

Statement of Joseph John Bannan

I, Joseph John Bannan, Manager, Asset Management branch, Brisbane City Council, of 266 George Street, Brisbane, in the State of Queensland, state on oath as follows:

1. Attachment "JJB-01" is a copy of a notice from the Commissioner of the Queensland Floods Commission of Inquiry (**Commission**) dated 19 August 2011 requiring me to provide certain information to the Commission in the form of a statement by 7 September 2011 (**Notice**). This Statement is provided in response to the Notice.
2. For the purposes of responding to the Notice and preparing this Statement I have, in my position as Manager, Asset Management branch (formerly known as City Assets branch) of the Brisbane City Council (**Council**), had access to:
 - (a) the business records of Council; and
 - (b) Council officers,to obtain information to provide a response to the Notice. I have also been advised on some issues of statute which arise by Clayton Utz. Unless otherwise stated, the matters set out in this Statement are based on my own knowledge and the information derived from the above sources.
3. The documents from the above sources and attached to this Statement have been collated by Council officers under my instruction.
4. I set out below my responses to each of the questions set out in the Notice based on the sources of information set out above.

Qualifications and Background

5. I hold the following academic qualifications:
 - (a) Master of Engineering Science, University of New South Wales;
 - (b) Bachelor of Engineering, Queensland University of Technology;
 - (c) Associate Diploma in Civil Engineering, University of South Queensland.
6. I am a Registered Professional Engineer in Queensland.

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7. I have held my current position since 17 January 2011. Prior to that:
- (a) I was employed by Moreton Bay Regional Council as Manager of its Asset Management branch from mid-2008 until December 2010;
 - (b) prior to mid-2008, I was employed in a number of engineering roles by each of the now superseded Pine Rivers Shire Council and Caboolture Shire Council for approximately 13 years.
8. The Notice covers a wide range of issues relating to stormwater network design and operation. There is no one branch of Council which has responsibility for all the areas raised by the Notice. In general terms:
- (a) policy in respect of design capacity standards is guided by Water Resources branch with input from Planning and Design branch of the City Projects office on technical and design issues;
 - (b) policy in respect of planning and development policies is guided by Water Resources branch with input amongst others from City Planning and Economic Development branch;
 - (c) application of planning and development policies relating to stormwater and sewerage is the province of Development Assessment branch;
 - (d) policy in respect of long term planning for the stormwater network is guided by Water Resources branch; and
 - (e) responsibility for general planning and policy in respect of the maintenance and rehabilitation of defects identified in the stormwater network lies with Asset Management branch.
9. My branch works closely with the Field Services group, which is responsible for carrying out in detail the direction provided by Asset Management in respect of maintenance and rehabilitation of defects. The infrastructure assets overseen by Asset Management go beyond stormwater infrastructure and include, for example: Council road infrastructure; park infrastructure; property infrastructure including Council owned buildings and Council owned bridges.


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Introductory Observations

10. Before addressing the specific matters raised by the Commission, it may be useful to make some introductory comments.
11. *First*, the Commission refers generally to stormwater infrastructure, stormwater drainage infrastructure and flood mitigation infrastructure. From my perspective as an engineer in Asset Management, stormwater infrastructure refers to infrastructure for which the primary purpose is the collection and conveyance of stormwater. Stormwater infrastructure has two functions: to manage the flow of stormwater and to manage the quality of water discharged.
12. Stormwater infrastructure that manages stormwater flow is properly described as having a flood mitigation function. Stormwater infrastructure that manages water quality only does not have a flood mitigation function. For the purposes of this Statement when referring to flood mitigation infrastructure, I am referring to stormwater infrastructure which has the purpose of managing stormwater flow. That seems consistent with the general thrust of the Notice and in particular the examples given of flood mitigation infrastructure in Request 1 of the Notice. While stormwater infrastructure may impact on the mitigation of major river and creek flooding, that is not ordinarily the purpose for which stormwater infrastructure is constructed.
13. *Second*, stormwater infrastructure refers to items of civil works built or created for stormwater collection and conveyance. It covers the familiar items such as the pipe network, the various kinds of gullies and inlets, culverts and so on. I list these in more detail in paragraph 18 below. Stormwater infrastructure, however, is only a part of the overall stormwater network which services the City (the **Stormwater Network**). The Stormwater Network includes not only the built infrastructure, but also other means of conveyance of stormwater such as overland flow paths and channels (which might be naturally occurring or partially or fully constructed) and natural waterways and wetlands. Stormwater planning for the City involves considering the performance of the whole Stormwater Network in conveying stormwater flow to a channel or natural watercourse.
14. The non-infrastructure components of the Stormwater Network are important. In particular, overland flow paths, where they can be established or maintained, are particularly effective in conveying stormwater efficiently because they involve minimal cost compared with the cost of constructing pipe and other infrastructure. I am aware that in recent years Council has


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undertaken extensive mapping of overland flow paths in the City and major overland flow paths are contained in Flood Flag Maps available to the public by internet search.

15. *Third*, some of the requests in the Notice refer to the sewerage network. Before 1 July 2010, Council was responsible for the provision of water services and wastewater services (that is, sewerage and trade waste related services (**Sewerage Network**)) in the City. Pursuant to the *South-East Queensland Water (Distribution and Retail Restructuring) Act* (the **Water Distribution Act**), Council was divested of the responsibility for providing water and wastewater services in the City. Together with Ipswich City Council, Lockyer Valley Regional Council, Scenic Rim Regional Council and Somerset Regional Council, Council's water and wastewater business was transferred to the Central SEQ Distributor-Retailer Authority trading as Queensland Urban Utilities (**QUU**). QUU was given responsibility for (amongst other things) providing water and wastewater services to the City on and from 1 July 2010. QUU does not represent the Council and is governed by an independent board.
16. *Fourth*, from the view point of stormwater management and flooding issues, it is relevant that the Sewerage Network is separate from the Stormwater Network and is not intended to convey stormwater. However, sewerage is designed with an allowance to carry additional water beyond the sewerage flow, which is included to provide a contingency allowance to minimise as far as possible the risk of overflows resulting from blockages or from leakage of stormwater into the sewerage network. Despite this, the Sewerage Network has (or at least it ought to have) no linkage to the Stormwater Network at all.
17. It is possible for the Sewerage Network to be affected by stormwater in the following ways:
 - (a) by an illegal connection from roof water downpipes or landscaping to the Sewerage Network;
 - (b) by reason of broken sewerage pipes and manhole lids allowing storm water to infiltrate;
 - (c) by flooding of the entire network up over the inlets or outlets of the Sewerage Network in a major flood event (i.e. the covering of pedestals by flood waters).


