University of Southern Queensland

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Investigation into Traffic Controller Health and Safety at Road Works in Queensland

A Dissertation Submitted by:

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Project Aim:

Occupational health and safety is foremost regarded with traffic controllers than any other occupation in the construction industry. Traffic controllers are employed on road works to provide a safe working environment for road works to be carried out. The work of a traffic controller is to employ health and safety principles for a safe work site, in which there are standards and code of conducts that govern. However this dissertation will look at the health and safety of the traffic controller themselves. The standards and code of conducts relating to the health and safety of traffic controllers will be analysed, as well as industry data to determine high risk factors of traffic control work.

On any traffic management site the main health and safety hazard to traffic controllers are drivers and their vehicles. Safety standards and code of conducts are set out to account for this main hazard. However varying driver behaviours at road work presents a varying risk. The overall aim of this dissertation is to determine what type of driver factors place traffic controllers at risk at road works. Understanding these factors/risks will allow possible new mitigation measures to be proposed to reduce the risk to traffic controllers. However in order for this to be carried out an understanding of risks, risk identification and risk management needs to be developed.

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Abbreviations

MUTCD 2010	-	Manual of Uniform Traffic Control Devices 2010 (National)
MUTCD	-	Manual of Uniform Traffic Control Devices (Queensland)
PPE	-	Personal Protective Equipment
AS1742	-	Australian Standard 1742 - Manual of Uniform Traffic Control Devices 2010
AS/NZ ISO 31000:2009	-	Australian and New Zealand: Risk management- Principles and guidelines

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Chapter 1 Introduction

1.1 Introduction

Traffic management of road works is vital in ensuring health and safety to all personnel on the road work sites. Traffic management takes many different forms from planning traffic routes around road works, planning traffic measures around road works, to directing traffic on a road work site (Department of Transport and Main Roads Queensland 2011). However the main focus within this report is the health and safety of the traffic controller directing traffic, in particular the health and safety of traffic controllers directing traffic with stop battens.

1.2 Project Objectives

As previously discussed the overall aim of this research study is to investigate the health and safety of the stop batten traffic controllers at road works. The objectives set in out in order for this overall aim to be achieved is outlined below.

I. Investigate the health and safety of traffic controllers
II. Identify risk present to traffic controllers
III. Understand the identified risks of traffic control work
IV. Investigate health and safety standards and guidelines to determine how or if these risks are managed to any degree
V. Investigate risk management for these identified risks to improve the health and safety of traffic controllers

As shown the five project objectives outlined above, if met will see the overall aim of investigating the health and safety of traffic controllers at road works carried out.

1.3 Consequential Effects

Overall it is hoped that the main outcome that this research study produces a safer work environment for traffic controllers at road works. This will be achieved by the study findings providing traffic control companies with insight into the main risks to traffic controllers and, measures to reduce or eliminate this risk.

The findings may also provide safety standard regulators or code of practice developers in the traffic control industry with assistance in making amendments to regulations or aiding in the development of producing new regulations.

Chapter 2 Literature Review

2.1 Health and safety

Workplace health and safety is important in all occupations. Occupational health and safety records in Australia are unsatisfactory according to (Davidson et al. 2009). Davidson et al. (2009) claims managers blame workers and workers hold management responsible for unsafe work environments and practices. The national legislation aimed at creating the ideal safe and healthy work environment and practices is the "Work Health and Safety Act 2011". This legislation requires employers to provide a safe and healthy workplace for their employees (Butrey et al. 1995). The national administrator of workplace health and safety legislation is the National Occupational Health and Safety Commission, also known as Worksafe Australia. Within Queensland the governing body for workplace health and safety is the Department of Employment, Vocational Education, Training and Industry Relations, division of Workplace Health and Safety, however Queensland abides by the national legislation, "Work Health and Safety Act 2011" (Butrey et al. 1995).

According to Butrey et al. (1995), Worksafe Australia estimates between 500 and 700 work related deaths every year and 300,000 work related injuries or illnesses with a cost of $9-12 billion per year to the Australian economy. This conforms to the finding of Davidson et al. (2009) which estimates inadequate health and safety standards create a cost in excess of $10 billion dollars annually for compensation, lost of production, training and welfare. The findings of Butrey et al. (1995) and Davidson et al. (2009) indicate the disturbing fact that Australia has a high incidence rate for work related injury, illness or death.

To relate these alarming incident rates to traffic controllers, Safe Work Australia's safety statistics show a similar trend of high incidents. Safe Work Australia's (2013) findings show

that out of ten work areas the roadway was the fourth most common place of injury occurrence within the years June 2006 to July 2009. Also according to Safe Work Australia's (2013) findings the construction industry which traffic controllers are grouped by, has the highest incidence rate of all other general industries, with 86 workers per 1000 workers being injured between 2005 and 2006, with the third most common place of injury being the roadway. These figures validate the view of Davidson et al. (2009) and Butrey et al. (1995), of Australia's high incidence rate for work related injury; however Safe Work Australia validates this disturbing fact within the traffic control industry.

Davidson et al. (2009) argues that the underlying foundation of the occupational health and safety system in Australia promotes self-regulation, the need to share, active involvement of employers, trade unions and employees. This is seen in many industries in the form of health and safety policy guidelines or code of conducts. According to Davidson et al. (2009) these types of documents are often created by consultation between unions and health and safety committees in reference to health and safety standards. These documents give guidelines on how to adhere to safety standards set. However Butrey et al. (1995), indicates that health and safety policies, guidelines or code of conducts should only be used for advice and that employers have prime responsibility for the protection of the health and safety of their employers under the set health and safety standards. Overall Butrey et al. (1995) questions the validity of documents such as code of conducts, as they are derived from health and safety standards, and are not the legislation that is needed to be adhered to. However some code of conducts or similar documents can be endorsed/approved by the state or national occupational health and safety governing bodies (Butrey et al. 1995). This action then officially recommends the use of the code of conduct or similar document as a method of

achieving the minimum health and safety requirement for the required health and safety standard.

2.2 Workplace Health and Safety Legislation for Traffic Controllers

Compliance with recommended health and safety standards does not confirm immunity from risks present in work environments as Ridley & Channing (2008) highlight in their literature on the subject. This indicates that within any occupation including traffic control, the safety standards are a minimum bench mark and are not health and safety methods which ensure complete protection from harm. Identifying key areas of risk to traffic controllers that are present with the minimum health and safety standards in place will allow possible new solution to eliminating or mitigating these risks and allow for a more safe work environment. There are 3 key health and safety standards which are specific to the occupation of a traffic controller.

The first health and safety legislation is Australian Standard 1742 Manual of Uniform Traffic Control Devices 2010. The standard is a national standard and sets the minimum requirements for each state and territories to adhere by for compliance to health and safety in traffic control. Within Queensland the Department of Transport and Main Roads regulated the standards for traffic control across the state (Department of Transport and Main Roads Queensland 2011). Queensland standards are derived from and adhere to the nationally set Australian Standard 1742 Manual of Uniform Traffic Control Devices 2010. The Queensland standard is also called Manual of Uniform Traffic Control Devices. All traffic control companies within Queensland must meet these requirements set within this manual (Department of Transport and Main Roads Queensland 2011).

This manual is designed to outline regulations for traffic controllers to provide a safe work environment on roadways. It is important to note that the manual only briefly touches on the

health and safety issues of traffic controllers themselves. Although adhering to the Manual of Uniform Traffic Control Devices, will ensure traffic controllers develop a work site to satisfy the minimum safety requirements of this standard. For this reason the standard relates to the health and safety of traffic controllers, as they will be working on the work site they develop from this standard.

The final piece of health and safety legislation relating to traffic controllers is a Code of Practice. This code relates directly to the health and safety of traffic controllers and not their occupation of providing safety to others. The Traffic Management for Construction or Maintenance Work: Code of Practice 2008 was developed by Workplace Health and Safety Queensland, the Department of Justice and Attorney-General and Worksafe Queensland (Department of Justice and Attorney-General 2011). The code provides the traffic control industry with a practice to achieving the minimum safety standard outlined by the Work Health and Safety Act 2011. The code is an approved code of practice under section 274 of the Work Health and Safety Act 2011(the act) (Department of Justice and Attorney-General 2011). Thus if traffic controllers adhere to this code they are in turn legally meeting the requirement of the Work Health and Safety Act 2011 which supersedes the code of practice.

These legislations if implemented correctly mitigate all risks to traffic controllers to a certain degree, and thus classify that traffic controllers are safe enough to operate. However mitigating a risk to a certain degree does not eliminate the risk completely. This dissertation will outline the major and most frequent risks which need to be mitigated further or eliminated to ensure greater safety of traffic controllers. In order to this to be achieved an understanding of risks, hazard and risk management needs to be gained.

2.3 Risks

A risk is a very important component of addressing health and safety. Risk is present constantly in most environments, some may be more threatening than others, or some may be unseen. Ridley & Channing (2008) outline that a risk in relation to workplace health and safety can be defined as, exposure to the chance that someone will be harmed. It it's important to note that the Australian standard on risk management, AS31000:2009 Risk management- Principles and Guidelines, points out a risk in general can have negative and positive outcomes with a definition of effect of uncertainly of objectives (Standards Australia 2009). However in relation to health and safety the negative outcome outweighs the positive outcome. This is due to the fact that a positive outcome is the same result of the risk not being in place. In other words a positive outcome of exposure to a risk in relation to workplace health and safety would be no harm to a person and a negative result would be harm done to the person exposed to the risk. Thus exposure to a risk in the occupation of traffic control presents no opportunity to gain, only the threat of loss.

As previously stated Ridley & Channing (2008) outlines a risk in relation to workplace health and safety as exposure to the chance that someone will be harmed. The key phrase within this definition which is important is "exposure to the chance"; this indicates if someone is exposed to the origin of a threat they have a chance of becoming harmed.

A risk can be divided into four main elements according to Ridley & Channing (2008), the hazard, consequences, likelihood and risk perception. Each of these components together creates the risk and determines the magnitude of the risk.

2.3.1 Hazards

Origins of risks are often referred to as hazards; Ridley & Channing (2008) states in general a hazard as anything that can cause harm. It's important to understand that a hazard is not causing harm constantly, but has the potential to harm at anytime, given the right circumstances. Butrey et al. (1995) and Ridley & Channing (2008) both believe hazards can be divided into two broad groups' acute hazards or safety hazards and chronic hazards or health hazards. A hazard can also be a combination of these two, in which would give the hazard two threaten elements and thus two risks. Acute hazards present the potential for immediate harm, to any person exposed to the hazard, thus they are referred to as safety hazards as a person's safety is at threat. Whereas chronic hazards present harm to a person over a period of time after being exposed to the hazard, thus they are referred to as health hazards as a person's health is threatened. As previously stated a hazard can be a combination of the acute and chronic hazards, thus presenting an immediate threat to the person exposed as well as a delayed time threat. Archer et al. (2009) writes that hazard identification needs to be an ongoing process in any work environment, in order for the hazards identified to be evaluated and understood. By doing this the threat or threats that they present can be managed, which will be further discussed within the risk management section.

2.3.2 Consequences

Already established from Ridley & Channing (2008), a risk can be divided into four main elements the hazard, consequences, likelihood and risk perception, which control the magnitude of the risk. However Conrow (2003) finds that a risk is a function of probability (likelihood) and consequences. This is not accurate as without understanding the origin of the risk, the hazard and not understanding the way people view the risk, the perception, the risk is not completely understood. However Conrow (2003) does highlight important points in

relation to the consequence element of a risk. A consequence of a risk is the outcome of being exposed to the hazard. Conrow (2003) and AS/NZS ISO 31000:2009 Risk management, both state the point that the outcome of a risk can be negative or positive. Thus the resulting consequence of a risk can have a positive impact or negative impact to the person exposed, in an occupational health and safety situation. Negative consequences in an occupational health and safety situation, would be the result of injury, illness or death. Whereas a positive consequence in an occupational health and safety situation, would be the result of no injury, illness or death. For that reason a risk in an occupational health and safety situation present a one sided consequence result, with only loss or no deviation in health, with the person exposed gaining no positive outcome. However depending on a person's perception of the resulting consequences a risk in this situation, a positive gain can be seen. The outcome of no deviation of health, being exposed to the hazard and leaving the hazard in the same health as entered, can be seen as a positive consequence of the risk. Though this relies on the individual's perception of the risk, which will be discussed within the perception section.

Consequences seen in risk vary in seriousness, often depending on the hazard which the risk originates. Ridley & Channing (2008) argues that the more serious a consequence is the greater need for hazard control, thus the consequence depends on the hazard. Control of hazards will be discussed within the risk management section; however Ridley & Channing (2008) outlines the point that negative consequences need to be reduced and positive consequence need to be increased. By doing this the outcome of exposure to the risk can be optimised. With this in mind Ridley & Channing (2008) states compliance with recommended safety standards for the occupation field, does not confer immunity from risk consequences.

2.3.3 Likelihood

When a hazard has potential to harm, a risk is formed; the measure of the potential to cause harm is referred to as the likelihood or probability. Probability that the hazard will cause injury, illness or death; this is how Ridley & Channing (2008) refers to likelihood in relation to occupational health and safety. It is not a measure of the frequency of the risk resulting in harm, as it is a prediction of the probability the risk will result in harm. As likelihood is a prediction, it is very hard to quantify. Ridley & Channing (2008) outlines that deciding the likelihood or probability of a hazard causing harm is difficult. As Koller (2005) indicates with any form of probability will come a degree of uncertainty. This is backed up by Ridley & Channing (2008) which argues the valuation of probability of a hazard causing harm is subject to the risk assessor and their knowledge and expertise. Thus the degree of uncertainty around the likelihood of the risk resulting in harm will decrease if the assessor of the risk has high knowledge and expertise in the area of the risk. The level of knowledge and expertise needed to achieve a low uncertainly degree when predicting the likelihood of the harm occurring from a hazard is vast. Understanding the hazard, the perception that people have of the hazard and how people interact with the exposed to the hazard, are key points of knowledge in measuring the likelihood of a risk resulting in harm.

Koller (2005) writes probability of occurrence of the consequence, which is the likelihood of harm arising from the hazard. In this simple form it can be seen that, the only approach to control the occurrence of harm is to control the probability or likelihood of the harm. Further discussion of this is seen in the risk management section.

2.3.4 Perception

When relating perception to occupational health and safety, the perception is considered from the person exposed to the risk. This is also the case for traffic controllers, as they perceive

risks in their own work environment, however it is also important to consider the perceived view of drivers and their perception of the risk they present at roadwork's to traffic controllers.

People perceive hazards differently according to Cohrssen & Covello (1989), depending on the nature of the risk and their experiences. This makes it impossible to determine with accuracy how a person will react being exposed to a hazard specific. As the perception of the hazard will, determine how a person deals with the presents of the hazard. Ridley & Channing (2008) states that understanding a risk provides insight into factors that contribute to that risk. Therefore understanding the elements of the risk, the hazard, likelihood and consequences, allow a clearer perception of the risk. This is correct, however again different people will view these factors differently, thus resulting in an overall different perceived view of the risk.

Cohrssen & Covello (1989) outline that some people judge risks solely on the likelihood of it having adverse effects, where others judge risks on the hazards present. Similarly Ridley & Channing (2008) outline 3 major reason people perceive risk differently; firstly people are unable to estimate risks with accuracy, secondly; people rank risk differently and ignore experts advise and finally; people react more to risk that are unknown to them where they feel they have little control. These points outline that a person's perception of a risk is simple combination judgments made based on their own experiences and knowledge.

When trying to determine the perception people have of a risk, Davidson et al. (2009) outlines four main categories on people's general views of risks; the four categories have been adapted in relation to occupation health and safety.

- Risk seekers - don't understand the negative consequences of the hazard and focus on the positive outcomes.

- Risk deniers - avoids hazards where possible, and perceives hazards as only resulting in negative consequences.
- Risk ignorers - perceives hazards as neutral, thus perceiving the consequence of the hazard as nothing
- Risk Tolerators - perceives the risk realistically and take steps to make good judgement of the hazard.

In an occupational health and safety situation where a risk is present, the two categories which provide suitable perceptions of risks are, risk deniers and risk tolerators. This is due to the fact they perceive the risk on sound judgement in relation to the hazard, which allows them to have a safe interaction with the hazard. Whereas risk seekers and risk ignorers don't perceive or make judgements on the hazards, thus not allowing them to understand the hazard. These four categories show that a perception of a risk varies between people, to perceive a risk correctly is to respect the consequences possible and understand the hazard involved.

2.4 Risk management

Risk management aims to control risks which are identified as detrimental to health and safety of workers. Identifying these risks in occupational health and safety situation in a developed work environment, according to Butrey et al. (1995) can be carried out with the following effected methods:

- A safety audit
- Inspection and review of the work environment
- Consultation with health and safety consultants, and/or health and safety regulators
- Analysis of incident investigations
- Injury and illness record evaluation

- Complaints and observations from the employers/employees within the work environment.

Identifying risks is vital in risk management; another key step is aimed at controlling/treating the risk. Davidson et al. (2009) indicates when controlling a risk, it relies on the attitude seen towards the risk. If the risk is seen in resulting in a positive consequence, then the risk can be controlled to enhance result. However within an occupational health and safety situation risks are mostly seen in resulting a negative consequence and thus the attitude towards the risk is different. Control of risks in relation to health and safety, sees the risk being eliminated or reduced. Butrey et al. (1995) outlines a hierarchy or method, which treats the risk, by initially trying to eliminate the risk if possible, and then if not possible try to reduce the risk. The hierarchy is as follows:

- Design out the hazard which the risk is developed from, this will eliminate the risk completely
- Remove or substitute the hazard, by doing this the hazard will be eliminated or reduced
- Mitigate the risk by adopting a more safe process, when exposed to the risk. by implementing this strategy the likelihood of consequences occurring from the risk is reduced
- Enclose or isolate the hazard, by implementing this strategy the hazard will be eliminated or reduced, as exposure to the hazard is reduced or eliminated.
- Manage work administration, via supervision of work around risks. This will ensure the person exposed to the hazard understand the risk and thus perceives the risk.
- Implement personal protective equipment, this is last alternative when all other controlling strategies are not adequate, and will result in a limited reduction of the risk.

