



**Dam Safety Review - Report of findings of an independent review of the Dam Safety Scheme**

**14 April 2010**

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## **Purpose of the Dam Safety Review**

1. As part of the Building Act Review, the Department of Building and Housing (the Department) has engaged Bruce McLean of The Project Company Ltd as an independent reviewer to undertake a review (the Review) of the Dam safety regulatory scheme (the Scheme) before it takes effect on 1 July 2010.
2. The purpose of the Review is to provide a well informed view to the Department on whether or not the Scheme is 'fit for purpose'. In addition the reviewer is to:
  - Advise on whether the scope of the scheme is appropriate given the nature and consequences of the risks that the scheme is intended to mitigate and whether or not any changes should be made to its scope i.e. should the scheme continue to apply to all dams capable of holding a reservoir of 20,000m<sup>3</sup> or more and of retaining three or more metres' depth of water (or other fluid)
  - Advise on any other issues associated with the scheme's design and operational requirements that are likely to negatively impact on its efficient and effective operation and result in greater than necessary compliance costs for dam owners. In doing so consideration should be given to the nature and frequency of the Scheme's requirements and obligations for dam owners and to the supply of suitably qualified and experienced engineers and other service providers needed to assist dam owners to meet their obligations under the scheme
  - Recommend any changes that are considered necessary to ensure the Scheme's efficient and effective operation before it comes into force

## **Introduction to the Review**

3. This report sets out the methodology and findings of the Review.
4. In undertaking the Review the Reviewer:
  - Researched the inventory of dams in New Zealand and current dam building trends
  - Became familiar with the risks and consequences of dam failure the Scheme seeks to mitigate
  - Became familiar with the legislative and regulatory features and requirements of the Scheme
  - Met and consulted with key stakeholder groups. Thirty two stakeholders were consulted during the Review. They include key people and organisations most affected by the Scheme and are listed in Appendix 1 of this report
  - Undertook some international research to determine what dam safety activity is underway in other jurisdictions

5. The scope of the Review does not include resource and building consent processes required to get permission to build a dam, and to build and operate it. Many stakeholders had a strong interest in these activities and pointed out there is an interface between them and the Scheme that needs addressing.
6. The approach to the Review is to separate out the various parts of the legislation (there are 15), to seek stakeholder feedback on each one, to provide some discussion on the feedback and to provide recommendations of any suggested changes for the Department to consider.
7. In the time available it has not been possible to consult with stakeholders fully on the suggested changes. It is clear some will be welcomed by some and resisted by others. The overriding philosophy behind the changes is to make the Scheme more effective and efficient without unnecessary compliance cost.

## **Dam Safety in New Zealand**

8. Dams are critical to New Zealand's infrastructure. They provide the backbone for the electricity system and are an increasingly important part of agriculture.
9. It is estimated there is up to 1150 large dams in New Zealand but there is no way of knowing how accurate this estimate is. The only inventory that is presently available is one from 1996 that includes 402 dams.
10. Hydroelectric dam building practically stopped in the 1980s but there have been an increasing number of dams built recently for agricultural purposes. These are for stock water, frost protection of horticultural crops and irrigation. These activities offer much improved productivity and economic rewards and are important to New Zealand's future.
11. Several farmers and farm sector representatives indicated that irrigation made a substantial difference to farm productivity in many regions. This is particularly so in areas that are tending to be drier because of the effects of climate change such as Pukekohe, Bay of Plenty, Hawkes Bay, Wairarapa, Marlborough, Canterbury and Otago. However the irrigation sector has been adversely affected in the last 18 months by a change of lending criteria of banks.
12. There have been few catastrophic dam failures in New Zealand. Major failures like Opuha, Ruahihi and Whaeo are well known. Other evidence of smaller dam failures on farms is mainly anecdotal and is not well documented.
13. There is a real prospect that, without appropriate action, some reasonably large dams will need to be decommissioned because they are deemed to be unsafe. This would lead to serious contraction of some local economies particularly in horticulture.
14. Since the hydroelectric work ceased in the 1980s technicians familiar with dam design and construction (such as engineers, hydrologists and geotechnical technicians) have become increasingly scarce. Their availability is especially important for New Zealand and Government policy needs to have this in mind.
15. World wide there has been a trend to introduce regulatory frameworks for dams. This is in response to a growing concern over safety of dams highlighted in the Report of the World Commission on Dams published in 2000. Recent trends internationally have been to implement specific dam safety legislation. In this respect New Zealand's Dam Safety Scheme is following the trends in other developed countries. New Zealand has been discussing dam safety legislation since the 1980s and there is now broad support for it.

16. As advised by the Department the current public policy objective is “to provide a clear and comprehensive regulatory scheme for the ongoing management of dam safety by ensuring that:
  - Dams are operated in a safe manner (particularly given changes to public ownership and commercial arrangements for owning operating and managing dams)
  - An integrated and structured approach to the ongoing monitoring and maintenance of dams occurs and that this occurs in a manner commensurate with the potential adverse impacts posed by the dams over time
  - The dam safety scheme balances risk management approaches with minimisation of compliance costs
  - Competent practitioners carry out dam safety certification and adequately discharge of their responsibilities under the Act
  - The scheme complements existing Regional Authority responsibilities under the Act and the Resource Management Act 1991”.
17. There is an urgent need to establish the Scheme to ensure dams are identified, inspected, monitored and kept safe. It is clear many are managed to the best international standards while others are suffering from neglect.
18. Ensuring their safety is the fundamental purpose of the Scheme. As a writer on dams observed “Dams are loaded weapons aimed down rivers pointed at ourselves; they are proof of the gambling nature of societies that build them”.

## Summary of key Review findings

19. The Review has found that a Dam Safety Scheme is needed but there are a number of changes that could be made to enhance the Scheme’s effectiveness and efficiency and reduce compliance costs.
20. It is worth stressing the importance of one of the public policy objectives in particular that “**the dam safety scheme balances risk management approaches with minimisation of compliance costs**”. No Scheme will eliminate risk completely. It is also important that dam owners and the public accept that the Scheme is worthwhile and is dealing with risks that can be catastrophic. Conversely they should not see the Scheme as a bureaucratic paper shuffling exercise.
21. There are ten key recommendations for change that come out of this Review and fifteen others.
22. The key recommendations are:
  1. That a Dam Safety Scheme is needed in New Zealand.
  2. That the Dam Safety Scheme in its current form needs modifying to improve its efficiency and effectiveness and to reduce compliance costs.
  3. That the definition of a large dam be increased to include dams that are at least eight metres high and hold a reservoir of 50,000m<sup>3</sup>. This is close to that used in the United States National Dam Safety Act. The existing large dam definition is a dam that retains at least three metres of water and holds 20,000m<sup>3</sup>. The purpose of this change is to eliminate a significant percentage (estimated at 36%) of low impact dams from the scheme. This will significantly reduce compliance costs for these dam owners and the processing authority. A similar dam size is used in other jurisdictions. The advice from the Department’s

consultant dam expert is that this change in dam definition combined with the power to issue a notice (recommendation below) will achieve the same outcomes with respect to risk management as the current Scheme.

4. That the authority administering the Scheme has the power to issue a notice requiring classification of any dam, regardless of whether the dam meets the large dam criteria. Any such notice will only be issued if there is reason to believe the dam may put persons at risk. This provision is recommended to deal with risky dams that would not otherwise be in the Scheme.
5. That the dam height is measured from the downstream toe of the dam to the crest. This deals with confusion and debate resulting from the current approach requiring reservoir depth to be measured. This simple approach is common in many other jurisdictions.
6. That the timing of the Scheme is adjusted to allow more time to prepare for the start date and more time for classifying dams. This is necessary because of the requirement for legislative changes, publicity and implementation before the start date and to allow a reasonable period for dam classifications.
7. That a new body responsible for administering and monitoring the Scheme on a nation-wide basis be established within central government and that the new body is named to clearly identify its role (such as the "Dam Safety Authority"). This centralisation of authority is standard in other jurisdictions and will provide critical mass, sufficient expertise and a consistent approach to the Scheme.
8. That a communications plan be developed to communicate with dam owners and other stakeholders including publicising the requirements under the legislation and providing suitable support material. This is important to ensure the Scheme is effectively rolled out.
9. That a Recognised Engineer be able to review the existing dam safety approach in place for dam owners with a portfolio of dams and certify that it meets the criteria and standards as set out in section 8 of the regulations. This applies to public and corporate dam owners that have best practice dam safety management systems in place now.
10. That legislation as it applies to dams (including resource consent and building consent legislation) be reviewed as a whole in order to provide effective, clear legislation that reduces compliance costs and provides consistent implementation across the sector.

