SUBMISSION

TO

QUEENSLAND FLOODS COMMISSION OF INQUIRY

By

Greg McMahon

11 March 2011

TERMS OF REFERENCE

UNDER the provisions of the *Commissions of Inquiry Act 1950*, Her Excellency the Governor, acting by and with the advice of the Executive Council, hereby appoints the Honourable Justice Catherine Holmes to make full and careful inquiry in an open and independent manner with respect to the following matters:-

a) the preparation and planning by federal, state and local governments; emergency services and the community for the 2010/2011 floods in Queensland,

b) the performance of private insurers in meeting their claims responsibilities,

c) all aspects of the response to the 2010/2011 flood events, particularly measures taken to inform the community and measures to protect life and private and public property, including

- immediate management, response and recovery
- resourcing, overall coordination and deployment of personnel and equipment
- adequacy of equipment and communications systems; and
- the adequacy of the community's response.

d) the measures to manage the supply of essential services such as power, water and communications during the 2010/2011 flood events,

e) adequacy of forecasts and early warning systems particularly as they related to the flooding events in Toowoomba, and the Lockyer and Brisbane Valleys,

f) implementation of the systems operation plans for dams across the state and in particular the Wivenhoe and Somerset release strategy and an assessment of compliance with, and the suitability of the operational procedures relating to flood mitigation and dam safety,

g) all aspects of land use planning through local and regional planning systems to minimise infrastructure and property impacts from floods,

h) in undertaking its inquiries, the Commission is required to:

- take into account the regional and geographic differences across affected communities; and
- seek public submissions and hold public hearings in affected communities.

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ABBREVIATIONS, ACTS AND CASE LAW USED AND CITED

City of Brisbane (Flood Mitigation Works Approval) Act 1952-1974	**CoB Act**
Criminal Justice Commission	**CJC**
Crime and Misconduct Commission	**CMC**
Department of Harbours and Marine	**DHM**
Department of Local Government	**DLG**
Department of Mapping and Surveying	**DMS**
Department of Mines and Energy	**DME**
Department of Natural Resources Management	**DNR**
Gold Coast City Council	**GCCC**
Institution of Engineers Australia	**IEA**
John Oxley Youth Detention Centre	**JOYDC**
Office of the Information Commissioner	**OIC**
Performance Report Document by supervisor A	**PR-A**
Performance Report Document by supervisor B	**PR-B**
Second Performance Report asserted to be PR-A	**PR-D**
Probable Maximum Flood	**PMF**
Probable Maximum Precipitation	**PMP**
Public Interest Disclosures	**PID**
Public Sector Management Commission	**PSMC**
Queensland Public Service	**QPS**
Water Resources Commission	**WRC**
Department of Primary Industries	**DPI**
Brisbane City Council	**BCC**

City of Brisbane (Flood Mitigation Works Approval) Act 1952-1974
Criminal Code (Qld)
Criminal Justice Act 1989
Crime and Misconduct Act 2001
Freedom of Information Act 1994
Integrated Planning Act
Libraries and Archives Act 1988.
Public Sector Ethics Act 1994
Public Service Act 1996
Public Service Management and Employment Act and Regulations 1988
Whistleblowers Protection Act 1994

R v Ensbey; ex parte A-G (Qld) [2004] QCA 335
Re Carruthers v Connolly, Ryan & A-G. [1997] QSC 132 (5 August 1997)
Stollery v The Greyhound Racing Control Board (1972) 128 CLR 509
Dickason v Edwards (1910) 10 CLR 243
Allinson v General Council of Medical Education [1894] 1 QB 750
R v London County Council ex parte Akkersdyk [1892] 1 QB 190)

OUTLINE

I provide information and advice relevant to concerns that further flood events may occur in the forthcoming wet seasons, and that more might have been done in the past, and can be done in the future, to avoid and/or mitigate loss of life and damages from those events.

This submission is provided in the public interest and may be made a public exhibit.

BACKGROUND

My credentials are as follows and, without gainsay, demonstrate my expertise in respect of the issues under review by this commission of inquiry.

With the Department of Local Government. The administration of the *City of Brisbane (Flood Mitigation Works Approval) Act* 1952-1974 ["**CoB Act**"] was delegated to me during the 1980's in my role as Executive Engineer for the Design group and then as Chief Engineer for Investigations and Reviews in the Engineering Branch of the Qld Department of Local Government ["**DLG**"] (and, for short periods, as part of the Qld Water Resources Commission ["**WRC**"] and of the Qld Department of Primary Industries ["**DPI**"] when the engineering function of the DLG was merged into these other agencies)

The *CoB Act* purported to give the Brisbane City Council ["**BCC**"] the benefit of exemption from liabilities arising out of those works if those works were constructed in accordance with the plans gazetted under that Act.

Despite the *CoB Act's* name, other local authorities could (and did) make application to have this Act applied to flood mitigation works undertaken within their local authority area. An important local authority to do so was the Gold Coast City Council ["**GCCC**"].

The 1980s were years in which most of the flood mitigation works, following on from the 1974 flood, were undertaken in Brisbane and in other local authorities. They were also the years in which large volumes of developmental works were undertaken, particularly with respect to canal developments, water supply dams, sand and gravel extraction and reclamation of floodplain land for urban subdivision.

That development infringed upon both the waterspace occupied by major floods, and also the catchment areas for dam sites likely to provide the future water supply for the South East Queensland region, for example, the Wolfdene Dam site.

Under that Act, I coordinated a multi-departmental review and approval process for most works undertaken within the BCC and GCCC areas in mitigation of future flooding. Those agencies included the Coordinator General/Premiers Department, the Department of Harbours and Marine ["**DHM**"], the Water Resources Commission ["**WRC**"] and the DLG.

The outcomes from this background of situations, both in the public sector (State and Local) and in the private sector (business and community), included:

1. The multi-agency coordination required for the *CoB Act* expanded the scope of that coordination into the conduct of flood studies, the steering of flood studies conducted by councils and consultants, the environmental review of developmental proposals, advice to councils on associated matters such as flood warnings and storm surge, and the review of flood legislation, land use plans *et al*;
2. A cross-agency cooperative 'team' developed, consisting of mutually supporting expertise;
3. The DLG team became the principal adviser to government on flood mitigation, both State and Local, and held the role of State government expert on flood estimation, mathematical modeling of flooding and floodplain management. This expertise was supported by the WRC expertise in rainfall hydrology and flood measurement, and by the expertise held in physical modeling of flooding by DHM. The expertise of Professor Colin Apelt from the University of Queensland was a continuing influence on the DLG's flood expertise;
4. The proactive role by DLG in floodplain management followed a history of development of state-of-the-art practices at DLG by its senior leaders when they were in the Chief Engineer role and engaged directly in engineering[1], and may have been influenced by the fact that their homes and the homes of family had been inundated during the 1974 flood.

