Fairfield City Overland Flood Study

- Fairfield City Council
- December 2004

In association with

FAIRFIELD CONSULTING SERVICES

A Division of Fairfield City Council

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1. Introduction

Fairfield City Council (FCC) commissioned Sinclair Knight Merz (SKM) in April 2003 to undertake Stage 1 of the Local Overland Flow Path Study for the entire catchment area of Prospect Creek located within FCC Local Government Area (LGA). This study was undertaken jointly by SKM and Fairfield Consulting Services (FCS).

1.1 Background

Like other Councils in NSW, Fairfield City Council (FCC) needs to address the significant changes that the 2001 NSW Floodplain Management Manual requires, especially with the inclusion of overland flooding in the floodplain management process. This has increased Councils' responsibility and risk considerably. In addition, the floodplain manual requires Councils to consider the impact of flooding for the PMF (Probable Maximum Flood).

1.2 Need for the Study

The NSW Floodplain Management Manual (2001) discusses the different types of local flooding problem and concludes that it is a matter of scale. At the lower end of the scale, minor flooding may result from a number of sources including blockage of drainage pits and pipes. At the upper end of the scale, major flooding can occur due to water flowing along natural floodways or across land due to the runoff exceeding the capacity of the trunk drainage system.

Fairfield LGA covers an area of around 102.5 km^2 and approximately 191,000 people live in the municipality according to the 1999 census report. Within the LGA there are typically old watercourses and tributaries that have been piped over the years. Unfortunately, most of the flow paths are in urban areas with direct impact and potential for damage to properties and hazard to residents.

FCS has undertaken, or been involved in a number of creek and river flood studies for FCC over the last few years including:

- Smithfield West Voluntary House Raising Program
- Canley Vale Voluntary House Raising Program
- Cabramatta Creek Flood Study
- Prospect Creek Flood Study
- Georges River (FCC section) Flood Study

These studies provide accurate flood levels in waterways that will be invaluable in planning development on and close to the floodplain. However there are many other areas in Fairfield which are potentially flood prone but have not been studied or mapped.

FCC has identified 31 creeks and overland flow paths within the LGA, see **Table 1-1**, which need to be assessed to determine flood levels, areas inundated and identification of flood prone properties. Flood prone properties near the major creeks have been identified from previous flood studies but the location and risk posed by the major overland flow paths are not well understood.

- **Table 1-1 Proposed Flood Studies**[1]

Catchment	Creek / Drainage Area
Major Overland Flow Paths	Smithfield
	Smithfield West
	Yennora
	Cabramatta West
	Cabramatta Golf Course
	Prout Creek
	Links Avenue
	Alick Street
	St Elmos Drain
	Wrentmore Street
	Bellingers Drain
	Long Creek
	Elizabeth Street/Meadows Road
	Porteous Road
	Mataro Close
	Eurabbie Street
	Moonshine Avenue
	Haywood Close
	Shackel Avenue
Prospect Creek	Prospect Creek (upper and lower)
	Orphan School Creek
	Clear Paddock Creek, including Wilson and Henty Creeks
	Green Valley Creek
	Burns Creek
	Edensor Park Creek
	Wetherill Park Industrial Area Channel and Tributary
Cabramatta Creek	Lower Cabramatta Creek
Georges River	Covers Lower Prospect Creek and Cabramatta Creek
Hawkesbury/Nepean (rural area)	Ropes Creek
	Reedy Creek
	Eastern Creek

[1] While **Table 1-1** lists all creeks and flow paths, this study is only related to the overland flow paths. The exact area inundated (and therefore which blocks are flood prone) from creek flooding will be assessed at a later date

FCC has been using the information available in drainage complaint registers, drainage studies, mapping of the major trunk drainage systems, etc. to identify 'major' flow paths within the LGA. Currently FCC advises property owners affected by overland flooding by way of a notification on a Section 149 (5) Certificate. There is also a reference on the Section 149 (2) Certificate that advises further information is available on the Section 149 (5) Certificate. However, FCC is concerned that insufficient information is available to adequately identify overland flooding and the properties that may be affected because of local overland flooding. FCC is also concerned about the potential legal exposure that may accompany this situation.

Identifying properties at risk of overland flooding within the entire LGA is a major undertaking. Instead of undertaking the study for the entire LGA in one step, FCC decided to undertake the overland flood study in a number of stages. At the first stage (this study), a preliminary risk assessment will be undertaken for one major catchment, to establish priority for detailed overland flood studies. Detailed overland flood studies for different areas will then be undertaken on the basis of the availability of funding and resources.

