RISKY BUSINESS - WHAT, HOW AND WHY

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RISKY BUSINESS: - WHAT, HOW AND WHY (A CASE STUDY CONDUCTED FOR GOULBURN VALLEY WATER)

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ABSTRACT

The concept of risk assessment is one, which is being increasingly used throughout Australia in the management of water supply systems and in the provision of safe and good quality drinking water. A number of the larger water authorities in major metropolitan centres and some rural Victorian and NSW water authorities are pursuing risk assessment as the accepted approach to scientifically evaluate pollutants and to develop protective public policies. The mechanism by which the risk management process is being undertaken may vary from authority to authority but essentially follows the same principles. This paper describes the elements of a risk management exercise conducted at Goulburn Valley Water in relation to the drinking water supplies, the methodology employed, the water authority response to outcomes and the benefits perceived to have arisen from the approach.

KEYWORDS

Risk Assessment and Management, Health risk, Drinking water supplies

1.0 INTRODUCTION

Risk management is increasingly being adopted as an adjunct to a regulatory approach to achieve good quality drinking water. The shortcomings of dependence on the traditional approach, of compliance with guidelines and reaction to exceedances, have become apparent in recent years. This approach is reflected in current drinking water guidelines, including the Australian Drinking Water Guidelines, 1996. These guidelines clearly state that although the implied emphasis of the guidelines is on regular testing for a variety of water quality characteristics, testing does not effectively guarantee the safety of water supplies, avoid contamination from human wastes, and maintain multiple barriers to contamination from catchment to tap.

Draft New Zealand health regulations likewise promote risk management procedures. Draft guidelines propose that the drinking water supply operator (ie water authority) in addition to achieving non-exceedance of maximum acceptable values (MAVs) for chemicals and microbes shall operate risk management procedures for community drinking water supplies. Such procedures are required to:

- identify the critical points of the process
- draw up risk management and contingency plans for each of the critical points
- implement the risk management and contingency plans
- be audited using assessors accredited by an internationally recognised accreditation body

These procedures are to be implemented for each of the stages in the provision of a drinking water supply, namely:

1. collection of raw water
2. treatment of raw water to provide finished water which is safe to drink
3. provision of a safe means of distribution from the supplier to the consumer

The concept of risk assessment is one, which is being increasingly used throughout Australia in the management of water supply systems and in the provision of safe and good quality drinking water.

A number of the major metropolitan water authorities and some rural Victorian and NSW water authorities are leading the way by pursuing risk assessment as the accepted approach to scientifically evaluate pollutants and to develop protective public policies. The mechanism by which the risk management process is being undertaken may vary from authority to authority but essentially follows the same principles (Scott *et al*., 1999). The generic standards, which may be employed in the risk management process, include:

- AS4360 (Australian Standard for Risk Management)
- ISO 9001 (managing the risk of failure to meet consumers' product expectations), ISO 14001 (managing the risk of failure to meet environmental standards)
- Hazard Analysis and Critical Control Point (HACCP) principles (managing the risk of contamination of the water supply).

The risk assessment and management exercise performed on behalf of GVW described here was performed on 5 GVW drinking water supplies. The risk assessment and management process essentially followed the same process as that conducted by Sydney Water on its whole 14 water supply systems (prior to the split of the Sydney Catchment Authority). The protocol employed represents one of the more sophisticated versions of a risk assessment and management exercise.

2.0 METHODOLOGY

The focus of the risk assessment and management process performed for GVW on 5 selected supplies was on the assessment of the catchment and other risks to GVW potable water supplies.