[1] Webber W [1975], *North Pine Dam Catchment Area Land Use Study*, Department of Local Government Qld, 1975

Methods[2] developed by the DLG team became recommended best practice in flood estimation for the profession.[3] The team members were a major contributors to the Position Papers on Flooding and on Drought developed by the Institution of Engineers Australia ["**IEA**"]. They developed, with Professor Colin Apelt, the State Government's state-of-the-art mathematical model for flooding (unsteady free surface flow) conditions[4], and developed with the Department of Mapping and Surveying ["**DMS**"] methods using satellite imagery for measuring the rate of development of the urban fringe towards catchment areas for furure water supply dam sites[5], and for measuring flood flows and inundation areas for very wide flooding in western Queensland[6].

As the leader of the DLG team during those times, I was in a key position to observe events, processes and decisions related to flooding and development issues, including canals, subdivisions and water supply.

With the Qld Water Resources Commission. I held the position of Senior Planning Engineer in 1989 to 1991, and developed the overview studies for identifying the water resource infrastructure needs in the State. That role included opportunities:

1. to develop the Five Year Plan for the WRC water infrastructure planning function,
2. to review applications by mining companies for tailwater dams and for other works that had the risk of degrading the water resources of the State, and
3. to take the initiative to develop an environmental agenda for the WRC, the first project of which was the *State of the Rivers* program

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[2] McMahon G & Muller D [1986], *The Application of Peak Flow Parameter Indifference Curve Technique with Ungauged Catchments*, Hydrology and Water Resources Symposium, I.E.Aust, Brisbane 1986, p.186-191

[3] IEAust [1987] Australian Rainfall & Runoff, Volume 1, *A Guide to Flood Estimation*, Revised Edition 1987, pp 180, 186, 188 and 192

[4] Muller D & McMahon G [1987], *Numerical Modelling of the Nerang River System*, Southern Engineering Conference, I.E.Aust., Gold Coast, August 1987

Muller D [1989] *Two Dimensional Unsteady Free Surface Flow*, Ph.D Thesis by D.K. Muller under supervision of Prof. C.J. Apelt (University of Queensland) and G.M. McMahon (Queensland Water Resources Commission)

[5] McMahon G and Collins L [1984], *Temporal Analysis of Rural-Urban Fringe Areas*, Third Australasian Remote Sensing Conference, Gold Coast 1984, p.235-251

[6] McMahon G and Collins L [1985], *Observations of Flooding Using Satellite Imagery*, Hydrology and Water Resources Symposium, I.E.Aust Sydney 1985, p.101-105

Jones S, McMahon G, Lennon P and MacPherson A [1987] *The Application of Satellite Imagery to the Problem of Floodplain Management*, Fourth Australasian Remote Sensing Conference Adelaide 1987Macpherson

In this position and in these activities, I had the opportunity to observe events, processes and decisions related to water supply and other development issues in WRC, and to maintain professional associations with teams in the former DLG engineering organisation that were now a part of WRC.

With the Department of Primary Industries. In 1990, WRC was merged into DPI. After a year selling beef and cotton to Indonesia and privatizing a Fruit & Vegetable Reporting Service owned by DPI, I became DPI Manager of the Resource Management Scientific Research Program.

This role included management of the Drought Management program that was researching the links between ocean temperatures/circulation patterns and rainfall patterns and probabilities within Queensland, and Australia as a whole. In common day parlance, this science is referred to by the terms '*el nino'*, '*la nina*' and the 'SOI' (i.e. Southern Oscillation Index).

This unit, despite its prominence in current flood management, was the only unit in the new DPI super-department at that time that was rated by the Minister as having only 'marginal' value to the Department. All other units were rated as 'desirable' or 'essential'. My task included resurrecting the relationship between the new science and the Minister. I also drew the task of resurrecting a proposal for the super-computing facilities necessary for the science to demonstrate its potential, a proposal that had been refused by an Engineer in a chief executive management role.

When received, the super-computing facilities turned the scientists from what engineers termed as 'paddock hydrologists' into regional hydrologic forecasters that surpassed the capacities of the engineering profession in important respects. I sought to involve water engineering professionals in the potential of the new science.

In this position and in these activities, I had the key opportunity to observe events, processes and decisions related to hydrologic forecasting across science and engineering.

With the Department of Natural Resources. The responsibility for floods went to the Department of Natural Resources ["**DNR**"] when DPI was split into DPI and DNR in 1995. I was mover to DNR.

I managed the Information and Education Unit of the Natural Resources program, and gained experience in the perceptions gained and held by community regarding science and engineering.

In this position and in these activities, I had the opportunity to observe events, processes and decisions related to community understanding of scientific and engineering programs associated with development issues on the banks and floodplains of rivers in Queensland.

I was subsequently moved to policy officer position in land administration.

Because I was reporting direct to the Manager for land administration in South East Queensland, and was the highest paid and most senior of his staff, I attended many meetings of the management team for this region.

In this position and in these activities, I had the opportunity to observe events, processes and decisions related to land administration and associated development issues on the banks and floodplains of rivers in this DNR region.

Changes in Responsibility for Flooding. The above history fairly describes the turbulence with which the responsibilities for flood management moved from government structure to government structure during the period 1989 to 1995. It involved three changes of agency, three changes of agency culture and three changes of budget priorities in six years.

Legal action. In 1996 I took legal action against the State Government under contract law and the Defence Re-establishment Act 1965, and, subsequently, under the Whistleblowers Protection Act 1994.

The dispute did not arise directly from any flood duties, but from a restrictive policy on leave for Army Reservists employed by WRC. My own passive response to the WRC policy was trumped by criticisms and alleged threats, by various senior military officers and military authorities, of action against the Chief Executive Officer of WRC if the leave policy was not changed.

The dispute that followed, I alleged in that legal action, led to my being assigned to duties away from my career in engineering and in my speciality of floodplain management and river hydrology and hydraulics.