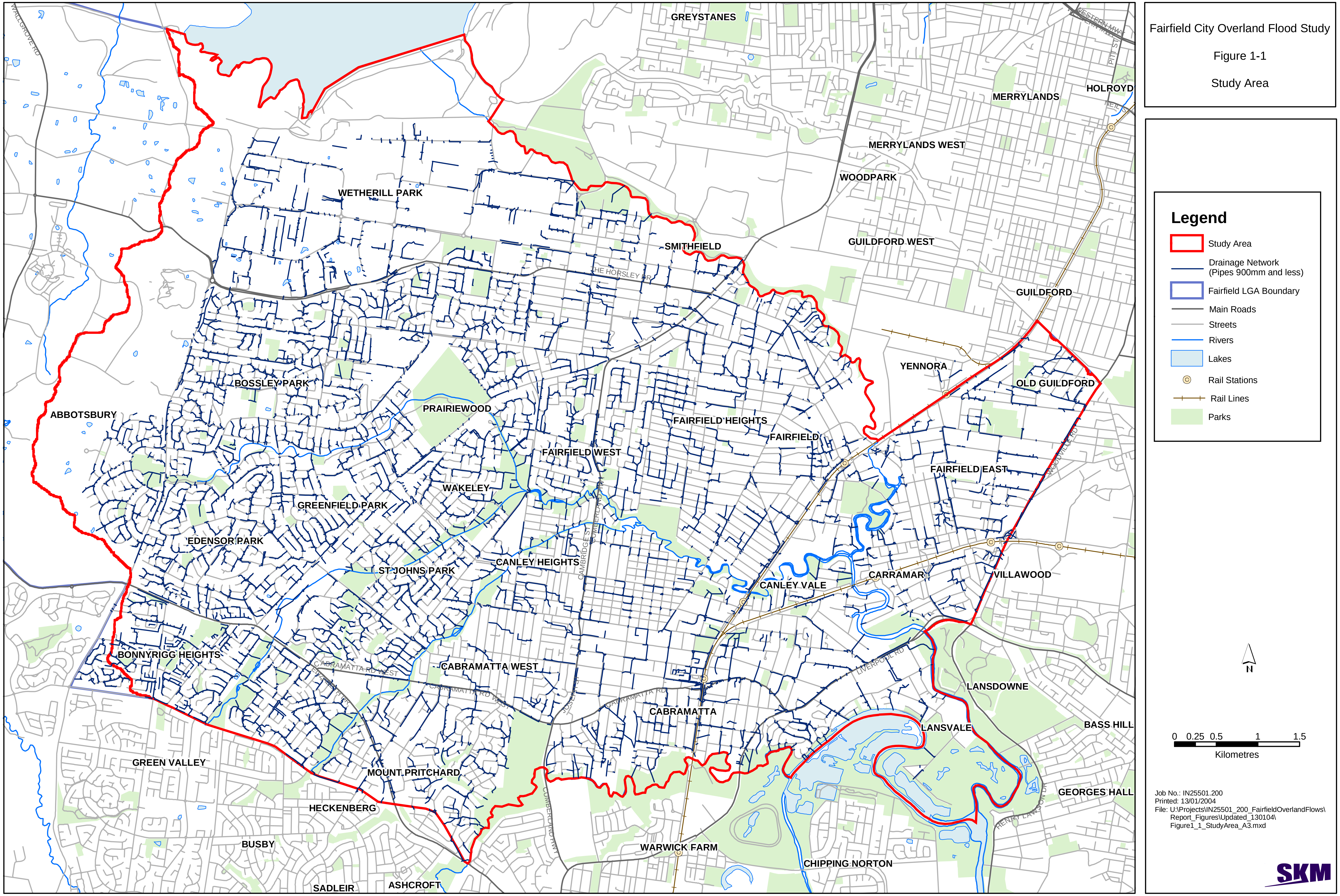
1.3 Study Area

Fairfield LGA lies within part of the catchments of Georges River, Cabramatta Creek and Prospect Creek. However of the total LGA of 102.5 square kilometres, approximately 70 square kilometres lies within Prospect Creek catchment.

The Prospect Creek catchment within FCC area includes many undefined overland flow paths and so it was decided that the study area should cover the entire catchment area of Prospect Creek within the LGA. The study area also includes all areas located within the LGA draining into Cabramatta Creek and Georges River. The study area is shown in **Figure 1-1**. While there are many major trunk drainage systems within the study area, a number of properties may be at risk of flooding due to insufficient capacities of the trunk drainage systems and/or because the properties lie on overland flow paths.

In a study of this nature, a decision needs to be made as to how far up a catchment the study should proceed. Clearly at the top of the catchment, there is no risk of flooding but as the catchment becomes larger, the flows increase and the risk of flooding becomes greater. In consultation with FCC it was decided to commence investigation of areas that are drained by stormwater pipes 900mm or smaller. The pipe drainage network for the study area is shown in **Figure 1-1**.

Fairfield City Council has also implemented an On-Site-Detention (OSD) Policy within the City's urban area to offset the impact of increased density of development. The likelihood of more red roofs and concrete, especially in the older areas of the City, as an outcome the introduction of Medium Density Infill Housing, was considered by the Council to be of concern in terms of the changed flow regime and the capacity of the existing drainage system to accommodate the increased rate of stormwater runoff.



Fairfield City Overland Flood Study

Figure 1-1

Study Area

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It has been some years since the introduction of the OSD Policy and the local government area is now almost fully developed with very few properties remaining with the potential for infill development. Any redevelopment of a site will be subject to the provisions of the OSD Policy to limit stormwater discharge from the site in a controlled way so that the existing downstream flooding problems are not exacerbated.

1.4 Objectives

In consultation with FCC, it was agreed that the objectives of the study are to:

- Identify major overland flow paths within the study area;
- Identify properties at risk of local overland flooding;
- Assess provisional flood hazard to identified properties due to local overland flooding for the 1:20 AEP (Annual Exceedance Probability), 1:100 AEP and the PMF (Probable Maximum Flood);
- Carry out field verification of identified overland flow paths at selected locations; and
- Rank drainage areas in terms of severity of flooding for further investigations.

1.5 Report Outline

This report presents the outcome of the Stage 1 investigations on the Preliminary Hazard Assessment to properties due to local overland flooding. The report includes the sections shown in the Table below:

Section	Outline of Content of Section
2. Available Data	This section outlines the data that was available to this study;
3. Overland Flow Paths	This section outlines the process of identifying overland flow paths within the study area;
4. Properties at Risk of Overland Flooding	This section outlines how properties at risk of overland flooding were identified, and flow velocity and flood depths in the vicinity of the identified properties were estimated;
5. Provisional Flood Hazard	This section details the provisional flood hazard categories adopted in this study and the outcomes of the provisional flood hazard analysis;
6. Ranking of Drainage Areas	Ranking of the selected drainage areas within the study catchment are discussed and evaluated in this section;

Section	Outline of Content of Section
7. Conclusions and Recommendations	This section concludes the study and recommends future actions;
8. References	This section contains a comprehensive list of references used to undertake this project.