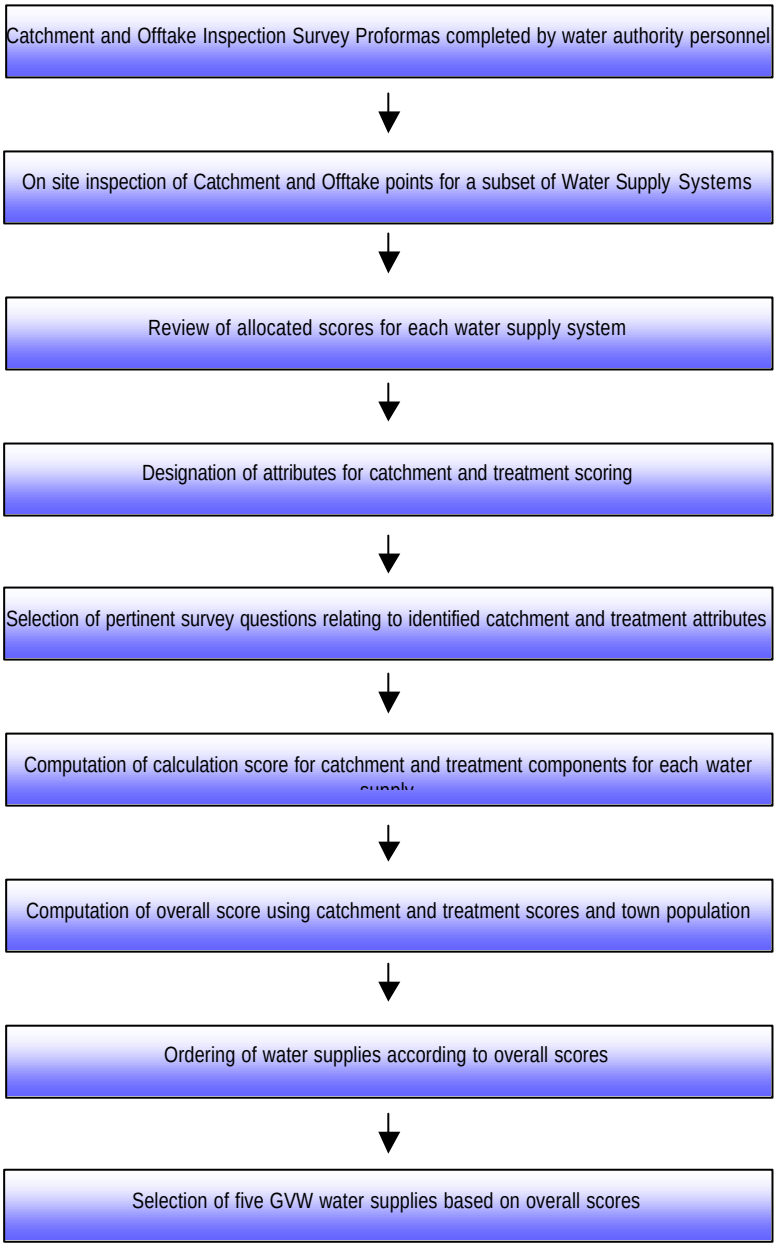
As a preamble to the risk assessment and management exercise proper, a preliminary screening was conducted to reduce the 51 "applicant" water supplies to a short list of 5. In the context of the widely differing state of catchment protection throughout the region it was the characteristics of the catchment and identified hazards, which primarily governed the initial categorisation and prioritisation of the 51 water supplies (equivalent to 38 water supply systems). This categorisation and prioritisation process resulted in the selection of the 5 supplies for the subsequent detailed risk assessment and management process.

Both microbial and chemical risks posed by the water supply catchments were considered. Those aspects of the catchment that were examined and which impacted to the greatest extent on the selection process related to the sources of animal and human faecal contaminants in the catchment. This focus on microbiological rather than chemical contaminants is consistent with approaches elsewhere. The WHO Guidelines for Drinking Water Quality Volume 1:Recommendations, 1993, deals with the relationship between chemical and microbial contaminants of drinking water. In particular, the potential consequences of microbial contamination and its control are stated as being of paramount importance, with the provision that they must never be compromised. In general terms, the greatest microbial risk is considered to be associated with ingestion of water that is contaminated with human and animal excreta. The health risk due to toxic chemicals in drinking water is discussed and seen to differ from that caused by microbiological contaminants.

In the selection of the 5 high risk profile supplies to be subjected to the risk assessment and management process, characteristics other than those relating to the catchment were also evaluated (treatment regime employed, turbidity breaches/spikes) as well as the population supplied. These aspects however were secondary to catchment characteristics.

The preamble selection process to obtain the 5 supplies for the subsequent detailed risk assessment/management process are shown in Figure 1 below.