In mid 2008, the matter was settled before the mediator, Mr Ian Hangar QC, after mediation was directed by His Honour Justice Fryberg. The settlement was for a judgment in my favour, and for payment by the State of Queensland to me of a substantial sum. The sum, however, has not been paid because I have not signed a deed of settlement proposed by the State Government that includes newly-inserted "gag" clauses contested by me that were specifically excluded from the original agreement made before Hangar QC.

The commission of inquiry needs to be made aware, by this submission, that I have been in dispute with organisations that have provided leadership, staff and professional advice to organisations that may come under inspection by this commission. Accordingly, it also needs to be aware of my need for protection from any reprisal for the disclosures that I make in this submission.

DANGERS TO LIFE AND PROPERTY ARISING FROM FUTURE FLOODING – GOLD COAST

I submit that the preparedness for flooding of authorities in the Gold Coast area may be unsatisfactory, due to development decisions taken during the 1980s and 1990s.

I believe that injury and loss of life could reach three figures should serious flooding occur on floodplains in the Gold Coast area, if sufficient action has not been taken since those times to remedy increases in flood levels, flow velocities and risks to residents caused by such developments.

I disclose events, processes and practices that I observed associated with developments along the Nerang River, Mudgeeraba Creek, Coomera River, Logan River, the Broadwater and Flat Rock Creek.

The matters I disclose are:

1. The removal of one of the flood bypass canals designed as part of the physical modeling of the Nerang River undertaken by the University of Queensland – the land for the flood canal was turned to purposes, as described before me by Minister Russell Hinze, that were to go to the benefit of horse racing and the Gold Coast Turf Club;
2. The apparent reclamation, post 1974, of natural flood mitigating detention pondage areas, and the loss of opportunities for flood mitigation structures, along Mudgeeraba Creek – this appears to have favoured residential developments along this watercourse to the detriment of residential areas existing prior to 1974, and may have involved conflict of interest situations for authorities in the former Albert Shire Council;
3. The activities of landowners along the rivers of the region, particularly along the Nerang River, to extend the usable land area of their allotments by reclaiming areas of the river, whether by rock walling with landfill, by swimming pool constructions, and/or by boating storage and anchoring structures, or other works, that acted to reduce the cross-sectional areas of these rivers when they are in flood;
4. The failure of developers of some river reaches and river island formations to provide escape routes for residents in times of major flooding, and the decisions to approve such developments based on the argument by the developers that escape (at night by retirees, pensioners and children, say) would be effected by helicopters with searchlights lifting residents off the roofs of the houses of those developments.

I acknowledge the efforts by Council officers and State Government officers at that time to deal with these issues as best they could.

For the benefit of the commission of inquiry, I will forward the report on flooding in Flat Rock Creek. I have maintained an opportunity to access it and provide it in the public interest. This report is special because:

1. On the positive side, the private sector consultants were upright in stating that they had erred in their analysis of flooding in the Creek, such that the true flood levels were greater than had been presented in the consultant's previous analysis and report;

2. On the negative side-

- Some agent or agents, suspected to be seeking higher water levels in the Creek next to a tourist attraction, had been repeatedly placing sand bags in the culverts that allowed flood waters to escape downstream from this reach of the Creek;
- I was briefed that Council denied liability for the flooding to the residents upstream of the culverts, except to the one resident who took legal action against Council, with which resident Council immediately settled; and
- When I questioned officers at GCCC about this denial of responsibility, I was told that this was done on instruction for insurance liability reasons.

The history of flooding in that Creek also showed the difficulty with communicating flooding issues to the community using probability. The first floods were dismissed by Council authorities as being the 1in50year flood. It was only because the 1in50year flood occurred three times in two years that complaints by residents got some traction with engineering authorities, and the Minister.

The Engineering profession is vulnerable to the loss of its credibility with the community because their expertise can be tied to such concepts, and because the profession has a reputation, amongst the public, for hiding its errors behind such concepts.

I refer also to the reports on flooding in the area of the Benowa and the Gold Coast Turf Club, undertaken by the DLG team in the mid 1980s. The reported studies followed concerns about the removal of one of the two floodways at Benowa, that had been designed using physical modeling of the Nerang River/Mudgeeraba Creek areas by the University of Queensland. This physical modeling, begun before the 1974 flood, had been the basis for the flood mitigation solution planned for these areas following extensive flooding in 1974.

The reports showed that the removal of this floodway took up all and nearly all of the flood mitigation benefit that would be gained by parts of the Nerang River floodplain once the Hinze Dam was raised to the level 91.4m, a few years after the report was written. The benefit went to horse racing, it appeared, not to the floodplain residents at risk of injury and loss of life.

The studies by DLG and GCCC about this time, completed by using the mathematical model developed by DLG with Professor Apelt, showed that developments, constructed subsequent to

the 1974 flood, may have caused floodwaters **to have increased** by as much as one metre in some places.

I acknowledge the action taken by the GCCC at that time to change the design of the proposal to raise Hinze Dam, so as to include a substantial flood mitigation component in its raised form. This provision for flood mitigation was, of course, at the cost of a loss in the water supply capacity of Hinze Dam. The enhanced flood mitigation capacity of the Dam would act to reduce the increases in flood levels that new developments would cause to flood heights during another 1974 flood and to the larger 1in100year flood. This reduction would be by as much as two thirds of the increases identified by the DLG mathematical modeling done without the flood mitigation effect of the raised Hinze Dam.

Residual increases above the 1974 levels were still substantial. They appeared to constitute a greater risk to residents of developments that were subjected to flooding, and subjected to the risk of flooding, during 1974.

The 1989 raising of Hinze Dam therefore **did not reduce** flooding below the 1974 levels – rather it reduced the increases in flood levels that would occur with a repeat of the 1974 flood (or with the occurrence of a 1in100year flood), increases in flood level that appeared to have been caused by post 1974 development along the Nerang/Mudgeeraba floodplains.

I acknowledge assurances from Gold Coast Mayor Ron Clarke that these issues that I have raised herein were being addressed, when I contacted his Office recently and in earlier times:

1. When plans to raise Hinze Dam again were announced during the drought years of the last decade – I expressed concern to him that the water supply goals were not allowed to reduce the flood mitigation purpose being served by the then existing Hinze Dam:
2. When I learned of the threat to South East Queensland of heavy rainfalls in January this year, I described the problems that may exist with the missing flood canal, the reduced detention storage and river cross sections, and the lack of escape routes during major floods.

