

## ***Review of Dams Safety Act 1978***

### **Final report of KPMG Australia**

### **Submission to NSW Trade and Investment by Leonard McDonald**

#### **THE REPORT**

The subject report is KPMG Australia, 2013, *Review of the Dams Safety Act 1978 and Dams Safety Committee*, Final Report to NSW Trade and Investment Regional Infrastructure and Services, September.

#### **MY CREDENTIALS**

I am an engineer with 37 years continuous involvement in dam engineering. That involvement includes more than two decades of continuous experience in each of dam design, dam safety regulation, dam safety risk assessment and identification of dam safety risk reduction measures. I was a member of the NSW Dams Safety Committee (DSC) for 22 years up to 30 June 2009.

#### **FOCUS OF MY SUBMISSION**

My aim is to provide factual evidence of the policies, requirements and operations of the current DSC and observations from my own experience of the current regulatory regime so that the Government and the community are better informed as to the way forward. If it can be demonstrated that anything I say is incorrect, I invite public correction.

#### **SUMMARY OF MY SUBMISSION**

This summary raises the key points of my submission. Attached to the summary are detail comments which directly address the text of the KPMG report.

#### **Reliability of the Commission of Audit report**

At the bottom of page 232 and top of page 233 of NSW Commission of Audit, 2012, *Government Expenditure*, Final Report, 4 May these statements appear in relation to the dam safety improvement program of State Water, states:

- *The Act requires dams to be designed to accommodate the Probable Maximum Flood.*
- *To meet the Act's requirements, very small reductions in risk are being achieved at a disproportionate cost ...*

The claim that the DSC (the Act) requires that State Water dams are to be upgraded to a flood capacity of *Probable Maximum Flood (PMF)* is not supported by the DSC guidance sheets. If the first statement would be correct, the second statement would then usually be correct.

According to the guidance sheets the DSC provides an alternative and much less costly option for dam owners of a risk-based determination of the required *acceptable flood capacity* using

tolerable public safety risks and taking account of all the impacts of a potential dam failure. That option was introduced by the DSC for the very purpose of avoiding large expenditures which achieve little risk reduction. Also the DSC permits the *progressive improvement* of dam safety, which allows for the deferment for decades of some large cost improvements whether or not the owner is taking a risk-based approach.

The only situation for which the DSC requires PMF capacity is where a dam has an estimated *potential loss of life (PLL)* from dam failure in excess of 1,000. From common knowledge of the location of State Water dams relative to population centres, it seems very unlikely that any State Water dam is in that situation.

Section 4 of *DSC2D Demonstration of Safety for Dams*, June 2010 states:

*There are now two main approaches to the demonstration of safety:*

- *The standards- based approach; and*
- *The risk-based approach [commonly called risk assessment].*

Later in the same guidance sheet this statement appears:

*The owner has a choice. The dam can either be brought into full compliance with all STD and DDM or risk assessment will be needed to determine its safety status.*

STD refers to *deterministic standards* and DDM is *defensive design measures* – a sub-set of deterministic standards.

Deterministic standards are the traditional basis for deciding on dam safety requirements. For flood capacity, which is the main driver for dam safety improvement, the DSC deterministic standards are set out in table 5.1 of *DSC3B Acceptable Flood Capacity for Dams*, June 2010. The safety levels in that table are the conservative (safer and more costly) end of the ANCOLD range set out in table 8.1 of ANCOLD, 2000, *Guidelines on Selection of Acceptable Flood Capacity for Dams*, March. The conservative end of the range was specified by DSC simply to ensure that owners transitioned correctly within the range as required by ANCOLD and so that the DSC could warn owners against unnecessarily costly upgrades which would sometimes arise where consequence categories are based on *population at risk (PAR)*. All of this is clearly set out in sub-section 5.3 of the guidance sheet DSC3B.

Under deterministic standards, table 5.1 of DSC3B only requires PMF capacity for dams of *Extreme* consequence category. According to the DSC annual report for 2011/2012, only 39.4% of prescribed dams are of *Extreme* consequence category. Not all of the State Water dams are of *Extreme* consequence category. Even by the deterministic standards test, the Commission of Audit statement that *The Act requires dams to be designed to accommodate the Probable Maximum Flood* is incorrect.

But the DSC introduced the risk-based determination of dam safety which provides a less costly alternative for dam owners. On page 42 of guidance sheet DSC2D there are safety classifications for dams. Standards-based classifications are designated “S” and risk-based classifications are designated “R”. Classification R1 applies if *risks are negligible*. For dams of

that classification *risks are acceptable in the long-term*. Classification R2 applies if *risks are in the region of tolerability review and judged as ALARP*. For dams of that classification *risks are tolerable and acceptable in the long-term*.

ALARP stands for *as low as reasonably practicable*.

The guidance sheet *DSC3B Acceptable Flood Capacity for Dams*, June 2010 states:

*Alternatively, if a detailed risk assessment outcome indicates a higher risk AFC (lower flood capacity), than that listed in Table 5.1, could be acceptable, then that outcome could be submitted to the DSC for consideration.*

The evidence that DSC allows a lower cost risk-based option as an alternative to upgrading to deterministic standards - which sometimes require PMF capacity - is incontrovertible.

If it be the case that State Water has made decisions to upgrade its dams to PMF capacity, then that was State Water's choice. State Water was not required to do so by the DSC requirements.

The assertion that DSC is responsible for over-investment in dam safety is not correct.

### **The IPART report**

The subject document is Independent Pricing and Regulatory Tribunal (IPART), 2010, *Review of the Productivity Performance of State Owned Corporations – Other Industries – Final Report*, July. At page 32 the following text is found:

*Dam safety standards are set by the Dams Safety Committee and compliance with them is compulsory. We note that dam safety standards are not set with regard to the costs and benefits that will arise from compliance but, rather, assessments of risk by the Committee. While the efficiency of State Water's proposed capital expenditure to meet dam safety and related requirements is subject to scrutiny through IPART's price review process, the driver of that expenditure – dam safety standards and the level of safety achieved – is not. Given the high cost of complying with dam safety and related requirements, it is important to ensure that benefits from lower risks outweigh the costs. This matter may warrant further inquiry by the NSW Government.*

A reading of DSC guidance sheets reveals that the cited paragraph is inaccurate for two reasons:

1. Dam owners have the option to make a risk-based determination of required safety improvements; and
2. Demonstration of ALARP, which would generally be part of a risk-based determination, requires the computation of *cost to save a statistical life (CSSL)* and that does involve "*regard to the costs and benefits that will arise from compliance*".

On the afternoon of Thursday 23 August 2007, the DSC Executive met with two IPART officers. The IPART officers had been provided with a DSC briefing note that outlined the risk-based

approach, the concept of ALARP and related matters. One matter which was discussed was whether too much was being spent on dam safety. That question was on the table because of the report Economic Regulation Authority of Western Australia (ERA), 2007, *Revised Final Report – Inquiry on Harvey Water Bulk Water Pricing*, 22 June. A reading of that report had suggested to knowledgeable dam safety regulators that the ERA believed that the major Western Australia dam owner, the Water Corporation, was spending too much on dam safety. However, the Water Corporation relied only on traditional deterministic standards to define required dam safety improvements, whereas DSC was implementing a risk-based approach. Among other things, the ERA recommended that the benefits of a risk-based approach for Western Australia should be examined. It was relevant therefore to discuss the ERA report with IPART in the context of whether the amount being spent on dam safety in NSW was excessive. My memory is that the IPART officers said that IPART had no position on the question since IPART accepted that the DSC had the expertise to set appropriate dam safety requirements.

On Wednesday 1 October 2008 a workshop of DSC stakeholders was held at the Menzies Hotel in the Sydney CBD. The purpose of the workshop was to explain the approach to risk-based determinations of dam safety then being considered by the DSC and to obtain stakeholder feedback. Briefing notes were placed on the DSC secure web site ahead of the workshop so that workshop attendees would be fully informed on the day. Apart from discussions during the workshop the attendees were invited to submit formal comments by posting them on the DSC secure web site. Some one hundred and fifty comments were received. An IPART officer attended the workshop. There is no record of IPART submitting a comment. The DSC staff were instructed to place on the DSC secure web site the report of the DSC decisions on all comments and the reasons for decision. That presumably happened, in which case IPART was well aware of the DSC regulatory requirements which would be introduced.

It is surprising therefore to now see the above citation from the July 2010 IPART report.

#### **Introduction of the risk-based approach by the DSC**

The DSC has known for a long time that the internationally accepted standard of PMF capacity for dams which threaten loss of life can result in very large expenditures for little reduction in risk. Recognizing that problem the Australian National Committee on Large Dams (ANCOLD) modified its flood capacity guidelines in March 2000 to set new deterministic standards in order to reduce the required expenditures. But the deterministic standards-based approach remained at PMF capacity for dams with large *populations at risk (PAR)*.

In October 2003 ANCOLD issued guidelines on risk assessment which provided a platform for the development of an alternative approach by the DSC.

The DSC has been in the vanguard of incorporating risk assessment into dam safety regulation. DSC Chairman Williams and a later successor Chairman McDonald were both very active in the International Commission on Large Dams (ICOLD). Firstly as Chairman of the ICOLD Committee on Dam Safety and then as Vice President of ICOLD, Williams persuaded ICOLD to embark on the process that would result in ICOLD having a position on the risk-based approach to dam safety decision-making. Later as *pro tempore* Chairman of the ICOLD Committee on

Dam Safety, McDonald became lead author for ICOLD, 2005, *Risk Assessment in Dam Safety Management – A Reconnaissance of Benefits, Methods and Current Applications*, Bulletin No. 130, the first ICOLD technical bulletin on risk assessment for dams. All of this required a great deal of effort and was achieved in the face of significant opposition.

With the groundwork established, DSC embarked on the task of incorporating risk-based decision making into regulatory practice. Some three years of sustained effort culminated in Cabinet endorsement in August 2006 of the *Risk Management Policy Framework for Dam Safety*. That framework provides the justification for very large reductions in dam safety investment, whilst adequately protecting public safety, provided dam owners take advantage of the risk-based option.

The DSC thus became the first dam safety regulator in the world to successfully incorporate risk-based decision making into regulatory practice. The whole purpose of the enormous effort, nationally and internationally, in introducing a risk-based approach was to prevent over-investment in dam safety.

The core thesis of the KPMG report that the DSC is responsible for over-investment in dam safety is an outrageous distortion of history. To say that the DSC is responsible for over-investment in dam safety, when it has done more than any other dam safety regulator in the world to defensibly reduce over-investment, is a gross injustice to current and past DSC members and to the dedicated DSC staff, and irreparably damages the reputations of all of those people.

#### **Quality of and responsibility for the KPMG report**

Whatever merits the KPMG report may have in other fields, it reveals a poor knowledge of dam safety management in general and of the policies, requirements and operations of the DSC in particular.

It seems hardly credible that GHD Australia would have signed off on ownership of the KPMG report. I know the two GHD dam engineers named in the KPMG report and both of them have knowledge and experience of dam engineering and DSC requirements which is far and away better than the text of the KPMG report would indicate. This raises a question of just what part GHD had in drafting the report and to what extent GHD endorses the report. The KPMG report states that GHD provided advice on “dam safety and risk standards”, produced Appendix D and assisted with development of the on-line survey. That is a quite limited role.

Though KPMG attributes Appendix D of its report to GHD, it would be incredible if either of the GHD engineers named in the report has written that appendix because of two extraordinary features it contains:

- The author of Appendix D makes the incorrect statement that the DSC risk-based framework does not take account of *gross disproportion* (last sentence on page 106 of the KPMG report). A person familiar with DSC guidance documents could not truthfully make that statement; and

- The author of Appendix D recommends that the dam safety regulator adopt the Department of Planning public safety risk criteria (page 114 of the KPMG report). A person experienced in use of the DSC guidance sheets would know that adoption of such a recommendation would considerably increase the cost of risk-based dam safety improvements. Such a move would go against the position of ANCOLD at a time when another GHD dam engineer is the Senior Vice Chairman of ANCOLD.

Who is responsible for those two features? That lack of transparency damages the credibility of the KPMG report for all persons familiar with the Australian dam engineering scene.