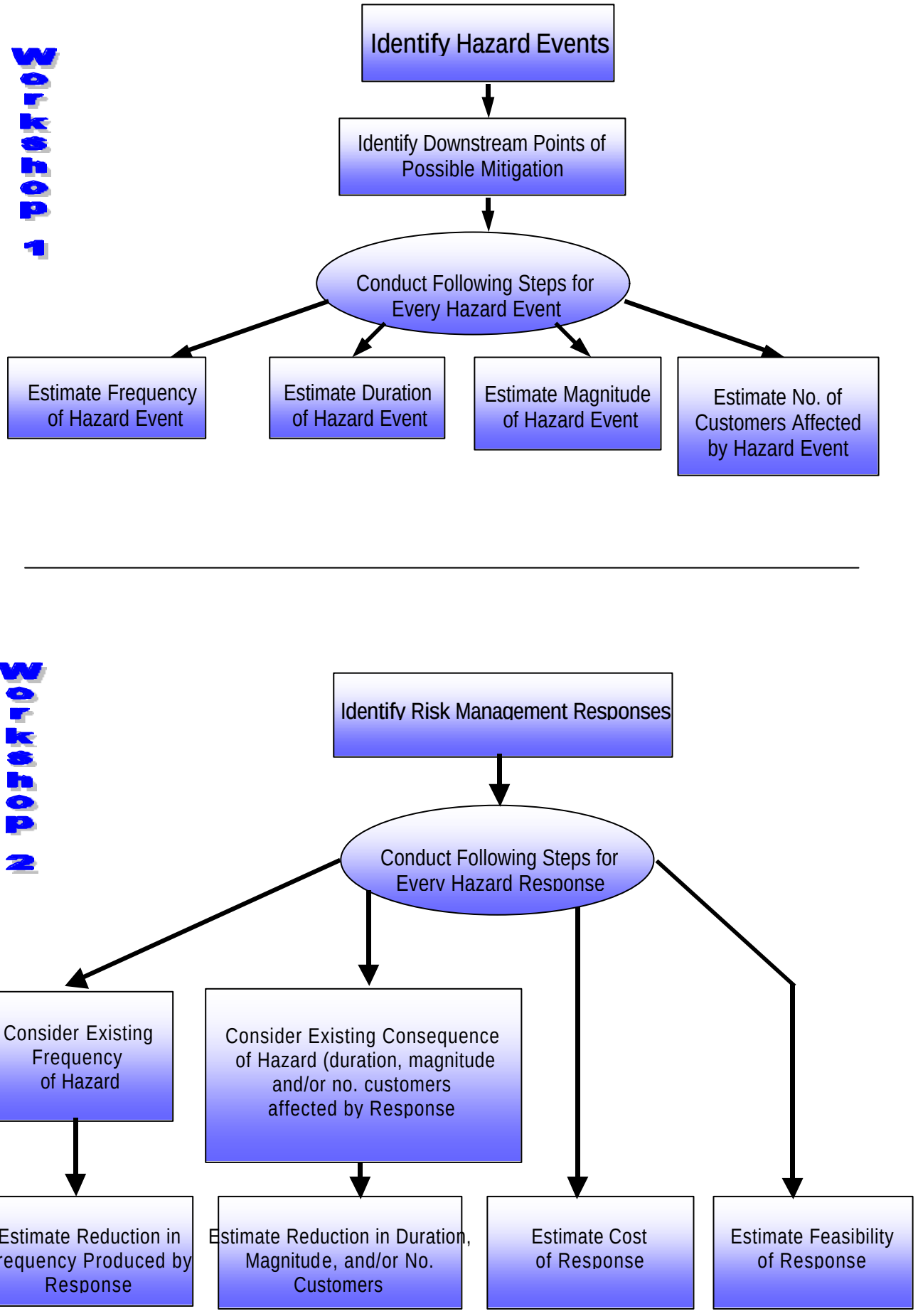
Figure 1: ***Preamble selection process of the 5 GVW supplies for the detailed risk assessment***



In the detailed risk assessment and management process for the 5 supplies selected for assessment, catchment characteristics, treatment regime/train, turbidity breaches, characteristics of intermediate storages and distribution system characteristics were all considered and hazards identified for each aspect.

In the execution of the risk assessment and management process, two workshops were held. Both were attended by the full range of experienced water authority personnel and included operational staff, who have a day to day knowledge of the operation of water supply systems. Workshop 1 involved the presentation of the risk assessment methodology and identification of hazards and their risks. Workshop 2 focused on providing solutions or responses to mitigate risks and estimating the feasibility and viability of these responses. The content of Workshops 1 and 2 are given in Figure 2.

