These report wording guidelines are those of the MSP Forensic Science Division and are based on the guidelines published in *ASTM E1618 (most current version) Standard Test Method for Ignitable Liquid Residues In Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry*.

5.1.5.1 Report Introduction

The report may include a statement or title reflecting the type of analysis conducted as per the request of the submitting agency or contributor.

The report should state which analytical/instrumental techniques were used. For example:

The volatile contents of Items 1, 2, and 3 were extracted using a passive carbon adsorption/elution technique and analyzed by gas chromatography - mass spectrometry (GC-MS).

Remarks, special instructions, requests, or additional information may appear in the report. Example comments include: references to commercial products, requests for comparison samples, additional testing that may or can be performed upon receipt of additional items, and the description of secondary evidence.

5.1.5.2 Terminology Used in Reporting Results/Conclusions and Opinions (also see "Explanations of Terms" chart below - 5.1.5.3)

Reporting Positive Results of an Ignitable Liquid or Residue:

Some possible phrases include: was present in, was detected on, was identified in, was recovered from, and was found in. The meaning of all these phrases are interchangeable and represent a positive result or identification/classification of an ignitable liquid or ignitable liquid residue. Regardless of the choice of phrases used, there is no implied difference in the perceived level of confidence for a positive result.

The reporting of a positive result does not preclude the contribution of ignitable liquids from the matrix of other material present in the debris. In general, the source of the ignitable liquid cannot be determined and therefore shall not be stated. It may be appropriate to add a qualifying statement to the report finding.

The results section may list examples of commercial products or substrates, or both, that might contain the ignitable liquid identified. Example of positive result:

- *A medium petroleum distillate was identified in Item 1 (Identification). Medium petroleum distillates include but are not limited to some paint thinners, mineral spirits, and charcoal lighter fluids*.

Gasoline:

Gasoline is a distinct class of ignitable liquid and shall be named as such in the report.

Petroleum Distillates:

These products are distilled from petroleum (crude oil) and are consequently named petroleum distillates. They are further characterized by their n-alkane range, such as light, medium, or heavy distillate. Petroleum distillates may not fit clearly into a single category, so it may be necessary to describe the ignitable liquid as “light to medium,” “medium to heavy,” or simply state the n-alkane range of the material.

The report may list examples of commercial products or substrates that may contain such liquids. For example:

- *A heavy petroleum distillate (HPD) was identified in Item 1 (Identification). Examples of HPDs include kerosene, diesel fuel, and some charcoal starters.*
- *A medium petroleum distillate in the range of C10 to C13 was identified in Item 4 (Identification). Examples of this distillate include some paint thinners and some specialty solvents. Medium petroleum distillates are also found in some shoe polish, wood staining products, insecticides, and automotive cleaner products.*

Other Ignitable Liquids:

Commercial products can be variations of petroleum products or derived from non-petroleum sources. These include: isoparaffinic products, aromatic products, naphthenic-paraffinic products, n-alkane products, oxygenated products, and miscellaneous products.

These products may also be reported by assigning an n-alkane range, or may be classified as light, medium, or heavy. For example:

- *A medium isoparaffinic product like that found in some lamp oils or toner solvents was identified in Item 7 (Identification).*

Single Compounds or Simple Mixtures:

Some commercial products contain a single compound or mixture of a few compounds. These ignitable liquids shall be reported based upon identification of the compounds rather than classification. For example:

- *Isopropyl alcohol and methyl alcohol were identified in Item 7 (plastic bottle of clear liquid) (Identification).*

Residues of Ignitable Liquids:

In many cases components of an ignitable liquid may be reduced or lost due to evaporation or other environmental condition, such as microbial degradation. The terms “residue,” “weathered,” or “evaporated” may be used to refer to recovered products. However, do not use a term such as “fire-aged” as it implies that fire was the only reason for the recovered condition of the ignitable liquid.

Special Materials and Matrices:

Debris and matrices of the submitted items sent in for fire debris analysis may contain ignitable liquids. Some commercial products that are ignitable liquids, such as turpentine, toluene, polish removers,

rubbing alcohol, and some cleaning solvents are also common to items submitted for analysis, such as wood (terpenes), shoes (toluene), and clothing (alcohols).

The analyst shall use caution in regards to reporting positive results if the submitted items may contain a matrix which is known to contain an ignitable liquid of the type detected. If the laboratory elects to report matrix compounds, such as terpenes in wood and alcohols in clothing, the report shall reflect the nature of the ignitable liquid.

Examples of report conclusions for items with matrices that contain known ignitable liquid compounds include:

- *No ignitable liquids were detected on Items 7 and 8 (sneakers) other than compounds associated with the items themselves.*
- *Toluene was identified on Items 3 and 4 (sneakers). Toluene is found in glue commonly used in the manufacturing of shoes.*
- *No ignitable liquids were detected on Item 11 (pine studs) except for terpenes which are common to softwoods.*

Reporting Negative or Inconclusive Findings of an Ignitable Liquid:

The words “not detected” may be used to describe no response great enough to be identified by gas chromatography-mass spectrometry (data did not indicate the presence of an ignitable liquid).

