

POWELLS CREEK AND
SALEYARDS CREEK REVISED
FLOOD STUDY



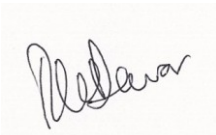



Level 2, 160 Clarence Street
Sydney, NSW, 2000

Tel: 9299 2855
Fax: 9262 6208
Email: wma@wmawater.com.au
Web: www.wmawater.com.au

POWELLS CREEK AND SALEYARDS CREEK REVISED FLOOD STUDY

NOVEMBER, 2016

Project Powells Creek and Saleyards Creek Revised Flood Study		Project Number 115010	
Client Strathfield Municipal Council		Client's Representative Said Saqeb	
Authors Richard Dewar Felix Taaffe		Prepared by 	
Date 17 November 2016		Verified by 	
Revision	Description	Distribution	Date
1	1st Draft Report	Said Saqeb	November 2015
2	2 nd Draft Report	Said Saqeb	March 2016
3	3 rd Public Exhibition Draft	Said Saqeb	September 2016
4	Final	Said Saqeb	November 17, 2016

POWELLS CREEK AND SALEYARDS CREEK REVISED FLOOD STUDY

TABLE OF CONTENTS

	PAGE
FOREWORD	i
EXECUTIVE SUMMARY	ii
1. INTRODUCTION	1
1.1. Background	1
1.2. Description of Study Area	2
1.3. Objectives.....	3
1.4. Floodplain Risk Management Process.....	4
1.5. Accuracy of Model Results	5
2. AVAILABLE DATA	7
2.1. Overview	7
2.2. Previous Studies.....	7
2.3. 1998 Powells Creek Flood Study (Reference 2)	8
2.3.1. ILSAX Model.....	9
2.3.2. HEC-RAS Model.....	10
2.3.3. Accuracy of the Design Flood Data.....	13
2.4. Comparison of Results with Previous Studies.....	13
2.5. Data Sources.....	14
2.6. Topographic Data	14
2.7. Structure Survey	15
2.8. Rainfall Data	15
2.8.1. Overview	15
2.8.2. Rainfall Stations.....	16
2.8.3. Analysis of Pluviometer Data	16
2.9. Design Rainfall	17
2.10. Stream Gauges	18
2.10.1. UNSW (Elva Street Gauge)	18
2.10.2. Sydney Water Gauge.....	20
2.11. Flood Levels from Debris or Other Marks	20
2.11.1. Resident Interviews	20
2.11.2. Surveyed Levels	21

2.11.3.	Sydney Water Data.....	24
2.12.	Flood Photographs	27
3.	APPROACH	28
3.1.	Hydrologic Model.....	29
3.2.	Hydraulic Model.....	30
3.3.	Assessment of Data from UNSW Elva Street Gauge	31
3.3.1.	Overview	31
3.3.2.	Gaugings and Rating Curve.....	32
3.3.3.	For Use in Flood Frequency Analysis	32
3.4.	Calibration and Verification of the Modelling Process	33
3.4.1.	Approach	33
3.4.2.	Calibration Events.....	34
3.5.	Design Flood Modelling	36
4.	HYDROLOGIC MODELLING	37
4.1.	Sub-catchment Definition.....	37
4.2.	Impervious Surface Area	37
4.3.	Rainfall Losses	38
4.4.	Design Rainfall Data.....	38
5.	HYDRAULIC MODELLING	39
5.1.	TUFLOW	39
5.2.	Boundary Locations.....	39
5.2.1.	Inflows and Downstream Boundary	39
5.3.	Roughness Co-efficient.....	39
5.4.	Hydraulic Structures	40
5.4.1.	Buildings.....	40
5.4.2.	Fencing and Obstructions	40
5.4.3.	Bridges	40
5.5.	Blockage Assumptions	40
5.6.	Ground Truthing	42
6.	MODEL CALIBRATION AND VERIFICATION	43
6.1.	Introduction.....	43
6.2.	Results	43
6.3.	Discussion of Results	46
6.3.1.	Elva Street Gauge	46
6.3.2.	Across the Catchment	46

7.	DESIGN EVENT MODELLING	47
7.1.	Overview	47
7.2.	Critical Duration for Rainfall Runoff Approach.....	47
7.3.	Downstream Boundary Conditions.....	48
7.4.	Design Results	48
7.4.1.	Summary of Results	48
7.4.2.	Provisional Flood Hazard Categorisation	51
7.4.3.	Provisional Hydraulic Categorisation.....	51
7.4.4.	Flooding Hotspots.....	52
7.5.	Flood Planning Area	54
7.6.	Flood Emergency Response Classification of Communities	55
8.	FLOOD FREQUENCY ANALYSIS	57
8.1.	Overview	57
8.2.	Examined Annual Series.....	57
8.2.1.	Inclusion of Incomplete Data from 1998 to 2014	59
8.2.2.	Adopted Data Set	59
8.3.	Probability Distribution	61
8.4.	Design Flow Results.....	61
8.5.	Reconciling Flood Frequency and Rainfall Runoff Results.....	62
9.	SENSITIVITY ANALYSIS	63
9.1.	Overview	63
9.2.	Climate Change Background	63
9.2.1.	Rainfall Increase.....	63
9.2.2.	Sea Level Rise	64
9.3.	Results	65
9.3.1.	Roughness Variations.....	65
9.3.2.	Blockage Variations	66
9.3.3.	Climate Variations.....	66
10.	COMMUNITY CONSULTATION.....	68
11.	ACKNOWLEDGEMENTS.....	69
12.	REFERENCES	70

LIST OF APPENDICES

APPENDIX A:	Glossary of Terms
APPENDIX B:	Flood Frequency Analysis – Tested Data Sets
APPENDIX C:	Flood Tagging Database

LIST OF DIAGRAMS

Diagram 1: Cadastral Plan near the time of Construction of the SWC Concrete Channel	3
Diagram 2: Flood Study Process	28
Diagram 3: (L1) Velocity and Depth Relationship; (L2) Provisional Hydraulic Hazard Categories (NSW State Government, 2005)	51

LIST OF PHOTOGRAPHS

Photo 1: Powells Creek gauge at Elva Street.....	18
--	----

LIST OF FIGURES

Figure 1: Powells Creek Study Area	
Figure 2: Land Use	
Figure 3: ALS Data	
Figure 4: Photographs of Structures	
Figure 5: Historical Flood Photographs	
Figure 6: Water Level Gauge Records	
Figure 7: Rating Curves at Elva Street Gauge	
Figure 8: Historical Flood Data	
Figure 9: Rainfall and Water Level Data	
Figure 10: DRAINS Sub Catchments	
Figure 11: TUFLOW Pits and Pipes	
Figure 12: TUFLOW Model Extent	
Figure 13: Calibration Results - Elva Street Gauge 3 rd , 7 th , 10 th , 17 th February 1990, 18 th March 1990, 2 nd January 1996	
Figure 14: Calibration Results - Peak Level Comparison 10 th February 1990, 2 nd January 1996	
Figure 15: Design Results - Peak Height Profiles	
Figure 16: Design Results - Flow and Level Hydrographs	
Figure 17: Design Results - Peak Flood Contours and Depths	
Figure 18: Design Results - Peak Flood Velocities	
Figure 19: Design Results - Provisional Hydraulic Hazard	
Figure 20: Design Results - Provisional Hydraulic Categorisation	
Figure 21: Design Results - Flood Frequency Analysis	
Figure 22: Hotspot Locations	
Figure 23: Duration of Inundation – 1% AEP Event	
Figure 24: Design Results – 1% AEP Event with Sea Level Rise	
Figure 25: Flood Planning Area	
Figure 26: Flood Emergency Response Classification of Communities	

LIST OF TABLES

Table 1: Previous Studies Listed in Reference 2	7
Table 2: ILSAX Calibration Results from Reference 2	9
Table 3: HEC-RAS Calibration Results from Reference 2 for 10 th February 1990	11
Table 4: Comparison of Flood Frequency Analysis and Runoff Routing from Reference 2	12
Table 5: Comparison of Design Peak Flows (m ³ /s) from Reference 2	13
Table 6: Comparison of Design Peak Levels (mAHD) from Reference 2	14
Table 7: Data Sources	14
Table 8: Pluviometers	16
Table 9: Historical Rainfall - Maximum Rainfall Depths (mm)	17
Table 10: Design Rainfall Intensities at the Catchment Centroid (mm/hr)	18
Table 11: UNSW Gauge at Elva Street - Major Floods (> 2.0 m) taken from Reference 2	19
Table 12: Significant Floods Obtained from 1998 Flood Study Questionnaire	21
Table 13: 1998 Flood Study Questionnaire Results	21
Table 14: Historical Flood Data from Field Interviews in August 1997 as part of Reference 2 ...	22
Table 15: Sydney Water Records of Flooding in the Powells Creek Catchment	24
Table 16: Annual Maxima Peaks	33
Table 17: Impervious Percentage per Land-use	37
Table 18: Adopted DRAINS Hydrologic Model Parameters	38
Table 19: Manning's "n" values adopted in TUFLOW	40
Table 20: Suggested 'Design' and 'Severe' Blockage Conditions for Various Structures (AR&R Revision Project 11, 2013)	41
Table 21: Calibration Results - Elva Street Gauge	43
Table 22: Calibration Results - Peak Heights	44
Table 23: Peak Flood Levels (mAHD) and Depths (m) at Key Locations	49
Table 24: Peak Flows (m ³ /s) at Key Locations	50
Table 25: Road Hotspots - Peak Flood Depth	53
Table 26: Road Hotspots - Rate of Rise	53
Table 27: Flooding Hotspots (Property)	54
Table 28: FPA - Flood Tagging Database of Powells Creek and Saleyards Creek Catchments	55
Table 29: Emergency Response Planning Classifications of Communities	55
Table 30: Flow (m ³ /s) Data Sets Used in FFA	58
Table 31: Comparison of Reference 2 and Data Set #1 FFA Design Flows	60
Table 32: Flood Frequency Analysis – Powells Creek Elva Street gauge	62
Table 33: Results of Variation in Channel Roughness - Change in Level	65
Table 34: Results of Variation in – Channel Roughness - Change in Flow	65
Table 35: Results of Blockage Analysis - Change in Level	66
Table 36: Results of Blockage Analysis - Change in Flow	66
Table 37: Results of Climate Change Analysis - Change in Level	67
Table 38: Results of Climate Change Analysis - Change in Flow	67

LIST OF ACRONYMS

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Average Recurrence Interval
AR&R	Australian Rainfall and Runoff
ALS	Airborne Laser Scanning sometimes known as LiDAR
BoM	Bureau of Meteorology
CBD	Central Business District
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CFERP	Community Flood Emergency Response Plan
DEM	Digital Elevation Model
DRAINS	Hydrologic computer model developed from ILSAX
ERP	Emergency Response Planning
EPR	Entire Period of Record of gauge data at Elva Street gauge)
EY	Exceedances per Year
FFA	Flood Frequency Analysis
FPA	Flood Planning Area
GEV	Generalised Extreme Value probability distribution
GIS	Geographic Information System
GSDM	Generalised Short Duration Method
HEC-RAS	1D hydraulic computer model
HGL	Hydraulic Grade Line
ILSAX	Hydrologic model - a precursor to DRAINS
IFD	Intensity, Frequency and Duration of Rainfall
IPCC	Intergovernmental Panel on Climate Change
LEP	Local Environmental Plan
LGA	Local Government Area
LiDAR	Light Detection and Radar
LP3	Log Pearson III probability distribution
m	metre
MHL	Manly Hydraulics Laboratory
m ³ /s	cubic metres per second (flow measurement)
m/s	metres per second (velocity measurement)
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
SEPP	State Environmental Planning Policy
SMC	Strathfield Municipal Council
SWC	Sydney Water Corporation
TIN	Triangular Irregular Network
TUFLOW	one-dimensional (1D) and two-dimensional (2D) flood and tide simulation software program (hydraulic computer model)
UNSW	University of New South Wales
1D	One dimensional hydraulic computer model
2D	Two dimensional hydraulic computer model

FOREWORD

The NSW State Government's Flood Policy provides a framework to ensure the sustainable use of floodplain environments. The Policy is specifically structured to provide solutions to existing flooding problems in rural and urban areas. In addition, the Policy provides a means of ensuring that any new development is compatible with the flood hazard and does not create additional flooding problems in other areas.

Under the Policy, the management of flood liable land remains the responsibility of local government. The State Government subsidises eligible flood mitigation works to alleviate existing problems and provides specialist technical advice to assist Councils in the discharge of their floodplain management responsibilities.

The Policy provides for technical and financial support by the Government through four sequential stages:

1. ***Flood Study***
 - Determine the nature and extent of the flood problem.
2. ***Floodplain Risk Management Study***
 - Evaluates management options for the floodplain in respect of both existing and proposed development.
3. ***Floodplain Risk Management Plan***
 - Involves formal adoption by Council of a plan of management for the floodplain.
4. ***Implementation of the Plan***
 - Construction of flood mitigation works to protect existing development, use of Local Environmental Plans to ensure new development is compatible with the flood hazard and implementation of community education and awareness programs and emergency response measures.

The Powells Creek Flood Study constitutes the first stage of the management process and updates the previous Powells Creek Flood Study undertaken for Strathfield Municipal Council in 1998. A Powells Creek Catchment Floodplain Management Study and Plan was completed for Strathfield Municipal Council in 2003. As per the described four stage process, the current study concerns determination of design flood behaviour in the study area, and is also part of the broader process aimed at managing the area's flood risk. The benefits of the study as part of this broader process are:

- allowing Council to carry out its duty of care regarding floodplain management,
- producing design flood information which can then be used to facilitate mitigation of flood risk, including mitigation options partially funded by the NSW Government,
- providing indemnity to Council under S733 of the LGA Act as outlined in the NSW Floodplain Development Manual, and,
- improving emergency response procedures for the area via providing description of floods of various sizes.

EXECUTIVE SUMMARY

Powells Creek is a small southern tributary of the Parramatta River and Saleyards Creek is the major tributary of Powells Creek (Figure 1). The total catchment area of Powells Creek to Homebush Bay Drive is 8.1 km² and Saleyards Creek to the confluence with Powells Creek is 3.2 km².

The study area comprises the floodplains of Powells Creek, Strathfield Creek and Saleyards as defined by the extent of the Probable Maximum Flood (PMF).

This Flood Study has been prepared for Strathfield Municipal Council under the direction of Council's Floodplain Management Committee that includes Council's three senior officers of relevant departments, officers of Government Departments including Office of Environment and Heritage (OEH), Sydney Water, State Emergency Services and a Community Representative. The NSW government provides policy direction and guidelines to Local Government through the 2005 Floodplain Development Manual and this provides indemnity to Council. OEH has been involved in the conduct of this Flood Study in order to ensure consistency with government policy. The study is funded on a 1/3 (Council) to 2/3 (NSW Government) basis.

The purpose of the revised Flood Study is to define mainstream and overland (where there is no defined channel) flood behaviour under historical and existing floodplain conditions in the study area while addressing possible future variation in flood behaviour due to climate change and provide information for its management. The previous study in the area, completed in 1998, was based on limited ground survey and did not include overland flow across the whole area.

This study produces information on flood levels and extents, velocities and flows for a range of flood events up to the probable maximum flood events and included flood emergency response classification of communities and the sensitivity of flood behaviour to changes in flood producing rainfall events due to climate change.

The study was carried out using a DRAINS hydrologic model and a TUFLOW hydraulic model. Relative to the previous study, the 1D/2D modelling approach allows improved definition of flood behaviour in the catchment. This provides flooding information for all properties including areas where ground survey was not available for the previous study and will assist Council when undertaking flood-related planning decisions for existing and future developments.

The study also assists Council to manage flood ways associated with new developments where predominantly medium and high density residential and mixed use redevelopment is planned to occur. In particular, the study will allow management of flood risk to life and property associated with the use of land, via development of land that is compatible with the site's flood hazard. It will also assist the SES during times of flood.

As outlined in Section 117 of the EPA Act Directive 4.3 Flood Prone Land development consent will not be granted to development on land to which flood planning clauses apply unless the consent authority is satisfied that the development:

- is compatible with the flood hazard of the land, and
- is not likely to significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties, and,

- incorporates appropriate measures to manage risk to life from flood, and,
- is not likely to significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses, and,
- is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding.

In addition to the above this study has regional significance because the catchment area impacts a number of key precincts in the Strathfield and Homebush area. This includes the state significant Strathfield Rail Station and the surrounding town centre. The catchment also includes the Parramatta Road corridor which is a regionally significant growth and transport corridor where significant predominantly medium density residential and mixed use redevelopment is planned to occur.

The key outputs from this study are:

- peak design flood extents, contours and depths (refer Figure 17);
- peak design flood velocities (refer Figure 18);
- provisional hydraulic hazard classification (refer Figure 19);
- hydraulic categorisation (refer Figure 20);
- flood emergency response classification of communities (refer Figure 26).

1. INTRODUCTION

1.1. Background

The Powells Creek catchment (Figure 1) is located on the southern bank of the Parramatta River at Homebush Bay, approximately 12 kilometres west of the Sydney CBD. The main tributary of Powells Creek is Saleyards Creek which enters immediately upstream of Homebush Bay Drive. Downstream of Homebush Bay Drive, Powells Creek is a natural channel surrounded by dense mangrove vegetation on both sides. Upstream Powells and Saleyards Creeks are concrete lined channels with Powells Creek bounded on the east by the City of Canada Bay LGA; largely comprising of residential development with residential, light industry and open space on the western SMC side. Saleyards Creek is bounded on both sides by open space until reaching Underwood Road where it is largely bordered by commercial developments.

The total catchment area of Powells Creek to Homebush Bay Drive is 8.1 km² and Saleyards Creek to the confluence with Powells Creek is 3.2 km².

The catchment includes the suburbs (or parts) of Burwood, Concord West, Homebush, Homebush West, North Strathfield, Strathfield and Rookwood (cemetery). Approximately 77% of the catchment is within the SMC LGA, 15% is within City of Canada Bay Council, 5% is within Burwood Council LGA and 3% (Rookwood cemetery) within Auburn LGA (herein termed the Councils). Saleyards Creek is predominantly within the SMC LGA apart from Rookwood cemetery.

Drainage elements in the catchment include kerbs and gutters, pits and pipes, and a network of trunk drainage elements including culverts and open channels. Ownership of the assets is split between SWC and the Councils, with SWC owning the open channels and larger pipe elements. Amongst the drainage assets is a length of brickwork drain that was one of the first purpose-built stormwater drains in Sydney and constructed in the 1890's. Open channel sections extend from Bicentennial Park at the north end to various points south of Parramatta Road. South of the Bicentennial Park, the open channel splits into three tributaries, with one section extending to between Pilgrim Avenue and Elva Street, the second to just beyond Ismay Avenue, and the third (Salesyard Creek) through Flemington Markets to Airey Park.

The present study has been commissioned by Strathfield Municipal Council to extend upon the previous study commissioned by SWC, to define mainstream and overland flood behaviour in the catchment. This report covers the part of the catchment lying in the Strathfield LGA, and results and analysis are virtually the same as those presented in the SWC-commissioned study. Mainstream is generally defined as flooding occurring from open channels, either lined or natural, whereas overland is mainly flooding where there is no defined open channel and drainage is via the pit and pipe system or overland through private and public properties. However, there are exceptions to these definitions.

1.2. Description of Study Area

The study area's catchment is fully urbanised. Within the Strathfield LGA approximately 79% of the catchment is zoned for residential development, 9% for special purpose, 6% for open space areas (parks and recreation areas) and the remaining 7% for business/commercial and industrial areas.

A land use zone map is provided as Figure 2. Upstream of the Parramatta railway Line both catchments are predominantly occupied by residential development with areas of open space, schools and active recreation. The residential developments are largely detached dwellings constructed prior to 1960 but there are also a number of recent higher density developments. Significant commercial development is located near Strathfield railway station at Strathfield Plaza.

Downstream of the railway line the catchments of both creeks are a mixture of residential, commercial (Flemington Markets) and light industrial developments. There are also significant areas of open space surrounding the lower parts of both creeks. The transport routes, M4 Motorway, Parramatta Road, Homebush Bay Drive and the railway lines have influenced the flow paths in the lower reaches.

Very little information is available in Council's records regarding the existing site drainage for the catchment in general (i.e. are there rubble pits? If so what size? Is the existing roof drainage connected directly to the street drainage?). On-site detention has been introduced by the Councils since the mid-1990s.

Diagram 1 indicates the significant change in alignment of Powells Creek with construction of the concrete lined SWC channel.

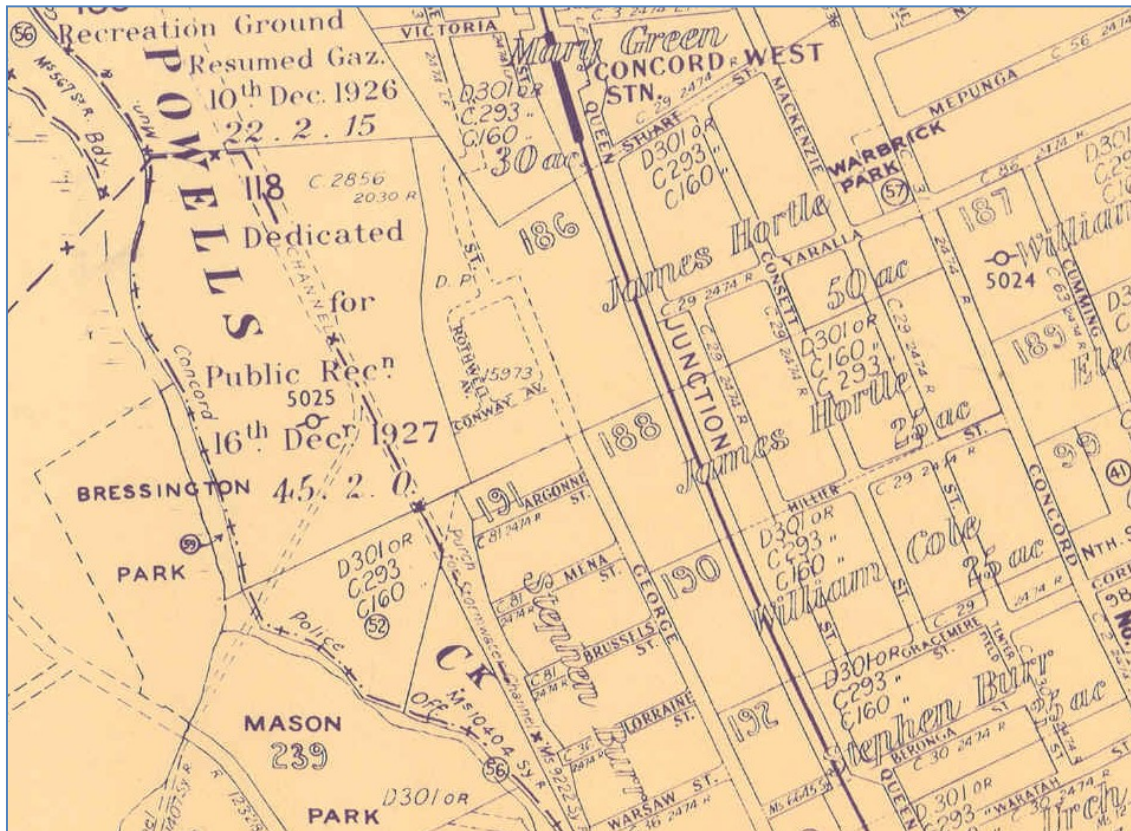


Diagram 1: Cadastral Plan near the time of Construction of the SWC Concrete Channel

Elevations in the upper part of the catchment (Figure 3) reach approximately 55 m AHD near Arthur Street and some reaches are relative steep with 2% to 4% grades. However, the overall catchment slope averages 0.8% along the main flow-path from headwaters to outlet. The main channel is tidal to upstream of Parramatta Road and the lined channel width varies from approximately 2 m in the upper areas to 22 m at Homebush Bay Drive.

Construction of buildings and structures over the open lined channel as shown on Figure 4 has significantly reduced the capacity of the natural waterways. As a result flooding has occurred in the past (Figure 5) causing significant tangible and intangible damages.

1.3. Objectives

The primary objective of the Flood Study was to develop a suitably robust hydrologic and hydraulic modelling system to be used to define flood behaviour, peak flood levels and inundation extents within the study area. There is no Floodplain Risk Management Study planned for the area, but if a study does come about, the modelling system can be used to assess the effectiveness and suitability of flood mitigation works.

The key stages in the flood study process are:

- undertake a comprehensive review of the available flood related data including previous studies, available survey data, historical rainfall and flood level data;
- establish a hydrologic model for the entire Powells Creek catchment to Homebush Bay Drive;

- develop a suitable hydraulic model of Powells Creek and major tributaries within the study area;
- calibration of the hydrologic and hydraulic models to historic flood data;
- define the flood behaviour and produce information on flood levels, velocities and flows for a full range of design flood events under existing conditions;
- assess the sensitivity of blockage and other assumptions on peak flood flows and levels;
- assess the impacts of sea level rise and increase in rainfall and runoff intensities due to climate change; and,
- prepare hydraulic hazard and category mapping.

This report details the results and findings of the above investigations.

1.4. Floodplain Risk Management Process

As described in the 2005 NSW Government's Floodplain Development Manual (Reference 1), the Floodplain Risk Management Process entails four sequential stages:

<i>Stage 1:</i>	<i>Flood Study</i>
<i>Stage 2:</i>	<i>Floodplain Risk Management Study</i>
<i>Stage 3:</i>	<i>Floodplain Risk Management Plan</i>
<i>Stage 4:</i>	<i>Implementation of the Plan</i>

The above first three stages were completed with publication of Powells Creek Flood Study (Reference 2) and the Powells Creek Floodplain Risk Management Study and Plan (Reference 3). Several other flood studies have also been undertaken for private developers and these are reviewed in Section 2.2.

This present document provides a review of the past flood studies and updates the design flood analysis to current best practice. A significant improvement over past studies has been the inclusion of Airborne Laser Scanning (ALS). ALS provides a detailed description of the topography with geo-referenced levels at approximately 1m spacing and thus is far superior to past approaches that were based on much more limited data.

A Flood Study is a technical document and is not always easily understood by the general public. A glossary of flood related terms is provided in Appendix A to assist. If more explanation of terms or a better understanding of the approach is required, type "NSW Government Floodplain Development Manual" into an internet search engine and you will be directed to the NSW Government web site which provides a copy of this manual (Reference 1) and further explanation.

Australian Rainfall and Runoff (AR&R) have produced a set of draft guidelines for appropriate terminology when referring to the probability of floods. In the past, Annual Exceedance Probability (AEP) has generally been used for those events with greater than 10% probability of occurring in any one year, and Average Recurrence Interval (ARI) used for events more frequent than this. However, the ARI terminology is to be replaced with a new term, EY.

AEP is expressed using percentage probability. It expresses the probability that an event of a certain size or larger will occur in any one year, thus a 1% AEP event has a 1% chance of being equalled or exceeded in any one year. For events smaller than the 10% AEP event however, an annualised exceedance probability can be misleading, especially where strong seasonality is experienced. Consequently, events more frequent than the 10% AEP event are expressed as Exceedances per Year (EY). Statistically a 0.5 EY event is not the same as a 50% AEP event, and likewise an event with a 20% AEP is not the same as a 0.2 EY event. For example an event of 0.5 EY is an event which would, on average, occur every two years. A 2 EY event is equivalent to a design event with a 6 month average recurrence interval where there is no seasonality, or an event that is likely to occur twice in one year.

While AEP has long been used for larger events, the use of EY is to replace the use of ARI, which has previously been used in smaller magnitude events. The use of ARI, the Average Recurrence Interval, which indicates the long term average number of years between events, is now discouraged. It can incorrectly lead people to believe that because a 100-year ARI (1% AEP) event occurred last year it will not happen for another 99 years. For example there are several instances of 1% AEP events occurring within a short period, for example the 1949 and 1950 events at Kempsey.