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Response to the Notice

1. The flood mitigation infrastructure (for example flood detention basins, stormwater culverts, back flow devices) in the Council's area, including a description of the maintenance programs for such infrastructure, for the following suburbs ('the Relevant Suburbs'):
- a. Brisbane City;
 - b. Fortitude Valley;
 - c. New Farm;
 - d. Newstead;
 - e. Teneriffe;
 - f. Bulimba;
 - g. Hawthorne;
 - h. Norman Park;
 - i. East Brisbane;
 - j. Kangaroo Point;
 - k. South Brisbane;
 - l. West End;
 - m. Hill End;
 - n. Fairfield;
 - o. Yeronga;
 - p. Rocklea;
 - q. Chelmer;
 - r. Graceville;

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s. Oxley;
t. St Lucia;
u. Toowong;
v. Auchenflower;
w. Milton;
x. Rosalie;
y. Fig Tree Pocket;
z. Bellbowrie.

Flood mitigation infrastructure

18. I understand flood mitigation infrastructure to comprise stormwater infrastructure whose purpose is the collection and conveyance of stormwater as explained in paragraphs 11 and 12 above. It covers the following kinds of assets:
- (a) the stormwater pipe network which includes stormwater drains (the higher order parts of the pipe network) and inlet connectors (secondary pipes linking gullies and inlets, described in (e) below, to the stormwater drains) (the **Pipe Network**);
 - (b) culverts, which are short conduits, open at both ends, passing under roads primarily for the purpose of allowing stormwater to flow from one side of the road to the other without becoming dammed by the roadway;
 - (c) detention basins, which are areas specifically designed to catch and hold stormwater in a rain event to allow release of stormwater at a controlled rate;
 - (d) back flow prevention devices, which are valves or gates installed at or near pipe outlets to prevent rising water at the outlet side of the gate from entering the Pipe Network;


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- (e) gullies and inlets which allow stormwater to enter the Pipe Network. The term "gully" typically refers to the grilled box inlets commonly seen in suburban streets, and the term "inlet" typically refers to an opening in a park or open area;
 - (f) kerbing and channelling which catches stormwater flow from urban roads and provides capacity on the road surface to convey overland flow along a roadway where the roadway is designed to perform that function.
19. The Stormwater Network also includes naturally occurring or constructed channels and watercourses and overland flow paths. Whilst these are not ordinarily considered to be items of infrastructure, channels and overland flow paths are sometimes constructed or modified or enhanced by some form of civil works.

Stormwater infrastructure in the Relevant Suburbs

20. Council maintains two databases which contain information about its stormwater infrastructure:
- (a) First, there is a geographical information system (GIS) which shows graphically the location of relevant infrastructure and other parts of the Stormwater Network such as overland flow paths;
 - (b) Second, there is a data base known as "Eclipse" which contains amongst other things Council's financial asset register for stormwater infrastructure.
21. These data bases can be interrogated to provide information about the Stormwater Network including items of stormwater infrastructure in particular areas. I have caused this to be done for the Relevant Suburbs and for the results of the interrogation to be tabulated. Although the databases are in my experience fairly reliable, it is possible that small sections of the Pipe Network are omitted or incorrectly recorded. Examples of this come to Council's attention from time to time, particularly in the course of CCTV pipe survey inspections referred to in paragraph 34 below. Such information is then added to the data base.
22. The table below shows the lengths of stormwater pipes (referred to as drains in Attachment JJB-02), and gully and inlet connections in the Relevant Suburbs. Rosalie and Hill End have been included in Paddington and West End respectively.


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SUBURB	STORMWATER PIPES (km)	INLET CONNECTIONS (km)	TOTAL (km)
Auchenflower	7.82	2.70	10.52
Bellbowrie	18.79	6.99	25.78
Brisbane City	17.76	7.55	25.31
Bulimba	13.82	4.29	18.11
Chelmer	7.65	2.17	9.81
East Brisbane	10.12	3.45	13.57
Fairfield	6.78	1.73	8.52
Fig Tree Pocket	8.04	4.68	12.73
Fortitude Valley	14.71	2.90	17.61
Graceville	8.94	2.94	11.88
Hawthorne	8.12	2.93	11.05
Kangaroo Point	9.07	2.90	11.96
Milton	11.28	3.25	14.53
New Farm	18.03	3.95	21.98
Newstead	10.05	1.88	11.93
Norman Park	11.94	5.11	17.05
Oxley	17.15	6.89	24.04
Paddington (includes Rosalie)	17.18	7.16	24.34
Rocklea	17.19	6.59	23.79
South Brisbane	15.01	5.84	20.85
St Lucia	15.66	4.58	20.24
Teneriffe	5.05	1.78	6.83
Toowong	15.44	6.04	21.47
West End (includes Hill End)	13.66	3.60	17.26

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SUBURB	STORMWATER PIPES (km)	INLET CONNECTIONS (km)	TOTAL (km)
Yeronga	12.23	4.29	16.52
Totals	311.47	106.19	417.66

