The Lab Report

Volume 6, Issue 3 December 2016

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ASCLD/LAB accredited since 2004.

Nebraska State Patrol Crime Laboratory Mission Statement

The mission of the Crime Laboratory Division is to provide quality forensic science services to the State of Nebraska. To fulfill the mission of the laboratory, the following objectives are supported and understood by the staff of the NSP Crime Laboratory:

To provide timely, effective and impartial forensic services to aid in the investigation of crimes; To provide relevant, professional and impartial testimony in judicial proceedings; To disseminate scientific information and educate the criminal justice community regarding forensic science matters; To provide traceable and accurate results that are pertinent to the needs of the criminal justice community.

NSPCL Frequently Asked Questions

http://statepatrol.nebraska.gov/vimages/shared/vnews/stories/56a799f237860/Crime%

Current Caseload and Turnaround Times

*** average turnaround time (TAT) is the average number of days that cases are turned around—this number includes Rush and Routine cases. The number is calculated by our LIMS system**

Analytical Section	Assignments Pending	Average TAT (4th qtr.)
Chemistry Unit		
Controlled Substances	459	53.80 days
Toxicology	199	136.01 days
Trace	26	111.25 days
Biology Unit		
Biology	383	185.04 days
Physical Sciences Unit		
Firearms/Toolmarks/ Footwear/Tire	59	117.58 days
Latent Fingerprints	215	221.34 days

NSP Crime Laboratory 2016 Statistical Recap

As we enter into the year 2017, the NSP Crime Laboratory would like to provide 2016 year-end statistics for the agencies we serve across the state of Nebraska. In addition to scientific evidence analysis, our analysts provide expert witness testimony for the court system (state and federal levels) as well as provide educational presentations/training free of charge throughout the state!

The laboratory received 703 more cases in 2016 than in 2015, equating to more than 852 separate section assignments. Additionally, the laboratory completed 1,129 more section assignments in 2016 than completed in 2015.

Listed below are the NSP Crime Laboratory year-to-date totals (as of December 31, 2016).

Total Number of Different Agencies Served by the Lab in 2016: 156

	Assignments Received/Submitted (2016)	Reports Written/Assignments Completed (2016)
Laboratory Totals	5,667	5,837
	Chemistry Unit	
Controlled Substances	3,759	4,180
Toxicology	657	648
Trace	46	32
	Biology Unit	
Biology Casework	676	573
	Physical Sciences Unit	
Firearms/Toolmarks/ Footwear/Tire	189	161
Latent Fingerprints	340	243

NSP Crime Laboratory 2016 Statistical Recap

Court Appearance/Testimony Stats

- Total Court Appearances by NSP Laboratory Staff in 2016: 58
- Total Miles Travelled for Court in 2016: 12,536 miles
- Number of Counties where Testimony was Provided in 2016: 17
- Number of Overnight Stays to Provide Testimony in 2016: 12

Database Statistics for 2016

- CODIS (Combined DNA Index System)

  Offender Samples Received for CODIS entry: 3,359

  CODIS Hits: 78
- AFIS (Automated Fingerprint Identification System)

  Latent Impressions searched through AFIS: 241

  AFIS Hits: 108 (of those, 47 were cold hits)

Free Presentations/Trainings Provided by NSPCL Staff

- Number of Presentations/Trainings Provided by NSPCL Staff: 35
- Approximate Number of Presentation/Training Attendees: 2,263

Anatomy of Biology Reports

As a result of customer feedback, the Biology Unit formed an ad hoc committee in 2014 that included law enforcement and attorneys from a cross section of the state to redesign our reports. **The Biology Unit reports are now simplified and use as much plain English as possible while still maintaining the content required by national standards.**

Biology Report - First Section

The first section of a Biology Unit report is a combined table that lists the evidence that was examined and the results of any screening tests that were performed.

Due to the large number of items that are often received, a full inventory of all submitted items is not included on a biology report. This information is maintained by the lab in the case record to ensure that a complete chain of custody is maintained on all items of evidence.

A legend below this table explains what is meant by the different testing results, such as the confirmation of semen or a presumptive test for blood.

The last column indicates if DNA testing was performed on the item or sub item (e.g. stain). Due to the expense and time required for DNA testing, not all positive stains are selected for DNA testing.

Biology Report - Second Section

The second section is the Methodology section.

This section is **not** written in plain English as it is verbiage required by national standards. This section does not affect most readers of the report, but rather will help an independent expert understand exactly what testing was performed by the lab should the expert review the report.

Biology Unit

Jason Linder (Mgr.)

Jeff Bracht
Heidi Ellingson
Dani Oshlo
Brandy Porter
Katherine Rector

Anatomy of Biology Reports

Biology Report - Conclusions Section

The Conclusions section often includes a table that lists the items of evidence on which DNA testing was performed along with each known reference sample tested. This table is a concise way to summarize the DNA results.

If someone is **Included**, it means they **may be the source** of the unknown DNA and a statistical weight to that inclusion will be listed in the text below.

If the person is **Excluded**, it means that **the person is not the source** of the DNA.

Often the result is too complex or too incomplete to draw any conclusions. This is reported as either a **No Conclusions or an Uninterpretable** result. There are minor differences between No Conclusions and Uninterpretable, however, to you, it simply means we are not able to determine the identity of the donor. Unfortunately, it is common for counsel on both sides to try and use this to their benefit when in reality, it means that nothing can be said about the profile.

The text below the table often includes useful information about the mixtures of DNA, the gender of the DNA donor, and statistical weights to any Inclusions that were made.

Biology Report - Additional Examination Notes Section

The final analytical section of the report is the Additional Examination Notes section.

This section often includes important information for the reader, such as a request for additional reference samples or suggesting a sample could be outsourced for Y-STR typing.

The Biology Unit staff are always willing to help you understand the report.

