

# The Arkansas State Crime Laboratory

## CODIS Section

### Quality Assurance Manual

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# CODIS Section

## QUALITY ASSURANCE MANUAL

### SECTION 1: INTRODUCTION

The Combined DNA Index System (CODIS) is a computerized program designed to house DNA profiles from convicted offender / arrestees, deceased individuals, missing persons and relatives of missing persons, Arkansas State Crime Laboratory staff, forensic cases (both evidence samples and suspect's known reference samples). The purpose of CODIS is to create a national information repository where law enforcement agencies can share DNA information obtained from convicted offender / arrestees and forensic evidence. This system allows agencies to cross reference case evidence profiles with that of other agencies' case evidence profiles.

Currently, there are three levels of CODIS: **National DNA Index System (NDIS)**, **State DNA Index System (SDIS)** and **Local DNA Index System (LDIS)**. The Arkansas State Crime Laboratory participates as a State and Local system that has the capability to upload (movement of DNA profiles between systems at different levels) DNA profiles to the National level. The Arkansas State Crime Laboratory is responsible for not only analyzing all convicted offender / arrestee samples for the state, but also to enter and search all crime scene samples obtained from forensic casework. The Federal Bureau of Investigation (FBI) maintains the National level.

As data is entered in the CODIS system it immediately becomes available to search at the State DNA Index System (SDIS).

The National DNA Index System (NDIS) is a centralized index of DNA profiles administered by the FBI. DNA profiles that are allowed by NDIS are contributed to NDIS by participating State CODIS laboratories. The profiles from all forensic cases nationally are searched at this level against the Offender Index and against all the profiles in the Forensic Index. NDIS requires a convicted offender / arrestee profile to contain results from all 13 CODIS core loci (CSF1PO, TPOX, THO1, vWA, D16S539, D7S820, D13S317, D5S818, D3S1358, D8S1179, D21S11, and FGA) and a forensic case profile to contain results from at least 10 of the 13 core loci.

The CODIS software is designed by and provided to the Arkansas State Crime Laboratory by the FBI. Upgrades and modifications to the software are periodically provided to the lab by the FBI through the FBI's contractor. The use of the CODIS system in Arkansas is in accordance with the most current version of the CODIS User Guide, CODIS Training Reference Manuals, CODIS

Installation support documents and CODIS Technical Notes provided to the lab by the FBI and the FBI's contractor. CODIS is a dynamic system and therefore undergoes frequent major and minor software upgrades, which may cause the actual operation of the software to not exactly reflect the policies and procedures in this document. Modifications to this manual will be made to accommodate the changes as necessary. Employees utilizing the CODIS database must receive proper training and clearance according to established NDIS guidelines.

**The mission of the Arkansas State Crime Laboratory CODIS Section is to blend forensic science and computer technology into an effective tool for solving crimes. We are committed to quality and integrity in our work. We profile samples allowed by State and Federal Laws to search against crime scene profiles.**

Goals: It is the goal of the CODIS of the Arkansas State Crime Laboratory to:

- A. Provide the users of laboratory services access to a CODIS system for searching DNA profiles at a National level.
- B. Ensure the quality, integrity and accuracy of the DNA typing data and its presentation through the implementation of a detailed Quality Assurance/Quality Control program.
- C. Provide the criminal justice system with a functional DNA database (CODIS) to help law enforcement agencies solve criminal cases.
- D. To provide timely, accurate, high quality services to the state of Arkansas and all other states participating in the National DNA Index System.

Objectives: It is the objective of the Quality Assurance (QA) program to:

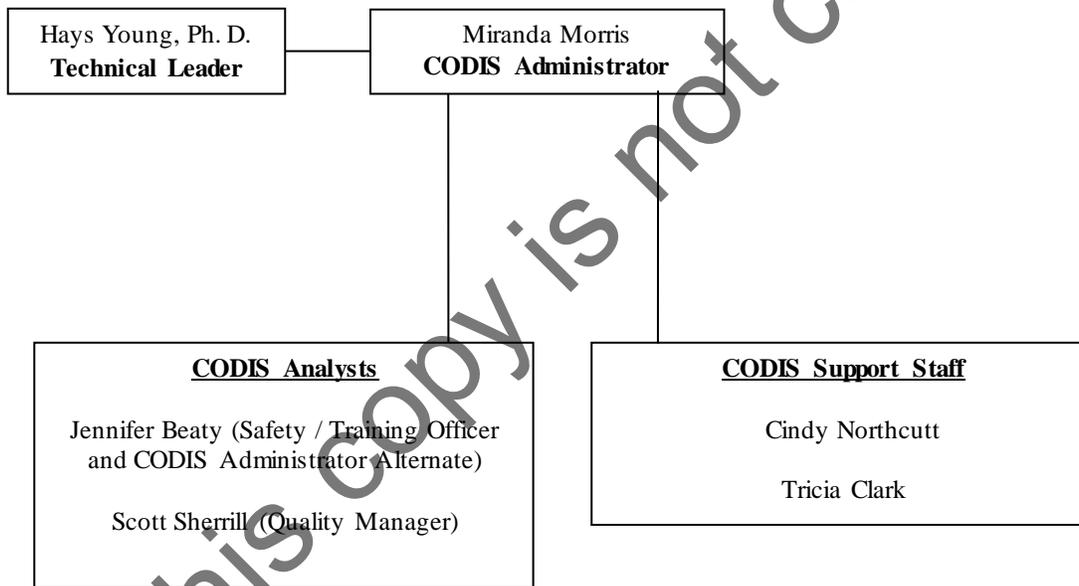
- A. Monitor on a routine basis the analytical testing procedure for DNA typing by means of Quality Control (QC) standards, proficiency test and audits.
- B. Verify that the entire DNA typing procedure is operating within the established performance criteria, as stated in the Analytical section of the Quality Manual and that the quality and validity of the analytical data are maintained.
- C. Ensure that problems are noted and that corrective action is taken and documented.
- D. Ensure the overall quality as outlined in the SWIGDAM Guidelines.

## **1.1: Organization and Management**

1.1.1: Relationship of QA Program, DNA Analysis, Lab Operations and Management:

This QA Manual has been approved by the CODIS Administrator, DNA Technical Leader, the DNA Casework Supervisor, lab wide Quality Assurance Manager, Scientific Operations Director, and the Executive Director and is accepted as routine operating policy of the CODIS Section within the Arkansas State Crime Laboratory. The QA standards prepared by the FBI provided the model for the Arkansas State Crime Laboratory DNA QA program. Any supplements and revisions to the FBI guidelines will be reviewed for possible incorporation into the QA program. To discuss possible revisions, meetings between the CODIS Administrator and the CODIS Analysts will be held as needed. Any changes to this QA manual must be approved through by the above mentioned individuals, with affected manual pages and files updated. Previous versions of revised documents are maintained in a separate Historical Archive Manual. All CODIS Analysts must be notified of the changes and must be given any necessary training.

1.1.2: Relationship of Individuals and Job Responsibilities:



**SECTION 2: PERSONNEL QUALIFICATIONS AND JOB DESCRIPTIONS**

The following establishes the job function, responsibility and qualifications for each position. This includes specification and description of lines of responsibility for developing, implementing, recording and updating the QA program. Job

descriptions for personnel are established and located in each employee history binder. Each subordinate is only accountable to one supervisor per function.

## **2.1: Personnel**

### **2.1.1: DNA Technical Leader**

#### 2.1.1.1: Responsibility

The technical leader is ultimately responsible for technical operations and the QA program and thus the management of the DNA analysis program including technical troubleshooting, validation and systems management. The technical leader also has the authority to initiate, suspend, and resume the DNA analytical operations for the laboratory or an individual. In the event that the technical leader position is vacated then the contingency plan is detailed in appendix A.

#### 2.1.1.2: Job Function

- a. Monitoring of development, validation, and implementation of the QA program, new methods and new technologies.
- b. Review the academic transcripts and training records for newly qualified analysts and approve their qualifications prior to independent casework analysis and document such review.
- c. Establishing professional liaisons with colleagues engaged in DNA testing and research.
- d. Approve the technical specifications for outsourcing agreements.
- e. Review internal and external DNA audit documents and, if applicable, approve corrective action(s), and document such review.
- f. Monitoring training and proficiency testing programs for CODIS Section personnel.
- g. Review, on an annual basis, the procedures of the laboratory and the quality system, then approve and document such review.
- h. Analyzing samples, providing expert testimony, and performing other routine duties of a CODIS Analyst.
- i. Review and approve training, quality assurance, and proficiency testing programs in the laboratory.
- j. Review request by contract employees for employment by multiple NDIS participating and/or vendor laboratories and, if not potential conflict or interests exist, may approve such request.
- k. Technical leaders must review validation and methodologies currently used by the laboratory and educational qualifications and training records of currently qualified analysts.
- j. Ensure compliance with ASCLD/LAB International requirements.

### 2.1.1.3: Qualifications

#### **Education**

The technical leader shall meet the following qualifications:

- Minimum educational requirements: The technical leader of a laboratory shall have, at a minimum, a Master's degree in a biology-, chemistry- or forensic science- related area and successfully completed 12 semester or equivalent credit hours from a combination of undergraduate and graduate course work covering the following subject areas: biochemistry, genetics, molecular biology, and statistics or population genetics.
- The 12 semester or equivalent credit hours shall include at least one graduate level course registering three (3) or more semester or equivalent credit hours.
- The specific subject areas listed above shall constitute an integral component of any course work used to demonstrate compliance with this Standard.
- Individuals who have completed course work with titles other than those listed above shall demonstrate compliance with this Standard through a combination of pertinent materials such as a transcript, syllabus, letter from the instructor or other document that supports the course content.
- If the degree requirements of listed above were waived by the American Society of Crime Laboratory Directors (ASCLD) in accordance with criteria approved by the Director of the Federal Bureau of Investigation (FBI), such a documented waiver is permanent and portable.

#### **Training**

The technical leader shall have three years of forensic, databasing or human identification DNA laboratory experience obtained at a laboratory where DNA testing was conducted for identification, databasing or forensic purposes. As of the effective date of this revision, any newly appointed technical leader shall have a minimum of three years of human DNA (current or previous) experience as a qualified analyst on database or forensic samples. The technical leader shall have previously completed the FBI sponsored auditor training or successfully complete the FBI sponsored auditor training within one year of appointment.

#### **Continuing Education**

The technical leader must stay abreast of developments within the field of DNA typing by reading current scientific or DNA applicable literature, attending seminars, courses or professional meetings. Management provides the opportunity to comply with this requirement through travel budget, membership dues and education expense reimbursement.

#### **Other**

Must additionally meet the requirements specified for a DNA Analyst.

## **2.1.2: CODIS Administrator**

### **2.1.2.1: Responsibility**

The CODIS administrator is responsible for the administration of the laboratory's local CODIS network. The CODIS Administrator is also responsible for the technical operations and provisions of the resources needed to ensure the required quality of the laboratory operations. The CODIS Administrator has the responsibility and authority to receive and take action on CODIS employee concerns. In the event that the CODIS Administrator position is unoccupied the laboratory shall not upload any DNA profiles to NDIS.

### **2.1.2.2: Job Function**

- a. Overseeing day-to-day operation of the CODIS Section i.e., scheduling workload, supervising analysts and technicians, monitoring and reviewing. These duties may be distributed among the CODIS Analysts to facilitate case flow.
- b. Scheduling and documentation of the CODIS computer training of CODIS analysts.
- c. Assurance that the security of data stored in CODIS is in accordance with state and/or federal laws and NDIS operational procedures.
- d. Assurance that the quality of data stored in CODIS is in accordance with state and/or federal laws and NDIS operational procedures.
- e. Assurance that matches are dispositioned in accordance with NDIS operational procedures.
- f. The CODIS administrator has authority to terminate an analyst's or laboratory's participation in CODIS until the reliability and security of the computer data can be assured in the event of an issue with the data identified.
- g. Ensure compliance with ASCLD/LAB International requirements.
- h. Maintain a list of all employees with access to the CODIS database.
- i. Notify the NDIS Custodian, within five business days, of the following:
  1. If a CODIS User, CODIS IT User or CODIS WAN User in its laboratory has been arrested for, or convicted or, a criminal offense
  2. If the laboratory loses its criminal justice agency status;
  3. If the laboratory loses its accreditations, has its accreditation suspended or has its accreditation revoked;

4. if the laboratory loses the capability to perform DNA analysis at its facility;
5. If the laboratory has fewer than two full-time employees who are qualified DNA analyst;
6. If the laboratory has a vacancy in the laboratory's Technical Leader position when there is no one in the laboratory who meet the Quality Assurance Standards' qualifications and is available to serve in that positions; or
7. If the laboratory is not in compliance with the external QAS audit requirement

#### 2.1.2.3: Qualifications

##### a. Education

The CODIS administrator shall have at a minimum, a BS/BA degree in a biological, chemical, or forensic science, with undergraduate or graduate coursework in genetics, chemistry, statistics, biochemistry, and molecular biology (molecular genetics or recombinant DNA technology).

##### b. Training

The CODIS administrator shall complete the DNA training program with individuals, agencies, or other laboratories that have an established training program and considerable experience in DNA methods and casework.

##### c. Experience

The CODIS administrator of the laboratory shall be or have been a qualified DNA casework analyst with documented training in mixture analysis. The CODIS administrator shall participate in CODIS software training within six (6) months of assuming CODIS administrator duties. The CODIS administrator shall have successfully completed the FBI sponsored auditor training within one year of appointment.

##### d. Continuing Education

The CODIS administrator must stay abreast of developments within the field of DNA typing by reading current scientific or DNA applicable literature, attending seminars, courses or professional meetings. Management provides the opportunity to comply with this requirement through travel budget, membership dues and education expense reimbursement.

##### e. Other

Must additionally meet the requirements specified for a DNA Analyst.

### **2.1.3: Alternate CODIS Administrator**

#### 2.1.3.1: Responsibility

The Alternate CODIS Administrator shall fulfill the CODIS Administrator's duties if needed when the Administrator is absent or unavailable.

#### 2.1.3.2: Qualifications

- a. Qualified DNA casework analyst with mixture interpretation analysis
- b. Complete the QAS Auditor training sponsored by the FBI within one year of assuming the role
- c. Complete CODIS software training sponsored by the FBI within one year of assuming the role

### **2.1.4: CODIS Analyst**

#### 2.1.4.1: Responsibility

The CODIS analyst is responsible for performing DNA analysis and specifically delegated QA responsibilities from the CODIS Administrator.

#### 2.1.4.2: Job Function

- a. Implementing the QA program.
- b. Handling reagents.
- c. Establishing liaisons with colleagues in the field.
- d. Analyzing, interpreting and reporting casework.
- e. Providing expert testimony.
- f. Interacting with investigative personnel.
- g. Executing all duties of QA Manager, if so designated.

#### 2.1.4.3: Qualifications

##### a. Education

The CODIS analyst shall have at a minimum, a BS/BA degree in a biological, chemical, or forensic science, with undergraduate or graduate coursework in genetics, chemistry, statistics, biochemistry, and molecular biology (molecular genetics or recombinant DNA technology). With a minimum of nine (9) cumulative semester hours or equivalent that cover the required subject areas.

##### b. Training

The CODIS analysts shall complete the DNA training program with individuals, agencies, or other laboratories that have an established training program and considerable experience in DNA methods and casework.

c. Experience

The CODIS analyst shall have a minimum of six (6) months of experience of human DNA lab experience. This training entails the analysis of a range of samples routinely encountered in forensic databasing prior to independent work using DNA technology. Additionally the analyst shall successfully complete a competency test and proficiency test before beginning independent DNA analysis. A complete list of training requirements can be located in the DNA Section Training Manual.

d. Continuing Education

The CODIS analyst must stay abreast of developments within the field of DNA typing by reading current scientific or DNA applicable literature, attending seminars, courses or professional meetings. Management provides the opportunity to comply with this requirement through travel budget, membership dues and education expense reimbursement.

### **2.1.5: CODIS Quality Manager**

#### 2.1.5.1: Responsibility

The CODIS quality manager is responsible for implementing the quality assurance program for the CODIS section.

#### 2.1.5.2: Job Function

- a. Ensure proper maintenance is being performed according to the quality assurance manual.
- b. Ensure that the quality manual procedures are being followed.
- c. Maintain all logs documenting the quality check of new chemicals.

### **2.1.6: CODIS Support Staff**

#### 2.1.6.1: Responsibility

The CODIS Support staff is responsible for administratively processing CODIS appropriate samples that are delivered to the laboratory.

#### 2.1.6.2: Job Function

- a. Receives CODIS appropriate samples into the laboratory
- b. Enters the CODIS appropriate samples into the State Convicted offender / arrestee Database System or JusticeTrax as applicable.
- c. Ships database collection kits to law enforcement personnel
- d. Schedule training with law enforcement agencies
- e. Facilitate communication between collection facilities
- f. Prepares samples for DNA analysis

## 2.2: Training

### **Training will be guided by the DNA Training Manual.**

The required six month training program for DNA / CODIS analyst will depend upon previous training and experience. The training period may consist of continuous training, or it may consist of a period of training plus time spent in supervised casework and CODIS analysis. The DNA technical leader, CODIS Administrator and Casework Supervisor will assess and document any adjustments to the established training program. At the completion of the training program each employee shall successfully complete a competency test which includes: a proficiency test, a written qualifying test and a moot court before performing independent casework. See the Training Manual for the complete training program.

As new technology or methodology is added to the DNA Section each analyst may be required to become qualified in the procedure. For an analyst to become qualified they must complete a qualifying exam. A proficiency test in the technology must be completed within six (6) months of the qualifying exam.

#### **2.2.1: scientific or DNA applicable literature**

All CODIS employees have access to scientific or DNA applicable literature. Each member of the Section will read articles of scientific interest periodically. An excel sheet, that is located on the S drive will be filled out to document the article read. The analyst can disperse the article to the rest of the Section either by email or via hand carry.

## 2.3: Actions and Approval

### 2.3.1: DNA Technical Leader

- a. Can initiate, suspend, and resume DNA analytical operations for the laboratory or an individual.
- b. Must approve DNA quality manager's action.

### 2.3.2: CODIS Quality Manager

- a. Can reject any chemical, reagent, supply or material which fails to meet the specifications set forth in the Quality manual. The rejection of any such item must be documented in the Reagent Preparation Manual.
- b. Can terminate DNA testing if a technical problem is identified and is not resolved by the Technical Leader. The CODIS Administrator and the rest of the DNA Section must be notified and the specific problem(s) must be documented in the QA manual where the CODIS Administrator and/or Technical Leader will initial to signify approval.

### 2.3.3: CODIS Administrator

- a. Can reject materials or suspend testing in the same manner as the CODIS Quality Manager, following the same unit notification and problem documentation specifications.
- b. Must approve the CODIS Quality Manager's actions.