Further details on the various aspects of this study are provided in the following appendices:

- Estimation of Design Floods **Appendix A**;
- Validation of Overland Flow Paths **Appendix B**;
- Local Overland Flow Path Map **Appendix C** and
- Properties at Risk of Overland Flooding **Appendix D.**

2. Available Data

The following data were collated and reviewed to identify any gaps in the data:

- Airborne Laser Survey (ALS);
- AusImage Aerial photography;
- SKM Building Polygon data set;
- 2m digital contours;
- Digital Cadastre;
- GIS layer on Drainage Pipes;
- Overland Flow Trouble Spot Maps (hard copy); and
- RAFTS model for Prospect Creek.

The relevance and use made of the data is described below.

2.1 Airborne Laser Survey

The Airborne Laser Survey data that was used in this study were collected for the entire LGA in January 2003. The thinned ground points were used. Following initial data collection, a data reduction process was undertaken to reduce the density of the points. Also, removal of non-ground points was carried out. This included the removal of levels on buildings, bridges and over/underpasses.

A validation process was carried out on this data at the outset of this study, by generating 0.5m contours over the area.

2.2 Other Data

2.2.1 Ausimage Aerial Photography

Aerial Photography was used extensively in this study, mainly for data validation. The aerial photography that was used was flown for FCC by SKM on the 25th March 2002. This photography was at a resolution of 0.15m. The photography was used in the following stages of the process:

- Validation of automatically generated flow paths;
- Validation of selection of potentially affected properties;
- Validation of pervious/impervious catchment area fractions;
- Estimation of clear width of the overland flow path; and
- Presentation of results.

2.2.2 SKM Building Polygon Data Set

This study also made use of a data set containing building polygons that had been generated by SKM. This data was generated by on-screen digitising of buildings from the Ausimage aerial photography. The March 2002 photography was also used in this process.

As part of the same process trees, parks and open areas, and hard stand areas were also digitised. This data was used in the calculation of impervious and pervious fractions for catchment areas.

2.2.3 Drainage Information (Pits and Pipes)

Pits and pipe data was supplied by the FCC at the outset of the study. This data was used to determine which flow paths would be used in the analysis, as areas containing pipes greater than 900mm diameter were not included in the study. It is expected that this data would be utilised further during more detailed analysis of the areas at risk of overland flooding.

2.2.4 Cadastral information

Cadastral information was also supplied by Fairfield City Council at the outset of the study. Due to the availability of the SKM Building Polygon data set, cadastral data was not used extensively in this study. It was used mainly in the presentation of results.

2.3 Previous Studies

Four public reports on local drainage studies within the LGA were available to this study. These studies included the following:

- Shackel Avenue Drainage Analysis, 1991;
- Crown and Seville Streets Flood Study, undated;
- Smithfield West Drainage Study Chifley Street to the Horsley Drive, 1996; and
- The Avenue, Canley Vale (Intersection The Avenue/Sackville St) Stormwater Drainage Study, 1998.

Due to the localised nature of these studies, outcomes from these studies were of limited use to this study.

3. Overland Flow Paths

Overland flow paths over the study area were automatically generated from the ground surface information using the following process:

- Airborne Laser Survey (ALS) data was used to create a Digital Terrain Model (DTM) of the ground surface. Initially a Triangulated Irregular Network (TIN) was created from the ALS data points, and then for analysis this was converted into a 2m by 2m square grid over the whole area.
- The next stage in the process used the ground surface heights to generate a flow direction grid by comparing these with the heights of neighbouring grid cells.
- From the flow direction grid a flow accumulation grid was generated, which calculates the number of cells flowing into a particular cell.
- A vector flow path file was created, delineating flow paths along lines of cells with high accumulation.

Flow paths were generated above a threshold of flow accumulation of 5000 grid cells (ie. 2 hectares area). The process was carried out using ArcGIS and the 3D Analyst and Spatial Analyst extensions. The generated overland flow paths for the study area are shown in **Appendix C.**

4. Properties at Risk of Overland Flooding

4.1 Identification of Properties

In the next stage of the analysis, the single thread flow path lines generated as described in the previous section were used to develop a 'design' overland flow path. At this stage of the investigation it is not known how wide an overland flow path will actually be and so it was assumed that the flow path would be 5 metres wide. Using the tools in ArcMap, a buffer strip was created 2.5m either side of the flow path line to simulate a 5m flow path width. Buildings were then selected from the SKM Building Polygon GIS dataset that lay within or intersected this flow path.

Using this process, a total of 1 793 properties (shown in **Appendix D**) were identified within the study area that lay within or intersected the 5m wide overland flow paths.

The flow paths and buildings were then overlaid on an aerial photograph and assessed as being correct or needing modification. It was neither practical nor considered necessary to analyse flood risk to all 1 793 properties individually and so the properties were grouped with other properties on the same local overland flow path with a similar risk of flooding. **Figure 4-1** is an example on how identified properties were grouped. As a result 756 groups of properties were identified for estimating provisional flood hazard. Each group comprised of 1 to 11 properties.

4.2 Flood Risk to Properties

A detailed assessment of flood risk to a property due to overland flooding would require information on the following:

- Characteristics of the upstream catchment area (including area, slope, land use etc);
- Rainfall intensity-frequency-duration (IFD) data;
- Details on the drainage system (eg. pits and pipes);
- Topographic characteristics of the overland flow path;
- Details on obstructions (eg. fence, trees) and encroachment of the overland flow paths; and
- Floor level of the building.

Given the scope and the nature of the study, a simplified approach was adopted in the study to estimate flood risk to properties within the study area. The adopted approach and underlying assumptions are discussed in the following sections.

