

**THE USE OF FIREARM EVIDENCE IN THE INVESTIGATION OF MURDER**

by

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**UNIVERSITY OF SOUTH AFRICA**

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**FEBRUARY 2018**

## DECLARATION

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I declare that this dissertation entitled **The use of firearm evidence in the investigation of murder** is my own work and that all sources, which I have used or quoted, have been acknowledged in the list of references. This dissertation is submitted in the partial fulfilment of the requirements for the degree Magister Technologiae in the subject Forensic Investigation, School of Criminal Justice at Unisa.

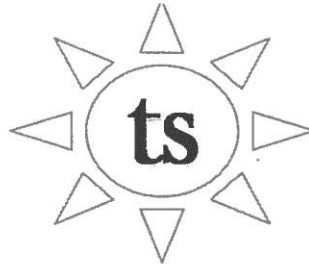
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## PROOF OF EDITING

This is to confirm that I have edited the theses, "The use of firearm evidence in the investigation of murder", submitted by Mpho Tshishonga, in terms of language usage, style, expression and consistency. I focused on grammar, tense, consistency, sentence construction and logical flow. I inserted comments and suggestions for the attention of the student where meaning needed to be clarified, or where points of confusion could arise for the reader.

I wish the candidate all success with her submission and trust it will be of value to the South African Police Service and the Department of Justice resulting in more successful prosecutions.

Yours faithfully

**Tania Stapelberg**

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## **ABSTRACT**

In this dissertation, the researcher wants to establish the use of firearm evidence in the investigation of the crime of murder. Firearm evidence can be of significance to the investigators during murder investigations. To determine the importance of this evidence the researcher has formulated the following research questions to address the research problem:

- What is the role of forensic science in the investigation of crimes?
- How can firearm evidence be used in the investigation of murder?

An empirical research design and qualitative research approach were used for this dissertation. International and national literature sources were consulted and the researcher conducted semi-structured interviews with the investigators from Akasia SAPS, crime scene experts from the Pretoria North LCRC and ballistics experts from the Forensic Science Laboratory in Silverton, Pretoria.

The role of forensic science and the use of firearm evidence in the investigation of murder were established. Recommendations have been made for further research on aspects highlighted by the findings.

### **Key terms:**

Crime scene, firearm, Locard principle, murder, physical evidence

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## ABBREVIATIONS

CRC	Criminal Record Centre
CS	Crime Scene
CSI	Crime Scene Investigator
DNA	Deoxyribonucleic Acid
FSL	Forensic Science Laboratory
FSS	Forensic Science Services
GIS	Geographical Information System
IBIS	Integrated Ballistic Identification System
LCRC	Local Criminal Record Centre
UNODC	United Nations Office on Drugs and Crime
PPE	Personal Protective Equipment
SAPS	South African Police Service
Unisa	University of South Africa

## **CHAPTER 1**

### **GENERAL ORIENTATION**

#### **1.1 INTRODUCTION**

The investigation of murder requires more effort from police investigators who need to answer questions such as who committed the crime, the instrument/s used and determining the motive for the killing. Murder investigation requires a team effort and it is the investigator's responsibility to collect evidence and coordinate information from sources such as witness, suspects, officers involved in the crime scene and the forensic pathologist (Fisher, 2004:379).

In murders where firearms are used a number of questions could be answered by the proper utilisation of firearm evidence. This study explored the use of firearm evidence in the investigation of murder cases. Firearm evidence is very important during reconstruction and corroborating accounts of the crime by witnesses, suspects and victims.

#### **1.2 PROBLEM STATEMENT**

According to Berg and Lune (2012:38), the research problem directs or drives the research enterprise. A problem statement is the problem or issue that leads to the need for the study. The research problem involves narrowing down the general interest in research, topic to focus on a particular research problem, which is small enough to be, investigated (Creswell, 2014:108). According to Leedy and Ormrod (2015:45), the research problem is the axis on which the research revolves and is at the heart of every research problem. Furthermore, Leedy and Ormrod (2015:49) mention that to resolve the research problem and to focus efforts towards achieving the ultimate purpose for gathering the information, the researcher must ask him/herself throughout the research process what he/she is doing and for what purpose.

The research problem should be specific rather than general because the more specific it becomes the more answerable it is (Bless, Higson-Smith & Kagee, 2006:29).

Fouche and Delpont (2017a:108) agree with Bless, Higson-Smith and Kagee (2006:29) and indicate that the problem formulation may serve as an effective point of departure for the research proposal. The researcher must explicitly limit the focus of the study and articulate the specific problem to be investigated. Kaniki (2014:19-20) also states that the research problem is important and warrants investing a researcher's resources, without an identifiable research problem there would be no need to conduct research.

The crime statistics provided in the South African Police Service annual crime statistics for the 2013/2014 financial year reflected that contact crime decreased by 26.8% over 10 years (2004/05 - 2013/14) and by 8.3% during the five years (2009/10 - 2013/14), but has shown a slight increase of 0.5% or 3 127 reported cases during the 2013/14 financial year. Murder has decreased by 9.2% over 10 years (2004/5 - 2013/14); but increased by 1.4% during the five years (2009/10-2013/14) and by 5.0% during the 2013/14 financial year (*SAPS Annual Report: Crime Statistics ...*, 2014).

The increase in contact crimes, specifically murder which increased by 5.0%, in the 2013/2014 financial year is of concern to the researcher. Gauteng Province with its huge population and 143 police stations also saw an increase in murder cases. This study focused on determining the use of firearm evidence in murder investigations at the Akasia Police Station in the City of Tshwane.

During the 2013/14 and 2015/16 financial years, the Geographical Information System (GIS) indicated that 49 murder cases where firearms were used were reported to the Akasia Police Station (SAPS, 2017). Of these 49 cases five were withdrawn from court due to insufficient evidence, 27 are still being investigated, 11 were closed undetected, five (5) were filed and in one case a warrant of arrest was issued, there have been no convictions. Murders are difficult to police, requiring investigations at the crime scene to be done properly the first time the scene is approached. "Firearm evidence is one of the most common types encountered and consists of items such as revolvers, pistols, rifles, shotguns, loaded cartridges, misfired cartridges, bullets, shell cases, powder residue, magazine, clips, shot pellets and wards used in older ammunition" (Swanson, Neil, Chamelin & Territo, 1988:100).

In murder cases where firearms have been used, components left at the scene can assist in establishing the criminal's identity and cartridge cases left at the scene can be directly linked to a specific firearm. It is important to measure the location of the cartridge cases, bullet holes, bullet fragments and shotgun slot patterns at the scene as this information can help reconstruct the scene and verify the witness and suspect statements (Palmiotto, 1994:201).

Firearm evidence recovered at the scene must be handled with care to prevent contamination and damage (Gilbert, 2004:268). From the researcher's experience as a police officer at the station who had an opportunity to visit murder scenes and who has worked as a ballistics expert, firearm evidence is important in murder investigations. The importance of firearm evidence in murder investigations cannot be realised if the evidence is incorrectly gathered as it loses its evidential value, integrity and therefore cannot be admissible in a court of law.

### **1.3 AIM OF THE RESEARCH**

Denscombe (2012:7) indicates that research aims are the precise information about the subject matter of the research, this is what the research is all about or what the research is trying to achieve. Furthermore, Denscombe (2012:7) indicates that without the research aims it becomes difficult to determine the appropriateness of the research methodology and whether there will be sufficient time and resources to complete the project.

Van der Riet and Durrheim (2014:84) indicate that research aims specify and operationalise the focus of the research, this is a brief and concrete statement of what the research plans to investigate. According to Bless, Higson-Smith and Sithole (2015:56), the research aim is the reason the study is being conducted. The aim of this research is to determine how firearm evidence can be used in the investigation of murder.

### **1.4 PURPOSE OF THE RESEARCH**

Denscombe (2002:25-27) indicates that "there must be a reason for doing the research as otherwise there would be no point of spending time, money and effort undertaking the investigation."

The driving force behind research is the desire to solve a practical problem or to improve procedure. Welman, Kruger and Mitchell (2012:23) explain that the purpose of conducting research into theories and other research problems is to define, explain and consequently predict and even modify or control, human behaviour, its organisations, products and/or events. Babbie and Benaquisto (2010:92) state that the three important purposes of research are exploration, description and explanation, and should be examined separately because each has different implications for other aspects of research design. According to Henning, Van Rensburg and Smit (2011:1), the purpose of research will have an influence on the use of certain methods of data collection and data analysis. The researcher has decided on the following as the purpose for this study:

- Evaluation of the situation: The researcher evaluated the procedures used in the examination of the firearm evidence in murder investigations.
- Exploration: The researcher explored the use of firearm evidence in murder investigations.
- Applied research: The study aimed to arrive at recommendations for good practices on the use of firearm evidence in murder investigations that can enhance the performance of members of the South African Police Service (SAPS) in murder investigations using firearm evidence.
- Empowerment of those being researched: The study aimed to create awareness of the significance of the firearm evidence and assist investigators with the knowledge and skills required to effectively use firearm evidence in murder investigations.

## **1.5 RESEARCH OBJECTIVES**

According to Du Plooy (2013:50), the research objectives are exploratory, descriptive, explanatory and predictive, these objectives are not mutually exclusive and therefore a particular study can have more than one objective. The research objectives give a broad indication of what researchers wish to achieve in their research (Mouton, 2014:101).



The specific research objectives of this study in order to address the research aim were:

- To describe the role of forensic science in the investigation of crime.
- To determine how firearm evidence can be used in the investigation of murder.

## **1.6 RESEARCH QUESTIONS**

Bless, Higson-Smith and Sithole (2015:71) say that the research question is the focal point of the entire study and determines the type of research, the design of the research, the way the sample is created, the way the data is collected and analysed, and ultimately the way in which the results are reported. According to Denscombe (2002:31), research questions specify what is to be investigated; they are directly investigated by the research; and are observed, measured and interrogated in order to shed light on the broader topic. Jansen (2014:3) attests that research questions specify what intrigues the researcher and focuses on what the researcher will study.

A good research question directs the researcher to appropriate literary resources and provides the researcher with the focus for data collection. Hammond and Wellington (2013:127) believe that the research question encapsulates what the researcher is trying to find out and provides the direction and shape for the research, the research question provides the starting point for considering the research methodology. Gorard (2013:36) cautions that it is of importance for a researcher to start with a draft of the research questions because only then can an appropriate design be created, otherwise the research will not be research, just data gathering.

The questions leading to the design gives the data gathering a necessary structure, they assist the researcher on what data to collect, where, when and how to analyse it. The researcher has formulated the following research questions to address the research problem:

- What is the role of forensic science in the investigation of crime?
- How can firearm evidence be used in the investigation of murder?

## **1.7 DEMARCATION OF THE STUDY**

The focus of this study was on the use of firearm evidence in the investigation of murder. According to Van Schalkwyk (1996:285), firearm evidence includes the firearm and fired bullets and cartridge cases used in the commission of the crime. In this research, the type of firearm the researcher will focus on is the pistol. The study was conducted at Akasia Police Station, Pretoria, Gauteng Province.

## **1.8 DEFINITION OF KEY TERMS**

According to Leedy and Ormrod (2010:119), the purpose of defining key concepts is to prevent any misunderstanding. For the purpose of this study, these concepts are defined as:

### **1.8.1 Crime scene**

Crime scene may be defined as the area where a crime has been committed, the immediate area surrounding the scene, including and entrances and exits to and from the scene and anywhere where evidence of the crime can be found (Dempsey, 2003:47).

### **1.8.2 Firearm**

Firearm is any device manufactured or designed to propel bullets or projectiles through a barrel or cylinder by means of burning propellant, at a muzzle energy exceeding 8joules; device manufactured or designed to discharge rim-fire, centre fire or pin fire ammunition (Firearms Control Act 2000, Act 60 of 2000).

### **1.8.3 Locard principle**

The Locard principle states that when an individual comes in contact with the person or location, certain small and seemingly microscopic debris may be left by the person or picked up from contact with the environment (Fisher, 2004:149).

### **1.8.4 Murder**

Murder “is the unlawful killing of another human being with malice aforethought” (Osterburg & Ward, 2010:338).

### **1.8.5 Physical evidence**

Physical evidence may be defined as anything that has been used, left, removed, altered or contaminated during the commission of the crime by either the victim or the suspect (Hawthorne, 1999:3).

## **1.9 LITERATURE REVIEW**

Fouche and Delport (2005:123) state that a review of literature is aimed at contributing towards a clear understanding of the nature and meaning of the problem that has been identified. Bless et al. (2006:24), are of the view that literature review is reading whatever has been published that appears relevant to the research topic. Kaniki (2014:19-20) states that the literature review puts the research project into context by showing how it fits into the particular field. Furthermore, Kaniki (2014:19-22) states that the literature review is conducted with the purpose of identifying knowledge gaps; developing a research problem; identifying issues and variables related to the research topic; identifying conceptual and operational definitions; identifying methodologies; refining key concepts and developing and executing a literature search strategy.

Thomas (2013:58) mentions that literature is reviewed to find out what other people have accomplished in researching the topic. Hammond and Wellington (2013:99) agree with Thomas (2013:58) and state that literature review gives an overview of what has been written about a particular topic and it covers what has been said, who has said it and sets out prevailing theories and methodologies. The researcher visited the library in search of literature related to the study and it was found that there is no literature on the same topic as this study. In order to obtain information or relevant literature, the research topic was divided into the following concepts: physical evidence, firearm evidence, crime scene and murder.

### **1.9.1 Physical evidence**

Physical evidence can be any kind of objects associated with the investigation, but it might be a physically tangible item, unlike other forms of evidence that may result from sensing observations or inferences (Gilbert, 2004:59). Rondinelli (2013a:26) shares the same sentiments as Gilbert (2004:59) by saying that “physical evidence shows us something” and takes the form of actual objects related to the crime.

Physical evidence includes objects that are directly linked to the occurrence of the crime. For this research, the physical evidence that the researcher focused on includes cartridge cases, bullets, and firearm and primer residue found at the murder scenes. Lyle (2012:22) and Gilbert (2004:105) indicate that crime scene evidence serves several purposes in the criminal investigation area and these purposes are as follows:

- Suspect identification.
- Establishment of suspect *modus operandi*.
- The exact type of crime will be revealed.
- Linkage of suspect to the victim, a place or other pieces of evidence is critical.
- Providing investigative leads.
- Crime scene reconstruction.
- Verification evidence can substantiate or refute suspect or witness statements.

When evidence is found at the crime scene the investigating officer must have accounting responsibility from when it was identified until it reaches the courtroom. Evidence plays an important role in criminal case investigations and as such needs to be properly packaged to avoid contamination so that it can be admissible in a court of law.

### **1.9.2 Crime scene**

The crime scene is a locale from which the majority of the physical evidence associated with the crime is obtained and provides the investigators with a starting point for the inquiry to determine the identities of the suspects and putting together the characteristics of what happened during the crime(Fisher2004:149). Watkins (2013:114) agrees and indicates that a crime scene can be any place where the crime has occurred and can be a place where evidence relating to a possible crime at some distant location or time has been located. The researcher also agrees with the authors in saying that a crime scene is the starting point for investigation and that the crime scene needs to be handled with care to protect the physical evidence.

Processing the crime scene is one of the most important phases of investigation. The crime scene investigator focuses on the search for physical evidence that might be left at the crime scene. Crime scenes frequently provide the key to the solution of a case and therefore careful observation of the crime scene is essential (Gilbert, 2004:91).

### **1.9.3 Murder**

“Murder is the unlawful killing of a human being with malice aforethought” (Gilbert, 2004:600; Hess & Hess 2013:262). For murder to take place there must be an intention to take the life of a person. A person commits murder if, when committing the act, he intends to kill or cause grievous body harm; he knows that such an act will cause death or that there is a probability of causing death or harm to another or is attempting a forcible crime other than voluntary murder (Gilbert, 2004:276). This research focused on the use of firearm evidence in the investigation of murder. When investigating officers approach the murder crime scene they need to be careful so that they do not contaminate or destroy the firearm evidence found at the scene as the evidence can assist in solving the murder case. Hess and Hess (2013:262) further indicate that murder can be classified as first degree-premeditated murder and intentional or when committing or attempting to commit a crime, Second degree murder is intentional but not premeditated and third degree is neither intentional nor premeditated, but the result of the an imminently dangerous act.

### **1.9.4 Firearm evidence**

Investigators normally encounter firearm evidence pertaining to one or more of the following: firearms, bullets, ammunition, cartridge cases or primer residue. By examining such evidence, the criminalistics can often provide answers to important questions including and not limited to the following: “Did a specific firearm discharge the specific bullets and or cartridge case?”, “What kind of firearm fired the specific bullets and or cartridge case?” and “What specific type of ammunition was discharged?” (Gilbert, 2004:260). Fisher (2004:257) shares the same sentiments and indicates that a number of questions may be answered by means of proper utilisation of firearm evidence.

According to Fisher's (2004:257) statement, it means that if firearm evidence is not properly utilised the firearm evidence cannot answer the questions stipulated above. When firearm evidence is found at the crime scene care must be taken to avoid accidental discharge. Since firearms play an important role in crimes, ammunition components left at the scene can assist in establishing the criminal's identity and cartridge cases left at the crime scene can be connected directly to a specific firearm (Palmiotto, 1994:201). Saferstein (1995:438) agrees and indicates that just as natural variation in skin ridge patterns and characteristics provide a key to human identification, minute random markings on surfaces can impart individuality to inanimate objects. Structural variations and irregularities caused by scratches, breaks and wear, permit the criminalistics to relate bullets to a gun, a scratch and abrasion mark to a single tool. Van Rooyen (2007:140) summarises this point by emphasising that the most important principle is that each firearm has unique marks, which are transferred to the bullet and cartridge case during the firing process.

The researcher agrees with the authors and this means that if the firearm evidence is found at the crime scene it becomes easy for the ballistics experts to answer the different questions that the investigator might have in relation to the murder case. Firearm evidence is important particularly for reconstructing the circumstances of the crime, and corroborating accounts of the crimes by witness, suspects and victims (Fisher, 2004:257).

#### **1.10 METHODOLOGICAL FRAMEWORK OF THE STUDY**

Vanderstoep and Johnston (2009:165) state that the study of knowledge is called epistemology. The quantitative research perspective assumes that knowledge is out there to be discovered and qualitative perspective assumes that knowledge is constructed through communication and interaction; as such knowledge is "not out there" but within the perceptions and interpretations of the individual. A qualitative perspective assumes that a person cannot analyse and understand an entity by analysis of its parts, rather must examine the larger context in which people and knowledge function, the concept is referred to as social construction of reality.

Tomal (2010:3) agrees with Vanderstoep and Johnston (2009:165) and states that research is the scientific approach to solving a problem when the answer is not known; the process of seeking the truth is defined as epistemology. This philosophy of science describes how researchers acquire knowledge, the two methods of epistemology are quantitative and qualitative. Quantitative research is a very objective type of scientific inquiry in which the researcher attempts to be detached from the actual subjects of the study. Quantitative researchers are characteristic of the classical medical scientists who study and independently make observations about the cause and effect of variables. Qualitative researchers on the other hand are much more personally involved with their study. Qualitative research is more naturalistic, emergent and case orientated.

Kumar (2014:30) shares the same sentiments and indicates that although quantitative and qualitative research methods are the two main paradigms of research methodology in social science research, there is also the mixed methods that mostly use the methods and procedures of quantitative and qualitative approaches. He continues by indicating that the paradigm that is rooted in the physical sciences is called the quantitative, systematic, scientific or positivist approach to social inquiry and the opposite paradigm has come to be known as the qualitative, ethnographic, ecological or naturalistic approach. Vanderstoep and Johnston (2009:167) indicate that the nature of your research question should dictate whether to pursue a qualitative or quantitative approach. Qualitative and quantitative approaches differ in purpose, focus, method and criteria for the truth. Table 1.1 below indicates the differences between the qualitative and quantitative approaches.

**Table 1.1: Comparison of qualitative and quantitative approaches**

	<b>Qualitative</b>	<b>Quantitative</b>
Purpose	Description	Prediction
Focus	Generalise to large population	Give voice to silenced people and groups
Method	Inductive analysis of texts	Deductive analysis of units (individual, corporations, etc.)
Criteria for truth	“aha” criterion, adequate and realistic	Statistics, replication and cumulative findings

(Vanderstoep & Johnston, 2009:167)

For this research, the researcher conducted qualitative research. The researcher went to the natural setting, made observations, and was to some extent involved in this study. The researcher also studied the theories and made narrative descriptions when concluding. The research questions for this study were:

- What is the role of forensic science in the investigation of crime?
- How can firearm evidence be used in the investigation of murder?

These research questions warranted that the researcher understand the viewpoint of a research participant in-depth. According to Thomas (2013:116), positivism is quantification and interpretivism is words, thoughts, and images and therefore qualitative. Welman, Kruger and Mitchell (2012:6) refer to qualitative research as the research that is conducted by the anti-positivists who believe that human experience, which is the object of behavioural research, cannot be separated from the person who is experiencing it. The next section focuses on the philosophical worldview offered in this study.

## **1.11 PHILOSOPHICAL WORLDVIEW OFFERED IN THE STUDY**

The research design process in qualitative research starts with philosophical assumptions that researchers make in deciding to undertake a qualitative study. Creswell (2007:15) indicates that there are five philosophical assumptions that lead to an individual's choice of qualitative research, namely: ontology, epistemology, axiology, rhetorical and methodological assumptions. The researcher focused on ontology and epistemology.

### **1.11.1 Ontology**

According to Mouton (2014:46), the term ontology means the study of being or reality. Ontology is concerned with beliefs about what there is to know about the world. There are three key distinctive stances of ontology: realism, materialism and idealism (Ritchie & Lewis, 2003:11). According to Thomas (2013:119-120), ontology is about the question of what we are looking at, where we borrow the ideas from, this is about the kinds of events that exist in the social world.



Ontology helps us to understand that there are different ways of viewing the world, of viewing what there is to study and that there are different ways of seeing and understanding the problem. Hammond and Wellington (2013:114) believe that ontology concerns claim about the nature of being and existence.

### **1.11.2 Epistemology**

Vanderstoep and Johnston (2009:165) and Tomal (2010:3) indicate that this philosophy of science describes how researchers acquire knowledge and the two methods of epistemology are called quantitative and qualitative research. A quantitative research perspective assumes that knowledge is “out there” to be discovered and the qualitative perspective assumes that knowledge is constructed through communication and interaction as such knowledge is not “out there” but within the perceptions and interpretations of individual, i.e. knowledge is constructed and created by people. The researcher conducted qualitative research and focused on the following worldviews that inform the qualitative research and identify how these worldviews shape the practice of this research. According to Thomas (2013:120), epistemology is the study of our knowledge of the world. Hammond and Wellington (2013:57) believe that epistemology refers to what we believe about how we come to know and understand the world.

### **1.11.3 Post positivism**

This approach has the element of being reductionist, logical, an emphasis on empirical data collection, cause and effect oriented and deterministic based on prior theories. The researcher viewed the inquiry as a series of logically related steps, and the acquired different perspectives from participants, and supported precise methods of qualitative data collection and analysis (Creswell, 2007:20). According to Creswell (2009:6-7) post positivism represents the thinking after positivism and hold a deterministic philosophy in which causes probably determine effects or outcomes, the problems studied post positivists reflect the need to identify and assess the causes that influence outcomes, such as found experiments. It is also reductionist in that the intent is to reduce the ideas into a small, discrete set of ideas to test, such as the variables that comprise hypothesis and research questions.

#### **1.11.4 Constructivism**

In this worldview individuals seek the understanding of the world in which they live and work. They develop subjective meanings of their experiences, meanings directed towards certain objects or things. The goal of the research is to rely as much as possible on the participants' views of the situation (Creswell, 2007:20-21). According to Hammond and Wellington (2013:91) constructivism offers a view that we are meaning makers: the world is one in which we are required to seek meaning rather than enter a world of behavioural associations. Mouton (2014:46) believes that constructivism is the doctrine that complex mental structures are neither innate nor passively derived from experience, but are actively constructed by the mind.

#### **1.11.5 Interpretivism**

In this worldview, the researcher and the social world impact on each other. Facts and values are not distinct and findings are inevitably influenced by the researcher's perspective and values. According to Thomas (2013:108), interpretivism means that the world in which the social scientist is interested in is not straightforwardly perceived because it is constructed by human beings in different ways. With words and events carrying different meanings. The method of natural sciences is not appropriate because the social world is not governed by law like regularities but is mediated through meaning and human agency; consequently, the social researcher is concerned about exploring and understanding the social world using both the participants' and the researchers' understanding (Ritchie & Lewis, 2003:17). According to Hammond and Wellington (2013:88), the goal of interpretivism research is to understand the meaning that cultural and institutional practices have for those taking part.

### **1.12 RESEARCH DESIGN AND APPROACH**

Research design is the plan to obtain research participants and collect information from them. Research design involves a set of decisions regarding what topic is to be studied, among what population, with what research methods and for what purpose (Babbie, 2011:179). According to Mouton (2014:107), research design is defined as the set of guidelines and instructions to be followed in addressing the research problem. Empirical research design was conducted to solve the problem that has been identified.

Empirical research is a way of gaining knowledge by means of direct and indirect observation or experience; it is based on observed and measured phenomena and derives knowledge from the actual experience rather than from the theory or beliefs. According to Thomas (2013:22), empirical means something that has been found out from experience, from trial and error or from the evidence of your senses. Empirical research is the production of knowledge based on experience (Maxfield & Babbie, 1995:4). The production of knowledge based on experience was very important in this study as there was not much written on the topic. The researcher used an empirical research design and went into the field, interviewed the participants and focused on the personal experience of the participants (Mouton, 2014:110).

The researcher followed the qualitative research approach. Qualitative research is a subjective study and the world is studied through the eyes of individuals, the participants tell their experience with what the researcher is researching. Qualitative research is an approach for exploring, understanding and measuring individuals or groups ascribed to a social or human problem (Creswell, 2014:4). Hammond and Wellington (2013:107) explain that qualitative research is seen as implying a concern for more inductive analysis, for exploring, explaining, uncovering phenomena and for generating new theoretical insights.

Since qualitative research is exploratory, the researcher listened to the participants to have a complete picture, based on their ideas and personal experience. By using the qualitative approach, an attempt was made to determine the use of firearm evidence in murder investigations. To obtain primary data, semi-structured interviews were conducted, the researcher had one-on-one contact with the participants and secondary data was obtained through literature review (Thomas, 2013:58).

### **1.13 TARGET POPULATION**

Bless, Higson-Smith and Sithole (2015:162) define population as the entire set of objects or people which is the focus of the research and about which the researcher wants to determine some characteristics. Babbie and Mouton (2012:173) defines population as the theoretically specified aggregation of the study elements.

Maree and Pietersen (2014:172) indicate that it is usually impossible to include the entire population in the study because of time and cost.

The population for this research would preferably be all investigators in the SAPS; however, it was impossible to conduct such a study in the wide population because of the time and the costs involved; therefore, the researcher used the target population. Babbie (2010:199) defines the study population as the aggregation of elements from which the sample is actually selected. According to Du Plooy (2013:109) and Welman, Kruger and Mitchell (2012:126), target population is the actual population to which the researcher ideally would like to make inferences based on the information contained in a sample.

This research was conducted in Gauteng Province as it was cost effective and was the province where the problem was identified. Gauteng has 143 police stations, of these 143 stations, 107 stations fall under Johannesburg and 36 stations fall under Pretoria. Gauteng is huge and therefore the researcher focused the study on Pretoria due to the fact that it is the area where the researcher resides, and the place where the problem was identified. The police stations in Pretoria are divided into six clusters. The researcher selected one station from each of the six clusters based on the 2013/2014 crime statistics and the stations that had an increase in murder cases in the previous year.

The stations with the highest cases reported per cluster were: Mamelodi East (54 cases), Temba (48 cases), Akasia (32 cases), Atteridgeville (24 cases), Bronkhorstspuit (13 cases) and Garsfontein (12 cases) in the 2013/2014 financial year. The researcher used simple random sampling to select the station. The names of the six selected stations were written down on a piece of paper and put in a box, and then the researcher closed her eyes and drew one station. The selected station was Akasia Police Station. The target population for this study was the detectives from Akasia Police Station.

The detectives at Akasia Police Station were selected as the target population as they are investigators who investigate crime that occurs in the jurisdiction of the Akasia Police Station. Akasia Police Station has 39 detectives.

The Local Criminal Record Centre (LCRC) crime scene experts from the Pretoria North (LCRC) were also included in the target group as they are the ones that attend to Akasia Police Station's crime scenes and the ballistic experts from the Forensic Science Laboratory in Pretoria were included as they examine firearm evidence. These three samples will be elaborated on below.

#### **1.14 SAMPLING**

Sampling is the selection of research participants from an entire population and involves decisions about which people, settings, events, behaviours, and/or social processes to observe (Durrheim, 2014:49). A sample is a group of elements drawn from the population that is considered representative of the population, and which is studied in order to acquire some knowledge about the entire population (Bless, Higson-Smith & Sithole, 2015:394).

Babbie (2010:191-200) and Strydom (2005:198-200) indicate that the two different categories of sampling are probability and non-probability sampling. Probability sampling is based on randomisation and each person or sample unit in the population has the probability of being selected. The techniques for probability sampling includes simple random sampling, stratified random sampling, proportional stratified sampling, cluster sampling and systematic sampling. The non-probability sampling techniques include convenience sampling, quota sampling and purposive sampling (Leedy & Ormrod, 2015:179-183).

A random sample is a sample in which each member of the sampling frame has an equal chance of being selected as a study participant (Vanderstoep & Johnston, 2009:27). The researcher used simple random sampling. Simple random sampling involves picking a certain number of participants out of the total number of possible participants in the sampling frame. In simple random sampling, a fixed percentage of the total sampling frame is selected for participation (Vanderstoep & Johnston, 2009:29).

The researcher decided to use systematic random sampling because in systematic random sampling each individual in the population has an equal opportunity of being selected (Du Plooy, 2013:110).

The sample for this study consisted of detectives from Akasia Police Station, Pretoria North LCRC crime scene experts and ballistics experts from the Forensic Science Laboratory in Pretoria. These three samples were referred to as samples A, B and C respectively.

- Sample A: Akasia Police Station has 39 detectives. The researcher conducted research on 28% of detectives. The list of the detectives was requested and the names were counted from the first and every third name on the list was selected to be used as part of the study.
- Sample B: The Pretoria North Local Criminal Record Centre consists of 41 experts and the researcher interviewed 36% of the members for this study. The name list was drawn and every second name on list was selected to form part of the study.
- Sample C: The ballistics experts at the Forensic Science Laboratory were also targeted, as they are responsible for examining the firearm evidence nationally. There are 63 ballistic experts at the laboratory and the researcher conducted the study on 20% of the experts. The name list of the ballistics experts was drawn and every fourth name on the list was selected.

During the sampling process, the researcher experienced challenges because some of those who were supposed to be part of the study were either on leave, transferred, out on duty or had a high volume of work and could not be part of the study. In such instances, the following name on the list used in the simple random sampling was then selected to be part of the study.

### **1.15 Data Collection**

Data collection refers to the methods used to collect information. Creswell (2014:189) states that the data collection steps include setting the boundaries for the study; collecting information through unstructured or semi-structured observations and interviews, documents, and visual materials as well as establishing the protocol for recording information. The researcher used literature and interviews as data collection techniques to ensure the trustworthiness of the findings. The researcher used the following methods to collect data for this study.

### **1.15.1 Literature study**

The purpose of conducting a literature study is to find out what has been done in the particular field of study (Mouton, 2014:119). Bless, Higson-Smith and Sithole (2015:49) and Mouton (2014:119-120) believe that the purpose of a literature study is for the researcher to determine and acquaint him/herself with the publications on major research already conducted in the field. A review of previous research provides guidelines on the design of one's own project and it provides useful definitions of key concepts.

Bless, Higson-Smith and Sithole (2015:49-50) believe that literature review is also conducted to identify gaps in knowledge as well as weakness in previous studies, to identify variables that must be considered in research as well as those that might be irrelevant, and to study the advantages and disadvantages of the research methods used by others in order to adopt or improve on them in one's research. Fouché and Schurink (2017:302) indicate that literature review provides the current state of knowledge regarding the research problem and assists the researcher to learn how others have delineated similar problems.

Welman and Kruger (2001:33) mention a few types of literature searches as previous research, journal articles, existing literature and tracing and recording of relevant literature. Welman, Kruger and Mitchell (2012:39) also indicate that libraries are no longer the only sources of information. According to Leedy and Ormrod (2014:52), information can be found in journals, newspapers, government publications, conference presentations and internet websites. The researcher also used the internet to access literature on this study.

Fouche and Delport (2005:128) indicated that internet not only saves time, but also serves as an information service that is available day and night. Kumar (2011:37) also agrees and states that the Internet has become an important tool for finding published literature. Fouche and Delport (2017b:140) state that a variety of sources of information can be used by researchers as part of in-depth literature review, any source relevant to the research subject or research question can provide the researcher with information.

The researcher visited the library in search of the literature related to the study and it was found that there is limited literature with the same topic as the study. In order to obtain information on the literature, the research topic was divided into the following concepts: firearm evidence, forensic science, the role of forensic science in the investigation of crime, criminal investigation, crime scene and murder.

### **1.15.2 Interviews**

According to Hammond and Wellington (2013:91), interviews can be defined as conversations between the researcher and the participants, interviews involve making explicit the rules of the conversations: what is being discussed, for how long and the roles each party is expected to take. Qualitative interviews allow the researcher to pursue issues in-depth and give the participant more freedom to direct the flow of conversation (Babbie & Benaquisto, 2010:342). According to Nieuwenhuis (2014:87), the aim of qualitative interviews is to see the world through the eyes of participants. Qualitative interviews are used to obtain rich descriptive data that will help the researcher to understand the participant's construction of knowledge and social reality. The researcher used interviewing as another method of data collection. It is a commonly used method of collecting information from people (Kumar, 2011:109).

