1.0 Purpose - This procedure specifies the required elements for the sampling of suspected controlled substances.

2.0 Scope - This procedure applies to the Drug Chemistry section of the Pitt County Sheriff's Office Forensic Services Unit.

3.0 Definitions

- **Administrative Sample Selection -** A practice for:
  a) Pharmaceutical preparations.
  b) Non-pharmaceutical items when a statutory threshold does not apply.
- **FAR (Forensic Analysis Report)** – The Pitt County Sheriff's Office form used to report the results of the analytical findings.
- **Homogenous –** Uniform.
- **Hypergeometric Sampling Plan -** A statistically-based sampling plan that allows the Chemist to analyze a portion of a population and make a statistical inference about the whole population stating that the material was analyzed with a statistical sampling plan that demonstrates with at least 95.45% (often referred to as "approximately 95%") confidence that at least 90% of the material contains the identified controlled substance(s). The hypergeometric sampling plan shall be used when the material present meets a statutory threshold, there are ten or more units present, and threshold sample selection is not practical.
- **NCSI –** No Controlled Substance Identified.
- **Population -** A carefully inspected group of units found to be homogenous and that are to be subjected to sampling.
- **Sample Selection -** A practice of selecting items to test, or portions of items to test, based on the Chemist's training, experience and competence. In sample selection, there is no assumption about homogeneity.
- **Sampling -** Taking a part of a substance, material or product, for testing in order to reach a conclusion, make an inference about, and report on the whole. Sampling shall only be used when there is a reasonable assumption of homogeneity about the whole population.
- **Sampling Plan -** For an item that consists of a multi-unit population (e.g., tablets, baggies, bindles), a sampling plan is a statistically valid approach to determine the number of sub-items that must be tested in order to make an inference about the whole population.
- **Sampling Procedure -** A defined procedure used to collect a sample or samples from the larger whole, to ensure that the value obtained in the analysis is representative of the whole. The sampling procedure may include details about size and number of sample(s) to be collected, locations from which to collect the sample(s), and a method to ensure the homogeneity of the larger whole (or to make it so).
- **Threshold Sample Selection -** A practice used when the material present meets a statutory threshold and the individual analysis of the units is practical. The practicality of analysis is determined by the Chemist based on his/her training and experience. No inferences about unanalyzed material shall be made.

- **Unit** – A single member of a set of submitted items that are grouped together into a population for analysis purposes.

4.0 Procedure

4.1 The Chemist shall have this procedure readily available at the location of sampling.

4.2 Material from individual units shall not be combined for analysis.

4.3 Upon completion of the analysis, material from individual units shall not be combined when repackaged for return to the submitting agency.

4.4 Analyzed individual units and data generated will be labeled to ensure that analysis data can be matched with the material it represents.

4.5 The unanalyzed portion shall be left intact in the event further analysis is required.

4.6 When the net weight of a single unit is less than 0.1 gram, the weight shall be reported as "Less than 0.1 gram" with no measurement assurance, according to the Technical Procedure for Balances. This applies to data collected on bench top and analytical balances.

4.7 Sample Selection

4.7.1 The Chemist shall evaluate the evidence and submission information based on his/her training and experience, and shall determine which items will be analyzed.

4.7.2 Chemists shall evaluate which items to analyze in a case based on several factors. These factors include nature of potential charge(s), location of items, and the nature of the item (i.e., biohazard, insufficient sample, etc.).

4.7.2.1 If a case consists of multiple items that are all residue amounts, analysis shall be performed on at least one item. If a controlled substance is identified in the first item analyzed, no other items shall be analyzed.

4.7.2.2 If the first item analyzed in a case approved for analysis does not contain a controlled substance, the complete analysis of no more than two additional items shall be required. If the second analysis identifies a controlled substance, no further analysis shall be required. No other items shall be analyzed.

4.7.3 The selection of samples shall be conducted in a manner that prevents the Chemist from consciously selecting a specific unit from the population.

4.7.4 There are several types of items to which the sampling plan shall not apply:

4.7.4.1 Single unit populations.

4.7.4.2 Items submitted for dilution/diversion.

4.7.4.3 Paraphernalia.

4.7.4.4 Partially consumed hand-rolled cigarettes.

4.7.4.5 Young marijuana/hemp plants.

4.7.4.6 Numerous intact marijuana/hemp plants/stalks packaged together that would be impractical to separate.

4.7.4.7 Residues.

4.8 Population Determination for Multiple Unit Items

4.8.1 Evaluate the number of units in an item carefully.
(eg. For analysis purposes, each intact piece of blotter paper shall be considered a unit).

4.8.2 Visually inspect each of the units in the item carefully as well as any contents for homogeneity in weight, size, color, packaging, markings, labeling, indications of tampering, and other characteristics. The Chemist shall document any perforations or indications of dosage units.