Fairfield City Overland Flood Study

Figure 4-1

Example of Grouping of Properties at Risk of Overland Flooding

Legend

Key Properties in Group

Properties at Risk of Overland Flooding

Overland flowpaths

N

1:2,000

0 10 20 40 60

Metres

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4.2.1 Delineation of Sub-Catchments

Sub-catchments were delineated for each of the 756 groups of buildings at risk from overland flooding, by using the same ground surface DTM that was used in the generation of overland flow paths. The catchments were delineated to the point where the buildings intersected with the flow path.

The catchment area and pervious and impervious fractions were then used in the next stage of the analysis to estimate the provisional flood hazard for each property.

4.2.2 Design Flood Events

The 5% AEP, 1% AEP and PMF were the design flood events selected for assessing local overland flood risk. The 5% flood was selected as being the minimum acceptable design standard for flooding. The 1% AEP was selected as the flood standard which is used for house floor levels and the PMF was selected as it represented the probable maximum flood extent.

4.2.3 Catchment Runoff

Considering the objectives of the study the following process was adopted in this study to estimate catchment runoff for the selected design events:

Relationships Between Catchment Area – Design Flood – Impervious Fraction

With more than 700 catchments to assess ranging from 110-1,156 hectares, it was not possible to use the normal hydrologic analysis (ie. setting up a hydrologic model) to determine the design flow for each catchment. So the following method was adopted to establish relationships between catchment area, magnitude of the design flood and impervious fraction:

- Analyse input data (catchment area, impervious fractions etc) used in the RAFTS model for Prospect Creek;
- Run the RAFTS model for Prospect Creek for the 5% AEP, 1% AEP events;
- Estimate Probable Maximum Precipitation (PMP) depths using the updated version of Bulletin 53 of the Bureau of Meteorology;
- Assume a uniform areal distribution of the PMP event and run the RAFTS model for a range of storm durations using rainfall losses recommended in Book VI of Australian Rainfall and Runoff (ie. an initial rainfall loss of 0 mm and a continuing loss rate of 1mm/hour); and
- Establish relationships between catchment area, catchment runoff and the selected impervious categories for each of the selected flood events on the basis of the input data used in the RAFTS model and results generated by the RAFTS model.

Appendix A provides further details of this process and identifies the relationship between catchment area, design flood and impervious fraction for a range of catchment areas, design flood events and impervious fractions.

Estimation of Catchment Runoff

Estimation of the design flood for the selected three flood frequencies, involved the following steps:

- Identify upstream catchment and measure catchment area in GIS;
- Estimate impervious area within the catchment on the basis of the available SKM Building Polygon data set for the study area;
- Check accuracy of the impervious area estimated using SKM Building Polygon data set on three selected catchments within the study area and adjust estimated impervious areas for the catchments if necessary (refer **A.4 Adjustment of Impervious Areas, and Fig. A.5-A.7**); and
- On the basis of the catchment area and impervious fraction estimate catchment runoff for the 5% AEP, 1% AEP and PMF events.

4.2.4 Flood Hydraulics

Drainage System

It is expected that drainage networks would carry a part of the flow during the design flood events. However, in this study the capacity of the drainage system to convey flood flow during the selected flood events was ignored. This assumption was made on the basis of the following considerations:

- To limit the scope and complexity of the study;
- Blockages of pits and pipes are not uncommon phenomenon; and
- Drainage systems are generally designed to carry 20% AEP to 10% AEP flood event and so in the 1% and PMF events would, at best, only be able to carry a small proportion of total flow.

Flood Depth and Velocity

Manning's formula was used to estimate flood depth and flow velocity on the overland flow path using the following methodology:

- Estimate clear width of flooding at the narrowest section of the overland flow path in the vicinity of the buildings in question from GIS;
- Assume a rectangular channel;
- Estimate appropriate Manning's 'n' value for the overland flow path; and
- Using Manning's formula and the continuity equation estimate flood depth and flow velocity for the three selected flood events.

The above approach assumes that there would be no attenuation to the flood flow due to obstructions (eg. buildings, fencing, trees etc.) along the length of the overland flow path and once obstructed the flood flow would not run along alternate flow paths. All calculations were made using Excel spreadsheets.

4.3 Validation

4.3.1 Ground Truthing

Officers from FCC inspected 106 properties that were originally identified to be blocking the overland flow paths completely. The inspections were on the basis of an analysis of the aerial photography, SKM Building Polygon data set and the overland flow paths estimated in GIS.

Officers from FCC visited all identified properties and inspected the presence of overland flow paths in the vicinity of the subject properties. In majority of the properties FCC officers identified alternate overland flow paths in the vicinity of the subject sites. Information supplied by FCC officers was utilised to estimate clear widths for alternative overland flow paths for the majority of the subject properties.

4.3.2 Previous Studies

A total of 1 793 properties were identified in this study that may be affected by overland flooding within the study area (lay within the 5 metre wide buffer strip). This was cross-checked against over 90 overland flow trouble spots identified by FCC and marked on a LGA map. FCC prepared the map showing Overland Flow Trouble Spots (dated 5th December 1991) within the LGA. The map was prepared by FCC on the basis of complaints received by FCC from time to time during historic storm events from residents.

The majority of the overland trouble spots identified on FCC's map for the study area were identified as also being potential problem areas from this study. There were only five spots on FCC's map that were not identified as being problem areas in this study. These five spots were closely examined in GIS to identify why the five spots were not picked up as being potential problem areas in this study. Details on the five overland trouble spots are given in **Appendix B**. Assessment of the five trouble spots identified the following reasons for not identifying the trouble spots in this study:

- Catchment area below the threshold used in this study (ie. flow accumulation of 5000 grid cells which is about 2 ha);
- Fairly flat topography making identification of the flow path problematical; and
- Local blockage of pits and pipes causing unexpected local flooding, not necessarily relating to overland flow paths.

This study identified approximately 95% of the overland trouble spots identified by FCC. Given the broad nature of this study, it is considered a satisfactory outcome.

