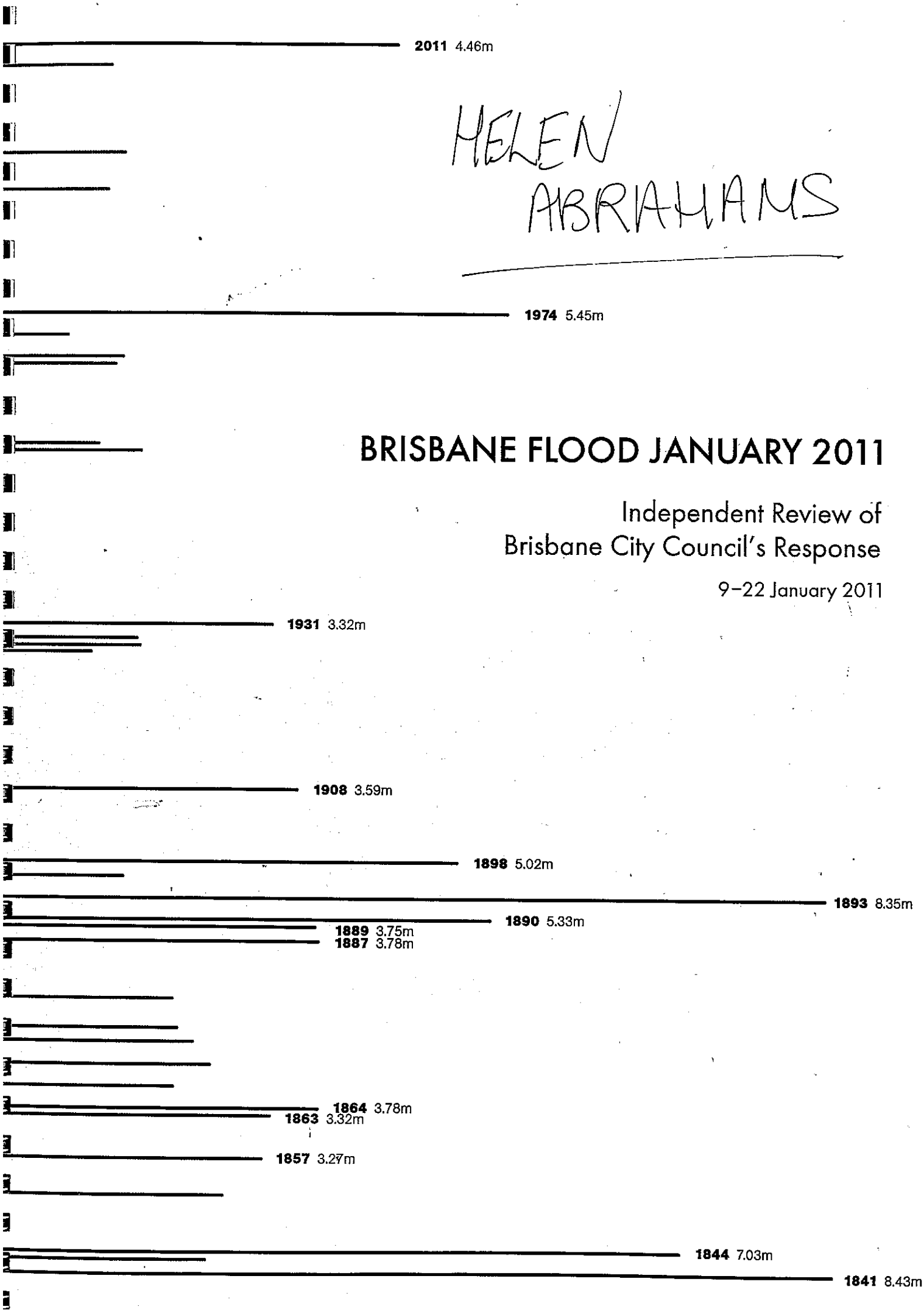

HELEN ABRAHAMS

BRISBANE FLOOD JANUARY 2011

Independent Review of Brisbane City Council's Response

9–22 January 2011

EXECUTIVE SUMMARY

In January 2011, Brisbane experienced the second-highest flood in the past 100 years, after the January 1974 flood. There was major flooding through most of the Brisbane River catchment, most severely in the Lockyer and Bremer catchments where many flood height records were set. The flooding caused substantial loss of life in the Lockyer Valley and thousands of properties were inundated in metropolitan Brisbane.