Figure 2: *The detailed risk assessment and risk management methodology for Workshops 1 and 2*



3.0 OUTCOMES

The outcomes of a risk management process included a listing of optimum responses, sorted in order of cost, which revealed a series of actions with minimal implementation cost.

Analysis of the management responses to the identified hazards for the five GVW supplies showed there to be some commonality in approach to reducing the risk associated with a variety of hazards. In particular, for those hazards relating to catchment, one of the management options identified in each case was to conduct a survey/ study to scope the problem and to identify areas/specific locations of greatest concern. While the execution of a survey/study does not result in a direct reduction in risk, it enables the hazard to be better defined. As a result of a well designed survey/ monitoring program the management responses for any given hazard may be better targeted and enable a reduction in cost per year per 1 % reduction in risk for many of the proposed management options.

In general, the catchment risk management options which were estimated to cost GVW the least per annum per 1 % reduction in risk were those relating to education, regulatory and treatment strategies. Catchment management options, which related to the control of entry of drainage water to the raw drinking water source were the more significant options with respect to cost. It should be noted that some management options represented significant expenditure to achieve <10% reduction in risk. Management options with respect to hazards relating to treatment were generally found to be more affordable (<$10,000 per annum per 1% reduction) when compared with those associated with the catchment. Management options essentially comprised the update of equipment and the introduction of maintenance, QA and operational protocols and associated documentation. Of particular note was the marginally greater expense ($11,000- $40,000) of options relating to the appointment, retention and training of staff. These management options have particular pertinence when seen in the context of risk reduction gains associated with changes to operational protocols, appropriate documentation and the execution of maintenance protocols as these activities are staff dependent.

4.0 GVW REASONS FOR EXECUTION OF THE RISK ASSESSMENT /MANAGEMENT EXERCISE

Goulburn Valley Water set a number of objectives for undertaking the study. Having regard to the recommendations in the ADWG 1996, and from a due diligence perspective, it was important to gain a better understanding of the risk profile of its systems. Involving experienced operators with first hand knowledge of the systems was a high priority to ensure the collective experience and knowledge of the entire Authority was brought to the process. Key benefits expected from this approach were ownership of the study, a sharing of knowledge and ideas and an improved understanding of decision drivers by all participants.

Resources and timeframe limited the scope of the assessment to 5 water supply sources, despite Goulburn Valley Water managing systems drawing from a total of 38 sources. The study was expected to develop a methodology suitable for reviewing each source and supply system.

A further benefit was the likelihood of identifying highly rated risks that have been previously overlooked, providing an opportunity to introduce controls with a commensurate improvement in the level of customer service.

Risk control is also an important consideration when planning the application of limited Authority resources. In the climate of a government imposed freeze on revenue increases and increased operating costs relating to significant investment in new infrastructure such as water treatment plants, funds and resources must be applied as efficiently as possible.

Understanding the risk profile allows effective targeting of activities to maximise benefits. It was unclear at the beginning of the study what the risk profile across the Authority was. There was a chance that the profile identified would be unacceptable to the Authority, its customers and its shareholders necessitating the introduction of new or improved controls at significant cost. Consequently the information coming out of the study was considered an important input to Goulburn Valley Water's consultation process with its customers and government in forming its business decisions.

It was anticipated that amongst other considerations, the risk study would form an important part of a review of Goulburn Valley Water's Water Quality Improvement Plan. In an environment where continuous improvement is necessary to achieve world's best practice, regular review of the plan is essential.

5.0 ACTIONS ARISING SINCE THE RISK ASSESSMENT/MANAGEMENT EXERCISE

Goulburn Valley Water has realised all of the outcomes planned at the commencement of the study in addition to a number of other benefits.

There was a significant commitment required to undertake the catchment audit and consider the 5 water sources in detail. It is planned in the near future to continue this commitment and complete the detailed assessment for the remaining 33 systems managed by Goulburn Valley Water. Once this assessment is complete, Goulburn Valley Water will have a significantly improved understanding of the risk profile across its entire region.

Risk controls have been considered and generally fall into three categories. These are recommendations for further investigation, physical controls and operational controls.

