

QCO/DME Safety Conference 1994  
"Changing the Culture"

*Occupational Health and Safety in the  
Queensland Coal Industry*

T.Mitchell, 1994

ABSTRACT

The Commissioned Study of Occupational Health and Safety in the Australian Coal Industry set out to identify priority occupational health and safety issues relating to the Australian black coal industry. This paper examines one part of that project, the investigation of major OHS issues related to the Queensland coal industry. For this purpose, it was necessary to combine the Queensland coal industry compensation data and accident/incident report data. Merging of the data sets of the Queensland Workers' Compensation Board and the Queensland Department of Minerals and Energy resulted in 3,636 (87%) matched records of a possible 4,196 mutual records for the period July 1st, 1989 to June 30th, 1993. **The report of the Commissioned Study highlighted inadequacies in the data that limited precise/scientific identification of priority occupational health and safety problems relating to the Queensland coal industry.** It was concluded that the sample of the 3,636 claims, therefore could only provide the **best available estimate** of problems in opencut and underground coal mining activities in Queensland. The analysis of the limited data found the main issues requiring preventive intervention to be:

i. **Opencut Mine Workers:**

- Vehicular traffic flow systems and road design;
- Ergonomics of manual handling tasks;
- Access/egress and associated issues related to opencut mining plant and equipment;
- Machine guarding around operating equipment;
- Noise and whole body vibration associated with surface mining equipment.

ii. **Underground Workers:**

- Ergonomics of manual handling tasks;
- Plant and equipment operator's cabin/workstation ergonomics and motion induce jarring and vibration;
- Vehicular traffic flow systems and underground road design;
- Access/egress and associated issues related to underground mining equipment;
- Control of risk of entrapment or being struck by mining equipment;
- Work environment, mining methods and OHS management systems associated with slide/fall of coal/rocks;
- Noise and both hand/arm and whole body vibration associated with underground mining equipment/plant.

iii. **U/ground Supervisors:**

- Same problems as Underground Workers however, further field risk assessment is necessary to verify the potential problems identified in the analysis.

The authors of the report discovered that the databases of Queensland Workers' Compensation Board and the Queensland Department of Minerals and Energy could not be merged by external researchers to accurately, nor expeditiously provide consequence and incident variable information for the identification of priority occupational health and safety issues relating to the Queensland coal mining industry. Furthermore, high levels of uncoded variable fields were noted in both databases. The degree of missing and incorrect data will seriously impede any future research initiatives to determine the level of occupational health and safety management performance of the industry unless steps are taken to rectify the methods of obtaining, reporting and coding information.



## **1. INTRODUCTION**

Management of the Queensland compensation and accident reporting data differs considerably from that of the New South Wales Coal Industry. In Queensland, there are separate authorities responsible for these two functions. The Queensland Workers' Compensation Board (QWCB) and the Queensland Department of Mineral and Energy (QDME) individually compile databases which are used extensively for monitoring and reporting the claims experience and accident statistics of the Queensland coal industry.

Each authority respectively produces periodic compensation summaries and accident statistics reports as a service to the coal industry. Such reports, separately measure the prevalence and consequence of occupational injury and disease in the Queensland coal industry. Information in these formats, however, do not adequately describe the economic consequence of work related injuries in terms of the factors contributing to the incident resulting injury. Therefore, priorities for preventive intervention in the past have been established mainly based on the prevalence of a particular type of injury.

The analysis, from which the results of the third part of the project were derived, was based on the combined (matched) compensation and accident report data sets for the period 01/07/89 to the 30/06/93.

The analysis of 3,636 matched cases of Queensland Workers Compensation Board and the Department of Minerals and Energy databases provided 2,249 lost time injury compensation claims for opencut workers with a value of \$7.5 million and 1,387 underground workers' claims with a value of \$5.1 million for the 48 month period studied. Concurrently 1,155 occupational disease claims were extracted from compensation data set provided by the Queensland Workers Compensation Board. These claims represented \$2.6 million in total compensation to Queensland coal industry workers during the period (see Mitchell and Larsson, 1994).