### 2.3.4: CODIS Analysts (Other than DNA Quality Manager)

- a. May recommend rejection of chemicals, reagents, supplies or materials that are found to be inadequate.
- b. May recommend termination of DNA testing if a technical problem is found.

## SECTION 3: FACILITIES

### Overall Laboratory Security

The Arkansas State Crime Laboratory building has security monitors that cover the external perimeter of the building and parking lots. Security cameras are also located on the first floor of the Crime Laboratory. Only authorized personnel are allowed access to the 2<sup>nd</sup> and 3<sup>rd</sup> floor unless accompanied by authorized personnel. Security fobs and keys are issued to authorized personnel in order to access the certain areas of the laboratory and must be approved by the Executive Director. The ASCL has a security fob access system controlled by a computer placed in the Administrative Section (access reports can be generated from the security fob access system software). Refer to the Arkansas State Crime Laboratory Quality Manual for comprehensive details regarding laboratory wide security.

### Forensic Biology Laboratory Security

#### (Physical Evidence, CODIS and Casework DNA analysis areas)

The Physical Evidence, CODIS and DNA Casework area of the laboratory is limited in access to other laboratory personnel through the security system. Each analyst is assigned a unique programmed fob that enables entry into the laboratory.

### Database Security

To ensure the security of the DNA database, the CODIS Server must be contained within a locked server cabinet at all times unless in use by the CODIS Administrator or designee.

All Analysts that access the CODIS database must be DNA analysts and have an FBI background check as per the NDIS guidelines. Each computer is password protected with individual logons. Logons and passwords must not be shared. No analysts, except the CODIS Administrator, should be logon to more than one CODIS computer concurrently.

## DNA Laboratory Set-up

The CODIS Section is designed to minimize contamination during the processing of evidence. The sensitivity of PCR-based analysis, involving the amplification of minute quantities of DNA, makes it necessary to take certain precautions to avoid sample contamination. The best way to prevent PCR contamination is to have a separate lab for pre-PCR work and post-PCR work.

## DNA Pre-PCR Laboratory

The DNA Pre-PCR area consists of sample handling, DNA extraction and isolation, and preparation of samples for amplification. The CODIS section shares this space for the processing, extraction, and amplification setup of database samples.

### Special Precautions (DNA)

1. Use disposable gloves at all times.
2. Sterilize the bench top before and after you use it with diluted bleach solution.
3. Sterilize those solutions which can be heated in an autoclave without affecting their performance. Steam sterilization under bacterial decontamination conditions degrades DNA to a very low molecular weight, rendering it un-amplifiable.
4. Always change pipette tips between handling each sample even when dispensing reagents.
5. Store reagents as small aliquots to minimize the number of times a given tube of reagent is opened. Record the lot numbers of reagents used in each set of samples so that if contamination occurs, it can be traced more readily. It is recommended that the small aliquots are retained until typing of the set of samples for which the aliquots were used is completed.
6. Centrifuge tubes before opening.
7. Include reagent blank controls with each set of DNA extractions to check for the presence of contaminating DNA in the reagents.
8. Never "blow out" the last bit of sample from a pipette. Blowing out may cause aerosols which may contaminate the sample.
9. Use disposable bench paper to prevent the accumulation of human DNA on permanent work surfaces. Bleach should be used to decontaminate exposed work surfaces after each use.
10. Wear a dedicated lab coat for pre-amplification sample handling when working in the pre-PCR DNA extraction work area.
11. Face masks and/or face shields must be worn when working with evidence and setting up amplifications.
12. Lab coats should be washed on a monthly basis.
13. General housekeeping should be performed as needed (e.g. sweeping, moping dusting).

## **CODIS Post-PCR Laboratory**

The CODIS Post-PCR area consists of amplification and PCR product typing. It is important that there is a one-way flow from the Pre-PCR lab to the Post-PCR lab. This is to prevent possible contamination between areas.

### **Special Precautions**

Even in the amplified DNA work area, amplified DNA should be handled carefully. Steps should be taken to avoid dispersing it around the room. Reducing the dispersal of amplified DNA within this work area will reduce the potential for transfer of amplified DNA to other work areas.

1. Always remove gloves and lab coat when leaving the Amplified DNA Work Area to avoid the transfer of amplified DNA into other work areas.
2. Sterilize the bench top before and after you use it with diluted bleach solution.
3. Reduce the unnecessary dispersal of DNA around the work area by changing gloves whenever they may have become contaminated with amplified DNA.
4. Use disposable bench paper to cover the work area used to perform the typing steps to prevent the accumulation of amplified DNA on permanent work surfaces.
5. Store plates of amplified DNA in the work area until all reviews are completed.

## **SECTION 4: CONVICTED OFFENDER / ARRESTEE SAMPLE CONTROL**

\*See Arkansas State Crime Laboratory Quality Manual for lab wide policy regarding Evidence Control and Case Management

NOTE: Convicted offender / arrestee samples are handled differently than casework evidence due to the fact that offender samples are not considered evidence at the Arkansas State Crime Laboratory they are considered reference materials.

### **4.1: Convicted Offender / Arrestee Sample Handling Procedures**

Convicted offender / arrestee samples enter the Arkansas State Crime Laboratory through the Evidence Receiving Section of the laboratory. Evidence Receiving will document the date and time the CODIS samples enter the lab. This can be documented via JusticeTrax or manual documentation. The samples are then sent to the CODIS section. CODIS Support Staff assigns a unique number to each convicted offender / arrestee sample and documents the date and time each sample arrives at the lab and in the CODIS Section. If JusticeTrax is used for documentation, the case number can be stored with each sample. The chain of

custody feature will document the transfer of samples. The sample is stored in a secure area before and after analysis.

All samples are worked in chronological order according to the unique identifier number unless directed by the CODIS Administrator or designee. All CODIS hit confirmations will be expedited in the work flow process.

All samples are collected, received, handled, sampled and stored so as to preserve the identity, integrity, condition and security of the sample.

Before analysis begins, a second review is conducted by the CODIS Administrator and/or analyst to determine if there is anything more specific about the request and to determine if the laboratory has the capability and resources to perform the services requested (i.e. adequate standards, controls and approved test methods). Documentation is only noted if significant changes are observed. By starting analysis the analyst agrees to the request.

If the contract needs to be amended after work has begun, all affected personnel shall be notified.

#### **4.2: Chain of Custody**

A clear, well-documented chain of custody must be maintained from the time the convicted offender / arrestee sample is first received by the CODIS unit.

#### **4.3: Transferring**

When CODIS samples are transferred between CODIS employees, the sample(s) must be scanned out to the employee receiving the sample(s).

#### **4.4: Release of Information**

The Arkansas State Crime Laboratory, as a NDIS participant, is required to follow the NDIS Operational Procedures. The procedure is detailed verbatim below.

**NDIS Operational Procedures Manual: Version 3 (dated December 18, 2014)**

**3.2 Federal DNA Act Limits Access to DNA Records and DNA Samples**

*The Federal DNA Act provides that the National DNA Index System "shall include only information on DNA identification records and DNA analyses that are maintained by Federal, State, and local criminal justice agencies (or the Secretary of Defense in accordance with section 1565 of title 10, United States Code) pursuant to rules that allow disclosure of stored DNA samples and DNA analyses only--*

- (A) to criminal justice agencies for law enforcement identification purposes;*
- (B) in judicial proceedings, if otherwise admissible pursuant to applicable statutes or rules;*
- (C) for criminal defense purposes, to a defendant, who shall have access to samples and analyses performed in connection with the case in which such defendant is charged;*  
*or*
- (D) if personally identifiable information is removed, for a population statistics database, for identification research and protocol development purposes, or for quality control purposes." [42 U.S.C. § 14132(b)(3)]*

*The unauthorized disclosure of individually identifiable DNA information stored in the National Index is punishable by a fine not to exceed \$100,000 (42 U.S.C. §14133(c)(1)). Obtaining DNA samples or DNA information, without authorization, is punishable by a maximum fine of \$250,000 or imprisonment for not more than one year or both fine and imprisonment (42 U.S.C. §14133(c)(2)). A laboratory's access to NDIS is subject to cancellation for noncompliance with these privacy requirements. The privacy requirements are applicable to NDIS participating laboratories by Federal law [42 U.S.C. §14132] and through the NDIS MOU.*

*The NDIS participating laboratory is responsible for compliance with the limited access and disclosure of DNA samples and DNA analyses required by the Federal DNA Act. While States may have DNA database laws that appear to permit more access to the DNA data, if that State is a participant in the National DNA Index System, the State agrees to abide by, and comply with, the more restrictive provisions contained in the Federal DNA Act by agreeing to the NDIS MOU. As noted in the Introduction, recommendations from the Federal DNA Advisory Board have also shaped the administration of the National DNA Index System. In the House of Representatives Judiciary Committee Report on predecessor legislation, the DNA Identification Act of 1993, the Committee explained its expectations that the DNA Advisory Board "also advise the Director on other scientific and policy questions relating to forensic applications of DNA. In particular, it would be appropriate for the Board to address: (1) the statistical, and population genetics issues that have been raised; and (2) the privacy, law enforcement and technical issues associated with the FBI's program to establish a databank of DNA profiles, known as CODIS." Pursuant to this legislative direction and its charter, the DNA Advisory Board considered standards for acceptance of DNA profiles in CODIS which take account of relevant privacy, law enforcement and technical issues and endorsed the "current level of enforcement of such access and disclosure provisions by the Department of Justice and the FBI and encourages the continuation of such efforts." The DNA Advisory Board also endorsed the interpretation of the Federal DNA Act to limit access of the anonymous DNA data to criminal justice agencies for a population statistics database, forensic identification, forensic research, forensic protocol development or quality control purposes.*

*NDIS participating laboratories are also responsible for complying with their applicable State law concerning access to the DNA data in their State DNA database, especially if those provisions are more restrictive than the Federal DNA Act.*

### **3.2.1 FBI Quality Assurance Standards Require Confidentiality**

*Standard 11 of the FBI's QAS require confidentiality for reports, case files, DNA records and databases, unless otherwise provided by Federal or State law. The QAS require that "personally identifiable information only be released in accordance with applicable State and Federal law" and that laboratories have "procedures to ensure the confidentiality and privacy of the DNA samples, DNA records, case files, reports and databases;" see Forensic QAS Standards 11.3.1 and 11.3.3 and Databasing QAS Standards 11.2 and 11.2.2.*

### **3.2.2 Access by Participating Criminal Justice Agencies**

*In accordance with the Federal DNA Act, disclosure of DNA records at NDIS is authorized for law enforcement identification purposes to the Federal, State and Local criminal justice agencies who participate in NDIS.*

### **3.2.3 Access by Defendant to DNA Records at NDIS**

*In accordance with the Federal DNA Act, a defendant may have access to the DNA samples and analyses performed in connection with his/her case. A defendant may generally have access to the forensic evidence DNA records and his/her exemplars under this provision of the DNA Act. This provision does not authorize a defendant to access all of the DNA records in the National DNA Index. Nor does this provision authorize access to candidate matches that are not confirmed as matches and for which no personally identifiable information is released. Thus, as currently worded, the Federal DNA Act entitles a defendant to access the defendant's DNA records at NDIS as well as the forensic evidence records for the case for which the defendant is arrested, charged and/or appealing.*

*The FBI shall respond to requests for access to DNA records that were contributed to NDIS by a State and /or Local agency with a referral to the contributing State and/or Local agency. The FBI shall respond to a request for access to DNA records that were contributed to NDIS by the FBI, as authorized.*

### **3.2.4 Access by Persons Whose DNA Records are at NDIS**

*An individual may request access to his/her DNA record for the purpose of reviewing that record and/or challenging its accuracy or appropriateness for maintenance in NDIS. An individual making a request to review his/her DNA record to the FBI Freedom of Information Officer or CODIS Unit will be referred to the NDIS participating laboratory that contributed the DNA record to NDIS.*

*An NDIS participating laboratory is responsible for responding to requests for access to a DNA record it generated by the subject of that record once locally specified requirements are met. The FBI is responsible for responding to requests for access to FBI Laboratory-generated DNA records.*

#### **4.5: Disposition**

All sample remaining after analysis will be retained by the CODIS section. The CODIS section will not store amplified products after sample has been uploaded to NDIS.

#### **4.6: Destruction of Sample**

The CODIS Section only destroys samples in accordance with section 4.7.5.1 and 4.7.6. The sample will be placed in a biohazard container and witnessed on the CODIS sample destruction form.

#### **4.7: Sample Handling and Storage**

The following written policy ensures that samples will be handled, processed and preserved so as to protect against loss, contamination or deleterious change. Testing of CODIS samples is conducted to provide the maximum information with the least consumption of the sample. Whenever possible, a portion of the original sample is retained by the CODIS Section.

*\*See NRC 1996 recommendations*

##### **4.7.1: Sample Labeling**

Each working sample must be labeled with a unique identifier. The CODIS Support Staff of the CODIS section generates this unique identifier. For convicted offender samples this number is designated by the year, a “-0-” and numerical order of cases submitted to the laboratory (ex: 2009-0-12345). For arrestee samples this number is designated by the year, a “-1-” and numerical order of cases submitted to the laboratory (ex: 2009-1-12345). For staff samples this number is designated by the year, a “-9-” and numerical order of cases submitted to the laboratory (ex: 2009-9-12345). Other identifiers may be utilized if appropriate for the specific case. The numerical order of cases submitted will restart at the beginning of the year.

NOTE: All samples prior to January 1, 2007 were designated by the year and numeric order of cases submitted. Ex: 2006-12345.

#### 4.7.2: Convicted offender / arrestee Processing

The convicted offender / arrestee samples accepted for DNA are tracked during analysis and accounted for on internal forms included in each sample packet. The examination worksheets include the following forms:

1. Plate Map
2. Master Mix
3. CODIS Database Review

These forms should be initialed and dated by the analyst, where appropriate, and scanned on the DNA drive for long term storage of data. It is noted that the forms are not mandated to be a particular order.

1. Prepare the work area. The bench space must be clean and free of clutter.
2. A lab coat must be worn to protect ones clothing from contamination. Gloves must be worn to protect one from infectious diseases that could be present in biological material or for protection from toxic chemicals. Mask must be worn over nose and mouth to prevent contamination of evidence.
3. The CODIS Analyst fills in each form completely with appropriate information, sample numbers and lot numbers. Once samples are complete and imported into the CODIS system, these forms and the import reconciliation forms are stored together on the S:

#### 4.7.3: Long Term Storage

Upon completion of the testing, the CODIS Analyst has the ultimate responsibility for long-term storage of the samples. All samples are returned to a CODIS Support Staff for long term storage. This is tracked by the chain of custody which is located in the DNA Database program on the computer\*. All CODIS samples are stored in the Evidence Section of the Arkansas State Crime Laboratory indefinitely. Physical or digital copies of paperwork related to CODIS samples and hits will be securely retained for a minimum of 15 years.

\* - The current location for the sample is listed in the Offender Form in the DNA Database program. The history can be viewed through the History button in the Offender Form. Due to limitation in the software the

Check-in date is not recorded. Therefore, the Check-Out date is an accurate record of the transfer of the sample to the location listed beside that date from the previous location listed.

#### **4.7.4: Request for Buccal Collection Kits**

All requests for database kits can be made in writing on the agency's letterhead, by email, or other appropriate form of communication. All requests will be documented within the CODIS Section. All requested kits, if available, will be sent by the Arkansas State Crime Laboratory to the requesting agency.

#### **4.7.5: Receipt of Samples into the Database**

Upon receipt of samples into ASCL, the Evidence Receiving Section will generate a barcode in JusticeTrax and adhere it to the sample's container. The sample will be transferred to the CODIS section and entered into the CODIS database. The information supplied with the sample will be evaluated to make certain that sufficient information has been provided to ensure quality of the sample being submitted and to verify that the violation is a qualifying violation as per the statutes (Adults-Act 1740 of 2003 (AR 12-12-1101) & Act 699 of 2011 (AR 12-12-1006); Juveniles - Act 1265 of 2003 (AR 9-27-356)). If information is not completed, discrepant or other issues on the DNA Database Information Card a 'DNA Problem' letter may be sent to the submitting agency. A copy of the letter should be initialed by the CODIS Administrator or designee, or DNA Technical Leader. If necessary a phone call or email can be made to the submitting agency to ensure quality of sample submission.

##### **4.7.5.1 Non-Qualifying Violations (Adults and Juveniles)**

Upon receipt of samples into the CODIS Section the sample will be checked to ensure the violation meets the requirement of the law (Adults-Act 1740 of 2003 (AR 12-12-1101) & Act 699 of 2011 (AR 12-12-1006); Juveniles - Act 1265 of 2003 (AR 9-27-356)). If the violation is deemed to be a non-qualifying violation a 'DNA Problem' letter for a non-qualifying violation will be sent to the submitting agency. This will explain to the agency that that sample does not have a qualifying violation and will be retained for 30 days. After the elapsed time, if the CODIS section is not contacted or does not have notice of a qualifying violation the sample will be destroyed. A copy of the letter should be initialed by the CODIS Administrator or designee, or DNA Technical Leader. If necessary a phone call can be made to the submitting agency to ensure quality of sample submission.

#### **4.7.6: Expungements**

It is recognized that occasionally a profile that was previously entered into CODIS will need to be expunged. The following process will allow for expungements:

## Removal and destruction of the DNA record and DNA sample:

Any person whose DNA record is included in the State DNA Database and whose DNA sample is stored in the State DNA Data Bank as authorized by Arkansas Law may apply to any circuit court for removal and destruction of the DNA record and DNA sample on the grounds that the adjudication of guilt that resulted in the inclusion of the person's DNA record in the database or the inclusion of the person's DNA sample in the databank has been reversed and the case dismissed.

(1) Resulted in a charge that has been resolved by:

(A) An acquittal;

(B) A dismissal;

(C) A nolle prosequi;

(D) A successful completion of a pre-prosecution diversion program or a conditional discharge; or

(E) A conviction of a Class B misdemeanor or Class C misdemeanor; or has not resulted in a charge within one (1) year of the date of the arrest.

The State Crime Laboratory shall remove and destroy a person's DNA record and DNA sample by purging the DNA record and other identifiable information from the State DNA Data Base and the DNA sample stored in the State DNA Data Bank when the person provides the State Crime Laboratory with:

(1) A court order for removal and destruction of the DNA record and DNA sample; and (2) Either of the following:

(A) A certified copy of an order of acquittal;

(B) An order of dismissal;

(C) An order nolle prosequi;

(D) Documentation reflecting a successful completion of a pre-prosecution diversion program or a conditional discharge;

(E) A judgment of conviction of a Class B misdemeanor or Class C misdemeanor

(F) A court order stating that a charge arising out of the person's arrest has not been filed within one (1) year of the date of the arrest.