As previously discussed health and safety standards are already in place to mitigate risks, which set minimum requirements for traffic controllers to adhere to. This does not mean adhering to the required standards eliminates the risks for health and safety in any occupation. Due to this the framework of risk management it is necessary to implement, in order to control, risk that are not mitigated effectively or not seen within standards.

Within Australia risk management strategies are implemented in all work environments. The Australian and New Zealand government has developed a standard guideline for implementing risk management in the work environment, AS/NZS ISO 31000:2009 Risk management-Principles and guidelines (Standards Australia 2009). This guideline in brief outlines to workplaces 6 steps that the Australian and New Zealand government believe to be essential in management of risks (Standards Australia 2009).

I. Identifying the risk - determines where the risk is and what hazard it originates from, as well as why the risk is present.
II. Analyse the risk - understand the elements of the risk; the hazard, consequences, likelihood and perception.
III. Evaluate the risk- evaluate the elements of the risk; the hazard, consequences, likelihood and perception, to determine the magnitude of the risk.
IV. Treat the risk - implement controlling strategies to reduce or eliminate the risk.
V. Risk monitoring - monitor the implemented controlling strategies to ensure satisfactory control of the risk
VI. Communication - consult with internal sources within the workplace exposed to the risk and well as external sources, to continually control the risk to a higher degree.

Risk management is an ongoing process which first starts with identifying a risk. Reducing the risk and trying to eliminate the risk is a constant process, it is not until the risk is

completely eliminated, when a one hundred percent safety guarantee is assured. This is rarely seen in relation to occupational health and safety, as many industries settle for the minimum safety standards required. With the minimum safety standards as a base, the degree of reduction that many risks can be further reduced by, would be alarming. Every measure possible should be taken to ensure risks in a work environment are controlled continually to full potential. The traffic control industry is no different; risk management needs to be continuous in order for all risks to be reduced to full potential.

Chapter 3 Methodology

3.1 Introduction

The planning of the processes necessary to meet the set objectives of this research study will be outlined within this section. The outlined methodology will suit the research area and be appropriate for the type of research study.

3.2 Methodology Outline

This research study centres around minimising health and safety risks to traffic controllers. Identifying these risks is necessary in order for risk management to analyse in relation to these risks. Section 2.1 of "Project Background" indicates in identify health and safety issues consultation is a suitable method. For this reason a survey will be developed and implemented. The survey will be aimed at identifying risks seen by traffic controllers day to day, and thus the target of the survey will be traffic controllers within the industry.

With the risk identified, an understanding of the risk will be gained. This will be done by breaking down the risk into the four elements outlined in Section 2.3 of "Project Background"; hazard, consequences, likelihood and perception. This will allow a more valuable understanding of the risks seen to traffic controllers and will in turn aid in finding management strategies/methods for minimising or reducing these risks.

A review health and safety standards outlined in Section 2.2 of "Project Background" will then be carried out in relation to risks identified. This will allow any mitigation strategies/method if any already seen from these standards to be outlined and reviewed.

From this point, with the understanding of the risk and an understanding of the risk management strategies in place, if any, risk management principles outlined in Section 2.4 of

"Project Background" can be analysed in relation to the risks. This will result in the possible reduction of risk magnitude or elimination of risks seen to traffic controllers. Thus obtaining the overall objective of improving the health and safety of traffic controllers at road works.

Methodology outline:

I. Develop traffic controller risk identification survey
II. Distribute traffic controller risk identification survey
III. Analysis traffic controller risk identification survey results and identify risks
IV. Gain understanding of the risks via element break down (risk analysis)
V. Review health and safety standards in relation to the risk identified
VI. Outline and analyses what risk mitigation strategies/method if any, are applied to the identified risks within the health and safety standards.
VII. Apply risk management principles to the identified risks to determine a feasible approach in reducing the risks to traffic controllers, and maintaining the functions of traffic controllers.

With regards to the implementation of the survey it will be assumed that all information gathered from the participants in the traffic control industry, is honest and therefore accurate. Also the sample size or number of participant will rely upon the number of willing participants, however a suitable number of participants will be sampled to ensure reliable information is obtained.

3.3 Ethics Approval

The risk present within this research study centres on the survey being developed and implemented. The survey will be requesting information from traffic controllers in the industry. Participants in the survey will not be identified within the research study and will remain anonymous. However a small amount of risk is present within this process, which relates to the ethics in carrying out a survey.

Therefore before a survey is implemented an approval from the University of Southern Queensland Human Research Ethics Committee is needed. The committee will ensure the survey is developed and implemented in an ethical manner. Thus ensuring protection of the, rights of the participants of survey and the rights myself as a researcher. This process is currently under way at present.

Chapter 4 Risk Identification (Survey development)

4.1 Introduction

Risk identification is a key component of this research project. However it is important to outline that as previously stated, the risks to be identified are, risks seen within the industry with the current health and safety legislation in place. In other words the major risks seen by the industry with current health and safety standards (MUTCD) in place. It is apparent that there are still major risks to traffic controller with the MUTCD in use. The project is not focused on determining if risks are seen in the industry, it is focused on identifying these risks. It is known that risks are seen in the industry as consequences of these risks show evidence of this, as injuries or deaths to traffic controllers. However it is important to grasp the degree of consequences that occur due to these risks.

In order for this to be seen police data regarding reported crash statistic was need. Appendix 2 'Queensland Police Data Request Form" was completed in relation to the information needed regarding traffic control. This form was lodged as a data request and the data retrieved is shown in Appendix B 'Queensland Police Crash Statistics'. The statistics shown in appendix C 'Queensland Police Crash Statistics' are collected from the Queensland Police Service by the Queensland Government Department of Transport and Main Roads. It important to note the statistics show all the crash incidents reported to the police within Queensland. Due to this a number of minor crash incidents some incidents may not have been reported and not included in the statistics. The statistics retrieved show all crash incidents from the year 2005 to 2009, data from recent years is not available as it is not released to the public. It important to note that the Manual of Uniform Traffic Control Devices (MUTCD) was introduced in 2003 and the data retrieved from 2005 to 2009 reflect this standard in use presently.

An analysis of the crash statistic was carried out in relation to traffic control incidents and the results are shown below in figure 4-1 Crash Incidents at road works. It was found during the data analysis that incidents at road works were categorised in two areas. First 'All crash incidents at road works', which shows the entire number of crash incidents at temporary road works sites. Whereas the second category 'crash incidents where vehicle is on path at road works', shows the number of crash incident where a vehicle has crashed while passing through a temporary road work site.

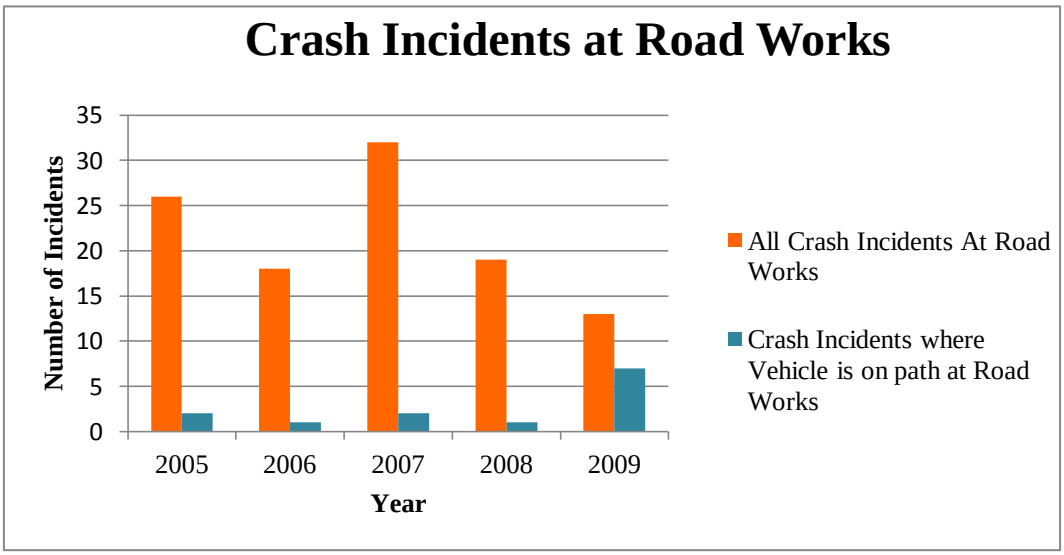

Figure 4-1-Crash Incidents at Road Works

It is clear from figure 4-1 'Crash Incidents at road works' and the two categories which indicate where at road works vehicles crashes occur, that more incidents occur at the start or end of temporary road works. This is important to outline as traffic controllers are employed to work in these areas of the road work. Figure 4-1 'Crash Incidents at road works' also shows that less crash incidents occur within the length of road works, when the vehicle passing through the road work site. This shows that traffic controllers and other workers on a

temporary road work site are less exposed to incidents if they are working in the middle of the road works and not positioned at the beginning or end of the site. Overall in Figure 4-1 'Crash Incidents at road works' the statistics show that within the 5 years 108 crash incidents at road works were reported, where the vehicles driver was injured or killed or a road worker was injured or killed. In either situation, each incident represents a consequence of a risk presented to traffic controllers on temporary road work site.

From the blunt statistic of 108 crash incidents at road works, within 5 years, it is obvious that major risk are present to traffic controllers with the current health and safety standard in place (MUTCD). Thus it is important that within this chapter a suitable method of identifying risks to traffic controllers is recognized.

As previously noted section 2.1 of 'Project Background', outlines that consultation is a reasonable method of identifying health and safety issues, in particular risks. To approach the problem of identifying risk in this manor a survey will be developed. The survey will provide a mode of consultation with the traffic control industry. In turn this method of consultation will be effective once implemented in the traffic control industry.

Implementation of the survey will also be discussed and outlined, as well as the ethical issues related to the implementation of a survey regarding health and safety in the traffic control industry.

4.2 Survey Methodology

It is important to note that the key technique required from the survey is a consultation process. Ideally an interview process would be implemented. Traffic controllers in the industry would be asked questions and discussion may arise from these questions. However as this process is time consuming, it would reduce the number of participants as most traffic

controllers in the industry wouldn't agree to give up such time. To increase participation the consultation style survey approach is suitable and was utilized.

The survey is a useful method in extracting information from traffic controllers in the industry, regarding the risk they see in their occupation. When developing any survey the data and information needed from the implementation is always considered first. In particular the type of data needed from the participants. Quantitative and qualitative data are the two main types of data which surveys can aim to extract. Qualitative data is classified as data that cannot be measured and is more of a description of a particular matter (Roberts D 2012). Whereas quantitative data is classified as data which can be measures and related to quantity of a matter (Roberts D 2012). When looking at a consultation process, for example an interview process, the data that will be retrieved from this will mostly be qualitative, the participant views and descriptions of a matter or issue. To achieve this consultation style within the survey, more qualitative data will be extracted from the industry relating to the risk seen. However a standard consultation process (an interview process) has the possibility to produce some form of quantitative data and for that reason some survey questions may be aimed at extracting quantitative data relating to risks. This amount of quantitative data that industry can offer on risks will be limited as the survey aims at identify major risks seen, which focuses on the views of industry workers relating what they have experienced, rather than trying to find a measure of a how risky/dangerous the industry can be. This type of quantitative data is not needed as the Queensland Police Service crash data previously analysed in section 4.1 'Introduction' already shows a measure of risk in the industry. With this quantitative data from the Queensland Police Service outlining the degree of risk seen by traffic controller, the survey can focus on identifying risk via a consultation style, by extracting qualitative data from the industry.

Overall the survey will ask the question why the degree of risk is seen in the industry, with the current health and safety standards (MUTCD) in place, in turn identifying the major risk to traffic controllers.

In order for the survey to be effective at extracting information from the industry the following aspects will be considered when developing the questions. The survey questions will be formatted to allow the participants to express their responses quickly. This will be seen by the survey incorporating short answer question, rated questions or multiple choice questions. These types of question formats will minimise the time the participant takes in completing the survey as well as maximising the number of questions asked to the participants in this time. This approach in utilizing the short response questions to decrease the survey time is aimed at recruiting more participants. The less time the survey takes to complete, the more likely participants will agree to partake. For this reason a survey time of less than ten minutes is a suitable target. It important to note having a short survey time does not mean fewer questions will be asked. As previously discussed, for this reason short response formats will be utilized in the survey, as well as this, the fact the survey relates to the participants everyday work means they will be familiar with the knowledge of the questions. This will allow the participants to be effective in giving their responses to the survey questions in a minimal time frame.

4.3 Survey Development

4.3.1 Aspects of Traffic Controller Considered

When focusing on the overall aim of the survey, as identifying risks to traffic controllers, it needs to be considered that health and safety standards are presently in place to mitigate any risk to traffic controller to a certain degree. As outlined in section 2.2 ‘Health and Safety Legislation for Traffic Controllers’, the set standard within Queensland is the Manual for

Uniform Traffic Control Devices (MUTCD). A review of this standard with the understanding of risk gathered in Chapter 2 ‘Literature Review’ will allow a survey to be developed which will aid in identifying the main risks to traffic controllers with the MUTCD presently in use.

With the understanding of the principles related to risks gathered in chapter 2, three main areas within traffic control where risks could develop from were outlined.

- the environment factors
- the main work procedures of traffic control
- the presence of vehicles/drivers in the work environment

These three aspects of traffic control will be discussed in the following sections and will be looked at in relation to the MUTCD. From this discussion and understanding, it will be seen if factors within these three aspects are potential areas of major risks. This will then be the basis of the survey question, in which the industry will aid in verifying if these three aspects present any form of risk, considering the fact that MUTCD safety standard is in place.

4.3.2 Environmental Factors

Environmental factors are important to consider when identifying risks to traffic controllers. They present as factors which cannot be controlled, such as the sun intensity or day or night conditions. These factors can present hazards, in the form of dangerous levels of ultraviolet radiation in the case of sun intensity or low visibility in term of night conditions. It is important to note that over exposure to ultraviolet radiation presents a chronic risk. As previously discussed a chronic risk threatens the health of a person a period of time after exposure to the hazard. Thus it is common that people ignore the hazard. This will be investigated in the survey in relation to sun and heat exposure to traffic controllers. The MUTCD itself does not detail any form of hazard protection for exposure to the sun, however it refers to the Workplace Health and Safety Act (2011) for providing this to traffic controllers. As discussed in section 2.2 'Workplace Health and Safety Legislation for Traffic Controllers' the specific code of practice derived from the Workplace Health and Safety Act (2011), for traffic control use presently is The Traffic Management for Construction or Maintenance Work: Code of Practice 2008. Within the Code of practice there are numerous mitigation methods for minimising the effects of the hazard of sun and heat exposure, Including:

- Personal Protective Equipment:
    - long sleeve shirts and pants
    - wide brim hat
    - sunglasses
    - sunscreen
- hydrating regularly

- minimise work between 9am and 3pm
- set time limits for sun exposure
- reorganise work schedules or rotating shifts
- Planning for treating heat/sun affected workers

With these mitigation methods in place, rarely should consequences of the risk of sun exposure be seen in the industry. However as this risk presents itself in form of a chronic hazard and it is common for this type of hazard to be forgotten, the survey will address this issue and determine if traffic controllers see this factor as a main risk to them.

The other environmental factor which presents risk to traffic controllers is night conditions. Night works is common for traffic controllers, as traffic volumes on roads reduce, thus reducing the risk in terms of the hazard or vehicles. On the other hand it produces the hazard of low visibility for drivers and traffic controllers. It will be important to determine if traffic controllers perceive night condition more risky than day conditions, this will show if the hazard of low visibility is seen as more hazardous than a normal traffic volume in day conditions.

The MUTCD accounts for this the factor of night works with two main objectives. Firstly as this research project is only considering stop/slow batten traffic controller at road works, it is important to note that this particular type of traffic management is avoided at night. This is due to the fact that the driver has low visibility and the stop batten sign is difficult to see in dark condition. The standard stop/slow batten R6-8A/T7-1A is shown below in figure 4-2.

Figure 4-2-Standard 'stop' batten (MUTCD)

As shown the battens do not have lighting to display the sign in dark conditions for drivers to see. The MUTCD states that in the event that stop/slow batten work is required in night conditions, the road works and the traffic controller conducting the stop/slow batten work needs to be sufficiently visible to driver by lighting the areas of traffic management and road works. This procedure most times requires numerous flood lights and generators and can be expensive, thus the reason why stop/slow battens are rarely utilized in night conditions.

Second mitigation method stated in the code of practice, which is utilized to minimise the hazard of low vision in night conditions is personal protective equipment. The use of retro-reflective/fluorescent vests allows drivers to identify workers in night conditions. The standard required vest to be worn by traffic controller in night condition is shown below in figure 4-3. Note the use of retro-reflective and fluorescent material.

