QPQI Low Speed Run-Overs of Young Children Research
Project Final Report

June 2010

Prof Jeremy Davey
Mr Bevan Rowland
Dr James Freeman

The Centre for Accident Research & Road Safety - Queensland
is a joint venture initiative of the Motor Crash Insurance Commission
and Queensland University of Technology
# Table of Contents

Executive Summary ...................................................................................................................... 4
1. Title of Project .......................................................................................................................... 7

2. Introduction .............................................................................................................................. 7
   2.1 Project Aims and Objectives ................................................................................................ 7
   2.2 Rationale for Research ....................................................................................................... 7
   2.3 Project Research Questions ............................................................................................... 9

3. Project Plan and Methodology ............................................................................................... 9
   3.1 Phase 1: Preliminary Work and Literature and Legislation Review ............................... 9
      3.1.1 Identification of industry (employer) partner organisations ................................... 10
   3.2 Phase 2: Data Collection ................................................................................................. 10
      3.2.1 Stage 1: Focus Group Discussions ......................................................................... 11
      3.2.2 Stage 2: Review of Organisational Records, Documentation and Initiatives ....... 11
      3.2.3 Stage 3: CARRS-Q Industry Fleet Safety Research Data ..................................... 12
   3.3 Phase 3: Data Analysis ..................................................................................................... 12
   3.4 Phase 4: Intervention Strategy Recommendations .......................................................... 12
   3.5 Phase 5: Project Report and Dissemination of Outcomes ................................................ 13

4. Literature Review .................................................................................................................. 13
   4.1 Prevalence of Low Speed Vehicle Run-Overs of Young Children ................................. 13
   4.2 Australian Research ........................................................................................................ 14
   4.3 Low Speed Vehicle Run-Overs of Young Children and Work-Related Drivers .............. 15
   4.4 Work-Related Drivers: A High Risk Road User Group ................................................. 16
   4.5 Workplace Health and Safety Legislation ...................................................................... 16
   4.6 Risk Management .......................................................................................................... 17
   4.7 Risk Management: An Integral Safety Requirement ....................................................... 18
   4.8 Management of Safety Risks ......................................................................................... 20
   4.9 Role of Behaviour Change in Injury Prevention .............................................................. 21
   4.10 Intervention Strategies and Initiatives ............................................................................. 24
      4.10.1 Previous Occupational Road Safety Intervention Research .................................. 24
      4.10.2 Previous Intervention Strategies Targeting Low Speed Vehicle Run-Overs .......... 24
   4.11 Section 4 Summary ....................................................................................................... 25

5. Field Research Data Analysis and Results ............................................................................ 26
   5.1 Stage 1 – Focus Group Discussions .............................................................................. 26
      5.1.1 Significance of the Issue ......................................................................................... 26
      5.1.2 Personal Performance ......................................................................................... 27
      5.1.3 Difficulties When Manoeuvring or Reversing Vehicles ....................................... 28
      5.1.4 Awareness Information ......................................................................................... 29
      5.1.5 Organisational Initiatives or Intervention Strategies ........................................... 30
      5.1.6 Risk Reduction .................................................................................................... 30
      5.1.7 Stage 1 Results Summary .................................................................................... 30
   5.2 Stage 2 – Organisational Records, Documentation and Initiatives .............................. 31
      5.2.1 Policy and Procedures ......................................................................................... 31
      5.2.2 Risk Management Plans and Assessments ............................................................ 31
      5.2.3 Incident Records .................................................................................................. 31
      5.2.4 Previous Organisational Road Safety Intervention Strategies and Initiatives ....... 32
      5.2.5 Stage 2 Results Summary .................................................................................... 32

6. CARRS-Q Industry Fleet Safety Research Data – Stage 3 ............................................... 33
   6.1 Source of Data ............................................................................................................... 33
   6.2 Data Collection Procedure ............................................................................................ 33
List of Tables

Table 1: Vehicles involved in run-over fatalities in Australia 2000/01 to 2006/07 ..........15
Table 2: Percentage of Work Where Children May Be Present .................................27
Table 3: Top Three Incident Types for the Five Participant Organisations ...................32
Table 4. Survey Participant Characteristics ....................................................................36
Table 5. Item Responses for “Hit/bump/scrape something while manoeuvring” ..........37
Table 6. Item Responses for “Physically check behind the vehicle for objects” ............38
Table 7. Mean and Standard Deviations for the Item “Hit/bump/scrape something.” ....38
Table 8. Mean and Standard Deviations for the Item “Physically check behind.” .........38
Table 9. Mean & Standard Deviations for the Five Less Safe Behavioural Items ..........39
Table 11. Fleet Safety Climate Correlations for Item: “Physically check behind.” ........41
Table 12. Fleet Safety Climate Correlations for Item: “Hit/bump/scrape something.” ........42

List of Figures

Figure 1: Diagrammatic representation of the triangulation pathways .........................10
Figure 2: The Five Step Risk Management Process ....................................................19
Executive Summary

Project Title

Development of Intervention Guidelines for Work-Related Drivers Targeting Low Speed Vehicle Run-Overs of Young Children

Introduction

This final report outlines the research conducted by the Centre for Accident Research and Road Safety – Queensland (CARRS-Q) for the research project (title above). This report provides an outline of the project methodology, literature review, three stages of research results (including the focus group discussions, review of organisational records, documentation and initiatives, and analysis of previous CARRS-Q occupational road safety self-report surveys), and recommendations for intervention strategy and initiatives development and implementation.

Project Aims and Objectives

The major aims of this project were to research, identify and develop intervention guidelines for work vehicles and drivers (visiting or being housed at home environments) to reduce the risk of low speed vehicle run-overs of young children. This package is framed within the workplace health and safety regulatory environment and the employer and employee obligation for the safe operation of work associated vehicles.

Project Methodology

This study used dissimilar but complementary methods including critical reviews of organisational records, documentation and current initiatives, in depth structured group discussions and previous CARRS-Q industry fleet safety research data to achieve convergent validity. This combination of methods was adopted to counterbalance the weaknesses of one method with the strengths of other methods. Subsequently, the findings from each stage will inform the identification and guideline development of potential intervention strategies and initiatives.

Results

Literature Review Summary

A review of the literature could not identify any research regarding work-related road safety interventions or strategies that were implemented to reduce the risk of low speed manoeuvring and/or reversing type incident injuries. The authors surmise that the current research may be the first research project targeting work-related drivers and industry organisations with reference to low speed vehicle incidents involving young children. However, the literature did identify that there is a considerable risk of low speed vehicle run-overs of young children, especially in residential areas, and that occupational drivers who attend these areas for work purposes may be considered a high risk group.

Stage 1 Summary

Stage 1 results revealed some interesting and alarming findings. Most participants suggested that low speed manoeuvring and reversing type incidents were a significant issue for their respective organisations, especially when working in domestic residential areas. The most common reported contributing factors to low speed incidents or near misses included rear visibility when reversing,
the type of vehicle, time/work pressure, third party/pedestrians, inattention/distraction and drug/alcohol use. Alarmingly, drug use was identified as a serious problem, especially amongst contractors and/or self-employed tradesmen. It was suggested that further research should be conducted to ascertain the prevalence of drug use and drug driving in this area. In addition, most participants stated that they were unaware of any intervention strategies or information provided by their organisation in relation to low speed manoeuvring or reversing.

**Stage 2 Summary**
Stage 2 results revealed a lack of organisational documentation, processes and practices specifically relating to low speed vehicle manoeuvring and reversing, especially in areas where young children may be present. Not only does this not meet occupational health and safety legislative requirements, it doesn’t assist or provide the supporting mechanisms for intervention or countermeasure development and implementation. Interestingly, reversing type incidents were identified in the top three incident types for all five organisations indicating that low speed vehicle incidents are a potential risk to young children where workers are performing tasks and driving in high risk areas (e.g., domestic residences, schools, shopping centres, etc). For example, one potentially dangerous event recorded in an organisation’s crash data involved a driver reversing his vehicle into a pram crushing it between his vehicle and the pram owner’s vehicle. Although the child was being secured in the vehicle and was not in the pram at the time of the incident, this event could have been catastrophic. In addition, no organisation recorded conducting any proactive intervention strategies or initiatives relating specifically to low speed vehicle manoeuvring or reversing. Three organisations did provide some skills-based driver training, however this training did not have a component addressing low speed manoeuvring or reversing.

**Stage 3 Summary**
The results outlined in Stage 3 research provided further insight into low speed vehicle manoeuvring and driver behaviour. It should be noted that the organisations and participants utilised in stage 3 were not the same participants as in stages 1 and 2. Rather, due to the exploratory nature of this research the surveys were included to gain a wider interpretation of the issue, especially relating to the prevalence and risks related to low speed and reversing type incidents. In total 6,907 participants from three medium to large organisations were utilised in the research. All respondents completed self-report surveys containing questionnaire items relating to driver behaviours and fleet safety climate. Alarmingly, the research indicated that a large proportion of occupational drivers either don’t check behind their vehicle at all before reversing, or rely primarily on the use of rear view mirrors to check their reversing path. In addition, results showed that the item “Physically check behind the vehicle for objects before reversing” was the second highest less safe behaviour for this sample of occupational drivers. Although weak, relationships were found between items relating to fatigue, work/time pressure, concentration/inattention, distraction, failing to check rear-view mirrors and low speed manoeuvring incidents. In addition, relationships were found between hitting, bumping or scraping something while reversing and individual fleet safety climate items relating to time/work pressure. These results may indicate that the potential negative effects of time/work pressure placed on drivers to increase performance may also increase the risk of low speed vehicle incidents. Results also suggest that those drivers exhibiting aberrant driving behaviours are less likely to take the time to physically check behind their vehicle before reversing. Furthermore, there were relationships between physically checking behind the vehicle before reversing and items relating to the perceived adequacy of organisational fleet safety rules and procedures, communication and support and management commitment.
Conclusion and Recommendations

Research evidence suggests that occupational drivers are potentially a high risk group, especially workers (and parents) using home as a work base and storing work-related equipment. In addition, for organisations where a substantial proportion of work is performed in areas where children may be present (e.g. residential areas, schools, shopping centres, etc) there is an increased risk of young child run-overs. The research identified both organisational and individual driver issues/problems as being contributing factors of low speed occupational vehicle incidents, and an increase in risk to young children (when working in areas where children may be present). The research also concluded that intervention strategies and initiatives should target both organisational issues and driver behaviours. For example, comprehensive organisational documentation, processes and systems need to be formally developed to support intervention strategies and initiatives, as well as, informing their development and implementation. Whereas, occupational driver-related intervention strategies should address both aberrant driver behaviour and also the contributing factors (e.g., work/time pressures, inattention/distraction, fatigue, alcohol/drug use, etc) identified as being a high risk to low speed vehicle manoeuvring incidents (including reversing). Further detailed recommendations are included within section 8 of this report.
1. Title of Project

Development of Intervention Guidelines for Work-Related Drivers Targeting Low Speed Vehicle Run-Overs of Young Children

2. Introduction

This final report outlines the research conducted by the Centre for Accident Research and Road Safety – Queensland (CARRS-Q) for the research project (title above). This report provides an outline of the project methodology, literature review, three stages of research results (including the focus group discussions, review of organisational records, documentation and initiatives, and analysis of previous CARRS-Q occupational road safety self-report surveys), and recommendations for intervention strategy and initiatives development and implementation.

2.1 Project Aims and Objectives

The major aims of this project were to research, identify and develop intervention guidelines for work vehicles and drivers (visiting or being housed at home environments) to reduce the risk of low speed vehicle run-overs of young children. This package is framed within the workplace health and safety regulatory environment and the employer and employee obligation for the safe operation of work associated vehicles.

To achieve these aims, further objectives of this research are to:

1. Within a work-related context gain a better understanding of the issue, low speed vehicle run-overs of young children, by conducting a literature review of the problem, theoretical models and research which attempt to explain driver behaviour and incident causation, and any previous intervention strategies or countermeasures;

2. Identify the workplace health and safety regulatory framework and structure for housing this intervention;

3. Identify the contributing factors of work-related low speed and reversing type incidents, especially in relation to low speed vehicle run-overs of young children; and

4. Identify appropriate intervention strategy guidelines for reducing low speed vehicle run-overs of young children.

2.2 Rationale for Research

There are a number of instances where work-related drivers pose a substantial risk to children, especially in relation to low speed vehicle run-overs. These include:

1. Many service and trades personnel drive commercial type vans or four wheel drives (4WDs) and other vehicles where rear visibility is greatly reduced. Subsequently, the lack of rear visibility is a problem, especially within areas where small children are present (e.g.
household driveways and schools, etc). Also, 4WDs are primarily used as work vehicles of choice within rural areas.

2. Recent CARRS-Q work-related road safety research indicated that reversing type incidents represent a high number of organisational incidents. For example, analysis of three organisations’ crash data indicated reversing incidents accounted for approximately 13-17% of all work-related road incidents (Rowland et al., 2005). In addition, for some organisations the percentage of low speed (including reversing and parking) incidents can be up to a quarter of all work-related road incidents.

3. Many industry organisations do not classify reversing type incidents as a high risk incident due primarily to the low impact and low cost vehicle damage. Therefore, organisations tend not to address this potential high risk incident (especially in areas where children are present) within their Workplace Health and Safety, Risk Management and/or Fleet Safety Systems, policy and procedures. There is an obvious need for this to change and for organisations to meet their legislative requirement with reference to the safe operation of vehicles.

4. Reporting of time pressure as a contributory factor of vehicle crashes/incidents is increasing. Research has shown that drivers who perceive they are under pressure to meet sales/service quotas or to attend a job or meeting are more at risk of being involved in a vehicle crash/incident (Rowland et al., 2008). Further focus group research conducted by CARRS-Q found that some drivers felt they had to use vehicle travel as a means to make up time. Reversing without adequately checking behind their vehicle was common, with a number of drivers stating that they “did not have time to walk around their vehicle and check that the vehicle travel path was clear”.

5. In today’s work environment many workers use their residence as a home base. For example, organisations require workers to home garage their work-related vehicle after hours. Generally, these workers perform their daily work tasks within the area that they live and often return home for breaks, including lunch, etc. This is especially relevant for workers in rural areas. Some even store spare parts and equipment at home and collect these during the day as required. Therefore, these workers would be a considerable high risk group in regards to low speed vehicle run-overs of young children.

6. Organisations provide salary sacrifice vehicles to executives and/or management personnel to offset salaries. Although classified as a work vehicle, which is maintained by the organisation, these vehicles often can be used by other family members. Therefore, these work-related vehicles, due to their widespread and locality of use can be considered as high risk. An opportunity exists to include salary sacrifice vehicles and all prospective drivers within potential intervention strategies, thereby widening the scope of such countermeasures.

7. Within Queensland, commuting to and from work is covered under Workers’ Compensation legislation. Therefore, incidents that occur while commuting can be considered as work-related and should be addressed appropriately by organisations. For example, fatigue (e.g. shiftwork) and work pressures (getting to a job or meeting on time) are all common contributing factors of commuting type incidents.
2.3 Project Research Questions

The central research question underpinning this research project is: *Within a work-related driving context how can the occurrence or potential of low speed vehicle run-overs of young children be reduced?* To answer this question several sub questions were explored.

1. How extensive is the problem of low speed vehicle run-overs of young children, especially in relation to work-related drivers?
2. What outcomes have been observed in previous low speed vehicle run-over initiatives?
3. Within industry organisations, what is current practice in relation to driving safety, especially when reversing and low speed manoeuvring, in areas where small children may be present?
4. How do industry organisations address the risk of reversing and low speed manoeuvring incidents, especially in areas where small children maybe present?
5. What potential intervention strategies or initiatives could be implemented to reduce the risk of low speed vehicle run-overs of young children, especially in relation to industry and the community?
6. What is the best content for such interventions and how should these interventions be integrated into an organisation’s duty of care and legal responsibility framework?

3. Project Plan and Methodology

There are five phases to this project:

3.1 Phase 1: Preliminary Work and Literature and Legislation Review

The following process was undertaken to ensure a comprehensive understanding of current knowledge in the field:

1. Research data and literature from both Australia and overseas was examined to provide a thorough background of the issue of low speed vehicle run-overs of young children, especially in relation to work-related drivers.

2. Theoretical models and research which attempt to explain driver behaviour and incident causation were examined in relation to both work-related and private vehicle drivers in order to identify an appropriate theoretical solution to examine low speed vehicle run-overs of young children.

3. Identification and review of relevant workplace legislation.

4. Information on past and current intervention strategies or initiatives was examined. This includes investigating potential strategies aimed at changing work-related driver behaviour in relation to low speed and reversing incidents.