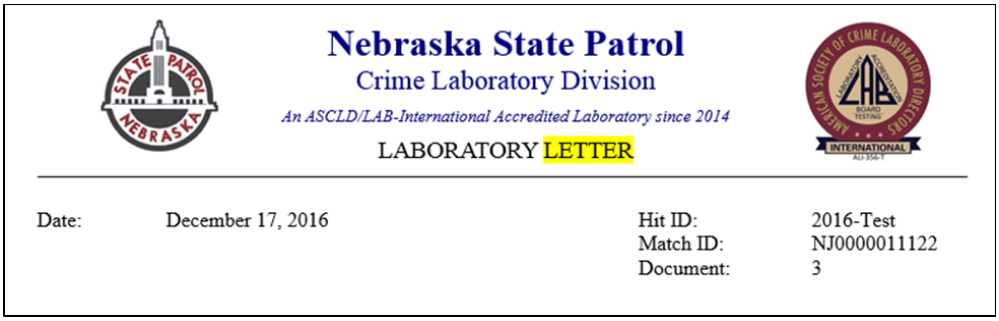
Feel free to give us a call or stop by and learn more!

Anatomy of a CODIS Hit Letter

Eligible DNA profiles are submitted to the Combined DNA Index System (CODIS) to be searched against each other to identify serial crimes and to provide investigative leads to our Law Enforcement Agencies.

Once a CODIS hit has been confirmed the Nebraska State Patrol Crime Laboratory issues a Hit Letter to the Law Enforcement Agency/Agencies to inform them about the investigative lead.

Header: The information contained in this section informs the agency that it is a 'Laboratory **Letter**' from the Nebraska State Patrol Crime Laboratory. It also provides the date that the letter was issued, as well as unique identifiers assigned to this CODIS hit by the laboratory.



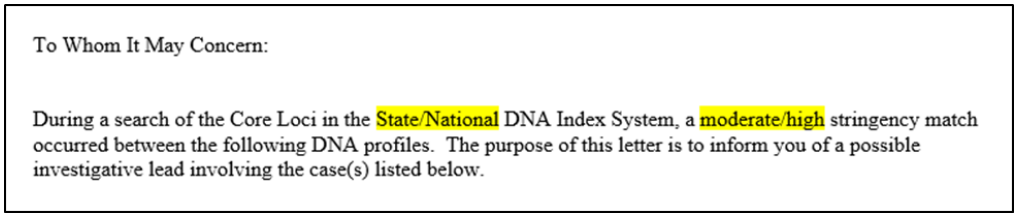
Nebraska State Patrol
Crime Laboratory Division
An ASCLD/LAB-International Accredited Laboratory since 2014
LABORATORY LETTER

Date: December 17, 2016

Hit ID: 2016-Test
Match ID: NJ0000011122
Document: 3

Introduction: This section specifies if the CODIS hit occurred at the State (Nebraska crime scene evidence hit to other Nebraska crime scene evidence, or a Nebraska offender) or National (Nebraska crime scene evidence hit to out-of-state crime scene evidence, or an out-of-state offender) level of CODIS.

This section also specifies the stringency of the CODIS match. A high stringency match means that the DNA types involved in the CODIS hit matched at all locations tested. A moderate stringency match means that there was not a 100% match between the DNA profiles involved in the CODIS hit. You will see moderate stringency matches with DNA mixtures or partial DNA profiles.



To Whom It May Concern:

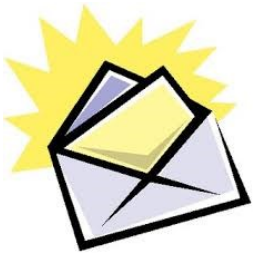
During a search of the Core Loci in the State/National DNA Index System, a moderate/high stringency match occurred between the following DNA profiles. The purpose of this letter is to inform you of a possible investigative lead involving the case(s) listed below.

Biology Unit:
CODIS

Katherine Rector
(Sup./State CODIS Administrator)

Ming Hansen-Gong
(CODIS Tech)

Anatomy of a CODIS Hit Letter



Body: **This section will list case information pertaining to the CODIS hit**. If the CODIS hit involves crime scene evidence only, there will be a section for **'Suspect Identified'.**

If this section is present, the Law Enforcement Agency who has 'No' needs to contact the other Law Enforcement Agency who has 'Yes' to obtain suspect information.

If both are 'No' then the two Law Enforcement Agencies need to work together and provide suspect information as it is obtained.

Case Information:

Case Agency:	Law Enforcement Agency 1
Agency Case Number:	16-001
Investigating Officer:	Smith
Agency Telephone:	402-555-1111
Suspect Identified:	No
NSP Lab Number:	L16-0001
NSP Lab Item Number:	1A
Specimen ID:	L16-0001 1A MAJ

Case Information:

Case Agency:	Law Enforcement Agency 2
Agency Case Number:	16-002
Investigating Officer:	Anderson
Agency Telephone:	402-555-2222
Suspect Identified:	Yes
NSP Lab Number:	L16-0002
NSP Lab Item Number:	5
Specimen ID:	L16-0002 5

If the CODIS hit involves crime scene evidence and an offender, then offender identifying information will be provided along with the case information.

Case Information:

Case Agency:	Law Enforcement Agency 2
Agency Case Number:	16-002
Investigating Officer:	Anderson
Agency Telephone:	402-555-2222
NSP Lab Number:	L16-0002
NSP Lab Item Number:	5
Specimen ID:	L16-0002 5

Offender Information:

Name:	John Doe
Date of Birth:	1/ 1/1980
SS Number:	111-11-1111
SID Number:	NB111111
FBI Number:	111111AA1
Qualifying Offense:	Felony Drug Offense
Last Known Whereabouts:	111 Street City, State Zip

Anatomy of a CODIS Hit Letter

<u>Confirmation Information:</u> If the CODIS hit involves a Nebraska offender, this section contains information about how the CODIS hit was confirmed. The DNA sample from the offender will be reanalyzed. It is also a requirement that all offenders provide their fingerprint at the time of DNA collection. This fingerprint is confirmed in addition to the DNA to ensure the correct person was collected. This is NOT a fingerprint from the crime scene evidence.