23. The table below shows the number of culverts in the Relevant Suburbs:

Suburb	Stormwater Culverts
Auchenflower	4
Bellbowrie	19
Brisbane City	1
Bulimba	2
Chelmer	3
Fairfield	8
Fig Tree Pocket	17
Graceville	1
Norman Park	5
Oxley	27
Paddington (includes Rosalie)	1
Rocklea	25
St Lucia	10
Toowong	6
Yeronga	5
Total	134

24. The table below shows a list of detention basins in the Relevant Suburbs:


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Suburb	Detention Basins
Oxley	3
Paddington (includes Rosalie)	1

25. The table below shows a list of back flow prevention devices in the Relevant Suburbs:

Suburb	Backflow Prevention Devices
New Farm	2
Newstead	1
West End	1
Yeronga	1

26. The back flow prevention device in Yeronga (Brisbane Corso) is comprised of four pipes each with tide gates. It was designed to prevent high tides entering the concrete lined open drain upstream of the culvert to prevent the build up of silt and to reduce the likelihood of the growth of mangroves. Elsewhere, back flow prevention devices (tide gates) have been installed on the end of the pipe outlet to reduce the impact of flooding on nearby properties and roads from water flowing back up the pipe from high tides.
27. The stormwater infrastructure for the Relevant Suburbs is set out in the three maps which are Attachment "JJB-02". Generally, stormwater pipes discharge either to a channel, creek or the River. Where the Pipe Network appears to be remote from a creek or the River, it is because the relevant pipes discharge to a channel, natural gully or watercourse, or overland flow paths.
28. Other important parts of the Stormwater Network are stormwater channels and overland flow paths. The maps which I have caused to be prepared also include constructed channels and overland flow paths.
29. The maps only show:
- (a) Council owned assets - as opposed to assets owned privately, or by the State or by other bodies, which are not included in Council's database; and

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- (b) Stormwater drains - as opposed to smaller secondary pipes linking inlets and gullies to the main network.

Maintenance of the Stormwater Network

30. Request 1 of the Notice seeks information about maintenance programs for flood mitigation infrastructure in the Relevant Suburbs. So far as I am aware from my own knowledge and from inquiries I have made within Council, maintenance in the Relevant Suburbs is carried out as part of the whole of City programs and activities carried out by Council. Those programs and activities are described below.


Inspection and maintenance of the Pipe Network (including gullies and inlets)

31. Council has an Asset Management Plan for Enclosed Stormwater Drainage Assets (**AMP-Enclosed Assets**) which deals comprehensively with management of such assets, a copy of which is Attachment "JJB-03". The AMP-Enclosed Assets sets out a summary of the practices for maintenance of condition and serviceability of the Pipe Network. Clause 2.4 relevantly provides:

"2.4 Current Level of Service

Currently enclosed stormwater drainage assets are providing a level of service that is effected by the current intervention levels for condition and serviceability, which are:

- *Blocked Pipes (roots, debris, sediment, etc) identified by complaint or inspection are listed for remedial works.*
- *Video and defect recordings are taken within the pipe network to determine structural and serviceability scores. The intention is to inspect all pipes every 15-20 years for the first 60 years of life, and then every 7-10 years until replacement or rehabilitation. Currently LAS are surveying 60-80 km of pipe each year.*
- *Pipes and manholes that are not structurally sound are listed for repair or replacement in either the quarterly maintenance program or annual asset renewal program.*
- *Gullies with components in poor condition are listed for repair or replacement in either the quarterly maintenance programs or annual asset renewal program.*
- *Gullies identified to be causing a serious safety hazard are made safe and repaired as soon as is practical.*


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- *Poor condition gully grates and gully grates on bike routes that are not bike-safe are listed for replacement as directed by the 15 year plan (this plan commenced in 2001).*
- *Gully tops, particularly in sags and leafy areas are cleansed on a regular basis. The frequency is dependent on the amount of leaf litter experienced. (Some locations have a long history and therefore cleansed up to 12 times / year).*
- *Gullies and pipelines that are known to be prone to siltation are cleaned out on a regular basis. The frequency is dependent on the amount of silt and debris historically experienced (over the past 1-5 years).*
- *Feedback on poor gully or pipeline performance or after local flooding is investigated and the gully or pipeline restored to safe and serviceable condition where appropriate. This feedback may also lead to listings in future capital works schedules for enclosed stormwater drainage asset renewal or creation through augmentation or relief drainage works.*
- *Local Stormwater Management plans also identify the need for enclosed stormwater drainage asset creation / enhancement and related capital works listings."*

32. I refer to the pipe survey referred to in the second dot point in the above quote. The pipe survey is an important part of Council's on-going inspection of the Pipe Network to identify maintenance and repairs required. It is my understanding that Council has had for some time a pipe survey program for its Pipe Network. Pursuant to this program Council develops, on an annual basis, an inspection regime for part of the Stormwater Network. This inspection regime provides the basis for maintenance operations. As I understand it, the criteria for inspection is developed each year, bearing in mind the funding and staffing resources and specialised equipment available and the issues which appear important. Criteria which may be important include:

- (a) flooding of parts of the Pipe Network;
- (b) the age of pipes and the period since their last inspection; and
- (c) recent infrastructure and residential developments.

33. As a consequence of the pipe survey, the surveyed assets are assessed and scheduled for maintenance. The results of the survey also provide a basis for scheduling rehabilitation or reconstruction works that are necessary to maintain design capacity. An example of a "Pipe Survey plan" is the 2010/2011 plan prepared by Council in September 2010, a copy of which is Attachment "JJB-04".