The State Crime Laboratory shall not remove or destroy a person's DNA record or DNA sample if the person had a prior felony or Class A misdemeanor conviction or a pending charge for which collection of a DNA sample is authorized under Arkansas law.

An Expungement Request form should be completed with each Expungement process. When the State Crime Laboratory removes and destroys a person's DNA record and the State Crime Laboratory shall request that the person's DNA record be expunged from the National DNA Index System.

### 4.7.6.1 Expungement Responsibilities from NDIS

Federal law requires that states participating in NDIS expunge the DNA records of persons whose qualifying convictions had been overturned.

The Federal DNA Identification Act of 2001 requires states that participate in NDIS promptly expunge DNA profiles if the state receives the following from the responsible agency or official:

- A certified copy of a final court order establishing that the specific qualifying offense has been overturned
  - A court order is not considered “final” for these purposes if time remains for an appeal or application for discretionary review with respect to the order (Federal DNA Identification Act).

For states uploading the DNA data of arrestees, indicted persons or similar legal specimens, amendments made by the DNA Fingerprint Act of 2005 require expungements in the event of the charge is dismissed or results in an acquittal or no charge was filed within the applicable time period.

NDIS participating states are required to expunge from NDIS the DNA profile of a person included in NDIS by that State if:

- the person has not been convicted of an offense on the basis of which that analysis was or could have been included in the index and
- the responsible agency or official of that State receives, for each charge against the person on the basis of which that analysis was or could have been included, a certified copy of a final court order establishing that such charge has been dismissed or has resulted in an acquittal or that no charge was filed within the applicable time period.”

#### **4.7.7: Administrative Removals**

Administrative removal may be warranted in such occasions: (1) individual did not meet a qualifying offense, (2) the collection agency notifies the Arkansas State Crime Laboratory, (3) there was a procedural deficiency in the collection of the DNA sample that cannot be resolved, or any other reason deemed necessary by the CODIS Administrator or Technical Leader.

To complete the Administrative Removal a ‘Deleted/Amended Specimen Request’ Form must be completed along with the supporting paperwork necessary.

## SECTION 5: VALIDATION

The laboratory shall only use validated methodologies for DNA analyses. There are two types of validation: developmental and internal.

### 5.1: Developmental Validation

Developmental validation is required on any novel methodology for forensic DNA analysis. The developmental validation shall include the following studies, where applicable:

1. Characterization of genetic markers.
2. Species specificity.
3. Sensitivity.
4. Stability.
5. Reproducibility.
6. Case-type samples.
7. Population.
8. Mixture.
9. Precision.
10. Accuracy.
11. PCR-based studies.
  - a. Reaction conditions.
  - b. Assessment of differential amplification.
  - c. Assessment of preferential amplification.
  - d. Effects of multiplexing.
  - e. Assessment of appropriate controls.
  - f. Product detection.

### 5.2: Internal Validation

Internal validation is required on any methodologies that are utilized for forensic DNA analysis in the laboratory. A developmentally validated methodology can not be utilized in the laboratory until it has been internally validated, reviewed and approved by the technical leader. The internal validation procedure will be tested using known and non-probative evidence samples or database type samples, and contain the following studies where applicable:

1. Accuracy.

2. Precision.
3. Reproducibility.
4. Sensitivity and Stochastic
5. Mixture.
6. Contamination assessment.

Internal validation shall define quality assurance parameters and interpretation guidelines.

Before an analyst can begin using an internally validated procedure for DNA, the analyst must successfully complete training and a qualifying test. . A proficiency test must be completed within (6) months of qualification of the new technology or methodology. See the Arkansas State Crime Laboratory Quality Manual for specific requirement of validation.

Material modifications made to validation procedures shall be documented and approved by the technical leader.

## SECTION 6: ANALYTICAL PROCEDURES

### 6.1: Generic Guidelines

#### 6.1.1: Reagents

The following is a list of critical reagents used in the CODIS Section:

#### Commercial Kits:

PowerPlex 16 HS	Promega
PowerPlex Y23	Promega

#### Miscellaneous Items:

9947A	Promega
2800M	Promega
Taq Gold Polymerase	Applied Biosystems
Promega Punch Solution	Promega
PowerPlex Direct Amp Reagent	Promega

#### 6.1.1.1: Sources of Materials, Reagents, Chemicals and Supplies

A listing of commercial sources for all materials, reagents, chemicals, and supplies will be maintained in the Reagent Log. All commercial reagents will be labeled with the identity of the

reagent, open date and the expiration date if applicable. All information relevant to material or services that must meet certain specifications for testing will be provided to the purchasing department.

#### 6.1.1.2: Supply and Materials Inventory

Upon receipt of all materials, reagents, chemicals and supplies, the packing slip will be checked for agreement with the items received when available. Reagents and supplies, which have passed their expiration date, will not be used on CODIS samples unless a performance check has been conducted and the technical leader has approved and documented the deviation to extend the expiration date.

#### 6.1.1.3: Material Safety Data Sheets (MSDS)

The MSDS received from the manufacturer for each chemical used in the laboratory can be found in the designated MSDS book or electronically. These data sheets are readily available to all laboratory personnel. A master copy of all MSDS sheets for the laboratory is kept by the Laboratory Health and Safety Manager.

#### 6.1.1.4: Laboratory Prepared Reagents and Solutions

A log will be maintained for each laboratory prepared reagent and solution except dilutions of laboratory concentrates. Each reagent/solution prepared will have the following recorded in the log book:

- Identity
- Date of preparation
- Date of expiration
- Instructions on preparation of reagent
- Lot numbers of solvents and/or chemicals used in preparation of reagent
- A method to verify the reagent's reliability (if applicable)
- Initials of the person preparing reagent
- Initials of the person verifying reagent (if applicable)

#### 6.1.1.5: Labeling Requirements

All laboratory prepared reagents and solutions will be clearly labeled. Labels will include identity, date of preparation, identity of preparing analyst, expiration date and, as appropriate, and storage requirements.

#### 6.1.1.6: Storage and Disposal

All chemicals must be stored, used, and disposed of in a manner conforming to established safety requirements.

#### 6.1.1.7: Critical reagents and supplies

Critical consumables, supplies, and services which affect the quality of testing will be obtained from reliable suppliers (see ASCL-DOC-01). All critical reagents and supplies must be quality control tested for accurate, reliable performance prior to use in the CODIS Section. Quality control test results will be recorded in the Quality Control of Critical Reagents Log.

##### 6.1.1.7.1: PowerPlex 16 HS Kits

The genetic typing kits will be marked with the receive date and initials of the individual who receives the kit. The appropriate positive control as described in the corresponding SOP will be amplified in duplicate along with an AMP- sample. The samples will then be analyzed to ensure the appropriate DNA profile is obtained. Once the lot has been verified the QC date will be placed on all received kits. If the kit does not produce the expected profile, the samples should be re-injected or re-amplified. If the positive or negative controls still do not produce the expected result, the Technical Leader, or designee will be informed. The Technical Leader, or designee, will examine the problem and contact the manufacturer if necessary.

##### 6.1.1.7.2: Taq Gold Polymerase

The Taq gold polymerase will be marked with the receive date and initials of the individual who receives the Taq. The appropriate positive control as described in the corresponding SOP will be amplified in duplicate along with an amplification blank (AMP-) sample. The samples will then be analyzed to ensure the appropriate DNA profile is obtained. Once the lot has been verified the QC date will be placed on all received kits. If the Taq does not produce the expected profile, the samples should be re-injected or re-amplified.. If the Taq fails the QC a second time the Technical Leader, or designee will be informed. The Technical Leader, or designee will examine the problem and contact the manufacturer if necessary.

#### 6.1.2: Controls and Standards

It is essential that proper control samples are included when samples are extracted, amplified and typed. The typing results obtained from these controls are important for the interpretation of the profiles obtained. All employees and supervisory personnel must be vigilant for any indication of nonconforming tests and work.

#### 6.1.2.1: Reagent Blank (RB)

The reagent blank consists of all reagents used in the test process minus any sample and is processed through all steps alongside the question or known samples. The reagent blank will be amplified at full strength. A reagent blank must be included with each extraction set unless the samples are processed with the direct amplification protocol.

\*During Direct Amplification the RB and AMP- are equivalent and in accordance with the SWGDAM clarification letter both do not need to be run.

The reagent blank is used to test for possible contamination of the sample preparation, reagents, and/or supplies by an external DNA source. If the reagent blank exhibits any typing results above the analytical threshold, the reagent blank can be re-amplified. If the typing results remain above threshold after re-amplification, then all DNA samples that were associated with reagent blank should be considered inconclusive for analysis and re-extracted. If the DNA sample has been consumed and re-extraction is not possible, then the DNA technical leader, CODIS Administrator and/or Laboratory Director will be consulted to analyze the samples and reagent blank. If after analysis the source of the contaminating DNA does not appear to be in the samples, then the contamination will be noted in the report. If the extraneous DNA is present in both the reagent blank and associated sample, then the sample will be reported as inconclusive.

#### 6.1.2.2: Positive Control

The positive control contains DNA from a known source with a known DNA profile. The positive control will be amplified and analyzed concurrently in the same instrument with the same samples and same PCR kit.

The positive control tests to insure the proper performance of the amplification and typing procedure. The positive control provided with each amplification kit serves as the appropriate positive control. If the positive control does not exhibit the appropriate results, then samples associated with that positive control are considered inconclusive for analysis and must be re-amplified.

Positive controls may be setup in duplicate to compensate for poor injections, spikes, or other artifacts. Only one of the positive controls is required to produce the expected results. If a positive control is lacking expected allele(s) at a locus, then the control can be used, but that locus will be marked as inconclusive in all samples associated with the positive control. If there are more than two loci that lack the expected allele(s) then all samples associated with the positive control must be re-injected or re-amplified.

**NOTE: Internal Positive Control:** A NIST traceable internal positive control may be run alongside the manufacturer's positive control. If the control genotypes are correct, the amplification is considered correct and the samples can be used.

#### 6.1.2.3: Negative Control (AMP-)

The negative control (amplification blank) contains all the reagents for the amplification mix but no DNA. The negative control will be amplified and analyzed concurrently in the same instrument with the same samples and same PCR kit.

The negative control tests for contamination of samples during the setup of the amplification reactions. If the negative control exhibits unexplainable peaks above the analytical threshold that are not eliminated after re-injection, then all samples associated with the negative control are considered inconclusive for analysis and must be re-amplified.

#### 6.1.2.4: Internal Size Marker and Allelic Ladder

Internal size marker is added to each sample and ladder prior to electrophoresis. The internal size marker allows the genetic analysis software to determine the size (in base pairs) of the peaks in the samples and ladders.

##### Allelic Ladder

The allelic ladder is supplied with each of the amplification kits and is run with each set of samples. The allelic ladder allows Gene Mapper to assign an allele call to any peaks observed based on their size.

#### 6.1.2.5: NIST Standard

DNA procedures will be checked using the NIST Standard Reference Material (SRM; 2391b for autosomal STRs or an

internal NIST traceable sample) annually or whenever substantial changes are made to the procedures.

#### 6.1.2.5 a: Internal NIST Standards

Internal NIST Traceable Standards are created by running NIST Standard Reference Material alongside the internal standard. The internal standard will be viable until a new lot is taken or until an internal expiration date (if applicable).

#### 6.1.2.5 b: NIST Standards Handling, Storage, and Prevention of Deterioration

NIST SRM samples will be maintained in as the manufacturer recommends. All internal NIST traceable standards will be maintained at room temperature. All NIST samples will be transported, handled, and used as all casework samples to prevent contamination and deterioration and to protect the integrity of the sample.

#### 6.1.3: Detection and Control of Contamination

The Arkansas State Crime Laboratory employs several safeguards to detect any contamination that might occur. The reagent blank detects contamination during extraction, the amplification blank detects contamination during the setup of amplification, and the monthly swipe test detects contamination of the laboratory spaces. In order to reduce the possibility of contamination the Arkansas State Crime Laboratory has devised procedures listed in the section on sample handling and processing.

If contamination has been discovered, the laboratory will try to discover the source of the contamination. The incident will be documented on a Non-Conformance Report. If a CODIS analyst is found to be the source of the contamination, the CODIS Administrator will be notified and take the necessary corrective actions. If the contamination is from outside the CODIS section, the appropriate supervisor will be notified to address the contamination source. If the contamination is systemic issue, the lab wide Quality Manager will be notified and a Corrective Action Request (CAR) may be necessary.

### **6.2: Standard Operating Procedures**

There are special circumstances when methods and procedures may be deviated. When these times arise and there is just cause, Methods/Procedures Deviations Form (CODIS-FORM-26) must be completed and signed by the CODIS Administrator or the DNA Technical Leader.

#### **6.2.1: Convicted Offender / Arrestee Sample Processing (CODIS Support Staff)**

As Convicted Offender/ Arrestee Samples are processed in the CODIS Section, the staff must check to ensure that the sample quality is adequate, that there is accurate and sufficient offender/arrestee biographical information provided and that a qualifying violation is met. A new sample may be requested if the sample quality is not adequate. The sample will not be processed if a qualifying violation is not met.

#### 6.2.1.1: Intake of Convicted Offender / Arrestee Samples (Blood Samples)

- A. Database envelopes are released from Evidence Receiving and stored in the CODIS Section.
- B. Envelopes are opened in a clean area and kits are placed in bundles. Gloves will be worn during the processing of any biological sample.
- C. All convicted offender / arrestee data on the database card is carefully entered into the Arkansas State Crime Laboratory DNA database program. The JusticeTrax case number and evidence item number are entered into the ASCL DNA database program. Any missing offender / arrestee information can be searched using ACIC (see ACIC Access 6.2.2.1), eOMIS or any other available software. The following is the process to enter a convicted offender / arrestee in the in-house database program:
  1. Click on the "DNA Database" icon located on the desktop
  2. Click on "File"
  3. Click on "Add a New Offender"
  4. Enter in all appropriate data
  5. If the entered data is a duplicate, a screen will appear to verify the information
  6. If the sample is a duplicate, print a barcode label, attach it to the database card and file with original. Duplicate information should be checked against the original information.
  7. If there is not a duplicate offender found, click on "Add/Print" and print out a new barcode
  8. Five barcode labels are generated and placed with each kit
  9. Barcode labels are placed in the following locations:
    - a. Outside of coin envelope
    - b. Inside of coin envelope (loose)
    - c. Database card/upper left corner on fingerprint side
    - d. Database card/inside on "Place Barcode Here"
    - e. On cut sample
- D. Each blood sample is halved. One half of the blood stain card is placed in a coin envelope to be analyzed and the other half is to be retained for confirmation purposes.

- E. The database cards (the half with the offender's information) are boxed numerically for storage.
- F. The coin envelopes are stored for analysis.
- G. Coin envelopes are scanned out to the analyst for punching.
- H. After punching, the coin envelopes are scanned back in and filed with the original database cards.

NOTE: If inadequate sample amount or inadequate information is given on the database card, a phone call can be made to the submitting officer or his/her supervisor.

6.2.1.2: Intake of Convicted offender / Arrestee Samples (Buccal Samples)

- A. Database envelopes are released from Evidence Receiving and stored in the CODIS Section.
- B. Envelopes are opened in a clean environment. Gloves will be worn during the processing of any biological sample.
- C. All convicted offender / arrestee data on the database card is carefully entered into the Arkansas State Crime Laboratory DNA database program. The JusticeTrax case number and evidence item number are entered into the ASCL DNA database program. Any missing offender information can be searched using ACIC (see ACIC Access 6.6.2.1), eOMIS, or any other available software. The following is the process to enter a convicted offender / arrestee in the in-house database program:

- 6.2.1: Click on the "DNA Database" icon located on the desktop
- 6.2.2: Click on "File"
- 6.2.3: Click on "Add a New Offender"
- 6.2.4: Enter in all appropriate data
- 6.2.5: If the entered data is a duplicate, a screen will appear to verify the information. All duplicate card information should be verified.
- 6.2.6: If the sample is a duplicate, print a barcode label, attach it to the database card and file with original
- 6.2.7: If there is not a duplicate offender found, click on "Add/Print" and print out a new barcode.
- 6.2.8: Five barcode labels are generated and placed with each kit
- 6.2.9: Barcode labels are placed on the outside of the envelope on in the specified area on the 'Specimen Identification Card'.

NOTE: Extra barcodes are placed with the envelopes.

- D. Barcodes are placed on the DNA Collectors in the laboratory area.

E. DNA Collectors are punched and placed in Long Term Storage.

NOTE: If inadequate sample amount or inadequate information is given on the database card, a phone call can be made to the submitting officer or his/her supervisor.

#### 6.2.1.3: Intake of Arrestee Samples with Submitted Cases

If arrestee samples are submitted to the CODIS Section with case numbers referencing specific cases in which the arrest was made, the sample can be processed for both the database and for the DNA Casework Section. The sample can also be processed if documentation from the submitting agency or the prosecutor requesting the Arrestee sample be referenced to the specific case the individual was arrested. In order for the sample to be used for both sections the qualifying violation the individual was sampled for must also be the case submitted to the DNA Section.

- A. Prior to use in Casework an 'Arrestee Confirmation Sheet' (CODIS-Form-43) must be completed. Once the 'Arrestee Confirmation Sheet' is completed it should be scanned in JusticeTrax along with biographical information.
- B. An 'Arrestee' Request in JusticeTrax must be created and canceled to inform an analyst that a sample related to his/her case is in the CODIS Section.
- C. A duplicate sample is not re-run in the CODIS Section. DNA Casework can work the sample if necessary and retain it with the appropriate evidence. It is noted that this can be changed on a case-by-case basis upon approval of the CODIS Administrator and/or the Casework Supervisor.
- D. If an arrestee sample that is referenced to an ASCL case number is given to the CODIS Section, and it is deemed to have a non-qualifying violation, the sample can be stored for the DNA Casework Section.
- E. All completed 'Arrestee Confirmation Sheets' are stored along the completed CODIS Hit information. Any additional hits from the arrestee sample will need to have the DNA profile confirmed.
- F. All arrestee profiles (autosomal and Y-STR) should be developed and entered into Specimen Manager by a CODIS Analyst for the Casework Analyst to obtain. It is noted that this can be changed on a case-by-case basis upon approval of the CODIS Administrator and/or Casework Supervisor.

#### Medical Examiner's Blood Samples

The CODIS Section processes most blood samples from the Medical Examiner's (ME) Office. The protocol for these samples is the

same as the protocol offender blood samples. It is not recommended that ME samples are processed on the same direct amplification plate as convicted plate.

#### 6.2.1.4: ACIC Access

Prior to obtaining access to the Arkansas Criminal Information Center (ACIC) an individual must attend a training class and be issued a unique CSN (Central System Number) and certification. The training gives options to access different data depending on the “known” information available.

