Technical Procedure for Locating, Developing, Analyzing and Evaluating Fridge Ridge Evidence

1.0 Purpose – This procedure outlines the analytical approach for the analysis, chemical and physical processing, comparison, and documentation of cases submitted for friction ridge examination.

2.0 Scope – This procedure applies to all friction ridge cases in Latent Evidence.

3.0 Definitions

- **Non-porous -** Any item of evidence, or part of an item of evidence, that does not absorb fingerprint residue.
- **Porous -** Any item of evidence, or part of an item of evidence, that may absorb fingerprint residue.
- **Semi Porous/Mixed -** Any item of evidence that exhibits the qualities of porous or non-porous evidence.
- **ACE-V** – The acronym for a scientific method: Analysis, Comparison, Evaluation, and Verification. Friction ridge comparison methodology. Modified (specialized) version of the scientific method of hypothesis testing.
- **Of Value/Sufficient – A** friction ridge impression that contains adequate qualitative and quantitative data to be utilized for comparison purposes.
- **Identification/Individualization –** The decision by an examiner that there are sufficient features in agreement to conclude that two areas of friction ridge impressions originated from the same source. Identification of an impression to one source is the decision that the likelihood the impression was made by another (different) source is so remote that it is considered a practical impossibility.
- **Elimination/Exclusion –** Exclusion/Elimination is the decision by an examiner that there are sufficient features in disagreement to conclude that two friction ridge impressions originated from different sources. Exclusion implies that the likelihood of making these observations if the impressions are coming from the same source is so remote that it is considered as a practical impossibility.
- **Inconclusive –** The decision by an Examiner that an identification or exclusion cannot be determined based upon a lack of sufficient data/detail present that is in agreement or disagreement.
- **Comparison Value –** A determination by an analyst that there is sufficient Friction Ridge detail to warrant further analysis. Friction Ridge detail should be un-ambiguous in nature and of such quantity in presentation upon development to indicate that it has potential to be identified to a known source.
- **Nonlinear ACE-V –** A continuous review of additional data discovered in the examination process utilized to strengthen the examiners conclusion.

4.0 Equipment, Materials, and Reagents

4.1 Equipment and Materials

- Alternate light sources (ALS) (CrimeScope, Mini-Blue Maxx)(Ruvis ,hand scope Xenon- spex)
- Image Processing Systems
- CSIPix Software Current Version
- UIS (universal imaging system-spex)
- Image processing System
- Comparator, Magnifier, Dome
- Protective Clothing
- Gloves
- FAR Forensic Analysis Report
- RMS Agency Reporting Software
- Processing Agents
- Scanner
- Photoshop (currently available version)
- SAFIS Latent work Station
- Photographic equipment
- Fume Hoods and Chambers

4.2 Reagents

4.2.1 Non-porous Processing Reagents

4.2.1.1 **Fingerprint Powder(s)** – Any of the commercially prepared fingerprint powders that are maintained within Latent Evidence (ex: black, bi-chromatic, magnetic, suspended (spr), etc.).

4.2.1.2 **Cyanoacrylate Ester** – Any of the commercially prepared cyanoacrylate ester products that are maintained within Latent Evidence (ex: vials, HotShot, Finder Print Pads, wand tips).

4.2.1.3 **Fluorescent Dyes** – Any of the approved fluorescent dyes currently available in Latent Evidence (ex: Rhodamine 6G, Ardrox, etc.).