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34. In practical terms, when stormwater pipe is surveyed by Council's Pipe Survey Unit and Council's contractors, it is inspected using CCTV in conjunction with the condition assessment guidelines described in the Stormwater Assets Pipe Survey CCTV - Specification & Guide (SAPS Specification & Guide). A copy of the SAPS Specification & Guide is Attachment "JJB-05". The SAPS Specification & Guide contains procedures for inspecting pipes and recording and reporting maintenance issues. It also contains a standardised rating scale for overall performance of a particular part of the Pipe Network which allows an assessment for long term planning purposes of the state of that part of the network.
35. I am informed by Council officers that the process of planned pipe inspections began in approximately 1982 using manual techniques for pipes of 900 mm or greater, with CCTV inspection technique commencing in the mid 1990s. Since then, approximately 65% of the entire stormwater network has been inspected at least once with on-going budget expenditure to survey 80km of conduit annually. At this rate the present Pipe Network can be reinspected every 30 to 40 years.
36. The January flood event resulted in the 2010/2011 Pipe Survey plan referred to above being overtaken by events. As a result of the flood, Council officers revised the planning for pipe inspections to address, as quickly as possible, any potential maintenance and defect issues arising in the Pipe Network in the areas affected by flooding. To the extent that the Relevant Suburbs contained areas affected by flooding, they would have benefitted from this realignment of effort.
37. Attachment "JJB-06" is a copy of Asset Services Situation Reports (Sitreps) which record the progress made on post-event inspection of the Pipe Network as at 3 August and 31 August this year. All the Relevant Suburbs are shown in Table 1.1 of the 3 August 2011 Sitrep apart from Teneriffe, Hill End and Rosalie which are included in areas P, J and Q respectively.
38. In addition to the pipe survey process, the identification of maintenance issues occurs as a result of reports from residents or observations made by local maintenance staff. Local maintenance staff are well placed to carry out this role. Many of them are very familiar with their areas and the particular aspects of the Stormwater Network which need regular attention of a minor kind. Because local maintenance staff spend most of their time in the field, they are well placed to identify other maintenance issues that might arise and refer them to regional maintenance crews to be addressed.


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39. It is my understanding that detailed records are not kept of this more informal maintenance process. However, if field staff generate work by regional maintenance there would be a record created for that work.

Maintenance of culverts

40. Inspections of culverts are straightforward as most culverts can be visually inspected. Council has an Asset Management Plan for Bridges and Culverts (**AMP-Bridges and Culverts**) which provides for the inspection and maintenance of Culverts in accordance with the approach taken to bridges under the Bridge Inspection Manual issued by the Queensland Department of Main Roads and set out in the AMP-Bridges and Culverts. Attachment "**JJB-07**" is a copy of the AMP-Bridges and Culverts. Maintenance and inspection is dealt with at pages 33 to 40.
41. Notwithstanding the general application of the AMP-Bridges and Culverts to all culverts, a different approach is taken to culverts less than 900 mm in height. For these smaller culverts, the rigorous approach applicable to bridges is not considered necessary or appropriate. Smaller culverts are inspected in response to customer services requests or after a major storm or flood event, and they are also inspected when Council's Field Services officers are completing normal duties in the vicinity of particular small culverts.

Maintenance of detention basins

42. Council is in the process of preparing Asset Maintenance Management Plans (**AMMPs**) for the detention basins in the City, focussing first on the larger assets. An example is the AMMP for the Beryl Roberts Park Detention Basin, which is the first of Council's AMMPs completed for a detention basin. A copy of the AMMP for Beryl Roberts Park Detention Basin is Attachment "**JJB-08**". Where an AMMP is in place, it mandates a schedule of inspection and maintenance. For major infrastructure like the Beryl Roberts Park Detention Basin, the AMMP provides for a detailed Hierarchy of Maintenance Inspections.
43. Council is currently developing AMMP's for detention basins in the City as follows:
- (a) Gubberly Creek Detention Basin;
 - (b) North Basins (Telegraph Road Basin);
 - (c) South Basins (Hamish Street Basin);
 - (d) East Basins (Barrack Road Basin);
 - (e) [REDACTED] West Basins (Gordon Road and Sedgley Street Basins).

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44. Additional Basin sites are to be included in the draft AMMPs for the North, South, East and West Basins. There is presently no AMMP for the four Detention Basins in the Relevant Suburbs.
45. Where no AMMP is in place, I am informed that Council undertakes maintenance in response to reports by field staff and residents. As I have already explained, local maintenance staff are familiar with problem areas and check on Detention Basins during rainfall events.

Backflow prevention devices

46. So far as I am aware, there is no documented inspection and maintenance regime for backflow devices. I am informed that as a matter of practice, backflow prevention devices are checked for effective operation prior to "King Tides" at least three times in summer and once in winter.

Channels and Natural Water Courses

47. Although natural and modified channels and water courses are not ordinarily considered to be stormwater infrastructure, they are an important part of the Stormwater Network and are also maintained by Council. Council is developing AMMPs for channels and water courses previously the subject of mitigation works designed to reduce local flooding impacts, amongst other things from stormwater flows. An example of one such AMMP is the Oxley Creek Flood Mitigation Assets AMMP a copy of which is Attachment "JJB-09". It deals with maintenance requirements at pages 22 to 23. Oxley Creek runs through Oxley, Chelmer, Rocklea and Graceville of the Relevant Suburbs.
48. So far the only AMMP for channels or natural water courses is the Oxley Creek AMMP. There are presently the following further AMMPs in preparation:
- (a) Breakfast Creek;
 - (b) Kedron Brook;
 - (c) Stable Swamp Creek;
 - (d) Norman Creek;
 - (e) Perrin Creek;
 - (f) Zillman Waterholes; and
 - (g) Gertrude Street open channel.


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49. It is intended that the AMMPs will formalise current maintenance practices that Council delivers by way of works undertaken by maintenance staff, that is, inspection regime, de-silting, vegetation management, weed spraying and clearing of debris etc.

2. The Council's planning scheme policy or other Council policy about sewerage or stormwater drainage infrastructure applicable to the Relevant Suburbs at any time since 1 October 2010.