There is reason to doubt whether the main text of the KPMG report, which makes numerous pronouncements on dam safety management, was written by GHD. This is an issue of real significance because it would be troubling if persons without credentials in dam safety management would be advising government on dam safety management.

In Section 6 of the KPMG report there is much that deals with the DSC role with regard to mining. There is no indication in the KPMG report of knowledge of the history of mining under stored waters. Neither the 1977 report *Coal Mining Under Stored Water* of the Judicial Inquiry by Mr Justice Reynolds (commissioned in 1974) nor the DSC's 1989 *Report on Coal Mining Beneath Reservoirs* are listed in the references. The 1989 report sets out much of the scientific investigation work which supported the DSC's guidelines for mining under stored waters. There is no indication that KPMG has any awareness of the troubling inflow of up to 100,000 litres per hour into the Blue Panel at Wongawilli Colliery below Avon Dam reservoir in 1982. At page 22 of DSC, 1985, *Annual Report 1984-85*, the following text, concerning the leakage at Wongawilli Colliery, appears:

*As a direct result of the above unexplained leakage, and in the interests of safety, the Committee made recommendations to the Minister for Mineral Resources that two areas of underground mining, in the vicinity of the water inflows, be discontinued.*

The responsible Minister was sufficiently concerned that a halt to mining was ordered.

Extensive investigations were undertaken in an effort to identify the source of the inflow. At page 23 of the 1989 DSC report cited above, the following statement appears:

*All the information from these investigations pointed to the fact that at least some of the water involved in the outflow [means inflow to the mine] had its source in Avon Reservoir.*

As a result of an apparent ignorance of the history of mining under stored waters the KMPG report is totally lacking in its comprehension of the significance of such mining and considers it a question of minimal loss of water and of dubious DSC jurisdiction. The problem really is: *If guidelines are relaxed, at what stage could a catastrophic situation be created?* This was one of the two immediate problems referred by the Minister to the DSC in 1978 for urgent study and solutions. Without the work done by the DSC in response to this direction, it is likely that mining under stored waters would have been prohibited at that time. The report fails to credit the DSC with the many million tonnes of coal safely extracted from dam *notification areas* since then. In conjunction with concern about coal seam gas extraction, the detrimental effects of mining in

storage catchment areas is being increasingly criticised by the public. As for mining near dams, no such problems have occurred since the Wongawilli incident and the KPMG report states that the majority of miners are content with the present system.

There is technical detail in Sub-section 6.2.2 of the KPMG report, attributed to Department of Planning, and the basis for criticism of the DSC approach to mining. The message which a reasonable person would take from that sub-section is that the DSC is not competent to deal with water losses arising from mining whereas the Department of Planning is competent to make the pronouncements recorded in the sub-section. The community has no way of knowing whether the people responsible for those criticisms of the DSC have any credentials in geology and mining. This lack of transparency also damages the credibility of the KPMG report.

#### **Definition of “over-investment” and status of industry dam safety standards**

KPMG has not defined “over-investment”. The Commission of Audit has an inferred qualitative definition of upgrades which incur very large costs for little risk reduction. No quantitative basis for over-investment has been defined by KPMG to enable the community to know whether or not a particular dam safety improvement constitutes over-investment.

At point b), paragraph 2, sub-section 1.3 of NSW Trade and Investment, 2013, *NSW Dams Safety Review – Community Consultation Paper*, it is said that the reviewer – KPMG – is required to:

*Consider the safety cost/benefit trade-offs that are made in other industries.*

No such consideration is seen in the KPMG report. Had there been such consideration, the community might have known just what constitutes over-investment in dam safety. A key question, not answered by KPMG, is whether, and to what extent, adherence to industry dam safety standards can constitute over-investment.

ANCOLD publishes guidelines on both deterministic safety standards for dams and on risk assessment for dam safety. These standards derive from internationally recognized standards, with the ANCOLD standards already going a long way in reducing over-investment in dam safety.

The dominant contributor to investment in dam safety is the flood capacity of dams. The deterministic standards of ANCOLD for flood capacity can often result in upgrades which incur very large costs for little risk reduction. By the Commission of Audit qualitative definition the ANCOLD deterministic standards can therefore constitute over-investment. The question is whether the ANCOLD dam safety standards are to be supplanted by some scheme proposed by KPMG. The KPMG report is silent on that crucial question.

The large dam owners, such as State Water, are all members of ANCOLD and collectively, with others, own the ANCOLD guidelines on deterministic standards concerning which the Commission of Audit has complained.

### **Evidence of over-investment in dam safety**

Sub-section 5.4 of the KPMG report is titled:

#### *Evidence of over-investment in dam safety.*

The only problem is that no evidence is provided. Instead this statement appears in that sub-section of the KPMG report:

*Information provided on a commercial – in –confidence basis has indicated there is evidence of some larger dams over-investing in dam safety. This evidence cannot be included in this report due to the commercial – in – confidence nature of the information.*

In other words “trust us”. What happened to the concept of *transparency* so strongly promoted by KPMG? What an extraordinary situation! A whole review is built on the thesis that there is over-investment in dam safety, yet not a shred of evidence is presented to demonstrate that over-investment exists. Public scrutiny of whatever evidence exists is impossible.

### **Reduction in dam safety investment**

The main remedies proposed by KPMG for the perceived over-investment in dam safety are:

1. Reliance on non-structural risk reduction measures; and
2. Reliance on benefit cost analysis.

KPMG has not demonstrated that either of these measures would actually achieve significant reductions in investment. There has been no quantification of projected reductions in investment.

### **Non-structural measures**

In implying that non-structural risk reduction measures have not been and are not being considered under the existing DSC regime, KPMG is incorrect.

The KPMG report conveys the offensive impression that dam engineers of 40 or 50 years experience are not aware that non-structural measures can affect risk and that this reality is something that has been discovered by KPMG – see the first bullet point on page 3 of the KPMG report. Far from that being the case, most of these non-structural measures have been tried before and have generally been found wanting as practicable risk reduction measures for significant dam safety problems. In my observation dam owners routinely consider non-structural measures but find that they only rarely provide a solution to inadequate safety of a dam. So consideration of non-structural measures is happening already and there is no unexploited panacea waiting to be implemented.

The one possible exception is constraints on development of the flood plain downstream of dams. That probably has the potential to achieve large savings in capital expenditure on dam safety for a limited number of dams. Whether development constraints would be socially palatable and acceptable to local government authorities and their communities is something on

which I am not qualified to comment. KPMG has provided no evidence that such constraints would be acceptable. Restriction on development was a DSC condition in the case of Dungowan Dam (see my detail submission) but the attempt to constrain development came to nothing.

### **Benefit cost analysis**

Under its Act the DSC has no charter to look after the financial affairs of dam owners. Where deterministic industry standards are the basis for dam safety improvement, owners are free to undertake benefit cost analysis but the DSC does not require such analysis. Where risk assessment is the basis for determination of dam safety improvements, and owners need to demonstrate that risks are ALARP the DSC requires that benefit cost analysis is undertaken.

Benefit cost analysis is routinely done already to compare improvement options and to demonstrate that risks are ALARP. From my observation, the computation of *cost to save a statistical life* (CSSL) is normal, at least for large dams or costly improvements. That computation is the form of benefit cost analysis used by the United Kingdom Health and Safety Executive (HSE) for hazardous industries, the CSSL being the cost that needs to be assigned to a life in order to get a benefit/cost ratio of 1.0. In applying CSSL results the threshold yardsticks of ANCOLD (tables 8.6 and 8.7 of the *Guidelines on Risk Assessment*, October 2003) embody a large *disproportion factor* (often also called a *proportion factor*). These factors could be reduced and that would result in reductions in capital expenditure but it would also increase the risk to public safety. If reduced *disproportion factors* are planned under a new regulatory regime that should have been said by KPMG in the interests of transparency so that people downstream of dams would know they will have to bear higher risks.

The KPMG report does not say just how benefit cost analysis is going to be applied. There are vague references to reliance on benefit cost analysis whilst ensuring that risks are tolerable to the community. It is not clear from the KPMG report how that will work. KPMG do not say whether the industry standards of ANCOLD, which have been endorsed by virtually all large dam owners - being members of ANCOLD – would be abandoned in part or in whole. If ANCOLD standards would still apply, it is not clear how savings would be made, since the DSC currently follows ANCOLD guidelines except for a couple of minor variations. For risk-based determinations, it is not clear whether benefit cost analysis would determine whether risks are, or are not, reduced where existing risks are above the *limit of tolerability*. It is not clear whether there would be any level of risk which must be reduced regardless of cost considerations. The KPMG report is silent on all of these issues, yet it asserts that over-investment would be reduced. No evidence is provided in support of that assertion. In not defining just what system is proposed the KPMG report lacks transparency and devalues the comments which will be received through the public consultation phase.

### **Responsibility for dam safety**

The DSC has made it abundantly clear that dam owners are responsible for dam safety. This statement appears in section 1 of guidance sheet *DSC1A Background, Functions and Operations*, June 2010:

*Whilst owners should meet current DSC normal requirements as a minimum, they are ultimately responsible for the safety of their dams and will own the liabilities in the event risks are realized.*

Consistently with that position, owners were free to reduce risks to lower levels (more costly improvements) than those required by the DSC in order to protect business viability, meet the owner's duty of care or for other reasons, provided it did not delay the elimination of *intolerable* public safety risks on other dams of the owner's portfolio. Principle C.2 of *DSC1B Background to DSC Risk Policy Context*, June 2010 states:

*C.2 the DSC's requirements for a prescribed dam define the minimum level of safety that will adequately protect community interests – the dam owner can implement a higher level of safety, subject to the need to optimize risk reduction over a portfolio of dams.*

The KPMG proposal seems to be that owners will be prevented by the reformed regulator from implementing risk reductions which do not meet some as yet unspecified benefit cost test. If the owner is allowed to implement measures which provide lower risks than justified by benefit cost analysis but is not allowed to recover the additional costs from consumers, that is an infringement of the owners freedom of choice and will act to impoverish the owner. It is a question for lawyers but might the KPMG proposal transfer liability from the owner to the regulator? Could it be that the owner would no longer be fully responsible for dam safety?

### **Risks tolerable to the community**

KPMG proposes that the community be asked what level of risk is tolerable. In principle that is sound but in practice it is extraordinarily difficult. It has been tried by the DSC already, as will be reported in my attached detail submission, but it is very difficult and costly to achieve a scientifically valid result. People at risk from a dam but who do not pay for its improvement have one view, people at risk who pay have another view, irrigators not at risk but who pay have another view, people neither at risk nor paying have another view and so on. As the result of its initial attempt to suvey community views, the DSC found it was unable to fund the level of work which would be needed to obtain a useful result. The KPMG report says nothing useful about the design and cost of a community survey.

Hazardous industry around the world has invested a huge amount in investigating the tolerability of public safety risks. Why does KPMG think that a different outcome can be discovered in NSW?

Risks tolerable to the community relates predominantly to risk-based determinations of safety levels rather than to those determinations based on deterministic standards. There seems to be an implicit hope in the KPMG proposal that the community would accept a higher level of risk than that of the DSC *public safety risk guidelines*, since that is the only way that capital expenditure on dams would be reduced for risk-based upgrades as the result of consulting the community on tolerable risk. It is worth remembering that the current DSC regime already expects people living downstream of dams to bear a higher risk than people subject to the stricter NSW Department of Planning risk criteria. If risks are to be further increased on those living downstream of dams, it must be concluded that those people are second class citizens in

that they are expected to endure significantly higher levels of risk than people living near petro-chemical plants or airports.

### **Operations of the reformed regulator**

Dam engineering knowledge and experience are the key attributes required for effective dam safety management. From Recommendation 3 of the KPMG report it appears that there may be only one or two persons with dam engineering credentials on a reformed DSC. It seems clear that the reformed regulator would have far weaker dam engineering credentials than the current DSC. That raises issues which have not been addressed by KPMG.

KPMG has given no consideration to the requirements for a quorum for meetings. If a quorum did not include a dam engineer that could result in a situation of the blind leading the blind for matters requiring a knowledge of dam engineering.