4.8.3 If after careful visual inspection, it is determined that the contents of the units are homogenous, the population shall consist of all of the units.

4.8.4 If there are significant differences, segregate the units into individual groups based upon such observed significant differences. Each group shall be analyzed as a separate population.

4.8.5 If in the course of analysis it becomes apparent that the population is not homogenous, new populations may be formed based upon individual chemical test results. Samples which are no longer available for indiscriminate selection may not be considered a part of the new population.

4.8.6 If no groups can be formed based upon visual examination, then sampling shall not be utilized.

4.8.7 For each unit to be analyzed, obtain the material for analysis.

4.8.7.1 If the material is homogenous, take the amount needed for each test to be performed.

4.8.7.2 If the material is not homogenous, obtain a portion of each type of material present.

4.8.7.3 If the material is a residue amount, physically remove a portion from the evidence or perform a chemical wash with a suitable solvent. (See the Technical Procedure for Extractions and Separations for details.)

4.8.7.4 If the material is a homogenous liquid an aliquot shall be considered a suitable portion to represent the item.

4.9 Sampling Plan Selection

4.9.1 If the population contains pharmaceutical preparations, Administrative Sample Selection shall be used.

4.9.2 If the amount of material or units present does not meet a statutory threshold, Administrative Sample Selection shall be used.

4.9.3 If there is sufficient material or units present in a population to meet a statutory threshold and the individual analysis of the units is practical, Threshold Sample Selection shall be used.

4.9.4 If there is sufficient material or units present in a population to meet a statutory threshold and the individual analysis of the units is not practical, then the Hypergeometric Sampling Plan shall be used. (**Note:** A minimum of ten units is required before the Hypergeometric Sampling Plan may be used.)

4.9.5 The Chemist shall document the sample selection method or plan being used in the casefile.

4.10 Administrative Sample Selection

4.10.1 Pharmaceutical Preparations

4.10.1.1 The complete analysis of one indiscriminately selected unit is required.

4.10.1.1.1 If additional testing is needed, the prosecuting attorney in the case may contact the Laboratory Director.

4.10.1.2 Opiate preparation tablets/capsules, and amphetamine tablets/capsules shall be weighed on a bench top balance. Separate net weights and applicable measurement assurance shall be recorded for the analyzed and the unanalyzed portions.

4.10.1.2.1 Pharmaceutical delivery systems such as (but not limited to) transdermal patches, sublingual films, and lollipops that contain opiates do not require a weight, and any recorded weights shall not be reported.

4.10.1.2.2 Report template for **ADMIN OPIATE PHARM** (*tablet* or other unit description as needed):

One tablet was analyzed and found to contain
XXX - Schedule X.
Net weight of tablet – X.XX (+/- 0.0X) gram(s) (confidence level 99.7%).
XXX tablets were visually examined; however, no chemical analysis was performed.
Net weight of tablets – X.XX (+/- 0.0X) gram(s) (confidence level 99.7%).
The physical characteristics, including shape, color, and manufacturer's markings of all units were visually examined and found to be consistent with a pharmaceutical preparation containing
XXX – Schedule X.
There were no visual indications of tampering.

4.10.1.3 Pharmaceutical tablets/capsules that contain controlled substances other than opiate preparations, or amphetamine, do not require a weight, and any recorded weights shall not be reported. The number of units present shall be reported.

4.10.1.3.1 Report template **ADMIN NON-OPIATE PHARM** (*tablet* or other unit description as needed):

One tablet was analyzed and was found to contain
XXX – Schedule X.
XXX tablets were visually examined; however no chemical analysis was performed.

The physical characteristics, including shape, color, and manufacturer's markings of all units were visually examined and found to be consistent with a pharmaceutical preparation containing
XXX – Schedule X.
There were no visual indications of tampering.

4.10.1.4 Non-controlled pharmaceutical preparations do not require a weight, and any recorded weights shall not be reported

4.10.1.4.1 Report template **ADMIN NCSI/UNIDENT PHARM** (*tablet* or other unit description as needed):

One tablet - No controlled substances identified.
XXX tablets were visually examined; however no chemical analysis was performed.
The physical characteristics, including shape, color, and manufacturer's markings of all units were visually examined and found to be consistent with a pharmaceutical preparation containing
No controlled substances.
There were no visual indications of tampering.

4.10.1.5 Non-pharmaceutical populations consisting of less than a threshold amount of material

4.10.1.5.1 Complete analysis of one indiscriminately selected unit shall be required.

4.10.1.5.2 Net weight and applicable measurement assurance shall be recorded for the analyzed portion.

4.10.1.5.3 The gross weight may be recorded in the casefile (but not reported) as needed for the unanalyzed portion of the population.