Audit. I nevertheless recommend that public confidence in the floodplain management of GCCC areas since 1974 be restored by the urgent conduct of an independent audit of the status of flood

preparedness for rivers and creeks in the GCCC area. The Commission of Inquiry is in a position to have this audit carried out. Such an audit needs to provide verifications of certain principal features of flood analysis and control for these rivers and creeks, including as appropriate:

1. **Inputs:**
    - The hydrologic analysis of rainfalls and the derivation of the design hydrograph(s) and of the Probable Maximum Precipitation ["**PMP**"] for input into the mathematical modeling of the flood and the Dam;
    - The currency of floodplain cross-sectional data, with allowance for development approvals given but not in place;
    - The current operating rules for the design flood and for the Probable Maximum Flood ["**PMF**"] and other large floods that exceed the design flood;
    - Setting of appropriate sizes for the design flood, and maintenance of standards for flood modeling and for the setting of reclamation levels, that include allowances for high tide, storm surge, wave set-up and sea water rises plus freeboard (all of which were included in reclamation levels set during the 1980s); and
    - Third party reports into the investigation of complaints and events that led to a fatality or that constituted a serious risk to life in flood events that have occurred in the Gold Coast area since 1974.

2. **Modelling:**
    - The mitigation effect of flood storage scenarios for Hinze Dam;
    - The validation testing of the mathematical model/s currently used for river hydraulics – a six test process developed by Professor Colin Apelt, and used by the DLG team to reject studies that used models that could not pass these validation tests, such as ensuring:
        a. that the models did not create or lose mass;
        b. that the models could model steady flow;
        c. that the models quickly settled when subjected to a discontinuity or perturbation in steady flow; and
        d. that the models could derive results for particular flow situations for which there was an analytical solution;
    - The calibration of the modeling of the river against the flow and flood height data for a major historic flood – used to reject plans that were based on mathematical

modeling that had not completed calibration tests of the applied mathematical modeling;

- The method for allowing for the effects of local rainfall on the floodplain;

3. **Outputs**
   - The comparison of flood levels and flood velocities for a design hydrograph, produced by a calibrated river model employing a validated mathematical modeling algorithm, with the levels of existing developments on the floodplain;
   - Plans and works for the protection of areas existing prior to the 1974 flood, for which the flood threat may have been subsequently increased by newer developments on the floodplain; and
   - A risk analysis for all flood related hazards identified from the study of the design flood and of the PMF event for that floodplain.
4. **Response:**
   - The rainfall warning system or links to the Bureau of Meteorology for these warnings;
   - Systems for staffing flood warning systems 24/7 once a threat of heavy rainfall is signaled to the relevant authority;
   - The flood warning system in place, including the reliability of pluviograph rainfall reporting systems, automatic flood flow recording systems, real time modeling of rainfall into flood flow forecasts;
   - The systems for broadcasting flood warnings to the community in concert with any other authority that might also be engaged in the issue of flood warnings;
   - The flood evacuation systems in place, including the arrangement for warning people in affected areas of the approaching flood (whether residents, campers or travelers, etc), access and direction to planned safe evacuation routes from flood waters, a system for warnings against movements by residents onto more dangerous routes that allow people to move away from the river flows but into dangerous river bank overflows.
5. **Outcomes:**
   - A loss of life estimate for the design flood and for the PMF.

Other Floodplain Situations. I recommend that such audits be completed every five years, and that it be mandatory for floodplains containing populations in excess of 10,000 residents, or for

floodplain communities that have already been subjected to historic floods that have caused unacceptable damage to property or loss of life.

Audit ratings. I recommend that the audits provide a rating of each floodplain management scheme so audited, against a progressive scale of development - namely:

Level 1: **Ad hoc** – ad hoc planning exists for managing flooding

Level 2: **Planned** – systems for managing floods are planned but not implemented to plan

Level 3: **Managed** – the planned system has been implemented and is being managed– minimum level expected for smaller towns and rural communities

Level 4: **Integrated** – the systems for managing flooding are integrated – minimum level expected for cities and towns > 10,000

Level 5: **Optimised** management system

with notings in the audit of

1. the priority issues requiring attention to get the rating of the floodplain management scheme to the next level; and
2. the priority threats to the audited floodplain management scheme losing its current rating.

DANGERS TO LIFE AND PROPERTY ARISING FROM FUTURE FLOODING – BRISBANE AND GENERALLY

Specific Concerns

Somerset and Wivenhoe Dams are under-designed for current estimates of the Probable Maximum Flood, in circumstances where:

1. The Wivenhoe and Somerset Dams are unsafe
2. The threat to Wivenhoe is for overtopping of a rockfill dam
3. The spillway at Wivenhoe Dam has a capacity to manage an inflow that is only 25% approx of the current PMF peak when it goes from gate flow conditions to orifice flow conditions [a specific question on this has yet to be answered by SEQWater]
4. The 25% PMF situation is one quarter of the standard in existence at the time of design of the Wivenhoe Dam
5. The problem has arisen from a doubling of the estimates for Probable Maximum Precipitation used when the original Dam was designed
6. The estimates of PMP have been changed three times in the last 30 years, and this estimate may not have settled
7. The response by the standards setting organizations in Australia, such as the Institution of Engineers, the Australian National Committee on Large Dams, and State Government Large Dam authorities, has been, not to build a bigger dam, but

to change the standards for design of large dams – the new standards are accepting as best practice what was once warned to be bad practice for large dams upstream of large urbanized floodplain communities

8. The particular strategy for mitigating the risk to the Wivenhoe Dam from overtopping, is to incorporate overtopping into the design and construction of the Dam
9. Overtopping of Somerset Dam is the greatest risk to overtopping of Wivenhoe Dam – the threat of dambreak at Somerset has been defended by an advice (of unknown origins to this author) that a concrete dam, not designed for an overtopping event, can withstand 2.2 metres of overtopping – the reports are silent on the probability of that advice being accurate

Overview

In any search for situations that may be a hazard to life and property along the Brisbane River valley (or in other areas of Queensland), the commission of inquiry faces the possible obstacles that:

1. Floodplain management of the Brisbane River valley (and of other parts of Queensland) including systems for flood warning and flood control, and for management of development consistent with the floodplain management scheme
    a. may not be assessed to be at the **Level 3 – Managed System** rating that I outlined above, even if overtopping of Wivenhoe and Somerset is decided to be good practice or acceptable
    b. may not be assessed to be at the **Level 2 – Planned System** rating that I outlined above, if overtopping of Wivenhoe and Somerset Dams is decided to be bad practice or unacceptable
2. Authorities with responsibilities for floodplain management in such areas may not admit to this, and may engage in efforts to deny the commission of inquiry, and deny stakeholders seeking to participate in the inquiry to maximum effect, the relevant facts and history that may give rise to such an assessment; and
3. Employees and consultants in a position to disclose the full situation may not come forward to the commission of inquiry with those important disclosures.