5. Provisional Flood Hazard

5.1 Hydraulic Categories

The NSW *Floodplain Management Manual* (NSW Government, 2001) defines three hydraulic classifications:

- Floodways;
- Flood storage areas; and
- Flood fringe areas.

Floodways are those areas where significant flows occur during floods and are essential flow paths for the majority of the flood flow. Floodways tend to be aligned with natural channels and are often, though not necessarily, areas where flood flows are deeper or velocities are higher. If floodways become blocked, even if only partially, during a flood event, significant redistribution of flood flows and/or large increases in flood levels may occur, adversely affecting other areas.

Flood storage areas are parts of the floodplain where flood waters are temporarily stored during a flood event. If the capacity of flood storage areas is reduced by filling, construction of levees or some other means, flood behaviour can change substantially, upstream flood levels may rise and downstream flows may increase.

Flood fringe areas are the remaining areas of land that are inundated during flood events, after floodways and flood storage areas have been defined. Flood fringe areas do not have a strong influence on flood behaviour and development in flood fringe areas would not significantly affect flood behaviour, peak flood levels or flows.

The hydraulic categories identified in the NSW *Floodplain Management Manual* (NSW Government, 2001) are related to mainstream flooding. The Manual does not provide any guidance on hydraulic categories relating to local overland flooding.

5.2 Hazard Categories

The NSW *Floodplain Management Manual* (NSW Government, 2001) defines two hazard categories:

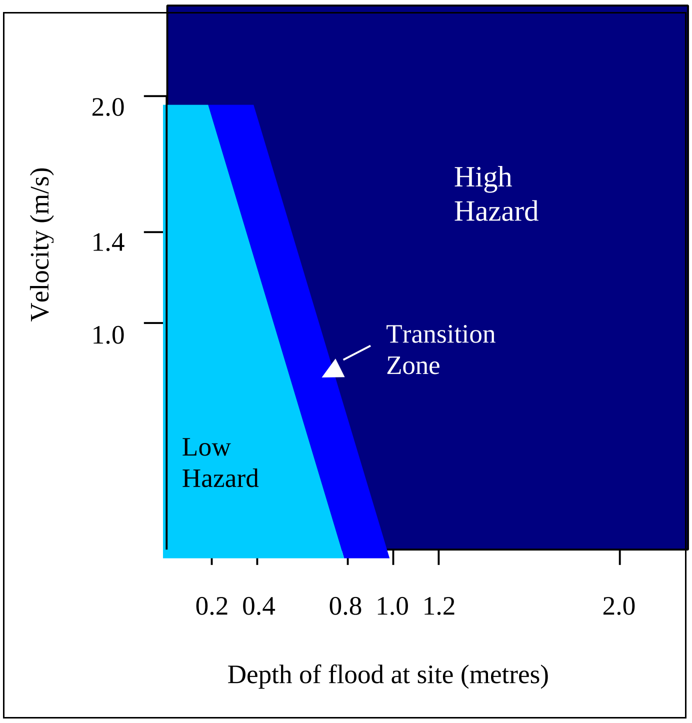
- High hazard; and
- Low hazard.

High hazard areas are those where there is possible danger to personal safety, evacuation by trucks would be difficult, able-bodied adults would have difficulty wading to safety or there is potential for significant structural damage to buildings.

Low-hazard areas are those where trucks could evacuate people and their possessions and able-bodied adults would be able to wade to safety.

Hazard categorisation is performed with reference to the flood depths and velocities over a range of flood events. A guide to the provisional flood hazard is shown in **Figure 5-1** (adapted from the NSW *Floodplain Management Manual*, 2001).

- **Figure 5-1: Hydraulic Hazard Categories**



In practice, provisional flood hazard also depends on a number of factors other than the peak depth and velocity:

- Size of the flood;
- Effective warning time;
- Flood preparedness amongst the community;
- Rate of rise of floodwaters;
- Duration of flooding;
- Evacuation problems;
- Effective flood access; and
- Type of development in the floodplain.

In the context of this study, it was decided that three provisional flood hazard categories should be adopted. Flood depths and flow velocities criteria used in the NSW *Floodplain Management Manual* were utilised to define the three flood hazard categories. The adopted categories are discussed below:

- **Provisional Flood Hazard -**
- **High Hazard -** where the product of flood depth and velocity is greater than one; or the depth of flooding greater than 1.2m; or the flow velocity is greater than 2m/s;
- **Medium Hazard -** Most of the properties within the LGA are generally 0.3m to 0.5m above the surrounding ground. A flood depth of 0.5m on the surrounding ground may trigger some damage to properties. A medium hazard was assigned to a property where the surrounding ground would be subjected to more than 0.5m depth of flooding; and
- **Low Hazard -** This is the lowest flood hazard category and represents minor flooding in the vicinity of properties. This type of flooding may result from a variety of sources including the rainfall runoff generated from a small catchment.

5.3 Method of Analysis

The study area covers an area of approximately 7,400 hectares and 1793 properties were identified in this study that may be at risk of overland flooding. The identified 1793 properties were grouped into 756 groups. Each group included up to 11 properties.

Design peak flows for each group was estimated using the relationships between catchment area and impervious fraction for the selected flood events (refer to **Appendix A**). The width of the overland flow path for each group was estimated from the aerial photography. Depth of flooding and flow velocity for each group was estimated using Manning's formula. The resulting flood depth and flow velocity for each group for each flood event was used to estimate provisional flood hazard.

Provisional flood hazards for the 756 groups were assessed for the 5% AEP, 1% AEP and the PMF events. It was assumed that provisional flood hazard for each of the properties in a group was similar to that for the group in question.

5.4 Results

Number of properties under the selected provisional flood hazard categories for the selected design flood events are shown in **Table 5-1**. **Table 5-1** shows that 41% of the identified properties would be under the high hazard category for the 5% AEP flood event. Approximately 48% of the identified properties would be under the high hazard category for the 1% AEP and more than 90% of the properties would be under the high hazard category for the PMF event.