The literature and legislation review provides information necessary for explaining research questions 1) *How extensive is the problem of low speed vehicle run-overs of young children, especially in relation to work-related drivers?*; and 2) *What outcomes have been observed in previous low speed vehicle run-over initiatives?*
3.1.1 Identification of industry (employer) partner organisations

Also during Phase 1 of the project, appropriate employer organisations were approached requesting their involvement in the study by providing work-related driver volunteers as participants in the structured group discussions. In addition, the organisations were asked to partake in a review of their current organisational records, documentation and initiatives. Typically, organisations involved in this study include operations/work tasks that would visit domestic dwellings as part of their normal operations (e.g. telecommunication and electrical service companies, couriers, home appliance repair, domestic service operators etc). As a condition of being part of this research project, the five organisations who volunteered to participate requested that their organisational identity be confidential. The industry in which each organisation operates includes:

- Organisation A: Regional Taxi Company;
- Organisation B: Home Office/Business Machine Maintenance, Installation and Repair;
- Organisation C: Home Insulation Installation;
- Organisation D: Home Appliance/White Goods Repair; and

3.2 Phase 2: Data Collection

A triangulation approach was adopted with the data from each stage of data collection being drawn from different sources. This approach was first applied in the academic setting in 1959 to enhance research (Campbell & Fiske, 1959). The term triangulation is borrowed from navigational circles, where it is a strategy for taking multiple reference points to locate an unknown position. In the academic setting triangulation refers to the use of a combination of research methods to gain a holistic understanding and to depict more accurately the phenomenon being investigated. This study used dissimilar but complementary methods including critical reviews of organisational records, documentation and current initiatives, in depth structured group discussions and previous CARRS-Q industry fleet safety research data to achieve convergent validity. This combination of methods was adopted to counterbalance the weaknesses of one method with the strengths of other methods. Subsequently, the findings from each stage will inform the identification and guideline development of potential intervention strategies and initiatives. See Figure 1.

![Diagrammatic representation of the triangulation pathways](image-url)

Figure 1: Diagrammatic representation of the triangulation pathways
3.2.1 Stage 1: Focus Group Discussions

Focus group discussions were conducted with drivers (including managers, supervisory and field staff) from the five organisations as well as individual domestic tradesmen who volunteered to be involved in the project. The domestic tradesmen included volunteers from various trades including builders, electricians, plumbers, tilers, carpenters, painters, bricklayers, and plasterers. Organisations relevant for this project typically included those operations that would visit domestic dwellings as part of their normal operations or daily work activities. A total of 51 individuals from the five organisations and individual domestic tradesmen volunteered to participate in Stage 1 of this research project. These included:

- Organisation A (n = 8);
- Organisation B (n = 5);
- Organisation C (n = 4);
- Organisation D (n = 7);
- Organisation E (n = 9); and
- Domestic Tradesmen (n = 18).

Stage 1 provided information necessary to explore perceptions in relation to research question 3) Within industry organisations, what is current practice in relation to driving safety, especially when reversing and low speed manoeuvring, in areas where small children may be present? An inductive “open” coding technique developed by Strauss (1987) was implemented and entailed re-reading transcripts, focusing on and coding the “conditions” and “consequences” that emerge from the text (e.g., themes), and developing and revising such codes. The technique is drawn from grounded theory which does not rely on frequency counts of specific words or pre-defined words, but rather facilitates the examination of major themes arising from the experiential data such as participants’ responses (Corbin & Strauss, 1990; Yin, 1993). In essence, the study incorporates a structured and open-ended inquiry method to generate linkages and identify patterns among key variables and outcomes such as the identification of characteristics that are associated with low speed vehicle run-overs of young children.

Questions and prompts developed for Stage 1 of this project are included in Appendix A. In addition, results of the focus group discussions are included in section 5.

3.2.2 Stage 2: Review of Organisational Records, Documentation and Initiatives

Information obtained from the interviews provided leads for the comprehensive critical review of organisational records, documentation and initiatives. Data obtained in Stage 1 was compared to the data obtained in Stage 2 to identify convergent and unique findings. Within Stage 2 organisational crash/incident data were reviewed to ascertain the scope of the problem in relation to low speed manoeuvring and reversing type incidents, especially where young children may be present (e.g. driveways). In addition, organisational documentation, such as work-related road safety policy and procedures and risk management strategies, were reviewed to determine if the organisation has a plan for addressing any potential risk of low speed vehicle run-overs. Furthermore, researchers were also to evaluate the impact of any initiatives that an organisation may have implemented to mitigate low speed vehicle run-over risks. The review of organisational records, documentation and initiatives will provide evidence relating to research question 4) How do industry organisations address the risk of reversing and low speed manoeuvring incidents, especially in areas where small children maybe present? Results of the review of organisational records, documentation and initiatives are included in section 5.2.
3.2.3 Stage 3: CARRS-Q Industry Fleet Safety Research Data

Within the scope of this exploratory research, data derived from recent quantitative research conducted by CARRS-Q was used to gain a wider interpretation of the issue. Although the survey data utilised does not include the participants and organisations acknowledged in stages 1 and 2, this additional data collection stage endeavoured to explore the prevalence and risks related to low speed and reversing type incidents. This addition to the scope of the research project may assist in determining the type and content of future intervention strategies. The CARRS-Q database contains relevant and contemporary information regarding work-related driver behaviours and attitudes, which may benefit this exploratory program of research. For example, surveys ask questions, such as, do drivers “physically check behind the vehicle for objects before reversing”. The frequency of responses have been collated and utilised within this study to ascertain a wider consensus in relation to driver behaviour and low speed incidents. Stage 3 will provide additional supporting and clarifying evidence for research questions 3 and 4.

3.3 Phase 3: Data Analysis

Initially, background information was gained from the comprehensive literature review in conjunction with the relevant workplace legislation. This may provide an insight into previous research in the area of low speed vehicle run-overs as well as examining the influence of work-related drivers as a high risk group. Furthermore, the literature review identifies the regulatory structure around which interventions are to be developed and operationalised.

As stated previously, the study utilises triangulation to achieve convergent validity. Data obtained in Stage 1 of data collection enabled project researchers to explore participants’ perceptions and experiences in relation to driving safety, especially when reversing and low speed manoeuvring, in areas where small children may be present. In addition, Stage 1 provided details for the identification of relevant organisational records, documentation and initiatives.

Stage 2 provided documented evidence of the scope of the issue within organisations (e.g. crash/incident records), whether the organisation has a plan for addressing any potential risk (e.g. policy and procedures/risk management processes), and if the organisation has implemented any initiatives to minimise the risk of low speed vehicle run-overs. Stage 3 provides additional data in relation to individual and organisational responses to characteristics of low speed vehicle manoeuvring, including reversing. In addition, Stage 3 assists in understanding the findings from Phase 1 and 2 by providing an opportunity to clarify and challenge findings. A detailed discussion of the results from the three study stages is included within section 7 of this report.

3.4 Phase 4: Intervention Strategy Recommendations

Information from the literature review and the three study stages informs the identification of guidelines for development of suitable intervention strategies and initiatives. The intervention and initiative recommendations will incorporate both brief and more extensive type strategies. Phase 4 of this research project will enable insight into research questions 5) What potential intervention strategies or initiatives could be implemented to reduce the risk of low speed vehicle run-overs of young children, especially in relation to industry and the community?; and 6) What is the best content for such interventions and how best to integrate these interventions into an organisation’s duty of care and legal responsibility framework?
A variety of road safety initiatives have been implemented by organisations in recent years to reduce the risks associated with work-related driving incidents. For example, existing initiatives employed by organisations to reduce incidents typically focus on fleet safety policies and procedures, driver training, driver education and incentives (Haworth et al., 2000; Lancaster & Ward, 2000; Murray et al., 2003). However, an overarching influence on any intervention implemented within work-related driving settings is the need for such countermeasures to be brief, as historically, managers as well as company drivers have little time to devote to safety initiatives. Given the importance of time management within fleet environments, the current research team recognise there is a clear need for brief interventions that demand little resources and can be completed without intense management supervision. These interventions offer a structure and guidelines for organisations to meet their regulatory requirements. At present these requirements are lacking in many situations with regards to low speed vehicle run-overs involving young children.

3.5 Phase 5: Project Report and Dissemination of Outcomes

Phase 5 of the research project will include:

1. This report detailing project methodology, project study results, outcomes, recommendations, and guidelines for intervention strategies; and

2. Writing and dissemination of the research findings within peer-reviewed conference proceedings and journals.

Further dissemination of project outcomes via academic journals and conferences will be ongoing and dependent upon dates of relevant road safety and occupational health and safety conferences, etc.

4. Literature Review

Currently, there is scant research literature relating to occupational road safety and low speed vehicle incidents including reversing type incidents. Subsequently, there is no literature relating to occupational vehicle low speed vehicle run-overs or reversing incidents involving young children. Therefore, this research project could be considered the first of its kind in Australia and overseas. The literature review below examines general low speed vehicle run-overs involving young children and explores the potential relationship between occupational driving and working in areas where young children may be present.

4.1 Prevalence of Low Speed Vehicle Run-Overs of Young Children

Traffic pedestrian incidents are generally defined as those that occur on a public street or highway, while non-traffic pedestrian incidents are defined as those that occur in driveways, parking lots, and laneways (Brison et al., 1988; Davey et al., 2007). It is the non-traffic pedestrian incident type that is a considerable risk to young children, as previous research has reported a higher paediatric mortality rate for this form of incident (Patrick et al., 1998). In addition, one in four child pedestrian hospitalisations result from injuries sustained on home driveways (Roberts et al., 1995), and young child pedestrian incident rates remained constant over the past decade (Murphy et al., 2002). After superficial injury, closed head and musculoskeletal type injuries tend to be more frequent (Murdoch, 2008). Furthermore, morbidity and mortality associated with these types of injuries can be severe, particularly if crush injuries occur to the head or chest (Murdoch, 2008).
The elevated risk of a young child being struck by a vehicle may be explained by the corresponding developmental stage, as young children are more likely to experience difficulty in recognising environmental hazards (Patrick et al., 1998), and are relatively small in size compared to the size of the vehicles (Davey et al., 2007; Murdoch, 2008). Research has demonstrated that a parent or older sibling of the child is most likely the driver of the vehicle in driveway incidents (Henderson, 2000; Holland et al., 2000; Murphy et al., 2002; Nadler et al., 2001; Patrick et al., 1998; Roberts et al., 1995; Robertson & Nolan, 1997; Silen et al., 1999; Winn et al., 1991). Generally, the vehicle is being reversed at low speed and the driver is unaware that a child is present behind the vehicle (Davey et al., 2007; Murdoch, 2008). In addition, considerable research has shown that commercial utilities and 4WD vehicles are over-represented in the data on driveway incidents, particularly in the more severe and fatal incidents (Moller & Kreisfeld, 1997; Murdoch, 2008; Nadler et al., 2001; Roberts et al., 1995; Winn et al., 1991). Research has also suggested that this is probably due to the height of the vehicles, which often results in poor driver visibility when reversing (Patrick et al., 1998).

Children injured in driveway incidents typically sustain soft-tissue injuries to the head, neck, torso, or limbs as well as fractures to the pelvis and limbs (Holland et al., 2000; Nadler et al., 2001). In addition, reported mortality rates vary between 6% (Nadler et al., 2001), 10% (Roberts et al., 1995) and 16% (Patrick et al., 1998), although fatalities are more common in children under the age of five years.

4.2 Australian Research

In Australia, an investigation into the incidence of low speed vehicle driveway fatalities during 1996 to 1998 revealed 12 fatalities on average per year (Neeman et al., 2002). The study indicated that most incidents resulted from young children positioning themselves behind large stationary vehicles (e.g. 4WDs). A similar Victorian study examined mortality rates from slow-speed, non-traffic incidents that occurred between 1985 and 1995 and identified 28 fatal paediatric pedestrian incidents, with 79% of incidents occurring between 1992 and 1995 (Robinson & Nolan, 1997). This study also found that the majority of fatalities involved 4WDs and heavy vehicles, reversing along the driveway. Further, incidents were more common in the morning, at the weekend, and during the warmer months (November – April), and the relative risk of a driveway fatality was estimated to be greater in rural than in urban areas of the state.

Examination of paediatric pedestrians admitted to the New Children’s Hospital (Sydney) between November 1995 and February 2000 as well as examination of entries into the NSW paediatric trauma death registry between January 1988 and December 1999 revealed that 14 recorded driveway related fatalities occurred in this period, accounting for 8% of all paediatric pedestrian deaths (Holland et al., 2002). In addition, the majority of these incidents involved male children, struck by a reversing vehicle driven by a parent or friend, in the afternoon hours. Four-wheel drive and light commercial vehicles were responsible for 42% of all incidents, even though they accounted for only 30% of all registered vehicles in New South Wales at the time. A closer examination revealed that driveways not protected or separated by a fence or building from a child’s play area had three times the number of incidents compared to protected driveways (Holland et al., 2002).

A similar Adelaide study reported emergency department statistics on 35 pedestrian incidents involving one-year-old children and highlighted that 11 of the incidents (30%) involved a reversing vehicle, with the majority occurring in driveways and car parks (Moller & Kreisfeld, 1997).
The Commission for Children, Young People and Child Guardian (CCYPCG) in Queensland have reported that amongst children under the age of five years, four are killed and 81 present at hospital emergency departments following low-speed run-over events each year (Fenton et al., 2005). Similarly, Queensland Health have reported that between July 2000 and June 2006, 376 children under the age of five years were admitted to Queensland hospitals after a low speed run over incident. This equates to an average of 75.2 children per annum.

The Parliamentary Travelsafe Committee (2007) report, “Investigation into Child Deaths and Injuries From Low Speed Vehicle Run-Overs”, revealed that larger vehicles are more frequently involved in low speed run-overs than smaller cars. The table below shows that while cars and taxis accounted for 49% of run-over fatalities in Australia during 2000/01 to 2006/07, 4WDs, vans, trucks and farm machinery accounted for 51% of fatalities.

Table 1: Vehicles involved in run-over fatalities in Australia 2000/01 to 2006/07

<table>
<thead>
<tr>
<th>Vehicle type</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger car</td>
<td>23</td>
<td>45.1</td>
</tr>
<tr>
<td>Taxi</td>
<td>2</td>
<td>3.9</td>
</tr>
<tr>
<td>Other specified transport, including 4WD’s</td>
<td>13</td>
<td>25.5</td>
</tr>
<tr>
<td>Light transport/Pickup truck/Van</td>
<td>7</td>
<td>13.7</td>
</tr>
<tr>
<td>Heavy transport vehicle</td>
<td>2</td>
<td>3.9</td>
</tr>
<tr>
<td>Waste collection truck</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>Bobcat</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>Tractor</td>
<td>2</td>
<td>3.9</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Parliamentary Travelsafe Committee (2007)

4.3 Low Speed Vehicle Run-Overs of Young Children and Work-Related Drivers

Anecdotal evidence suggests that work-related vehicles visiting the home environments (e.g. delivery or home appliance repair) pose a potentially high risk situation due to the novelty of the vehicle for young children, unfamiliarity of the environment for the driver, competing demands for parents concentration at the time of visit, and type of vehicle involved. The issue is that parents, in certain circumstances, can also be a work-related driver. The coverage of work-related driving also includes parents as drivers when operating a company supplied vehicle.

Statistics of low speed vehicle run-overs of young children do not identify the frequency of work-related drivers involved in such incidents. However, examination of Table 1 reveals that a considerable percentage of low speed vehicle run-overs of young children could involve work-related drivers. For example, the ‘taxi’, ‘heavy transport vehicle’, ‘waste collection truck’, ‘bobcat’, and ‘tractor’ incidents could all be considered as work-related vehicles (total = 13.7%). In addition, a percentage of ‘light transport/pickup truck/van’ (generally used for work-related activities), ‘other specified transport, including 4WDs’ (used extensively as work-related vehicles in rural areas) and even ‘passenger cars’ (e.g. salary sacrifice vehicles) could also be considered as being used for work-related purposes. Therefore, work-related drivers could be a considerable high risk group in
relation to low speed vehicle run-overs of young children. The following section provides additional
evidence in relation to work-related drivers and low speed vehicle run-overs of young children.

4.4 Work-Related Drivers: A High Risk Road User Group

Within the literature, work-related drivers are commonly defined as those who drive at least once
per week for work-related purposes (Haworth et al., 2000). For example, these drivers include sales
people, tradesmen, couriers, and home and office machine repair technicians. Work-related drivers
also include senior executives and managers provided with salary sacrificed vehicles, those who
drive work-related vehicles both for work and non-work purposes, and those employed to drive
fleet cars, vans and other specialist vehicles (Dimmer & Parker, 1999).