The researcher conducted semi-structured interviews to gain a detailed picture of the participants' beliefs, perceptions or accounts for a particular topic. Semi-structured interviews are commonly used to corroborate data emerging from the other data sources, the participants answer a set of predetermined questions and it allows for probing and clarification of answers (Nieuwenhuis, 2014:87). Semi-structured interviews gave the researcher and the participants more flexibility as the researcher was able to follow up interesting avenues that emerged in the interview and the participants were able to give a fuller picture. The researcher used different interview schedules for the different samples and the copies of the interview schedules for sample: A, B and C are attached as follows: Annexure A for sample A, Annexure B for sample B and Annexure C for sample C.



The questions for the interview schedule were generated from the research aim and the research questions. Leedy and Ormrod (2015:128) state that a researcher may conduct a pilot study in order to test the measurement instruments, methods of analysis and the procedures. The interview schedule was piloted in order to refine and assess the phrasing of the questions and to recheck the suitability of the questions asked, this was also done to ensure that the correct questions were asked to the correct participants.

Welman, Kruger and Mitchell (2005:148) state that when a new instrument is developed, it is useful to test it out before administering it. The purpose of the pilot study is to detect possible flaws in the measurement procedure and to identify and unclear ambiguously formulated items. To determine the feasibility of the interview schedule a pilot study was conducted. The identified shortcomings were corrected and the draft interview schedule was sent to the supervisor for reading and approval. The interview schedule was tested on three different people representing the three types of samples in the conducted study (detectives, LCRC members and the ballistic experts).

The samples were represented as follows in the pilot study: the detective was from Garsfontein police station, the LCRC member was from the GaRankuwa Cluster and ballistics was represented by a member who is on duty arrangement from the ballistics section to a different unit within the SAPS. There is no technique that was used to identify the people to be tested but it depended on their availability and willingness to assist in this study. The pilot study was conducted on people that were not among the participants in the research.

The researcher conducted interviews as per the guidelines provided by Leedy and Ormrod (2015:282-285). In terms of these guidelines, the following was done:

- **Identify general interview questions in advance**

The researcher used the research questions and aim as a guide in the development of an interview schedule. The interview schedule consisted of open-ended questions.

- **Consider how participants' cultural background might influence their response**

Participants' cultural background can influence their responses. The researcher was sensitive to the fact that culture may play a role in how the participants interpret and respond to the interview questions.

- **Make sure the sample includes people who will give you the kind of information you are seeking**

The researcher interviewed different participant groups in order to get different perspectives and perceptions on the topic being researched. The researcher interviewed the investigating officers, the members from the LCRC and the ballistics experts from the Forensic Science Laboratory.

- **Find a suitable location**

The interviews were conducted in the participants' offices as it was quite and the participants were comfortable in their own spaces.

- **Get written permission**

The researcher was granted permission to conduct research from the SAPS. During the interview process, the researcher explained the nature of the study and the plans for using the results to the participants. The researcher obtained written consent from the participants indicating that they are participating in the research of their own free will and they can withdraw from the interview at any given time.

- **Establish and maintain rapport**

The researcher showed genuine interest in what the participants had to say and was courteous and respectful at all times.

- **Don't put words in people's mouths**

The researcher allowed the participants to say what they wanted to say in the way they wanted to say it. The researcher listened and allowed the participants to choose their own way of expressing their thoughts.

- **Record responses verbatim**

During the interview, the researcher was writing down the responses of the participants and recording the conversations electronically. The researcher captured everything that was said in the interviews.

- **Keep your reactions to yourself**

The researcher did not show any reaction to the responses of the participants, and did not show any signs of surprise, agreement or disapproval of what the participants were saying.

- **Remember that you are not necessarily getting facts**

The researcher always treated the participants' responses as perceptions and opinion rather than facts.

## **1.16 DATA ANALYSIS**

Hammond and Wellington (2013:9) define analysis as the breaking down of a topic or object into its components parts and understanding how the parts fit together. The intent of data analysis is to make sense out of text and images, which involves segmenting and taking apart data as well as putting it together (Creswell, 2014:195). Durrheim (2014:52) agrees and states that the aim of data analysis is to transform information into an answer to the original research question. To analyse the data, the researcher captured all the raw information collected and the information was read in detail and then grouped into categories. Themes were identified in order to get more meaning (Leedy & Ormrod, 2014:143-144).

According to Creswell (2009:183), the process of data analysis involves making sense out of text and image data. It involves preparing the data for analysis, conducting different analysis, moving deeper and deeper into understanding the data, representing the data, and making an interpretation of the larger meaning of the data. Leedy and Ormrod (2015:309) state that in qualitative data analysis, data is closely analysed to find meanings that lie within them. Furthermore, Leedy and Ormrod (2015:315) indicate that the data analysis spiral as explained by Creswell (2013) best describes and offers perspective on how qualitative data analysis can be conducted.

For this study, the researcher used Creswell's data analysis spiral as explained by Leedy and Ormrod (2015:315). The data analysis spiral phases were followed as discussed below:

- The researcher organised and prepared the data for analysis by typing up field notes, and transcribing the interview recordings. Welman, Kruger and Mitchell (2012:211) state that preparing field notes and transcripts involves converting the notes into write ups that can be read, edited, commented on and analysed.
- The researcher read and reread the data to in order to understand the data, to obtain the general sense of the information, and to understand the general ideas that the participants are giving. Bless, Higson-Smith and Sithole, (2015:342) state that a fundamental step in qualitative data analysis is the immersion in data, in this step the researcher reads and rereads the collected data in order to create a mental picture of the entire data set. The researcher will also gain ideas on how to categorise data.
- The data was broken down into fragments or categories which share some common characteristics. Bless, Higson-Smith and Sithole (2015:342) and Creswell (2009:186), refers to this process as coding and describes coding as the process that involves organising the collected data into segments or breaking up the original transcripts and classifying all the fragments into various categories before bringing meaning to the information. Bless, Higson-Smith and Sithole (2015:342) further indicate that the codes are often developed by looking for themes and patterns within the data.
- The identification of categories and themes was followed by the researcher integrating and summarising the data. The narrative passages and tables were used to convey the findings of the analysis (Creswell, 2009:189; Leedy & Ormrod, 2015:315).

From the interviews with sample A (investigating officers), the following information was gathered from the 11 participants: four participants have been investigating officers for periods of between one and five years, six participants have been investigating officers for a period of between five and 10 years and one participant has been an investigating officer for more than 10 years.

When asked if they were involved in investigations of murder cases, two participants responded yes and nine responded no. All the participants have undergone the basic detective programme.

The background of sample B's (LCRC members) 15 participants are as follows: when asked what their current position is, two participants indicated that they are criminalistics experts (one warrant officer and one captain), two are forensic analysts (warrant officers), seven are fingerprint experts and crime scene examiners (constables), two indicated that they are crime scene examiners (warrant officers), one participant indicated that he is a crime scene expert and one participant indicated that he is AFIS expert (warrant officer). To the question of how many years they have been in their current position, participants responded as follows: five indicated between one and five years, six indicated between five and 10 years and four participants indicated more than 10 years' experience.

As to the courses attended related to their specific field, participants completed several courses: 13 indicated that they have completed the basic photography and videography course, 10 indicated that they have completed the basic fingerprint comparison course, 13 participants indicated that they have completed the advance crime scene course, seven participants completed the deoxyribonucleic acid (DNA) recovery course, one participant completed the advanced crime scene photography course, one participant completed the plan drawing course, one completed the fingerprint recovery course.

Four completed the crime scene management course, two participants completed the fingerprint expert status course, two completed the forensic training course, one completed the introduction to basic fingerprinting for police course, one participant completed the cyanoacrylate course, one participant completed the fluorescent powder and fluorescent light course, one participant completed the fingerprint laboratory course, one participant completed the identification course, one participant completed the forensic evidence identification and collection course, one completed the explosives identification course.

One participant completed the programme on attending complaints, one participant completed the forensic analysis for LCRC personnel course, one participant completed the blood stain analysis course and one participant completed the basic management learning programme.

The background of the 13 sample C (ballistics experts) participants interviewed was as follows: four participants indicated that they are senior forensic analysts and nine indicated that they are forensic analysts. To the question of how many years they have in their current occupation, two participants indicated between one and five years and 11 indicated between five and ten years in the ballistic environment. As to courses related to their specific field that they have attended, participants have completed several courses: all 13 participants indicated that they have undergone the ballistics in-house training that consists of 12 modules over a period of three years.

Four of the participants indicated they have completed the crime scene analysis/examination course, five completed the blood spatter and pattern analysis course, three completed the firearm mechanism and identification course, one completed the advance shooting incident reconstruction course, two completed the shooting reconstruction course and one completed the presentation course.

### **1.17 METHODS TAKEN TO ENSURE VALIDITY**

According to Babbie (2010:153), validity refers to the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration. Validity concerns the accuracy and precision of the data, it also concerns the appropriateness of the data in terms of the research question (Denscombe, 2011:298). The researcher used literature and interviews as sources of information for this study. To enhance validity, the researcher also conducted pilot interviews in order to check and determine obvious and possible weakness in the interview schedule as the instrument used to collect information during interviews (Leedy & Ormrod, 2014:94).

Information was gathered from interviews and specific books and journals in the relevant subject field to ensure that information was gathered from reliable and valid sources. All interpretations, analysis and conclusions were made based on the data gathered from the literature and interviews as explained by Mouton (2014:110-111).

### **1.17.1 Credibility**

Qualitative study explores perceptions, experiences, feelings and beliefs of people. Participants were best placed to determine whether the research findings reflected their opinions and feelings accurately. Credibility is synonymous to validity in quantitative research, and is judged by the extent of participant concordance. Researchers take their findings to those who participated in research for confirmation, congruence, validation and approval. The higher the outcome of these, the higher the validity of the study (Kumar, 2011:185). According to Denscombe (2011:299), credibility concerns the extent to which qualitative researchers can demonstrate that their data is accurate and appropriate.

To ensure credibility of this study the researcher drew on the following validation strategies as outlined by Creswell (2014:200), namely:

- **Triangulation** refers to the use of more than one approach to the investigation of a research question. The researcher used different sources of information by examining evidence from the sources and used it to build a coherent justification for the themes that emerged. The converging of several sources and perspectives of participants added value to the credibility of this study.
- **Member checking**, the researcher also determined the accuracy of the findings by taking the preliminary findings of the members and themes that emerged back to the participants to provide them with the opportunity to comment on the findings in order to determine whether the participants feel they were accurate.
- **Prolonged time in the field**, the researcher spent extended time in the field to develop an in-depth understanding of the phenomenon under study that enabled her to convey details about the participants that gave credibility to the narrative description.

### **1.17.2 Transferability**

Transferability refers to the extent to which the results apply to other, similar situations (Bless, Higson-Smith & Sithole, 2015:237). Hammond and Wellington (2013:80) and Kelly (2014:381) refer to transferability as generalisability, and they indicate that generalisability or transferability refers to the extent to which the interpretative account or the consequences of one action can be applied in the other contexts other than the one being studied. The researcher used rich, thick description to convey the research findings by describing in detail the participants' responses to the interview questions by providing verbatim quotations. Comprehensive details of general ideas ensured interconnecting of the details. This description gave the discussions an element of shared experiences. Such detailed descriptions will allow readers to make decisions regarding the transferability of the findings.

### **1.18 METHODS TAKEN TO ENSURE RELIABILITY**

According to Denscombe (2011:298), reliability refers to the same research instrument that would produce the same results on different occasions (all things being equal). It refers to whether the instrument is neutral in its effect and is consistent across multiple uses. Reliability relates to the methods of data collection and concerns that they should be consistent and not distort the findings, it entails evaluation of the methods and the techniques used to collect the data (Denscombe, 2002:100). Babbie (2010:150) and Durrheim and Painter (2014:152) indicate that reliability refers to the dependability of a measurement instrument; that is the extent to which the instrument yields the same results on repeated trials. The researcher described how the data was gathered, analysed, and how the sampling was done.

According to Henning, Van Rensburg and Smit (2011:33-34), in order to accurately report the findings of the research, the researcher needs to have a comprehensive understanding of the methods and methodologies, must have the recent literature and needs to know the empirical field and the site where the study will unfold. The researcher interviewed participants who conduct criminal investigations at the Akasia Police Station, crime scene investigators from the LCRC and ballistics experts who specialise in examining firearm evidence.



The main aim of interview data is to bring to our attention what individuals think, feel, do and what they have to say, giving the researcher their subjective reality in a formatted discussion which will be guided and formatted by the interviewer and later integrated into a report (Henning, Van Rensburg & Smit, 2011:52). The interviews were recorded and written down to provide a proper record for analysis and were structured in such a manner that similar kinds of information were obtained about each participant to ensure consistency, and the same questions were put to all the participants.

The researcher also ensured confidentiality and anonymity by conducting the interviews in private, which gave the participants the opportunity to express themselves freely. The researcher did not make use of leading questions or influence the answers of the participants in any way. All literature that was used throughout this research report was acknowledged. The literature study and semi-structured interviews ensured the richness of data.

#### **1.18.1 Dependability**

Dependability demands that the researcher follows a clear research strategy and the researcher must indicate that each step has been thoroughly completed (Bless, Higson-Smith & Sithole, 2013:237). To ensure dependability in this study the researcher kept a detailed record of research procedures in order for others to follow the same procedures. Participants' responses were recorded and written down. The researcher also verified transcripts to ensure they accurately reflected participants' responses.

#### **1.18.2 Conformability**

According to Bless, Higson-Smith and Sithole (2013:237), conformability requires that if the same research is conducted under the similar context and similar research process by a different researcher, the researcher should be able to come up with similar results. To ensure conformability in this study, the researcher kept a detailed record of the research process followed to ensure that the interpretation of the findings, the recommendations and conclusions made can be traced to their sources.

## **1.19 ETHICAL CONSIDERATIONS**

Research should be based on mutual trust, acceptance, cooperation, promises and well accepted conventions and expectations between all parties involved in the research project. According Bless, Higson-Smith and Sithole (2013:28-29), research ethics relates to whether behaviour conforms to the code or a set of standards. The purpose for research ethics is to minimise the risk to the research participants. Participants should be treated in a humane and sensitive manner. This means that researchers have the right to conduct their studies but they should not do so at the expense of the rights of the participants.

Therefore, ethics is a set of moral principles which is suggested by an individual or group and is subsequently widely accepted, offering rules and behavioural expectations about the most correct conduct towards experimental subjects, participants, employers, sponsors, other researchers, assistants and students. Leedy and Ormrod (2014:106) caution that it is the responsibility of the researcher to look at the ethical implications of their proposed study whenever human beings are the focus of the study.

Strydom (2015:113) states that research should be based on mutual trust, acceptance, cooperation, promises and well accepted conventions and expectations between all the parties involved in a research project. Strydom (2015:114) says that ethics is a set of moral principles which is suggested by an individual or group, is widely accepted, and which offers rules and behavioural expectations about the correct conduct towards experimental subjects and participants, employers, sponsors, other researchers, assistants and students. The researcher has studied and familiarised herself with the University of South Africa (Unisa) policy on research ethics and has adhered to the Unisa ethical considerations in this research. The researcher was guided by the policy on research ethics of the UNISA (University of South Africa, 2007:7). The researcher adhered to the following ethical guidelines during this study as stipulated in Leedy and Ormrod (2014:106-111).

### **1.19.1 Protection from harm**

The researcher ensured that the participants were not exposed to any physical or psychological harm. The participants were protected from harm by keeping their identity anonymous, the researcher treated the participants with dignity and respect and the interviews were conducted in a safe environment where the participants were free and comfortable.

### **1.19.2 Informed consent**

The researcher informed the participants about the type, nature and purpose of the research. The researcher informed the participants that participation in the study is voluntary and that they could expect no special rewards or incentives. The participants signed consent forms to indicate that they were not forced to participate in this study. A blank copy of this agreement is attached as Annexure D. Participants were also informed that they were free to withdraw from participating in this study at any time and they were not obliged to give any explanation for the withdrawal.

### **1.19.3 Right to privacy**

The participants' right to privacy was respected at all times by ensuring that the participants' responses were kept confidential and no other person except the researcher was aware of how the individual participants responded or behaved during the interviews. The participants' responses were also not made available to anyone other than the researcher and the data collected from the participants was kept safe at all times. The participants were also not referred to by their names but were given numbers to identify them. The right to privacy of the participants was respected and maintained at all times.

### **1.19.4 Approval to conduct research**

The researcher was granted approval to conduct research by the SAPS research committee prior to the research being conducted. The SAPS National Instruction 1/2006, which regulates research within the SAPS, was also taken into account. The official letter of approval to conduct research is attached as Annexure E. In addition to SAPS approval, the researcher was also granted approval to conduct research by the Unisa Ethics Committee, the official Unisa College of Law Ethics Committee letter is attached as Annexure F.

## **1.20 RESEARCH STRUCTURE**

**Chapter 1:** General orientation. This chapter provides a general orientation of the study and the research methodology that was used.

**Chapter 2:** This chapter focused on the role of forensic science in the investigation of crime. The following topics are covered under this chapter: criminal investigation, objectives of criminal investigation, forensic science, forensic science laboratory (FSL), the role of forensic science in investigation of crime, the division Forensic Services (FS), firearms investigations and firearms.

**Chapter 3:** This chapter focused on the use of firearm evidence in murder investigations. This chapter covers the following topics: the meaning of physical evidence, Locard principle, identification, individualisation, continuity of possession, contamination of evidence, the meaning of crime scene, firearm evidence, the type of firearm evidence found on a murder crime scene, the procedure to collect firearm evidence on a crime scene, how firearm evidence can be used in the investigation of murder, the value of crime scene reconstruction in a murder case and the requirements for firearm evidence to be admissible in court.

**Chapter 4:** Findings and recommendations. This chapter outlines the findings of the study, recommendations and conclusions.

## CHAPTER 2

### THE ROLE OF FORENSIC SCIENCE IN THE INVESTIGATION OF CRIME

#### 2.1 INTRODUCTION

“Survivor shocked as gunmen are acquitted” ( Star, 2016:14). Two years ago (in the year, 2014) there was a shooting at the Windmill Park taxi rank in Boksburg where two gunmen shot indiscriminately. The victims were shot multiple times and four died at the scene. Subsequent to the incident, two suspects were arrested and charged with four counts of murder, and one count of attempted murder. When the accused appeared in court, they were both acquitted on all charges (Koko, 2016:14). The survivor of the shooting feels that the justice system has failed the families of the victims.

TV shows such as *CSI* simplifies the scientific process and procedures involved in forensic investigation. This has given many people an inaccurate picture of forensic science and has created unrealistic expectations of forensic science among the public and the legal community (Saferstein, 2013:4). Contrary to television shows where one character gathers evidence from the crime scene; questions witness; analyses evidence in the laboratory and arrests the suspect, in real life these duties are performed by different individuals from different units with different specialisation, knowledge and expertise (Watkins, 2013:107).

The researcher has observed that in most cases the first to arrive at the scene are the uniform members, followed by detectives, crime scene investigators and then a forensic scientist. The forensic scientist arrives after a lot of work has been done and sometimes they arrive when the evidence has been packaged and prepared for submission to the laboratory. De Forest, Gaensslen and Lee (1983:18) emphasise that irrespective of the division and responsibility, everyone has an important role to play. The value of the results of the overall process is dependent upon all participants doing their part while being aware of the responsibilities and capabilities of the others.

Anderson (2013:174-175) indicates that during the commission of a crime, the perpetrator may either transfer something (trace evidence) to the crime scene or take something from the crime scene. This trace evidence can be analysed to link the victim with the suspect and the scene and to help identify or eliminate the suspect. Lushbaugh and Weston (2012:9) believe that the collection and analysis of the physical evidence using scientific methods is forensic science. Saferstein (2011:4) describes forensic science as the science that is applied in the criminal justice system to enforce criminal and civil law. Forensic science is that part of science applied to answering legal questions. It is the examination, evaluation and explanation of physical evidence in law (Swanson, 1996:253).

As indicated in the annual report (SAPS, 2013/2014:226), the mandate of Forensic Services is to support the investigation of crime by contributing towards the effective and efficient functioning of the Criminal Justice System (CJS) in South Africa. The efforts of Forensic Services cannot only be to prove the guilt of a person but also to exonerate the innocent. It is further indicated in the SAPS Annual Report 2013/2014 that Forensic Services plays a critical role towards the realisation of the SAPS strategic objectives by contributing to the successful prosecution of crime, by investigating; gathering and analysing evidence, thus increasing the detection rate of prioritised crime categories. Successful investigation and prosecution of crime depends on physical evidence.

This chapter will endeavour to answer the first research question, namely: "What is the role of forensic science in the investigation of crime?" as reflected in paragraph 1.6 of Chapter 1. This chapter discusses the meaning of forensic science, outlines the objectives of forensic science, Division Forensic Services and role of forensic science in the investigation of crime and this leads into the discussions of the role of LCRC in the investigation of crime, the criminal record and crime scene management. The researcher further explains the role of FSL in the investigation of crime and discusses the meaning of criminal investigation. The chapter concludes with a discussion on the objectives of criminal investigation.

## **2.2 FORENSIC SCIENCE**

Forensic is defined as any science that is used in the service of the justice system in both civil and criminal cases (Jackson & Jackson, 2008:1). Dempsey (2003:120) and Swanson (1996:253) on the other hand define forensic science as science applied to solve legal problems, they further point out that science is applied during examination, evaluation, and explanation of physical evidence related crimes. Forensic science involves the use of scientific methods to analyse physical evidence. Fisher, Tilstone and Woytowicz (2009:12) and Lushbaugh and Weston (2012:9) define forensic science as the use of science to solve criminal cases. This indicates that forensic science is used when there is a legal problem that needs to be solved scientifically. Scientific techniques are applied in collecting and analysing physical evidence.

Forensic science will be applied where normal investigations cannot yield the desired results, as there is a need to apply science to solve the case. Jackson and Jackson (2004:1) indicate that science is important because it has the ability to provide reliable information to the case being investigated, and information that it supplies cannot be obtained by any other means.

Vanderkolk (2009:2) on the other hand contends that forensic science is the science of comparing one object to the other for the purposes of potential inquiry by the court of law or a forum of organised debate. He further explains science as the process of knowing and believing truth; and the process of operating under general laws about the reality of the phenomenon within the universe by observing nature, forming questions about nature and answering those questions. The questions and answers are then challenged and tested with more questions and answers, and those answers accumulate into knowledge and the knowledge is shared among the communities of those who are interested (Vanderkolk, 2009:2). Vanderkolk (2009:7) continues and indicates that “forensic science is the search for the objective understanding of objects and their relationships to other objects within an aggregate of knowing and believing.”

Science also has a subjective component because the scientists study relationships within experiences, understandings and the judgment of the community of scientists 'experiences of objects relationship to objects'. It was indicated that subjectivity is involved once the scientist does the observing and judging from the human perspective. The courts do not independently know the objective relationship between the two objects until it trusts on the judgment of the experts. The scientist observes and comparatively measure the objects and judge the images of what is known within the community of scientists and from his or her own point of view. Forensic science is therefore objective as well as subjective (Vanderkolk, 2009:7).

Houck and Siegel (2010:1-2) explain that forensic science is the science of associating people, places, and things involved in criminal activities. This scientific discipline assists in the investigation and the adjudicating of both criminal and civil cases. Houck and Siegel (2010:2) breaks down forensic science further and explains that science is the collection of systematic methodologies used to understand the physical world. Houck and Siegel (2010:2) further indicate that the word forensic was derived from the Latin word *forum* meaning public, these authors furthermore indicated that together forensic science is the appropriate term for the profession which answers scientific questions for the courts.

Stelfox (2009:130) indicates that the word forensic means relating to courts or to the law. Forensic science in relation to criminal investigation is the techniques of biological or physical science used during criminal investigation or interpretation of evidence. The basis of most facets of forensic science is the rationale of Locard Edmond that states that where there is contact between two people there will be exchange of material. Stelfox (2009:136) further indicates that the application of science and technology to interpret this material (physical or biological) is forensic science. Biological material includes bodily fluids (blood, urine, semen, and saliva), hair and cells. Whereas physical evidence may include glass, fibers, paints, and impressions left on material such as writing, tool marks, footwear marks and fingerprints.



Saferstein (2011:4) also alludes that forensic science is when science is applied in the criminal justice system to enforce criminal and civil laws. Saferstein (2011:4) further indicates that forensic science includes different professions that use their skills to assist investigations. Osterburg (1992:21) indicates that criminalistics and forensic medicine are the two major branches of forensic science; he indicated that criminalistics is that branch of forensic science that is concerned with scientific examination, recording and interpretation of the details found on physical evidence. Forensic science is the application of scientific methods in the investigation of crime and specific examination of physical exhibit material. The basis of most facets of this field is the Locard principle that states that every contact leaves a trace (*Forensic science laboratory ...*, c2014d).

Lyle (2008:4) indicates that forensic science relates to the use of science in the investigation of criminal activity and the analysis and presentation of evidence before the court. Brown and Davenport (2012:4-7) believe that forensic science is the application of science to law and that the scientist relies on scientific methods for processing and evaluating the evidence. They further indicate that scientific methods are logical steps used to solve the problem and are used to collect and observe the evidence found at the crime scene.

Forensic science encompasses pathology, toxicology, physical anthropology, odontology, psychiatry, questioned documents, firearms, tool mark comparison and serology amongst other fields. One of the branches of forensic science is criminalistics, which deals with the study of physical evidence related to a crime (Swanson, 1996:253). Criminalistics deals with physical evidence recognition; identification; individualisation and evaluation. Criminalistics is one of the branches of forensic science and it includes pathology; toxicology; physical anthropology; odontology; psychiatry; questioned documents; ballistics; tool work comparison and serology (Dempsey, 2003:120).

Osterburg and Ward (2010:21) believe that forensics depicts the scientific examination of evidence. The two major branches of forensic science are criminalistics and forensic medicine, the criminalistics branch consists of drug analysis; instrumental chemistry; firearm and tool marks; questioned documents; fingerprints/footprints, lip prints; photography; forensic biology, DNA;

trace evidence; imprint evidence; digital evidence and crime scene reconstruction. Forensic medicine on the other hand comprises of anthropology; serology; toxicology; odontology and psychiatry (Osterburg & Ward, 2010:21).

De Forest et al. (1983:4-6), explains that forensic science includes forensic medicine; odontology; anthropology; psychiatry; toxicology; questioned documents examination and firearm; tool mark and fingerprint examination as well as criminalistics. It is further indicated that criminalistics is concerned with recognition, identification, individualisation and evaluation of physical evidence using the methods of natural sciences in matters of legal significance. According to Du Preez (1996:11), the criminalistics technique includes scientific investigations by police experts in respect of dactyloscopy, ballistics, investigation of disputed documents, tool imprints, erased numbers and hair investigations.

From the consulted literatures above, it can be concluded that the two branches of forensic science include forensic medicine and criminalistics. Forensic science represents the application of knowledge and methodology in different scientific disciplines towards the resolution of legal dispute. The approaches employed are case driven and the practitioners must evaluate whether the problems need to be addressed in evidence analysis and utilise the most appropriate scientific methodology (Ubelaker, 2013:1).

The participants from samples A, B and C were asked the question: What do you understand about the term forensic science? This was an open-ended question and there were no choices provided for the participants to choose from. The participants provided their own answers and some gave more than one answer. The participants had varied answers to the question. The participants from sample A responded as follows:

- One participant referred to forensic science as the study of evidence by experts.
- Five participants indicated that forensic science involves the analysis of exhibits such as DNA, saliva, blood samples, fingerprints, ballistics and blood samples.
- One participant said that is where they test firearms and test cartridge/bullet in murder case and also when somebody has been poisoned, and analysis of dagga and drugs.

- One participant indicated that forensic science identifies perpetrators or the owners of the firearm as well as DNA of who is involved.
- One participant indicated that forensic science is the collection of evidence that is not visible to the human eye, evidence that you cannot see or touch but you can collect through forensics.
- One participant referred to forensic science as forensic analysis, forensic investigation, investigation that can only be done by means of forensic investigation.
- One participant did not provide a response.

The participants from sample A gave varied responses, some of which are relevant. The consulted literature (Lyle, 2008:4) indicates that forensic science is the use of science in the investigation of criminal activities, the analysis and presentation of evidence in court. Literature (De Forest et al, 1983:4-6; Swanson, 1996:253) states that physical evidence deals with evidence recognition, identification, individualisation and evaluation. Based on the examples provided by the participants in their responses, it is evident that the investigators are only using biology, fingerprint examination and firearm examination and not using all the branches of criminalistics as indicated by Osterburg and Ward (2010:21) who said that the criminalistics branch consists of drug analysis; instrumental chemistry; firearm and tool marks; questioned documents; fingerprints/footprints; lip prints; photography; forensic biology; DNA; trace evidence; imprint evidence; digital evidence and crime scene reconstruction. The participants have partial knowledge of what forensic science is and the researcher believes that if the investigating officers can use all the different branches of criminalistics in their investigations, there will be more convictions in the courts of law.

Sample B answered as follows:

- Three participants referred to forensic science as the collection of evidence such as DNA and blood, from the crime scene.
- One participant said it is the study of biological stuff/evidence that we get from the scene.
- One participant said it is a study to process the scene to find the hidden clues.

- One participant said that it is the study of collecting evidence by using advanced methods.
- One participant said that forensic science is all the stuff that you cannot see with bear eyes, it has to do with analysing certain stuff, like firearms and to document things done to get evidence information.
- One participant said it is fingerprint investigation at the crime scene and forensic lab, biology, ballistics and other related things like questioned documents and scientific analysis.
- One participant said it is forensic methods used, scientific methods for tracing evidence such as DNA evidence, ballistic evidence, questioned documents, biological evidence.
- One participant said is the way of investigating using scientific methods of modern day equipment e.g. shifting from using powders and manual to the newer methods.
- One participant said it is the processing of crime scene that occurred, the analysis made at the crime scene and the analysis of objects until there is judgment in court.
- One participant said is something that you apply at the crime scene, finding unknown suspect/s using evidence that you found at the crime scene.
- One participant said it is the employment of searching methods of “every contact leaves a trace” to resolve a crime.
- One participant said it is a huge field that does everything that involves a crime scene from fingerprints to exhibit, photography, anything that you can find from the crime scene.
- One participant said conducting forensic investigation.
- Two participants did not provide a response.

From the participants’ responses it can be noted that the participants were more practical in their definition of forensic science, the participants explained more about how science will be applied in solving crime unlike in the definition of forensic science as provided in the different literature which only indicated that forensic science is the application of science in solving legal problems.

The participants in their explanation referred to forensic science as the process where evidence identified at the crime scene will be collected, studied and analysed using scientific methods. The participants from sample B had a fair understanding of forensic science.

The responses of sample C are as follows:

- One participant said it is the application of science in law.
- One participant said it is the gathering of information so that it can help in the court of law.
- One participant said it is scientific evidence used for legal process, investigation for court purposes.
- One participant said it is the science of forensic.
- Four participants referred to forensic science as the study: Forensic science is the study of projectile in motion (one participant), the study of bullets (one participant), the study of forensic evidence (one participant) and the study with regard to crime which has been committed in order to get scientific results to solve a specific crime, it is also a scientific tool to resolve specific crime to solve crime scientifically (one participant).
- One participant said it is about the application of scientific methods and processes to solve crimes; it is about the interpretation of scientific data.
- One participant said it is the knowledge that we gain while in the lab when performing our duties.
- One participant said it is a field that is scientifically based, relating to normal policing area, to see if a crime was committed, it includes fingerprint investigators at the scene, investigations that need a lab, things that cannot be done in the field.
- One participant referred to forensic science as the field that deals with foreign evidence, something that is beyond layman to understand which needs skills, knowledge and experience.
- One participant referred to forensic science as the field that aids the police to reduce crime whereby they need evidence that needs to be proved using scientific techniques.

The participants' responses were compared with the views of the authors consulted above. Participants responses though worded differently are not too far from the literature consulted. The participants are generally in line with the literature on what forensic science entails. Both the literature and the participants indicated that forensic science is where scientific techniques and methods are applied to solve criminal cases. Participants are in line with the authors (Dempsey, 2003:120; Fisher et al., 2009:12; Lushbaugh & Weston 2012:9; Swanson, 1996:253) when they refer to forensic science as the application of science to solve legal problems.

One of the participants referred to forensics as the knowledge gained while performing their duties in the lab. This participant is in line with Vanderkolk (2009:2) where he indicated that science is the process of knowing and believing the truth and operating under law and forming questions and answers that will accumulate into knowledge. As the participant (from ballistics) indicated, forensic science is knowledge gained during the performance of one's duties.

Vanderkolk (2009:2) indicated that knowledge is important in order for it to be shared among the communities of those who are interested and to share it with the courts while presenting evidence. One participant indicated that forensic science is about the application of scientific methods and process to solving crimes, it is about the interpretation of scientific data, application of science in law. The participants have a fair knowledge of forensic science.

### **2.3 OBJECTIVES OF FORENSIC SCIENCE**

Stelfox (2009:131) alludes that the objective of forensic science is to locate, gather and interpret material for investigation, he further indicates that very often the objective will be to determine if a particular suspect is connected with the offence. The purpose of forensic investigation is to scientifically investigate evidence and to determine how perpetrators can be brought before a court of law (Benson, Jones & Horne, 2015:11). The objective of forensic science is to present reliable analysis of the evidence that will stand scientific attacks. Forensic science analysis must help the court to ensure that the guilty receive punishment and that the innocent remain free (James & Nordby, 2005:3).

Osterburg (2010:22) outlines the purpose of forensic science as to: identify a substance, object or the instrument; establish a connection between physical evidence, victim, suspect and the potential crime scene; reconstruction of how the crime was committed and how the event transpired when the crime was committed; the analysis of blood stain patterns (location, size, shape and distribution) or to determine the trajectory of the bullet or the gun to the target range and to protect the innocent by developing evidence that may exonerate the suspect and to provide expert testimony in court. Rodivich (2012b:100) believes that the objectives of forensic science include the identification of unknown substances, linkage of items and persons to the crime scenes and the reconstruction of the sequence of events during the commission of the crime.