KPMG has not addressed voting rules. KPMG have not defined any measures that would prevent persons without dam engineering credentials out-voting the dam engineers.

Over the past fifteen years I have worked at times in Canada, firstly in British Columbia and currently in Ontario. It is a decade since I worked in British Columbia with the dam safety regulator's staff present. At the time the dam safety regulator had qualified engineers but with only limited experience of dam engineering. My observation was that the dam engineering expertise available to the DSC made for more effective regulation than was available in British Columbia at the time. Although Ontario currently has dam safety regulators technically competent in the traditional standards-based environment, I have observed significant difficulties in their adjusting to the challenges posed by the technically more demanding regulatory approach informed by risk. In my observation the Canadian regulators have dedicated and conscientious staff but it is evident to me that dam engineering experience matters for a regulator of dam safety.

### **National and international standing of the dam safety regulator**

The existing DSC is greatly respected and admired among dam engineers, both nationally and internationally.

The current Chairman of ANCOLD is a DSC member. A past Chairman was also a DSC member. A DSC member has been a Vice President of ICOLD. Two DSC members have chaired the ICOLD Committee on Dam Safety, a technical committee representative of twenty eight countries. DSC members have contributed to ICOLD technical bulletins. Most recently a DSC member was the lead author for the bulletin ICOLD, 2005, *Risk Assessment in Dam Safety Management – A Reconnaissance of Benefits, Methods and Current Applications*, Bulletin No. 130.

It seems very unlikely that the proposed new regulator could command equivalent respect.

### **Conflict of interest**

Relying solely on a principle in the better regulation guide, KPMG has said that members of a reformed DSC should not come from owners of prescribed dams.

KPMG has not considered whether DSC members from the major dam owners have actually wrought any malign influence upon the deliberations of the DSC. According to the Commission of Audit, State Water has over-invested in dam safety. It might well be asked how that could happen if the State Water member on the DSC would be looking after the financial interests of State Water.

The first and most obvious answer to that question is that the conflicted member on the DSC is controlled by another eight members who are not conflicted.

The second, and main, reason is that DSC members are “nominees” and they are not “representatives”. It appears that KPMG has totally misunderstood the role of DSC members from nominating entities. KPMG apparently thinks that the DSC members “represent” their nominating entity, meaning they are on the DSC to look after the interests of their nominating entity. In fact it has been established from the very inception of the DSC that members are to bring their knowledge and experience to serve the interests of dam safety in NSW and that they are not on the DSC to look after the interests of the nominating entity. All DSC members understand their role, which has been judicially defined in the judgment *In Equity, Street, J, 1967, Bennetts v Board of Fire Commissioners of New South Wales and Others*, 8 September.

Further, KPMG has not acknowledged the role of the two nominees of Engineers Australia. It has always been my understanding that these two members are to bring independence that will ensure that members from the large dam owners do not act inappropriately.

KPMG either does not know of, or has failed to acknowledge, the DSC policy on conflict of interest and conflict of duty. Under that policy the DSC maintains a register of conflict of duty (the main issue) and conflict of interest. All such conflicts must be declared during DSC meetings and recorded in the register. The DSC policy was based on guidelines of the Independent Commission Against Corruption (ICAC).

KPMG has not mentioned the benefits to dam safety regulation which arise from the first hand knowledge of dam safety matters, which is only available to the DSC from the large owner nominees.

Again, KPMG has said nothing of the members of a reformed DSC who will provide dam engineering expertise. Will those members be prevented from working on prescribed dams? If so, the pool of potential candidates could be surprisingly small.

Finally, KPMG is apparently recommending that the members of a reformed DSC will represent their nominating entities. But it has not addressed at all the conflicts of interest which will thereby arise.

In relation to the DSC, this whole conflict of interest issue is another example of the triumph of appearance over reality.

### **The role of the existing DSC and the dedicated staff in reducing the costs of dam safety improvement**

The existing DSC is widely admired around the world for being the first dam safety regulator anywhere to have successfully integrated a risk-based approach to dam safety with the traditional deterministic standards approach. As part of the process the DSC gained government endorsement of tolerable public safety risks for dam safety, a step which a number of other regulators have contemplated but which has been found by them to be a too challenging task to date.

The main purpose for introduction of the risk-based approach was to reduce the costs of dam safety improvement. That reality would never be recognized from a reading of the KPMG report, which sees the DSC as the problem rather than the solution. But the risk-based approach introduced by the DSC is the solution.

Dam owners may choose not to take advantage of the risk-based approach. In the DSC world that is their right, since they are responsible for dam safety. But it is wrong to attribute the over-investment in dam safety to the DSC, when the cause in reality is the choice made by the dam owner.

Development of the risk-based approach drew on knowledge gained by DSC members through their national and international contacts. The huge effort involved included:

- privately funded travel in the order of \$100,000 to attend meetings of the ICOLD Committee on Dam Safety and author groups;
- hundreds of hours of unpaid work by DSC members and staff;
- long train journeys home late at nights by staff;
- organisation of international and national reviews;
- organisation of meetings with other state regulators, Treasury and IPART;
- putting multiple draft documents on the DSC web site for comment by stakeholders;
- organisation of stakeholder workshops;
- recording of the reasons for DSC decisions on over four hundred comments on the drafts leading up to the *Risk Management Policy Framework for Dam Safety* and around one hundred and fifty comments on draft guidance sheets.

The resulting *Risk Management Policy Framework for Dam Safety* is scholarly and defensible. All of this effort was over and above the normal DSC workload and was only possible because of special dedication by DSC members and staff. The government and people of NSW gained the benefit of a fine dam safety risk management framework which was developed at virtually no cost.

Justice requires that the good work of the DSC and the staff is publicly acknowledged. No such acknowledgement is to be found in the KPMG report, the overall tone of which is critical of the DSC – uninformed and misguided criticism in my opinion.

### **Stakeholder consultation by DSC in setting regulatory requirements**

On the basis of one minor updating of a single DSC guidance sheet, the KPMG review has concluded that DSC does not consult with stakeholders when setting regulatory requirements (see principle 5 of table 3 of the KPMG report). That is an entirely uninformed and misleading allegation.

In developing the risk management framework endorsed by Cabinet and the subsequent guidance sheets, the DSC:

- organised international and national reviews by industry specialists;
- produced over 200 pages of documentation of the consultation and review processes so that state agencies and the cabinet might be fully informed on the DSC proposals;
- over half of the documentation in the preceding point was placed on the DSC web site. The volume containing the actual review comments was kept confidential to the DSC, the state agencies and the cabinet because of an agreement with some reviewers that their comments would not be made public;
- organised meetings with other state regulators, Department of Natural Resources (DNR), Treasury and IPART;
- put multiple draft documents on the DSC web site and by separate letters invited stakeholders to comment;
- organised stakeholder workshops. Attendees included representatives of all major dam owners, miners, councils, consultants, legal practitioners, Department of Planning (DOP), IPART, Department of Environment and Climate Change (DECC), Department of Water and Energy (DWE), Department of Primary Industries (DPI), Treasury and the Australian Competition and Consumer Commission (ACCC);
- put briefing materials on the DSC secure web site so that workshop attendees might be fully informed in advance;
- recorded the reasons for DSC decisions on over four hundred comments on the drafts leading up to the *Risk Management Policy Framework for Dam Safety* and some one hundred and fifty comments on draft guidance sheets;
- put the files of the DSC reasons for decisions on the DSC secure web site so that stakeholders could see how their comments had been treated;
- had draft guidance sheets reviewed by a legal practitioner and obtained the advice of a barrister on the introduction of a risk-based option for determination of dam safety requirements.

The KPMG review reveals no knowledge whatsoever of that consultation process. All the details of the consultation process could have easily been discovered by appropriate inquiries. My advice to the Steering Committee and the Minister is that the KPMG finding - that DSC does not consult with stakeholders in setting regulatory requirements - is not a reliable finding.

### **Benefit cost analysis of the proposed change**

If there has been a benefit cost analysis of the review and change process for regulatory arrangements, the results are not disclosed in the KPMG report.

The costs of the process are fairly evident and include all costs of getting the new system implemented. They include costs of the KPMG and GHD engagements, steering committee, legislative amendment, public and industry consultation, new guidance sheets, new stationery and so on.

At this stage the only benefit which seems to be clear is \$1.3 million saving in DSC funding and about \$1.0 million in savings to nominating agencies provided owner funding of the regulator is successfully implemented. And owner funding is not actually a benefit but a transfer of costs from one suite of community sectors to another suite of community sectors. The reductions in dam safety capital expenditure to dam owners flowing from adoption of its proposals have not been demonstrated by KPMG and are not defined in the KPMG report and have apparently not been quantified.

Given that shortfalls in dam safety have been fixed in most large dams, the savings could be limited. Table 5A of DSC, 2012, *NSW Dams Safety Committee Annual Report 2011/2012* reveals only a couple of large dams remaining with significant shortfalls in safety and likely large improvement costs. Those dams are Hume Dam and Prospect Dam. Nepean Dam, Talbingo Dam and Warragamba Dam are under investigation but a need for improvement is not yet demonstrated.

Having made its recommendations, the onus is on KPMG to demonstrate how capital cost savings will be achieved given that;

- Non-structural options are already fully exploited, except for constraints on residential and other development; and
- Benefit cost analysis is already undertaken routinely for risk-based dam safety improvements and has no impact on improvements based on the deterministic industry standards, other than for options comparisons for which cost effectiveness analysis is common for the projects on which I work.

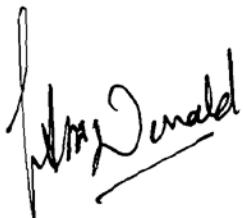
### **CONCLUSION**

On the serious charges brought by KPMG the DSC is *not guilty*. To the extent over-investment in dam safety is occurring, that is the result of choices made by those owners which do not take advantage of the risk-based option and of progressive improvement of safety. The apparent focus on engineering fixes is the result of choices made by owners, though any experienced dam engineer understands why owners make those choices. The DSC has not banned benefit cost analysis and DSC requires benefit cost analysis for demonstration of ALARP as part of a risk-based option.

In my respectful submission to the Steering Committee and to the Minister the following advice is offered:

1. For advice on dam safety management rely upon the advice of persons with credentials in that field.
2. Retain the DSC *Risk Management Policy Framework for Dam Safety* and the current suite of DSC guidance sheets. That regulatory edifice was carefully constructed over almost a decade with extensive stakeholder involvement and with national and international specialist reviews. It is rigorous, it reduces over-investment in dam safety, it adequately protects public safety and it is defensible.
3. Do not let benefit cost analysis override the defensible public safety criteria. If a dam failure were to occur with many fatalities a government would be in a difficult position if a benefit cost test had supplanted, in whole or in part, internationally recognized public safety criteria.
4. In any reformed DSC ensure that a majority of members are highly experienced dam engineers, since that skill lies at the heart of effective dam safety management.
5. The test by which the reform process will be judged is that the new regulatory regime is demonstrably better than the existing DSC regime. Meeting that test will be a tough challenge.

I would urge the Steering Committee and the Minister to give careful consideration to my submission and I trust my contribution will be helpful to a sound outcome whilst giving due credit to the existing DSC. My request is that my submission be made public by posting it on the NSW Trade and Investment web site.



Leonard McDonald

*Leonard McDonald, BE, MEngSc, FIEAust, CPEng, LGE,  
Dam Safety and Risk Consultant*

Previously a nominee of Engineers Australia on the DSC

## DETAIL COMMENTS ON KPMG REPORT

### LEONARD MCDONALD

There are so many questionable statements in the KPMG report that it is not reasonably practicable to address all of them. There follows a reasonably detailed treatment of the Executive Summary. Then only a relative few selected issues from the remainder of the report are addressed.

#### **Executive Summary**

##### **Strong focus on engineering solutions**

Sentence 1, bullet 1, first full paragraph, page 3 of the KPMG report states:

*In the absence of the Act having clear objectives, the DSC has developed a strong focus on engineering solutions in order to minimize the risk of dam infrastructure failure, rather than on a broader range of possible risk reduction strategies.*

No compelling evidence in support of that statement is provided in the KPMG report. The DSC guidance sheets clearly state that it is dam owners which must develop risk reduction measures. The DSC does not develop risk reduction strategies. If there is a strong focus on engineering fixes that is the result of solutions devised by dam owners.

