Title: Controlled Substance Analysis Training Module

A. **Introduction**:

The purpose of this module is to provide the Examiner-trainee with a comprehensive understanding of the forensic analysis of materials/evidence that either are or may contain drugs – mainly those that are controlled or scheduled. This primarily involves solids or liquids and/or associated compounds (e.g., vegetative materials) either in bulk or at residual amounts. Evidence is submitted and requests are usually in the form of determining whether a controlled substance is present. Topics of study within this module include, but are not limited to: the chemistry of drugs, drug types and physical properties, matrices that may contain drugs, evidence handling, extraction theory and techniques, analytical methods, data evaluation and interpretation, report writing, and testimony. Employees assigned to work within the controlled substance discipline are expected to become competent in all the analyses performed within the Unit. Training will allow the Lead Examiner (and higher) to assess the ability of trainees to follow laboratory procedures, analyze case materials, use instrumentation, make logical assessments of findings, and write laboratory reports.

Note-01: The terms 'drug' and 'controlled substances' can be considered synonymous in this document.

B. **Scope**

This procedure is designed to accompany and follow the laboratory's and the section's training manuals. It is designed for analysts that have been assigned to work within the controlled substance and drug disciplines. Any remediation or retraining will involve following this and other appropriate procedures in order to correct deficiencies and ensure quality in every authorized Forensic Science Examiner. Once qualified, Examiners will maintain their skills through appropriate continuing education venues and applicable requirements. Acceptable performance of trainees will result in authorization to perform casework.

The speed and timeliness of the training process will rely solely on the Examiner-trainee. It will be the responsibility of the trainee to fulfill all training requirements and anticipated completion times within this process. If at any time trainees feel that they are not getting the proper training or they do not have the proper training resources, then it is the responsibility of the trainee to bring that to the attention of the assigned mentor, the Lead Examiner, and/or higher – and especially during periodic reviews of the training process. Periodic reviews of the trainee's progress should occur and open communication is encouraged. Training may be suspended or accelerated based

on progress reports and recommendations of mentors, fellow Examiners, Lead Examiners, and management.

C. **Procedure**:

The section's training procedure will be used in conjunction with this module. While a mentor will be assigned during the training process, other analysts within the laboratory can assist in training, as appropriate.

Note-02: Authorizations may occur throughout the training process (e.g., independent operation of instruments, evidence handling, administrative review of case files) which may occur prior to full completion of the training module.

Upon successful completion of the following parts of this module the trainee will be expected to know the fundamental concepts outlined therein. The trainee should keep in mind that these are generalizations that will help them stay focused. The trainee is expected to observe and discuss topics with other Examiners who may be experienced in various parts/disciplines. Practice should involve using mock samples throughout the training process. While certain evidentiary samples may be acceptable for training purposes (e.g., old adjudicated samples), approval should be obtained by an appropriate manager prior to their use. Previously approved evidentiary samples may be used without continual manager re-approval. The training for this module will concentrate on simple sample types and the more commonly used analyses in order to prepare the trainee for casework

This training information is mainly developed for new employees who may have no controlled substance analysis experience. It is the under the purview of the Lead Examiner (or higher) to work to modify this training after assessing a new employee's experience or knowledge.

<u>General Outline (can be tailored/modified) and in no specific order, within reason</u>:

1. Completion of basic general laboratory training (e.g., Bloodborne Pathogen, Chemical Safety, Orientation, Ethics)
2. Assignment of workspace and possible evidence locker (not essentially necessary until qualified for casework analysis).
3. Review of safety practices, procedures, and engineering requirements (e.g., Personal Protective Equipment (PPE), Hood Operations, Safety Showers, Eye Wash Stations, Chemical Safety, Clandestine Materials, Hazardous/Sharp Materials).
4. Review of general forensic science knowledge
5. Review of drug types/schedules/properties/forms.