Table 5-1 Number of Properties under Different Flood Hazard Categories

Flood Event	Low Hazard	Medium Hazard	High Hazard
5% AEP	1010 (56%)	59 (34%)	724 (41%)
1% AEP	891 (50%)	31 (2%)	871 (48%)
PMF	109 (6%)	20 (1%)	1664 (93%)

% in terms of the total number of identified properties at risk of overland flooding (ie. 1793)

Results presented in **Table 5-1** were obtained on the basis of the following major assumptions:

- Capacity of the drainage system ignored;
- Flow paths were generated above a threshold of flow accumulation of 5000 grid cells (ie. an area of 2 hectares);
- Main buildings located within the 5m wide overland flow paths identified being at risk of overland flooding;
- Provisional flood hazard estimated for the group applies to all properties in the group;
- Presence of alternate overland flow paths not investigated in detail;
- A rectangular channel was assumed in the estimation depth of flooding and flow velocity;
- Attenuation of the peak flood flow due to floodplain storage ignored; and
- Presence of any flood mitigation measures not included.

Given the nature and the scope of the study, these assumptions are considered valid at the screening level study. Provisional flood hazards to all identified buildings for the 5% AEP, 1% AEP and the PMF events are shown in **Figure 5-2** to **Figure 5-4** respectively.

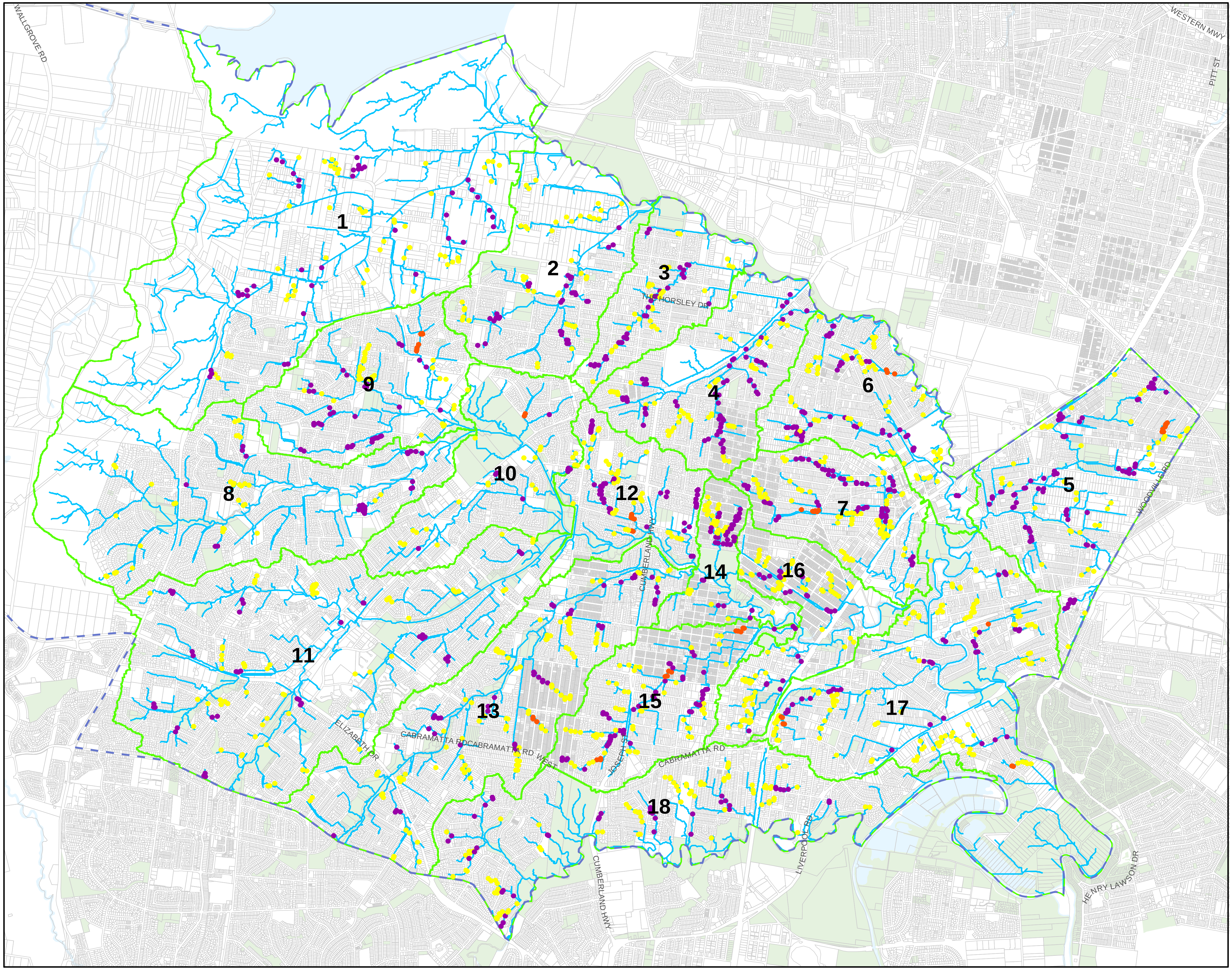


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Figure 5-2

Provisional Flood Hazard for the 5% AEP Event

Legend

Provisional Flood Hazard Categories (5% AEP)

- High Hazard
- Medium Hazard
- Low Hazard
- Automatically generated flowpaths (No. of cells for a flowpath = 5000)
- Sub-Catchments
- Fairfield LGA Boundary
- Cadastre

Notes on Flood Hazard Categories:
High Hazard:
Product of velocity and flood depth > 1
OR flood depth > 1.2m
OR velocity > 2m/s
Medium Hazard:
Depth of flooding >= 0.5m (ie. some cause damage to property)
Low Hazard:
Otherwise