This statement from the last paragraph, section 7, sheet *DSC1A DSC Background, Functions and Operations*, June 2010 is relevant:

*It is for dam owners to determine how to achieve these goals (including DSC normal requirements) and to demonstrate to the DSC they have been achieved, or will be achieved following improvement(s) in their dams or safety management practices.*

The statement follows an enumeration of DSC safety goals. Note that it does not specify an engineering fix.

There are similar statements in several other guidance sheets. Nowhere is there any requirement that risk reduction must be achieved by an engineering fix. If KPMG know of any such requirement it should have been cited in their report.

At page 3 of DSC, 2012, *NSW Dams Safety Committee Annual Report 2011/2012* the following text appears:

*To achieve its roles, the DSC follows a goals-based approach to dam safety regulation. With such regulation, the means of achieving compliance is not specified but goals are set that allow alternatives for achieving compliance. The responsibility for dam safety lies principally with the dam owner while the DSC has a challenge/audit role.*

The Chairman of the DSC signed his name to the truth of that statement.

The assertion by KPMG that the DSC has developed a strong focus on engineering solutions is without foundation.

Non-structural risk reduction measures

Sentence 2, bullet 1, first full paragraph, page 3 of the KPMG report states:

*However, the risk to public safety arising from a dam depends on a number of factors other than the structural integrity of the dam, such as dam operations, changes in downstream development and emergency management procedures.*

The whole thrust of the KPMG report is that non-structural measures to reduce risk either are not considered by owners or are not accepted by the DSC. In my observation, neither of these assertions is correct. Owners do consider non-structural options and the DSC will accept them if they meet the required risk target.

This has been the case for decades. From 1982, long before the concept of tolerable public safety risk was introduced into the DSC safety goals, there was the case of Dungowan Dam owned by Tamworth City Council. A record of that case is available in Macoun, T W, 1988, *Upgrading of Dungowan Dam – A Case Study in Dam Safety*, ANCOLD Bulletin No. 81, December. The dam had a *High* hazard category, which at the time required a spillway capacity of *Probable Maximum Flood (PMF)*. The owner proposed that the hazard rating be downgraded to *Significant* on the basis of a highly reliable emergency management plan, in which case the owner claimed the required flood capacity would be 0.5PMF. The DSC accepted the proposal subject to these conditions:

1. *Installation of a highly reliable flood (dambreak) warning system.*
2. *Preparation of an evacuation plan.*
3. *Demonstration that the flood warning system and evacuation plan are, and will remain, effective and that no loss of life would be expected in the event of failure of the dam due to inadequate spillway capacity.*
4. *Constraints on development to prevent further dwelling construction in the dambreak inundation area.*
5. *Adoption of an inflow design flood of not less than 0.5 PMF with normal freeboard requirements applicable to a new dam.*

My memory is that the local government authorities declined to implement condition 4.

In any event, controversy arose locally and a Commission of Inquiry was held around 1987 under the terms of the then *Environmental Planning and Assessment Act 1979*. The Commission found that the dam should be upgraded to PMF capacity.

Having spent very large sums in developing its proposal, the owner had to face the maximum capital expenditure after all. The proposal to rely on emergency management planning was not rejected by the DSC but by the public consultation process mandated by legislation.

Here is a relevant excerpt from the paper of Macoun 1988:

*The various alternative standards of spillway upgrading were costed and, in conjunction with flood damage studies, economic analyses were carried out to determine the preferred economic solution.*

Contrary to that statement KPMG infers that benefit cost analysis is not undertaken under the existing DSC regime to identify preferred risk reduction options.

And a second excerpt:

*The option of purchasing properties and relocating residences was also examined. Demolishing the dam was also an option.*

KPMG incorrectly implies that such non-structural solutions are neglected under the existing DSC regime.

A more detailed account of the Dungowan Dam case can be found at McDonald, L A, Vesk, M and Macoun, T W, 1994, *Dungowan Dam – A Case Study in Flood Security Upgrading*, Report Q.68, R.49, 18<sup>th</sup> Congress of International Commission on Large Dams, Durban, South Africa.

A similar case of reliance on emergency management planning had been introduced at Blue Ridge Dam in the United States with flood capacity increased to 0.5 PMF rather than to PMF. This case is reported in Spearman, E L, 1983, *Spillway Addition at TVA's Blue Ridge Dam*, United States Committee on Large Dams, Newsletter No. 68. After several years in service the plan was abandoned because of the cost and difficulty of maintaining a high state of emergency readiness. The owner, Tennessee Valley Authority, proceeded to further increase the dam's flood capacity to PMF.

The United States Bureau of Reclamation considered reliance on emergency planning for a few years around the late 1990s but abandoned the approach as not worthwhile.

Under the current DSC regime any dam posing public safety risk must have a dam safety emergency plan and the State Emergency Service (SES) has its own evacuation and welfare plan.

Where is KPMG's evidence that non-structural options are not considered by owners and the DSC and that benefit cost analyses are not undertaken? In the face of the facts outlined above, how has KPMG determined that capital expenditure can be reduced by reliance on emergency planning?

As to Operations and Maintenance (O&M) manuals, raised by KPMG at last sentence, bullet 1, first full paragraph, page 3 of its report, they do not offer any hitherto undiscovered solution to over-investment in dam safety. Experienced dam engineers know that the volumes of extreme floods are typically so large that lowered reservoir levels or other operating rules rarely provide any significant assistance in dealing with a significant shortfall in a dam's flood capacity. In the case of Wivenhoe Dam, the normal full reservoir has a capacity of about 1.6 million megalitres, there is additional flood storage of 1.4 million megalitres but the January 2011 inflow flood had a volume of 2.5 million megalitres. See Seqwater, 2011, *January 2011 Flood Event – Report on*

*the Operation of Somerset Dam and Wivenhoe Dam, 2 March.* And it must be realized that was a minor flood in comparison with the design flood. Experienced dam engineers know that operating restrictions, though they reduce the beneficial function of dams, will generally make an insignificant contribution to solving a flood capacity problem.

In the special case of dams with a large reservoir capacity but with a small catchment area operating restrictions can sometimes solve a flood capacity problem. There is at least one such large dam in NSW which currently meets the required flood capacity on account of a restriction on the maximum normal storage level. In that particular case the situation has been endorsed by the DSC, something which KPMG infers does not happen.

It is not that DSC will not accept non-structural risk reduction measures. Rather is it the case that the owner's experienced dam safety engineers know that non-structural measures rarely provide a solution to the major dam safety problems, such as inadequate flood capacity, inadequate safety against internal erosion and piping or inadequate earthquake capacity. Whilst non-structural options are routinely considered in my observation, it is generally rather obvious that they will not provide a solution. On what evidence does KPMG know otherwise?

#### Lack of transparency

Bullet 2, first full paragraph, page 3 of the KPMG report refers.

It is difficult to see what the problem is here. The DSC normal requirements are set out in its guidance sheets which are available to the world at large. Those requirements mainly relate to the levels of risk which are to be met. The DSC does not make decisions that a particular owner is to spend so many millions of dollars. Rather the owner proposes measures it has identified as the means to achieve the required risk levels. The estimated costs are those of the owner. The DSC's interest is to see whether its risk goals are, or are not, met. In my observation the typical response is a brief letter stating that the DSC endorses the proposal, which means the proposal is accepted as achieving the required risk levels. It is the owner's estimation of risk levels and demonstration of ALARP which are being endorsed. There is no complex decision making process – it is a simple question of whether or not the DSC accepts that the owner's proposal will meet the required risk levels. If the DSC does not accept that the case has been made, it tells the owner what further demonstration is required. Occasionally, there are more unusual or complex issues but the DSC always judges the situation against its guidance sheets, except for those rare cases where an owner seeks to depart from the DSC normal requirements. Letters to owners in my observation make clear the reasons for DSC requirements. Has KPMG actually reviewed any DSC correspondence? What is the problem that KPMG considers to be in need of a solution?

#### Limited application of benefit cost analysis to identify the most efficient option

Bullet 3, first full paragraph, page 3 of the KPMG report refers.

Dam owners, especially owners of large dams, are more than capable of looking after their financial interests. Does KPMG propose that a reformed DSC will look after the financial interests of dam owners? In any event, as a person who sits on owners' review boards my

observation is that reports sent to the DSC routinely contain benefit cost comparisons of risk reduction options. I have not worked for mining company dam owners or private owners but have worked for most major owners. I am at a loss to know how KPMG came to its conclusion that risk reduction options are not rated by benefit cost analysis. Generally, but by no means exclusively, the comparisons are in terms of CSSL comparisons. Some large owners employ economists to prepare a business case.

As stated elsewhere in this review, KPMG has not defined how benefit cost analysis will relate to industry standards such as the ANCOLD guidelines, the United States Army Corp of Engineers (USACE) guidelines, the United States Bureau of Reclamation (USBR) guidelines and the International Commission on Large Dams (ICOLD) guidelines. Is that whole body of engineering practice, or any part of it, to be thrown overboard and replaced by benefit cost analysis? If not, how will benefit cost analysis achieve significant reductions in dam safety investment?

#### Highly prescriptive regulation

This statement on page 3 of the KPMG report refers:

*Australian jurisdictions vary considerably in the dam safety regulatory frameworks applied, varying from a highly prescriptive approach in NSW to no specific regulation in Western Australia.*

The underline is mine. The common spectrum of regulatory approach in my experience varies from fully prescriptive to fully goals-based (called *performance based* in the *Better Regulation Guide 2009*). On that spectrum it is entirely incorrect to describe the DSC regime as *highly prescriptive* because it is explicitly *goals-based*. This excerpt from section 7 of *DSC1A DSC Background, Functions and Operations*, June 2010 will suffice:

*The DSC's approach to dam safety is goals-based as far as practicable, with its prime goal being that dams meet the DSC safety requirements set out in this and other DSC guidance sheets.*

#### The Victorian regulatory approach

On page 4 of the KPMG report this text appears as a description of the benefits of the Victorian regulatory approach:

*Under this approach, the regulator would enforce a consistent regulatory regime for all dams in NSW. This would involve the regulator setting the dam safety standards and guidelines, providing dam owners with relevant information in regard to these standards and guidelines, being responsible for monitoring compliance and, where necessary, taking appropriate enforcement action. However, the regulator would not determine the individual investment strategies that dam owners undertake to achieve the required standards.*

KPMG presents this as an improvement on the current DSC regime. But the reality is that the whole paragraph is a perfectly accurate statement of what the DSC currently does. It is wrong

to suggest otherwise. It seems obvious that KPMG does not properly understand the operations of the existing DSC.

These are the facts:

1. The DSC has a consistent regulatory regime applying to all dams – as set out in its guidance sheets;
2. The DSC sets safety standards – see *DSC1B Background to DSC Risk Policy Context*, June 2010;
3. The DSC provides information to dam owners – its guidance sheets are on its web site,
4. The DSC monitors compliance – through inspections and surveillance reports;
5. The DSC takes enforcement action - through section 15 and section 18 notices, see tables 5B and 5C of DSC, 2012, *NSW Dams Safety Committee Annual Report 2011/2012*;
6. The DSC does not determine investment strategies – see in *DSC1B* this text: *Owners must work out how to meet the DSC's goals-based safety objectives and send their proposals to DSC for review. Once plans are agreed, the DSC monitors compliance.* It is the owners which determine investment strategies.

The last sentence of the subject paragraph in the KPMG report says that the proposed new regulator would not determine investment strategies. That is not a change because the DSC does not determine investment strategies. Will not the enforcement of benefit cost tests by the reformed regulator amount to the determination of investment strategies, contrary to the subject statement of KPMG?

#### Transparency of regulation

This sentence appears at the bottom of page 4 of the KPMG report:

*Transparency of regulation and the regulatory decision making process are an important part of a best-practice regulatory framework.*

And a second sentence follows shortly after:

*Where the regulator proposes changes to dam safety regulation, these changes should be subject to consultation with dam owners and other interested stakeholders and should undergo benefit cost analysis.*

These and surrounding statements will clearly give readers of the KPMG report the impression that the DSC makes changes in secret. Nothing could be further from the truth.

