Submission to the

The Honourable Justice Catherine Holmes

Commissioner of the

Queensland Floods Commission of Inquiry

By

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Acronyms and abbreviations

AHD	Australian Height Datum
BCC	Brisbane City Councils
DFE	Defined Flood Event
DFL	Defined Flood Level
DNRME	Department of Natural Resources, Mines and
Q100	There is a one percent chance that the quantity of water (Q) flowing past a given point, in this case the Port Office Gauge, in any year will exceed the (Q100) volume.
SEQWater	South East Queensland Water Corporation Limited

Units of measure and scientific symbols

m^3/s	cubic metres per second (cumecs)

Chapter 1: Introduction

Who was responsible for allowing new subdivision and housing to be built in Brisbane on land that was flooded in 1974? Was it the engineers who appear to have spent years arguing whether the design standard should be based on a Q100 of 5000 m^3/s or 9000 m^3/s? Was it the Brisbane City Council's (BCC) desire to fill in every piece of vacant land with medium density housing or was it the developers who took advantage of the Council's desire. The following information may provide the reader with the necessary information to make a judgement.

Chapter 2: Q100 deliberations

Since 1978 hydrologist, the BCC, South East Queensland Water Corporation Limited (SEQWater) and the Department of Natural Resources, Mines and Energy (DNRME) have spent many hours deliberating over the value of Q100.

Q100, short for a 1-in-100 year flood event, is a hydrological estimate of the one per cent annual probability that a flood of a given size or larger (also referred to as the design flood) will occur. Flood studies produce estimates of flood flows, measured in cubic metres per second (cumecs or m^3/s), that are then converted to estimated flood levels, measured in metres (Crime and Misconduct Commission 2004). There is a one percent chance that a quantity of water (Q) flowing past a given point , in this case the Port Office Gauge, in any year will exceed the Q100 volume.

Table 1 shows a summary of the information presented in the Crime and Misconduct Commission report, regarding the deliberations on the estimate of the Q100 volume of water passing the Port Office Gauge and the resulting river height.

Table 1 – Q100 deliberations

Year	Decision
1978	6,800 m³/s, with a resulting level of 3.7 m AHD
1984	6,800 m³/s, with an accompanying flood level 3.8 m AHD
1992	9,380 m³/s
1998	9.560 m³/s, with an accompanying flood level 5.7 m AHD
1999	8,600 m³/s, with an accompanying flood level 4.7 m AHD
2003	5,000 to 7,000 m³/s and accompanying flood level of 2.8 to 3.8 m AHD.
2003	Council resolved to maintain current development control levels based on the 1984 Q100 flow estimate of 6,800 m³/s

The Joint Flood Taskforce Report on the January 2011 flood states that the peak height of the flood at the Brisbane Port Office gauge was 4.46 m (Apelt 2011, p. 12). The Q100 flow rate does not appear to be mentioned.

What concerns the homebuyer is the likely flood height in their area not the estimated Q100 volume at the Port Office Gauge. The suburbs of Chelmer, Graceville, Sherwood, Corinda and Tennyson experienced some of the worst damage to well being and property and two reference points have been chosen within these suburbs. The Sherwood Arboretum was selected because it has a sculptured 1974 flood marker (see Appendix - Figure 5) and Graceville adjoining Oxley Creek because that area was reported in the Weekend Australian Magazine of 5-6 Feb 2011 and a photo taken from the magazine may be found in the Appendix - Figure 6.

The relationship between the flood height at the Port Office Gauge and the flood height at the Sherwood arboretum is shown graphically in Figure 1. For example, the 1974 flood height of 5.45 m at the Port Office Gauge produced a flood height of 13.61 m in the Sherwood Arboretum. Similarly, the 2011 flood height of 4.46 m at the Port Office Gauge produced a flood height of 11.6 m in the Sherwood Arboretum.