Under-developed Floodplain Management Schemes

Indicators that flood warning and flood control aspects to flood management may be under-developed for the Brisbane River Valley may be:

1. The poor performance of the river level forecasts for the January 2011 flood that were provided to the public downstream of the Dams, and that were stated to have come from catchment and river flood modeling;
2. Any indications that *the suite of hydrologic and hydraulic computer programs*, described in these terms in the operating rules for Somerset/Wivenhoe flood controls, but given a title of Real Time Flood Model (RTFM), is less than a real time flood forecasting model for flows entering into the Dams; and
3. Indications that modeling, or the results of modeling, may not have been used, during important periods of the approach of the 2011 flood rains, to operate the Somerset/Wivenhoe flood controls, where the current version of the operating rules dated 2009 does refer to modeling and to modeling being used in this way.[7]

The DLG team was involved in advising councils about use of real time hydrologic and hydraulic modeling for the purpose of issuing flood warnings in the 1980's.

Twenty plus years later, I would have reasonably expected that a greater level of sophistication and performance of river flood forecasting based on modeling would have been in place for the capital city of this State.

I have concerns for how people respond to the next warning that flood levels will be greater than 1974, when the actual flood heights fell substantially below these predictions during January 2011. Any modeling that has an accuracy of 1 metre is under-developed modeling in my view.

As a former Chief Engineer Investigation and Review with responsibilities for investigating flooding events, I strongly recommend that the commission of inquiry inform itself of the system for exercising flood controls and warnings along the Brisbane River – that is, complete an audit of the total system. This effort, I recommend, should start from the radar interpretation of storm cells and cyclones, through rainfall and flow measurement, to modeling and forecasting, and then

[7] SEQWater [2009], Manual of Operational Procedures for Flood Mitigation at Wivenhoe Dam and Somerset Dam, Revision 7, November 2009

decision-making, with coverage of validation and calibration of systems and models, the qualifications, training and experience of personnel in these systems, and the staffing of the system on weekends and overnight of all participant authorities in that decision-making.

A comparison with systems in place in other cities and for large floodplain communities subjected to the same level of flood risk should provide another benchmark for judging the attention that has been paid by authorities to the floodplain management agenda in Brisbane, South East Queensland and in Queensland more generally.

The poor performance of forecasting surges arising from recent cyclones may also indicate under-development of modeling skills and expertise with respect to surge sizes and timing.

The public should be encouraged that Professor Colin Apelt has acted in a consultative capacity with respect to Brisbane River flooding, and with respect to modeling of Gold Coast rivers, but the public may not be aware of the extent of that consultancy. The public confidence in the system requires a comprehensive audit as described above if Professor Apelt was not commissioned to perform a review of the same scope.

Contributing Factors

Should these indicators prove to have some substance, some possible factors that may have contributed to such under-development of a principal floodplain management system are offered below:

- The movement to core roles of agencies
- De-engineering of State Government agencies
- The politicization of technical operations
- The engineering culture within relevant organisations

The Core Roles of Agencies. Floodplain management at the State Government level was never the province of one agency.

DLG, WRC, DHM, and the Coordinator General/Premiers Department formed and practised a coordination protocol with respect to floodplain development during the time of DLG.

During the turbulence of government restructuring over the period 1988 to 1995, agencies tended to focus upon matters that were their sole responsibility – to what might have been seen to be core activities. Government drives for agencies to do more with less also caused agencies to prioritize their funding, and to move staff to what was seen as 'core'.

As a result, there was a significant drop in the involvement of State authorities in flood related matters. Flooding was the province of several agencies rather than the responsibility of one agency. Flooding lost priority amongst these stakeholder agencies.

I recall correspondence from the GCCC complaining of the drop in service, during the early 1990s, that Council was receiving from WRC with respect to the administration of the *CoB Act.*

In the new WRC / DPI / DNR of the 1990s, to my observation, irrigation and rural water was core, but town water and city flooding was not core.

A check of the number of flood related reports produced by State Government agencies since 1995, compared to the previous 15 year period, might give the commission of inquiry an indicator as to whether there has been a significant decrease in flood related studies at State Government level since the period of turbulence in agency re-structuring that occurred within the organisations that housed the flood management responsibilities.

De-engineering of State Government Agencies. The period of turbulence in the agency structures that housed the various responsibilities pertaining to flood management, also saw a withdrawal by engineering agencies from the technical expertise that had existed in the 1980s and before.

In emphasis, the shift moved towards policy development and planning, with the hard engineering being outsourced to private sector entities.

De-engineering disabled agencies from performing engineering reviews. The main volume of engineering opinion on flooding aspects came to rest with the engineering consultants, and these organisations of course were usually working for an entity with its own private interests for the floodplain.

Consequently, it is strongly open to suggest that the public interest may not always have been as well represented as it had been in the past.

All approaches have their positives and negatives. The negative for the policy planning approach, adopted without an in-house core of expertise in the hard technical issues, is a reduced ability within the agency to exercise technical control of engineering operations.

Politicization of Agencies. An inconsistency arose in the de-engineering approach being adopted by the Public Sector Management Commission ["**PSMC**"] of that time. Ministers, for political control of public agenda, employed ministerial advisers so as to exercise, increasingly and progressively, all controls of public issues through their public service agencies, including technical control of engineering operations of those agencies. With de-engineering, the Ministers, however, were less able to do this well, and the public interest in the impacts of flooding was placed at greater risk.

A vehicle that allowed Ministers to select developments for what I term 'purple' treatment[8] was the *Integrated Planning Act 1997*.

I attach the term 'purple' to processes and decisions that have not been made in accordance with the facts. Purple decisions usually demonstrate a selection or omission or misrepresentation of the facts relevant to the decision at hand. Political decisions can often display this characteristic.