Council policies on Stormwater and Sewerage Infrastructure Generally

50. There are two categories of policies which relate to stormwater and sewerage infrastructure.
51. The first category comprises planning scheme policies which apply in the assessment of assessable development under the *Sustainable Planning Act 2009* (Qld) (SPA). These policies relate to the requirements which can be imposed for the provision of stormwater and sewerage infrastructure and other aspects of the Stormwater and Sewerage Networks directly related to the particular development proposed (ie. non-trunk infrastructure).
52. The range of conditions for a development approval in relation to non-trunk infrastructure are a function of the scale of the development. A major subdivision will have to provide within the subdivision itself an effective Stormwater Network including necessary stormwater infrastructure, while an infill development in an established area might require only minor stormwater infrastructure connecting to Council's existing Stormwater Network. Council's power to impose conditions in this respect is recognised by s. 626 SPA.
53. The second kind of policies comprise policies relating to the City wide Stormwater Network including trunk infrastructure. Trunk infrastructure refers to Council owned infrastructure involving pipes equal to or greater than 750 mm diameter and associated infrastructure. Those policies deal, as I understand it, with two areas: Stormwater Network upgrading and the recovery of contributions from applicants for development approvals towards the costs of current and future trunk infrastructure. With recent legislative changes I understand that contributions are dealt with by a combination of Brisbane Adopted Infrastructure Charges Resolution (No.1) 2011 (**Resolution**), and the Draft State Planning Regulatory Provision (Infrastructure Charges).


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54. As I understand the position, Council no longer has a role in making policy for sewerage infrastructure (and water reticulation infrastructure) and that the powers in respect of that kind of infrastructure has passed to QUU under the Water Distribution Act.

Council Planning Scheme Policies

55. I am not familiar with the detail of planning scheme policies relating to sewerage and stormwater infrastructure and I have little knowledge of how the development assessment process operates in this respect. I have made some inquiries of other Council officers including officers of Development Assessment branch in this regard and they have provided me with some basic information which allows me to identify how the design standards are incorporated in the planning scheme. If the Commission seeks a more detailed and precise response on this issue, evidence will need to be obtained from another Council officer with development expertise.
56. I have been informed that the planning scheme contains provisions relevant to stormwater infrastructure through the Stormwater Management Code and the Waterways Code which, amongst other things, call up detailed provisions in the Subdivision and Development Guidelines relating to stormwater design standards. I deal in more detail with these design standards in my response to Request 5 of the Notice.
57. Council also develops from time to time Local Stormwater Management Plans (LSMPs). These plans are, as I understand it, also planning scheme policies. The plans are primarily concerned with identifying deficiencies and rectifying local flooding issues. They also make provision for considerations in respect of assessment of future development. Some of these plans apply to local catchments in some of the Relevant Suburbs. I deal with these further in my response on Request 5 of the Notice.

Other Policies about Stormwater Infrastructure

Stormwater Design Standards

58. Council also has had for some time a policy relating to the up-grading of the existing Stormwater Network in established areas. I deal further with policy for up-grading design capacity in my response to Request 5 of the Notice.



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Recovery of contributions by applicants for development approval to the cost of the Council's Trunk Infrastructure

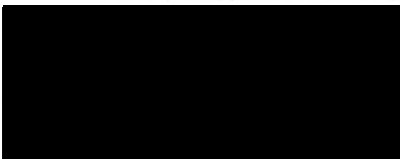
59. As I understand it, Council has in recent years recovered contributions from applicants for development approvals contributions to the cost of current and anticipated future infrastructure, including for stormwater and, until recently, sewerage infrastructure. I am aware that in recent years, the process for levying the equivalent of head works contributions has been transferred from the planning scheme to a separate statutory scheme under the *Integrated Planning Act* and now the SPA. The manner in which the SPA deals with this issue is complex and not within my knowledge, except in the most general terms.

3. The Council's drainage plans applicable to the Relevant Suburbs at any time since 1 October 2010.

60. I refer to my response to Request 1 of the Notice and in particular to the maps referred to in paragraph 27. Those maps show plans of Council's stormwater infrastructure and other elements of the Stormwater Network as it currently exists in the Relevant Suburbs.

61. In addition, Council has further plans for stormwater infrastructure which are applicable to the Relevant Suburbs since 1 October 2010. These plans fall into three categories:

- (a) the first category comprises plans of work completed in the 2010/2011 financial year to upgrade the Stormwater Network in areas falling within the Relevant Suburbs. It might be that not all of this work has as yet been included in Council's relevant data bases. Attachment "JJB-10" comprises copies of those plans;
- (b) the second category comprises plans and relevant supporting documents for work to be completed in the 2011/2012 financial year to upgrade the Stormwater Network in areas falling within the Relevant Suburbs. Attachment "JJB-11" comprises copies of those supporting documents and plans;
- (c) the third category comprises plans and/or relevant documents relating to work intended to be completed in future years to upgrade the Stormwater Network in areas falling within the Relevant Suburbs. Attachment "JJB-12" comprises copies of the relevant documents and plans.


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62. There are further works contemplated in the Relevant Suburbs arising from LSMPs for areas in those suburbs which have not yet reached the stage of preparation of plans.

4. The standards applicable to property owners or developers who seek to connect to a Council stormwater drain or sewerage infrastructure owned by Queensland Urban Utilities within the Relevant Suburbs at any time since 1 October 2010.

Connection to Stormwater Drains

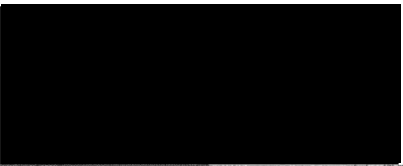
63. I am not personally familiar with the detail of the applicable standards the subject of this Request of the Notice. However, I understand the position to be as follows, based on information from Council officers familiar with the issue.
64. For building work, the applicable standards for connection to a Council stormwater drain are contained in the Building Code of Australia and the Queensland Development Code which are called up by s. 30 of the *Building Act 1975* (Qld). For other aspects of assessable development under the Brisbane City Plan 2000, the applicable standards for connection to a Council stormwater drain are contained in Part B Chapter 2, Part C Chapters 3 to 5, and any relevant design and construction procedures set out in Part D, of Council's Subdivision and Development Guidelines 2008.

