all powders, except magnetic. Stiff bristles can damage latent impressions, usually by causing light or dark streaks in the latent print. Commercially produced latent print hair brushes are most often made from camel hair. Soft fine brushes are appropriate for applying TapeGlo™, Wetwop™ and Sticky Side powder.

13.1.2 MAGNETIC WANDS

These wands are used only for the application of magnetic type powders (or mixtures of magnetic/conventional powders). In that the "bristles" involved consist of the magnetic powder itself, the applicator head of the wand will not wear out. One magnetic wand will suffice for many colors of powder. "Self-contained magnetic brushes" include a built-in powder reservoir.

13.1.3 CASTING MATERIAL

Commercially available silicone rubber or dental/die stone powder may be used for lifting difficult latent impressions from uneven surfaces. Mix according to manufacturer's directions and apply to the intended casting area.

Should you need to change a light colored casting medium to dark, you can cautiously add black fingerprint powder to the mixture until the desired shade is achieved. Dark colored silicone rubber is available.

13.1.4LIFTING MATERIALS

Lifting materials for latent fingerprints consist primarily of transparent, opaque, adhesive-coated materials and electrostatic dust lifts. The background color of the opaque lifting medium is dependent upon the color of the impression to be lifted.

Caution must be exercised in utilizing general-purpose tapes in place of specialized latent print lifting tape or lifts. The reason being that a thick adhesive emulsion base can cause the migration and disappearance of some latent print ridge detail (especially with some light colored powders) either immediately or over a period of days or weeks. Following is a list of recommended tapes and lifts for latent print preservation.

Tape

Special latent print lifting tape, both transparent and frosted, is available from several commercial sources. They can be used with a wide variety of black or white backing materials, including pre-printed backing cards, index cards, photographic papers and vinyl backing tabs. Flexible lifting tape may be used in place of rubber lifters for curved surfaces.

Hinge Lifts

These consist of a transparent lifting medium (tab) attached to a clear, black or white plastic backing tab. The lifting tab is usually of a less flexible nature than most lifting tapes that sometimes results in white circles surrounding powder particles (especially with magnetic powders). This can be mostly alleviated through the use of a more pliable medium. Lifts of materials similar to hinge lifts are available in sizes suitable for lifting palm prints and footprints.

Rubber Lifts

Available in black or white with transparent covers, the primary advantage is the ability to lift latent impressions from curved surfaces without the creases inherent to tape and hinge lifts. A disadvantage is that the ridge detail must be photographically (or optically as with a prism/mirror viewer) reversed to enable comparison with inked impressions. Rubber lifts are also available in sizes appropriate for lifting entire palm prints and footprints.

Gelatin Lifts

These are soft pliable lifts with a moist gelatin like base and can be used for dried mud, dried blood, or dust impressions. They may stand alone or can be used as an adjunct to the electrostatic lift for dust impressions. These are available commercially with black, white, or transparent backgrounds and come in various sizes.

13.1.5POWDERS

Many commercially produced latent print "dusting" powders are available. No powder is universally applicable to all types of non-porous surfaces and a variety of powders should be available.

13.1.6MISCELLANEOUS SUPPLIES

Lab ware, lab tools, personal protective equipment, and other miscellaneous supplies should be laboratory grade and suitable for the intended use.

13.2 EQUIPMENT

An Equipment Logbook containing necessary validation procedures, performance verifications, User's Manual (or locations) and service and maintenance logs for each items will be maintained in each laboratory.

13.2.1ALTERNATE LIGHT SOURCES (ALS)

Authorized alternate light sources are listed in the Equipment Log.

Calibration/Recertification

Performance verification is only required if an ALS is taken out of service for maintenance or repair. Control tests with fluorescent cyanoacrylate and various fluorescent reagents will suffice as regular performance checks.

Performance Verification: Examine a positive control print (fluoresced as expected with a verified ALS) developed with R6G, RAM, or LCA at 415nm-535nm with an orange viewing filter, and one developed with DFO at 515nm-590nm and a red viewing filter. A positive test will result in the expected fluorescence of each sample.

Maintenance

Inspect, clean, and repair as needed. Follow manufacturer's instruction in the User Manual for cleaning. Log all maintenance in the Equipment Log.

13.2.2BALANCES

Authorized balances will be listed in the Equipment Log.

Calibration/Recertification

Balances will be calibrated at least once a year. No other regular performance checks are necessary.

Maintenance

Each balance must be wiped clean after each use. Inspect and repair as needed. Log all repairs in the Equipment Log.

13.2.3CAMERAS

Calibration/Recertification

Performance verifications are not required for DSLR cameras and accessories. The images that are created indicate whether the equipment is working properly or not.

Maintenance

Maintenance of the cameras should be in accordance with manufacturers' recommendations. Refer to the User's Manual retained in the Equipment Log for preventive measures and routine cleaning.