In Australia, it is estimated that approximately a third of all travel is work-related and if commuting
is included in calculations, this estimation increases to over a half (Wheatley, 1997). Not
surprisingly, evaluations reveal that vehicle crashes comprise a substantial proportion of all work-
related fatality figures. For example, data from the Australian National Occupational Health and
Safety Commission (NOHSC) showed that approximately 26% of work-related fatalities (including
bystanders) between 1989 and 1992 were the result of road incidents (NOHSC, 1998). This figure
increases to 49% when commuting is included. In the state of Queensland, research has reported that
around 37% of all fatal vehicle crashes/incidents between the years 1997 and 2000 involved a
commercial vehicle (Meers, 2001). Workers compensation claims between the years 1996 and 2001
also showed that 203 claims were made for fatal work-related crashes/incidents, which represents
47% of all workplace fatal incidents for that period (Travelsafe, 2002).

4.5 Workplace Health and Safety Legislation

Arguably the most significant effect upon work-related driving has been the increasing focus on the
issue from a legal perspective within Australia. Under all Occupational Health and Safety (OHS)
acts in Australia, a vehicle used for the purpose of work is classified as a workplace under those
OHS acts. Therefore, employers must ensure safe and healthy workplaces (which include vehicles)
and conditions of work (duty of care). In addition, it is the responsibility of the employing
organisation to ensure their driving activities do not present a hazard to the community. While there
is a trend toward national standards regarding OHS processes, particularly crash investigation, the
responsibility of risk management policy and procedures related to work-related road safety
currently rests with the organisation in many instances. As a result, the quality and extent of policy
and procedure and countermeasure implementation related to work-related road safety between
organisations is variable.

A fleet safety system is a practical guide which aims to assist organisations to achieve best practice.
This is important because best practice in safety systems within organisations reflects a risk
management approach as a central feature of quality management and safety management principles
and practice (Anderson & Plowman, 1999). Furthermore, minimising risk impacts upon an
organisation’s operating costs and production efficiency, personnel health and safety, and in
potentially all cases, the community. There are five steps to the risk management process that are
required to be performed in order to discharge obligations under Workplace Health and Safety
legislation and ensure that workplace hazards are either eliminated or minimised (refer to section
4.7).

From the previously stated instances where work-related drivers pose a substantial risk to children,
especially in relation to low speed vehicle run-overs (previous section) the issue is potentially a
large problem for work-related organisations, government and the community. In respect to reducing or minimising the risk of low speed vehicle run-overs, the utilisation of risk management principles within organisations and the community, with support from government agencies could achieve a favourable result for all concerned.

Workplace Health and Safety Obligations
An organisation’s obligations and safety requirements are governed by the following legislative documents:

- *Workplace Health and Safety Act 1995*, which imposes obligations on people at workplaces to ensure workplace health and safety;
- *Workplace Health and Safety Regulation 2008*, which describes what must be done to prevent or control certain hazards which cause injury, illness or death; and
- Codes of practice, which are designed to give practical advice about ways to manage exposure to risks common to industry (e.g., Risk Management Code of Practice).

It is a requirement of the *Workplace Health and Safety Act 1995* that risks must be assessed and control measures then implemented and reviewed to prevent or minimise exposure to the risks. In addition, a vehicle used for the purpose of work is classified as a workplace under legislation covered within the *Workplace Health and Safety Act 1995*. Therefore, organisations and/or individuals have an obligation to manage the risks associated with the vehicle, vehicle use, drivers and members of the public.

If the regulation describes how to prevent or minimise a risk at a workplace the organisation and/or individual must do what the regulation says. If there is a code of practice that describes how to prevent or minimise a risk at a workplace then the organisation and/or individual must follow what the code says or adopt and follow another way that gives the same level of protection against the risk.

If there is no regulation or code of practice regarding a risk at a workplace organisations and/or individuals must choose an appropriate way to manage exposure to the risk. In addition, organisations and/or individuals should, where there is no regulation or code of practice about a risk, take reasonable precautions and exercise proper diligence against the risk.

4.6 Risk Management

A requirement to manage risks to workers’ and members of the public health and safety underpins the core Occupational Health and Safety legislation in all Australian states and territories. As governments have moved from prescriptive legislation towards performance-based provisions, undertaking the risk management process has become a principal requirement for all workplaces (Grammeno, 2006). Previously, employers were expected to comply with stringent rules and regulations, which specified exactly what they could and could not do with regard to workplace safety (i.e., minimum standards compliance). However, since Risk Management has become the dominant approach, employers have increasingly been given the power (and the duty) to identify their own workplace problems and find effective solutions to them (Grammeno, 2006).

Specific legislation for risk management
Under the *Workplace Health and Safety Act 1995*, to properly manage exposure to risks, a person must:
1. Look for the hazards
2. Determine who might be harmed and how
3. Decide on control measures
4. Put controls in place
5. Review the controls

Control measures should be implemented in the following order:

1. get rid of the harm or prevent the risk
2. if this is not possible:
   - replace with something less harmful
   - separate people from the harm
   - change work processes or the physical work environment, for example, by redesigning work, plant, equipment, components or premises
   - apply administrative arrangements, for example, limit entry or time spent in a hazardous area
   - use personal protective equipment

4.7 Risk Management: An Integral Safety Requirement

Risk management is recognised as an integral part of good management practice. It is an interactive process consisting of steps, which, when undertaken in sequence, enable continual improvement in decision making. Risk management is the term applied to a logical and systematic method of establishing the context, identifying, analysing, treating, monitoring and communicating risks associated with any activity, function or process in a way that will enable organisations to minimize losses and maximize opportunities. Risk management is as much about identifying opportunities as avoiding or mitigating losses (Standards Australia, 2004 [Australian/New Zealand Standard AS/NZS 4360:2004 – Risk management]).

All persons in the workplace have obligations under the Workplace Health and Safety Act 1995. To help meet these obligations the Workplace Health and Safety Act, Regulations, Advisory Standards and industry codes of practice have been made. These documents provide information about how to identify a variety of workplace hazards and how to manage exposure to the risks associated with these hazards.

The Risk Management Code of Practice 2007 outlines a five-step process that assists in the identification and management of health and safety problems. In order to manage risks some definitions are required. For example, hazards and risks are not the same thing. A hazard is something with the potential to cause harm. This can include chemical substances, plant, work process and/or other aspects of the work environment. Risk is the likelihood that illness, injury or even death might result because of the hazard.
**Step 1: Identifying the hazards**
The first step in the risk management process is to identify any possible hazards. In the workplace this is done by dividing the workplace into obvious groupings by tasks and examining all possible hazards that could occur. The process would be the same for domestic environments and other places where children may be present.

**Step 2: Assessing the risks**
The second step in the risk management process involves assessing the risk associated with the hazards identified in Step 1. What is required at this step is a prioritised list of risks for further action. In a domestic driveway or environment where young children may be present this would mean deciding what risk controls and priority of control implementation would be most effective in reducing the risk of low speed vehicle run-overs of young children.

**Step 3: Deciding upon Control Measures**
The third step of the risk management process is involved with deciding upon control measures to use in order to manage exposure to the identified risks. Within Workplace Health and Safety controls for the elimination or reduction in risk are determined by the “Hierarchy of Control Measures”.

Eliminate the hazard is the first choice. The ideal solution is to get rid of the hazard completely. This is the most effective control measure and should always be considered first. If the hazard cannot be eliminated completely the following control options that can be used to prevent or minimise exposure to the risk:
- **Substituting** a less hazardous material, process or equipment;
- **Redesigning** the equipment or work process;
- **Isolating** the hazard through engineering – separating the worker or bystander from the hazard;
- **Administrative** controls involve minimising exposure to a risk through the use of procedures or instruction; or
- **Personal Protective Equipment (PPE)** is used as a last resort when exposure to risk is not or cannot be minimised by other means. PPE is worn by people as a final barrier between themselves and the hazard. This measure does not control the hazard at the source but relies on behaviour modification for its success. The success of this control is dependent upon the correct PPE being chosen, worn correctly, used correctly and maintained in good condition.

Administration and the use of personal protective equipment are the lowest priority on the list of controls. These controls should not be relied on as the primary means of risk control until the options higher in the control priorities have been exhausted. These controls require management, enforcement, and commitment, together with behavioural modification.

The first and foremost step is to try and eliminate the hazard. If it is not possible to eliminate the hazard, then the next step is to prevent or minimise exposure to the risk. This step would involve the organisation deciding on what actions could be taken by them or the driver that would minimise the risk of children being run-over.

**Step 4: Implementation of control measures**
The fourth step involves implementing selected control measures. This is the action phase where the organisation and the driver (staff) make either behavioural, vehicle or environmental changes (or a combination of changes) within the context of domestic residences or other places where children may be present.

**Step 5: Monitoring and reviewing the effectiveness of measures**
The fifth and final step is to monitor and review the effectiveness of the measures. Essentially this step would involve organisations conducting regular risk assessments and reviews of safety systems for domestic environments or places where children may be present.

### 4.8 Management of Safety Risks

Management of workplace health and safety and environmental risks is currently seen to be a critical component of the risk management activities of any business. There are specific controls that must be implemented for dealing with specific safety issues. At the specific workplace level, a safety risk control may be some device, procedure, function of design, personal protective equipment, etc., that ensures that a specific safety risk is minimised. At the broader level, a safety management system provides the basis for ensuring the overall management of safety risks. There are five key principles for health and safety management systems. These principles are:

- Occupational Health and Safety Policy
- Planning;
- Implementation;
- Measurement and Evaluation; and
The completion and formal adoption of a policy is the foundation and should be integrated into the existing safety system by modifying and augmenting existing policies, procedures, people and performance issues to incorporate occupational road/vehicle-related risk (RoSPA, 2003). Assessment of the risk focuses on classifying the various driving tasks within the organisation, looking at risk factors associated with journeys, vehicles and drivers to ascertain whether existing safety measures are adequate or whether more needs to be done, enabling problems to be prioritised for attention. Having identified and prioritised the risk factors, a list of objective action plans can be developed to reduce risk at its source, addressing factors such as: vehicle selection and maintenance issues; work travel procedures; and driver selection and competence, etc.

Monitoring and measuring performance brings together the various pieces of data to compare and contrast pre and post intervention performance (RoSPA, 2003). The essence is to assess how performance compares with previous periods, and against previously set targets. This information management phase provides measures to enable managers to manage more proactive interventions and to consider a range of supporting options to optimise effectiveness. Relevant data should be collected using methods which include proactive monitoring (sampling journey type, length and time; checking licences; driver assessment and training records; and vehicle checklists) and reactive monitoring (incident reports and incident investigation reports). Having assessed the system’s effectiveness and made any revisions to procedures, it is vital to review the process, including performance indicators to assess progress towards targets (RoSPA, 2003). Management can prepare performance reports to spread good practice and recommend practical variations leading to continuous improvement in the culture, policies, practices and performance of the organisation.

4.9 Role of Behaviour Change in Injury Prevention

Within the behaviour change literature, there are a number of theoretical models that have been developed which can aid in understanding key factors associated with the antecedents of behavioural change. Previously, the limited success of behaviour change efforts in modifying injury-related behaviours can be traced, in part, to failure to fully understand the determinants of the behaviours and a failure to properly apply health behaviour theory to the development and implementation of effective intervention strategies (Gielen & Sleet, 2003). Theory has been described as a set of interrelated propositions including concepts that describe, explain or predict a phenomenon (Glantz et al., 1997). In this instance, the phenomenon of interest is human behaviour, specifically injury-related behaviour, such as risk behaviour and safety practices. Theories are important not simply because they assist in the understanding of the causes of problems, but because they enable the identification of the mechanisms of change, determination why programs succeed or fail, and perhaps most importantly, guide the development of better prevention strategies (Gielen & Sleet, 2003). Selection of the most appropriate theory is situation-specific and depends on the specific audience, the setting and the characteristics of the behaviour to be changed. A thorough discussion of all the different types of behaviour change theories and models are beyond the scope of this project. However, a brief description of those theories which have been widely applied to injury prevention in road safety, pedestrian/child safety and more specifically work-related road safety have been included below:

Health Belief Model
The health belief model (Becker, 1974) states that preventative behaviours are a function of individual’s beliefs about their susceptibility to the health/injury problem, the severity of the health/injury problem and the benefits versus costs of adopting the preventative behaviour, as well as, whether people experience a cue to action (Janz & Becker, 1984). In recent years, the concept of self-efficacy was added to the model. Self-efficacy, a concept originally taken from Bandura’s work
is one’s confidence in one’s ability to perform a specific behaviour. An illustration of the application of this model in injury prevention comes from Peterson et al.’s (1990) study of the beliefs and safety practices related to predictions about how parents’ attitudes would influence their injury prevention teaching and environmental modifications. Within this study, the health belief constructs most strongly associated with parental safety efforts were beliefs that their actions would be effective (i.e., benefits), a realistic appraisal of the costs of action (i.e., costs), and feeling knowledgeable about and competent to perform the behaviours (i.e., efficacy). Results from the study were used to target educational messages and strategies toward those variables associated with the desired behavioural outcomes.

Theory of reasoned action
The theory of reasoned action characterises behaviour as a function of behavioural intention, subjective norms, and attitudes (Fishbein & Ajzen, 1975). The model says that people’s intention to perform a behaviour predicts their actual behaviour. Intention is a function of attitudes and subjective norms. Attitudes are derived from measures of beliefs about the consequences of the behaviour in question and the relative importance of these consequences to the individual. Subjective norms are derived from measures of beliefs about significant others’ preferences and the individual’s motivation to comply with their wishes. Ajzen (1991) later modified the theory of reasoned action, calling the modified version the theory of planned behaviour, and included the concept of perceived behavioural control, which reflects how easy or difficult the individual perceives the behaviour to be.

Theory of Planned Behaviour
One social psychology model proposed to understand volitional and non-volitional human behaviour is the theory of planned behaviour (TPB [Ajzen, 1985; 1988]). In short, according to the theory the best predictor of a person’s behaviour is their intention to perform the behaviour. This includes their intentions to commit violations, and their intention to perform safe behaviours that would avoid making errors. These behavioural intentions are determined by three preceding factors: the person’s attitude towards the behaviour (e.g., whether the driver believes the behaviour to lead to good outcomes); their subjective norms (their beliefs about the attitudes and behaviours of socially relevant others); and their perceived behavioural control (the degree to which they feel they can personally influence the behaviour in question). Perceived behavioural control can also directly influence the behavior (Poulter et al., 2008). If no opportunity is available to perform the behaviour, then a person’s attitude, subjective norm, and intentions are rendered irrelevant. Therefore, if one is interested in understanding why drivers do or do not engage in risky behaviour, previous research shows that psychological antecedents of behaviour are good predictors of actual behaviour (Poulter et al., 2008). As a consequence one can develop a greater understanding of behaviour by measuring drivers’ attitudes towards a behaviour, their perception of the social pressure associated with the behaviour, and the level of confidence they have in controlling that behaviour.

Applied behavioural analysis
The term "applied behavioural analysis" identifies a specific subfield within psychology that uses the technology of behaviour modification and operant conditioning to facilitate change. Behaviour is viewed as learned, and principles of stimulus control, feedback, reinforcement, and punishment shape the acquisition, maintenance, and extinction of behaviour (Hovell et al., 1986). Applied behavioural analysis seeks to understand and modify behaviour by addressing the "ABCs" of behaviour (antecedents, behaviour, and consequences). For example, in studying drinking and driving behaviour, behaviourists are interested in analysing: 1) antecedents to the behaviour, such as cues in the environment, social pressure exerted by friends, or the practice of driving alone to a social function; 2) the behaviour itself, such as frequency of drinking, size of the typical drink
consumed, and amount of time between drinking and driving; and 3) the consequences that follow the behaviour (both positive and negative), such as social attention or punishment for drinking and driving (Geller et al., 1991).

Understanding the ABCs that control a behaviour can help the behaviourist intervene by shaping behaviour and the environment to yield change. For example, removing roadside billboards that remind drivers of drinking, increasing the number of prompts and cues in the drinking environment that discourage drinking and driving, and encouraging the selection of a designated driver can be used to modify the antecedents. Slowing the rate of alcohol consumption, enhancing patron refusal skills, promoting server intervention in the drinking environment, and obtaining feedback from blood alcohol consumption meters can be used to modify the behaviour. Social and peer support for not drinking and driving, positive feedback from bartenders or friends, and punishment for being caught drinking and driving can be used to modify consequences (Geller et al., 1991; Sleet & Lonero, 2002). This behavioural safety approach also has a strong history of use and success in promoting occupational health and safety (Margolis & Kroes, 1975), and it has been successfully applied to increase the use of personal protective devices such as hard hats and ear protection, to reduce injuries on the job, and to increase worker productivity and morale (Geller, 1998; Krause et al., 1990).