To interpret the lost time injury data, a severity index was used based on various amounts paid in compensation, lump sum payments, medical expenses and other miscellaneous expenses. This severity index was used in conjunction with injury descriptors including activity, occupation, mechanism, agency, nature of injury and part of body injured.

## **2. Employment and Mining Activity Distribution**

There were 10,688 people employed in the Queensland coal mining industry during the study period. Of these, 6,473 worked in open cut production activities, 1,339 worked in underground production activities, approximately 400 worked in coal processing activities and 2,476 worked in administration/management/surface support activities. These data are summarised in Figure 1.

## **3. Summary of All Claims Reviewed**

The total compensation payments for the claims considered by this study was \$13.2 million. Of this amount, \$7.4 million was paid as compensation, \$2.7 million was paid in the form of lump sum payments, \$2.4 expended on medical services (including rehabilitation) and \$770,000 on miscellaneous payments to mine workers. Table 1 summarises the analysis of all claims data for the period.

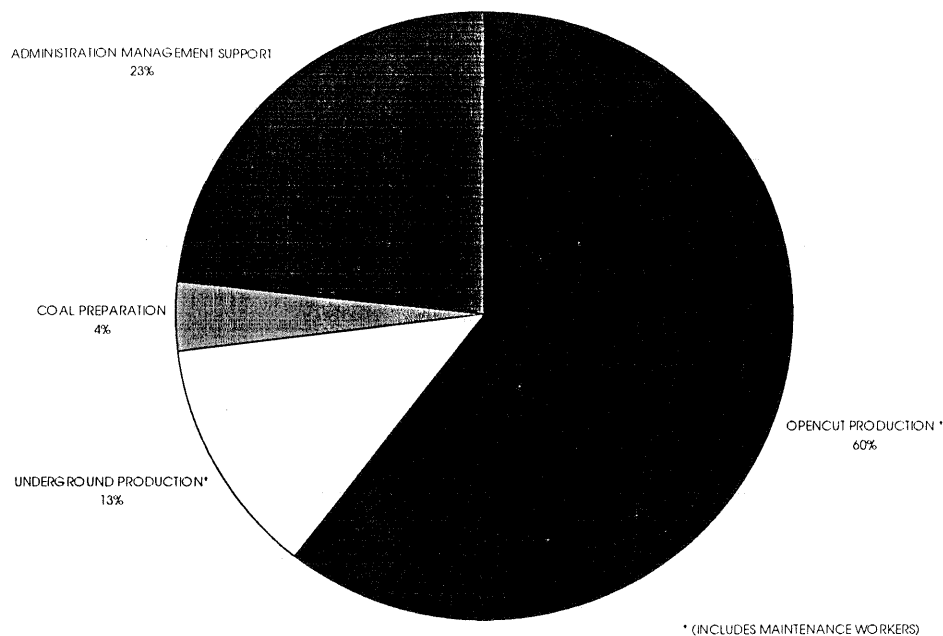


Figure 1. Distribution of mine workers by mining activity. [Source: Qld Coal Board, 1993]

Mining Activity Group	Employees	Claims	Days Lost	Compensation Component (\$)	Lump Sum Component (\$)	Medical Component (\$)	Other/Misc Component (\$)	Total Comp (\$)
ALL CLAIMS <sup>(1)</sup>								
Underground Mining	1,980	1,680	15,586	2,847,657	773,619	713,521	254,997	4,589,793
Surface Excavations	8,708	3,096	22,178	4,539,158	1,889,492	1,636,039	514,734	8,579,422
Other	n/a	15	0	0	27,636	1,120	1,054	29,810
<b>Total</b>	<b>10,688</b>	<b>4,791</b>	<b>37,764</b>	<b>7,386,815</b>	<b>2,690,747</b>	<b>2,350,680</b>	<b>770,784</b>	<b>13,199,026</b>

