

QUEENSLAND FLOODS
COMMISSION OF INQUIRY

STATEMENT OF STEVEN KENNETH JACOBY

I, **STEVEN KENNETH JACOBY** of c/o- Level 9, Landcentre, 867 Main Street, Woolloongabba, Brisbane in the State of Queensland, General Manager, Spatial Information, Department of Environment and Resource Management (DERM), solemnly and sincerely affirm and declare:

Requirement from Queensland Floods Commission of Inquiry

1. I have seen a copy of a letter dated 7 October 2011, which is attachment **SKJ-01**, from the Commissioner, Queensland Floods Commission of Inquiry to me requiring a written statement under oath or affirmation, and which details the topics my statement should cover.

Role

2. I am currently General Manager, Spatial Information within DERM, where I lead the Spatial Information Group which is the lead agency within the Queensland Government for spatial information. Spatial information is any information that can be related to a location on (below or above) the surface of the Earth. In my role I have responsibilities for spatial policy and strategy, administration of the *Survey and Mapping Infrastructure Act 2003*, coordination and maintenance of key spatial datasets and systems, as well as the provision of spatial products and services to a range of clients including government, business and the public.
3. In my current position, I report directly to the Assistant Director-General, Land and Indigenous Services Division of DERM.
4. I have been employed by DERM and its predecessors for a period of more than 8 years. Prior to taking up my current role I was General Manager, Information Policy for 6 years.
5. Since 1 December 2010 I have been on leave for the following periods:
 - 24 December 2010 to 31 December 2010
 - 27 April 2011 to 29 April 2011
 - 20 May 2011
 - 16 June 2011 to 24 June 2011
 - 6 July 2011
 - 19 August 2011
 - 27 September 2011

Qualifications

6. I am the holder of a Bachelor of Applied Science degree (Cartography) from RMIT and a Masters, Surveying Science from the University of Melbourne.

Item 1: The involvement of the Department of Environment and Resource Management (DERM) in flood-related mapping projects for the Queensland Reconstruction Authority (QRA) in 2011

7. DERM has assisted the QRA with 3 significant flood-related mapping projects:
 - a. 2010 – 2011 spatial imagery acquisition and flood line mapping;
 - b. Mapping to support Brisbane City Council's temporary local planning instrument;
 - c. Interim Floodplain Assessment Overlay
8. The Spatial Information Group (SIG) in conjunction with Emergency Management Queensland (EMQ) began acquiring spatial imagery from 31 December 2010, consisting of satellite imagery (optical & radar) as well as aerial photography in support of the response and recovery efforts for the Queensland floods.
9. Aerial photography was acquired in key areas, commencing with towns in the Fitzroy Basin and the Condamine-Balonne Basins where significant or record floods were expected and as close to or after the flood peak as weather permitted. This was done to ensure an accurate spatial record of the floods' extent was made and as an aid to both the recovery efforts and to inform future (general) planning. As the extent of the floods expanded, so did the spatial imagery program.
10. The department as lead agency for spatial information in Queensland is responsible for coordinating the acquisition of spatial imagery on behalf of government agencies. This is achieved normally through competitive tendering to the private sector. The department works with other agencies to determine priorities, contract work and ensure standards and whole-of government licensing is achieved to maximise the use of this imagery.
11. During the 2011 flood events the department has acquired aerial imagery through direct contracting, purchasing or sharing rights to imagery collected by several local governments and aerial imaging contractors and through cooperation with the of the Australian Defence Forces (ADF) aerial imaging resources.
12. Upon acquiring aerial photography, SIG commenced the digitising of the flood line. Using aerial photography taken at and/or shortly after the peak allows the water or debris line to be clearly seen and accurately mapped. This was performed by SIG's staff skilled in photo-interpretation examining the flood line property by property. It was a manual and labour intensive task.
13. In particular, the SIG worked closely with Brisbane City Council (BCC) and the Land Use Planning team in the Queensland Reconstruction Authority (QRA) to ensure that there was only one agreed flood extent map produced. This was both to avoid duplication of effort amongst agencies and minimise risk of competing data sets purporting to represent the 2011 floods. DERM's flood line and mapping was used to support BCC's Temporary Local Planning Instrument, see <http://www.brisbane.qld.gov.au/planning-building/tools-forms/TLPI/Interim-flood-maps/index.htm> and refer to SKJ-02 for an example. This product was significantly aided by the availability of high resolution Lidar data which provides

for 25cm contours in this urban area.