This section will also request a reference DNA sample from the listed offender, or any suspects that may be developed, for comparison and/or court purposes. The Law Enforcement Agency/Agencies need to work with each other and their County Attorneys to determine how to obtain this reference sample (warrant etc.).

- If the crime scene evidence was submitted to the Nebraska State Patrol Crime Laboratory, the reference sample must be submitted to them with a NSP750 submission form. If the crime scene evidence was submitted to the UNMC HDI Laboratory, the Hit Letter will direct that the reference sample be submitted to the UNMC HDI Laboratory.
- A reference sample is requested because the offender DNA samples do not have a chain of custody.
- **Do NOT use the Nebraska State Offender DNA Collection Kits to collect this reference.** It can simply be collected with a sterile swab and packaged in a swab box or envelope after it has been properly dried.

> The offender specimen was reanalyzed and the DNA profile has been confirmed. The fingerprint impression submitted with the offender sample has been confirmed.
>
> A reference sample from John Doe must be collected and submitted to the Nebraska State Patrol Crime Laboratory for comparison and/or court purposes.

If you have any questions regarding the anatomy of a CODIS Hit Letter, feel free to contact Katherine Rector at 402-471-8950

Katherine.Rector@nebraska.gov

<u>Biology Unit:</u>
<u>CODIS</u>

Katherine Rector (Sup./State CODIS Administrator)

Ming Hansen-Gong (CODIS Tech)

Anatomy of Controlled Substances (Drug) Reports

A typical Drug report contains the following information:

Inventory: An inventory of ALL evidence submitted, including the status/existence of any seals

- Weights of individual items will **not** be listed in the inventory due to the laboratories accreditation requirement of listing an "uncertainty of measurement*" with each weight.

An appendix will be included with the report listing individual item weights and their associated uncertainty

Individual weights CANNOT simply be added to determine the total combined weight, there is an appropriate mathematical formula for combining weights with uncertainties

Results Section

- **List of substances "identified"**
- **Weights of substances identified**, like substances combined utilizing appropriate mathematical formulas, along with the "uncertainty" * expressed as X.XXg +/- X.XXg at a coverage probability of 99.73%**

Purity Results

Purity Results: Purity analysis is a measurement, which like weighing, has an inherent "uncertainty". Calculation of the "methamphetamine actual" in a sample requires a specific mathematical procedure therefore:

- Purity results will be reported as the "minimum" actual methamphetamine which could be present in the sample taking into account the uncertainty of the weighing process and the purity analysis.

The % purity is not reported.

Controlled Substances Section

Celeste Laird (Mgr.)

Jerry Smith
(Tech Lead)

Vicky Cowan
Meggan Macomber
Amanda Neely
Jake Oshlo

Anatomy of Controlled Substances (Drug) Reports

Examples of Drug Results and Their Meanings

1) **Item X: Confirmed _____, Schedule _____.**
   - Substance confirmed using Gas Chromatography/Mass Spectrometry (GC/MS)

2) **Item X: Negative for controlled substances**
   - Substance could not be identified

3) **Item X: Analysis indicated, but did not confirm _____.**
   - The substance appears to be a controlled substance but the crime laboratory doesn't have a method to confirm or was unable to obtain or verify a reference material.

4) **Item X: No substance identified. Analysis indicated the presence of either _____or _____.**
   - A substance that was possibly controlled was seen by analysis and there is another substance that appears similar analytically. The laboratory either cannot obtain/verify reference materials, or has no methodology to differentiate the substances

5) **Item X: Negative for controlled substances. Analysis indicated, but did not confirm _____.**
   - The screen of the substance did not show a controlled substance but indicated a substance that may be of investigative value e.g. a cutting agent, so the screening information is provided

Controlled Substances Section

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Anatomy of Controlled Substances (Drug) Reports

*<u>Uncertainty of Measurement</u>: **Every measurement is subject to some "uncertainty", meaning the measuring instrument, the type of item being weighed, the environment, operator etc. can impact the measurement result.** There are established rules for calculating an estimate of uncertainty.

The Crime Laboratory Drug section has done these studies and calculations so is able to report the uncertainty of weights it provides. **An example would be; Item 1A – indicated Cocaine, schedule II. Total Net Weight = 1.00g +/- 0.30g meaning the weight could be as much as 1.030g or as little as 0.970g based on the scientifically determined uncertainty for the laboratory.**

<u>Coverage Probability of 99.73%</u>: A coverage factor is a number that demonstrates the statistically valid confidence level you have chosen when reporting data e.g. Uncertainty of Measurement data.

By choosing a 99.73% coverage probability, we are saying that 99.73 times out of 100, if we weighed the same item it would fall into the range created when we list the weight +/- the uncertainty.

It DOES NOT mean we are only 99.73% certain of the identification of the substance, it only refers to the weighing process.

<u>Controlled Substances Section</u>

Celeste Laird (Mgr.)

Jerry Smith (Tech Lead)

Vicky Cowan
Meggan Macomber
Amanda Neely
Jake Oshlo

Anatomy of Toxicology Reports

A typical toxicology report contains the following information:

<u>Inventory</u>: An inventory of the evidence submitted, including the status/ existence of any seals and all labeling of the urine container.

- Title 177, Chapter 7 of the Nebraska Administrative Code has very specific requirements for the labeling of urine containers relevant to Driving Under the Influence of Drug cases.

Anatomy of Toxicology Reports

Cutoff Levels: Title 177 lists cutoff levels for a limited number of drugs. They will be listed on the report if one of the specific drugs listed is identified and/or was requested but not identified.

- **These cutoff levels DO NOT have any correlation to impairment.** Title 177 lists them as determining the presence or absence of the drug. **Simply put, if the level is below the cutoff Title 177 does not consider them present in the sample.**

- **There are many drugs that have no cutoff levels listed in Title 177, that does not mean they cannot be detected by our laboratory and does not mean they cannot be impairing**

Results:

1) Will list any substances identified;
- The substance was confirmed by Gas Chromatography/Mass Spectrometry
- The substance was above the cutoff level if the substance has one listed in Title 177

2) Will address any substance requested on the submittal form that was NOT identified or cannot by tested for by the Crime Laboratory;
- It was not seen above the cutoff during screening or;
- It was seen on screening but was not above the cutoff during confirmation or;
- The NSP Crime laboratory does not have the capability and/or validated procedures for testing of the substance

3) Some drugs are not identified as the original or "parent" drug, rather a metabolite (what the body turns the drug into prior to excretion in the urine);
- The metabolite will be listed in the results
- An explanation of what it is a metabolite of will also be listed.