Stages of change model
The stages of change model is a relatively newer model of behaviour change. It is also called the transtheoretical model, because it incorporates constructs from several other theoretical models (Prochaska & DiClemente, 1983). This model is distinguished from the previous ones because it conceptualises behaviour change as a dynamic process rather than a static process, acknowledging that people differ in their readiness to change a behaviour, and that changes occur in discrete steps over time. There are typically five stages in this model: 1) precontemplative - not thinking about changing; 2) contemplative - aware and thinking about changing; 3) preparation - taking steps necessary for changing; 4) action - making the change for a short period of time; and 5) maintenance - successfully maintaining the change in behaviour, usually measured as maintaining the change for 6 months or longer. This model includes the possibility of relapse to earlier stages, noting that maintained behaviour change often occurs after a cyclical process of progressing and relapsing. The most obvious example of the utility of the stages of change model is the experience of many smokers who are trying to quit; and in fact, this model was developed from studies of how smokers stopped smoking on their own. The stages of change model has been applied to organisational change in the areas of ergonomics and health promotion (Haslam, 2002; Prochaska et al., 2001). In addition, a case study of health and safety appraisal within a manufacturing company identified that the stages of change model provided a constructive framework for assessing attitudes and beliefs and assisting in recognising individual and organisational readiness to change (Barrett et al., 2005). Furthermore, the stages of change model have also been utilised as a framework for understanding worker road safety behaviour change, readiness to engage in work-related road safety behaviour change and utilising the stages of change framework to tailor interventions that most effectively meet all stakeholder needs (Banks et al., 2007). The point of knowing what stage an individual is in with regard to a desired outcome is that it allows the interventionist to select and apply the most appropriate, stage-matched intervention. For example, to assist someone in moving from precontemplation to contemplation, strategies for raising awareness are recommended (e.g., distribution of information). Helping a person move from contemplation to the stages of preparation and action requires identifying and facilitating skills and access to the necessary resources.

The current research proposes to use (if supported by the field research) the constructs described above and more specifically the stages of change theory and Risk Management process (described
previously) as a basis for identifying organisational and behaviour change interventions. Firstly, to meet Occupational Health and Safety legislation requirements, organisations are required to utilise the risk management model to control their safety risks and the model provides a process which enables accurate identification of all potential risks, including behaviour, environment, work processes and equipment. Secondly, the stages of change model assists the identification of interventions relevant to driver behaviour and their readiness to change.

4.10 Intervention Strategies and Initiatives

4.10.1 Previous Occupational Road Safety Intervention Research

A variety of occupational road safety initiatives have been implemented to reduce the above work-related driving risks previously, although existing initiatives employed by organisations to reduce crashes typically focus on fleet safety policies and procedures, driver training, driver education and incentives (Haworth et al., 2000; Lancaster & Ward, 2000; Murray et al., 2003). Despite the importance of these initiatives, there is little systematic research investigating their effectiveness. Historically, Australian organisations have implemented road safety strategies or interventions directed toward human error and violations. Furthermore, typical work-related driving intervention strategies have involved some form of driver training, often based on improving driver skills and not targeting driver behaviours (Davey et al., 2008). However, previous researchers (e.g., Wishart & Davey, 2004) have suggested that skills-based driver training, especially when implemented as a “one off or silver bullet” strategy, does not effectively change the driving behaviour nor reduce crash and offence involvement of professional drivers. However, there is evidence to suggest that driver training and education has been found to be associated with decreased crash risk (Gregersen, Brehmer, & Moren, 1996), improved audit ratings of work-related traffic risk management (Salminen, 2008) and enhanced overall driving ability (Llaneras, Swezey, Brock, Rogers & Van Cott, 1998).

Other initiatives developed to improve occupational road safety have included group discussions (Gregersen et al., 1996; Ludwig & Geller, 1991; Salminen, 2008); safety awareness and information campaigns (Gregersen et al., 1996; Scheltema, Brost, Skager, & Roberts, 2002), group goal setting (Ludwig & Geller, 1997; Ludwig, Geller, & Clarke, 1999), performance feedback (Ludwig, Biggs, Wagner, & Geller, 2001; Ludwig et al., 1999; Olson & Austin, 2001), self-monitoring forms (Olson & Austin, 2001), safety pledge cards (Ludwig & Geller, 1991; Scheltema et al., 2002) and safety reminders (Ludwig & Geller, 1991). Interestingly, group discussions were found to be associated with a significant decrease in both crash risk and crash cost (Gregersen et al., 1996). In relation to crash cost reduction, group discussions reduced crash costs significantly compared to the other study conditions including driver training, campaigns, rewards and control group. In contrast, a number of intervention studies reported initial improvement in driver behaviour or crash risk but improvements were not maintained, including safety awareness and information campaigns and safety pledge cards (Scheltema et al., 2002).

4.10.2 Previous Intervention Strategies Targeting Low Speed Vehicle Run-Overs

Regardless of the situation, environment or relationship between the driver and the child, there is a highlighted necessity of being aware of the whereabouts of children before moving a vehicle (Davey et al., 2007). Previous research has suggested that intervention strategies and initiatives should incorporate a holistic approach and involve addressing the driveway environment, the driver and vehicle, as well as the appropriate supervision of children (Davey et al., 2007; Murphy et al., 2002; Neeman et al., 2002). Recommendations for intervention strategies and initiatives can be
divided into three distinct categories: environmental modification; vehicle modification; and behavioural modification.

Environmental modification is primarily related to changes to the home environment or other areas where low speed manoeuvring or reversing is required. For example, fencing off driveways or providing other physical barriers to prevent children from entering where vehicles are driven (Henderson, 2000; Holland et al., 2000; Murphy, et al., 2002; Roberts et al., 1995). Although this method may be the most effective technique (Hockey et al., 2003), the erection of driveway fences and other barriers may not be practical (Henderson, 2002) and would incur a substantial cost (Davey et al., 2007; Henderson, 2002). Therefore, for families that may be perceived at most risk, such as lower socio-economic status families, this method is not economically practical (Henderson, 2002).

There have been many suggestions regarding vehicle modifications to improve visibility and also sensory modification to alert the driver before hitting an object (or child) or alert the pedestrian that the vehicle is reversing. For example, vehicle modifications suggested include extended mirrors for high risk vehicles (e.g., 4WD) (Davey et al., 2007), wide-angle lenses that adhere to the rear window of a vehicle to increase rear visibility (Paine & Henderson, 2001); proximity sensors (Paine & Henderson, 2001; Parliamentary Travelsafe Committee, 2007), reversing cameras (Paine & Henderson, 2001; Parliamentary Travelsafe Committee, 2007), and back-up warning systems (emits a beeping sound) (Sapien et al, 2003). While there are many benefits to having additional vehicle modifications, there are also problems related to the effectiveness of some of the technologies. For example, the effectiveness of proximity detectors decreases with both the increasing speed of the vehicle and the greater distance between the vehicle and the child (Paine & Henderson, 2001). In addition, it has been argued that a proximity detector would not suffice as a stand-alone measure, and that rather a combination of proximity and visual aids (e.g., video camera) is required (Neeman et al., 2002; Paine & Henderson, 2001).

Previous research has suggested that the risk factor most open to direct modification is “preventable behaviour” (Henderson, 2002). Primarily, behaviour-based intervention strategies include public communication and education campaigns (Henderson, 2002; Murdoch, 2008; Silen et al., 1999), education campaigns specifically targeting parents (Henderson, 2002; Holland et al., 2002; Nadler et al., 2001; Williamson et al., 2002) and targeted messages, such as, advertising, posters, stickers and messages strategically included on relevant equipment/notice boards (e.g., baby capsule hire services, mother’s groups, early childhood centres and other community organisations) (Murdoch, 2008).

4.11 Section 4 Summary

A review of the literature could not identify any research regarding work-related road safety interventions or strategies that were implemented to reduce the risk of low speed manoeuvring and/or reversing type incident injuries. The author’s surmise that the current research may be the first research project specifically targeting work-related drivers and industry organisations with reference to low speed vehicle incidents involving young children. However, the literature did identify that there is a considerable risk of low speed vehicle run-overs of young children, especially in residential areas, and that occupational drivers who attend these areas for work purposes may therefore be considered a high risk group.
5. Field Research Data Analysis and Results

5.1 Stage 1 - Focus Group Discussions

This section provides an overview of the issues identified from the focus group discussions conducted with participants from five industry organisations and a cohort of domestic/commercial tradesmen. All participants were male which indicated a typical representation of the various industries utilised within this research where the majority of self-employed workers are male. All participants volunteered to participate within this research project and are all located within the South East Queensland region. Questions asked within each of the focus groups are listed in Appendix A. A list of the organisation and participant numbers are as followed:

- Organisation A: Regional Taxi Company (n = 8);
- Organisation B: Home Office/Business Machine Maintenance, Installation and Repair (n = 5);
- Organisation C: Home Insulation Installation (n = 4);
- Organisation D: Home Appliance/White Goods Repair (n = 7);
- Organisation E: Water Supply, Maintenance and Water Meter Readers (n = 9); and
- Domestic/Commercial tradesmen/contractors (n = 18).

5.1.1 Significance of the Issue

Most participants suggested that low speed manoeuvring and reversing type incidents were a significant issue for their respective organisations. This statement was provided based on their knowledge that reversing type incidents were a prominent type of incident within their organisations. Participants from the water supply, maintenance and water meter readers organisation (Organisation E) identified that their organisation included safe reversing procedures in one of their fortnightly works meetings and also sent out a safety alert regarding reversing of vehicles. This was provided in response to an incident involving one driver who reversed into a pram. However, it was also noted that the child/baby was not in the pram at the time. The driver of the vehicle was not one of the participants in this study. Some of the domestic/commercial tradesmen stated that they have had a few incidents when reversing but did not think much of it because the incidents only resulted in minor vehicle and/or property damage. Participants were not aware of any low speed vehicle run-overs of young children within their organisations. However, some noted a few near misses involving young children and animals. Some of these incidents are described in following sections. A male home office/business machine repairer stated that he was involved in a near miss with a child in a shopping centre:

Reversing out of car parks in shopping centres can be scary, especially when its school holiday time... kids don’t think they just run behind vehicles without looking. I almost hit a child, he was running ahead of his mother to get to the centre and I didn’t see him till he was behind me. Fortunately, I stopped in time...you have to keep your wits about you.

Table 2 below shows the percentage of work conducted in areas where children may be present. The figures are approximate only for each of the organisations/groups and consensus was provided by the participants within the group interviews/focus groups. Participants stated that the remaining percentage (for each organisation/group) was identified for locations where children were not generally present.
Table 2: Percentage of Work Where Children May Be Present

<table>
<thead>
<tr>
<th>Organisation/Group</th>
<th>Domestic Residences</th>
<th>Other (schools, shopping centres, etc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxi Company</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Business Machine Repair</td>
<td>25%</td>
<td>40%</td>
</tr>
<tr>
<td>Insulation Installers</td>
<td>90%</td>
<td>5%</td>
</tr>
<tr>
<td>White Goods Repair</td>
<td>70%</td>
<td>15%</td>
</tr>
<tr>
<td>Water supply/maintenance, meter readers</td>
<td>30%</td>
<td>25%</td>
</tr>
<tr>
<td>Domestic/Commercial Tradesmen</td>
<td>50%</td>
<td>25%</td>
</tr>
</tbody>
</table>

5.1.2 Personal Performance

Generally, most participants stated that they only utilise their vehicle’s rear vision mirrors when reversing. They further stated that they perform this function most times when reversing. However, it was further noted that the rear visibility from many vehicles utilised for the purpose of their work was poor. One male participant stated:

*I find it difficult to see when reversing ...it is because of all the equipment we need to carry and there is always that blind spot where you just can’t see.*

Approximately eight percent of participants (n = 4) stated that they walk around behind their vehicle and check the rear direction of the vehicle before reversing. For two of the participants, this procedure was performed only after they were involved in an incident whilst reversing. One male home insulation installer stated:

*On completion of a job at a private residence, I was in a hurry, turned on the vehicle and started reversing straight away... the owners dog was in the shade of my vehicle’s tray and I ran over it which resulted in the dog eventually dying...it could have been one of their kids...now no matter how busy I am I check behind the vehicle before reversing.*

Some drivers (n = 7) stated that sometimes when they were under time pressure from their management and clients, they reversed their vehicle without even checking their vehicles rear vision mirrors. For example, one male taxi driver stated:

*...the call centre had doubled up on fares and was on my back about how long I would be till I got to my next client...rushing I just started to reverse once the passenger was in the taxi.*

In addition, a male plumbing sub-contractor (tradesman) stated:

*I went home to collect some pipe fittings I needed for a job and I was in a hurry to drop the fittings off to my guys (casual employees) so they could finish the job and get to the next one ...I started to reverse when my neighbour yelled out to me to stop. It turned out that my son was playing with the vice mounted on the back of the tray on my ute, which he often did...I didn’t even look and if it wasn’t for Frank (his neighbour) I would have run over him.*
5.1.3 Difficulties When Manoeuvring or Reversing Vehicles

Participants identified the following factors that contribute to the difficulty and their ability to drive safely when low speed manoeuvring and reversing a work vehicle:

- Rear visibility;
- Vehicle type;
- Time/work pressure;
- Third party/pedestrians, etc;
- Inattention/distraction; and
- Alcohol/drugs.

The most frequent response was rear visibility due primarily to the type of vehicle used for the purpose of work and/or loads (including equipment and materials). Approximately 92% of participants suggested that they have had some difficulty reversing safely due to poor rear visibility. For example one male white goods repairer stated:

*I drive a van which is usually loaded with equipment and spare parts...when reversing you can only use your mirrors because you can’t see out the back window and there are no side windows or glass.*

As mentioned previously, time or work pressure was also a relatively frequent response indicating that workers either perceive they need to rush or organisations are pushing them to complete as much work as possible and meet client needs. For example a male business machine repairer stated:

*We are required to at least six calls or jobs a day... if you get stuck on a problem machine you fall behind, so we make up time driving... sometimes when rushed you don’t check (with reference to reversing and parking) as well as you should.*

Seven participants (13.7%) suggested that other drivers and pedestrians (including young children) were also an issue whilst low speed manoeuvring or reversing. For example, a male electrical contractor (tradesman) stated:

*People don’t watch where they are walking...you can have a reversing beeper but they still walk behind you.*

In addition, a plasterer (tradesman) suggested:

*Parents don’t look after their kids, some are left to run wild, they muck around with your gear, they play around your truck, its dangerous...and when you say something to them the parent gets stroppy.*

Some participants suggested that inattention and distraction contribute to some low speed manoeuvring and reversing type incidents. They identified inattention due to work pressure, mobile phone use, passengers talking, listening to the radio/CD player, watching pedestrians (reference to watching women walking past), eating a meal or drink and inattention due to fatigue. Alarmingly, a few domestic/commercial tradesmen (n = 3) admitted being under the influence alcohol or drugs when they have had an incident or near miss (e.g., parking lot, home residence) when low speed manoeuvring and reversing. For example, one male carpenter stated:
On a Friday afternoon after work on site me and a few of the guys had a few drinks (indicating alcoholic drinks)… a client rang regarding her quote so I told her I would drop it off on my way home…I felt OK but I was probably over the limit…at the client’s house I gave her the quote and talked it over with her, and when leaving I did not realise her two girls were playing behind and to the passenger side of the truck... I got in selected reverse and she yelled at her two girls to get out of the way...I didn’t know they were even there, scary!

Alarmingly, a number of domestic/commercial tradesmen (or contractors) identified drug use, especially drug driving, as a potentially serious issue. Further discussion revealed that drug use while working (including driving) was prevalent within the industry, especially among younger tradesmen. For example, one male carpenter suggested:

I know of a lot of tradies who are working while under the influence of drugs. No one really says anything ... as long as the work gets done. When you smoke a fair bit (reference to smoking cannabis) you can hide the effects pretty well, no one questions you and during work hours there isn’t really any police about where we work.

In addition, a painter stated:

I don’t take drugs at work ... my boss is too clued up to it and it would mean me losing my job. But I often have a joint driving home. I’m usually on my way home at about 3 in the afternoon so the traffic isn’t so bad at that time.

Interestingly, most tradesmen/contractors indicated that they were aware of drug use within the industry, whether personally or by word of mouth. Unfortunately, drivers under the influence of drugs pose a substantial risk not only to young children at domestic residences where they are performing work, but also to their own children (or children in their own neighbourhood) when returning home. This issue requires further research to ascertain the seriousness and extent of this serious safety issue within the contractor/self-employed worker industry.

When asked “how do you think the difficulties associated with low speed manoeuvring and reversing could be addressed?” participants identified:

- Being more vigilant when reversing;
- Checking behind your vehicle thoroughly before reversing;
- Physically checking behind the vehicle, e.g., walk behind and check;
- Not feel like you have to rush;
- Load equipment in vehicle allowing rear view visibility;
- Fit reversing indicators and/or cameras; and
- Not drive while under the influence of alcohol or any drugs and more enforcement on and off the job site.