To access Criminal History of an offender:

- A. LOGON
- B. After confirmation of “Connection Successful” and “LOGON Accepted” information can be obtained
- C. F4: Query Name; can be accessed when only the name is known
- D. F5: The agency information will be automatically filled in. Under “PERSON DATA” enter all available information for the offender
- E. F6: REQUESTING OFFICER (OFC) is the name of the individual requesting the data (last name, first initial). Fill in the “OPERATOR DATA” (OPR) the same as OFC data.
- F. Use the “+” key to enter data (not “enter” key)
- G. F7: Queries with only the SID (State ID) number
- H. F2: LOGOFF

NOTE: Most information is listed under the F5 option

#### 6.2.1.5: BSD Punch

NOTE: The humidity level can be low at the Arkansas State Crime Laboratory especially in the winter season. A low humidity level can make punching using the BSD punch difficult. If this occurs the humidifier can be used to increase the humidity in the DNA pre-amplification room. It is recommended to use the humidifier if the humidity falls below 25% prior to using the BSD punch. The humidity levels will be logged on CODIS-Form-20.

##### 1. Making Plates:

- a. Open BSD Duet 600 software. Icon for program is on computer desktop.
- b. Enter username and password. Click: ‘Continue’
- c. Click: ‘Edit Test Sequences’
- d. Click: ‘Create a new test’
- e. Select appropriate punching file then Click: ‘Open’

- f. Each well (96 total) will be listed as a *Sample*. Double click the wells you want to change. Mark all cells that are not going to be used as *Unused*. All wells that will contain + and – controls need to be labeled *Liquid Control*.
- g. After labeling all the cells, Click ‘Test’ in the toolbar. Click ‘Test Configuration’. Change direction to ‘Vertical’. A template plate can be used instead of creating a new plate format.
- h. Click ‘File’. Click ‘Save.’ Name plate and Click ‘Save’.
- i. After test is saved, close Test window.

## 2. Filling Plates:

- a. Click Distribute Spots button on main BSD menu.
- b. Place a 96 well plate in the BSD Punch.
- c. Wait for spot detector to self-adjust. Click ‘Continue’ when button appears.
- d. Click ‘Continue’ at next screen.
- e. Select appropriate plate in left hand list. Only the plate you want should be check marked.
- f. Above Continue button; the Samples, Standards and Controls should be checked. Cleaning should not have a checkmark.
- g. Click ‘Continue’
- h. Starting sample is #1. Click ‘Continue’.
- i. Enter plate name. Click ‘Continue with manually entered barcode or scan the plate barcode’.
- j. At next screen Click ‘Continue’.
- k. Start scanning the sample barcodes and punching the appropriate samples.
- l. If you have to enter a barcode manually, after typing in the barcode Click ‘Continue with manually entered barcode’.
- m. After last spot is punched, Click ‘All Spots Present’ on pop up screen. Click ‘All Spots Present’ on second pop up screen.
- n. Click: ‘Print plate maps and end’.

### 6.2.1.6: Transferring Plate Setup to 3500xl

1. Set-up data for 3500xl:
  - a. Put Travel Drive into USB Slot.
  - b. Open FP5 from desktop.
  - c. When prompted for the data file select “BSD Output Files” from the Desktop.
  - d. Scroll down and Select the last file in the list that has a file size of 5 or 6 KB.

- e. Select QC Samples.
- f. Select CODIS Hit Samples.
- g. Type Initials.
- h. Select Travel Drive Press OK

2. Transferring to 3500xl:

- a. Put Travel Drive into USB Slot.
- b. Select Library.
- c. Press IMPORT.
- d. Select txt file on Travel Drive.
- e. Click OK
- f. Make sure file imported correctly.

**6.2.2: Amplification Protocol**

6.2.2.1: Background

6.2.2.1.1: PowerPlex 16 HS

The PowerPlex® 16 HS System<sup>(a-e)</sup> allows co-amplification and three-color detection of sixteen loci (fifteen STR loci and Amelogenin), including Penta E, D18S51, D21S11, TH01, D3S1358, FGA, TPOX, D8S1179, vWA, Amelogenin, Penta D, CSF1PO, D16S539, D7S820, D13S317 and D5S818. One primer for each of the Penta E, D18S51, D21S11, TH01 and D3S1358 loci is labeled with fluorescein (FL); one primer for each of the FGA, TPOX, D8S1179, vWA and Amelogenin loci is labeled with carboxytetramethylrhodamine (TMR); and one primer for each of the Penta D, CSF1PO, D16S539, D7S820, D13S317 and D5S818 loci is labeled with 6-carboxy-4',5'-dichloro-2',7'-dimethoxy-fluorescein (JOE). All sixteen loci are amplified simultaneously in a single tube and analyzed in a single injection or gel lane. (Table 1)

**Table 1.** The PowerPlex 16 HS PCR Amplification System

STR Locus	Label	Chromosomal Location	Alleles Included in PowerPlex 16 HS Allelic Ladder	Control 9947a	Control 2800M
Penta E	FL	15q	5 - 24	12, 13	7,14
D18S51	FL	18q21.3	8-10, 10.2, 11-13, 13.2, 14-27	15, 19	16,18
D21S11	FL	21q11-21q21	24, 24.2, 25, 25.2, 26-28, 28.2, 29, 29.2, 30, 30.2, 31, 31.2, 32, 32.2, 33, 33.2, 34, 34.2, 35, 35.2, 36-38	30, 30	29,31.2
TH01	FL	11p15.5	4-9, 9.3, 10-11, 13.3	8, 9.3	6,9.3
D3S1358	FL	3p	12-20	14, 15	17,18

FGA	TMR	4q28	16-18, 18.2, 19, 19.2, 20, 20.2, 21, 21.2, 22, 22.2, 23, 23.2, 24, 24.2, 25, 25.2, 26-30, 31.2, 43.2, 44.2, 45.2, 46.2	23, 24	20,23
TPOX	TMR	2p24-2pter	6-13	8, 8	11,11
D8S1179	TMR	8q	7-18	13, 13	14,15
vWA	TMR	12p12-pter	10-22	17, 18	16,19
Amelogenin	TMR	Xp22.1-22.3 and Y	X, Y	X, X	X,Y
Penta D	JOE	21q	2.2, 3.2, 5, 7-17	12, 12	12,13
CSF1PO	JOE	5q33.3-34	6-15	10, 12	12,12
D16S539	JOE	16q24-qter	5, 8-15	11, 12	9,13
D7S820	JOE	7q11.21-22	6-14	10, 11	8,11
D13S317	JOE	13q22-q31	7-15	11, 11	9,11
D5S818	JOE	5q23.3-32	7-16	11, 11	12,12

#### 6.2.2.1.2: PowerPlex Y23

The PowerPlex® Y23 PCR Amplification Kit is a short tandem repeat (STR) multiplex assay that amplifies 23 Y-STR loci in a single PCR reaction. The following table shows the loci amplified by the Y23 kit and the corresponding dyes used. The Y23 Kit Allelic Ladder is used to genotype the analyzed samples. The alleles contained in the allelic ladder and the genotype of the Control DNA 2800M are listed in the table. (Table 3)

**Table 3.** The PowerPlex® Y23 PCR Amplification System

STR Locus	Label	Alleles Included in Y23 Allelic Ladder	Control 2800M
DYS576	Fluorescein	11-23	18
DYS389I	Fluorescein	9-17	14
DYS448	Fluorescein	14-24	19
DYS389II	Fluorescein	24-35	31
DYS19	Fluorescein	9-19	14
DYS391	JOE	5-16	10
DYS481	JOE	17-32	22
DYS549	JOE	7-17	13
DYS533	JOE	7-17	12
DYS438	JOE	6-16	9
DYS437	JOE	11-18	14
DYS570	TMR-ET	10-25	17
DYS635	TMR-ET	15-28	21
DYS390	TMR-ET	17-29	24
DYS439	TMR-ET	6-17	12
DYS392	TMR-ET	4-20	13
DYS643	TMR-ET	6-17	10
DYS393	CXR-ET	7-18	13
DYS458	CXR-ET	10-24	17
DYS385 a/b	CXR-ET	7-28	13, 16

DYS456	CXR-ET	11-23	17
Y GATA H4	CXR-ET	8-18	11

### 6.2.2.2: Amplification Setup

#### 6.2.2.2.1: PowerPlex 16 HS

##### a. Blood on FTA Cards

Create a master mix of PCR reagents by combining the reagents following ratios:

	Full Rxn.	Half Rxn.
PowerPlex 16 HS PCR Reaction Mix	5.0 $\mu$ L	2.5 $\mu$ L
PowerPlex 16 HS Primer Set	2.5 $\mu$ L	1.25 $\mu$ L
Promega Direct Amp Solution	17.5 $\mu$ L	8.75 $\mu$ L
Total Volume	25 $\mu$ L	12.5 $\mu$ L

1. Place appropriate volume of Master Mix into each required well on a 96-well plate.
2. Add 1  $\mu$ L of the positive control to the appropriate well.
3. Punch a 1.2 mm pill into the appropriate well.
4. Cover the plate with PCR septa.
5. Briefly spin the plate in the centrifuge and place into the 9700 AB Thermocycler
6. Turn on the power to 9700 thermocycler
7. Press Run
8. Scroll to the appropriate program
9. Press Start
10. Ensure the proper volume is entered
11. Press Start again

The following is the 9700 thermocycler parameters that are used during amplification of PowerPlex 16 HS:

96°C      2min

ramp 100% to 94°C      30sec 10cycles  
ramp 29% to 60°C      30sec 10cycles  
ramp 23% to 70°C      45sec 10cycles

ramp 100% to 90°C      30sec 20cycles

ramp 29% to 60°C      30sec 20cycles  
ramp 23% to 70°C      45sec 20cycles

60°C      30min

4°C      forever

b. Buccal on Bode DNA Collectors

Manual Pipetting

1. Place 2 ul Promega Punch Solution into the appropriate wells.
2. Punch a 1.2 mm pill into the appropriate wells.

Create a master mix of PCR reagents by combining the reagents following ratios:

	Full Rxn.	Half Rxn.
PowerPlex 16 HS PCR Reaction Mix	5.0 µL	2.5 µL
PowerPlex 16 HS Primer Set	2.5 µL	1.25 µL
Promega Direct Amp Solution	17.5 µL	8.75 µL
Total Volume	25 µL	12.5 µL

3. Place appropriate volume of Master Mix into each required well on a 96-well plate.
4. Add 1 µL of the positive control to the appropriate well.
5. Cover the plate with PCR septa.
6. Briefly spin the plate in the centrifuge and place into the 9700 AB Thermocycler
7. Turn on the power to 9700 thermocycler
8. Press Run
9. Scroll to the appropriate program
10. Press Start
11. Ensure the proper volume is entered
12. Press Start again

The following is the 9700 thermocycler parameters that are used during amplification of PowerPlex 16 HS:

96°C      2min

ramp 100% to 94°C      30sec 10cycles  
ramp 29% to 60°C      30sec 10cycles

ramp 23% to 70°C	45sec	10cycles
ramp 100% to 90°C	30sec	20cycles
ramp 29% to 60°C	30sec	20cycles
ramp 23% to 70°C	45sec	20cycles
60°C	30min	
4°C	forever	

#### 6.2.2.2.2: PowerPlex Y23

##### a. Blood on FTA Cards

Create a master mix of PCR reagents by combining the reagents following ratios:

Y23 PCR 5x Master Mix	5.0 $\mu$ L
Y23 10x Primer Pair Mix	2.5 $\mu$ L
Promega Direct Amp Solution	17.5 $\mu$ L
Total Volume	25.0 $\mu$ L

12. Place 25  $\mu$ L of Master Mix into each required well on a 96-well plate.
13. Add 2  $\mu$ L of 2800M positive control to the appropriate well.
14. Punch a 1.2 mm pill into the appropriate well.
15. Cover the plate with PCR septa.
16. Briefly spin the plate in the centrifuge and place into the 9700 AB Thermocycler
17. Turn on the power to 9700 thermocycler
18. Press Run
19. Scroll to the appropriate program
20. Press Start
21. Ensure the proper volume is entered
22. Press Start again

The following is the 9700 thermocycler parameters that are used during amplification of PowerPlex Y23:

96°C	2min
------	------

94°C 10sec  
61°C 1min  
72°C 30sec  
28 cycles (ramp speed should be set at Max mode)

4°C forever

b. Buccal on Bode DNA Collectors

Manual Pipetting

13. Place 2 ul Promega Punch Solution into the appropriate wells.

14. Punch a 1.2 mm pill into the appropriate wells.

Create a master mix of PCR reagents by combining the reagents following ratios:

Y23 PCR 5x Master Mix	5.0 $\mu$ L
Y23 10x Primer Pair Mix	2.5 $\mu$ L
Promega Direct Amp Solution	17.5 $\mu$ L
Total Volume	25.0 $\mu$ L

23. Place 25  $\mu$ L of Master Mix into each required well on a 96-well plate.

24. Add 2  $\mu$ L of 2800M positive control to the appropriate well.

25. Punch a 1.2 mm pill into the appropriate well.

26. Cover the plate with PCR septa.

27. Briefly spin the plate in the centrifuge and place into the 9700 AB Thermocycler

28. Turn on the power to 9700 thermocycler

29. Press Run

30. Scroll to the appropriate program

31. Press Start

32. Ensure the proper volume is entered

33. Press Start again

The following is the 9700 thermocycler parameters that are used during amplification of PowerPlex Y23:

96°C 2min

94°C 10sec  
61°C 1min  
72°C 30sec  
28 cycles (ramp speed should be set at Max mode)  
4°C forever

### 6.2.2.3: Sample Setup for the 3500xl Instrument

#### 6.2.2.3.1: PowerPlex 16 HS

After amplification is complete, samples are set up for the 3500xl. A 96 opti-well plate is used. Create a master mix solution in the following ratios:

1.0 µl of Internal Lane Standard (ILS-600)  
9.0 µl of HiDi Formamide

1. Pipette 10µl of mix into each well used.
2. Ensure that all the wells of an injection contain master mix. The 3500xl should never inject sample from a dry well.
3. Add 1 µl of sample to each well (a multi-channel pipette is beneficial).
4. Add 1 µl of ladder to each ladder sample. At minimum, 1 ladder per plate must be present.
5. Briefly spin the plate in the centrifuge.
6. Heat the plate for approximately 3 minutes.
7. Chill the plate for approximately 3 minutes.
8. Place the plate into the 3500xl instrument. The plate only fits into the instrument in one direction.

#### 6.2.2.3.2: Y23

After amplification is complete, samples are set up for the 3500xl. A 96 opti-well plate is used. Create a master mix solution in the following ratios:

1.0 µl of Internal Lane Standard (ILS-500)

10.0 µl of HiDi Formamide

1. Pipette 11µl of mix into each well used.
2. Ensure that all the wells of an injection contain master mix. The 3500xl should never inject sample from a dry well.
3. Add 1 µl of sample to each well (a multi-channel pipette is beneficial).
4. Add 1 µl of ladder to each ladder sample. At minimum, 1 ladder per plate must be present.
5. Briefly spin the plate in the centrifuge.
6. Heat the plate for approximately 3 minutes.
7. Chill the plate for approximately 3 minutes.
8. Place the plate into the 3500xl instrument. The plate only fits into the instrument in one direction.

#### 6.2.2.4: 3500xl Instrument Setup

PowerPlex 16HS and Y23

1. Go to Library
2. Click on Import
3. Select the txt file to import.
4. Click 'OK'
5. It is best to start the oven approximately 15 minutes before the run starts.
  - a. Go to the Dashboard
  - b. Press the Pre-Heat Button
6. Link the appropriate plate to the plate map under the 'Load Plates for Run'.
7. To start the run Click on the Start Run Button

## 6.2.2.5: Analysis of Raw Data / GeneMapper ID-X

### 6.2.2.5.1: PowerPlex 16 HS

GeneMapper ID-X analysis software is used to analyze the raw data collected by the 3500xl Genetic Analyzer.

- A matrix file is applied to the raw data to create a single baseline as well as to correct for spectral overlap and produce peaks of the five individual colors.
  - A size curve is created using co-injected DNA fragments of known size and the unknown peaks are assigned a size by interpolation.
1. Open the GeneMapper ID-X program with a blank project window or from the GeneMapper ID-X program select **File>Add Samples to Project**.
  2. Select the appropriate run folder saved on the DNA drive and click **Add to List**. Once all samples have been added to the list, click **Add** to import the files.
  3. In the Sample Type column, assign the correct sample type to each sample (i.e. sample, ladder, control)
  4. Select Analysis Method.
  5. Select **PowerPlex\_16\_IDX\_alpha** as the Panel.
  6. Select **ILS 600** as the Size Standard.
  7. Click the green arrow to analyze the project.
  8. View the raw data to examine the ILS. Verify that the analysis range is between 60bp and 600bp and the peaks are correctly labeled.
  9. Review controls
    - Display each control (including positive and negative amplification controls, and blank controls).
    - If peaks above 175 RFU are observed in the negative controls, the sample can be re-injected.
    - Examine the Positive control and verify the correct calls of the alleles.
  10. Examine the allelic ladders.

- Verify that the allelic ladder is called correctly for each marker.
11. Analyzed samples can be viewed as a group or individually by highlighting the samples to view. After selecting the sample click the **Display Plots** button. There are several options available to view the electropherogram.
  12. Edit any labels as appropriate e.g. spike, background, - A
  13. Review the remaining sample files. Evaluate the following parameters:
    - Peak shape and height (optimal values between 1000-6000 RFU, although acceptable and type able signals may occur outside of this range).
    - Matrix quality (baselines should be relatively flat and there should not be a pattern of pronounced peaks or dips below true DNA peaks in the other four colors).
    - Peak profile (examine for artifactual peaks e.g. spikes).

#### 6.2.2.5.2: Y23

GeneMapper ID-X analysis software is used to analyze the raw data collected by the 3500xl Genetic Analyzer.

- A matrix file is applied to the raw data to create a single baseline as well as to correct for spectral overlap and produce peaks of the five individual colors.
- A size curve is created using co-injected DNA fragments of known size and the unknown peaks are assigned a size by interpolation.