The Probable Maximum Flood (PMF) is a term used in describing the largest possible flood and is related to the PMP, the Probable Maximum Precipitation.

This report has adopted the approach of the AR&R draft terminology guidelines and uses % AEP for all events greater than the 10% AEP and EY for all events smaller and more frequent than this.

All levels in this report are in metres to Australian Height Datum (AHD). Mean sea level is approximately 0 mAHD and an approximate tidal range in Homebush Bay is +0.6 mAHD to -0.4 mAHD.

1.5. Accuracy of Model Results

The accuracy of all model results provided in this report is dependent on the input data sets and the ability of the modelling approach to replicate recorded historical flood data. As modelling approaches improve over time and additional flood data becomes available from future flood events the accuracy of the results will improve.

A key input data set is the topographic information provided by SWC and the Councils for use in this study. The topographic information was derived from Airborne Laser Scanning (ALS) with an estimated accuracy of $\pm 0.15\text{m}$ in cleared areas, such as car parks or on roads. In locations with more complex terrain, such as vegetated areas, the accuracy is likely to be much lower and could vary significantly, by up to $\pm 1\text{m}$. It is cost prohibitive to obtain detailed field survey throughout the entire study area and the ALS is assumed to be correct. However due to these potential accuracy limitations, some of the floodway extents, depth estimates and design flood levels may change if more accurate field survey is obtained. It is estimated that an order of accuracy of the design flood levels is $\pm 0.3\text{ m}$ where quality historical calibration data are

available nearby and up to ± 0.5 m where no such data are available.

The results from the present study incorporate best practice in design flood estimation at this time, as well as recent ALS data and a 2D hydraulic model, but it is acknowledged that changes in approach in the future will cause changes to design flood levels. A good example of this is the collection of rainfall data which forms the basis of design flood estimation. As more rainfall data are collected and analysed (and particularly from continuously read gauges termed pluviometers) the BoM will provide new estimates of design rainfalls and design temporal patterns over NSW. An updated version of the 1987 edition of AR&R - Reference 4 will also introduce new approaches and guidelines which may change design flood levels.

2. AVAILABLE DATA

2.1. Overview

The first stage in the investigation of flooding matters is to establish the nature, size and frequency of the problem. On large river systems such as the Hawkesbury or Parramatta Rivers there are generally stream height and historical records dating back to the early 1900's, or in some cases even further. However, in most small urban catchments there are no stream gauges or official historical records available.

The Powells Creek catchment is unique in Sydney because a stream gauge has been operated by the UNSW at Elva Street for a long period (50 years). The records from this gauge have been used for many technical papers and university undergraduate and graduate theses.

An overview of historical of flooding is also available from an examination of the Councils and SMC records, previous reports, internet search of newspapers, rainfall records and local knowledge.

2.2. Previous Studies

A number of previous studies (Table 1) have been undertaken as described in Reference 2. Numbers 1 to 6 used ILSAX hydrologic models to assess solutions to drainage problems with the majority distributing a questionnaire to the residents in order to obtain information about the drainage problems. Only numbers 7 to 11 determined design flood levels. No. 1 provides a summary of the more recent studies.

Table 1: Previous Studies Listed in Reference 2

Title	Consultant	Branches	Date	Comment	No.
Strathfield Local Flooding Issues	Kinhill Engineers	Wentworth Rd, Strathfield Ck, Albyn Rd	March 1997	Expanded upon References 2 and 3. Undertook HGL.	1
Redmyre Road/Florence Street Catchment Study	Giammarco	Albyn Rd	November 1993	Undertook HGL.	2
Rochester Street Catchment Drainage Investigation	Bewsher Consulting	Strathfield Ck	December 1990	Undertook HGL.	3
Stormwater Drainage Upgrading Programme - Rochester Street Catchment - Feasibility Study and Design Report	Taylor, Thomson, Whitting	Strathfield Ck	1992	Expanded on Ref. 3. Undertook HGL.	4
Rochester Street Drainage Investigation Report	Rankine and Hill	Strathfield Ck	May 1985	Examined upgrading of pipe system.	5
Arthur Street Catchment Study	Bewsher Consulting	Saleyards Ck	July 1996	Only upstream of the railway line.	6
Saleyards Creek at Park Road, Flemington	Bewsher Consulting	Saleyards Ck	October 1996	Determined design flood levels.	7
12-14 Wentworth Road, Homebush	Bewsher Consulting	Saleyards Ck	February 1995	Determined design flood levels.	8
32-36 Burlington Road,	B Lysenko	Strathfield Ck	February	Determined design	9

Title	Consultant	Branches	Date	Comment	No.
Homebush			1994	flood levels.	
Lower Parramatta River Flood Study	Willing & Partners	Powells Ck to approx.Pomeroy St	February 1986	Determined design flood levels.	10
Powells Creek at Underwood Street Site Flood Study	Tierney & Partners	Powells Ck at Pomeroy St	November 1993	Determined design flood levels.	11

However, the references listed in Table 1 are of little value in the current study as they provide little historical data and the results cannot be easily compared. The 1998 Powells Creek Flood Study (Reference 2), however, is a comparable study to the current one and extensive use has been made of the data contained and results.

2.3. 1998 Powells Creek Flood Study (Reference 2)

The 1998 Powells Creek Flood Study was undertaken under the NSW Government Floodplain Management Program and used best practice techniques available at the time. A field survey was undertaken to provide approximately 100 cross sections of the creek channel as well as to collect historical flood height data. Some of the cross section data have been used in the current study and the historical flood height data is provided in Section 2.11.

The study area for determination of design flood levels was taken as:

Powells Creek:

- open channel from Homebush Bay Drive to Elva Street;
- Wentworth Road branch from Powells Creek to the M4 overpass (including the sub-branch from The Boulevard);
- Boulevard branch from Albyn Avenue to Strathfield Avenue;
- Strathfield Creek branch from Powells Creek to Newton Road;
- Albyn Road branch from Powells Creek to Alviston Street, including the sub-branch from Alviston Street to Victoria Street (Florence Street sub-branch) and from Alviston Street to Llandilo Avenue (Llandilo Avenue sub-branch).
-

Saleyards Creek:

- open channel from Homebush Bay Drive to Hampstead Road, including the sub-surface section to Mitchell Road;
- the Edgar Street sub-branch from Airey Park to Edgar Street, also including Pemberton Street.

A comprehensive data search was undertaken including:

- a review of previous studies;
- interviews with local residents;
- discussions with Council Officers;
- contact with SWC, the then Roads & Traffic Authority, the then State Rail Authority, the then Department of Land & Water Conservation and the UNSW;
- review of aerial photographs;
- provision of a questionnaire and review of all previous questionnaires;

- obtaining height and rainfall data from the stream and rainfall gauges operated by the UNSW and SWC.

2.3.1. ILSAX Model

An ILSAX hydrologic model of the entire Powells and Saleyards Creeks catchment was constructed using ILSAX files from some of the studies listed in Table 1. Unfortunately there is no record of the 1130 sub catchment delineation. Inflows from ILSAX were then input into the 1D HEC-RAS hydraulic model which determined flood levels and velocities. Flood extents were not defined, however this has subsequently been undertaken using the peak levels and ALS in Reference 5.

The ILSAX model was calibrated to the events of 3rd February, 7th February, 10th February, 17th February and 18th March 1990 using rainfall from two pluviometers at St Sabina College and at the Elva Street gauge. Calibration to the Elva Street gauge for the January 1996 event could not be undertaken as the gauge malfunctioned. The results are provided in Table 2 and adopted the St Sabina pluviometer as being representative of the catchment rather than the Elva Street gauge, except for the 18th March 1990 event.

Table 2: ILSAX Calibration Results from Reference 2

Event	Peak Flow (m ³ /s)			Volume (ML)			Runoff Co-efficient		Rainfall (mm)
	Actual	Model	% Diff	Actual	Model	% Diff	Actual	Model	
3 February 1990	15.5	15.6	<1%	205	196	-4%	0.76	0.73	110
7 February 1990	15.6	16.8	+8%	85	190	+123%	0.34	0.76	102
10 February 1990	20.9	20.8	<1%	94	110	+17%	0.69	0.80	56
17 February 1990	11.8	12.1	+2%	30	52	+73%	0.38	0.67	32
18 March 1990 St Sabina pluvi	23.3	20.2	-13%	70	91	+30%	0.58	0.76	49
18 March 1990 Elva St pluvi	23.3	24.7	+6%	70	105	+50%	0.52	0.78	55

The main features of the calibration were stated as:

- *there is a good match to the peak flows for all the February 1990 events. For 18th March 1990 a flow midway between the results from the two pluviographs would provide a good match,*
- *the timing and rate of rise of the modelled hydrographs is generally good. The exceptions are 18th March 1990 and 7th February 1990 (timing of streamflow gauge is incorrect),*
- *ILSAX provides a poor match to the volume of runoff. For the majority of events (the exception is 3rd February 1990) ILSAX overestimates the volume by up to 123%. It could be that ILSAX does not accurately represent the losses during the recession limb of the hydrograph. The poor match to the volume of runoff is of less relevance in this type of study than the match to the peak flow,*

- *the results were obtained with identical rainfall loss parameters for each event. A slightly better match may be achieved by varying these parameters but this would make it difficult to decide upon those to be adopted for design,*
- *the variation in actual runoff co-efficient (0.76 to 0.34) is difficult to explain. There are a number of possible reasons including:*
 - *malfunctions in the instrumentation (rainfall and streamflow),*
 - *the recorded rainfall at the pluviometer does not reflect the catchment rainfall. Records show that the rainfall can vary significantly across a short distance (such as between the two UNSW pluviometers),*
 - *the actual losses over the catchment can vary significantly between events.*

Overall the calibration was considered satisfactory and the model appropriate for use in design analysis.

2.3.2. HEC-RAS Model

Approximately 160 cross sections were included in the HEC-RAS model with the majority based on field survey and the remainder interpolated (generally these were required to define upstream and downstream of a structure). The following tailwater levels in Homebush Bay were adopted:

1% AEP	1.40 mAHD;
2% AEP	1.35 mAHD;
5% AEP	1.30 mAHD;
10% AEP	1.25 mAHD;
0.2 EY	1.20 mAHD;
0.5 EY	1.15 mAHD.

Detailed investigation of the peak historical level data revealed a number of problems:

- the majority of the historical recorded levels were for the two most recent events (1990 and 1996) but it was concluded that is unlikely that these were the largest floods. A summary of the historical data shows:
 - January 1996 = 39 levels (rainfall data not available),
 - February 1990 = 21 levels (assumed to be 10th February 1990),
 - 1992 = 2 levels (rainfall data suggested this was only a minor event),
 - 1989 = 2 levels (rainfall data suggested this was only a minor event),
 - others = 9 levels (data unsuitable for calibration).
- as the depth of inundation was generally less than 0.4 m (the greatest depth was 0.8 m) a recorded level may reflect a local “low spot” or “ponding area” rather than being indicative of the level of the main flow,
- local structures (buildings, fences, gates, cars, drains blocked) are likely to have a significant effect upon the recorded levels. This effect may vary between floods (e.g. new fence, or gate open/closed),
- in many places there is a steep local gradient across a property which was not always represented by the survey data. This meant that it was difficult to match to data points

not taken at cross-sections. The exact location of the recorded level within the property was also not always known.

The intention was to calibrate HEC-RAS to the January 1996 and February 1990 events but as the Elva Street gauge malfunctioned in January 1996 and rainfall data were not readily available calibration could only be undertaken for the February 1990 events.

The results of the calibration are shown in Table 3.

Table 3: HEC-RAS Calibration Results from Reference 2 for 10th February 1990

Location	Recorded Depth of Flow (m)	Recorded Level (mAHD)	Model Level (mAHD)	Model minus Recorded Level (m)
STRATHFIELD CREEK BRANCH:				
No. 56 Ismay Avenue	0.2	3.8	4.0	0.2
No. 41 Ismay Avenue	0.1	3.7	4.2	0.5
No. 51 Ismay Avenue	0.3	4.2	4.2	0.0
No. 55 Ismay Avenue	0.4	4.3	4.2	-0.1
No. 82 Underwood Road	0.5	5.0	4.9	-0.1
No. 12 Loftus Crescent	0.2	7.9	7.7	-0.2
No. 29 Burlington Road	not recorded	9.2	9.2	0.0
No. 38-46 Burlington Road	0.5	9.7	9.5	-0.2
No. 89 Rochester Street	0.1	12.8	12.7	-0.1
No. 28 Broughton Street	0.2	12.9	12.7	-0.2
No. 109 Rochester Street	0.4	14.3	14.3	0.0
No. 53 Beresford Road	0.1	15.3	15.4	0.1
No. 100 Beresford Road	0.1	15.9	15.9	0.0
No. 102 Beresford Road	0.1	16.4	16.4	0.0
No. 104 Beresford Road	0.6	17.0	16.7	-0.3
No. 108 Beresford Road	0.3	17.5	17.2	-0.3
No. 110 Beresford Road	0.4	17.5	17.2	-0.3
No. 137 Albert Street	not recorded	19.0	19.3	0.3
No. 137 Albert Street	not recorded	19.2	19.3	0.1
No. 141 Albert Street	0.3	19.5	19.3	-0.2
LLANDILO AVENUE BRANCH:				
No. 21 Llandilo Avenue d/s	0.8	28.8	28.9	0.1
No. 21 Llandilo Avenue u/s	0.1	29.9	30.6	0.7
SALEYARDS CREEK:				
No. 79 The Crescent	0.3	8.2	8.1	-0.1
No. 6 Kessell Avenue	not recorded	8.4	8.1	-0.3
POWELLS CREEK:				
No. 34 Ismay Avenue	0.4	2.6	2.4	-0.2
Elva Street Gauge	1.8	7.0	7.2	0.2

The main features of the calibration were stated as:

- *a reasonable match to all flood levels was obtained,*

- *the 0.6 m difference in level between adjacent properties at 102 and 104 Beresford Road could not be replicated. It is possible that there is an error with the records or the levels do not reflect the “mainstream” flow,*
- *the 1.1 m difference in level within 21 Llandillo Avenue could not be replicated.*

Overall the calibration was considered satisfactory and the model appropriate for use in design analysis. The report suggested that further calibration of the hydraulic model should be undertaken as more data become available. However, since 1998 there have been no significant floods suitable for model calibration.

The 2 hour duration was adopted as the critical storm duration for design events. Design flood results were provided in various formats and a comparison between runoff routing and flood frequency approaches (using the Elva Street gauge data) is shown in Table 4. The flood frequency analysis was undertaken by the University of New South Wales using the Flike program and fitting to a log Pearson III distribution.

Table 4: Comparison of Flood Frequency Analysis and Runoff Routing from Reference 2

AEP (%)	Flood Frequency		Runoff Routing (2h Duration)	
	Level (mAHD)	Flow (m ³ /s) *	Level (mAHD)	Flow (m ³ /s) *
20	7.2	23.8 (50%)	7.4	26.1 (55%)
10	7.5	29.3 (62%)	7.6	29.8 (63%)
5	7.8	34.6 (73%)	8.1	35.3 (75%)
2	#	41.7 (88%)	8.3	41.8 (89%)
1	#	47.2	8.9	47.2

Notes: * flow as a percentage of the 1% AEP event shown in brackets.

Levels for the flood frequency analysis are not provided for events greater than a 5% event. For such events the flow is above the coping of the channel and there are significant backwater influences from the bridges downstream. The extension of the UNSW rating curve used in their flood frequency analysis does not appear to reflect the backwater influence.

The following are some general comments regarding the results:

- *high velocities in the lined channel make it difficult to determine the true velocity and therefore the flow,*
- *the gauging station is well sited to reflect in channel flows but less so for overland flows, the majority of which may enter downstream of the gauge,*
- *the properties of the channel (area, Mannings “n” value, wetted perimeter) can be precisely measured but values above the channel are subject to considerable variation,*
- *ILSAX does not explicitly account for the considerable floodplain storage which occurs within most road reserves and within private property. The only exceptions to this are at Leicester Avenue and Airey Park where detention basins were explicitly included in the model.*

It was concluded that the differences between the design flood levels obtained from flood frequency and runoff routing could only be resolved once high flow calibration data are obtained. These data are difficult to obtain due to the rapid rise (1.8 m in 30 minutes) and fall of the water level. Flood levels from the runoff routing analysis have been adopted for design as the HEC-RAS model should provide a more accurate definition of the channel hydraulics at high flows.

2.3.3. Accuracy of the Design Flood Data

The study concluded that accuracy of the design flood data depended upon a number of factors including:

- **quality of the survey data.** How well do these data represent the floodplain? In an urban catchment the flow path can change dramatically over a short distance (fences, buildings, trees). In this study sections have been located to be representative of the typical flow path in the region.
- **downstream boundary conditions.** Changing the downstream boundary will affect flood levels upstream. This issue is not significant in this study as the main areas of interest are not affected by the downstream boundary.
- **accuracy of design rainfall data.** As the most up to date rainfall data have been used in this study this issue is unlikely to be significant. They may change as a result of climate change.
- **ability of the models to accurately represent the channel hydraulics.** This is likely to be a significant factor.
- **quantity and quality of available historical data.** The calibration of ILSAX to the flow data from the stream gauge provides a high degree of confidence in the results from the hydrological model at the gauge. Calibration of the HEC-RAS model is satisfactory but can be significantly improved if peak height data from future events can be replicated.

The main factors affecting the accuracy of the design data were considered to be the ability of the models to simulate the channel hydraulics and the quantity and quality of the historical data. Based upon the above considerations the accuracy of the design flood levels were considered to be ± 0.4 m. This could be improved if further calibration of the models to future flood events was undertaken.

2.4. Comparison of Results with Previous Studies

A comparison of design peak flows from Reference 2 with other studies was shown in Table 5 and Table 6.

Table 5: Comparison of Design Peak Flows (m^3/s) from Reference 2

Location/Reference and ILSAX Branch/Reach (N/P = data not provided)	1% AEP		2% AEP		5% AEP	
	Ref	Ref 2	Ref	Ref 2	Ref	Ref 2
Strathfield Creek Branch: Railway Line (R/49T) (Ref. 3)	38	32	N/P	29	31	26
Saleyards Creek: Park Road (0/25Q) (Ref. 7)	76	47	68	43	61	38
Saleyards Creek: Wentworth Road (0/27Q) (Ref. 8)	76	55	N/P	50	N/P	44
Powells Creek: Homebush Bay (A/41Q) (Ref. 10)	140	182	120	165	105	148
Powells Creek: Pomeroy Street (A/38S) (Ref. 11)	77	97	N/P	90	59	82
Powells Creek: Confluence with Saleyards Creek (A/40S) (Ref. 11)	82	106	N/P	98	67	89
Powells Creek: d/s of conf. with Saleyards Creek (A/41Q) (Ref. 11)	139	182	N/P	165	101	148

Table 6: Comparison of Design Peak Levels (mAHD) from Reference 2

Location/Reference and HEC-RAS River Station Number (N/P = data not provided)	Design Events (AEP)					
	1%		2%		5%	
	Ref	Ref 2	Ref	Ref 2	Ref	Ref 2
Saleyards Creek: Park Road * (49) (Ref. 7)	4.60	4.31	4.50	4.12	4.10	3.91
Saleyards Creek: Wentworth Road (46) (Ref. 8)	2.90	2.59	N/P	2.58	N/P	2.57
Strathfield Creek Branch: 32-36 Burlington Road (84) (Ref. 9)	9.91	9.80	N/P	9.74	N/P	9.68
Powells Creek: Saleyards Creek confluence (1.5) (Ref. 10)	2.50	1.75	2.23	1.62	2.15	1.51
Powells Creek: Pomeroy Street (4.5) (Ref. 10)	3.00	3.15	2.85	3.11	2.75	3.05
Powells Creek: Lemnos Street (approx) (6) (Ref. 10)	3.25	3.11	3.14	3.07	3.03	3.03
Powells Creek: d/s of Pomeroy Street (4) (Ref. 11)	2.11	2.18	N/P	2.06	1.84	1.97
Powells Creek: u/s of Pomeroy Street(4.5) (Ref. 11)	2.80	3.15	N/P	3.11	N/P	3.05

Sensitivity analyses to changes in design rainfall intensities and parameters in ILSAX were also undertaken. Blockage was considered and was summarised in the following statement. *In the absence of any conclusive data on this issue and the fact that all previous studies assumed nil blockage, nil blockage was adopted for this study. As only a small percentage of flow is within the pipe system in a large flood, varying this parameter will have little impact on design flood levels.*

2.5. Data Sources

Data utilised in the present study has been sourced from a variety of organisations. Table 7 lists the type of data sourced and from where it has been extracted.

Table 7: Data Sources

Type of Data	Format Provided (Source)	Format Stored
Location, description and invert depths of pits, pipes and trunk drainage network	GIS (SWC and Councils)	DRAINS and TUFLOW models
Ground levels from ALS data	GIS (SWC and SMC)	GIS and TUFLOW model
Detailed survey data	GIS (SWC)	GIS and TUFLOW model
GIS information (cadastre, drainage pipe layout)	GIS (SWC and Councils)	GIS and TUFLOW model
Design rainfall	AR&R (1987)	DRAINS
Recorded flood data	Observation by SMC, SMC and previous reports	Report

2.6. Topographic Data

Airborne Laser Scanning (ALS) or Light Detection and Ranging (LiDAR) survey of the catchment and its immediate surroundings was provided for the study by SWC and SMC. It was indicated that the data were collected in 2007 by AAMHatch. These data typically have accuracy in the order of:

- +/- 0.15m (for 70% of points) in the vertical direction on clear, hard ground; and
- +/- 0.75m in the horizontal direction.

The accuracy of the ALS data can be influenced by the presence of open water or vegetation (tree or shrub canopy) at the time of the survey.

From this data, a Triangular Irregular Network (TIN) was generated by WMAwater. This TIN was sampled at a regular spacing of 1 m by 1 m to create a Digital Elevation Model (DEM), which formed the basis of the two-dimensional hydraulic modelling for the study.

2.7. Structure Survey

All bridges and structures within the open channel extent of the study area were inspected in May 2014. Survey data collected as part of Reference 2 were used to define the structures. Photographs on Figure 4 provide a descriptive overview of the key characteristics of the open channel system.

2.8. Rainfall Data

2.8.1. Overview

Rainfall data is recorded either daily (24hr rainfall totals to 9:00 am) or continuously (pluviometers measuring rainfall in small increments – less than 1 mm). Daily rainfall data have been recorded for over 100 years at many locations within the Sydney basin. In general, pluviometers have only been installed since the 1970's. Together these records provide a picture of when and how often large rainfall events have occurred in the past.

However, care must be taken when interpreting historical rainfall measurements. Rainfall records may not provide an accurate representation of past events due to a combination of factors including local site conditions, human error, or limitations inherent to the type of recording instrument used. Examples of limitations that may impact the quality of data used for the present study are:

- Rainfall gauges frequently fail to accurately record the total amount of rainfall. This can occur for a range of reasons including operator error, instrument failure, overtopping and vandalism. In particular, many gauges fail during periods of heavy rainfall and records of large events are often lost or misrepresented.
- Daily read information is usually obtained at 9:00 am in the morning. Thus if a single storm is experienced both before and after 9:00 am, then the rainfall is “split” between two days of record and a large single day total cannot be identified.
- In the past, rainfall over weekends was often erroneously accumulated and recorded as a combined Monday 9:00 am reading.
- The duration of intense rainfall required to produce overland flooding in the study area is typically less than 4 hours (though this rainfall may be contained within a longer period of rainfall). This is termed the “critical storm duration”. For a larger catchment (such as the Parramatta River) the critical storm duration may be greater (say 12 hours). For the study area a short intense period of rainfall can produce flooding but if the rain stops quickly, the daily rainfall total may not necessarily reflect the magnitude of the intensity and subsequent flooding. Alternatively the rainfall may be relatively consistent throughout the day, producing a large total but only minor flooding.

- Rainfall records can frequently have “gaps” ranging from a few days to several weeks or even years.
- Pluviometer (continuous) records provide a much greater insight into the intensity (depth vs. time) of rainfall events and have the advantage that the data can generally be analysed electronically. This data has much fewer limitations than daily read data. However, pluviometers can also fail during storm events due to the extreme weather conditions.
- Rainfall events which cause overland flooding (as opposed to mainstream flooding) in the Powells Creek catchment are usually localised and as such are only accurately represented by a nearby gauge. Gauges sited even only a kilometre away can show very different intensities and total rainfall depths.

2.8.2. Rainfall Stations

There are a number of daily read rainfall stations within the catchment and surrounding area. Data were not collected from these stations as more suitable data were available from six pluviometers (Table 8). The two UNSW pluviometers have operated since approximately 1977 but the dates shown in Table 8 are the periods for which digital data are available. No correction has been made in the digital records for the UNSW gauges to account for errors in the clock speed. Thus the time of the recorded rainfall can be out by several hours. This has not been corrected for in this report; however, Reference 6 provides an approach that can be used.

Table 8: Pluviometers

Gauge No.	Operator	Operating Period	Location
566005	UNSW	Mar 1981 to Feb 1996 (period when digital records available)	St Sabina College (Russell St, The Boulevarde)
566004	UNSW	Dec 1980 to June 1993 (period when digital records available)	Stream gauge at Elva St/Beresford Rd
566022	SWC	May 1969 to August 1983, July 1990 to Present	Homebush Bowling Club (Pomeroy St)
566020	SWC	Oct 1958 to Present	Enfield (Belfield Bowling Club - Margaret St)
566036	SWC	February 1970 to Present	Potts Hill Reservoir
566064	SWC	June 1988 to Present	Concord (Western Suburbs Club).

2.8.3. Analysis of Pluviometer Data

Rainfall data were collected from some of the available pluviometers for the significant recent flood events with the peak bursts provided in Table 9 and Figure 9. An estimate of the rainfall frequency for each event can be obtained from comparison with the design rainfalls (Table 10).

Table 9: Historical Rainfall - Maximum Rainfall Depths (mm)

	Duration						
	5 or 6 min	10 min	20 min	30 min	60 min	90 min	120 min
2nd January 1996:							
Homebush	15	23	36	44	52	54	58
Enfield	17	25	45	57	81	83	88
Potts Hill	11	17	31	42	49	52	54
Concord	7	11	21	30	46	49	52
Elva Street	Instrument Failed						
St Sabina	11	22	37	50	64	n/a	71
8th February 1992:							
Homebush	Instrument Failed						
Enfield	4	6	10	13	22	28	33
Elva Street	Instrument Failed						
St Sabina	2	5	6	11	16	n/a	n/a
11th March 1991:							
Homebush	No Significant Rain						
Enfield	13	19	34	37	-	-	-
Potts Hill	11	18	33	35	-	-	-
Concord	10	16	24	24	-	-	-
Elva Street	Instrument Failed						
St Sabina	Instrument Failed						
18th March 1990:							
Elva Street	20	34	41	44	45	47	50
St Sabina	8	23	26	31	36	43	46
10th February 1990:							
Homebush	Gauge Not in Operation						
Enfield	11	15	23	26	40	45	50
Potts Hill	12	19	31	36	44	48	52
Concord	7	11	17	25	31	33	38
Elva Street	9	13	22	28	39	n/a	50
St Sabina	6	11	21	31	42	n/a	52
4-6th August 1986:							
Homebush	Gauge Not in Operation						
Enfield	12	17	27	36	50	59	64
Potts Hill	11	16	27	37	52	60	64
Concord	Gauge Not in Operation						
Elva Street	10	13	17	21			
St Sabina	Very Little Rain						

Note: Data for January 1989 are not shown as the Enfield pluviometer record indicated no significant rainfall events.

Data from other pluviometers may be available but were not collected.

2.9. Design Rainfall

Design rainfall intensities were based on procedures in AR&R 1987 (Reference 4). Design rainfall intensities at the centre of the catchment are provided in Table 10.