Seqwater, in its review of the magnitude of the January 2011 flood, concluded that the river flood volumes indicated that the volume of the January 2011 flood was almost double that of the January 1974 flood and similar to the February 1893 flood and that peak water levels at gauging stations in the Brisbane River above Wivenhoe Dam were the highest on record.

The Lord Mayor of Brisbane, the Right Honourable Campbell Newman, on 21 January 2011, appointed a Board of Enquiry to review the response to the flood event in Brisbane during the period Sunday 9 January to Saturday 22 January 2011. The Board consists of Major General Peter Arnison AC, CVO (Retd), Mr Robert Gotterson QC and Emeritus Professor Colin Apelt. The Board's Terms of Reference are contained in the List of Attachments.

The Report addresses the Terms of Reference in five Sections. Section One examines the characteristics of the flood and the resultant levels including a comparison against the Q100 flood level and an explanation of terms relating to the probability of flooding occurrence and defined flood events and levels. Section Two deals with the effectiveness of Brisbane City Council's disaster management arrangements including preparation, response and recovery. Section Three considers the effectiveness of Brisbane City Council's response to the flood event including the actions in inundated areas, the establishment of evacuation centres, the organising and tasking of volunteers for the clean up, and waste and debris collection and disposal. Section Four looks at the impact of the existing planning regulations in flood affected areas. Section Five deals with the effectiveness of flood prevention and stormwater infrastructure and the reasons for Brisbane City Council's riverine infrastructure failures.

Section One – The Characteristics of The Flood

Following a record period of drought, the annual rainfall in 2010 caused the wettest year on record for Queensland and the wettest year since 1974 for Brisbane City. The catchment of the Brisbane River system was saturated and most of the rain that fell on it in January 2011 ran off rapidly to produce the flood event. The distribution of the flood-producing rainfalls and the behaviour of the flood that they caused are described in this Section. The mitigating effect of Wivenhoe Dam is noted but the Brisbane River flood was joined by floods from Lockyer Creek and the Bremer River downstream from the dam and their impacts are described. The pattern of rainfall caused little, if any, significant creek flooding in Brisbane, though creeks were flooded by backwater from the river.

The peak flood levels along the Brisbane River are given for Moggill, Bellbowrie, Jindalee, Oxley Creek mouth and Brisbane City. For each location, the times are given for when the water rose above moderate then major flood levels to reach heights greater than the Defined Flood Level, together with the lengths of time that the flooding lasted above these levels.

The technical terms, "Defined Flood Event", "Defined Flood Level" and "Q100" used to describe the nature and level of a flood event and its probability and to inform planning and policy for dealing with floods, are explained. Since all measured flood levels throughout greater Brisbane for the January 2011 flood event, except towards the river mouth, are higher than the Defined Flood Levels and these have been calculated for a flood with the same characteristics as the January 1974 flood but after its effects have been reduced by Wivenhoe Dam, it is considered that the January 2011 flood event, as actually experienced, was larger than a flood similar to that of 1974 after mitigation by Wivenhoe Dam. The flood was therefore larger than the theoretical Q100 flood which, for Brisbane, is a little smaller than the flood corresponding to the Defined Flood Levels.

The history of flooding in Brisbane since the 1840s shows clearly that periods of frequent flooding can occur as well as long intervals with few floods and that the timing of flood events is variable. Comparison with records of historical floods shows that the January 2011 flood was a rare and large flood event.