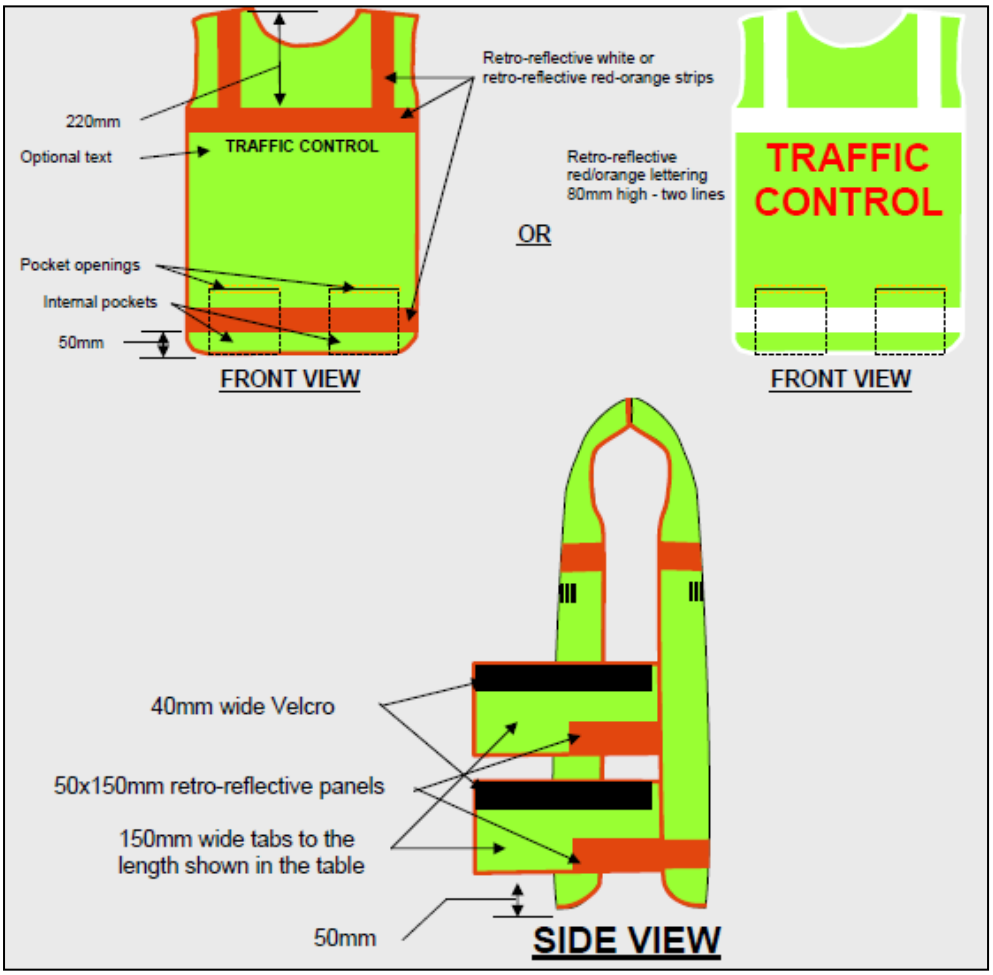

Figure 4-3-PPE Vest (Department of Transport and Main Roads)

4.3.3 Work Procedures

Work procedures relates to functions that traffic controllers are required to carry out in order to manage traffic at a road work site. In particular, procedures of traffic controllers carrying out stop/slow batten work. The key aspects of areas of risk within the procedures that traffic controllers follow, are to be determined in the survey. The first procedure which will be investigated in the survey is the action of stopping oncoming traffic. This requires the traffic controller to display the stop sign face of the stop/slow batten shown in figure 4-2 and stepping on to the traffic path to exert presents. The second action is the release of traffic through the road works, this requires the traffic controller to display the slow face of the stop/slow batten shown in figure 4-2 and stepping of the traffic path. The final action is observing traffic as it flows pass and through the road works, this requires the traffic controller to display the slow face of the stop/slow batten shown in figure 4-2 while standing close to the traffic path. These three action/procedures of a traffic controller will be investigated in the survey to determine which aspect of 'traffic control' is perceived to be of high risk.

A key risk management aspect utilized by traffic controllers is an escape path. The MUTCD requires all traffic controllers carrying out stop/slow batten work to have a pre-planned escape path. A pre-planned escape path is a planned route to be taken away from vehicles if it is on track to hit the traffic controller. The route is a last contingency in defending against a risk. The planned escape path is to be utilized in any situation the traffic controller feels they are at risk of being hit by a vehicle. This could be in many situations for example a speeding vehicle, a vehicle off the road way or a distracted driver. It important to investigate pre-planned escape paths and the frequency of their use within the survey, as this will give a reflection of the frequency at which speeding vehicles, vehicles off the road way or distracted drivers are seen at traffic control sites. Thus determining the frequency at which the risk is

exposed to traffic controllers. It will also investigate if the escape path requirement is an effective form of mitigation as a last contingency in avoiding the consequences of the risk.

The stop/slow batten show in figure 4-2, it the standard batten for use by traffic controller as required by the MUTCD. This is the foremost critical piece of equipment for a traffic controller. The batten displays a legally enforced traffic direction in the form of a stop sign. The Road Use Management Regulation section 101, which is enforced by the Queensland Police Service, state that failure to stop at a hand-held 'STOP' banner incurs a three hundred and thirty dollar fine and 3 demerit points, which is the same penalty as a failure to stop at a fixed 'STOP' sign. However it is important to note that the sign is rounded and not octagonal as regular fixed stop signed are. This may present transparency between the signs. The survey will investigate the use of the batten, in particular the frequency at which drivers fail to stop at the 'STOP' batten. This will determine the frequency of ignorant drivers or distracted drivers at road works.

It's important to understand that traffic control is a job requiring attention and observation. It just important to understand the work of a traffic controller is undertaken at or near a road work site. At a work site, distractions such as noise, dust and machinery can obviously affect the attention and observations traffic controllers. The MUTCD and code of practise aim to mitigate these distractions to a degree. The use of personal protective equipment such as ear muffs and noise barriers aid in the reduction of noise. However this also hinders the procedure of the traffic controller as they are required to communicate with hand held two way radios. Thus the noise from the work site and the ear muffs for protection create an issue in relation to hearing the hand held two way radios. Overall distractions on site will be investigated within the survey to determine if distraction contributes to an increase in risk to traffic controllers.

4.3.4 Vehicles in the Work Environment

Vehicles make up the main area of risk to traffic controllers, as traffic management is a part their job. Different vehicle characteristics and driver characteristics present varying risks within a traffic flow. For this reason safety standards (the MUTCD and code of practice) are set to account for the risks which the majority of vehicles and drivers present on the road. Outside of this limit driver/vehicle factors such as speeding, distracted driver, drink/drug drivers and poor driver skills are not accounted for within the MUTCD and code of practice. This in only addressed to a certain degree in relation to the escape path of a traffic controller previously discussed. However these factors are addressed in terms of the responsibilities of drivers and the laws which regulate road use. Even with laws in place to stop these driver/vehicle factors, they are still seen on the road and for that reason they present a risk to traffic controllers even if the frequency at which these hazards are seen is low. The frequency of the risk occurring are low, however the consequence can be of great magnitude. Due to this fact it is important to investigate if traffic controllers perceive these driver/vehicle factors as a source of major risk.

One other factor relating to vehicles in the work environment which may produce a greater risk to traffic controllers is increased traffic volume. Traffic volumes at road work increase a peak hours of the day. The MUTCD takes into account the traffic volume when planning traffic management for a road work site and also account for peak traffic times. However this is carried out in the planning stages. Traffic flow may some reason increase unexpectedly during traffic control work, then this will present an increased risk as the traffic management site was not planned to operate at this unexpected traffic volume. Also in the case that traffic volume at a particular road work site has been low and rapidly increases, traffic controllers would require a rapid change in attention to their job and increase in work rate. For this

reason the survey will investigate if traffic controllers perceive there is an increase in risk at peak traffic volume times.

4.3.5 Overview of Survey Development

Overall the survey will be aimed at identifying risks. As outlined in the above sections risks to the traffic controller is a structure consisting of consequences, likelihood (frequency), hazards and perception. The survey will be develop with these four factors considered, in order to allow high magnitude risks to traffic controllers to be identified. As discussed in section 2.3 'Risk' high magnitude risk is risks which encompass negative attributes from all four of the factors.

4.3.6 Ethical Issues

Ethical issues need to be considered when undertaking any survey. However as the survey being developed relates to health and safety, ethical awareness is essential. Also as the survey relates to a legal standard the MUTCD, it is important ethical consideration is taken in regard. If no ethical consideration was seen when developing the survey, negative consequences could be produced and affect either the participants or myself. For this reason when developing the survey consideration for how the questions asked may affect the participant and myself will be considered.

They will be considered firstly in relation to the legal standard in place and ensure no questions within the survey create legal implication to the participants or myself for releasing information regarding the participants not adhering to the MUTCD (the practising legal standard) when carrying out work . An example of this would be if a participant states they have carried out traffic control whilst not following the MUTCD, to avoid this questions

within the survey will state, “in accordance with the MUTCD’ if asking a question regarding the work of a traffic controller.

The Second ethical consideration is the aspect of health and safety. This will be considered to ensure no ethical issue arises if participants release health or medical information regarding themselves. For example if a participant releases information on specific injuries they have received whilst working as a traffic controller. This ethical issue will be avoided by not asking for any medical or health information. This is type of information is not needed from the survey as the consequence of the risk seen to traffic controller is clear as explained in 4.1 ‘Introduction’ and the survey aims at identify the risk which cause these consequences.

As well as these two considerations for ethical consideration, participants will not be identified, and will remain anonymous throughout the survey process and throughout this research project. This will ensure greater ethical consideration to the participant information they release.

In order to ensure ethical consideration is seen to be carried out sufficiently with the developed survey, a review by the University of Southern Queensland’s Human Research Ethics Committee will be carried out. Ensuring protection of my rights and the participant’s rights will be achieved after this review.

4.4 Survey

With all the background knowledge discussed within the chapter specifically section 4.3 ‘Survey Development’ and 4.2 ‘Survey Methodology’, along with the ideas discussed in Chapter 2 ‘Literature Review’ a survey was developed. The survey can be found in appendix 4 ‘Survey’. The survey consists of twelve questions which aim to identify and understand three main areas which are believed to be key aspects of traffic control work which may

present risk. These three aspects were previously discussed in detail within section 4.3.1 ‘Analysis of the MUTCD’, the working environment factors of a traffic controller, the main work of procedures of traffic controller and the presence of the vehicles/drivers as a hazard to traffic controllers. The results from this survey will be utilized to identify key risks to traffic controllers, which need to be addressed, to develop a safer work environment for traffic controllers.

With the developed survey shown in appendix D ‘Survey’, ethics approval was needed before implementation of the could commence. This was granted by the University of Southern Queensland’s Ethics committee and the approval letter is shown in appendix E ‘University of Southern Queensland Ethics Approval’.

4.5 Survey Implementation

Implementation of the survey was carried out with in the industry. As previously stated the participants of the survey are traffic controller working the industry. To recruit participants for the survey, traffic management companies were approached and asked if they would implement the survey within their organisation to their employed traffic controllers. This was a suitable method of implementation as hard copies of the survey could be sent to the participating traffic control companies to implement with their employees who wished to participate. Then the hard copies were collected from the participating companies if any of their employees participated in the survey. This hard copy method of implementation was selected as suitable, as it presented ease of use for the participants and quicker response rate, rather than an electronic form of survey. The following chapter will discuss results gathered from this industry investigation in detail.

Chapter 5 Identified Risks (survey Results)

5.1 Introduction

The developed survey shown in appendix D 'Survey' was implemented in the traffic control industry as previously discussed. This chapter discusses the results of the industry investigation and outlines the key risks identified from this process.

5.2 Survey Results

As previously discussed in section 4.3 'Survey Development' three aspects of potential areas of risk to traffic controllers were outlined in relation to developing the survey around these issues to identify risk to traffic controllers. These three aspects are environmental factors, work procedures and vehicles in the work environment. These three aspects were outlined as high potential areas of traffic control work which could present risks. Due to this the survey was aimed at identifying risks within areas. The survey result shows a number of interesting results in relation to these aspects and the perceived notions of traffic controllers to these aspects. Firstly the survey investigated which of the three aspects traffic controllers view as the most 'dangerous'. The word dangerous was used as it describes what aspect has the most potential to present risks and takes into account what aspect has the most harmful risks. It is important to note that risk can be less frequent with high consequences. Due to this it was important to try and determine which aspect was the most 'dangerous' as it allowed the participants to take into account the frequency of the risks, the number of risks and the consequences of the risk. The results returned from this specific inquiry are shown in figure 5-1.

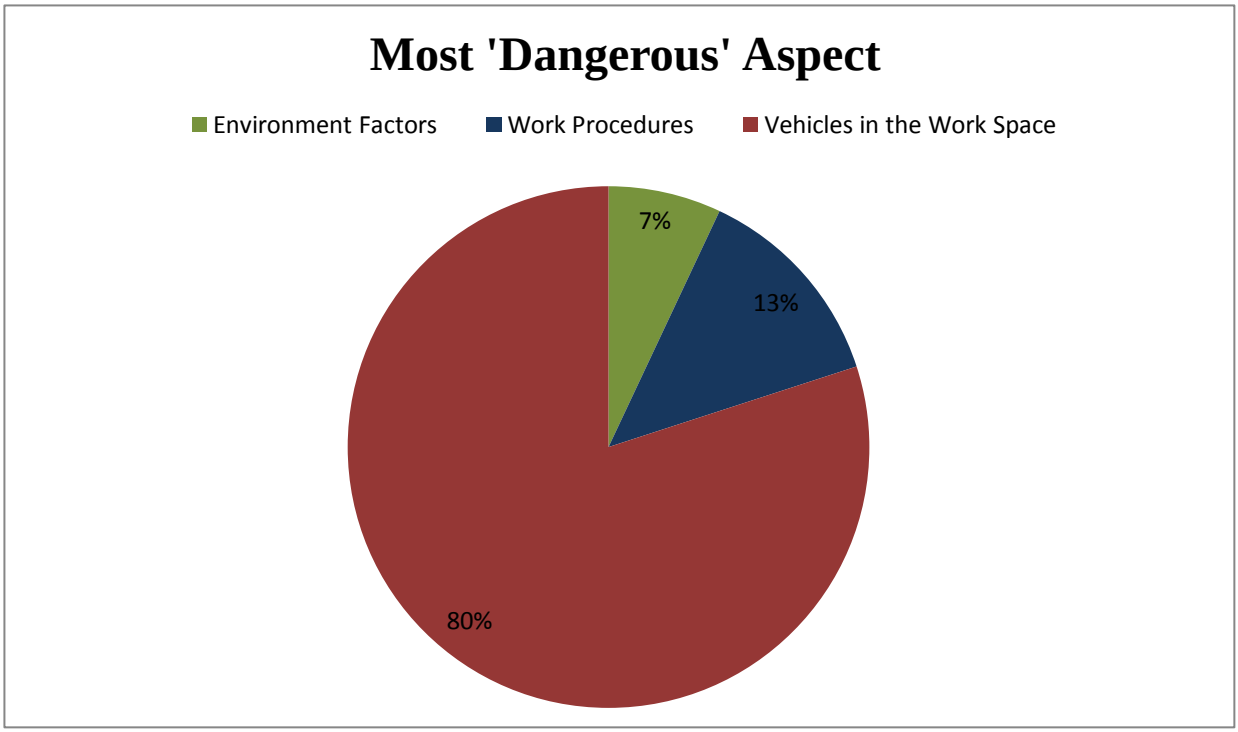

Figure 5-1-Most 'Dangerous' aspect of traffic control work

As shown in figure 5-1, the industry investigation reveals that the aspect of vehicles in the work environment is the most dangerous aspect/area of traffic control work, with eighty percent of participant agreeing. This figure also shows that environmental factors such as sun exposure and weather conditions are not seen as a high potential aspect to present risks in comparison to work procedures or vehicles in the work environment. Overall this shows in general the risks seen to traffic controllers are developing from the aspect of traffic in the work environment. The following results from the continuing survey questions will develop on this theory further.

5.2.1 Environmental Factors Investigation

The two main environmental factors investigated within the survey were night works and over exposure to the affects of the sun. Firstly night conditions as previously discussed presents the hazard of decreased vision, which increases the risk to traffic controllers. Section 4.3.2 'Environmental Factors' outlines the mitigation methods in place by the MUTCD, which aim to reduce/remove this risk. The survey questioned participants on the effectiveness of these mitigation methods by comparing night conditions with day time conditions. This allowed participants to differentiate between night conditions where the hazard of decreased visibility was seen and the MUTCD mitigation method were utilized verses the day time condition where this hazard was not seen and none of the mitigation methods were needed. The result showed that 90 percent of participants saw an increase in risk in night conditions and felt less safe working in these conditions compared to day conditions. This shows that the MUTCD's mitigation method for reducing risk at night do not make traffic controllers feel as safe as if they are working in day conditions. This however does not show that the MUTCD's mitigation method are not affective at reducing the risk in night conditions, it only shows that the traffic controllers view night conditions as a more risky aspect of the work.

The second form of environmental factor investigated within the industry investigation is over exposure to the affects of the sun. As with the increased risk of night conditions, the MUTCD's outlines various mitigation methods to reduce/remove the risk that the sun presents to traffic controllers. These methods are outlined within Section 4.3.2 'Environmental Factors'. The survey investigated whether these methods are sufficient in reducing/removing the risk of sun exposure. The participants were questioned on the consequences the risk of sun exposure present in relation the mitigation method of the MUTCD, dehydration, sunburn and sun cancer. As stated in Section 4.3.2 'Environmental Factors' personal protective equipment is the main mitigation method implemented by the

MUTCD. The perception of this method in relation to preventing dehydration and sunburn/sun cancer was found from traffic controllers. The results are shown in figure 5-2.