Table 10: Design Rainfall Intensities at the Catchment Centroid (mm/hr)

Event	Duration						
	5 min	10 min	20 min	30 min	60 min	90 min	120 min
0.2 EY	144	111	81	66	45.4	35.6	29.9
10% AEP	161	124	91	74	51	40.2	33.8
5% AEP	184	142	104	85	59	46.3	39
2% AEP	213	165	121	99	69	54	45.7
1% AEP	236	182	134	110	76	60	51
0.5% AEP	258	200	148	121	84	66	56
0.2% AEP	288	224	165	135	94	75	63
PMP				440	326	248	208

Probable Maximum Precipitation (PMP) design rainfall depths were calculated using the 2003 BoM Generalised Short Duration Method (Reference 7) for durations up to 6 hours.

2.10. Stream Gauges

2.10.1. UNSW (Elva Street Gauge)

Flood levels have been recorded continuously from September 1958 at the Elva Street gauge (Photo 1) until 2010. Apart from this gauge there are no other long term flood records for the catchment. SWC operated a gauge on Powells Creek (under the M4) but records are only available from October 1995.



Photo 1: Powells Creek gauge at Elva Street

At the time of completion of the 1998 Powells Creek Flood Study (Reference 2) only a limited amount of water level and rainfall data were available from the UNSW as only parts of the historical records were digitised or quality checked.

Subsequently the entire water level and pluviometer record (both at St Sabina and at Elva Street) have been digitised and a rating table adopted to assign flows to the recorded levels.

However there are many gaps in the digital record and this means that the record is only complete to November 1997. The digital record has also not been corrected for timing errors. This timing error correction has not been undertaken for this study.

A summary of the water level data is provided on Figure 6 and below indicates the number of days where the water level has exceeded a threshold (1958 to November 1997):

- >3m - 1 day;
- >2.5m - 3 days;
- >2m - 6 days;
- >1.5m - 31 days;
- >1m - 116 days.

The coping of the channel is approximately 3m above the invert and thus only one event (February 1959) has exceeded the capacity of the channel in approximately 55 years of record (1958 to 2014). A review of Figure 6 indicates that since 1974 (40 years) no event has exceeded 2m on the gauge but 5 events did in the period from 1958 to 1974. Unfortunately this means that calibration can only be undertaken on events smaller than 2m gauge height as the two UNSW pluviometers were not in operation until 1980.

Reference 2 included Table 11 which listed the largest events recorded on the UNSW gauge above 2.0 m. These height data were obtained from inspection of the gauge charts or estimated from debris (Reference 6). The corresponding digital records are shown alongside in Table 11.

Table 11: UNSW Gauge at Elva Street - Major Floods (> 2.0 m) taken from Reference 2

Rank	Year	Date	Gauge Height (m)	RL(mAHD)	Gauge Height (m) from Digital Record
1	1961	18 Nov	4.18 *	9.43	No Record
2	1964	10 Jun	3.52 *	8.77	1.8
3	1959	18 Feb	3.29 *	8.54	3.26
4	1972	29 Oct	3.20	8.45	0.9
5	1970	9 Dec	3.09	8.34	Gauge failed
6	1963	13 Dec	2.40	7.65	2.47
7	1973	9 Apr	2.35	7.60	0.7
8	1974	25 May	2.34	7.59	2.23

* estimated from debris.

Gauge zero is RL 5.25 mAHD.

A limited number of gaugings (height v velocity measurements) have been undertaken enabling the construction of a rating curve (height versus flow). Whilst in theory this approach appears very simple it becomes complex for a number of reasons, including:

- the events occur within a few hours and thus it was very hard for the UNSW staff to get to the gauge whilst a flood was in progress;
- the above means that there are several low flow gaugings but very few high flow gaugings which are more relevant for use in a flood study;

- a gauging was taken by the UNSW at high flows which produced velocities above the rating of the instrument (say above 5 m/s). Thus even this gauging could not confidently determine the peak flow.

Rating curves from various sources are provided on Figure 7.

2.10.2. Sydney Water Gauge

This gauge, which is located on Powells Creek under the M4, has only recorded one significant flood (January 1996) since it was installed in 1995. The gauge zero is RL 2.15 mAHD and the January 1996 flood peaked at 2.04 m (4.19 mAHD) at 1405 hours. Three streamflow gaugings have been undertaken. All gaugings are below 0.1 m gauge height (flow <2 m³/s). Extrapolation of the rating curve based on these data is not appropriate and as a result flow data from this gauge have not been used for calibration of the hydrologic model.

2.11. Flood Levels from Debris or Other Marks

2.11.1. Resident Interviews

As part of the 1998 Powells Creek Flood Study (Reference 2) and earlier studies (refer Table 1) questionnaires were distributed to local residents in order to collect information about past flood events. Prior to the 1998 Powells Creek Flood Study the responses were generally concerned with drainage issues (blocked pits, minor overland flow) and not with identifying historical flood levels. The only exception to this was at Airey Park (Saleyards Creek) for the January 1996 event.

No questionnaire was distributed as part of the present study as there have been no major floods since 1998 and questionnaire results from the 1998 Powells Creek Flood Study are still relevant.

Data obtained from residents should be used with caution for a number of reasons, including:

- residents may have only been in the study area for a short period;
- residents may have “missed” a flood whilst they were away;
- the more recent events are remembered more clearly than (say) a larger event several years ago;
- some events noted by residents may be as a result of a blocked drain or other local factors and are more typically referred to as local drainage problems rather than flood related;
- residents can easily forget the date of a flood or become confused about the extent and nature of the problem. Experience has shown that water entering a house may have resulted from a leak in the gutter or a local drainage problem in the yard rather than overbank flow from the main creek.

Table 12 provides the most widely remembered events (obtained from the results of the 1998 Powells Creek Flood Study (Reference 2) and previous questionnaire surveys).

Table 12: Significant Floods Obtained from 1998 Flood Study Questionnaire

Approximate Date	Comment
? 1930's	Infrequently mentioned.
1943	Infrequently mentioned.
18 February 1959	Infrequently mentioned.
? 1960's	Infrequently mentioned.
November 1961	Infrequently mentioned.
? 1964	Infrequently mentioned.
? 1973	Infrequently mentioned.
August 1986	Appears to be the largest event in the last 30 years
March/April and July 1988	Infrequently mentioned.
January 1989	Widely remembered.
February 1990	Widely remembered, larger than 1996 in Saleyards Creek
March 1990	Infrequently mentioned.
April 1990	Infrequently mentioned.
March 1991	Widely remembered.
2 December 1992	Infrequently mentioned.
February 1995	Infrequently mentioned.
October 1995	Infrequently mentioned.
June 1995	Infrequently mentioned.
December 1995	Infrequently mentioned.

Table 12 indicates that 50% of the most widely remembered events are in the 1990's. This figure could suggest that flooding in the 1990's has been a major issue compared to other periods. This is unlikely to be the case, and merely reflects some of the points noted previously regarding obtaining data from residents. Clearly the gauge record (Figure 6) indicates the period from 1958 to 1974 had more large floods.

As part of the 1998 Powells Creek Flood Study (Reference 2) 125 questionnaires were returned out of approximately 800 hand delivered or mailed (to non-resident owners) with some followed up by telephone or field interview. Table 13 summarises the results from this survey.

Table 13: 1998 Flood Study Questionnaire Results

Total number of questionnaires returned	125 (approx.15%)
Number who responded indicating that their property had been inundated by a water depth greater than 100 mm.	60 (49%)
Number not inundated.	65 (52%)
Number who could indicate a historical flood level.	39 (31%)
Number of buildings inundated above floor level*.	6 (5%)

Note: * Previous questionnaire surveys have indicated that other buildings have been inundated above floor level.

2.11.2. Surveyed Levels

A number of historical flood levels were collected from field interviews as part of the 1998 Powells Creek Flood Study (Reference 2). The majority of levels were for either the January 1996 or the February 1990 events. These are shown in Table 14 and on Figure 8.

Table 14: Historical Flood Data from Field Interviews in August 1997 as part of Reference 2

Address	Date of Flood	Depth (m)	Description	Flood Level (mAHD)
No. 21 Llandilo Avenue	Approx 1990	0.05-0.08	Garage Floor Level	29.96
	Approx. 1990	0.8	North-West Corner	28.8
No. 8 Agnes Street	Jan-96	0.1	Driveway and Front Boundary	26.71
No. 41 Albyn Road	Jan-96	0.08	Crest of Driveway	22.54
	Jan-96	0.35	Low Point along West. Boundary	21.64
No. 47 Albyn Road	Jan-96	0.25	Garage Floor Level	21.18
No. 35 Redmyre Road	Jan-96	0.05-0.1	Crest of Driveway	13.26
	Jan-96	0.5	Ground Level at Back Fence	12.13
No. 37 Redmyre Road	Jan-96	0.05-0.1	Crest of Driveway	13.27
	Jan-96	0.3	Ground Level at Garage	12.21
No. 45 Churchill Avenue	Jan-96	0.1	Base Steps at Front House	10.74
No. 60 Churchill Avenue	Jan-96	0.2	Ground Level at Path Granny Flat	11.49
No. 66 Churchill Avenue	18th February 1959	0.3	Floor Level	12.06
Upstream Railway crossing near Elva Street	Unknown		Top coping LHS looking Downstream	8.1
			Top coping RHS looking Downstream	7.83
Pharmacy adjoining Plaza Entrance, The Boulevarde	Jan-96		Floor Level - water entered shop	12.29
No. 11 The Boulevarde (Gumbleys Butchery - now gone)	Nov-61	0.3	Estimated Floor Level	12.55
No. 26 Barker Road	Regularly	0.1	Drive at Boundary	25.83
No. 65 Oxford Street	Jan-96	0.45	Carport Slab	24.16
No. 63 Oxford Street	Jan-96	0.3	South-West corner of house	23.75
No. 61 Oxford Street	Jan-96	0.5	Garage Floor Level	23.24
No. 59 Oxford Street	Jan-96	-	Patio Level	23.14
No. 141 Albert Street	Approx. 1990	0.3	Ground level along eastern fence	19.51
No. 135 Albert Street	Approx. 1990	0.5	Bottom steps rear of house	18.49
No. 137 Albert Street	Feb-90	-	Crest of driveway	19.24
	Feb-90	-	Water reached floor level	19.01
No. 100 Beresford Road	Feb-90	0.1	Driveway at entrance to house	15.91
No. 102 Beresford Road	Feb-90	0.12	Ground level at back door	16.43
No. 104 Beresford Road	Feb-90	0.55	Ground level rear house	17
No. 110 Beresford Road	Feb-90	0.35	Midway along eastern fence	17.5

Address	Date of Flood	Depth (m)	Description	Flood Level (mAHD)
No. 53 Beresford Road	Feb-90	0.05	Garage floor level	15.29
No. 108 Beresford Road	Feb-90	0.34	Base steps rear house	17.49
No. 89 Rochester Street	Feb-90	0.1	Floor level shop	12.84
No. 107 Rochester Street	Jan-89	0.45	GL at rear of house	14.12
No. 109 Rochester Street	Feb-90	0.42	Base steps rear house	14.33
	Jan-96	0.24	Base steps rear house	14.15
No. 57 Rochester Street	Jan-96	0.41	Ground level back yard	9.92
No. 28 Broughton Road	Approx. 1992	0.24	North East corner of house	12.88
No. 33-35 Burlington Road	1989	0.3	Garage Floor Level	9.14
No. 38-46 Burlington Road(Hairdresser)	Feb-90	0.48	Ground level at rear shed	9.71
No. 48 Burlington Road	Jan-96	0.1	Ground Floor Level	9.55
No. 29 Burlington Road	Feb-90	-	Stormwater reached this level at rear of factory	9.16
No. 30 The Crescent (Unit No. 2)	Jan-96	0.4	Garage Floor Level	8.7
No. 31 The Crescent	Jan-96	0.2	Garage Floor Level	8.33
No. 79 The Crescent	Feb-90	0.3	Floor level	8.2
	Jan-96	0.28	Base patio at rear	7.75
No. 12 Loftus Crescent	Feb-90	0.15	Ground level backyard	7.87
No. 82 Underwood Road	Feb-90	0.45	Ground level at front house and driveway	4.97
No. 86 Underwood Road	Jan-96	0.3	Base steps front house	4.89
No. 90 Underwood Road	Jan-96	0.16	Base steps front of house	4.74
No. 22 Ismay Avenue	Approx. 1986	0.3	Ground at back fence	2.2
No. 34 Ismay Avenue	Jan-90	0.35	Path at back door	2.57
No. 60 Ismay Avenue	Jan-96	0.1	Ground level at front of house	3.83
No. 55 Ismay Avenue	Feb-90	0.37	Base front steps	4.3
	Jan-96	0.18	Base front steps	4.11
No. 51 Ismay Avenue	Feb-90	0.3	Base front steps	4.19
No. 56 Ismay Avenue	Feb-90	0.2	Base front steps	3.83
No. 49 Ismay Avenue	Jan-96	0.22	Base front steps	4.16
No. 48 Ismay Avenue	Jan-96	0.15	Base front steps	3.43
No. 41 Ismay Avenue	Feb-90	0.14	Base front steps	3.71
	Jan-96	0.07	Base front steps	3.64
No. 17 Pemberton Street	1992	0.4	Ground level backyard	16.95
No. 27 Pemberton Street	1992	0.17	Base steps rear house	18.72

Address	Date of Flood	Depth (m)	Description	Flood Level (mAHD)
No. 10 Mitchell Road	Jan-96	0.28	Ground level low side house	14.75
No. 6 Mitchell Road	Jan-96	0.24	Ground level low side house	14.35
No. 104 Arthur Street	Jan-96	0.27	Ground level front of house	13.87
No.106 Arthur Street	Jan-96	0.34	Ground level at boundary	13.85
No. 105 Arthur Street	Jan-96	0.55	Ground level at house steps side house	13.89
No. 29 Arthur Street	Jan-96	0.16	Base front steps	13.23
	Jan-96	0.4-0.5	Ground level at rear fence	12.98
No. 6 Kessell Avenue	Jan-96	0.44	Ground level at fence	7.76
	Feb-90	-	Water reached floor level	8.42
Airey Park Photos	Jan-96	0.75	Base wall No. 77	7.65

2.11.3. Sydney Water Data

SWC holds records of flooding on Powells Creek and the relevant information is provided in Table 15. These records show no instances of flooding in 1990 and only one record (Feb 1996) since 1988.

Table 15: Sydney Water Records of Flooding in the Powells Creek Catchment

Date Flooded From	Address	Depth (m)	Level Above Floor (m)	Level Above Coping (m)	Property Inundation	Comments
?/07/1952	135 Albert Road, Strathfield				Y	Flooding due to construction activity-water supply. Loss of goods.
6/05/1953	Lot 3, Allen St, Homebush					Flooding occurred where Council's bridge restricts the flow
6/05/1953	4-6 Elva St, Strathfield					Flooding occurred where the channel is deficient in capacity
6/05/1953	36 Minna St, Burwood					Flooding occurred where the channel & Council's subsidiary drainage works are deficient
6/05/1953	Lot 2 Bates St, Homebush (cnr The Crescent)					Flood waters crossed the road where Council's culvert is deficient in capacity
6/05/1953	103 Parramatta Rd, Strathfield					Flooding occurred where the channel is covered at coping level.
9/02/1956	8-10 Elva St, Strathfield			0.45	Y	At the future gauging site
9/03/1958	2A Belgrave St, Burwood	0.37				Flooding of road only?
9/03/1958	4-6 Elva St, Strathfield			0.75		Flooding
9/03/1958	9 Bold St, Burwood (Minna St, Burwood - west of its intersection with Bold St)	0.53			Y	Water banked up to a max. of 0.53m deep against the northern fence of Minna St.
9/03/1958	33 Nicholson St, Burwood	0.1				Flooding of road only?
9/03/1958	20 Woodside Ave, Burwood	0.15				Flooding of road only?

Date Flooded From	Address	Depth (m)	Level Above Floor (m)	Level Above Coping (m)	Property Inundation	Comments
9/03/1958	36A Nicholson St, Burwood	0.05			Y	Water (0.05) deep northern side Nicholson St & sewer surcharge in No. 6A
9/03/1958	24 The Boulevard, Strathfield	0.6			Y	Flood entered the shop and damaged the stock- insufficient inlets
17/02/1959	5 Bold St, Burwood		0.45		Y	Flooding occurred above garage floor level at rear of house, but 0.65m below floor level of house
17/02/1959	7 Bold St, Burwood		0.56		Y	Flooding occurred above garage floor level at rear of house, but .28m below floor level of house
18/02/1959	4-6 Elva St, Strathfield			1.14	Y	1.14m above the coping level of the Stormwater channel at Gauging Station. Floodwater entered the Elva Street and carried some of the timbers away
18/02/1959	2 Elva Street, Strathfield			1.24	Y	
18/02/1959	58 Churchill Avenue		1.5		Y	1.5 m above the kitchen floor. No damage was done and the kitchen floor is considerably lower than the back yard.
18/02/1959	66 Churchill Avenue		0.3		Y	0.3 m above the floor. Water coming from Redmyre Road has swept through the house and damaged carpets and furniture. Many premises had been flooded.
18/02/1959	27 Minna St, Burwood	0.84			Y	Flooding occurred above the yard level at NW corner of house, but was 0.35m below floor level of house
30/10/1959	7 Bold St, Burwood					Slight flooding only. Flood water rose to 0.30m above footpath level, no houses flooded
17/11/1961	53 Ismay Ave, Homebush				Y	Flooding of homes reported.
19/11/1961	19 Oxford St, Burwood		0.15		Y	Above floor flooding
19/11/1961	21 Morwick St, Strathfield		0.3		Y	Above floor flooding
19/11/1961	26 Morwick St, Strathfield		0.025		Y	New block of home units, water rose to within .025m of floor level & 0.38m above laundry floor.
19/11/1961	41 Woodside Ave, Burwood				Y	Brick fence along the frontage collapsed
19/11/1961	19 Oxford St, Burwood		0.15		Y	Above floor flooding
19/11/1961	62/64 Oxford St, Burwood				Y	Extensive damage to fencing & back gardens
19/11/1961	4-6 Elva St, Strathfield		0.87		Y	Harrisons Timber P/L flooded. Damage to motors & furniture.
19/11/1961	8-10 Elva Street				Y	Flood water was just below the floor level. Garden was ruined. Photos available
19/11/1961	7 Bold St, Burwood.				Y	Severe flooding. Flood water rose to 0.75m above footpath level on North side of Minna St - 19th 4.00 a.m. The water was held back by the side palings of the house No.7 Bold Street but eventually found an outlet through No. 27 Minna Street.

Date Flooded From	Address	Depth (m)	Level Above Floor (m)	Level Above Coping (m)	Property Inundation	Comments
19/11/1961	27 Minna Street				Y	Water rose .1m below the floor level of the rear house
19/11/1961	35 Nicholson Street	0.73			Y	Water level was 0.73 m above ground level and .3 m below the floor level.
19/11/1961	11 The Boulevard(Gumbleys Butchery), Strathfield.		0.3		Y	Water entered several shops & rose to about 0.30m above floor in Gumbleys Butchery at No. 11
19/11/1961	2 Elva St, Strathfield (U/S main Western Railway Line)					Considerable damage done along route of main channel. S/water unable to reach underground drains flowed over ground surface to low lying areas & followed course of original creek downstream.
7/05/1963	2 Elva Street, Strathfield			0.6	Y	Observed at 8.15am. High tide at 7.15 am= 1.4m?
20/12/1963	12, 13, 14, 15, 16 & 17 Brunswick St, Strathfield				Y	Flooding of roadway & front yards, did not enter premises. Date of rain-not clear
20/12/1963	2 Elva St, Strathfield , (Railway viaduct on Main Western Line)			0.75	Y	No apparent damage to properties.
9/06/1964	2 Elva St, Strathfield - Sydney Night Patrol			1.52	Y	Flooding caused by culvert under railway + 2 curves immediately upstream. Property flooding = .9m above ground
11/06/1964	2 Elva St, Strathfield - Sydney Night Patrol			0.46	Y	Flooding caused by culvert under railway + 2 curves immediately upstream.
15/04/1969	177 Parramatta Rd, Homebush				Y	A brick retaining wall collapsed at Saleyards Ck Bch. Poor foundation
29/10/1972	2 Elva St, Strathfield - Sydney Night Patrol				Y	Water rose to 1.22m above brickwork recently added to walls within this property. Vehicles were submerged & a wooden bridge lifted & dumped 9m downstream.
29/10/1972	11 Pilgrim Avenue				Y	Basement of a block of home units was flooded - approximately 1 metre
29/10/1972	2 Elva St, Strathfield (Railway Culvert under the Main Western Line)					Embankment surcharged - see photo
17/03/1983	167-173 Parramatta Road, Homebush	0.3			Y	Flood level 300 mm above footpath. Above floor flood in one work shop-150mm
8/11/1984	7-9 Underwood Road, Homebush			0.6	Y	Debris mark on the fence
8/11/1984	Lot 2 Bates St, Strathfield (cnr The Crescent, Railway Culvert upstream)			0.6	Y	Debris on the embankment
29/04/1988	53 Ismay St, Homebush				Y	Surface flooding of 5 houses in Ismay Ave & overland flow at Powell St.
29/04/1988	Flemington Markets, Parramatta Rd, Homebush					Channel overflowed near markets.
29/04/1988	Lot 2 Bates St, Homebush (U/S of The Crescent, Homebush)			0.3	Y	Was contained within the banks. Flood debris 800 mm above the ground at upstream railway line culvert
7/05/1988	32 The Crescent, Homebush				Y	Above floor flooding. Damage \$10,000

Date Flooded From	Address	Depth (m)	Level Above Floor (m)	Level Above Coping (m)	Property Inundation	Comments
2/02/1996	Lot C Allen St, Nth Strathfield					Debris on adjacent fences indicated water flowed 500mm above upstream headwall. Flooding confined to adjacent park.
2/02/1996	24 Pomeroy St, Strathfield			0.3	Y	

2.12. Flood Photographs

A number of flood photographs taken during floods were provided by SMC and these are shown on Figure 5.

3. APPROACH

The approach adopted in flood studies to determine design flood levels largely depends upon the objectives of the study and the quantity and quality of the data (survey, flood, rainfall, flow etc.). Whilst there is a limited flood record from the Elva Street gauge there is no extensive historical flood record elsewhere on Powells Creek or on Saleyards Creek. A flood frequency approach can be undertaken at the Elva Street gauge but reliance must also be made on the use of design rainfalls and establishment of a hydrologic/hydraulic modelling system. A diagrammatic representation of the flood study process undertaken in this manner is shown below.

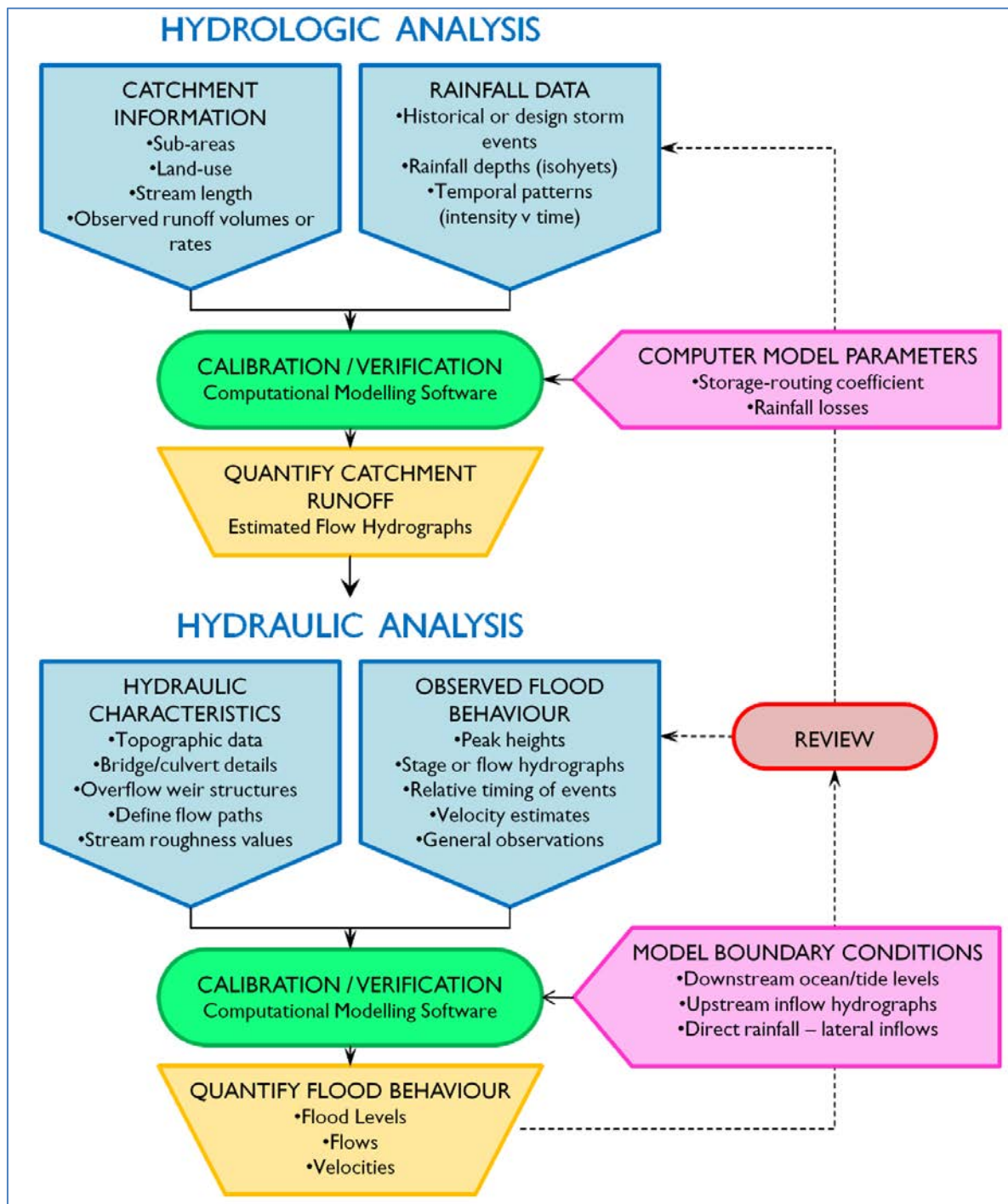


Diagram 2: Flood Study Process

The estimation of flood behaviour in a catchment is undertaken as a two-stage process, consisting of:

1. hydrologic modelling to convert rainfall estimates to overland flow and stream runoff; and
2. hydraulic modelling to estimate overland flow distributions, flood levels and velocities.

As such, the hydrologic model, DRAINS, was built and used to create flow boundary conditions for input into a two-dimensional unsteady flow hydraulic model, TUFLOW.

Good historical flood data facilitates calibration of the models and increases confidence in the estimates. The calibration process involves modifying the initial model parameter values to produce modelled results that concur with observed data. Validation is undertaken to ensure that the calibration model parameter values are acceptable in other storm events with no additional alteration of values. Recorded rainfall and stream-flow data are required for calibration of the hydrologic model, while historic records of flood levels, velocities and inundation extents can be used for the calibration of hydraulic model parameters. In the absence of such data, model verification to peak level data is the only option and a detailed sensitivity analysis of the different model input parameters constitutes current best practice.

The use of a flood frequency approach for the estimation of design floods and/or independent calibration of the hydrologic model is possible for the Powells Creek catchment using the Elva Street gauge data.

Flood estimation in urban catchments generally presents challenges for the integration of the hydrologic and hydraulic modelling approaches, which have been treated as two distinct tasks as part of traditional flood modelling methodologies. As the main output of a hydrologic model is the flow at the outlet of a catchment or sub-catchment, it is generally used to estimate inflows from catchment areas upstream of an area of interest, and the approach does not lend itself well to estimating flood inundation in mid- to upper-catchment areas, as required for this study. The aim of identifying the full extent of flood inundation can therefore be complicated by the separation of hydrologic and hydraulic processes into discrete models. As such, these processes are increasingly being combined in a single modelling approach.