Toxicology Section

Brad Rutledge
(Tech Lead)

Debra Davis
Abbey Dodds

Anatomy of Trace Analysis Reports

Because the Trace Section receives a large range of evidence items from crime scenes, the trace section reports are highly variable in language.

If you have questions/concerns regarding the verbiage used in analytical reports issued by the Trace Section, please contact Mike Auten (Trace Section Tech Lead) at 402-471-8950.

Trace Section

Mike Auten

(Tech Lead)

Anatomy of Latent Fingerprint Reports

Latent Prints Section

Mariana Ward

(Sup./Tech Lead)

Bridget Driver

Sarah Zarnick

Since the Latent Print section deals with the identification of latent impressions to a specific individual(s), there is a multitude of information that Latent reports can address. The cases received by the Latent Print section range from one item submitted for Latent examination and/or processing to several, the number of individuals to compare to can range from none listed, to several. One item can contain No Value (NV) latent impressions, or it can have a numerous Of Value (OV) latents on it. Of the value latents received or developed on one item, they all may belong to just one individual, or an examiner can determine that multiple individuals handled that one item.

Because of the variety of information we end up with at the conclusion of our analysis, the Latent Section's reports will slightly differ from each other, making it hard to issue a generalized explanation of the wording used in them.

Therefore, to try and simplify we will divide our reports into two categories:

1) **Those containing no value latent impressions in a case (nothing developed); and,**

2) **Those containing value latent impressions, that can be used for the identification or exclusion of individuals.**

Anatomy of Latent Print Reports

Latent Prints Section

Mariana Ward
(Sup./Tech Lead)

Bridget Driver
Sarah Zarnick

Scenario 1: NO VALUE latent impressions being received or developed

The "No Value" Latent case reports are generally short and condensed, containing only information pertaining to the explanation of why the ridge detail received or developed is of no value for comparison purposes. No descriptive information of any individuals involved in a case will be noted. In the event of a "No Value" case, if no other Laboratory assignments are pending, the evidence will be returned to the agency, and no follow up action is required by an investigative officer.

Sample Latent Report wording for NO VALUE Latent cases:

"The above listed items have been **examined**, **processed** and **evaluated**. **Quality** and **quantity** of **friction ridge detail** received and developed in this case is **insufficient for comparison purposes** due to **smudging**, **swipes**, **overlap** and **broken ridge detail** of impressions".

In Summary .....

No value latent impressions were developed or received that can be used for comparison purposes, and the reason why the developed ridge detail was insufficient for comparison purposes is given.

Anatomy of Latent Print Reports

Relevant terminology from Scenario 1:

Examined: Each item received for latent analysis is visually examined for presence of visible friction ridge detail, in which case it may or may not require further chemical processing.

Processed: Porous and non-porous items are generally processed with chemicals and dyes in order to make the latent (invisible) ridge detail readily visible for examination purposes.

Evaluated: Any received or developed friction ridge detail is evaluated for sufficiency (if it is Of Value, or No Value) to determine if it can be used for further examination and comparison purposes or not.

Quality: Also refers to the "clarity" of an impression (how clear the impression is?).

Quantity: The number of unique characteristics available in an impression, being used for identification or exclusion purposes.

Friction ridge: A raised (corrugated) portion of the epidermis on the palmar (hands), and plantar (feet) surfaces, consisting of one or more connected ridge units.

Friction ridge detail: An area comprised of a unique combination of ridge flow, ridge characteristics, and ridge structure.

Sufficient: The impression(s) contains enough Quality and Quantity of friction ridge information needed for comparison purposes.

No Value (NV) Latents: the friction ridge detail developed does NOT contain sufficient Quality and Quantity of information for comparison purposes. **Some of the reasons for No Value determination may be:**

- **Distortion** (caused by the friction ridge skin's twisting, swiping/sliding, torqueing, too much pressure on the surface, or presence of a substrate and/or a matrix of the surface where the impression is being deposited).
- **Faint ridge detail** (not enough contrast between the received/developed friction ridge detail and the surface, in order to deem the impression suitable for comparison purposes);
- **Smudges** (parts of the impressions are smudged, and the remainder of the visible impression is lacking in quality and quantity of the detail); **Smudges with no classifiable friction ridge detail** may also appear, in which case a smudge in a shape of a finger will be observed, but absolutely no friction ridge detail will be present.
- **Swipes** (generally created when friction ridge skin or the surface contain certain amount of residue, causing a finger to "slip" across the surface);
- **Overlap** (two or more impressions being deposited atop of each other, where an examiner is unable to determine a clear separation of one impression against the others);
- **Broken ridge detail** (friction ridge path appears broken up, with segments of the ridges missing)

Anatomy of Latent Print Reports

Scenario 2: OF VALUE latent impressions being received or developed

The "Of Value" case reports will generally be much more comprehensive, since they contain information regarding the number of value latent impressions received and/or developed, the results of the AFIS and/or NGI database searches, the examiner's comparison conclusions, and the descriptive information of all individuals listed on the Evidence Submittal Form to which the value latent impressions were compared to (suspect(s), victim(s), elimination(s), and the investigative officer).

In the event of an "Of Value" case where the examiner determined an Inconclusive conclusion, a reason for such determination will be given. In most instances, a set of fully rolled, legible impressions of a known individual in question will be requested for a complete comparison with a particular latent impression.

If no other Laboratory assignments are pending, the evidence will be returned to the agency upon completion of the Latent assignment. If there is no additional physical evidence in the case that also requires Latent analysis, the officer should only submit the requested set of known impressions, or impressions of any other individual(s) of interest for that case. There is no need to re-submit the evidence that was already processed by the NSP Crime Lab's Latent Print Section, unless requested by a NSP Latent Print examiner.