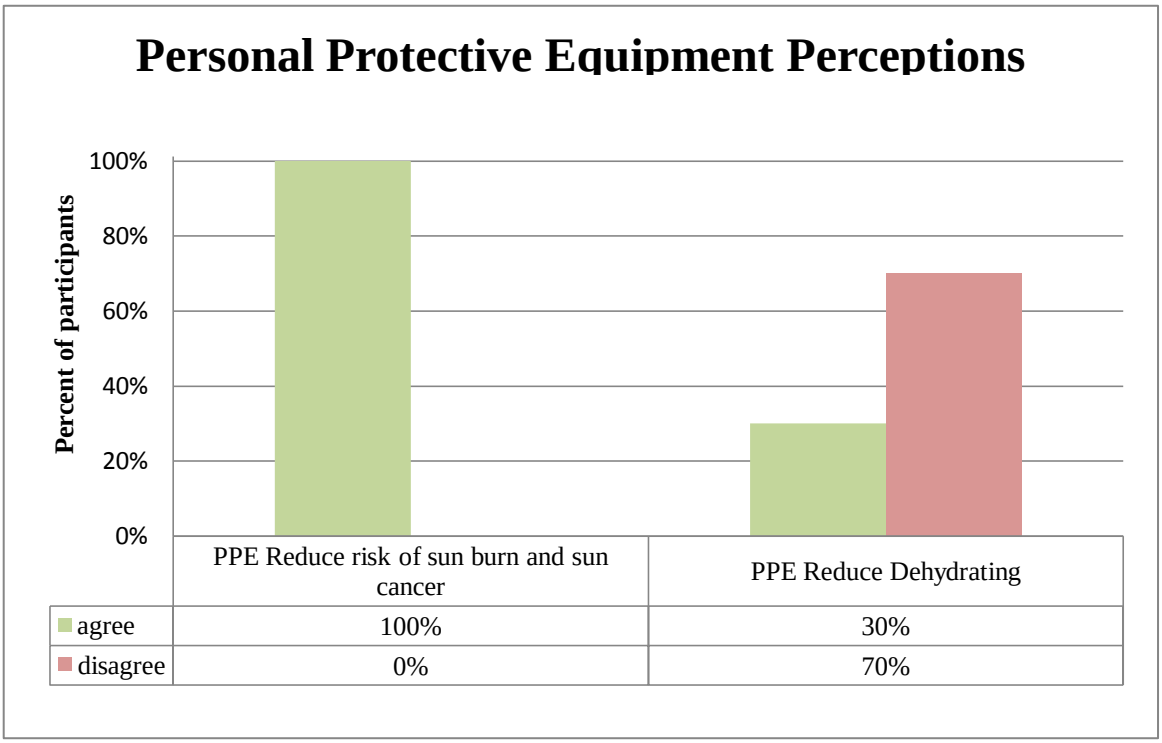

Figure 5-2-Perception of PPE by Traffic Controllers

Figure 5-2 shows that the participant industry sample perceives the use of PPE as an effective mitigation to remove the risk of sunburn and sun cancers. However only 30% perceive the same PPE is effective in reducing dehydration, with 70% disagreeing and perceiving the PPE does not help reducing dehydration. These results show a interesting relationship, where the PPE is employed to reduce the major risk of obtaining sunburn/sun cancer, but simultaneously hindering the mitigation of the risk of dehydrating. The PPE protects traffic controller's skin from exposure to the sun; however this requires long sleeve clothing, thus reducing air circulation around the body, aiding in dehydration of the body. This relationship is being addressed by use of specially designed PPE which allows for a degree of air circulation in the clothing, and the fact that the code of practice advises regular hydration

breaks as mitigation to dehydration. However it would be assumed that the participants of this survey are utilizing these forms of mitigations to dehydration in the industry, and nonetheless are experiencing a degree of dehydration due to the PPE in use.

5.2.2 Work Procedures Investigation

Work procedure was investigated within the survey and a number of interesting findings were obtained. Many work procedures that traffic controllers carry out are related to vehicles. Due to this the survey investigated work procedures related to traffic in the work environment and not related to traffic in the work environment.

The key issue investigated within procedures of traffic controllers not relating to traffic, was the works aspect on site. In particular the distraction and impairment site work may cause to the traffic control work of stop batten worker. As previously stated the MUTCD aim to mitigate these distractions such as noise by use of ear protection. However the MUTCD does not account for the impairment of dust and the effects of impaired visibility. For this reason the participants questioned in relation to the distraction and impairment that site work produces. Specifically machinery noise, dust, movement and exhaust emissions. The finding of the survey showed that 100% of participants saw all four of these factors as an impairment of distraction to their work. The particular survey question which these findings resulted from was not a rated question and thus participant did not specify which of the four factors they perceived as the most threatening to distracting/impairing them from their work. Upon reflection this question should have been a rated question for that reason. However it can be concluded from the results that site work is a major factor which affects the work of a traffic controller, presenting a risk. Where site work entails machinery use dust, movement, noise and exhaust emissions will be seen, thus overall the use of machinery on the work site were a traffic controller is employed, presents a risk as identified by the participants.

The most frequent work procedure carried out by stop batten traffic controllers is the stopping and releasing of traffic. This was investigated to determine which aspect of the procedure was the most threatening to the safety of traffic controllers. The frequency of this procedure carried out by traffic controllers is high and is repeated numerous times during a days work. Due to this any risk seen within this procedure could in turn present frequent consequences, thus it was important to investigate. Within this procedure there are three key aspects a traffic controller must carry out: initially stopping the traffic, releasing the traffic through the work site and observe the traffic flowing through the work site. These three steps in the procedures were presented to the participants to determine which step was seen as the most threatening to the safety of traffic controllers. Figure 5-3 shows the results below. It is important to note the survey question relating, was a rated question, for this reason the most threatening and second most threatening step ratings are shown.

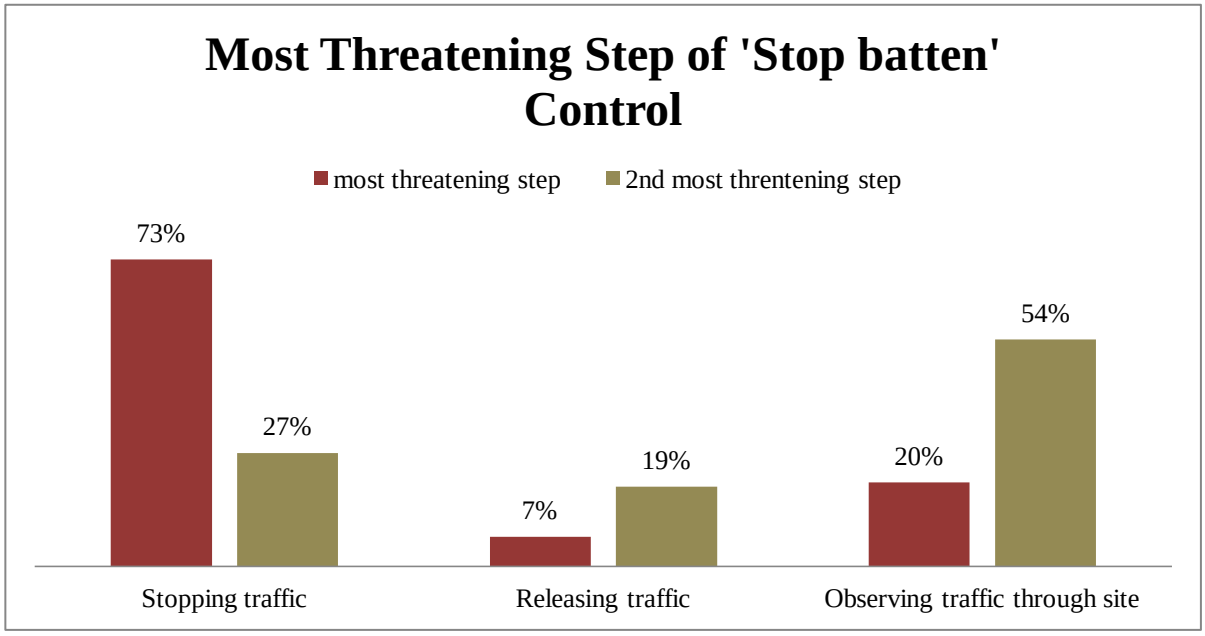

Figure 5-3-Work Procedures most threatening aspect

As shown in figure 5-3, 73% of participants rated stopping traffic as the most threatening step in the procedure. This was expected as this step requires traffic controllers to step out on the

traffic path and display their ‘STOP’ batten, which is vastly more threatening than the other two steps. It is also shown in figure 5-3 that the step of observing traffic is rated as the second most threatening step with 54% of participants indicating this. This is interesting as the step of releasing traffic through the work site would be assumed to be more threatening to traffic controllers, as this step requires the traffic controller to maintain observation on the traffic stopped while changing the face of the stop batten to slow and walking off the path of the traffic flow. Compared to standing in the path of the traffic flow and observing the traffic. However the step of observing the traffic flow requires traffic controllers to communicate between each other at the separate ends of the road work site, while observing the traffic entering or exiting the road work site. This presents multitasking, whereby the traffic controller cannot concentrate completely on the more important task of observing traffic, as they are communicating at the same time on when to stop the traffic flow next. Due to this the traffic controller cannot constantly effectively observe the approaching vehicles and thus cannot constantly see the risk of an off course vehicle approaching them. Overall the findings show that the procedure which place traffic controllers at most risk is stopping the traffic.

This step of stopping traffic, in the procedure of ‘stop batten’ work was explored further in the survey. The frequency at which risks are seen at the step was investigated. The approximate occurrence rate of the vehicles disobeying the ‘STOP’ sign face of the batten was investigated. This will show the frequency of this risk seen. It’s also important to note that this is a high magnitude risk as traffic controllers are on the traffic flow path when displaying a ‘STOP’ face of the batten, thus the vehicles disobeying the sign have a high possibility of causing high consequences in terms of injuries to traffic controllers. The result of the approximate occurrence rate is presented in figure 5-4.

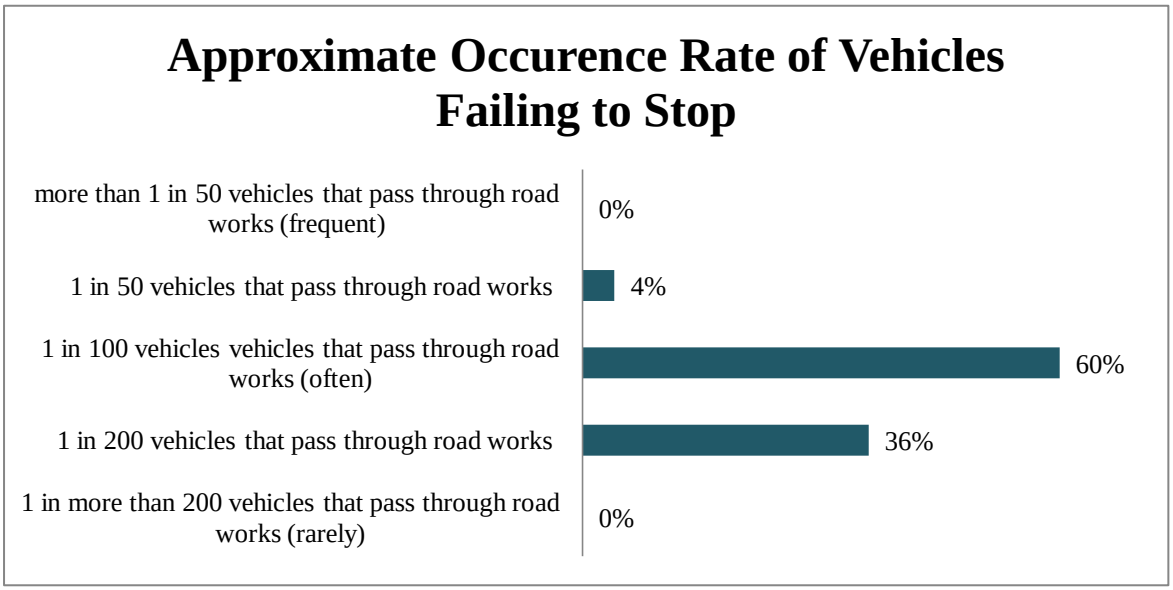

Figure 5-4- Failure to stop occurrence rate

As shown above 60 % of participants indicated that approximately 1 in 100 vehicles that pass through traffic control at road works fail to stop at a batten displaying a 'STOP' face. This is classed as often and a higher occurrence rate than expected as previously discussed in section 4.3.3 'Work Procedures' this is an illegal act for a driver to take on the road. However this does not excuse the fact that the frequencies that traffic controllers are placed at risk by vehicles failing to stop is high. Overall the findings show that the frequency of this risk and the potential consequences of the risk present a high magnitude risk to traffic controllers.

As previously discussed the MUTCD outlines the use of a pre-planned escape path for traffic controllers to have while working on a road work site. This can be utilized by traffic controllers to avoid being hit by an off course or out of control vehicle. Figure 5-4 shows that vehicles often fail to stop at a stop batten; this can present traffic controllers with a situation where they may have to utilize their pre-planned escape path. The frequency of the failure to stop rate, in turn gives an insight to the frequency of use of the pre-planned escape path. To further investigate the frequency of use of a pre-planned escape path, the survey asked

participants if they have utilized an escape path on a road work site in the past year. Of the participants 83% had utilized their escape path in the last 12 months. This is consistent with the frequency of occurrence rate of vehicles failing to stop. However it important to note the participant circumstance for utilizing their escape path is unknown. For example some participant may have utilized their escape path for avoiding a minor risk just as a precautionary measure, whereas others may have utilized there escape path for avoiding a major risk of a vehicle out of control heading straight for them. Due to this the determined frequency that pre-planned escape paths are utilized is approximate, but a fair reflection of the industries uses. This finding reflects the effectiveness of the pre-planned escape path as a mitigation method in place by the MUTCD for avoiding off course vehicles.

5.2.3 Vehicles in the Work Environment Investigation

As outlined at the beginning of this chapter survey result found that traffic controllers perceive vehicles in the work environment as the most threatening aspect/area of traffic control work. The survey further investigated this area and the results will be outlined and discussed within this section. The development and reasoning behind investigating this aspect is discussed in section 4.3.4 ‘Vehicles in the Work Environment’

Firstly it is important to outline that the aspect of vehicles, in turn relates to drivers and their behaviour/characteristics. A key factor with any risk is perception, driver perceptions of the risk they present at road works is important is to investigate, to determine whether traffic controllers are exposed to varying levels of risks. 100% of industry participants agreed that different driver characteristics for example younger drivers or older drivers, presented a varying risk due to the drivers perceptions of the risk. This result was expected, however justification was needed to state that the traffic flow at a road work site varies in risk, thus there is no measure of risk a traffic flow presents to a traffic controller. With this justified

driver factors and vehicle factors were investigated within the survey to determine which factors of the two present the most risk to traffic controller, giving a measure the highest risk seen in a traffic flow to traffic controllers.

Firstly four common driver factors were considered speeding, driver ignorance, driver distraction and poor driver skill (impaired by drugs/alcohol). Participants were then asked to rate the factors as to which was the most threatening to them in terms of frequency seen at traffic control sites, possible consequences and likelihood to cause harm. Figure 5-5 shows the results.

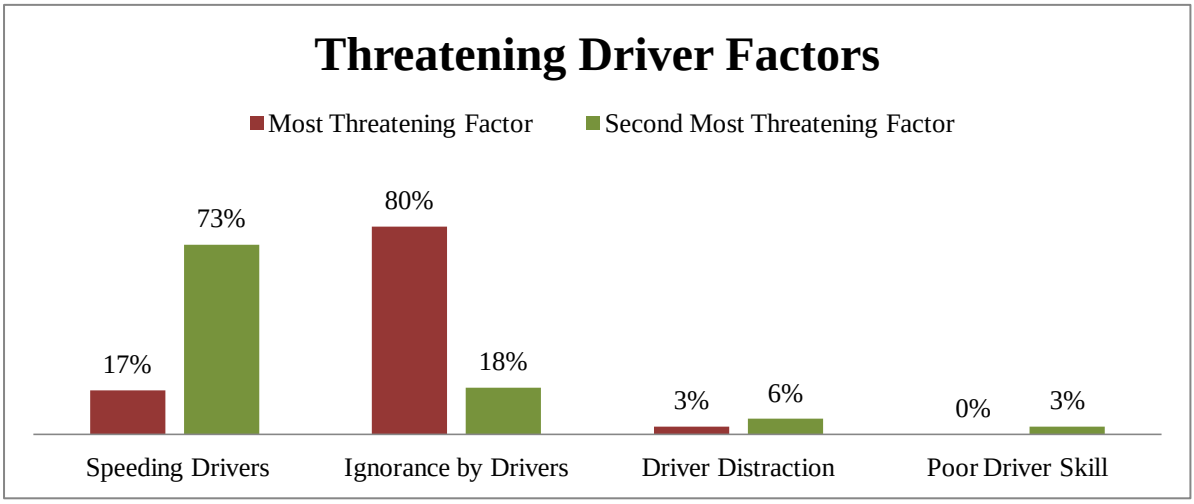

Figure 5-5-Percived most threatening driver factors

80% of participants see driver ignorance as the most threatening driver factor to their health and safety whilst working. This can be related to the previously discussed high occurrence rate of drivers failing to stop at a 'Stop' batten. This relationship shows that the driver factor of ignorance, see traffic controllers being placed at risk frequently as driver ignorantly fail to sight and stop at the stop batten. Figure 5-5 also shows that the second most threatening factor to traffic controllers is speeding drivers, with 73% of participants indicating this fact. It was expected traffic controllers would perceive the driver factor of speed as very threatening as the consequences of the risk can be potentially deadly to traffic controller. However the

frequency of the hazard presenting is low, the MUTCD outlines the correct mitigation methods to remove speed as a factor such as speed limit signs and traffic cones. The other factors driver distraction and poor driver skill returned as a low threaten traffic controllers; this is most likely due to the fact that these factors present at low frequency to traffic controllers and result in low consequence, thus not as threatening as speeding drivers or ignorance by drivers. Overall the finding in figure 5-5 and the some of the pervious sections of this chapter reveal a trend which sees driver ignorance at road works presenting a high magnitude risk to traffic controllers.

The second factor relating to traffic flow risk is vehicles and the different risk the vehicle classification present. In order to determine the most threatening vehicle to traffic controllers six general vehicle classification were outlined; small cars, medium cars, 4x4 and SUV's, motorcycles, small trucks and large trucks. The risk a vehicle presents to traffic controllers is a relationship between the frequency at which the particular type of vehicle is seen a traffic control works and the potential consequence the particular vehicle can produce. The survey addressed this issue to the participant, to determine which vehicle is perceived as the most threatening to traffic controllers, disregarding the factor of the driver. The results are presented in figure 5-6.