The words “not identified” may be used when compounds are detected that may be present in some ignitable liquids however there are possible factors that prevented identification. Examples include:

- Compounds were present that are typically observed from the substrate and/or pyrolysis, but also have the potential to originate from ignitable liquids
- Compounds were present in the sample that impeded data interpretation
- Unexplained absence of components or differences in ratios of compound types compared to a reference liquid
- No comparable sample in the reference collection

Wording Examples:

- *No ignitable liquid residues were detected in Item 18 (Not detected).*
- *No ignitable liquid residues were identified on Item 6 (Not identified).*

The use of the phrase “No ignitable liquids were present” is not recommended as an ignitable liquid may be present below the detectable limits of the method.

For clarification purposes, the analyst may elect to report to the submitter that something other than an ignitable liquid was detected or identified. For example:

- *The analysis identified volatile compounds consistent with the interfering products associated with a variety of synthetic materials. These compounds may be responsible for the positive alert on the investigator’s monitoring equipment at the scene.*

Misleading Terminology:

Certain words shall not appear without explanation within the report. All extracts from organic materials are likely to contain "hydrocarbons." The word "hydrocarbon" shall not appear in a report unless those hydrocarbons can be specifically identified and classified. The phrase "hydrocarbons from an unknown source" is expressly prohibited. Similarly, words such as "consistent with," "in the boiling range of," "similar to," or "characteristic of" a particular ignitable liquid shall not be used unless that liquid has been positively identified and classified.

Examples of misleading terminology include:

- *Item 22 contained hydrocarbons in the range of gasoline.*
- *Hydrocarbons from an unknown source were detected in Item 12.*
- *Flammable compounds were present in Item 6.*
- *Some components consistent with gasoline were identified in Item 9.*

Common interfering compounds resulting from pyrolysis, combustion, or distillation of a substrate at the fire scene are not normally reported except when a significant quantity of an unexplainable product is detected.

The analyst cannot determine the source or intended use of an ignitable liquid residue. For this reason, residues shall not be characterized as "accelerants" by the analyst.

Qualifying Statements:

A finding of either a positive or negative result/conclusion shall be scientifically accurate and supported by the analytical data. Positive and negative results often cannot be reported in simple terms because of the presence of matrix and interfering compounds. The analyst may use qualifiers or disclaimers to convey the proper significance of both positive and negative results.

If the analyst or laboratory elects to report a positive ignitable liquid finding of a known matrix component, a qualifying statement shall be used. For example:

- *Toluene was identified on Item 5 (tennis shoes). Toluene is an ignitable liquid but is a component of some glues used in the manufacturing of shoes.*
- *Terpenes were identified in Item 8 (charred wood and debris). Terpenes are a natural component in some softwoods and are also found in turpentine solvents and pine-based cleaners.*

Additional Remarks:

Additional information may be included in a report for further clarification. For example, if a distinctive set of compounds were identified in a sample, the following additional investigative information could be given:

- *Examples of commercial products that contain methyl alcohol, acetone, toluene, and methylene chloride include some paint and varnish removers.*

- *The ignitable liquid and components identified in Item 2 are consistent with the ingredients found in "John Smith's Oven Cleaner" or similar product.*

Other information or comments that may appear in the remarks section include contact information of the analyst (phone number), websites and references to product information, additional testing, testing that could not be conducted, and damage to the submitted items during shipment/delivery. Examples include:

- *The liquid in Item 6 (bottle) contained a mixture of gasoline and a medium petroleum distillate. The request to determine the flashpoint of the liquid was not conducted as this laboratory does not have the required equipment to conduct the requested test.*
- *Items 1 through 5 were not examined for the presence of ignitable liquids because they were improperly packaged. Samples from fire scenes to be tested for ignitable liquids should be packaged in metal paint cans, heat-sealable arson bags, or glass jars.*
- *Item 3 was not examined as the glass container was broken upon receipt by the laboratory.*

5.1.5.3 The following "Explanation of Terms" chart shall be included on reports associated with the examination of fire debris samples (ignitable liquid examinations):

Explanation of Terms:

The following descriptions are meant to provide context to the types of opinions reached in fire debris / ignitable liquid examinations.

Identification: The sample contained an ignitable liquid or residues of an ignitable liquid.

Not Identified: Compounds were detected that may be present in some ignitable liquids. Possible factors that prevented identification of an ignitable liquid may include one or more of the following:

- The detected compounds may originate from substrate materials and/or pyrolysis of substrate materials
- Other compounds in the sample impeded data interpretation
- An unexplained absence of components and/or differences in ratios of compound types compared to a reference liquid was observed
- No comparable sample in the reference collection was found

Not Detected: The data did not indicate the presence of an ignitable liquid.

5.1.5.4 References

ASTM E1618 (most updated version) Standard Test Method for Ignitable Liquid Residues In Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry, ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States.

TWGFEX Standard Guide for Fire Debris Report Wording; www.TWGFEX.org