Latent Prints Section

Mariana Ward
(Sup./Tech Lead)

Bridget Driver
Sarah Zarnick

Anatomy of Latent Print Reports

Sample Latent Report wording for OF VALUE Latent cases:

"The above listed items have been examined, processed and evaluated. Three (3) value latent impressions containing quality and quantity of friction ridge detail suitable for latent comparison have been received and developed. An ***AFIS*** *search was conducted on* ***value latent impressions L1, L2 and L3****, resulting in* ***identifications*** *being made on value latent impressions L1 and L3.*

Latent impression L1 was compared to the ***finger #6 (Left Thumb)****, and latent impressions L3 was compared to the finger #3 (Right Middle), both located on the fingerprint record* ***bearing the name John Doe, DOB: 5-15-1985, SID# 123456****, located at the Nebraska State Patrol Records Division – AFIS. It was determined that they all belong to the same individual.*

It was determined that latent impression L2 belongs to a tip of a finger. Latent impression L2 was ***Excluded*** *as belonging to John Doe. The results of comparison of latent impression L2 with the fingerprint impressions on file with the Nebraska AFIS bearing the name Jane Doe, DOB: 09-20-1989,* ***AFIS# 982A00012345****, located at the Nebraska State Patrol Records Division – AFIS are* ***Inconclusive****. The areas of the known impressions on file with the Nebraska AFIS for Jane Doe needed for a complete comparison with the latent impression L2 contain smudges and/or are not completely captured. No fingerprints on file with the Nebraska AFIS were found for Jake Smith, DOB: 03-23 -1983.*

Latent impression L2 was also searched through the ***FBI's NGI*** *(formerly known as IAFIS), resulting in* ***no identification*** *being made.*

A set of a fully rolled impressions*, to include tips of the fingers, for Jane Doe, Jake Smith and anyone else in contact with the evidence, should be submitted for a complete comparison with latent impression L2."*

In Summary …..

Three value latent impressions (L1, L2 and L3) were developed in this case:

- **Latents L1 and L3 were Identified to John Doe.**
- **L2 was determined NOT to be made by John Doe (he was Excluded).**
- **It is not clear whether latent impression L2 belongs to Jane Doe (the result is Inconclusive) – we need better exemplars in order to positively determine the identification or exclusion (please send a set of legible prints for Jane Doe to the Lab).**

(summary continued on page 18…)

Anatomy of Latent Print Reports

In Summary (continued from page 17) …..

- **Jake Smith has no fingerprints or palm prints on file with the Nebraska AFIS – please send a set of legible prints for Jake Smith to the Lab, so that we can compare his prints to the value latent impression L2.**
- **Also submit fingerprints of anyone else you think may have been in contact with the evidence from which latent impression L2 came from (any family members, friends, roommates, officers not wearing gloves at the scene, etc.).**
- **Latent L2 was searched through the FBI's NGI database, but was not identified.**

Relevant terminology from Scenario 2:

Of Value (OV) Latents: The friction ridge detail developed contains sufficient Quality and Quantity of information, and is suitable for comparison purposes.

L1, L2 and L3: Each impression determined to be Of Value for comparison purposes will be given a unique identifier. The unique identifier will always start with a letter "L" (Latent), followed by a consecutive number in a case. The L# will never be repeated within the same case. The numbering of value latent impressions received or developed through subsequent submissions will continue with the next sequential number from the last noted value impression.

AFIS: An Automated Fingerprint Identification System is the State of Nebraska's biometric system, containing fingerprint and palm print impressions obtained through civil or criminal bookings within the State of Nebraska. The Nebraska AFIS is divided into two separate databases: Known Impressions (LCF – Latent Cognizant File database), and Unknown Impressions (ULF – Unknown Latent File database).

- The LCF (Known) database contains fingerprint and palm print impressions of known individuals, with their descriptive information (e.g. name, DOB, sex, race, SSN, booking information, etc., and in many cases a photo of the individual).
- The ULF (Unknown) database contains latent impressions collected through processing of evidence obtained at various crime scenes. The latent impressions contained within the Nebraska AFIS can be either finger of palm print impressions. The Nebraska AFIS does not contain plantar impressions.

Any known and/or unknown impressions being added to the Nebraska AFIS will automatically be searched against the LCF and ULF databases. The Nebraska AFIS is maintained by the Nebraska State Patrol.

SID#: State Identification number, a unique identifier of an individual contained within the Nebraska AFIS as a result of a criminal booking (adult or juvenile).

Latent Prints Section

Mariana Ward
(Sup./Tech Lead)

Bridget Driver
Sarah Zarnick

Anatomy of Latent Print Reports

Relevant terminology from Scenario 2 (continued):

AFIS#: a unique identifier of an individual contained within the Nebraska AFIS as a result of a civil booking (various job application, licensing, permits, etc.), and in some instances relating to a previous criminal booking (sex offender registry, FBI wants, Federal arrests, etc.).

FBI's NGI: The Next Generation Identification system is a biometric database containing known fingerprints, palm prints, mugshots, iris scans, etc. of individuals, obtained through civil or criminal bookings from all 50 states. The NGI also contains a database of unsolved latent impressions, which is also available for searching. The NGI is maintained by the Federal Bureau of Investigations (FBI).

Latent Conclusions: There are three conclusions in Latent print analysis: Identification (Individualization), Exclusion and Inconclusive.

Identification (Individualization): A determination that two impressions belong to the same source.

Exclusion: A determination that two impressions do not belong to the same source (individual).

Inconclusive: Based on the available information, the examiner cannot positively determine whether the two impressions belong to the same source (individual). In such instance, a reason for an Inconclusive determination will be given, and an examiner may request a set of fully rolled impressions to be submitted for complete comparison.

A set of fully rolled, legible impressions: A fingerprint and/or palm print card(s) of a known individual containing all areas of friction ridge detail necessary for an examiner to be able to reach a positive determination of an Identification or an Exclusion.