In view of the above, the broad approach adopted for this study was to use a widely utilised and well-regarded hydrologic model to conceptually model the rainfall concentration phase (including runoff from roof drainage systems, gutters, etc.). The hydrologic model used design rainfall patterns specified in AR&R 1987 (Reference 4) and the runoff hydrographs were then used in a hydraulic model to estimate flood depths, velocities and hazard in the study area.

The sub-catchments in the hydrologic model were kept small such that the overland flow behaviour for the study was generally defined by the hydraulic model. This joint modelling approach was then verified against previous studies and historical data.

3.1. Hydrologic Model

Inflow hydrographs are required as inputs at the boundaries of the hydraulic model. Typically in

flood studies a rainfall-runoff hydrologic model (converts rainfall to runoff) is used to provide these inflows. A range of runoff routing hydrologic models is available as described in AR&R 1987 (Reference 4). These models allow the rainfall depth to vary both spatially and temporarily over the catchment and readily lend themselves to calibration against recorded data.

DRAINS is a hydrologic/hydraulic model that can simulate the full storm hydrograph and is capable of describing the flow behaviour of a catchment and pipe system for real storm events, as well as statistically based design storms. It is designed for analysing urban or partly urban catchments where artificial drainage elements have been installed.

The DRAINS model is broadly characterised by the following features:

- the hydrological component is based on the same theory applied in the ILSAX model which has seen wide usage and acceptance in Australia;
- its application of the hydraulic grade line method for hydraulic analysis throughout the drainage system; and
- the graphical display of network connections and results.

DRAINS generates a full hydrograph of surface flows arriving at each pit and routes these through the pipe network or overland, combining them where appropriate. Consequently, it avoids the "partial area" problems of the Rational Method and additionally it can model detention basins (unsteady flow rather than steady state).

Runoff hydrographs for each sub-catchment area are calculated using the time area method and the conveyance of flow through the drainage system is then modelled using the Hydraulic Grade Line method. Application of the Hydraulic Grade Line method is recommended in AR&R 1987 (Reference 4) for the design of pipe systems. The method allows pipes to operate under pressure or to "surcharge", meaning that water rises within pits, but does not necessarily overflow out onto streets. This provides improved prediction of hydraulic behaviour, consistency in design, and greater freedom in selecting pipe slopes. It requires more complicated design procedures, since pipe capacity is influenced by upstream and downstream conditions.

DRAINS cannot however adequately account for an elevated downstream tailwater level which would drown out the lower reaches of a drainage system (it can if the upstream pit is above the tailwater level but not if it is below). For this reason flooding within reaches affected by elevated water levels is more accurately assessed using the TUFLOW model.

It should be noted that DRAINS is not a true unsteady flow model and therefore does not account for the attenuation effects of routing through temporary floodplain storage (down streets or in yards). As such the use of DRAINS within the study is limited to some minor upstream routing and development of hydrological inputs into the downstream TUFLOW model.

3.2. Hydraulic Model

The availability of high quality LiDAR/ALS data means that the study area is suitable for two-dimensional (2D) hydraulic modelling. Various 2D software packages are available and the TUFLOW package (Reference 8) was adopted as it is widely used in Australia and WMAwater

has extensive experience with the model.

The TUFLOW modelling package includes a finite difference numerical model for the solution of the depth averaged shallow water flow equations in two dimensions. The TUFLOW software is produced by BMT WBM and has been widely used for a range of similar projects. The model is capable of dynamically simulating complex overland flow regimes. It is especially applicable to the hydraulic analysis of flooding in urban areas which is typically characterised by short duration events and a combination of supercritical and subcritical flow behaviour.

The Powells Creek study area consists of a wide range of developments, with residential, commercial and open space areas. For this catchment, the study objectives require accurate representation of the overland flow system including kerbs and gutters and defined drainage controls.

For the hydraulic analysis of complex overland flow paths (such as the present study area where overland flow occurs between and around buildings), an integrated 1D/2D model such as TUFLOW provides several key advantages when compared to a 1D only model. For example, a 2D approach can:

- provide localised detail of any topographic and/or structural features that may influence flood behaviour,
- better facilitate the identification of the potential overland flow paths and flood problem areas,
- dynamically models the interaction between hydraulic structures such as culverts and complex overland flowpaths; and
- inherently represent the available floodplain storage within the 2D model geometry.

Importantly, a 2D hydraulic model can better define the spatial variations in flood behaviour across the study area. Information such as flow velocity, flood levels and hydraulic hazard can be readily mapped across the model extent. This information can then be easily integrated into a GIS based environment enabling the outcomes to be readily incorporated into planning activities. The model developed for the present study provides a flexible modelling platform to properly assess the impacts of any overland flow management strategies within the floodplain as part of the ongoing floodplain management process.

In TUFLOW the ground topography is represented as a uniformly-spaced grid with a ground elevation and a Manning's "n" roughness value assigned to each grid cell. The grid cell size is determined as a balance between the model result definition required and the computer run time (which is largely determined by the total number of grid cells).

3.3. Assessment of Data from UNSW Elva Street Gauge

3.3.1. Overview

It is important that the best possible use is made of the available data as this is the only urban catchment in Sydney where there is a long term record for use in flood frequency analysis and which can be used to calibrate hydrologic (flows) and hydraulic (water level) models. However,

there are a number of issues with the data and these are discussed below.

3.3.2. Gaugings and Rating Curve

The cross-sectional area of the channel has not changed (lined 'U' shaped channel) since 1958 although the coping has been raised. The gauge zero is at RL 5.25 mAHD and over 29 stream gaugings have been taken. The channel is well gauged below 1 m (RL 6.25 mAHD); there are 14 gaugings below 0.5 m (RL 5.75 mAHD); 14 gaugings between 0.5 m and 1.0 m; and the highest gauging is at 1.35 m (RL 6.6 mAHD). The gaugings show very little scatter and fit as a smooth line on log-log paper. Above 0.2 m the flow tends to be supercritical and velocities are very high (above 4 m/s). This is the greatest source of uncertainty in the gauging as the velocity is above the normal range of the current meter used to take velocity measurements.

There are three known rating curves (Figure 7) as indicated below but the Reference 2 and digital record curves are practically identical and shown as the same:

- used in Reference 6 and taken from UNSW records at the time;
- used in the 1998 Powells Creek Flood Study (Reference 2);
- used in the digital records.

As part of the present study a rating curve is produced from the TUFLOW model (Figure 7). All the prior curves, whilst based on various velocity gaugings aimed to extend the rating curve beyond the highest flow gauging height of 1.35 m (RL 6.6 mAHD).

It is interesting to note that the Reference 2 rating curve and the TUFLOW model rating curves are relatively similar in magnitude at a given height. The TUFLOW model rating produces a smaller flow up to approximately 1.8 m before transitioning to produce larger flows than the Reference 2 rating above this level.

Uncertainty between the prior rating curves listed above increases once the flow breaks out of the channel (approximately at 2.5 m or RL 7.75 mAHD). The channel may also choke downstream at very high depths. This is not the case with the TUFLOW model rating which performs equally well for both in and out of bank floods. Since approximately 2000 there have been significant changes in the number and size of the bridges across the channel in the immediate reach upstream from the railway line. There is no complete record of the dates when bridges have been removed or installed. The presence of bridges will influence the high flow rating but for the majority of the record the events were not above the coping and thus not influenced by these changes.

3.3.3. For Use in Flood Frequency Analysis

Flood frequency analysis is the fitting of statistical distribution to either the annual maxima peaks or a partial series which are events above a threshold. Partial series analysis is not possible for this study as there are too many gaps in the record. Whilst the gaps in the record also affect the annual maxima series it is expected that this approach will still provide a robust result.

Derivation of the annual maxima needs to address whether the record should be based on just

the digital record or whether it should be extended to include the data shown in Table 11, and whether the record should be extended from the end of the digital record (1997) to date. It is known that there have been no large events since 1997.

A tabulation of the annual maxima from the various sources is provided on Table 16.

Table 16: Annual Maxima Peaks

Year	Peak Stage (m) from Reference 6	Peak Stage (m) from Digital Records	Difference in Peak Stage (m)	Peak Flows from Reference 6 (m ³ /s)	Peak Flows from 1998 Flood Study Reference 2 (m ³ /s)	Peak Flows from Digital Record (m ³ /s)
1958		1.48			16.0	16.1
1959	3.29	3.26	0.03	29.9	48.2	49.1
1960	1.30	1.12	0.18	11.1	10.8	10.6
1961	4.18	0.79	3.39	38.3	7.0	5.9
1962	1.69	1.74	-0.05	14.8	20.0	20.3
1963	2.40	2.47	-0.07	22.0	33.0	32.1
1964	3.52	1.88	1.64	32.1	25.3	22.5
1965	1.02	0.88	0.14	8.0	8.8	7.2
1966	1.28	1.23	0.05	10.9	12.6	12.3
1967	1.52	1.40	0.12	13.2	17.2	14.9
1968	0.84	0.70	0.14	5.9	5.3	4.7
1969	1.71	1.62	0.09	15.1	18.3	18.4
1970	3.09	1.43	1.66	28.0	17.4	15.4
1971	1.93	1.10	0.83	17.8	12.1	10.3
1972	3.20	2.76	0.44	29.1	38.0	37.3
1973	2.35	2.17	0.18	21.5	33.5	27.1
1974	2.34	2.23	0.11	21.4	28.9	28.0
1975	1.58	1.52	0.06	13.8	17.0	16.7
1976	1.70	1.25	0.45	14.9	14.9	12.6
1977	1.15	1.49	-0.34	9.6	16.5	16.3
1978	1.47	1.38	0.09	12.7	15.1	14.6
1979	1.27	1.22	0.05	10.8	12.6	12.1
1980	1.26	1.27	0.00	10.7	12.7	12.8
1981	1.41	1.38	0.03	12.1	14.6	14.6
1982	1.71	1.67	0.04	15.1	19.3	19.1
1983	1.83	1.80	0.03	16.8	21.3	21.2
1984	1.84	1.81	0.03	16.9	21.3	21.4
1985	1.30	1.21	0.09	11.1	13.1	11.9
1986	1.93	1.73	0.20	17.8	20.2	20.1
1987		1.18			11.8	11.4
1988		1.92			23.1	23.1
1989		1.28			13.9	13.0
1990		1.92			23.3	23.1
1991		1.68			19.2	19.2
1992		1.53			17.1	16.9
1993		1.88				22.4
1994		1.44			6.9	15.4
1995		1.31			13.3	13.4
1996		0.90			7.8	7.4
1997		0.86			7.6	6.9

3.4. Calibration and Verification of the Modelling Process

3.4.1. Approach

As flow data is available from the Elva Street gauge this means that the catchment hydrology

(flows) can be calibrated and verified at this location. This is a significant advantage for this catchment as this is possible for only approximately 10 urban catchments in Australia and less than 5 in NSW. TUFLOW model peak levels and the shape of the hydrograph can also be calibrated to water level data from the Elva Street gauge.

In addition, peak levels from TUFLOW can be calibrated to observed water level data provided by Council and Sydney Water (Section 2.11 and Figure 8).

The stages in the model calibration approach were as follows:

1. collect available historical rainfall and water level data;
2. select events for calibration and verification based on the quality and quantity of available data;
3. input historical rainfall data for calibration event to DRAINS;
4. input output of above DRAINS model to TUFLOW;
5. run TUFLOW for historical event;
6. compare output from TUFLOW for calibration event at the Elva Street gauge and other locations where historical flood height data are available;
7. re run steps 3 to 6 and adjust model parameters until a suitable match is obtained;
8. re run steps 3 to 6 for verification events without adjustment of model parameters;
9. compare output from TUFLOW from verification events at the Elva Street gauge and other locations where historical flood height data are available;
10. re-run steps 3 to 9 until a satisfactory calibration/verification is achieved.

3.4.2. Calibration Events

The choice of floods used in calibration depends upon a number of factors including the:

- *time since the flood occurred.* The longer the time since a flood occurred, the greater the likelihood of subsequent changes to the catchment. The major changes in recent times have been construction/alterations to buildings and fences in the floodplain and to the piped drainage system. The most significant change in recent times at the Elva Street gauge is construction of several bridges across the channel. However, as all the recent events suitable for calibration did not overtop the coping the impact of new bridges is not relevant;
- *quantity and quality of rainfall and streamflow data which are available.* This should have been of lesser importance in this study as data are available from two well placed pluviometers and the Elva Street water level gauge. However, problems with the UNSW rainfall and water level data meant that this became the most important factor in determining the choice of events;
- *quantity, quality and location of recorded levels along the creeks.* It may be preferable to use a small flood with several levels which define a profile rather than a large flood with only one level. This issue is of little significance as there are few events with suitable recorded levels, apart from at the gauge;
- *magnitude of the flood levels.* The larger the flood the more suitable it is for calibration as it is closer to the larger design flood events.

The following is a summary of the available data considered suitable for calibration.

2 January 1996

- Elva Street water level gauge malfunctioned and the Elva Street pluviometer had no digital record. The St Sabina pluviometer recorded 62 mm in 45 minutes;
- only record available for Sydney Water gauge under the M4;
- 39 flood levels are available (Table 14);
- at Enfield this event approached a 1% AEP (20 min to 60 min duration) but was approximately only a 5% AEP (or less) at the other gauges.

8 or 9 February 1992

- the Elva Street gauge recorded a peak of 1.5 m and it would appear from the available pluviometer records that this was not a large event. For this reason it is not suitable for calibration purposes.

11 March 1991

- the Elva gauge recorded a peak of 1.7 m and the rainfall intensity approached a 10% AEP (30 minute duration) at Enfield but the lack of other flood height data and failure of both the UNSW pluviometers meant this flood was not suitable for calibration purposes.

18 March 1990

- the flood was approximately a 30% AEP event at the St Sabina pluviometer and a 5% AEP (30 minute duration) at the Elva Street pluviometer. The peak levels and flows at the Elva Street gauge are 1.92 m and approximately 23 m³/s (based on the UNSW rating curve),
- the availability of water level and pluviometer records from the UNSW gauges meant that this event could be used for calibration at the Elva Street gauge. However, no flood height data were available for calibration of the TUFLOW model elsewhere.

February 1990

- four peaks occurred during February 1990 (3rd, 7th, 10th and 17th). The water level and pluviometer data (UNSW gauges) are shown on Figure 9. The peak levels and flows (based on the UNSW rating curve) at the Elva Street gauge are:
 - 3rd Feb 1990 - 1.4 m - 14 m³/s,
 - 7th Feb 1990 - 1.4 m - 15 m³/s,
 - 10th Feb 1990 - 1.8 m - 21 m³/s,
 - 17th Feb 1990 - 1.1 m - 11 m³/s,
- several flood levels (assumed to be for 10th February 1990) are available (Table 14),
- the 10th February event was slightly less than a 20% AEP rainfall event (30 minute and 60 minute durations);
- the water level records indicates a peak on the morning of 8th February 1990. This is not compatible with the rainfall record which indicates that the peak was approximately 24 hours earlier. It has been assumed that the timing on the water level gauge malfunctioned;
- the availability of pluviometer and water level data from the UNSW gauges meant that all four events could be used for calibration at the Elva Street gauge. The largest event

(10th February) was used for calibration of the TUFLOW model as it is presumed the recorded flood levels relate to this event.

4-6 August 1986:

- digital records from the Elva Street gauge shown no record for this event. However Reference 2 indicates a peak of 1.95 m obtained from data collected as part of Reference 6,
- the St Sabina pluviometer malfunctioned and the Elva Street pluviometer recorded a maximum of 21 mm in 30 minutes which is only modest rainfall. For this reason this event could not be used for calibration.

Summary

Five events (3rd, 7th, 10th and 17th February 1990 and 18th March 1990) were available for calibration of the Elva Street gauge and two events (10th February 1990 and 2nd January 1996) for calibration of the TUFLOW model.

3.5. Design Flood Modelling

Following model establishment and calibration the following steps were undertaken:

- design tributary inflows were obtained from the DRAINS hydrologic model and included in the TUFLOW model;
- flood frequency of the Elva Street gauge records;
- assessment of the design event causing the maximum water levels which is termed the critical storm duration;
- sensitivity analyses to assess the effect of changing model parameters and the assumed water level in the Parramatta River;
- assessment of possible effects of climate change on design flood levels.

4. HYDROLOGIC MODELLING

4.1. Sub-catchment Definition

The total catchment represented by the current DRAINS model is 8.45 km². This area has been represented by 749 sub-catchments (Figure 10) giving an average sub-catchment size of approximately 1.13 hectares. The sub-catchment delineation ensures that where hydraulic controls exist that these are accounted for and able to be appropriately incorporated into hydraulic routing. The pit and pipe network is shown on Figure 11. The drainage system defined in the model comprises:

- 2,156 pipes;
- 1,847 inlet pits;
- 96 upstream inlet pits;
- 317 junction pits.

4.2. Impervious Surface Area

Runoff from connected impervious surfaces such as roads, gutters, roofs or concrete surfaces occurs significantly faster than from vegetated surfaces. This results in a faster concentration of flow within the downstream area of the catchment and increased peak flow in some situations. It is therefore necessary to estimate the proportion of the catchment area that is covered by impervious surfaces.

DRAINS categorises these surface areas as either:

- paved areas (impervious areas directly connected to the drainage system);
- supplementary areas (impervious areas not directly connected to the drainage system; instead connected to the drainage system via the pervious areas), and
- grassed areas (pervious areas).

Within the Powells Creek catchment, a uniform 5% was adopted as a supplementary area across the catchment. The remaining 95% was attributed to impervious (or paved areas) and pervious surface areas, as estimated for each individual sub-catchment. This was undertaken by determining the proportion of the sub-catchment area allocated to a land-use category and the estimated impervious percentage of each land-use category, summarised in Table 17.

Table 17: Impervious Percentage per Land-use

Land-use Category	Impervious Percentage
Residential/Commercial property	60% Impervious
Non-bitumen road reserve	60% Impervious
Vacant land	0% Impervious
Green space (such as public parks)	0% Impervious
Roadway/Car parks	100% Impervious
Waterways	0% Impervious

4.3. Rainfall Losses

Methods for modelling the proportion of rainfall that is “lost” to infiltration are outlined in AR&R (Reference 4). The methods are of varying degrees of complexity, with the more complex options only suitable if sufficient data are available. The method most typically used for design flood estimation is to apply an initial and continuing loss to the rainfall. The initial loss represents the wetting of the catchment prior to runoff starting to occur and the continuing loss represents the ongoing infiltration of water into the saturated soils while rainfall continues.

Rainfall losses from a paved or impervious area are considered to consist of only an initial loss (an amount sufficient to wet the pavement and fill minor surface depressions). Losses from grassed areas are comprised of an initial loss and a continuing loss. The continuing loss is calculated from an infiltration equation curve incorporated into the model and is based on the selected representative soil type and antecedent moisture condition. The catchment soil was assumed to have a slow infiltration rate and the antecedent moisture condition was considered to be “rather wet”.

The adopted parameters are summarised in Table 18. These are consistent with the parameters adopted in previous studies undertaken by WMAwater.

Table 18: Adopted DRAINS Hydrologic Model Parameters

RAINFALL LOSSES	
Paved Area Depression Storage (Initial Loss)	1.0 mm
Grassed Area Depression Storage (Initial Loss)	5.0 mm
SOIL TYPE	3
Slow infiltration rates. This parameter, in conjunction with the AMC, determines the continuing loss	
ANTECEDENT MOISTURE CONDITONS (AMC)	3
Description	Rather wet
Total Rainfall in 5 Days Preceding the Storm	12.5 to 25 mm

4.4. Design Rainfall Data

Rainfall intensities were derived from the BoM website using AR&R (Reference 4) data. Calculation of the Probable Maximum Precipitation (PMP) was undertaken using the Generalised Short Duration Method (GSDM) according to Reference 7.

For the PMP estimate the following criteria applied:

- as the catchment area is less than 1000 km² and located in the coastal transitional area the Generalised Short Duration Method (GSDM) was adopted;
- zero adjustment for elevation was assumed as the catchment topography is less than 1500 mAHD;
- a moisture adjustment factor of 0.7 was adopted;
- the catchment is considered to be 100% 'smooth'.

5. HYDRAULIC MODELLING

5.1. TUFLOW

The TUFLOW modelling package includes a finite difference numerical model for the solution of the depth averaged shallow water equations in two dimensions. The TUFLOW software has been widely used for a range of similar floodplain projects both internationally and within Australia and is capable of dynamically simulating complex overland flow regimes. The TUFLOW model build used in this study is 2013-12-AC-w64 and further details regarding TUFLOW software can be found in the User Manual (Reference 8).

The model uses a regularly spaced computational grid, with a cell size of 2 m by 2 m. This resolution was adopted as it provides an appropriate balance between providing sufficient detail for roads and overland flow paths, while still resulting in workable computational run-times. The model grid was established by sampling from a DEM generated from a triangulation of filtered ground points from the ALS dataset, discussed in Section 2.6 and shown in Figure 3.

The TUFLOW hydraulic model includes the Powells Creek catchment to Homebush Bay with the open channel in 1D and the overland areas in 2D. The total area included in the 2D model is approximately 10 km². The extents of the TUFLOW model are shown in Figure 12.

5.2. Boundary Locations

5.2.1. Inflows and Downstream Boundary

Local runoff hydrographs were extracted from the DRAINS model for inclusion within the TUFLOW model domain. These were applied to the downstream end of the sub-catchments within the 2D domain of the hydraulic model. The inflow locations typically corresponded with inlet pits on the roadway as this is where most rainfall is directed.

The downstream boundary was located at the Parramatta River, as shown in Figure 12.

5.3. Roughness Co-efficient

The hydraulic efficiency of the flow paths within the TUFLOW model is represented in part by the hydraulic roughness or friction factor formulated as Manning's "n" values. This factor describes the net influence of bed roughness and incorporates the effects of vegetation and other features which may affect the hydraulic performance of the particular flow path.

The Manning's "n" values adopted, including flowpaths (overland, pipe and in-channel), are shown in Table 19 and were based on site inspection and past experience in similar floodplain environments.

Table 19: Manning's "n" values adopted in TUFLOW

Material	Manning's n Value
Bitumen road reserve and some car parks	0.02
Green Space - Golf Course, Parks, Vacant Lots	0.04
Residential/urban area	0.03
Non-bitumen road reserve	0.032
Waterways	0.015
Pipes	0.012

5.4. Hydraulic Structures

5.4.1. Buildings

Buildings and other significant features likely to act as flow obstructions were incorporated into the model network based on building footprints, defined using aerial photography. These types of features were modelled as impermeable obstructions to the floodwaters.

5.4.2. Fencing and Obstructions

Smaller localised obstructions within or bordering private property, such as fences, were not explicitly represented within the hydraulic model, due to the relative impermanence of these features. The cumulative effects of these features on flow behaviour were assumed to be addressed partially by the adopted roughness parameters.

5.4.3. Bridges

Key hydraulic structures were included in the hydraulic model, as shown in Figure 12, bridges were modelled as 1D features within the 1D channels, with the purpose of maintaining continuity within the model.

The modelling parameter values for the culverts and bridges were based on the geometrical properties of the structures, which were obtained from detailed survey, photographs taken during site inspections, and previous experience modelling similar structures.

5.5. Blockage Assumptions

Blockage of hydraulic structures can occur with the transportation of a number of materials by flood waters. This includes vegetation, garbage bins, building materials and cars, the latter occurred in the Newcastle area in June 2007. However, the disparity in materials that may be mobilised within a catchment can vary greatly.

Debris availability and mobility can be influenced by factors such as channel shear stress, height of floodwaters, severity of winds, storm duration and seasonal factors relating to vegetation. The channel shear stress and height of floodwaters that influence the initial dislodgment of blockage materials are also related to the AEP of the event. Storm duration is another influencing factor, with the mobilisation of blockage materials generally increasing with increasing storm duration.

The potential effects of blockage include:

- decreased conveyance of flood waters through the blocked hydraulic structure or drainage system;
- variation in peak flood levels;
- variation in flood extent due to flows diverting into adjoining flow paths; and
- overtopping of hydraulic structures.

Existing practices and guidance on the application of blockage can be found in:

- the Queensland Urban Drainage Manual (Department of Natural Resources and Water, 2008);
- AR&R Revision Project 11 Blockage of Hydraulic Structures (Engineers Australia, 2013); and
- the policies of various local authorities and infrastructure agencies.

The guidelines proposed by the AR&R Revision Project 11 utilise generic blockage factors presented in Table 20.

Table 20: Suggested 'Design' and 'Severe' Blockage Conditions for Various Structures (AR&R Revision Project 11, 2013)

Type of structure		Blockage conditions	
		Design blockage	Severe blockage
Sag Kerb Inlet	Kerb slot inlet only	0/20%	100% (all cases)
	Grated inlet only	0/50%	
	Combined inlets	[1]	
On-grade kerb inlets	Kerb slot inlet only	0/20%	100% (all cases)
	Grated inlet only (longitudinal bars)	0/40%	
	Grated inlet only (transverse bars)	[2]	
	Combined inlets		
Field (drop) inlets	Flush mounted	0/80%	100% (all cases)
	Elevated (pill box) horizontal grate	0/50%	
	Dome screen	0/50%	
Pipe inlets and waterway culverts	<i>Inlet height < 3m and width < 5m</i> Inlet Chamber	0/20% [3]	100% [4]
	<i>Inlet height > 3m and width > 5m</i> Inlet Chamber	0/10% [3]	25% [3]
	Culverts and pipe inlets with effective debris control features	As above	As above
	Screened pipe and culvert inlets	0/50%	100%
Bridges	Clear opening height < 3 m	[5]	100%
	Clear opening height > 3 m	0%	[6]
	Central piers	[7]	[7]
Solid handrails and traffic barriers associated with bridges and culverts		100%	100%
Fencing across overland flow paths		[8]	100%
Screened stormwater outlets		100%	100%

Current modelling has been undertaken assuming no blockage of pipes, culverts and bridges greater than 300 mm in diameter. Pipes less than or equal to 300 mm in diameter were conservatively assumed to be completely blocked. This is an assumption that can be consistently applied across the catchment, but it should be noted that blockage of larger pipes can also occur. For example, council staff have reported complete blockage of a 525 mm diameter drainage pipe due to a child's scooter becoming lodged inside it and collecting debris.

Various scenarios have been investigated to assess the catchment's sensitivity to 20% and 50% blockage and the results of this are discussed in Section 9. These scenarios included blockage of all pipes, blockage of bridges/culverts over the open channel, and blockage of the drainage infrastructure. Blockage was assumed to occur laterally across the cross-section. Alternative applications of blockage include reducing the cross-sectional area upwards from the invert. This is perhaps more relevant to vegetated open channels that are subject to sedimentation rather than the concrete lined open channels present in the Powells Creek catchment.

No historical evidence of blocking in the catchment is available; however, it is possible that changed activities on the floodplain may mean that there may be a higher chance of blockage today than in the past. For example, colourbond fencing is much less permeable and less likely to collapse than the more traditional paling fencing. Individual palings becoming mobile in a flood are also less likely to cause blockage than a panel of colourbond fencing. In some council areas garbage bins are known to become mobile during floods and can cause blockage. In summary, it is impossible to accurately determine whether blockage will or will not be an issue in the next flood.

5.6. Ground Truthing

Inspection of the above-ground features along the catchment's overland flowpaths was undertaken following calibration and verification of the hydraulic model. This entailed producing design flood results and mapping the peak flood depth in detail across the catchment. This allowed identification of features (largely buildings) that blocked or partially blocked overland flow. Model schematisation of these features was then compared to the actual features on a site visit, and the model was updated where any discrepancy was identified. Changes were minor and only impacted results in the vicinity of the modification. The most common change was to areas where two houses had been represented as a single impermeable barrier in the model grid, which was amended to allow flow between the buildings.

6. MODEL CALIBRATION AND VERIFICATION

6.1. Introduction

It is important that the performance of the overall modelling system be substantiated prior to defining design flood behaviour.

Typically in urban areas such information is lacking. Issues which may prevent a thorough calibration of hydrologic and hydraulic models are:

- there is only a limited amount of historical flood information available for the study area; and
- rainfall records for past floods are limited and there is a lack of temporal information describing historical rainfall patterns within the catchment.