Table 1. Summary Information of All Claims for the period of study

Mining Activity Group	Avg. Claims per Year	Claims/1000 Employees per Year	Avg. Comp per Claim
ALL CLAIMS <sup>(1)</sup>			
Underground Mining	420	212	\$2,732
Surface Excavations	774	89	\$2,771
Other	4	n/a	\$1,987
<b>Total</b>	<b>1,198</b>	<b>112</b>	<b>\$2,755</b>
LOST TIME <sup>(2)</sup>			
Underground Mining	347	175	\$3,007
Surface Excavations	562	65	\$2,857
Other	n/a	n/a	n/a
<b>Total</b>	<b>909</b>	<b>85</b>	<b>\$2,914</b>
NO LOST TIME <sup>(3)</sup>			
Underground Mining	73	37	\$1,432
Surface Excavations	212	24	\$2,544
Other	4	n/a	\$1,987
<b>Total</b>	<b>289</b>	<b>27</b>	<b>\$2,255</b>

Table 2 All data analysed described as the average number of claims per year; the average number of claims per employee; and the average amount compensated per claim.

NOTE:

- (1) Data set of claims reviewed
- (2) Lost Time Injury claims were based on the matched QWCB and QDME records
- (3) Disease claims extracted from the unmatched QWCB records

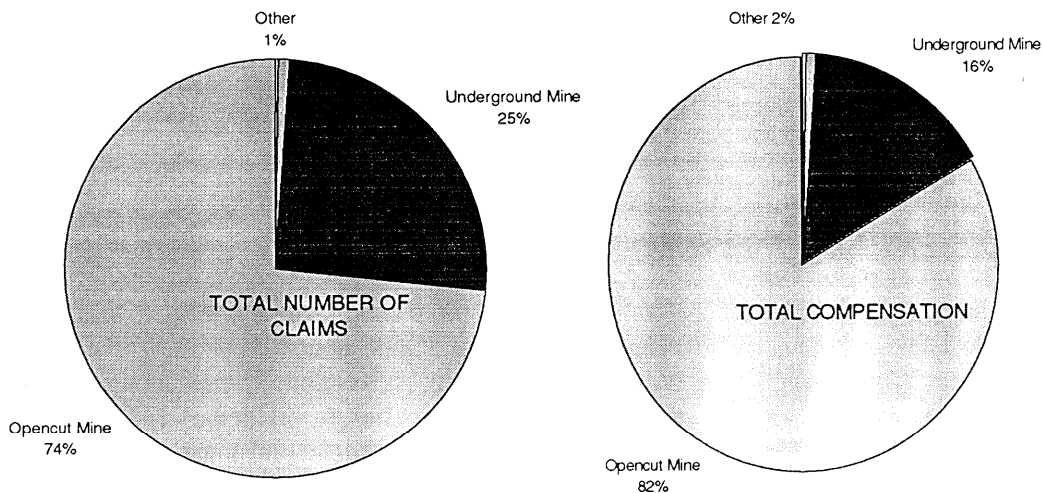
#### 4. Analysis of Lost Time Injury Claims by Industry

A total of 3,636 matched records comprising 99% traumatic injury claims and 1% disease related claims resulting in time lost were analysed. An initial review of these data indicated problems with categorising the data by the occupation groups used in Part Two - Analysis of NSW Compensation Claims (see Mitchell and Larsson, 1994, Volume One). Because of the large number of NSW claims it possible to categorise the claims into six occupation groups. Categorisation of the limited number of Queensland claims using the same occupation categories would have provided reasonable sized data sets for opencut excavation workers and underground face workers, however, the data sets for the remaining occupation groups would have produced smaller numbers of claims per category. As a result, the matched records were separated into two categories of coal mining production, based on the QWCB industry codes. These were **underground mining** and **open cut mining**.

#### 5. Claims for No Lost Time Injuries/Diseases

A total of 1,155 no lost time injury claims were reviewed during the study. These claims were extracted from the QWCB data and are not represented in the matched data set. The no lost time injury claims represent a total of \$2.6 million compensation payments.