Major Case prints: A set of fingerprints, palm prints and rolled finger joints and extreme sides and tips of the fingers of a known individual.

For any questions regarding the wording on the Latent Print Section reports, please contact the NSP Crime Lab at 402-471-8950.

Anatomy of Firearm/Toolmark Reports

Firearm/Toolmark Conclusions 101

The field of forensic firearm and toolmark analysis uses the same range of conclusions for comparative exams regardless of whether a suspect firearm (and its test fires) are being compared to fired ammunition evidence or a suspect tool (and its test toolmarks) are being compared to evidence toolmarks. **In each scenario, analysis relies upon the evaluation and comparison of features called "class characteristics" and "individual characteristics." Before the full range of conclusions is discussed in more detail, it is important to know what is meant by these terms.**

When the term "class characteristics" is used in a conclusion, it refers to known or intended characteristics of a particular item, as designed by the manufacturer or as an inherent trait that is somehow measurable and/or recognizable. Class characteristics are imparted in varying ways from a source item to the items it produces. The suspect item in question is what provides the guide to class characteristics evaluated and used for that comparison.

Firearm/Toolmark Section

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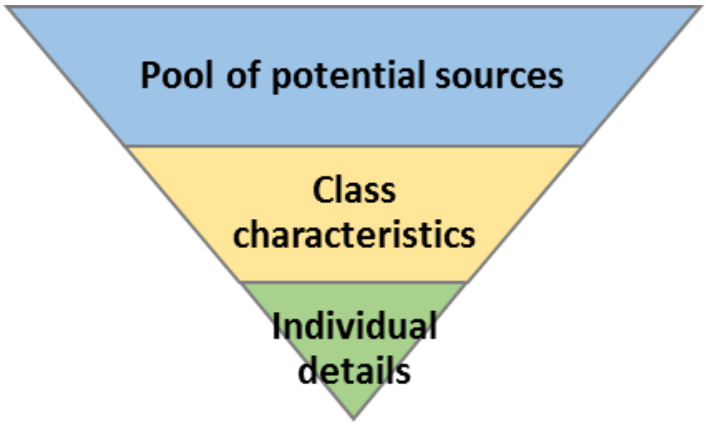
Common Class Characteristics for Firearms/Tools

Firearms	Tools
Caliber	# of blades/jaws/heads
Rifling type (conventional vs. polygonal)	Configuration of blades/jaws/heads
Rifling - # of lands/grooves	Interaction between multiple blades/jaws/heads
Rifling – direction of twist	Surface texture (smooth, grooved, cross-hatched, etc.)
Rifling – land/grove dimensions	Dimensions of blades/jaws/heads
Rifling – pitch of twist (if discernable)	Widest opening dimension for blades/jaws/heads
Extractor configuration/location	Sharpened edge contour (smooth vs. serrated)
Ejector configuration/location	Blade set style
Breechface configuration	Operating angles of blades/jaws/heads
Firing pin aperture configuration	Bevel dimensions on blades/jaws/heads
Firing pin shape/manuf. method	Tooth/serration spacing
Known manuf. variations over time	

Anatomy of Firearm/Toolmark Reports

Depending on the type of firearm or tool used in a crime, many of the listed class characteristics on the table are detectable on the respective fired ammunition components or resulting toolmarks. By accounting for class characteristics on recovered evidence items, and comparing those characteristics directly to the suspect firearm, tool, or exemplars created by that suspect firearm or tool, it becomes apparent to the trained analyst whether an agreement of class characteristics exists between that firearm/tool and the evidence items recovered from a crime scene. **It is important to understand that finding agreement of class characteristics, alone, does not mean an analyst has narrowed the field of possible sources down to a single source. Rather, it conveys the message that the group of possible sources is now better defined through the class characteristics that were detected (see figure below). This is merely the first level of comparative analysis in firearm and tool casework, and must be conducted prior to more in-depth comparison.**



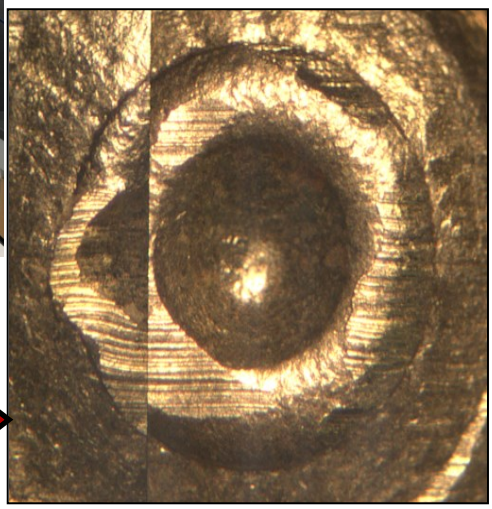
Individual characteristics are another set of features evaluated and compared between a suspected source item and other evidence recovered at a scene. As they pertain to firearms and tools, these characteristics are not intended or repeated predictably by the manufacturing process and they do not have a known dimensional or quantitative value upon creation. **Individual characteristics are created by a combination of the many machining and tooling methods that formed class characteristics for a firearm or tool, with the addition of randomized finishing and refining processes at the manufacturer level (grinding, sharpening, sanding, filing, tumbling, polishing, etc.). By the time a firearm or tool leaves the factory, these individual distinguishing details are developed to the point that even consecutively manufactured items possess different minute characteristics from one another.**

Anatomy of Firearm/Toolmark Reports

Once an item has been put to use post-manufacture, it can take on additional randomized characteristics depending on how that item is used (or abused). **When a trained analyst evaluates and uses individual characteristics in comparative exams, repeatability of these distinguishing details is verified during the creation of exemplars (e.g. multiple test fired items or multiple toolmarks).**

While these distinguishing characteristics cannot be measured or quantified in absolute terms, it has been shown through numerous studies that trained examiners have an extremely low error rate in their ability to correctly associate and eliminate potential source items (firearms and tools) when compared to unknown samples (fired ammunition components and toolmarks). The use and agreement of individual characteristics as an additional layer of comparative analysis, therefore, permits a trained analyst to provide more definitive results than is possible through agreement of class characteristics alone.