13.2.4CYANOACRYLATE FUMING CHAMBERS (MVC™ CHAMBERS)

Calibration/Recertification

Performance verification is only required if the MVC™ is taken out of service for maintenance or repair. Required control tests with each use will suffice as regular performance checks.

Performance Verification: Deposit a sebaceous rich print onto a non-porous substrate of choice and place it in the fuming chamber. Run the MVC™ according to the manufacturer's instructions. A positive test will result in a cyanoacrylate developed control print.

Maintenance

Replace the filter when specified and as instructed in the User Manual. Inspect, clean, and repair as needed. Log all maintenance in the Equipment Log.

13.2.5CYVAC™ VACUUM SYSTEM

Calibration/Recertification

Performance verification is only required if the Cyvac™ is taken out of service for maintenance or repair. Required control tests with each use will suffice as regular performance checks.

Performance Verification: Deposit a sebaceous rich print onto a non-porous substrate of choice and place it in the fuming chamber. Run the Cyvac™ according to instructions in the Equipment Log. A positive test will result in a cyanoacrylate developed control print.

Maintenance

The manufacturer specifies that the Cyvac™ requires very little cleaning and maintenance. Inspect, clean, and repair as needed. Log all maintenance in the Equipment Log.

13.2.6LASER

Authorized lasers are listed in the Equipment Log.

Calibration/recertification

Performance verification is only required if a laser is taken out of service for maintenance or repair. Control tests with fluorescent cyanoacrylate and various fluorescent reagents will suffice as regular performance checks.

Performance Verification: Examine a positive control print (fluoresced as expected with a verified ALS) developed with DFO, fluorescent powder, Indanedione, R6G, RAM, or LCA with the appropriate viewing filter. A positive test will result in the expected fluorescence of each sample.

Maintenance

Inspect, clean, and repair as needed. Follow manufacturer's instructions in the User Manual for cleaning. Log all maintenance in the Equipment Log.

13.2.7OVENS

Authorized ovens are listed in the Equipment Log and may only be used for chemical processes described in this manual. Glass laboratory cylinders may be used to introduce humidity into the ovens, as needed.

Calibration/recertification

As a development aid, oven usage does not require a precision temperature. Performance verification is only required when an oven is taken out of service for maintenance or repair. Control tests with various reagents requiring the use of an oven will suffice as regular performance checks.

Maintenance

The ovens require very little cleaning and maintenance. Inspect, clean, and repair as needed. Log all maintenance in the Equipment Log.

13.2.8 NINCHA

Authorized NINchas are listed in the Equipment Log and may only be used for chemical processes described in this manual.

Calibration/recertification

Performance verification is only required when the NINcha is taken out of service for maintenance or repair. Control tests with various reagents requiring the use of the NINcha will suffice as regular performance checks.

Maintenance

The NINcha requires very little cleaning and maintenance. Inspect, clean, and repair as needed. Log all maintenance in the Equipment Log.

13.3 CONTROLS

Commercially obtained or created materials used for control testing must be traceable.

13.3.1BLOOD

The source of blood obtained for the creation of controls shall be documented and the lot shall be assigned a unique identifier. Any controls created from that source of blood shall reference the unique identifier.

13.3.2REFERENCE PADS

The source of sebaceous oil or amino acid reference pads obtained for the creation of controls shall be documented and the lot shall be assigned a unique identifier. Any controls created from those pads shall reference the unique identifier.

14.0 APPENDIX B – REAGENT SPECIFICATIONS

Latent reagents have no established purity or impurity threshold; therefore reagents will be laboratory reagent grade (sufficient for the technical analysis), or greater. Since most reagents purchased from specialty latent print supply vendors generally do not have a specified grade, reagents will be functionally tested. Reagents that have expiration dates may be used beyond the expiration date if the final latent reagent has a positive control test. The positive functioning of a reagent when tested at its creation (if made on site) and again during a daily (or more frequent) evidence processing session, in conjunction with appropriate documentation, shall suffice for establishing that a reagent is of an appropriate grade. See CLD Quality-Operations Manual.

The use of one's own sweat or sebum or the use of the commercial fingerprint reference pads will suffice for the positive check of latent print reagents. Use of other materials will require the documentation of the specific control. An untouched area of the test piece shall suffice for the negative control; negative controls are assumed to be negative unless documented otherwise.

Containers for chemical reagents and solvents should be kept tightly closed. All chemicals required for technical processing will be stored in accordance with applicable standards for that chemical. If appropriate, these chemicals will be marked with expiration dates. Disposal shall be in accordance with applicable standards.

Standard reference solutions and reagents prepared in the laboratory will be labeled properly with their identity, the date prepared, initials of the person who prepared them, lot number, and safety precautions. The lot number for each reagent used in processing will be recorded in the case notes.

15.0 APPENDIX C – ALS FILTER AND GOGGLE RECOMMENDATIONS

These are general recommendations and other combinations may result in better contrast especially at the extreme ends of each range where the chart shows overlap. In addition, other combinations, including not using filters, may provide better contrast when dealing with background fluorescence and scientist's discretion should be used in determining the best combination.