4.2.2 Porous Processing Reagents

4.2.2.1 Any of the approved porous reagents currently available in Latent Evidence, to include:

- 1,2 Indanedione
- Ninhydrin and Ninhydrin-HFE
- Zinc Chloride, Zinc Chloride-HFE

4.2.3 Adhesive Processing

4.2.3.1 Any of the approved adhesive print processing reagents currently available in Latent Evidence, to include:

- Crystal Violet
- Sticky-Side Powder (Wet Wop)
- Tape Glo

4.2.4 Blood Print Processing

4.2.4.1 Any of the approved blood print processing reagents currently available in Latent Evidence, to include:

- Amido Black
- Coomassie Blue
- LCV

4.2.5 Miscellaneous Processing Reagents

4.2.5.1 In some instances, reagents that are reactive to a specific medium or are specific to the substrate are required. These reagents include, but may not be limited to:

- Sudan Black (grease print processing)
- Small Particle Reagent (wet print processing)
- Gun Blue- Blue Etching solution.

5.0 Quality Control (Positive Controls/Test Prints)

5.1 Test prints, also called control samples or positive and/or negative controls, shall be performed on all prepared or commercially purchased reagents prior to use during the processing of test items in accordance with the Procedure for Quality Control. Case test prints are positive control and shall

be prepared on a substrate similar to the actual item of evidence and shall be tested and verified along with the evidence. The results of the test print shall be recorded in the master case file. A positive result is defined as the presence of friction ridge detail within the test print..

6.0 Evidence Processing Procedure

6.1 Physical and Chemical Processing - Processing for the presence of latent prints is broken down into three general categories: non-porous, porous, and mixed/semi-Porous. Additionally the evidence received may contain adhesive surfaces and/or be contaminated by blood, body fluid(s), and/or other biohazardous material. Prior to beginning any processing technique the examiner shall note the type of evidence and its condition to be examined to determine the most appropriate course of action.

The extent of processing will be determined on a case by case basis based on the surface type(s) of an item and the circumstances surrounding the request (e.g. DNA, ballistics, etc.). It is up to the examiner to determine the most appropriate processing techniques which are likely to develop prints.

Evidence processing must be done in sequential order to develop the highest quality and quantity of latent prints. The specific techniques used depend on the type of surface being processed and deposition medium observed or detected. Different techniques may be inhibited by other methods or techniques.

Reagent listings and the analytical processing techniques listed in this document are representative of the proper sequence to be followed.

At any step during the course of the examination and/or processing of an item of evidence the examiner shall evaluate the sufficiency of any friction ridge detail observed. If the examiner deems it appropriate based on training, experience and detail observed, the friction ridge detail may be documented photographically, via a scanned image, and/or lifting the ridge detail prior to proceeding to the next processing step.

Copies digital/printed must be made of paper items when there is concern that information contained on an item may be damaged or destroyed during processing. Copies must be labeled on outer packaging/digital file name used "Copy" along with the case number, evidence item number, date and processor employee number. The step of copying must be documented in the processing notes.

Note: Examiners shall wear gloves and other appropriate protective clothing while handling all evidence that is to be physically or chemically processed for latent prints.

6.1.1 Non-porous Processing – Analytical Approach

6.1.1.1 Examine the item of evidence under ambient or directional lighting conditions. Document any observations.

6.1.1.2 Examiner may examine the item of evidence utilizing an alternate light source, including all wavelength filters available on the chosen ALS. Document any observations.

6.1.1.3 Chemically process the item(s) of evidence. Document any observations.

6.1.1.3.1 The following is a list of the recommended and available processing procedures for non-porous items of evidence that are submitted for analysis.

Note: Based upon his or her training and experience, the examiner has the authority to determine the most appropriate methods among the listed Technical Procedure available in the lab by which to process a particular item.

- Cyanoacrylate Fuming
- Fingerprint Powder(s)
- Fluorescent Dye(s)
- Alternate Light Source (specific to fluorescent dye available)
- Blood Print Processing (if needed)
- Adhesive Surfaces Processing (if needed)
- Wet Item Processing (if needed)
- Grease Print Processing (if needed)

6.1.1.3.2 Based on the condition of the evidence at the time of submission, some processing steps may be omitted. If omitting the visual examination, ambient/directional lighting, or post-dye alternate light source examination, the Examiner shall note in the processing worksheet a reason that the step was omitted.