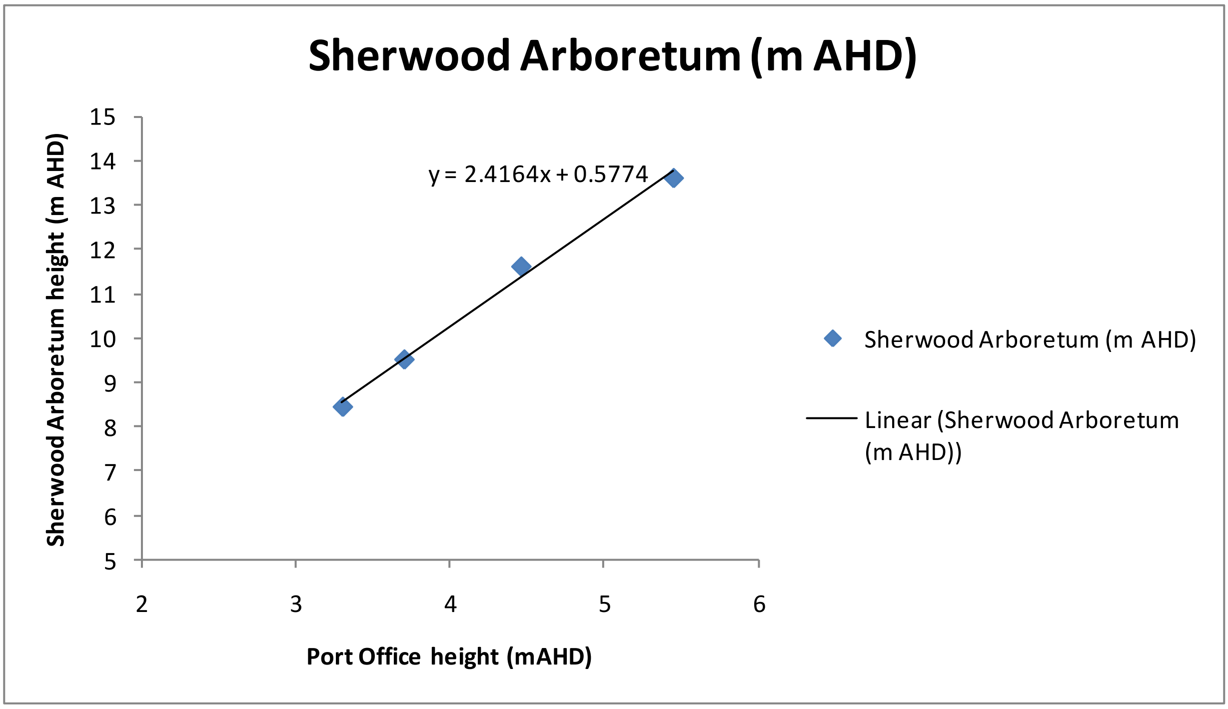

Figure 1 - Relationship between Port Office gauge and Sherwood Arboretum

The maximum height of the 2011 flood in the Sherwood Arboretum was approximately 2 m lower than the 1974 height as evidenced by the water level mark adjacent to the concrete base of the Sherwood Arboretum marker on 13 January 2011. The water level in lower Graceville was also approximately 2 m lower as evidenced by the fact that two story houses that were almost completely flooded in 1974 experienced flooding in the bottom floor only in 2011.

In summary, over twenty years have been spent arguing the design flow event (Q100) volume at the Port Office Gauge, when the 1974 flood levels were known and which presented a logical level on which to base approvals for new housing.

Chapter 3: Housing approval

The housing Defined Flood Level (DFL) is set based on a Defined Flood Event (DFE) and referenced to the Australian Height Datum (AHD). The DFL the level that Council requires habitable floors to be built above to provide protection against floods up to the magnitude of the DFE. BCC has defined the DFE to be slightly higher than the agreed 1978 Q100 volume, due to previous experience with river flooding (1974 floods). BCC uses a flow of 6,800 cumecs as its DFE with a resulting level of 3.7 m AHD at Brisbane's City gauges as its DFL (Apelt 2011). Since the 1974 flood height at the Port Office Gauge was 5.45 m compared to the Q100 level of 3.7 m, the flow in 1974 would have been be far in excess of 6,800 cumecs. Nevertheless, the Q100 of 6,800 cumecs first set in 1978, was reconfirmed in 2003 (Apelt 2011).

Table 2 - Proposed DFL prepared from the Joint Flood Taskforce report

Selected Locations	1974 Flood Approx Level m AHD	Jan 2011 Flood Approx. Level m AHD	Q100 Design Level m AHD	Difference between2011 and Q100 m	DFL current - based on Q100 m AHD	Difference between 2011 and DFL m	Difference between 1974 and DFL m
City Gauge	5.45	4.46	3.3	-1.16	3.7	-0.76	-1.75
Mouth Oxley Creek	12	10	7.12	-2.88	7.99	-2.01	-4.01
Graceville (Low Side)	12.1	10.1	7.18	-2.92	8.05	-2.05	-4.05
Sherwood Arboretum	13.61	11.61	8.44	-3.17	9.51	-2.1	-4.1

The Joint Flood Taskforce Report recommends "the actual January 2011 flood event, as observed during the event, be used as the interim standard on which Brisbane City Council bases its decisions concerning new development and redevelopment."(Apelt 2011).