1. Open the GeneMapper ID-X program with a blank project window or from the GeneMapper ID-X program select **File>Add Samples to Project**.
2. Select the appropriate run folder saved on the DNA drive and click **Add to List**. Once all samples have been added to the list, click **Add** to import the files.
3. In the Sample Type column, assign the correct sample type to each sample (i.e. sample, ladder, control)

4. Select Analysis Method.
5. Select **PowerPlexY23\_IDX\_v1.0** as the Panel.
6. Select **CC5\_ILS\_500\_IDX** as the Size Standard.
7. Click the green arrow to analyze the project.
8. View the raw data to examine the ILS. Verify that the analysis range is between 60bp and 500bp and the peaks are correctly labeled.
9. Review controls
  - Display each control (including positive and negative amplification controls, and blank controls).
  - If peaks above 175 RFU are observed in the negative controls, the sample can be re-injected.
  - Examine the Positive control and verify the correct calls of the alleles.
10. Examine the allelic ladders.
  - Verify that the allelic ladder is called correctly for each marker.
11. Analyzed samples can be viewed as a group or individually by highlighting the samples to view. After selecting the sample click the **Display Plots** button. There are several options available to view the electropherogram.
12. Edit any labels as appropriate e.g. spike, background, - A
13. Review the remaining sample files. Evaluate the following parameters:
  - Peak shape and height (optimal values between 1000-6000 RFU, although acceptable and type able signals may occur outside of this range).
  - Matrix quality (baselines should be relatively flat and there should not be a pattern of pronounced peaks or dips below true DNA peaks in the other four colors).
  - Peak profile (examine for artifactual peaks e.g. spikes).

#### 6.2.2.6: Interpretation Guidelines

The purpose of these guidelines is to establish a general framework and outline minimum standards to ensure that:

- Conclusions for CODIS samples are scientifically supported by the analytical data, including that obtained from appropriate standards and controls;
- Interpretations are made as objectively as possible, consistently from analyst to analyst, and within established limits.

The goal of the evaluation and interpretation is to amplified STR data and determine the DNA profiles for NDIS.

- A peak is defined as a distinct, triangular section of an electropherogram.
- Genotypes are determined from the diagnostic peaks of the appropriate color and size range for a particular locus.

a. Threshold

The minimum peak height threshold will be set at 175 (Relative Fluorescent Unit) RFU for PowerPlex 16 HS and Y23. The interpretation threshold is set at 175 RFU for PowerPlex 16 HS and Y23. Optimal peak height values range between 1000-4000 RFU, although acceptable and typeable signals may occur outside of this range.

b) Peak Height Ratio

Peak height ratios of heterozygote alleles are defined as the ratio of the lower peak's height to the higher peak's height, expressed as a percentage. Peak height ratios lower than 60% may indicate a mixture. Occasionally a non-mixed sample will be outside of this range. Depending upon the sample source, the loci in question, the number of loci affected and the percent disparity between alleles, the sample may need to be re-amplified and typed.

Homozygote allele peak heights are approximately twice that of heterozygotes as a result of a doubling of the signal from two alleles of the same size.

c) Off Ladder Variants

Off ladder (OL) calls are first converted to size in base pairs (bp), and then compared to the size of the appropriate ladder alleles and the allelic designation determined. If the OL is not a “perfect” repeat, but rather varies by 1, 2 or 3 bp from a ladder allele, then it will be designated as an integer of that variation. For example, if a green OL peak size is 238.39 bp, and the 36 allele of the **D21S11** ladder is 236.32 bp, then the peak will be designated a **D21S11 36.2**. If an allele falls above the largest or below the smallest peak of the sizing ladder, the allele will be designated as either greater than (>) or less than (<) the respective ladder allele.

The analyst will re-amplify or re-inject, then type any sample containing a peak not properly interpreted as an allele by the software, especially if it is not appropriately balanced with an associated allele or at a height expected for a homozygote.

An off ladder variant which has been seen and confirmed at least two times in the population sampled at the Arkansas State Crime Laboratory is no longer considered a rare variant. These peaks can be confidently and accurately called without confirmation.

d) Tri-Allele

A tri-allelic system is one which contains three distinct alleles, rather than the normal one or two. In order to insure that the sample is a true tri-allelic specimen, the sample should be re-amplified and run a second time. However, if observed in overlapping systems or in multiple samples from the case, tri-allelic loci may be considered confirmed. If there is not enough extract left for re-amplification, the sample may be re-loaded. However, if the tri-allelic sample cannot be confirmed, the locus may be reported as inconclusive or a technical note may be recorded in the case file (the CODIS Administrator or Technical Leader may need to be notified to determine how to report the locus).

e) Artifacts

Artifacts can occur and need to be recognized. These may include, but are not limited to, the following: spikes, pull-up, stutter, and non-template nucleotide addition.

### 1) Spikes

Spikes are artifactual peaks usually observed in at least two colors. Spikes can be caused by urea crystals in the capillary, power surges, or other instrument related issues. A spike will not exhibit the same morphology as a peak, but will be sharper or “spike” shaped. Spikes are unique to fragments analyzed using capillary electrophoresis. Spikes will have fragment sizes which vary only slightly in the 3500xl data. Above threshold spikes should be noted and may be re-injected.

### 2) Stutter

In addition to an allele’s primary peak, artifactual minor “stutter” peaks can occur at four-base intervals. The most common stutter peaks observed in all loci are four bases smaller than the primary peak (“n-4”). It is also possible to see additional “n+4” peaks (four bases larger), especially when excessive amounts of DNA are amplified.

#### ■ Stutter in PowerPlex 16 HS

Stutter peaks are evaluated by examining the ratio of the stutter peak height to the height of the appropriate adjacent allele, expressed as a percentage. The height of stutter peaks can vary by locus, and longer alleles within a locus generally have a higher percentage of stutter. In general, the maximum expected percentage of stutter is less than 20% for any locus. Peaks in the stutter positions greater than this value may indicate the presence of a mixture. Therefore, CODIS samples will be evaluated with a global stutter ratio of 20%.

Analyzed peak heights above the optimal range may be “off-scale” in the raw data, meaning that the CCD camera may be saturated. While the Gene Mapper ID-X software will alert the analyst to any off-scale raw data peaks, the analyzed peak may be assigned a lower value due to smoothing and base-lining functions.

Therefore, the observed percent stutter will be inaccurately high. If the stutter peak is greater than the maximum allowed and the primary peak is above 10,000 RFU and/or has been labeled off-scale, the analyst should interpret the results with caution. The sample may be re-amplified with less input DNA or re-injected

### 3) Non-Template Nucleotide Addition (-A)

Amplification conditions have been set to maximize the non-template addition of a 3' terminal nucleotide by DNA polymerase. Failure to attain complete terminal nucleotide addition results in "band splitting", visualized as two peaks one base apart. This is most often seen when an excessive amount of DNA is amplified or amplification is performed under sub-optimal PCR conditions.

### 4) Pull-Up

Small artifactual peaks can appear in other colors under true peaks. This phenomenon is termed "pull-up". Pull-up is a result of spectral overlap between the dyes, which is normally corrected for by the spectral calibration. If a pull-up peak is above the minimum peak height detection threshold, it will be sized at approximately the same size as the true peak. Pull-up can occur as a result of the following:

- Application of a sub-optimal spectral can cause pull-up. If necessary, spectral standards can be injected on the same capillary after the analytical run and a new spectral can be made and applied.
- Amplification using excess input DNA can lead to off-scale peaks. The matrix may not perform properly with off-scale data.

### 5) Other

In addition to amplification artifacts described above the following anomalies can arise during electrophoresis and analysis:

Significant room temperature fluctuation may result in size variation between injections such that allelic ladder peaks differ by more than 0.5 bp from allelic peaks in other injections. This will disrupt sample analysis using the Gene Mapper ID-X program. Analyzing samples with an injection of allelic ladder nearest the questioned samples may alleviate this problem. If desired, the sample(s) and an allelic ladder may be re-injected to confirm the typing.

Artifactual peaks of a single color will not display the typical spectral overlap characteristic of the five fluorescent dyes in the raw data. Peak width may not be similar to the peaks resulting from dye-labeled DNA. These peaks can be shown to be artifactual by re-injection of the sample.

#### **6.2.2.7: STR Profile Interpretation**

Amplified products from convicted offender / arrestee samples will be interpreted based on peak quality, peak morphology and RFU values. It is a requirement of the analyst, based on experience, to determine which sample peaks meet the criteria for allele designation. All peaks called in the CODIS section must meet a minimum RFU threshold of 175 for PowerPlex 16 HS and.

In general, a single source profile at each locus will appear as a single peak or a double peak. On rare occasions, a tri-allelic pattern may be detected. The observation of tri-allelic patterns does not preclude that locus from interpretation. However, a tri-allelic pattern must be confirmed by, at minimum, re-injecting the sample.

Inconclusive Allele Calls: In those cases where peaks are not present or are below the minimum 175 RFU for PowerPlex 16 HS and Y23 threshold for D2S1338 and D19S433, allele calls for that sample at that locus may be designated as inconclusive "INC". If any of the CODIS core loci have alleles that are not present or are below the RFU threshold, the sample must be re-amplified to gain a complete profile at the 13 core loci.

#### **6.2.2.8 Re-Runs**

All samples that have been labeled as re-run will be reprocessed. The sample will be marked and verified for re-run. Recently entered samples into SDIS will be compared to all samples into the DNA Database at the point of sample data entry. It is noted, that problematic samples (both CODIS and Medical Examiner's samples) can be extracted, quantitated and amplified using the sample methods employed in the Casework Section. When these methods are used, the Casework SOP will be followed.

### **6.2.3: CODIS Data Import and Searching**

#### **6.2.3.1: Import STR Data**

All STR data created by the Arkansas State Crime Laboratory or a contract company which is NDIS acceptable (see NDIS Acceptance Form) will be entered and searched in CODIS.

Profiles can be manually entered or entered using the import program into the system. Any profiles entered into CODIS by the import program must be in the Common Message Format (CMF). Each CMF file must have a unique file name to ensure that the correct file is entered into CODIS. The Arkansas State Crime Laboratory maintains several indexes of data in CODIS.

##### **6.2.3.1.1: Creating a CMF File**

1. File → Export table from CODIS
2. Save the file on desktop or a thumb drive
3. Fill in Source and Destination as "AR06035Y"
4. Click Export

##### **6.2.3.1.2: Importing a CMF File**

1. Open specimen manager
2. Click "Import"
3. Locate and highlight files ready for import
4. Click "Open"
5. Assign Read, when prompted and Click "OK"
6. Ensure that correct number of files are imported
7. Open DNA Comm
8. Under the "Import Files" tab, click on each file imported to either verify or execute the file
9. Under "Import Reports" tab, click each file to create a reconciliation report and print.

10. Ensure all loci/samples have successfully been imported.
11. All reconciliation reports are maintained with the database packets.

#### 6.2.3.2: Searching the CODIS Indexes

##### 6.2.3.2.1: Keyboard Searches

1. All eligible profiles from the casework section may be keyboard searched and a confirmation sheet placed in the case file prior to entry to SDIS.
2. Keyboard searches will be searched against the following indexes:
  - a. Deceased Individuals
  - b. Incomplete Forensic Profiles
  - c. Forensic Mixtures
  - d. Forensic Partial
  - e. Forensic Unknowns
  - f. Offender
  - g. Staff
  - h. Suspect Profiles
  - i. Missing Person
  - j. Relatives of Missing Person
  - k. Unidentified Human (Remains)
  - l. Elimination Knowns

**NOTE:** No profile will be searched in the CODIS system until a technical review is performed on the sample in question.

3. If a match occurs against another casework sample, the match should be investigated.
4. To perform a keyboard search:
  - a. From the Target Profile window, type the Lab ID field (AR060035Y)
  - b. From the Target Profile Window, type the Specimen ID field.
  - c. Enter the allelic values for the loci

- d. Conduct the Search and print out the match results to be placed into the case file
  - e. If a match is made, the analyst must set the disposition
  - f. Save all matches to Match Manager.
5. Any one-time keyboard search will be reported to the investigating agency. This can be performed by phone, email, report, etc.

#### 6.2.3.2.2: AutoSearches

1. Periodically AutoSearches are performed. Many indexes are searched against each other. For a complete list of indexes searched, please see the AutoSearcher program.
2. All relevant convicted offender / arrestee samples matches must be confirmed.
3. All hits must be investigated to determine the disposition of the match

#### 6.2.3.2.3: NDIS Searches

1. Once a week, a search is performed at the NDIS level. The matches are routinely checked.
2. Convicted offender / arrestees are verified and confirmations are sent once requested by the agency with the hit. The confirmations are sent to other NDIS hits on "CODIS DNA Match Data Response" forms.
3. Matches with ASCL cases and other NDIS agencies convicted offender / arrestees are requested for verification by using "CODIS Match Data Requested". Once the confirmation is received a CODIS hit letter is sent to the investigating agency.

#### 6.2.3.2.4: CODIS HITS

Every convicted offender / arrestee match must be confirmed before a "CODIS Hit Letter" is sent to the agency. The CODIS Administrator or designee will send the letter to the agency.

1. Inform a Database Coordinator or the CODIS Administrator of any hit that should be confirmed. Hits will also be determined by routine Autosearches.
2. A "CODIS Hit Verification" form should be completed

3. The Database Card or DNA Collector is taken from secure storage
4. The sample is processed (See Section 6)
5. Every CODIS Hit should contain the letters 'CH' at the end of the unique identifier number.
6. The fingerprint is confirmed in the Latent Print Section
7. After confirmation and review a "CODIS Hit Letter" is sent to the investigating agency or a "CODIS DNA Match Data Response" is sent to the CODIS Administrator of the other matching laboratory.

NOTE: A minimum of 8 core loci have to be obtained for a CODIS confirmation.

#### 6.2.3.2.4.1: CODIS Hit Verifications Requirements

The CODIS Hit Verification packet is considered a technical record and will therefore contain either an electronic signature or initials of the analyst on all pages. Every CODIS Hit Verification is unique and may need different items to ensure the complete verification. However, there are a few items that are needed in each verification packet. These items include: the CODIS Hit Verification form (CODIS-FORM 01), and the Match Detail Report. Other items that may be in the packet include, but are limited to the following: submission sheet(s), offender detail report, copy of offender information card, electropherograms, fingerprint card, conversation sheet/email, ACIC report, or out-of-state hit report.

NOTE: Additional documentation may be needed if verification of the profile or offender/arrestee biographical data is in question.

#### 6.2.3.2.4.2 CODIS Hit Review

All reviews of CODIS hits are documented on the CODIS Hit Verification Form (CODIS-FORM -01)

- Technical Review

Each CODIS hit must be reviewed for accuracy. The Technical Reviewer must check for the following information:

1. The profiles match
2. The offender number matches what is confirmed
3. The case number matches what is confirmed
4. The offense is a qualifying offense
5. DNA profile that was confirmed is correct and matches the profile in CODIS
6. The biographical data of the offender is correct

- Administrator Reviewer

Each CODIS hit must be administratively reviewed for accuracy. The Administrative Reviewer must check for the following information:

1. The profiles match
2. The offender number matches what is confirmed
3. The case number matches what is confirmed
4. The offense is a qualifying offense
5. DNA profile that was confirmed is correct and matches the profile in CODIS
6. The biographical data of the offender is correct
7. The hit letter is correct

#### 6.2.3.2.5: Familial Searching/Partial Matches

When a DNA profile is obtained from evidence (forensic unknown) it is routinely searched in the Arkansas CODIS Database. If a potential familial match is determined the match will be reviewed by the following criteria: a complete profile shares at minimum 13 STR alleles; an incomplete profile will be examined on a case-by-case basis by the CODIS Administrator or designee. Any potential familial match with a potentially related profile, the name of the offender may be released to the investigating agency if the protocol outlined below has been followed and all of the following conditions are met:

1. The crime scene (evidence) profile is a single-source profile or an interruptible mixture.
2. The case must be a sexual assault or homicide. Any other case must have prior approval by the Laboratory Director and CODIS Administrator.
3. All complete profiles must be searched at NDIS prior to review of the potential familial match.
4. The case is unsolved and all investigative leads have been exhausted (conversation sheet must document that an inquiry has been made about the case with the submitting officer).
5. No other probative evidence yielding biological fluids are available for DNA typing.
6. Y-STR typing of the same crime scene (evidence) that resulted in the potential familial match must be concordant with the 'matching' Y-STR profile.

If all of the above conditions are met, the CODIS Administrator, DNA Supervisor and DNA Casework analyst assigned to the case must review all the information before a decision is reached to release the name of the individual.

Any predetermined case that matches the above criteria may go into a Batch Target file if approved by the CODIS Administrator. This file will be periodically searched with modified search parameters and all matches reviewed for familial match eligibility.

#### 6.2.3.2.6: Specimen Categories

##### Arrestee:

The known sample from a person who has been arrested in accordance with the law of the applicable jurisdiction is required to provide a DNA sample for analysis and entry into a state DNA database. The term 'arrestee' includes persons who have been charged in a formal criminal instrument, such as an indictment or information.

##### Biological Child:

The known reference sample voluntarily provided by an adult child or provided with the parental/guardian consent for a minor child of a reported missing person. The DNA record for this specimen category is stored in the Relatives of Missing Person Index.

##### Biological Father:

The known reference sample voluntarily provided by the biological father of a reported missing person. The DNA record for this specimen category is stored in the Relatives of Missing Person Index.

##### Biological Mother:

The known reference sample voluntarily provided by the biological mother of a reported missing person. The DNA record for this specimen category is stored in the Relatives of Missing Person Index.

##### Biological Sibling:

The known reference sample voluntarily provided by the full or half biological adult sibling or provided with the parental/guardian consent for a by the full or half biological minor sibling of a reported missing person. The DNA record for this specimen category is stored in the Relatives of Missing Person Index.

##### Convicted Offender:

The known sample from a person who has been convicted of a state qualifying offense in a jurisdiction that requires that persons convicted of enumerated crimes or qualifying offenses

provide a DNA sample for analysis and entry into a state DNA database. The DNA profile for this specimen category is stored in a Convicted Offender Index.

**Deduced Missing Person:**

The DNA record of a reported missing person that has been generated by examining intimate items purported to belong to the missing person, (such as a toothbrush or glasses), and compared to close biological relatives, if possible. Considered a reference sample, this DNA record is stored in the Missing Person Index.

**Detainee:**

The known sample from a non-United States (U.S.) person detained under the authority of the U.S. and required by law to provide a DNA sample for analysis and entry into a state/national DNA database.

**Elimination Sample:**

A biological sample from a known individual, other than the alleged perpetrator or victim, which is analyzed for purposes of indentifying those portions of a forensic DNA profile attributable to the alleged perpetrator. The DNA profile for this specimen category may be stored at the state and/or local levels.

**Forensic Mixture:**

A specimen category in the CODIS software that is stored in the Forensic Index and originates from a forensic sample (biological sample found at the scene of a crime) that contains DNA contributed from more than one source.

**Forensic Unknown:**

A specimen category in the CODIS software that is stored in the Forensic Index and originates from a single source (or a fully deduced profile originating from a mixture) Forensic Sample attributable to the putative perpetrator.

**Forensic Partial:**

A specimen category in the CODIS software that is stored in the Forensic Partial Index and originates form a single source (or a fully deduced profile originating from a mixture) Forensic Sample attributable to the putative perpetrator with either locus or allelic dropout at any of eh 13 core CODIS loci.