As additional information is detected and compared, a trained analyst is able to narrow the possible sources of fired ammunition or toolmarks, offering expert opinions regarding a likely source of evidence items recovered at the crime scene.



Firearm/Toolmark Section

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Anatomy of Firearm/Toolmark Reports

The range of comparative conclusions used in firearm/tool-related exams is explained below:

- **Identification** – requires agreement of class characteristics plus significant agreement of individual characteristics of a quality and quantity that are verifiable by other trained examiners.

- **Inconclusive** – an agreement of class characteristics is present, but other information needed for more definitive results is lacking. This could be due to a lack of quality or quantity of distinguishing characteristics, or a lack of clarity. Frequently, this conclusion is a result of damage to an evidence sample or involvement of a firearm/tool that leaves behind little to no individual characteristics, or does not repeatedly produce the same characteristics.

- **Elimination** – a disagreement of class characteristics has been observed; or in some instances, there is class characteristic agreement, but a significant disagreement of individual distinguishing characteristics (e.g. a different firearm with the same/similar class characteristics may have been used)

- **Unsuitable** – The evidence item is lacking in quality to the extent that it is of no use in comparative analysis (e.g. a bullet fragment with no rifling information present).

If you have any questions regarding the anatomy of a Firearm/ Toolmark Section Report, feel free to contact the laboratory!

Anatomy of Footwear/Tire Impression Reports

Footwear/Tire Tread Conclusions 101

The field of forensic footwear and tire track analysis is primarily concerned with the comparative analysis of evidence impressions from shoes and tires to potential sources of those impressions. This forensic field uses some of the same terminology and examination processes that were explained in the firearm/toolmark analysis section. **Conclusions reached as a result of comparisons between crime scene impressions and potential source shoes/tires are based upon the detailed examination and comparison of class characteristics and individual distinguishing characteristics (also referred to as randomly acquired characteristics).**

These class and individual characteristics are evaluated and compared by producing exemplar impressions from the potential source shoe/tire, and then comparing exemplar impressions directly to the crime scene impression evidence. The shoe/tire in question is used in conjunction with the exemplar impressions to ensure comparative details seen in the exemplars and crime scene impressions are authentic and not an artifact from an unknown source. **The ability to reach a definitive conclusion following an examination is impacted by the quality/clarity of details in the crime scene impression, the completeness of an impression, and the extent to which crime scene best practices were employed for the capture/recovery of that impression.**

As was discussed regarding firearm and tool characteristics, shoes and tires are made with an intended set of manufacturer traits that are referred to as class characteristics. These characteristics are specific to certain brands, styles, and/or product lines of shoes and tires, and may display some small variations due to the particular manufacturing molds, forms, or machines that were used to create the shoe/tire tread patterns for that product line. Analysts use class characteristics of the crime scene impression as a starting point in the examination and comparison of those impressions versus a potential source shoe/tire. Specifically, an analyst evaluates features of the tread pattern, physical size/spacing measurements, and general condition of wear.

Class characteristic comparisons, without any other details, are only used to determine whether general similarity, or a clear dissimilarity, exists between the items of evidence at hand. Impressions that appear identical to the casual observer often contain overlooked information that can take a case in a very different direction.

Firearm/Toolmark Section

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Anatomy of Footwear/Tire Impression Reports

Footwear/Tire Tread Conclusions 101

For this reason, careful documentation of class characteristics is necessary to prevent false assumptions from taking hold in the early stages of the examination process. Ultimately, if class characteristic correspondence is verified between a crime scene impression and a potential source shoe/tire, it conveys the message that the potential sources of that impression are narrowed to those shoes/tires with the same tread pattern, physical size, and general condition of wear within the brand(s) known to possess those characteristics.

In other words, correspondence of class characteristics, by themselves, is not enough to opine that a single shoe/tire origin exists for an impression.

Footwear	Tires
Overall tread pattern	Overall tread pattern
Intersection of tread pattern elements	Sipe count, locations, and orientation
Pattern mold characteristics	Location/spacing of wear indicators
Overall physical size	Overall physical size
Spacing of tread elements	Size/spacing of tread elements (pitch sequence)
Presence/placement of logos, brand markings	General condition of wear
General condition of wear	

Table 1 – Class characteristic examples (not an all-inclusive list)

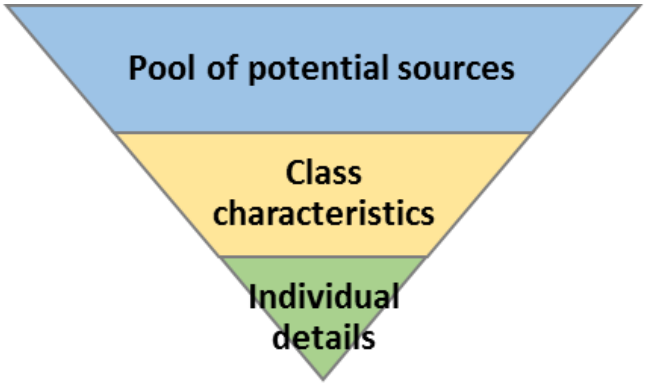

Figure 1 – Comparative analysis process

Anatomy of Footwear/Tire Impression Reports

Individual (randomly acquired) characteristics are a second level of detail examined and compared between crime scene impressions and potential shoe/tires sources. This type of characteristics includes all manner of distinguishing details caused by damage and pronounced wear found throughout the tread or contact surface of shoes/tires. These random distinguishing details can take the form of tears, cuts, gouges, abrasions, holes, embedded objects, repair patches, plugs, etc.

The quantity, clarity, and spatial relationships of these individual characteristics factor into the strength of the analytical conclusions for a given case. Also of importance in the evaluation and comparison of individual characteristics are the date of occurrence (e.g. date the impression was formed), date of potential shoe/tire source recovery, and the use/status of the potential shoe/tire source between the date of occurrence and date of recovery.