All 25 of the recommendations are outlined at the end of the Review.

## **Approach taken to develop recommendations**

23. The approach to the Review is to separate out the various parts of the legislation (there are 16), to seek stakeholder feedback on each one, to provide some discussion on the feedback and to provide recommendations of any suggested changes for the Department to consider. Each issue is separated in the remainder of the Review report.

## **Issue 1: Is the Dam Safety Scheme needed?**

### ***Issue***

24. The first question is whether the Dam Safety Scheme (the Scheme) is actually needed. New Zealand has not had a scheme like this in the past and there have been no known fatalities from dam breaches or failures.

### ***Stakeholder feedback***

25. Generally there is strong support for a Dam Safety Scheme that is light handed and effective. This support in particular comes from Regional Authorities, NZSOLD, the engineering profession and public sector organisations that own large dams. There is some concern from the farming sector, including horticulture and irrigation interests, that the Scheme will have an associated cost and will present potential obstacles to new dams. Some farmers believe this is another “nanny state thing” that will just add compliance cost with no benefit. An engineer with significant dam experience said there was a downside to not having a dam safety scheme. He noted that many dam owners were more interested in the reservoir than the dam itself and this often led to overlooking maintenance issues. The Ministry of Agriculture and Fisheries advised that there are a number of dams in New Zealand that they are aware of that do not meet modern engineering standards. These dams need to be inspected and monitored to ensure they do not pose a risk to people living downstream. This was reinforced by a Regional Authority.

### ***Discussion***

26. World wide there has been a trend to introduce regulatory frameworks for dams. This is in response to a growing concern over safety of dams highlighted in the Report of the World Commission on Dams published in 2000. Recent trends internationally have been to implement specific dam safety legislation. In this respect New Zealand’s Dam Safety Scheme is following the trends in other developed countries.
27. New Zealand has been discussing dam safety legislation since the 1980s. It is clear there is now broad support for it.
28. The current public policy objective is “to provide a clear and comprehensive regulatory scheme for the ongoing management of dam safety by ensuring that:
  - Dams are operated in a safe manner (particularly given changes to public ownership and commercial arrangements for owning operating and managing dams)
  - An integrated and structured approach to the ongoing monitoring and maintenance of dams occurs and that this occurs in a manner commensurate with the potential adverse impacts posed by the dams over time
  - The dam safety scheme balances risk management approaches with minimization of compliance costs

- Competent practitioners carry out dam safety certification and adequately discharge of their responsibilities under the Act
  - The scheme complements existing Regional Authority responsibilities under the Act and the Resource Management Act 1991”
29. Some farmers would rather not have to deal with any dam safety legislation on the basis that it is not required and will impose compliance cost unnecessarily. These concerns can be managed provided that dams that are subject to the legislation can be shown to impose a significant risk to the community affected by their failure.
30. In summary the reasons why a Dam Safety Scheme is needed are:
- New Zealand is following behind international trends in dam safety. Dam safety schemes are in place in most developed countries and have been for some time.
  - New Zealand has a number of “legacy” dams that are not being adequately inspected or monitored properly. A dam safety scheme will address this issue.
  - The risk profile posed by dams can change during the dam’s life e.g. land uses changes above and below the dam
  - Unlike many structures dams can pose a threat people other than the owner. It is therefore prudent to have a public policy response in place to address this threat.

### ***Recommendations***

31. That a Dam Safety Scheme is needed in New Zealand.
32. That the Dam Safety Scheme in its current form needs modifying to improve its efficiency and effectiveness and to reduce compliance costs.

## **Issue 2: Is the definition of a large dam appropriate?**

### ***Issues***

33. Definition of large dams - The Dam Safety Scheme only applies to large dams as defined by the Act. Large dams are defined as having the capacity to hold a reservoir of 20,000m<sup>3</sup> or more and to retain three or more metres depth of water (or other fluid). Smaller dams are not covered by the Scheme even if their failure could cause damage to people, property or infrastructure. If the defined large dam was made larger then less dams would be affected by the Scheme. This would reduce the compliance cost of the Scheme but it would have to be weighed against increased risk of not classifying and monitoring some dams.
34. Measuring of a large dam – The current large dam definition requires the measurement of the depth of the reservoir and a calculation of the capacity of it. How these measurements are made needs to be clear and unambiguous.
35. Definition of Appurtenant Structures – Appurtenant Structures means structures that are integral to the proper functioning of the dam. These might include for example intake towers, powerhouse structures, tunnels, canals, penstocks, low-level outlets, surge tanks and towers, gate hoist mechanisms and their supporting structures, and all critical water control and release facilities. Consideration of a dam in the Scheme has to include these structures if they are necessary to ensure the dam’s safe performance. It is therefore important to make sure Appurtenant Structures are appropriately defined and included in the Scheme.

36. Dams included in the definition in the Act – A large dam as currently defined includes a flood control dam (detention dam) and a natural feature that has been significantly modified to function as a dam and a canal.

### **Stakeholder feedback**

37. There was very strong feedback on the current definition of a large dam. Many stakeholders believe it represents a dam that is too small to be included in the Scheme. These stakeholders include all of the agricultural sector (including dam-owning farmers, horticulturalists, the irrigation sector, and Federated Farmers), many dam engineers, and some Regional Authorities. On the other hand NZSOLD indicated it was not uncomfortable with the current 3m plus 20,000m<sup>3</sup> definition. A group of large dam owners (including SOEs and other corporates) indicated that they would like the current definition of large dams kept. One Regional Authority indicated that it would like to exert control below three metres. Another Regional Authority was concerned that a dam with a 2.5m deep reservoir that contained 100,000m<sup>3</sup> would not be subjected to the scheme even if it posed a substantial risk. A farming representative indicated that three metres was not much of a dam but that a reservoir of 20,000m<sup>3</sup> was quite large.
38. An alternative large dam definition was tested on stakeholders to gauge their reaction. This alternative defined a dam as being eight metres high (measured from the downstream toe to the dam crest) and with a reservoir capacity of 50,000m<sup>3</sup>. If this was to be the new dam definition it was explained that smaller dams that put people at risk would also be included in the Scheme. This definition was strongly supported by all of the agricultural sector, many dam engineers, and some Regional Authorities mainly because it would take out the requirement to classify many low impact dams. It was noted by two engineers that the risk posed by eight metre dams would be similar to that posed by many existing stopbanks and therefore the resulting risk profile has some consistency. A group of large dam owners supported keeping a minimum dam size in the Scheme and recommended keeping the current definition. This was because they claim it is in line with New Zealand and international dam safety practice and that any other criteria would take some rigor to justify.
39. Regional Authorities noted that if the dam definition was changed from that defined in the Building Act it would mean that there would be different definitions for building consents and the Scheme. This could lead to confusion.
40. Some stakeholders expressed confusion about the process of measuring the depth of the reservoir to determine whether it was three metres or not. This seems to them to be unnecessarily complex. It depended on what water surface was to be used for measurement and it was noted that this was subject to ongoing debate. There was agreement that measuring the dam height rather than the reservoir depth should be simpler.
41. Public sector large dam owners including SOEs expressed a wish to get better clarity in defining Appurtenant Structures. This has been a particular issue for building consents but also is relevant to the Dam Safety Scheme. Suggestions were made to address this issue.
42. An engineer expressed concern about the lack of maintenance of detention dams. In one case he had seen considerable vegetation growing in the spillway and in another a chicken coop had been built on the spillway. He felt it is important to include detention dams in the Scheme. A Regional Authority recommended detention dams be taken out of the Scheme because they were dry 99.99% of the time.

## Discussion

43. **Large dam definition** – The current 3m plus 20,000m<sup>3</sup> definition represents a relatively small dam compared to other dam safety schemes internationally. It is unknown how this definition arose. It was used in a Dam Inventory published in December 1994 but there is no known justification for its adoption as a definition of a large dam. Importantly there is no apparent linkage with any risk analysis.
44. The following table indicates dam definitions used for safety scheme regulation elsewhere (from European Club – Dam Safety Group publication)

	Minimum dam height metres	Reservoir volume M3
Austria	15	500,000
Finland	3	-
France	20	-
Germany	5	100,000
Italy	15	1,000,000
Norway	4	500,000
Portugal	15	100,000
Slovenia	10m	1,000,000
Spain	10m	1,000,000
Sweden	15	50,000
Switzerland	10 or 5	50,000
U. Kingdom	-	25,000

The US National Dam Safety Act defines a dam as being greater than 25 feet (7.62m) and impounding more than 50 acre-feet (61,650m<sup>3</sup>). The national dam safety program across the United States is based on this definition.