This statement appeared at page 3 of DSC, 2006, *NSW Dams Safety Committee Annual Report 2005/2006*:

*Good progress was made on the review of safety policies to meet modern principles of safety management and good regulation. The review was finalized in late 2005 after taking account of comments by leading safety management specialists, a legal practitioner, dam owners and other stakeholders.*

At page 25 of DSC, 2007, *NSW Dams Safety Committee Annual Report 2006/2007* the following statement appears:

*In line with modern principles of good regulation the DSC has adopted a goal of full “transparency”. During the year it continued to work toward having all its safety policies accessible to all stakeholders, by their incorporation into Information Sheets, available on the DSC Internet site.*

Both of the statements just cited were signed off by the Chairman and Deputy Chairman of the DSC.

In developing the risk management framework endorsed by Cabinet and the subsequent guidance sheets, the DSC:

- organised international and national reviews;
- organised meetings with other regulators, Treasury and IPART;
- put multiple draft documents on the DSC web site and by separate letters invited stakeholders to comment;
- organised stakeholder workshops;
- recorded the reasons for DSC decisions on over four hundred comments on the drafts leading up to the *Risk Management Policy Framework for Dam Safety* and some one hundred and fifty comments on draft guidance sheets. Files recording the DSC decisions and the reasons for those decisions were made available to stakeholders.

The new policy framework was subjected to a form of benefit cost analysis which was acceptable to the NSW Treasury. Two workshops were held during the development of the current DSC guidance sheets, one on 1 October 2008 and one on 10 June 2010 – the latter to publicize the new sheets. The first workshop sought input to the DSC guidance sheets. Attendees included representatives of all major dam owners, miners, councils, consultants, legal practitioners, Department of Planning (DOP), IPART, Department of Environment and Climate Change (DECC), Department of Water and Energy (DWE), Department of Primary Industries (DPI), Treasury and the Australian Competition and Consumer Commission (ACCC).

On what evidence then does KPMG imply that the DSC was not transparent? It will be seen later that KPMG cites one isolated case of the minor updating of one information sheet. However, KPMG totally ignores the evidence of extensive consultation set out by me above. An objective observer who reviewed the total process for establishment of the current DSC risk-based regulatory regime could not reasonably conclude that DSC has failed to consult stakeholders in that process.

### Recommendations

#### *Recommendation 1*

The first sentence is reasonable. The remainder carries a false inference that all conceivable options are not being considered by dam owners whereas my observation is that they are being considered.

*Recommendation 2*

The second paragraph carries the false inference that the existing DSC is identifying dam safety improvement strategies and is thus not operating reasonably. Whereas the reality is that the DSC has no part in identifying risk reduction strategies – that is the dam owner's task.

*Recommendation 5*

The recommendation carries the false inference that the current regulator is not operating transparently and that the DSC has not been clear about the legal responsibility for dam safety. DSC guidance sheets, in particular section 3 of sheet *DSC2E Some Legal Considerations for Dam Owners*, June 2010 are unmistakably clear about the legal liability of dam owners. Elsewhere my submission includes evidence of the high level of transparency provided by the current DSC.

*Recommendation 6*

The recommendation carries the false inference that the current regulator does not consult with stakeholders on changes to its requirements. See my evidence to the contrary elsewhere in this submission. Draft DSC guidance sheets were based on feedback from stakeholder workshops and the drafts were on the web for months for owners and others to submit comments.

*Recommendation 7*

The recommendation carries the false inference that the current regulator is not consulting about changes to its requirements. See my evidence to the contrary elsewhere in this submission.

*Recommendation 8*

Obtaining scientifically valid views from the community is not a trivial exercise. The DSC has prior experience of this issue as will be reported later in my submission. KPMG has said nothing as to how this recommendation will be implemented and what the costs might likely be.

*Recommendation 13*

As currently defined, DSEPs require dam engineering expertise. The current definition is that of ANCOLD. KPMG has not proposed an alternative definition. For many years now the SES has been involved with the DSC in formulating requirements for DSEPs. The DSC *Emergency Management Sub-committee* has a member from SES.

**Section 2**

**Use of a risk-based approach**

At paragraph 2, sub-section 2.3.1.2 of the KPMG report the following statement appears:

*The DSC allows a risk-based approach where risks are lower than its level of tolerability and higher than its negligible level of risk.*

That statement is misleading and reveals that KPMG has no understanding of the DSC guidance sheets. It would be fair to ask whether KPMG has even read the guidance sheets. Risk assessment can be applied regardless of the level of risk. Indeed it is difficult to know where risks lie relative to the *limit of tolerability* without undertaking a risk assessment. The risk zone identified by KPMG is where there is need to demonstrate that risks are ALARP.

#### Ministerial approval

Sentence 2, last paragraph, page 10 of the KPMG report states:

*However, this requires ministerial approval.*

That statement is not correct. Ministerial approval is only required where the person to be constrained is not the dam owner.

#### Issue of fines and notices

At the penultimate paragraph on page 17 of the KPMG report these statements appear:

*Where fines have been issued, dam owners have generally addressed the DSC's safety concerns. However, the DSC has in practice issued relatively few Section 18 notices (three notices were issued in 2011-12, and one of these has been followed by legal proceedings).*

There appear to be two errors in these statements. Firstly up to 30 June 2012 no fine had ever been imposed by the DSC according to its annual reports. Unless the DSC has imposed a fine since 30 June 2012 the first statement is misleading. Secondly, it is incorrect to say that three Section 18 notices were issued in 2011-12. There were two show cause notices issued, a possible prelude to later Section 18 notices – see Table 5B of DSC, 2012, *NSW Dams Safety Committee Annual Report 2011/2012*. There were three Section 15 notices issued.

#### Responsibility of dam owners

Sentence 1, paragraph 1, sub-section 2.3.2 is misleading to the extent that the Figure 1 process is far from typical. That should have been said. The typical process is that the “no” leg below the first decision diamond leads immediately to definition of risk reduction measures by the owner, submission of the owner’s proposal to the DSC, endorsement and implementation.

Sentence 6 of the same paragraph states:

*Particularly where the risks are deemed tolerable and a risk-based approach is allowed, owners have the flexibility to determine the preferred method for reducing risks in the dam so that they are ALARP.*

That sentence is confused and misleading and reflects a completely inadequate understanding of the risk-based approach. Firstly, owners always determine how risks are reduced. The DSC never determines how risks are to be reduced, except in minor maintenance matters such as the removal of trees growing on embankment dams. Secondly, to be tolerable a risk must be ALARP - see sub-section 4.5 of *DSC2D Demonstration of Safety for Dams*, June 2010. Thirdly,

an owner is always free to use risk assessment – see the last bullet on page 17 of *DSC2D Demonstration of Safety for Dams*, June 2010.

#### Remuneration of DSC members

Sentence 2, paragraph 1, sub-section 2.3.4 of the KPMG report states:

*DSC members are not paid for their work on the DSC and their contribution is in-kind (i.e. their time is paid for by their employing organizations).*

The statement is only partially correct. The members nominated by the Institution of Engineers Australia are paid for their work on the DSC out of the DSC budget.

#### Conflicts of interest

Sentence 1, paragraph 4, sub-section 2.3.4 states:

*Given the fact that the DSC includes representatives of dam owners there is a risk that conflicts of interest may arise given that the business being regulated are (sic) represented in the regulator.*

Others can make a judgment on this issue. My purpose is to state some facts which KPMG has failed to mention. Committee members are not “representatives” – they are “nominees”. The guiding legal precedent is In Equity, Street, J, 1967, *Bennetts v Board of Fire Commissioners of New South Wales and Others*, 8 September. The DSC members have always been aware that their duty is to serve the interests of dam safety in NSW and it is not to represent their nominating agency.

It has always been my understanding that the role of the two nominees of Engineers Australia on the DSC is to provide independence so that perceived conflicts of duty or conflicts of interest do not result in inappropriate decisions. Such conflicts are dealt with under the DSC policy on the subject, which was developed according to ICAC guidelines and, if memory serves me correctly, was reviewed by a legal practitioner.

#### Dam owner's choice of standards-based or risk-based safety

The whole of sub-section 2.3.5, in particular paragraphs 3 and 4, page 22, of the KPMG report reveals a total lack of understanding of DSC requirements.

Generally owners have a choice of following a standards-based approach or of following a risk-based approach, regardless of the existing level of risk. Contrary to what KPMG assert, the choice has nothing to do with the risks being, or not being, above the *limit of tolerability*. However, the DSC has said that the owners must follow a risk-based approach if the dam has spillway gates or is an earth core dam which lacks the contemporary defensive design measures needed to adequately protect against internal erosion and piping – principally fully intercepting filters. That is because there are no recognized standards for the reliability of spillway gates or for actions needed where an existing earth core dam lacks the contemporary defensive design measures. These exceptions were designed to save on capital expenditure

for owners. All of this is clearly set out in sub-section 4.6 of *DSC2D Demonstration of Safety for Dams*, June 2010 and in other sheets, such as *DSC3B Acceptable Flood Capacity for Dams*, June 2010. Sentence 2, paragraph 3, sub-section 5.3 of DSC3B states:

*Alternatively, if a detailed risk assessment outcome indicates a higher risk AFC (lower flood capacity), than that listed in Table 5.1, could be acceptable, then that outcome could be submitted to the DSC for consideration.*

A dam with an estimated *potential loss of life (PLL)* from dam failure greater than 1,000 must meet all applicable deterministic standards. There are only a few such dams.

KPMG should not have been permitted to speak on DSC requirements since it apparently lacks the knowledge to do so.

### **Section 3**

#### **Consistency with better regulation principles**

A number of the ratings in the third column of Table 3 are questionable but the most glaring example is Principle 5, *consultation to inform regulatory development*, where the rating is entirely devoid of any sense of balance. The DSC gets a negative rating because:

- Some stakeholders criticized the DSC's approach to consultation. How many critics there were and how knowledgeable they are is not revealed; and
- There was a recent change to requirements without consideration of the impact on regulated businesses and without consultation.

The matter in my bullet 2 is clearly a reference to the November 2012 update of the guidance sheet *DSC3A Consequence Categories for Dams*, June 2010, updated November 2012.

The updating of that guidance sheet gave effect to the publication of ANCOLD, 2012, *Guidelines on the Consequence Categories for Dams*, October. In his Foreword the Chairman of ANCOLD stated:

*These Guidelines were drafted by a group of industry professionals and reviewed for consistency with international best practice.*

*The draft Guidelines were also widely disseminated within the dam industry and feedback was sought. This industry feedback has been very useful and the Guidelines have been improved by the thoughtful contribution of many within the Australian dam industry.*

Now here is the real issue. Just about all, if not all, of the "regulated businesses" are members of ANCOLD and had every opportunity to comment during the year or more that the draft ANCOLD guidelines were on its web site. They were not caught by surprise since, as ANCOLD members, they own the guidelines.

Moreover, the impact of the updated guidance sheet DSC3A is overwhelmingly positive for dam owners, reducing the capital expenditure on dams.

Against this case cited by KPMG, there is the massive stakeholder and public consultation program and the international reviews arranged by DSC in developing, over a period of five years, the June 2010 suite of guidance sheets. Details have been provided earlier in this submission.

A rating of “no” against Principle 5 is grossly unfair to the DSC and demonstrates a complete lack of balance in the KPMG report. Either KPMG knew of the massive consultation program underpinning the 2010 suite of guidance sheets and chose not to mention it or KPMG did not know of the program and chose not to inquire about the process for development of those sheets.

#### Representatives versus nominees

Table 4 of the KPMG report provides an opportunity to correct an error made frequently by KPMG throughout its report. Against “Composition” and in the field “DSC” of that table these words appear:

*Two members representing the Federal Council of the Institution of Engineers, Australia ...*

The underline is mine. No member of the DSC represented any entity. Members were nominated by various entities and were to apply their knowledge and skills to the interests of dam safety in NSW and were not to apply their talents to further the interests of the nominating agency. The legal precedent is *In Equity, Street, J, 1967, Bennetts v Board of Fire Commissioners of New South Wales and Others*, 8 September.