According to Jackson and Jackson (2011:3), the objectives of forensic science are the establishment of links between the suspect, victim and the crime scene, based on the Locard exchange principle that every contact leaves a trace; the comparison of similar items of trace evidence recovered to establish whether there is a connection between the two; forensic science can also provide information that corroborates or refutes the information given by the other sources and forensic science is also concerned with the establishment of suspects.

Eckert and James (1997a:33-34) explain that the objectives of forensic science are to examine physical evidence associated with crime scene, victims and suspects. They further outline that the physical evidence may be utilised in forensic investigations in order to define the elements of crime; provide investigative leads for a case; linking a crime scene or victim to the suspect; corroborating or refuting suspects alibi or statement; identification of the suspect; inducement of a confession from a suspect; exonerating the innocent and providing expert testimony in court.

The participants of this study, sample A, B and C, were asked: in your opinion what are the objectives of forensic science? This was an open-ended question where the participants could either give one or more answers to the question. Some of the participants provided more than one answer. The participants' responses are indicated below:

The participants' responses for sample A are as follows:

- Two participants indicated that the objective of forensic science is to give expert evidence in court.
- Two participants indicated it is to collect evidence from the crime scene.
- One participant said it is to analyse and examine evidence.
- One participant said it is to help with investigation.
- One participant said it is to identify.
- One participant said it is to compare instruments used.
- One participant said it is to crack down on the unresolved cases like housebreakings. Forensics can also help in closing the gap between field and science.
- Two participants did not provide responses.

When the researcher compares the responses of participants from sample A with the consulted literature, the researcher found out that there is agreement between the literature and the responses of the participants. The participants have a fair understanding of the objectives of forensic science. One participant referred to the comparison of the instrument used as another objective of forensic science, this participant differs from the literature consulted because the literature refers to identifying a substance, object or instrument and the participant is alluding to the comparison of the instrument used.

The participants from sample B responded as follows:

- Six participants indicated that is to give evidence in court.
- Five participants indicated that is to collect and gather evidence samples from the crime scene.
- Five participants indicated that is to link the suspect to the crime scene and to the case.
- Two participants said is to analyse and examine evidence.
- Two participants said to get the perpetrator to be held liable for his actions and put him behind bars.
- Three participants said to help with investigation.
- One participant said to identify.



- Two participants said to attend and process crime scenes.
- One participant said to identify the suspect.
- One participant said to bring the solution, like for instance, evidence collected at the crime scene just to find the logical sense of what transpired at the crime scene.
- One participant said maintaining a database of possible suspects.
- One participant said to identify any possible leads by means of scientific evidence such as trace evidence, DNA evidence, ballistic evidence, questioned documents and biological evidence.
- One participant did not provide a response.

The responses of the participants from sample B are in line with the consulted literature (Benson, Jones & Horne, 2015:11; Jackson & Jackson, 2011:3; Osterburg & Ward, 2010:22). One of the participants indicated that the maintaining of the database of possible suspects is another objective of forensic science, none of the consulted literature referred to this as the objective of forensic science. The participants have a fair understating of the objectives of forensic science.

Participants from sample C responded as follows:

- Four participants indicated that the objective of forensic science is to prove and give scientific expert evidence in court and to satisfy the justice system in our country.
- Two participants said it is to collect and gather evidence and samples from the scene.
- Two participants said it is to analyse and examine evidence.
- Three participants said is to use facts to determine answers to particular questions and to get criminal convictions and to get perpetrators to be held liable for their actions.
- Two participants said to prove the existence of crime by examination of physical evidence.
- One participant said to resolve the crime that involves firearms.
- One participant said to obtain facts in terms of evidence that can be obtained usually using scientific methods.

- One participant said it is the reduction of crime.
- One participant said is to determine if the crime was committed, if there is a crime, that the criminal must be brought to justice and to bring closure to families of what happened to their loved ones.

Except for the participants who indicated that the objective of forensic science is the reduction of crime and to bring closure to the family of what happened to their loved ones, when comparing the literature consulted (Benson, Jones & Horne, 2015:11; Jackson & Jackson, 2011:3; Osterburg & Ward , 2010:22), with the responses of the other participants the researcher concluded that they agree with each other. The participants from sample C have a fair understanding of the objectives of forensic science.

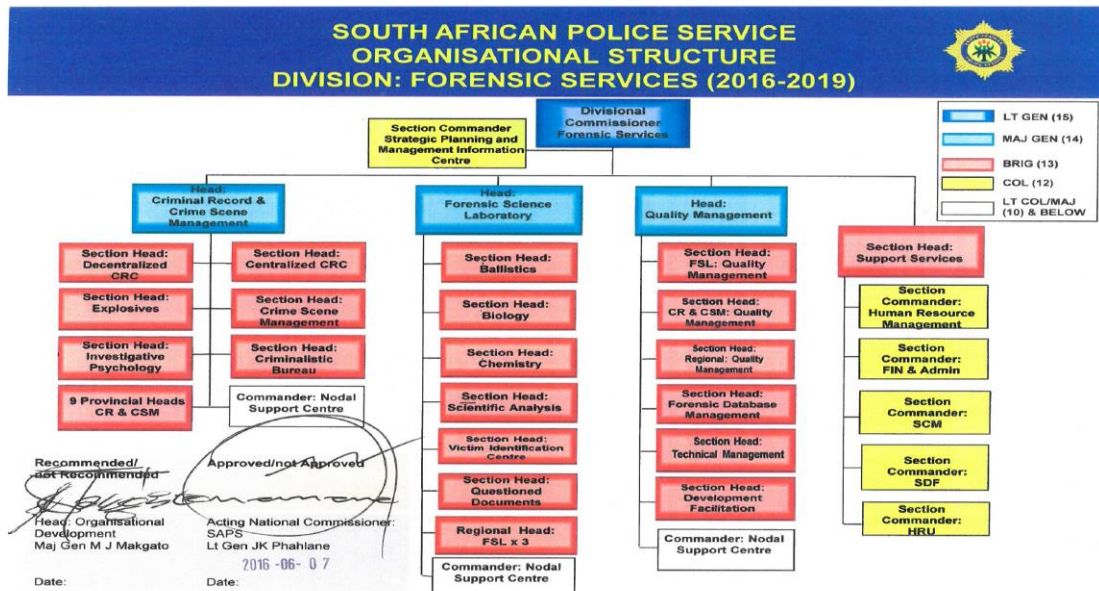
When the researcher considers the responses of participants from all three samples (A, B and C) the researcher realised that none of the participants referred to reconstruction of how the crime was committed, how the event transpired when the crime was committed and to the protection of the innocent by developing evidence that may exonerate the suspect as indicated in the literature (Osterburg & Ward, 2010:22; Rodivich 2012b:100).

## **2.4 DIVISION: FORENSIC SERVICES**

The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996), section 205(3) outlines that the objectives of the SAPS are to prevent, combat and investigate crime; to maintain public order; to protect and secure the inhabitants of the Republic and their property; and to uphold and enforce the law. To achieve this the SAPS has established different divisions to ensure that the objectives as stipulated by the Constitution are achieved.

Division: Forensic Services is among the established divisions. The purpose of the division is to aid investigators in the investigation of crime. Forensic science is the application of science to the criminal and civil laws that are enforced by police agencies in a criminal justice system. Forensic science embraces different professions and skills to assist law enforcement officials to conduct their investigations (Saferstein, 2013:2).

Figure 2.1 below indicates the structure of the Division: Forensic Services and shows the different sections of the SAPS Division: Forensic Services.



**Figure 2.1: The structure indicating the Division: Forensic Services of the SAPS**

Source: (South African Police Service, 2017)

## 2.5 THE ROLE OF FORENSIC SCIENCE IN THE INVESTIGATION OF CRIME

According to Lyle (2008:8), the placing of a suspect at the scene is one of the basic functions of forensic science. The evidence is analysed to create a link between the perpetrator and the crime. He believes that the linking of the evidence proves that a person has come in contact with another person, place or object and may also prove that two objects or pieces share a common source. Lyle (2008:8) adds that linking the evidence is the heart and soul of forensics. It proves the sharing of the common source by the two objects. Erzinqlioglu (2000:10-12) on the other hand says that forensic science is concerned with finding out what happened in the past. The past could be the recent past or long time ago. He further indicated that forensic science is like archeology, the aim of which is to discover the course of events that took place a long time ago. Analysing of evidence to link the victim with the suspect and the scene, and to help with the identification or elimination of the suspect is one of the roles played by forensic science.

Forensic science can be used by police investigators to understand what has transpired and allow the truth to be provided in a court of law (Anderson, 2013:174). Forensic science is concerned with the recording, scientific examination and interpretation of the minute details found in physical evidence. The role of forensic science includes: the identification of substance, object or instrument; the establishment of the connection between physical evidence, victim, suspect and potential crime scene; for the protection of the innocent by developing evidence that may exonerate a suspect; providing expert testimony in court and the reconstruction of how a crime was committed and what happened at the time it was being committed (Osterburg & Ward, 1992:22).

Jackson and Jackson (2008:1-3) outline the role played by forensic science in the investigation of crime and indicate that the first role played by forensic science is the recovering of the evidence from the crime scene; followed by the examination and analysis of the recovered evidence from the crime scene and the presentation of scientific test results in court. Dempsey (2003:120) shares the same sentiments and further indicates that the analysis and examination of the physical evidence recovered from the crime scene may provide answers to a number of questions and help the investigating officer in determining if the crime was committed; establish if there is a link between the victim, suspect and the crime scene; provide information that corroborates or refutes evidence from another source; facilitates intelligence gathering by the police; acquit suspects from the crime committed; reconstruction of the crime scene and may also help with the establishment of the identity of an individual suspected of committing a crime.

The participants from samples A, B and C were asked: in your opinion, what is the role of forensic science in the investigation of crime? This was an open-ended question where the participants could provide more than one answer to the question and no choices were provided from which they could choose.

Sample A responded to the question on the role of forensic science in the investigation of crime as follows:

- Four participants indicated that the objectives of forensic science are to analyse and examine exhibits.

- Two participants indicated that it is to gather and collect exhibits from the crime scene.
- Two participants indicated that it is to provide expert evidence in matters that need expertise and cannot be decided by any investigation officer or by a layman.
- One participant said to compare evidence received from the crime scene with exhibits received from the suspect.
- One participant said to determine what was used to commit the crime.
- One participant said to investigate crime.

Jackson and Jackson (2008:1-3) assert that the first role played by forensic science in the investigation of crime is the recovering of evidence from the crime scene, followed by the examination and analysis of the recovered evidence and the presentation of the evidence in court. One participant indicated that the role of forensic science in the investigation of crime is to investigate crime, this participant's answer is not in line with the consulted literature. The participants from sample A mentioned some but not all of the roles played by forensic science in the investigation of crime as alluded to in the consulted literature. The participants do not fully comprehend the role of forensic science in the investigation of murder.

Sample B responded to the question on the role of forensic science in the investigation of crime as follows:

- Five participants said to link or connect the suspect to the exhibits collected from the crime scene; link the suspect to the crime scene and to the crime that has been committed.
- Six participants said investigation of the crime scene in order to find clues and to document the crime scene.
- Two participants said to gather and collect exhibits from the crime scene.
- Three participants said to present factual evidence in court.
- One participant said to determine what was used to commit the crime.
- One participant said to help investigating officers to combat crime.
- One participant said to identify the perpetrator.

- One participant said to enhance the investigation so that we can quickly get the results expected from any member in this field.
- One participant said it plays a big role, if we do not have forensic service many cases will be withdrawn from court and suspects will walk free.

The participants from sample B in this research study gave a wide range of responses to the question on the role of forensic science in the investigation of crime. To help the investigating officer to combat crime and to enhance investigation are some of the objectives of forensic investigation as mentioned by two different participants, none of the consulted literature mentioned those aspects as objectives of forensic science. The answers given by the majority of the participants from this sample are in line with the role of forensic science as outlined in the consulted literature, Anderson (2013:174) and Osterburg and Ward (1992:22). One participant from the LCRC indicated that forensic science plays a big role in the investigation of crime and said that if there were no forensic services many cases would be withdrawn from court and suspects would walk free. The researcher can conclude that the participants have a fair understanding of the role of forensic science in the investigation of crime.

Sample C responded to the question on the role of forensic science in the investigation of crime as follows:

- Two participants said to link or connect the suspect to the exhibits collected from the crime scene; to link suspect to the crime scene and to the crime that has been committed.
- One participant said to gather and collect exhibits from the crime scene.
- One participant said to examine and analyse the exhibits.
- Two participants said to present factual evidence in court.
- One participant said to compare evidence received from the crime scene with the exhibits received from the suspect.
- One participant said to determine whether the crime has been committed or not.
- One participant said to determine what happened at the crime scene and how the crime was committed.

- One participant said it is a tool that can answer questions factually without supposition, it can either prove or disprove something.
- One participant said to have more knowledge of what other people do not have in this field, we have to make things better so that the criminal justice system can understand the process of investigation.
- Two participants did not provide answers to the question.

The participants from sample C gave varied responses that are in line with the consulted literature. The participants comprehend the role of forensic science in the investigation of crime. De Forest et al. (1983:18), indicate that the important factor is the communication between investigators, scene personnel and the laboratory. It is further indicated that everyone has an important role to play, and the value of results of the overall process is totally dependent upon all participants doing their own part while being aware of the responsibilities and the capabilities of the others. Evidence should be recognised, documented, handled, collected, transported and analysed in a way that ensures maximum information yield for the case and effort expended (De Forest et al., 1983:18).

## **2.6 THE ROLE OF LCRC IN THE INVESTIGATION OF CRIME**

After a crime has been committed the crime scene must be processed. When processing the crime scene, the scene must be documented and the location of the exhibits must be recorded. This can be done using crime scene sketches, photography and using laser computer assisted surveying devices (Fisher et al., 2009:5-6).

Dempsey (2003:47-51) on the other hand stipulates that the first step of investigation is the processing of the crime scene and indicates that the crime scene investigators respond to crime scenes to collect and process the physical evidence. He further indicates that the crime scene examiners should put more effort into preserving the integrity of the scene, photograph, sketch the scene, preserve the evidence and try to reconstruct the events and sequence of what happened at the scene.

The role of the crime scene investigation unit includes the collection of evidence; preservation of evidence from the crime scene; transporting evidence from the crime scene to the laboratory; exposing and lifting latent fingerprints; collecting hair and fibres and gathering any other article of evidence at the crime scene (Lyle, 2008:13). According to Brown and Davenport (2012:8), the crime scene investigator's roles include: securing the crime scene; photographing the crime scene; searching the crime scene; collecting and packaging the evidence; delivering evidence to the laboratory and providing expert testimony in court.

According to the SAPS National Instruction 1 (2015:14), during the investigation of the crime scene, the crime scene supervisor and the crime scene examiner must come from the LCRC in whose service area the incident occurred. The provincial and the national crime scene management teams may be deployed after the crime scene supervisor has consulted with the provincial and the national crime scene management teams from Division: Forensic Services. Furthermore, the SAPS National Instruction 1 (2015:16) outlines that the roles of the crime scene supervisor and the crime scene experts are to:

- Manage the team processing the crime scene and ensure collection of appropriate forensic evidence.
- Ensure that the crime scene is photographed or recorded to provide visual representation of the scene (the scene must be photographed and recorded in the condition found before it is altered and all physical evidence must be photographed in their original position and the condition of the scene must be photographed after the conclusion of the process).
- Coordinate the processing of the scene for physical evidence.
- Coordinate the gathering of information for determining the point of entry and event reconstruction.
- In a death investigation, collaborate with the pathologist or forensic pathology officer to ensure that they remove the deceased at the appropriate time when processing of the crime scene is concluded by the crime scene examiner.
- Maintain communication between the investigation team and the crime scene processing team (verbal feedback must be provided to the crime scene commander).



In the SAPS, the crime scene examiners or crime scene technicians are located at the Criminal Record and Crime Scene Management in head office and they are available at provincial level. At local level, the crime scene examiners are located at the LCRC. The purpose of criminal record and crime scene management is to ensure an effective criminal record centre in respect of expert evidence handling, crime scene management or processing and the provision of criminal history and related information (*SAPS: Criminal record and crime ...*, c2014b).

According to the SAPS Criminal Record and Crime Scene Management service delivery charter, the Criminal Record and Crime Scene Management plays the following roles in the investigation of crime: the administration of information on wanted persons (SAPS55- circular of wanted/ missing persons); updating, maintaining and achieving criminal histories (SAPS69-fingerprint results); providing criminal histories and related information; rendering a 24-hour service to investigating officers; issuing police clearance certificates and processing of fingerprints pertaining to firearm license applications (*SAPS: Criminal record and Crime scene ...*, c2014a).

According to SAPS Resolving of Crime Learnership guide (2009:361-362), the primary purpose of LCRC is to render a scientific support service to investigating officers by investigating crime scenes where it is suspected that the perpetrator left identifiable prints. The identifiable prints do not only include finger, palm and footprints but also tool markings, shoe and tyre imprints; comparison of the prints from crime scenes with the existing records at the LCRC in order to identify criminals and link them with the specific crime scenes; crime scene documentation by means of photographs, videos and plans for investigation and trial purposes; the collection, packaging and sending of exhibits for forensic analysis and conducting specific forensic tests.

Samples B and C were asked an open-ended question: What is the role of LCRC in the investigation of crime? Some of the participants gave more than one answer because there were no provided answers for them to choose from. Sample A will not contribute to this aspect, as the question was not put to them. The participants' responses are indicated in Table 2.1 below.

**Table 2.1: Participants' understanding of the role of LCRC in the investigation of crime**

<b>The role of LCRC in the investigation of crime</b>	<b>Sample B: LCRC (15)</b>	<b>Sample C: Ballistics experts (13)</b>	<b>Total</b>
Collect or gather fingerprints and/or forensic related evidence from the crime scene.	8	11	19
Record, document and photograph the scene.	6	5	11
Submitting the exhibits to FSL.	4	7	11
Investigation and searching for fingerprints.	4	1	5
Linking or placing an unknown suspect to the crime scene.	4		4
Provide reports and presentation of evidence in court.	2	1	3
Crime scene reconstruction.	1	1	2
Submitting exhibits to LCRC for search of IDs on the system and also submitting 192s and 695s to the investigation officers.	1		1
It is an intermediate between the police station and the court because they take part after the first person/police station member and then the LCRC. Their role includes taking fingerprints, photography and collection of evidence. First member, LCRC member = court.	1		1
Ensure safekeeping of exhibits collected from the crime scene.		1	1
LCRC is like a "sniffer dog", they sniff all forensic evidence for further investigation by either the detectives or FSL. They will only link the case.	1		1
<b>Total</b>	<b>32</b>	<b>27</b>	<b>59</b>

Considering Table 2.1 above, the majority of the participants, eight from sample B and 11 from sample C, believes that the collection of fingerprints and forensic related evidence is the main role of LCRC in the investigation of crime; six participants from sample B and five from sample C believe that the recording, documenting and photographing the scene are also roles of the LCRC.

Submitting the exhibits to the FSL is also the main role of the LCRC as indicated by Table 2.1 above. The participants' responses concur with the views of the consulted literature, however none of the participants, from samples B and C, referred to the preservation of the integrity of the scene as one of the roles of the LCRC as indicated by Dempsey (2003:47-51). One participant from the LCRC referred to LCRC as the "sniffer dog" and that they sniff out all the forensic evidence for further investigation. Some participants believe that the linking or placing of the suspect to the crime scene is another role played by the LCRC, none of the consulted literatures referred to such a role played by LCRC or by the crime scene investigators.

Considering the participants' responses on the question of their understanding of the role of LCRC in the investigation of crime and the literature consulted, the researcher concludes that the majority of the participants are familiar with the role played by the LCRC in the investigation of crime as their responses are in line with the consulted literature. The participants understand the role of the LCRC in the investigation of crime.

## **2.7 THE CRIMINAL RECORD AND THE CRIME SCENE MANAGEMENT UNIT**

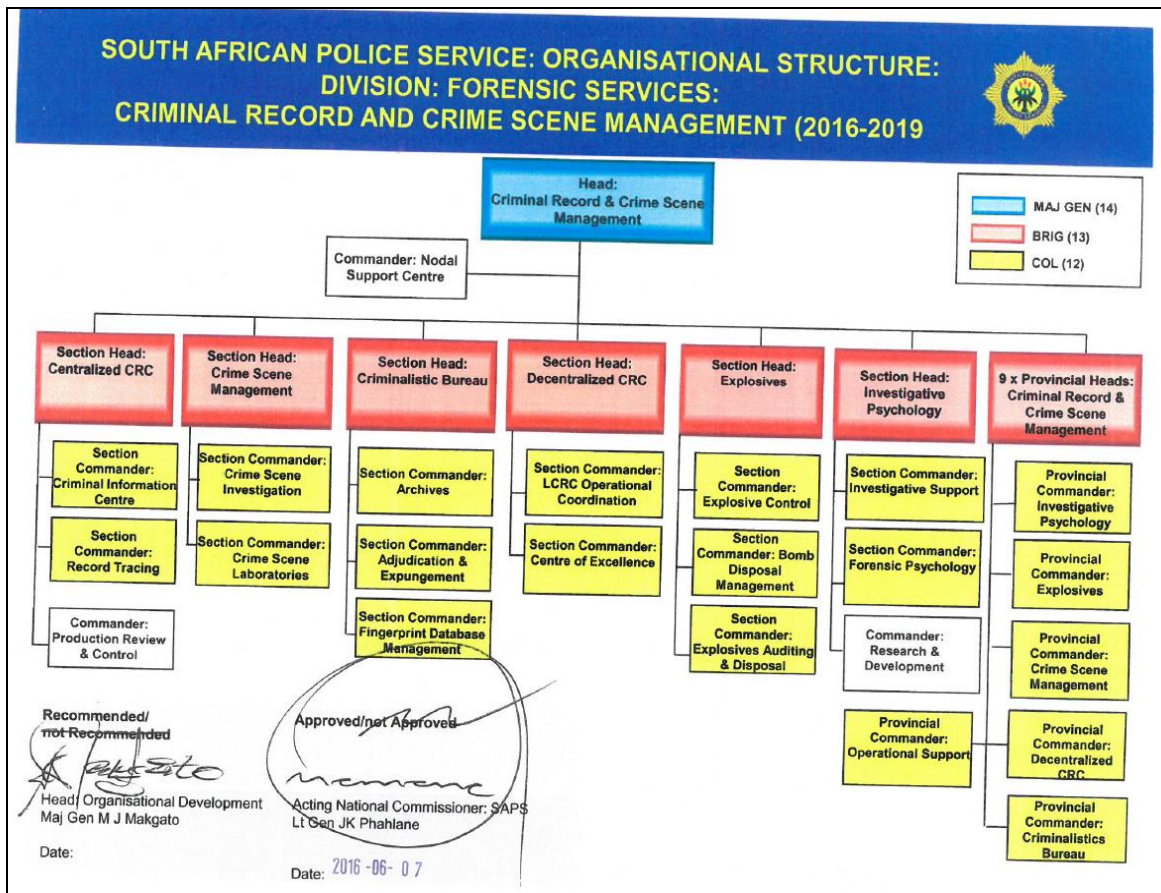
Forensic science begins at the crime scene, evidence at the crime scene must be preserved and recorded in its original condition as much as possible, and failure to protect the crime scene may result in the destruction and altering of the physical evidence (Saferstein, 2013:34). In the SAPS, criminal record and crime scene management forms part of the Division: Forensic Services as indicated in Figure 2.2 below. The criminal record and crime scene management unit is the unit that conducts the crime scene investigation. According to the SAPS National Instruction 1 (2015:3), crime scene management means the process of planning and implementation of measures to:

- Take control and secure the scene;
- Ensure the integrity, preservation and the originality of evidence and exhibits;
- Investigate and process the crime scene thoroughly without the crime scene being altered or contaminated;
- Co-ordinate and optimise the collection of exhibits;

- Utilise the investigation support resources optimally;
- Record facts and events properly; and
- Ensure the crime scene remains under police protection.

Omar (2008:29-30) explains that the function of the criminal record center is the management of criminal records and the application of different techniques to recover physical evidence from the crime scene. Lyle (2008:10) indicates that the crime scene investigation unit consists of crime scene experts that are trained in recognition of evidence, collection and preservation of evidence. The crime scene investigators are also skilled in performing field tests and screening that may be necessary to be conducted at the crime scene.

Watkins (2013:108) believes that the crime scene investigators are specialist in locating, collecting and preservation of evidence from the crime scene. He further indicates that the roles of the crime scene investigators include amongst others, identification; documenting; collection; preservation; analysing and submitting physical evidence collected from the crime scene to the laboratory for analysis. Figure 2.2 below indicates the structure of the Criminal Record and the Crime Scene Management Unit of the SAPS.



**Figure 2.2: The structure of the Criminal Record and Crime Scene Management**

Source: (South African Police Service, 2017)

## 2.8 THE ROLE OF THE FORENSIC SCIENCE LABORATORY (FSL) IN THE INVESTIGATION OF CRIME

After the crime scene expert has collected the evidence from the crime scene, the evidence is forwarded to the forensic science laboratories for analysis. Eckert and James (1997a:33) and Palmiotto (2013:119) indicate that FSL serves as a tool for analysing evidence collected from the crime scene. The FSL scientifically examines the evidence to assist the investigating officers to answer the questions of who, what, when, why, and how of the crime that was committed. The FSL examines evidence in order to reduce or eliminate uncertainty by providing facts to the court based on scientific examination (Palmiotto, 2013:120).

Eckert and James (1997a:33) further indicate that the FSL examines evidence associated with the crime scene, victims and suspects. They further indicate that the FSL scientific findings are used together with the other areas of forensic science and criminal investigation in preparation for the court proceedings.

Standing Order General 016 (16:1) provides that the FSL of the SAPS shall, subject to the provisions of the Police Act and regulations and in compliance with the directions of the Commissioner, be charged with serving the force as an aid in the detection of crime by means of objective scientific analyses, investigations and the comparing of organic and inorganic matter by trained experts, and to make available expert testimony for court purposes.

The SAPS National Instruction 1 (2015:27) on crime scene management stipulates that the forensic science laboratory must attend the crime scene when it is necessary to render specialised service on the scene where firearms were used and shot range or distance determination is required. It is further emphasised that FSL must be available 24 hours a day, including for telephonic advice, and if the specific scientific service is required, the scene must be attended by the forensic expert from the FSL.

Jackson and Jackson (2008:4-6) reports that after the collection of evidence and items of potential forensic importance from the crime scene, the items and evidence are sent to the laboratory for scientific investigation. Jackson and Jackson (2008:4-6) further indicate that the investigations conducted at the laboratory include: the comparison of evidence, this refers to the comparison between two pieces of evidence obtained from different places in order to determine whether the two pieces are similar forensic evidence; comparison between an evidential object and relevant database to identify the class characteristics; comparison between questioned samples, both positive and negative controls and reference collections; comparisons between scene impression and test impressions.

Establishment of what occurred during a crime is also an investigation conducted in the laboratory. Lyle (2008:22) believes that experts at crime laboratories identify and compare evidence received from the crime scene and links the evidence to a particular individual or a suspect. The FSL applies scientific principles, methods and techniques to the process of investigation and objective search for the truth.

The intention is not only to bring offenders of law to justice, but also to protect innocent people from prosecution. To do so the scenes of crimes are visited and physically analysed in order to arrive at meaningful conclusions (*Forensic Science Laboratory ...*, c2014). Rodivich (2012b:105-123) points out that the divisions/units within the modern full-service crime laboratories represents major types of physical evidence recovered during criminal investigations. He further indicates the following sections are found within full-service crime laboratories: fingerprints section, biology/DNA section, firearms and tool marks section, impression evidence section, trace evidence section, drug identification section, toxicology section, questioned documents section and photography section. It is further indicated that there are specialised forensic services outside the traditional crime laboratories settings that are available for use by law enforcement agencies and personnel, these include forensic medicine, forensic anthropology, forensic odontology, forensic entomology, forensic psychology, forensic engineering, forensic computer science and forensic reconstruction.

The FSL of the SAPS consists of the following units and subsections: Ballistics Unit with subsections: Mechanical Engineering and Metallurgical Engineering; Scientific Analysis Unit with subsection: Polygraph; Questioned Document Unit; Biology Unit; Chemistry Unit: with subsections, Forensic Drug Analysis and Fire and Explosion Investigations (arson and explosions). Lastly the Toxicology and Explosive Unit (Forensic Services, c2014c).

Kirk and Bradford (1965:85) outlines the role of FSL as follows: to discover, collect and preserve physical evidence; maintain and establish a chain of evidence possession; provide complete security of evidence at all times; ensure that the evidence is subjected to all useful examination; interpret all the findings in an accurate manner and provide clear findings for presentations in court. It is the role of crime laboratories to determine the elements of crime, link the victim to the crime scene, or to the criminal and to reconstruct the crime (Osterburg & Ward, 2010:39). The mission of the crime lab is to assist the process of the criminal justice by providing answers to the questions posed by the investigating officers.

Questions such as whether the crime has been committed, by whom, how was the crime committed, when was the crime committed and who could not have committed the crime should be answered. The answers to these questions are found through the scientific analysis of physical evidence and materials collected from the crime scenes or from the suspects (Swanson, 1996:253).

The question of what is the role of the FSL in the investigation of crime was asked to samples B and C respondents. Sample A will not contribute to this question, as the question was not posed to them. Some of the participants from samples B and C gave more than one answer. They were asked an open-ended question with no choices to choose from. The participant's responses are outlined in Table 2.2 below.

**Table 2.2: The participants' understanding of the role of the FSL in the investigation of crime**

<b>The role of the Forensic Science Laboratory (FSL) in the investigation of crime</b>	<b>Sample B: LCRC (15)</b>	<b>Sample C: Ballistics experts (13)</b>	<b>Total</b>
To further investigate, process, analyse and examine exhibits collected from the crime scene by LCRC members.	11	4	15
To provide and present reliable scientific evidence and results in the form of a scientific report to the relevant authorities.		5	5
Link the exhibits from the crime scene with the suspect; to other cases and to link the crime scene to another crime scene.	3	1	4
Is a place where we send physical evidence like DNA, ballistics, chemistry related evidence for identification and analysis, FSL is divided into different units that analyses, test the evidence collected at the crime scene and do an in-depth investigation into the exhibits collected from the crime scene by LCRC.	2	2	4
Comparing the results and exhibits with previous exhibits brought to the FSL.	2		2
Establish the evidence using scientific methods because certain evidence needs to be tested in order to come with the		1	1



<b>The role of the Forensic Science Laboratory (FSL) in the investigation of crime</b>	<b>Sample B: LCRC (15)</b>	<b>Sample C: Ballistics experts (13)</b>	<b>Total</b>
connections and eventually with the correct facts.			
To apply scientific methods to assist the court to come to an informed conclusion.		1	1
No answer given.		1	1
<b>Total</b>	<b>18</b>	<b>15</b>	<b>33</b>

The majority of the participants from sample B indicated that the main role of the FSL involves the processing, analysing and examination of evidence. Three participants indicated that the aim is to link the exhibits with the suspect, crime scene and to other crimes. Four participants from sample C also indicated that the role of the FSL is to process, analyse and examine exhibits collected from the crime scene, several participants indicated that the analysed evidence must be presented in the form of a scientific report to court. Some participants believe that the FSL is a place where physical evidence is sent in order to be analysed and the results compared with the previous exhibits brought to the FSL.

The participants' responses are in line with the literature regarding the role of the FSL in the investigation of crime. It is evident from the literature as well as the participants' response that the main role of the FSL is to analyse and examine the evidence collected from the crime scene. The researcher agrees that the FSL analyses the exhibits collected from the crime scene in order to link the suspect to the crime scene, link the suspect to the crime committed, to the victim and to link one crime scene to the other. The participants also indicated that the FSL must provide and present the scientific evidence to the relevant authorities, the participants are in line with Eckert and James (1997a:33) and Palmiotto (2013:120).

Forensic Science Laboratory (c2014) indicates that the intention of the FSL is not only to bring the perpetrator to court but also to protect innocent people from prosecution. Four participants (two from the LCRC and two from ballistics) indicated that the FSL is a place where we send physical evidence like DNA, ballistics and chemistry related evidence for identification and analysis.

The FSL is divided into different units that analyse, test the evidence collected at the crime scene and do an in-depth investigation into the exhibits collected from the crime scene by LCRC members. Rodivich (2012b:105-123) explains that the fingerprints section, biology/DNA section, firearms and tool marks section, impression evidence section, trace evidence section, drug identification section, toxicology section, questioned documents section and photography section are the sections of fully functioning crime laboratories.

There are specialised forensic services outside the traditional crime laboratory settings that are available for use by law enforcement agencies and personnel. These include forensic medicine, forensic anthropology, forensic odontology, forensic entomology, forensic psychology, forensic engineering, forensic computer science and forensic reconstruction. The FSL of the SAPS consist of the following units and subsections: Ballistics Unit with subsections: Mechanical Engineering and Metallurgical Engineering. Scientific Analysis Unit with subsections: Polygraph; Questioned Document Unit; Biology Unit and the Chemistry Unit with subsections: forensic drug analysis and fire and explosion investigations (arson and explosions). Lastly, there is the toxicology and explosives unit (Forensic Science Services, c2014c.).

Figure 2.3 below indicates the structure of the Forensic Science Laboratory of the SAPS.