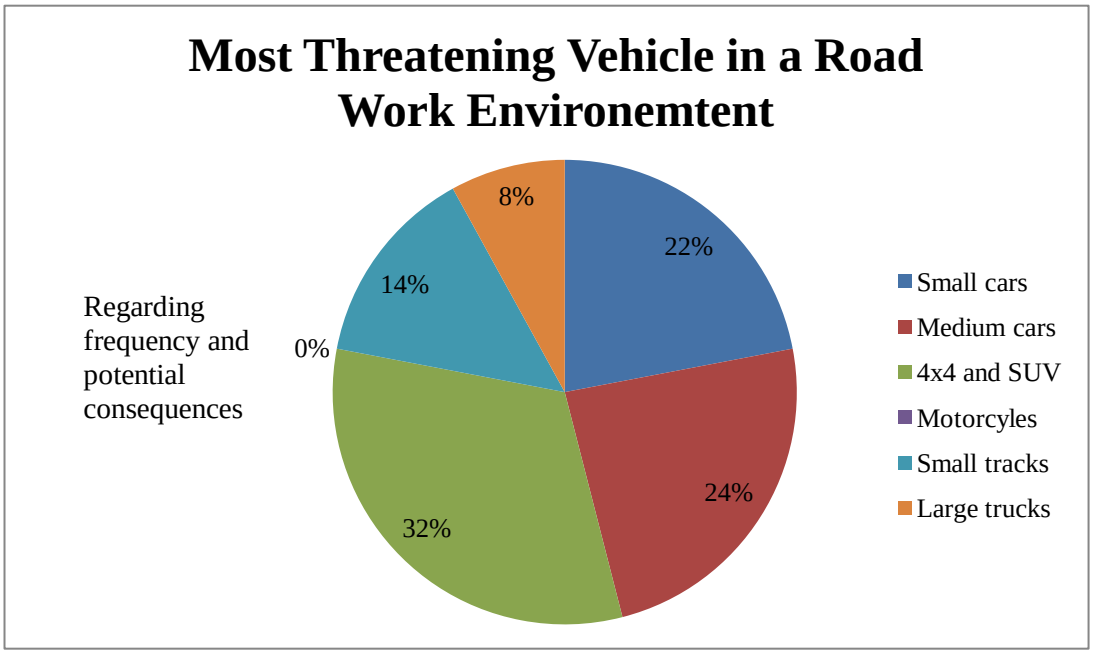

Figure 5-6-Most threatening vehicle in the work environment

Figure 5-6 shows a fairly uniform result across three of the six vehicle classifications. Noting the threat was graded by the participants in relation to the frequency and consequences, it is clear that small cars and medium cars are frequently seen in traffic flow, however the fact that lesser participants perceive them as threat compared to 4x4/SUV's, shows that the consequence these vehicles cause at road works is minor compared to 4x4/SUV's. The classifications of large and small truck show traffic controller don't see them as a high threat. The potential consequences of these types of vehicles are of high magnitude; however the frequency seen at road works is low. This is the opposite of small cars, medium cars and 44x4 and SUV's. The fact that small and large trucks are not seen as a great threat to traffic controller may also be in relation to driver perceptions, as previously discussed. Drivers of larger vehicles are more aware of the risk they present to works at a road work site, thus they operate the vehicle more carefully and pay more attention to the environment they are entering (the road work site). Overall industry participant view 4x4/SUV's as the most threatening in terms of frequency and potential consequences.

With these two factors of traffic flow analysed it is clear that the perceived most threatening traffic composition is consistent with a high volume 4x4/SUV with drivers ignorant to the risk they pose to traffic controllers.

The final area/aspect relating to vehicles in the work environment which the survey addresses is the increase of traffic volume through traffic control site at peak hours of the day. Section 4.3.4 'Vehicles in the Work Environment' outlines the MUTCD measures in place to remove this as a factor which would cause risk to traffic controllers. However it is important to address this issue with the industry to determine the participant's perceptions of traffic volume increase while carrying out work. The result of the survey concluded that 88% of participants felt an increase in risk when carrying out traffic control at peak traffic times. This shows the MUTCD is not sufficient in mitigating the risk of increase traffic volumes. However the increase in the risk due to increase in traffic volume was not found within the survey, thus the risk could increase by a small degree or a large degree when traffic volume increase. Although as an increase in risk is seen no matter what the degree, the MUTCD is still not sufficient in mitigating the risk, as indicated by the industry participants.

5.3 Risks Identified

It is clear from the above result and the discussion above there are numerous risks concerning traffic controllers at road works. These risks are:

- Working in night conditions
- Dehydration due to poor air circulating PPE
- Impairment/distraction due to site work machinery (dust and noise in particular)
- Vehicle/driver failure to stop at a 'STOP' batten

- Increase in traffic volume at peak traffic hours.

However there are two risks which need to be addressed/mitigated to a degree of where the risk is not as threatening as they are presently in the industry. The majority of the risks stated above are addressed to some degree within the MUTCD/code of practice, however the two risks which need mitigation are risks of high magnitude. These two risks are:

- Impairment/distraction due to site work/machinery (dust and noise in particular)
- Vehicle/driver failure to stop at a 'STOP' batten

These risks will be discussed in further detail in the following chapter, chapter 6 'Risk Evaluation', to gain further understanding of their structure, specifically outlining possible consequences, the likelihood (frequency), the hazards and perception. The outline of the risks in chapter 6 will aid the risks mitigation (Chapter 7 'Mitigation of Risks').

Chapter 6 Risk Evaluation and Analysis

6.1 Introduction

As outlined in chapter 5 section '5.3 Risks Identified' numerous risk were identified from the industry investigation. However the two risks identified to be of high magnitude and are most in need of addressing in terms of mitigation are impairment/distraction due to site work and vehicle/driver failure to stop at a 'STOP' batten. This section will analyse these two identified risk in terms of the issues discussed in the literature review. Specifically aimed at understanding the hazard, consequences, likelihood and perception of the two risks. Thus outlining a general understanding of the risks, aiding in the development of mitigation methods for the two risks.

6.2 Site Work Impairment and Distraction

6.2.1 Hazard

As previously discussed a hazard is referred to as the origin of a risk. In regards to site work impairment and distraction the risk develops for the hazard of site machinery. The site work machinery can create many forms of hazards; in this case noise and dust are the affecting hazards. These two hazards can vary in degree from work site to work site depending on the site conditions and machinery utilized on site. A traffic controllers (stop batten) work space is at the start and end of a road work site, thus it is easy to understand how these two hazards produce issues to traffic controller's health and safety and work procedures.

6.2.2 Consequences

The consequences of being exposed to the two hazards of this risk; noise and dust are very different. Firstly exposure to impairing machinery noise sees traffic controllers distracted and affected in work procedural communication. As traffic controllers utilize two way hand held radios to communicate with colleagues, if noise was present they use of this equipment would be affected as the hearing of the traffic controller would be impaired, to a degree depending

on the amount of noise produced from the machinery. Thus in regards to the hazard of noise impairment traffic controllers would not be able to communicate effectively, resulting in a wide range of consequences, eventuating from poor work procedure due to impaired work. The hazard of noise/impaired communication is an acute hazard, meaning consequence are of immediate affect (refer to chapter 2 section '2.3.1 Hazards' for detail), the consequences which could range from collision with a vehicle causing injury or death.

In terms of the hazard of dust, this presents a chronic and acute form of hazard to traffic controllers, refer to chapter 2 section '2.3.1 Hazards' for details on chronic and acute hazards. Site dust can result in traffic controllers becoming visually impaired and distracted, and not allowing full visual of the whole road work site needed by a traffic controller. This could result in acute hazard consequences similar to that of the hazard of noise/impaired communication, collision with a vehicle causing injury or death due to impaired visual distraction causing poor work procedures from the traffic controller. As well as these acute consequences, the hazard also produces chronic consequences. Long term exposure to poor air quality (dust particles) can cause respiratory health issues. Depending on the work site dust may not be a present risk, however the fact that traffic controllers frequently change sites for work, indicates they will be exposed to this hazard, thus long term exposure is a possibility of occurring.

6.2.3 Likelihood

The likelihood of these hazards producing harm to traffic controller relates to the work site conditions. Obviously an increase in the likelihood of consequences occurring would be seen if the work site encompassed machinery and had soil properties which produced dust. The frequency of traffic controllers working on such a site is unknown. Traffic controllers work on numerous types of road work sites, include bitumen inspection sites, road barrier repair sites and many more where no dust or noise impairment is seen. If the frequency that traffic

controllers work on dust/noise prone sites was known the likelihood of this risk producing consequence would be easy to determine. Due to this the likelihood of consequence occurring from this risk is unable to be estimated with accuracy. However it is known that if the road work site was dust and noise prone the likelihood of the risk causing impairment to the work of traffic controllers is high.

6.2.4 Perception

The two hazards of the risk are perceived similarly by traffic controllers, as an impairment and distraction. Previously discussed was the fact that the MUTCD utilizes ear muff protection from noise impairment. However the use of ear muffs also impairs the use of the two way hand held radios for communication. Thus as the survey identified the traffic controller perceives the noise and dust as a dangerous hazard, even with the MUTCD ear muff mitigation method in place. This is obviously due to the fact that the ear muff protection further impairs the work procedures of a traffic controller, whilst protecting the traffic controller's ear health.

6.3 Vehicles Failing to Stop

6.3.1 Hazard

A vehicle disobeying a traffic signal is a life threaten risk to traffic controller. When focussing on the hazard itself the vehicle, the size and shape of vehicles can vary. As well as this the reason for the vehicle failing to stop can also vary; speeding driver, driver ignorance, out of control vehicle. However any vehicle of any size or shape disobeying a traffic signal for any reason presents the same risk to traffic controllers, the risk of having a crash incident with a vehicle. It is also important to note that this hazard is not restricted to traffic controllers of a road work site. A vehicle failing to stop also presents a hazard to the entire work force on the road work site.

6.3.2 Consequences

The risk of vehicles failing to stop can present severe consequence to traffic controller. The hazard produces acute consequence refer to chapter 2 section '2.3.1 Hazards' for details on acute hazards. The acute consequence of the disobeying vehicle will be in the form of injury or death to the traffic controller. The consequence would stem from a vehicle collision with a traffic controller. The severity of the collision would depend on numerous factors; for example location of impact with the vehicle or the speed of vehicle. However any type of collision between a traffic controller and a vehicle should not be seen within the industry. Thus consequence should not be seen; however pervious discussions note this is not the case.

6.3.3 Likelihood

The industry investigation outlined the occurrence rate of vehicles failing to stop as often (1 in 100 vehicles) refer to chapter 5 section '5.2.2 Work Procedures Investigation' for details on this frequency. This frequency however doesn't relate to the occurrence rate of the risk resulting in consequences, therefore it doesn't indicate the likelihood of consequence occurring. Although as the frequency of vehicles failing to stop is often it indicates those traffic controllers are being exposed to this risk regularly in their work procedures. Thus it can be assumed there is a relationship between the frequency of vehicles failing to stop and the frequency that vehicles failing to stop cause consequences. Therefore as the frequency of vehicles failing to stop is of often frequency, the likelihood of consequences occurring can be assumed to be regularly.

6.3.4Perception

Previously outlined was the fact that the industry investigation revelled traffic controllers perceive vehicles and drivers differently, thus traffic controllers perceptions of a vehicle failing to stop at a stop batten is different for each traffic controller. Some traffic controllers may be more alert to the fact that this risk is frequently seen and thus they take more care

within situations where this risk can arise, whereas others are less aware and don't take extra care when this risk is presented to them. This indicates the perception of this risk varies with different levels of industry experience.

6.4 Evaluation Summary

The discussion above outlined the key aspects of each of the two identified risks. From this discussion the two risks show vast differences in relation to the risks likelihood and perception. In comparison the risks share similarities in the aspect of consequences and their hazards. The risk both have different hazards which create the risk; dust/noise from machinery and disobeying vehicles. However the hazards present the same consequences to traffic controllers, the potential to be hit by a vehicle. This finding will be vital for the development of mitigation methods from these risks.

Chapter 7 Mitigation of Risks

7.1 Introduction

The final stage within this research project focuses on producing and recommending possible mitigation methods for the identified risk. The recommended mitigation methods will aim at eliminating or reducing the identified risk to traffic controllers. This in turn will produce a safer work environment or safer work procedures for traffic controllers. Chapter 2 section '2.4 Risk Management' outlines the procedure for risk management according to AS/NZS ISO 31000:2009 Risk management-Principles and guidelines (Standards Australia 2009), as well as outlining a hierarchy of risk mitigation methods which should be applied to risk to ensure sufficient mitigation. These two extracts will be utilized to ensure mitigation is seen for the two identified risk.

7.2 Mitigation of Risks

From chapter 6 'Risk Evaluation and Analysis' it is clear that the two identified risk of site work impairment/distraction and vehicles failing to stop, contain the similar consequence of a traffic controller having a crash incident with a vehicle. In the case of site work impairment/distraction this consequence stems from poor work procedures due to work impairment from dust or noise. For the risk of vehicles failing to stop, the similar consequence stems from disobeying traffic. Both these risks incorporate an aspect of vehicles as a part of the consequences. The hazards are very different, however the consequences are similar. This allows mitigation of the two risks to be carried out together.

The key aspect of risks mitigation aims at reducing the consequences that the hazard creates. This approach sees the hazard being treated, to reduce or remove the hazard. The hierarchy of risk mitigation methods outlined in Chapter 2 section '2.4 Risk Management' indicates the hazard should be removed or designed out of the work environment. However in relation to

the two risks identified this mitigation cannot be applied, as the hazard is vehicles, which for obvious reason cannot be removed from the workspace of a traffic controller.

All other mitigation methods in the hierarchy; improve work procedures, enclose the hazard, increase work administration or provide personal protective equipment are feasible methods of mitigation for the two risks identified. However the hierarchy prefers improvement of work procedure or enclosing the hazard over increasing work administration or provide personal protective equipment. Personal protective equipment is already heavily relied upon by traffic controllers, an increase in this equipment would render as an ineffective mitigation method. Increasing work administration is also be an ineffective method as traffic management plans are utilized by the MUTCD as form of work administration to minimise risk to traffic controllers.

With consideration to the discussion above the two mitigation methods applied to the two identified risk are improving work procedure and enclosing the hazard. These two mitigation methods in relation to the work environment of a traffic controller and two identified risks yielded the following possible mitigation recommendations.

Firstly from the industry investigation the two major identified risks encompassed an aspect of vehicles as a hazard. Work procedures of a traffic controller see them enter the roadway and stand in the path of a vehicle. The two risks outline that when traffic controller is impaired by dust/noise the work procedure affected on the roadway or a disobeying vehicle threatens the traffic controller on the roadway. In order to mitigate these risks the traffic controller must be removed from the roadway. This would alter the work procedures of traffic controller, however in turn separating the workspace of a traffic controller from the operation space of vehicles. By removing traffic controllers from the roadway, this also removes the presence that traffic controllers have on drivers. The purpose of a traffic

controller entering the roadway is to show a presence and ensure the driver is aware of the road work site. The industry investigations finding show that this presence is not always effective, shown by the vehicle failure to stop frequency. Whilst removing traffic controllers from the roadway brings the effective mitigation of separating the vehicle operation space from the workspace of traffic controller, consideration needs to be accounted for to ensure a presence is still seen on the roadways to alert drivers.

In order to ensure a presence is still seen on the roadway, with the traffic controller off the roadway, a boom gate would be suitable form of equipment to achieve this. The boom gate would allow the traffic controller to operate the 'stop' and 'slow' display signal sign from off the roadway. The boom gate would also provide a presence on the road to alert driver of the road work site in the form of a barrier across the width of the road. The boom gate equipment would need to be developed specifically of traffic control work on temporary road work sites. Thus the design of the boom gate equipment would need to be highly portable and light weight in order for manual operation by traffic controllers. This boom gate design could also be developed to enclose the traffic controller from the site environment, reducing the effects that dust and noise can have on traffic controller and their work.

This mitigation method of altering the work procedure by placing the traffic controllers work space off the road way and the utilization of a boom gate, sees the risk of traffic controller being hit by a vehicle due to work procedure impairment or vehicles failing to stop decreased.

The second mitigation method recommended would see traffic controller utilize on person video cameras. Traffic controllers would wear a video camera whilst working or attach a video camera to the stop batten they are utilizing for the work. This camera would then record all aspects of the work carried out by the traffic controller. The camera would capture information regarding vehicles that pass through the road work site, including vehicle

registration number. If any vehicle failed to stop at a displayed stop batten the camera recording can then be utilized as evidence against the driver as see the driver prosecuted for their offence. This mitigation method will see drivers become more alert at traffic control sites as they are aware they are on camera and if they fail to stop they will be recorded and prosecuted. Thus traffic controllers will see a decrease in risk from vehicles failing to stop at a displayed stop batten to some degree.

Attaching video cameras on person to traffic controllers or on stop battens also allows for data collection for health and safety analysis. The video cameras will capture the work procedure of traffic controller, volume of vehicles flowing through the road work site, number of vehicle failing to stop, number of speeding vehicles and numerous other traffic flow characteristic. This data can then be analysed in relation to the health and safety of traffic controller and allow for further development of safety within the industry.

The two mitigation methods proposed above of utilizing a boom gates and attaching an on-person video camera, would achieve a reduction in threat to traffic controllers from the two identified risks. Having concluded this it is clear the proposed mitigation methods have not been tested or trailed in industry. Test and trails of the two mitigation methods within the industry would confirm that a reduction in these risks would be seen, however the degree of risk reduction is unknown. Due to this it cannot be assured that the mitigation methods proposed completely remove the two identified risk from the workspace of a traffic controller. Test and trails are a key component of implementing developed mitigation methods in a work environment; however this is outside the scope of this research dissertation. Therefore it is recommended that tests and trails are carried out when implementing the two mitigation methods of utilizing boom gates and attaching an on-person video camera within the traffic control industry.

Chapter 8 Conclusions

8.1 Introduction

This chapter provides a conclusion to this research dissertation. The approach taken to investigate traffic controller health and safety saw numerous research findings within this dissertation. The initial literature review allowed an understanding of relevant literature relating to health and safety and traffic controller to be gained, in turn seeing the development of an industry survey. This industry investigation revealed finding of key importants to this dissertation in regard to the health and safety of traffic controllers. These findings saw a basis where improvements in the health and safety of traffic controller could be seen. This allowed recommendations for the advancement of health and safety in the industry to be proposed.