In Queensland “referable dams” are more than eight metres in height and have storage of more than 500,000m<sup>3</sup>.

In New Zealand large dams are defined by the Building Act and this definition is used to determine whether a building consent is required or not. If a different dam definition is selected for the Scheme that could cause confusion.

45. Dam safety policy work (from within DIA in 2002) used a definition of an eight metre dam height with a 50,000m<sup>3</sup> capacity reservoir. This definition has been used to test potential compliance benefits against the current definition.
46. An indicative analysis has been done of the only national dam inventory available (completed in 1996) to determine the impact of increasing the size of large dams on the number of dams in the Scheme.

The following results were derived from this analysis:

Potential Impact	Total no. of dams	Dams 3m-8m	% of total dams
High PIC	58	9	16%
Medium PIC	96	23	24%
Low PIC	248	145	58%
Total	402	177	44%

The results show that raising the dam size to this level would reduce the number of dams in the Scheme by 44% based on this inventory.

47. There is however obviously an increased risk with larger dams. This risk primarily arises because dams smaller than 8m plus 50,000m<sup>3</sup> capacity would not be subjected to the Dam Safety Scheme at all.
48. There does remain a risk to people living downstream from a dam less than 8 metres high. This risk could be mitigated if the body responsible for administering the Scheme had the power to issue a notice requiring classification of any dam, regardless of whether the dam meets the dam criteria. Any such notice will only be issued if the body administering the Scheme has good reason to believe the dam may put persons at risk (or as an alternative is likely to be medium or high PIC as defined in the Regulations). This power to issue a notice will need to be structured so that:
  - It is only applied where there is reasonable cause to believe there are people at risk
  - There is no confusion with dangerous dams and emergency powers of Regional Authorities
49. If this notice provision is applied to the inventory above, about nine dams of high PIC and 23 dams of medium PIC (a total of 32 additional dams) would be included in the Scheme.
50. On this basis 145 dams (36%) of the inventory total of 402 dams would not require classification and would remain outside the Scheme. If this percentage was applied to the estimated 1150 large dams currently in New Zealand about 414 dams would not need classification. At an estimated average of \$3000 per classification per dam this would save \$1.24m of engineering fees alone.
51. It is the view of the Department's dam specialist consultant that "the (proposed) change in the dam definition, with the provision to issue a notice to classify smaller dams where a dam puts persons at risk, will achieve the same outcomes with respect to risk management as the scheme based on the current definition of the large dam (3m depth and 20,000 cubic meters volume). Fewer dams will require classification, with the large dam definition change, but a similar volume (number) of dams will with time require dam safety assurance programmes".
52. There is a potential confusion with defining dams requiring a building consent. At present large dams are defined in the Building Act. If a larger dam is to be accepted as a definition for the Scheme then it should have another name such as Inventory Dam, Classifiable Dam or Referable Dam to reduce confusion.
53. **Measuring a large dam** – The current three metre measurement of the depth of the reservoir is causing confusion. Here are two examples of the measurement currently being offered to dam owners:

Example 1 (from the Department):

- a) Where the hydrology is current and spillway capacity meets NZSOLD Dam Safety Guidelines based on the dam potential impact classification (PIC) – the reservoir level corresponding to the dam operating at its design flood level
- b) Where there is a free overflow flood spillway (minimum 3.0 metres width) and the design hydrology is not known or current– typical of rural dams - the reservoir level at the spillway crest level plus 300 mm of spillway operation.
- c) Where there is only an outlet pipe (and no overflow flood spillway or the overflow flood spillway less than 3.0 metres wide) – the reservoir level at the dam crest

**Example 2 (from ARC):**

Height ' $h$ ' should be measured at the deepest point at the upstream toe of the dam wall. If you are unable to measure the depth of your dam impoundment, you may wish to consider using the height of the dam (measured on the downstream side) as a conservative estimate.

A simpler approach (used in other dam safety schemes) is to measure the depth of the dam on the downstream side such as:

Dam height is defined as the vertical distance from the top (crest) of the dam measured:

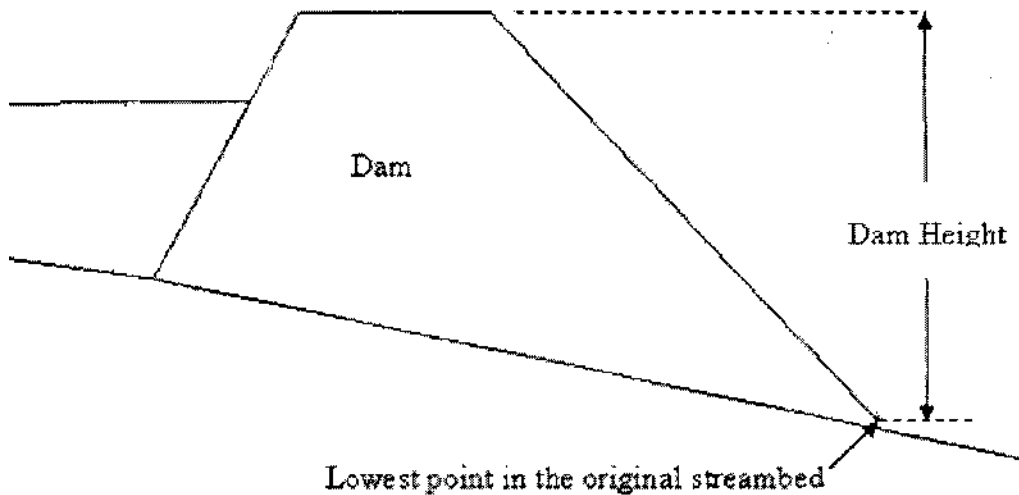
1. In the case of a dam across a stream, from the natural bed of the stream at the lowest downstream outside limit of the dam, or
2. In the case of a dam that is not across a stream, from the lowest elevation at the outside limit of the dam.

(This definition is from the British Columbia Dam Safety Regulations).

There is no reference to the spillway level in the definition. It is simply a measure of the height of the dam itself which is a proxy for dam size.

This dimension includes the freeboard of the dam (typically a metre). Therefore an eight metre dam height would translate into a five to seven metre reservoir depth depending on the gradient of the dam foundation. The impact of adopting this new dam height would mean that a large dam reservoir would be potentially five to seven metres deep compared to three metres as in the current Scheme.

This is shown diagrammatically below:



54. **Appurtenant Structures** – NZSOLD advises “It is very difficult to provide a single definition or list of the dam appurtenant structures because the appurtenant structures on one dam will be different from those of another dam. NZSOLD suggests that the dam owner should be required to submit a list of the dam’s appurtenant structures as part of the Dam safety Assurance Programme which will be certified by the Recognised Engineer. What this means is that the most appropriate person, the Recognised Engineer, will define what structures are appurtenant to the safe operation of the dam. This will reduce costs by removing the possibility of future debate or determination”. This approach appears sensible.
55. **Dams included in the definition of the Act** – Flood control or detention dams are often situated in built up environments and even though they are dry most of the time, they pose a significant risk to persons when they are full.

### **Recommendations**

56. That the definition of large dams be changed (for the purposes of the Scheme) to include dams having the capacity to hold a reservoir of 50,000m<sup>3</sup> or more and to be at least eight metres high.
57. That a dam requiring to be classified under the Scheme be described as an Inventory Dam,, Classifiable Dam or a Referable Dam (and not a Large Dam as at present).
58. That dam height is defined as the vertical distance from the top (crest) of the dam measured:
  - In the case of a dam across a stream, from the natural bed of the stream at the lowest downstream outside limit of the dam, or
  - In the case of a dam that is not across a stream, from the lowest elevation at the outside limit of the dam.
59. That the body responsible for administering the Scheme has the power to issue a notice requiring classification of any dam, regardless of whether the dam meets the dam criteria. Any such notice will only be issued if there is reason to believe the dam may put persons at risk,
60. That Appurtenant Structures for each dam be determined by the Recognised Engineer responsible for certifying the Dam Safety Assurance Programme.

### **Issue 3: Is the start date of 1 July 2010 practical?**

#### **Issue**

61. The start date for the Scheme is defined in the Building (Dam Safety) Regulations 2008 as being 1 July 2010. The question is whether there is sufficient time to properly implement the Scheme from this date.

#### **Stakeholder feedback**

62. All stakeholders that commented on this issue stated that the date was unrealistic or words to that effect. This was for a number of reasons such as:
  - The review is underway and no one knows what might arise from it
  - Even if there is no change to the legislation some regulations are still not in place

- Revised NZSOLD Dam Guidelines need to be reissued. This is on hold pending the review.
  - Many in the agricultural sector said that many dam-owning farmers “have no idea” about the Scheme
  - There are some public sector bodies who owned dams but did not know anything about them
  - There needs to be further publicity before the Scheme is started
- A Regional Authority said it was important that the Department indicated soon when the Scheme was to start so it could plan accordingly.