Wavelength of ALS	Recommended Filter and/or Goggles
< 400nm	Yellow or UV safe
400nm – 450nm	Yellow
450nm – 540nm	Orange
540nm – 700nm	Red
700nm – 1100nm	Red or IR

The laser is not included in these recommendations. The only appropriate filters for the laser are argon goggles and an orange barrier filter.

It is required that both the wavelength of the ALS and type of goggles and/or filters used be documented in case notes.

16.0 APPENDIX D – ABBREVIATION INDEX

16.1 ADMINISTRATIVE TERMS

CLD	Crime Laboratory Division
CSRT	Crime Scene Response Team
FLSB	Forensic Laboratory Services Bureau
FS	Forensic Scientist
LIMS	Laboratory Information Management System
PEC	Property/Evidence Custodian
WSP	Washington State Patrol

16.2 AUTOMATED BIOMETRIC IDENTIFICATION SYSTEM (ABIS) TERMS

CAL-DOJ	California Department of Justice
CRD	Criminal Records Division
DIS	Digital Imaging System
DOB	Date of Birth
FBI	Federal Bureau of Investigation
Ident.	Identification Section
LI	Latent Inquiry
LI-P	Latent Inquiry - Palm
LR	Latent Registration
LVMPD	Las Vegas Metro Police Department
NCIC	National Crime Information Center
NGI	Next Generation Identification system
SBPD	San Bernardino Police Department
SID	State Identification Number
ULW	Universal Latent Workstation
WASIS	Washington State Identification Section
WIN	Western Identification Network

16.3 ANALYSIS/COMPARISON/EVALUATION TERMS

AIR	Added in review
BQ	Better quality exemplars needed
CIR	Changed in review
CJE	Criminal Justice Employee
DisP	Distal Phalanx
EX	Source exclusion
FP	Fingerprint
FRS	Friction Ridge Skin
HQ	High Quality
IC	Inconclusive
ID	Source identification
Img	Image
Imp	Impression
INC	Incomplete
IPA	Inner Pattern Area
J	Medial and/or proximal segment(s) of the finger
LI	Left Index finger
LL	Left Little finger
LM	Left Middle finger
LQ	Low Quality

LR	Left Ring finger
LT	Left Thumb
L1 (L2, L3)	Level of Detail
MCP	Major case prints
MCPN	Major case prints needed
MedP	Medial Phalanx
MHQ	Medium High Quality
MLQ	Medium Low Quality
NC	No comparison
Neg	Negative
NSA	Not suitable for ABIS search
NV	No value
OV	Of value
P	Palm
PP	Palm print
ProxP	Proximal Phalanx
Reg	Registered to unidentified latent database
RD	Ridge detail
RI	Right Index finger
RL	Right Little finger
RM	Right Middle finger
RR	Right Ring finger
RT	Right Thumb
S	Sides of the fingers
Sub	Subject
Sus	Suspect
SWI	See Working Image
T	Tips of the fingers
Unk	Unknown
VEO	Of value for exclusion only
Vic	Victim
WI	Working Image

16.4 PROCESSING EQUIPMENT AND TECHNIQUES

AAR	Amino Acids Reference Pad
AB	Amido Black
ALS/FLS	Alternate/Forensic Light Source
AY	Acid Yellow
BY	Basic Yellow
CA	Cyanoacrylate
DFO	1,8-Diazafluoren-9-One
FC	Fuming Cabinet
GB	Gun Blue
HH	Heat and humidity
IND	1,2-Indanedione
IO	Iodine crystals
LAS	Laser
LCA	Lumicyano
MBD	P-Methoxybenzlamino-4Nitrobenz-2-Oxa-1,3-Diazole
NIN	Ninhydrin
NIN HT	Ninhydrin HT
P	Powder (used with modifier –see below)
PD	Physical Developer
RAM	Rhodamine-Ardrox-MBD

R6G	Rhodamine 6G
SPR	Small Particle Reagent
SOR	Sebaceous Oils Reference Pad
SS	Sticky Side Powder
VIS	Visual examination
WW	Wetwop™
ZC	Zinc Chloride

POWDER MODIFIERS:

B – Black
BI – Bi-chromatic
FL – Fluorescent
G – Green
M – Magnetic
R – Red
W – White

16.5 RIDGE DETAIL ASSESSMENT TERMS

NAO	No additional ridge detail observed
NRD	No ridge detail present
RDNV	Ridge detail - no value

16.6 FINGERPRINT PATTERN TYPES

A	Arch
A-T	Tented Arch
A-P	Plain Arch
L	Left Slant Loop
R	Right Slant Loop
W	Whorl
W-A	Accidental Whorl
W-CP	Central Pocket Loop Whorl
W-DL	Double Loop Whorl
W-P	Plain Whorl