Where KPMG speak of DSC members representing an entity they are in all cases in error.

From the wording of its report, KPMG is apparently recommending to Government that members of a new regulator are to represent various entities. If that is correct, it raises an issue of conflict of duty which KPMG has not addressed.

#### Section 4

##### Reduction of costs through benefit cost analysis

In the last sentence of the first paragraph under Table 5 of the KPMG report this statement appears:

*There is also greater scope for investment decisions to be based on benefit cost analysis, which can help to reduce costs to dam owners, and in turn, consumers.*

This is an assertion for which no supporting evidence has been provided. The existing DSC has done nothing to prevent dam owners applying benefit cost analysis and in my observation all of the large owners do rely on benefit cost analysis. KPMG needs to demonstrate how their recommended regulatory arrangement will reduce costs.

##### Regulatory regime similar to that of Victoria

In the second paragraph under Table 5 of the KPMG report, the existing DSC already does all of the things listed in the four bullets as already explained by me, more fully, where I address the Executive Summary of the KPMG report.

#### Enforcement and benefit cost analysis

Readers would infer from the last two paragraphs of sub-section 4.1.2 of the KPMG report that the DSC does not compel compliance and that the DSC does not permit benefit cost analyses.

Both inferences are wrong.

On the first point see page 22 of DSC, 2012, *NSW Dams Safety Committee Annual Report 2011/2012* where the following statement will be found:

*As part of its policy of being more rigorous in issuing S18 notices on dam owners with high risk dams on which no significant upgrading has occurred for unjustifiably long periods, the DSC issued an S18 Notice to Mid Western Regional Council in June 2011 to make Redbank Creek Dam safe.*

On the second point, the DSC has no charter to look after the financial affairs of dam owners. The owners, especially those providing water at charge to the community, have the primary responsibility to ensure that dam safety risk reduction measures are economically efficient.

However, on page 38 of *DSC2D Demonstration of Safety for Dams*, June 2010 the following statement will be found:

*For a dam with existing risks in the intolerable region, a case by an owner that an improvement would result in risks in the region of tolerability review which are ALARP could only succeed if the CSSL is at least the current threshold value derived from Table 8.6 of ANCOLD (2003b).*

The source cited there is the ANCOLD *Guidelines on Risk Assessment*, October 2003. CSSL is the form of benefit cost analysis applied by the United Kingdom Health and Safety Executive. Thus the DSC already requires benefit cost analysis for demonstration of ALARP.

#### DSC communication with dam owners

This text will be found in paragraph 6, sub-section 4.2.1 of the KPMG report:

*The DSC has issued a number of publications on all aspects of its operations, including detailed guidance notes, annual reports, and its interpretations of its objectives. Many stakeholders appear unaware of the availability of this information. While this review has found that the Act should be amended to provide greater clarity to stakeholders, these issues could be addressed by improved communications between the regulator and dam owners.*

What can we say about the second sentence? My six year old grandson knows how to search the web.

That whole text is designed to convey an impression that the DSC communicates poorly with dam owners. No evidence was provided except that “many” people did not know about DSC publications.

Here is some real evidence from DSC, 2012, *NSW Dams Safety Committee Annual Report 2011/2012*. In 2011/2012:

- There were two DSC meetings in country locations, the purpose of which is to communicate with owners of the dams in those areas. This schedule has been an unbroken practice since the inception of the DSC and rotates around NSW on about a five year cycle, with two meetings every year being in country areas;
- All DSC guidance sheets are on its web site;
- DSC annual reports are on its web site;
- There were 6 dam safety training courses with 175 attendees, being almost entirely employees of dam owners;
- 75 prescribed dams were inspected by DSC staff and/or members. Such inspections are nearly always made in company of the owner’s personnel;
- 2,656 items of correspondence were dealt with, mostly from dam owners or miners;
- DSC maintains a technical library for the assistance of owners.

At various times DSC staff were instructed to write to all dam owners and enclose a copy of a CD containing all of the DSC guidance sheets then current. It is reasonable to believe that this happened.

Any objective, balanced review of communication between DSC and dam owners could not reasonably conclude that communication is poor.

#### Dam owners confusion as to legal liability

Whilst it is important to be aware of stakeholder perceptions, those perceptions and reality are two different things. At the bottom of page 38 of the KPMG report the following statement is found:

*Some stakeholders saw the DSC as a supervisory body with oversight functions whereas others assumed that meeting regulatory requirements would remove their legal liability for dam failure.*

Instead of guessing dam owners would be well advised to read the DSC guidance sheets. At section 3 of *DSC2E Some Legal Considerations for Dam Owners*, June 2010 owners would find this advice:

*Satisfaction of DSC requirements should not be seen as meeting the legal responsibility which lies upon a dam owner. The extent of responsibility at law to other persons is not defined by DSC requirements.*

There is no reasonable excuse for the confusion of dam owners which is reported by KPMG.

#### One DSC member not required to be experienced in dam engineering

Sentence 2, paragraph 1, sub-section 4.3.2 of the KPMG report states:

*Currently, the Act requires that one member of the DSC has expertise in mine engineering, while all other members have dam engineering expertise.*

That is an incorrect statement. No member of the DSC is required to be experienced in mine engineering. The Act simply says that one member need not be experienced in dam engineering. However, it has always been the case that the member in question is experienced in mine engineering.

#### *Difficulty in understanding ALARP*

Bullet 2, last paragraph, section 4.4 of the KPMG report includes this statement:

*The DSC could better explain ALARP to dam owners who struggle to apply the principles for dams.*

Have these stakeholders bothered to read *DSC2D Demonstration of Safety for Dams*, June 2010? There is extensive guidance on ALARP in that sheet and all of the ANCOLD and HSE guides on the subject are cited and the references provided. People constantly look for a simple cook book when some concepts are inherently complex and require some diligent study and hard thinking.

A similar concept of ALARP is found at section 17 of the *Work Health and Safety Act 2011*. Such concepts do not lend themselves to a simple cook book determination. DSC provides far more guidance on ALARP than is to be found in Department of Planning, 2011, *Risk Criteria for Land Use Planning*, Hazardous Industry Planning Advisory Paper No 4, Final, January

#### *Changes to DSC regulatory requirements*

The inference of sub-section 4.4.3 of the KPMG report is that the DSC does not consult stakeholders when changing its requirements. That inference is incorrect. The stakeholders surveyed by KPMG or KPMG itself – it is not clear which – have chosen to reach a general conclusion from the isolated case of the November 2012 update of the guidance sheet *DSC3A Consequence Categories for Dams*, June 2010, updated November 2012. That matter has been covered earlier in my submission.

But people have chosen to ignore the far more significant case of the issue of the whole suite of new guidance sheets in June 2010. The consultation undertaken in that case included:

- Review by industry specialists;
- International review;
- Workshop of persons who were representative of all types and level of dam owners, consulting engineers, price regulators, treasury, other government regulators;
- Multiple rounds of draft guidance sheets on the web site for months and stakeholder comment invited;

- A report prepared in which every comment received was recorded and the DSC's reasons for decision were also recorded.

A similar process was followed leading up to Cabinet endorsement in August 2006 of the *Risk Management Policy Framework for Dam Safety*.

Why does not KPMG record these facts by way of giving some balance to its report? If stakeholders failed to mention that consultation it would be a sad commentary on their sense of balance and fairness. In any event, it only needed a simple inquiry for KPMG to find all the details. The DSC holds documents which describe the whole process and it is surprising that these documents have apparently not been made available to KPMG.

## **Section 5**

### **Status of ANCOLD and its guidance on the tolerability of public safety risk**

Sentence 1, paragraph 1, sub-section 5.2.1 of the KPMG report states:

*A criticism of the approach used by regulators such as the DSC, ANCOLD and the HSE is that the tolerable risk level is subjective and differs across regulators.*

ANCOLD is not a regulator. ANCOLD provides guidance on the tolerability of public safety risk based on a review of world literature on that topic. Virtually all of the major dam owners in NSW are members of ANCOLD and, with others, collectively own the ANCOLD guidelines.

Moreover, is KPMG justified in describing risk levels as "subjective" when the HSE tolerability of risk framework has been painstakingly developed over a period of thirteen years? This major effort by the HSE arose out of a recommendation of Sir Frank Layfield, in his report of the public inquiry into the Sizewell B nuclear power station. In his report Sir Frank recommended that HSE "*formulate and publish guidelines on the tolerable levels of individual and social risk to workers and the public from nuclear power stations*". He further said that "*the opinion of the public should underlie the evaluation of risk; there is at present insufficient public information to allow understanding of the basis for the regulation of nuclear safety*".

In response to this recommendation, a discussion document on the tolerability of risk from nuclear power stations was published by HSE in 1988 to provide a basis for public, expert and parliamentary comment. Extensive comment was received. Following consideration of the comments, a further document, setting out a tolerability of risk framework for nuclear power was published by the HSE in 1992. Since that time, the framework has been extended to provide a basis for regulation of all hazardous facilities and land use planning, and has been further developed as experience was gained in its application.

In 1999, HSE published *Reducing Risks, Protecting People* (R2P2) as a discussion document, setting out the generic tolerability of risk framework then being followed by HSE in its regulatory functions. The document was widely disseminated and was posted on the HSE web site. Over 150 consolidated submissions were received and there were some 10,000 hits on the web site. Following consideration of the comments, the final R2P2 document was published by HSE in 2001. The ANCOLD guidelines draw on that document. The final R2P2 goes beyond the

tolerability of risk framework to include the risk management decision processes followed by HSE in its regulatory function.

The adjective “subjective” would seem to be an inappropriate description of the process followed by the HSE.

Benefit cost analysis as the sole determinant of dam safety risk reduction measures

Sentence 2, paragraph 1, sub-section 5.2.1 of the KPMG report states:

*A suggested alternate approach has been to solely rely on a benefit cost analysis to determine the level of dam safety investment consistent with an appropriate level of risk.*

Such a statement would never be accepted in a peer reviewed paper.

Firstly, “suggested” by whom? What were their credentials to make such a suggestion? What is the source document? Is their view a minority view or a majority view?

Secondly, if benefit cost analysis is the sole determinant how does “an appropriate level of risk” (whatever that may mean) enter into the process?

The implicit criticism of DSC created by paragraph 2, sub-section 5.2.1 of the KPMG report is entirely unfounded because the DSC requires the computation of CSSL for demonstration of ALARP. That computation requires consideration of the total costs of dam failure. Computation of CSSL is routinely provided by the major dam owners in my observation.

Appendix C of DSC2D Demonstration of Safety for Dams, June 2010 contains this text:

*The CSSL value is effectively the value that would need to be assigned to a life to obtain a cost/benefit ratio of 1.0. The formula for computation of CSSL is:*

$$\text{CSSL} = \frac{C_{PA} - [E(L)_B - E(L)_A] - [(O)_B - (O)_A]}{[E(PLL)_B - E(PLL)_A]}$$

*where*

*CSSL = the cost to save a statistical life, dollars*

*C<sub>PA</sub> = the annualized cost of safety improvements, dollars per annum*

*E(PLL)<sub>B</sub> = the product of probability of failure and potential loss of life before improvement, lives per annum. We obtain this value by taking the product for each failure scenario and then summing over all scenarios*

*E(PLL)<sub>A</sub> = the product of probability of failure and potential loss of life after improvement, lives per annum. We obtain this value by taking the product for each failure scenario and then summing over all scenarios*

*E(L)<sub>B</sub> = the product of probability of failure and dollar losses before improvement, dollars per annum*

$E(L)_A$  = the product of probability of failure and dollar losses after improvement, dollars per annum

$(O)_B$  = the annual cost of operation and maintenance before improvement, dollars per annum

$(O)_A$  = the annual cost of operation and maintenance after improvement, dollars per annum

It is clear that DSC requires owners to consider the total costs of dam failure, contrary to the clear inference of the KPMG report at paragraph 2, sub-section 5.2.1.