5.1.4 Awareness Information

Most participants stated that they were unaware of any information provided by their organisation in relation to low speed manoeuvring or reversing. However, as stated previously and within section 5.2, Organisational Records, Documentation and Initiatives, Organisation E: Water Supply, Maintenance and Water Meter Readers did provide information in response to a potentially dangerous incident. Information was provided in relation to safe reversing procedures and communicated to all field staff within one of their fortnightly works meetings. In addition, they sent
an email safety alert to all staff with specific information on safe reversing procedures. The safety alert recommended that drivers thoroughly check their rear view mirrors and behind their vehicles (if inadequate rear visibility) before reversing. In relation to the safety alert, a few participants (n = 3) stated that although they received the email safety alert, they did not read it thoroughly. All three participants stated that they were too busy to read all emails sent to them. For example, one male driver stated:

*I’m too busy to read all the emails we get...matter of fact I don’t read many at all...if we read all the emails, sometimes a dozen plus a day we wouldn’t get any work done and I’m not reading them in my own time.*

5.1.5 Organisational Initiatives or Intervention Strategies

All participants within the structured group discussions/focus groups stated that they have not received any education, training or induction relating to low speed manoeuvring or reversing. The only initiative (stated previously) provided by any organisation was by Organisation E (i.e., works meeting information and email safety alert).

5.1.6 Risk Reduction

When asked what could be done organisationally and personally to reduce the risk of low speed manoeuvring and reversing incidents (including run-overs of young children), participants suggested:

Organisationally:
- Provide information and awareness to all staff relating to safe procedures and identification of potential risks;
- Provide more suitable and safe vehicles;
- Change work processes and reduce time pressure placed on staff;
- Install reversing cameras;
- Training and education; and
- Develop safe work procedures when working in domestic situations.

Personally (participants suggested the same risk reduction methods as per those identified in question 3 Difficulties When Manoeuvring or Reversing Vehicles):
- Being more vigilant when reversing;
- Checking behind your vehicle thoroughly before reversing;
- Physically checking behind the vehicle, e.g., walk behind and check;
- Not feel like you have to rush;
- Load equipment in vehicle allowing rear view visibility;
- Fit reversing indicators and/or cameras; and
- Not drive while under the influence of alcohol or any drugs.

5.1.7 Stage 1 Results Summary

Stage 1 results revealed some interesting and alarming findings. Most participants suggested that low speed manoeuvring and reversing type incidents were a significant issue for their respective organisations, especially when working in domestic residential areas. The most common reported contributing factors to low speed incidents or near misses included rear visibility when reversing,
the type of vehicle, time/work pressure, third party/pedestrians, inattention/distraction and drug/alcohol use. Alarmingly, drug use was identified as a serious problem, especially amongst contractors and/or self-employed tradesmen. It was suggested that further research should be conducted to ascertain the prevalence of drug use and drug driving in this area. In addition, most participants stated that they were unaware of any intervention strategies or information provided by their organisation in relation to low speed manoeuvring or reversing.

5.2 Stage 2 - Organisational Records, Documentation and Initiatives

This section provides a summary of the review of organisational records, documentation and initiatives within each of the five organisations who volunteered to participate in this research project. For the purposes of this report, the identities of each organisation are illustrated below:

- Organisation A: Regional Taxi Company;
- Organisation B: Home Office/Business Machine Maintenance, Installation and Repair;
- Organisation C: Home Insulation Installation;
- Organisation D: Home Appliance/White Goods Repair; and

Overall, the review of organisational records, documentation and initiatives revealed a lack of specific organisational processes in relation to low speed vehicle manoeuvring and reversing.

5.2.1 Policy and Procedures

Alarmingly, only Organisation E had developed a Driver Safety Standard (Policy and Procedures). However, within the document there was no mention of safe procedures regarding reversing and low speed manoeuvring. Both Organisations A and E had developed Risk Management policy and procedures which described the process for developing work-related risk assessments. However, there was no policy/procedure to develop risk assessments for work-related driving risks.

5.2.2 Risk Management Plans and Assessments

No organisations have developed risk management plans or risk assessments in relation to reversing/low speed manoeuvring nor working/driving in areas where young children may be present (e.g., driveways, schools, shopping centres, etc). Organisation E does develop and communicate risk assessments for driver related safety in relation to journey planning and fatigue. However, no risk assessments are planned or developed for risks associated with work locations, specifically those areas which pose a risk to pedestrians and young children.

5.2.3 Incident Records

Interestingly, reversing type incidents were identified in the top three incident types for all five organisations. The other two incident types which figured highly included “rear end” type incidents and “damage whilst parked”. Crash data was provided for the previous 12 months (September 2008 to September 2009). Due to erroneous and limited crash/incident records, only the previous year of crash data (or incident forms) could be provided by all five organisations. The table below shows the percentage of each of the top three incident types for each of the organisations:
Table 3: Top Three Incident Types for the Five Participant Organisations

<table>
<thead>
<tr>
<th>Organisation</th>
<th>1st No. of Incidents</th>
<th>2nd No. of Incidents</th>
<th>3rd No. of Incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisation A</td>
<td>Reversing (24%)</td>
<td>DWP (20%)</td>
<td>Rear End (15%)</td>
</tr>
<tr>
<td>Organisation B</td>
<td>Rear End (32%)</td>
<td>DWP (21%)</td>
<td>Reversing (17%)</td>
</tr>
<tr>
<td>Organisation C</td>
<td>Rear End (27%)</td>
<td>Reversing (22%)</td>
<td>DWP (15%)</td>
</tr>
<tr>
<td>Organisation D</td>
<td>Reversing (25%)</td>
<td>Rear End (23%)</td>
<td>DWP (19%)</td>
</tr>
<tr>
<td>Organisation E</td>
<td>Reversing (28%)</td>
<td>Rear End (23%)</td>
<td>DWP (12%)</td>
</tr>
</tbody>
</table>

*DWP = Damage Whilst Parked

Most stated rear end type incidents recorded included both those caused by employees of the organisation as well as those caused by a third party. However, the rear end type incidents recorded for Organisation A included only those incidents caused by the organisation’s employees. Although rear end type incidents are frequently recorded in organisational crash data (whether organisational driver or third party at fault), low speed vehicle incidents, such as, reversing type incidents, figure prominently within each organisation’s crash data. Many low speed vehicle run-overs of young children have resulted from reversing vehicles (Davey et al., 2007; Murdoch, 2008). It is noteworthy that none of the organisations performed any analysis of their crash data with a view to identify any trends or contributing factors of the incidents/crashes. In addition, only Organisation E recorded near misses within their data. Four near misses, when reversing, were recorded by Organisation E with rear visibility the major contributing factor. One potentially dangerous event recorded by Organisation E involved a driver reversing his vehicle into a pram crushing it between his vehicle and the pram owner’s vehicle. The child was being secured in the vehicle and was not in the pram. The contributing factors of this incident included:

- Visibility – incident occurred in an underground car park with poor lighting;
- Visibility – there was limited rear visibility from within the driver’s vehicle due to the load and height of his vehicle (e.g., four wheel drive);
- Driver was under time pressure to get to his next call/job; and
- Driver was distracted – he was talking to the contact for his next call/job (on his hands free mobile) providing an estimated time of arrival.

5.2.4 Previous Organisational Road Safety Intervention Strategies and Initiatives

Generally, no substantial intervention strategies or initiatives were conducted by the organisations in relation to low speed manoeuvring or reversing. Organisations B, C and E have previously provided driver training for all field type staff. However, the training provided was only skills-based training and did not contain any relevance towards low speed manoeuvring and reversing. Due to the incident involving the pram (described above) and a number of recent reversing incidents, Organisation E did communicate the importance of safety whilst reversing by including it in their next fortnightly works meeting and also via an email safety alert, the day after the incident occurred where the driver reversed into the pram.

5.2.5 Stage 2 Results Summary

Stage 2 results revealed a lack of organisational documentation, processes and practices relating to low speed vehicle manoeuvring and reversing, especially in areas where young children may be present. This result is consistent with previous research identifying a lack of organisational commitment in the development, implementation, consultation and communication of relevant work-related road safety policy, procedures and practices (Wishart et al., 2010). Not only does this not meet occupational health and safety legislative requirements, it doesn’t assist or provide the
supporting mechanisms for intervention or countermeasure development and implementation. Interestingly, reversing type incidents were identified in the top three incident types for all five organisations indicating that low speed vehicle incidents are a potential risk to young children where workers are performing tasks and driving in high risk areas (e.g., domestic residences, schools, shopping centres, etc). For example, one potentially dangerous event recorded in an organisation’s crash data involved a driver reversing his vehicle into a pram crushing it between his vehicle and the pram owner’s vehicle. Although the child was being secured in the vehicle and was not in the pram at the time of the incident this event could have been catastrophic. In addition, no organisation recorded conducting any proactive intervention strategies or initiatives relating specifically to low speed vehicle manoeuvring or reversing. Three organisations did provide some skills-based driver training, however this training did not have a component addressing low speed manoeuvring or reversing.

6. CARRS-Q Industry Fleet Safety Research Data – Stage 3

6.1 Source of Data

The data for this project was taken from three organisational work-related driving surveys obtained from previous CARRS-Q occupational road safety projects. Within the scope of this exploratory research, data derived from recent quantitative research conducted by CARRS-Q was used to gain a wider interpretation of the issue. Although the survey data utilised does not include the participants and organisations acknowledged in stages 1 and 2, this additional data collection stage endeavoured to explore the prevalence and risks related to low speed and reversing type incidents and associated driver behaviour. A total of 6,907 surveys from previous CARRS-Q industry research projects involving three large Australian industry organisations were collated and analysed. The three organisations represent differing industry types and incorporate both government and private sectors. The names of the organisations and industry type remain confidential. Surveys responses from the three organisations include:

- Organisation 1: 4,792 participants;
- Organisation 2: 1,672 participants; and
- Organisation 3: 443 participants.

6.2 Data Collection Procedure

Originally, surveys were distributed to the various organisations either in paper format or online. The individual organisations were responsible for promoting the completion of the surveys within their own organisation. All participants who completed the survey were volunteers and all were management or employees of the respective organisations. In addition, the names of participants were also kept confidential to encourage participation and completion of the surveys.

For the purposes of this project, data from the three organisations were transferred into one database for analysis. Only assessment tools/variables and other data, such as participant/organisational demographics, common to all three organisations and relevant to this project was utilised in this analysis. Analysis of the survey data was conducted using SPSS version 17.0 for Windows.
6.3 Survey Materials

Due to time and resource limitations by occupational organisations for participants to complete the various surveys, it was decided by the research team to reduce the length of various survey assessment tools thereby reducing the time required to complete the survey. This was primarily performed to encourage more participation and subsequently more completed surveys by organisational participants. Factor analytic procedures combined with an examination of alpha coefficients were implemented to develop the abbreviated assessment tools. In addition, the wording of some variables from previously developed international assessment tools (questionnaires) were changed to represent the Australian work-related driving context. Brief descriptions of the assessment tools utilised for the purpose of this project are provided below.

6.3.1 Driver Behaviour Questionnaire (DBQ)

A version of the Manchester Driver Behaviour Questionnaire (DBQ) used by Davey et al. (2006) was utilised in the research project. The DBQ utilised previously by Davey et al. (2006) was a modified version of the original DBQ developed by Reason et al. (1990), changed in order to make the questionnaire more representative of Australian work-related driving conditions. Respondents were required to indicate on a five point likert scale (1 = never to 5 = always) how often they commit each of the DBQ questions.

The DBQ has become one of the most prominent measurement scales to examine self-reported driving behaviours (Lajunen & Summala, 2003) and investigation into the relationship between self-reported driving behaviour and crash/offence involvement (Davey et al., 2006; Freeman et al., 2007; Gras et al., 2006; Rowland et al., 2007; Wishart et al., 2006). The adaptability of the DBQ has also been established via the utilisation of the questionnaire in other countries and cultures, including Australia (Blockey & Hartley, 1995; Davey et al., 2006; Dobson et al., 1999; Freeman et al., 2007; Newnam et al., 2004; Rowland et al., 2008), New Zealand (Sullman et al., 2002), China (Xie & Parker, 2002), Finland (Bianchi & Summala, 2004; Mesken et al., 2002; Özkan et al., 2006), Sweden (Åberg & Rimmö, 1998), Spain (Gras et al., 2006), Greece (Kontogiannis et al., 2002), Turkey (Sümer et al., 2002) and the United Kingdom (Parker et al., 1995; Parker et al., 2000).

Initially, the questionnaire was developed to distinguish between two empirically different classes of behaviour, errors and violations (Gras et al., 2006; Reason et al., 1990), and further modified to include “lapses” (Lajunen & Summala, 2003). However, recent versions of the DBQ included three different subscales: errors, highway-code violations and aggressive violations (Davey et al., 2006; Freeman et al., 2007; Rowland et al., 2008); four different subscales: errors, lapses, violations and aggressive violations (Gras et al., 2006; Lajunen et al., 2004; Lawnton et al., 1997; Meskin et al., 2002; Sullman et al., 2002); or even five factors (Parker et al., 2000). In addition to the differing number of factors identified, research has generally reported differences in factor structure, as specific items often load on different factors depending on the driving context (Davey et al., 2006), which ultimately influences the naming and interpretation of each factor (Freeman et al., 2007). Despite the general consistency of the factor structure, cross-cultural implementation of the DBQ has highlighted different “national scoring keys” and changes in the number of items used in the scale, as well as wording of some questions (Lajunen et al., 2003; Wishart et al., 2006). Notwithstanding the variability of factor structure and wording of items, previous applied research has demonstrated that the DBQ is robust to minor changes to some items that have been made to suit specific organisational, cultural and environmental contexts (Blockey & Hartley, 1995; Davey et al., 2007; Özkan & Lajunen, 2005; Parker et al., 2000).
There is an increasing quantity of research that has utilised the DBQ to investigate the driving behaviours of professional drivers (Davey et al., 2006; Freeman et al., 2007; Newnam et al., 2002; Newnam et al., 2004; Rowland et al., 2007; Sullman et al., 2002; Wishart et al., 2006; Xie & Parker, 2002). Within a professional driver setting, research utilising the DBQ have also reported a substantial level of factor structure variability. For example, Sullman et al. (2002) and Xie and Parker (2002) examined the driving behaviours of professional drivers and identified four factors: errors, lapses, violations and aggressive violations. In contrast, Dimmer and Parker (1999) focused on company car drivers and reported a six factor DBQ structure. In addition, an Australian study by Davey et al. (2006) utilised the DBQ to examine the behaviours of a group of work-related drivers and reported a traditional three factor solution of errors, aggressive and speeding violations. However, within this study a greater number of traditional items considered to be speeding violations actually loaded on the aggressive violation factor. More recently, Freeman et al. (2007) included an additional 15 items to the traditional 20-item DBQ, and reported a three factor solution (e.g. Speeding/Aggression, Fatigue and Errors). A substantial proportion of the additional items, which related to fatigue, time pressure and multi-tasking behaviours, loaded on the fatigue factor. The fatigue factor was also reported to be predictive of self-reported offences (i.e., demerit point loss), identifying the potential value of the contemporary items in assessing aberrant behaviours within a professional driver setting. Furthermore, this research also highlighted the need to include additional items addressing non-traditional driver behaviours.

A modified version of the DBQ was used in the current study that consisted of 43 items (see Appendix B). In addition to the traditional 20 items incorporated with the DBQ, the researchers of the current research project also included the 15 additional items utilised in previous research (Davey et al., 2006; Freeman et al., 2007), as well as a further eight items that were also included within the various organisational surveys. The extra items included two items related to reversing and low speed manoeuvring. For example, Hit/bump/scrape something while manoeuvring (including parking and reversing) and Physically check behind the vehicle for objects before reversing. One item (e.g., Hit/bump/scrape something while manoeuvring) was originally included within the DBQ slips and lapses subscale. However, this item was included as a separate item primarily because of the high rate of low speed manoeuvring incidents (including parking and reversing) by professional drivers in Australia (Rowland et al., 2005).

### 6.3.2 Safety Climate Questionnaire (SCQ)

In simple terms, “climate” relates to how employees perceive the organisational culture and practice of a company (Glendon & Stanton, 2000), and it is hypothesised that this perception impacts upon the way in which workers ultimately behave at work (Wills, 2006). In regards to safety climate, a growing body of research is demonstrating a link between safety culture and a variety of outcomes, ranging from vehicle crash rates (Diaz & Cabrera, 1997; Mearns, Whitaker & Flin, 2003), to injury severity (Gillen et al., 2002). For example, Wills, Watson and Biggs (2006) investigated the driving behaviours of 323 fleet employees and reported that work pressure and communication were significantly related to driver distraction. Also, Newnam, Watson and Murray (2002) examined the self-reported driving behaviours of fleet drivers and reported that the safety policies and practices within organisations had a direct impact on driving performance. Taken together, research is beginning to suggest that perceptions regarding the safety policies and practices of organisations may have a direct impact on driving outcomes.