As Table 2 shows, if the DFL is the 2011 flood level, then in the Graceville area the DFL will be raised by approximately 2 metres. Nevertheless, the new DFL will still be almost 2 metres below the 1974 flood level. It is difficult to comprehend how in 1978, just four years after the 1974 floods, the DFL was set almost 4 metres below the 1974 flood level in the Graceville area. This decision has been very deleterious on the welfare of householders and on property built on the flood plains since 1974. Examples of the building of medium density housing on flood plains was most evident in the Chelmer area as shown in the Appendix - Figure 7 and Figure 8, and Figure 9, which show the same area of Graceville in 1974 and 2009 and 2011.

Chapter 4: Future Risk

Middelmann, Harper, and Lacey (2000) presented a graph similar to Figure 2, which is also available from the Bureau of Meteorology (2010) and was updated by Pielke (2011). The graph shows the flood height at the Port Office Gauge for known floods in the Brisbane and Bremer River Basin up until 2011.

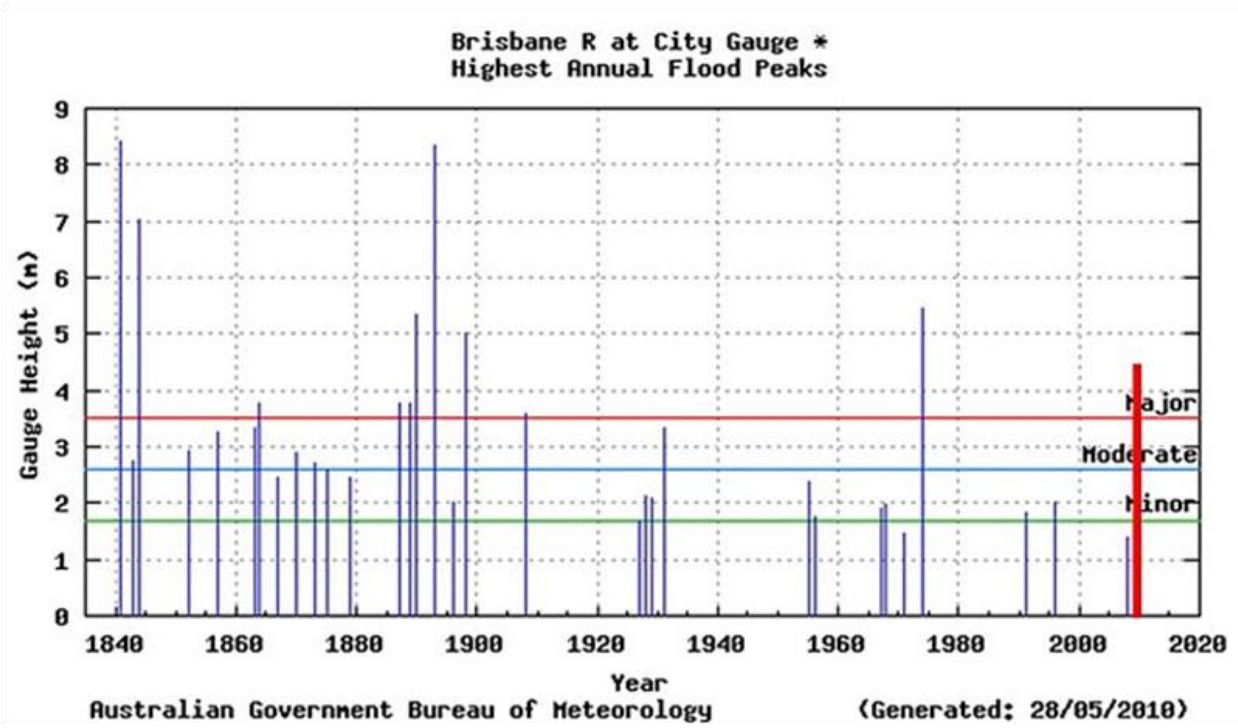

Figure 2 - Major flood events recorded at the Port Office Gauge

Although only one line is shown for 1983, three floods occurred during February 1893. During the first (peak 8.43 m), the Queensland Government gunboat HMQS Paluma whilst undergoing a refit in the Brisbane River was swept away and grounded in the Brisbane Botanic Gardens along with S.S. Elamang and an unidentified hulk believed to be the Mary Evans. Nine days later a second minor flood was experienced. However, a week after that there was another major flood (peak 8.09), which carried the stranded Elamang and Paluma back into the Brisbane River (Gibbs 1974, p. 13). The author was unable to reconcile the river heights reported by Gibbs for the first and second flood, which were 9.51 m and 9.24 m respectively, with Figure 2.