### ***Discussion***

63. The start date for the Dam Safety Scheme is dependent on the following:
- Consulting and agreeing any changes as a result of this Review
  - Passing all legislation including any changes to the Act and Regulations
  - Providing any publicity associated with the Scheme
  - Publishing any guidelines needed for the Scheme to run properly
  - Fully implementing the Scheme
- It is unclear how long this may take but it could take six to twelve months.

### ***Recommendation***

64. That the start date for the Scheme be delayed sufficiently to allow any legislative changes arising from this Review to be passed, to allow sufficient publicity to be communicated to dam owners and other stakeholders and to allow the Scheme to be properly implemented.

## **Issue 4: Is the three month period to classify large dams long enough?**

### ***Issue***

65. Section 135 of the Act requires that within three months of the start date every Large Dam must be classified by a Recognised Engineer (as defined in the Regulations). A dam owner must identify all the dams they own, verify that their dam is a large dam, arrange for the dam to be classified by a Recognised Engineer and submit the classification to the Regional Authority. Is there sufficient time to ensure the estimated 1150 dams are all properly classified in this period? What constraints exist to this being achieved and what is the outcome if it was unable to be achieved?

### ***Stakeholder feedback***

66. The consensus from all stakeholders is that three months is too short a time for dams to be classified, that a short timeframe like this is not necessary and that it will offer no advantage to getting the Scheme up and running. There were various reasons given why a longer period is needed:
- There is a restricted pool of Recognised Engineers to classify the dams and they need to be used effectively
  - Dam owners need to understand what they have to do and this will take time
  - There was concern expressed that if all the dams were not classified in the three month period this could lead to the media undermining the Scheme’s credibility

- There was concern about the need to identify dams that need classification. Some owners either do not know they have a large dam that needs classifying or may know but are not prepared to comply. It was noted that extending the time to six or preferably 12 months would help implementation of the Scheme immensely.

### ***Discussion***

67. The reasons put forward by stakeholders appear to have merit. Of particular importance is the requirement to allow an orderly use of a limited engineering resource.

### ***Recommendation***

68. That a period of twelve months be allowed after the Scheme's start date for dam owners to have dam classifications certified by a Recognised Engineer.

## **Issue 5: Is the methodology for classifying large dams satisfactory?**

### ***Issue***

69. The Scheme identifies a methodology for classifying dams that reflects the potential impact a dam failure would have on people, property and the environment. The question is whether the methodology is appropriate way to determine the impact and resultant classification of high, medium or low Potential Impact Category (PIC). The PIC is important to determine what monitoring regime that dam will be subjected to in future. It is therefore important to make sure it is properly arrived at.

### ***Stakeholder feedback***

70. There was little feed back on the classification process itself. Stakeholders appeared to be comfortable with the approach outlined in the Scheme.
71. A Category B engineer expected a low PIC dam classification to cost between \$2,000 and \$3,000 plus GST. A medium to high PIC dam classification he expected would cost between \$3,000 and \$10,000 depending on a number of factors.
72. The Director of Dam Safety in Queensland indicated that a straightforward dam classification costs about A\$2,000.

### ***Recommendation***

73. That no change be made to the methodology for classifying dams.

## **Issue 6: Is the accreditation and role of Recognised Engineers appropriate?**

### ***Issue***

74. Recognised Engineers are critical to the success of the Scheme. They have the crucial roles of certifying a dam's classification, Dam Safety Assurance Plans, and Annual Dam Compliance Certificates. The Scheme does not provide any opportunity for challenging the documentation certified by engineers other than through the IPENZ disciplinary process.

### ***Stakeholder feedback***

75. The main concern is the use of Category B engineers to classify low PIC dams without any ability for any other party to challenge the classification. There appears to be a potential conflict of interest for a Category B engineer because if the dam is not a low PIC dam then the classification process would have to be handed over to a Category A engineer. This gives the Category B engineer every incentive to classify the dam as a low PIC dam. This process is totally dependent on the professional integrity of the engineer. This was a particular concern of some Regional Authorities. They are concerned a low PIC dam will not be adequately inspected and maintained. On the other hand a Category A engineer advised he was less concerned noting that this is a risk management scheme and if one or two dams were classified as low PIC when they could arguably be medium PIC this would not change overall risk of the Scheme much if at all. He also noted that using a Category B engineer should be cheaper and would lower the compliance cost for many dam owners.
76. Some Regional Authorities would like the right to challenge a low PIC classification for a dam if they believed it should be medium or high. An appeal body of some sort was suggested possibly a body of two or three Category A Recognised Engineers. They understood this right to challenge a classification may incur some liability on the Regional Authority they don't currently have under the Scheme. It was noted by the Department representative that any appeal process would increase compliance cost.
77. It was noted that the IPENZ complaints and disciplinary process may not be suitable to deal with this classification of dam issue. The process deals with three specific areas: competence, disciplinary issues and negligence. A subjective dam classification by a Recognised Engineer may not easily fall into one of these areas.
78. One Regional Authority is concerned about its recent experience with engineers in design and construction of large dams. This experience included an engineer's role in construction of a dam starting before a building consent was issued, building a 7.5m dam up 3m on the basis that was acceptable to this level without a building consent and building a 4.5m dam without resource or building consents. On the basis of this experience this Regional Authority questions the powers being given the Recognised Engineers under the Scheme particularly when there is no way for the Regional Authority to challenge the judgments made.

### ***Discussion***

79. The concern about the role and competence of Category B engineers needs to be considered. The scheme is a risk management approach to dams and therefore there will always be some residual risk. Not allowing Category B engineers to undertake classification of low PIC dams would increase compliance costs and impose an unnecessary burden on Category A engineers who are already in short supply. Allowing Regional Authorities to challenge Category B engineer's classifications introduces an appeal system that will increase compliance costs.
80. There are measures that could be taken to train Category B engineers. This approach of training engineers is an important part of the Queensland dam safety scheme. A one or two day course could be developed by NZSOLD and Category B engineers required to do the course to be able to classify dams under the Scheme.

81. Another possible initiative would be to establish a panel of two or three Category A engineers who would review dam classifications at the end of the classification period and recommend to the Department any changes to legislation at that time.

***Recommendation***

82. That Category B engineers be required to undertake a one or two day dam classification training course before being able to classify dams. This course to be organised by the Department in conjunction with NZSOLD.
83. That a panel of two or three Category A engineers be established to review all dam classifications at the end of the classification period and recommend any needed legislative changes to the Department at that time.

**Issue 7: Are there sufficient Recognised Engineers?**

***Issue***

84. Category A Recognised Engineers are required to classify high and medium PIC dams and to certify all Dam Safety Assurance Plans and Annual Dam Compliance Certificates. They can be supported by other professionals in these activities. Category B Recognised Engineers can classify low PIC dams. Given the timeframes for the Scheme the question is whether there is a sufficient pool of Recognised Engineers available to meet the Scheme requirements.

***Stakeholder feedback***

85. The IPENZ Registrar advised there are currently 22 Category A Recognised Engineers with one in the process of accreditation. There are an undetermined number of Category B Recognised Engineers since they are chartered civil engineers with broad experience.
86. Category A engineers appear to have a relatively even age distribution with only five of the 22 over 60 years of age. This indicates that there is not an imminent issue with their retiring from the workforce.
87. There is some concern about the geographic spread of engineers. There are some areas in New Zealand that do not have any Category A engineers at all including the East Coast, Hawkes Bay, Taranaki, Wanganui, Manawatu, Nelson, West Coast, South Canterbury and Southland. There are only five in the South Island.
88. Advice was given by an experienced engineer that many of the Category A Engineers are engaged working for public sector or corporate dam owners and therefore would not be available for consulting work to other dam owners. This is expected to reduce the available engineers able to provide services to the broader market to about 10.
89. A Regional Authority expressed their concern that if the timeframe for the dam classifications was too short this would create an immediate shortage of Category A engineers. They could potentially put their price up to \$300 to \$400 per hour if this were the case.
90. Many engineers and dam owners advised that it is not necessary for the Recognised Engineers to do all of the classifying and certifying work required under the Scheme. Other engineers and other technical experts could and would be involved. Using others would increase the resources available, potentially reduce costs in some areas and broaden the range of skills available. The Recognised Engineers would however still need to assure themselves that the work had been correctly done before signing off on it.