N

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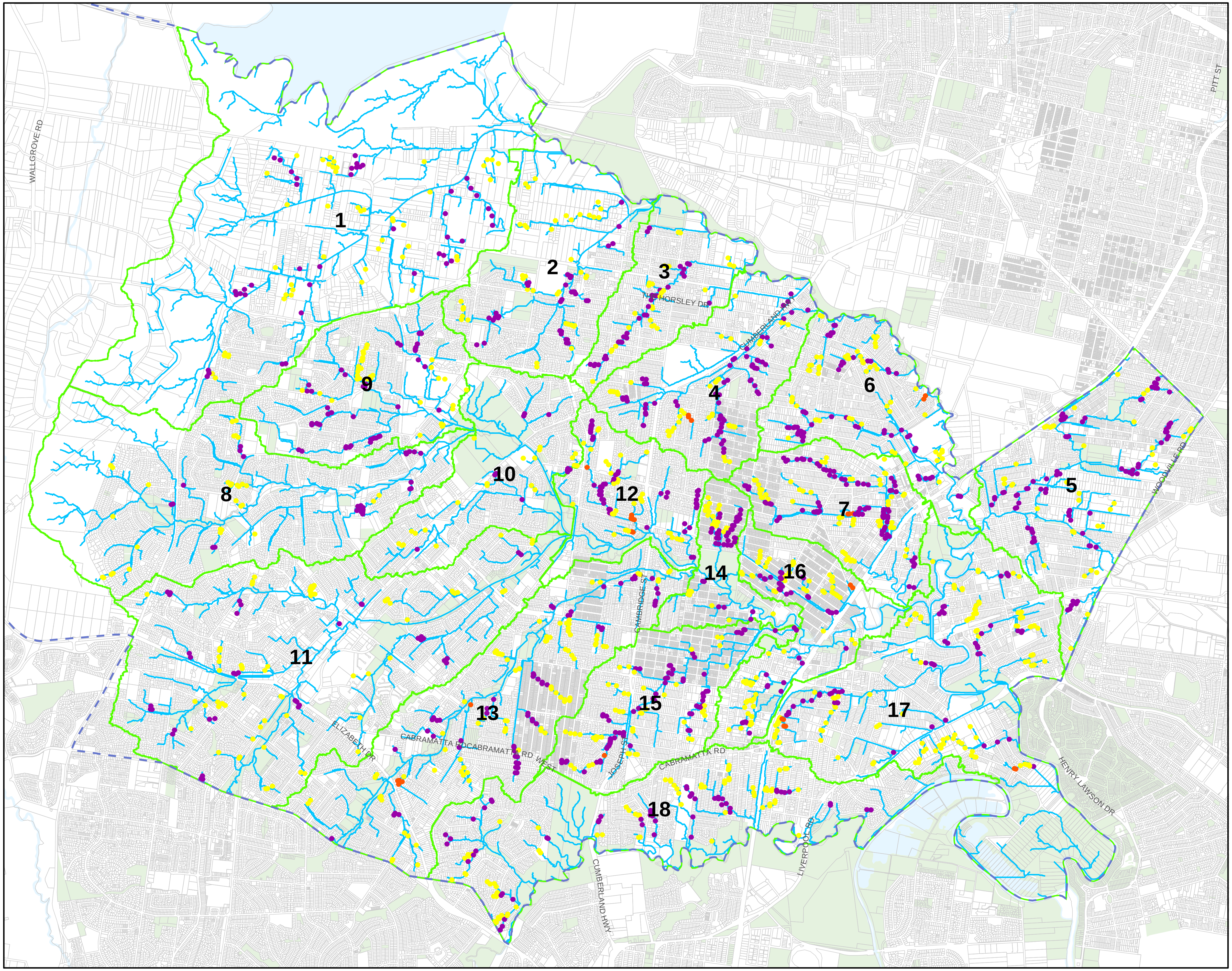

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Figure 5-3

Provisional Flood Hazard
for the 1% AEP Event

Legend

Provisional Flood Hazard Categories (1% AEP)

- High Hazard
- Medium Hazard
- Low Hazard
- Automatically generated flowpaths (No. of cells for a flowpath = 5000)
- Sub-Catchments
- Fairfield LGA Boundary
- Cadastre

Notes on Flood Hazard Categories:
High Hazard:
Product of velocity and flood depth > 1
OR flood depth > 1.2m
OR velocity > 2m/s
Medium Hazard:
Depth of flooding >= 0.5m (ie. some cause damage to property)
Low Hazard:
Otherwise