6. Review of federal and state legal statutes/policies/regulations applicable to controlled substances/drugs.
7. Review of instrumental theory (e.g., Balances, Microcopy, Gas Chromatography/Mass Spectrometry (GC/MS) ; Fourier-Transform Infrared Spectrophotometry (FTIR))
8. Review of laboratory and unit-specific standard operating procedures (SOPs).
9. Review of training materials from outside vendors (handouts, PowerPoint presentations, etc.).
10. Literature Review
    a. Standard Operating Procedures (SOPs – both GL and unit-specific)
    b. Other standards (SWGDRUG, OSAC, other laboratories)
    c. Reference articles
    d. Research articles
    e. Drug Laws: CT statutes, Federal Register, DEA Regulations (drug schedules)
    f. On-line searches (e.g., drug information, logos)
11. Process for obtaining evidence

    The trainee will observe evidence transfers within the Unit and between units (e.g., Evidence Receiving Unit (ERU)).
12. Proper storage/accountability of drug standards and evidence.
13. General Observation/Shadowing of Examiners

    The trainee will observe the trainer or other Examiners as they work through cases. Observation of Examiners working in other units/sections is encouraged. Reviews of procedures such as opening and sealing (closing) of case materials, daily storage of cases, and the handling of portions of cases will occur.
14. Use of JusticeTrax' LIMS-Plus for chain of custody (CoC) tracking and other activities.

    The trainee will be assigned a login username, password, and select privileges within the Laboratory Information Management System (LIMS) and should have access to test cases in order to become familiar with the system. Training for this area may occur outside the Unit (i.e., LIMS administrator). Training for within LIMS software will be continual throughout the training process.
15. Accessing evidence
    a. Appropriate forms/case notes
    b. Reviewing evidence description

c. Reviewing case information

d. Proper inventorying/accessioning of evidence (including witnessing procedures)

16. Sample/Control preparation

a. Preparing examination area and control solutions/materials (QA/QC)

b. Preparing materials and associated documentation (e.g., form usage, case notes, photography)

c. Techniques (weighing ; sample selection ; extraction/elution ; sample preparation)

d. Additional Sample preparation (dilution ; concentration ; extraction)

17. Sample analyses

a. Sample types

i. Powders

ii. Rocks

iii. Botanical/Vegetative

iv. Cigars/Cigarettes

v. Tablets

vi. Residues/Drug paraphernalia

vii. Liquids

viii. Food Stuffs

ix. Other (e.g., blotter paper)

b. Sample processing

i. Proper amount of material to analyze

ii. Selection of proper solvent

iii. Extractions (if necessary)

iv. Diluting or concentrating Samples

c. Daily instrument evaluation (QA/QC) – Day of use evaluations

d. Instrumental operation (software/hardware (user maintenance))

i. Balances (Weight Measurements)

(a) Case types/manner of weighing (e.g., direct, with packaging, net)

(b) Criteria weights (based on laws)

(c) Balance operation (sample measurements, taring, significant figures)

(d) Reporting weight values, items analyzed, groups of like-items

(e) Reporting measurement uncertainty (including when to report uncertainty)

(f) Use of known/reference weights (validated masses)

(g) Documentation/printouts/recording of data (day of use weight recording)

ii. Microscopy/Mi-Scope® (Marijuana-related)

(a) Cystolithic-like hairs

(b) Glandular hairs

(c) Documentation and labeling

(d) Retention of photographs

iii. Fourier-Transform Infrared Spectrophotometry (FTIR)

(a) Experiment setup parameters (Attenuated Total Reflectance (ATR) accessory)

(b) Obtaining background spectrum

(c) Sample analysis

(d) Use of proper controls

(e) Saving pertinent data information (filename, case information)

(f) Data processing

(g) Library searching/comparison

(h) Cleaning

(i) Proper documentation/data printouts/labeling

iv. Gas Chromatography/Mass Spectrometry (GC/MS)

(a) Experiment setup parameters (Autoinjector, GC, and MS)

(i) MS-Full Scan

(ii) MS-Selected Ion Monitoring (SIM)

(iii) Split/Splitless (if applicable)

(b) Sample preparation/analysis

(c) Sequence generation/verification

(d) Use of proper controls/blanks

(e) Saving pertinent data information (filename, case information)

(f) Data processing

(i) Total Ion Chromatograms (TIC)

(ii) Extracted Ion Chromatograms (EIC)

(iii) Macros (if applicable)

(iv) Mass spectral library searching

(v) Mass spectral comparisons

18. Proper note-taking (ink versus pencil, black/blue ink versus red ink)

    Laboratory notes should be taken on all cases and the trainee will be introduced to the proper forms/techniques (legible, allow a technical reviewer to follow conclusions).