This Act is now repealed, but there are other 'fast-tracking' or 'State interest' provisions in active legislation that allow 'purple decisions' to be imposed on floodplains. Such legislation does this by taking matters out of the hands of State Agencies and Local Authorities engaged in proper processes of responsible decision-making.

In leadership terms, the resort by Ministers to purple uses of this type of legislation tended to demoralize officers motivated towards the public interest, when they saw 'purple decisions' made that had little or no foundation in the disciplines that had guided earlier decisions.

[8] McMahon G [2010], Purple Projects: The Politicization of Projects on Social Systems, National Conference for the Australian Institute of Project Management, Darwin, October 2010

Purple decisions, of course, were made before the *Integrated Planning Act* and its successor legislation came into effect. Bureaucracies, too, including engineering bureaucracies, have shown that they were capable of them every bit as much as their Ministers

Purple decisions cause professionals to disclose or depart, and the first to depart are those who can depart, because of their capabilities as managers and/or their value as experts in their fields.

Purple considerations of technical issues can lead to some silly situations. For example, then DPI Minister Ed Casey had given the lowest rating to the Drought Management Group. The Minister was perceived to have given this award winning group this low rating because he held that Group responsible, at some level, for the repeated ***el nino*** drought conditions that were occurring.

It appeared that the Minister believed that, if the analysis by the Drought Management Group was changed, the ***el nino*** climate pattern would reverse or go away.

An overview of decisions made at the beginning and end of the 2011 Brisbane flooding might lead reasonably to a suspicion that these decisions were not made by engineers acting in technical control mode.

Educated managers understand that technical control is not their role, and they appreciate the need to develop working relationships with those who can exercise technical control. As a general statement, politicians do not have this education, nor do their advisers. Their attitude to control can be self directed.

The decision to hold back on releases **before** and **just before** the flood peak waters arrived, and the decision recently to release water down to the 75% level in the Wivenhoe Dam based only on the presence of the ***la nina*** climate pattern, do not appear to be an engineer's decisions.

For an engineer to make a decision to reduce water levels in these circumstances, there would have to be a weakness in the dam structure, or a lack of confidence in their ability to forecast the run-off outcome from approaching rainfalls into the Somerset/Wivenhoe Dams system in sufficient time to operate the flood mitigation storage effectively.

Any such lack of confidence would be deserved if the forecasting system for run-off hydrographs into the two dams was rudimentary, and/or if recent rainfalls for critical durations (not all durations), in the dam catchment area or nearby (e.g. at Murphy Creek), were more intense than the design rainfalls for the limits of normal operation of these dams.

In questioning the reasons for the slowness to release waters from the Dams in question at the early stages of the 2011 flood, I would remind the commission of inquiry that the SEQWater manages a larger number of dams than just Somerset and Wivenhoe Dams. The development of any 'purple control' systems would have been influenced by events from **all** these dams.

Further, for the longest durations, the operations of all these dams have been in non-flood or minor flood mode.

A check of the complaint registers held by SEQWater might support anecdotal evidence that a common complaint about the operations of SEQWater, coming from the public, is the release of waters that overflow vehicle routes (e.g. Colleges Crossing). These events cause inconvenience to persons who regularly use low level crossings downstream of the various SEQWater dams. Such complaints would come from the operations of all dams managed by SEQWater where such inconveniences have occurred.

The next level of purple control may arise from any realization that developments, allowed on the floodplain since 1974, were about to be flooded.

In non-flood situations, the operations of water storages to minimize traffic disruptions would not be 'purple'. In a flood scenario, however, traffic disruptions are not a relevant consideration, and a continuation of such practices, when the flood mitigation requires larger releases of water, is a problem for the flood affected community.

The issue is how long it takes for the operators to reverse back from traffic control to flood control when the possibility of a flood situation looms into their decision-making. Political imperatives, imposed upon technical staff during the long periods of non-flood operations, may cause this switch of imperatives to take much longer than it should when public interest is the driver for both flood and non-flood situations. Time is critical to a successful flood control operation.

I offer these points about core roles, de-engineering and politicized operation of technical controls, not as a disclosure, but as a guide to the points that might be listed within the scope of a comprehensive investigation that the commission of inquiry might properly undertake concerning Queensland's principal populated floodplain.

Culture. I place this heading on the list in good faith for the commission of inquiry to consider, but I withdraw from explaining it.

I was in a dispute situation with certain principals from the government water management authorities, so my experience of the beliefs, values, attitudes and assumptions of these organisations may not be the normal experience.

I do believe, however, that my experience with these organisations is the norm for public officers who make disclosures to outside authorities about events in those organisations, their processes and their decision-making.

I will therefore leave description of my experience to that section of my submission, the section after next, namely 'Disclosures by Employees'.

Where may be the Loss?

The middle history of the 2011 flood through the Somerset/Wivenhoe system does appear to be an exercise of engineering control.

The decisions taken, however, appear to have in mind the protection of the Dams themselves as much as any purpose of protecting downstream residents.

The issue here may be the PMP/PMF for which the Somerset/Wivenhoe Dam was designed, and how 'probable' that flood may be.

The adverse outcome that may have occurred to flood engineering in Queensland, because of the above factors of core roles, de-engineering, purple decision-making and culture, may be the onset of a flood frequency mindset amongst some organizations. That mindset appears to be dominating

flood flow analysis applied to major flooding, and flood engineering practitioners may have lost some confidence in this approach.

The loss may be in the loss of criticism of this flood frequency approach and of the loss of challenges to the way that it has been introduced for the control of extreme flooding.

Flood frequency analysis has strong positives for many flood situations, but it has limitations that can render it bad practice for very large floods. The 'mindset' term refers to thinking that loses sight of these limitations, or decides, for other reasons, to ignore these limitations.

The perspective that can be taken to recorded data about flooding, as an addition to the flood frequency approach to analyzing this information, is a curiosity approach best expressed by Professor McKay of the University of Queensland with his words (to me and a hundred other of his hydraulic engineering students), namely,

"…Greg, what is the water trying to tell us?"

Purple Decisions on the PMP. The Bureau of Meteorology, the Institution of Engineers and the Australian National Committee on Large Dams decided to adopt guidelines for practice that attached a probability to the PMP/PMF.

This practice has been followed in the decision-making about Wivenhoe and Somerset Dams, after the Bureau of Meteorology increased the Probable Maximum Precipitations for these Dams in the early 1980s

In establishing this practice, these organisations appeared to have *'twisted the arms'* of the rainfall gurus of the 1980s, Kennedy & Hart, to produce a table, against the better judgment of Kennedy & Hart, that attributed a very large range of probabilities to the PMF.