6.1.2 Porous Processing – Analytical Approach

6.1.2.1 Examine the item of evidence under ambient/directional lighting conditions. Document any observations.

6.1.2.2 Examiner may examine the item of evidence utilizing an alternate light source, including all wavelength filters available on the chosen ALS. Document any observations.

6.1.2.3 Chemically process the item(s) of evidence. Document any observations.

6.1.2.3.1 The following is a list of the recommended and available processing procedures for porous items of evidence that are submitted for analysis.

Note: Based upon his or her training and experience, the examiner has the authority to determine the most appropriate methods among the listed Technical Procedure available in the lab by which to process a particular item.

- 1,2 Indanedione Zinc
- Ninhydrin/Ninhydrin-HFE
- Zinc Chloride/Zinc Chloride HFE
- Alternate Light Source (specific to the fluorescent reagent available)
- Blood Print Processing
- Adhesive Processing
- Grease Print Processing

6.1.2.3.2 Based on the condition of the evidence at the time of submission, some processing steps may be omitted. If omitting the visual examination, inherent luminescence, and/or alternate light source examination the examiner shall note in the processing worksheet a reason that the step was omitted.

6.1.3 Semi-porous/Mixed Surface Processing – Analytical Approach

6.1.3.1 Examine the item of evidence under ambient/directional lighting conditions. Document any observations.

6.1.3.2 Examiner may examine the item of evidence utilizing an alternate light

source, including all wavelength filters available on the chosen ALS. Document any observations.

6.1.3.3 Chemically process the item(s) of evidence. Document any observations

6.1.3.3.1 Semi-porous/Mixed items of evidence may be processed utilizing methods that are determined by the examiner to be most appropriate for the surface. The method and order of processing may be determined based on the training and experience of each examiner. See Technical procedures for porous and non-porous processing.

6.1.4 Adhesive Processing – Analytical Approach

6.1.4.1 Adhesive surfaces are often found in conjunction with standard porous and/or non-porous surfaces. In the instances where adhesive surfaces are present, it is prudent to process the porous/non-porous surfaces first. Additionally, the use of adhesive processing reagents on the non-adhesive portion of tape may lead to further development of friction ridges.

6.1.4.2 Chemically process the adhesive surfaces utilizing Crystal Violet, Sticky-Side Powder, or Tape Glo. The Examiner has the authority to determine which processing technique to use. The method and order of processing may be determined based on the training and experience of each examiner. Document any observations. See Technical procedures for porous and non-porous processing.

6.1.5 Blood Print Processing - Analytical Approach

6.1.5.1 Surfaces contaminated with blood or other biohazardous materials are often found in conjunction with standard porous and/or non-porous surfaces. It is at the discretion of the examiner, based on his or her training and experience, as to the order by which the item will be processed. See Technical procedures for porous and non-porous processing.

6.1.5.2 Following the appropriate technical procedure, chemically process the item(s) of evidence utilizing Amido Black, Coomassie Blue, or LCV. Document any observations.

Note: It has been noted that Ninhydrin-7100HFE is also effective at developing friction ridge detail in blood or other biohazardous material on porous surfaces. Ninhydrin may be utilized in conjunction with other blood print processing methods.

6.1.6 Miscellaneous Processing - Analytical Approach

6.1.6.1 At times items of evidence are submitted that have unique processing needs. Items that have been submerged in water and items that contain greasy friction ridge stains (ex: soda or greasy food residue stains) or in the instance of fired cartridge casings, require special processing considerations. When it becomes apparent that either of these circumstances exists it is at the discretion of the examiner, based on his or her training and experience, as to the most prudent processing technique to be utilized. See Technical procedures for porous and non-porous processing.

6.1.6.2 Examine the item of evidence under ambient lighting conditions. Document any observations.

6.1.6.3 Examiner may examine the item of evidence utilizing an alternate light source, including all wavelength filters. Document any observations.