**Incomplete Forensic Unknown**

A specimen category in the CODIS software that is stored in the Forensic Index and originates from a form a single source (or a fully deduced profile originating from a mixture). This category contains profiles from crime scene evidence deemed appropriate for entry into CODIS that contain less than 10 loci. The DNA record for this specimen category is stored in the Incomplete Forensic Profile Index and is only searched at the state level.

#### Incomplete Forensic Mixture:

A specimen category in the CODIS software that is stored in the Forensic Index and originates from a forensic sample (biological sample found at the scene of a crime) that contains DNA contributed from more than one source. This category contains profiles from crime scene evidence deemed appropriate for entry into CODIS that contain less than 10 loci. The DNA record for this specimen category is stored in the Incomplete Forensic Profile Index and is only searched at the state level.

#### Maternal Relative:

The known reference sample voluntarily provided by a maternal biological relative who is not a mother, child or sibling of a reported missing person. The DNA record for this specimen category is stored in the Relatives of Missing Person Index.

#### Missing Person:

The known reference sample from an individual that is missing. The source of the DNA has been verified as originating from the missing person and is stored in the Missing Person Index.

#### Paternal Relative:

The known reference sample voluntarily provided by a paternal biological relative who is not a father, child or sibling of a reported missing person. The DNA record for this specimen category is stored in the Relatives of Missing Person Category.

#### Proficiency

The samples from all proficiency test. The DNA record for this specimen category is stored at SDIS and does not search other specimens in the proficiency category.

### 6.2.3.3: Match Dispositions

- Candidate Match

Candidate Match is defined as a possible match between two or more DNA profiles reported by CODIS software after a search. This is an interim disposition and laboratories must assess each candidate match to disposition appropriately.

- Waiting for More Data

Waiting for More Data is an intermediate missing person disposition, indicating that additional genetic analyses and/or meta data evaluation is being conducted to confirm or refute a match or rank

- Pending

Pending is an intermediate disposition, indicating that the Candidate Match is in the process of being confirmed or refuted.

- Offender Hit

A match between a convicted offender's DNA profile and the DNA profile from a forensic unknown or forensic mixture profile in an unsolved forensic case where it aids the investigation.

- Forensic Hit

A match between a forensic unknown or forensic mixture profile in an unsolved case and a forensic unknown, known or forensic mixture profile from another solved or unsolved case. The match is considered a forensic hit if the match aids the investigation in some way.

When a SDIS match occurs between a forensic unknown and a suspect known the DNA casework section will be notified about the match.

- Conviction Match

A Conviction Match occurs when CODIS matches a forensic unknown or forensic mixture DNA profile to a DNA profile from an offender (Convicted Offender Index, Arrestee Index, Detainee Indexes, Legal Index), but the

crime from which the evidence was collected has already been solved or the match does not aid the investigation in any way. The forensic lab must determine in some manner that the identity of the matching offender is the same as the identified subject in their solved case.

- Bench work Match

Benchmark Matches occur when forensic profiles linked externally to CODIS are also matched by CODIS. When CODIS makes the association no new information or assistance is provided to the investigation.

- Offender Duplicate

A match made between two offender (Convicted Offender Index, Arrestee Index, Detainee Index, or Legal Index) profiles that does not provide probative information.

- Investigative Information

This disposition is used as a generic category for matches that do not provide probative information and/or does not readily fit the other disposition categories.

- No Match

During the confirmation process a qualified DNA analyst determines that a match is dispositioned as Candidate, Pending or Waiting for More Loci is not a confirmed DNA match.

- Twins

This disposition is used when it is believed that a match involves two individuals that share the same profile and are believed to be the result of the same pregnancy.

- User Defined #1

User Defined #1 disposition is used when the sample matches itself, or another sample(s) within the case. This is also a disposition for all miscellaneous matches that are not considered true or valuable matches.

- User Defined #2

User Defined #2 is reserved for all matches that occur because of contamination reasons.

- User Defined #3

User Defined #3 is used when a sample from the deceased victim's index matches a convicted offender.

- Arrestee Hit

A match between an arrestee's DNA profile and the DNA profile from a forensic unknown or forensic mixture profile in an **unsolved** forensic case where it aids the investigation.

- Detainee Hit

A match between a detainee's DNA profile and the DNA profile from a forensic unknown or forensic mixture profile in an **unsolved** forensic case where it aids the investigation.

- Duplicate

A match made between any two profiles that does not provide probative information.

- Duplicate Match

The same match is already in the database (same Candidate and Target DNA profiles).

- ID Confirmed

A match or association between an unidentified human (remains) profile and a pedigree, reference profile or another profile of known origin where the identification has been confirmed by the appropriate authorities (such as a coroner or medical examiner).

- ID Pending

A match or association between an unidentified human (remains) profile and a pedigree, reference profile or another profile of known origin where the identification has **not** been confirmed by the appropriate authorities (such as a coroner or medical examiner).

- Insufficient Data

This missing person disposition is used following a match or rank when the combination of metadata and genetic information is lacking in either quantity or quality to either confirm or refute kinship or issue a report to law enforcement.

- Legal Index Hit

A match between a legal index DNA profile and the DNA profile from a forensic unknown or forensic mixture profile in an **unsolved** forensic case where it aids the investigation.

- Maternal Relatives

This disposition is used following a match or rank and indicates that although the association does not represent the specific relationship being sought, the two profiles likely originate from individuals of the same maternal lineage.

- No Profile

Indicates that the search had no data for the selected technology (STR or mtDNA).

- Offender Duplicate

A match made between two offender (Convicted Offender Index, Arrestee Index, Detainee Index, or Legal Index) profiles that does not provide probative information.

- Paternal Relatives

This disposition is used following a match or rank and indicates that although the association does not represent the specific relationship being sought, the two profiles likely originate from individuals of the same paternal lineage.

- Requesting More References

This missing person disposition is used when the laboratory requests more reference samples to confirm or refute the validity of an association.

- Siblings

This disposition is used when it is believed that a match involves two individuals in the database that share at least one biological parent.

#### 6.2.3.4: Indexes

##### 6.2.3.4.1: Convicted Offender Index

This index contains profiles from individuals convicted of felonies, misdemeanor sex offenses and violent offenders as according to Arkansas Law (Act 1470 of 2003). It also contains qualifying juvenile offenses according to Arkansas Law (Act 1780 of 2001). This index is uploaded to NDIS. For specimens that contain out-of-bin microvariants or tri-allelic patterns, the remaining loci may be entered into CODIS pending confirmation.

##### 6.2.3.4.2: Arrestee Index

This index contains profiles from individuals arrested of capital murder, murder in the first, kidnapping, first and second degree sexual assault according to Arkansas Law (Act 699 of 2011). This index is uploaded to NDIS. For specimens that contain out-of-bin microvariants or tri-allelic patterns, the remaining loci may be entered into CODIS pending confirmation.

##### 6.2.3.4.3: Detainee Index

A Detainee Index consists of DNA records from non-United States (U.S.) persons detained under the authority of the U.S. and required by law to provide a DNA sample.

##### 6.2.3.4.4: Forensic Unknown Index

This index contains profiles from crime scene evidence deemed appropriate for entry into CODIS. This index is uploaded to NDIS. The primary purpose of entering a forensic casework profile into the database is to identify the possible perpetrator of that particular crime for which the DNA analysis was conducted. This should be kept in mind when considering whether a profile is probative and should be entered into CODIS. Forensic 'Unknown' samples for which there is no suspect or the suspect has been eliminated should be entered in as the case number, the item number followed by a question mark (ex. YYYY-000000Q1?). 'Unknown' samples which include a

submitted suspect should be entered in as the case number, the item number, followed by a CFM (Case File Match) (ex. YYYY-000000Q1CFM) CODIS entries should be documented on the "CODIS Entry Sheet". The source ID on case work samples should be marked as either "Yes" or "No" depending if the source has been identified through DNA testing. If a Forensic Unknown profile is incomplete, it can only be entered into the system if it contains ten or more of the core loci.

#### 6.2.3.4.5: Forensic Mixture Index

This index contains a profile from crime scene evidence which has multiple contributors. Mixtures are only deemed appropriate for CODIS if Match Estimator does not produce a number higher than 1 in the size of the database at the time the sample is entered into the database. If numerous matches are made it is the discretion of the CODIS Administrator, or designee, to remove the sample. Analyst discretion will be used to determine what alleles will be entered into CODIS. The victim's profile will be subtracted from the mixture, leaving the profile that is determined to be the Most Likely Profile (MLP) to have come from the suspect. The profile will be entered into CODIS as the case number, the item number followed by MLP (ex. YYYY-000000Q1MLP). The MLP is determined by placing the victim's and evidence profile on the "CODIS Entry Sheet". Another qualified analyst must review the mixture and the MLP determination prior to entering the sample into CODIS.

When three alleles are present and the victim is heterozygous at that locus, the analyst must determine the obligate allele. The following is an example:

Victim = 12, 17      Evidence = 12, 17, 18

The analyst would search and enter this locus as 12, 17, 18+ (+) indicated the obligate allele.

#### 6.2.3.4.6: Forensic Partial Index

A Forensic Partial Index consists of DNA profiles from forensic samples that do not contain results for all 13 core CODIS loci and/or that may indicate a possibility of allelic dropout

#### 6.2.3.4.7: Legal Index

A Legal Index consists of DNA records of persons whose DNA samples are collected under applicable legal authorities.

6.2.3.4.8: Relatives of Missing Person Index

A Relatives of Missing Person Index consists of DNA records from biological relatives of individuals reported missing.

6.2.3.4.9: Spouse Index

A Spouse Index consists of the DNA records of a presumptive parent of a common child of a missing person.

6.2.3.4.10: Deceased Individuals Index

This index contains samples from all deceased individuals which are submitted to the DNA Section by the Medical Examiner's Section. This index is not uploaded to NDIS. The profile will be entered into CODIS as the case number, K#, and V (ex. 2006-li-12345K1V). The source identified field should be marked as "Yes".

6.2.3.4.11: Unidentified Human Remains Index

This index contains profiles from living persons of unknown identity and profiles from recovered dead persons whose identities are not known. This index is uploaded to NDIS.

6.2.3.4.12: Missing Persons Index

This index contains profiles of Known samples of missing persons and profiles obtained by examining intimate items purported to belong to a reported missing person, such as a tooth brush.

6.2.3.4.13: Staff Index

This index contains profiles of all Arkansas State Crime Laboratory staff members hired since July 18, 2005 and all staff members who worked at the lab prior to that date who volunteered their samples. Each member of the staff is given a unique number that is only known to the CODIS Administrator.

6.2.3.4.14: Suspect Knowns Index

This index contains profiles of suspects submitted in DNA cases. The suspect “Knowns” do not need to be entered on Case File Matches (CFM), only the evidence sample profile should be entered. The profile will be entered into CODIS as the case number and K# (ex. 2013-123456K1).

#### 6.2.3.4.15: Incomplete Forensic Unknown Index

This index contains profiles from crime scene evidence deemed appropriate for entry into CODIS that contain less than 10 loci. This index is not uploaded to NDIS. This index contains both specimen categories of Incomplete Forensic Unknowns and Incomplete Forensic Mixtures. The primary purpose of entering a forensic casework profile into the database is to identify the possible perpetrator of that particular crime for which the DNA analysis was conducted. This should be kept in mind when considering whether a profile is probative and should be entered into CODIS. Forensic ‘Unknown’ samples for which there is no suspect or the suspect has been eliminated should be entered in as the case number, the item number followed by a question mark (ex. 2013-123456Q1?). ‘Unknown’ samples which include a submitted suspect should be entered in as the case number, the item number, followed by a CFM (Case File Match) (ex. 2013-123456Q1CFM) CODIS entries should be documented on the “CODIS Entry Sheet”. The source ID on case work samples should be marked as either “Yes” or “No” depending if the source has been identified through DNA testing.

#### 6.2.3.4.16: Incomplete Forensic Mixture Index

This index contains a profile from crime scene evidence which has multiple contributors that contain less than 10 loci. Mixtures are only deemed appropriate for CODIS if the Match Estimator does not produce a number higher than 1 in the size of the database at the time the sample is entered into the database. If numerous matches are made it is the discretion of the CODIS Administrator, or designee, to remove the sample. Analyst discretion will be used to determine what alleles will be entered into CODIS. The victim’s profile will be subtracted from the mixture, leaving the profile that is determined to be the Most Likely Profile (MLP) to have come from the suspect. The profile will be entered into CODIS as the case number, the item

number followed by MLP (ex. YYYY-000000Q1MLP). The MLP is determined by placing the victim's and evidence profile on the "CODIS Entry Sheet". Another qualified analyst must review the mixture and the MLP determination prior to entering the sample into CODIS.

When three alleles are present and the victim is heterozygous at that locus, the analyst must determine the obligate allele. The following is an example:

Victim = 12, 17      Evidence = 12, 17, 18

The analyst would search and enter this locus as 12, 17, 18+ (+ indicated the obligate allele).

NOTE: The CODIS Administrator will resolve all discrepancies on match dispositions, CODIS index and STR entries.

## 6.2.4: GeneMapper ID-X as an Expert System

### 6.2.4.1: Process RAW Data

1. Open GeneMapper ID-X.
2. Add samples to project (File→Add Sample to Project).
3. Any profile with a 'Green Box' at 'CGQ' or Composite Genotype Quality does not have to be examined by an analyst and can be uploaded to SDIS.
4. Any profile with a 'Yellow or Red Box at 'CGQ' must be checked for accuracy prior to upload. A 'Yellow Box' indicates an analyst should review the sample to determine if the profile is ready for upload or is in need of editing. If no change is necessary the analyst may change the box to 'Green'. A 'Red Box' is a high indication the profile should be reviewed.
5. Once an edit is complete the 'Yellow or Red' box can then be switched to 'Green' and it is ready for review.
6. If a change to the profile occurs the profile must be reviewed by another qualified analyst prior to upload to SDIS.
7. All necessary samples must be placed on a re-run sheet.

#### 6.2.4.2: Secondary Review of Changed Profiles

- 1.The reviewer can view all profiles that need to be reviewed under the table setting “Viewed Edited Samples” or can use the ‘View CGQ Overrides’ tables setting. This will only show the samples the Expert System deems necessary for a secondary review.
- 2.The technical reviewer must look at each profile.
- 3.If the reviewer agrees with the edits he/she can accept the changes and mark the sample reviewed. The profile is now ready for upload.
- 4.An Expert System Technical Review Sheet must be completed.

#### 6.2.4.3: Analysis Guidelines

Gene Mapper ID\_X will analyze the data against a set of rules that is described below. If the data exhibits peaks that are outside the ‘acceptable’ range for the rules, then Gene Mapper ID\_X will mark the sample for review and designate what rule caused the need for review.

##### 6.2.4.3.1: Expert System Rule set/Flags

The following is a list of abbreviations used to flag as quality flags in the Expert System. A ‘Green Box’ indicates high quality. A ‘Yellow’ box indicates an analyst should view the sample to determine if there is an issue with the profile. A ‘Red’ flag is a high indication of an issue with the profile and it should be reviewed.

- SE-Sample Edit
- SOS-Sample Off Scale
- SQ-Size Quality
- SSPK-Sample Spike
- MIX-Mixed Source
- OMR-Outside Marker Range
- CGQ-Composite Genotype Quality
- BD-Broad Peak
- BIN- Out of Bin Allele
- OVL Overlap
- SPK-Marker Spike
- AN-Allele Number

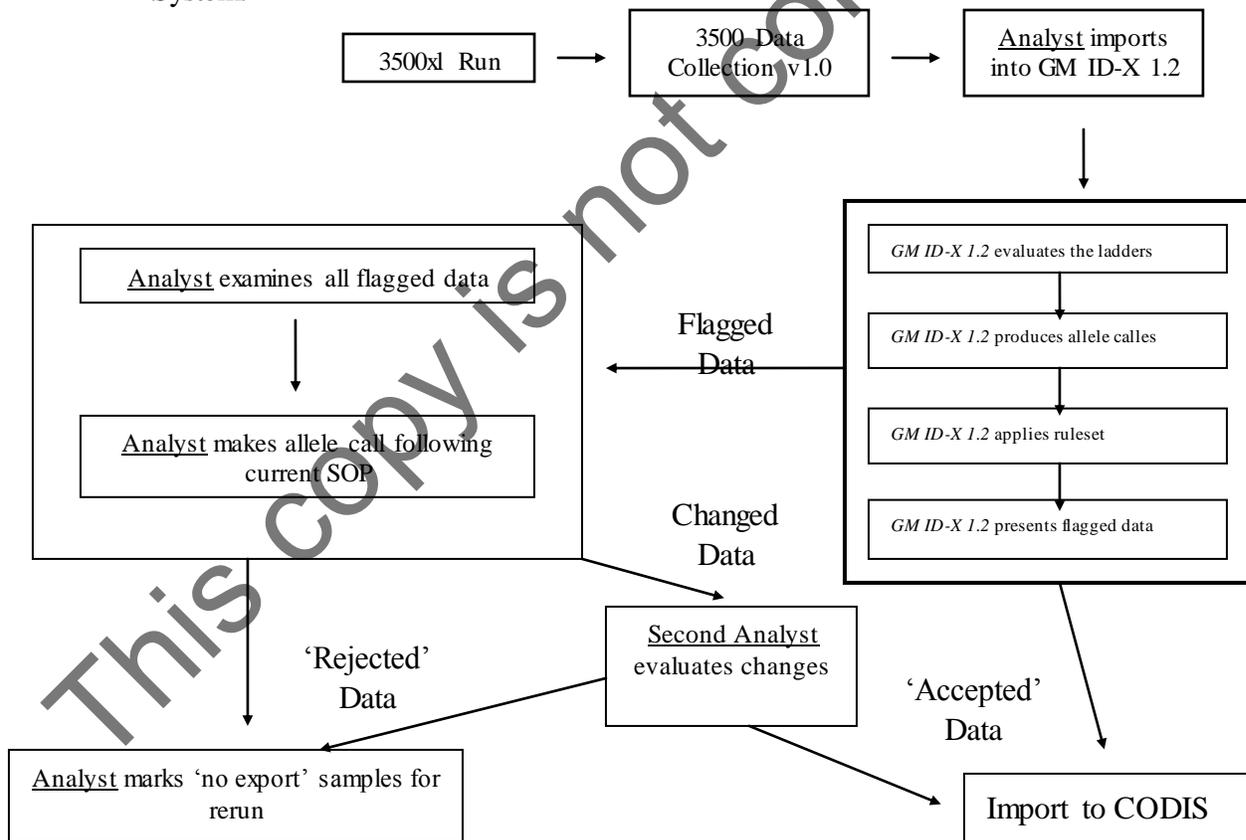
- LPH-Low Peak Height
- MPH-Max Peak Height
- OS-Off-Scale
- PHR-Peak Height Ratio
- CC-Control Concordance
- GC-Genotype Quality

#### 6.2.4.3.2: Export Data for CODIS

To export a table for CODIS import.