Section Two – Brisbane City Council's Disaster Management Arrangements including Preparation, Response and Recovery

The Board's analysis of Council's response to the January 2011 flood event indicates that it performed at a highly creditable level. Fatalities were minimised with only one death recorded in the greater Brisbane area that was linked to the flood event, compared to around 14 people who died in the Brisbane and Ipswich areas during the January 1974 flood.

While early public warnings during November and December were issued and alerts in January worked reasonably well, many citizens, and particularly those who had not experienced the 1974 flood, developed little understanding of the size and scale of the impending threat.

Council has developed a very effective set of arrangements to enable it to deal with a major flood event. These arrangements reflect and follow the various Commonwealth and Queensland Government Acts, policies and best practice guidelines pertaining to disaster management. Council has ensured that appropriate disaster management organisational structures are in place and that facilities, equipment and systems are available and most importantly, individuals are nominated for duties and prepared to undertake them through training and exercises. The Report indicates that Council performed very well in this regard, with some areas requiring minor additional effort.

Council demonstrated a very good appreciation of the major risks associated with flooding and has a good capability to detect, monitor and respond to flood events. The importance of an education strategy aimed at improving community knowledge and resilience was well understood by Council and implemented, although there are opportunities for further improvement.

Council's conduct of the flood disaster operations through the Brisbane City Local Disaster Management Group (BCLDMG) chaired by the Lord Mayor provided clear, high level strategic direction to the Local District Coordinating Centre (LDCC). Council's Chief Executive Officer coordinated disaster operations as determined by the BCLDMG through the LDCC and its subordinate entities. Effective strategic level forward planning was undertaken by the Forward Planning Group, including developing the response and recovery concepts. The Field Operations Group was responsible for the conduct of response and recovery operations either directly or through the Regional Incident Management Teams active in each of Council's regions (Central, North, South, East and West). The Disaster Intelligence Group supported the LDCC with the provision of information and intelligence analysis across a range of areas and worked closely with the Flood Information Centre as it provided forecasts, based on analysis of the Bureau of Meteorology (BoM) forecasts and Seqwater data. The Incident Support Group provided communications, administrative and logistics planning and support to the LDCC. The Board assessed that these arrangements worked very well with some scope for minor improvement.

Before and during the flood event Council sought to provide the public with both general and detailed, specific to property, information. All available communication channels were used including print media: newspapers, Council bulletins and notes and large poster displays; electronic media: radio, television and the internet and most significantly social media including Facebook and Twitter which proved remarkably successful in rapidly disseminating information. Council's Call Centre played a very significant role in responding to caller's questions and requests for information. Council's website collapsed under an avalanche of contacts, particularly for flood flag maps for individual properties, and because of band-width limitations. The site was re-established in a more limited fashion within 24 hours, hosted off shore using cloud computing.

In an attempt to provide flood information to a wide range of individuals in a very short time period Council, along with Townsville City Council, had contracted the Early Warning Network System to deliver pre-prepared Short Message System (SMS) messages to the mobile phones of those who had subscribed. Despites Council's efforts to widely publicise the availability and utility of this free system, the take up prior to the flood was disappointing.

All Council staff made an enormous contribution prior to, during and after the flood to ensure that the disaster was properly managed, that safety considerations were a priority, and that the care of people, their property and communities was of paramount importance. Similarly, the contribution by the Lord Mayor and Councillors was highly commendable.

Section Three – Brisbane City Council's Operational Response in the Field

Council's operational response in the suburbs and the Central Business District (CBD) was coordinated and well managed. Decision making authority was delegated so the regionally-based staff could deploy local assets effectively in dealing with local problems. Dedicated operations rooms at the regional level are suggested.

The volunteer response by the citizens of Brisbane was a truly amazing example of the City's spirit. Council's management of the Mud Army, as these volunteers became known, was impressive. The Board's review has identified some matters which should be addressed in future planning. They relate to briefing of volunteers, liaison with residents concerning their wishes and health care arrangements.