8.2 Identified Risks

The development and implementation of the industry survey saw risks to traffic controller's health and safety identified. Numerous risks where identified:

- Work in night conditions
- Dehydration due to poor air circulating PPE
- Impairment/distraction due to site work machinery (dust and noise in particular)
- Vehicle/driver failure to stop at a 'STOP' batten
- Increase in traffic volume at peak traffic hours.

Of these five identified risk the industry investigation clearly found that two risks were of high magnitude, and the most threat to traffic controller's health and safety.

- Impairment/distraction due to site work machinery (dust and noise in particular)

- Vehicle/driver failure to stop at a ‘STOP’ batten

These two risks showed aspects of most danger to traffic controller. For this reason the two identified risks were evaluated and analysed in relation to the four main risk elements outlined in Chapter 2 ‘Literature Review’. From this analysis and evaluation a detailed understanding of the two risks was gained. The understanding was then utilized to determine recommendations to reduce or eliminate the risks from the traffic control industry.

8.3 Recommendations

With the two high magnitude risks to traffic controller’s health and safety outlined and analysed, mitigation techniques were applied to the risks. Mitigation techniques for mitigation risk in general were investigated with in Chapter 2 ‘Literature Review’. From this two possible mitigation methods were developed to ensure the two identified risks to traffic controller health and safety were reduced. The two recommended developed mitigation methods are:

- Utilizing boom gate equipment
- Attaching an on-person video camera

These two methods would achieve a reduction is risk to traffic controllers health and safety. However the degrees to which reduction is seen is unknown. It is recommended that the two mitigation methods are tested and trailed in the industry to determine to what degree they reduce the risks. This would allow for a measure of feasibility to be determined between the cost of implementation and reduction in risk. This was not seen within this research dissertation as it was beyond the research scope. The methods would be implemented by

independent traffic control companies, and are not recommendations for additions to the MUTCD or code of practice.

8.4 Conclusion

Risks are seen in all work environments, continuing risk management is needed to ensure work spaces as low risk as possible. This principle was applied to the traffic control industry specifically stop batten workers. Risks were identified in the work environment, a number of which were of high magnitude. Recommended mitigation methods were developed to reduce these risks, providing an increase in safety to traffic controllers in their work environment. Traffic controllers have one of the most demanding jobs in terms of health and safety, providing a safe workplace for others and ensuring personal safety is difficult to balance, providing solution for reducing risks to traffic controllers sees this balance easier to achieve.

Reference list:

Archer, R, Borthwick, K, Travers, M & Ruschena, L 2009, *WHS: A Management Guide,* 3rd edn, Cengage Learning Australia, South Melbourne, Victoria

Butrey, D, Butrej, PL & Douglas, G 1995, *Hazards at work: a guide to health and safety in Australian workplaces,* 2nd edn, Redfern, N.S.W.: The Open Training and Education Network in conjunction with the Work Cover Authority of N.S.W

Cohrssen, JJ & Covello VT 1989, *Risk Analysis: A Guide to Principles and Methods for Analysing Health and Environmental Risk,* Council on Environmental Quality, Executive Office of the President of the United States

Conrow, EH 2003, *EFFECTIVE RISK MANAGEMENT: SOME KEYS TO SUCCESS,* 2nd edn, American Institute of Aeronautics and Astronautics Inc, United States of America

Davidson, P, Simon, A, Woods, P & Griffin RW 2009, *Management,* 4th Australasian edn, John Wiley & Sons, Milton Queensland, Australia

Department of Justice and Attorney-General 2011, *Traffic Management for Construction or Maintenance Work Code of Practice 2008,* Queensland Government, viewed 2nd March 2013, < http://www.deir.qld.gov.au/workplace/resources/pdfs/traffic-management-construction-cop-2008.pdf>

Department of Transport and Main Roads Queensland 2011, *Traffic Controller Accreditation Scheme Approved Procedure and Scheme Information version 1.0,* Queensland Government, viewed 1 April 2013, <http://www.tmr.qld.gov.au/~/media/busind/accreditations/Traffic%20controller%20accreditation%20scheme/Traffic_controller_accreditation_scheme_approved_procedure.pdf>

Department of Transport and Main Roads, 2010, *'Specification for Traffic Controller Vest Set and Shirt Option'*, Accessed: 10th August 2013, Source: from: http://www.tmr.qld.gov.au/~/media/busind/accreditations/Trafficcontaccredscheme/Traffic_controller_vest_set_and_shirt_options.pdf

Department of Transport and Main Roads Queensland 2011, *Manual of Uniform Traffic Control Devices,* Queensland Government, viewed 3 March 2013, <http://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Manual-of-uniform-traffic-control-devices.aspx>

Koller, G 2005, *Risk Assessment and Decision Making in Business and Industry A Practical Guide,* 2nd edn, Chapman & Hall/CRC Taylor & Francis Group, NW Boca Raton, FL United States of America

Ridley, J & Channing, J 2008, *Safety at work,* 7th edn, Butterworth Heinemann, Oxford UK

Roberts, D 2012, 'Qualitative vs. Quantitative Data', , Accessed 10 July 2013, Source: from http://regentsprep.org/regents/math/algebra/ad1/qualquant.htm

Safe Work Australia 2013, *WORK-RELATED INJURIES RESULTING IN HOSPITALISATION JULY 2006 TO JUNE 2009,* Safe Work Australia, viewed 25 April 2013, <http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/756/WR-Injuries-Hospitalisation-July-2006-June-2009.pdf>

Safe Work Australia 2013, *WORK-RELATED INJURIES IN AUSTRALIA 2005-06: Construction industry*, Safe Work Australia, viewed 25 April 2013, <http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/220/WorkRelatedInjuries2005_2006_Construction_2009_PDF.pdf>

Standards Australia 2009, *AS/NZS ISO 31000:2009 Risk management - Principles and guidelines,* Standards Australia, Sydney, viewed 1 April 2013, <http://www.saiglobal.com/online/autologin.asp>

Bibliography:

Archer, R, Borthwick, K & Tape, S 2009, *WHS: A Management Guide,* 2rd edn, Cengage Learning Australia, South Melbourne, Victoria

Australian Government 2011, *Work Health and Safety Act 2011,* Australian Government, Canberra, Australian Capital Territory, Australia

Mayhew, C & Peterson, CL 1999, *Occupational health and safety in Australia: industry, public sector and small business,* Allen & Unwin, St Leonards, New South Wales, Australia

Pro-System Training Services P/L 2010, *Training Manual: Manual of Uniform Traffic Control Devices Part 3,* Pro-System Training Services P/L, Bowen Hills, Queensland, Australia

Queensland Government 2011, *Work Health and Safety Act 2011,* Queensland Government, Brisbane, Australia

Appendices:

Appendix A: Project Specification

University of Southern Queensland

FACULTY OF ENGINEERING AND SURVEYING

ENG4111/ENG4112 RESEARCH PROJECT
Project Specification

FOR: **William Nico DANN**

TOPIC: Investigation into traffic controller health and safety at road works in Queensland

SUPERVISER: Dr David Thorpe

ENROLMENT: ENG4111 S1 2013
ENG4112 S2 2013

PROJECT AIM: Investigate the health and safety of traffic control workers (stop and go controllers) at road works, and provide a solution to the health and safety risks found to cause issues in the industry.

PROGRAMME: (Issue B, 29 May 2013)

1. Research traffic controller health and safety polices, code of practices and standards/regulation used in Queensland.
2. Identify risks to traffic controller health and safety at road works, via vehicle and traffic controller accident statistic and a industry investigation
3. Analyse identified risks to determine how it affect/threatens traffic controllers health and safety
4. Investigate if and how the traffic controller health and safety polices, code of practices and standards/regulation used in Queensland, address the risks identified.
5. Investigate and determine risk management solutions to eliminate or reduce the identified risks to traffic controller

As time permits:

6. Investigate what type of injury is most common due to vehicle and traffic controller incidents
7. Investigate what health issues are most common (e.g. heat stroke, de-hydration)

AGREED _____ (Student) _____(Supervisor)
Date: 29/ 05 /2013 Date: / /2013

Examiner/Co-examiner:_____

Appendix B: Queensland Police Data Request Form

Department of Transport and Main Roads - Road Crash, Registration, Licensing and Infringement Data Request Form

*Please use **BLOCK LETTERS** if handwritten.*

Contact Details

Name:	
Email	
Phone:	
Alternate phone:	
Fax:	
Organisation	

Office Use Only

Request Number: rq ……

Priority: ……

Link Number: rq ……

Due Date: ……

Please tick appropriate box(es): ☐ Road Crash Data ☐ Registration/Licensing/Infringement Data

Request Information

When do you require this data? *Note: Normal turnaround time is at least 5 working days; complex requests will take longer. If data is required before this time, please state the date (& time if appropriate) you require it. If your requested timeframe is not achievable we will contact you to negotiate a timeframe.*
requests marked as "URGENT" or "ASAP" will be automatically allocated a 5 working day turnaround

Is this **updating previous data supplied**? If possible, please provide the **request number** and/or approximate **date** that the previous data was supplied. Also, if available, please **attach** the data.

How do you plan to **use** this data? For example: *presentation, research paper, ministerial.*

Geographical area

☐ All of Queensland	☐ Police Region	☐ Queensland Transport Region	☐ Road/Hwy
☐ Local Government Area	☐ Police District	☐ Main Roads District	☐ Road/Hwy section
☐ Statistical Local Area	☐ Police Division		☐ Intersection

Geographic details and comments. ***Note:*** *Registration, licensing and infringement data are not available for some areas such as, Road/Hwy, Road/Hwy section and Intersection.*

Statistical Data Required

Road Crash Data: *(examples of possible characteristics)*

Crashes	Casualties	Units	Unit controllers	Contributing circumstances
☐ Severity ☐ Crash nature ☐ Roadway feature ☐ Traffic control ☐ Speed limit ☐ Roadway surface ☐ Atmospheric condition ☐ Lighting ☐ Horizontal alignment ☐ Vertical alignment ☐ DCA code ☐ DCA group ☐ Time of day ☐ Day of week	☐ Severity ☐ Road user type ☐ Road user type – unit group ☐ Age ☐ Gender ☐ Helmet use ☐ Restraint use ☐ Seating position	☐ Unit type ☐ Intended action ☐ Overall damage ☐ Main damage point ☐ Towing ☐ Number of occupants ☐ Dangerous goods ☐ Defective ☐ Registration status ☐ Type of use (business or private)	☐ Road user type ☐ Age ☐ Gender ☐ Licence type ☐ State licensed in	☐ Contributing circumstances ☐ Contributing factors (circumstance groupings)

Registration Licensing and Infringement Data: *(examples of possible characteristics)*

Registration	Licensing	Infringement	Recreational Vessels
☐ New Business ☐ Transfers ☐ Vehicles by body type ☐ Make ☐ Model ☐ Gross Vehicle Mass ☐ Purpose Of Use	☐ Age ☐ Gender ☐ Class ☐ Level	☐ Category ☐ Description ☐ Code	☐ Length ☐ Draft ☐ Body Type ☐ Registration Category ☐ Powered by

Data request comments and details:

Please send this form to:

Data Analysis, Department of Transport and Main Roads

Email: DataAnalysis@tmr.qld.gov.au

Fax: (07) 3066 2410

The Department of Transport and Main Roads is collecting the information on this form for the purposes of providing you with road crash, registration, licensing and infringement data. Your personal details will not be disclosed to any other third party without your consent unless required or authorised to do so by law.

Appendix C: Queensland Police Crash Statistics

All Crash incidents Queensland:

Date extracted: 22-Mar-2013
All crashes, Queensland
01-Jan-2005 to 31-Dec-2009
Each column represents a 12 month period between January and December

Crash - Severity	2005	2006	2007	2008	2009	Total
Fatal	296	313	338	294	296	1537
Hospitalisation	5135	4855	5031	5526	5470	26017
Medical treatment	5433	5524	5534	5832	5774	28097
Minor injury	3070	3361	3810	3116	2477	15834
Property damage only	9156	8409	8136	8751	8921	43373
Total Crashes	**23090**	**22462**	**22849**	**23519**	**22938**	**114858**

Crash - Contributing factors	2005	2006	2007	2008	2009	Total
Alcohol/drug Related	2435	2544	2700	2904	2748	13331
Drink Driving - Illegal BAC	1806	1780	1873	1989	1869	9317
Drink Walking - Pedestrian Any BAC	102	133	142	132	121	630
Fatigue related	1252	1200	1235	1196	1190	6073
Speed Related - driver	1260	1415	1470	1358	1188	6691
Fail to Give Way or Stop	3418	3361	3488	3649	3596	17512
Disobey Traffic Light/Sign	1126	1186	1172	1244	1093	5821
Illegal Manoeuvre	3105	3158	3118	3168	3089	15638
Dangerous Driving	1951	1835	1825	2245	2702	10558
Disobey Road Rules - Other	68	64	67	61	75	335
Distracted	77	100	79	83	79	418
Other Driver Conditions	1347	1341	1278	1324	3226	8516
Rain/wet road	2104	2001	2162	1835	1738	9840
Road Surface	145	131	169	171	159	775
Road Gradient	100	111	171	123	107	612
Road Quality	115	135	135	115	83	583
Roadworks	26	18	32	19	13	108
Road - Other	636	532	539	512	544	2763
Vehicle Defects - Mechanical	362	302	361	287	291	1603
Vehicle Defects - External	324	353	321	284	307	1589
Other Circumstance	2858	2668	2721	2820	3402	14469
Total Crashes	**23090**	**22462**	**22849**	**23519**	**22938**	**114858**

Total Crashes	23070	22440	22829	23519	22937	114795
Crash - DCA (Definition for Coding Accidents)	2005	2006	2007	2008	2009	Total
000-PED'N: HIT OTHER	122	93	111	97	114	537
001-PED'N: NEAR SIDE VEHICLE HIT FROM RIGHT	249	271	256	240	255	1271
002-PED'N: HIT EMERGING BEHIND VEHICLE	48	24	52	42	43	209
003-PED'N: FAR SIDE VEHICLE HIT FROM LEFT	212	222	201	227	212	1074
004-PED'N: PLAY; WORK; STAND; LIE ON C'WAY	84	97	89	91	70	431
005-PED'N: HIT WALKING WITH TRAFFIC	18	22	27	30	26	123

006-PED'N: HIT FACING TRAFFIC	9	10	9	15	9	52
007-PED'N: HIT BY VEHICLE ENTER/LEAVE D'WAY	18	14	16	16	10	74
008-PED'N: ON FTWAY HIT BY VEHICLE ON FTWAY	3	2	1	3	8	17
009-PED'N: HIT WHILE BOARDING/ALIGHTING	14	23	12	19	16	84
100-VEH'S ADJACENT APPROACH: OTHER	107	101	104	117	110	539
101-VEH'S ADJACENT APPROACH: THRU-THRU	1611	1618	1586	1625	1500	7940
102-VEH'S ADJACENT APPROACH: RIGHT-THRU	216	218	193	218	201	1046
103-VEH'S ADJACENT APPROACH: LEFT-THRU	39	37	54	28	40	198
104-VEH'S ADJACENT APPROACH: THRU-RIGHT	1316	1240	1288	1268	1273	6385
105-VEH'S ADJACENT APPROACH: RIGHT-RIGHT	45	45	46	45	52	233
106-VEH'S ADJACENT APPROACH: LEFT-RIGHT	68	41	43	36	36	224
107-VEH'S ADJACANT APPROACH: THRU-LEFT	209	221	225	217	219	1091
108-VEH'S ADJACENT APPROACH: RIGHT-LEFT	2	0	1	1	0	4
109-VEH'S ADJACENT APPROACH: LEFT-LEFT	14	6	5	5	7	37
200-VEH'S OPPOSITE APPROACH: OTHER	138	133	110	113	119	613
201-VEH'S OPPOSITE APPROACH: HEAD ON	674	661	723	748	675	3481
202-VEH'S OPPOSITE APPROACH: THRU-RIGHT	2120	2165	2120	2182	1968	10555
203-VEH'S OPPOSITE APPROACH: RIGHT-LEFT	17	11	15	18	20	81
204-VEH'S OPPOSITE APPROACH: RIGHT-RIGHT	3	3	5	3	9	23
205-VEH'S OPPOSITE APPROACH: THRU-LEFT	5	11	3	7	8	34
206-VEH'S OPPOSITE APPROACH: LEFT-LEFT	0	1	0	0	0	1
207-VEH'S OPPOSITE APPROACH: U-TURN	107	114	105	88	102	516
300-VEH'S SAME DIRECTION: OTHER	82	68	74	69	54	347
301-VEH'S SAME DIRECTION: REAR END	3534	3362	3517	3566	3615	17594
302-VEH'S SAME DIRECTION: LEFT REAR	564	464	501	528	508	2565
303-VEH'S SAME DIRECTION: RIGHT REAR	928	845	843	841	775	4232
304-VEH'S SAME DIRECTION: U-TURN	35	32	30	42	32	171
305-VEH'S SAME DIRECTION: LANE SIDE SWIPE	300	280	306	301	320	1507
306-VEH'S SAME DIRECTION: LANE CHANGE RIGHT	181	162	178	203	179	903
307-VEH'S SAME DIRECTION: LANE CHANGE LEFT	198	191	232	235	223	1079
308-VEH'S SAME DIRECTION: RIGHT TURN S/SWIPE	413	437	387	356	308	1901
309-VEH'S SAME DIRECTION: LEFT TURN S/SWIPE	160	137	153	164	156	770
400-VEH'S MANOEUVRING: OTHER	234	249	255	274	252	1264
401-VEH'S MANOEUVRING: LEAVING PARKING	80	88	82	66	55	371
402-VEH'S MANOEUVRING: PARKING	24	42	43	42	45	196