Connection to Sewerage Infrastructure

65. The standards for connection to sewerage infrastructure owned by QUU are not a matter for Council.

5. The stormwater design capacity and urban run-off capacity, sewerage design capacity and the most recent review of these capacities, including any plans to upgrade, for the Relevant Suburbs.

66. I am familiar with the expression "stormwater design capacity" and can address Request 5 of the Notice by reference to that concept. I am not familiar with the expression "urban run-off capacity" and I am unsure what the Commission means by that expression. Accordingly this part of my Statement address stormwater design capacity.


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Sewerage Design Capacity

67. As stated above, following water reforms introduced by the State of Queensland in July 2010, responsibility for Brisbane's sewerage infrastructure lies with QUU.

Stormwater Network Design Capacity for New Development

68. Design standards for stormwater capacity are specified for new developments in the Subdivision and Development Guidelines. The guidelines apply to all development including development in the Relevant Suburbs. As I have said, I am not familiar with how those guidelines are incorporated into the planning scheme. Those guidelines, relevantly, apply the standards specified in the Queensland Urban Drainage Manual (QUDM). Clause 3.2 of Chapter 2 of Part B of the Subdivision and Development Guidelines provides:

"The major and minor drainage systems as described in Section 5.03 of QUDM forms the basis of the drainage system within the urban area. The design standards are given in Table B2.1.

The major drainage system is that part of a drainage system in a catchment that is designed to convey rare design storms. The system may comprise open space floodway channels, road reserves, pavement expanses, overland flow paths, natural or constructed waterways, detention/retention basins and other major water bodies. Where the major system is within the road reserve, the design standard is the 50 year ARI storm event.

The minor drainage system is that part of a drainage system in a catchment that controls flows from the minor design storm such as the 2 year ARI and 10 year ARI events. The system usually comprises kerbs and channels, roadside channels, gully inlet pits, underground pipes, manholes and outlets."

TABLE B2.1 DESIGN STANDARDS FOR MAJOR/MINOR DRAINAGE SYSTEMS

Development category	Design parameter	Design standard
2-5 dwelling units per hectare (typically in Rural/Environmental Protection Areas where predominant uses include house on large allotment and farm)	Minor drainage system	Minimum 2y ARI
	Major drainage system	Minimum 50y ARI (less piped flow if applicable)
>5 and ≤ 20 dwelling units per hectare (typically in Low Density Residential Area comprising mainly one or two	Minor drainage system	Minimum 2y ARI
	Major drainage system	Minimum 50y ARI (less piped flow

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Development category	Design parameter	Design standard
storey single houses)	Roofwater drainage	if applicable) Level II QUDM Section 5.13.4
>20 dwelling units per hectare (typically in Low-medium to High Density Residential Areas comprising multi-unit dwellings)	Minor drainage system	Minimum 10y ARI
	Major drainage system	Minimum 50y ARI (less piped flow if applicable)
	Roofwater and lot drainage	Level III and IV QUDM Section 5.13.4
Industrial areas	Minor drainage system	Minimum 2y ARI*
	Major drainage system	Minimum 50y ARI (less piped flow if applicable)
	Roofwater and lot drainage	Level IV QUDM Section 5.13.4
New use centre activities (incorporating a wide range of commercial, retail and residential uses)	Minor drainage system	Minimum 10y ARI
	Major drainage system	Minimum 50y ARI (less piped flow if applicable)
	Roofwater and lot drainage	Level IV and V QUDM Section 5.13.4
Major roads (district access, suburban route, arterial route, major industrial access through road)	Kerb and channel flow	Minimum 10y ARI
	Cross drainage (culvert) flow	To suit flood immunity requirement of Chapter 1 of Part A of this document
	Roadway flow width & depth limits	Refer QUDM Table 5.04.1
Minor roads (local access, neighbourhood access, minor industrial access)	Kerb and channel flow	Refer relevant development category, minimum 2y ARI
	Cross drainage (culvert) flow	To suit flood immunity requirement of Chapter 1 of Part A of this document
	Roadway flow width & depth limits	Refer QUDM Table 5.04.1

* For industrial roads that will be major through roads, the minor drainage design will need to increase to 10y ARI.

69. I understand that the above standards are generally consistent with those which have applied since the adoption of QUDM by Council in June 1994 as set out in the memorandum referred to in paragraph 58 above. Further, I understand that there have been revisions to the QUDM manual from time to time since June 1994, but that the stormwater design capacity standards

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have not been altered. It is likely that Council would adopt any revisions to stormwater design capacity made to QUDM.

70. I am not aware of any plans to upgrade those standards either for the Relevant Suburbs or generally. Council applies equivalent standards to those contained in the Subdivision and Development Guidelines in planning for greenfields extensions to the Stormwater Network.