14. Priority was assigned to completing flood lines and flood extent maps in the most populated areas first and as soon as possible after spatial imagery became available. Aerial photography was acquired for 187 towns and suburbs in Queensland and flood lines produced for 115 (Refer to SKJ-03). DERM attempted to map flood lines from all aerial photography taken but in many cases a flood line could not be discerned. This was usually due to the imagery being acquired too long after the flood peak (after a week it became difficult and after two weeks almost impossible, particularly if it had rained in that period). However, having current aerial photography of flood affected communities was still considered useful.
15. In order to provide a flood extent map as quickly as possible a 2D interpretation has been made using the available aerial photography. This technique permitted a low cost, fast acquisition of the 2011 flood lines. A higher quality, but significantly more costly and time consuming approach would have involved a 3D interpretation (viewing the photography stereoscopically). This would have assisted where a clear view of the ground surface was obscured by tree canopies and built infrastructure. Feedback and ground checking by the department and other agencies assisted in validating the (2D) flood extent maps.
16. DERM is the custodian (owner) of the flood extent mapping and data and released it under a standard Creative Commons attribution licence as per the Queensland Government's information licensing policy (at no cost).
17. Maps, showing natural disaster affected towns before and after the 2011 events were published on the QRA's website from 26 February 2011, see www.qldreconstruction.org.au A complete copy of this mapping in hardcopy and digital form has been made available to the Floods Commission by DERM (a total of 548 maps were provided as detailed in SKJ-25). Aerial photography and the digital dataset of the flood lines are also available in an interactive map on the same website and the actual data can be downloaded from the Information Queensland website administered by DERM see www.information.qld.gov.au
18. Feedback on the accuracy of the flood lines mapped by DERM was encouraged via the QRA's interactive map. A total of 174 feedback items have been received to date from the public and each was investigated by DERM. 12 have resulted in a change or amendment to the flood line for example, see SKJ-28.
19. The department also acquired imagery from a number of satellite systems during the 2011 floods. This imagery came from existing programs and through the provision of commercial imagery (at no cost) through the activation of the International Charter Space and Major Disasters (see www.disasterscharter.org/web/charter/map). DERM activated this Charter through Geoscience Australia on 3 January 2011. This was the first time that this Charter had been activated for Australia. It was again activated for Tropical Cyclone Yasi in February 2011.

20. Imagery outputs from these satellite systems were used to map flood extents at small scales, typically at river sub basin levels, where the department did not have aerial photography coverage. The primary purpose of this mapping was to assist in the broad identification of rural and regional lands affected by inundation. An example of a 2010 / 11 flood extent sub basin map is attached as SKJ-04.
21. Limitations with this approach arose where the (optical) satellite imagery was affected by cloud and where the coverage and cycle of the satellites meant that some areas were not acquired or were acquired at times prior to or well after the flood peak. The various resolutions of the imagery used and its reliability to detect inundated areas as opposed to saturated or wet ground was also a factor in determining its usefulness. These factors resulted in only 14 sub basins being mapped for the 2010 / 11 floods by DERM.

Item 2: DERM's activities with respect to the interim floodplain mapping released to the public by the QRA and available at www.qld.gov.au/floodcheck including:

- a) **the instructions given to DERM by the QRA**
 - b) **the timeline for the work set by the QRA**
 - c) **how, and by whom, it was decided which areas were priority areas for interim floodplain mapping**
 - d) **how, and by whom, it was decided what to show on the map (i.e. Q100, historical flood, whole of the floodplain, or other)**
 - e) **details of any other options for what was to be shown on the map considered by DERM or the QRA**
 - f) **how, and by whom, it was decided which data to use in the mapping process**
 - g) **what data sources were used to create the maps and how they were used**
 - h) **how the mapping was performed**
 - i) **details of any briefings given by DERM to any Minister regarding the maps**
22. The QRA's first contact with DERM with regard to what is now described as the Interim Floodplain Mapping project was in late May 2011 (Refer to SKJ-05) where we were asked whether we could 'piece' together these initial basin maps (as per example SKJ-04) into a state-wide layer. Subsequent scoping clarified that the QRA were seeking mapping that may be able to be adopted by Councils on an interim basis as a Natural Hazard Management Area (flood).
 23. During the first two weeks in June, several meetings and discussions took place between DERM and QRA staff (Refer to SKJ-06) to determine the feasibility and assessing potential techniques for creating a state-wide floodplain map (DERM staff had confirmed that such a dataset did not exist).
 24. A meeting was convened on 15 June 2011 attended by myself, Mr Brendan Nelson (General Manager, Land Use Planning – QRA) and a number of our agencies' staff to review requirements for the Interim Floodplain Mapping project (including product specifications and methodologies).