4.10.1.5.4 Report template for **ADMIN CONTROLLED NON-PHARM**:

One (*unit*)
XXX – Schedule X.
Net weight of material – X.XX (+/- 0.0X) gram(s) (confidence level 99.7%).

XXX (*unit*) – No chemical analysis.

4.10.1.5.5 Report template for **ADMIN NCSI/UNIDENTIFIED NON-PHARM**:

One (*unit*) – No controlled substances identified.
Net weight of material – X.XX (+/- 0.0X) gram(s) (confidence level 99.7%).
XXX (*unit*) – No chemical analysis.

(Note: For all **ADMINISTRATIVE SINGLE UNIT** populations: the unit description and No chemical analysis lines may be omitted for reporting purposes.)

4.10.2 Suspected Synthetic Cannabinoid populations ("Commercially labeled")

4.10.2.1 If a single commercial package is submitted, complete analysis of a single unit is required.

4.10.2.2 If multiple commercial packages of the same type are submitted, complete analysis of a single unit shall be required.

4.10.2.3 If multiple commercial packages of various types are submitted, the Chemist, based upon his/her training and experience, shall select units for complete analysis taking into consideration the packaging, labeling, and purported contents of the package.

4.10.2.4 Report template: See above for controlled and non-controlled Non-pharmaceutical populations.

4.11 Threshold Sample Selection

4.11.1 See the North Carolina Controlled Substances Act for North Carolina statutory thresholds (and the United States Sentencing Commission Guidelines Manual for federal thresholds when applicable).

4.11.2 Complete analysis of a single unit shall be required as a minimum.

4.11.3 When analysis of the first unit confirms the presence of a controlled substance, separate and complete analysis of additional units to satisfy the statutory threshold shall be required.

4.11.3.1 A calculation of the required number of units to be analyzed may be made by using the net weight of the first analyzed unit to estimate the

net weight of the entire population based on the total number of units present.

4.11.3.2 When complete analysis of the required number of units to satisfy the statutory threshold is not practical, the Hypergeometric Sampling Plan shall be used.

4.11.3.3 The net weight and applicable measurement assurance shall be recorded for the analyzed portion.

4.11.3.4 The gross weight may be recorded in the casefile (but not reported) as needed for the unanalyzed portion of the population.

4.11.3.5 Report template for **THRESHOLD CONTROLLED**:

XXX (*unit*) was/were individually analyzed and were each found to contain
XXX – Schedule X.
Net weight of material – X.XX (+/- 0.0X) gram(s)
(confidence level 99.7%).
XXX (*unit*) – No chemical analysis.

4.11.4 When analysis of the first unit does NOT confirm the presence of a controlled substance, or the substance cannot be identified, no further chemical analysis is required.

4.11.4.1 The gross weight may be recorded in the casefile (but not reported) as needed for the unanalyzed portion of the population.

4.11.4.2 Report template for **THRESHOLD NCSI/UNIDENTIFIED**:

One (*unit*) - No controlled substances identified.
Net weight of material – X.XX (+/- 0.0X) gram(s)
(confidence level 99.7%).
XXX (*unit*) – No chemical analysis.

4.12 Hypergeometric Sampling Plan

4.12.1 Separate and complete analysis of the number of indiscriminately selected units as determined from the table below shall be required. (Values are based on the ENFSI DWG Calculator for Qualitative Sampling of Seized Drugs (Version July 2017). When the population size exceeds 10,000 the ENFSI DWG Calculator

shall be used to determine the number of units for analysis. (See DM for current version of the calculator.)

Population Size	Units (Sample size)
10	8
11-12	9
13	10
14	11
15	12
16-17	13
18	14
19-24	15
25	16
26-27	17
28-35	18
36	19
37-38	20
39-47	21
48-57	22
58-67	23
68-78	24
79-98	25
99-137	26
138-198	27
199-348	28
349-1418	29
1419-10000	30

4.12.2 Separate net weights and applicable measurement assurance shall be recorded for the analyzed portion.

4.12.3 Gross weight may be recorded in the casefile (but not reported) as needed for the unanalyzed portion of the population.

4.12.4 If there is material present to satisfy a statutory weight threshold that is not met by the weight of the analyzed portion from above, then the Chemist shall obtain individual weights and the applicable measurement assurance of enough additional indiscriminately chosen units to meet the statutory threshold. When the material is not individually packaged, (for example clandestine tablets), then the net weight of the unanalyzed units in the remaining portion of the 90% of the

entire population may be used with applicable measurement assurance. These additionally weighed units do not require chemical analysis.