The history of this alleged 'arm-twisting' appears to be:

In 1981[9], Kennedy & Hart described the attachment of a probability to the PMF idea as

'… not possible …'

[9] Workshop on Spillway Design, Melbourne, October 1981

In 1982[10], they produced a paper that made the attachment, but said that it was

'… for discussion purposes …',

'… very rough guide …', and

'… not meant as recommendation …'

In 1984[11], they produced estimates that made this attachment, but described it as

'… very approximate …', and a

'… very rough guide …'

I spoke to one of the authors at the 1982 Symposium about the change.

The Symposium was told that the presentation was a complete 'about-face' by the Bureau of Meteorology, from its earlier conclusions reached on the assignment of probabilities to PMPs for the previous Workshop on Spillway Design. The authors specifically stated in their paper that:

"…The values in the table are ***not*** *meant as recommendations for assigning probabilities to PMP estimates."* [emphasis added]

Other commentators who attended these events reported justifications for the 'about-face', being the need to do cost-benefit analysis and risk assessments. Those reports accord with what I heard and was told by other stakeholders. The Bureau was yielding, I was told, to pressures from others to provide probabilities for the PMP.

It is open to suggest that the situation became one of 'accepted bad practice', at least in hydrologic science and flood engineering.

Inaccurate figures for PMF must also produce poor results (and thus constitute bad practice) for economic analysis and risk assessments, but at least the probability graphs could be used, and no one got killed if the dollar figure produced was wrong.

Being able to use the probability graphs appeared to be the 'mindset'.

[10] Hydrology and Water Resources Symposium, Melbourne, October 1982
[11] Institution of Engineers Australia, Civil Engineering Transactions, 1984

The Institution of Engineers Australia, however, in the lead up to the 1987 revision of the hydrologic and hydraulic 'bible' publication, **Australian Rainfall and Runoff** ["**AR&R**"], stated that attachment of probability to the PMF:

'… must be done …',

and in 1987, they did this – with the statement:

"…Although it is theoretically impossible, a probability must be assigned …',

and the AR&R described the probability figures listed as[12] '

'Adapted from Kennedy & Hart (1984)'

While Kennedy & Hart had stated that the figures produced were:

'… very approximate …', and a ***'… very rough guide …',***

ANCOLD were referring to these figures as a ***'general guide***' before the year was out[13].

ANCOLD, in this same publication, accurately forecast the recommendations that would be in AR&R three years later.

While Kennedy & Hart had stated that the figures produced were:

'… not meant as recommendation s…'

by 1989, a report[14] by the Bureau of Meteorology, for which Commissioner Cummins was a joint signatory, described the same figures as

'… recommended by *Kennedy & Hart (1984)* …'.

Impact on Practice in Qld. In my opinion, the surface hydrology group within WRC in the early 1980s was the premier group of hydrologists in Australasia. They were well led and encouraged mightily by that leader to excellence in that profession.

[12] AR&R 1987, Table 13.1, pp280-1
[13] Interim Guidelines on the Design Floods for Dams, ANCOLD, 1984
[14] Probability of Occurrence of Extreme Rainfalls and Floods, by Kennedy, Pescod, Pearse, Laurenson, Canteford, Hall, Murley and Cummins, AWRAC Research Project P86/33, August 1989

The hydrologists in the DLG group, then a separate organization, were invited into co-operations with the WRC experts and expertise, and this was very beneficial to the smaller number of professionals from DLG.

When 'purple' appeared to occur, and the leader left, other specialists also left the group over time - that standing gradually decreased. The DLG team had occasions to find itself in opposition with WRC professionals over aspects of what is termed a flood frequency mindset. Two examples were:

> **Design Floods**. WRC officers were proposing to treat as 'outliers' – flood events on the historical record seen to be not part of the record of flows used in the flood frequency analysis – the two largest floods on record for one river. This was the proposed practice, when using the frequency analysis to identify the 1 in 100 year design flood for that river.
>
> Professor McKay's 'what-is-the-water-trying-to-tell-us' technique would not allow the DLG reviewers to dismiss the two largest floods on record from the decision. It appeared that the methodology of frequency determination was driving the decision irrespective of the limitations of the frequency analysis.
>
> **PMFs.** DLG and WRC were both large dam organisations. When the Institution of Engineers Australia published the guidelines on the probability of PMFs in its AR&R publication, the DLG team proposed to submit a paper titled 'A Criticism of Procedures for Estimating Rare Floods' to the ANCOLD Conference on Dams. Permission was refused, for the reason that the paper might be in conflict with WRC policy.
>
> Part of that criticism was going to use the extrapolation of the flood frequency curve for river flows recorded at Wivenhoe, that was used to estimate the probable maximum flood / probability of the PMF. The 95% confidence limits for that flood frequency curve at the PMF indicated that the PMF, then estimated at about 43,000cumecs, could in fact range between 8,000cumecs or 300,000cumecs – the flood frequency results were a nonsense, unless one ignored the confidence limits aspect to the flood frequency methodology.

The Current PMF. The current PMF has not been derived from extrapolation of a flood frequency curve.

It has been derived from what I understand to be a physical rainfall limit approach.

The problems are:

1. that the current PMF is at the end of a history of PMF calculations for Wivenhoe, that go
    a. 1977 – 15K cumecs
    b. 1983 – 43K cumecs
    c. 1991 – 30K cumecs
    d. 2003 – 49K cumecs,

    which pattern does not inspire confidence that the profession knows what it is doing, nor that we are at the top of the series of PMF estimates; and,
2. that a probability has been placed on this last estimate without any rationale for doing so.

The 1999 version of AR&R and various ANCOLD Guidelines for Dams and Risks to Dams have polished the latter practice, without changing its intrinsic flaw.

The 1952 version of AR&R, however, advised that the spillway capacity for major dams should be designed for the PMF [the design rainfall / probable maximum precipitation = 1], with a specific mention of rockfill dams and the threat of over-topping of these dams. The Wivenhoe Dam was built to this standard.

The current revised estimates of PMP, however, mean that the current spillway can only handle 30% approx of its PMF (and only 25% approx when the gates become orifices, as is likely to occur with very large flooding).

The current design of the dam is being defended by engineering statements, such as:

> **the Dam can handle the 1in100,000year flood** (or the less understandable 'I in 100,000 AEP event').