403-VEH'S MANOEUVRING: PARKING VEH'S ONLY	18	4	23	13	19	77
404-VEH'S MANOEUVRING: REVERSING	26	29	28	40	32	155
405-VEH'S MANOEUVRING: REV INTO FIXED OBJECT	19	32	26	33	30	140
406-VEH'S MANOEUVRING: LEAVING DRIVEWAY	471	438	458	468	446	2281
408-VEH'S MANOEUVRING: ENTERING FROM FOOTWAY	263	220	244	372	372	1471
500-VEH'S OVERTAKING: OTHER	34	37	28	35	30	164
501-VEH'S OVERTAKING: HEAD ON	37	26	17	24	18	122
502-VEH'S OVERTAKING: OUT OF CONTROL	67	67	75	70	81	360
503-VEH'S OVERTAKING: PULLING OUT	5	11	8	9	3	36
504-VEH'S OVERTAKING: CUTTING IN	5	7	5	9	9	35
505-VEH'S OVERTAKING: PULLING OUT REAR END	7	6	12	8	9	42
506-VEH'S OVERTAKING: OVERTAKE-RIGHT TURN	118	123	101	93	92	527
600-VEH'S ON PATH: OTHER	50	52	46	52	57	257
601-VEH'S ON PATH: PARKED	497	439	437	343	388	2104
602-VEH'S ON PATH: DOUBLE PARKED	0	0	0	0	1	1
604-VEH'S ON PATH: CAR DOOR	32	32	21	12	30	127
605-VEH'S ON PATH: PERMANENT OBSTRUCTION	31	25	25	34	26	141
606-VEH'S ON PATH: TEMPORARY ROADWORKS	2	1	2	1	1	7
607-VEH'S ON PATH: TEMPORARY OBJECT ON C'WAY	358	329	359	365	392	1803
608-VEH'S ON PATH: ACCIDENT OR BROKEN DOWN	45	44	30	24	33	176
609-PASS & MISC: HIT ANIMAL	210	198	197	193	251	1049
610-PASS & MISC: LOAD HIT VEHICLE	33	41	51	41	45	211
700-OFF PATH-STRAIGHT: OTHER	428	424	359	325	385	1921
701-OFF PATH-STRAIGHT: LEFT OFF CWAY	209	189	191	183	144	916
702-OFF PATH-STRAIGHT: RIGHT OFF CWAY	121	139	131	119	109	619
703-OFF PATH-STRAIGHT: LEFT OFF CWAY HIT OBJ	1434	1447	1628	1718	1652	7879
704-OFF PATH-STRAIGHT:RIGHT OFF CWAY HIT OBJ	703	701	715	767	736	3622
705-OFF PATH-STRAIGHT:OUT OF CONTROL ON CWAY	452	396	416	460	472	2196
706-OFF PATH-STRAIGHT: LEFT TURN	25	31	34	43	30	163
707-OFF PATH-STRAIGHT: RIGHT TURN	46	35	44	36	39	200
708-OFF PATH-STRAIGHT: MOUNTS TRAFFIC ISLAND	302	318	306	357	362	1645
800-OFF PATH-CURVE: OTHER	287	281	143	156	294	1161
801-OFF PATH-CURVE: OFF CWAY RIGHT BEND	191	176	175	159	143	844
802-OFF PATH-CURVE: OFF CWAY LEFT BEND	124	131	134	122	111	622
803-OFF PATH-CURVE: OFF CWAY RT BEND HIT OBJ	859	839	934	1037	927	4596
804-OFF PATH-CURVE: OFF CWAY LT BEND HIT OBJ	638	713	704	767	722	3544
805-OFF PATH-CURVE: OUT OF CONTROL ON CWAY	366	361	376	419	438	1960

806-VEHICLE LEFT-TURNING AT I/S (OR DRIVEWAY	5	13	11	17	12	58
807-VEHICLE RIGHT-TURNING AT I/S (OR DRIVEWA	11	13	11	9	18	62
808-OFF PATH-CURVE: MOUNTS TRAFFIC ISLAND	111	109	113	145	128	606
900-PASS & MISC: OTHER	52	52	52	50	45	251
901-PASS & MISC: FELL IN/FROM VEHICLE	101	97	106	114	95	513
903-PASS & MISC: HIT TRAIN	27	21	11	28	10	97
904-PASS & MISC: HIT RAILWAY XING FURNITURE	7	12	8	4	9	40
905-PASS & MISC: HIT ANIMAL OFF CARRIAGEWAY	0	0	0	1	1	2
906-PASS & MISC: PARKED CAR RAN AWAY	61	42	53	58	67	281
Total Crashes	**23089**	**22462**	**22849**	**23519**	**22938**	**114857**

Crash - Contributing circumstances	**2005**	**2006**	**2007**	**2008**	**2009**	**Total**
ACCIDENTAL INTERFERENCE TO A UNIT	6	2	4	10	2	24
ANIMAL UNCONTROLLED-ON ROAD	652	608	642	629	713	3244
ATMOSPHERIC-DUST	16	15	21	12	12	76
ATMOSPHERIC-FOG	36	31	28	40	43	178
ATMOSPHERIC-HAIL	8	2	6	4	2	22
ATMOSPHERIC-HEAVY RAIN	298	230	199	255	284	1266
ATMOSPHERIC-RAIN	13	19	18	13	13	76
ATMOSPHERIC-SMOKE	6	7	5	4	5	27
ATMOSPHERIC CONDITIONS-MISCELLANEOUS	56	35	45	27	33	196
CONDITION-UNDER INFLUENCE OF LIQUOR/DRUG (NOT NECESSARY BAC)	609	743	833	955	901	4041
CROSS MEDIAN CRASH	93	102	102	105	111	513
DELIBERATE PASSENGER INTERFERENCE TO A UNIT IN TRANSPORT	16	18	11	16	12	73
DRIVER-DISTRACTED	53	57	36	37	32	215
DRIVER-FATIGUE RELATED BY DEFINITION	730	693	706	658	728	3515
DRIVER-FATIGUE/FELL ASLEEP	525	515	534	542	466	2582
DRIVER-MEDICAL CONDITION (HEART ATTACK; EPILEPSY ETC.)	371	388	406	409	401	1975
DRIVER-TAKING AVOIDING ACTION TO A ROAD HAZARD	9	2	2	4	5	22
DRIVER-TAKING AVOIDING ACTION TO MISS ANOTHER ROAD USER	441	474	466	475	457	2313
DRIVER-UNDERAGE (INEXPERIENCE)	102	101	86	67	53	409
DRIVER DISTRACTED-MOBILE PHONE	24	43	43	46	47	203
DRIVER VIOLATION TRAFFIC LAW-MISCELLANEOUS	3	4	2	2	0	11
EXCESSIVE SPEED FOR CIRCUMSTANCES	980	1044	1026	912	861	4823
LIGHTING-HEADLIGHT GLARE	28	42	31	40	41	182
LIGHTING-HEADLIGHTS OFF/NO LIGHTS ON VEHICLE	57	60	57	47	36	257
LIGHTING-HEAVILY OVERCAST	3	6	7	5	4	25
LIGHTING-NO STREET LIGHTING	75	53	53	40	38	259
LIGHTING-SUNLIGHT GLARE (DAWN/DUSK/REFLECTION)	299	349	326	301	343	1618
LIGHTING-WEARING DARK CLOTHING	30	37	40	28	23	158

LIGHTING CONDITIONS-MISCELLANEOUS	40	26	22	24	16	128
POLICE CHASE	45	34	30	21	18	148
ROAD-CREST/DIP-VIEW OBSCURED	83	92	136	100	78	489
ROAD-GRAVEL/DIRT	36	21	47	26	31	161
ROAD-NARROW	73	68	69	54	38	302
ROAD-NARROW BITUMEN	15	46	38	42	36	177
ROAD-POTHOLES	36	42	41	66	48	233
ROAD-ROADWORKS	26	18	32	19	13	108
ROAD-ROUGH SHOULDER(S)	32	32	32	24	13	133
ROAD-ROUGH SURFACE	78	69	91	81	82	401
ROAD-STEEP GRADE	17	19	35	24	29	124
ROAD-TEMPORARY OBJECT ON CARRIAGEWAY	246	216	228	222	218	1130
ROAD-WATER COVERING	203	203	202	223	241	1072
ROAD-WET/SLIPPERY	1815	1723	1894	1505	1408	8345
ROAD CONDITIONS-MISCELLANEOUS	395	319	314	292	328	1648
VEHICLE-BRAKES	105	78	97	91	88	459
VEHICLE-LIGHTS (HEADLIGHTS/TAIL LIGHTS)	7	17	14	18	10	66
VEHICLE-LOAD SHIFT	40	31	48	40	38	197
VEHICLE-PRIOR CRASH OR BROKEN DOWN (CAUSE BUT NOT INVOLVED)	15	26	25	12	15	93
VEHICLE-STEERING	29	34	27	23	31	144
VEHICLE-STRUCTURAL DEFECT	1	3	3	4	3	14
VEHICLE-SUSPENSION	5	6	4	5	4	24
VEHICLE-TOWING ATTACHMENT	14	25	13	19	17	88
VEHICLE-TURN SIGNALS	5	6	9	0	6	26
VEHICLE-TYRES (I.E. LOW TREAD, PUNCTURE/BLOW OUT)	298	304	286	245	277	1410
VEHICLE-VISION (BROKEN WINDSCREEN/WINDOWS)	0	1	1	2	0	4
VEHICLE DEFECTS-MISCELLANEOUS	170	127	162	118	113	690
VEHICLE ENTERING DRIVEWAY	842	734	756	756	702	3790
VIOLATION-CROSS DOUBLE LINES	97	121	120	148	208	694
VIOLATION-DANGEROUS DRIVING	291	305	276	215	218	1305
VIOLATION-DISOBEY GIVE WAY SIGN	1626	1603	1712	1809	1746	8496
VIOLATION-DISOBEY RED TRAFFIC LIGHT	905	963	886	973	822	4549
VIOLATION-DISOBEY STOP SIGN	707	720	717	730	661	3535
VIOLATION-DISOBEY TRAFFIC LIGHT	54	52	68	48	44	266
VIOLATION-DISOBEY TRAFFIC SIGN	168	173	222	228	229	1020
VIOLATION-DRIVE MOTOR VEHICLE OF EXCESS DIMENSIONS	5	4	11	5	7	32
VIOLATION-EXCEEDING SPEED LIMIT	299	384	457	455	341	1936
VIOLATION-FAIL TO GIVE WAY	1001	957	974	1033	1102	5067
VIOLATION-FAIL TO GIVE WAY ON PEDESTRIAN CROSSING	84	81	85	78	89	417
VIOLATION-FAIL TO KEEP LEFT	330	296	319	324	473	1742
VIOLATION-FAIL TO SIGNAL INTENTION	33	31	31	37	21	153
VIOLATION-FOLLOW TOO CLOSELY	1660	1530	1549	2030	2484	9253
VIOLATION-ILLEGALLY PARKED	7	8	4	5	10	34
VIOLATION-IMPROPER OVERTAKING	173	222	193	190	146	924
VIOLATION-IMPROPER TURN-OTHER THAN U-TURN	167	154	129	123	102	675
VIOLATION-IMPROPER U-TURN	280	331	283	261	213	1368
VIOLATION-INSECURE LOAD	24	21	27	24	22	118
VIOLATION-OPEN CAR DOOR CAUSING	36	35	27	30	46	174

DANGER						
VIOLATION-OVER PRESCRIBED CONCENTRATION OF ALCOHOL (MUST HAVE BAC)	1830	1815	1896	2012	1892	9445
VIOLATION-TESTED FOR DRUGS ONLY	6	9	6	3	1	25
VIOLATION-TURN IN FACE OF ONCOMING TRAFFIC	1690	1674	1658	1682	1561	8265
VIOLATION-UNSAFE LANE CHANGE	353	346	399	427	373	1898
Total Crashes	**23090**	**22462**	**22849**	**23519**	**22938**	**114858**

Serious Crash incidents Queensland:

Serious crashes, Queensland
01-Jan-2007 to 31-Dec-2011
Each column represents a 12 month period between January and December

Crash - Contributing factors	2007	2008	2009	2010	2011	Total
Alcohol/drug Related	878	1015	966	854	791	4504
Drink Driving - Illegal BAC	592	679	634	557	527	2989
Drink Walking - Pedestrian Any BAC	95	95	88	82	80	440
Fatigue related	394	383	382	365	368	1892
Speed Related - driver	436	414	372	318	232	1772
Fail to Give Way or Stop	725	799	850	781	757	3912
Disobey Traffic Light/Sign	313	362	300	311	304	1590
Illegal Manoeuvre	761	830	833	844	813	4081
Dangerous Driving	271	385	468	444	451	2019
Disobey Road Rules - Other	15	10	18	19	18	80
Distracted	16	23	21	25	26	111
Other Driver Conditions	351	388	870	793	860	3262
Rain/wet road	442	417	379	441	325	2004
Road Surface	50	58	68	52	76	304
Road Gradient	32	36	24	25	27	144
Road Quality	36	33	26	20	25	140
Roadworks	7	5	5	2	3	22
Road - Other	136	124	139	106	144	649
Vehicle Defects - Mechanical	80	69	73	60	71	353
Vehicle Defects - External	69	72	67	55	57	320
Other Circumstance	633	707	881	815	804	3840
Total Crashes	**5369**	**5820**	**5766**	**5462**	**5345**	**27762**

Crash - DCA (Definition for Coding Accidents)	2007	2008	2009	2010	2011	Total
000-PED'N: HIT OTHER	56	57	59	57	66	295
001-PED'N: NEAR SIDE VEHICLE HIT FROM RIGHT	155	120	144	137	108	664
002-PED'N: HIT EMERGING BEHIND VEHICLE	29	22	24	21	18	114
003-PED'N: FAR SIDE VEHICLE HIT FROM LEFT	125	129	131	115	127	627
004-PED'N: PLAY; WORK; STAND; LIE ON C'WAY	59	52	40	44	50	245
005-PED'N: HIT WALKING WITH TRAFFIC	17	18	13	15	16	79
006-PED'N: HIT FACING TRAFFIC	5	10	6	6	6	33
007-PED'N: HIT BY VEHICLE ENTER/LEAVE D'WAY	2	5	2	6	5	20
008-PED'N: ON FTWAY HIT BY VEHICLE ON FTWAY	1	1	4	2	0	8
009-PED'N: HIT WHILE BOARDING/ALIGHTING	6	12	8	17	17	60
100-VEH'S ADJACENT APPROACH: OTHER	28	28	26	15	22	119
101-VEH'S ADJACENT APPROACH: THRU-THRU	327	352	335	340	334	1688
102-VEH'S ADJACENT APPROACH: RIGHT-THRU	34	44	51	36	34	199
103-VEH'S ADJACENT APPROACH: LEFT-THRU	18	4	10	15	10	57
104-VEH'S ADJACENT APPROACH: THRU-RIGHT	304	313	320	285	278	1500
105-VEH'S ADJACENT APPROACH: RIGHT-RIGHT	6	8	12	9	5	40
106-VEH'S ADJACENT APPROACH: LEFT-RIGHT	8	7	8	7	7	37

107-VEH'S ADJACANT APPROACH: THRU-LEFT	52	41	53	53	51	250
108-VEH'S ADJACENT APPROACH: RIGHT-LEFT	0	1	0	0	0	1
109-VEH'S ADJACENT APPROACH: LEFT-LEFT	1	0	2	1	0	4
200-VEH'S OPPOSITE APPROACH: OTHER	15	17	15	17	15	79
201-VEH'S OPPOSITE APPROACH: HEAD ON	313	335	287	280	270	1485
202-VEH'S OPPOSITE APPROACH: THRU-RIGHT	497	568	515	530	495	2605
203-VEH'S OPPOSITE APPROACH: RIGHT-LEFT	6	1	3	6	2	18
204-VEH'S OPPOSITE APPROACH: RIGHT-RIGHT	0	0	2	1	3	6
205-VEH'S OPPOSITE APPROACH: THRU-LEFT	2	2	2	0	3	9
207-VEH'S OPPOSITE APPROACH: U-TURN	22	21	16	19	16	94
300-VEH'S SAME DIRECTION: OTHER	13	13	13	16	14	69
301-VEH'S SAME DIRECTION: REAR END	471	540	570	549	577	2707
302-VEH'S SAME DIRECTION: LEFT REAR	49	51	58	49	47	254
303-VEH'S SAME DIRECTION: RIGHT REAR	127	164	155	133	161	740
304-VEH'S SAME DIRECTION: U-TURN	3	9	5	2	3	22
305-VEH'S SAME DIRECTION: LANE SIDE SWIPE	77	73	86	62	61	359
306-VEH'S SAME DIRECTION: LANE CHANGE RIGHT	24	35	34	30	23	146
307-VEH'S SAME DIRECTION: LANE CHANGE LEFT	42	43	32	45	40	202
308-VEH'S SAME DIRECTION: RIGHT TURN S/SWIPE	69	76	71	53	56	325
309-VEH'S SAME DIRECTION: LEFT TURN S/SWIPE	31	37	39	22	25	154
400-VEH'S MANOEUVRING: OTHER	63	74	79	77	73	366
401-VEH'S MANOEUVRING: LEAVING PARKING	8	9	4	8	9	38
402-VEH'S MANOEUVRING: PARKING	10	3	5	7	8	33
403-VEH'S MANOEUVRING: PARKING VEH'S ONLY	1	1	1	1	2	6
404-VEH'S MANOEUVRING: REVERSING	3	3	2	4	1	13
405-VEH'S MANOEUVRING: REV INTO FIXED OBJECT	4	2	3	5	1	15
406-VEH'S MANOEUVRING: LEAVING DRIVEWAY	94	90	99	90	92	465
408-VEH'S MANOEUVRING: ENTERING FROM FOOTWAY	59	103	108	120	70	460
500-VEH'S OVERTAKING: OTHER	6	11	8	5	6	36
501-VEH'S OVERTAKING: HEAD ON	10	13	11	12	10	56
502-VEH'S OVERTAKING: OUT OF CONTROL	26	24	29	21	18	118
503-VEH'S OVERTAKING: PULLING OUT	4	4	0	0	2	10
504-VEH'S OVERTAKING: CUTTING IN	0	2	7	1	1	11
505-VEH'S OVERTAKING: PULLING OUT REAR END	2	0	3	1	7	13
506-VEH'S OVERTAKING: OVERTAKE-RIGHT TURN	22	23	24	27	33	129
600-VEH'S ON PATH: OTHER	21	16	13	9	15	74
601-VEH'S ON PATH: PARKED	69	53	51	61	57	291
602-VEH'S ON PATH: DOUBLE PARKED	0	0	1	0	0	1
604-VEH'S ON PATH: CAR DOOR	10	4	8	9	5	36
605-VEH'S ON PATH: PERMANENT OBSTRUCTION	3	3	1	3	0	10
606-VEH'S ON PATH: TEMPORARY ROADWORKS	1	0	0	0	0	1
607-VEH'S ON PATH: TEMPORARY OBJECT ON C'WAY	67	76	79	96	91	409
608-VEH'S ON PATH: ACCIDENT OR BROKEN DOWN	6	6	8	15	15	50
609-PASS & MISC: HIT ANIMAL	39	43	56	50	52	240
610-PASS & MISC: LOAD HIT VEHICLE	9	5	8	2	8	32
700-OFF PATH-STRAIGHT: OTHER	86	75	102	78	100	441
701-OFF PATH-STRAIGHT: LEFT OFF CWAY	46	60	50	38	41	235
702-OFF PATH-STRAIGHT: RIGHT OFF CWAY	40	45	45	26	28	184
703-OFF PATH-STRAIGHT: LEFT OFF CWAY HIT OBJ	357	405	371	335	326	1794
704-OFF PATH-STRAIGHT:RIGHT OFF CWAY HIT OBJ	179	198	192	172	166	907
705-OFF PATH-STRAIGHT:OUT OF CONTROL ON CWAY	165	182	184	181	183	895
706-OFF PATH-STRAIGHT: LEFT TURN	9	21	11	20	16	77
707-OFF PATH-STRAIGHT: RIGHT TURN	18	10	14	12	10	64
708-OFF PATH-STRAIGHT: MOUNTS TRAFFIC ISLAND	63	80	69	72	69	353