- Select File
- Export Table for CODIS....
- Save the CMF file on a 'thumb drive'
- Import in the CMF file from the 'thumb drive' to the CODIS computer

Below is a flowchart of the workflow using GeneMapper ID-X as an Expert System:



It is noted that GMID-X 1.2 can be upgraded to GMID-X 1.3 without a validation. The change in the software is to allow the GeneMapper ID-X to be compatible with Windows 7.0. It did not affect the algorithms or the analysis and does not need any additional testing.

### 6.3: Reports

No reports are required for the CODIS Section. A CODIS hit letter informs the agency about a hit. The letter is produced by the CODIS Administrator or her Designee. All CODIS hit documentation is stored in the CODIS section. A copy of official hit letter is also stored in JusticeTrax in the case file(s).

## SECTION 7: EQUIPMENT CALIBRATION AND MAINTENANCE

Only suitable and properly operating equipment will be employed and only authorized personnel should operate the equipment. The purpose of the procedures in this section is to ensure that the parameters of the testing process are routinely monitored in the manner necessary to maintain the success and reliability of the testing procedures.

It is possible to verify “after the fact” that the equipment, materials and reagents used in an analysis have not significantly affected the reliability of the results. For example, controls utilized during each phase of the testing procedure are designed to signal potential problems in the analysis. If acceptable results are obtained on these controls, it is reasonable to assume that the results from other samples analyzed simultaneously are also reliable. If the controls indicate a problem with the analysis, it may be possible to determine the source of the problem and make corrections. Depending on the nature of the problem, re-analysis of the samples may be required.

However, where the samples are irreplaceable and/or limited in amount, it is highly desirable to minimize the need for repeat analysis due to failure of equipment, materials or reagents. To that end, quality control (QC) procedures should focus as much as possible on preventing problems before they occur rather than dealing with them after they happen.

### 7.1: Instrument and Equipment

The following Category 1 equipment is considered to be critical for the forensic CODIS section:

Pipettes	Thermocyclers
Thermometers	Refrigerators
Freezers	Heat Blocks
pH Meter	3500xl
GeneMapper ID-X	
Qiagility	

### 7.2: Inventory

An inventory log will be maintained on the S: for each instrument or piece of equipment considered to be essential for DNA analysis. This log may include the manufacturer, model number, serial number, purchase date, replacement

date, and if present, asset number and all additional requirement of the Arkansas State Crime Laboratory Quality Manual Section 5.5.5.

### **7.3: Operating Manuals**

Warranty information and operating manuals will be filed in the laboratory and readily available to all operators of instruments and equipment.

### **7.4: Calibration / Maintenance / Repair Records**

Anytime an instrument or piece of equipment requires calibration, service or maintenance, that information will be documented and maintained on the S: \*\*. In the event that any piece of equipment fails or does not pass its specific requirements, the equipment must be taken out of service until it can be maintained properly.

- a. All equipment failing must be documented on the S:
- b. A sign must be placed on the equipment as "Out of Service"
- c. No equipment will be placed back into service until proper performance is demonstrated.
- d. The CODIS Quality Manager must inform the Technical Leader and/or CODIS Administrator of all equipment failure.

### **7.5: Calibration and Maintenance Schedules**

Each instrument/piece of equipment considered essential for DNA typing will be maintained (may include calibration) or verified on an appropriate schedule. Preventative maintenance on the 3500xl will be performed at a minimum, yearly, by the manufacturer. Schedule for maintenance is found in the DNA drive on the computer. A maintenance log is maintained on any instrument or piece of equipment in which the following has occurred: damage, malfunction or modification or repair to equipment. Schedule and description for maintenance is found in the DNA drive on the computer. The date all equipment is removed from service is recorded and maintained on the DNA drive for a minimum of one full ASCLD/LAB accreditation cycle.

#### **7.5.1: As Needed or Annually at a Minimum**

- pH meter - solution is probe checked and replaced as necessary by laboratory personnel.
- Centrifuges - cleaning by laboratory personnel with 10% bleach solution.
- Spatial and Spectral for 3500xls (whenever array door is opened a spatial and spectral must be performed according to the manufacturer.
- Tachometer - will be sent for calibration

#### **7.5.2: Annually**

- Pipettes – performance checks and calibrated by an outside company.

- Drift-con- Thermal cyler calibration system must be sent out annually for calibration.
- NIST Traceable Thermometer – A NIST traceable thermometer with be calibrator or purchased.

#### 7.5.3: Semi-Annually

- Thermometer –
- All thermometers will be verified by laboratory personnel using a NIST traceable thermometer. In addition, prior to being placed into service, thermometers will be verified using a NIST traceable thermometer (unless the thermometer being placed into service is NIST traceable).

#### 7.5.4: Quarterly

- Biological safety hoods – serviced and calibrated by outside company, if needed

At the current time, the fume hoods in the laboratory are monitored through a software program called WinControl. The Software receives data from control points throughout the hood system and displays them on a monitor in the office of Rick Gallagher. Another monitor is located in the Arkansas Building Authority's (ABA) office located in the Natural Resources Building adjacent to the Arkansas State Crime Laboratory. The HVAC system is monitored by both ABA Engineering and Operations Sections. The monitoring is through a we based remote entry software program provided by the HVAC controls vendor. Currently, if an alarm goes off in a hood, it will display an alarm message which will trigger a computer response and if needed, an on-site visit from maintenance personnel. If the problem persists, an outside company will be brought in to handle the problem.

- All test tube racks are cleaned with a 10% bleach solution or by using a stratalinker.

#### 7.5.5: Bi-Monthly

- Thermocyclers – Drifcon temperature verification test performed by laboratory personnel. If test fails, an outside company is called for service and unit is taken out of service.

#### 7.5.6: Monthly

- Swipe tests: A swipe test of the DNA, CODIS and Physical Evidence Section is on a scheduled rotation. Cotton swabs are moistened with

distilled water and rubbed on the analyst's bench top. Results will be submitted to DNA Technical Leader to analyze and produce a report. If contamination is detected, the work area with contamination will be wiped down with a 10% bleach solution and retested immediately and also placed on the next month's swipe test schedule. This area will not be used until the results are deemed acceptable by the Technical Leader. The DNA Supervisor, CODIS Administrator, Physical Evidence Supervisor, Quality Managers for CODIS, DNA, and Physical Evidence will receive the report. All documentation is kept on the DNA "S" drive on the computer.

- The 3500xl and computer restarted.
- Burn DVD's with data and back-up the oracle database and clear database.
- Wet the seals on the 3500xl

#### 7.5.7: Weekly (by laboratory personnel as needed)

- Polymer is changed on the 3500xl.
- Conditioning wash is performed on the 3500xl.
- Change buffer containers, septas, and reagents on the 3500xl.

#### 7.5.8: Each Day of Use (by laboratory personnel as needed)

- Autoclave – check water levels before use.
- Check temperature of refrigerators and freezers in both pre-amp and post-amp rooms on forms DNA-FORM17a,b and CODIS-FORM-15
- Heat Blocks – temperature checked prior to use.
- Bench tops – CODIS DNA (pre): After each use, the bench tops must be cleaned with a 10% bleach solution and documented on DNA-FORM-11.

#### 7.5.9: Instrument or Equipment Cleaning Procedures

- Centrifuges  
Wipe out the inside of the centrifuge with 10% bleach solution as needed, or appropriate cleaner as recommended by manufacturer.
- Biological Safety Hood  
After each use, wipe down inside of hood with 10% bleach.

#### 7.5.10: Transport/Storage of Equipment

In the event the equipment needs to be stored or transported the following precautions will be taken to ensure proper functioning and to prevent contamination and deterioration.

- Storage  
Equipment will be decontaminated and processed for storage according to manufacturer recommendations.

- Transport  
Equipment will be prepared for movement if necessary according to manufacturer's recommendations. Equipment sensitive to movement (eg. 3500xl) will be, at a minimum, performance checked according to Section 7.6.

## 7.6: Performance Checks

Any new critical instruments or equipment or equipment that has been serviced requires a performance check to ensure it is operating properly before being used for analysis. The performance check will be documented and approved by the DNA technical leader.

1. 3500xL: Annually or following the maintenance or moving of any 3500xl a performance check will be performed. The performance check requires a ladder to be injected using the standard protocol. The run will then be analyzed in Gene Mapper ID-X to ensure that the ladder passes the requirements setup in Gene Mapper ID-X.
2. 9700: Following the maintenance or repair a performance check will be performed. The performance check requires a set (minimum of 2) of 2800M and an AMP – to be amplified according to standard PowerPlex 16HS protocol. The samples will then be run on the 3500xl and analyzed in GeneMapper ID-X to ensure the sample amplified properly. All samples are required to amplify properly to pass the performance check. The DNA Technical Leader can override this requirement if there are documented reasons for the failure.

## SECTION 8: PROFICIENCY

Proficiency testing is used periodically to demonstrate the quality performance of the DNA laboratory and serves as a mechanism for critical self-evaluation. This is accomplished by the analysis and reporting of results from appropriate biological specimens, submitted to the laboratory as open and/or blind case evidence.

All specimens submitted as part of a proficiency test must be analyzed and interpreted according to the DNA analysis protocol approved by the laboratory at the time of the proficiency test.

Since the proficiency-testing program is a critical element of a successful QA program, it is an essential requirement. The Arkansas State Crime Laboratory utilizes proficiency testing offered from approved ASCLAD-LAB providers

Open proficiency test specimens are presented to the laboratory and its staff as proficiency specimens and are used to demonstrate the reliability of the laboratory's analytical methods as well as the interpretive capability of the DNA Analyst. Participation in the open proficiency test program is the primary means by which

the quality performance of this DNA laboratory is judged and is an essential requirement since this laboratory performs analysis.

### **8.1: Personnel**

Proficiency testing pertains to those DNA Analysts actively engaged in DNA testing. It is mandatory that the DNA Analyst conduct the entire test alone without selecting or accepting any assistance from other persons. Violation may result in disciplinary action for those receiving and those rendering assistance. If the examiners have any questions or require assistance, they should contact the DNA Technical Leader or their supervisor. In order to avoid unfair advantages to other examiners at different stages of analyzing the same proficiency test samples, they may not consult one another with regard to their samples, procedures, analysis or interpretations. To do so defeats the purpose of proficiency testing for the individual and the laboratory. Newly qualified analysts will complete a proficiency test within 6 months of their qualification.

### **8.2: Frequency**

Proficiency tests are performed semi-annually such that each DNA Analyst is tested at least twice a year, (once in the first six months of the year and a second in the second six months of the year). There must be at least four months between each test, and not more than eight months between tests. For the purpose of tracking the time between tests, the date the test is performed has been designated as the date of the proficiency review. All analysts, technical reviewers and technicians shall be proficiency tested at least once per year in each of the DNA technologies, including test kits for DNA typing, and each platform in which they perform analysis.

### **8.3: Specimen**

Each proficiency test may consist of dried specimens of blood and/or other physiological fluids, either singly or as a mixture. Each sample to be tested should contain an amount sufficient so that a conclusion can be drawn from the results of the analysis.

### **8.4: Documentation of Proficiency Test Results**

When the proficiency test is complete, all results (proficiency paper test case file) will be given to the Technical Leader or designee. The official case file is stored in JusticeTrax. The official electronic version must include all administration, examination documentation, how samples were obtained or created (if internal test), results from provider, and any corrective action reports.

The Technical Leader or designee will provide a yearly summary of who was tested and status of their performance. This information will be documented in a

separate secure filing system. Documentation of this is also submitted to the NDIS Custodian.

\*It is noted that all proficiency tests must be processed consistent with the normal processing of casework, including all associated documentation (technical and administrative review.)

#### Data Documentation

Upon the completion of a proficiency test, at a minimum, the following proficiency test data and information should be collected and submitted to the Technical Leader, or designee and the outside test source for evaluation:

1. Proficiency Test Set Identifier
2. Identity of DNA Analyst
3. Dates of Analysis and Completion
4. Copies of all Work Sheets/Notes and supporting conclusions
5. GeneMapper ID-X worksheets
6. Any discrepancies noted
7. Corrective actions taken (if applicable)
8. Test Results

#### Report Format for DNA Analyst's Test Findings

Some conclusion is required as to whether the unknown and known specimens could have a common origin or whether an exclusion can be demonstrated. Adequate and correct discrimination must be demonstrated in order to pass the proficiency test.

#### Review and Reporting of Proficiency Test Results

The Technical Leader and either the CODIS Administrator or Casework Supervisor (depending on proficiency cycle) reviews all test materials and compares results to the information from the test manufacturer and informs the DNA Analysts of the tests results and documents their performance. The Scientific Operations Director will review the results of the Technical Leader and CODIS Administrator and document it on the proficiency log. This review should be conducted in a timely manner. The electronic copy of the proficiency test is the official copy

### **8.5: Evaluation of Proficiency Test**

1. No analyst performing/assigned to a proficiency test will be involved in the proficiency review process. Except for the technical leader see #2.
2. The technical leader must review and initial on the review sheet that any inconclusive result complies with the laboratory's guidelines.
3. All final reports are graded as satisfactory or unsatisfactory.
  - a. A satisfactory grade is attained when there are no analytical errors for the DNA profile typing data. Administrative errors shall be documented and corrective action taken to minimize the error in the future.
    - i. All reported major and minor\* alleles are correct

- ii. All reported inclusions and exclusions are correct.
- iii. All reported genotypes and/or phenotypes are correct according to consensus genotypes/phenotypes or within established empirically determined ranges.
- iv. All reports reported as inclusive or un-interpretable are consistent with written laboratory guidelines. The basis for inconclusive interpretations in proficiency tests must be documented.

\*Minor allele calls: If there is a discrepancy between the provider results versus the analyst's results, the test can be graded satisfactory if the minor alleles meet interpretational guidelines (refer to Section 6.2.2.2).

- b. An unsatisfactory grade is attained when any of the above satisfactory criteria are not met.
4. If there is a discrepancy between the expected results and the experimental results, the Casework Supervisor and/or DNA Technical Leader must notify the labwide QA Manager. Minor discrepancies may be deemed satisfactory based on the following factors with approval of the labwide QA Manager: Discipline interpretation guidelines or Consensus results.
5. All discrepancies/errors and subsequent corrective actions must be documented.
6. All proficiency test participants shall be informed of the final test results.

#### Proficiency Test Review Procedure

1. All proficiency tests will be reviewed the same as casework. See section 9 for technical and administrative review procedures.
2. Since reports do not include the locus and alleles, the proficiency test documentation to be sent to the proficiency provider must be technically reviewed to eliminate transcription errors. As a further measure to additionally eliminate any transcription errors, the Administrative Reviewer must also examine the locus and alleles that are being transcribed onto the proficiency provider's worksheets.
3. When proficiency test reviews are documented in the analyst's Employee History Binder on the Proficiency Testing Log (ASCL-FORM-01), the *Date Completed* indicates the date that the administrative review occurred. The *Date* under *Results Review* indicates the date the results from the proficiency provider are reviewed.

### 8.6: Corrective Action for Proficiency Test Errors

The following clearly defines the specific policies, procedures and criteria for any corrective action taken as a result of a discrepancy in a proficiency test.

#### 8.6.1: Authority and Accountability

It is the responsibility of the CODIS Administrator to assure that discrepancies are acknowledged and that any corrective action is documented.

## Types of Errors

### 8.6.1.1: Administrative Error (**Level 2 Nonconformity**)

Any significant discrepancy in a proficiency test determined to be the result of administrative error (clerical, sample mix-up, improper storage, documentation, etc.) may be corrected as follows:

1. A second sample set may be submitted to an individual within one week if the CODIS Administrator believes discrepancies occurred in the first test sample set. The second sample or test material will be different than the first sample but will apply to the same subject matter under testing. The individual will immediately examine the second sample upon receipt.
2. If an error of this type is not detected until the Analyst has concluded their analysis, and therefore negates their work, they must be issued an additional proficiency test set. The duplication of analysis due to administrative error in no way reflects negatively on the analyst. However, the cause of the error should be found and eliminated from future proficiency tests.
3. If an error is due to any clerical or administrative error (typographical or otherwise – not including analyst sample mix-up or improper storage), the internal review processing steps must be evaluated to eliminate or reduce errors.

### 8.6.1.2: Systemic Error (**Level 1 Nonconformity**)

Any significant discrepancy in a proficiency test determined to be the result of a systematic error (equipment, materials, environment) may require a review of all relevant case work since the DNA unit's last successfully completed proficiency test. Once the cause of the discrepancy has been identified and corrective action taken, all DNA Analysts should be made aware of the appropriate corrective action in order to minimize the recurrence of the discrepancy.

### 8.6.1.3: Analytical / Interpretative Error

1. Any significant discrepancy in a proficiency test result determined to be the consequence of an analytical

/interpretative discrepancy must prohibit the individuals involved in producing the discrepant result from further examination of case evidence until the cause of the problem is identified and corrected. The Technical Leader determines the need to audit prior cases based upon the type of error and its cause.

2. Before resuming analysis or interpretation of casework, an additional set of open proficiency samples must be successfully completed by the individual responsible for the discrepancy.

#### 8.6.2: Documentation

The results of the proficiency tests and corresponding identifiers are kept in the DNA Analyst's personnel manual. Any corrective action needed due to one of the above discrepancies must be documented in Qualtrax.

#### 8.7: Storage

Once the proficiency has been completed it will be transferred to proficiency storage, and will serve as training samples.

### SECTION 9: CASE RECORD

The testing period is defined in the examination notes as the date punched to the date analyzed.

Prior to the import of data into SDIS, all CODIS samples are subject to technical reviews. All CODIS hit documents are subject to an administrative review.

#### 9.1: Reviews

##### 9.1.1: Technical Review

All convicted offender samples must have a 100% review of the electronic data before entered into the CODIS system. The "CODIS Database Review" must be completed and all discrepancies must be alleviated before any sample can be entered into CODIS.

##### 9.1.1.1: The Technical Record for CODIS Samples

After processing all Convicted Offender / Arrestee Samples, the file should contain a Plate Map, a Master Mix Work Sheet and a Review Sheet. Each worksheet must contain the analyst's and /or technician's initials and date the analysis began. They are scanned into the appropriate folder on the S:. The import reconciliation reports (if imported by CMF file) are filed and scanned alongside the completed

worksheets. The following is the recommended order in which the worksheets must reside:

1. Review Sheet
2. Plate Map
3. Master Mix Sheet
4. CODIS Database Failure Review Sheet (if applicable)
5. Import Reconciliation Reports (if applicable)

Handwritten notes and observations must be in ink. Nothing in the handwritten information will be obliterated or erased. Any corrections will be made by a single line strikeout (so that what is stricken can still be read) and initials. Correction fluid or correction tape may not be used.