Figure 3 - HMQS Paluma with S.S. Elamang and hulk believed to be the "Mary Evans" (Hume Family Photograph Collection 1893)

The row of Bunya Pines behind the ships in Figure 3 is a prominent feature of the City Botanic Gardens today. At Bulimba, New Farm, Fortitude Valley, Breakfast Creek road, and the Hamilton, the third flood was several inches higher than the peak of the first flood (The Telegraph, 20 February, 1893), though flood damage across Brisbane was considerably less from the third flood because of the extensive damage already suffered in earlier floods.

Because of changes in the physical characteristics of the river and its catchment, it is very difficult to calculate return periods for flooding in Brisbane. However, four floods well in excess of the 1974 levels have occurred in the past 133 years and, according to a previous Professor of Economic Geology at the University of Queensland (Professor Sergent), there is geological evidence of water levels 5.5 m higher than the 1974 flood in the Indooroopilly area of Brisbane. Meteorological studies suggest that rainfalls well in excess of those recorded in the floods of 1893 and 1974 are possible (Gibbs 1974). Figure 4 shows the extent of flooding in the Chelmer-Corinda area in 1983 that was then mainly farming land.

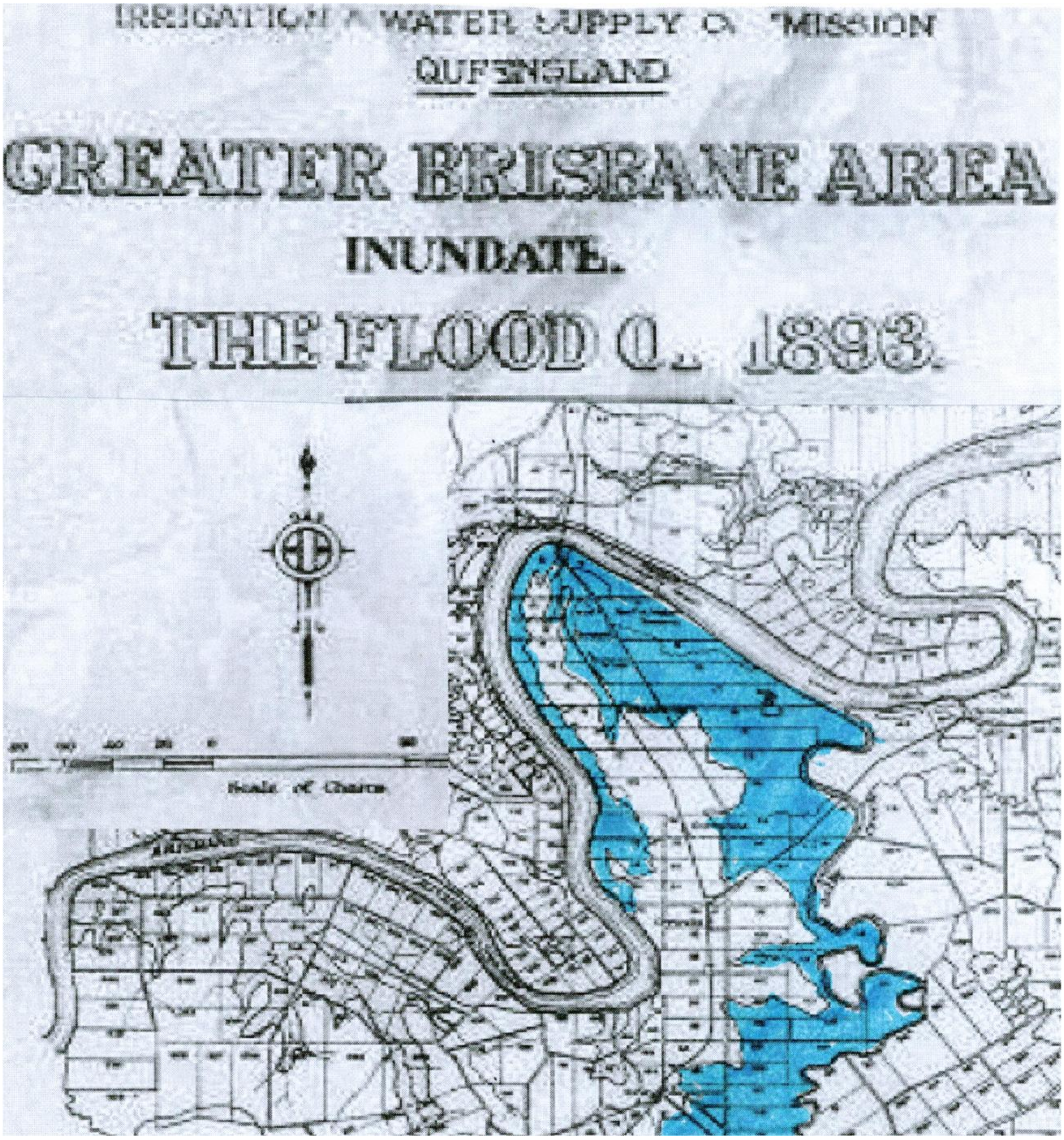

Figure 4 - 1893 flood Chelmer to Corinda (Middelmann, Harper, and Lacey 2000)

According to Associate Professor Stewart Franks, Hydro-Climatologist, of the University of Newcastle we do not have the same risk of flooding from one year to the next. Obviously, we have very high flood risk in La Nina years and very low flood risk in El Nino years. However, we also see that El Ninos and La Ninas tend to cluster into what we refer to as multi-decadal epochs or periods. There are 20 to 40 year periods where El Nino may be dominant and stronger than normal and we get devastating droughts that go on more or less over a 20 to 40 year period followed by a high frequency of La Nina events with a marked increase in flood risk.

“The best example I can give you in the 20th century is from about 1910 until the mid-1940s we were dominated by El Ninos and eastern Australia was dominated by drought. We then had 30 years from the mid-1940s until the mid-1970s where we had La Ninas more or less every other year and they were much stronger than normal La Ninas as well. These were responsible for floods up and down eastern Australia, in 1951, 1955 Maitland floods, culminating in the 1974 flooding through Queensland and Brisbane”.