While not strictly a risk control, there were a number of recommendations to further investigate the significance of particular risks through monitoring programs or on site investigation. This stemmed from the assessment of hazards being primarily undertaken through a workshop environment. In some instances, the significance of the hazard was not well understood. An example was the impact of drains entering a watercourse. None of the participants were confident of estimating the frequency or magnitude of contamination events, so a recommendation to establish a monitoring program or investigate the availability of existing data was made. The outcome of these additional studies will feed back into the assessment, and may result in an adjustment to the risk rating for the associated hazard. Similarly, it was assumed that turbidity spikes resulting after backwash or filter startup were contributing to a high risk of poor water quality at one facility. Later investigation demonstrated that turbidity spikes were not as high as assumed, and the risk rating for the hazard was reviewed.

Examples of physical controls are treatment facilities, fencing along stream banks and standby equipment. Already some infrastructure investment directly related to the study recommendations have been justified and implemented. One example is the Shepparton Water Treatment Plant chlorinator. The former chlorinator consisted of a single unit some thirty years old, for which it was difficult to acquire spare parts. The frequency and consequence of failure resulted in the installation being considered a high risk requiring early action. Consequently it was replaced with a duty/standby arrangement.

Operational controls may include monitoring at locations not previously monitored or improved monitoring systems, installation of on-line monitoring equipment and formal response plans. A further consideration may be the implementation of a hazard assessment and critical control point (HACCP) system of management.

Once the assessment of all supply systems is complete, it is proposed to review Goulburn Valley Water's existing Water Quality Improvement Plan. From a due diligence perspective this will involve a strategic approach involving consultation with customers and government to establish an acceptable level of risk balanced against the resources required to achieve this position. It is anticipated that this will be achieved by presenting a number of models involving escalating risk controls and the related financial impacts, allowing all involved to make informed decisions.

6.0 CONCLUSIONS

The importance of undertaking a structured risk assessment from the catchment through to the customer cannot be overrated. Goulburn Valley Water has embarked upon this path and made a significant resource commitment to its success, recognising the many benefits that will be realised for its customers.

To date, the following objectives have been achieved and the following benefits have emerged from conducting the process.

- A methodology for assessing the risk profile of each potable water supply system has been established. This structured approach will allow Goulburn Valley Water to compare risks across all supply systems in its region to facilitate fair and equitable allocation of resources where they reap the greatest benefit. While the assessment was limited to water supply systems, the concepts apply equally to all other activities of Goulburn Valley Water. Risk management forms a key component of all decision processes;

- The process that has been undertaken is a significant precursor to introducing HACCP systems should Goulburn Valley Water adopt this management approach;

- Management, engineers and operators have significantly increased their understanding of the risks facing the Authority. The interaction between operators and engineers in particular has ensured all ideas and experience fed into the study, maximising the value and accuracy of the outcome. With a better collective understanding of the issues, the team has far more opportunity of working toward achieving the same goals;

- Goulburn Valley Water has pro-actively undertaken a risk assessment of its systems, meeting the recommendation of the ADWG 1996 to 'know its systems'. More importantly, from a due diligence perspective, the Authority is in a position to make informed decisions to control risk to an acceptable level for both its customers and shareholders. It is also able to demonstrate responsible performance in the management of its responsibilities;

- The expertise brought to the process by AWT was not just limited to the ideology. In particular, with their wealth of experience in the water industry and related areas, AWT have been able to advise in relation to current best practice. Consequently the process allowed for a degree of benchmarking, enabling Goulburn Valley Water to gauge and target areas of weaker performance.

The identification of hazards with the potential to have a high, significant or major impact on the functions of Goulburn Valley Water, has raised the bar for the Authority. As a responsible corporate body, and from a due diligence perspective, these risks must be considered and addressed. The consequence of inaction is intolerable. In some instances control of the risks may be beyond the capacity of the Authority, or the costs to implement controls may be financially constraining, however through this structured approach, Goulburn Valley Water will ensure the best outcome for its customers and shareholders.

In summary, the risk based approach is proving a useful tool for Goulburn Valley Water in critical business decisions. While the Authority still has some way to go, and it is recognised that the risk management strategy is a 'living' process, significant benefits are already being realised for our customers through immediate improvements in critical systems. In the short term, it will be necessary to complete the assessment by reviewing the outstanding 33 supply systems. Armed with this information, it will be possible to strategically review the Authority's Water Quality Improvement Plan, implementing a prioritized strategy of works and management systems to maximise the delivery of high quality services to our customers.

7.0 REFERENCES

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