Council established two large scale evacuation centres at very short notice. About 2400 evacuees registered at these centres. They were well managed by Red Cross with participation of other Agencies. In a future flood event, evacuation centres should be more decentralized, with arrangements made for areas isolated by flood waters. Issues relating to security, diversity and suitability for handling donated goods need to be addressed in future planning.

The large volume of debris produced by the flood and the major disruption to waste disposal systems posed significant health risks. The use of temporary waste disposal sites, the placement of skips for food waste, and the support of waste disposal contractors, industry volunteers and the broader waste industry were instrumental in the successful response,

Section Four – The Impact of Existing Planning Regulations in Flood Affected Areas

Council is progressively implementing the "Key Actions" recommended by the Lord Mayor's Taskforce on Suburban Flooding (2005). Council does not have a free hand in setting planning regulations for the city. It has to work within the legal framework created by State legislation.

Council's planning regulations and guidelines have been influenced to a significant degree, by the Defined Flood Level (DFL) adopted in 1978. It has been, in part, responsible for guiding development away from flood-prone areas. Almost 90% of residential properties in Brisbane that were flood affected are in areas that had been predominantly developed prior to 1978.

However, the adopted DFL is not without limitations. The time has come to undertake a complete Flood Risk Management analysis of flood affected areas in the city. Though very expensive, the analysis should be seen as vital for an important metropolis. It needs to be constantly borne in mind that large floods do occur in Brisbane; that they occur with unpredictable frequency; and that when they have occurred, great loss and hardship has been caused to the city and its citizens.

Section Five – Flood Prevention, Stormwater and Riverine Infrastructure

The most important infrastructure items for mitigation of flooding from the Brisbane River are the Wivenhoe and Somerset Dams but Council has no statutory role in dam releases or flood mitigation operations. In this Section the engineering options that Council could consider for

flood prevention in Brisbane are reviewed but only two measures, backflow prevention devices and use of levees to protect specific high value infrastructure, are found to be appropriate for further consideration. Detailed review of their feasibility including a full risk analysis would be required to determine whether the use of either would be suitable for specific application.

The flood event in January 2011 was essentially a river flood, with little run-off in Brisbane from local rainfall. The stormwater network system did not add to flood levels. Some flooding was caused by backwater flooding from the river that entered low lying areas through stormwater pipes and open drains. The main impact of the flood on the stormwater system was from the large amounts of silt and debris deposited within the network. Council's rapid response in cleaning all gully pits within the flood affected areas and initiating the major program of works required to remove silt from all of the stormwater system affected by the flood is commended.

The flood caused substantial damage to much of Council's riverine infrastructure. Nearly half of the Floating Riverwalk was washed away. Thirty of Council's 97 river walls failed. At least 34 bank slips occurred on Council sites and six of these are assessed as Very High Risk, four as High Risk and five as Medium Risk. Six stormwater outlets were damaged by scouring or slumping during the flood and require repair. Council owns 23 ferry terminals, four moorings/refuelling stations and 25 pontoons and jetties. Eight of the ferry terminals, two of the moorings and 15 pontoons were significantly damaged. In some cases the damage arose because of the need to locate these facilities to meet their functional requirements in places where they were subject to the full force of the river flood. Reports from independent engineering consultants commissioned to provide advice to Council on reasons for the failure of riverine infrastructure assets is expected to be presented in May 2011. Fortunately, the entire fleet of City Cats and cross river ferries was saved by Council's prompt actions in removing it to safe locations.

Commendations, Affirmations and Recommendations

The Board has arrived at a number of Commendations, Affirmations and Recommendations arising from its consideration of the circumstances relating to the January 2011 Brisbane Flood. The Commendations indicate those actions and activities which the Board considers Council performed at a very high standard. The Affirmations refer to those actions and activities which the Board considers Council performed at a high standard and include Recommendations for further improvement. The Recommendations refer to actions and activities which the Board considers Council should adopt to further improve Council's capability to respond to another such flooding emergency. The Commendations, Affirmations and Recommendations follow.