6.2. Results

The results of the calibration and verification process using the six historical events are shown on Figure 13 (Elva Street Gauge) and Figure 14 (across catchment) and on Table 21 (Elva Street Gauge) and Table 22 (across catchment).

Table 21: Calibration Results - Elva Street Gauge

Date	Recorded Level (m AHD)	Modelled Level St Sabina Pluviometer (m AHD)	Difference (m)	Modelled Level Elva St Pluviometer (m AHD)	Difference (m)
3-Feb-90	6.67	6.59	-0.08	6.61	-0.06
7-Feb-90	6.68	6.68	0.00	6.77	0.09
10-Feb-90	7.00	6.80	-0.20	7.01	0.01
17-Feb-90	6.41	6.46	0.05		
18-Mar-90	7.13	6.75	-0.38		
2-Jan-96		8.06			

Table 22: Calibration Results - Peak Heights

Address	Location	Surveyed Level 1990 February 10 (mAHD)	Surveyed Level 1996 January 2 (mAHD)	Modelled Level 1990 February 10 (mAHD)	Modelled Level 1996 January 2 (mAHD)	Difference-1990 February 10 (mAHD)	Difference-1996 January 2 (mAHD)
21 Llandilo Avenue	Garage Floor Level	29.9	N/A	30.03	N/A	0.13	N/A
21 Llandilo Avenue	North-West Corner	28.8	N/A	28.69	N/A	-0.11	N/A
8 Agnes Street	Driveway and Front Boundary	N/A	26.71	N/A	26.66	N/A	-0.05
41 Albyn Road	Crest of Driveway	N/A	22.54	N/A	22.48	N/A	-0.06
41 Albyn Road	Low Point along West Boundary	N/A	21.64	N/A	21.58	N/A	-0.06
47 Albyn Road	Garage Floor Level	N/A	21.18	N/A	21.16	N/A	-0.02
37 Redmyre Road	Crest of Driveway	N/A	13.27	N/A	13.10	N/A	-0.17
37 Redmyre Road	Ground Level at Garage	N/A	12.21	N/A	12.44	N/A	0.23
35 Redymre Road	Crest of Driveway	N/A	13.26	N/A	13.12	N/A	-0.14
35 Redmyre Road	Ground Level at Back Fence	N/A	12.13	N/A	12.07	N/A	-0.06
45 Churchill Avenue	Base Steps at Front House	N/A	10.74	N/A	11.02	N/A	0.28
60 Churchill Avenue	Ground Level at Path Granny Flat	N/A	11.49	N/A	11.42	N/A	-0.07
Pharmacy adjoining Plaza Entrance, The Boulevard		N/A	12.29	N/A	12.70	N/A	0.41
65 Oxford Street	Carport Slab	N/A	24.16	N/A	23.98	N/A	-0.18
63 Oxford Street	South-West corner of house	N/A	23.75	N/A	23.60	N/A	-0.15
61 Oxford Street	Garage Floor Level	N/A	23.24	N/A	22.99	N/A	-0.25
59 Oxford Street	Patio Level	N/A	23.14	N/A	23.06	N/A	-0.08
141 Albert Street	Ground level along eastern fence	19.51	N/A	19.31	N/A	-0.20	N/A
135 Albert Street	Bottom steps rear of house	18.49	N/A	18.26	N/A	-0.23	N/A
137 Albert Street	Crest of driveway	19.24	N/A	19.06	N/A	-0.18	N/A
137 Albert Street	Water reached floor level	19.01	N/A	18.93	N/A	-0.08	N/A
100 Beresford Road	Driveway at entrance to house	15.91	N/A	15.80	N/A	-0.11	N/A
102 Beresford Road	Ground level at back door	16.43	N/A	16.46	N/A	0.03	N/A
104 Beresford Road	Ground level rear house	17	N/A	16.81	N/A	-0.19	N/A
110 Beresford Road	Midway along eastern fence	17.5	N/A	17.63	N/A	0.13	N/A
108 Beresford Road	Base steps rear house	17.49	N/A	17.33	N/A	-0.16	N/A

Address	Location	Surveyed Level 1990 February 10 (mAHD)	Surveyed Level 1996 January 2 (mAHD)	Modelled Level 1990 February 10 (mAHD)	Modelled Level 1996 January 2 (mAHD)	Difference-1990 February 10 (mAHD)	Difference-1996 January 2 (mAHD)
53 Beresford Road	Garage floor level	15.29	N/A	15.17	N/A	-0.12	N/A
89 Rochester Street	Floor level shop	12.84	N/A	12.70	N/A	-0.14	N/A
109 Rochester Street	Base steps rear house	14.33	N/A	14.23	N/A	-0.10	N/A
109 Rochester Street	Base steps rear house	N/A	14.15	N/A	14.33	N/A	0.18
57 Rochester Street	Ground level back yard	N/A	9.92	N/A	10.45	N/A	0.53
38-46 Burlington Road	Ground level at rear shed	9.71	N/A	9.93	N/A	0.22	N/A
48 Burlington Road	Ground Floor Level	N/A	9.55	N/A	9.49	N/A	-0.06
29 Burlington Road	Stormwater reached this level at rear of factory	9.16	N/A	8.97	N/A	-0.19	N/A
30 The Crescent	Garage Floor Level	N/A	8.7	N/A	8.58	N/A	-0.12
31 The Crescent	Garage Floor Level	N/A	8.33	N/A	8.23	N/A	-0.10
79 The Crescent	Floor level	8.2	N/A	7.13	N/A	-1.07	N/A
79 The Crescent	Base patio at rear	N/A	7.75	N/A	7.8	N/A	0.05
12 Loftus Crescent	Ground level backyard	7.87	N/A	Local runoff	N/A	Local runoff	N/A
86 Underwood Road	Base steps front house	N/A	4.89	N/A	5.02	N/A	0.13
82 Underwood Road	Ground level at front house and driveway	4.97	N/A	4.50	N/A	-0.47	N/A
90 Underwood Road	Base steps front of house	N/A	4.74	N/A	4.95	N/A	0.21
60 Ismay Avenue	Ground level at front of house	N/A	3.83	N/A	3.80	N/A	-0.03
55 Ismay Avenue	Base front steps	4.3	4.11	4.02	4.27	-0.28	0.16
51 Ismay Avenue	Base front steps	4.19	N/A	3.94	N/A	-0.25	N/A
56 Ismay Avenue	Base front steps	3.83	N/A	3.78	N/A	-0.05	N/A
49 Ismay Avenue	Base front steps	N/A	4.16	N/A	3.97	N/A	-0.19
48 Ismay Avenue	Base front steps	N/A	3.43	N/A	3.43	N/A	0.00
41 Ismay Avenue	Base front steps	3.71	N/A	Local runoff	N/A	Local runoff	N/A
10 Mitchell Road	Ground level low side house	N/A	14.75	N/A	14.7	N/A	-0.05
6 Mitchell Road	Ground level low side house	N/A	14.35	N/A	14.33	N/A	-0.02
104 Arthur Street	Ground level front of house	N/A	13.87	N/A	13.72	N/A	-0.15
106 Arthur Street	Ground level at boundary	N/A	13.85	N/A	13.78	N/A	-0.07
105 Arthur Street	Ground level at house steps side house	N/A	13.89	N/A	13.94	N/A	0.05
29 Arthur Street	Base front steps	N/A	13.23	N/A	13.36	N/A	0.13
29 Arthur Street	Ground level at rear fence	N/A	12.98	N/A	12.88	N/A	-0.10

Address	Location	Surveyed Level 1990 February 10 (mAHD)	Surveyed Level 1996 January 2 (mAHD)	Modelled Level 1990 February 10 (mAHD)	Modelled Level 1996 January 2 (mAHD)	Difference-1990 February 10 (mAHD)	Difference-1996 January 2 (mAHD)
6 Kessell Avenue	Ground level at fence	N/A	7.76	N/A	7.80	N/A	0.04
6 Kessell Avenue	Water reached floor level	8.42	N/A	8.15	N/A	-0.27	N/A

Note: Local runoff denotes when the flooding is very localised and is therefore not identified in the TUFLOW model. Highlighted values are referred to in discussion of results across the catchment.

6.3. Discussion of Results

6.3.1. Elva Street Gauge

Apart from 18th March 1990 and to a lesser extent 10th February 1990, there is a good match to the peak at the Elva Street gauge using the St Sabina pluviometer. The use of the Elva Street pluviometer significantly improves the match for the 10th February 1990 event compared to using the St Sabina pluviometer.

For all events the relative timings of the water level gauge and the pluviometer are incorrect due to timing errors with the instruments. This was recognised in Reference 6 and an attempt was made to correct this by assuming that the "clocks" decrease or increase in speed linearly (this can be calculated as the on and off times are recorded and the elapsed real time can be compared to the chart time).

In general the gauge shows a much more rapid rise and fall than the model results, particularly on the falling limb. Thus the model assumes a greater volume of runoff than actually occurs.

Where comparisons can be made, the results from the St Sabina and Elva Street pluviometer show similar shapes of hydrographs. The timing of the two pluviometers are also similar suggesting that the error in timing is the water level gauge. The two pluviometers are only 800 m apart but timing differences may reflect the passage of a storm across the area.

6.3.2. Across the Catchment

For the historical event of 10th February 1990, most of the differences between surveyed and modelled levels were within 0.2 m. However, the modelled flood level at 79 The Crescent was 1.07 m below the level recorded at the floor. The ALS at this location was 7.05 mAHD which was far lower than the recorded flood level of 8.2 mAHD.

The differences were also generally within 0.2 m for the historical event of 2nd January 1996. The recorded flood level at the ground level at 57 Rochester Street was 0.53 m lower than the modelled level. This cannot be explained as the location is a major flow path with depths up to 0.8m deep. The ALS at the Pharmacy adjoining Plaza Entrance indicates ground levels of 12.49 mAHD, which is higher than the recorded level and the reason that the modelled level was 0.41 m higher.

7. DESIGN EVENT MODELLING

7.1. Overview

There are two basic approaches to determining design flood levels, namely:

- *flood frequency analysis* – based upon a statistical analysis of the flood events, and
- *rainfall and runoff routing* – design rainfalls are processed by hydrologic and hydraulic computer models to produce estimates of design flood behaviour.

The *flood frequency* approach requires a reasonably complete homogenous record of flood levels and flows over a number of decades to give satisfactory results. Powells Creek is one of the two catchments in the Sydney basin that has a reasonably reliable water level record over a long period and has had velocity gaugings undertaken (required to derive a rating curve). Thus flood frequency analysis can be undertaken. However this approach only provides results at the gauge location and a *rainfall and runoff routing* approach, using DRAINS model results, is also required to derive inflow hydrographs to the TUFLOW hydraulic model, which determines design flood levels, flows and velocities in areas beyond the actual gauge location. This approach reflects current engineering best practice and is consistent with the quality and quantity of available data.

7.2. Critical Duration for Rainfall Runoff Approach

To determine the critical storm duration for various parts of the catchment, modelling of the 1% AEP event was undertaken for a range of design storm durations from 15 minutes to 4.5 hours, using temporal patterns from AR&R (1987). An envelope of the model results was created, and the storm duration producing the maximum flood depth was determined for each grid point within the study area.

It was found that a combination of the 25 minute, 1 hour and 2 hour design storm durations produce the highest flood levels across the entire catchment for the 1% AEP event. However, having a combination of storm durations is difficult to manage (for example which event produces the peak velocity or peak hazard). It is therefore preferable to adopt a single storm duration for design flood estimation.

The 25 minute design storm duration was mostly higher in areas of shallow overland flow (92% of the area having a peak flood depth no greater than 0.3 m). As such, the 25 minute storm does not reflect the areas of deeper flow which are considered more hazardous. The 2 hour storm duration was selected as it was the critical storm over a greater area than the 1 hour storm duration. However, the height difference between the two durations was within ± 0.025 m across 90% of the area affected by these two durations.

Additionally, the critical storm duration was determined for the PMF event for a range of storm durations, ranging from 30 minutes to 6 hours. Similarly, an envelope of the model results was created, and the storm duration producing the maximum flood depth was determined for each grid point within the study area. It was found that the 1 hour storm duration was critical in the

PMF event.

7.3. Downstream Boundary Conditions

In addition to runoff from the catchment, downstream areas can also be influenced by high water levels at the confluence of the Parramatta River and Powells Creek. Consideration must therefore also be given to accounting for the joint probability of coincident flooding from both catchment runoff and backwater effects.

A full joint probability analysis to consider the interaction of these two mechanisms is beyond the scope of the present study. It is accepted practice to estimate design flood levels in these situations using a 'peak envelope' approach that adopts the highest of the predicted levels from the two mechanisms. However, the 1986 Parramatta River Flood Study (Reference 9) indicates that in this reach of the river the design water level is determined by the tide level and no design flood levels are provided. For the present study a constant water level of 1m AHD was applied to the downstream boundary for each design rainfall event. As the typical tidal in Homebush Bay is +0.6 m AHD to -0.4 m AHD a tailwater level of 1m AHD is relatively high. The maximum ocean tide in a year is 1.1 m AHD. The extent of tidal inundation with a 1.1 m AHD tide is shown on Figure 1.

7.4. Design Results

The results from this study are presented as:

- Peak flood level profiles in Figure 15;
- Flow and level hydrographs in Figure 16;
- Peak flood depths and level contours in Figure 17;
- Peak flood velocities in Figure 18;
- Provisional hydraulic hazard in Figure 19
- Provisional hydraulic categorisation in Figure 20.

The definition and methodology used to derive these categorisations from the results are discussed below.

7.4.1. Summary of Results

Peak flood levels, depths and flows at key locations within the catchment are summarised in Table 23 for both design and historical events. These key locations coincide with the key locations used for the sensitivity analysis discussed in Section 9 and are shown on Figure 12.

Table 23: Peak Flood Levels (mAHD) and Depths (m) at Key Locations

Level (mAHD)									
Locations	0.5 EY	0.2 EY	10% AEP	5% AEP	2% AEP	1% AEP	0.5% AEP	0.2% AEP	PMF
Torrington Road	27.45	27.45	27.45	27.45	27.46	27.46	27.46	27.46	27.48
Brunswick Avenue	16.18	16.28	16.33	16.40	16.44	16.48	16.54	16.59	17.10
Beresford Road	15.23	15.25	15.28	15.31	15.34	15.36	15.39	15.43	15.79
Redmyre Road	12.42	12.51	12.55	12.67	12.79	12.90	12.94	13.07	14.36
Pilgrim Avenue	9.22	9.30	9.35	9.41	9.45	9.49	9.51	9.56	12.10
Parramatta Road	5.41	5.42	5.43	5.44	5.45	5.46	5.47	5.76	6.83
Pomeroy Street	1.83	2.11	2.24	2.46	2.55	2.63	2.67	2.78	4.03
Underwood Road	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.72
The Crescent	6.95	7.31	7.45	7.68	7.85	8.00	8.13	8.32	11.25
Park Road	3.46	3.49	3.51	3.55	3.56	3.58	3.63	3.65	5.02
Allan Davidson	9.36	9.37	9.38	9.40	9.43	9.56	9.63	9.69	11.26
Arthur Street	13.09	13.13	13.16	13.20	13.23	13.25	13.29	13.33	13.87
Depth (m)									
Locations	0.5 EY	0.2 EY	10% AEP	5% AEP	2% AEP	1% AEP	0.5% AEP	0.2% AEP	PMF
Torrington Road	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.05
Brunswick Avenue	0.47	0.57	0.63	0.69	0.73	0.78	0.83	0.88	1.39
Beresford Road	0.20	0.23	0.25	0.29	0.32	0.34	0.37	0.41	0.76
Redmyre Road	0.07	0.17	0.21	0.33	0.45	0.56	0.60	0.73	2.02
Pilgrim Avenue	0.17	0.26	0.30	0.36	0.40	0.44	0.46	0.51	3.06
Parramatta Road	0.09	0.11	0.12	0.13	0.13	0.14	0.15	0.44	1.51
Pomeroy Street	0.83	1.11	1.24	1.46	1.55	1.63	1.67	1.78	3.03
Underwood Road	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29
The Crescent	0.22	0.57	0.72	0.95	1.12	1.27	1.39	1.58	4.52
Park Road	0.24	0.27	0.29	0.34	0.35	0.37	0.41	0.44	1.80
Allan Davidson	0.05	0.06	0.07	0.09	0.12	0.25	0.32	0.38	1.95
Arthur Street	0.07	0.11	0.14	0.18	0.21	0.23	0.27	0.31	0.85
Level (m AHD)									
Locations	3-Feb-90	7-Feb-90	10-Feb-90	17-Feb-90	18-Mar-90	2-Jan-96			
Torrington Road	27.50	27.50	27.50	27.50	27.50	27.45			
Brunswick Avenue	16.02	16.02	16.16	15.99	16.13	16.42			
Beresford Road	15.17	15.17	15.21	15.14	15.21	15.30			
Redmyre Road	12.26	12.26	12.31	12.25	12.32	12.68			
Pilgrim Avenue	8.97	9.00	9.00	8.90	8.96	9.43			
Parramatta Road	5.39	5.37	5.42	5.37	5.42	5.43			
Pomeroy Street	1.57	1.71	1.79	1.41	1.71	2.50			
Underwood Road	3.53	3.53	3.53	3.53	3.53	3.43			
The Crescent	6.73	6.73	7.06	6.73	6.82	7.77			
Park Road	3.41	3.42	3.44	3.39	3.44	3.56			
Allan Davidson	9.41	9.41	9.42	9.41	9.42	9.39			
Arthur Street	13.05	13.06	13.07	13.02	13.06	13.18			

Locations	Depth (m)					
	3-Feb-90	7-Feb-90	10-Feb-90	17-Feb-90	18-Mar-90	2-Jan-96
Torrington Road	0.01	0.01	0.01	0.01	0.01	0.02
Brunswick Avenue	0.29	0.29	0.43	0.27	0.41	0.70
Beresford Road	0.00	0.00	0.03	0.00	0.03	0.10
Redmyre Road	0.00	0.00	0.04	0.00	0.05	0.35
Pilgrim Avenue	0.01	0.03	0.03	0.00	0.01	0.41
Parramatta Road	0.07	0.05	0.09	0.05	0.09	0.11
Pomeroy Street	1.30	1.44	1.52	1.14	1.44	2.23
Underwood Road	0.17	0.19	0.20	0.15	0.19	0.36
The Crescent	0.04	0.04	0.34	0.03	0.12	1.03
Park Road	0.08	0.08	0.10	0.05	0.10	0.25
Allan Davidson	0.04	0.04	0.06	0.03	0.05	0.10
Arthur Street	0.03	0.03	0.05	0.01	0.03	0.15

The tabulated summary of peak flows at key locations is presented in

Table 24.

Table 24: Peak Flows (m³/s) at Key Locations

Locations	Flow (m ³ /s)								PMF
	0.5 EY	0.2 EY	10% AEP	5% AEP	2% AEP	1% AEP	0.5% AEP	0.2% AEP	
Torrington Road	0.17	0.23	0.27	0.31	0.35	0.39	0.44	0.49	1.10
Brunswick Avenue	2.73	6.61	8.17	10.46	12.63	14.36	17.25	20.08	58.56
Beresford Road	2.52	3.68	4.43	5.69	6.65	7.51	8.68	10.41	31.42
Redmyre Road	0.73	2.42	3.38	5.96	7.09	8.14	8.55	9.53	27.12
Pilgrim Avenue	2.09	5.20	6.87	9.69	12.09	14.37	15.59	19.90	83.58
Parramatta Road	19.94	28.98	34.04	42.30	49.52	57.11	59.49	71.83	250.71
Pomeroy Street	31.37	43.46	49.83	64.09	74.08	84.54	90.38	106.64	359.92
Underwood Road	20.98	30.02	33.78	39.54	44.65	50.20	55.44	62.41	168.27
The Crescent	13.09	19.31	20.90	23.34	25.46	27.24	28.95	30.75	80.38
Park Road	17.43	24.87	27.83	32.94	36.81	40.27	43.99	49.15	118.93
Allan Davidson	9.61	14.34	16.88	21.27	23.06	25.86	28.43	33.28	119.65
Arthur Street	2.47	3.94	4.83	6.20	7.44	8.71	9.93	11.79	42.03

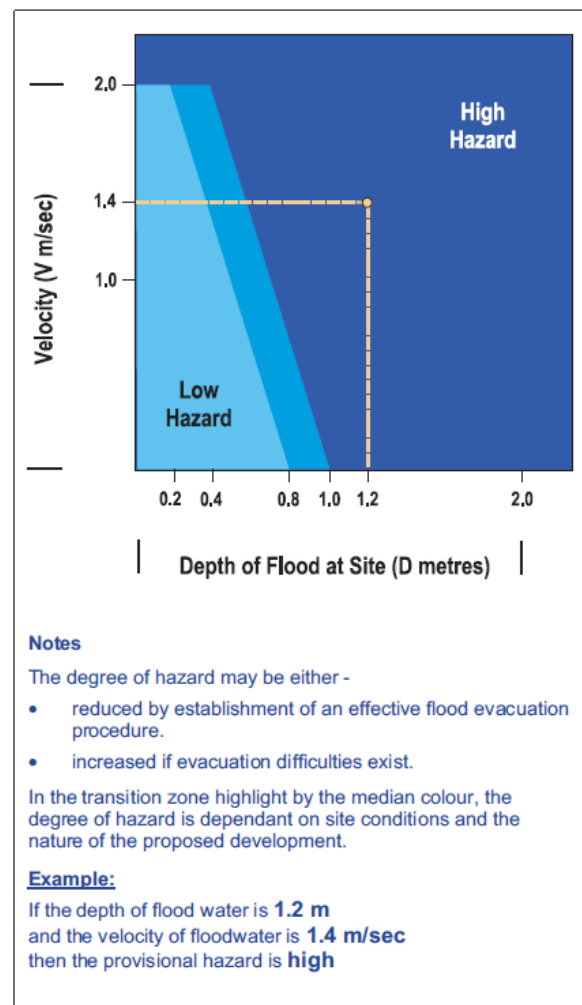
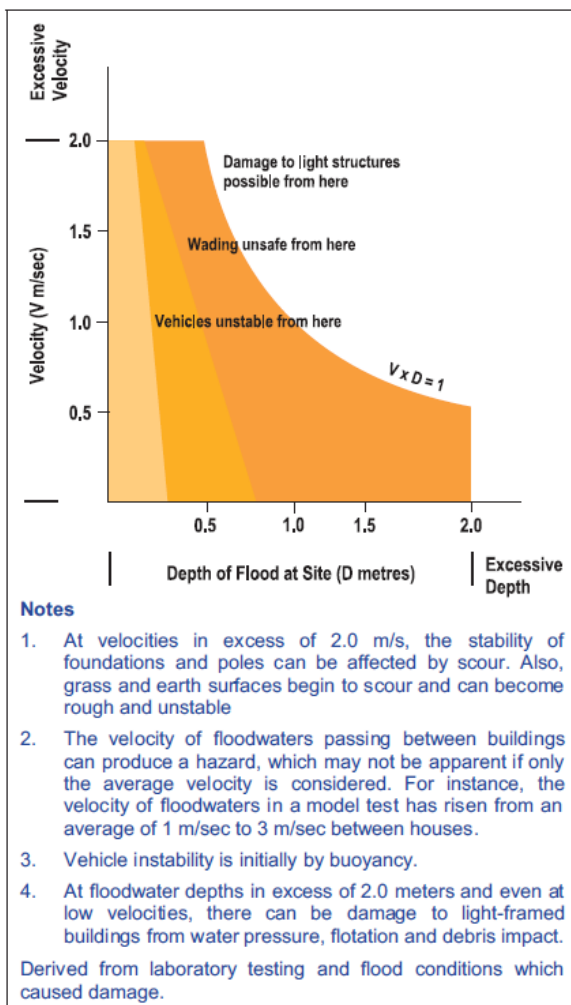
Locations	Flow (m ³ /s)					
	3-Feb-90	7-Feb-90	10-Feb-90	17-Feb-90	18-Mar-90	2-Jan-96
Torrington Road	0.07	0.06	0.13	0.05	0.14	0.26
Brunswick Avenue	0.32	0.36	2.34	0.21	1.77	11.02
Beresford Road	0.39	0.42	1.42	0.17	1.35	5.32
Redmyre Road	0.27	0.25	0.47	0.19	0.50	6.06
Pilgrim Avenue	0.01	0.01	0.03	0.00	0.02	11.48
Parramatta Road	12.58	14.61	16.74	9.16	15.68	45.76
Pomeroy Street	19.75	25.06	28.09	14.77	25.51	66.75
Underwood Road	13.10	15.95	22.18	9.55	19.51	42.66
The Crescent	8.02	8.96	15.23	5.66	11.58	24.35
Park Road	10.94	13.17	18.50	7.90	16.23	35.19

Allan Davidson	4.87	5.50	9.35	2.81	8.09	20.66
Arthur Street	0.92	0.98	1.97	0.54	1.63	5.35

7.4.2. Provisional Flood Hazard Categorisation

Hazard categories were determined in accordance with Appendix L of the NSW Floodplain Development Manual (Reference 1), the relevant section of which is shown in Diagram 3. For the purposes of this report, the transition zone presented in Diagram 3 (L2) was considered to be high hazard.

Diagram 3: (L1) Velocity and Depth Relationship; (L2) Provisional Hydraulic Hazard Categories (NSW State Government, 2005)



7.4.3. Provisional Hydraulic Categorisation

The hydraulic categories, namely floodway, flood storage and flood fringe, are described in the Floodplain Development Manual (Reference 1). However, there is no technical definition of hydraulic categorisation that would be suitable for all catchments, and different approaches are used by different consultants and authorities, based on the specific features of the study catchment in question.

For this study, hydraulic categories were defined by the following criteria, which has been

adopted by consultants in a number of flood studies in NSW:

- Floodway is defined as areas where:
 - the peak value of velocity multiplied by depth ($V \times D$) > 0.25 m²/s **AND** peak velocity > 0.25 m/s, **OR**
 - peak velocity > 1.0 m/s **AND** peak depth > 0.15 m.

The remainder of the floodplain is either Flood Storage or Flood Fringe,

- Flood Storage comprises areas outside the floodway where peak depth > 1 m; and
- Flood Fringe comprises areas outside the Floodway where peak depth < 1 m.

However, councils are increasingly moving away from the practice of defining Floodway, Flood Storage and Flood Fringe, as the mapping of Flood Fringe may allow landowners to bypass a Council Development Application and instead apply to a private certifier, under the 2008 Exempt and Complying SEPP. To avoid this, a “Low Risk” and “High Risk” classification is sometimes adopted where:

- High Risk corresponds with areas classified as Floodway and Flood Storage; and
- Low Risk corresponds with areas classified as Flood Fringe.

7.4.4. Flooding Hotspots

Hotspots in the area are defined as those locations where there is a known flood issue. They are identified by considering accounts of previous floods, and by examining the flood behaviour. The latter involves identifying areas of high hazard flow where flooding of property occurs, where inundation of main roads occurs and through consideration of subsurface drainage capacity. As described in Section 2, the catchment has a history of flooding and is well understood through both the community’s experience and the hydraulic model results. Description of hotspots can also be utilised by the SES in planning for and responding to flood events in the area.

Hotspots have been categorised as either road or property hotspots, depending on where the flood risk lies. Figure 22 shows the location of the hotspots in the study area, while Table 25 lists the road hotspots with regards to their peak flood depth for three design flood events, while Table 26 lists the rate of rise at eleven locations in the catchment for three design events, assuming an 120 minute event duration. Note that for the locations in Table 25 (and shown in Figure 22) the points are numbered from 20 to 50, as points 1-19 are in the catchment’s other LGAs (Burwood, Canada Bay and Auburn) and so are not covered in this report.

A description of the six property hotspots follows in Table 27. It should be noted that several broad locations have been classified as flooding hotspots in the catchment, along each of the catchment’s reaches. The similarity between these areas means that each have generally similar flood risk.