#### Role of CSSL in demonstration of ALARP

Paragraph 3, box 2, sub-section 5.2.2 of the KPMG report states in part:

*The DSC has stipulated that it will not accept a case based on cost to save a statistical life as a demonstration that risks are ALARP,*

What the DSC actually says at sub-section 6.18 of *DSC2D Demonstration of Safety for Dams*, June 2010 is:

*The DSC will not accept a case based on CSSL alone as a demonstration that risks are ALARP.*

The underline is mine. By leaving out the word “alone” KPMG has completely changed the meaning of the DSC requirement, which results in the false impression that DSC will not permit owners to apply benefit cost analysis in demonstration of ALARP.

#### Specific tests for demonstration of ALARP

At the first paragraph below box 2, sub-section 5.2.2 of the KPMG report these statements are made:

*It is difficult to evaluate ALARP, and the DSC does not have specific tests in place to measure if further risk reductions are justifiable. This was raised as a concern by some dam owners, as some investments they would consider as unnecessary under the ALARP principle have been considered necessary by the DSC.*

The first sentence is simply untrue. The DSC applies the measures set out in the ANCOLD Guidelines on Risk Assessment, October 2003. At sub-section 6.18 of *DSC2D Demonstration of Safety for Dams*, June 2010 this text will be found:

*For societal risk, the level of risk is what determines whether the threshold value of CSSL in Table 8.6 or Table 8.7 (ANCOLD 2003b) or the appropriate interpolated value should apply.*

ANCOLD 2003b is the ANCOLD Guidelines on Risk Assessment, October 2003.

The second sentence is a damaging allegation made anonymously and without any supporting evidence being provided. If owners wish to make such allegations they should identify themselves and they should produce the correspondence wherein the DSC rejected their case

that risks were ALARP. Moreover, presented with such a serious allegation, KPMG should have invited the DSC to confirm that the owner's case for ALARP was rejected. My submission is that without supporting evidence the Steering Committee and the Minister should dismiss this allegation as being without foundation.

By the way, with regard to the allegation it would be interesting to know which dam owner in NSW has an understanding of ALARP which is superior to that of the DSC and how the owner came to acquire that understanding.

#### Demonstration of ALARP – comparison of Victoria and NSW

The second paragraph below box 2, sub-section 5.2.2 of the KPMG report is misleading because:

- both Victoria and NSW judge ALARP by the ANCOLD *Guidelines on Risk Assessment*, October 2003; and
- in both cases the computation of CSSL requires consideration of the total costs of dam failure; and
- any “focus on structural characteristics” in NSW arises from the solutions proposed by dam owners.

As to this last point, I have worked on some dams in Victoria and have read ANCOLD papers on many more. I have observed no difference in approach as regards risk reduction measures. Structural improvements have been the normal risk reduction measure on Victorian dams which do not satisfy standards. KPMG has produced no evidence to demonstrate otherwise.

The one aspect which may differ between the two states is that the DSC does require owners to demonstrate to the satisfaction of the DSC that risks are ALARP, whereas the Victorian regulator may accept the owner's assurance that risks are ALARP.

The last bullet of the subject paragraph in the KPMG report, speaking of the DSC, states:

*There is poor transparency in decision making, driven by lack of clarity on compliance requirements and the overarching regulatory objective.*

It is not easy to work out what that really means. But the question must be asked as to whether the authors of this text have actually read *DSC2D Demonstration of Safety for Dams*, June 2010. Owners of dams, especially the large owners, are expected to employ sophisticated well-educated people. What is it in *DSC2D Demonstration of Safety for Dams*, June 2010 that they cannot understand? In my observation, the consulting engineers employed by dam owners have no difficulty in understanding *DSC2D Demonstration of Safety for Dams*, June 2010. In my submission, the KPMG text just cited should be rejected as without foundation unless KPMG can provide some cogent substantiation.

#### DSC use of disproportionality ratios

Sentence 2, last paragraph, sub-section 5.2.2 of the KPMG report states:

*The DSC suggests that dam owners use disproportionality as a basis for their investment plans, however, it does not recommend the use of specific ratios.*

That statement is untrue. Whoever drafted that text has either not read *DSC2D Demonstration of Safety for Dams*, June 2010 or is not familiar with the *ANCOLD Guidelines on Risk Assessment*, October 2003, or suffers from both impediments. It is highly unlikely that an experienced GHD dam engineer drafted the text.

At sub-section 6.18 of *DSC2D Demonstration of Safety for Dams*, June 2010 this text will be found:

*For societal risk, the level of risk is what determines whether the threshold value of CSSL in Table 8.6 or Table 8.7 (ANCOLD 2003b) or the appropriate interpolated value should apply.*

ANCOLD 2003b is the *ANCOLD Guidelines on Risk Assessment*, October 2003. Tables 8.6 and 8.7 embody the ANCOLD disproportionality ratios and it is abundantly evident from *DSC2D Demonstration of Safety for Dams*, June 2010 that the ANCOLD ratios are the guide to judgment of ALARP so far as disproportionality is concerned.

Finally, the subject KPMG statement contradicts this statement in Appendix D at page 106 of the KPMG report:

*One concept that does not seem to have translated into the DSC framework is the concept of gross disproportion, an aspect of the HSE framework that has precedence in UK and Australian law.*

Inconsistencies within a report damage the report's credibility.

#### *ANCOLD guidelines clearer on ALARP than DSC guidelines*

Sentence 1, paragraph 3, sub-section 5.3 of the KPMG report states:

*In addition the ANCOLD guidelines include greater clarity around the use of disproportionality to determine whether the risks of dam failure are ALARP.*

The statement is outright nonsense because the DSC requires owners to follow the ANCOLD guidelines in undertaking risk assessment unless the DSC specifically says otherwise. Sentence 1, paragraph 1, sub-section 6.12 of *DSC2D Demonstration of Safety for Dams*, June 2010 states:

*The approach to risk assessment is to be that of ANCOLD (2003b).*

ANCOLD (2003b) is the *ANCOLD Guidelines on Risk Assessment*.

#### *DSC societal risk F-N chart versus the ANCOLD horizontal truncation*

Sub-section 5.3.1 of the KPMG report is all about the fact that the DSC societal risk F-N chart does not have the horizontal truncation shown on the corresponding ANCOLD chart.

Sentence 1, paragraph 2, sub-section 5.3.1 of the KPMG report states:

*This difference means that for dams with large consequences in terms of the potential for loss of life, the DSC standard requires greater investments in risk standards than the ANCOLD requirements.*

In itself that is a reasonable statement. However, it does not amount to a demonstration that the difference has resulted in any additional investment.

These points need to be considered:

1. few, if any, dams are within the trapezium between the ANCOLD and DSC societal risk F-N lines – a point acknowledged by KPMG in the same subject paragraph;
2. where owners elect to rely on a standards-based approach to safety, the difference has no impact; and
3. the difference in *limit of tolerability* has no impact on any investment determined by an ALARP demonstration.

Given these facts, has any additional investment occurred due to the difference between ANCOLD and DSC? If so, what is the quantum of the excess investment? I do not know the answer to these questions and nor does KPMG on the evidence available in its report. But the problem could be solved by asking the DSC.

In my submission the Steering Committee and the Minister might usefully consider these issues:

1. has the difference between the ANCOLD and DSC criteria actually resulted in any additional investment in dam safety?
2. Why does the difference exist? Might it have something to do with the fact that the Department of Planning indicative societal risk F-N chart has a vertical truncation at N=1,000 and that there needs to be some reasonable consistency across NSW regulators? See Figure 3 of Department of Planning, 2008, *Risk Criteria for Land Use Planning*, Hazardous Industry Planning Advisory Paper No 4, Consultation draft, July. The final HIPAP No. 4 issued in January 2011 retains the same chart;
3. Given that ANCOLD established the horizontal truncation because of the relative immaturity of risk analysis for dam safety in about 2001 and that such risk analysis is now far better understood, where would the KPMG case sit if ANCOLD would remove the horizontal truncation from its chart?

#### Avoiding avoidable risks

Sentence 2, paragraph 2, sub-section 5.3.2 of the KPMG report, speaking of DSC requirements, states:

*Even in cases where numerical risk criteria are already being met, there is a further principle of avoiding avoidable risks which needs to be followed.*

From the context, this could be interpreted as a criticism of the DSC and a factor contributing to over-investment in dam safety according to KPMG. However, text later in the report suggests that may not have been the intention of KPMG.

In any event the principle is a common one in safety management. The following statement appears at sentence 1, paragraph 1, sub-section 2.2 of Department of Planning, 2011, *Risk Criteria for Land Use Planning*, Hazardous Industry Planning Advisory Paper No 4, Final, January:

*Irrespective of the numerical value of any risk criteria level for risk assessment purposes, it is essential that certain qualitative principles be adopted concerning the land use planning acceptability of development.*

The first such principle to be listed is:

*All 'avoidable' risks should be avoided.*

#### Evidence of over-investment in dam safety

The title of sub-section 5.4 of the KPMG report would suggest that some evidence of over-investment in dam safety would be provided. But we shall see that any such evidence as is presented is highly suspect. Paragraph 2 of sub-section 5.4 of the KPMG report asserts that there is evidence, presumably compelling in that the text is in bold, of over-investment in dam safety but the evidence cannot be provided. What an extraordinary basis for a recommendation to Government to completely change the form of dam safety regulation. What an extraordinary lack of transparency. The community is expected to take the central thesis of the KPMG report on trust. How can the community give any critical scrutiny of the evidence of over-investment if that evidence will not be disclosed?

#### Risk levels tolerable to the community

This text is found at paragraph 2, sub-section 5.5.1 of the KPMG report:

*The government should seek comment from the community on its willingness to accept the risk of dam failure and the appropriate level of dam safety investment. Community feedback should be considered when the government or the regulator sets safety standards for dams.*

This is fine in principle but it raises a number of troubling issues.

Firstly, obtaining community feedback on the tolerability of risk has been tried by the DSC and was found to be difficult and costly. The experience is recorded at Bishop, B J, Syme, G J and Bates, B, 1992, *Public Involvement and Dam Safety Criteria*, ANCOLD Bulletin No. 92, December. Those authors report at their Figure 1 safety levels surprisingly in line with the current ANCOLD standards-based criteria. The authors report at Table V of the paper that very few respondents felt that the community should set safety standards because it lacked the necessary expertise. Overall the paper gives a picture of the difficulty of obtaining scientifically valid results through community consultation.

Secondly, if tolerable public safety risks are set by the community what is then the relevance of the vast body of industry standards, of which the community is entirely ignorant? For dams these include ANCOLD guidelines, the United States Army Corp of Engineers (USACE) guidelines, the United States Bureau of Reclamation (USBR) guidelines and the International Commission on Large Dams (ICOLD) guidelines. Which of these, or what parts of them, would be abandoned in favour of the criteria found from public consultation?

Thirdly, if a process of community consultation would result in higher tolerable public safety risks, would that relieve the dam owner of legal liability? A reading of *DSC2E Some Legal Considerations for Dam Owners*, June 2010 suggests that it would not. If the dam safety regulator, perhaps through IPART, would prevent recovery of the over-investment needed to protect against liability, is that not simply a means of impoverishing the dam owner because directors on the board would not want to be exposed to liability?

KPMG has addressed none of these issues.

#### High CSSL values with the current DSC approach

The last paragraph, page 56, sub-section 5.5.1 of the KPMG report states:

*The current approach has required a significant investment in dam safety in some cases with a high Cost to Save a Statistical Life.*

Taken in context, this is a criticism of the DSC, presumably by some of the large dam owners. In this one sentence is to be found the core of the alleged over-investment problem. Consequently the issue needs to be examined in some detail.

Firstly – Owner choice for determination of required flood capacity. By far the main driver for expenditure on dam safety improvement is the flood capacity of dams. Under its normal requirements the DSC allows owners to determine the required flood capacity by either of:

- Deterministic standards – these being based on the so-called “fall-back” flood capacity in table 8.1 of ANCOLD, 2000, *Guidelines on Selection of Acceptable Flood Capacity for Dams*, March; or
- Tolerable public safety risks – meeting the risk criteria set out in *DSC1B Background to DSC Risk Policy Context*, June 2010 following the procedures of *DSC2D Demonstration of Safety for Dams*, June 2010.