Figure 2, provides comparative distribution of the number of claims and the total compensation proportions for opencut, underground and other mining activities. The charts show a noticeable variation in the claims to compensation ratio between opencut and underground mine workers. This indicates that the severity per claim associated with underground workers, on average is less than that of opencut workers.



**Figure 2.** *No Lost Time Injury data (n = 1155) Distributed of number of claims and compensation payments.*

Of the occupational disease claims, 911 were for noise induced hearing loss and accounted for \$1.8 million in total compensation. This amount represents approximately 65% of the total no lost time injury compensation experience for the industry.

Mining Activity Group	Employees	Claims	Days Lost	Compensation Component	Lump Sum Component	Medical Component	Other/Misc Component	Total Comp
NO LOST TIME <sup>(2)</sup>				(\$)	(\$)	(\$)	(\$)	(\$)
Underground Mining	1,980	293	0	0	269,557	102,910	47,199	419,665
Surface Excavations	8,708	847	0	0	1,543,548	450,891	160,351	2,154,790
Other	n/a	15	0	0	27,636	1,120	1,054	29,810
<b>Total</b>	<b>10,688</b>	<b>1,155</b>	<b>0</b>	<b>0</b>	<b>1,840,741</b>	<b>554,921</b>	<b>208,603</b>	<b>2,604,265</b>

*Table 3. Summary of No Lost Time Injury/Disease data analysed.*

Carpal tunnel syndrome claims (n = 83) represented approximately 12% of the compensation experience. Respiratory system disease claims (n = 13) accounted for 3.2% of the total compensation for occupational diseases during the 48 month study period.

In terms of the most severe no lost time injury/disease claims, seven heart attack claims recorded during the period were observed to have an average compensation per claim of \$31,391. In comparison, noise induced hearing loss claims for the period averaged \$1,942 per claim.

The analysis also identified 18 cases of mental disorder (probably stress related) with a higher than average medical cost component per claim. Soft/connective tissue injuries show a high medical consequence associated with a significant number of claims.

The limited number and scope of descriptive variables used by the QWCB has limited the analysis of factors contributing to the diseases and injuries that result in claims involving only medical intervention (i.e. no lost time injury claims). Of the descriptive variables contained in the data set, information describing the claimants' occupation was available, although coding for these data was generally poor. In relation to this issue, more than half of the claims registered in the data set were not coded. In addition, because of the descriptive text input for this particular data field, there was considerable variation between the coded entries for most occupations in these data.

## 6. Lost Time Injury Claims - Opencut Workers

Opencut workers represent a broad coal mining activity group comprising 8708 employees. The group includes Opencut Excavation Workers, Administrative/Management/Support Workers, Supervisors, Washery Workers and Trades Workers. There were 2,249 lost time injuries among opencut workers during the 48 month period under study (see Table 4). Thus, based on the 01/07/89 to 30/06/93 claims experience, each year one opencut worker in fifteen had a lost time injury. These claims amounted to \$7.5 million total compensation paid to this group during the period under study.

NO. CLAIMS	DAYS LOST	COMPENSATION(\$)	LUMP SUM(\$)	HOSP/MEDICAL(\$)	OTHER(\$)	TOTAL COMP(\$)
2,249	23,908	4,539,158	345,943	1,185,147	354,383	7,484,911
<b>AVG/CLAIM</b>	10.6	2,018	154	527	158	3,328

*Table 4. Summary information for claims involving opencut workers (n=2249)*

NOTE:

(2) Lost Time Injury claims were based on the matched QWCB and QDME records

The results of the sample studied shows that claims lodged by opencut mine workers (n= 2249 claims) amount to almost twice the number of compensation claims lodged by underground mine workers (n= 1387 claims). The average cost per lost time injury claim from opencut mining activities during the study period was \$2,857. This compared with \$3,007 for claims from underground mining activities.

Table 5 identifies the general variable categories that describe the majority of the compensation claims experience for opencut workers. Specific key variables identified by the relative severity analysis for this occupation group are summarised in Table 6.