6.1.6.4 **Wet Non Porous Items –** Chemically process the item(s) of evidence utilizing Small Particle Reagent.

6.1.6.4.1 When processing items that are submitted to the laboratory submerged in water a visual examination, ALS examination, and the use of Small Particle Reagent shall be required. Additional processing steps are at the discretion of the examiner, based on his or her training and experience.

6.1.6.5 **Sticky and/or Greasy Items –** Chemically process with Sudan Black.

In instances where Sudan Black is available it is also prudent to process the item(s) of evidence utilizing non-porous and/or porous processing techniques. It is at the discretion of the examiner, based on his or her training and experience, as to the order by which the item will be processed. See Technical procedures for porous and non-porous processing.

7.0 Foundations for Identification

7.1.1 All Identifications performed within the Latent Evidence discipline shall be independent with conclusions based on scientifically sound premises. The Laboratory recognizes the following concepts:

7.1.1.1 No two individuals have been found to have the same fingerprint.

7.1.1.2 The fingerprint does not change naturally from before birth until after death, barring scars, disease or mutilation.

7.1.1.3 Identification is effected when sufficient unique identifying characteristics are present in both the known and questioned impressions without any unexplained differences. The identification is based on the complete examination of observational data from the evidence utilizing the principles outlined in the ACE-V method and its ability to withstand scrutiny.

7.1.1.4 There is no scientific requirement of a minimum number of identifying characteristics in order to effect a positive identification. A positive identification relies on the analyst's examination of the demonstrable data that limits ambiguity and utilizes the application of sufficient criteria to form a conclusion.

8.0 Friction Ridge Comparison Procedure – Analytical Approach

8.1 Friction ridge impression comparisons in Latent Evidence are conducted utilizing the Analysis, Comparison, Evaluation, and Verification (ACE-V) methodology. All ACE-V examinations involve the gathering and use of both qualitative and quantitative data present within a friction ridge impression in order to reach a conclusion. These examinations include comparisons of developed impressions captured photographically or via a scanner, impressions submitted on latent lifts, impressions submitted in photographs, impressions submitted via digital media (CDs, DVDs, and portable storage devices), SAFIS and reverse SAFIS hits.

8.2 Examiners in Latent Evidence have multiple tools available for conducting comparative examinations. Based on the training and experience of each individual examiner an optical comparator, any of the various magnifying magnifiers/glasses available, and/or a comparison on a computer may be used.

8.3 All comparisons shall be documented in Latent Evidence ACE-V worksheet. The ACE-V worksheet shall be retained in the case record.

8.4 ACE-V

8.4.1 **Analysis (collect data)** includes the assessment of each individual friction ridge impression to determine its suitability/sufficiency for comparison. The assessment includes examination and documentation of the matrix (if known), substrate (if known), and the presence of level 1, level 2, and if present, level 3 detail as outlined in the procedure for ACE-V. The examiner may document any additional relevant information that is deemed pertinent to the comparison, to include, but not limited to: impression type (finger, palm, and impression), scars, creases, distortion, movement, pressure differentials, and background interference.

During the analysis phase the examiner shall determine and document if the friction ridge impression is sufficient (of value) for comparison purposes. Any friction ridge impression that is determined to be insufficient for comparison (not of value) will end the ACE-V process for that particular impression. The only exception would be that an impression has sufficient Level one detail to be used to exclude a source.

The analysis phase is completed prior to entering the comparison phase.

8.4.2 **Comparison (testing)** of a friction ridge impression is a side-by-side, direct comparison of the impression with a known standard. Known standards may be submitted by a law enforcement agency and/or obtained via SAFIS. See Technical Procedure for SAFIS/IAFIS.