**SOUTH AFRICAN POLICE SERVICE: ORGANISATIONAL STRUCTURE**  
**DIVISION: FORENSIC SERVICES:**  
**FORENSIC SCIENCE LABORATORY (2016-2019)**

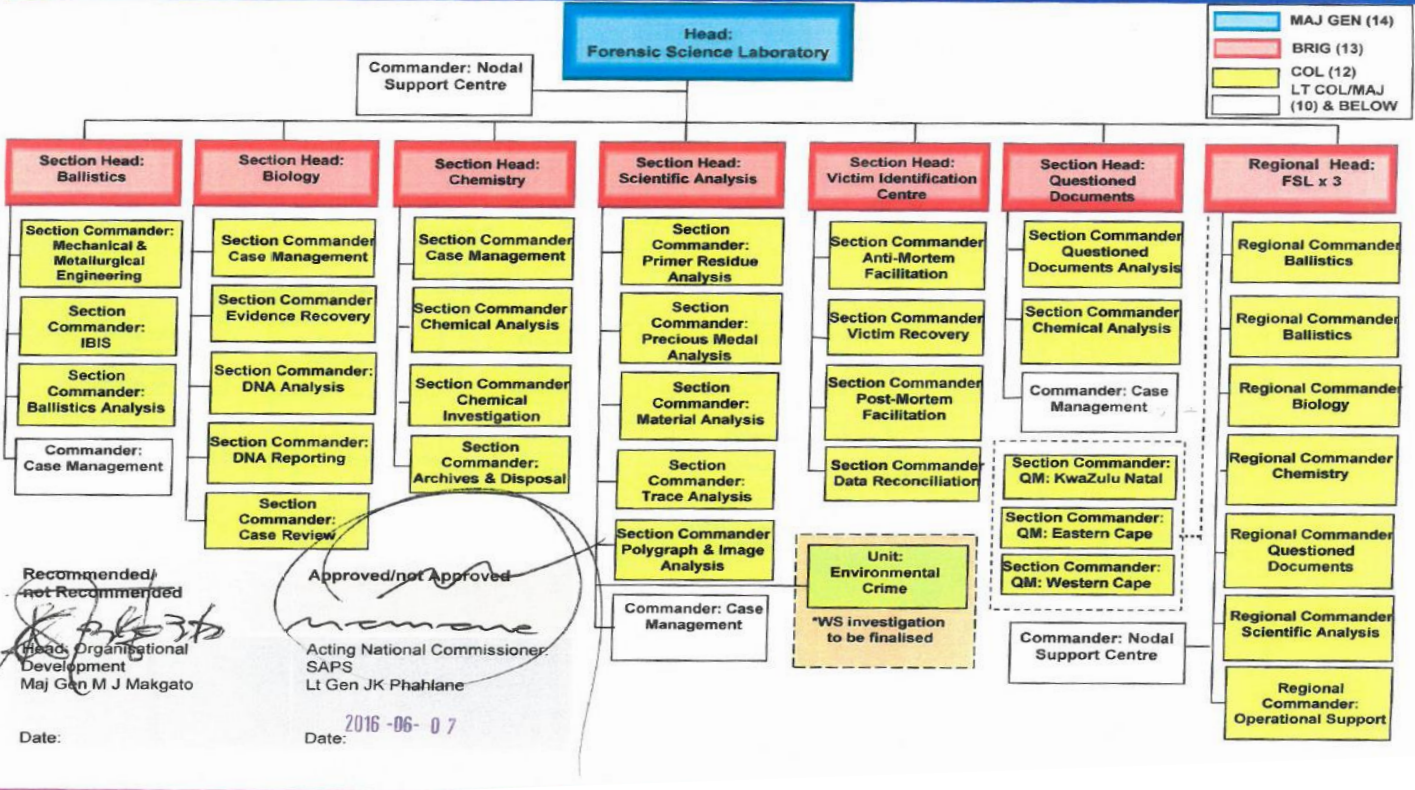


Figure 2.3: The structure of the Forensic Science Laboratory of the South African Police Service

Source: (South African Police Service, 2017)

## **2.9 CRIMINAL INVESTIGATION**

Criminal investigation refers to identification of evidence, collection of information, presenting the evidence to a court of law with the purpose of determining what happened and apprehending the offender, it also includes the reconstruction of past crimes (Hess & Hess 2013:8). On the other hand, Dempsey (2003:29-33) defines investigation as the process of conducting inquiries and examination of something or someone in order to obtain facts. The facts are recorded in the report. Dempsey (2003:33) defines crime as any act that is declared to be a crime by the law and prosecuted in criminal proceedings.

Pena (2000:1) believes that investigation is a systematic, methodological and detailed inquiry and examination of all components, relationships and circumstances pertaining to an incident. According to Du Preez (1996:1-2) criminal investigation is the systematic search for the truth with the primary objective of finding positive solution to the crime with the help of subjective and objective clues. It is further indicated that criminal investigation is police activities aimed at identifying and apprehending the suspected criminal and presenting the evidence in court.

Crowder (2010:366) holds the opinion that criminal investigations is inquiries conducted when there is a violation of law, it is an objective systematic legal inquiry involving the possible criminal activity. Crowder (2010:368) further indicates that criminal investigation is reactive and dependent on the complaint or event that took place. The collection of evidence and information with the purpose of identifying the suspect, wanting to identify, apprehend, convict the suspected offender and reconstructing the past event is criminal investigation (Osterburg & Ward 1992:41).

The question "What is your understanding of criminal investigation?" was only provided to sample A to provide answers. Sample A will therefore be the only sample contributing to this aspect. The numbers in brackets indicate the number of individuals who gave that response. In response to the question: What is your understanding of criminal investigation? The participants answered as follows:

- Mostly criminal investigation is where we have to try to prove that the culprit was criminally capable of committing an offence; (1)
- Is broad and comes in different ways, differ from crime to crime; (1)
- Is the systematic search for the truth; (1)
- To collect all the evidence; (1)
- When we investigate the unsolved cases whereby a person was beaten, raped or killed, to assist people to solve crime; (1)
- To investigate the crimes that the criminals have committed; (1)
- Is dealing with criminals; (1)
- For day-to-day crime investigations to get to the bottom of what happened after the crime was committed, to get to the root of what happened and to get all the exhibits of what happened after the crime was committed; (1)
- To prove beyond reasonable doubt regarding the matter which is being investigated; (1)
- It is investigation regarding the criminals; (1) and
- To thoroughly investigate the crime scene and to have a successful conviction. (1)

The participants gave varied responses to the question on their understanding of criminal investigation. From the participants' responses it is evident that the participants do not fully comprehend what criminal investigation is. Although there are differences in the participants' responses, the participants' responses are relevant to the definition of the meaning of criminal investigation as provided by Hess and Hess (2013:8) who, when describing criminal investigation indicated, that it involves identification of evidence, collection of information and presenting the evidence in the court of law.

One participant (participant A2) indicated that "criminal investigation is broad and comes in different ways, differs from crime to crime" the researcher agrees with this participant in that criminal investigation is broad. Although the participant did not respond correctly to the answer of what criminal investigation is, the participant's response is not totally in line with the definition of criminal investigation.

The other participants' responses are still not relevant to the explanation of the definition of criminal investigation, the researcher opines that a possible reason for the difference in the participants' response to the literature maybe that the participants lack a common understanding of criminal investigation and that the participants gave the responses from their practical point of view. The views of the participants show many different meanings of the term and it indicates that the participants do not fully comprehend the real meaning of the term criminal investigation.

## **2.10 OBJECTIVES OF CRIMINAL INVESTIGATION**

According to Dempsey (2003:29-30); Hess and Hess (2013:11) and Swanson (1996:27-28), the objectives of criminal investigation can be collectively outlined as follows: to establish if a crime has been committed; to locate persons; locate leads to additional firearm evidence; to arrest the suspects; to locate and recover stolen property; determine if there is enough evidence and facts to support or defeat the cause of action; obtain information and evidence to identify the responsible person; to assist the state in prosecuting the party charged with the offence and to present the best case to the prosecutor. Stelfox (2009:2) is of the opinion that bringing the offenders to justice, suspect identification and evidence gathering to support prosecutions are not the only purposes of criminal investigation.

Furthermore, Stelfox (2009:2) believes that caring for victims, disruption of criminal network, intelligence gathering, community reassurance and managing a wide range of crime risks are also the fundamental objectives of criminal investigation. The objective of criminal investigation is the establishment of the truth and the falsity of the complaint by conducting complete and impartial investigations from which the conclusions will be drawn (Pena, 2000:1). Crowder (2010:366) indicates that the gathering of firearm evidence and information related to the committed crime and the identity of suspect, determining whether the crime was committed, locating and facilitating the arrests of the suspect, recovering of stolen or lost property, and the preparation of the case for criminal prosecution are the objectives of criminal investigation.

Benson, Jones and Horne (2015:13) outline the objectives of criminal investigations as: the detection of a crime; organised and systematic search for the truth; suspect identification and locating; gathering objective and subjective evidence about an alleged offence; discovering facts and ascertaining the existence of such facts and testifying and assisting in the presentation of legally obtained evidence and documents in order to get the accused convicted. Similarly, Du Preez (1996:4-7) is of the opinion that the objectives of criminal investigation involve the identification of the crime, gathering of evidence, arresting the criminal, recovering of stolen properties, involvement in the prosecution process. Du Preez (1996:4-7) also believes that the individualisation of the crime is also the objective of criminal investigation.

Only sample A was asked the question: in your opinion, what are the objectives of criminal investigation? Samples B and C will not contribute to this aspect as the question was not given to them. The participants replied as follows (these responses have not been edited):

- To investigate crime that has happened or that has been reported; (1)
- To eliminate doubt as far as investigation is concerned and to come to the truths as to what was the cause; (1)
- Collection of evidence; (1)
- To fight crime and to uphold the law; (1)
- Is to investigate criminals, to make sure that kids do not commit crime and they must see that crime does not pay; (1)
- To ensure that the perpetrators are behind bars; (1)
- Honesty, keeping time frame, bring the perpetrator to the court of law to respond to the allegations; (1)
- To put criminals before court, prosecution is the results; (1)
- To find answers to find the suspect; (1)
- To send criminals to prison/jail; and (1)
- No answer given (1).

The researcher established that although the participants' responses are partially in agreement with the objectives of criminal investigation as outlined by the consulted literature, the participants' lack knowledge about the objectives of criminal investigation leads the researcher to opine that if the participants had knowledge and understanding of the objectives of criminal investigation each of them would have mentioned all six objectives as suggested by Du Preez (1996:4-7) and the other consulted literature.

Though the participants' responses correspond to some extent with the objectives of criminal investigation as outlined by consulted authors above, none of the participants mentioned the following: to locate and recover stolen property; to establish if the crime has been committed; determine if there is enough evidence and facts to support or defeat the cause of action as they are also the objectives of criminal investigation as alluded by the consulted literature.

Benson, Jones and Horne (2015:20) agree with Dempsey (2003:29-30), Hess and Hess (2013:11) and Swanson (1996:27-28), but further indicates that criminal investigation is also conducted in order to conduct scene reconstruction, discovering, identifying and collecting specific information and evidence and to find answers to solve the crime that has been committed.

## **2.11 SUMMARY**

The discussions in this chapter has revealed that TV series such as *CSI* simplifies the scientific process and procedures involved in forensic investigation. Forensic investigation is a complex process that involves the extensive utilisation of time, resources and skills in order to arrive at a scientific explanation for what could have transpired at the crime scene.

Forensic science is popularly defined as the science applied to solve legal problems, it is the application of science in the criminal justice system to enforce civil and criminal laws. The objectives of forensic science are to examine physical evidence in order to identify substances; establish linkage between the physical evidence, victim and the suspect; crime scene reconstruction and to assist the court in ensuring that the offenders are prosecuted and the innocent are exonerated.



The Locard exchange principle forms the basis of forensic science. Forensic science embraces different professions and skills to assist law enforcement officials to conduct their investigations. The Division: Forensic Services was established with the purpose of aiding the investigators in the investigation of crime.

Criminal investigation is the detailed inquiry of the circumstances pertaining to an incident in order to obtain the truth. The objectives of criminal investigations include identification of suspect; gathering of evidence to support prosecution and bringing the offender to justice.

Whereas the crime scene examiner or the crime scene expert is tasked with identification, examination, gathering of forensic evidence at the crime scene and conveying the evidence to the forensic science laboratory. The forensic scientist analyses the exhibits at the laboratory. On the other hand, after all the evidence has been collected from the crime scene and examined both at the crime scene and at the laboratory, the investigating officers/detectives continue with criminal investigation until such time the case is taken to court and the offender is prosecuted. All these professionals have an important role to play in crime solving.

The crime scene is usually attended by different role-players, there is a need for the different role players involved in the processing of evidence from the crime scene to court to work together as a team and to communicate effectively. The investigators, crime scene personnel and the forensic scientist at the laboratory all have an important role to play. The value of the result is totally dependent upon all participants doing their part while being aware of the capabilities and the responsibilities of the others.

Although forensic science is important in the investigation of crime, it does not solve crime on its own, good police investigators do so by using forensic science to understand what has transpired and allow the truth to be proved in a court of law. The role played by forensic science will only be realised if the integrity of physical evidence is maintained at the crime scene. The next chapter will focus on the use of firearm evidence in the investigation of murder.

## CHAPTER 3

### THE USE OF FIREARM EVIDENCE IN MURDER INVESTIGATIONS

#### 3.1 INTRODUCTION

Palmiotto (2013:164) believes that murder is the killing of one person by another. Murder investigations requires more effort from the police investigators as they must determine answers to questions such as who committed the crime, what instrument was used to commit the crime as well as determining the nature of the crime that has been committed (Fisher & Fisher, 2012:379).

Firearm evidence such as cartridge cases, fired bullets and firearms are often found at crime scenes involving shooting incidents. The firearm found at the scene of crime can be examined to determine operability, the bullets and cartridge cases can be examined for the presence of rifling characteristics that will indicate the calibre, the types of ammunition used, manufacturer and the model of firearm that discharged the cartridge cases and the bullets (Lee, Palmbach & Miller, 2001:156). To ensure the maximum value of the firearm evidence, this evidence should be properly identified, preserved and packaged. Proper chain of custody should be maintained from the crime scene until the evidence is presented in court.

This chapter will endeavour to answer the second research question, namely: "How firearm evidence can be used in the investigation of murder?" as reflected in paragraph 1.6 of Chapter 1. The chapter begins with a discussion on physical evidence; Locard's exchange principle; identification; individualisation and continuity of possession. The researcher then looks at the crime scene; firearm evidence; the different types of firearm evidence; procedure to collect firearm evidence; the use of firearm evidence in murder investigations and the value of crime scene reconstruction. The chapter concludes with a discussion on the requirements of firearm evidence to be admissible in court.

### **3.2 PHYSICAL EVIDENCE**

According to Marais (1992:5), a person cannot commit crime without performing some act and the possibility is that the perpetrator will leave or remove something from the crime scene which could contribute to connecting the perpetrator with the criminal act. Marais (1992:5-6) further mentions that physical evidence is real evidence which is visible and recognisable as either a liquid, object, print or instrument and can be measured, photographed, analysed and presented in court as a physical object.

Dempsey (2003:109) agrees with Marais (1992:5-6) and states that physical evidence is real evidence, he indicates that real evidence is tangible objects that can be introduced in a court of law to prove or disprove the fact in issue. Furthermore, Dempsey (2003:109) states that examples of real evidence includes firearms, fingerprints, bloodstains and fibre evidence. Rodivich (2012a:83) concurs with Dempsey (2003:109) and Marais (1992:5-6) that physical evidence is tangible items collected from the crime scene during criminal investigations for examination, analysis and presentation in court. Van Rooyen (2012:110) implies that real evidence is an object which is exhibited to the court so that the court can see, touch or even taste it. Joubert (2014:380) also indicates that real evidence is objects that upon identification becomes evidence in itself and the investigating officer must ensure that this evidence is not lost.

Rodivich (2012a:83) opines that firstly, physical does not imply that the evidence is visible to human eye, other physical evidence not visible needs to be developed using instrumentation to visualise. Secondly, physical evidence cannot be denied because it is real and tangible, it never lies, however failure of human element to identify, collect and examine it may lead to the true nature and significance of physical evidence not being realised. Thirdly, Rodivich (2012a:83) further indicates that physical evidence establishes a framework of facts and objective knowledge that guides the investigating officers and that understanding of the case being investigated can lead to a subsequent decision of whether the defendant is guilty or innocent.

The United Nations Office on Drugs and Crime (UNODC) (2009:4) states that physical evidence ranges from big to small microscopic items generated as part of the crime and recovered from the crime scene. Considering all other sources of information available for investigations, physical evidence plays a crucial role. With the exception of physical evidence, all other sources of information suffer problems of limited reliability. Physical evidence, when it is recognised and properly handled, offers the best prospect for providing objective and reliable information about the crime that took place or incident under investigation.

Eckert and Wright (1997b:72) on the other hand refer to physical evidence as demonstrative evidence and indicates that physical evidence is something which may be seen, heard, touched, smelled or tasted by the jury itself. Physical evidence may be any material collected or observed at a crime scene that has the potential of linking the suspect to a crime, the size of physical evidence can range from a drop of blood to large objects. The examples of physical evidence include: documents, hair, blood, fibres, fingerprints and soil (Brown & Davenport, 2012:10). Contrary to testimonial evidence that tells us something, physical evidence shows us something and takes the form of actual objects related to crime (Rondinelli, 2013a:26). According to Bertino (2012:22) and Lyle (2008:23-24), examples of physical evidence include fingerprints, firearms, weapons, bullets and shell casings, fibres, drugs, paint, glass, tool marks, shoe and tire impressions, documents and explosives. Gaensslen and Young (2005:341) indicate that physical evidence can be divided into drugs and chemicals, trace, biological and pattern evidence. The pattern evidence includes fingerprints, questioned documents, tool marks, firearm evidence, and patterns such as footwear and tire impressions.

Bertino (2012:22) indicates that:

- Physical evidence is circumstantial evidence that no one other than the suspect or the victim sees when it is left at the crime scene.
- Circumstantial evidence can be used to imply a fact but not directly prove it, it is further indicated that circumstantial evidence found at the crime scene may provide a link between a crime scene and the suspect.
- Circumstantial evidence can either be physical or biological in nature.

Furthermore, Bertino (2012:22) indicates that most physical evidence, except for fingerprints, reduces the number of suspects to a specific, smaller group of individuals. According to Orthman and Hess (2013:124), physical evidence can be classified into direct and indirect evidence. It is anything real, which has substance that helps establish the facts of a case. It can be seen, touched, concealed or tasted, is solid, semi-solid or liquid and can be large or tiny. It may be at an immediate crime scene or miles away; it may also be on a suspect or a victim.

Eckert and James (1997a: 33-34), Fisher and Fisher (2012:1-4); Girard (2008:36-37); Lyle (2008:22); Marais (1992:6) and Van Rooyen (2007:37) believe that physical evidence can be used to:

- Identify the perpetrator;
- Connect the perpetrator with the crime scene;
- Prove an element of crime;
- Indicate the associative link between one crime or events with another;
- Provide the investigator with general background information and clues; and
- Confirm or refute the veracity of statements made by witness.

Furthermore, Eckert and James (1997a: 33-34), Fisher and Fisher (2012:1-4), Girard (2008:36-37) and Lyle (2008:22) state that physical evidence can also be used to:

- Determine if the crime was committed or establish key elements of a crime;
- Exonerate the innocent;
- Induce a confession; and
- Direct further investigation.

Fish, Miller and Braswell (2013:15) are in agreement with the authors above Eckert and James (1997a:33-34); Fisher & Fisher (2012:1-4); Girard (2008:36-37); Lyle (2008:22) and Marais (1992:6) indicate that physical evidence when properly identified, collected and preserved, can link the suspect to the victim, to the crime scene, to the weapon or to the physical evidence.

Linking a suspect to a victim is the most important and common type of linkage that can be established by physical evidence. Furthermore, Fish, Miller and Braswell (2013:15) opine that the scientific analysis of physical evidence will provide essential information and investigative tools that will enable detectives to validate or reject the credibility of witness statements. Rodivich (2012b:102) states that physical evidence is analysed in an attempt to get information that will help the investigator in solving the case.

Fish, Miller and Braswell (2013:15-16) and Rodivich (2012b:102) share the same sentiments and indicate that proper recognition, documentation, collection, and preservation can reveal data that will aid the investigation by:

- Providing essential information on the facts of the case;
- Providing information on *corpus delict*;
- Revealing the *modus operandi*;
- Demonstrating linkages between the victim, suspects, locations and objects;
- Proving or disproving witness statements;
- Identifying a suspect through DNA or other individualisations;
- Classifying unknown substances;
- Reconstructing the crime scene; and
- Developing investigative leads.

Fisher and Fisher (2012:1-4) state that physical evidence may be more reliable than eyewitnesses to crimes and the value of evidence is directly affected by what happens to it immediately after the crime was committed. Evidence in an unprotected crime scene will be contaminated, degraded and diminish over time unless collected and preserved. The value of physical evidence depends on its ability to show that a crime was committed, how, when, and by whom (Orthman & Hess 2013:128-129). Saferstein (2013:20) indicates that criminal cases are inundated with individuals who were wrongly charged and convicted of committing crime. Inappropriate confessions and misleading eyewitness statements can increase these errors. Saferstein (2013:20) further indicates that with physical evidence, such errors cannot be made because physical evidence allows investigators to sort facts as they are, not as they want them to be.

According to Swanepoel (2014:199) real evidence (items capable of being attached or seized, such as weapons or firearms used during an alleged offence or clothing worn by or in the possession of the victim or accused during the commission of the crime) can be seized by the police during investigation and kept in safe custody and may later be presented in court for the purpose of identifying the accused and as evidence if it is not excluded by the court. Bezuidenhout (2014:302) refers to physical evidence as objects which are capable of being physically placed before the court in order for the court to see them.

Physical evidence is factual information that cannot be incorrect, false or absent but it is only during the interpretation thereof that incorrect assumptions can be made and failure of man in detection and analysis can diminish its value (Marais 1992:6). According to Schwikkard and Van der Merwe (2009:395) and Zeffertt and Paizes (2009:849), real evidence consists of things which are examined by the court as means of proof and upon proper identification it becomes evidence itself. They gave an example of weapon, knife or a photograph produced in a prosecution for an offence against the person.

The participants in samples A, B and C were asked the question: what is physical evidence? This was an open-ended question where participants could provide more than one answer and no choices were provided from which they could choose. Some participants accordingly provided more than one answer. The answers of the participants are provided in Table 3.1 below.

**Table 3.1: Participants' understanding of physical evidence**

<b>The meaning of physical evidence.</b>	<b>Sample A: Detectives (11)</b>	<b>Sample B: LCRC (15)</b>	<b>Sample C: Ballistics experts (13)</b>	<b>Total</b>
Evidence that can be touched.	7		6	13
Evidence that can be seen.	4	3	5	12
Evidence found at the crime scene.	1	7		8
Evidence that can be collected at the crime scene e.g. cartridge cases, bullets and firearms.		5	2	7

<b>The meaning of physical evidence.</b>	<b>Sample A: Detectives (11)</b>	<b>Sample B: LCRC (15)</b>	<b>Sample C: Ballistics experts (13)</b>	<b>Total</b>
Evidence that can be collected, packaged and analysed.			1	1
Is the exhibit found with the suspect.	1			1
Witnesses and witness statements are also physical evidence.	2			2
Evidence can be straightforward, like in a case of assault, when people were fighting it's a strong evidence, J88, etc. While in a rape case, you will sometimes find there is no evidence at all.	1			1
It is evidence that can be reproducible anytime when it is needed, e.g. firearm or any evidence that has a physical state that cannot be changed during the duration of its availability.			1	1
Not necessarily, everything that can be seen can be scientifically proven, e.g. fingerprints cannot be seen but they are there and was brought by somebody.			1	1
<b>Total</b>	<b>16</b>	<b>15</b>	<b>16</b>	<b>47</b>

The majority of participants from sample A (seven participants), as indicated in Table 3.1 above, indicated that physical evidence is evidence than can be touched. These participants are in agreement with Dempsey (2003:109), Marais (1992:5-6) and Rodivich (2012a:83) when they said that physical evidence is real tangible objects that can be introduced in a court of law. A few participants indicated that it is evidence that can be seen, these participants are in line with Brown and Davenport (2012:10); Eckert and Wright (1997b:72); Van Rooyen (2012:110) and other consulted literature. The participants from sample A partially comprehend what physical evidence entails.



The majority of participants (seven participants) from sample B indicated that physical evidence is evidence found at the crime scene, these participants are partially correct in saying that physical evidence is found at the crime scene but they did not explain what physical evidence is. Several participants (five participants) are in line with the consulted literature in their examples of the physical evidence. Gaensslen and Young (2005:341) stated that physical evidence can be divided into drugs and chemicals, trace, biological and pattern evidence.

Gaensslen and Young (2005:341) further mention that pattern evidence includes fingerprints, questioned documents, tool marks and firearm evidence. Three participants from this sample also indicated that evidence can be seen and they are in line with the literature. Based on the responses of the participants, the researcher concludes that the participants partially comprehend what physical evidence is, but it also raises concerns for the researcher, as these are the individuals that are responsible for the collection of physical evidence from crime scenes.

The majority of participants from sample C indicated that physical evidence is evidence that can be touched and seen. Orthman and Hess (2013:124) used the words that are used by the participants in their definition of physical evidence when they indicated that physical evidence is evidence that can be seen and touched. One of the participants in his response indicated that physical evidence does not have to be visible to naked eye, this participant's response is in agreement with Rodivich (2012a:83) where he stated that not all physical evidence is visible to human eye, but some evidence such as fingerprints need instruments to visualize them. Another participant indicated that the physical evidence must be produced to court as indicated by Dempsey (2003:109). The researcher concludes that these participants understand what physical evidence is.

### **3.3 LOCARD PRINCIPLE**

Orthman and Hess (2013:123); Saferstein (2011:8); Stelfox (2009:136) and Turvey and Petherick (2010:28) indicate that the Locard exchange principle states that whenever two objects come into contact with each other, there is always a transfer or exchange of material and information between them. When a person comes into contact with an object or person, a cross transfer of material occurs.

A criminal can be connected to a crime by dust particles carried from the crime scene. Turvey and Petherick (2010:28) further state that any action of an individual, and obviously the violent action constituting a crime, cannot occur without leaving a mark. What is amazing is the variety of these marks. Sometimes they will be prints, sometimes simple traces and sometimes stains. It is impossible for a criminal to act without leaving indications of his steps. Furthermore, Turvey and Petherick (2010:28) indicate that by recognizing, documenting and examining the nature and extent of evidentiary traces and exchanges at a crime scene, the criminal/s could be tracked down and then associated with particular locations, items of evidence and persons. This means that the criminals will always remove something from the crime scene and leave behind incriminating evidence.

Girard (2015:38-39) is in agreement with the authors above and adds that whenever two objects come into contact with each other, a thorough search for trace evidence should be conducted on every victim and every suspect. Crime scenes should be connected to the criminal and the victim should be connected to the crime scene. Van Heerden (1977:135) indicates that fibres of clothing materials are like hair, special contact traces can easily be loosened and transferred to the objects with which they come into contact and that, according to the Locard principle, the presence of the fibres is the rule rather than the exception.

Fisher and Fisher (2012:32) emphasises that it is not possible for anyone to enter a place without changing it in some way either by bringing something to it or by removing something from it. According to Jackson and Jackson (2011:15), the perpetrator of a crime will not only leave something at the crime scene but will also take something from the crime scene. Rodivich (2012a:86) maintains that the Locard principle addresses the transfer of materials when people and objects come into contact, and the transferred material both left behind and removed becomes physical evidence that assists in establishing linkages among the suspect, crime scene and the victim.

Van Rooyen (2012:20) refers to the Locard principle as the reciprocal transfer of traces, he mentions that a clue is usually left behind when two or more objects or people come into contact with each other. According to Fisher (2004:149) this principle states that that when an individual comes in in contact with the person or location, certain small and seemingly microscopic debris may be left or picked up by the person from contact with the environment. Van Rooyen (2012:20) gave an example of a suspect touching the window, leaving traces of his fingerprints on the window and the dust or glass particles transferred to his hands.

The participants in samples A, B and C were asked the question: what is your understanding of the term Locard principle? This was an open-ended question where the participants could provide their own answers to the question and no choices were provided from which they could choose. The participants' responses are indicated below:

Sample A responded as follows:

- Two participants indicated that Locard principle is that every contact leaves a trace.
- One participant indicated that is the “methods used to search or to penetrate through the crime scene.”
- Eight participants did not provide an answer to the question.

Sample B responded as follows:

- Ten participants mentioned that the Locard principle is that every contact leaves a trace.
- One participant indicated that it is the “study of fingerprint investigation to connect suspect with fingerprint.”
- Four participants did not provide an answer to the question.

Sample C responded as follows:

- Eight participants indicated that the Locard principle is that every contact leaves a trace.
- Five participants did not provide an answer to the question.

The viewpoints of the participants show that the samples have different understanding and opinion of the Locard principle. Though some of the responses of the participants from samples A, B and C correspond with the consulted literature they did not mention all the aspects of Locard principle and 17 participants from the three samples did not provide a response to the question, they said they did not know. The researcher concluded that the participants did not fully comprehend the meaning of the Locard principle. The lack of understanding of the Locard principle is concerning to the researcher as all the participants of this study work on a daily basis with physical evidence and yet they are not conversant with the meaning of the Locard principle.

### **3.4 IDENTIFICATION**

Girard (2015:40) points out that the purpose of analysing physical evidence is for identification and comparison. Marais (1992:18) and Van Rooyen (2012:20-21) stipulate that identification is based on the fact that everything in the universe is unique and that it has distinctive individual and class characteristics. Furthermore, Van Rooyen (2012:20) states that identification is used to pinpoint an object as belonging to a specific category of objects. This is the classification process whereby the objects with similar characteristics are placed in one category.

Fisher and Fisher (2012:5); Girard (2015:40) and Saferstein (2011:61) share the same sentiments in saying that identification is the process of determining a substance's physical or chemical identity with as much certainty as possible. Fisher and Fisher (2012:5) further indicate that the examples of identification are drug analysis, species determination and residue analysis.

According to Fish, Miller and Braswell (2013:17) and Osterburg and Ward (2010:36-37), identification describes the classification process by which an entity is placed in a predefined, limited or restricted class. If the individual characteristics are the same and are found in sufficient number at the same location, then two specimens under comparison may be judged an identity.

Physical evidence cannot always be related to a common origin with a high degree of certainty, therefore when it can be associated only with a group and never with a single source, it is placed into a class. It is not usually possible for the examiner to assign exact or even appropriate probability values when comparing class evidence (Fish, Miller & Braswell 2013:17). The purpose of identification is the determination of the physical or chemical identity of a substance with as near absolute certainty as existing analytical techniques will permit (Saferstein, 2011:61).

According to Osterburg and Ward (1992:118), the question of how many individual characteristics are needed for conclusion of an identity or an identification has not been definitely settled. There is no valid basis that exists at this time for requiring that a predetermined number of friction ridge characteristics must be present in two impressions or in order to establish a positive identification. The qualitative value of each kind of individual characteristic is a matter largely ignored in establishing a minimum quantitative standard as proof of an identity (Osterburg & Ward, 1992:118).

Classification means that an item of evidence shares a common source. These items can be placed into groups with all other items having the same properties or class characteristics (Fisher & Fisher, 2012:5). Swanson, Chamelin and Territo (1992:78) indicate that when characteristics of physical evidence are common to a group of objects or persons, they are referred to as class characteristics. Regardless of how thoroughly examined, such evidence can be placed only into a broad category, an individual identification cannot be made because there is a possibility of more than one source for the evidence.

Swanson, Chamelin and Territo (1992:78) further state that evidence with individual characteristics can be identified as originating with a particular person or source. The ability to establish individuality distinguishes this type of physical evidence from those possessing only class characteristics. The different categories of identification as stipulated in Du Preez (1996:6) and SAPS (2009:337-339) are situation identification, witness identification, victim identification, imprint identification, origin identification, action identification, culprit identification and cumulative identification. This study focused on imprint identification.

The aim of this study is to determine how firearm evidence could be used in the investigation of murder. Van Heerden (1977:153) stipulates that imprint identification is based on the principle that all objects have unique individual characteristics which can be transferred to convenient surfaces. Furthermore, Van Heerden (1977:167-168) indicates that firearm examination is based on the same principle of uniqueness and universality. The uniqueness in ballistics examination is due to the fact that each firearm has its own individual characteristics which are transferred to the cartridge cases and the bullet in the firing process. According to Marais (1992:145), imprint identification attempts to achieve individualisation by comparing a disputed imprint with a control imprint or object (Van der Westhuizen 1996:6).

SAPS (2009:338) stipulates that imprint identification is based on the Locard exchange principle, the fundamental principle of imprint identification is that the distinctive characteristics of objects are transferred to the surface with which they come into contact. Furthermore, SAPS (2009:338) mentions that the imprints are first identified for what they are, and thereafter compared with that of suspect's instrument/tool and if there are sufficient corresponding marks, it can be accepted that the specific imprint found on the scene was made by a specific instrument/tool.

Fisher (2004:224) indicates that in comparative examination, impression type evidence is studied and the marks left at the crime scene are compared with the test markings made by the tool or object in question. A determination can be made as to whether or not a particular item was responsible for the specific mark. The different imprint identification methods that are used are dactyloscopy, casts of foot, shoe, bicycle and vehicle tracks, marks made by tools, bite marks, forensic and ballistic comparisons (SAPS, 2009:338).

The participants in samples A, B and C were asked the question: what does the term identification mean? This was an open-ended question where participants could provide more than one answer and no choices were provided from which they could choose. Some participants accordingly provided more than one answer. The answers of the participants are provided in Table 3.2 below.

**Table 3.2: Participants' understanding of the term identification**

The meaning of identification	Sample A: Detectives (11)	Sample B: LCRC (15)	Sample C: Ballistics experts (13)	Total
Identifying something.	7	3	8	18
Identifying fingerprints of the suspect.	4	9		13
Comparing one object with another in order to categorise or classify objects.		2	3	5
Pointing out specific things is a means of showing.	2	1		3
Identifying suspect found on the scene.		2		2
Identifying the DNA of the suspect.	1			1
Identify information with regard to the opened case.	1			1
Physically describes the attributes of something that gives its identity.			1	1
To determine the calibre, if something has the correct calibre or correct shape.			1	1
Whatever you have, what does it mean?	1			1
To be able to use skills and knowledge in order to bring about reliable results using specific processes or procedures and techniques.			1	1
Can be feedback of the analysis that have been made.		1		1
To know things and understand things better.			1	1
No answer given.		2	1	3
<b>Total</b>	<b>16</b>	<b>20</b>	<b>16</b>	<b>52</b>

According to participants from sample A, except for one participant who deviated and indicated that identification means that whatever you have, what does it mean, identification entails the following: identifying something (seven participants), identifying fingerprints of the suspect (four participants), pointing out specific things is a means of showing (two participants), identifying the DNA of the suspect (one participant), identify information with regard to the opened case (one participant).