N

1:40,000

0 0.25 0.5 1 1.5
Kilometres

Job No.: IN25501.200
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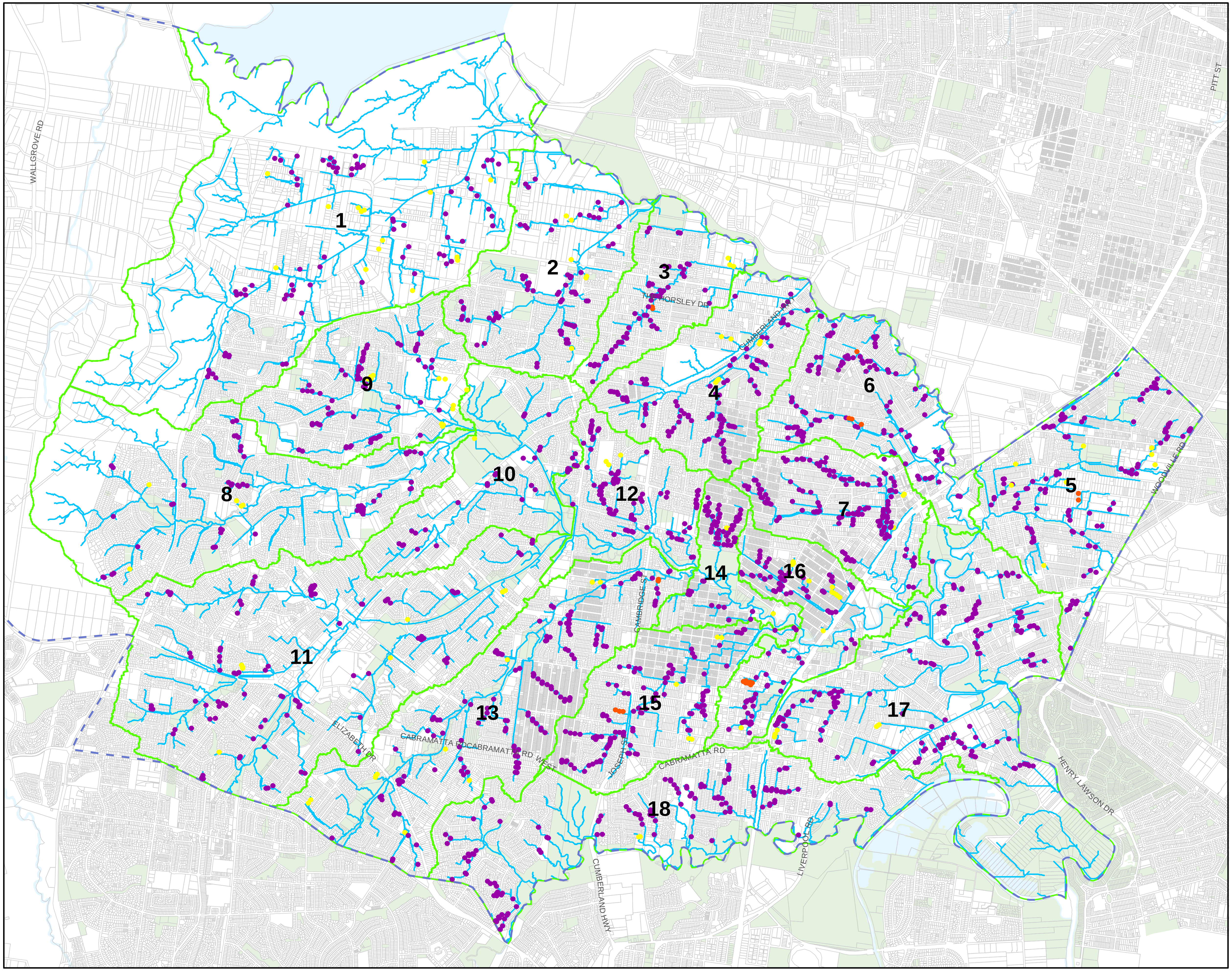
File: U:\Projects\IN25501_200_FairfieldOverlandFlows\Report_Figures\Updated_130104\Figure5_3_FHC1AEP_A3.mxd

SKM



Fairfield City Overland Flood Study

Figure 5-4

Provisional Flood Hazard
for the PMF Event

Legend

Provisional Flood Hazard Categories (PMF)

- High Hazard
- Medium Hazard
- Low Hazard
- Automatically generated flowpaths (No. of cells for a flowpath = 5000)
- Sub-Catchments
- Fairfield LGA Boundary
- Cadastre

Notes on Flood Hazard Categories:
High Hazard:
Product of velocity and flood depth > 1
OR flood depth > 1.2m
OR velocity > 2m/s
Medium Hazard:
Depth of flooding >= 0.5m (ie. some cause damage to property)
Low Hazard:
Otherwise

N

1:40,000

0 0.25 0.5 1 1.5
Kilometres

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5.5 Floodplain Risk Management

Floodplain risk management is about occupying the floodplain and optimising its use in a manner which is compatible with the provisional flood hazard and at a level of risk which is accepted by the community. Risk can be simply defined as a product of frequency and consequence. The frequency (or probability of a flood) is a natural phenomenon which cannot be controlled by structural mitigation works to any substantial degree. The consequence of a flood varies with the nature of the hazard (depth, velocity, warning time etc) and what it impacts (property and people).

The control and management of land use provides the most effective means of managing the consequences of flood and, hence minimising flood risks. Floodplain risk management involves more than setting a **F**lood **P**lanning **L**evel (**FPL**). It is about comprehensively managing the risk to people and assets (both below and above the FPL if it is lower than the PMF) by applying and integrating a range of available measures.

Given that some floodplains have an extensive flood range, and given the difficulty in addressing the associated variability in flood risks with simple rules, the use of a planning matrix approach is recommended. Using this approach, a matrix of development controls, based on the provisional flood hazard and land use, can be developed which balances the risk exposure across the floodplain.

The second stage of the matrix development would be to identify different flood risk precincts. While the below criteria may be transferable to other floodplains individual characteristics of each floodplain need to be considered when preparing a Floodplain Risk Management Plan. In short;

High Flood Risk: this is defined as the area of land below the 1% AEP flood level that is either subject to a high hydraulic hazard or where there are significant evacuation difficulties. The high flood risk precinct is where high flood damages potential risk to life, or evacuation problems would be anticipated.

Medium Flood Risk: This has been identified as land below the 1% AEP flood level that is not subject to a high hydraulic hazard and where there are no significant evacuation difficulties. In this precinct there would still be significant risk of flood damage or risk to life, but these damages or risk to life can be minimised by the application of the appropriate development controls.

Low Flood Risk: This has been defined as all other land within the floodplain (ie. within the extent of the probable maximum flood) but not identified as either a high flood risk or medium flood risk precinct. There will be a low cost benefit to compulsorily apply flood related development controls, where risk of damages are low for most land uses. The low flood risk precinct is that area above the 1% AEP flood level and most land uses would be permitted within this precinct.