25. A pilot area was selected in the Dawson River sub basin including the towns of Taroom and Theodore and it was agreed that two techniques would be evaluated. Both would utilise the best available state-wide datasets including, elevation, drainage, imagery, DERM gauging stations, 2011 aerial imagery and flood lines, 2011 satellite imagery and flood lines as well as pre-clear vegetation and soils (alluvium systems) datasets. One technique would aim to automate the extraction of a floodplain layer from this information and the other would utilise manual interpretation.
26. Further meetings took place with the QRA on the 23rd June, 27th June, 30th June and 4th July 2011 to review progress, develop map product specifications and methodology. A product specification (version 4 dated 14th July 2011, refer to SKJ-07) was utilised for production of mapping for the full extent of the Dawson River sub basin. This utilised the manual interpretation technique as we were not able to satisfactorily automate the process to produce the Interim Floodplain Mapping area.
27. The Interim Floodplain Mapping products to be produced included an overview map of each sub basin (Refer to SKJ-08), a digital layer which was the floodplain area (shown in all products) and an A3 size mapbook for the sub basin depicting the floodplain area with an imagery backdrop and the digital cadastral map base at a scale of 1:50,000 (Refer to SKJ-09).
28. The Interim Floodplain Mapping products for the Dawson River sub basin were completed and presented to the Banana Shire Council on 20 July 2011 by the QRA for comment and review. Following minor cartographic amendments and adjustments to the mapbook template the mapping specification (including all products) was signed off on 21 July 2011 by the QRA (Refer to SKJ-10) and production was cleared to commence the following day. The Dawson River sub basin mapping products effectively became the specification template for the remaining production run.
29. A detailed description of DERM's methodology used to produce the agreed products, based upon manual, cartographic interpretation of the relevant state-wide datasets is attached (Refer to SKJ-11).
30. The custodianship (ownership) of the floodplain area dataset resides with the QRA. The mapping products were produced by DERM for the QRA and are also QRA owned products. The conditions, manner and timing of release for these products remain a matter for the QRA.
31. The Spatial Information Group, and to my knowledge DERM did not brief any Minister on the Interim Floodplain Mapping project. The Acting Assistant Director-General, Land & Indigenous Services was initially briefed on the project on 27 June 2011 and the Acting Director-General, DERM, was briefed on 30 June 2011. DERM's Executive Management Group was briefed on 1 August 2011 by myself and the QRA.
32. Presentations and briefings on the project have been made by the QRA and / or DERM in a number of forums with a view to raising awareness and seeking

feedback on the project. As at 17 October 2011, the following information sessions had been run:

- a. Banana Shire Council, Biloela (20 July 2011)
- b. State Agency Briefing, Brisbane (21 July 2011)
- c. North West Regional Planning Committee (Flinders, Richmond, McKinlay, Cloncurry and Mt Isa Councils), Hughenden (26 July 2011)
- d. South West Regional Planning Committee (Murweh, Quilpie, Paroo, Bulloo), St George (28 July 2011)
- e. Maranoa –Balonne Regional Planning Committee (Maranoa, Balonne Councils), St George (28 July 2011)
- f. Emergency Response & Recovery Conference, Brisbane (28 July 2011)
- g. National Flood Modelling Workshop, Canberra (29 July 2011)
- h. DERM Executive Management Group (1 Aug 2011)
- i. Central Queensland University Property Conference, Rockhampton (12 Aug 2011)
- j. LGAQ Briefing, Brisbane (18 Aug 2011)
- k. Queensland Design Council, (19 Aug 2011)
- l. Far North Qld Planning Symposium, Cairns (19 Aug 2011)
- m. LGAQ Briefing, Brisbane (25 Aug 2011)
- n. Natural Disaster Insurance Review Workshop, Sydney (26 Aug 2011)
- o. SEQ Post Flood Science Review & Planning Forum, Brisbane (2 Sep 2011)
- p. LGAQ Briefing, Brisbane (8 Sep 2011)
- q. Queensland Chief Scientist Briefing, Brisbane (9 Sep 2011)
- r. Toowoomba Regional Council, Toowoomba (14 Sep 2011)
- s. National Emergency Management Council Land Use Planning and Building Code Taskforce Meeting, Canberra (16 Sep 2011)
- t. Queensland Spatial Information Council (19 Sep 2011)
- u. CSIRO Briefing, Brisbane (20 Sep 2011)
- v. Inter-Departmental Committee – SPP1/03 Review, Brisbane (21 Sep 2011)
- w. Planning Institute of Australia, Queensland Division, Toowoomba (22 Sep 2011)
- x. International River Symposium, Brisbane (26 Sep 2011)
- y. Urban Development Institute of Australia (Qld Division), Brisbane (28 Sep 2011)
- z. State Agencies Briefing, Brisbane (3 Oct 2011)
- aa. Engineers Australia, Water Panel, Brisbane (5 Oct 2011)
- bb. Central Highlands Regional Council, Emerald (7 Oct 2011)
- cc. Spatial Information Officers Conference, Brisbane (10 Oct 2011)
- dd. South Burnett Regional Council, Kingaroy (10 Oct 2011)
- ee. Southern Downs Regional Council, Warwick (11 Oct 2011)
- ff. Goondiwindi Regional Council, Goondiwindi (11 Oct 2011)
- gg. PSMA (Public Sector Mapping Agencies) Australia Board Meeting, Canberra (11 Oct 2011)
- hh. North Burnett Regional Council, Gayndah (11 Oct 2011)
- ii. Gympie Regional Council, Gympie (11 Oct 2011)
- jj. ANZLIC (Australia New Zealand Land Information Council) Meeting, Canberra (12 Oct 2011)
- kk. Balonne Shire Council, St George (12 Oct 2011)
- ll. Paroo Shire Council, Cunnamulla (13 Oct 2011)