19. Measurement Traceability
20. Measurement Uncertainty
21. Case File Review (proper documents within case files)
22. Use of JusticeTrax' LIMS-Plus for entering findings and other case-related activities
23. Report generation
24. Review process (Technical Reviews, Administrative Reviews, Rejecting Findings)
25. Amended/Supplemental Reporting
26. Other casework and/or non-casework activities, as appropriate
27. Review of criminal law, civil law, court procedures/expert testimony

D. **Practical Exercises**

Practical activities are critical to learning techniques and allowing Examiner-trainees to obtain the ability to adequately examine evidence. The number of practical exercises will vary based on the Examiner-trainee's abilities and on the mentor's comfort level. Initial samples (known compounds/mixtures) for practice can be made by either the trainee or the mentor. As training progresses more advanced practical exercises should be prepared/facilitated by the mentor. Practical exercises may include:

1. Sample accessioning, witnessing, preparation, and analysis using current Unit procedures.
2. Proper documentation (e.g., forms, note taking, photography)

3. Sample handling/preparation and data analysis of known standards or materials to cover many different schedules of controlled substances.
4. Instrumentation operation and data processing (e.g., microscopy, FTIR, GC/MS ; data retention)
5. Analysis of instrument data files from completed cases to determine what, if any, drugs and/or compounds were present. Both positive and negative cases should be practiced.
6. Quizzes may be given on specific topics throughout the training process to assess trainee's understanding of concepts. These can be oral or written and should be used to help determine the progress of the trainee's learning process.
7. Examiner-trainees should be given mock case(s) for practice which may include multiple samples. The goal of this exercise will be to cover a variety of drug schedules, multiple sample matrices, and to mimic casework. These mock cases are for practice, may not be evaluated as training test cases, may not have all the paperwork associated to real casework, and may not be packaged how properly sealed evidence would be submitted.
8. Written competency test (this may be verbal if approved by the Deputy Director) with known passing criteria listed on test.
9. Practical competency test covering different sample matrices and scheduled drugs. Incorrect sample identification, improper application of an SOP, or improper analyses are some reasons for not passing. Explanation of reasons for any competency test failure will occur.
10. Moot court exercise (can be based on either a mock case or a competency test)
    a. Should include a judge, jury, prosecutor, defense attorney, and the Examiner-trainee as the expert witness.
    b. Attempts should be made to mimic actual court activities (presentation of witness, voir dire of witness, presentation of evidence, direct testimony, cross-examination, re-direct).
    c. If possible, the moot court should be recorded and a copy be available to the trainee so that they can critique themselves.
    d. Evaluations will be given to all participants and returned to the Examiner-trainee for review of their performance. Names of evaluators on paperwork are optional.
    e. Pass or fail evaluations will only be given to the Mentor, the Unit lead, section directors, and other appropriate individuals (e.g., expert guests, attorneys). Because such moot courts are subjective, explanation of reasons for any moot court failure will occur. A trainee may pass with a recommendation (or requirement) that it be repeated.

The topics listed below need not be performed in any particular order and may be changed, added, or subtracted from the trainee's plan (e.g., tailored based on past experience).