ACTIVITY	OCCUPATION	INJURY	PART OF BODY	AGENCY	MECHANISM	EQUIPMENT
Production Mechanical	Mine Production Earthmoving Oper. Mechanical Trades	Sprain/Strain Fracture Open Wound Contusion	Back/Trunk Arms/Shoulders Legs/Hips Head and Neck	Other/Unspecified Mobile Equipment Non Power Tools Work Environment	Vehicle Accident Falls/Slips/Trips Body Stress Hit by Moving Object	Non Power Tools Mobile Equipment Fixed Plant Semi Mobile Equipment

*Table 5. Summary table of prominent factors identified by analysis of total compensation payments to Opencut Workers for lost time injury claims.*

ACTIVITY	OCCUPATION	INJURY	PART OF BODY	AGENCY	MECHANISM	EQUIPMENT
Administration Production	admin/support earthmoving oper. production workers	diseases fractures hernia/soft tissue	multi location back and trunk	outdoor roads vehicles < 5 tonne trailing cable vehicles > 5 tonne dozer (tracked) front-end loaders component/parts belly dump trucks	vehicle roll-over falls/slips/trips vehicle motion muscular stress	vehicles < 5 tonne dozer (tracked) trailing cable vehicles > 5 tonne hoses non-powered equip front-end loader belly dump truck powered handtools

*Table 6. Table of specific variables with higher than average relative severity per claim for Opencut Workers.*

The results of the analysis of severe injuries among opencut production activities imply a high level of exposure to risks associated with operation of mobile mining equipment, work involving manual handling and the use of handtools, both powered and non-powered. The volume and nature of claims data associated with traumatic injury also suggests that there is a high degree of unintentional body contact with objects and equipment, slips/trips/falls (from equipment) and muscular stress.

In addition, the risks associated with opencut production activities were increased by environmental factors such as the condition of road and floor/platform surfaces.

## 7. Lost Time Injury Claims - Underground Workers

The underground workers activity group includes Underground Miners, Machinemen, Loadermen, Underground Mine Administrative/Management/Support Workers, Deputies and Trades Workers at underground coal mine operations. These employees constitute 1,980 employees of the QLD Coal Industry work force. There were 1,387 lost time injuries among underground workers during the 48 month period under study (see Table 7). Thus, based on the 01/07/89 to 30/06/93 claims experience for the industry, on average each year one underground worker in six had a lost time injury.

NO. CLAIMS	DAYS LOST	COMPENSATION(\$)	LUMP SUM(\$)	HOSP/MEDICAL(\$)	OTHER(\$)	TOTAL COMP(\$)
1,387	13,856	2,847,657	504,062	610,611	207,798	5,067,001
AVG/CLAIM	9.9	2,053	363	440	150	3,653

*Table 7. Summary of Underground Workers Lost Time data (n = 1387).*

The analysis indicated that there were 1,387 claims amounting to \$5.1 million total compensation paid to this group during the period under study. Table 8 identifies the general variable categories that describe the majority of the compensation claims experience for underground workers. Specific key variables identified by the relative severity analysis for this occupation group are summarised in Table 9.

Manual handling is the dominant problem in the **underground production activity** group. Falls leading to injuries are very common, as were injuries resulting from being struck by or striking equipment or material from the coal face or roof. The data also shows a significant proportion of injuries with high severity resulting from incidents involving the operation of mining equipment (e.g. shuttle cars, continuous miners and conveyor systems), vehicles in motion, and slides/cave-ins at the face.