Commendations

The Board highly commends the actions of Council staff in their preparation for, and response to, the flooding disaster which may appropriately be characterised as well above and beyond that usually expected.

The Board commends Brisbane City Council's disaster management approach and in particular for:

Its compliance with, and implementation of, the various Commonwealth and Queensland Government legislative and policy parameters which direct and inform disaster management arrangements.

Its integrated response through the BCLDMG with other Queensland and Federal Government agencies and Non-Government Organisations.

Its alignment with the State Disaster Management Plan, and the District Disaster Management Plan.

The Board commends Council's approach to preparing for a possible disaster event over the summer months and, in particular, for the general public warnings and advice in the November - December 2010 period, and for the conduct of readiness training and exercises.

The Board commends Council's approach, during the flood event, in providing public information, advice and alerts using a multi-channel broadcast approach, for print and electronic media, the internet including website, email and social media, telecommunications including Council's Call Centre, mobile SMS and the Early Warning Alert Service (EWAS) and off-line, including the "Living in Brisbane" newsletter, fact sheets, other community newsletters, posters, and outdoor advertising.

The Board commends the efforts of Council's Call Centre and Social Media staff for their untiring efforts to respond, in a calm and helpful manner, to the thousands of requests for information and advice during the flood event.

The Board commends Council's coordination and management of the field operations response through the Field Operations Group (FOG), the Regional Incident Management Teams (RIMTs) and other appropriate Council business units.

The Board commends Council for developing and implementing at short notice a citizens' volunteer management strategy, including establishing the capacity to register, brief, equip and deploy the volunteers to priority recovery locations, and for coordinating and deploying business and professional volunteers (including trades people, contractors and plant operators) and community groups to enhance the pace and efficiency of the cleanup.

The Board commends Council for undertaking a major waste collection and disposal effort for vast quantities of flood debris and household waste, in conjunction with waste disposal contractors, industry volunteers and the broader waste industry.

The Board commends Council's transition to recovery policies and procedures including the establishment of the various Council sub-committees as recommended in the Concept for Recovery document prepared by the Forward Planning Group (FPG), the formation of the Joint Flood Taskforce and the engagement of engineering consultants.

The Board commends Council for its Growth Planning Strategy which envisages growth centres and transport corridors outside potentially flood affected areas and notes that 89.5% of all flood affected residential properties were in areas developed predominantly prior to 1978.

The Board commends Council for its progressive implementation of the recommendations of the Lord Mayor's Taskforce on Suburban Flooding (2005) which has resulted in a reduction in the risk of flooding in recently developed areas.

The Board commends the initiative of Council through its Town Planning Sub-Committee in developing strategies and effective planning instruments to encourage development of flood resilient building design and construction.

The Board commends Council for the rapid response in cleaning gully pits within the flood affected areas and for initiating the major program of works required to remove silt from all of the stormwater system affected by the flood.

The Board commends Council's prompt actions in relocating the entire fleet of City Cats and cross river ferries to safe locations.

The Board commends Council for commissioning independent engineering consultants to provide advice on reasons for the failure of certain riverine infrastructure assets.

Affirmations

The Board affirms Council's approach to its business as usual and risk management policies. The Board **recommends** that:

In relation to Council activities, Information Services Branch reviews its Business Continuity Plans (BCPs) to ensure the capacity exists to maintain the data centre, including an alternative site capable of taking over without delay and to maintain Council's website at all times, particularly during significant disasters.

Line of business managers review BCPs to ensure their ongoing robustness and to capture any lessons learnt from the flood event.

Contracts and arrangements be reviewed to ensure that the business continuity plans for key external outsourced service and infrastructure providers are understood, robust and able to support Council during times of emergency and disaster.

In relation to the Brisbane Central Business District and high-rise residential building inundation, that Council consider hosting a symposium for all affected parties with a view to identifying best practice approaches to ensure improved flooding resilience.