Topic		Expected completion date	Trainee initial/date	Mentor/Trainer Initial/date
General Introduction to Division / Section / Unit				
Familiarization of Seized Drug Handling / Analysis				
Literature review	Unit SOPs ; Reference Articles ; Reading Log			
Shadowing of Examiners	Log Daily Activity within Training Log			
Qualtrax	SOPs, Workflows, Tasks, Trainings			
Evidence Handling / Security	ERU ; Receipt, Storage, Return Evidence ; ERU Lockbox Combinations			
	Evidence Security			
Analyst/Witness Review	Opening and Closing			
Opening and Itemization	Agency ID Numbers			
Handling Discrepancies	Weights ; # of submissions			
Drug Security	Witnessing ; Safe Operation ; Combinations			
Item Labeling	Evidence Itemization ; Case Note-Taking			
Weighing of Case materials	Use of Balances			
	Calculated Weights			
	Weight printouts			
	Direct Weights			
	Net Weight with Packaging			

Measurement Uncertainty	Events			
	Calculation of Measurement Uncertainty			
Sample Types	Rock/Powder			
	Plant material			
	Tablets/Capsules/Pills			
	Extractions			
	Residue Extractions			
	Liquids			
	Foods			
	Microscopy/Mi-Scope®			
Fourier Transform Infrared Spectrophotometry (FTIR)	Theory			
	Instrumental Methods ; SOPs			
	Instrument Software / General Operation			
	Sample Preparation			
	Daily/Monthly ; QA/QC			
	Data Processing / Interpretation of Results / Data Backup			
	Instrument Maintenance			
Gas Chromatography/ Mass Spectrometry (GC/MS)	Theory			
	Instrumental Methods ; SOPs			
	Instrument Software / General Operation			
	Sample Preparation			
	Daily/Monthly ; QA/QC			
	Data Processing / Interpretation of Results			
	Data Backup			
	Instrument Maintenance			

Reference Standards and Verifications	Finding and Using Reference Standards ; Appropriate Paperwork			
	Verification of Reference Standards using FTIR			
	Verification of Reference Standards using GC/MS			
Laboratory Information Management System (LIMS)	LIMS-Plus operation ; JusticeTrax (JT)			
	Viewing, Creating, Entering Data			
	Itemization of Evidence			
Laboratory Information Management System (LIMS) – Cont'd	Transferring Evidence			
	Updating milestones (e.g., Draft Report, Technical Review, Administrative Review)			
Case Files	Case Documentation			
	Required Data			
	Unit Forms			
	Report Writing and Related Itemization			
	Finding Case Files (Old / New)			
Case Observation (5)				
Written Competency Test				
Practical Competency Test				
Testimony Observation				
Moot Court(s)				

E. **Safety**

Appropriate personal protective equipment (e.g., PPE) and engineering controls (e.g., hoods) will be utilized by trainees whenever handling potentially hazardous materials (whether known

materials or evidence). At a minimum this should entail gloves, a laboratory coat, and safety glasses. Universal safety precautions will be used, when appropriate.
Sources of safety threats include, but are not limited to:

1. Hypodermic needles
2. Broken glass
3. Razors
4. Biological material will be assumed to be potentially infectious

Other:

1. Drugs may absorb through the skin including phencyclidine (PCP), lysergic acid diethylamide (LSD), fentanyl
2. Chemicals (Material Safety Data Sheets (MSDS) are available for proper handling and information)

F. **References**:

1. Clark's Isolation and Identification of Drugs in Pharmaceuticals, Body Fluids, and Post-Mortem Materials, The Pharmaceutical Society of Great Britain.
2. The Drug Identification Bible
3. Baselt, R.C., *Disposition of Toxic Drugs and Chemicals in Man*, 7th ed., Biomedical Publications: Foster City, California, 2004.
4. Moffat, A.C., *Isolation and Identification of Drugs*, 2nd ed., Pharmaceutical Press: London, 1986.
5. Instrumental Data for Drug Analysis; 2nd edition volumes 1-4, Terry Mills III and J. Conrad Roberson

Rev. #	History
5	Title added ; Overall format change ; 'Introduction' and 'Scope' sections replaced 'Purpose' and 'Responsibility' sections ; 'Safety' section moved to bottom ; 'General Information' section removed ; 'Procedure' section simplified and consolidated ; 'Practical Exercises' section added ; Personal Training Plan template/example added ; References updated ; Revision History section added