A 10 item abbreviated version of the Safety Climate Questionnaire – Modified for Drivers (Wills et al., 2005) was also utilised in the research project (see Appendix B) with minor modifications to ensure the questions related specifically to “work-related driving” and the Australian context.
The Safety Climate Questionnaire – Modified for Drivers (SCQ-MD) contains 5 sub-factors that aim to measure perceptions towards fleet safety rules, communication and support, work pressures, adequacy of fleet safety procedures and management commitment. Recent research has demonstrated that the SCQ-MD is a reliable tool to measure work-related drivers’ attitudes towards the safety climate of an organisation (Davey et al., 2006; Wills et al., 2006; Wills et al., 2007). The fleet safety climate assessment tool was utilised in this study to identify any potential factors of fleet safety climate that may influence driver behaviour in relation to reversing and low speed manoeuvring.

6.3.3 Demographic Measures

A number of socio-demographic questions were included in the questionnaire to determine participants’ age, gender, driving history (e.g., years experience, number of traffic offences and crashes) and their weekly driving exposure (e.g., kilometres, driving hours).

6.4 Survey Participant Characteristics

From the 6907 participants utilised within this study, The largest proportion of occupational drivers drove operational vehicles (70%), with a further 28% of drivers reported driving a salary sacrificed vehicle (primarily management). Driving exposure for this study sample was represented by both kilometres per year and hours per week. Hours per week were included because of the high traffic situation of city and suburban driving and the resultant high proportion of time in potentially slow traffic conditions. Most participants reported driving between one and 20 hours per week for work (1-10 hours = 39.5%; 11-20 hours = 37%). Additionally, 1,797 participants (26%) reported driving between 1 and 10,000 kilometres per year, with 1,439 participants (21%) reported driving 10,001 to 20,000 kilometres per year and a further 1,824 participants (26.5%) reported driving between 20,001 to 30,000 kilometres per year. A total of 856 participants (12.5%) reported being involved in a crash while driving for work in the last year while 789 individuals (11%) reported incurring traffic infringements (i.e., demerit point loss) during the same time period. In addition, a total of 558 participants (8%) reported being involved in a crash while driving outside of work in the last year while 912 individuals (13%) reported incurring traffic infringements during the same period. Further survey participant characteristics are included in Table 4.

Table 4: Survey Participant Characteristics

<table>
<thead>
<tr>
<th>Age:</th>
<th>Gender:</th>
<th>Type of Work (vehicle):</th>
<th>Driving Terrain:</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 – 69 years</td>
<td>Male</td>
<td>Operational</td>
<td>Mainly city, suburban roads</td>
</tr>
<tr>
<td>$M = 43$</td>
<td>Female</td>
<td>Salary Sacrifice</td>
<td>Both city/suburban and country roads</td>
</tr>
<tr>
<td></td>
<td>Missing</td>
<td></td>
<td>Mainly country roads</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Licence Held:</td>
<td>1-51 years</td>
<td>4,835 (70%)</td>
<td>2,926 (42.5%)</td>
</tr>
<tr>
<td></td>
<td>$M = 23$</td>
<td></td>
<td>2,708 (39%)</td>
</tr>
<tr>
<td></td>
<td>$(SD = 12.2)$</td>
<td></td>
<td>1,013 (15%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>260 (3.5%)</td>
</tr>
<tr>
<td>Vehicle Category:</td>
<td>Passenger vehicles:</td>
<td>4,455 (64.5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Four Wheel Drive</td>
<td>1,271 (18.5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vans</td>
<td>866 (12.5%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trucks</td>
<td>54 (&lt;1%)</td>
<td></td>
</tr>
</tbody>
</table>
6.5 Data Analysis Results

Section 6.5 shows the data analysis results from self-report surveys conducted within three medium to large organisations within Australia. The results specifically relate to items probing low speed manoeuvring and reversing issues for employees from the three organisations.

6.5.1 Low Speed Manoeuvring Survey Items

Within the driver behaviour assessment tool, two variables relating to reversing and low speed manoeuvring were primarily utilised for the purpose of this research study. For example:

1) Hit/bump/scrape something while manoeuvring (including parking and reversing);
and

2) Physically check behind the vehicle for objects before reversing.

Participants from the three industry organisations provided some interesting yet alarming responses to the two questions. Firstly, in relation to the item “Hit/bump/scrape something while manoeuvring (including parking and reversing)” (see Table 5) the majority of participants stated that they either never (45.5%) or rarely (42%) hit/bump/scrape something while manoeuvring. However, 742 participants (11%) stated that they sometimes hit/bump/scrape something while manoeuvring. Alarmingly, a further 90 participants stated that they have often or always hit/bump/scrape something while manoeuvring (including parking and reversing). These results indicate that low speed manoeuvring (including parking and reversing) incidents can be considered a high risk activity for occupational drivers with more than one in 10 drivers stating that they at least sometimes hit/bump/scrape something while manoeuvring their work vehicle. This result becomes more alarming in relation to those drivers who work in areas where young children may be present (e.g., residential areas, schools, shopping centres, etc).

Table 5. Item Responses for “Hit/bump/scrape something while manoeuvring, including parking and reversing (n = 6886)

<table>
<thead>
<tr>
<th>Response Scale</th>
<th>No. of Responses</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>3,144</td>
<td>45.5</td>
</tr>
<tr>
<td>Rarely</td>
<td>2,910</td>
<td>42</td>
</tr>
<tr>
<td>Sometimes</td>
<td>742</td>
<td>11</td>
</tr>
<tr>
<td>Often</td>
<td>71</td>
<td>1</td>
</tr>
<tr>
<td>Always</td>
<td>19</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

Secondly, responses to the item “Physically check behind the vehicle for objects before reversing” also produced some interesting results (see Table 6). Encouragingly, one in three drivers (37%) stated that they always or often physically check behind their vehicle before reversing. Additionally, 24% or approximately one in four drivers stated that they only sometimes check behind their vehicle before reversing. However, over a third of the sample (39%) stated that they either never or rarely physically check behind their vehicle before reversing. Furthermore this result indicates that a large proportion of occupational drivers either don’t check behind their vehicle at all before reversing or rely primarily on the use of rear view mirrors to check their reversing path.
Table 6. Item Responses for “Physically check behind the vehicle for objects before reversing” (n = 6882)

<table>
<thead>
<tr>
<th>Response Scale</th>
<th>No. of Responses</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>1,035</td>
<td>15</td>
</tr>
<tr>
<td>Rarely</td>
<td>1,674</td>
<td>24</td>
</tr>
<tr>
<td>Sometimes</td>
<td>1,636</td>
<td>24</td>
</tr>
<tr>
<td>Often</td>
<td>1,376</td>
<td>20</td>
</tr>
<tr>
<td>Always</td>
<td>1,161</td>
<td>17</td>
</tr>
</tbody>
</table>

6.5.2 Means and Standard Deviations

This section reports on the means and standard deviations for both the total sample and for each organisation. Table 7 shows that for the item “Hit/bump/scrape something while manoeuvring (including parking and reversing)” the means for each organisation are similar for all organisations as well as the total sample. A low score for this item represents a safer result (e.g., 1 = ‘Never’ to 7 = ‘Always’). Therefore, the mean scores indicate a relatively positive result in relation to low speed manoeuvring incidents.

Table 7. Mean and Standard Deviations for the Item “Hit/bump/scrape something while manoeuvring (including parking and reversing)”

<table>
<thead>
<tr>
<th>Organisation</th>
<th>No. of Participants</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisation 1</td>
<td>4,792</td>
<td>1.63</td>
<td>.77</td>
</tr>
<tr>
<td>Organisation 2</td>
<td>1,672</td>
<td>1.66</td>
<td>.57</td>
</tr>
<tr>
<td>Organisation 3</td>
<td>443</td>
<td>1.70</td>
<td>.74</td>
</tr>
<tr>
<td>Total Sample</td>
<td>6,907</td>
<td>1.68</td>
<td>.73</td>
</tr>
</tbody>
</table>

In contrast to Table 7, Table 8 reveals some interesting results. Table 8 shows the total and organisational means and standard deviations for the item “Physically check behind the vehicle for objects before reversing”. This item was reverse scored to indicate that a high score is less safe (e.g., 1 = ‘Always’ to 7 = ‘Never’). For example, a higher score indicates that drivers are less likely to physically check behind their vehicles before reversing. Compared to the total mean score (M = 3.03), both organisations 2 (M = 3.44) and 3 (M = 3.23) indicated less safe behaviours. However, all results indicate that the task of physically checking behind vehicles before reversing is an issue that needs to be addressed within organisational safe driving programs/systems.

Table 8. Mean and Standard Deviations for the Item “Physically check behind the vehicle for objects before reversing” (reversed)

<table>
<thead>
<tr>
<th>Organisation</th>
<th>No. of Participants</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisation 1</td>
<td>4,792</td>
<td>2.87</td>
<td>1.26</td>
</tr>
<tr>
<td>Organisation 2</td>
<td>1,672</td>
<td>3.44</td>
<td>1.44</td>
</tr>
<tr>
<td>Organisation 3</td>
<td>443</td>
<td>3.23</td>
<td>1.59</td>
</tr>
<tr>
<td>Total Sample</td>
<td>6,907</td>
<td>3.03</td>
<td>1.35</td>
</tr>
</tbody>
</table>
Table 9 shows the five least safe behaviour items in the survey’s behaviour assessment tool. The table shows that the item “Physically check behind the vehicle for objects before reversing” is the second least safe behaviour for this sample of occupational drivers. Consequently, the item relating to using a “hands free” mobile phone, which is currently still a legal action, was the only behaviour item which scored a less safe result compared to the “Physically check behind the vehicle for objects before reversing” item.

Table 9. Mean & Standard Deviations for the Five Less Safe Behavioural Items (n = 6,907)

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Drive while using a “hands-free” mobile phone</td>
<td>3.14</td>
<td>1.45</td>
</tr>
<tr>
<td>2. Physically check behind the vehicle for objects before reversing</td>
<td>3.03</td>
<td>1.35</td>
</tr>
<tr>
<td>3. Drive while under time pressure</td>
<td>2.76</td>
<td>1.17</td>
</tr>
<tr>
<td>4. Exceed the speed limit on a highway/freeway without realising</td>
<td>2.45</td>
<td>.86</td>
</tr>
<tr>
<td>5. Drive while tired</td>
<td>2.37</td>
<td>.91</td>
</tr>
</tbody>
</table>

(Item “Physically check behind the vehicle for objects before reversing” has been reversed to indicate a high score as an unsafe behaviour)

6.5.3 Correlations Between Variables

An examination was undertaken to determine the bivariate relationships between the items “Physically check behind the vehicle for objects before reversing” and “Hit/bump/scrape something while manoeuvring (including parking and reversing)” and the rest of the items in the survey.

6.5.3.1 Correlations Between Target and Behaviour Variables

Firstly, in relation to the item “Hit/bump/scrape something while manoeuvring (including parking and reversing)” there were only weak to moderate relationships with other items in the survey. Table 10 shows the significant correlations above \( r = .2 \) (\( p < .001 \), 2 tailed).

Table 10. Behaviour Correlations for Survey Item: “Hit/bump/scrape something while manoeuvring (including parking and reversing)” (n = 6,907)

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Pearson correlation ((r))</th>
<th>No. of Participants</th>
<th>Significance Value ((p))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find your attention being distracted from the road</td>
<td>.33</td>
<td>6,882</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Lose concentration while driving</td>
<td>.28</td>
<td>6,880</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Fail to check rear-view mirror before pulling out or changing lanes</td>
<td>.27</td>
<td>6,880</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Drive while tired</td>
<td>.25</td>
<td>6,883</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Have difficulty driving because of tiredness or fatigue</td>
<td>.25</td>
<td>6,883</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Save time during the day by driving quicker between jobs</td>
<td>.24</td>
<td>6,880</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Find yourself nodding off while driving for work</td>
<td>.22</td>
<td>6,883</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Drive while under time pressure</td>
<td>.21</td>
<td>6,884</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Find yourself driving on “autopilot” on way home</td>
<td>.20</td>
<td>6,876</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>
Results in Table 10 reveal that items relating to fatigue, work/time pressure, concentration/inattention, distraction and failing to check rear-view mirrors are associated with low speed manoeuvring incidents. These results indicate that reversing and low speed manoeuvring incidents are not caused by a lack of driver skill alone. Consequently, evidence identified in Table 9 identifies a number of potential behavioural relationships to reversing and low speed manoeuvring incidents.

Secondly, in relation to the variable “Physically check behind the vehicle for objects before reversing”, there were moderate relationships with “Check the tyre pressure and fluid levels of your work vehicle” \( r = .31, p < .001 \) and “Conduct pre-trip vehicle inspections” \( r = .39, p < .001 \). These results suggest that drivers who perform regular maintenance checks are also more likely to physically check behind their vehicle before reversing. As pre-trip inspections and regular minor maintenance checks are generally an aspect of organisational policy and procedures, an additional assumption could suggest that those drivers who are aware and follow organisation policy and procedures are also more likely to perform safer driving practices. Therefore, it is recommended that safe reversing and low speed manoeuvring should be included within organisational policy and procedures and other relevant documentation. Recent research (Wishart & Rowland, 2011) supports the addition of safe reversing practices within organisational policy and procedures, whereby the introduction of safe reversing procedures, along with promotion, communication and training of the procedures for employees provided an immediate and considerable reduction in reversing type incidents.

Further correlational analyses with behavioural items revealed a number of weak negative associations with variables “Physically check behind the vehicle for objects before reversing”. These include: “Disregard the speed limit on a residential road” \( r = -.14, p < .001 \); “Exceed the speed limit on a highway/freeway” \( r = -.12, p < .001 \); “Race away from the traffic lights with the intention of beating the driver next to you” \( r = -.12, p < .001 \); and “Fail to check rear-view mirror before pulling out or changing lanes” \( r = -.10, p < .001 \). Although only weak associations, these results may suggest that those drivers exhibiting aberrant driving behaviours (e.g., speeding) are also less likely to take the time to physically check behind their vehicle before reversing. In addition, weak associations were identified between the item “Physically check behind the vehicle for objects before reversing” and two demographic variables: age \( r = .13, p < .001 \); and driving experience (years licence held) \( r = .13, p < .001 \). Although weak, these relationships indicate that older drivers or drivers with a greater driving experience are more likely to check behind their vehicles before reversing.

### 6.5.3.2 Correlations Between Target and Safety Climate Variables

Correlational analysis was conducted between each target variable (e.g., Physically check behind the vehicle for objects before reversing and Hit/bump/scrape something while manoeuvring (including parking and reversing)) and the Fleet Safety Climate Scale sub-factors: fleet safety rules, communication and support, work pressures, adequacy of fleet safety procedure and management commitment. This analysis aims to determine if there are any relationships between driver perceptions of the organisational fleet safety climate and the target variables relating to low speed manoeuvring and reversing. Although weak, there were relationships between the variable “Hit/bump/scrape something while manoeuvring (including parking and reversing)” and the fleet safety climate sub-factors work pressure \( r = .14, p < .001 \) and management commitment \( r = .10, p < .001 \). In addition, there were also weak relationships between the variable “Physically check behind the vehicle for objects before reversing” and the fleet safety climate sub-factors communication and
support $r = .15, p < .001$, adequacy of fleet safety procedures $r = .14, p < .001$, fleet safety rules $r = .13, p < .001$ and management commitment $r = .13, p < .001$. Interestingly, the fleet safety climate sub-factor “work pressures” was associated with low speed manoeuvring incidents but not associated with failing to physically check behind the vehicle before reversing.

Additionally, correlation analyses were conducted between the two target variables and the individual fleet safety climate items. Table 11 demonstrates the relationship between physically checking behind the vehicle before reversing and individual fleet safety climate items. Although weak, there were relationships between physically checking behind the vehicle before reversing and items relating to the adequacy of organisational fleet safety rules and procedures, communication and support and management commitment. These results indicate that comprehensive organisational documentation and processes are related to safe driving practices.