The Board affirms Council's approach to training, exercising and workforce planning in relation to disaster management preparation. The Board **recommends** that further emphasis be placed on:

Individual and team training, including opportunities to attend Emergency Management Australia Disaster and Emergency Response courses;

Workforce planning to reflect a needs analysis including disaster management related job descriptions, and a specific Council term be developed to describe "internal volunteers" to avoid confusion and to reflect the professional nature of the training and tasks; and

Annual exercises continue to be conducted with a theme of "Brisbane Ready for Summer".

The Board affirms the operations and workings of the Local Disaster Coordination Centre (LDCC) and, in particular, the integration of operations (tasking), intelligence, public information, logistics and the coordination with external supporting agencies. The Board **recommends** that:

Further training and development occur for senior appointments including LDCC Incident Controllers and group leaders as well as for more junior appointments.

The Disaster Intelligence Group's structure, manning and core competencies be reviewed and further staff training be conducted.

The Forward Planning Group's responsibilities to the Brisbane City Local Disaster Management Group (BCLDMG) and to the LDCC be examined to remove ambiguity.

Enhancements to process be implemented including:

Ensuring that Situation Reports are well drafted and widely distributed on a regular basis using multiple communications channels;

Developing a readily accessible database of frequently asked questions to address "who does what" to support the LDCC staff and agencies (this could also include information available on Council's Call Centre database);

Synchronising the shifts of Council and agencies staff working in the LDCC to better facilitate handover briefings;

Improvements to logging incoming and outgoing information and tasking; and

Formalising the written briefing processes for handovers between shifts.

The Board affirms Council's flood intelligence management and information dissemination arrangements. The Board **recommends** that Council undertake upgrades to the Flood Information Centre (FIC) along the following lines:

Review and update Standing Operating Procedures (SOPs), including a major update of selected Brisbane River and Creek Flooding SOPs, river flood maps and storm tide maps, property counts and critical infrastructure lists;

Upgrade the Brisbane River Flood Forecast Reporting System to the most extreme flood event (Probable Maximum Flood) and to include a flood forecast system for Brisbane creeks;

Conduct additional training and exercises including with the LDCC and Queensland Government agencies, and develop better communications protocols;

Provide computers capable of GIS modelling tasks and 3D visualisation analysis; and

Provide a dedicated flat screen television for situation awareness and news monitoring.

The Board affirms Council's approach to implementing a range of early warning systems and alert measures across a number of delivery channels. The Board **recommends** that Council examine and develop the range and variety of early warning systems and alert measures; including the proposed National Emergency Warning System, social media platforms and further improve the effectiveness of door knocking.

The Board affirms the contribution of region-based RIMTs noting that they provide a critical layer in the command and control structure for dealing with the on ground situation, managing local resources and coordinating external resources allocated to them. The Board **recommends** that:

A senior officer be assigned to mentor each Regional Incident Management Team Manager and conduct high level discussions with the LDCC;

Dedicated Regional Incident Management Team operations rooms be established; and

Planning for alternative Regional Incident Management Team sites, in the event that the primary sites become unusable, be conducted.

The Board affirms Council's planning for and implementation of evacuation centres as detailed in the Disaster Management Plan. The Board **recommends** that further consideration be given to refining Council's evacuation centre planning to address:

Greater decentralisation of evacuation centres, particularly for communities that are known to be prone to isolation by flooding;

Early and close liaison with Red Cross, particularly in regard to registration of evacuees and vetting of volunteers;

Early and close liaison with Queensland Police Service (QPS) in regard to exclusion of persons not suitable to be in a general public evacuation centre;

The special needs of frail, aged, incapacitated, nursing home and oxygen-dependant evacuees for whom separate and special arrangements need to be made;

Social, cultural and religious diversity of evacuees, including those with a non-English speaking background; and

Purchase and supply of special items such as personal hygiene kits and baby requisites.

The Board affirms Council's action in rapidly increasing sandbag production to a total of more than 390,000. The Board **recommends** that estimates be developed of likely sandbag demand for regions during future flood events and that the best situated potential sites for filling and distribution points in each region be identified.