Evaluation of these factors is a necessary part of the analytical process due to the possibility of a shoe/tire taking on additional wear and damage after an impression has been left behind. For instance, if a shoe/tire is recovered soon after an impression is left behind, chances are good that the shoe/tire has not changed significantly. However, if a shoe/tire is not recovered until months after an impression is made, and that shoe/tire continued to take on additional damage/pronounced wear characteristics, it is likely that a great deal of change/differences will be noted between an older impression and that potential source shoe/tire.

When individual characteristics are present with enough quantity and clarity, comparative exams involving class and individual characteristics can be much more definitive, pointing towards a single origin for an impression.

While these distinguishing characteristics cannot be measured or quantified in absolute terms, theoretical models and repetitive wear studies demonstrate that two shoes/tires do not acquire and display the same distinguishing details with the same quantity, dimensions, orientation, and spatial relationships. The use and agreement of individual characteristics as an additional layer of comparative analysis, therefore, permits a trained analyst to provide more definitive results than is possible through agreement of class characteristics alone.

Firearm/Toolmark Section

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Anatomy of Footwear/Tire Impression Reports

Range of Conclusions for Footwear and Tire Impression Examinations

Identification – **This is the highest degree of association expressed by a footwear and tire impression examiner**. The questioned impression and the known footwear/tire share agreement of class and randomly acquired characteristics of sufficient quality and quantity. In the opinion of the examiner, the particular known footwear or tire was the source of, and made, the questioned impression. Another item of footwear or tire being the source of the impression is considered a practical impossibility.

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

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

(Range of Conclusions Continued on Following Page…)

Anatomy of Footwear/Tire Impression Reports

Range of Conclusions for Footwear and Tire Impression Examinations

(continued…)

Limited association of class characteristics – **Some similar class characteristics were present; however, there were significant limiting factors in the questioned impression that did not permit a stronger association between the questioned impression and the known footwear or tire. These factors may include but were not limited to: insufficient detail, lack of scale, improper position of scale, improper photographic techniques, distortion or significant lengths of time between the date of the occurrence and when the footwear or tires were recovered that could account for a different degree of general wear.** No confirmable differences were observed that could exclude the footwear or tire. In the opinion of the examiner, factors (such as those listed above) have limited the conclusion to a general association of some class characteristics. Other footwear or tires with the same class characteristics observed in the impression are included in the population of possible sources.

Indications of non-association – **The questioned impression exhibits dissimilarities when compared to the known footwear or tire; however, the details or features were not sufficiently clear to permit an exclusion**. In the opinion of the examiner, dissimilarities between the questioned impression and the known footwear or tire indicated non-association; however, the details or features were not sufficient to permit an exclusion.

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

Lacks sufficient detail

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

Or….

- **A comparison was conducted: the examiner determined that there was insufficient detail in the questioned impression for a meaningful conclusion**. This opinion only applies to the known footwear or tire that was examined and does not necessarily preclude future examinations with other known footwear or tires. In the opinion of the examiner, the impression lacked sufficient detail for a meaningful conclusion regarding the particular known footwear outsole or tire tread.

Firearm/Toolmark Section

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Anatomy of NSPCL Laboratory Report Headers

The header information for all NSPCL Laboratory analytical reports contain the same basic information:

1) **Date—** date that the laboratory report was issued.

2) **Lab Number—** laboratory assigned case number.

3) **Document—** the number of the report issued. If multiple reports are issued for the submitted evidence, the documents are numbered sequentially.

4) **To—**submitting officer/agency information.

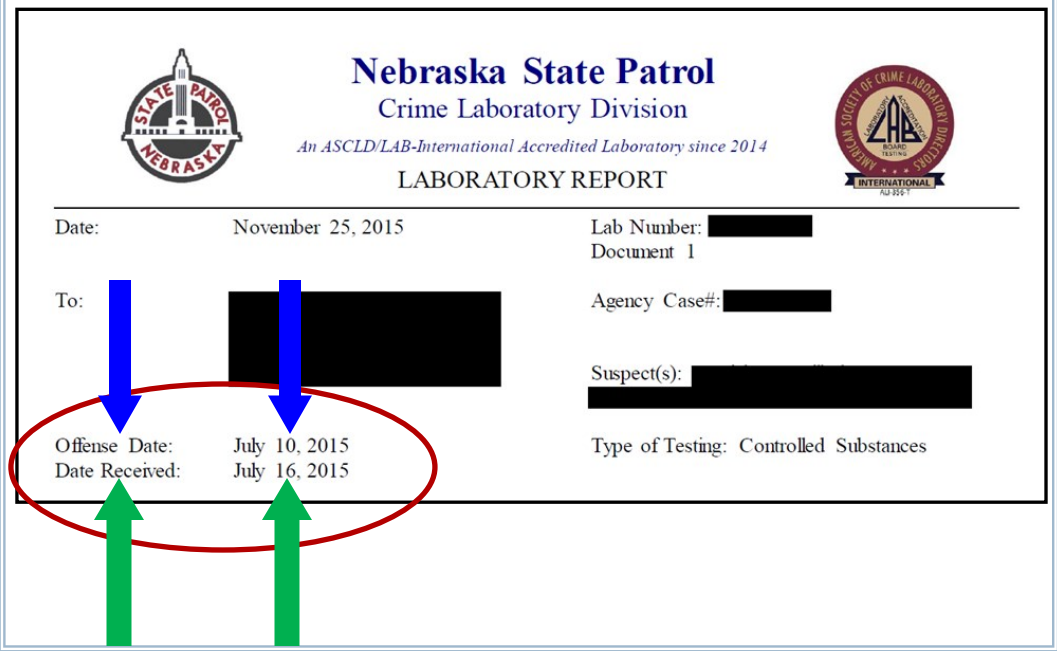
5) **Agency Case Number—** submitting agency case number.

6) **Suspect and Victim Information**

7) **Offense Date— date when the listed offense occurred.**

8) **Date Received—date when the evidence was submitted to the NSPCL for analysis by the investigating agency.**

9) **Type of Testing—** type of analysis that was performed on the evidence submitted and listed in the evidence inventory in the report body.



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