Duration of flooding has also been mapped on Figure 23, which shows the duration for which different locations have greater than 0.3 m of depth in the 1% AEP 2 hour event. The figure shows that for this duration, the majority of the inundation is drained quickly, typically in less than 30 minutes. Although the mapped data is for a design event with an idealised temporal pattern and duration, the results are useful as giving indicative values of duration and for

showing areas where flooding is more prolonged relative to the wider catchment.

Table 25: Road Hotspots - Peak Flood Depth

ID	Locations	Depth (m)			ID	Locations	Depth (m)		
		0.2 EY	1% AEP	PMF			0.2 EY	1% AEP	PMF
20	Albert Road	0.27	0.48	2.89	36	Railway Near Homebush Station	0.0	0.11	1.51
21	The Crescent near Hornsey Road	0.00	0.24	0.35	37	Saleyard Bridge Mason Park side	0.67	1.09	2.68
22	The Crescent near Kessell Avenue	0.41	1.10	4.38	38	Pilgrim Avenue	0.36	0.55	3.16
23	Railway near Strathfield Station	0.00	0.00	1.72	39	Redmyre Road	0.00	0.32	1.77
24	Western Motorway before Homebush Bay Drive	0.22	0.28	0.43	40	Beresford Road	0.18	0.26	0.62
25	Parramatta Road near Saleyard Creek	0.24	0.26	0.90	41	Brunswick Road	0.03	0.21	0.83
26	Parramatta Road near Underwood Road	0.13	0.25	0.80	42	Underwood Road near Powells Creek	0.00	0.00	0.72
27	The Crescent near Flemington Station	0.39	0.42	0.42	43	Underwood Road near Homebush bay drive	0.41	0.46	1.60
28	Arthur Street near Hudson Park Golf Course	0.07	0.14	0.68	44	Parramatta Road near Bedford Road	0.04	0.06	0.77
29	Flemington Markets	0.29	0.37	1.71	45	Allan Davidson Oval	0.00	0.04	1.60
30	Mena Street	1.96	2.34	3.94	46	Park Road	0.00	0.04	1.39
31	Pomeroy Street	0.52	0.93	2.64	47	Broughton Road	0.01	0.05	0.35
32	Hamilton Street	1.35	1.83	3.29	48	Redmyre Road near Vernon Street	0.17	0.33	0.90
33	Allen Street	0.00	0.14	1.15	49	Underwood Road near Western Motorway	0.22	0.50	1.47
34	Parramatta Road near Railway	1.74	2.00	2.25	50	Churchill Avenue	0.48	0.71	2.19
35	Parramatta Road near Station Street	0.15	0.18	1.57					

Table 26: Road Hotspots - Rate of Rise

ID	Locations	Rate of Rise (m/hour)		
		0.2 EY	1% AEP	PMF
28	Arthur Street near Hudson Park Golf Course	0.1	0.2	1.1
35	Parramatta Road near Station Street	0.2	0.3	1.7
39	Redmyre Road	0.1	0.5	2.7
40	Beresford Road	0.2	0.4	1.3
41	Brunswick Road	0.1	0.3	1.7
43	Underwood Road near Homebush bay drive	0.5	0.6	1.4
44	Parramatta Road near Bedford Road	0.1	0.1	1.1
45	Allan Davidson Oval	0.0	0.1	1.4
47	Broughton Road	0.0	0.1	0.7
48	Redmyre Road near Vernon Street	0.02	0.4	1.6

Table 27: Flooding Hotspots (Property)

Hotspot	Flood Behaviour	Hydraulic Hazard (1% AEP event)
Ismay Avenue	Overland flow from the west enters the open channel, resulting in a mix of overland and mainstream flooding. Depths on Ismay Avenue range from less than 0.1 m in the 0.2 EY to 0.2 m in the 1% AEP, while at the rear of properties on the street, depths range from 0.6 m in the 0.2 EY to 1 m in the 1% AEP.	High hazard flow occurs at the rear of properties of Ismay Avenue due to flow in the open channel.
Underwood Road	Overland flow passes beneath the M4 into the area before flowing to east towards the main channel. Depths downstream of the M4 on Underwood Road range from 0.2 m (0.2 EY) to 0.6 m (1% AEP).	High hazard flow occur under the M4 and at the start of Underwood Avenue, and is mostly on the road.
Rochester Street	A large hotspot that covers the overland flowpath between Beresford Road and Parramatta Road, which passes between approximately 50 properties. Depths are around 0.1-0.2 m in the 0.2 EY and 0.3-0.7 m in the 1% AEP.	High hazard in the north of the hotspot in the centre of the flow. Mostly on roads although some properties affected.
Kessell Avenue	Overland flow accumulates in Airey Park upstream of the culvert under the rail line, affecting properties around the park. The depth of flooding is 0.1 m (edge of park) to 0.6 m (centre of park) in the 0.2 EY, which rises to 0.6 m and 1.3 m in the 1% AEP.	Large area of high hazard flow but mostly concentrated in the park and little adjacent to property.
Redmyre Road	Overland flow passes towards the rail line on roads and between properties. Flow occurs to a depth of 0.1 – 0.3 m in the 0.2 EY and 0.3 – 0.6 m in the 1% AEP.	High hazard flow occurs in the centre of the flowpath, accumulation behind houses and flow between properties results in high hazard around houses.
Strathfield Plaza	An overland flowpath originating to the south-east of the commercial area passes through it, resulting in inundation throughout the commercial area. Depths of 0.3-0.4 m occur in the 0.2 EY and 0.5 -0.7 m in the 1% AEP.	High hazard flow outside and through Strathfield Plaza, as well as downstream on Raw Square and Albert Road.

7.5. Flood Planning Area

The Flood Planning Area (FPA) is defined (Appendix A) as "*The area of land below the flood planning level and thus subject to flood related development controls*". The flood planning level is defined as "*the combinations of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans*".

Strathfield Municipal Council determined that the FPA should be defined by the following criteria in a process commonly termed Flood Tagging. Flood tagging is based on the extent of inundation of the land and does not consider whether or not the building is inundated):

Mainstream Flooding (where there is a significant sized open channel)

- land inundated in the 1% AEP flood extent.

Overland Flooding (where there is no significant sized open channel)

- the lot is subject to 100mm or greater depth of inundation in the 1% AEP event as defined in this study, and
- at least 10% of the lot is inundated by floodwaters (i.e the depth is > 0m).

In addition to the above properties that have a significant proportion of their land covered by

buildings, thus 10% coverage was not possible as the building footprint was "dry", were manually defined as being in the FPA through ground truthing (field inspection of the properties).

A map of the proposed FPA (Flood Tagging Database) of flood affected properties is provided as Figure 25 and a summary of the proposed number of flood affected properties identified is provided in Table 28 with a listing of the flood affected properties in Appendix C.

Table 28: FPA - Flood Tagging Database of Powells Creek and Saleyards Creek Catchments

Criteria	No of Properties	% of Total
Total inundated in the 1% AEP	1976	100%
Tagged	1187	60%
Not Tagged but within the 1% AEP	789	40%
Tagged as Mainstream	174	9%
Tagged as Overland	931	47%
Tagged as Mainstream and Overland	72	4%

7.6. Flood Emergency Response Classification of Communities

To assist in the planning and implementation of response strategies, the SES in conjunction with OEH has developed guidelines to classify communities according to the impact that flooding has upon them. These Emergency Response Planning (ERP) classifications consider flood affected communities as those in which the normal functioning of services is altered, either directly or indirectly, because a flood results in the need for external assistance. This impact relates directly to the operational issues of evacuation, resupply and rescue. Communities are classified as either; Flood Islands (high and low); Road Access Areas; Overland Access Areas; Trapped Perimeter Areas (high and low) or Indirectly Affected Areas.

Key considerations for flood emergency response planning in these areas include:

- cutting of external access isolating an area;
- key internal roads being cut;
- transport infrastructure being shut down or unable to operate at maximum efficiency;
- flooding of any key response infrastructure such as hospitals, evacuation centres, emergency services sites;
- risk of flooding to key public utilities such as gas, power, sewerage; and
- the extent of the area flooded.

The ERP classification can identify the type and scale of information needed by the SES to assist in emergency response planning (refer to Table 29).

Table 29: Emergency Response Planning Classifications of Communities

Classification	EMERGENCY RESPONSE		
	Resupply	Rescue/Medivac	Evacuation
High flood island	Yes	Possibly	Possibly
Low flood island	No	Yes	Yes

Area with rising road access	No	Possibly	Yes
Area with overland escape routes	No	Possibly	Yes
Low trapped perimeter	No	Yes	Yes
High trapped perimeter	Yes	Possibly	Possibly
Indirectly affected areas	Possibly	Possibly	Possibly

This provisional ERP classifications shown on Figure 26 are largely based on the PMF as at most locations there is little difference in depth of inundation across the range of flood events (refer Table 23). The provisional ERP classifications should be reviewed by the SES and particularly following the next flood.

8. FLOOD FREQUENCY ANALYSIS

8.1. Overview

Flood frequency analysis (FFA) enables the magnitudes of floods (5%, 1% AEP etc.) to be estimated based on statistical analysis of recorded flows. It can be undertaken graphically or using a mathematical distribution.

The reliability of the flood frequency approach depends largely upon the length and quality of the observed record and accuracy of the rating curve. In addition, flood frequency inherently accounts for many assumptions which are required in rainfall-runoff routing for determining the magnitude of floods for annual exceedance probabilities.

This approach has the following advantages in design flood estimation:

- no assumptions are required regarding the relationship between probabilities of rainfall and runoff;
- all factors affecting flood magnitude are already integrated into the data;
- estimation of rainfall losses is not required;
- confidence limits can be estimated;
- historic rainfall data is not required.

The flood frequency approach does, however, have some limitations. These are:

- there is no “perfect” distribution”, thus different distributions will provide different answers;
- as most flood records are relatively short (compared to the design event for which a magnitude is required) there is considerable uncertainty. Whilst rainfall records at a particular location are also short, data can be used by the BoM from other gauges to accurately estimate design intensities much greater than the period of record at a single gauge;
- changes to the local topography such as levee banks, hydraulic controls and the construction of retarding basins or bridges can affect the homogeneity of the data set;
- short to medium term climatic changes may influence the flood record; and
- there are many issues with the accuracy of rating curves, especially at high flows. However, this is less of an issue with the use of hydraulic models based on high quality survey (ALS) to obtain site rating curves.

While some of these factors can affect the quality of the flood frequency analysis, for the purpose of providing confirmation for the runoff routing results they are considered reasonable.

8.2. Examined Annual Series

Utilising the data presented in Table 16, various data sets of annual maximum levels are available for converting to flows for the purpose of FFA. These levels can be converted into flows using one of the rating curves described in Section 3.3.2 and presented in Figure 7. Eight potential scenarios have been evaluated for FFA with the tested combinations presented in Table 30 and described below.

Table 30: Flow (m³/s) Data Sets Used in FFA

Year	Data Set #1*	Data Set #3**	Data Set #5	Data Set #6	Data Set #7	Data Set #8
1958	16.09	12.66	12.66	12.66	12.66	12.66
1959	49.07	54.56	54.56	54.56	54.56	53.9
1960	10.57	10.06	10.06	10.06	10.06	7.34
1961	5.87	83.07	3.47	83.07	3.47	3.47
1962	20.3	19.04	19.04	19.04	19.04	21.24
1963	32.06	35.74	35.74	35.74	35.74	37.06
1964	22.48	61.01	61.01	26.39	26.39	26.39
1965	7.16	6.01	6.01	6.01	6.01	4.38
1966	12.3	9.74	9.74	9.74	9.74	8.95
1967	14.91	13.52	13.52	13.52	13.52	11.45
1968	4.75	3.96	3.96	3.96	3.96	2.66
1969	18.39	19.89	19.89	19.89	19.89	16.4
1970	15.35	50.46	50.46	50.46	50.46	11.82
1971	10.33	27.57	27.57	27.57	27.57	7.06
1972	37.3	52.65	52.65	52.65	52.65	42.85
1973	27.12	34.82	34.82	34.82	34.82	31.63
1974	28.03	34.64	34.64	34.64	34.64	32.67
1975	16.72	15.12	15.12	15.12	15.12	13.52
1976	12.56	19.46	19.46	19.46	19.46	9.26
1977	16.31	7.76	7.76	7.76	7.76	12.86
1978	14.6	12.47	12.47	12.47	12.47	11.25
1979	12.15	9.58	9.58	9.58	9.58	8.8
1980	12.78	9.42	9.42	9.42	9.42	9.58
1981	14.58	11.56	11.56	11.56	11.56	11.25
1982	19.11	19.89	19.89	19.89	19.89	18.24
1983	21.21	24.98	24.98	24.98	24.98	24.03
1984	21.39	25.28	25.28	25.28	25.28	24.36
1985	11.92	10.06	10.06	10.06	10.06	8.65
1986	20.14	27.57	27.57	27.57	27.57	20.78
1987	11.4	8.2	8.2	8.2	8.2	8.2
1988	23.08	27.35	27.35	27.35	27.35	27.35
1989	13	9.74	9.74	9.74	9.74	9.74
1990	23.11	27.35	27.35	27.35	27.35	27.35
1991	19.21	18.63	18.63	18.63	18.63	18.63
1992	16.89	13.76	13.76	13.76	13.76	13.76
1993	22.38	26.39	26.39	26.39	26.39	26.39
1994	15.45	11.97	11.97	11.97	11.97	11.97
1995	13.41	10.23	10.23	10.23	10.23	10.23
1996	7.35	4.6	4.6	4.6	4.6	4.6
1997	6.87	4.17	4.17	4.17	4.17	4.17
Average	17.4	22.1	20.1	21.3	19.3	16.7

* Data Set #2 uses the same data as Data Set #1 however incorporates 17 additional years of data as mentioned in Section 8.2.1.

** Data Set #4 uses the same data as Data Set #3 however incorporates 17 additional years of data as mentioned in Section 8.2.1.

Digitally Record Flows

1. Entire Period of Record (EPR);
2. EPR with data from 1998 incorporated using Bayesian methods (see Section 8.2.1).

Reference 6 Levels Converted with TUFLOW Rating

3. EPR with missing years 1958 and 1987 - 1997 completed using the Digital Record;
4. EPR with missing years 1958 and 1987 - 1997 completed using the Digital Record with data from 1998 incorporated using Bayesian methods (see Section 8.2.1);
5. As 4. but with 1961 event stage replaced by digital record stage;
6. As 4. but with 1964 event stage replaced by digital record stage;
7. As 4. but with 1961 and 1964 events stage replaced by digital record stage.

Digital Record Stage

8. Digital record stage converted to flow using TUFLOW rating with additional data from 1998 incorporated using Bayesian methods (see Section 8.2.1).

8.2.1. Inclusion of Incomplete Data from 1998 to 2014

As mentioned in Section 2.10.1, the Elva Street gauge's digital records after November 1997 are incomplete. Accordingly data from this period cannot be used as part of an annual series for FFA purposes. However, use of Bayesian methods (an interpretation of the concept of probability) method now allow historic events of unknown magnitude to be included into the FFA. Essentially, Bayesian methods allow events to be added above and below a threshold value for use in the analysis.

Anecdotal evidence suggests that there have been no significant flood events in the period of 1998 to 2014. As the exact magnitude of these events is unknown, an assumption has been made as to the likely maximum flow achieved in at least one of these events. This has been determined to be the average of the digital data set flows for each data set (see the last row of Table 30) which varies depending on the data set being analysed. Using Bayesian methods, data from the period of 1998 to 2014 (17 years of additional data), have been incorporated into the FFA by assuming that they have not exceeded this threshold value.

8.2.2. Adopted Data Set

FFA of the eight data sets presented in Table 30 has been performed with the results presented in Appendix B. Further examination of the data sets was undertaken to determine which provides the most reasonable representation of annual maximum flows for FFA. This analysis is presented below.

Data Sets #1 and #3

With new computational technology and Bayesian statistical methods it seems appropriate that the incomplete data from 1998 to 2014 (see Section 8.2.1) be incorporated into the FFA. Accordingly, Data Sets #1 and #3 have been discounted from further consideration as Data Sets #2 and #4 use the same annual series but incorporate this additional data.

It is interesting to compare design flow results from Data Set #1 to the Reference 2 FFA results as FFA has been performed on the same data set and should therefore produce similar results. Table 31 presents this flow comparison and shows that as expected the results are similar. Minor differences in the larger design flows are due to differences in the applied statistical distribution fitting method.

Table 31: Comparison of Reference 2 and Data Set #1 FFA Design Flows

AEP (%)	Reference 2 Design Flows (m ³ /s)	Data Set #1 Design Flows (m ³ /s)
20	23.8	24.0
10	29.3	29.7
5	34.6	35.2
2	41.7	42.6
1	47.2	48.2

Data Set #2

Due to the uncertainties associated with the digital record rating curve described in Section 3.3.2, the TUFLOW model rating is preferred for converting levels to flows. As Data Set #2 uses the digital record rating curve this data set has been discounted.

Data Sets #4, #5 and #6

As presented in Table 11, a number of events used debris marks to estimate peak flood level. In particular, the 1961 and 1964 events. Reference 6 levels were obtained from flood marks as no digital gauge data was available. Peak flood marks obtained from reported debris are considered less reliable than those recorded by the gauge. To test the veracity of the magnitude of the 1961 and 1964 events, daily and pluviometer rainfall data for these events were examined for proximate gauges. It should be noted that at the time of these events rainfall data and particularly sub-daily rainfall data (pluviometer) was sparse.

This analysis could not confirm the estimated magnitude of these events as the estimated rainfall AEP was generally much less than the estimated flow AEP for these events. This led to the 1961 and 1964 events being discounted for FFA purposes. The 1959 event peak flood level was also estimated from debris however the reported Reference 2 and Reference 6 peak gauge heights are effectively the same giving credit to the true magnitude of this event.

In light of these findings, Data Sets #4, #5 and #6 have been excluded from the design flow estimates.

Data Set #7 and #8

FFA results of Data Sets #7 and #8 were analysed to determine which of these two data sets should be used to produce design flows. Two variables were examined, namely, the goodness of fit of the:

- Annual series data to the distribution; and
- TUFLOW model design flows to the distribution.

Appendix B, Figures B7 and B8 presents the annual series, distributions and TUFLOW model design flows for both Data Sets. For both examined variables, Data Set #8 displayed better correlation than Data Set #7 and was thus selected in preference.

8.3. Probability Distribution

AR&R (Reference 4) recommends that FFA should be applied to peak flows rather than heights. In frequency analysis of flows, the fitting of a particular distribution may be carried out analytically or by fitting a probability distribution. The data may consist of an annual series, where the largest peak in each year is used, or a partial series, where all flows above a selected base value are used. The relative merits of each method are discussed in detail in AR&R. In general, an annual series is preferable as there are more methods and experience available.

Many probability distributions have been applied to FFA and this is a very active field of research. However, it is not possible to determine the “correct” form of the distribution as there is no robust evidence that any particular distribution is more appropriate than another. AR&R provides further discussion on this issue.

Since publication of AR&R (Reference 4) in 1987 there have been significant developments in the field of FFA both in Australia and overseas. The approach adopted in this study reflects these developments. Recent research has suggested that the fitting method is as important as the adopted distribution. The traditional fitting method has generally been based on moments and this makes the fit very sensitive to the highest and lowest values. Recent research has shown that L-moment and Bayesian likelihood approaches are much more robust than traditional moment fitting and are now the recommended methods.

For this analysis a Bayesian maximum likelihood approach has been adopted in preference to L-moments because the method readily lends itself to include limited information about events outside the continuous period of record. The Flike flood frequency analysis software developed by Kuczera (Reference 10) uses the Bayesian approach and was utilised in this study.

The rating curve (height-discharge relationship) adopted for the estimation of streamflows from the recorded gauge heights is critical to the success of FFA. The FFA was conducted using the rating curve derived from the calibrated hydraulic model (refer subsequent sections) as well as that obtained from the digital records (see Section 3.3.2).

Two probability distributions were tested, Log Pearson III (LP3) and Generalised Extreme Value (GEV) distributions and it was found that the LP3 distribution produced a better curve fit to the data.

8.4. Design Flow Results

The results of the FFA are provided in Table 32 and shown on Figure 21 for the LP3 distribution. The choice of distribution was found to have some influence on design flow estimates. It was found that the LP3 distribution fit the annual series data better than the GEV distribution and was therefore selected in preference for determining design flows.

Table 32: Flood Frequency Analysis – Powells Creek Elva Street gauge

Design Flood Event	Peak Flow FFA (m ³ /s)	
	LP3 Distribution	GEV Distribution
0.5 (1 in 2 year) EY	11.4	11.6
0.2 (1 in 5 year) EY	20.9	20.5
10% (1 in 10 year) AEP	28.5	28.1
5% (1 in 20 year) AEP	36.9	37.1
2% (1 in 50 year) AEP	49.1	51.7
1% (1 in 100 year) AEP	59.5	65.4

8.5. Reconciling Flood Frequency and Rainfall Runoff Results

When compared to FFA design flow estimates those from TUFLOW (Figure 21) overestimate flows for more frequent events and underestimate flow in the 2% AEP event or greater.

There are many explanations as to why the flood frequency and rainfall runoff modelling do not reconcile. These are primarily due to data limitations as well as the adequacy of the hydrologic model in representing the runoff routing behaviour of the catchment. Some of the main limitations of the FFA are the limited period of record as well as rating curve errors. Due to the nature of the rating curve, high flow estimates at the Elva Street gauge are very sensitive to small changes in the water level.

In addition to potential uncertainty of the analysis it is important to realise that the flood frequency relationship may not be representative of the greater Powells Creek catchment given that the Elva Street catchment only covers a proportion of the catchment.

As FFA estimates become more uncertain for less frequent flooding such as the 1% AEP which is generally adopted for development control purposes, flow estimates from TUFLOW modelling were adopted for the current study.

9. SENSITIVITY ANALYSIS

9.1. Overview

The following sensitivity analyses were undertaken to establish the variation in design flood levels and flow that may occur if different parameter assumptions were made:

- Manning's "n": The hydraulic roughness values were increased and decreased by 20%;
- Blockage (pipes): Sensitivity to blockage of all pipes was assessed for 20% and 50% blockage;
- Climate change (rainfall increase): Sensitivity to rainfall/runoff estimates were assessed by increasing the rainfall intensities by 10%, 20% and 30% as recommended under current guidelines;
- Climate change (sea level rise): Sea level rise scenarios (elevated levels in the Parramatta River) of 0.4 m and 0.9 m were assessed.

These sensitivity scenarios were undertaken for the 1% AEP rainfall event with a tailwater level of 1 mAHD in the Parramatta River.

9.2. Climate Change Background

Intensive scientific investigation is ongoing to estimate the effects that increasing amounts of greenhouse gases (water vapour, carbon dioxide, methane, nitrous oxide, ozone) are having on the average earth surface temperature. Changes to surface and atmospheric temperatures may affect climate and sea levels. The extent of any permanent climatic or sea level change can only be established with certainty through scientific observations over several decades. Nevertheless, it is prudent to consider the possible range of impacts with regard to flooding and the level of flood protection provided by any mitigation works.

Based on the latest research by the United Nations Intergovernmental Panel on Climate Change, evidence is emerging on the likelihood of climate change and sea level rise as a result of increasing greenhouse gasses. In this regard, the following points can be made:

- greenhouse gas concentrations continue to increase;
- global sea level has risen about 0.1 m to 0.25 m in the past century;
- many uncertainties limit the accuracy to which future climate change and sea level rises can be projected and predicted.

9.2.1. Rainfall Increase

The BoM has indicated that there is no intention at present to revise design rainfalls to take account of the potential climate change, as the implications of temperature changes on extreme rainfall intensities are presently unclear, and there is no certainty that the changes would in fact increase design rainfalls for major flood producing storms. There is some recent literature by CSIRO that suggests extreme rainfalls may increase by up to 30% in parts of NSW (in other places the projected increases are much less or even decrease); however, this information is not of sufficient accuracy for use as yet (Reference 11).

Any increase in design flood rainfall intensities will increase the frequency, depth and extent of inundation across the catchment. It has also been suggested that the cyclone belt may move further southwards. The possible impacts of this on design rainfalls cannot be ascertained at this time as little is known about the mechanisms that determine the movement of cyclones under existing conditions.

Projected increases to evaporation are also an important consideration because increased evaporation would lead to generally dryer catchment conditions, resulting in lower runoff from rainfall. Mean annual rainfall is projected to decrease, which will also result in generally dryer catchment conditions. The influence of dry catchment conditions on river runoff is observable in climate variability using the Indian Pacific Oscillation index. Although mean daily rainfall intensity is not observed to differ significantly between Indian Pacific Oscillation phases, runoff is significantly reduced during periods with fewer rain days.

The combination of uncertainty about projected changes in rainfall and evaporation makes it extremely difficult to predict with confidence the likely changes to peak flows for large flood events within the Powells Creek catchment under warmer climate scenarios.

In light of this uncertainty, the NSW State Government (Reference 11) advice recommends sensitivity analysis on flood modelling should be undertaken to develop an understanding of the effect of various levels of change in the hydrologic regime on the project at hand. Specifically, it is suggested that increases of 10%, 20% and 30% to rainfall intensity be considered.

9.2.2. Sea Level Rise

The *NSW Sea Level Rise Policy Statement* was released by the NSW Government in October 2009 (Reference 12). This Policy Statement was accompanied by the *Derivation of the NSW Government's sea level rise planning benchmarks* (Reference 13) which provided technical details on how the sea level rise assessment was undertaken. Additional guidelines were issued by OEH, including the *Flood Risk Management Guide: Incorporating sea level rise benchmarks in flood risk assessments* (Reference 14).

The Policy Statement says:

“Over the period 1870-2001, global sea levels rose by 20 cm, with a current global average rate of increase approximately twice the historical average. Sea levels are expected to continue rising throughout the twenty-first century and there is no scientific evidence to suggest that sea levels will stop rising beyond 2100 or that current trends will be reversed... However, the 4th Intergovernmental Panel on Climate Change in 2007 also acknowledged that higher rates of sea level rise are possible” (Reference 13).

In light of this uncertainty, the NSW State Government's advice is subject to periodical review. As of October 2012 the NSW State Government withdrew endorsement of sea level rise predictions but still require sea level rise to be considered. This was taken as a 0.4 m rise by the year 2050 and a 0.9 m rise by the year 2100. The extent of tidal inundation with a

1.1 mAHD, a 1.1 mAHD tide +0.4m sea level rise and +0.9m sea level rise are shown on Figure 1.

9.3. Results

The sensitivity scenario results were compared to the 1% AEP rainfall event and a summary of peak flood level and peak flow differences at various locations are provided in the sections below.

Comparison of peak flood levels have been highlighted such that yellow highlighting indicates that the magnitude of the change is greater than 0.1 m, while red highlighting indicates changes greater than 0.3 m in magnitude.