These responses are in line with the consulted literature though worded differently, the main point from the participants is that in identification you identify something. Some of the participants gave an example of identifying the fingerprints, DNA, and pointing out a specific thing. Van Rooyen (2012:20) stipulates that identification is used to pinpoint an object as belonging to the specific category of objects. The researcher can conclude that the participants from sample A have a fair understanding of identification.

From sample B, the majority of the participants (nine participants) gave practical responses and indicated that identification refers to the identification of fingerprints of the suspect. The researcher opines that it is because they identify fingerprints daily while performing their duties. Three participants indicated that it is identifying something, two participants referred to identification as comparing one object with another in order to categorise or classify the objects, another two participants indicated that identification is identifying a suspect found on the scene. These responses from participants in sample B are in line with the literature consulted. The researcher concludes that they have a fair understanding of identification.

From sample C, the majority of the participants (eight participants) indicated that identification is identifying something, three participants indicated that it is comparing of one object with another in order to categorise or classify the objects, three indicated that it is pointing out a specific thing, one participant indicated that identification is physically describing the attributes of something that gives its identity and the other participants indicated that it is to determine the calibre, if something has the correct calibre or correct shape.



These participants are in line with the consulted literature, except for one participant that did not give a response to the question and one participant that deviated and indicated that identification is to know things and understand things better. The researcher concludes that the majority of the participants in this sample have a fair understanding of identification.

### **3.5 INDIVIDUALISATION**

Van Rooyen (2012:21) indicates that identification and individualisation are two unchangeable concepts in investigation. He goes on to say that identification has no value in investigation because the investigator will identify an object without relating it to the source of origin. Furthermore, Van Rooyen (2012:21) opines that:

- Identification only attains significance if the individuality thereof is determined;
- Identification is possible when a series of identifications has been conducted;
- Individualisation is based on comparison of and demonstration that a particular sample is unique even amongst members of the same class and also that the object found at the crime scene and the standard of comparison are of the same origin; and
- Is intended to individualise positively the disputed objects and to indicate the involvement of the objects or person that provides the standard of comparison.

Van Heerden (1977:11) states that individualisation takes place through comparisons, the identified physical evidence or disputed objects found at the scene must be compared with the control or standards of comparison to determine or decide its individuality. De Forest, Gaensslen and Lee (1983:7) believe that individualisation refers to the demonstration that a particular sample is unique, even amongst members of the same class, this may also mean that the questioned piece of physical evidence and a similar known sample have the same origin.

Brown and Davenport (2012:13); Fish, Miller and Braswell (2013:17); Saferstein (2011:62) and Saferstein (2013:105-106) share the same sentiments and indicate that physical evidence is said to have individual characteristics when that evidence can be associated with a unique common source with an extremely high degree of probability.

This includes evidence such as matching ridge characteristics of two fingerprints, matching striation markings on bullets and tool marks. Bertino (2012:23) believes that individual evidence narrows the identity to a single person or thing and has a unique combination of characteristics that could only belong to one person or thing. The SAPS (2009:336) indicates that individualisation is based on comparison, it involves comparing the identified disputed object connected with the crime and objects with other samples of known origin to determine individuality. Successful individualisation depends on a series of identifications, therefore identification is the prerequisite for individualisation.

Fish, Miller and Braswell (2013:17) state that individualisation permits the forensic examiner to determine the uniqueness of any single object or piece of evidence. The mathematical probability that there are two identical sources of the unique individual evidence is beyond human comprehension. It is further stated in Fish, Miller and Braswell (2013:17) that the scientific examiner can state in court the scientific conclusion that excludes the possibility of identical sources of the physical evidence or, more simply stated beyond a reasonable degree of scientific certainty. Items of physical evidence that can be individualised and associated with a single originating source when the quality of physical evidence is high are impressions, fingerprint ridges, tool marks, bullet and casing comparisons, footwear and tire impressions, and handwriting (Fish, Miller & Braswell, 2013:17).

The participants in samples A, B and C were asked: what does the term individualisation mean? This was an open-ended question where participants could provide more than one answer and no choices were provided from which they could choose. Some participants accordingly provided more than one answer. The answers of the participants are provided in Table 3.3 below.

**Table 3.3: Participants' understanding of the term individualisation**

<b>The meaning of individualisation</b>	<b>Sample A: Detectives (11)</b>	<b>Sample B: LCRC (15)</b>	<b>Sample C: Ballistics experts (13)</b>	<b>Total</b>
Identifying one item and separate it from other items/specimens by means	11	3	4	18

<b>The meaning of individualisation</b>	<b>Sample A: Detectives (11)</b>	<b>Sample B: LCRC (15)</b>	<b>Sample C: Ballistics experts (13)</b>	<b>Total</b>
of certain unique features which are on the specimen.				
To identify if two objects are from the same origin. If you compare two exhibits (e.g. cartridge cases) to identify if they are from the same origin.			3	3
Individualised in terms of fingerprints, a fingerprint is unique and belongs to one person.		3		3
When you say for instance, these bullets are all 9mm parabellum, but there are differences between them for instance they were fired from different firearms, they have marks that indicate that they were fired from different firearms, so when you do that you individualise or when you identify firearm and specify the mark made by that firearm.			2	2
Single out.	2			2
Separation of marks that are not the same as other exhibits.			2	2
You are recognising the identity of certain objects.			2	2
To individualise.		1	1	2
To take two evidence and individualise one by its role e.g. if the evidence was used in this crime and differentiate it from the one that was used in other crime.	1			1
Is working alone or someone being placed to do something without needing any help.		1		1
Any grouping of exhibits to help individualise a certain suspect.		1		1

<b>The meaning of individualisation</b>	<b>Sample A: Detectives (11)</b>	<b>Sample B: LCRC (15)</b>	<b>Sample C: Ballistics experts (13)</b>	<b>Total</b>
Pinpointing one certain object or person.		1		1
To define something in its own version.			1	1
No answer given.	3	6		9
<b>Total</b>	<b>17</b>	<b>16</b>	<b>15</b>	<b>48</b>

The majority of participants (11) from sample A indicated that individualisation is identifying one item and separating it from other items/specimens by means of certain unique features which are on the specimen, these participants are in agreement with Van Rooyen (2012:21) who indicated that individualisation is based on comparison of and demonstration that a particular sample is unique even among members of the same class and also that the object found at the crime scene and the standard of comparison are of the same origin.

The researcher is of the view that the two participants from sample A who indicated that individualisation is to single out are confusing identification with individualisation because identification is used to pinpoint an object as belonging to a specific category and objects of similar characteristics are placed in the same category (Van Rooyen, 2012:20-21). The researcher can conclude that the participants from sample A have a partial understanding of individualisation.

Three participants from sample B indicated that individualisation is the process of identifying one item and separating it from other items/specimens by means of certain unique features which are on the specimen, these participants are in line with Van Rooyen (2012:20-21), the other three participants who indicated that fingerprints are unique and belong to one person are in agreement with Bertino (2012:23) who believes that individual evidence narrows the identity to a single person or thing and has a unique combination of characteristics that could only belong to one person or thing.

Six participants from sample B did not give a response to the question and in order to adhere to the research ethics, the researcher could not force the participants to give a response to the question. The remaining participants from sample B gave responses that do not correspond with the literature consulted. Based on the responses of participants from sample B, the researcher can conclude that participants from sample B lack knowledge and do not comprehend what individualisation is.

The responses of four participants from sample C correspond with the consulted literature (Van Rooyen, 2012:20-21). Three participants provided a practical response and indicated that individualisation is when you compare cartridge cases to determine if they are from the same origin, two participants also gave a practical example and indicated that individualisation is when you take two 9mm parabellum bullets and by looking at the unique marks are able to determine if they were fired from the same firearm or when a firearm is identified and specify the marks that were made by the firearm, these participants are in agreement with the consulted literature (Brown & Davenport, 2012:13; De Forest, Gaensslen & Lee (1983:7); Fish, Miller & Braswell, 2013:17; Saferstein, 2011:62; Saferstein, 2013:105-106. The researcher can conclude that the participants from sample C have a fair understanding of what individualisation entails.

Collectively, nine participants: three from the detectives and six from the LCRC did not give responses to the question, the researcher could not force the participants to provide an answer as the researcher would be violating the research code of ethics. Four participants provided responses that do not correspond with the literature consulted namely: one participant from the detectives who indicated that individualisation means to take two evidence and individualise one by its role e.g. if the evidence was used in this crime and differentiate it from the one that was used in other crime. One participant from LCRC who indicated that individualisation is working alone or someone being placed to do something without needing any help; one participant from LCRC who indicated that individualisation is pinpointing one certain object or person; and the participant from ballistics who indicated that individualisation is to define something in its own version.

The researcher concluded that the participants (samples A, B and C) lack knowledge and understanding of individualisation and this raises a concern for the researcher because individualisation starts at the crime scene and ends when giving evidence in the court of Law, yet the participants do not comprehend the concept of individualisation.

### **3.6 CHAIN OF CUSTODY/CONTINUITY OF POSSESSION**

Du Preez (1996:3) states that the maintaining the continuity of possession is the continuous safekeeping and identification of physical evidence which is of importance in the evidential process. Similarly, Prinsloo (1996:29) refers to the continuity of possession as the continuous safe possession and identification of physical information which is of greatest importance for the purpose of individualisation. The degree to which continuity of possession is maintained determines the acceptability of the information, its interpretation and the results of investigation. Furthermore, Prinsloo (1996:30) cautions that even the gathering, marking and packaging and sealing of the physical crime information takes place in accordance with the generally accepted rules and procedures, doubts about the people and their motives for handling the evidence during investigation can prejudice the integrity of the evidence and therefore the number of people who handle the evidence must be kept to a minimum.

UNODC (2009:4) indicates that integrity of evidence refers to the requirements that any item introduced in court must be in the same condition as when it was found at the crime scene. The importance of evidence depends on its ability to establish that a crime was committed and to show how, when, and by whom the crime was committed (Orthman & Hess 2013:129). Fisher and Fisher (2012:9-10); Fish, Miller and Braswell (2013:22); Jackson and Jackson (2011:42-43) and UNODC (2009:4) share the same sentiments when explaining that the chain of custody is the chronological and careful documentation of evidence from the start at the crime scene until the end of forensic process.

It is the documentation of what has happened to the evidence from the time it was discovered until it is needed in court; documentation of every person who has had custody of the evidence and why, the documentation of the changes made to the evidence, and reasons for the changes should also be indicated. UNODC (2009:4) further states that it is important to demonstrate every single step undertaken to ensure traceability and continuity of evidence from the crime scene to the courtroom. The value of the recovered and preserved physical evidence can be lost if the chain of custody is not properly maintained. Chain of custody is the weak link in criminal investigations.

When sending items of evidence to the FSL to be analysed, the information that is needed to establish chain of custody as outlined in Fisher and Fisher (2012:9-10), Jackson and Jackson (2011:42-43) and Saferstein (2011:43) includes the following:

- Name and initials of the individual collecting the evidence and each person subsequently having custody of it;
- Dates the item was collected and transferred;
- Agency, case number and the type of crime;
- Voucher and property clerk number;
- Victim or suspect's name; and
- Storage location and brief description of item.

Fisher and Fisher (2012:9-10) and Jackson and Jackson (2011:42-43) further indicate that the documented information about what has happened to the evidence from the crime scene until the evidence is produced in court serves to prove the chain of custody to the court; is used to help locate evidence years down the road in case additional testifying is required and creates an uninterrupted series of identified individuals, each of whom can be asked to testify in court that the integrity of the item of evidence was not compromised while it was in his or her safe keeping. Furthermore, Fisher and Fisher (2012:9-10) state that to prove that the integrity of the physical evidence has been maintained, the court will require proof that evidence collected during investigation and the evidence ultimately submitted to court are one and the same.

Bertino (2012:28) and Saferstein (2011:43) opine that chain of custody must be established whenever evidence is presented in court, and can be established by adhering to the standard procedures in recording the location of evidence, marking evidence for identification, properly completing the evidence or exhibit log sheet and accounting for every person who handled or examined the evidence. Bertino (2012:28) emphasises that the chain of custody should be maintained at all times and that failure to validate the evidence's chain of custody may lead to serious questions regarding the authenticity, integrity of the evidence and the examinations conducted on the evidence.

Furthermore, Saferstein (2011:43) indicates that the marking of all items of physical evidence should be done with the utmost care to avoid destroying their evidential value or restricting the number and kind of examination to which the criminalist may subject them. All the individuals involved in the collection and transportation of the evidence may be requested to testify in court, this is to avoid confusion and to retain complete control of the evidence at all times, the chain of custody should be kept to a minimum (Saferstein, 2011:43). Heard (2013:309) opines that the chain of custody is being able to account to what has happened to the evidence from the crime scene to the forensic science laboratory and to the courtroom.

Fish, Miller and Braswell (2013:23) believes that the chain of custody will provide a chronological timeline that accurately depicts the journey of the evidence during the life of the case. It portrays the actions that were taken to identify, collect, and preserve the integrity of physical evidence and plays an essential role in the admissibility of evidence into courtroom proceedings. Fish, Miller and Braswell (2013:23) emphasise that a break in the chain of custody will weaken or may even disqualify the physical evidence and remove it from the consideration of the court, even a gap or oversight in the documentation process can be costly and lead to the exclusion of critical information necessary to convict or exonerate the suspect. Prinsloo (1996:29-30) alludes that maintaining continuity of possession implies the continuous, safe possession and identification of physical information, the degree at which physical integrity is and continuity of possession is maintained determines the quality of substantive integrity, which implies the acceptability of physical crime information.



Van Heerden (1977:12) is of the opinion that the continuous safekeeping and identification of physical evidence is essentially important in individualisation. Failure of the investigating officer to properly identify the disputed specimen or to maintain the continuity of safe possession reduces the value of laboratory analysis. According to Marais (1992:15) the integrity of physical evidence is questioned in court and the correct methods applied during collection, marking and packaging of evidence may be nullified if account of who handled the exhibits cannot be given. In the case of *S vs Kaptein* 1984, the SAPS members failed to account on the chain of custody of the evidence. The flawed marking of the exhibits caused confusion in this case at court, the court held that the chain of custody was compromised.

Marais (1992:15) and Van Rooyen (2004:12) developed the guidelines to be followed in order to maintain the chain of custody. The following basic guidelines are important and must be adhered to in order to maintain the chain of custody:

The persons handling the evidence must write their names, force numbers and assignment on the package.

- The number of individuals who handle the evidence from the time it is found to the time it is presented in court should be limited.
- If the evidence leaves your possession, record to whom it was given, the time, date and the reason for being given to another, when and by whom it was returned.
- A signed receipt should be obtained from the person accepting the evidence.
- When the evidence is returned, check for your identification mark and ensure that it is the same item. Determine if it is in the same condition as it was when recovered.
- Any change in the physical appearance of the evidence should be brought to the attention of the court.

The participants from samples A, B and C were asked: what do you understand about the term continuity of possession? This was an open-ended question and there were no choices provided for the participants to choose from. The participants provided their own answers and some gave more than one answer. The participants' responses are summarised in Table 3.4 below:

**Table 3.4: Participants' understanding of the term continuity of possession**

The meaning of continuity of possession	Sample A: Detectives (11)	Sample B: LCRC (15)	Sample C: Ballistics experts (13)	Total
Chain of custody is being able to trace the evidence from collection at the crime scene until the evidence is presented in court. The documentation of what happened to the exhibit and the details of who handled the exhibit, when and what was done on the exhibit should also be detailed.		15	12	27
Handling of evidence from one person to another.	1			1
When a person always commits the same crime.	3			3
Chain of custody.			1	1
The same marks appear again, if you are trying to rotate something then it will appear again and again.			1	1
Is not having a stable position.			1	1
Storage of evidence for future use.	1			1
The stolen object will remain stolen even if it is at the next person.	1			1
When one person possesses something and keep it for a long time.	1			1
Something that continues, it does not happen once it happens more than once.	1			1
Possessing something that does not belong to you from one person to another.	1			1
No answer given.	2			2
<b>Total</b>	<b>11</b>	<b>15</b>	<b>15</b>	<b>41</b>

Based on the responses of participants from sample A, the researcher acknowledges that there is disagreement between the participants' responses and the information obtained in the literature with regard to chain of custody/continuity of possession. All the participants from sample A provided responses that are irrelevant and not in line with the literature consulted and the researcher concluded that the participants lack understanding of the concept of chain of custody. Two participants did not provide a response to the answer and to adhere to the research ethics the researcher could not force them to respond.

None of the participants from sample A provided relevant responses which is concerning to the researcher as the chain of custody plays an important role in the admissibility of evidence when evidence is presented in court. The researcher believes that if the investigating officers are knowledgeable on the concept of chain of custody, their cases could possibly not be withdrawn from court as they will be able to account for the changes made to the evidence from the time it was collected at the crime scene until it was presented in a court of law.

The responses of all the participants of sample B as indicated in Table 3.4 are in line with the consulted literature (Fisher & Fisher, 2012:9-10; Jackson & Jackson; 2011:42-43), indicating that the documented information about what has happened to the evidence from the crime scene until the evidence is produced in court serves to prove the chain of custody to the court. The researcher can conclude that the participants from sample B comprehend what chain of custody is all about.

The majority (12) of participants from sample C as indicated in Table 3.4 above are also in line with the consulted literature. One participant did not provide an explanation of continuity of possession but provided the other name for it. The participant who indicated that continuity of possession is the same marks appearing again if you are rotating something and the participant, who indicated that continuity of possession is not having a stable condition, gave responses that are totally not in line with the description of the chain of custody as explained in the literature. The researcher can conclude that the majority of the participants from sample C comprehend chain of custody.

The researcher agrees with the participants and the literature that there is a need to maintain the chain of custody and be able to prove to the court that the integrity of the evidence was not tampered with. There is a need to prove that the chain of custody was maintained at all times from the moment the exhibits were collected from the crime scene until the exhibits were presented as evidence in court. The participants in their explanations did not indicate the importance of maintaining chain of custody as specified by the consulted literature (Du Preez, 1996:3; Prinsloo, 1996:29).

### **3.7 CONTAMINATION OF EVIDENCE**

According to Orthman and Hess (2013:128-129), the value of evidence is affected by what happens to it immediately following the crime. Gilbert (2004:93) and Lyman (2013:43) refer to the act of allowing the evidence to be tampered with or not protecting the chain of custody as contamination of evidence. Furthermore, Lyman (2013:43) indicates that unnecessary or improper entry onto the crime scene may: destroy or contaminate the evidence; introduce items into the crime scene that may mislead the investigations; and provide defence attorneys with the basis for discrediting the investigators or the findings of a crime laboratory. Orthman and Hess (2013:128-129) believe that:

- Evidence in an unprotected crime scene will degrade, diminish or disappear over time unless collected and preserved.
- The importance of evidence depends on its ability to establish that a crime was committed and to show how, when, and by whom.
- The integrity of evidence refers to the requirements that any item introduced in court must be in the same condition as when it was found at the crime scene.
- Chain of evidence is the documentation of what has happened to the evidence from the time it was discovered until it is needed in court including every person who has had custody of the evidence and why.

Similarly, Heard (2013:310) states that for the evidence to be of use in the trial, the journey of evidence from the crime scene to laboratory and to the court must be in a validated manner so that all involved can be assured that it has not been contaminated and that the evidence is relevant to the crime investigated.

Jackson and Jackson (2011:2) outline that to minimise the risk of evidence contamination, the following precautionary steps should be applied:

- the use of chain of custody labels;
- opening each package in an area other than where it was originally sealed;
- repackaging each item of evidence as soon as it has been analysed;
- using the logging systems;
- minimising the number of people handling the evidence; and
- storing the packaged evidence in a dedicated secure area.

Watkins (2013:112-114) agrees with Locard's principle of exchange and indicates that the same principle is central to the issue of crime scene contamination. Watkins (2013:112-114) raises a concern that if every contact leaves a trace, then everyone -including police officers who enter the crime scene after a crime scene has occurred -will leave behind evidence of his or her presence and also take away some trace from the scene. Furthermore, Watkins (2013:112-114) is concerned that for the police officer, the evidence left at the crime scene will not be related to the crime but the evidence taken away may be related to it.

Lyman (2013:43) emphasises that every entry to the crime scene has the potential to destroy evidence and introduce irrelevant substances into the crime scene. When police officers enter the crime scene to perform their necessary duties, they should avoid touching or moving objects at the scene or entering areas where entry is unnecessary as the crime scene can be contaminated and evidence that is potentially related to the crime can also be lost. Watkins (2013:113-114) further opines that the potential for the crime scene to be contaminated exists in the period between the occurrence of crime.

Contamination of the scene further occurs when the police arrive to secure the scene; and some degree of contamination will occur when the police and the medical service enter the scene to safeguard life or property, search for victims or suspects and to gain a sense of what has transpired.

To ensure that no further contamination of the crime scene occurs, the crime scene must be secured and access to the crime scene controlled; proper evidence collection procedures should be followed and the action of all individuals involved should be documented (Watkins, 2013:113-114). Gilbert (2004:93) also mentions that crime scene protection is important with regard to admitting of evidence in judicial proceedings because only evidence demonstrated to be authentic to the scene and free from contamination will be allowed to be presented during the trial.

According to Du Preez (1996:29), the handling of physical or material crime information determines its physical integrity. Van Heerden (1977:10) cautions that the preservation of the integrity of physical evidence is not merely a routine action, but a fundamental requirement in the process of presenting evidence. The preservation of the integrity of physical evidence is a continuous responsibility from the time it is discovered until it is presented in court or until the final settlement determines its disposition (Marais, 1992:13).

The participants from samples A, B and C were asked: what do you understand about the term contamination of evidence? This was an open-ended question and there were no choices provided for the participants to choose from. The participants provided their own answers and some gave more than one answer. The participants' responses are summarised in Table 3.5 below:

**Table 3.5: Participants' understanding of the term contamination of evidence**

The meaning of contamination of evidence	Sample A: Detectives (11)	Sample B: LCRC (15)	Sample C: Ballistics experts (13)	Total
Tampering with exhibits.	5	1	6	12
Coming into contact with physical evidence without wearing PPEs.		5	2	7
Touching the exhibits and allowing everyone to come and go at the crime scene.	1	3	1	5
Not following correct procedure when handling exhibits and destroy the evidence.	2		2	4

The meaning of contamination of evidence	Sample A: Detectives (11)	Sample B: LCRC (15)	Sample C: Ballistics experts (13)	Total
Disturbing the evidence found at the crime scene.	1	2		3
Changing things from their original state.		3		3
Using the same PPEs (e.g. gloves) at different crime scene.	1	1		2
When evidence comes into contact with foreign objects that are not supposed to be in contact with.	1		1	2
To distort the physical entity of evidence.			1	1
Not properly packaging the exhibits and exhibits not sealed in a prescribed manner and not having necessary protective gear.			1	1
When you open the evidence not in a safety environment, just open it in public.			1	1
<b>Total</b>	<b>11</b>	<b>15</b>	<b>15</b>	<b>41</b>

It is evident from Table 3.5 above that the majority of the participants, five (5) from sample A and six (6) from sample C believe that contamination of evidence is tampering with evidence, only one participant from sample B shares the same sentiment. These participants (majority of participants from samples A and C and one from sample B) are in line with Gilbert (2004:93) and Lyman (2013:43) who state that the act of allowing the evidence to be tampered with or not protecting the chain of custody is contamination of evidence.

The other responses from all the samples (A, B and C) are relevant to the discussion on contamination of evidence from the consulted literature. Several participants indicated that the evidence becomes contaminated by coming in contact with it without wearing personal protective equipment (PPEs) such as gloves.

They also indicated that contamination of evidence is disturbing the evidence found at the crime scene by touching the exhibits, allowing everyone to enter the crime scene, moving the exhibits from their original position and not following the proper procedures when handling the exhibits. Some participants indicated that using the same PPEs at different crime scenes and when foreign objects come in contact with the exhibits it causes contamination of evidence.

When comparing these responses with the literature, it became evident that the participants touched on the discussions on contamination of evidence as contained in the literature. The responses of the majority of the participants from samples A, B and C are in line with the consulted literature and the researcher can conclude that the participants are conversant with what contamination of evidence entails. Jackson and Jackson (2011:2) say that to minimise the risk of evidence contamination, the following precautionary steps should be applied:

- the use of chain of custody labels;
- opening each package in an area other than where it was originally sealed;
- repackaging each item of evidence as soon as it has been analysed;
- using the logging systems;
- minimising the number of people handling the evidence; and
- storing the packaged evidence in a dedicated secure area.

### **3.8 CRIME SCENE**

Dempsey (2003:47) classifies crime scenes according to perimeters. Dempsey (2003:47) believes that a crime scene is a place where the crime has been committed (the inner perimeter); the immediate area surrounding the scene, including entrances and the exits to and from the scene (the outer perimeter) and anywhere that evidence of crime can be found (the extended perimeter). Dempsey (2003:47) further indicates that the crime scene can be extended from the actual area in which the crime took place to any area where the suspect flees to or leaves evidence. Van Rooyen (2007:13) also believes that the crime scene is not only the place where the crime is committed, it also includes any other place away from the crime scene where physical clues in relation to the crime can be found.



Van Rooyen (2007:13) further indicates that the different types of crime scenes include the potential crime scenes, active crime scenes, passive crime scenes and disasters. The varied nature of crime scene will be determined by the following:

- indoor scenes;
- outdoor scenes;
- mobile scenes where crimes such as murder and rape are committed in vehicles and or vessels; and
- person oriented crime scenes where the body and clothing of a person can supply important clues.

Miller (2005:167) explains that a crime scene can be classified into different categories based on sequence of criminal activity or the location of the original activity as the primary and secondary crime scene. The primary crime scene is the first place or the original place where the crime occurred and the secondary crime scene refers to any subsequent crime scene. Miller (2005:167) further indicates that the other classification of crime scene is based on the size and can be classified as macroscopic and microscopic crime scenes. Macroscopic crime scene composes of many crime scenes, for example, the gunshot victim's body dumped in the field represents the following crime scenes within the overall crime scene of the field: body, the body's wounds and the ground around the body. Microscopic classification of the crime scene is more focused on the specific types of physical evidence found at the macroscopic scene. Microscopic crime scenes are the trace evidence on the body, the gunshot residue around the wound and the tire tread marks on the ground next to the body.

Furthermore, Miller (2005:168) indicates that the other classifications of crime scenes are based on the type of crime that occurred (murder crime scene, robbery crime scene); crime scene classified based on the crime scene condition (organised or not organised). The crime scenes can also be classified based on the physical location of the crime scene (vehicle, indoor, outdoor); and the crime scene classification based on the type of criminal behaviour associated with the scene (passive or active).

Crime scene is not only the actual location of the crime it includes the staging and planning areas, the paths of flight to and from the primary scene, and the paths between primary and secondary scenes (Ngenge, 2004:3). According to Stelfox (2009:127) crime scene includes the following:

- places used to plan the crime;
- places where the victim was attacked;
- places where the victim and the suspect had an encounter;
- places where the offender detained the victim;
- places where the offender attacked the victim;
- the places where the body was deposited;
- weapon deposit site; weapon's routes to and from any scene;
- places used to clean or discard material used in or obtained during the offence;
- and
- people who have come in contact with the suspect or the scene and the vehicles or other forms of conveyances used in the crime.

A crime scene is any place where the crime has occurred and can be the place where evidence relating to the specific crime has been located. The crime scene can be confined or extensive, indoors or outdoors (Watkins, 2013:114-115). According to the SAPS National Instruction 1 (2015:2), crime scene means the place, including the surrounding area where an alleged offence was committed or where items with potential evidential value may be collected. Van Heerden (1977:12) highlighted that the scene of crime constitutes the source of hidden clues that may lead to the solution of the crime, and the crime scene can be regarded as a field laboratory where disputed objects are detected for laboratory investigations at later stage.

The participants in samples A, B and C were asked: what is a crime scene? This was an open-ended question where the participants could provide their own answers to the question and no choices were provided from which they could choose. The participants' responses are indicated below.

Sample A responded as follows:

- Ten participants indicated that a crime scene is a place where crime has occurred.
- One participant indicated that a crime scene is a place where necessary exhibits to link the suspect can be collected.

Sample B responded as follows:

- Fourteen participants indicated that a crime scene is a place where crime has occurred.
- One participant mentioned that is a place where the incident took place, where you find the exhibits and the clues.
- One participant defined crime scene as a place where the crime was committed, where any kind of evidence was left behind.
- One participant did not provide an answer to the question.

Sample C responded as follows:

- Twelve participants mentioned that a crime scene is a place where crime has occurred.
- One participant is of the opinion that a crime scene is a place where the crime has been committed, where exhibits can be collected.
- Another participant defines crime scene as a place where a crime has been committed and evidence is present.
- One participant believes that a crime scene is a place where crime has been committed or took place, it can be indoor or outdoor as long as the crime has been committed.
- One participant defined crime scene as a process of following sequential steps which took place step by step, the way the scene happened until you are at the reliable conclusion or result of what actually happened.

The majority of the participants (10) from sample A indicated that a crime scene is a place where crime has occurred, and one participant from this sample indicated that it is the place where necessary exhibits that can link the suspect can be collected. These participants are in agreement with Van Rooyen (2007:13) and Watkins (2013:114-115) who indicated that a crime scene is a place where the crime has occurred and can be a place where evidence relating to the specific crime has been located.

From sample B, except for one participant that did not provide a response, all the other participants are in agreement with the consulted literature in their definition of a crime scene. The participants are in agreement with Watkins (2013:114-115) when they indicated that a crime scene also includes the place where exhibits and clues can be found.

The majority of the participants from sample C share the same sentiments with the majority of the participants from samples A and B when they indicated that a crime scene is a place where the crime was committed. Two participants also confirm that the place where evidence is present or can be found and be collected is also a crime scene. One participant from sample C gave a response that does not correspond with the definition of crime scene as contained in the literature. However, one participant when defining crime scene indicated that the crime scene can be indoor or outdoor, this participant is in agreement with Van Rooyen (2007:13) and Watkins (2013:114-115) when they stated that the crime scene can be confined or extensive, indoors or outdoors.

The researcher is concerned that when viewing the participants' responses from all the samples collectively, the participants only referred to the actual place where crime took place and the place where evidence can be collected as the crime scene. Though the participants are partially correct when defining crime scene, none of the participants, except for one participant who indicated that the crime scene can be indoor or outdoor classified the crime scene into different categories as contained in the consulted literature (Dempsey, 2003:47; Miller, 2005:168; Van Rooyen, 2007:13; Watkins, 2013:114-115).

Stelfox (2009:127) indicates that a crime scene includes:

- places used to plan the crime;
- places where the victim was attacked;
- places where the victim and the suspect had an encounter;
- places where the offender detained the victim;
- places where the offender attacked the victim;
- the places where the body was deposited;
- weapon deposit site; weapon's routes to and from any scene;
- places used to clean or discard material used in or obtained during the offence;  
and
- people who have come in contact with the suspect or the scene and the vehicles or other forms of conveyances used in the crime.

Based on the participants' responses, the researcher can conclude that the participants from all three samples are not totally conversant with what a crime scene is. The participants have a fair understanding of what the crime scene entails but lack knowledge.

### **3.9 FIREARM EVIDENCE**

Firearm evidence includes the firearms and ammunition components contained within or expelled from a gun during the firing process (Rodivich, 2012a:88). Saferstein (2013:81) believes that firearm evidence is any firearm as well as ammunition discharged or intact ammunition, suspected of being involved in a criminal offence.

According to Van Schalkwyk (1996:285), firearm evidence includes the firearm, fired bullets and cartridge cases used in the commission of the crime. Osterburg and Ward (2010:59-60) indicate that whenever a firearm is used in the commission of a crime, physical evidence such as the weapon, the cartridge cases, the bullets and the ammunition is likely to be found at the crime scene. Furthermore, Osterburg and Ward (2010:59-60) indicate that a weapon that has been recovered from the crime scene can be test fired to link it to the bullet or the cartridge cases that have been found at the crime scene, this evidence is useful for investigation and can be presented in a court of law.

Girard (2015:192) believes that the recovering of firearm and firearm related evidence such as bullets and cartridge cases is a vital part of investigation of crimes involving the use of firearms. The participants from samples A, B and C were asked: what is firearm evidence? This was an open-ended question and there were no choices provided for the participants to choose from. The participants provided their own answers. The participants' responses are summarised in Table 3.6 below.

**Table 3.6: The participants' understanding of what firearm evidence is**

The meaning of firearm evidence	Sample A: Detectives (11)	Sample B: LCRC (15)	Sample C: Ballistics experts (13)	Total
Firearm evidence is evidence such as firearms, cartridges, projectile, bullets, firearms, primer residue, touch DNA, fingerprints on the firearm, cartridge case, magazine, bullet wound and bullet holes.	3	8	6	17
Evidence collected from the crime scene where the firearm was used.	6	6	1	13
Is ballistic reports where by cartridges or other items which were used from the firearm were removed.	1			1
Anything that can be used to connect/link the firearm with the crime that has been committed.			1	1
Refer to marks found on the firearm, breech face marks, riffling in the barrel.			1	1
Evidence which is produced through firearm mechanism.			1	1
Any knowledge that can be obtained during examination and be associated to that particular firearm.			1	1
Evidence collected from the firearm or which can be produced from a firearm.			1	1
Results that comes out from the examination of firearm.			1	1
No answer.	1	1		2
<b>Total</b>	<b>11</b>	<b>15</b>	<b>13</b>	<b>39</b>

Table 3.6 above indicates that from sample A, the majority of the participants six (6) believe that firearm evidence is evidence collected from the crime scene where a firearm was used. There is disagreement between the information received from participants and the consulted literature. Rodivich (2012a:59-60) states that firearm evidence includes firearms and ammunition components contained within or expelled from the gun during the firing process. The researcher is in agreement with the literature in that from the crime scene where the firearm was used, not only the firearm evidence would be found, the DNA evidence, foot prints and other physical evidence can be found on the scene where the firearm was used.