Council's approach to upgrading existing Stormwater Network capacity

71. Notwithstanding the design capacity standards currently applying to new development, there are many parts of the City where the Stormwater Network does not perform to those standards.
72. The first stormwater infrastructure was constructed in Brisbane in 1860 when the local population was about 5,000 people. Currently serving a population in excess of 1,000,000 people, Council's network of stormwater drainage infrastructure has an estimated length in excess of 2,640 km and a replacement value of \$2.9 billion.
73. Drainage in most of the older areas of Brisbane City was constructed prior to the introduction of modern design standards, when Council had less control over the subdivision of land and the construction of dwellings. In addition, the density of development was lower and there was less recognition of flood hazards and the importance of preserving natural flow paths for stormwater.
74. As a consequence, some older areas of Brisbane do not meet current design requirements. Residents within these areas suffer nuisance flooding which varies from yard pondage to flooding of low-lying utility areas. In more extreme instances, habitable areas are flooded at an unacceptable frequency. Many of the Relevant Suburbs are older areas of Brisbane which have areas which have stormwater flooding issues which need to be addressed.
75. I understand that Council has had for many years undertaken relief drainage schemes for parts of the City which have difficulties with stormwater flooding issues. Attachment "JJB-13" is a memorandum dated 23 October 1995 which reflects the approach taken by Council in 1995 to such relief schemes.
76. Prior to about 1997, I understand that Council's approach to relief drainage schemes was generally responsive to particular problems. From about 1997 (when Council obtained a report on relief drainage strategic planning a copy of which is Attachment "JJB-14"), Council has adopted a more proactive approach to relief drainage schemes. While such schemes might

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still be in response to particular events, Council also undertakes the preparation of LSMPs for older areas.

77. LSMPs have been prepared for a number of prioritised catchments. The purpose of the LSMPs is to assess the existing stormwater drainage system capacity, identify the problem areas within the catchment and the cause of problems, and develop relief drainage options to reduce inundation. The plans provide an assessment of the extent of flooding before and after relief works are in place for existing and ultimate catchment development and identify the overland flow paths to be protected from development. The LSMPs which involve catchments which are in general terms in the Relevant Suburbs are set out in the table below:

LSMP	DATE	RELEVANT SUBURB
West End Local Stormwater Management Plan Technical Report	October 2004	South Brisbane, West End
Local Stormwater Management Plan Albion Catchment Technical Report	July 1999	Albion
New Farm - Teneriffe Catchment Report On Relief Drainage Investigation	March 1997	New Farm, Teneriffe
Relief Drainage Investigation Sydney Street, Merthyr Catchment	April 1997	New Farm
Castlemaine Street - Caxton Street Catchment, Milton Report On Relief Drainage Investigation	18 September 1996	Milton
Stratton Street Catchment Relief Drainage Investigation	June 1997	Newstead
Stratton Street Drainage Report on Additional Investigations	November 1997	Newstead, Fortitude Valley, CBD
Stratton Street Drainage Report on Revised Drainage Relief Options	September 1998	Newstead, Fortitude Valley, CBD
Water-Campbell Streets Catchment Relief Drainage Investigation	Undated	Fortitude Valley
Faulkner Park, Graceville Local Stormwater Management Plan	Undated	Graceville, Chelmer

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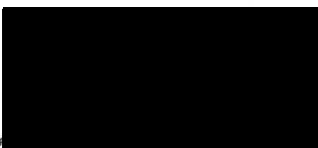
Long Street East, Graceville Local Stormwater Management Plan	January 2003	Graceville
Local Stormwater Management Plan Pashen Creek, Hawthorne Catchment	March 1998	Bulimba, Hawthorne, Norman Park
Yeronga Local Stormwater Management Plan	June 2003	Yeronga, Fairfield
Local Stormwater Management Plan Technical Report Western Creek Catchment Milton	June 2004	Rosalie, Milton
Langsville Creek Local Stormwater Management Plan	approx. 2003	Auchenflower, Toowong

78. Council's LSMP process has identified significant and expensive works to improve, so far as reasonable in the circumstances, the capacity of particular problem areas in the Stormwater Network. In addition, Council's investigations in response to particular complaints also generate recommendations for works to improve the capacity of the Stormwater Network.
79. At present, the total cost to carry out all upgrading works identified by the above investigations vastly exceeds any possible capacity of Council to undertake. Accordingly, Council adopts a prioritisation methodology to try to match the most pressing works to available resources.
80. The first step is to categorise the character of the flooding issue by reference to the following classes:
- (a) S Safety Issue
 - (b) A Flooding of Living Areas
 - (c) B Flooding of Utility Areas
 - (d) D Flooding of Other Properties (commercial, industrial)
 - (e) E Flooding on Roads
 - (f) F Flooding of Parks
 - (g) H Other.
81. Priority is allocated to works in the order set out in the previous paragraph.


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82. The works within each category are also very extensive. Therefore they are further prioritised by reference to:
- (a) cost effectiveness;
 - (b) severity of flooding;
 - (c) number of affected residential properties;
 - (d) frequency of flooding events/frequency of flooding inundation;
 - (e) weighting factors are applied to each property based on the category of inundation - that is, flooding to living areas, utility areas or yards of residential dwellings.
83. Council maintains a spreadsheet that deploys a formula for prioritising works in accordance with the criteria in the previous paragraph.
84. The total cost of works identified in the categories S and A alone is very substantial. Attachment "JJB-15" is a copy of the spreadsheet maintained by Council in respect of just those works, prioritised as specified above. It shows that there is \$875M in works which have been identified as at 24 June 2010. Attachment "JJB-16" is a copy of that spreadsheet showing just such works in respect of the Relevant Suburbs. Despite the accumulated cost of works, I understand that further works continue to be identified each storm season. Frequently, the costs and complexity require construction of relief works to be staged over a number of financial years.
85. Attachment "JJB-17" is a copy of Council's five year rolling program comprised of the current financial year construction works and four years of future works. As is apparent from the program, Council is committed to deliver stormwater infrastructure to minimise flooding impacts to residential properties. The projects allocated under specific years are subject to change dependent upon future budget funding and other high priority projects identified during any future flood events.


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6. Whether and how the Council monitors the capacity of its stormwater drainage infrastructure, and in particular, assesses the suitability of its capacity for the existing and future need.