9.3.1. Roughness Variations

Table 33: Results of Variation in Channel Roughness - Change in Level

1% AEP Level Comparison (m)		
Locations	Decrease roughness by 20%	Increase roughness by 20%
Torrington Road	0.00	0.00
Brunswick Avenue	-0.03	0.02
Beresford Road	-0.01	0.01
Redmyre Road	-0.01	-0.02
Pilgrim Avenue	-0.02	0.02
Parramatta Road	0.00	0.00
Pomeroy Street	-0.07	0.02
Underwood Road	0.00	0.00
The Crescent	-0.02	0.10
Park Road	0.01	0.00
Allan Davidson	0.13	0.13
Arthur Street	-0.01	0.01

Table 34: Results of Variation in – Channel Roughness - Change in Flow

1% AEP Flow Comparison (m ³ /s)		
Locations	Decrease roughness by 20%	Increase roughness by 20%
Torrington Road	-0.01	-0.02
Brunswick Avenue	0.78	0.08
Beresford Road	0.44	-0.58
Redmyre Road	0.78	-0.82
Pilgrim Avenue	0.24	-0.30
Parramatta Road	0.89	-1.99
Pomeroy Street	-2.36	-4.90
Underwood Road	1.30	-4.56
The Crescent	1.11	-1.40
Park Road	0.77	-3.58

Allan Davidson	1.61	-0.96
Arthur Street	0.09	-0.16

9.3.2. Blockage Variations

Table 35: Results of Blockage Analysis - Change in Level

1% AEP Level Comparison (m)		
Locations	20% Pipe Blockage	50% Pipe Blockage
Torrington Road	0.00	0.00
Brunswick Avenue	0.01	0.04
Beresford Road	0.01	0.03
Redmyre Road	0.02	0.06
Pilgrim Avenue	0.02	0.04
Parramatta Road	0.00	0.00
Pomeroy Street	-0.02	-0.05
Underwood Road	0.00	0.00
The Crescent	-0.04	-0.06
Park Road	0.00	0.00
Allan Davidson	0.00	0.01
Arthur Street	0.03	0.06

Table 36: Results of Blockage Analysis - Change in Flow

1% AEP Flow Comparison (m ³ /s)		
Locations	20% Pipe Blockage	50% Pipe Blockage
Torrington Road	0.00	0.00
Brunswick Avenue	0.32	1.34
Beresford Road	0.41	0.97
Redmyre Road	1.23	3.42
Pilgrim Avenue	1.45	3.54
Parramatta Road	-2.27	-4.33
Pomeroy Street	-3.06	-7.44
Underwood Road	0.00	-0.67
The Crescent	0.17	-0.25
Park Road	-0.31	-0.35
Allan Davidson	-0.05	0.86
Arthur Street	0.48	0.78

9.3.3. Climate Variations

The effect of increasing the design rainfalls by 10%, 20% and 30% and sea level rise have been evaluated for the 1% AEP rainfall event with impacts on peak flood levels observed throughout the study area (Table 37 and Table 38). Generally speaking, each incremental 10% increase in rainfall results in an approximately 0.05 m increase in peak flood levels at most of the locations analysed. The 1% AEP event with a rainfall increase of 30% is approximately equivalent to a 0.2% AEP event in present day conditions and a significant impact on flood levels is not

unexpected. The peak flood level and depth for the 1% AEP event with a 2050 and 2100 tailwater are shown on Figure 24.

Table 37: Results of Climate Change Analysis - Change in Level

1% AEP Level Comparison (m)					
Locations	Tailwater increase to 1.4 m AHD	Tailwater increase to 1.9 m AHD	Increase in rainfall by 10%	Increase in rainfall by 20%	Increase in rainfall by 30%
Torrington Road	0.00	0.00	0.00	0.00	0.00
Brunswick Avenue	0.00	0.00	0.05	0.09	0.12
Beresford Road	0.00	0.00	0.02	0.05	0.07
Redmyre Road	-0.01	-0.01	0.03	0.08	0.11
Pilgrim Avenue	0.00	0.00	0.04	0.08	0.12
Parramatta Road	0.00	0.00	0.01	0.22	0.38
Pomeroy Street	0.01	0.10	0.06	0.13	0.22
Underwood Road	0.00	0.00	0.00	0.00	0.00
The Crescent	-0.02	-0.02	0.13	0.26	0.40
Park Road	0.01	0.01	0.02	0.05	0.74
Allan Davidson	0.00	0.00	0.12	0.20	0.25
Arthur Street	0.00	0.00	0.02	0.05	0.08

Table 38: Results of Climate Change Analysis - Change in Flow

1% AEP Flow Comparison (m ³ /s)					
Locations	Tailwater increase to 1.4 m AHD	Tailwater increase to 1.9 m AHD	Increase in rainfall by 10%	Increase in rainfall by 20%	Increase in rainfall by 30%
Torrington Road	0.00	0.00	0.03	0.06	0.10
Brunswick Avenue	0.11	0.11	2.48	4.49	6.60
Beresford Road	0.06	0.06	0.86	1.76	2.96
Redmyre Road	-0.26	-0.26	1.94	5.09	8.32
Pilgrim Avenue	-0.24	-0.25	2.32	6.06	10.02
Parramatta Road	-0.22	-0.22	5.12	12.35	21.21
Pomeroy Street	-1.35	-5.26	7.97	17.78	29.27
Underwood Road	-0.77	-1.12	4.38	9.12	13.89
The Crescent	0.39	0.47	2.10	3.65	4.88
Park Road	-0.24	-0.26	3.48	6.97	54.66
Allan Davidson	-0.26	-0.26	2.45	6.52	9.23
Arthur Street	0.01	0.01	1.09	2.32	3.54

10. COMMUNITY CONSULTATION

Community consultation for the current study consisted of a newsletter sent to residents in the study area. As described in Section 2.11, extensive consultation was undertaken as part of a previous study, including distribution of a questionnaire and interviews with residents. No major flooding has occurred since that time which would warrant a new questionnaire. For this reason, the consultation was limited to a newsletter, which described the reasons for the study being undertaken and its outputs. The newsletter is shown below.



11. ACKNOWLEDGEMENTS

Strathfield Municipal funded this document, with most analysis being undertaken as part of a Sydney Water-funded study of the entire catchment. The assistance of the following in providing data and guidance to the study is gratefully acknowledged:

- Sydney Water;
- Strathfield Municipal Council;
- City of Canada Bay Council;
- Burwood Council;
- Bureau of Meteorology;
- Residents of the Powells Creek catchment.

12. REFERENCES

1. **Floodplain Development Manual**
NSW Government, April 2005
2. Strathfield Municipal Council
Powells Creek and Saleyards Creek Flood Study
Webb McKeown & Associates Pty Ltd, October 1998
3. Strathfield Municipal Council
Powells Creek Catchment Floodplain Management Study & Plan
Perrons Consultants Pty Ltd, May 2003
4. Pilgrim H (Editor in Chief)
Australian Rainfall and Runoff – A Guide to Flood Estimation
Institution of Engineers, Australia, 1987
5. Strathfield Municipal Council
Powells Creek Floodplain Mapping
WMAwater, May 2010
6. Dewar R.W & Robinson D.K
An Investigation into Lag Times for an Urban Catchment
Hydrology and Water Resources Symposium, Canberra, September 1988
7. Bureau of Meteorology
The Estimate of Probable Maximum Precipitation in Australia: Generalised Short Duration Method
June 2003
8. TUFLOW User Manual
Version 2013-12-AE
BMT WBM, 2011
9. Public Works Department
Lower Parramatta River Flood
February 1985
10. Kuczera, G
Bayesian Flood Frequency Analysis Software (Version 4.50)
Department of Civil Surveying Environmental Engineering, University of Newcastle, NSW, 2001
11. NSW Department of Environment and Climate Change
Floodplain Risk Management Guidelines – Practical Consideration of Climate Change

October 2007

12. **NSW Sea Level Rise Policy Statement**
New South Wales Government, October 2009
13. Department of Environment, Climate Change and Water
Derivation of the NSW Government's Sea Level Rise Planning Benchmarks
October 2009
14. Department of Environment, Climate Change and Water
Flood Risk Management Guide
August 2010



**FIGURE 1
POWELLS CREEK (STRATHFIELD LGA)
STUDY AREA**



- Local Government Area Boundary
- ▭ Study Area
- - - Catchment Boundary
- Open Channels
- 1.0m Highest Astronomical Tide (HAT)
- 1.4m HAT + 0.4m sea level rise
- 1.9m HAT + 0.9m sea level rise

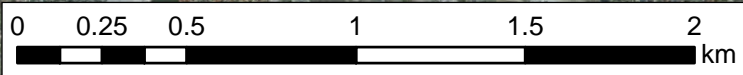
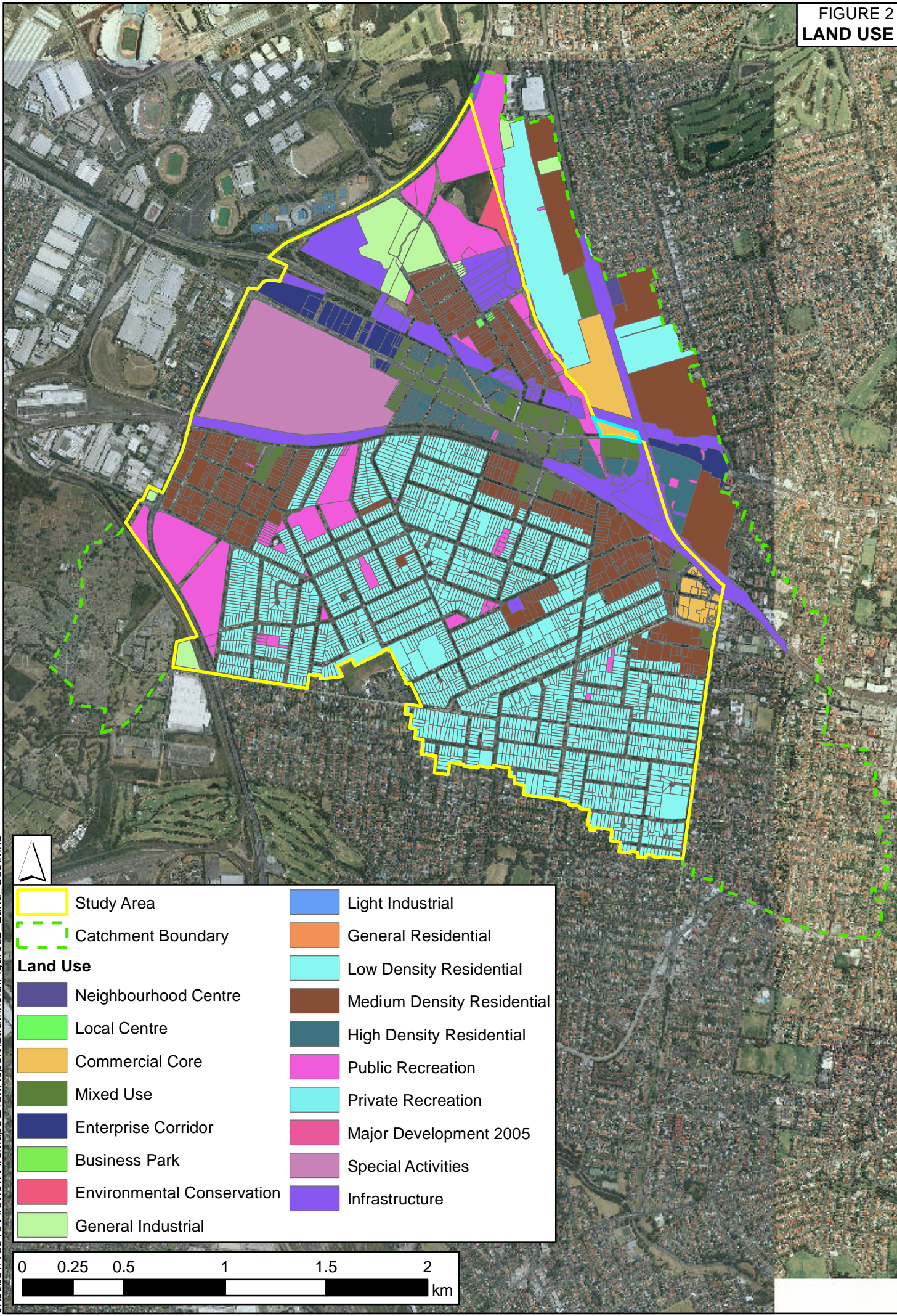



















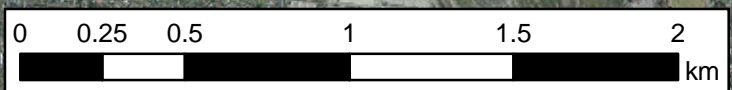


FIGURE 2
LAND USE



	Study Area		Light Industrial
	Catchment Boundary		General Residential
Land Use			
	Neighbourhood Centre		Low Density Residential
	Local Centre		Medium Density Residential
	Commercial Core		High Density Residential
	Mixed Use		Public Recreation
	Enterprise Corridor		Private Recreation
	Business Park		Major Development 2005
	Environmental Conservation		Special Activities
	General Industrial		Infrastructure



J:\jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure02_Land_Use.mxd

FIGURE 3
ALS DATA

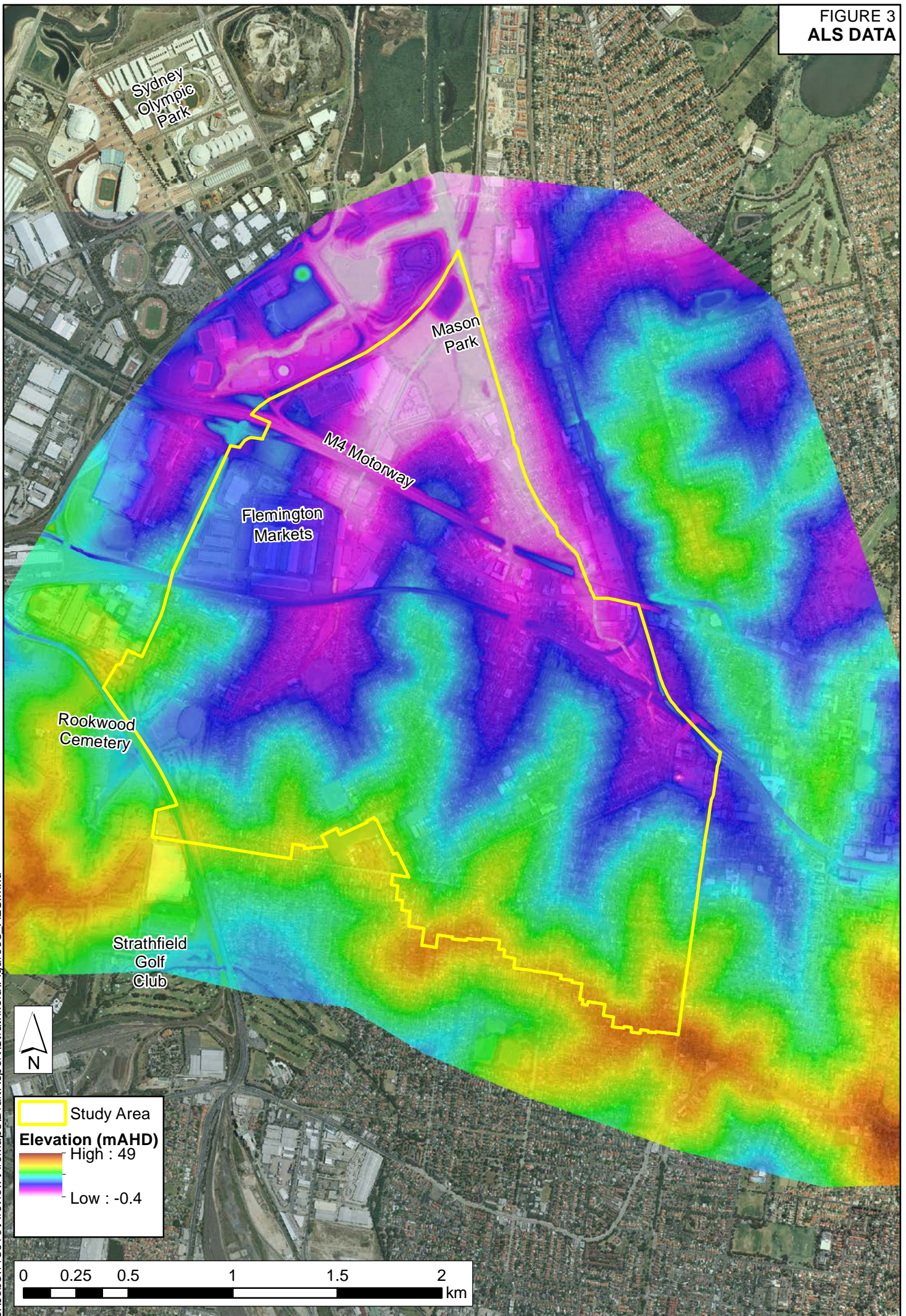


FIGURE 4
PHOTOGRAPHS OF STRUCTURES



J:\Jobs\115070\1A\review\ArcMaps\DraftReport\Strathfield\Figure04_Photos of Structures.mxd



0 0.125 0.25 0.5 0.75 1 km



Airey Park 2/01/96



Airey Park 2/01/96



The Crescent opposite Airey Park 2/01/96



19 Shortland Ave 10/02/1990



Airey Park The Crescent 2/01/96



Oxford Road 2/01/96



1 Heyde Ave 2/01/96



Rochester Street eastern side, Mirabooka Ave & Broughton Rd



Redmyre Road 2/01/96



62 Beresford Road 10/02/1990



19 Shortland Ave 10/02/1990



Corner of Todman Ave and Oxford Rd: eastern side



Barker Road, Southern side



Todman Ave; at Barker Road



Corner of Badgery Ave; and Bates Street



29 Badgery Avenue



Outside 29 Badgery Avenue



139 Albert Road 10.2.90



139 Albert Road 10.2.90



139 Albert Road 10.2.90



139 Albert Road 10.2.90



139 Albert Road 10.2.90



Underwood Road 18/03/1990



Underwood Road 18/03/1990

FIGURE 6
WATER LEVEL GAUGE RECORDS

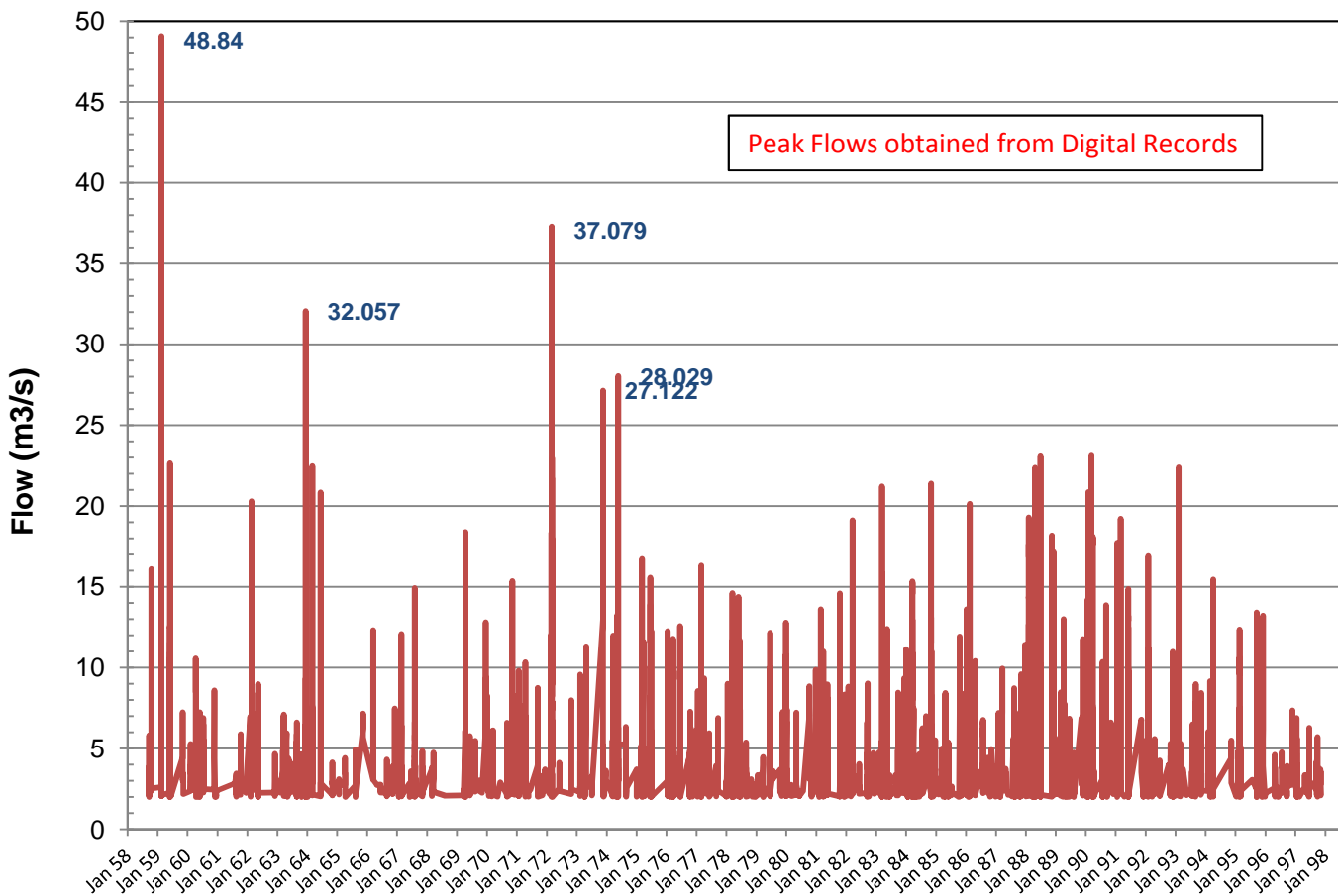
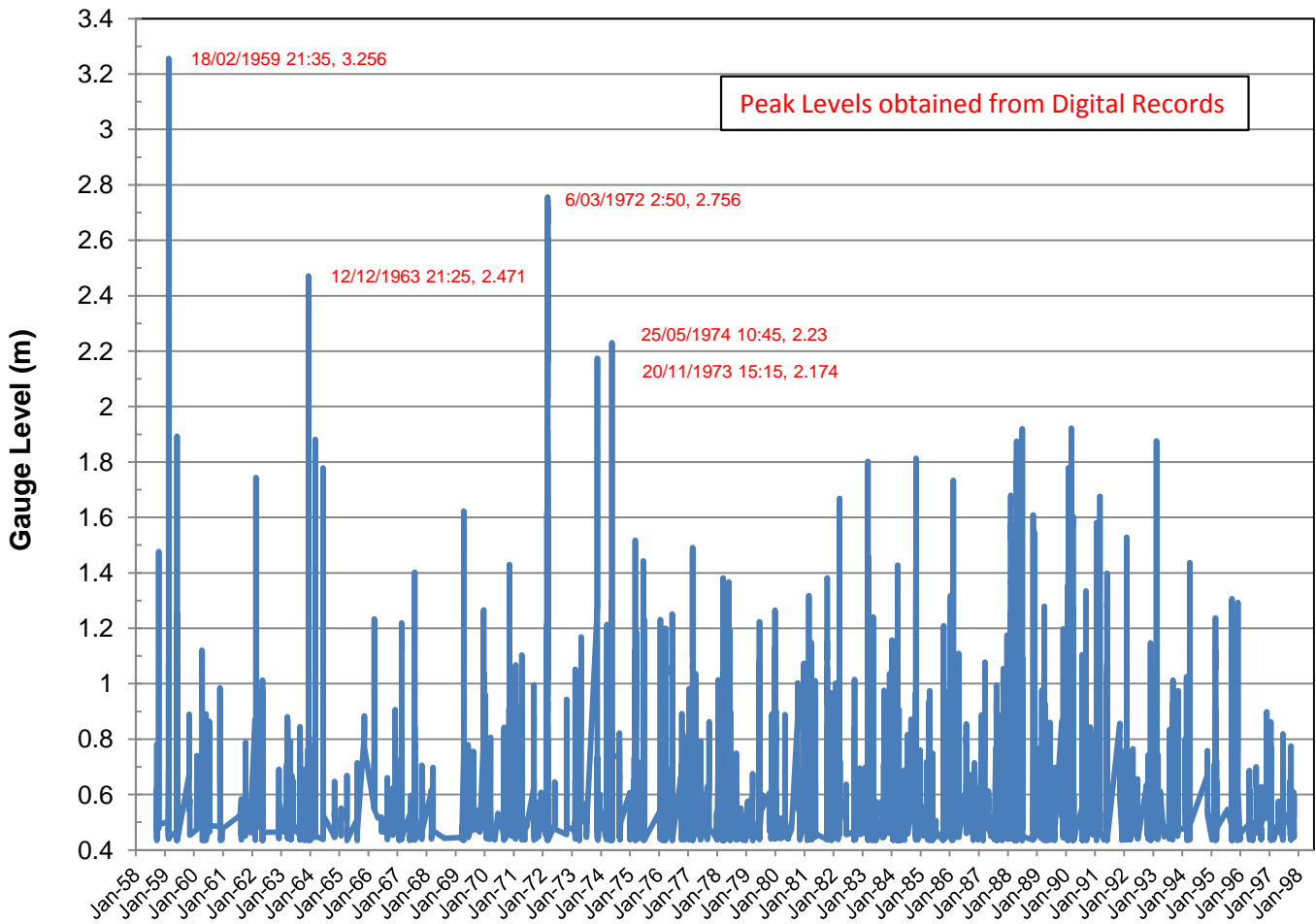
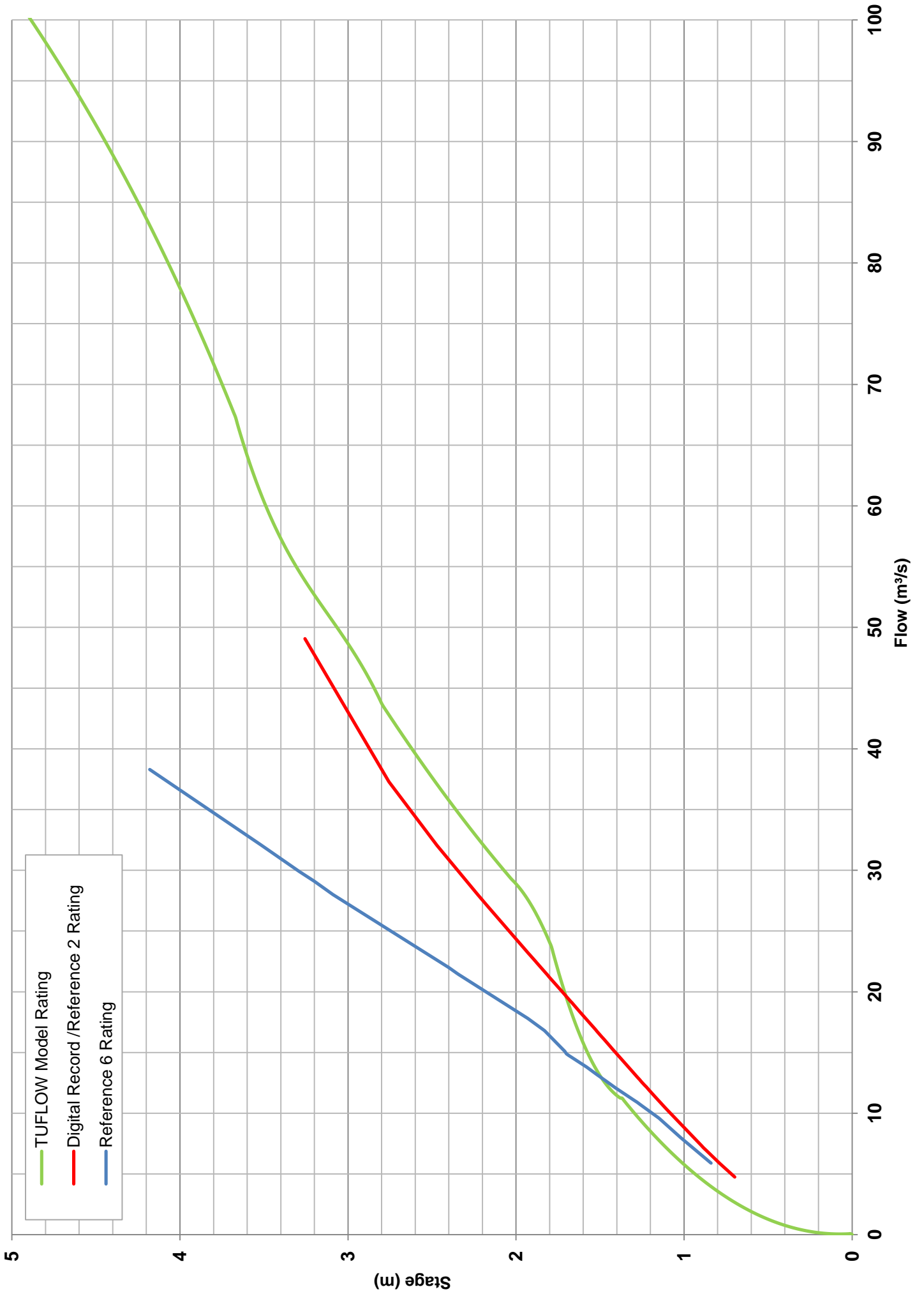