4.12.4.1 Report template for **HYPER WEIGHED ADDITIONAL UNITS**:

XXX (*unit*) – were individually analyzed and found to contain XXX –Schedule X.
Net weight of material – X.XXXX (+/- 0.000X) gram(s) (confidence level 99.7%).
XXX (*unit*) – No chemical analysis.
Net weight of material – X.XXXX (+/- 0.000X) gram(s) (confidence level 99.7%).
This material was analyzed with a statistically-based sampling plan that demonstrates with approximately 95% confidence that at least 90% of the material contains the identified substance(s).
XXX (*unit*) – No chemical analysis.

4.12.5 If there is material present to satisfy a weight threshold that is not met by the analyzed portion from above, and the Chemist determines, based on his/her training and experience, that it is impractical to obtain individual weights of additional units as described above, the weight of the additional units needed to satisfy the statutory threshold shall be extrapolated.

4.12.5.1 Determine the number of units used for extrapolation to 90 % of the population.

- Multiply the total number of units in the entire population by 0.9.
- If this number is not a whole number, round up to the next whole number.
- Subtract from this number the number of units in the analyzed portion.

4.12.5.2 Determine the average weight of a unit.

- Divide the total weight of the analyzed portion from above by the number of units analyzed.

4.12.5.3 Determine the extrapolated weight.

- Multiply the average weight of a unit by the number of units in the extrapolated portion.

4.12.5.4 Determine the measurement assurance for the extrapolated weight.

- Using the ENFSI-DWG Calculator for Qualitative Sampling of Seized Drugs (Version July 2017) enter the number of units in the extrapolated portion in the "Estimation of WEIGHT (with Uw)" tab to obtain the measurement assurance value for the extrapolated portion.

4.12.5.5 The following information shall be reported:

- Number of units analyzed and net weight of the analyzed portion including the measurement assurance value.
- Number of units in the extrapolated portion and the weight of the extrapolated portion including the measurement assurance value, with a notation that it is an extrapolated weight.
- Number of units of the remaining 10 % of the total population.

4.12.5.6 Report template for **HYPER EXTRAPOLATED ADDN'L UNITS**:

XXX (*units*) were individually analyzed and were each found to contain
XXX – Schedule X.
Net weight of material – X.XXXX (+/- X.000X) gram(s) (confidence level 99.7%).

XXX (*units*)– No chemical analysis.
Extrapolated weight (not individually weighed) – X.X gram(s) (+/- 0.X) gram(s) (confidence level 99.7%).
This material was analyzed with a hypergeometric sampling plan that demonstrate with approximately 95% confidence that at least 90% of the material contains the identified substance(s).
XXX (*units*) – No chemical analysis.

5.0 References

Guidelines on Representative Drug Sampling. United Nations, New York: United Nations Office on Drugs and Crime, 2009.

Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) Recommendations. 8th Edition. June 13, 2019.

Frank, Richard S., et. al. "Representative Sampling of Drug Seizures in Multiple Containers." *Journal of Forensic Sciences,* Volume 36, Issue 2 (March 1991), 350-357.

ENFSI-DWG Calculator for Qualitative Sampling of Seized Drugs (Version July 2017)

Hypergeometric Sampling Tool (2012) – background of calculation and validation_DWG-SGL-002-vers001

6.0 Records

- Casefiles

REVISION HISTORY		
CURRENT VERSION	EFFECTIVE DATE	SUMMARY OF CHANGES
1	2017/11/14	Original Document.
2	2018/04/01	**Header** – Removed "Forensic Chemistry" **Title** – Added "Drug Chemistry" **Purpose** – Updated "Illicit Drugs discipline" to "Drug Chemistry Section"
3	2018/05/16	**4.12.4** – Added single weighing event for clandestine tablets
4	2018/10/22	**Entire Document** - Added confidence level to report templates.
5	2019/04/02	**Entire Document -** Update 95% to "approximately 95%" **4.12.1** - Replaced hypergeometric sampling chart with updated version calculated at 95.45%. Added reference to ENFSI DWG calculator used for chart. **4.12.5** – Added measurement assurance calculation and reporting for extrapolated weights using the ENFSI DWG Excel based calculator. **4.12.5.5** – Included measurement assurance calculation to reporting of net weight. **References** – Added ENFSI-DWG Calculator for Qualitative Sampling of Seized Drugs (Version July 2017). Added Validation report on Qualitative Sampling (2012)_ DWG-SGL-001-vers002. Added Hypergeometric Sampling Tool (2012) – background of calculation and validation_DWG-SGL-002-vers001. Updated (SWGDRUG) Recommendations version number.
6	2020/01/15	**Header** – Updated "Instruments" to "Drug Chemistry Section **4.7.4** – Added "/hemp" to marijuana **References** – Updated to newest edition of SWGDRUG Recommendations.