Table 11. Fleet Safety Climate Correlations for Item: “Physically check behind the vehicle for objects before reversing”

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Pearson correlation ($r$)</th>
<th>No. of Participants</th>
<th>Significance Value ($p$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety rules relating to the use of motor vehicles are followed even when a job is rushed</td>
<td>.15</td>
<td>6,859</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Fleet safety problems are openly discussed between employees and managers/supervisors</td>
<td>.12</td>
<td>6,845</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Safety policies relating to the use of motor vehicles are effectively communicated to workers</td>
<td>.15</td>
<td>6,852</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Our organisation ensures that safety procedures and rules relating to the use of motor vehicles are available to employees</td>
<td>.13</td>
<td>6,846</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Safety procedures relating to the use of motor vehicles are complete and comprehensive</td>
<td>.14</td>
<td>6,824</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Driver safety is central to management’s values and philosophies</td>
<td>.13</td>
<td>6,855</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Management expectations encourage safe driving</td>
<td>.11</td>
<td>6,853</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

Table 12 shows weak relationships between hitting, bumping or scraping something while reversing and individual fleet safety climate items relating to time/work pressure. These results indicate that the potential negative effects of time/work pressure placed on drivers to increase performance may increase the risk of low speed vehicle incidents.
Table 12. Fleet Safety Climate Correlations for Item: Hit/bump/scrape something while manoeuvring (including parking and reversing)

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Pearson correlation ($r$)</th>
<th>No. of Participants</th>
<th>Significance Value ($p$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is sufficient time to enable employees to drive safely for work</td>
<td>-.12</td>
<td>6,857</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Time schedules for completing work projects are realistic</td>
<td>-.12</td>
<td>6,843</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Enough time is allocated in the day to allow employees to</td>
<td>-.13</td>
<td>6,845</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>drive between jobs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.5.4 Further Analysis

A lack of meaningful significant bivariate correlations negated the need for multivariate analysis. However, further bivariate and multivariate analyses were conducted to assess any relationship with the two items: “Hit/bump/scrape something while manoeuvring (including parking and reversing)” and “Physically check behind the vehicle for objects before reversing”. However, the results showed few meaningful findings and are therefore not reported.

6.6 Stage 3 Results Summary

The results outlined in Stage 3 research provided further insight into low speed vehicle manoeuvring and driver behaviour. In total 6907 participants from 3 medium to large organisations were utilised in the research. All respondents completed self-report surveys containing questionnaire items relating to driver behaviours and fleet safety climate. The two items relating to low speed vehicle manoeuvring and reversing included “Hit/bump/scrape something while manoeuvring (including parking and reversing)” and “Physically check behind the vehicle for objects before reversing”. Subsequently, these items were used as the dependent variables within the study. Alarmingly, the research indicated that a large proportion of occupational drivers either don’t check behind their vehicle at all before reversing or rely primarily on the use of rear view mirrors to check their reversing path. In addition, results showed that the item “Physically check behind the vehicle for objects before reversing” was the second least safe behaviour for this sample of occupational drivers. Although weak, relationships were found between items relating to fatigue, work/time pressure, concentration/inattention, distraction, failing to check rear-view mirrors and low speed manoeuvring incidents (e.g., Hit/bump/scrape something while manoeuvring). In addition, weak relationships were exhibited between hitting, bumping or scraping something while reversing and individual fleet safety climate items relating to time/work pressure. These results may indicate that the potential negative effects of time/work pressure placed on drivers to increase performance may also increase the risk of low speed vehicle incidents. In relation to the variable “Physically check behind the vehicle for objects before reversing”, there were moderate relationships with “Check the tyre pressure and fluid levels of your work vehicle” and “Conduct pre-trip vehicle inspections”. In addition, results suggest that those drivers exhibiting aberrant driving behaviours (e.g., speeding) are also less likely to take the time to physically check behind their vehicle before reversing. Furthermore, there were relationships between physically checking behind the vehicle before reversing and items relating to the perceived adequacy of organisational fleet safety rules and procedures, communication and support and management commitment.
7. Discussion of Research Results

From a review of the literature it was surmised that the current research may be the first research project targeting work-related drivers and industry organisations with reference to low speed vehicle incidents involving young children. In addition, the literature identified that there is a considerable risk of low speed vehicle run-overs of young children, especially in residential areas, and that occupational drivers who attend these areas for work purposes may be considered a high risk group. Evidence does support the need for research in this area of occupational road safety.

Participants within the focus group discussions suggested that low speed manoeuvring and reversing type incidents were a significant issue for their respective organisations, especially when working in domestic residential areas. In addition, the occupational workers/drivers suggested that the most common contributing factors to low speed incidents or near misses included rear visibility when reversing, the type of vehicle, time/work pressure, third party/pedestrians, inattention/distraction and drug/alcohol use. Interestingly, the analysis of the self report data relating to driver behaviours (Stage 3) found relationships (although weak) between items relating to fatigue, work/time pressure, concentration/inattention, distraction, failing to check rear-view mirrors and low speed manoeuvring incidents (e.g., Hit/bump/scrape something while manoeuvring). In addition, weak relationships were also found between hitting, bumping or scraping something while reversing and individual fleet safety climate items relating to time/work pressure. Therefore, the two research stages identify both work/time pressures and inattention/distraction as being associated with low speed vehicle manoeuvring incidents. Furthermore, intervention strategies should not aim to address low speed manoeuvring and reversing alone. Rather, the additional contributing factors should also be targeted (e.g., work/time pressures, inattention/distraction, fatigue, alcohol/drug use, etc) for intervention strategies and initiatives.

Alarming, the research conducted in Stages 1 and 3 indicated that a large proportion of occupational drivers either don’t check behind their vehicle at all before reversing or rely primarily on the use of rear view mirrors to check their reversing path. In addition, results showed that the item “Physically check behind the vehicle for objects before reversing” was the second least safe behaviour for the sample of occupational drivers. Organisational documentation, such as policy and procedures, and awareness information may promote safer practices in relation to low speed vehicle manoeuvring and reversing. In addition, for the survey variable “Physically check behind the vehicle for objects before reversing”, there were moderate relationships with “Check the tyre pressure and fluid levels of your work vehicle” and “Conduct pre-trip vehicle inspections”. These variables represent common items often found in documented organisational processes and represent safe practices. Furthermore, there were relationships between physically checking behind the vehicle before reversing and items relating to the perceived adequacy of organisational fleet safety rules and procedures, communication and support and management commitment. Therefore, these results indicate that comprehensive organisational documentation and processes are related to safer driving practices.

A review of organisational documentation revealed a lack of organisational documentation, processes and practices relating general occupational road safety, and especially to low speed vehicle manoeuvring and reversing where young children may be present. Not only does this not meet occupational health and safety legislative requirements it doesn’t assist or provide the supporting mechanisms for intervention or countermeasure development and implementation. In addition, organisations did not facilitate any relevant proactive intervention strategies or initiatives.
relating specifically to low speed vehicle manoeuvring or reversing. Research suggests that within organisations intervention strategies and initiatives should address both organisational and individual driver issues. In addition, comprehensive organisational documentation, processes and systems need to be formally developed to support intervention strategies and initiatives, as well as informing their development and implementation.

8. Intervention Recommendations and Implementation Guidelines

Historically in terms of exploring and implementing occupational road safety interventions, industry organisations have often taken a “silver bullet” approach directed at developing and implementing a single countermeasure or intervention strategy to encompass and address all work-related road safety issues (Wishart & Davey, 2004). This approach is often reactive rather than proactive. Davey et al. (2008) state that one shortcoming with a reactive approach is that often times the single implemented countermeasure results in only a short term fix and does not address the underlying contributing behavioural factors relating to the crash.

Generally, intervention strategies have consisted only of skill based training (e.g. driver training). Ideally, intervention strategies should encompass proactive programs targeting both organisational issues (e.g. occupational road safety culture and climate) and driver behaviour and attitudes. In addition, intervention strategies should be evaluated to assess short term and long term benefits (if any). Furthermore, organisations should consider implementing a combination of broad-based intervention strategies applicable to the whole organisation, and specific intervention strategies targeting identified high risk sections of the organisation.

In attempting to satisfy legislative needs of OHS, organisations will plan the development of work-related road safety intervention strategies. However, the reality within the majority of organisations is that they often struggle to implement such interventions. The failure to effectively implement work-related road safety interventions often stems from a lack of management commitment and support, and general under resourcing (Davey et al., 2008; Davey & Wishart, 2004). Thus, there is an immense discrepancy between what organisations plan to do and what is actually undertaken in addressing work-related road safety risks and initiatives. Furthermore, Davey et al. (2008) suggest that there are a number of additional organisational difficulties that impact upon the successful implementation of fleet-based interventions. For example, these include:

- A tendency to focus on asset management rather than on employee safety;
- Fleet safety is rarely considered to be a core business issue;
- There is often a lack of resources allocated to work-related road safety;
- Occupational health and safety and fleet safety are historically viewed as separate and often competing issues;
- Organisations do not always see an instant monetary return;
- Fleet safety is often overlooked until a crash happens; and
- Organisations rely heavily on inconclusive evidence based on insufficient crash data.

In relation to low speed vehicle incidents (including parking and reversing), the following sections detail specific intervention strategy and countermeasure recommendations and guidelines for implementing each intervention/countermeasure. It is envisaged that these strategies, primarily directed towards organisational practices and processes, as well as driver awareness and training, will reduce the likelihood of low speed vehicle incidents involving young children. In addition, the
interventions should be developed and implemented utilising the Risk Management model approach. The risk Management approach enables organisations to identify, assess and control for specific risks to occupational road/driver safety within the organisation and members of the public. Furthermore, specific targeted intervention strategies should be informed by research and suitable theoretical models, and not in reaction to recent incidents. For example, the Stages of Change model assists the identification of interventions relevant to driver behaviour and their readiness to change. Therefore, intervention development, content and implementation, targeted towards the major issue and driver readiness to change, reduces the burden on organisational time and resources and may improve the likelihood of successful outcomes.

In relation to small or individual operations, such as, domestic/commercial trades and contractors, these operators are generally not required to develop safety policy and procedures or induction procedures, etc. However, they do have an obligation to ensure the safety of fellow workers/employees and members of the public. Furthermore, developing and implementing intervention strategies and initiatives for this target group becomes problematic. This is primarily due to the itinerant nature of their work (e.g., different work locations) and the fact that safety within the industry for self-employed workers and contractors (e.g., domestic/commercial trades) is not sufficiently targeted by relative governing bodies (Rowland et al., 2010). This is further discussed in section 8.3.

8.1 Organisational Documentation and Processes

This section describes recommended changes to organisational documentation, processes and practices. It is envisaged that these initiatives will not only enable an organisation to meet legislative requirements but also increase the awareness of potential low speed vehicle incidents (including where young children maybe present) and promote a continued safety improvement system in relation to low speed vehicle manoeuvring and reversing. It is important that workers/staff understand and acknowledge that a vehicle used for the purpose of work is classified as a “workplace” under health and safety legislation (Workplace Health and Safety Act, 1995), even when commuting to and from work. Ultimately, these measures would reduce the risk of low speed vehicle run-overs of young children, especially for organisations who perform work tasks (including driving) in areas where young children may be present.

8.1.1 Organisational Policy and Procedures

A stand alone work-related road safety policy is an important initial step in outlining employee and the organisation’s expectations and responsibilities in relation to driving a vehicle for work-related purposes. There are safety benefits to be gained from a comprehensive work-related road safety policy as it identifies the safety processes and procedures required to ensure that vehicle operations comply with legislative requirements that ensure a safe workplace. A comprehensive work-related road safety policy (and procedures) also communicates the “rules of the game” to employees and employers outlining the responsibilities and accountabilities associated with safe vehicle operation. In addition, a comprehensive organisational occupational road safety policy and procedures provides a mechanism to support intervention development and implementation.

In relation to low speed vehicle use including parking and reversing, it is recommended that organisational policy and procedures state the organisation’s position in relation to safe low speed vehicle manoeuvring and reversing practice. For example:
1) Eliminate the need to reverse – if safe to do so, reverse park on arrival, thereby enabling the driver to exit in forward motion or park on the street and not in a domestic driveway;

2) Before leaving a site, especially when reversing a vehicle, the driver should walk around the vehicle checking for children, obstructions and that the reversing path is safe, before entering the vehicle. It takes only 6-8 seconds more to walk around the rear of a vehicle compared to entering the vehicle from the front;

3) If working at a domestic residence, etc where children are present, before leaving ensure the parent or guardian (etc) is aware of the children’s location and safety; and

4) Where there are two or more workers in the vehicle, one worker should direct the driver to safely park, reverse or exit a parking area before entering the vehicle him/herself.

8.1.2 Risk Management Processes

Risk assessments are a legislative requirement. The purpose of a risk assessment is to determine:

- Whether there is any likelihood of a potentially hazardous situation causing death, injury, illness or disease to people in the workplace;
- How severe that risk is; and
- Whether the risk needs to be controlled and how urgently.

Under Workplace Health and Safety legislation, vehicles used for the purpose of work are classified as a workplace. Therefore, risk assessments are required to be completed for all activities in relation to the use of vehicles and the safety of personnel driving the vehicles, passengers, and members of the public.

A formal work-related road safety risk assessment process should be a key component of all occupational road safety strategies. Occupational road safety should be considered as an aspect of all work-related risk assessments, especially considering that work-related road incidents often account for a high proportion of work-related incidents. Within OH&S legislation, all risks are required to be identified, controls developed and risks communicated to staff, including occupational road safety.

It is recommended that organisations consider developing a risk assessment for work (including driving) in domestic areas where children may be present. This would be especially important for those organisations where a considerable proportion of their work is in areas where children are present (e.g., domestic residences, schools, shopping centres, etc). The risk assessment should also outline the safe work practice or controls to reduce the identified risks. For example, risks controls may include those recommended in section 8.1.1. Furthermore, it is recommended that risk assessment documents be communicated and promoted to all operational staff (including drivers) and that the content be continually monitored and reviewed.

8.1.3 Inductions

The Induction section relates to identifying the induction mechanisms that are utilised to:

1) communicate the organisations approved work-related road safety policies and procedures to all new employees, contractors and visitors; and
2) communicate/induct employees into the safe use of a new or different type of vehicles.
Thorough communication of work-related policies and procedures throughout the organisation may contribute to increased understanding of requirements and expectations of safe vehicle operation. It is recommended that all new employees should be made aware of the organisation’s occupational road safety policy and procedures, any risk management processes and documentation, and specific vehicle use.

8.1.4 Vehicle Selection

Generally, within organisations there is no formal review process for determining vehicle “fit for purpose”, nor are minimum safety standards acknowledged. Rather standard type vehicles are hired/leased/purchased for operational tasks and travel. It is recommended that organisations consider the potential acquisition of suitable vehicles for all operational tasks, operational locations and road conditions. Acquisition of appropriate vehicles including suitable and safe additions may alleviate vehicle specific problems such as poor visibility (especially rear visibility as stated within Stage 1 research results) and other safety incidents, and improving the organisational climate by creating a sense of ownership by drivers. In addition, it is suggested that a formal process be developed and implemented to ensure vehicles are fit for purpose and that a minimum requirement of specific safety features (e.g., sufficient rear visibility, reversing sensors/cameras, etc) be prioritised and included in the selection of all vehicles.

8.1.5 Crash Reporting and Recording

Crash reporting is not only a legislative requirement, but also a means (although reactive in nature) to identify specific issues and contributing factors of crashes. This can be achieved if the crash reporting form has the necessary fields of information that assist crash contributing factor assessment. In addition, crash reporting can be utilised as a long term tool to evaluate potential occupational road safety interventions or countermeasures. However, due to its reactive basis, crash statistics should not be utilised as the only tool to evaluate interventions, etc. The event of a crash can be a stressful time for a driver. Therefore, crash reporting should be made as easy and accessible as possible and all staff should be aware of the crash reporting process and procedures. Thorough identification of contributing factors of low speed vehicle incidents (including reversing incidents) will enable a meaningful assessment of the risks and identification of those risks requiring further attention. Identification of the contributing factors of incidents would also identify potential gaps in organisational occupational road safety documentation, processes and practice.

8.1.6 Crash/Near Miss Investigations

All occupational road safety crashes/incidents should be investigated, at some level, to ensure all details relevant to contributing factors are ascertained. The degree or level of investigation may depend on the seriousness of the crash/incident. For example, discussions with a manager/supervisor for low level crashes/incidents to full investigations for more serious incidents. The organisation ideally should have a process to identify the level of the seriousness of a crash and subsequent crash investigation.

Research evidence suggests that in relation to incident investigation, there seems to be a lack of formal processes and consequences and corrective actions are not utilised. It is recommended that a more formal documented process be undertaken by organisations for all incidents and further investigations undertaken to develop and adopt corrective actions for personnel involved (especially in the case of multiple incidents by one driver). All occupational road safety incidents have the potential to be serious, including low speed vehicle incidents. Many incidents will result in only
small property damage. However, the next occasion could be a young child run-over. Therefore, investigations of all incidents may ensure all potential risks are identified and that lapses in driver awareness and organisational processes may be addressed before future similar incidents occur.

8.1.7 Crash Data Analysis

Reporting, recording and investigating crashes are essential to meet legislative requirements. Although reactive in nature, crash data may provide valuable information in relation to the identification of occupational road safety risks and contributing factors of crashes. Therefore, crash data analysis may assist with intervention development and resource allocation by highlighting specific areas of concern in relation to the organisation and the individual. However, if crash data analysis is not comprehensively undertaken then information obtained within the reporting process is not being efficiently utilised. The recording but under utilisation of data may increase the risk of litigation under certain circumstances. For example, a crash that results in a fatality may actually be as a result of a recurrence of specific incident types that are previously revealed through crash data trends. Failure to observe trends and effectively mitigate risk may proportionately increase legal liability.