91. It was also noted that some technical specialties such as geotechnical engineers (currently in demand in the roading sector) and specialist dam surveyors were in short supply and this may affect the progress of some Dam Safety Assurance Programme work.
92. The Director of Dam Safety in Queensland advised that in their experience there were not many engineers who can do the assessments well and they put a lot of effort into training engineers.
93. A SOE that owns a large number of hydro electric dams has the view that Category A engineers employed by dam owners should be able to classify and certify dams owned by their employer. This is not currently allowed under the Scheme.

### ***Discussion***

94. Provided the period for classifying dams is extended to twelve months and the time for developing and certifying dams is twelve months for both high and medium PIC dams there should be sufficient engineers to service the Scheme.
95. It will help if the large dam definition was increased to a minimum of 8 metres and 50,000m<sup>3</sup> because that will reduce considerably the number of low PIC dams in the Scheme.
96. The authority(s) responsible for implementing the Scheme can assist by coordinating the use of engineers with dam owners.
97. It is important to ensure that Category A Engineers remain independent from the dam owners.

### ***Recommendation***

98. That the authority(s) responsible for administering and monitoring the Dam Safety Scheme monitors the availability of Recognised Engineers during the Scheme's implementation..

## **Issue 8: Is the administration and monitoring role of Regional Authorities appropriate?**

### ***Issue***

99. The Act requires Regional Authorities to:
  - Establish and maintain a register of large dams in their region
  - Consider and approve (or not approve) dam classifications of large dams – the only basis for non approval is if the engineer is not an appropriately qualified Recognised Engineer
  - Consider and approve (or not approve) the Dam Safety Assurance Programmes for each medium and high PIC dam in their region - the only basis for non approval is if the engineer is not a Category A Recognised Engineer
  - Consider and approve (or not approve) annual Dam Compliance Certificates - the only basis for non approval is if the engineer is not a Category A Recognised Engineer

Alternatively this administration and monitoring role could be undertaken on a nation-wide basis by a body specifically established for the task. The question is whether or not this would provide a more effective solution.

### **Stakeholder feedback**

100. This issue attracted a lot of feedback.
101. Regional Authorities were generally concerned that they were required to undertake an administration “post box” function only and would not have any powers to challenge dam classifications, Dam Safety Assurance Programmes or Annual Certificates issued by Recognised Engineers.
102. Some Regional Authorities indicated that if their powers were limited to the “post box” function then the Administration and monitoring role would be better to be centralised possibly in the Department in Wellington. Reasons supporting this view included:
  - The view that Regional Authorities have a range of competencies in dams implying that some would struggle with the role
  - It would be good to have a centralised critical mass of competence in dams
  - This approach would provide more consistency
103. Other Regional Authorities disagreed with the centralisation role. Reasons given against centralising were:
  - It would further fragment an already fragmented dam consenting sector
  - If it was a “post box” approach it would be straightforward and not cost a lot
  - One Regional Authority suggested a centralised function would cost more overall
  - Regional Bodies do resource consent and building consents for dams now. They have the database resulting from this and this is useful for the Dam Safety Scheme
  - Regional Authorities need to deal with dangerous dams and dams that need immediate attention and there needs to be a clear interface with the Scheme
104. NZSOLD expressed a concern that Regional Authorities want to get more involved in the classification and certifying process.
105. Dam owners, engineers and the agricultural sector expressed concerns about the potential for costs associated with the Scheme and delays implementing it being passed on to dam owners by Regional Authorities. Their experience to date led them to believe that this would be the outcome if Regional Authorities were required to undertake the administration and monitoring role.
106. One engineer expressed a view that Regional Authorities were “looking for words they could hang onto rather than a risk management approach” to dam safety.
107. A group of public and corporate dam owners advised that “regulation management processes already in place are introducing significant unintended consequences and inconsistent interpretations of the Act and Regulations. Given the small number of dams in New Zealand and the fact that regulators are already seeking to consolidate responsibilities, it may be more efficient to have a single pragmatic regulating body to ensure consistent application and that the original intent of the Act and Regulations are being followed”.
108. There were additional concerns expressed by dam owners, engineers and the agricultural sector about Regional Authorities including:
  - Questions about the competence of some Regional Authorities
  - Concerns about the way some Regional Authorities charged on a “user pays” basis
  - Concerns about consistency in approach between Regional Authorities

## **Discussion**

109. There are a number of roles for Regional Authorities included in the Act including:
  - Performing the function of a building consent authority
  - Carrying out a variety of building control functions such as issuing project information memoranda and issuing certificates of acceptance
  - Adopting and implementing a policy on dangerous dams, flood and earthquake prone dams
  - Taking action if any dam poses an immediate danger
  - Administering and monitoring the Act
110. A World Bank study called “Regulatory Frameworks for Dam Safety” identified “a general trend to making the owners responsible for monitoring dam safety and conducting all necessary dam inspections. This is linked to a trend to limiting the regulatory authority to developing standards and norms and to monitoring the dam owner’s performance. A consequence of this development is that there is a trend toward reducing the size of the regulatory authority. The reason is that the authority does not need large numbers of people if its responsibilities are limited to monitoring the performance of the dam owner”.
111. Most developed countries have established a single dam safety authority at either national or state level. This includes Australian states, Canadian provinces, US states, Argentina, South Africa and most countries throughout Europe. Generally these authorities have jurisdiction over dams including dam safety. Any person interested in constructing and operating dams is required to gain permission from this agency. Dams are classified, inspected and monitored.
112. In New Zealand there are comparatively few dams. Sixty percent of these are estimated to be owned by local authorities.
113. Building consents for dams in New Zealand have been recently managed by Regional Authorities. They have elected to only use three Regional Authorities for this role due to the cost and practicality of maintaining a suitable resource in each authority. The feedback from the user side of this is that they are generally frustrated and believe the process is costly and takes too long. Regional Authorities have various levels of frustration as well.
114. As far as the administration and monitoring role of the Dam Safety Scheme is concerned there are advantages and disadvantages to having one national centralised “Dam Safety Authority”.
115. Advantages:
  - It would allow a critical mass of staff who understand and are responsible for implementing, administering and monitoring the Scheme
  - It would provide a nation-wide consistent approach
  - It would allow suitable guidance and training material to be produced
  - It would be able to deal easily with dam owners who own dams in several regions
  - It could commission national satellite dam searches – this is undertaken for example in Queensland
  - Two major Regional Authorities are being restructured at present (ARC and Environment Canterbury) and this may lead to a loss of intellectual property. Regional Authorities own a significant number of dams and this may lead to a conflict of interest
  - There are few existing dams and few being built

116. Disadvantages:
- It provides a potential disconnect between building consents and the Scheme. The extent of this is difficult to measure because the disconnect already exists because of the grouping activities already underway between Regional Authorities. (The Otago Regional Council suggested this role also be included as a function of the centralised function). This may be able to be addressed in a more global review of all dam legislation
  - Regional Authorities may distance themselves from the Scheme
117. On balance the Reviewer considers there is merit in establishing a centralised dam safety body.

### ***Recommendation***

118. That a new body responsible for administering and monitoring the Scheme on a nation-wide basis be established within central government and that the new body is named to clearly identify its role (such as the “Dam Safety Authority”).
119. That consideration is given to (at least partially) funding the body with a simple low fee charge regime to all dam owners included in the Scheme.

## **Issue 9: Is the proposed Dam Safety Assurance Programme appropriate?**

### ***Issues***

120. The Dam Safety Assurance Programme is the key to dam safety under the Scheme. Dams will be made safe or not depending on the contents of the Programme and how it is implemented. Is it suitable for this purpose as described in Legislation?
121. Is the twelve month period to put a high PIC dam DSAP in place appropriate? Is a two year period to put a medium PIC dam DSAP in place appropriate?
122. Is the five year review interval for both high PIC dams and medium PIC dams appropriate?

### ***Stakeholder feedback***

123. A Category A engineer expressed the view that there is no need to allow two years for medium PIC dam owners to get a DSAP in place. Twelve months as required for high PIC dams would be sufficient.
124. There is general agreement that a five yearly review for high PIC dam DSAP is appropriate but that a seven yearly review would suffice for a medium PIC dam DSAP as specified in the NZSOLD Dam Safety Guidelines.
125. Dam owners and engineers advised that many public and corporate dam owners already had their own dam safety management schemes and that preferably these could be used to satisfy the requirements of this Scheme.
126. The importance of the DSAP to the Scheme was reinforced by several senior engineers who regard it as the key to the Scheme’s success.

### ***Discussion***

127. If the dam classification period is extended from three months to twelve months then a twelve month period should be sufficient for both high PIC and medium PIC dam DSAPs to be completed.