The statistic is intimidating – who could question a design practice giving such a remote possibility of over-topping.

Compare this probability description though with the true situation, unaffected by any blind eye towards theory and associated falsehoods, that:

the Dam can cope with 87% of the PMF (on peak flow terms).

The second of these figures may give a perception of hazard to the community at risk that is different to that perceived from the 1in100,000 AEP descriptor. This 87% PMF expression of the situation invites the question from the public: 'Why cant we be safe during the 100% PMF?'

And this is where professional dam engineers saw the issue.

The probability figure could be used for economic analysis undertaken so as to answer the question, but the fear was that the probability figure would also be used for dam design.

And this is what started happening almost immediately AR&R 1987 was published:

> ***'… since publication*** (of AR&R 1987) ***they*** (probability estimates) ***have been used in design practice without evident problems'***[15]

That claim in 1993 was made in early times. A problem is now evident at Wivenhoe

The 40 year Flood Cycle. The further concept that seems to have disappeared from professional discussion is the observation that major flooding appears to be occurring in South East Queensland every 40 years. The observation has also been made that the major floods appear to occur usually in groups.

In accordance with the 40 year cycle observation, the estimate was made that major flooding would occur again in South East Queensland in 2013 ± 2.5 years – that is, during the space of the five wet seasons 2010/2011 to 2014/15.

The January 2011 flood has occurred at the beginning of these five seasons. It is well founded that this commission of inquiry should be anxious that another major flood, if not two, may occur during these seasons.

[15] Pilgrim & Doran: Practical Criteria for the Choice of Method for Estimating Extreme Design Floods, Extreme Hydrological Events: Precipitation, Floods and Droughts, Yokohama Symposium, July 1993

By its methodology, the flood frequency analysis directs the practitioner to focus on the set of flow records at one point on one river.

To catch the observation that major flooding may be occurring every 40 years, [using the 'what-is-the-water-trying-to-tell-us' curiosity approach], one needs to take the wider view of flooding in South East Queensland - for example:

1. 1893 – largest river heights on record on the Brisbane River
2. 1931 – largest river heights on record on the Pine River (major on Brisbane River)
3. 1974 – largest river heights on record on the Nerang River (major on Brisbane River)
4. 2011 – I do not have the records, but very large in Lockyer / Murphy Creek areas.

There are also plates on a wall at the Regatta Hotel on Coronation Drive at Toowong that makes this type of observation. I was having a drink with my son at that hotel in 2009, and he was looking at the plates describing the levels of flooding that had occurred at that hotel.

After an interval, my son (who is a jeweler rather than an engineer) turned to me and said,

'Dad, I think we are due for a flood'.

Some regard to this phenomenon, reinforced by the 2011 flood, may have caused responsible authorities to have done any upgrades or refits or other preparations for flooding in the South East Qld region in the years before 2010.

It is the experience of professional natural resource managers in this country, that during floods one needs to make preparations for the rains, and during the wet years one needs to get ready for the drought

The 'La Nina' Science. The reliance on flood frequency methods may mean that insufficient attention may be being paid, by flood engineers in Queensland, to the *La Nina* science.

The scientists, in the 1990s, were using this science to make three-month total predictions of rainfalls for the benefit of the agricultural and pastoral industries – they had not turned their time to how the science could be applied to forecasts for flooding.

Behind the scientific predictions that the scientists make, however, are studies of world ocean currents and histories to the oscillations in sea temperature patterns that might explain, or give perspective to, the cyclic and grouping type observations made about flooding in South East Queensland.

The Flood Frequency Method assumes that each year is a 'throw of the dice' as to whether or not a 1-in-100 year flood, say, will occur. The same dice is thrown again next year. Engineers have observed that this assumption is not borne out in real world flood records, and names like 'Hurst Phenomenon', 'Persistence' and 'Long Memory Flooding' have been used to describe the discrepancies between theory and real outcomes with the flood frequency approach.

Patterns to the occurrence and strength of *el nino* and *la nina* that I observed, during my time managing the scientific research program at the Drought Management Group, gave me the interest in the possibilities for this science providing some explanations for observations made by engineers who have looked at river flood events and asked: *what are they trying to tell us?*

I note also that one of the sets of methods that should be competing with flood frequency analysis for the PMF determination are those based on maximizing historic storms. One part of this approach relies on dew point. I recall the description made during the 1980s by engineers about this approach, that the dew point depends on sea water temperatures, but that sea water temperatures do not vary significantly and could be treated as constant.

The *La Nina* Science, however, demonstrates that this is not true, and has drawn interest about the relationship between the tracks taken by cyclones and the geographic pattern to sea water temperatures

Summary

The Wivenhoe / Somerset Dam system is unsafe, in that the Dams do not offer protection from the current estimates of PMF, and thus pose a possibility of dambreak

The apparent poor performance of the operations of the Somerset/Wivenhoe Dam storages as a vehicle for flood mitigation, and of the systems that provided forecasts of flood heights, may

indicate that this flood management system is only entitled to be termed a ‘Planned System’ against the five rating scale earlier provided in this submission.

The way in which the dams were operated by engineers in the middle stage of the January 2011 event leaves it reasonably open to submit that those operations may have been carried out with concern for risks faced by the dams. The operation may have become, at least in part for critical times in the developing flood, one of flooding the floodplain to protect the Dam rather than of flooding the Dams to protect the floodplain.

Consequently, under-development of the flood forecasting system for the dams, and an appreciation of the nature of the PMF decided for the dam, may be two factors that reduced confidence in the existing operating system for the Somerset/Wivenhoe Dam flood mitigation facility.

I submit that wider perspectives than those given from a flood frequency mindset may improve confidence that the structures have or have not got a problem, given the current design rainfall estimates.

It is open to consider and make inquiry, I submit, as to the possibility that the operators, be it the organizations or some individual decision-makers, or some officers exercising technical control, may have lost some confidence in the capacity of the system to deal with a flood that was within the scope of flooding that the system was supposed to be able to control.

Purple systems can have that impact when situations arise that test the system.

Not only have the fuseplugs reduced the flood mitigation impact of the Wivenhoe Dam on the larger floods in a physical sense, it is open to consider and make inquiry, I submit, as to the possibility that the fuseplugs may be affecting abilities to employ clear thinking, and other people factors, when such testing floods arrive.

Most will have family in Brisbane.

Material removed at the Commission’s discretion.

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