The unique CODIS plate number, examiner's initials or name, date and must be on each page of the examination documentation in the case record. Observations, data and calculations shall be recoded at the time they are made and shall be identifiable to the specific task.

#### 9.1.1.2: Sample Review

The laboratory will conduct a technical/peer 100% review of all case files and reports. This review can be conducted using a validated Expert System.

All CODIS samples will be technically reviewed. An examiner qualified under the QAS guidelines will execute the review. The technical reviewer must be:

- Previously qualified analyst in the methodologies being reviewed.
- Successful completion of a competency test administered by the NDIS participating laboratory prior to participating in the technical review for DNA data
- Participation in an external proficiency testing program at an NDIS participating laboratory on the same technology, platform and typing amplification test kit used to generate the DNA data being reviewed.

The Technical Leader or CODIS Administrator should resolve discrepancies and concerns that are detected by the technical or administrative review. The Technical Leader or CODIS Administrator will ensure that appropriate action has been taken before permitting any sample to be entered into the CODIS system.

Steps performed by the Technical Reviewer if an Expert System is not used for review of data:

- Technical reviewer must examine all areas described on the CODIS Database Review Sheet.
- During the review process, the reviewer must do the following in addition to those items listed on the review form.
- All allele calls must be checked for accuracy and the absence of mixtures.
- All profiles are acceptable for upload to NDIS
- If discrepancies occur or clarification is needed during the technical review process, the reviewer must notify the CODIS analyst or the CODIS Administrator. The Technical Leader is responsible for any unresolved discrepancies between the analysts and reviewer.
- A review of all notes, all worksheets, and the electronic data (or electropherograms) supporting the results.
- A review to ensure all examination documents are marked with the plate number and handwritten initials.
- A review of all DNA types to verify that they are supported by the raw or analyzed data (electropherograms).
- A review of all controls, internal lane standards and allelic ladders with expected results
- A review to confirm that reworked samples have appropriate controls
- A review of the accuracy of specimen categories

If an Expert System is being used to conduct the review of data, the following must be technically reviewed by an examiner qualified under the QAS guidelines:

- The Technical Reviewer must ensure that all data has been placed through the Expert System.
- Ensure that all necessary analyses were performed according to established guidelines.
- Ensure that all analyses were documented according to the established guidelines.
- All necessary corrections have been completed.
- All appropriate examination documentation are completed
- All profiles not exported to the CMF file are either added to Re-run list or entered to SDIS via 'STR Data Entry' (i.e. microvariants, trialleles, and samples without the core loci).
- Verify that all samples on the plate will be entered into SDIS or placed on a re-run sheet to ensure a profile is obtained.
- A review of the accuracy of specimen categories

If no problems occur during the peer review process, the reviewer sends electronic file and worksheets to the CODIS Administrator or designee for import into CODIS. The analyst importing the samples into CODIS can make minor changes and sign the corrective action

line on the "Database Review Form" before the samples are imported into CODIS. If an expert system is being used the analysts can import the data into CODIS. The analysis is considered complete once the sample has been successfully uploaded into SDIS.

### Administrative Reviews

CODIS hit letters must have an administrative review of the official correspondence. The reviewer must document that he/she reviewed the hit on the 'CODIS Hit Verification' form. The clerical errors must be checked and documented at the bottom of each 'CODIS Hit Verification' form with the initial of the individual performing the review. The review consists of the following:

- A review of individual's biographical data, qualifying offense, and DNA profile
- A review of accuracy of information
- A review of clerical errors

A list of all Convicted Offenders/Arrestees can be printed and compared to the database to determine which samples have not had a profile entered into SDIS. This process ensures that all samples are entered into the database. The review cannot be performed by the author of the report.

## 9.2: Corrective Action

Corrective actions will be performed according to the Arkansas State Crime Laboratory quality manual section 4.11.

### 9.2.1: Authority and Accountability

The CODIS Administrator will be responsible to assure that discrepancies are acknowledged, the effect of the discrepancy is documented, and corrective actions are documented according to the Arkansas State Crime Laboratory Quality Manual. Corrective actions shall not be implemented without the documented approval of the technical leader. Any deviation from the CODIS Quality Manual (CODIS-DOC-01) will be approved by the CODIS Administrator and DNA Technical Leader. A log will be kept of each deviation from the CODIS Quality Manual.

## SECTION 10: TESTIMONY REVIEW

See the Arkansas State Crime Laboratory Quality Manual for the policy regarding testimony review.

## SECTION 11: AUDITS

Audits are an important aspect of the QA program. They are an independent review conducted to compare various aspect of the DNA laboratory's performance with a standard for that performance. The audits are not punitive in nature, but are intended to provide management with an evaluation of the laboratory's performance in meeting its quality policies and objectives

### **11.1: Frequency**

Audits must be conducted once per year, with the interval between audits not less than six (6) months and not exceeding eighteen (18) months. At least one audit must be completed by an outside agency once every two years.

### **11.2: Records**

Records of each inspection should be maintained and should include the date of the inspection, area inspected, name of the person conducting the inspection, findings and problems, remedial actions taken to resolve existing problems and schedule of next inspection. These records are maintained in the DNA Audit Manual.

## **SECTION 12: COMPLAINTS**

Any staff member receiving a complaint notify their supervisor. The complaint shall be documented and given to the supervisor. The supervisor shall forward the complaint to the Scientific Operations Director who will investigate the situation and notify top management when necessary. When the concern takes on the nature of a complaint about the laboratory's activities or deficiencies in the quality system, the supervisor will investigate the situation and forward all the information to the QA Manager.

See the Arkansas State Crime Laboratory Quality Manual for the complete policy regarding complaints.

## **SECTION 13: MISCELLANEOUS**

### **13.1: Safety**

All safety protocol and information is contained in the Arkansas State Crime Laboratory Health and Safety Manual (ASCL-DOC-08). The safety manual covers general laboratory safety. The Arkansas State Crime Laboratory tries to maintain a safe working environment. It is the responsibility of the DNA/CODIS staff to familiarize themselves with all exit doors, safety showers and fire extinguishers. The crime lab provides training in chemical hygiene, blood borne pathogens, CPR, and first aid to all of the employees.

### **13.2: Manuals and Documents**

All controlled documents and manuals are maintained on Qualtrax. These are the official copies and are approved by the appropriate personnel.

The CODIS Quality Manual must be reviewed and approved by the CODIS Administrator, DNA Casework Supervisor, DNA Technical Leader, QA Manager, Scientific Operations Director and Executive Director. Internally generated documents should be prepared by personnel with adequate expertise in the subject. Individuals may print hardcopies of internal documents as needed for personal use; however, these copies are unofficial.

External documents, software, or any other document in which a particular revision/version is required, will be referenced in the appropriate internally generated controlled document (i.e. Quality Manuals, Training Manuals, etc.) or as an attachment to the appropriate document. The reference must identify the current revision/version and location of the document. These documents will be available at each location where related work is conducted.

Documents shall be available at all locations where operations essential to the effective functioning of the laboratory are performed (i.e. annex building, illicit lab scenes, etc.).

Employees will destroy outdated documents upon receiving updated documents. It is the employee's responsibility to verify that they are using the current revision of any document.

Internally generated documents should be prepared by personnel with adequate expertise in the subject. Individuals may print hardcopies of internal documents as needed for personal use; however, these copies are unofficial.

The Preparer of the document is responsible for:

- Preparing the document in the proper format.
- Addressing or resolving comments from reviewers.
- Submitting the document in Qualtrax.

The CODIS Administrator and Technical Leader are responsible for:

- Ensuring that all CODIS documents have been reviewed annually (refer to Section 4.3.2.2.b of the ASCL Quality Manual) Reviewing and approving all discipline specific controlled documents.
- Ensuring that the documents are scientifically suitable for issue.
- Ensuring that the documents contain the required quality assurance elements (i.e., QC, measurement of uncertainty, traceability)

Revised documents are subject to the same review, approval, documentation and issuance requirements of the original document.

Case-related discussions with the customer documented on an *Agency Contact Form* (ASCL-FORM-06), e-mail, or equivalent document.

### 13.3: Outsourcing

The Arkansas State Crime Laboratory will only outsource to a vendor laboratory that complies with Quality Assurance Standards and accreditation requirements of federal law and can provide documentation of the compliance. All vendor laboratories must also comply to standards set forth in the Arkansas State Crime Laboratory quality manual. Prior to any outsourcing of data, the DNA Technical Leader will document the approval of the technical specifications.

The data generated from samples that are outsourced by the Arkansas State Crime Laboratory will be re-analyzed by a qualified proficient DNA analyst in the methodology used by the vendor laboratory. The re-analysis will give ownership of the data to the analyst performing the analysis. The data must be technically reviewed prior to being searched in the NDIS system. The case then gets an administrative review before a report can be released.

The DNA Technical Leader or his/her designee will conduct an initial on-site visit to the vendor laboratory. If the contract extends beyond one year, an annual on-site visit will be required. Each annual on-site visit shall occur every calendar year and shall be at least 6 months and no more than 18 months apart. The laboratory can accept an on-site visit conducted by another NDIS participating laboratory who is a qualified or previously qualified DNA analyst in the technology, platform and typing amplification test kit used to generate the DNA data. Alternatively, the laboratory may accept an on-site visit conducted by a designated FBI employee. Please see DNA-FORM-21 for the on-site visit checklist.

If the Arkansas State Crime Laboratory finds it necessary to transfer evidence to an outside laboratory (e.g. FBI, UNT), an *Inter-Laboratory Evidence Transfer Form* (see ASCL-FORM-07) must be completed and entered into the case file. If there will be a cost incurred to the customer, the customer must be notified and approve of the arrangement. This must be documented and placed in the case file. The Quality Assurance Manager maintains a register of all subcontractors used for testing and/or calibrations and maintains documentation of their competency and compliance as described in section 4.5.1.

The Arkansas State Crime Laboratory can enter into CODIS outsourced data for other agencies. Data may only be entered into CODIS if the following criteria are met:

- All requirements of Standard 17 from the QAS Document are fulfilled
- A letter from the laboratory the case originated stating:
  - NDIS eligibility

- All potential court cost will be covered by the originating laboratory
- ASCL has permission to enter the case into the CODIS system
- A brief synopsis of the case
- Contact with ASCL to the originating state's CODIS Administrator should be made and documented.

A casefile in JusticeTrax may then be set up to electronically maintain the data. A review of all documents must occur prior to entering any data into CODIS. Once the data has been uploaded to CODIS a letter to the appropriate State CODIS Administrator (or applicable individual) should be mailed. All potential CODIS hit letter should be delivered to the appropriate CODIS State Administrator or applicable individual.

### 13.4: CODIS Hit Counting

The effectiveness of CODIS can be measured in the number of crimes the Hits solve. Thus an accurate measure of hit counting is important. There is a two track metrics involved in hit counting. The primary metric is the number of investigations aided by CODIS. The second metric is the number of hits made by CODIS. Counting the number of Hits gives laboratories credit for their investment in CODIS and indirectly shows the value CODIS adds to fighting crime. The best measurement of CODIS' value to society is the number of criminal investigations it assists.

#### Match

A match occurs when CODIS makes an association between two or more DNA profiles and a confirmation process is started by designated laboratory personnel from each affected laboratory.

#### Hit

A hit occurs when a confirmed or verified match aids in an investigation and one or more of the case(s) involved in the match is unsolved.

#### HIT COUNTING RULES:

**Rule #1:** The level in the CODIS hierarchy (LDIS, SDIS, NDIS) at which hit occurs get credit for the hit. The following metrics reflects the investimen in and activity of the different levels of CODIS.

**Rule #2:** An offender hit disposition takes precedence over a forensic hit disposition when the hits occur during the same search. In the event where an unsolved case profile matches a solved case previously identified as an offender hit, the hit disposition will be "Offender Hit" for that hit and all subsequent hits. Previous forensic hits will not be reclassified when they match an offender. Since offender hit dispositions take precedence, new forensic to forensic matches shall be dispositioned as "Investigative Information".

**Rule #3:** A hit is counted for each unique set of matching profiles where at least one of the matching profiles is from an unsolved case. Since it takes two samples for a hit to occur, the total number of hits equals the total number of samples minus one (N-1)

**Rule #4:** An investigation may be aided only once. Count the number of actual investigations CODIS has aided and not the number of times CODIS has assisted a particular investigation or investigations. This reflects a direct one-to-one relationship between the metric and cases involved. As a point of clarification, an investigation with profiles from more than one source may be aided only once. Laboratories may only count their own investigations as having been aided.

**Rule #5:** A single hit may aid more than one investigation. A single hit may associate several separate cases. Laboratories may claim credit for all of the cases aided within their jurisdiction.

**Rule #6:** An investigation aided must be associated with a hit. An investigation is aided if CODIS provides value to the investigation.

**Rule #7:** Only investigation of unsolved cases may be aided.

### **Missing Persons**

#### **Matches**

For searches involving missing persons or unidentified human (remains), some of the results can be defined as matches, while others are considered to be associations. When a search result involves profiles that may have originated from the sample individual, the term match may be used. In most instances for missing person 'hits', the appropriate disposition is ID pending, and the metric reported to NDIS by the laboratory responsible for the unidentified human (remain) or missing person is a Putative Identification. The laboratory responsible for the other samples may count one Identification Aided. If unidentified human (remains) match to a forensic unknown, the laboratory responsible for hit forensic sample may report the Identification Aided. The remains subsequently match to an offender that may result in a Putative Identification but no further Identifications Aided shall be counted.

It is important to note that the disposition and metric do not conclusively state that an identification has been made. Only the competent legal authority in each jurisdiction can issue a death certificate confirming the identity of the unidentified human (remains). If the laboratory is notified that this has occurred, than the disposition can be updated to ID Confirmed and the metric updated to a Confirmed Identification. The changes do not need to be reported to NDIS, as Putative and Confirmed Identification will be grouped together.

## Associations

When a search in CODIS involves the Relatives of Missing Person or Pedigree Tree Indexes, the result is not considered to be a match. In these cases, the target and candidate profiles are not believed to have originated from a common source. Instead, the search indicated that the unidentified human (remains) may be those of the missing person sought by the relatives(s). For this reason, the term "association" is used. Associations are produced by using an Identity Search for single family references. These results will appear in match manager. Pedigree Tree Searches produce a ranked list of associations of unidentified remains to each Pedigree. A confirmed association may still be considered a 'hit' and shall be dispositioned as ID Pending. The rules for counting and reporting these hits are the same as matches.

### Missing Person Hit Counting Rules

The following rules apply only to hits, not matches or associations:

**Rule #1:** The level in the CODIS hierarchy (LDIS, SDIS, NDIS) at which hit occurs get credit for the hit. The following metrics reflect the investment in and activity of the different levels of CODIS.

**Rule #2:** A hit involving a direct match takes precedence over a hit arising from an association when the hit occurs during the same search. If more than one hit involving a direct match occurs during the same search, when an unidentified human (remains) hit is to an offender profile, it takes precedence over an unidentified human (remains) hit to a forensic profile. Any subsequent hits shall be dispositioned as Investigative Information.

**Rule #3:** A hit is counted for each unique set of unidentified human (remains) entered into CODIS. If a single investigation involves two sets of remains, then there may be up to two Putative Identifications and two Identifications Aided. Note that this is different than Rule #4 for Forensic Hits.

**Rule #4:** An identification may be aided only once. Count the number of actual identifications CODIS has aided not the number of times CODIS has assisted a particular identification or identifications. This reflects a direct one-to-one relationship between the metric and cases involved.

**Rule #5:** A single hit may aid more than one identification. A single hit may associate several separate cases. Laboratories may claim credit for all of the cases aided within their jurisdiction.

**Rule #6:** An identification aided must be associated with a hit. An investigation is aided if CODIS provided value to the investigation.

### Report CODIS Hit Statistics

Hit statistics should be reported to NDIS before the 10<sup>th</sup> of every month. NDIS shall total the number of national hits and shall not calculate interstate (NDIS) forensic hits by state. At the state and local level, states may continue to track the number of NDIS hits they participated in as AH<sub>N</sub>, DH<sub>N</sub>, FH<sub>N</sub>, LH<sub>N</sub> and OH<sub>N</sub> as described below.

The following methods will be used to minimize the duplicate counting of national hits:

- For offender hits, the Casework Laboratory will report the number of investigations aided and the Offender Laboratory will report the number of offender hits
- For forensic hits where one case is solved, the Laboratory with the unsolved case will report the number of investigations aided and the Laboratory with the solved case will report the forensic hit
- For forensic hits where neither case is solved, each Laboratory will report the number of investigations aided and Laboratories will agree on who reports the hit to NDIS.

The following methods should be used to report hits:

AH<sub>S</sub>: Arrestee hits within the state (match detected by SDIS)

AH<sub>N</sub>: Arrestee hits at national (match detected by NDIS)

DH<sub>S</sub>: Detainee hits within the state (match detected by SDIS)

DH<sub>N</sub>: Detainee hits at national (match detected by NDIS)

FH<sub>S</sub>: Forensic hits within the state (sum of FH found by SDIS)

FH<sub>N</sub>: Forensic hits at national (match detected by NDIS)

IA: Investigations aided

IC<sub>S</sub>: Confirmed Identifications within the state (sum of Identifications found by SDIS)

IC<sub>N</sub>: Confirmed Identifications within the state (sum of Identifications found by NDIS)

ID: Identifications Aided

LH<sub>S</sub>: Legal Index hits within the state (match detected by SDIS)

LH<sub>N</sub>: Legal Index hits within the state (match detected by NDIS)

OH<sub>S</sub>: Convicted Offender hits within the state (match detected by SDIS)

OH<sub>N</sub>: Convicted Offender hits at national (match detected by NDIS)

PI<sub>S</sub>: Putative Identifications within the state (sum of Identifications found by SDIS)

PI<sub>N</sub>: Putative Identifications at NDIS (Identification detected by NDIS)

**Note: All relevant NDIS Procedures are followed at the Arkansas State Crime Laboratory.**

## Appendix A

In the event the technical leader position is vacated, the following contingency plan will be submitted to the FBI within 14 days for approval. Any work that is in progress may be completed during the 14 day period, but new casework shall not be started until the plan is approved by the FBI.

The Arkansas State Crime Laboratory will conduct interviews within the laboratory among any qualified individuals. If there are no interested or qualified individuals the Arkansas State Crime Laboratory will contact the surrounding states to ask for the assistance of their technical leader until the technical leader position can be posted, interviewed and filled.

A newly appointed technical leader shall be responsible for the documented review of the validation studies currently used by the laboratory and educational and training records of currently qualified analysts.

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# Appendix B

State Acts relating to CODIS samples can be accessed on Qualtrax System under CODIS discipline section.

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