Examiners shall conduct the comparison in order to determine if the quantitative and qualitative data observed in the friction ridge impression agrees with the quantitative and qualitative data present within a known standard. The analyst examines the latent and the known exemplar simultaneously for the presence and agreement of unique identifying characteristics, in the same relative position, and containing the same spatial relationship to each other. Each friction ridge impression that is deemed "of value" shall be compared to all available known exemplars.

8.4.3 **Evaluation** is when the examiner compiles all data that was observed in the analysis and comparison phase utilizing a non-linear application of ACE-V. The conclusions that may be reached are elimination/exclusion, identification, and inconclusive due to a lack of sufficient detail available in either the known exemplars or the unknown friction ridge impression. All conclusions shall be documented in the (FAR) Forensic Analysis Report and in the ACE-V worksheet.

If an identification was effected with the exceptions of elimination and exclusion the friction ridge impression and the corresponding known impression shall be charted and stored in the case file. In instances where multiple identifications are made to multiple known individuals 'one identification for each individual shall be charted and stored in the case file. The charting of identifications shall satisfy the requirement of having one charted "of value" impression stored in the case file.

8.4.4 **Verification (Peer Review)** is an independent application of the analysis, comparison, and evaluation phases of ACE-V by another qualified examiner. All friction ridge impression identifications and exclusions shall be verified. Additionally, in cases involving a death, all determinations of value and inconclusive results shall be verified.

A verification review shall be completed and documented in the case file prior to scheduling any additional reviews. The examiner acting as the verifier shall document the verification on the individual item(s) of evidence, the known exemplars, as well as by completing the verification review on the ACE-V worksheet. For all identification verifications the verifier shall indicate the date of the verification, and his or her initials on the item(s) of evidence prior to returning the evidence to the assigned examiner.

Conflicts of opinion between the assigned examiner and the verifying examiner shall be resolved as provided in the lab-wide **QSP 5-9-4 Administrative and Technical Reviews**.

9.0 State Automated Fingerprint Identification System (SAFIS)

9.1 The SAFIS interface is a tool by which examiners can perform state- wide searches of unknown/unidentified fingerprints and palm prints (SAFIS only) as well as search for and obtain known exemplars that are available through the state fingerprint database. The systems are maintained by the North Carolina State Bureau of Investigation Criminal Information and Identification Section (CIIS) and the manufacturer.

9.2 When SAFIS is requested, the examiner shall determine, based upon his or her training and experience, which friction ridge impressions are suitable for search on the SAFIS.

9.3 Detailed instructions as to the operation and functionality of the SAFIS computer terminal may be found in the **Latent Procedure for SAFIS/IAFIS.**

9.4 Guidelines for SAFIS searches may be found in the **Latent Procedure for SAFIS/IAFIS Searches.**

9.5 Copies of known exemplars may be obtained through the SAFIS system and the Federal Bureau of Investigation. The source of known exemplars shall be documented in the master case file as noted on the ACE-V Notes sheet.

9.6 Steps for retrieving known exemplars from SAFIS are found in the Technical Procedure for SAFIS/IAFIS.

9.6.1 Compare applicable comparison quality latent impressions to the known exemplar images as necessary and prepare the required notes and reports.

9.6.2 When copies of known exemplars are received from these databases they are not considered to be items of evidence. They are considered to be certified copies and shall be held in the hard case file.

10.0 Recording of All Analytical Data

10.1 Information Required in Every Master Case File:

10.1.1 All examination activities.

10.1.2 Activities include the development techniques applied, control or reagent checks used in development techniques, photography/digital imaging used, Image Processing history logs, any SAFIS searches conducted, known exemplar capture and/or retrieval, comparisons conducted, and conclusions reached.

10.1.3 Examination documentation shall also acknowledge the existence and disposition of any captured latent prints which are not analyzed, compared or evaluated. This includes any photographs or scans taken where the friction ridges were later determined to be not "of value."