“We do have this alternating flood and drought dominating regimes that dictate our climate on 10, 20, 30-year periods. So if you've had 30 years of drought, then it is not unreasonable to expect that at some point soon we would change back to a La Nina dominated and flood dominated climate in the east coast.” (Franks 2011).

Franks’ analysis is supported by the rainfall pattern in the nineteenth century. Between 1885 and 1900, two floods of the Brisbane River were almost twice the height of the 1974 flood at the Port Office Gauge and there were two floods equivalent to the 1974 flood (Figure 2). As noted earlier there is evidence of floods higher than the 1893 flood.

Therefore, it seems certain that unless major flood mitigation schemes, such as a dam on the Bremer River similar to the Wivenhoe Dam, are implemented, floods even greater than those of 1974 will again be experienced in Brisbane.

Home buyers who have bought and built houses on land that was flooded in 1974 thinking that it was now safe from flooding are no doubt disillusioned with the engineers, council officers and developers whose advice they accepted. Nevertheless, given the evidence it appears that it is my own profession of engineering, which gave the professional advice on which these decisions were made, that appears to have acted without regard for the welfare of citizens.

Chapter 5: Recommendations

Having talked to some of those most affected by the recent flooding, these recommendations are made:

i. Early flood warning, similar to cyclone warnings, would give residents in likely flood affected areas time to move valuable possessions to higher ground;

ii. The river walk should not be rebuilt. This money would be better spent fixing drainage in the flood-affected areas. A small amount of the saving may also be used to construct flood level markers similar to the ones in the City Botanic Gardens and the Sherwood Arboretum showing the 2011 and 1974 flood heights. Flood markers should have a plaque indicating the approximate height of the 1893 flood;

iii. Cease the unproductive attempts to estimate the Q100 volume and set the Defined Flood Level (DFL) based on known flood levels;

iv. The Joint Flood Taskforce Report recommendation that the DFL be the January 2011 flood level is a belated move in the right direction. Nevertheless, unless a second Wivenhoe is built on the Bremer River, the flood history indicates that the 1974 flood level will occur again; and

v. Construction of medium density housing on the flood plains since 1974 was one of the main causes of the increased impact on lives and property compared to the higher 1974 flood. Owners of undeveloped flood land should have the option of selling the land to the Council and that land be incorporated into parks and playing fields where practical.