ACTIVITY	OCCUPATION	INJURY	PART OF BODY	AGENCY	MECHANISM	EQUIPMENT
Production	Production Deputy	Strain/Sprains Contusions Fractures Open Wounds	Back/Trunk Arms/Shoulders Leg/Hips Work Environment	Other/Unspecified Mobile Equipment Non Power Tools Vehicle Accident	Body Stress Hit by Moving Object Falls/Slips/Trips	Non Power Tools Mobile Equipment Fixed Plant Semi Mobile Equipment

*Table 8. Summary table of prominent factors identified by analysis of total compensation to Underground Workers for lost time injury claims.*

ACTIVITY	OCCUPATION	INJURY	PART OF BODY	AGENCY	MECHANISM	EQUIPMENT
Supervision Production	deputies /undermanagers production workers	fractures	multiple locations back and trunk	underground face conveyors shuttle car component/parts trailing cable underground roads non-powered handtools	trap by machine motion of vehicle slide/cave-in fall/slip/trip muscular stress	continuous miner, conveyor trailing cable underground vehicles

*Table 9. Table of specific variables with higher than average relative severity per claim for Underground Workers.*

There were a considerable number of claims involving deputies in the compensation material for underground workers. This suggests that deputies working in Queensland underground mining are exposed to many and varied hazards due to the nature of their work tasks and work environment. The degree of risk appears similar to that of their New South Wales counterparts. It should be noted however, that due to inadequate coding in the QWCB and QDME data sets (in their present state), this observation requires further investigation to verify the extent of the problem.



## 8. USING THE QUEENSLAND DATA SETS TO PRIORITISE RESEARCH

Currently in Queensland, the occupational health and safety performance of the black coal industry is measured using either the compensation claims experience or the accident experience data independently. As a result, it is probable that the compensation data indicates to the industry the high severity injuries and diseases categories. No descriptive information, however, is available to adequately identify factors contributing to the injurious events. Alternatively, accident experience data is able to provide considerable information to identify prevalent occupational injuries as well as describing factors contributing to such accidents. The accident/incident data set, however, is not able to provide a measure of the actual economical consequence of injuries. It is, therefore, possible that the most common injuries occurring may not necessarily be the most expensive to the industry.

The report (Mitchell and Larsson, 1994) noted that there were no formal arrangements existed for linking the databases of the Queensland Workers' Compensation Board and Queensland Department of Minerals and Energy to facilitate access to both descriptive incident and consequence information. This problem requires immediate attention if relevant data is to be obtained on an ongoing basis to assist the Queensland coal industry to prioritise occupational health and safety initiatives.

In addition, the following three specific coding problems were apparent in the data analysed. These indicated quality assurance problems associated with data collection, coding and/or input. The problems identified included:

- i. **Unspecified Data Entries** - Considerable gaps exist in certain variable fields that were critical to both the matching and analysis processes. One example was the "occupation" variable of the Queensland Workers' Compensation Board data. For this variable approximately 50% of the data in the matched sample were found to have either missing (blank) data cells or data cells entered with an "other" or "unspecified" code.
- ii. **Discrepancies in Variable Codes Between Data Sets** - considerable differences exist between the two data sets in the terms and codes used to classify similar information. An example was the industry business descriptor of the Queensland Workers' Compensation Board data. This is based on a combination of the company name and the mine site name. A similar descriptive variable field in the Queensland Department of Minerals and Energy data lists mine site names or pit names.
- iii. **Discrepancies in Variable Codes Within Data Sets** - Within the QWCB data set several variables are coded in alpha text format. Due to variation in interpretation by data input personnel, a single descriptive variable can be described in several terms (e.g. The occupation variable - DEPUTY - was also coded as MINE DEPUTY, U/G DEPUTY, MINER'S DEPUTY, DEPUTY UNDERGROUND, DEPUTY MINER etc.). This creates considerable problems when attempting to extrapolate valid data to express the injury and disease experience of these workers.

Further, the absence of a precise occupation classifications distribution information within the Queensland coal mining industry restricted the study. Specifically, the absence of this information limited the ability to correlate the consequence information to risk exposures associated with individual occupation groups. It should be noted that national restructuring of occupation classifications within the Australian coal industry is presently being undertaken. This provides an opportunity to establish a better measure of the contemporary occupation classification distribution for the industry.