It is recommended that crash data should be analysed to identify contributing factors of crashes and utilised in conjunction with proactive data information methods (e.g. organisational work-related road safety behavioural surveys) to develop suitable and effective interventions targeted toward specific organisation work-related road safety problems and not waste valuable resources. For those organisations whose workers operate in residential areas or areas where young children may be present, analysis of previously considered minor incidents, such as low speed manoeuvring or reversing incidents, becomes more important because failure to identify the risks may mean serious implications for organisations (e.g., litigation, adverse publicity, etc). Although reactive, identification of risks from crash data analysis and subsequent corrective actions targeting the contributing factors of low speed vehicle incidents may assist in the reduction of the likelihood and consequences of future incidents, injuries and fatalities.

8.1.8 Repeat Offenders

A repeat offender is a driver who has incurred multiple breaches of legislation through infringements and can therefore be classified as a high risk driver. Therefore, as a high risk driver he/she should be targeted for additional specific interventions. Furthermore, the repeat offender process should also incorporate multiple crashes/incidents and/or complaints and/or infringements. Generally, drivers who have incurred multiple incidents usually have a record of additional infringements or complaints in relation to their driving.

It is recommended that organisations adopt a formal process that be implemented to adequately address repeat offenders within the organisation. For example, drivers who have incurred multiple low speed vehicle incidents should be targeted for additional intervention strategies (e.g., specific training and education). However, to identify repeat offenders comprehensive incident/crash data recording and analysis are required.

8.1.9 Consultation and Communication

Communication is a considerable aspect of Workplace Health and Safety legislation and employers have an obligation to ensure safety communication processes are in place. All staff are required to be informed on all organisational safety requirements, policy and procedures, and any changes in
relation to safety, including occupational road safety. For staff to conform to organisational safety requirements, the relevant information must be communicated. Communication strategies may encompass how, what and why occupational road safety information is to be disseminated to staff. Records of communication will depend on factors such as the scale and the sensitivity of the activity.

It is suggested that a range of work-related road safety issues be included as part of a scheduled communication strategy highlighting a proactive approach to work-related road safety awareness. These communication strategies may include email alerts, newsletters, targeted safety/works meetings, training, etc.

A consultative team approach (utilising all levels within an organisation) is useful to help define the context appropriately, to help ensure risks are identified effectively, for bringing different areas of expertise together in analysing risks, for ensuring different views are appropriately considered in evaluating risks and for appropriate change management during risk treatment. Involvement also allows the ‘ownership’ of risk by managers/supervisors and the engagement of stakeholders. It allows them to appreciate the benefits of particular controls and the need to endorse and support a treatment plan. Records of consultation will also depend on factors such as the scale and the sensitivity of the activity.

Consultation with all levels of staff is crucial to future occupational road safety strategies to ensure that all needs and safety issues are addressed across the whole organisation. It is also suggested that a formal process be adopted to ensure that all employees are familiar with changes and understand the changes. It is also suggested that when changes occur these changes should be a focus of team meetings and briefings.

8.2 Organisation Targeted Intervention Strategies and Initiatives

Targeted intervention strategies and initiatives aim to address specific issues or topics relating to occupational road safety. The following sections identify initiatives to address low speed vehicle incidents (including potential child run-overs) by promoting awareness of the issue, identification of the risks and controls to reduce the likelihood of the risks occurring.

8.2.1 Awareness Campaign

Road safety awareness campaigns aim to provide road safety information and messages to all organisational staff, particularly work-related drivers. The campaign may utilise a combination of methods including road safety posters, information in the form of work-related road safety hints or tips, easy-read fact sheets, and computer screen messages (i.e. road safety message at log off or shut down, etc). By using a variety of tools, the road safety awareness campaign aims to reach as many individuals as possible and encourage staff to drive safely in all circumstances. Appendix B illustrates a sample reversing poster that could be utilised to promote awareness of low speed vehicle run-overs of young children within occupational organisations. In addition, fact sheets can be used to create awareness of specific issues within the organisational fleet setting that may have a detrimental effect on work-related driving safety. Fact sheets not only provide information about a specific work-related driving safety topic but also identify methods or procedures to eliminate or reduce the detrimental effects on driver safety.

Information in the form of an awareness campaign can be implemented within organisations using a variety of methods. For example, posters (e.g., Appendix C) can be placed around work depots or
offices where the majority of occupational drivers may congregate. Illustrations (e.g., poster details) safety hints/tips, and fact sheets can be included within an organisation newsletter or email safety alert and distributed to all staff. In addition, information can be communicated to occupational driving staff at designated works or safety meetings. These meetings may include work-related road safety discussion groups which are described in the section below.

8.2.2 Discussion Groups

One consistent finding in international occupational road safety research is that the use of small group facilitation, such as tool box talks (small work group/unit discussions), are successful methods for introducing material to employees and have been shown to be significantly related to behaviour change. This approach would support the concept of building credibility of occupational road safety as a key issue to be considered in everyday work situations. Additionally, a consistent finding in workplace behaviour change programs is that gaining line manager/supervisor support and involvement in program implementation is often essential to effective employee workplace behaviour change. Furthermore, it places responsibility for behaviours firmly within the smaller organisational units where it may become part of a self managing strategy. The support and involvement of supervisor and middle management appears to be an area that can be further developed within organisations. This supervisor or mid management level offers the opportunity to effectively target and deliver programs to personnel. Perhaps more importantly for the long term, they are also essential in developing a corporate culture conducive of occupational road safety and are essential in embedding the program for future growth within organisations. It is suggested that supervisors could be the gateway to behaviour change. Therefore it is highly recommended that a specific program for this level of management be developed and implemented. Most industry organisations already facilitate discussion groups in the form of tool box talks, weekly works meetings or safety meetings. It is recommended that information in relation to the topic of low speed vehicle incidents (including potential young child run-overs) be introduced and discussed within these occupational meetings/discussion groups on a regular basis.

8.2.3 Training and Education

Occupational road safety training and education is a vital aspect for transferring awareness and ensuring competency. Traditionally within industry, training was provided on a reactive and adhoc basis and as the only work-related road safety countermeasure in an attempt to reduce incidents/crashes. Research has suggested that training/education alone does not significantly reduce occupational road incidents/crashes, especially long-term. The type of training should also meet the needs of both the organisation and individual, and not just an “off the shelf” or generic type program. Training and education may need to be tailored to suit specific organisational requirements and needs such as low speed manoeuvring and reversing, especially when a substantial proportion of occupational driving is in areas where young children may be present. Training/education is not only a tool to instil knowledge and awareness but an aspect of legislative requirement (e.g. ensuring employees are competent and have a safe place to work).

Ideally, education and training should be implemented on a proactive basis, informing drivers about occupational road safety issues before they occur. It is recommended that specific training and education be accompanied by an information campaign to maximise the promotion and awareness of the road safety issue (i.e., low speed vehicle run-overs of young children). Furthermore, all training and education programs should be recorded and ensure all targeted personnel have completed the program. Additionally, training/education programs should be evaluated to assess their continued relativity and are meeting both organisational and individual needs.
8.3 Intervention Strategies and Initiatives for Small Business and Individual Contractors

As stated previously, the difficulty in identifying, developing and implementing any intervention strategies for small business or individual contractors (i.e., domestic/commercial trades people) is the itinerant nature of their work (e.g., different work locations) and lack of legislative enforcement to undertake initiatives. In addition, a further issue is that this target group generally does not have any safety systems whereby interventions and initiatives can be imbedded (e.g., organisational policy/processes, etc). However, the targeted intervention strategies and initiatives stated in section 8.2 are relevant to this target group, such as, awareness campaign, discussion groups, and training and education. Unfortunately, the mode in which these intervention strategies and initiatives can be delivered and implemented is challenging. For example, it requires a relevant third party organisation to deliver and implement the strategies to the target group, such as the Master Builders Association, other professional bodies and government departments, etc. Furthermore, work-related road safety issues are not considered a priority for this target group and there may be a reluctance to participate in any interventions or initiatives – “time is money” (Rowland et al., 2010).

Generally, most self employed workers or individual contractors (i.e., domestic/commercial trades people) utilise their home as a work base. Therefore, interventions and initiatives that specifically target parents may also be beneficial for targeting self employed workers or individual contractors (i.e., domestic/commercial trades people). Examples of interventions and initiatives were discussed within section 4.10.2 of this report, such as, media and education campaigns.

9. Conclusion

Research evidence suggests that occupational drivers are potentially a high risk group especially for workers (and parents) using home as a work base and storing work-related equipment. In addition, for organisations where a substantial proportion of work is performed in areas where children may be present (e.g. residential areas, schools, shopping centres, etc) there is an increased risk of young child run-overs. The research identified both organisational and individual driver issues/problems as being contributing factors of low speed occupational vehicle incidents and an increase in risk to young children (when working in areas where children may be present). The research also concluded that intervention strategies and initiatives should target both organisational issues and driver behaviours. For example, comprehensive organisational documentation, processes and systems need to be formally developed to support intervention strategies and initiatives, as well as informing their development and implementation. Whereas occupational driver-related intervention strategies should address both aberrant driver behaviour and also the contributing factors (e.g., work/time pressures, inattention/distraction, fatigue, alcohol/drug use, etc) identified as being a high risk to low speed vehicle manoeuvring incidents (including reversing). In relation to “tool of trade” domestic/commercial contractors there are major issues associated with intervention/initiative participation and implementation. Therefore, this target group may benefit from more mainstream media and education campaigns.

10. Study Limitations

When interpreting the results of this study a number of limitations should be taken into account. The number of organisations and participants involved within the focus groups (Stage 1) was
relatively low, but consistent with previous research of this scope and scale. Concerns also remain regarding the reliability of self-report questionnaires (Stage 3), such as the propensity of professional drivers to provide socially desirable responses. However, previous research indicated that bias caused by socially desirable responding is relatively small in DBQ responses (Lajunen & Summala, 2003). Questions also remain about the representativeness of the sample utilised in Stage 3. However, the participants in Stage 2 of this study sample include both government and private industry drivers and are similar to a greater proportion of the Australian work-related driver population. For example, the present study’s participants are primarily field type employees who drive in similar road and environmental contexts (city, urban, rural and off road). Therefore, although this sample may not be a true representation of all professional driving populations in Australia and especially overseas, it does represent a substantial cohort.

11. Further Research

The findings of this research project suggest that it is an area of considerable risk. Therefore, further research should be conducted utilising larger numbers of participants within the discussion groups, and utilise an increased cross section of industry organisations, to improve generalisability and reliability of results. This is highlighted due to the number of reversing and low speed vehicle manoeuvring incidents incurred within industry organisations. Furthermore, contractors/self-employed workers and tradesmen were identified as a high risk driving group and further research is required in this area. Alarmingly, drug use was identified as a serious problem, especially amongst contractors and/or self-employed tradesmen. It is suggested that further research should be conducted to ascertain the prevalence of drug use and drug driving in this area.
12. References


Meers, G. (2001). Queensland crash data on work-related crashes and injuries. Symposium conducted at the Work-related Road Trauma and Fleet Risk Management in Australia, Brisbane, Australia.


Appendix A

LOW SPEED VEHICLE RUNOVERS
FLEET PARTICIPANT INTERVIEW/DISCUSSION GROUP QUESTIONS

Fleet participant interview/discussion group questions are grouped within six specific themes:

1) **Significance of the Issue**

How significant is the issue of low speed manoeuvring and reversing incidents in your organisation?

Are you aware of any low speed vehicle run-overs of pedestrians/children within your organisation or generally?

Prompts:
- Crash data,
- Organisational communication (e.g. email alert, notice),
- Personally,
- Word of mouth.

What percentage of work (when driving/parking) is in the vicinity of domestic households or where children may be present (e.g. schools, shopping centres, etc)?

2) **Personal Performance**

What procedure do you use when low speed manoeuvring and reversing?

Is this procedure performed every time?

Have you thought about it?

Prompts:
- Use mirrors to check rear,
- Physically walk around vehicle,
- Just reverse.

3) **Difficulties When Manoeuvring or Reversing Vehicles**

Do you have any difficulties when manoeuvring or reversing vehicles at low speed (including 4WD and trailers)?

Are there any factors that influence your ability to drive safely, specifically when manoeuvring or reversing your vehicle?

Prompts: For example,
- Visibility,
- Type of vehicle,
- Time pressure,
Inattention,
Distraction.

How do you think these difficulties could be addressed?

4) **Awareness Information**

Does your organisation provide any information in relation to low speed vehicle manoeuvring and reversing?

If yes, what type of information?

If yes, do you read/remember the information?

Prompts:
- Fleet safety policy,
- Operational procedures,
- Fleet safety newsletters, posters, etc,
- Within safety or works meetings,
- Organisational communication (e.g. personal, email, intranet, etc).

Have you seen/read any other information (other than within your organisation) in relation to vehicle low speed manoeuvring and reversing?

5) **Organisational Initiatives or Intervention Strategies**

Have you received any education, training, induction or other initiative relating specifically to vehicle low speed manoeuvring or reversing?

If yes, what type?

Prompts:
- Online or face-to-face,
- Practical or theory based,
- With your organisation or external provider,
- Induction – when employed or before driving a work vehicle.

6) **Risk Reduction**

What do you think could be done to reduce the risk of low speed manoeuvring and reversing incidents within your organisation (including run-overs of young children)?

Prompts:
- Organisationally,
- Personally.
## Appendix B – Survey Questionnaire Items

### Driver Behaviour Questionnaire

(Please **circle one number** from 1 = ‘Never’ to 7 = ‘Always’ for each item)

<table>
<thead>
<tr>
<th>Behaviour Description</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Uncertain</th>
<th>Often</th>
<th>Nearly Always</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attempt to overtake someone that you hadn’t noticed to be turning in front of you</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Stay in a lane that you know will be closed ahead until the last minute before forcing your way into another lane</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Miss ‘Stop’ or ‘Give Way’ signs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Intentionally disobey a ‘Stop’ or ‘Give Way’ sign</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Pull out of a junction so far that you disrupt the flow of traffic</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Fail to notice that pedestrians are crossing in your path of traffic</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Drive especially close to the car in front as a signal to its driver to go faster or get out of the way</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Sound your horn to indicate your annoyance to another driver</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Queuing to enter a main road, you pay such close attention to the main stream of traffic that you nearly hit the car in front</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Cross a junction knowing that the traffic lights have already turned against you</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Whilst turning nearly hit a cyclist who has come up on your inside</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Exceed the speed limit on a highway/freeway</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Exceed the speed limit on a highway/freeway without realising</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Fail to check your rear-view mirror before pulling out or changing lanes, etc</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Become angered by a certain type of driver and indicate your hostility by whatever means you can</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Become impatient with a slow driver ahead and overtake on the inside</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>When overtaking underestimate the speed of an oncoming vehicle</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Race away from the traffic lights with the intention of beating the driver next to you</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Skid while braking or cornering on a slippery road</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Behavior</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Drive even though you suspect you may be over the legal blood-alcohol limit</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Disregard the speed limit on a residential road</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Exceed the speed limit on a residential road without realising</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Become angered by another driver and give chase</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Drive while under time pressure</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Find your attention being distracted from the road</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Hit/bump/scrape something while manoeuvring (including parking and reversing)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Drive while tired</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Save time during the day by driving quicker between jobs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Have difficulty driving because of tiredness or fatigue</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Not wear your seatbelt</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Find yourself nodding off while driving for work</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Have one or two alcoholic drinks before driving for work</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Lose concentration while driving</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Check the tyre pressure and fluid levels of your work vehicle</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Do paperwork or other admin while driving</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Remove your seatbelt for some reason while driving</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Eat a meal while driving for work</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Physically check behind the vehicle for objects before reversing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Find yourself driving on “autopilot” on the way home from work</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Drive home from work after a long day (after working 12 hours or more)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Conduct pre-trip vehicle inspections</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Drive while using a “hand-held” mobile phone</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Drive while using a &quot;hands-free” mobile phone</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
Safety Climate Questionnaire – Modified for Drivers

How much do you think the following practices apply to your organisation?

(Please circle one number from 1 = ‘Strongly Disagree’ to 7 = ‘Strongly Agree’ for each item)

<table>
<thead>
<tr>
<th>Practice</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety rules relating to the use of motor vehicles are followed even when a job is rushed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety rules relating to the use of motor vehicles can be followed without conflicting with work practices</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleet safety problems are openly discussed between employees and managers/supervisors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety policies relating to the use of motor vehicles are effectively communicated to workers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is sufficient time to enable employees to drive safely for work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time schedules for completing work projects are realistic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Our organisation ensures that safety procedures and rules relating to the use of motor vehicles are available to employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety procedures relating to the use of motor vehicles are complete and comprehensive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver safety is central to management’s values and philosophies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management expectations encourage safe driving</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C – Sample Reversing Poster

Check Your BACKSIDE Before Reversing

Who knows what you might back into

© CARRS-Q Fleet Safety Team