Appendix

Figure 5 - Sherwood Arboretum Flood Marker taken 10 a.m. Thursday 13 January

Figure 6 – Chelmer adjacent to Oxley Creek Weekend Australian Magazine 5-6 Feb 2011 (Newspix/News Limited 2011)

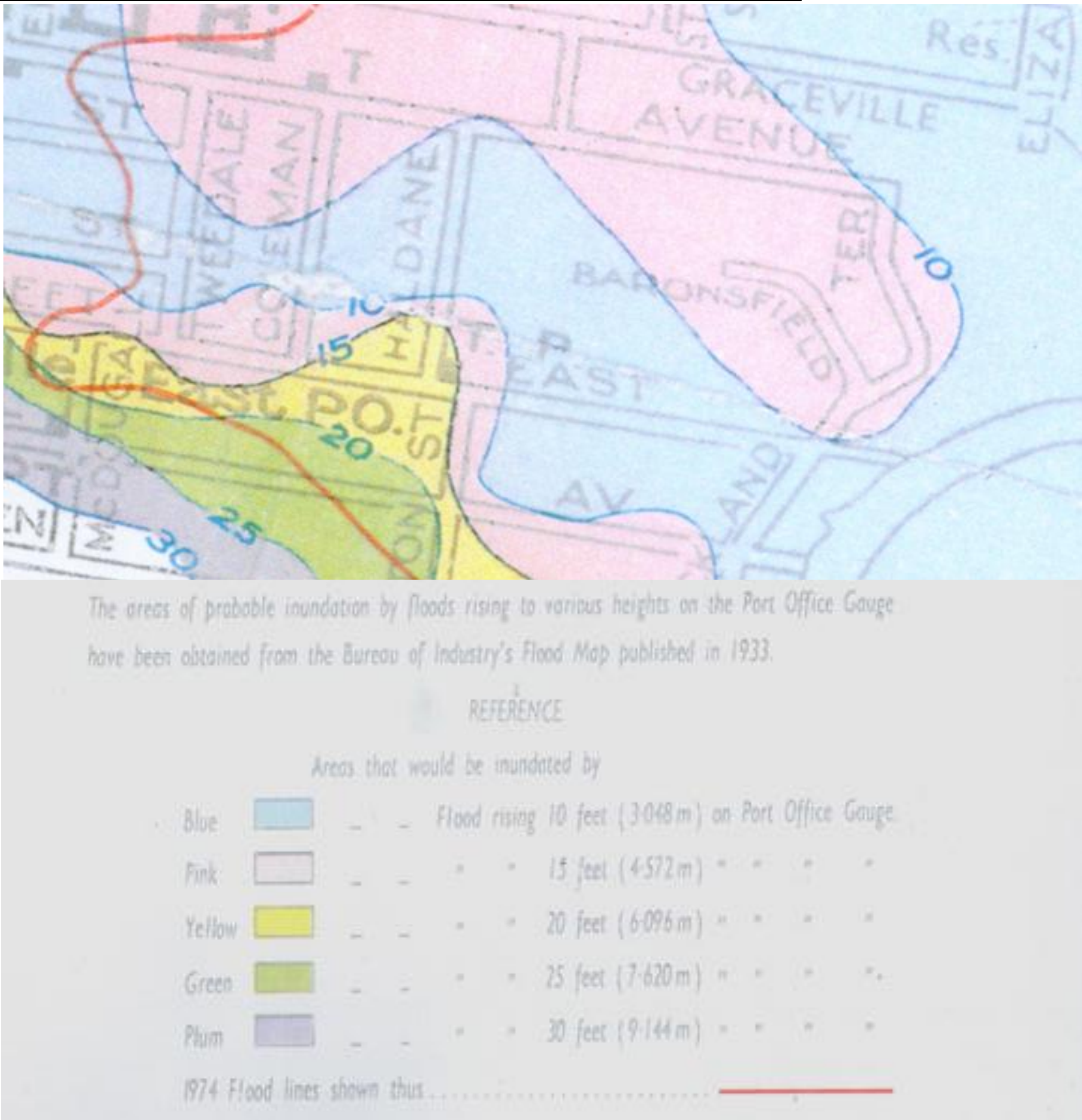

Figure 7 – Section of 1974 Flood Map of Brisbane (Department of Lands 1974)