## 9. CONCLUSIONS

Volume Two, Part Three of the Commissioned Study of Occupational Health and Safety in the Australian Coal Industry set out to identify priority occupational health and safety issues relating to the Queensland black coal industry. For this purpose, it was necessary to combine the Queensland coal industry compensation data and accident/incident report data. Merging of the data sets of the Queensland Workers' Compensation Board and the Queensland Department of Minerals and Energy resulted in 3,636 (87%) matched records of a possible 4,196 mutual records for the period July 1st, 1989 to June 30th, 1993.

**From the outcome of the matching process, the authors conclude that there are still inadequacies in the data that limit the ability to confidently prioritise occupational health and safety problems relating to the Queensland coal industry.**

Acknowledging this point, the analysis of the sample of the 3,636 matched claims data provide the **best available estimate** of problems in opencut and underground coal mining activities in Queensland. Therefore, the analysis of compensation claims and accident data suggests the main issues requiring preventive intervention to be:

- i. Opencut Mine Workers:
  - Vehicular traffic flow systems and road design;
  - Ergonomics of manual handling tasks;
  - Access/egress and associated issues related to opencut mining plant and equipment;
  - Machine guarding around operating equipment; and
  - Noise and whole body vibration associated with surface mining equipment.
  
- ii. Underground Workers:
  - Ergonomics of manual handling tasks;
  - Plant and equipment operator's cabin/workstation ergonomics and motion induce jarring and vibration;
  - Vehicular traffic flow systems and underground road design;
  - Access/egress and associated issues related to underground mining equipment;
  - Control of risk of entrapment or being struck by mining equipment;
  - Work environment, mining methods and OHS management systems associated with slide/fall of coal/rocks; and,
  - Noise and both hand/arm and whole body vibration associated with underground mining equipment/plant.
  
- iii. Underground Supervisors:
  - Same priorities as Underground Workers.

**The occupational disease data analysed for this study was extracted independently from the matched data and all available disease claims data for the period of study were analysed. Hence sufficient data was considered to substantiate the following conclusions.**

The study finds that noise induced hearing loss accounted for \$1.8 million (65%) of the total \$2.6 million compensation for occupational disease in the study material. In comparison, respiratory diseases claims for the same period only represented 3.2 % of the total compensation costs. It was also noted that symptoms of disease commonly found to relate to repetitive work activities, have accounted for approximately 12% of the compensation experience for occupational diseases.

In addition to the analysis of compensation and accident data, the commissioned study considered the possibilities of using existing databases to identify priority OHS problems relating to the Queensland (and national) coal mining industry.

The study found that the databases of the Queensland Workers' Compensation Board and the Queensland Department of Minerals and Energy have significant discrepancies between the input variable coding systems of the two organisations. This was found to be restrictive in terms of speed of processing data and scope of results able to be obtained. Additionally, missing and unspecified data were found to limit the amount of matched data available for analysis and inhibit the analysis undertaken for this project.

It is recognised that the two authorities were able to merge their respective data sets thus providing an opportunity to study the combined incident and consequence data to identify major occupational health and safety management deficiencies within the industry. Presently, this approach has proved to be a time consuming process that is still unable to accurately reflect the true experience of the industry. It is beyond the scope of this project to analyse the many problems associated with the data management systems of both the QWCB and the QDME. It can however be concluded that the existing arrangements are unsuitable.

The Queensland Workers' Compensation Board claims data system is not suitable for monitoring and measuring the true extent of occupational disease exposure within the industry. At its best, this system can only provide a measure of the consequence long after the damage caused by the occupational disease has occurred. The Queensland Workers' Compensation Board system does however provide an extensive classification of occupational diseases due to the descriptive information being translated directly from the doctor's certificate submitted with the compensation claim form.

Finally, the report has identified several areas for attention by the Queensland coal industry. These issues must be addressed, as they are essential to the effective management of the industry's resources for obtaining accurate information, efficient research activities and ultimately safe and healthy working conditions for coal mining employees.

## 10. REFERENCES

Mitchell, T. and Larsson, T.J. (1994) *Final Report of the Commissioned Study into OHS Performance of the Australian Black Coal Industry*. Australian Coal Association Research Program, Sydney.