128. A five yearly review period for a high PIC dam DSAP is widely supported
129. A seven yearly review for a medium PIC dam DSAP aligns with the NZSOLD guidelines and would reduce compliance cost. This also will help balance resource demand across the sector.

### **Recommendations**

130. That the Dam Safety Assurance Programme for a medium PIC dam be required to be in place twelve months after the date on which the Scheme authority approves the classification for the dam.
131. That Dam Safety Assurance Programme review periods be increased from five to seven years for medium PIC dams to align with NZSOLD Guidelines.

## **Issue 10: Are the Annual Dam Compliance Certificate requirements appropriate?**

### **Issue**

132. The Act states that every owner must provide an Annual Dam Compliance Certificate with confirmation from a Category A Recognised Engineer that all procedures in the Dam Safety Assurance Programme have been fully complied with. It must be signed by the dam owner or chief executive (if the dam owner is a corporate). Is this appropriate?

### **Stakeholder feedback**

133. There is a general concern expressed by dam owners and engineers that the requirements of the Annual Dam Compliance Certificate is unnecessarily restrictive and this will led to a poor and possibly unintended outcome. In particular the main concern is that for the DSAP to “*be fully complied with*” means strict compliance. This strict compliance would be compromised if, for example, a monthly inspection was not conducted in a month the inspector was sick or on holiday. It was suggested that provided the general intent of the DSAP was adhered to the annual certificate could be issued even if there were minor non-compliances.
134. Public and corporate dam owners strongly believe that the annual dam sign off is too frequent. They make the point that the operating lives of dams are measured in decades.

### **Recommendations**

135. That the wording of the Annual Compliance Certificate be changed so that there is not a requirement for the DSAP to be “fully complied with”. Instead the Category A Engineer and dam owner (or chief executive) will certify that the dam owner has complied with the criteria and standards of the Dam Safety Assurance Programme as set out in section 8 of the Regulations and where necessary include a list of any non-compliances that warrant corrective action.
136. That consideration be given to allowing a dam owner to supply bi-annual Dam Compliance Certificates provided a Category A Recognised Engineer certifies the implementation of the DSAP warrants it.

## **Issue 11: Are the dangerous dams and immediate danger policies appropriate?**

### ***Issue***

137. The Act requires Regional Authorities to develop a dangerous dams policy within their region. The purpose of this policy is to help prevent catastrophic failure of a potentially dangerous dam. The Regional Authority has functions and powers under the Act including putting up hoardings, attaching a warning on the dam, requiring work to be carried out on the dam to reduce or remove the danger and subject to a court order or a chief executive's warrant, carry out the required building work. Are these roles, functions and powers appropriate?

### ***Stakeholder feedback***

138. Regional Councils advised that the regulations relating to dangerous dams still needs to be passed. These regulations will specify what a moderate earthquake is and what a moderate flood is. Both are required to define a dangerous Dam.
139. There seems to be general agreement by stakeholders that Regional Authorities should have powers relating to dangerous dams and have powers to avoid immediate danger.
140. Regional Authorities advised that there should be a requirement that a Recognised Engineer certify that a dam is dangerous if it became apparent that it was. It was also suggested that a dam owner be required to advise the Regional Authority if they were aware the dam was dangerous.

### ***Recommendation***

141. That if in the process of certifying a dam it becomes apparent to the Recognised Engineer that a dam is dangerous then it will be notified as such to the Scheme authority.

## **Issue 12: Is the earthquake-prone and flood-prone dam's policy appropriate?**

### ***Issue***

142. The Act requires Regional Authorities to develop an earthquake-prone and flood-prone dams policy within their region. These "prone" dams are high PIC or medium PIC dams that are likely to fail in a threshold event (as defined by the regulations). The Regional Authority can request that a large dam owner review its Dam Safety Assurance Scheme if the dam is earthquake-prone or flood-prone. Is this appropriate?

### ***Stakeholder feedback***

143. NZSOLD and dam owners advised that there is no need to give the Regional Authority any powers to deal with earthquake-prone and flood-prone dams. These "prone" dams should be dealt with in the DSAP.
144. One Regional Authority would like to see the "prone" dam powers of the Regional Authorities remain.
145. An SOE dam owner suggested the shift in risk for prone dams is minimal under the existing legislation, the process is questionable and there is the question of who bears the cost.

146. An engineer pointed out that analyzing these structures for earthquakes is complex and can take 12 months. He also pointed out that the powers in the Act do not deal with the recalcitrant owner who ignores authorities. He therefore thinks the “prone” dams policy would be of little use.
147. The Department solicitor advised that the threshold events required to identify “prone” dams could be included in the legislation. It could be required to be taken into account in developing the Dam Safety Assurance Programme.

### ***Recommendation***

148. That all reference to earthquake-prone and flood-prone dams is removed from the Act.

## **Issue 13: Has the Scheme been adequately publicised?**

### ***Issue***

149. There are potentially about 1150 dams that meet the criteria for a large dam. Owners of all dams need to be made aware of the Dam Safety Scheme and need to determine whether their dam is a large dam and, if it is, get it classified according to the Scheme within three months from 1 July 2010. A suitable communications and publicity strategy needs to be in place for this to happen. Some work has been done already to publicise and communicate the Scheme but is it enough given the timing?

### ***Stakeholder feedback***

150. There appears to be a universal view that the Scheme has not been adequately publicised for its introduction. This view was expressed by NZSOLD, public and corporate dam owners, dam owners, Horticulture NZ, Irrigation NZ, Federated Farmers, and engineers. Some of these stakeholders offered to assist.
151. It was noted that some parties have “no idea” about the Scheme and some public bodies had no idea what dams they own.
152. Suggestions and advice included:
  - Publicity be delayed until the Legislation was passed
  - That guidelines be provided
  - That “education was better than excessive regulation”
  - That information provided was consistent across the country
  - A road show should be held
  - That it would take some time to adequately publicise the Scheme
  - That industry organisations be used to help

### ***Discussion***

153. The view of stakeholders is clear and well supported. A communications plan should be developed by the Department and Regional Authorities identifying:
  - All stakeholders and their communication requirements
  - The best means of communicating with them and publicising the Scheme
  - Communication risks and how they will be managed
  - Guidelines that need developing
  - Industry bodies and others who can assist

### ***Recommendation***

154. That a communications plan be developed to communicate with dam owners and other stakeholders including publicising the requirements under the Act and providing suitable support material.

## **Issue 14: Can the Scheme be simplified for Dam Owners with several dams?**

### ***Issue***

155. Some dam owners have several dams that are in many cases very large dams. Most of these have an existing dam safety management system that is often undertaken on a portfolio basis. It is expected that, in most circumstances, these dam safety management systems will meet the objectives of the Dam Safety Scheme. Is there a way to ensure that there is a minimum of compliance cost that these dam owners would have to bear to comply with the Scheme?

### ***Stakeholder feedback***

156. There is a consistent concern from public and corporate dam owners (that often own a portfolio of dams) that the new Scheme will cause unnecessary compliance cost. They agree that the accreditation scheme originally proposed was of no value but they would like to be able to get some sort of “blanket” coverage to get their existing safety management scheme approved as a whole on a portfolio basis.
157. One SOE suggested that large corporate dam owners with an established track record for safety compliance should be exempted from the Scheme legislation.
158. Another SOE noted that their dams were in several Regional Authority’s jurisdictions and this could present consistency issues.

### ***Discussion***

159. Provided that an existing dam safety management scheme meets the intent of the Scheme and is certified by an independent Recognised Engineer there it should be able to be accepted. There is no point in requiring the dam owner to redo his scheme to comply with the Scheme when it meets the overall objectives already. That approach increase compliance cost with no benefit.

### ***Recommendation***

160. That a Recognised Engineer be able to review the existing dam safety approach in place for dam owners with a portfolio of dams and certify that it meets the criteria and standards as set out in section 8 of the Regulations.

## **Issue 15: Is there an effective interface between the Scheme and consents requirements for building dams?**

### ***Issue***

161. Certain dams need resource and building consents from Regional and Territorial Authorities. There are necessary requirements within these consents to ensure the dam does not present an unreasonable hazard and that it will be able to be maintained in future. There is therefore a risk that there is some overlap between the consent requirements and the requirements of the Dam Safety Scheme.