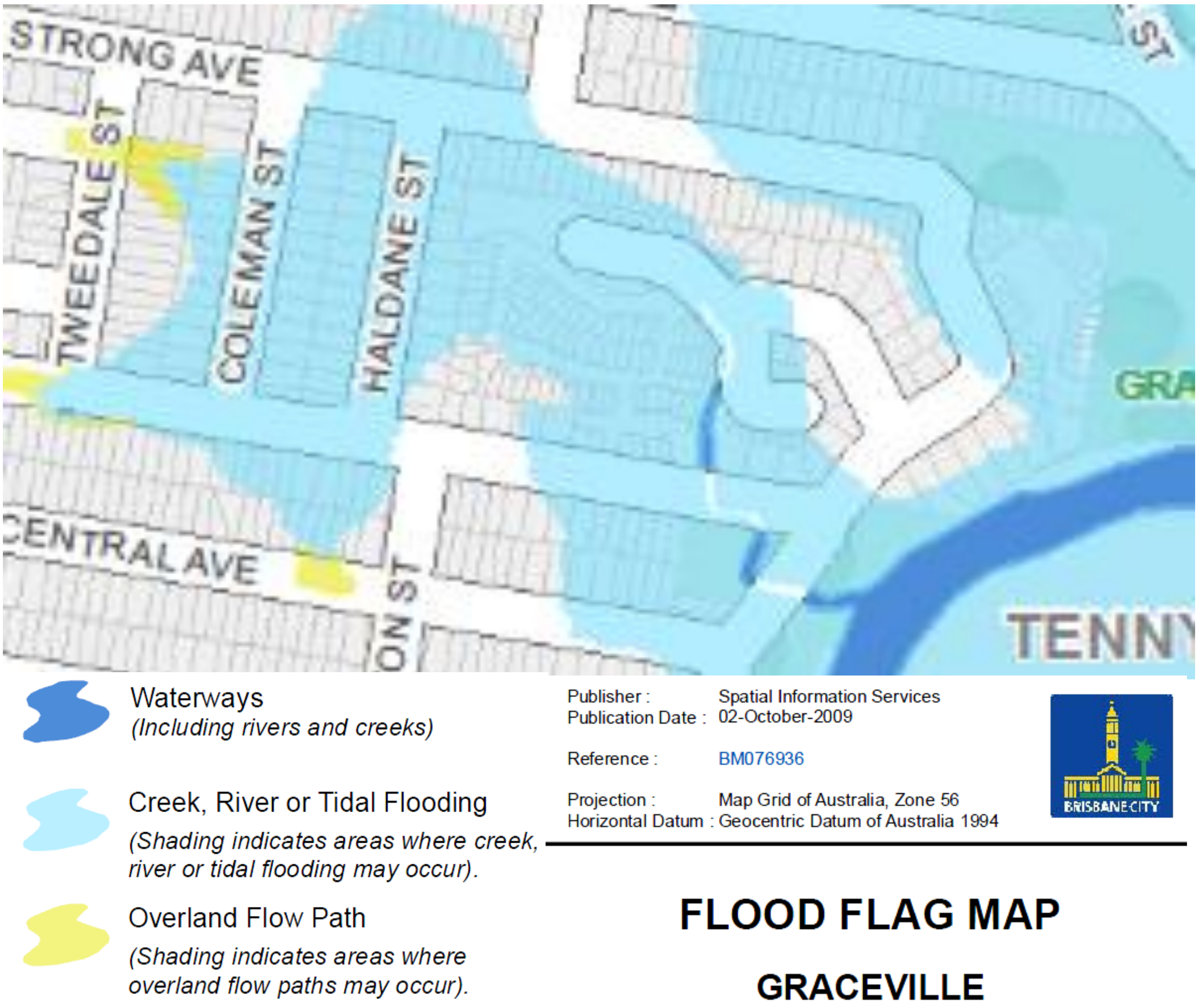

Figure 8 - Section of 2009 Graceville Flood Flag Map (Brisbane City Council 2009)

Figure 9 – The same section of Graceville shown in Figure 7and Figure 8 showing the extent of flooding and the increased density of housing (Whimpey and Kesper 2011)

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