The participants were not specific and did not indicate that the ammunition and ammunition components expelled from or contained within the gun during the firing process is also evidence and they did not refer to evidence found on a crime scene where the firearm was used. One participant referred to a ballistic report, this participant is not in line with the consulted literature, and one participant did not respond to the question and due to research ethics, the researcher could not force him to respond.

Three (3) participants gave examples of firearm evidence and mentioned that firearm evidence includes evidence such as firearms, cartridges, projectile, bullets, firearms, primer residue, touch DNA, fingerprints on the firearm, cartridge case, magazine, bullet wound and bullet holes. These participants are in line with the consulted literature (Girard, 2015:192; Osterburg & Ward, 2010:59-60; Saferstein, 2013:81; Van Schalkwyk, 1996:285). The researcher concludes that the participants from sample A do not fully comprehend what firearm evidence entails.

From sample B, one participant did not provide a response to the answer, few participants six (6) referred to firearm evidence as evidence collected from the crime scene where the firearm was used, these participants are not in line with the literature consulted. The majority of participants eight (8) are in line with the consulted literature in their description of firearm evidence. The participants in this sample have a fair understanding of firearm evidence.

The majority of participants six (6) from sample C are in line with the consulted literature in their explanation of what firearm evidence entails. All the other participants from this sample gave varied responses to the question but are still in line with the consulted literature. One participant indicated that firearm evidence is anything that can be used to link the firearm to the crime that has been committed. Another participant referred to the evidence that is provided through the marks on the firearm, breech face marks and rifling on the barrel. The other participant from ballistics referred to evidence produced through the firearm mechanism as firearm evidence.

The researcher believes that the participants were responding to the answer based on their personal experience and focusing on the issues they check on daily basis when analysing the firearm evidence received as exhibits for analysis. None of the consulted literature referred to the marks on the firearm, breech face marks, rifling on the barrel and evidence produced through the firearm mechanism as part of firearm evidence. Based on the participants' responses the researcher can conclude that the participants are familiar with what firearm evidence entails.

### **3.10 TYPES OF FIREARM EVIDENCE THAT CAN BE FOUND ON A MURDER CRIME SCENE**

The evidence that can be found on a murder crime scene where a firearm was used includes the firearm itself, the bullet and sometimes the cartridge cases (De Forest, Gaensslen & Lee, 1983:399). In a shooting case, the ammunition, firearm, fired bullet and cartridge cases are the firearm evidence that can be found on a crime scene (Rowe 2005:401). According to Eckert and James (1997a:47), the different types of firearm evidence that can be found at the murder crime scene and sent to the laboratory for examination includes the firearm, bullets and cartridge cases. When the firearm is sent to the laboratory, it can be examined to determine its working condition. At the scene of incident where the firearm was involved, the firearm, cartridges, bullet holes and bullets will be found and should be properly recorded before they are collected (Manamela & Mokwena, 2015:150).



Jackson and Jackson (2011:297) believe that evidence recovered from the scene of crime includes spent cartridge cases, projectiles and/or gunshot residues. The type of weapon used will determine the type of projectile found at the crime scene, the projectile may be bullets, shot or wadding. Girard (2015:192) indicates that in crimes involving firearms, the recovery of firearms and firearm related evidence such as cartridge cases and bullets is important for investigation.

According to SAPS (2002:16), fired bullets and cartridge cases are often the physical evidence found at the crime scene where a firearm was used. O'Hara (1981:759) mentioned that the bullet, the cartridge case, the firearm, the wound and the indication of the trajectory found at the scene, if studied, can lead to the owner of the weapon and to the establishment of the criminal responsibility.

The participants from samples A, B and C were asked: what type of firearm evidence can be found on a murder crime scene? This was an open-ended question and there were no choices provided for the participants to choose from. The participants provided their own answers and some participants provided more than one answer. The participant's responses are summarised in Table 3.7 below as follows:

**Table 3.7: The participants' understanding of the types of firearm evidence that can be found on a murder crime scene**

Types of firearm evidence that can be found on a murder crime scene	Sample A: Detectives (11)	Sample B: LCRC (15)	Sample C: Ballistics experts (13)	Total
Cartridge cases		9	12	21
Firearms	3	10	7	20
Primer residue	2	11	6	19
Bullets	1	6	12	19
Cartridges	8	8		16
Projectile	5	5		10
Bullet wounds	1	4	2	7
Bullet jackets		3	3	6
Ammunitions	1	1	3	5
Fingerprints		2	1	3
The body of the deceased	1		1	2

Types of firearm evidence that can be found on a murder crime scene	Sample A: Detectives (11)	Sample B: LCRC (15)	Sample C: Ballistics experts (13)	Total
Clothing			2	2
Blood		1	1	2
Distance the bullet travelled and the path it took until it landed.		2		2
Fired bullet core			1	1
Bullet point	1			1
Wads			1	1
Pellets			1	1
Tools			1	1
Bullet ricochet marks			1	1
Ownership of the firearm.	1			1
How the firearm was used to commit crime.	1			1
<b>Total</b>	<b>25</b>	<b>62</b>	<b>55</b>	<b>142</b>

Table 3.7 above reflects the responses of participants from samples A, B and C on the types of firearm evidence that can be found on a murder crime scene. When the researcher analysed the responses of the participants in the table above, it was discovered that none of the participants from sample A referred to cartridge cases and bullet jackets as the types of firearm evidence that can be found on a murder crime scene. Only three (3) participants from sample A referred to firearms, one participant referred to bullets and two (2) participants referred to primer residue as firearm evidence that can be found in a murder crime scene.

One participant referred to ownership of the firearm as the type of firearm evidence that can be found at the crime scene. One participant indicated how the firearm was used to commit crime as firearm evidence that can be found at the scene, none of the consulted literature mentioned this as the type of evidence that can be found from the crime scene. The researcher believes that the participants from sample A do not comprehend what firearm evidence can be found at a murder crime scene because at a standard crime scene where a firearm was used, the cartridge cases, bullets, firearms, bullet jackets and firearms are mostly the types of firearm evidence that can be found.

All the participants should mention all of these as an indication of knowledge on the types of firearm evidence that can be found in a murder crime scene. It is evident from the table above that the responses from samples B and C were in agreement with each other and in line with the consulted literature. The majority of the participants (samples B and C) indicated that cartridge cases, firearm, primer residue, bullets, cartridges and projectiles are the most likely firearm evidence that can be found at the murder crime scene. Several participants referred to bullet wound, bullet jacket; ammunition and fingerprints as firearm evidence that can be found at the murder crime scene. A participant from ballistics referred to bullet ricochet marks as types of firearm evidence that can be found on a murder crime scene. The participants from samples B and C are in line with the consulted literature and the researcher can conclude that the participants comprehend the different types of firearm evidence that can be found at the murder crime scene.

### **3.11 PROCEDURE FOR COLLECTING FIREARM EVIDENCE ON A CRIME SCENE**

Fisher (2004:29) believes that physical evidence found at the scene can be the key to the solution of the crime where firearms were used. The most important task at the scene is to prevent the destruction of the potential evidence that may lead to the apprehension of the criminal and the ultimate resolution of the crime. Fisher (2004:64) further indicates that when collecting firearm evidence, the crime scene should be carefully processed and special care must be taken when walking through the location where evidence is found so that casings and bullets are not stepped on or unintentionally kicked. The evidence collection methods differ as a result of the specific type of evidence to be recovered. The sequence of collection is determined by the investigating officer but the evidence that can easily be moved or lost due to factors that the investigating officer cannot control should be collected first (Rodivich, 2012a:91).

SAPS (2002:16-24) and SAPS (2009:190-191) stipulates that all fired bullets and cartridge cases found at the crime scene must be sent to the laboratory for examination.

Furthermore, it is indicated in SAPS (2002:16-24) and SAPS (2009:190-191) that:

- During collection, the position of cartridge cases and bullets at the scene must be accurately recorded and the exhibits must be marked accordingly, marks must not be made on the bullets or cartridge cases.
- The cartridge cases and bullets must be placed in containers, such as envelopes.
- The containers must be marked with case number, station, place where the exhibit was found and the exhibit number.
- The lead bullets must be wrapped in tissue paper before being packaged.
- Bullets and cartridge cases must never be placed on cotton wool.
- All firearms forwarded to ballistics for examination must be unloaded before sending it for examination.
- If a bullet is removed from a body, care must be taken not to damage it, the bullet must immediately be rinsed under running water after removal and must be air dried.

Rodivich (2012a:96-97) indicates that when collecting firearm evidence, the condition and functioning properties of the firearm, the safety mechanism and the presence of the chambered rounds should be noted prior to its unloading and collection. The revolver holds ammunition in its chamber within the rotating cylinder, the chamber aligned with the barrel should be noted before the cylinder is released. Firearms should never be collected by inserting a tool inside the barrel as that can destroy any possible DNA, trace evidence or alter the rifling of the barrel. Fired cartridge cases and spent cartridges should never be collected using sharp metal instruments as that can alter the markings used for comparison.

Manamela and Mokwena (2015:150) caution that the firearms found at the scene must be made safe before being packaged for examination. If two or more firearms were recovered from the scene, they should be packaged in different packages to prevent cross contamination. The ammunition should also be packaged separately and sent to ballistics for examination.

Saferstein (2013:213-214) and Swanson, Neil, Chamelin and Territto (1988:105) share the same sentiments and indicate that picking up the firearm by putting a pencil or stick on its barrel should be avoided as it disturbs the powder deposits, rust, or dirt in the barrel and may also alter the striation markings on the test fired bullets thereby confusing the laboratory examiner. Saferstein (2013:213-214) further mentions that:

- The firearms should be collected by the checkered portion of the grip in order to preserve the fingerprints on it.
- Accidental discharge of the firearm in transit should be avoided by ensuring that the firearm is safe before the weapon is sent to the laboratory; and
- The weapon must be unloaded.

Furthermore, Saferstein (2013:213-214) indicates that the location of all fired and unfired ammunition in the weapon must be recorded; extreme caution is needed when removing a lodged bullet from the wall or other object. To ensure the protection of class and individual markings on bullets and cartridge cases and bullets, cartridge cases and discharged shells should be placed in a container that is appropriately marked for identification.

Pena (2000:97-99) developed a firearm, bullets, cartridge cases and ammunition precautions checklist. It is stated that:

- A loaded gun should never be submitted to the laboratory;
- The bore, the chamber or the cylinder must never be cleaned before submitting the firearm to the laboratory;
- A firearm must never be fired before it is examined;
- The weapon/firearm should never be picked up by placing a pencil or other object in the end of the barrel;
- The serial number, make and model of the firearm should be recorded in a conspicuous manner before sending it to the laboratory; and
- The firearm must be placed in a strong cupboard or wooden box to prevent shifting of the gun.

Ngenge (2004:108-109) discusses the don'ts of firearm collection including don't: transport loaded firearms; pick up a weapon by sticking a pencil or chopstick down the barrel; handle cartridges; assume that any ammunition or ammunition component is chemically stable; or package metal bullets, weapons, cartridges, or shot in plastic containers as the dampness can cause corrosion. Gilbert (1993:222) also cautions that if the firearm is recovered, it must be handled with care to avoid contamination and damage, the gun should be marked in an inconspicuous area with the officer's initials.

According to Marais (1992:167-168), the following guidelines should be followed when handling and preserving firearm evidence:

- The firearm must be handled with extreme care as it may be loaded;
- Under no circumstances must a pencil or other sharp instrument be placed in the barrel of the weapon in order to lift it up as that could destroy the unique characteristics that are present in the barrel at that time;
- Care must be taken not to remove the existing fingerprints or leave the new ones;
- Bullets embedded in walls, tiles or any other material should be removed by cutting out the portion of the wall, tile material in which the bullet is embedded as trying to remove the bullets by digging the bullet out can damage the bullet and make it unsuitable for comparison.
- Discharged bullets must under no circumstances be pushed back into the empty cartridge cases;
- No marks must be made on the cartridge cases and the bullets; and
- Each packaged exhibit must contain the date, time, place and the investigator's particulars.

Marais (1992:167-168) further indicates that for investigation purposes the following should be determined and be recorded in respect of the firearm arm:

- The position of the firearm in relation to the body of the deceased;
- The inclination of the weapon in relation to the body; and
- Ejected cartridge cases and the location thereof.

Van Rooyen (2007:148) stipulates that to ensure ease in handling, speed up investigation and to ensure that the chain of evidence remains intact, the evidence should always be packed and sealed properly. When packaging evidence, the following should be kept in mind:

- No loaded firearms, or loaded magazines that are placed on the firearm should be packed and sealed;
- Pack exhibits properly to prevent damage;
- Loose exhibits should be placed in suitable containers;
- The copy of the covering minute should be placed inside the parcel;
- When the firearm is forwarded to FSL, it must be properly packed so that it will not be damaged during transport;
- Envelopes that could be easily torn should not be used when sending firearms;
- The parcel should be sealed more than once and ensure that the number is visible;
- Mark the parcel with the identification reference number; and
- Make sure that the covering minute can be removed without having to open the parcel.

The participants from samples A, B and C were asked: what is the procedure for collecting firearm evidence on a crime scene? This was an open-ended question and there were no choices provided for the participants to choose from. The participants provided their own answers and some participants provided more than one answer. The participants' responses are summarised in Table 3.8 below, the responses are not placed in a sequence or in a particular order.

**Table 3.8: The participants' understanding of the procedure for collecting firearm evidence on a crime scene**

<b>The procedure to collect firearm evidence on a crime scene</b>	<b>Sample A: Detective (11)</b>	<b>Sample B: LCRC (15)</b>	<b>Sample C: Ballistics experts (13)</b>	<b>Total</b>
Wear personal protective equipment (PPEs).	8	5	6	19
Package the exhibits separately in different forensic bags.	5	9	5	19

<b>The procedure to collect firearm evidence on a crime scene</b>	<b>Sample A: Detective (11)</b>	<b>Sample B: LCRC (15)</b>	<b>Sample C: Ballistics experts (13)</b>	<b>Total</b>
Send the exhibits to FSL (ballistics).	2	13	3	18
Photograph the exhibits (firearm, cartridges, bullets, etc.) in the places where they were found.	4	9	4	17
Take the exhibits and book them in the SAPS 13 of the station in which the crime took place.	2	12		14
Make firearm safe.	2	9	2	13
Seal the exhibit bag at the crime scene.	3	5	4	12
Swab the firearm/exhibits for touch DNA, and check for fingerprints.	1	8	1	10
Book exhibit out from the SAPS 13 of the station and book it at the LCRC.		7		7
Photograph the sealed evidence bag.		6	1	7
Take photographs of the scene.	1	3	2	6
Collect the exhibits.	3	3		6
Mark the positions of the different exhibits.	1		4	5
If suspect is on the scene, take primer residue within two hours (primer residue can be taken from the suspect or deceased).		4	1	5
Serial numbers of evidence bags must appear on the photos.	1	3	1	5
Document the information (write in exhibit log).		1	3	4
Type the covering letter.		3	1	4
Mark the evidence bag with the station name and case number.	2	1		3
No answer.		1	3	4
<b>Total</b>	<b>35</b>	<b>102</b>	<b>41</b>	<b>178</b>



The majority of the participants from sample A, as illustrated in Table 3.8 above, indicated that the person collecting firearm evidence should wear the PPEs, package the exhibits separately and must also photograph the exhibits (firearms, cartridges and bullets) in the places they were found. Three (3) participants indicated that the evidence bag should be sealed at the crime scene. The participants from sample A had some knowledge of how to collect firearm evidence, though they did not mention all the aspects that need to be considered when collecting firearm evidence from the crime scene as contained in the consulted literatures (Manamela & Mokwena, 2015:150; Marais, 1992:167-168; Rodivich, 2012a:96-97; SAPS, 2002:16-24).

Table 3.8 above shows that the participants from sample B gave varied responses to the question. Except for one participant that did not provide a response to the answer, the participants' responses indicate that the participants are involved in the collection of firearm evidence from the crime scene. The majority of the participants also indicated that after collecting the firearm evidence, the evidence should be booked out at the station in which the incident occurred and should also be booked in the SAPS 13 of the LCRC. None of the consulted literature referred to the booking of the exhibits in the SAPS 13 of the station and SAPS 13 of the LCRC, the researcher is of the opinion that this is done in order to maintain the chain of custody of the evidence. The responses provided by the participants are in agreement with the consulted literature on the procedure to collect firearm evidence on the crime scene. The researcher can conclude that the participants from sample B fully comprehend the procedure to collect firearm evidence from the crime scene.

The participants from sample C gave varied responses that are relevant to the literature consulted. Three participants from this sample did not provide a response to the answer, this is a concerning factor to the researcher as the researcher is of the opinion that even if it is not their core function as the experts, they are supposed to have knowledge of the procedure to collect firearm evidence from the murder crime scene because at times they attend murder crime scenes. Except for the participants that did not provide a response to the question, the researcher concludes that the majority of the participants from this sample comprehend the procedure to follow when collecting firearm evidence from the crime scene.

### **3.12 THE USE OF FIREARM EVIDENCE IN MURDER INVESTIGATIONS**

Fisher (2004:260-261) and Girard (2015:202) believe that firearm evidence has an essential role to play in the investigation of crime and indicates that the striking of the firing pin, scratching of the sides of the bullet by rifling and any other imperfections inside the barrel will provide individualised characteristics that may help to identify the weapon that fired the bullet. If the firearm is recovered, it can be test fired for the bullet and the cartridge cases to be compared with the bullets and cartridge cases recovered from the scene. Fisher (2004:260-261) further points out that beyond determining if the bullet was fired from the same firearm, the availability of the cartridge cases may indicate that an automatic, semiautomatic, bolt action, slide action firearm or single shot firearm was used.

It is further stated by Fisher (2004:260-261) that the weight and size of the bullets, bullets fragments, projectile and the examination of the striations on the outside surface of the bullets may be used to determine the type of weapon used. Tests on the shooter's hands can be done to determine if the weapon was recently fired. Girard (2015:202) further indicated that: firearm evidence can provide information such as the position of the suspect when he fired the shot; if the bullet travelled in a straight path to its target or ricochet as a result of striking another object; and that an examination of the entry and exit wound will provide information on whether the bullet passed through the victim from the front or from the back.

Death caused by a firearm usually leaves trace evidence on the body. This evidence helps to prove what weapon was used to commit murder. Residue from the firearm or on the victim's hand should be collected whenever possible before the body is removed (Palmiotto, 2013:169). Additionally, Palmiotto (2013:169) states that: the firearm wounds in the body can reveal the type of ammunition and the range, angle and direction of fire. The entry and exit wounds of a bullet can usually be identified; ricocheting bullets with a tumbling action cause ragged punctures and bullets passing across the body can cause uneven surfaces and gashes that may look like knife wounds. A high-speed bullet causes shock waves that destroy tissue in the body; bone damage can indicate the bullet's path of travel.

The exit wounds show more damage than entrance wounds; that a contact wound has an abrasive collar, with its edges and the bullet track burned; and the surrounding fabric that the bullet passes through is burned. Eckert and James (1997a:47-48) explain that the examination of firearms determines the functioning and whether the firearm was in good condition, operable and if it is capable of accidental discharge. Projectiles are examined to determine whether the ammunition was fired from a specific firearm, if the firearm is not recovered from the crime scene the examination of the grooves in the fired bullet will provide information about the type of firearm used and thereby excluding other types of firearms. The firing pin mark and the ejector on the cartridge cases can also be compared with test casings fired from the suspect's weapon.

Rodivich (2012b:112) explains that the examination of firearm evidence consists of three main phases:

- **Phase one:** is the process of test firing the firearm to determine whether the firearm is capable of being fired or whether the safety feature is functional.
- **Phase two:** involves the comparison of classification where the class characteristics are compared between the exemplars and the evidence samples, the class characteristics includes the shape of the firing pin impressions, number, width and direction of spin of lands and grooves of the bullet.
- **Phase three:** the individualisation by comparing the striation patterns present on the cartridge, shot shell and the bullet. Linkages between cases can also be established by comparing the recovered bullets and cartridge cases with the ones on the database.

Marais (1992:153) is of the opinion that the evidential value of firearm evidence revolves around determining:

- The type, calibre and manufacture of the firearm;
- The direction from which the shot was fired;
- The distance of the firearm from the victim;
- The person who discharged the firearm;
- Whether the firearm is in working condition or not; and
- The time at which the firearm was discharged.

Bertino (2012:494-502) mentions that the investigators can investigate the lands and grooves that can be matched with the land and grooves of a specific firearm. On the cartridge case, the firing pin marks; breechblock marks; extractor and ejector marks are examined to match evidence at a crime scene with a specific firearm. Furthermore, Bertino (2012:494-502) indicates that the gunshot residue found on victims, shooters and objects can help during the reconstruction of the crime scene. When looking at the clues at the crime scene the investigators can also determine the location of the shooter and the location of the victim during the shooting. The examination of the wounds on the victim can help to determine where the bullet entered and exited the victim.

Manamela and Mokwena (2015:153) believe that the evidential value of firearm evidence is that it may provide valuable information to the investigating officer. Furthermore, Manamela and Mokwena (2015:153) state that the information the firearm evidence can provide includes:

- Information of the type, calibre and the manufacturer of the firearm, by identifying the type of firearm used during the incident;
- When conducting the primer residue test and the metal objects test, the person who discharged the firearm can be identified;
- The direction from which the shot was fired can be determined by measuring the angle of bullet holes at the scene of incident;
- The carbon marks on the bullet wounds or clothing of the victim, muzzle impression on the skin or powder fragments at the entrance area of the wound is important when determining the distance of the firearm from the victim during the shooting incident; and
- The trigger pressure is tested to determine if the firearm is in good working condition.

The participants from samples A, B and C were asked: in your opinion how can firearm evidence be used in the investigation of murder? This was an open-ended question and there were no choices provided for the participants to choose from. The participants provided their own answers and some participants provided more than one answer. The participants' responses are summarised below:

Sample A answered as follows:

- Three participants said it is used to link the firearm found with the projectile found in the body of the deceased.
- One participant indicated that it is used to determine the type and calibre of firearm used during the commission of the crime.
- Two participants mentioned that it can be used to compare firearm evidence found at the murder scene with evidence found in possession of the suspect.
- One participant indicated that it can be used to conduct primer residue test.
- Two participants mentioned that it can be used to analyse evidence found at the murder scene in order to complete investigations.
- One participant said that it is used to link the suspect's fingerprints with the fingerprints found at the scene.
- One participant mentions that it can be used for comparison of the primer residue found on the wound of the deceased with the primer residue found on the suspect.
- One participant indicated that it can be used to determine if maybe the deceased was killed by firearm.

Sample B responded to the question as follows:

- Two participants indicated that it is used to link the firearm found with the projectile found on the body of the deceased.
- Three participants said it is used to link fired exhibit with the specific firearm.
- Three participants said to determine the type and calibre of firearm used during the commission of the crime.
- Three participants stated that it is used for distance determination.
- Two participants said that it is used to compare firearm evidence found at the murder scene with evidence found in possession of the suspect.
- Three participants stated that it is used to conduct primer residue tests.
- Three participants said it is used to link the different crime scenes with the specific firearm that was used.
- Three participants stated that it is used to link the suspect with the crime and the crime scene.

- One participant said that it is used for analysing evidence found at the murder scene.
- One participant said that is used to link a suspect's firearm to the scene.
- One participant said to verify versions of events.
- One participant said to determine the number of shots fired.
- One participant said to determine the owner of the firearm.
- One participant said to link the cartridge cases found from different crime scenes with those found at a specific crime scene.
- One participant said it is used to determine if the bullets and cartridge cases were fired from the same firearm.
- One participant stated that is used in determining the user of the firearm during the commission of the crime.

Sample C answered as follows:

- Four participants indicated that it is used to link the firearm found with the projectile found from the body of the deceased.
- Four participants stated that to link the fired exhibit with the specific firearm.
- Two participants said to determine the type and calibre of firearm used during the commission of the crime.
- Three participants said it is used for distance determination.
- One participant said to compare firearm evidence found at the murder scene with evidence found in possession of the suspect.
- Two participants said to link the suspect's firearm to the scene.
- One participant said to conduct primer residue test.
- One participant said to link the different crime scenes with the specific firearm that was used.
- One participant said to link the suspect with the committed crime and the crime scene.
- One participant said to verify versions of events.
- One participant said to link the firearm to the perpetrators.
- One participant said to connect criminals.
- One participant said to exclude the suspect from the committed crime.

- One participant said for reconstruction of the scene.
- One participant said to link the crime scene to the victim.

The participants of sample A provided many answers to the question that was posed to them. These participants had some idea of what firearm evidence can be used for, but they did not mention all the facts as stated in the literature. The participants from sample A do not fully comprehend and lack knowledge on the use of firearm evidence in the investigation of murder. The researcher believes that if sample A can use firearm evidence in their investigations, they would win more cases and have suspects convicted in the courts of law.

The participants from sample B demonstrated a fair understanding of the use of firearm evidence in murder investigations. One participant from sample B indicated that from the firearm evidence, the owner of the firearm can be determined. The participants from sample B are in agreement with the literature.

It is evident from the responses of the participants from sample C that they comprehend what firearm evidence is used for. One participant from sample C indicated that firearm evidence can be used to exclude the suspect from the committed crime. The participants from sample C are in agreement with the consulted literature.

Eckert and James (1997:47-48) indicated that the examination of firearms determines the functioning of and whether the firearm was in good condition, operable and if it is capable of accidental discharge. None of the participants provided this information.

### **3.13 THE VALUE OF CRIME SCENE RECONSTRUCTION IN A MURDER CASE**

According to Osterburg and Ward (1992:287), information needed to reconstruct the past is available through three sources: people, physical evidence and records. A crime is reconstructed to check details provided by a suspect or witness against those disclosed by the crime scene examination. The crime scene reconstruction can also help to determine where the criminal stood to fire the shot.

Any significant discrepancy between individual's statement and physical evidence will raise suspicion if not explained satisfactorily, the development of evidence that protects the innocent is another reason for conducting crime reconstruction (Osterburg & Ward, 2010:40). Saferstein (2011:298) believes that crime scene reconstruction is a method used to support sequence of events at a crime scene by observing and evaluating physical evidence and statements made by individuals involved in the incident, the evidence may include information obtained from re-enactments. Therefore, reconstruction has the best chance of being accurate when investigators use proper documentation and collection methods for all types of evidence.

Fish, Miller and Braswell (2011:1) indicate that reconstruction of a crime scene is essential in determining the events that took place prior to, during and after the crime occurred. Physical evidence will play a crucial role in linking the suspect to the victim and the location of the crime as well as providing support or contradictions of witness/victims/suspects recollections of the incident. An accurate and objective crime scene search yields the "story" told by evidence so that it is reasonable and convincing to a jury. Physical evidence is used to provide impartial facts and is often referred to as the silent witness. Furthermore, Fish, Miller and Braswell (2011:82) explain that the primary goal of crime scene investigation is to reconstruct what happened and identify the perpetrators of the crime. The Crime Scene Investigator (CSI) should conduct an investigation that will help determine the sequence of events, the identity and movements of victims and perpetrators and the location of evidence.

Bertino (2012:29) believes that crime scene reconstruction involves forming the hypothesis of the sequence of events from before the crime was committed. He further indicates that reconstruction is conducted in order to examine and compare evidence with witness statements in order to determine the reliability of the information given. The investigator determines how the information fits into the crime picture. Saferstein (2013:151) indicates that crime reconstruction is the method used to develop the possible sequence of events at a crime scene by observing and evaluating physical evidence and statements made by witnesses.



Furthermore, Saferstein (2013:151) explains that the reconstruction of events that occurred prior, during and subsequent to the commission of crime is done in order to determine if there was more than one person involved; to determine how the victim was killed and to determine if there were actions taken to cover up what took place. Jackson and Jackson (2011:6-7) indicate that the reconstruction of a crime scene is important in corroborating or refuting the accounts of events given by the suspect or by the witness; the analysis of blood pattern at the crime scene can provide information of what actually happened; simulation experiments are performed in order to help with the determination of what could have happened during the incident. For example, the comparison of the damage patterns at the scene with those produced during the simulation experiment, the distance at which the shot was fired during the incident can be established and this information is important in corroborating or refuting versions of events provided by the suspect or by the witnesses (Jackson & Jackson, 2011:6-7).

Girard (2015:46-51) believes that physical evidence left at the crime scene may be used to establish the sequence of events that occurred before, during or immediately after the crime. The reconstruction of the crime scene may corroborate or refute the description of events by the suspect or witnesses. Girard (2015:46-51) further indicates that reconstruction can be done on pattern evidence, explosion patterns, firearm ballistics and bloodstain patterns. The reconstruction of a scene involving firearms is important to determine the cause of death and can provide information that places the shooter and the victim in a precise location within the crime scene. The reconstruction of the bullet trajectory can also prove or disprove the statement of the witness. When reconstructing the scene that involves firearm evidence, analysis can be done that includes the entry and exit hole geometry; bullet trajectory; bullet ricochet and shell casing analysis (Girard, 2015:46-47).

In the case of *State vs Pistorius*, the ballistic expert was instrumental in the reconstruction of the scene. Although a number of issues in his evidence were placed in dispute, the crux of his evidence remained largely unchallenged. Petherick and Turvey (2010:149) explain that crime reconstruction is the determination of the actions of events surrounding a crime to verify if the crime scene was not simulated or staged by the suspect.

Turvey (2010:434-435) further indicates that a crime scene reconstruction may be accomplished by using the examination and interpretation of evidence, witness statements, statement of the living victim or the confession of the suspect. According to Haag and Haag (2011:10), the objective of the reconstruction of the shooting incident is to determine:

- The range from which the firearm was discharged;
- The position of the firearm at the moment of discharge;
- The orientation of the firearm at the moment of discharge;
- The position of the victim at the moment of the impact;
- The orientation of a victim at the moment of impact;
- The number of shots in a multiple discharge shooting incident;
- The sequence of shots in a multiple discharging shooting incident;
- The presence and the nature of any intervening material between the firearm and the victim or the struck object;
- The effect of any intervening material on the subsequent exterior/terminal ballistics performance of the projectile;
- The probable flight path of the projectile;
- The manner in which the firearm was discharged; and
- Other interior and exterior ballistic events that may have special significance in a particular case.

The participants from samples A, B and C were asked: in your experience, what is the value of crime scene reconstruction in a murder case? This was an open-ended question and there were no choices provided for the participants to choose from. The participants provided their own answers and some participants provided more than one answer. The participant's responses are summarised in Table 3.9 below:

**Table 3.9: The participants' understanding of the value of crime scene reconstruction in a murder case**

The value of crime scene reconstruction in murder case	Sample A: Detectives (11)	Sample B: LCRC (15)	Sample C: Ballistics experts (13)	Total
To determine what happened at the specific murder case.	3	1	9	13

<b>The value of crime scene reconstruction in murder case</b>	<b>Sample A: Detectives (11)</b>	<b>Sample B: LCRC (15)</b>	<b>Sample C: Ballistics experts (13)</b>	<b>Total</b>
For the court to know and get clarity of what happened at the crime scene.	1	6	1	8
To recheck the crime scene for exhibits, points missed or exhibits forgotten at the scene.	3	2		5
Ensuring that the measurements were done correctly.		2	3	5
To look at other aspects that might have been omitted or not done properly.		2	1	3
Be able to provide the direction of the bullet, angle at which the bullet was fired and also to place the suspect at a certain position at the crime scene and to determine the range between the suspect and the victim.			3	3
For the experts on the scene to have a proper view of the scene.		2		2
Important to prove or disprove what has been said.			2	2
Helps investigating officers to refresh and have a logical thinking of what transpired during the commission of the crime.		1		1
Determining if the exhibits were not tampered with during collection.		1		1
To check if everything was done properly at the crime scene.		1		1
To draw a right sketch plan.		1		1
Eliminate doubt at the crime scene.	1			1
Ensure correct evidence is given before the court.	1			1
No answer	2	1	1	4
<b>Total</b>	<b>11</b>	<b>20</b>	<b>20</b>	<b>51</b>

According to Table 3.9 above, only three participants from sample A indicated that the value of crime scene reconstruction is to determine what happened at the crime scene and another three participants indicated that it is to recheck the crime scene for exhibits and points missed or exhibits forgotten at the scene, these participants' answers are in line with the literature (Girard, 2015:46-51 and Petherick and Turvey, 2010:149). The other participants from this sample gave varied responses that fairly correspond with consulted literature; however, they did not cover all the aspects of the value of crime scene reconstruction in murder crime scenes. Two participants did not provide any response. The participants from sample A do not fully comprehend the value of crime scene reconstruction in a murder case.

From sample B, the majority of the participants indicated that the value of crime scene reconstruction in murder cases is for the court to know and get clarity of what happened at the crime scene. These participants are in agreement with Jackson and Jackson (2011:6-7) who indicated that the reconstruction of the crime scene is important in corroborating or refuting the accounts of events given by the suspect or by the witness. One participant indicated that crime scene reconstruction helps the investigating officers to refresh and have a logical thinking of what transpired during the commission of the crime. The participants demonstrated a fair understanding of the value of crime scene reconstruction in murder investigations.

The responses of the participants from sample C correspond with the literature on the value of crime scene reconstruction in murder investigations. It is evident from the literature as well as the participants' responses that the main objective of crime scene reconstruction is to determine what happened at the crime scene and for the court to get clarity on what transpired at the crime scene. The researcher agrees that the main aim of reconstruction is to determine the events that occurred at the crime scene. Fish, Miller and Braswell (2011:1) explain that crime scene reconstruction is conducted in order to determine the events that took place prior, during and after the criminal activity has occurred. Based on the literature and the participant's responses the researcher concludes that the participants are familiar with the value of crime scene reconstruction in murder crime scenes.