### **Stakeholder feedback**

162. The terms of reference of the Review does not include consideration of resource and building consents. Many stakeholders wished to discuss issues relating to these consents as part of the Review and it is clear the Department should consider providing a forum for this to happen. It is likely that some recommendations of this report will need to be considered in conjunction with a broader review of all dam issues.
163. There is consistent feedback from stakeholders that there is potential confusion between the resource and building consent requirements and the Scheme.
164. Public and corporate dam owners have concerns that the Dam Safety legislation does not sit well under the Building Act. They consider “the prescriptive nature of the Building Act is at odds with the light-handed legislation accepted by DBH as being appropriate for dam safety. The buildings aspect of the Act and regulations is designed around a standards based system where the Dam Safety Scheme relies on a risk management systems”.
165. A number of dam owners have resource consent conditions which deal with dam safety compliance requirements. Public and corporate dam owners advise that Regional Authorities are reluctant to accept that when the Scheme comes into effect these conditions will be an unnecessary duplication of compliance requirements.
166. Some Regional Authorities were concerned about having different definitions of large dams in the Building Act and in the Scheme. At present a large dam is defined in the Building Act and the Scheme as “a dam that retains 3 or more metres depth, and holds 20,000 or more cubic metres volume of water or other fluid. If the Dam Safety Scheme defines a large dam as a larger dam this will cause confusion.
167. The main area of concern is the compliance cost and time taken to process dam building consents. Federated Farmers representatives advised that there needs to be a balance between pragmatism and practicality on one hand and compliance costs on the other. A dam owner who had recently built a substantial dam complained about the “red tape” involved, the number of consents required and that both the Regional Authority and the Territorial Authority were both heavily involved.
168. Engineers working on dam projects were of the view that the definition of large dams was set too low in the Building Act and this caused unnecessary compliance cost and delays. As a result dams are being routinely built just less than three metres to avoid building consents. They advised that this perverse outcome did not necessarily provide the best economic outcome for the dam owner and the country.
169. Engineers complained the dam designs were always referred by the Council to an independent dam engineer for a peer review which means increased costs and delays. The peer reviewer is required to have professional indemnity insurance which further increases the cost for dam owners.
170. The cost and resources required to process dam building consents is an issue for the 16 Regional Authorities in New Zealand. They are attempting to overcome this by forwarding their building consents for processing to one or two councils in each island. In the South Island Environment Canterbury and the Otago Regional Council are qualified to process dam building consents. For example Southland and Westland regional councils referred their dam building consents to Otago. In the North Island Environment Waikato is qualified to process dam building

consents for North Island Regional Authorities. The Auckland Regional Council may qualify later.

171. Some engineers are concerned about the consistency of standards between Environment Waikato and the Otago Regional Council.
172. One Regional Council advised that dams should be out of the Building Act and should be an adjunct to the Resource Management Act. They would support centralisation of dam consents and safety scheme. This, in their view, would provide a small, specialised resource with a consistent approach. They were of the view that a firm regulatory environment was needed and it could not be relaxed.

### ***Discussion***

173. Consideration of resource and building consents is outside the terms of reference for this review. It is however apparent that the total legislation as it applies to dams needs to be reviewed in order to provide effective and clear legislation and consistent implementation.
174. There is the potential for some overlap of requirements between the Resource Management Act and a Dam Safety Scheme. In particular Regional Authorities may require inspection, monitoring and maintenance provisions as part of the Resource Consents for a new dam and these may overlap or conflict with the requirements of the Dam Safety Scheme. Clearly the two should be aligned.
175. In the event that some of the recommendations in this Review are accepted there is potential for confusion between the Building Consent process and the Dam Safety Scheme for new dams. This could apply for example to confusion about dam definitions, and which agency is responsible for administration and monitoring of building consents and the dam safety scheme. Dam legislation as a whole needs to be reviewed to ensure confusion is minimized and compliance costs kept down.

### ***Recommendation***

176. That legislation as it applies to dams (including resource consent and building consent legislation) be reviewed as a whole in order to provide effective, clear legislation that reduces compliance costs and provides consistent implementation across the sector.

## **Issue 16: Further consultation before implementing changes to the Scheme**

### ***Issue***

177. The Scheme to date has been developed over many years with a significant consultation programme involving many stakeholders. If the Government wishes to accept some or all of these recommendations is further consultation needed?

### ***Stakeholder feedback***

178. There is a close interest expressed by most stakeholders in any changes. There is alignment on many issues and there are only a limited number of suggested changes that there appear to be opposing views.
179. One Regional Authority responded to a suggested change (large dam definition) by suggesting “any change to thresholds needs a rational technical basis having particular regard to local conditions and risk tolerances”. That Regional Authority would clearly like to be part of that process. Similarly a group of large dam

owners suggested for example that “moving away from these (large dam definition) criteria would take some rigor to justify”.

### ***Discussion***

180. The stated policy objectives of the Scheme includes that “The dam safety scheme balances risk management approaches with minimisation of compliance costs”. This Review proposes recommendations that test this objective. Some stakeholders are less concerned with compliance cost and more concerned with risk and some are the opposite.
181. In the time available for this Review it has not been possible to properly test the recommendations. Some have not been canvassed with stakeholders at all. If the Government wishes to change the Dam Safety Scheme substantially it should consult with stakeholders before making the changes.

### ***Recommendation***

182. That following consideration of this Review, Government should consult stakeholders before making changes to the Dam Safety Scheme,

## Recommendations

1. That a Dam Safety Scheme is needed in New Zealand.
2. That the Dam Safety Scheme in its current form needs modifying to improve its efficiency and effectiveness and to reduce compliance costs.
3. That the definition of large dams be changed (for the purposes of the Scheme) to include dams having the capacity to hold a reservoir of 50,000m<sup>3</sup> or more and to be at least eight metres high.
4. That a dam requiring to be classified under the Scheme be described as an Inventory Dam, Classifiable Dam or a Referable Dam (and not a Large Dam as at present).
5. That dam height is defined as the vertical distance from the top (crest) of the dam measured:
  - In the case of a dam across a stream, from the natural bed of the stream at the lowest downstream outside limit of the dam, or
  - In the case of a dam that is not across a stream, from the lowest elevation at the outside limit of the dam.
6. That the body responsible for administering the Scheme have the power to issue a notice requiring classification of any dam, regardless of whether the dam meets the dam criteria. Any such notice will only be issued if there is reason to believe the dam may put persons at risk.
7. That Appurtenant Structures for each dam be determined by the Recognised Engineer responsible for certifying the Dam Safety Assurance Programme.
8. That the start date for the Scheme be delayed sufficiently to allow any legislative changes arising from this Review to be passed, to allow sufficient publicity to be communicated to dam owners and other stakeholders and to allow the Scheme to be properly implemented.
9. That a period of twelve months be allowed after the Scheme's start date for dam owners to have the dam classifications certified by a Recognised Engineer.
10. That no change be made to the methodology for classifying dams.
11. That Category B engineers be required to undertake a one or two day dam classification training course before being able to classify dams. This course to be organized by the Department in conjunction with NZSOLD.
12. That a panel of two or three Category A engineers be established to review all dam classifications at the end of the classification period and recommend any needed legislative changes to the Department at that time.
13. That the authority(s) responsible for administering and monitoring the Dam Safety Scheme monitors the availability of Recognised Engineers during the Scheme's implementation.

14. That a new body responsible for administering and monitoring the Scheme on a nation-wide basis be established within central government and that the new body is named to clearly identify its role (such as the “Dam Safety Authority”).
15. That consideration is given to (at least partially) funding the body with a simple low fee charge regime to all dam owners included in the Scheme.
16. That the Dam Safety Assurance Programme for a medium PIC dam be required to be in place twelve months after the date on which the Scheme authority approves the classification for the dam.
17. That Dam Safety Assurance Programme review periods be increased from five to every seven years for medium PIC dams to align with NZSOLD Guidelines.
18. That the wording of the Annual Compliance Certificate be changed so that there is not a requirement for the DSAP to be “fully complied with”. Instead the Category A Engineer and dam owner (or chief executive) will certify that the dam owner has complied with the criteria and standards of the Dam Safety Assurance Programme as set out in section 8 of the Regulations and where necessary include a list of any non-compliances that warrant corrective action.
19. That consideration be given to allowing a dam owner to supply bi-annual Dam Compliance Certificates provided a Category A Recognised Engineer certifies the implementation of the DSAP warrants it.
20. That if in the process of certifying a dam it becomes apparent to the Recognised Engineer that a dam is dangerous then it will be notified as such to the Scheme authority.
21. That all reference to earthquake-prone and flood-prone dams is removed from the Act.
22. That a communications plan be developed to communicate with dam owners and other stakeholders including publicising the requirements under the Act and providing suitable support material.
23. That a Recognised Engineer be able to review the existing dam safety approach in place for dam owners with a portfolio of dams and certify that it meets the criteria and standards as set out in section 8 of the regulations.
24. That legislation as it applies to dams (including resource consent and building consent legislation) be reviewed as a whole in order to provide effective, clear legislation that reduces compliance costs and provides consistent implementation across the sector.
25. That following consideration of this Review, Government should consult stakeholders before making changes to the Dam Safety Scheme,