- mm. Murweh Shire Council, Charleville (13 Oct 2011)
- nn. Maranoa Regional Council, Roma (14 Oct 2011)
- oo. National Flood Risk Advisory Meeting, Brisbane (17 Oct 2011)

33. The priority areas to be mapped, subject to a successful Dawson pilot, were identified by the QRA and conveyed to DERM on 21 June 2011 (Refer to SKJ-12). The list was based on Planning Scheme Areas that had been reviewed by the QRA and found to contain no current flood hazard mapping. This list of planning schemes was translated into a list of whole river sub basins. It was estimated that DERM could complete this task (27 sub basins) by the end of July based on the Dawson pilot and available data. This was adopted as Phase 1 of the Interim Floodplain Mapping.
34. At the end of July (Phase 1), DERM had completed 24 of the 27 river sub basins and delivered these to the QRA.
35. Phase 2 was developed following a categorisation of all planning schemes by population into 3 sectors. The highest priority sector contained schemes with a population of greater than 50,000. The lowest priority sector contained schemes with a population of less than 4,000. Those remaining sub basins in the two highest priority areas were included in Phase 2 (a further 39 sub basins). The remaining sub basins were placed in Phase 3. In total there are 129 river sub basins in Queensland.
36. DERM will complete Phase 2 on 19th October 2011, a total of 63 sub basins and 2504 map book pages (Refer to SKJ-26 for a map showing the Phase 2 coverage). Phase 3 is estimated for conclusion in late December 2011 (total 116 full or part sub basins will be mapped under this project – 13 basins will not be mapped as they are either not required, islands or have been mapped at better scales see, SKJ-23).

Item 3: his understanding of what constitutes the interim floodplain area in terms of flood risk, previous flood occurrence, future likely flood occurrence or any other measure able to be understood by members of the public

37. The Interim Floodplain Mapping area is a graphical representation of the floodplain derived through the methodology referenced in SKJ-11. It forms one part of the QRA's toolkit "Planning for stronger, more resilient floodplains". Importantly, the Floodplain Mapping may be adopted or amended as a Natural Hazard Management Area (Flood) and then incorporated as an overlay within a Council's planning scheme. The overlay works to trigger any new applications within its area against a Council's Floodplain code.
38. It does not represent a defined flood event, a probable maximum flood or attempt to map to any flood annual recurrence interval, such as a Q100. It is designed for small and medium scale use and should not be used at scales larger than 1:50,000 which DERM considers to be the reasonable working limits of the datasets used to generate the mapping.


39. Information related to previous floods was used to create the Interim Floodplain area. This information included aerial photography and satellite imagery of the 2010/2011 flood event and highest recorded data from DERM gauging stations. It also includes evidence of vegetation and soils typically associated with floodplains. The methodology expects that these data inputs would be contained within the Interim Floodplain Mapping area unless conflicts are detected (the methodology describes how conflicts in the data are resolved).
40. In my view, noting that I am not a hydrological engineer, I would expect future flood occurrence to fall within the Interim Floodplain area, however, it is possible for larger floods to exceed this area. A Local Authority's knowledge and verification / amendment of the mapping is very important given the methodology used and noting that it has not been checked in the field. The QRA's toolkit "Planning for stronger, more resilient floodplains" (refer to SKJ-27) makes it clear (page 9) that the Floodplain Mapping should be considered as Level 1 in a flood maturity mapping model, where Level 0 is a Council with no flood mapping. Level 2 would be achieved by a Council verifying and validating the mapping. This could include incorporation of higher quality data (eg where it existed in towns) and / or amending the Floodplain Mapping Area through the application of local knowledge.
41. It is important to note that the methodology ignores headwater streams (eg. order 1 streams as per the Strahler system, refer to SKJ-24 & SKJ-27 (p.10). Flash flooding in particular does and will occur in these streams. An example of this was the flash flooding in Toowoomba's East and West creeks on the 10th January 2011. These are both class 1 ordered streams.

I make this solemn declaration conscientiously believing the same to be true, and by virtue of the provisions of the *Oaths Act 1867*.

Signed 

Steven Kenneth Jacoby

Taken and declared before me, at Brisbane this 17th day of October 2011


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Solicitor/~~Barrister~~/Justice of the
Peace/~~Commissioner for Declarations~~