### **3.14 REQUIREMENTS OF FIREARM EVIDENCE TO BE ADMISSIBLE IN COURT**

Marais (1992:16) and Van Rooyen (2007:98) state that physical and tangible evidence when presented in court must be identified and authenticated as relevant to the case by the oral testimony of those who have knowledge of the facts, it would mostly be the investigator or another policeman. According to Zeffertt and Paizes (2009:237), for the evidence to be admissible, it must be relevant, these authors indicate that relevant evidence is admissible and irrelevant evidence is inadmissible in court. Schwikkard and Van der Merwe (2009:20) share the same sentiments as Zeffertt and Paizes (2009:237) in that for evidence to be admissible it must be relevant. Schwikkard and Van der Merwe (2009:20) further state that there are no degrees of admissibility, evidence is either admissible or inadmissible, however it may carry more or less weight according to the particular circumstances of the case. The court weighs the evidence to determine if the required standard has been attained.

According to Lyle (2008:18), the court system is adversarial in nature and each side argues with the other, each attempt to present evidence that favours their side and spin any contrary evidence in a manner that supports their theory or case. This can put the forensic expert in a difficult position. Lyle (2008:18) cautions that the forensic expert should expect to be qualified before the jury, as the attorneys will ask questions about his credentials, training, experience and areas of expertise. Lyle (2008:18) further cautions that the testimony of the expert should be honest and measured, he should be neither too sure nor too unsure of his opinion as this might either alienate the jury or undermine his credibility.

Furthermore, Lyle (2008:20-21) indicates that for the evidence to pass the standards of acceptance in court it should pass the Frye and Daubert standards. The Frye standard states that the court will accept the testimony on well-organized scientific principle and discovery, i.e. if it has been sufficiently established and has achieved general acceptance in the scientific community. This means that the new scientific test will only be presented after they have been thoroughly hashed out and accepted by the scientific community (Lyle 2008:20).

Furthermore, Lyle (2008:21) mentions that the Daubert standard states that the judge may use expert testimony to understand the evidence and to determine a fact in issue at his discretion. The guidelines offered by the court for new scientific techniques or theory to be acceptable to court are that the techniques or theory must be subject to testing and to peer review; be standardised with recognised maintenance of such standards; have a known and accepted error rate and attain widespread acceptance. The techniques must therefore be spelled out, tested, reviewed and continually monitored for accuracy (Lyle, 2008:21).

According to Palmiotto (2013:99), the crime scene investigator must:

- Satisfy legal requirements concerning physical evidence that has been found at the crime scene and be able to identify each piece of evidence even months after collecting it.
- Describe the exact location of the item at the time it was collected.
- Prove that from the moment of collection until it is presented in court, the evidence was continuously in proper custody and describe changes that may have occurred in the evidence between the time of collection and its introduction as evidence in court.

Rondinelli (2013b:36) indicates that evidence that is relevant and material is admissible unless there is an exclusionary rule that makes the evidence inadmissible or the probative value of the evidence is outweighed by the prejudicial effect of the evidence. Furthermore, Rondinelli (2013b:36) stipulates that for evidence to be admissible in court, it has to be relevant to the fact in issue, relevancy is the logical relationship that makes a proposition more or less probable and in determining which pieces of evidence will be admitted in court, relevancy becomes fundamental. Dempsey (2003:110) on the other hand states that relevance refers to whether the evidence will assist in proving or disproving a particular point that the jury should consider in determining the defendant's guilt or innocence.

Dempsey (2003:110) believes that material evidence indicates whether the evidence presented is significant and important to the outcome of the case. This evidence has much significance to the facts of the case and the jury places much weight, as they believe that it may prove the facts in dispute.

Materiality refers to matters that one side must prove to win the case, material issues are mostly defined by how the parties have defined the case; how the offence is defined in the criminal code and how the offence is defined in the information or in the indictment (Rondinelli, 2013b:37). Probative value describes evidence that proves the fact in issue. In order to determine if the evidence has no, little or great probative value they try to determine what the evidence is trying to prove and the reliability of the evidence (Rondinelli, 2013b:37).

Rondinelli (2013b:41) further mentions that the collection and preservation of the evidence is important. Evidence collected, maintained and preserved in an improper way might be excluded in court. Clean evidence is evidence that is collected and maintained in a proper way. Heard (2013:309) indicates that in order to maintain the chain of custody, from the crime scene to the courtroom, evidence must be entered into the inventory and secured to preserve its integrity. Furthermore, Heard (2013:309-310) indicates that the admissibility of evidence in court depends upon an unbroken chain of custody and therefore it becomes essential to prove to the court that the evidence that is produced at a trial is the same evidence that was collected from the crime scene.

Field (2010:528-537) is of the opinion that evidence tendered as expert opinion evidence will be admissible if:

- There is a field of specialised knowledge;
- The witness demonstrates that she/he has become an expert in an identified aspect of that field by virtue of specified training, study or experience;
- The opinion which is given is wholly or substantially based on the witness' expert knowledge;
- That opinion based on facts, either be based on facts observed by the expert which are identified and admissibly proved by that expert, or be based on assumed or accepted facts identified and proved in some other way; and
- It can be proved that the facts upon which the opinion is based form a proper foundation and the expert's evidence must explain how the specialised knowledge in which the witness is an expert and on which the opinion is wholly or substantially based, applies to the facts assumed or observed to produce the opinion given.

Heard (2013:310) explains that the evidence collected at the crime scene must be taken to the laboratory and to court in a secure and validated manner to assure the people involved that the evidence has not been contaminated and that it is relevant to the crime investigation. The first person to collect the evidence will ensure chain of custody is maintained by writing his details on the packaging.

The participants from samples A, B and C were asked: what are the requirements for firearm evidence to be admissible in court? This was an open-ended question and there were no choices provided for the participants to choose from. The participants provided their own answers and some participants provided more than one answer. The participants' responses are summarised in Table 3.10 below:

**Table 3.10: The participants' understanding of the requirements for firearm evidence to be admissible in court**

Requirements for firearm evidence to be admissible in court	Sample A: Detectives (11)	Sample B: LCRC (15)	Sample C: Ballistics experts (13)	Total
Chain of evidence should have been properly followed.	1	6	3	10
Experts should be credible, competent and trained in the field they are testifying.		1	8	9
Evidence should not have been tampered with.	4	1	1	6
Evidence given should be relevant to the case and authentic.		3	2	5
Evidence should have been collected by experts.	3	1		4
There must be ballistic report and statement of the collector under oath.	1	2		3
Investigation must be done by an accredited institution.			3	3
Exhibits must be authentic and there must be explanation and accountability of anything that has been done to the exhibits.		2	1	3
There must be positive link between firearm and the exhibits.		1	1	2
Convince the court that the firearm presented as evidence is real firearm as			2	2



Requirements for firearm evidence to be admissible in court	Sample A: Detectives (11)	Sample B: LCRC (15)	Sample C: Ballistics experts (13)	Total
per the Firearm Control Act and can discharge ammunition.				
Type of firearm, serial number and the owner of firearm.		2		2
Projectile, cartridge case and firearm found from the scene, finger prints from the scene and primer residue test.	1	1		2
Exhibits should be kept safe from the crime scene until court and the integrity thereof is proved.		1	1	2
Must have ownership (present or previous owner) lawful or unlawful.	1			1
Should evidence be examined by a different expert their results should be the same.			1	1
There must be no contamination of evidence.			1	1
Physical evidence should be produced in court.			1	1
Examination must be done without biasness.			1	1
No answer.	1	2	2	5
<b>Total</b>	<b>12</b>	<b>23</b>	<b>28</b>	<b>63</b>

Some of the participants, four (4) from sample A believe that for evidence to be admissible in court it should not have been tampered with, these participants are in agreement with Rondinelli (2013b:41) when he indicates that it is important to preserve the evidence because the evidence collected, maintained and preserved in an improper manner may be excluded in court. Some participants, three (3) are of the opinion that for the evidence to be admissible, the evidence should have been collected by the experts, these participants are in line with Field when he indicated that the evidence tendered as expert opinion evidence will be admissible if it is a field of specialised knowledge. One participant did not provide an answer and the other participants were vague in their responses.

The researcher concluded that the participants from sample A do not fully comprehend the requirements for firearm evidence to be admissible in court.

The participants from sample B gave varied responses to the question of the requirements of firearm evidence to be admissible in court. The majority of the participants indicated that for firearm evidence to be admissible, the chain of evidence should have been followed. These participants' responses are in agreement with Field (2010:528-537), all the other answers provided by these participants correspond with the information contained in the literature consulted. Two (2) participants did not provide a response. The researcher can conclude that the majority of participants comprehend what the requirements are for firearm evidence to be admissible in court.

The majority of the participants from sample C indicated that for firearm evidence to be admissible in court, experts should be credible, competent and trained in the field they are testifying about. These participants' responses are in agreement with Field (2010:528-537), where it is indicated that: the experts should prove that he is testifying in the field of his specialised knowledge; the witness must demonstrate that she/he has become an expert in an identified aspect of that field by virtue of specified training, study or experience. Except for the two (2) participants that did not provide answers to the question, the participants' responses are in agreement with the literature consulted. From the participants' response, the researcher can conclude that the majority of the participants from sample C fully comprehend the requirements of firearm evidence to be admissible in court, this is possibly ascribed to their line of duty in which they are expected to provide expert testimony on firearm evidence, hence they understand the requirements of firearm evidence to be admissible in court.

### **3.15 SUMMARY**

This chapter focused on the use of firearm evidence in the investigation of murder. Firearms account for many murders today. When attending to murder crime scenes where firearms were used, the investigators are likely to find firearm evidence such as firearms, cartridge cases and fired bullets. The firearm evidence is distinct and has similar characteristics to fingerprints. No two fingerprints are the same and no two firearms will make the same markings on the fired bullets and cartridge cases.

Firearm evidence is a useful form of forensic evidence because of the ability to provide answers about the crime scene and to reveal clues to solve the crime, thereby assisting the investigating officers to bring the perpetrators before a court of law.

When attending the shooting incident, the number of shots fired; the direction from which the projectiles originated; and the type of ammunition and firearm used can be established. The scene should be accurately examined for reconstruction purposes. The exact location of the cartridge cases, bullets, firearm and the victim should be properly documented before the evidence is collected.

During examination of the firearm evidence by forensic experts the following can be determined: the type of weapon used in the crime; the distance between the perpetrator and the victim when the firearm was fired; the operability of the weapon and who the perpetrator was. The effects caused when a bullet strikes the target will differ depending on numerous factors, particularly the material of the target.

The most crucial aspect of firearm evidence is the ability to help narrow down the search for the weapon used. The investigation of the firearm is often to establish whether or not the weapon was responsible for firing the shot in question and this can be done by analysing the cartridge cases, ammunition, fired bullets, gunshot residues, and the characteristics of the wound or other bullet damage. The cartridge cases and the bullets can be linked to different crimes that happened over a long period by comparing the cartridge cases and the bullets recovered from the crime scene with the cartridge cases and bullets on the Integrated Ballistic Identification System (IBIS) database. Firearm evidence is mostly used in criminal proceedings and therefore the science of ballistics remains an important part of the world of forensics. In the next chapter, chapter 4, the findings of the study will be discussed followed by recommendations forthcoming from the findings and the conclusions derived from this study.

## **CHAPTER 4**

### **FINDINGS AND RECOMMENDATIONS**

#### **4.1 INTRODUCTION**

Firearm evidence can usually be found at any crime scene where a firearm was used. When evidence such as cartridge cases, bullets and ammunition are recovered from the crime scene, they can be analysed to determine the type of firearm used. When a firearm is recovered from the crime scene, the analysts can examine it to either identify or eliminate it as the firearm used in the crime.

The researcher decided to conduct this research in order to enhance the knowledge on the use of firearm evidence in the investigation of murder. The aim of this research was to determine how firearm evidence could be used in the investigation of murder.

In order to achieve the aim of the research, two research questions were asked and these questions were:

- What is the role of forensic science in the investigation of crime?
- How could firearm evidence be used in the investigation of murder?

This chapter focuses on what was discovered during this research. The findings relate to the research problem, the research aim and the research questions. Recommendations will be made based on these findings. The findings and recommendations below are all based on the information obtained during the interviews with investigating officers from Akasia SAPS, Pretoria North LCRC and the ballistics experts from the FSL, coupled with a thorough literature study on the topic.

#### **4.2 FINDINGS**

The findings below were derived from the information obtained from the interviews conducted with the chosen samples and the consulted literature.

#### **4.2.1 Primary findings**

The primary findings are the findings that answer the main research questions of this study.

##### **4.2.1.1 Research question 1: What is the role of Forensic Science in the investigation of crime?**

This research sought to understand the meaning of forensic science, the objectives of forensic science, the role of forensic science in the investigation of crime, the role of FSL in the investigation of crime, the role of LCRC in the investigation of crime, criminal investigation and the objectives of criminal investigation.

- Forensic science is the application of science to law and it plays an important role in police investigations. The consulted literature emphasises that forensic science is the science applied to solve legal problems; it is the use of science in the investigation of criminal activities, the analysis of physical evidence using scientific methods and presentation of evidence before a court of law. The participants in their explanation referred to forensic science as the process where evidence identified at the crime scene will be collected, studied and analysed using scientific methods.

Both the literature and the participants indicated that forensic science is the application of scientific techniques and methods to solve criminal cases. Based on the examples provided by the participants from sample A in their responses, it is evident that the investigators are only using biology, fingerprint examination and firearms, and are not using all the branches of criminalistics as indicated by Osterburg and Ward (2010:21). They indicated that the criminalistics branch consists of drug analysis; instrumental chemistry; firearm and tool marks; questioned documents; fingerprints/footprints; lip prints; photography; forensic biology; DNA; trace evidence; imprint evidence; digital evidence and crime scene reconstruction. The participants from sample A have partial knowledge of what forensic science is, and samples B and C have a fair understanding of forensic science.

- It was established in the literature consulted (Benson, Jones & Horne 2015:11; James & Nordby, 2005:3; Osterburg & Ward, 2010:22; Rodivich, 2012b:100; Stelfox, 2009:131) in this research that the objectives of forensic science are to:
  - Locate, identify, gather and interpret material for investigation;
  - Examine physical evidence and establish connection between physical evidence; victim; suspect and the potential crime scene;
  - Scientifically investigate evidence and to determine how the perpetrators can be brought before a court of law;
  - Reconstruction of the sequence of events during the commission of the crime; and
  - To present reliable analysis of the evidence.

The responses of the participants from samples A, B and C are relevant and in agreement with the consulted literature, though the participants did not mention all the objectives of forensic science as indicated in the literature. The participants from samples A, B and C have a fair knowledge of the objectives of forensic science. None of the participants referred to the reconstruction of how the crime was committed, how the event transpired when the crime was committed and to the protection of the innocent by developing evidence that may exonerate the suspect as indicated in the literature (Osterburg & Ward, 2010:22; Rodivich, 2012b:100). The participants agreed with the literature pertaining to the objectives of forensic science in the investigation of crime. Participants are also of the opinion that the comparison of the instrument used to commit crime and maintaining a database of possible suspects are objectives of forensic science.

- The consulted literature revealed that the role of forensic science in the investigation of crime includes recovering of evidence from the crime scene and the examination and analysis of the recovered evidence from the crime scene. Literature (Osterburg & Ward, 1992:22; Dempsey, 2003:120) also revealed that the evidence recovered from the crime scene is analysed and examined in order to:
  - Determine the linkages between perpetrator and the crime;
  - Place the perpetrator at the crime scene;
  - Prove the sharing of the common source by the two objects;

- Exonerate the innocent;
- Determine if the crime was committed;
- Determine what transpired during the commission of the crime; and
- Present scientific test results in court.

When the question “what is the role of forensic science in the investigation of crime?” was posed to the participants of samples A, B and C, various answers were provided, although two participants from sample C did not answer as they say they did not know. The main response to the question from sample A was to examine and analyse the exhibits. Sample B provided more answers: investigation of the crime scene in order to find clues, to document the crime scene, link the suspect to exhibits collected from the crime scene and to link the suspect to the crime scene and to the crime that has been committed. Sample C gave varied responses that are all in line with the consulted literature. Data from the interviews revealed that participants from sample A do not fully comprehend the role of forensic science in investigation of crime, participants from sample B had a fair understanding of the role of forensic science in the investigation of crime and participants from sample C comprehend the role of forensic science in the investigation of crime.

- The literature and data from the participants (samples B and C) revealed that the main role of FSL is to analyse and examine the evidence collected from the crime scene. From the literature consulted, this research also revealed that the intention of FSL is to bring the perpetrator to a court of law and to protect innocent people from prosecution. FSL is divided into different units that analyse and test the evidence collected at the crime scene and do an in-depth investigation into the exhibits collected from the crime scene by LCRC. Rodivich (2012b:105-123) explains that the following sections: fingerprints, biology/DNA, firearms and tool marks, impression evidence, trace evidence, drug identification, toxicology, questioned documents and photography section are the sections of a fully functioning crime laboratory. The specialised forensic services outside the traditional crime laboratories that are available for use by law enforcement agencies and personnel includes: forensic medicine, forensic anthropology, forensic odontology, forensic entomology, forensic psychology, forensic engineering, forensic computer science and forensic reconstruction.

According to Forensic Science Laboratory (c2014d), the FSL of the South African Police Service consist of the following units: forensic biology, ballistics, forensic chemistry, victim identification, scientific analysis and questioned documents. The participants' responses (samples B and C) are in agreement with the literature regarding the role of FSL in the investigation of crime. It is evident from the literature as well as the participants' responses that the main role of FSL is to analyse and examine the evidence collected from the crime scene. The participants (samples B and C) comprehend the role of FSL in the investigation of crime.

- This research presented that after the crime has been committed, the crime scene must be processed and documented by using crime scene sketches and photography. The participants (samples B and C) and the consulted literatures outlined the role played by LCRC in the investigation of crime as: the collection and packaging of fingerprints and forensic related evidence; recording and documenting the scene; submitting the exhibits to the FSL and providing expert testimony in court. Though the participants' responses concur with the views of the consulted literature on the roles of LCRC in the investigation of crime, none of the participants from samples B and C referred to the preservation of the integrity of the scene as one of the roles of the LCRC as indicated by Dempsey (2003:47-51).

One participant from the LCRC referred to LCRC as the "sniff dog" and that they sniff all the forensic evidence for further investigation. Some participants believe that linking to or placing the suspect at the crime scene is another role played by the LCRC, none of the consulted literature referred to such as the role played by LCRC or by the crime scene investigators. Considering the participants' responses on the question of their understanding of the role of LCRC in the investigation of crime and the literature consulted, the researcher concludes that the participants are familiar with the role played by LCRC in the investigation of crime because their responses are in line with the consulted literature. The participants understand the role of LCRC in the investigation of crime.



- Hess and Hess (2013:8) emphasise that criminal investigation refers to identification of evidence; collection of information; presenting the evidence to a court of law with the purpose of determining what happened, apprehending the offender; and it also includes the reconstruction of the past. From the interviews conducted with sample A, the data indicates that the participants' (sample A) responses correspond with the literature consulted to a fair extent. The participants (sample A) provided varied responses to the question on their understanding of criminal investigation. The views of the participants show many different meanings of the term and do not correspond with the consulted literature. This indicates that the participants do not understand the real meaning of the term criminal investigation.
- Benson, Jones and Horne (2015:13) and Du Preez (1996:4-7) outline the objectives of criminal investigation as the identification of the crime, gathering of evidence, arresting the criminal, recovering of stolen properties, and involvement in the prosecution process. Du Preez (1996:4-7) also believes that the individualisation of the crime is also the objective of criminal investigation. The researcher hereby established that although the participants' responses correspond fairly well with the objectives of criminal investigation as outlined by the consulted literature, the participants lack knowledge about the objectives of criminal investigation. The researcher opines that if the participants had knowledge and understanding of the objectives of criminal investigation, each of the participants would have mentioned all six objectives as suggested by Du Preez (1996:4-7) and other consulted literature.

#### **4.2.1.2 Research question 2: How could firearm evidence be used in the investigation of murder?**

In answering this research question, the researcher sought to determine what a crime scene is, what firearm evidence is, the types of firearm evidence that can be found at the murder crime scene, the procedure to collect firearm evidence from the crime scene, how firearm evidence can be used in investigation of murder, the value of crime scene reconstruction and the requirements for firearm evidence to be admissible in court.

The literature revealed that the crime scene is not only the place where a crime was committed, but can also be the place where evidence relating to the specific crime has been located. The crime scene can be confined or extensive, indoors or outdoors. Data from the participants is in agreement with the literature consulted, however, the participants only referred to the actual place where the crime took place as the crime scene and the literature includes the place where evidence relating to the specific crime can be located. Consulted literature differentiates the crime scene as the primary, secondary and tertiary crime scenes.

The researcher is concerned when collectively viewing the responses of all the participants as the participants only referred to the actual place where the crime took place and the place where evidence can be collected as the crime scene, though the participants are partially correct when defining crime scene, the consulted literature (Dempsey, 2003:47; Miller, 2005:168; Van Rooyen, 2007:13; Watkins, 2013:114-115) classified the crime scene into different classifications. Stelfox (2009:127) indicates that a crime scene includes:

- places used to plan the crime;
- places where the victim was attacked;
- places where the victim and the suspect had an encounter;
- places where the offender detained the victim;
- places where the offender attacked the victim;
- the places where the body was deposited;
- weapon deposit site; weapon's routes to and from any scene;
- places used to clean or discard material used in or obtained during the offence;  
and
- people who have come in contact with the suspect or the scene and the vehicles or other forms of conveyances used in the crime.

Based on the participants' responses the researcher can therefore conclude that the participants from samples A, B and C are not totally conversant with what a crime scene is.

The consulted literature revealed that firearm evidence is evidence found at the crime scene where a firearm was used. Firearm evidence includes firearm, fired bullets and cartridge cases used in the commission of the crime. Firearm evidence is any firearm as well as ammunition discharged or intact ammunition suspected of being involved in a criminal offence. Even though the participants from samples A and B gave varied responses that are in agreement with the literature consulted, they did not mention all the facts surrounding firearm evidence, whereas sample C had similar answers to that stated in the literature. The participants from sample A do not fully comprehend what firearm evidence entails, participants from sample B had a fair understanding of firearm evidence and sample C comprehended what firearm evidence is.

This research revealed that firearm evidence is the evidence that can be found on a murder crime scene where a firearm was used. The firearm evidence includes the firearm; cartridge cases; ammunition/cartridges; projectile (the projectile may be fired bullets, shot or wadding); bullet holes; gunshot/primer residues; bullet wound, bullet jacket and the indication of the trajectory found at the scene. The participants from sample A do not comprehend the types of firearm evidence that can be found on a murder crime scene and participants from samples B and C fully comprehend the types of firearm evidence that can be found at a murder crime scene.

Fisher (2004: 264-266) stipulates that the crime scene in which a firearm was involved should be processed with care and a number of considerations must be taken into account in these types of cases. The evidence collection methods differ as a result of the specific type of evidence to be recovered and the sequence of collection is determined by the investigating officer (Rodivich 2012a:91). The literature consulted in this research cautions that:

- firearms should never be collected by inserting a tool inside the barrel as that can destroy any possible DNA or trace evidence or alter the rifling of the barrel;
- fired cartridge cases and spent cartridges should never be collected using sharp metal instruments as that can alter the markings used for comparison;
- firearms found at the scene must be made safe before being packaged for examination;

- if two or more firearms were recovered from the scene they should be packaged in different packages to prevent cross contamination;
- the ammunition should also be packaged separately and sent to ballistics for examination;
- the firearms should be picked up by holding the checkered part of the grip in order to preserve any fingerprints that may be found on it;
- extreme caution is needed when removing a lodged bullet from a wall or other object, this is to ensure the protection of class and individual markings on bullets and cartridge cases;
- the bore, the chamber or the cylinder must never be cleaned before submitting the firearm to the laboratory;
- firearms must never be fired before they are examined;
- all precautions to avoid accidental discharge of the firearm on transit should be avoided by ensuring that the firearm is safe before the weapon is sent to the laboratory and the weapon must be unloaded; and
- the firearm must be placed in a strong cardboard or wooden box to prevent shifting of the gun.

Data from the participants revealed that the participants from sample A had some knowledge on how to collect firearm evidence, though they did not mention all the aspects that need to be considered when collecting firearm evidence from a crime scene as contained in the consulted literature (Manamela & Mokwena, 2015:150; Marais, 1992:167-168; Rodivich, 2012b:96-97; SAPS, 2002:16-24). Participants from sample B provided varied responses to the question. Except for one participant that did not provide a response to the question, the participants' responses indicate that they are involved in the collection of firearm evidence from crime scenes. The responses provided by the participants are in agreement with the consulted literature on the procedure for collecting firearm evidence on the crime scene.

The researcher can conclude that the participants from sample B fully comprehend the procedure to collect firearm evidence from the crime scene. The participants from sample C gave varied responses that are relevant to the literature consulted.

Three (3) participants from this sample did not provide a response to the question, this is concerning to the researcher as the researcher is of the opinion that even if it is not their core business as experts, they are supposed to have an idea of the procedure to collect firearm evidence from the murder crime scene because at times they attend the murder crime scenes. Except for the participants who did not provide a response, the researcher concludes that the participants from this sample comprehend the procedure to follow when collecting firearm evidence from the crime scene.

The literature revealed that the striking of the firing pin, scratching of the sides of the bullet by riffling and any other imperfections inside the barrel will provide individualised characteristics that may help to identify the weapon that fired the bullet. Fisher (2004:261) points out that beyond determining if the bullet was fired from the same firearm, the availability of the cartridge cases may indicate that an automatic, semiautomatic, bolt action, slide action firearm or single shot firearm was used when more than one round was fired. The participants of sample A provided many answers to the question "how can firearm evidence be used in the investigation of murder" that was posed to them. These participants had some idea of what firearm evidence can be used for, but they did not mention all the facts stated in the literature. None of the participants mentioned determining the distance of the firearm from the victim, whether the firearm is in working condition and testing the trigger pressure to determine the working condition of the firearm as some of the uses of firearm evidence.

The participants from sample A lack knowledge on the use of firearm evidence in the investigation of murder. Though the participants from sample B also provided varied responses to the question, their responses corresponded fairly well with the information from the consulted literature and this sample demonstrated a fair understanding on the use of firearm evidence in murder investigation. The responses from participants in sample C corresponded with the literature and these participants from sample C comprehend the use of firearm evidence in the investigation of murder.

Eckert and James (1997a:47-48) indicate that the examination of firearms determines the functioning of the firearm, whether it was in good condition, operable and if it was capable of accidental discharge. None of the participants gave this information.

Both the literature and the data from the participants (samples A, B and C) presented that firearm evidence can be used for the comparison of firearm evidence found at the murder scene with evidence found in possession of the suspect; linking the firearm found with the projectile found from the body of the deceased and also to determine the distance between the victim and the person who shot the firearm. This research also revealed that firearm evidence can provide information such as the position of the suspect when he fired the shot, and if the bullet travelled in a straight path to its target or ricocheted as a result of striking another object.

The examination of the striations on the outside surface and tests on the shooter's hands can be made to determine if the weapon was recently fired. The examination of firearms determines the functioning and whether the firearm was in good condition, operable and if it is capable of accidental discharge. Linkages between cases can also be established by comparing the recovered bullets and cartridge cases with the ones on the database.

Bertino (2012:29); Fish, Miller and Braswell (2011:1, 82) and Jackson and Jackson (2011:6-7) indicate that the reconstruction of the crime scene is important in corroborating or refuting the accounts of events given by the suspect or by the witness/es; the analysis of blood pattern at the crime scene can provide information of what actually happened; simulation experiments are performed in order to help with the determination of what could have happened during the incident. Information needed to reconstruct the past is available through three sources: people, physical evidence and records (Osterburg & Ward, 1992:287).

The participants from sample A do not fully comprehend the value of crime scene reconstruction in a murder case. The participants from sample B demonstrated a fair understanding of the value of crime scene reconstruction in murder investigations.

They partially comprehend the value of crime scene reconstruction in a murder case. The responses of participants from sample C were in line with the consulted literature, the participants are familiar with the value of crime scene reconstruction in murder crime scenes.

Saferstein (2013:151) puts it clearly when he says that the reconstruction of events that occurred prior, during and subsequent to the commission of crime is done in order to determine if there was more than one person involved; to determine how the victim was killed, to determine if there were actions taken to cover up what took place, to determine the cause of the death and can provide information that places the shooter and the victim in a precise location within the crime scene.

The consulted literature (Schwikkard & Van der Merwe, 2009:20; Zeffertt & Paizes, 2009:237) indicated that for evidence to be admissible in court, it must be relevant. Relevant evidence is admissible whereas irrelevant evidence is inadmissible in court. Schwikkard and Van der Merwe (2009:20) further state that there are no degrees of admissibility, evidence is either admissible or inadmissible, however, it may carry more or less weight according to the particular circumstances of the case. The court weighs the evidence to determine if the required standard has been attained. The evidence that is relevant and material is admissible unless there is an exclusionary rule that makes the evidence inadmissible or the probative value of the evidence is outweighed by the prejudicial effect of the evidence. Evidence collected, maintained and preserved in an improper way might be excluded in court (Rondinelli, 2013b:36).

According to Field (2010:528-537), evidence tendered as expert opinion evidence will be admissible if there is a field of specialised knowledge; the witness demonstrates that she/he has become an expert in an identified aspect of that field by virtue of specified training, study or experience. The participants from sample A do not fully comprehend the requirements for firearm evidence to be admissible in court, whereas the participants from samples B and C do comprehend the requirements of firearm evidence to be admissible in court. The participants from samples B and C confirmed what was stated in the literatures when they indicated that for firearm evidence to be admissible in court:

- the chain of evidence should have been followed; experts should be credible, competent and trained in the field they are testifying about;
- an expert should prove that he/she is testifying in the field of her/his specialised knowledge; the witness must demonstrate that she/he has become an expert in an identified aspect of that field by virtue of specified training, study or experience;
- that evidence should not have been tampered with;
- that evidence given should be relevant to the case; and
- authentic evidence should have been collected by the experts.

#### **4.2.2 Secondary findings**

The secondary findings are based on the important aspects that arose from the discussions in each chapter. These findings are outlined below.

##### **4.2.2.1 Physical evidence**

Marais (1992:5-6) states that physical evidence is real evidence which is visible and recognisable as either a liquid, object, print or instrument and can be measured, photographed, analysed and presented in court as a physical object. It was established from the consulted literature that physical evidence is tangible items collected from the crime scene for examination, analysis and presentation in court to prove or disprove the fact in issue. It was also revealed that physical evidence does not imply that the evidence is visible to human eye, other physical evidence is not visible and needs to be developed using instrumentation to visualise it.

Physical evidence ranges from big to small microscopic items generated as part of the crime and recovered from the crime scene (UNODC 2009:4). Physical evidence is demonstrative evidence and is something which may be seen, heard, touched, smelled or tasted by the jury itself (Eckert & Wright 1997:72). Eckert and James (1997a:33-34); Fisher and Fisher (2012:1-4); Fish, Miller and Braswell (2013:15); Girard (2008:36-37) and Lyle (2008:22) believe that physical evidence can be used to:

- link the suspect and the victim;
- linking person to a crime scene;



- corroborate or refute an alibi;
- determine if the crime was committed or establish key elements of a crime;
- establish the identity of persons associated with the crime, i.e. to identify the perpetrator or victim;
- exonerate the innocent;
- induce a confession; and
- direct further investigation.

The participants from sample A do not fully comprehend what physical evidence entails. Though the other participants from sample B gave responses that were partially in line with the literature, the participants do not fully comprehend what physical evidence is. The responses provided by sample C are in agreement with the consulted literature. The participants from sample C comprehend what physical evidence is.

#### **4.2.2.2 Locard principle**

It was established from the literature (Turvey and Petherick, 2010:28) that any action of an individual, and obviously the violent action constituting a crime, cannot occur without leaving marks, the marks can be in the form of prints, simple traces or stains. It is impossible for a criminal to act, and mainly to act with the intensity that supposes criminal action, without leaving indications of his steps. Orthman and Hess (2013:123); Saferstein (2011:8); Stelfox (2009:136) and Turvey and Petherick (2010:28) indicate that the Locard principle states that whenever two objects come into contact with each other, there is always a transfer or exchange of material and information between them. When a person comes into contact with an object or person, a cross transfer of materials occurs.

Fisher and Fisher (2012:32) emphasises that it is not possible for anyone to enter a place without changing it in some way either by bringing something to it or by removing something from it. Fisher (2004:149) mentions that when an individual comes in in contact with the person or location, certain small and seemingly microscopic debris may be left or picked up from contact with the environment.

Various answers were provided by the participants in samples A, B and C to the question “what is your understanding of the term Locard principle.”

The views of the participants showed that the samples (A, B and C) do not fully comprehend the Locard exchange principle.

Only two participants from sample A indicated that the Locard principle refers to the principle that every contact leaves a trace. One participant gave an answer that is not in line with the information supplied by the literature. Eight participants did not provide responses to the question. Participants from sample A do not comprehend what the Locard principle entails. Ten participants from sample B and eight participants from sample C indicated that the Locard exchange principle refers to the principle of every contact leaves a trace, these participants are in agreement with the consulted literature as indicated above.

Four participants from sample B and five participants from sample C did not provide the response to the question asked. The combined total of 17 participants did not provide a response to the question. The researcher concluded that the participants do not comprehend the meaning of the Locard exchange principle. The lack of understanding of the Locard principle concerns the researcher as all the participants of this study work on a daily basis with physical evidence and yet they are not conversant with the meaning of the Locard principle.

Van Rooyen (2012:20-21) stipulates that identification is based on the fact that everything in the universe is unique and has distinctive individual and class characteristics. Identification is used to pinpoint an object as belonging to a specific category of objects. This is the classification process whereby the objects with similar characteristics are placed in one category. Fisher and Fisher (2012:5); Girard (2015:40) and Saferstein (2011:61) believe that identification is the process of determining a substance's physical or chemical identity with as much certainty as possible.