The Board affirms Council's collaborative efforts with QPS and the Australian Defence Force (ADF) in providing a workable framework for overall traffic management. The Board **recommends** that the Council consider developing advanced plans, in consultation with QPS, to improve traffic flow in flood recovery congested areas including converting some streets into one way, route designation for heavy vehicles and identification for residents' vehicles.

Recommendations

The Board recommends that the term, DFL, be used exclusively in public documents concerning flood planning levels for Brisbane, regardless of the cause of the flooding.

The Board recommends that Council use a more readily understandable description of flood levels (to reflect BoM descriptions).

The Board recommends that effort continue to be put into providing more localised (property, street, suburb and Ward) information regarding inundation and flood level forecasts through a range of channels including the Early Warning Alert Service EWAS, Floodwise Property Report and Flood Flag Maps (including rate notices to draw attention to the existence of the Floodwise Property Report) and flood markers.

The Board recommends that the Flood Flag Map be further developed to enable NearMap data obtained on the morning of 13 January 2011 to be included and accessed.

The Board recommends that Council investigate the Flood COP system and examine its utility, in conjunction with hand held devices, to improve the efficiency and effectiveness of data collection, the provision of information, the prioritisation of tasks and the deployment of resources.

The Board recommends that Council further develop its capabilities to produce flood maps for a larger set of scenarios based on a range of 2 to 20 m^3/s in electronic and hard copy format.

The Board recommends that Council review the disaster management arrangements for a major flooding situation as they apply to Pullenvale Ward.

The Board recommends that Council review the disaster management arrangements for a major flooding situation as they apply to Tennyson Ward to ensure the ongoing provision of a flood-free Ward Office.

The Board recommends that Council examine appropriate ways for Councillors to assist during disaster events, particularly given their community leadership responsibilities and their detailed local knowledge of circumstances and capabilities that exist in their Wards, in a way which does not cut across the existing and appropriate arrangements detailed in Council's disaster management arrangements.

The Board recommends that permanent flood markers be installed on key roads that are known to become flood affected to complement other public awareness and safety campaigns.

The Board recommends Council develop a process for handling donated goods separately from evacuation centres.

The Board recommends Council implement strategies in relation to volunteer clean up activities for:

Development of a proforma briefing sheet for volunteers based on experience gained in this flood event;

Identification of house team leaders to liaise with residents so that clean up activity is in accordance with the residents' wishes;

Ensuring the provision of appropriate health care arrangements to accompany deployed volunteer groups;

In conjunction with QPS, developing processes to ensure the security of flooded residents' dwellings during volunteer cleanup activity; and

Making provision for a co-ordination cell within the LDCC particularly for individual volunteers.

The Board recommends that Council develop a comprehensive single list of potential sites suitable for temporary waste collection, incorporate a liaison officer from the CWS team into the LDCC; and strengthen the link between procurement and waste management during a disaster by establishing a dedicated liaison officer position in the City Waste Services (CWS) team.

The Board recommends that, in relation to planning, Council undertake a complete Flood Risk Management analysis for the area of Brisbane affected by flooding from the Brisbane River and associated tributaries in line with National Flood Risk Advisory Group (NFRAG) and other relevant guidelines. This would require a detailed assessment of the benefits and costs of a full range of flood mitigation options.

The Board recommends that:

Council investigate the feasibility of the installation of devices to prevent backflow from river flooding in locations such as in parts of the Central Business District (CBD) and in high rise buildings which would not have been flooded otherwise, where all those potentially affected by backflow flooding have responsibility for oversight of the maintenance of the device in working order; and

No backflow prevention device should be incorporated into the stormwater network system unless a complete risk based flood management analysis has confirmed that this is the best option.

The Board recommends that Council investigate the feasibility and appropriateness of establishing local levees to protect areas of strategic significance such as the Rocklea Markets. This will require a complete risk based flood management analysis.