86. Council monitors the performance of its existing stormwater infrastructure by its inspection and maintenance practices set out in my response to Request 1. Council assesses the suitability of its existing Stormwater Network, including stormwater infrastructure for existing need by the processes identified for assessing adequacy of the Stormwater Network set out in my response to Request 5 of the Notice.
87. Council's LSMPs also assess the suitability of the capacity of the Stormwater Network for future need in the areas covered by each plan. This is done by developing the LSMP by taking into account the likely future development in the area based on the current City Plan.
88. Outside the LSMP process, Council is presently in the process of developing a Priority Infrastructure Plan (PIP) which is called for by the provisions of the SPA. As I understand it, the PIP remains in draft. However, prior to the PIP process, Council had undertaken the development of Stormwater Management Plans (SMPs). In contrast to LSMPs, SMPs were specifically directed at planning the Stormwater Network necessary to address future need in likely greenfield sites for future development. Attachment "JJB-18" is a plan showing areas subject to both LSMPs and SMPs for the Relevant Suburbs and adjacent areas included in the particular plan. As can be seen, the SMPs relate to areas of future development for which there is as yet no extensive constructed Stormwater Network.
89. Further, as set out in paragraph 95 below, Stormwater Network Trunk Infrastructure Plans showing future infrastructure have been prepared for use in the PIP. To the extent that those plans are not based on LSMPs or SMPs, they will have been derived from computer modelling of likely future need.

7. The existing and future need for stormwater drainage infrastructure within the Relevant Suburbs, including any report, study, investigation or briefing note prepared or commissioned by Council.

90. So far as I am aware, Council has the following documents which respond to Request 7.

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[Redacted]
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91. First, there are a number of LSMPs which relate to areas within some of the Relevant Suburbs as identified in paragraph 77 above.
92. Second, there is the list of proposed major drainage works for residential areas relating to the Relevant Suburbs at Attachment JJB-16.
93. Third, to the extent that planning exists for works to be undertaken in the current or future financial years to address stormwater issues in the Relevant Suburbs, those documents appear in Attachments JJB-11 and JJB-12.
94. Fourth, there is a SMP which covers the Pullen Pullen Creek area which impacts on Bellbowrie.
95. Fifth, there are the Stormwater Network Trunk Infrastructure Plans prepared for the PIP which identify planned future stormwater infrastructure for the whole City including the Relevant Suburbs. There would be an overlap between the works identified in the LSMPs and the future works shown in those plans. Attachment "JJB-19" is a copy of the Stormwater Network Trunk Infrastructure Plans.

8. Whether and how the Council monitors the capacity of the sewerage infrastructure owned by Queensland Urban Utilities and, in particular, assesses the suitability of its capacity for existing and future need.

96. Council does not, nor is it required to, monitor the capacity of the sewerage infrastructure owned by QUU. However, the capacity of such infrastructure will be relevant to the consideration of future infrastructure and planning requirements.

9. The Council's regulatory role in relation to property owners or developers who seek to connect to sewerage infrastructure owned by Queensland Urban Utilities.

97. Although I have had some experience in relation to the matters the subject of Request 9 in the past, I am not familiar with the current position in respect of those matters. It is my understanding however, that the position is as follows.
98. Connection to sewerage infrastructure is affected by the provisions of the following regulatory regimes:

(a) The development assessment process under the SP4;

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- (b) Connection to or interference with a service provider's infrastructure under the *Water Supply (Safety and Reliability) Act 2008* (Qld);
- (c) Compliance assessment of regulated plumbing or drainage work under the *Plumbing and Drainage Act 2002* (Qld).
99. Council's role in relation to sewerage infrastructure during the development assessment process is not addressed in any detail in this Statement for the reasons given in paragraph 55 above.
100. Council has no regulatory role in relation to connection to a Distributor-Retailer's sewer infrastructure under the *Water Supply (Safety and Reliability) Act*.
101. Council has a role in relation to compliance assessment under the *Plumbing and Drainage Act* for certain "regulated work".
102. The *Plumbing and Drainage Act* requires that a connection, disconnection or change to a Distributor-Retailer's infrastructure be approved by or for the Distributor-Retailer, or alternatively, that Council be given written advice by the Distributor-Retailer that such approval is not required for particular connections.

10. The use of backflow prevention devices, including any plans to expand, upgrade or investigate the use of these devices, in the Relevant Suburbs.

103. Backflow prevention devices have been used primarily to reduce tidal water entering to drainage systems during high tides in low lying areas. Council is maintaining a number of backflow prevention devices in tidally affected areas. Attachment "JJB-20" is a list of locations of backflow prevention devices. Only five such devices are in any Relevant Suburb. Those devices are located in New Farm, Yeronga, West End and Newstead.

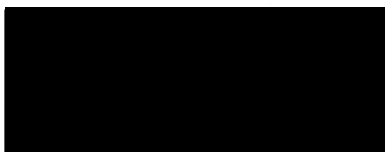
104. The Flood Response Review Board (FRRB) recommended:

"Council investigate the feasibility of the installation of devices to prevent back flow 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 back flow flooding have responsibility for the oversight of the maintenance of the device in working order. No back flow 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."

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105. Consistent with the recommendation of the FRRB, investigations have commenced to assess the back flow flooding experienced in January 2011 and the feasibility of installing back flow prevention measures. A project brief for that purpose was prepared by Council and dated 7 July 2011. Attachment "JJB-21" is a copy of the project brief. MWA Environmental has been retained to carry out those investigations. The initial stage of the investigations involves a case study on three areas:
- (a) Milton (including Rosalie);
 - (b) New Farm; and
 - (c) CBD.
106. Community consultation and information sessions have already commenced. Attachment "JJB-22" is a fact sheet produced by Council in respect of the investigation process. Attachment "JJB-23" are maps showing the areas the subject of the back flow case study investigation.



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I make this statement conscientiously believing the same to be true, and by virtue of the provisions of the Oaths Act 1867 (Qld).

Signed and declared by Joseph John Bannan at
Brisbane
in the State of Queensland
this 8th day of September 2011
Before me:



Signature of person before whom the declaration is made



Signature of declarant

SCOTT WILLIAM SHARP (SOLICITOR)

Full name and qualification of person before whom the declaration is made