800-OFF PATH-CURVE: OTHER	36	44	94	78	65	317
801-OFF PATH-CURVE: OFF CWAY RIGHT BEND	52	49	50	40	42	233
802-OFF PATH-CURVE: OFF CWAY LEFT BEND	43	52	44	30	24	193
803-OFF PATH-CURVE: OFF CWAY RT BEND HIT OBJ	286	316	267	252	276	1397
804-OFF PATH-CURVE: OFF CWAY LT BEND HIT OBJ	196	215	223	219	173	1026
805-OFF PATH-CURVE: OUT OF CONTROL ON CWAY	153	163	177	171	157	821
806-VEHICLE LEFT-TURNING AT I/S (OR DRIVEWAY	4	6	6	3	3	22
807-VEHICLE RIGHT-TURNING AT I/S (OR DRIVEWA	2	4	6	6	5	23
808-OFF PATH-CURVE: MOUNTS TRAFFIC ISLAND	27	33	31	36	33	160
900-PASS & MISC: OTHER	10	10	9	21	21	71
901-PASS & MISC: FELL IN/FROM VEHICLE	59	58	44	46	55	262
903-PASS & MISC: HIT TRAIN	3	12	7	3	4	29
904-PASS & MISC: HIT RAILWAY XING FURNITURE	0	0	3	2	0	5
905-PASS & MISC: HIT ANIMAL OFF CARRIAGEWAY	0	1	0	0	0	1
906-PASS & MISC: PARKED CAR RAN AWAY	4	4	8	1	4	21
Total Crashes	**5369**	**5820**	**5766**	**5461**	**5342**	**27758**

Crash - Contributing circumstances	**2007**	**2008**	**2009**	**2010**	**2011**	**Total**
ACCIDENTAL INTERFERENCE TO A UNIT	2	2	0	1	0	5
ANIMAL UNCONTROLLED-ON ROAD	139	139	152	157	149	736
ATMOSPHERIC-DUST	11	2	3	1	6	23
ATMOSPHERIC-FOG	8	11	10	12	11	52
ATMOSPHERIC-HAIL	1	1	1	0	0	3
ATMOSPHERIC-HEAVY RAIN	46	61	63	71	47	288
ATMOSPHERIC-RAIN	4	4	3	4	3	18
ATMOSPHERIC-SMOKE	3	0	2	1	2	8
ATMOSPHERIC CONDITIONS-MISCELLANEOUS	8	9	10	7	9	43
CONDITION-UNDER INFLUENCE OF LIQUOR/DRUG (NOT NECESSARY BAC)	283	350	342	303	278	1556
CROSS MEDIAN CRASH	31	41	36	43	25	176
DELIBERATE PASSENGER INTERFERENCE TO A UNIT IN TRANSPORT	5	5	7	4	4	25
DRIVER-DISTRACTED	5	10	8	7	9	39
DRIVER-FATIGUE RELATED BY DEFINITION	225	216	237	212	200	1090
DRIVER-FATIGUE/FELL ASLEEP	170	168	148	154	169	809
DRIVER-MEDICAL CONDITION (HEART ATTACK; EPILEPSY ETC.)	158	171	170	159	182	840
DRIVER-TAKING AVOIDING ACTION TO A ROAD HAZARD	0	1	0	2	1	4
DRIVER-TAKING AVOIDING ACTION TO MISS ANOTHER ROAD USER	87	94	99	88	90	458
DRIVER-UNDERAGE (INEXPERIENCE)	27	24	17	8	15	91
DRIVER DISTRACTED-MOBILE PHONE	11	13	13	18	17	72
DRIVER VIOLATION TRAFFIC LAW-MISCELLANEOUS	0	0	0	0	2	2
EXCESSIVE SPEED FOR CIRCUMSTANCES	265	260	242	242	160	1169
LIGHTING-HEADLIGHT GLARE	11	13	13	12	5	54
LIGHTING-HEADLIGHTS OFF/NO LIGHTS ON VEHICLE	27	23	20	25	11	106
LIGHTING-HEAVILY OVERCAST	0	3	1	1	2	7
LIGHTING-NO STREET LIGHTING	27	14	9	16	12	78
LIGHTING-SUNLIGHT GLARE (DAWN/DUSK/REFLECTION)	76	78	95	63	69	381
LIGHTING-WEARING DARK CLOTHING	28	16	17	19	16	96
LIGHTING CONDITIONS-MISCELLANEOUS	11	11	4	3	6	35
POLICE CHASE	3	6	4	0	2	15
ROAD-CREST/DIP-VIEW OBSCURED	23	27	17	16	22	105

ROAD-GRAVEL/DIRT	12	11	17	4	11	55
ROAD-NARROW	20	17	13	7	10	67
ROAD-NARROW BITUMEN	9	12	11	13	10	55
ROAD-POTHOLES	11	21	15	18	37	102
ROAD-ROADWORKS	7	5	5	2	3	22
ROAD-ROUGH SHOULDER(S)	8	7	3	1	6	25
ROAD-ROUGH SURFACE	30	26	37	31	30	154
ROAD-STEEP GRADE	9	10	7	9	5	40
ROAD-TEMPORARY OBJECT ON CARRIAGEWAY	58	52	39	41	49	239
ROAD-WATER COVERING	35	42	39	54	35	205
ROAD-WET/SLIPPERY	391	346	313	355	263	1668
ROAD CONDITIONS-MISCELLANEOUS	79	73	100	65	96	413
VEHICLE-BRAKES	27	24	26	13	21	111
VEHICLE-LIGHTS (HEADLIGHTS/TAIL LIGHTS)	7	4	3	2	3	19
VEHICLE-LOAD SHIFT	9	12	11	11	9	52
VEHICLE-PRIOR CRASH OR BROKEN DOWN (CAUSE BUT NOT INVOLVED)	5	3	3	4	1	16
VEHICLE-STEERING	7	4	6	4	5	26
VEHICLE-STRUCTURAL DEFECT	1	0	0	2	0	3
VEHICLE-SUSPENSION	0	2	1	0	0	3
VEHICLE-TOWING ATTACHMENT	0	2	3	0	4	9
VEHICLE-TURN SIGNALS	3	0	0	1	1	5
VEHICLE-TYRES (I.E. LOW TREAD, PUNCTURE/BLOW OUT)	59	66	61	53	49	288
VEHICLE DEFECTS-MISCELLANEOUS	32	26	26	26	36	146
VEHICLE ENTERING DRIVEWAY	159	181	168	141	156	805
VIOLATION-CROSS DOUBLE LINES	55	67	98	100	111	431
VIOLATION-DANGEROUS DRIVING	97	92	102	97	76	464
VIOLATION-DISOBEY GIVE WAY SIGN	347	387	411	374	361	1880
VIOLATION-DISOBEY RED TRAFFIC LIGHT	251	297	226	243	245	1262
VIOLATION-DISOBEY STOP SIGN	166	164	145	133	149	757
VIOLATION-DISOBEY TRAFFIC LIGHT	17	13	11	15	12	68
VIOLATION-DISOBEY TRAFFIC SIGN	45	55	63	53	48	264
VIOLATION-DRIVE MOTOR VEHICLE OF EXCESS DIMENSIONS	0	0	1	0	0	1
VIOLATION-EXCEEDING SPEED LIMIT	176	154	136	82	77	625
VIOLATION-FAIL TO GIVE WAY	178	213	262	236	210	1099
VIOLATION-FAIL TO GIVE WAY ON PEDESTRIAN CROSSING	34	35	33	38	38	178
VIOLATION-FAIL TO KEEP LEFT	123	129	153	160	146	711
VIOLATION-FAIL TO SIGNAL INTENTION	7	12	2	4	7	32
VIOLATION-FOLLOW TOO CLOSELY	174	293	366	347	375	1555
VIOLATION-ILLEGALLY PARKED	2	2	3	1	1	9
VIOLATION-IMPROPER OVERTAKING	65	58	45	43	51	262
VIOLATION-IMPROPER TURN-OTHER THAN U-TURN	21	20	22	25	22	110
VIOLATION-IMPROPER U-TURN	55	61	46	41	37	240
VIOLATION-INSECURE LOAD	5	3	2	0	5	15
VIOLATION-OPEN CAR DOOR CAUSING DANGER	10	7	15	19	11	62
VIOLATION-OVER PRESCRIBED CONCENTRATION OF ALCOHOL (MUST HAVE BAC)	614	699	651	570	540	3074
VIOLATION-TESTED FOR DRUGS ONLY	1	2	1	0	0	4
VIOLATION-TURN IN FACE OF ONCOMING TRAFFIC	373	410	404	401	386	1974
VIOLATION-UNSAFE LANE CHANGE	64	79	64	70	57	334
Total Crashes	**5369**	**5820**	**5766**	**5462**	**5345**	**27762**

Appendix D: Survey

University of Southern Queensland

The University of Southern Queensland

Participant Information Sheet

HREC Approval Number: H13REA141

Full Project Title: ***Investigation into traffic controller health and safety at road works***

Principal Researcher: William Dann

Other Researcher(s): Supervisor Dr David Thorpe

Project Description:

I am currently undertaking research regarding the health and safety of traffic controllers. The research centres on risks to traffic controllers on the job and how these risks can be controlled. Identifying these risks is a necessary first step in this process. I would like to invite you to take part in this research project, by completing the attached survey.

1. Procedures

Participation in this project will involve:

- *Approximately 5 minute survey time*
- *11 questions regarding experience in the traffic control industry*
- *All questions are multiple choice or rating answer to reduce survey time*
- *By participating in the survey you will assist the researcher with their final year BENG Research Project which may be published by USQ in 2014*
- *Participants will remain anonymous within the Research Project*
- *Risk is minor*

2. Voluntary Participation

Participation is entirely voluntary. **If you do not wish to take part you are not obliged to.** The survey allows participants to remain anonymous, thus you will not be able to withdraw participation from the research after completion and submission of the survey. Please take this in to consideration before completing the survey. Your decision whether to take part or not to take part, will not affect your ***relationship with*** the University of Southern Queensland

Should you have any queries regarding the progress or conduct of this research, you can contact the principal researcher:

William Dann
University of Southern Queensland Faculty of Engineering and Surveying
Email: ***U1006237@umail.usq.edu.au*** *PH: 0412302918*

University of Southern Queensland

The University of Southern Queensland

Consent Form

HREC Approval Number: **H13REA141**

TO: ***Participant***

Full Project Title: Investigation into traffic controller health and safety at road works

Principal Researcher: William Dann

Other Researcher(s): Supervisor Dr David Thorpe

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.
- I understand the purpose of the research project and my involvement in it.
- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I confirm that participants are 18 years of age.
- I understand that while information gained during the study may be published, identification and personal results will remain confidential.

If you have any ethical concerns with how the research is being conducted or any queries about your rights as a participant please feel free to contact the University of Southern Queensland Ethics Officer on the following details.

Ethics and Research Integrity Officer
Office of Research and Higher Degrees
University of Southern Queensland
West Street, Toowoomba 4350
PH: +61 7 4631 2690
Email: ***ethics@usq.edu.au***

Statement of Information disclosure: Participation in this survey is voluntary, and participant's information will remain anonymous, also participant's names if detailed on the survey will not be disclosed to anyone other than myself. However as the survey is anonymous supplying a name for identification is not required.

Survey

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD), ***what is the most dangerous hazard to you?*** Rate hazards from 1 to 4 with 1 being most dangerous

- ___ :Environmental factors (e.g. Sun, Weather conditions, etc)
- ___ :Construction on the site (machinery on the road works site)
- ___ :Traffic passing through the road works
- ___ :Other (If need)_____

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD), ***when is vehicle traffic most threatening to your safety?*** Rate from 1 to 3 with 1 being most threatening

- ___ :Stopping traffic before allowing the traffic to enter the road works (stop display on batten)
- ___ :Releasing traffic through the road works (switching batten to slow)
- ___:When traffic is flowing through the road works(slow displayed on batten)

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD), ***has vehicle traffic ever ignored the batten, fail to spot the batten or miss interrupted the batten and drove pass a stop sign displayed on the batten? If yes please circle the approximate occurrence rate of vehicles disobeying the stop batten.***

- ○ 1 in more than 200 vehicles that pass through the road works (rarely happens)
- ○ 1 in 200 vehicles that pass through the road works
- ○ 1 in 100 vehicles that pass through the road works (often)
- ○ 1 in 50 vehicles that pass through the road works
- ○ More than 1 in 50 vehicles that pass through the road works (happens frequently)

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD), ***does machinery on the road work site add any form distraction or impairment to the traffic control work you carry out?*** Circle the appropriate below.

- ○ Noise from machinery
- ○ Dust from machinery
- ○ Movement of machinery on the site
- ○ Exhaust emission from the machinery

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD), ***have you had to use your pre-planned escape path(in the last year), to avoid the threat of a vehicle hitting you?*** If more than 1 time state occurrence rate, e.g. 2 times in 1 year of work.

- ○ Yes
- ○ More than one time(approximate occurrence rate)_____
- ○ No

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD***), do you believe the personal protective equipment required for wear(long sleeve clothing), aids in dehydrating you during day time work?***

- ○ Yes
- ○ No

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD), ***do you believe the personal protective equipment required for wear (long sleeve clothing), aids in preventing over exposure to the sun (sunburn/ sun cancer)?***

- ○ Yes

- ○ No

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD), ***do you believe different driver characteristic (e.g. younger drivers or learners) present different level risks to you at road works?***

- ○ Yes
- ○ No

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD), ***what driver factor is the most threaten to your health and safety at road works?*** Rate driver factors from 1 to 4 with 1 being most dangerous ***(consider frequency seen, consequences and likelihood to cause harm).***

- ___ :Speeding Driver
- ___:Driver ignorance to traffic control
- ___ :Driver distraction (e.g. drive on mobile phone)
- ___ :Poor driver skill (e.g. stalling in middle of road works)

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD), with ***your experience what vehicle is tend to the most threatening to the health and safety to yourself (most likely to cause a incident and frequency seen, not cause the most injury to you)?***

- ○ Small cars
- ○ medium cars
- ○ 4x4 and large SUVs
- ○ Motorcycles
- ○ Small trucks
- ○ Large trucks

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD), ***do you believe working under night conditions is less or more safe than day conditions?***

- ○ More safe at night
- ○ Less safe at night

When carrying out traffic control (stop Batten control) at road works in accordance with the Manual for uniform Traffic control devices (MUTCD), ***do you feel an increase in risk when carrying out traffic control at peak traffic times?***

- ○ Yes
- ○ No

Thank you for participating in this survey and sharing your experience and knowledge of you work.

Appendix E: University of Southern Queensland Ethics Approval

University of Southern Queensland
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OFFICE OF RESEARCH AND HIGHER DEGREES
Ethics Committee Support Officer
PHONE (07) 4631 2690 | FAX (07) 4631 1995
EMAIL ethics@usq.edu.au

24 July 2013

Mr William Dann
12 Gayndah Street
KARALEE QLD 4350

Dear William

The Chair of the USQ Fast Track Human Research Ethics Committee (FTHREC) recently reviewed your responses to the FTHREC's conditions placed upon the ethical approval for the below project. Your proposal now meets the requirements of the *National Statement on Ethical Conduct in Human Research (2007)* and full ethics approval has been granted.

Approval No.	**H13REA141**
Project Title	Investigation into traffic controller health and safety at road works
Approval date	24 July 2013
Expiry date	24 July 2014
FTHREC Decision	**Approved**

The standard conditions of this approval are:

(a) conduct the project strictly in accordance with the proposal submitted and granted ethics approval, including any amendments made to the proposal required by the HREC
(a) advise (email: ethics@usq.edu.au) immediately of any complaints or other issues in relation to the project which may warrant review of the ethical approval of the project
(b) make submission for approval of amendments to the approved project before implementing such changes
(c) provide a 'progress report' for every year of approval
(d) provide a 'final report' when the project is complete
(e) advise in writing if the project has been discontinued.

For (c) to (e) forms are available on the USQ ethics website: http://www.usq.edu.au/research/ethicsbio/human

Please note that failure to comply with the conditions of approval and the *National Statement (2007)* may result in withdrawal of approval for the project.

You may now commence your project. I wish you all the best for the conduct of the project.

Annmaree Jackson
Ethics Committee Support Officer

Copies to: u1006237@umail.usq.edu.au
david.thorpe@usq.edu.au