## **Appendix 1**

### **List of stakeholders consulted:**

**Michael Mills** – Manager, Building Act Review, Department of Building and Housing  
**Hassan el Maaroufi** – Advisor Operational Policy, Department of Building and Housing  
**Jeremy Ford** – Senior Solicitor, Department of Building and Housing  
**Peter Foster** – Principal Civil/Hydro Engineer, MWH New Zealand Limited  
**Jeff Wastney** – Registrar, IPENZ  
**Ken Roberts** – Chairman of New Zealand Society on Large Dams and Dam Safety  
Manager, Contact Energy Limited  
**Peter Mulvihill** – NZSOLD Management Committee and Asset Manager – Pioneer  
Generation Limited  
**Peter Amos** – NZSOLD Management Committee and Managing Director, Damwatch  
Services Limited  
**Jim Walker** – Senior Engineer – Dam Safety and Civil Strategy, Meridian Energy  
Limited  
**Kenyon Schur** – Hydro Engineer, Genesis Energy Limited  
**Graeme Hill** – Generation Engineering Manager, Mighty River Power Limited  
**Justin Howes** – Hydro/ Civil Engineer, Mighty River Power Limited  
**Wallace McQuarrie** – Dam Safety Engineer, Watercare Services Limited  
**Peter Lilley** – Engineering Manager, Trustpower Limited  
**Chris Keenan** – Manager, Resource Management and Environment, Horticulture New  
Zealand  
**Paula Hammond** – Greater Wellington Regional Council  
**Peter Allen** – Director Dam Safety (Water Supply), Office of the Water Supply  
Regulator, Department of Environment and Resource Management, Queensland State  
Government  
**Terry Heiler** – Irrigation New Zealand  
**Andrew Curtis** – Chief Executive, Irrigation New Zealand  
**Dave Attewell** – Attewell Consultants, Consulting Engineers, Timaru  
**David Hamilton** – David Hamilton and Associates, Consulting Engineers, Dunedin  
**Irene Parminter** – Principal Advisor, Natural Resources Group, Ministry of Agriculture  
and Fisheries  
**Garry Herrington** – Advisor, Ministry of Agriculture and Fisheries  
**Bruce Wills** – National Board Spokesman on Building Issues, Federated Farmers and  
dam owning farmer  
**Peter Reynolds** – Horticulture farmer who owns dams, Pukekohe  
**Chris Nicholson** – Horticulture farmer who owns dams, Pukekohe  
**Anders Crofoot** – Wairarapa Provincial President, Federated Farmers and dam owning  
farmer  
**Graeme Martin** – Chief Executive, Otago Regional Council  
**Gavin Palmer** – Director of Environmental Engineering and Natural Hazards, Otago  
Regional Council  
**Darryl Lew** - Hawkes Bay Regional Council  
**Neil Morris** – Marlborough District Council  
**Katrina Browne** – Auckland Regional Council

## **Appendix 2: Terms of Reference**

### **TERMS OF REFERENCE – DAM SAFETY REVIEW**

The Building Act 2004 provides for a Dam Safety regulatory scheme.

As part of the Building Act Review, the Department of Building and Housing wishes to engage an independent and suitably qualified and experienced person to undertake a review of the Dam Safety regulatory scheme before it takes effect on 1 July 2010.

### **Background**

#### *The Building Act Review*

In August 2009 the Minister for Building and Construction announced a review of the Building Act 2004 (the Act) in response to concerns about:

- the Act's implementation at local government / consent authority level
- the costs and complexity associated with the building consent process
- consumer confidence in the technical capability of practitioners
- The allocation of risk and liability between the parties involved in the building control system.

The aim of the review is to identify reforms to the Act and its associated regulation and administration to reduce the costs associated with the building control system without compromising building quality. The review therefore seeks to achieve the following results:

- quality homes and buildings are produced through a business-enabling and efficient regulatory framework
- consumers make informed decisions and have confidence transacting in the building and housing market
- homes and buildings are produced cost-effectively by a productive sector with the right skills and knowledge
- An efficient and cost-effective regulatory system.

#### *The Dam Safety Regulatory Scheme*

New Zealand has about 1,150 large dams that, until now, have not been subject to a formal system of dam monitoring, inspection and maintenance.

The Building Act provides for a Dam Safety Scheme with the intention of ensuring that from 1 July 2010 all large dams are regularly monitored, and that any associated risks to people and property from their failure are minimised.

The regulations apply to large dams that are capable of holding a reservoir of 20,000m<sup>3</sup> or more (about the size of eight Olympic-sized swimming pools) and of retaining three or more metres' depth of water or other fluid. This is classified as a large dam in terms of the Act and means it has to comply with the Dam Safety Scheme. The definition also applies to dams that only rarely hold and retain these amounts and depths of water or other fluid. The definition includes flood detention dams but excludes stopbanks.

The Dam Safety Scheme requires the owners of dams to assess whether their dams are affected by the scheme, and the owners of large dams to:

- classify the dam as having low, medium or high potential impact (on people, property and the environment in the downstream area if the dam were to fail)
- get the dam classification certified by a recognised engineer, and
- Register the dam and submit its classification with the appropriate regional authority (within three months of the 1 July 2010 commencement date of the Scheme or within three months of their dam being commissioned).

For dams classified as having a medium and high potential impact the dam owner must also:

- prepare and submit a Dam Safety Assurance Programme (which includes surveillance and maintenance procedures) to the regional authority, within one year if a high potential impact dam, and two years if a medium potential impact category dam
- provide evidence that all procedures in the Dam Safety Assurance Programme have been complied with by submitting an annual Dam Compliance Certificate to the regional authority, and
- Ensure the Dam Safety Assurance Programme and annual Dam Compliance Certificate are audited and certified by a recognised engineer.

The Building Act provides for the administration of the scheme by Regional authorities, who must compile and maintain a register of dams.

Smaller dams are not affected by the dam safety scheme, although they still need to comply with the Building Act 2004 in terms of meeting the Building Code standards, etc.

## **Purpose**

The purpose of the review is to provide the Department of Building and Housing with an independent and well informed view on whether or not the Dam Safety regulatory scheme is 'fit for purpose' before it takes effect on 1 July 2010.

The reviewer is required to:

- familiarise themselves with:
  - the risks and potential consequences of dam failure that the dam safety regulatory scheme seeks to mitigate
  - the legislative and regulatory features and requirements of the dam safety scheme
  - key stakeholder groups with interests in the scheme, the nature of their interests and any issues they might have with the scheme's design and operational requirements (including large dam owners and farmers)
- advise on whether the scope of the scheme is appropriate given the nature and consequences of the risks that the scheme is intended to mitigate and whether or not any changes should be made to its scope i.e. should the scheme continue to apply to all dams capable of holding a reservoir of 20,000m<sup>3</sup> or more and of retaining three or more metres' depth of water or other fluid

- Advise on any other issues associated with the scheme's design and operational requirements that are likely to negatively impact on its efficient and effective operation and result in greater than necessary compliance costs for dam owners. In doing so consideration should be given to:
  - the nature and frequency of the schemes requirements and obligations for dam owners
  - the supply of suitably qualified and experienced engineers and other service providers needed to assist dam owners to meet their obligations under the scheme
- recommend any changes that they consider necessary to ensure the scheme's efficient and effective operation before it comes into force

### **Stakeholder engagement**

In developing their advice to the Department, the reviewer is expected to meet with the representatives of dam owners and other stakeholders. The purpose of doing so is to ensure that stakeholder views and any issues with the dam safety scheme are identified and considered by the review. The reviewer must, however, form their own independent view on the substance and significance of any issues identified by stakeholder representatives during the course of the review

### **Timing and Reporting**

Time is of the essence. The review must be completed by the end of March 2010.

The product of the review will be a short written report that clearly sets out the reviewers:

- understanding of the risks of dam failure (and consequences) that the scheme is designed mitigate
- advice on whether or not the current scope of the scheme is appropriate given their understanding of the risks and consequences of dam failure
- identification of any other issues with the schemes design and implementation that will likely result in the scheme's inefficient or ineffective operation
- recommendations on any changes that are necessary to improve the schemes efficient and effective operation

### **Independence**

The review must be conducted by a suitably experienced and qualified person who is independent on the particular interests of stakeholders and persons affected by the scheme's operation. As well as being able to understand the technical aspects of the scheme and the risks that it seeks to mitigate, this person must be sensitive to the public policy context in which the scheme operates and the public interests in mitigating the risks of dam failure.