The choice of method is a matter for the dam owner, except for dams with an estimated *potential loss of life (PLL)* greater than 1,000 or for dams with failure modes for which there is no recognized standard. In those cases the deterministic standards must be followed (for dams with risks in the red box at the bottom right of Figure 5 of the KPMG report) or safety must be risk-based for dams with no recognized standard.

Beyond its normal requirements, the DSC gives dam owners a third option as in this excerpt from paragraph 1, section 1 of *DSC1A DSC Background, Functions and Operations*, June 2010.

*The NSW Dams Safety Committee's (DSC) normal requirements are set out in its Guidance Sheets (see Appendix A for listing). However, the DSC's overriding policy is to determine appropriate dam safety arrangements in any particular case on the merits of the case. Where owners believe that a departure from the DSC's normal requirements is warranted, they should submit substantiated proposals for the DSC's consideration.*

So there are effectively three options available to owners in selecting the long-term flood capacity of dams.

Secondly – the Commission of Audit report. At the bottom of page 232 and the top of page 233 of NSW Commission of Audit, 2012, *Government Expenditure*, Final Report, 4 May the following statements appear:

*State Water is currently halfway through a major capital program of dam safety upgrades which has a total cost of around \$400 million. This dam safety work is being driven by standards established by the Government Dam Safety Committee under the Dam Safety Act 1978. This Act requires dams to be designed to accommodate the Probable Maximum Flood. The current spend is to ensure that dams can withstand a one in 700 year flood. To meet the Act's requirements, very small reductions in risk are being achieved at a disproportionate cost that is not consistent with safety cost/benefit trade-offs in other industries.*

Unfortunately the Commission of Audit has been ill-informed because the DSC does not require the dams to be upgraded to Probable Maximum Flood (PMF) capacity for the reason set out in my preceding point, namely that State Water could have chosen to follow a risk-based determination of required flood capacity. If State Water plans to upgrade to PMF capacity, that was its choice.

At paragraph 3, sub-section 5.3 of *DSC3B Acceptable Flood Capacity for Dams*, June 2010 the DSC says this about alternatives to a deterministic standard flood capacity:

*Alternatively, if a detailed risk assessment outcome indicates a higher risk AFC (lower flood capacity), than that listed in Table 5.1, could be acceptable, then that outcome could be submitted to the DSC for consideration.*

Table 5.1 gives the starting point deterministic standard flood capacity.

Unless State Water proposes a risk-based flood capacity to the DSC, the responsibility for over-investment lies with State Water and not with the DSC, contrary to what the Commission of Audit has said. The central thesis of the KPMG report – that the DSC is responsible for over-investment in dam safety - is therefore incorrect.

If State Water has proposed a risk-based determination of flood capacity and the DSC has rejected the proposal, then evidence of that rejection should be produced. See also my last paragraph under "Specific tests for demonstration of ALARP". I know of no NSW dam owner which has a better understanding of ALARP than the understanding which the DSC has acquired through its members travelling to international meetings over a decade.

However, if the State Water dams would be upgraded to PMF capacity, the last sentence of the above text from the Commission of Audit report is likely to be correct for most dams.

Thirdly – the poor cost-effectiveness of deterministic standard flood capacities. Experienced dam engineers have known for many years that the deterministic standards-based flood capacities for dams will often result in enormous CSSL values, sometimes in the billions of dollars, with the case for further improvement becoming progressively poorer as risks are reduced. See in this regard table 4 and surrounding text of Marsden, J, McDonald, L, Bowles, D, Davidson, R and Nathan, R, 2007, *Dam Safety, Economic Regulation and Society's Need to Prioritise Health and Safety Expenditures*, Workshop at NZSOLD/ANCOLD Conference on Dams, Queenstown, New Zealand, 21 November. The following excerpt summarizes the situation:

*The Dams Safety Committee has found that, whilst the reduction of risks to the limit of tolerability can often have good justification under Table 8.6 of the ANCOLD risk guidelines (ANCOLD 2003b), the reduction of risks to well below the limit of tolerability, starting from the limit, typically has very poor justification. The situation can be illustrated by the following notional, but plausible, example.*

The text then develops the example which is the basis for table 4 of the paper.

The following text can be found in sub-section 6.18 of *DSC2D Demonstration of Safety for Dams*, June 2010:

*For risks at or below the limit of tolerability the CSSL for further improvement of safety will typically be extremely high, in the billions of dollars. Both ERA [2008] and Marsden et al. [2007] raised the issue of whether safety improvements of such low cost-effectiveness are in the best interests of society. The DSC has legal advice that its charter does not permit it to consider whether available funds would be better spent on other health and safety needs of society, such as an improved health system and safer road travel.*

The realization that ANCOLD deterministic flood capacities were causing very large expenditures for very little risk reduction was the main reason that the DSC developed the alternative of a risk-based approach as a lower cost, but defensible, basis for selecting flood capacity. The DSC was the first dam safety regulator in the world to incorporate risk-based procedures into its requirements and to gain government endorsement of tolerable public safety risk guidelines. This was done to reduce the costs of dam safety improvement. The DSC deserves credit for a bold ground-breaking innovation in dam safety management which is admired around the world. No such credit is to be found in the KPMG report.

Fourthly – role of the ANCOLD deterministic standards for flood capacity. The KPMG report does not say what will be the place of the ANCOLD deterministic standards for flood capacity in a reformed regulatory regime. Since it is these standards which have given rise to the disproportionate costs about which the Commission of Audit complains, the role of these standards is a vitally important question. Will benefit cost analysis override the ANCOLD standards? Where would that leave the major dam owners, such as State Water, which are all members of ANCOLD and, with others, own the ANCOLD guidelines? By what mechanism

would large owners, such as State Water, be prevented from selecting flood capacity on the basis of ANCOLD deterministic standards? If the owners were so prevented from relying on costly standards, what impact would that have on the owners' liability?

The KPMG report steers well clear of these questions but they must be confronted if costs are to be reduced.

#### Benefit cost analysis and ALARP

This text appears at the second full paragraph, page 57, sub-section 5.5.1 of the KPMG report:

*Benefit cost analysis is an important tool for determining whether risks are ALARP, however, this is not included in the current approach.*

This statement is untrue. How can KPMG make these errors? Have the authors not read the DSC guidance sheets?

The following text appears at sub-section 6.18 of *DSC2D Demonstration of Safety for Dams*, June 2010.

*Thus for DSC, cost-effectiveness is a means of comparing the worth of alternative safety improvement options, against the background that very high values of CSSL are one consideration in judging that risks are ALARP.*

Computation of CSSL is the form of benefit cost analysis used by the HSE, though their term is *cost of preventing a fatality (CPF)*.

On what evidence can KPMG say that benefit cost analysis is not part of ALARP determination under the existing DSC regime?

#### Section 6

Enough has been said about mining under stored waters in the Summary section of my submission. There is too much to challenge in the KPMG text of section 6 to trawl through statement by statement.

#### Section 7

##### Emergency management as a risk reduction measure

This sentence appears at sub-section 7.2 of the KPMG report:

*For example, increased investment in the State Emergency Service (SES) may in some instances lead to improved emergency response times and evacuation procedures, resulting in a lower number of fatalities if a dam were to fail as a result of reduced investment in safety standards.*

This sounds fine when said quickly but is there any evidence anywhere that such an outcome can be reliably achieved? In order to justify a reduced investment on the dam, it would be

necessary to demonstrate that the improved SES posture justifies a lower consequence category (for a standards-based approach) or a lower estimated potential loss of life (for a risk-based approach). I know of no currently available methodology which would reliably do that. Who is going to carry the liability for such an approach? Is it the dam owner? Is it the regulator? Is it the SES? Is it the government?

KPMG would do well to carefully study the cases of Dungowan Dam and Blue Ridge Dam already cited in my submission.

#### *Reduction in PAR due to improved emergency response*

Bullet 1, paragraph 1, sub-section 7.5 of the KPMG report refers to:

*The reduction in any costs (benefits) associated with reduced safety standards, and the level of PAR.*

The reference to PAR is rather obscure and the intended meaning is not clear. But it is worth making clear that PAR is defined as the number of persons who occupy the dam failure flood zone prior to an evacuation. It follows therefore that improved emergency response can have no impact on the PAR number. Only consequence categories based on *potential loss of life (PLL)* could be affected by better emergency response.

#### *Approval of DSEPs*

Regarding recommendation 13 in sub-section 7.6, the existing DSC approves nothing, consistent with the owner's responsibility for dam safety. The DSC "endorses" which actually means that it accepts owner's proposals as meeting the DSC safety requirements. But the owner and its engineers are responsible for a host of matters, with which the DSC does not concern itself. Is there sufficient reinforcing steel in the energy dissipater walls? Such matters are for the owner to worry about. The DSC may challenge obvious errors but the DSC never instructs the owner, except in minor, low cost issues like removing young trees from spillway approach channels where the challenge process is simply too tedious relative to the costs involved.

So what does "approval" of DSEPs under the proposed new regulatory regime do in terms of liability?

#### **Appendix D**

##### *DSC does not consider disproportion*

Sentence 2, paragraph 3, Sub-section D.2 of the KPMG report states:

*One concept that does not seem to have translated into the DSC framework is the concept of gross disproportion, an aspect of the HSE framework that has precedence in UK and Australian law.*

Who on earth wrote that? The word or part-word “proportion” appears 34 times in DSC2D *Demonstration of Safety for Dams*, June 2010 – all in the context of gross disproportion. The DSC has adopted the disproportionality factors embedded in tables 8.6 and 8.7 of the ANCOLD risk assessment guidelines. Did KPMG people not read the DSC guidance sheets? In any event the text quoted above conflicts with statements made in the main text of the KPMG report, making the report internally inconsistent.

#### DSC individual risk criteria

Bullet 1, paragraph 1 under Individual Risk Criteria, page 114, sub-section D.2 states:

*Are based on UK HSE limits for the public but are being used as LSIR whereas the UK values are ISIR.*

The statement is incorrect. The DSC criteria are ISIR, which the KPMG author also says in the first row of table E-4 (which presumably should be D-4).

#### Dams to follow the Department of Planning individual risk criteria

Paragraph 2 under Individual Risk Criteria, page 114, sub-section D.2 states:

*The obvious question is why dams are being treated differently to other industrial hazards. While the new dam criteria are coming into line with the NSW DOP criteria for “active open spaces” they are not as sophisticated as the DOP criteria as they do not consider land use. Hence the recommendation is to converge to the DOP criteria.*

The KPMG recommendation in the last sentence is extraordinary. Having criticized the DSC at Section 5 of the report for having risk standards which are lower (safer and more costly) than those of ANCOLD – a largely misguided criticism – KPMG now recommends that the DSC risk standards should be lowered (made safer and more costly) still further. The result would be significantly increased investment in risk-based dam safety measures contrary to the whole purpose of the Commission of Audit's recommendation to government.

The estimated loss of life from dam failures would at least double because the Department of Planning criteria do not allow exposure factors or evacuation. And the DOP criteria are lower than those of the DSC.

A report which argues against itself damages its own credibility.

#### Dams to follow the Department of Planning societal risk criteria

At paragraph 1 under Societal Risk Criteria, page 114, sub-section D.2 states:

*Again the question can be asked as to why are dams being treated differently from other industrial hazards, and perhaps, should they be using the NSW DOP criteria which also are similar to the UK R2P2 criteria.*

Can KPMG be serious? This suggestion would really drive up the costs of risk-based dam safety improvement. Not only would the estimated loss of life from dam failure increase

dramatically but the risk standard is far lower (safer and more costly) than that of the DSC as a glance at Figure 2 of the KPMG report would reveal. Moreover, the suggestion that the DOP criteria are similar to those of HSE is not correct as will be evident from the same Figure 2.

A handwritten signature in black ink, appearing to read "Leonard McDonald".

Leonard McDonald

*Leonard McDonald, BE, MEngSc, FIEAust, CPEng, LGE,  
Dam Safety and Risk Consultant*

Previously a nominee of Engineers Australia on the DSC