10.1.4 When identifications are made, a legible copy of the latent print and the known exemplar used shall be retained in the master case file. If multiple identifications are made to one individual only the charted identified latent and known exemplars shall be stored. They shall be stored on a data/image drive of the county server infrastructure and downloaded to CD/DVD as stated in the technical procedure for Image Processing. Legible copies of additional identifications shall be held in the master case file and may

be stored digitally.

10.2 Comparison cases and known exemplars:

10.2.1 If the known exemplar is retrieved from data bases, repositories or other sources then they shall be labelled as a copy and retained in the hard case file. If the known exemplar is an original recording of the known inked impression of a subject then a legible copy of the original shall be labeled as such and retained in the hard case file. Originals shall be treated as evidence. Originals shall be retained with unique evidence item number and will follow the same tracking protocols as any other evidence or test item.

10.2.2 Known inked Impressions turned in as an item of evidence and signed for by the examiner from Evidence Control shall retain the assigned evidence designation and item number. These Exemplars shall be annotated as any other Exemplars used in analysis. Upon completion of examination legible copies shall be labelled and retained as such and the original returned to general evidence.

10.3 Latent lifts, photographs/digital images, and/or legible copies of friction ridge impressions:
All photographs, digital images, or legible copies of all latent prints shall be retained in the master case file. Digital records shall be stored in/on data/image drive of the county server infrastructure and recordable media in hard case file.

10.3.1 Legible copies of all latent lifts, photographs, or scans of friction ridge impressions determined not to be "of value" or part of an inconclusive result during analysis shall be retained in the master case file.

10.3.2 Any annotations made on sub-item evidence, such as latent print lifts or photographs/digital images of latent prints shall be retained as examination and supportive documentation in the master case file.

10.3.3 Latent prints submitted to this laboratory for analysis shall be annotated with our agency case number, item number, date and initials of the Examiner. Every Latent lift card shall be annotated upon receipt by the Examiner. If originated from our agency, additional notation of our case number is not necessary as it appears on the latent already.

10.4 Databases which generate lists that are reference materials include the following: SAFIS- PCSO

and/or other agency repositories. If a search results in identification, the physical fingerprint card shall be printed and retained as described in previous section**.**

10.5 SAFIS Match Reports shall be retained in the case file and annotated with the coinciding latent number.

11.0 Results Statements

11.1 Results statements shall be recorded in accordance with the Latent Section Technical Procedure for Writing Results Statements.

12.0 Records

- ACE-V Worksheet
- Processing Worksheet
- Latent additional Notes Sheet

13.0 Attachments – N/A

REVISION HISTORY		
CURRENT VERSION	**EFFECTIVE DATE**	**SUMMARY OF CHANGES**
1	2016/11/05	Original Version-Started development 2016/08 with changes to result statements.
2	2017/01/31	Change Revision table, Change issue date to effective date, Rev# to Vers#, Add terminology, Add negative control to initial reagent testing, Add and move around statements Under physical and chemical processing to include new language about sequential processing, copying documents and determining extent of process, Under ACE-V section add collection of data and other statements linking ACE-V to Scientific Hypothesis testing. Under safis remove instruction on submission of latent to FBI (ULW) refer to tutorial located on the SAFIS Terminal. Remove most of Stated results statements as they are in the procedure for reporting results. Under records add Latent additional Notes Sheet. Under foundation of identification add additional explanations to describe what actually supports the conclusion.
3	2018/04/01	Change text in section for processing, accept tracked changes, remove repetitive language "for the steps" . Add in accordance with Latent Section Writing Results Statements. Modify 1,2indanedeone not to combine zinc.
4	2018/10/23	Change sections pertaining to labeling and retention of Known Exemplars and Latent evidence. Correct typo's font and case.
5	2019/03/22	5.1 removed text on recording pos-neg-controls of reagent prior to use on test item on the reagent log.
6	2019/10/15	Clarify language for situation where a chart "shall be done" for all Identifications- Resolve Close DRF 19-000