Fisher and Fisher (2012:5) further indicate that the examples of identification are drug analysis, species determination and residue analysis. The researcher established that identification is based on the fact that everything in the universe is unique and has distinctive, individual and class characteristics.

Identification is a matter of picking out an object and classifying it in certain class of objects.

The participants from samples A, B and C gave varied responses to the question and some of the responses are true when compared to the information provided by the literature. Though some of the participants' responses are in line with the consulted literature, they did not mention all the aspects of categorisation as indicated by the literature. The researcher concludes that the participants (A, B and C) have a fair understanding of what identification entails. This study focused on imprint identification. Imprint identification is based on the Locard exchange principle, the fundamental principle of imprint identification is that the distinctive characteristics of objects are transferred to the surface when they come into contact.

The different imprint identification methods that are used are dactyloscopy; casts of foot, shoe, bicycle and vehicle tracks; marks made by tools; bite marks; forensic and ballistic comparisons (SAPS, 2009:338). According to Van Heerden (1977:167-168), firearm examination is based on the principle of uniqueness, the uniqueness in ballistics examination is the fact that each firearm has its own individual characteristics which are transferred to the cartridge cases and the bullet in the firing process.

#### **4.2.2.3 Individualisation**

Van Rooyen (2012:21) indicates that identification and individualisation are two unchallengeable concepts in investigation; he goes on to say that identification has no value in investigation because the investigator will identify an object without relating it to the source of origin. Fish, Miller and Braswell (2013:17) state that individualisation permits the forensic examiner to determine the uniqueness of any single object or piece of evidence. Individualisation takes place through comparisons, the identified physical evidence or disputed objects found at the scene must be compared with the control or standards of comparison to determine or decide its individuality (Van Heerden, 1977:11).

Literature revealed that individualisation is the demonstration that a particular sample is unique, even amongst members of the same class, this may also mean that the questioned piece of physical evidence and a similar known sample have the same origin.

The physical evidence is said to have individual characteristics when that evidence can be associated with a unique common source with an extremely high degree of probability. This includes evidence such as matching ridge characteristics of two fingerprints, matching striation markings on bullets and tool marks. Individualisation is based on comparison, it involves comparing the identified disputed object connected with the crime and objects with other samples of known origin to determine individuality. Successful individualisation depends on a series of identifications, therefore identification is the prerequisite for individualisation.

Three participants from sample A did not respond to question as they said they do not know and the other participants gave responses that are partially in line with the consulted literature. The participants from sample A have a fair understanding. Six participants from sample B did not provide a response to the question and in order to adhere to research ethics, the researcher could not force the participants to give a response to the question. The remaining participants from sample B provided responses that are not in agreement with the literature consulted. Based on the responses of participants from sample B the researcher can conclude that participants from sample B lack knowledge and do not comprehend what individualisation is.

Collectively, nine (9) participants: three (3) from the detectives and six (6) from the LCRC did not give responses to the question, the researcher could not force the participants to provide the answer to the question as the researcher would be violating the research code of ethics. Four participants provided responses that are totally not in line with the literature consulted namely: one participant from the detectives who indicated that individualisation means to *take two evidence and individualise one by its role, e.g. if the evidence was used in this crime and differentiate it from the one that was used in other crime*; one participant from LCRC indicated that individualisation is working alone or someone being placed to do something without needing any help.

One participant from LCRC indicated that individualisation is *pinpointing one certain object or person*; and a participant from ballistics who indicated that individualisation is to *define something in its own version*.

The researcher can conclude that the participants (samples A, B and C) lack knowledge and understanding of individualisation and this raises a concern with the researcher because the process of individualisation starts at the crime scene and ends when giving evidence in a court of law, yet the participants do not comprehend the concept of individualisation.

#### **4.2.2.4 Continuity of possession**

Du Preez (1996:3) states that maintaining the continuity of possession is the continuous safekeeping and identification of physical evidence which is of importance in the evidential process. Similarly, Prinsloo (1996:29) refers to the continuity of possession as the continuous safe possession and identification of physical information for the purpose of individualisation and the degree to which continuity of possession is maintained determines the acceptability of the information, its interpretation and the results of investigation.

Fisher and Fisher (2012:9-10); Fish, Miller and Braswell (2013:22); Jackson and Jackson (2011:42-43) and UNODC (2009:4) reveal that the chain of custody is the chronological and careful documentation of evidence beginning at the crime scene until the end of forensic process. It is the documentation of what has happened to the evidence from the time it was discovered until it is needed in court. Data from sample A revealed that there is disagreement between both the participants and the information given in the literature with regard to chain of custody/continuity of possession. All the participants from sample A provided responses that were irrelevant and not in agreement with the literature and the researcher concludes that the participants lack understanding of the concept of chain of custody.

The responses of the participants of sample B are in line with the consulted literature (Fisher & Fisher, 2012:9-10; Jackson and Jackson, 2011:42-43) indicating that the documented information about what has happened to the evidence from the crime scene until the evidence is produced in court serves to prove the chain of custody to the court. The researcher can conclude that the participants from sample B comprehend what chain of custody is all about.

The majority (12) of participants from sample C are in agreement with the consulted literature.

One participant did not give an explanation of continuity of possession but gave another name for it and the participant who indicated that continuity of possession is the same marks appearing again if you are rotating something and the participant who indicated that continuity of possession is not having a stable condition, gave responses that are totally not in line with the description of the chain of custody as explained in the literature. The researcher can conclude that the majority of participants from sample C comprehend chain of custody.

Literature and the participants revealed that there is a need to maintain the chain of custody in order to prove the integrity of the evidence to the court, that it was not tampered with and that the chain of custody was maintained at all times from the moment the exhibits were collected from the crime scene until the exhibits were presented as evidence in court. The participants in their explanations did not indicate the importance of maintaining chain of custody as specified by the consulted literature.

#### **4.2.2.5 Contamination of evidence**

The researcher established that contamination of evidence is the act of allowing the evidence to be tampered with or not protecting the chain of custody. The value of evidence is affected by what happens to it immediately following the crime. Unnecessary or improper entry onto the crime scene may: destroy or contaminate the evidence; introduce items onto the crime scene that may mislead the investigations; and provide defence attorneys with a basis for discrediting the investigators or the findings of a crime laboratory. Orthman and Hess (2013:128-129) believes that:

- Evidence in an unprotected crime scene will degrade, diminish or disappear over time unless collected and preserved;
- The importance of evidence depends on its ability to establish that a crime was committed and to show how, when, and by whom; and
- The integrity of evidence refers to the requirements that any item introduced in court must be in the same condition as when it was found at the crime scene.

When comparing the responses of the participants with the literature, it became evident that the participants touched on the discussions on contamination of evidence as contained in the literature. The participants' responses (samples A, B and C) are in agreement with the consulted literature and the researcher can conclude that the participants are conversant with what contamination of evidence entails. Jackson and Jackson (2011:2) suggest that to minimise the risk of evidence contamination, the following precautionary steps should be applied:

- the use of chain of custody labels;
- opening each package in an area other than where it was originally sealed;
- repackaging each item of evidence as soon as it has been analysed;
- using the logging systems;
- minimising the number of people handling the evidence; and
- storing the packaged evidence in a dedicated secure area.

The handling of physical or material crime information determines its physical integrity. In judicial proceedings, only evidence demonstrated to be authentic to the scene and free from contamination is allowed to be presented during the trial. Van Heerden (1977:10) cautions that the preservation of the integrity of physical evidence is not merely a routine action, but a fundamental requirement in the process of presenting evidence.

#### **4.3 RECOMMENDATIONS**

The recommendations in this study are based on the findings of the study and the reviewed literature.

##### **4.3.1 Research question 1 finding: The role of forensic science in the investigation of crime**

- It is recommended that a module on the role of forensic science in the investigation of crime be developed and incorporated in the basic police-training curriculum so that police students familiarise themselves with the forensic science; the importance of it and the role that forensic science plays in the investigation of crime.

- It is recommended that the experts from the forensic science environment also provide training sessions and conduct workshops on a continuous basis to capacitate the investigating officers on the role played by forensic science in the investigation of crime.
- It is further recommended that all-inclusive training that details the forensic science environment and the objectives of forensic science be offered to investigating officers. The training can be conducted quarterly for all the investigating officers.
- Criminal investigation is the core function of the investigating officers in the SAPS, the researcher recommends that an in-depth programme on criminal investigation and objectives of criminal investigation be conducted for investigating officers to empower them on what criminal investigation entails.
- It is also recommended that yearly workshops and refresher courses on criminal investigation and objectives of criminal investigation be conducted with all investigation officers.

#### **4.3.2 Research question 2 finding: The use of firearm evidence in the investigation of murder**

- It is recommended that investigators should be offered comprehensive practical and theoretical teaching on the use of firearm evidence in murder investigations.
- It is recommended that comprehensive programmes, workshops and lectures dealing with the use of firearm evidence in murder investigations should be developed and held with investigating officers on a continuous basis.
- It is further recommended that the SAPS, specifically the ballistics section, should have conferences and awareness campaigns to educate investigating officers on the use of firearm evidence in murder investigations.
- The researcher recommends that investigating officers, members of the LCRC and ballistics experts need to continuously refresh and update their knowledge on what crime scene entails; firearm evidence, how to collect firearm evidence from the crime scene and the types of firearm evidence that can be found on a murder crime scene.



- It is also recommended that step-by-step guidelines that outlines the procedure to collect firearm evidence and outlines the precautions to take when collecting firearm evidence should be developed for investigating officers.
- It is recommended that newly appointed investigating officers should be mentored and coached by experienced investigators when reconstructing the scene of a crime.
- It is further recommended that investigating officers are offered workshops and lectures on the requirements for firearm evidence to be admissible in court.
- It is also recommended that an integrated multi-disciplinary approach be adopted and implemented to ensure the collaboration between different environments in law enforcement, where matters relating to the admissibility of firearm evidence will be discussed.

#### **4.3.3 Secondary findings: Physical evidence, Locard principle, identification, individualisation, continuity of possession and contamination of evidence**

- It is recommended that work sessions and further training for investigating officers, and crime scene experts be conducted on the Locard exchange principle; what the principle entails; what physical evidence entails; the uses of physical evidence and the importance of physical evidence. Similar work sessions can be conducted for ballistics experts to address the concept of Locard principle.
- It is furthermore recommended that workshops and lectures focusing on the concept of identification, individualisation, continuity of possession and contamination of evidence be offered to the investigating officers, members of the LCRC and ballistics experts.
- It is also recommended that it should be stressed through training and workshops to investigating officers and crime scene experts that the failure to protect the crime scene and the evidence from contamination and not maintaining the chain of custody diminishes the value of physical evidence and can render the evidence inadmissible in judicial proceedings.

#### **4.4 CONCLUSION**

The aim of this research was to determine the use of firearm evidence in murder investigations. In this research, relevant literature was reviewed to gain an understanding of the problem being researched. Interviews were also conducted and data was gathered from the following participants: sample A were investigating officers from Akasia Police Station, sample B were members of the Pretoria North LCRC, and sample C were ballistics experts from the Forensic Science Laboratory.

The aim of the research was attained by answering the following research questions:

1. What is the role of forensic science in the investigation of crime?
2. How could firearm evidence be used in the investigation of murder?

The researcher answered these research questions through the research design and methodology that was used. This research revealed that each firearm has unique marks, which are transferred to the cartridge cases and the bullet during the firing process. The forensic analyst at the FSL ballistics section is able to determine if a particular bullet or cartridge case was fired from a specific firearm. Though the examiners are not able to determine who actually fired the weapon, matching the ammunition to a weapon provides vital facts for investigation. It remains the responsibility of the investigating officer to link the suspects/accused. After all evidence has been collected from the crime scene and examined at the FSL, the investigating officer continues with criminal investigation until such time when the case is taken to court and the offender is prosecuted. All these professionals (the first responder, the investigating officers, the crime scene experts and the forensic analyst) play an important role in solving crime.

The researcher has empowered herself with the knowledge gained from this research. The researcher anticipates that this research will empower and provide investigating officers with the necessary knowledge and understanding of the use of firearm evidence in murder investigations.

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## **CASE LAW**

S v Kaptein 1984(3) SA 316 (CPD).

S v Pistorius (CC113/2013) [2014] ZAGPPHC 793, 12 September 2014).

## 6. ANNEXURES

### 6.1 ANNEXURE A: A COPY OF THE INTERVIEW SCHEDULE FOR SAMPLE A

#### INTERVIEW SCHEDULE FOR DETECTIVES

PARTICIPANT NUMBER



**TOPIC: THE USE OF FIREARM EVIDENCE IN THE INVESTIGATION OF MURDER.**

**AIM:** The aim of this research is to determine how firearm evidence can be used in a murder investigation.

#### **RESEARCH QUESTIONS:**

- What is the role of forensic science in the investigation of crime?
- How can firearm evidence be used in the investigation of murder?

I am a student at the University of South Africa (UNISA) and I am currently conducting research on the use of firearm evidence in the investigation of murder. To get more information on the topic, I must conduct interviews in the form of face to face interviews and an interview schedule will be used. I am asking you to kindly assist me by providing answers to the questions in this interview schedule.

Written authorisation to conduct the study among members the South African Police Service (SAPS) was granted in May 2016 as per the attached letter of approval from the SAPS.

Take note that the following will be adhered to during the interview process:

- The researcher will treat you with respect and dignity at all times.
- To protect you from any kind of harm you will remain anonymous and your name and surname as a participant will not be used; you will be given numbers and will be referred to as, for example, participant number 1, participant number 2, etc.

- Participants will be treated equally irrespective of the qualifications, experience and positions they hold.
- There will be no form of incentive given to the participants by the researcher.
- You will be participating voluntarily in this study.
- During the interview the researcher will be recording the conversation and taking notes to use later during the data analysis process.
- You are requested to provide only one answer for each question. Feel free to ask for clarity if there is any question that is not clear or if there is a question that you do not understand.
- Answer the questions based on your opinion and also according to your understanding of the concept.
- The information that you provide will be treated and kept confidential and will not be available to anyone other than the researcher.
- You have the right to withdraw from the interview at any time and in such instances, the information given, notes taken and the recordings, will be destroyed and will not be included in the study.
- After the interview, the information that you have provided will be analysed, interpreted and will be used only for the research project in the school of criminal justice for the degree of Master of Arts in Criminal Justice: Forensic Investigation.

## **PARTICIPANT**

I hereby give permission to be interviewed and that information supplied by me can be used in this research.

YES / NO

## **HISTORICAL INFORMATION**

1. For how long have you been an investigator?

1 – 5 years	5 – 10 years	More than 10 years
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2. Did you undergo the Basic Detective Course?

Yes	No
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3. Are you involved in the investigation of murder cases?

Yes	No
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### **THE ROLE OF FORENSIC SCIENCE IN THE INVESTIGATION OF CRIME**

4. What do you understand about the term forensic science?
5. In your opinion what are the objectives of forensic science?
6. What is your understanding of criminal investigation?
7. In your opinion, what are the objectives of criminal investigation?
8. In your opinion, what is the role of forensic science in the investigation of crime?

### **THE USE OF FIREARM EVIDENCE IN THE INVESTIGATION OF MURDER**

9. What is physical evidence?
10. What do you understand by the term Locard Principle?
11. What does the term identification mean?
12. What does the term individualisation mean?
13. What do you understand by the term continuity of possession?
14. What do you understand by the term contamination of evidence?
15. How would you define a crime scene?
16. What is firearm evidence?
17. What type of firearm evidence can be found on a murder crime scene?
18. What is the procedure for collecting firearm evidence on a crime scene?
19. In your opinion, how can firearm evidence be used in the investigation of murder?
20. In your experience, what is the value of crime scene reconstruction in a murder case?
21. What are the requirements for firearm evidence to be admissible in court?



## **6.2 ANNEXURE B: A COPY OF THE INTERVIEW SCHEDULE FOR SAMPLE B**

### **INTERVIEW SCHEDULE FOR EXPERTS AT THE LOCAL CRIMINAL RECORD CENTRE**

**PARTICIPANT NUMBER**



**TOPIC: THE USE OF FIREARM EVIDENCE IN THE INVESTIGATION OF MURDER.**

**AIM:** The aim of this research is to determine how firearm evidence can be used in a murder investigation.

#### **RESEARCH QUESTIONS:**

- What is the role of forensic science in the investigation of crime?
- How can firearm evidence be used in the investigation of murder?

I am a student at the University of South Africa (UNISA) and I am currently conducting research on the use of firearm evidence in the investigation of murder. To get more information on the topic, I must conduct interviews in the form of face-to-face interviews and an interview schedule will be used. I am asking you to kindly assist me by providing answers to the questions in this interview schedule.

Written authorisation to conduct the study among members the South African Police Service (SAPS) was granted in May 2016 as per the attached letter of approval from the SAPS.

Take note that the following will be adhered to during the interview process:

- The researcher will treat you with respect and dignity at all times.
- To protect you from any kind of harm you will remain anonymous and your names and surname as a participant will not be used; you will be given numbers and will be referred to as, for example, participant number 1, participant number 2, etc.

- Participants will be treated equally irrespective of the qualifications, experience and positions they hold.
- There will be no form of incentive given to the participants by the researcher.
- You will be participating voluntarily in this study.
- During the interview the researcher will be recording the conversation and taking notes to use later during the data analysis process.
- You are requested to provide only one answer for each question. Feel free to ask for clarity if there is any question that is not clear or if there is a question that you do not understand.
- Answer the questions based on your opinion and also according to your understanding of the concept.
- The information that you provide will be treated and kept confidential and will not be available to anyone other than the researcher.
- You have the right to withdraw from the interview at any time and in such a case the information given, notes taken and the recordings will be destroyed and will not be included in the study.
- After the interview, the information that you have provided will be analysed, interpreted and will only be used for the research project in the school of criminal justice for the degree of Master of Arts in Criminal Justice: Forensic Investigation.

## **PARTICIPANT**

I hereby give permission to be interviewed and that information supplied by me can be used in this research.

YES / NO

## **HISTORICAL INFORMATION**

1. What is your current position within the LCRC?
2. How many years of experience do you have in your current occupation (LCRC)?

1 – 5 years	5 – 10 years	More than 10 years
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3. What courses related to your specific occupation have you attended?

### **THE ROLE OF FORENSIC SCIENCE IN THE INVESTIGATION OF CRIME**

4. What do you understand about the term forensic science?
5. In your opinion what are the objectives of forensic science?
6. In your opinion, what is the role of forensic science in the investigation of crime?
7. What is the role of the LCRC in the investigation of crime?
8. What is the role of the FSL in the investigation of crime?

### **THE USE OF FIREARM EVIDENCE IN THE INVESTIGATION OF MURDER**

9. What is physical evidence?
10. What do you understand by the term Locard Principle?
11. What does the term identification mean?
12. What does the term individualisation mean?
13. What do you understand by the term continuity of possession?
14. What do you understand by the term contamination of evidence?
15. How would you define a crime scene?
16. What is firearm evidence?
17. What type of firearm evidence can be found on a murder crime scene?
18. What is the procedure for collecting firearm evidence on a crime scene?
19. In your experience, what is the value of crime scene reconstruction in a murder case?
20. In your opinion, how can firearm evidence be used in the investigation of murder?
21. What are the requirements for firearm evidence to be admissible in court?

### 6.3 ANNEXURE C: A COPY OF THE INTERVIEW SCHEDULE FOR SAMPLE C

#### INTERVIEW SCHEDULE FOR EXPERTS AT THE FORENSIC SCIENCE LABORATORY

PARTICIPANT NUMBER



**TOPIC: THE USE OF FIREARM EVIDENCE IN THE INVESTIGATION OF MURDER.**

**AIM:** The aim of this research is to determine how firearm evidence can be used in a murder investigation.

#### **RESEARCH QUESTIONS:**

- What is the role of forensic science in the investigation of crime?
- How can firearm evidence be used in the investigation of murder?

I am a student at the University of South Africa (UNISA) and I am currently conducting research on the use of firearm evidence in the investigation of murder. To get more information on the topic, I must conduct interviews in the form of face-to-face interviews and an interview schedule will be used. I am asking you to kindly assist me by providing answers to the questions in this interview schedule.

Written authorisation to conduct the study among members of the South African Police Service (SAPS) was granted in May 2016 as per the attached letter of approval from the SAPS.

Take note that the following will be adhered to during the interview process:

- The researcher will treat you with respect and dignity at all times.
- To protect you from any kind of harm you will remain anonymous and your names and surname as a participant will not be used; you will be given numbers and will be referred to as, for example, participant number 1, participant number 2, etc.

- Participants will be treated equally irrespective of the qualifications, experience and positions they hold.
- There will be no form of incentive given to the participants by the researcher.
- You will be participating voluntarily in this study.
- During the interview the researcher will be recording the conversation and taking notes to use later during the data analysis process.
- You are requested to provide only one answer for each question. Feel free to ask for clarity if there is any question that is not clear or if there is a question that you do not understand.
- Answer the questions based on your opinion and also according to your understanding of the concept.
- The information that you provide will be treated and kept confidential and will not be available to anyone other than the researcher.
- You have the right to withdraw from the interview at any time and in such an instance the information given, notes taken and the recordings will be destroyed and will not be included in the study.
- After the interview, the information that you have provided will be analysed, interpreted and will only be used for the research project in the school of criminal justice for the degree of Master of Arts in Criminal Justice: Forensic Investigation.

## **PARTICIPANT**

I hereby give permission to be interviewed and that information supplied by me can be used in this research.

YES / NO

## **HISTORICAL INFORMATION**

1. What is your current position within the FSL?
2. How many years of experience do you have in your current occupation (FSL-Ballistics)?

1 – 5 years	5 – 10 years	More than 10 years
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3. What courses related to your specific occupation have you attended?

## **THE ROLE OF FORENSIC SCIENCE IN THE INVESTIGATION OF CRIME**

4. What do you understand about the term forensic science?
5. In your opinion what are the objectives of forensic science?
6. In your opinion, what is the role of forensic science in the investigation of crime?
7. What is the role of the LCRC in the investigation of crime?
8. What is the role of the FSL in the investigation of crime?

## **THE USE OF FIREARM EVIDENCE IN THE INVESTIGATION OF MURDER**

9. What is physical evidence?
10. What do you understand by the term Locard Principle?
11. What does the term identification mean?
12. What does the term individualisation mean?
13. What do you understand by the term continuity of possession?
14. What do you understand by the term contamination of evidence?
15. How would you define a crime scene?
16. What is firearm evidence?
17. What type of firearm evidence can be found on a murder crime scene?
18. What is the procedure for collecting firearm evidence on a crime scene?
19. In your opinion, how can firearm evidence be used in the investigation of murder?
20. In your experience, what is the value of crime scene reconstruction in a murder case?
21. What are the requirements for firearm evidence to be admissible in court?

## 6.4 ANNEXURE D: A COPY OF INFORMED CONSENT FORM SIGNED BY THE PARTICIPANTS



### ANNEXURE A: INFORMED CONSENT FORM QUALITATIVE DATA COLLECTION

Researcher: Tshishonga Mpho

Department of Police

[Telephone: 012 421 8288](tel:0124218288)

Supervisor: Dr J S Horne

Department of Police practise

Telephone: 012 4339415

Dear Research Respondent,

#### *The use of firearm evidence in murder investigations*

Thank you for your involvement in this research study. Please see the attached research proposal for more information regarding the study. It is deemed ethical practice to obtain informed consent from a research respondent prior to the commencement of a research initiative. Informed consent involves the following:

- 1. Purpose of the study.** The present study is being undertaken for the fulfillment of a Masters Degree in forensic investigation at the University of South Africa. With the aim of determining how firearm evidence could be used in murder investigation.
- 2. Procedures.** A semi-structured interview will be used in order to gain valuable information from the participants. The interview will serve as a means to gain insight and knowledge from then participants' respective fields. The interview should not last longer the 60 minutes and will be held according to the participant's convenience. The interviewer will be recorded and notes will be written during the interview.
- 3. Risks and discomfort.** There are no predetermined risks accompanying this study. The research participant is merely providing the researcher with knowledge about the subject matter.



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PO Box 392, UNISA 0003 South Africa  
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4. **Benefits.** There are no perceptible benefits or incentives available for the respondents of this study. However, it can be proposed that the research participant will benefit in some way through the process of knowledge production. If the researcher receives permission from the respondent, the researcher will publish their names in the final dissertation.
5. **Respondent's rights.** Respondents are of liberty to withdraw from the study at any stage of the research provided a courtesy notification of withdrawal is sent to the researcher. No negative repercussions will be enacted on the respondent, as participation is voluntary, and all data received from the respondent will be assumed void.
6. **Confidentiality.** All information will be regarded as personal and confidential. The researcher will not disclose respondents' names or contact details unless permission is obtained,
7. **Data storage and dissemination of findings.** The information received will be stored (password protected) by the researcher. The findings of the research will be documented in the form of an academic dissertation.
8. **Ethical considerations.** The study was ethically constructed and approved by UNISA's Ethical Committee.
9. **Questions and concerns.** The researcher welcomes any questions or concerns regarding the research study.

Please provide your initials and surname below:

I understand my rights as a research respondent and voluntarily give my consent to participate.	
<b>Research respondent:</b>	<b>Date:</b>
<b>Researcher:</b>	<b>Date:</b>



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6.5

**ANNEXURE E: THE APPLICATION TO CONDUCT RESEARCH IN THE SAPS AND THE OFFICIAL SAPS LETTER OF APPROVAL TO CONDUCT RESEARCH**

G.P.S 002-0222

SAPS 21

SUID-AFRIKAANSE POLISIEDIENS



SOUTH AFRICAN POLICE SERVICE

Private Bag / Privaatsak X 57, BRAAMFONTEIN, 2017

Reference Verwysing	3/34/2(201600004)
Enquiries	Lt. Col. Peters
Navrae	SAC Linda Ladzani
Telephone Telefoon	(011) 274- 7529
Fax number Faksnommer	(011) 547- 9189

OFFICE OF THE  
PROVINCIAL COMMISSIONER  
SOUTH AFRICAN POLICE SERVICE  
GAUTENG

2016-02-29

- A. The Provincial Head: Legal Service  
S A Police Service  
GAUTENG
- B. The Deputy Provincial Commissioner: Crime Detection  
S A Police Service  
GAUTENG
- C. The Deputy Provincial Commissioner: Human Resource Management  
S A Police Service  
GAUTENG

**APPLICATION FOR RESEARCH: THE USE OF FIREARM EVIDENCE IN INVESTIGATION OF MURDER: LT. TSHISHONGA**

- A: For recommendation.
- B: For approval.

1. Attached herewith is an application of Lt. Tshishonga to conduct research within the South African Police Service.
2. The application has been evaluated by the Provincial Research Office (Strategic Management) as per attached Annexure and found to be in compliance with National Instruction 1 of 2006: Research.
3. In the opinion of the Strategic Management Office, the research will assist the South African Police Service by improving the knowledge of investigators and competence regarding the role of forensic science in investigation of crime and will also improve the investigators, Local Criminal Record Centre members and Ballistics expert's knowledge on how firearm evidence can be used in the investigation of murder cases where firearms were used.

**APPLICATION FOR RESEARCH: THE USE OF FIREARM EVIDENCE IN INVESTIGATION OF MURDER: LT. TSHISHONGA**

4. In line with National Instruction 1 of 2006, you are afforded the opportunity to comment on the relevance and feasibility of the proposed research within your area of responsibility. Any objections against the research will be noted and you will be requested to clarify and motivate those with the Provincial Head: Organisational Development & Strategic Management.
5. In order to ensure the effective and efficient finalisation of this application you are requested to submit your comments to Strategic Management office within the allocated timeframe.
6. Your cooperation and assistance is appreciated.



PROVINCIAL HEAD: ORGANISATIONAL DEVELOPMENT & STRATEGIC MANAGEMENT: GAUTENG  
SJ PHETO

Date:

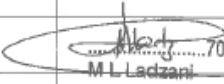

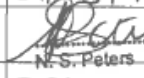
2016/04/01

BRIGADIER

ANNEXURE A

APPLICATION FOR RESEARCH: THE USE OF FIREARM EVIDENCE IN INVESTIGATION OF MURDER: LT. TSHISHONGA

COMMENTS & RECOMMENDATION: PROVINCIAL RESEARCH CENTRE

i	OFFICIAL FILE NO:	3/34/2 (201500004)		
	FILE COMPUTER REFERENCE NO:	7398364		
ii	MOTIVATION FOR RESEARCH:	To determine how firearms evidence could be used in murder investigations.		
	APPLICATION FOUND TO BE COMPLETE:	YES	<input checked="" type="checkbox"/>	NO
	INDEMNITY / UNDERTAKING SIGNED	YES	<input checked="" type="checkbox"/>	NO
iii	APPLICATION PERUSED BY:	SAC ML Ladzani		
	CONTACT NO:	011 274 7529		
	SIGNATURE:	 .....7003079-1 M.L. Ladzani		
	DATE:			
iv	APPLICATION VERIFIED BY:	 ..... Lt Col N. S. Peters		
	APPLICATION RECOMMENDED:	YES	<input checked="" type="checkbox"/>	NO
	CONTACT NO:	011-5479110		
	SIGNATURE:	 ..... Lt Col N. S. Peters		
	DATE:	2016-03-01		

**APPLICATION FOR RESEARCH: THE USE OF FIREARM EVIDENCE IN INVESTIGATION OF MURDER: LT. TSHISHONGA**

**A. RECOMMENDATION BY PROVINCIAL HEAD: LEGAL SERVICE**  
**TIME ALLOCATED: 3 days**

<i>COMMENTS WITH REGARDS TO ANY LEGAL OBJECTIONS AGAINST THE RESEARCH WITH ANY ADDITIONAL LIMITATIONS TO RESEARCHER:</i>			
No legal objections.			
APPLICATION RECOMMENDED:	YES	<input checked="" type="checkbox"/>	NO
SIGNATURE: <i>[Signature]</i> N. RAMBACHAN-NAIDOO	DATE:	31-03-2016	

**B. RECOMMENDATION BY THE DEPUTY PROVINCIAL COMMISSIONER: CRIME DETECTION**  
**TIME ALLOCATED: 3 days**

<i>COMMENTS WITH REGARDS TO THE RELEVANCE AND FEASIBILITY OF THE RESEARCH WITHIN YOUR INVORNMENT</i>			
APPLICATION RECOMMENDED:	YES	<input checked="" type="checkbox"/>	NO
SIGNATURE: <i>[Signature]</i> R.M. Pattar	DATE:	2016-04-29	



## PERMISSION TO CONDUCT RESEARCH IN THE SAPS

**RESEARCH TOPIC:** THE USE OF FIREARM EVIDENCE IN INVESTIGATION OF MURDER

**RESEARCHER:** LT. TSHISHONGA

Permission is hereby granted to the researcher above to conduct research in the SAPS based on the conditions of National Instruction 1 of 2006 (as handed to the researcher) and within the limitations as set out below and in the approved research proposal.

This permission must be accompanied with the signed Indemnity, Undertaking & Declaration and presented to the commander present when the researcher is conducting research.

This permission is valid for a period of Twelve (12) months after signing.

Any enquiries with regard to this permission must be directed to Lt. Col. Peters or SAC Linda Ladzani at [PetersNS@saps.gov.za](mailto:PetersNS@saps.gov.za) / [Ladzanim@saps.org.za](mailto:Ladzanim@saps.org.za).

### RESEARCH LIMITATIONS / BOUNDARIES:

Research Instruments:	Interviews (Semi-structured) Case studies Interview schedule
Target audience / subjects:	Ballistics experts / Investigating officers / Local Criminal Record members
Geographical target:	Forensic Science laboratory – Ballistic unit Pretoria Ga-Rrankuwa Cluster <ul style="list-style-type: none"><li>• Akasia SAPS – Investigation Officers</li><li>• Pretoria North SAPS - LCRC Members</li></ul>
Access to official documents:	Yes Previous case dockets

  
LT. GENERAL  
PROVINCIAL COMMISSIONER: GAUTENG  
DS DE LANGE

03 MAY 2016

Page 5 of 5

6.6 ANNEXURE F: THE OFFICIAL UNISA COLLEGE OF LAW ETHICS COMMITTEE LETTER OF APPROVAL TO CONDUCT RESEARCH



COLLEGE OF LAW RESEARCH ETHICS REVIEW COMMITTEE

Date: 2016/06/17

Reference: ST 64  
Applicant: T. Mpho

Dear T. Mpho  
(Supervisor: Dr J. Horne)

**DECISION: ETHICS APPROVAL**

Name	T. Mpho
Proposal	The use of firearm evidence in the investigation of murder
Qualification	MTech

Thank you for the application for research ethics clearance by the College of Law Research Ethics Review Committee for the above mentioned research. **Final approval is granted.**

*The application was reviewed in compliance with the Unisa Policy on Research Ethics.*

*The proposed research may now commence with the proviso that:*

- The researcher will ensure that the research project adheres to the values and principles expressed in the Unisa Policy on Research Ethics which can be found at the following website:*  
  
[http://www.unisa.ac.za/cmsys/staff/contents/departments/res\\_policies/docs/Policy\\_Research%20Ethics\\_rev%20app%20Council\\_22.06.2012.pdf](http://www.unisa.ac.za/cmsys/staff/contents/departments/res_policies/docs/Policy_Research%20Ethics_rev%20app%20Council_22.06.2012.pdf)
- Any adverse circumstances arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the College of Law Ethical Review Committee.*



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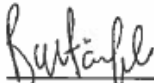
*An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants*

- The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.*

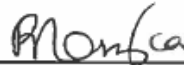
**Note:**

*The reference number (top right corner of this communique) should be clearly indicated on all forms of communication (e.g. Webmail, E-mail messages, letters) with the intended research participants, as well as with the UERC.*

Kind regards



PROF B W NAEFELE  
CHAIR PERSON: RESEARCH ETHICS  
REVIEW COMMITTEE  
COLLEGE OF LAW



PROF R SONGCA  
EXECUTIVE DEAN:  
COLLEGE OF LAW