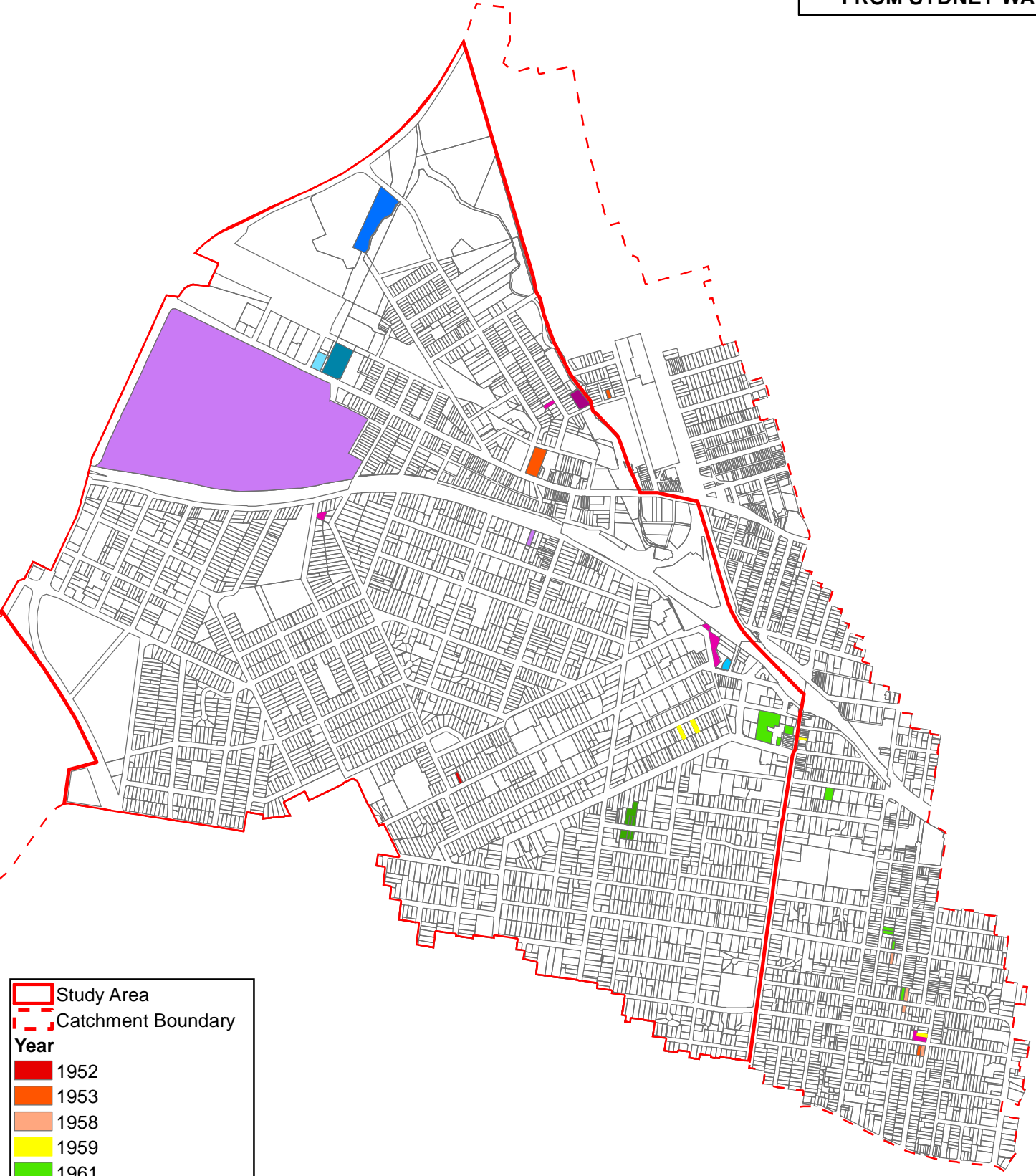
FIGURE 7
RATING CURVES AT ELVA STREET GAUGE



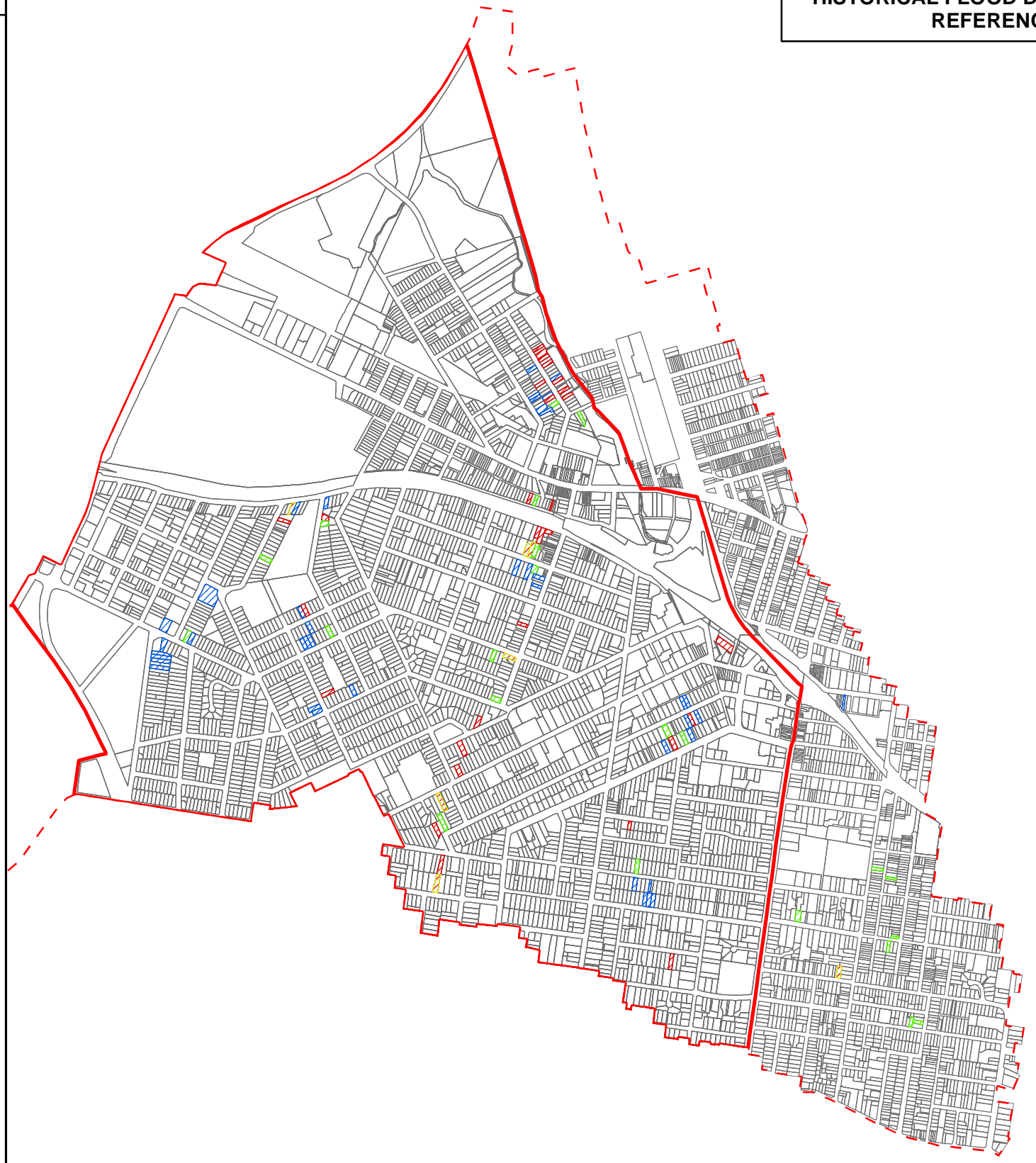
**HISTORICAL FLOOD DATA
FROM SYDNEY WATER**

**FIGURE 8
HISTORICAL FLOOD DATA
REFERENCE 2**

J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure08_Historical_Flood_Data_Sydney_Water_A3.mxd



- Study Area
- Catchment Boundary
- Year**
- 1952
- 1953
- 1958
- 1959
- 1961
- 1963
- 1969
- 1972
- 1983
- 1984
- 1988
- 1996
- Flooded Multiple Years



- Study Area
- Catchment Boundary
- INUNDATION ABOVE FLOOR LEVEL (WM SURVEY)
- FLOODING ACROSS PROPERTY AND IDENTIFIABLE FLOOD LEVEL (WM SURVEY)
- FLOODING ACROSS PROPERTY (WM SURVEY)
- FLOOD PROBLEM (OTHER SURVEY)



FIGURE 9a
EVENTS OF FEBRUARY 1990

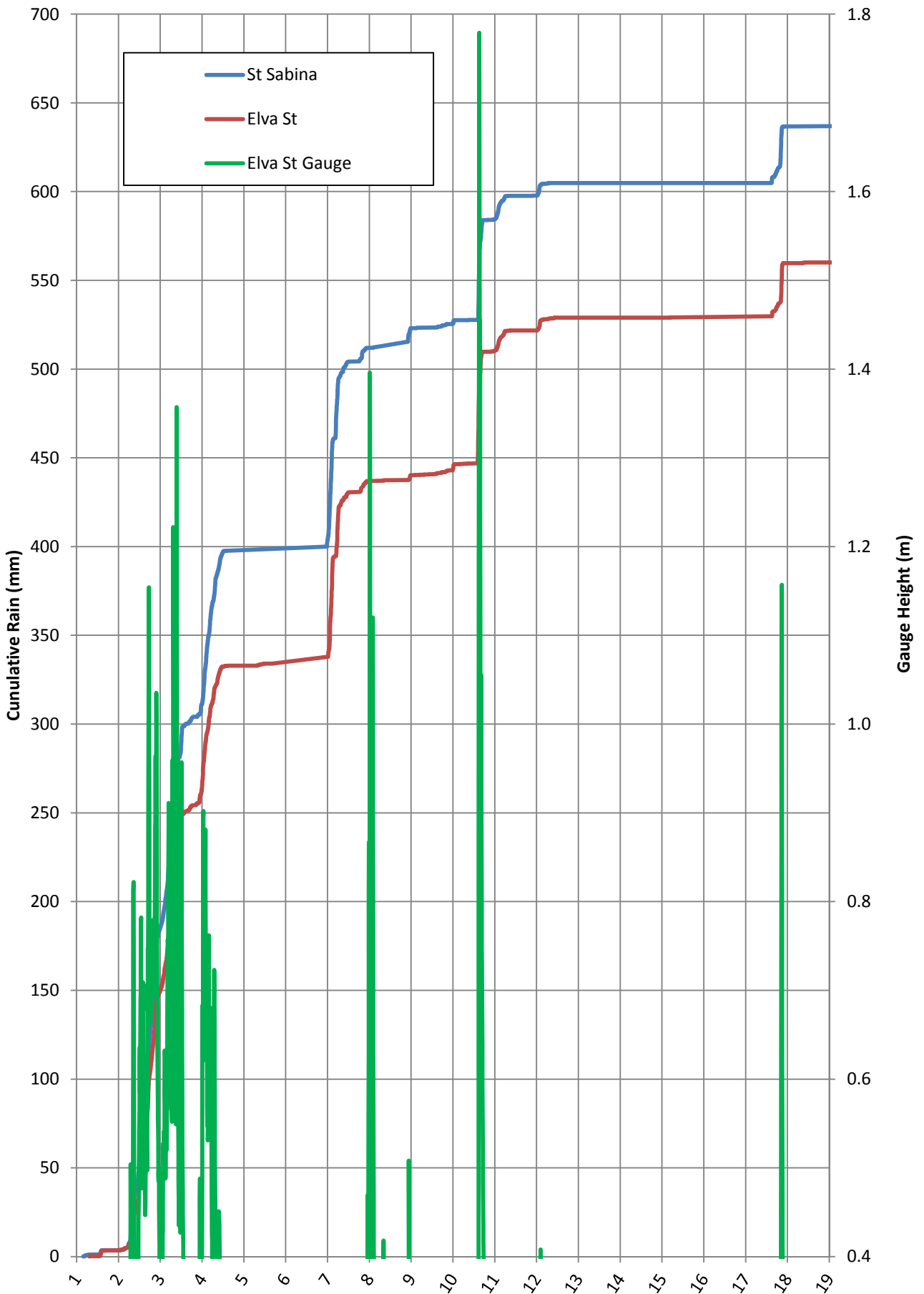


FIGURE 9b
PLUVIOMETER DATA
2-4 FEBRUARY 1990

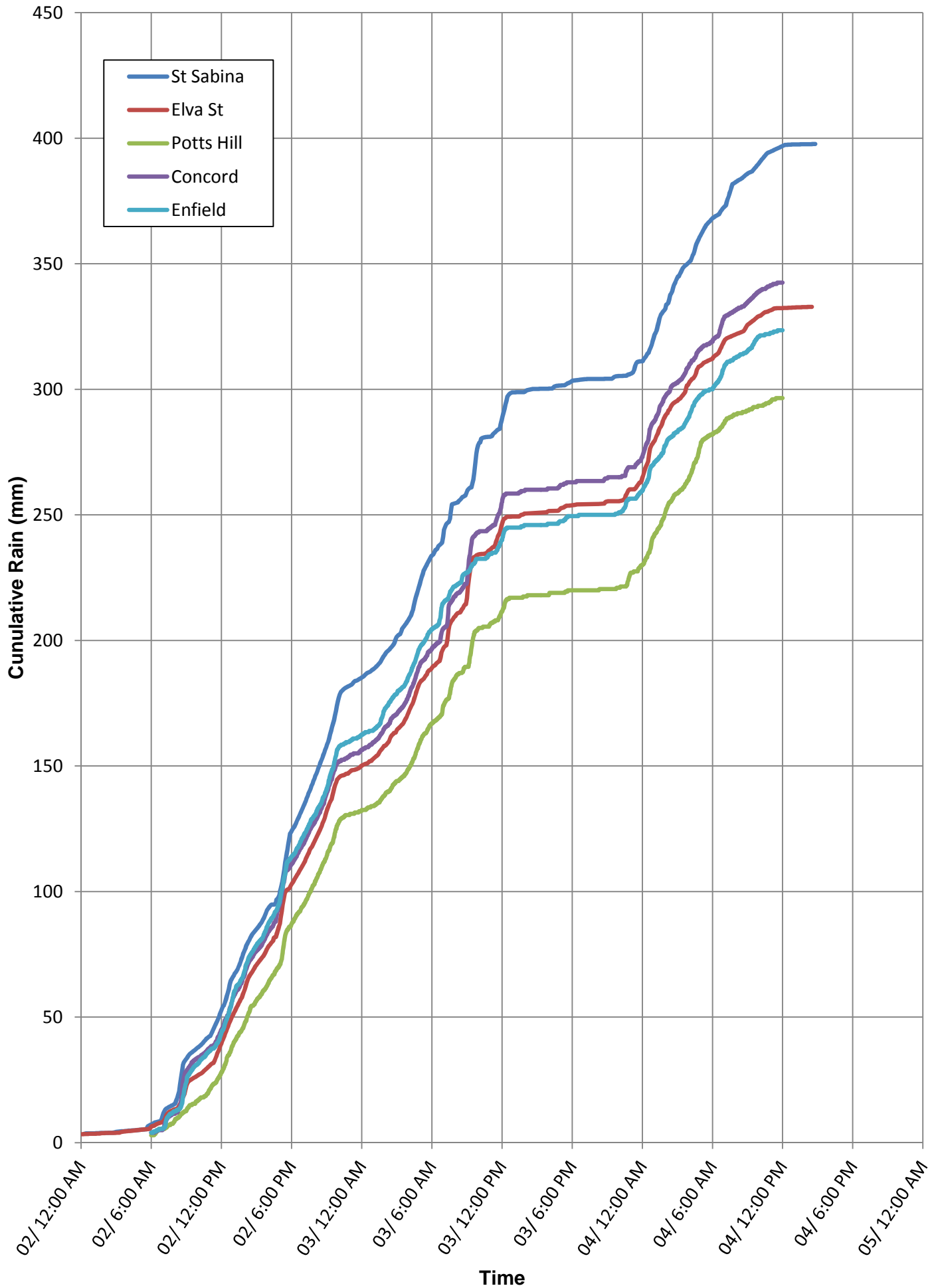


FIGURE 9c
PLUVIOMETER DATA
7 FEBRUARY 1990

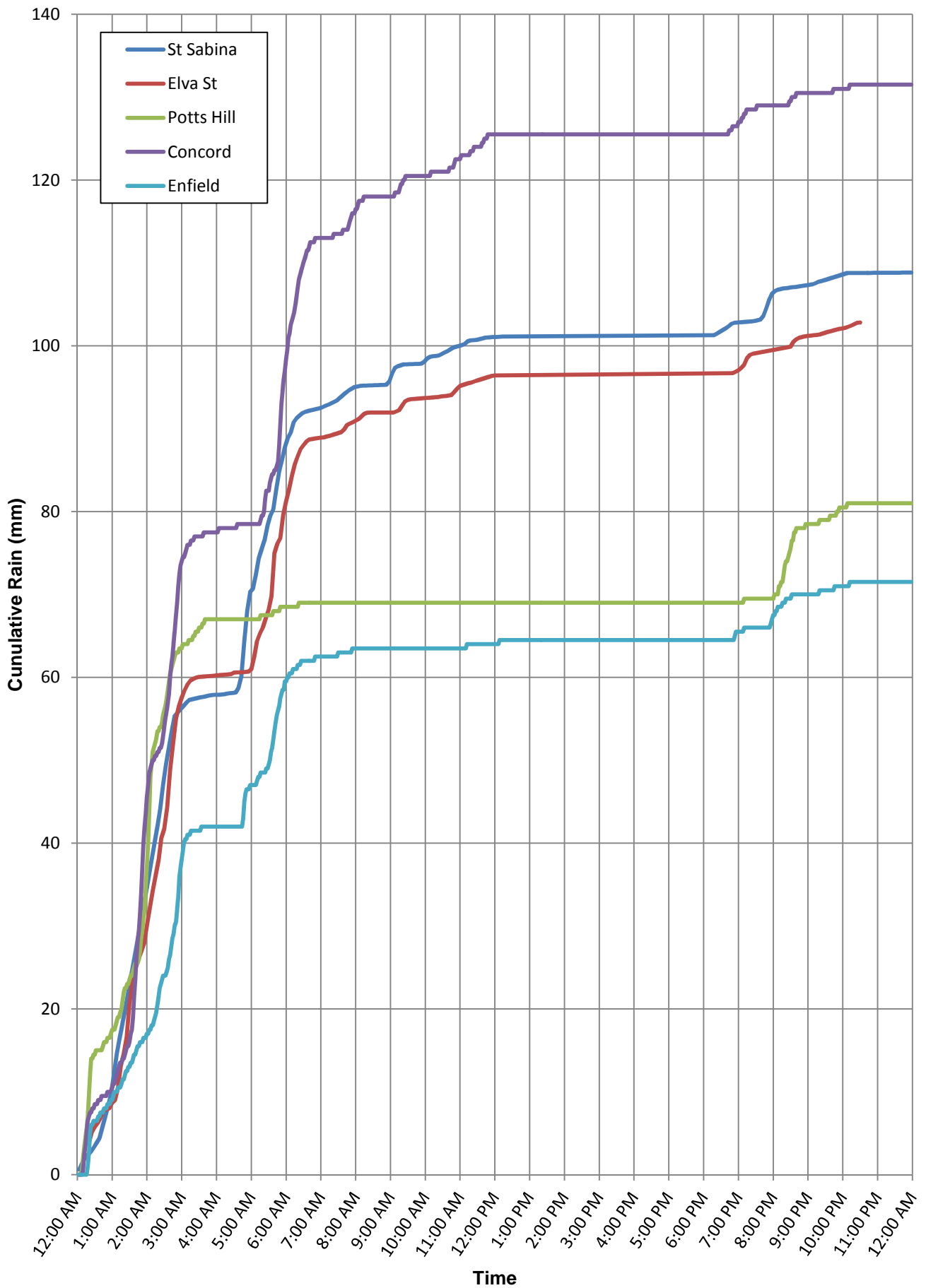


FIGURE 9d
PLUVIOMETER DATA
10 FEBRUARY 1990

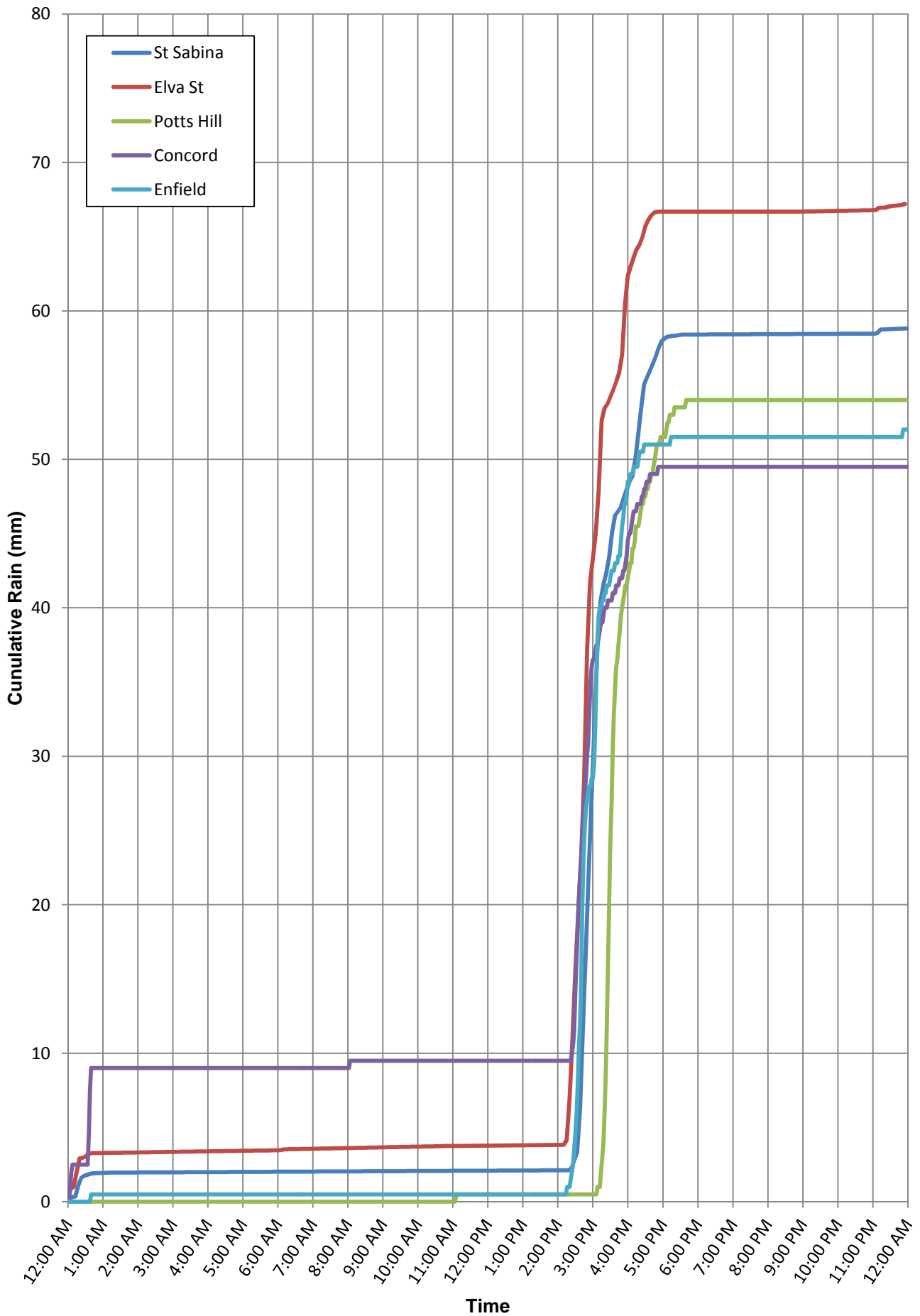


FIGURE 9e
PLUVIOMETER DATA
17 FEBRUARY 1990

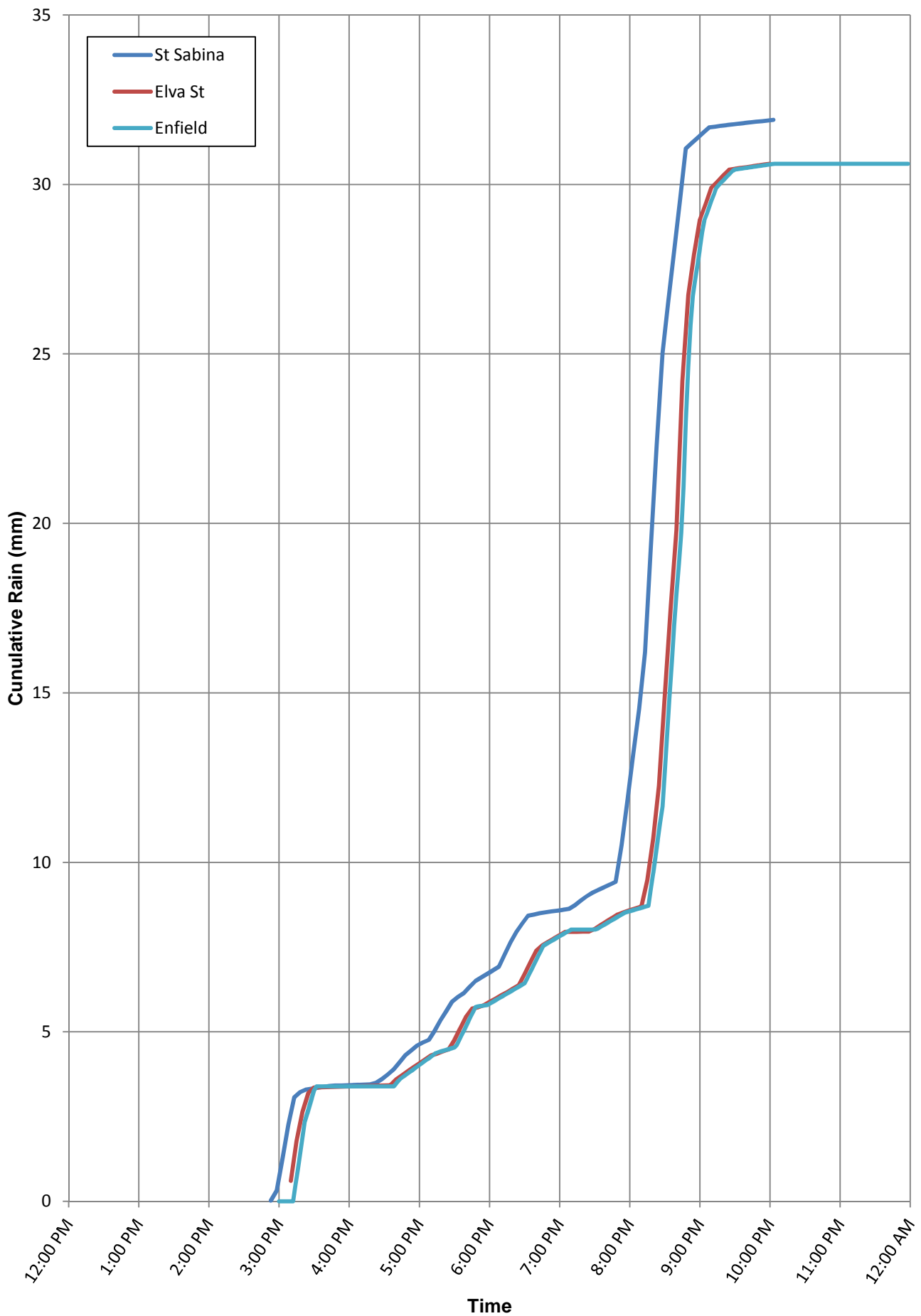


FIGURE 9f
PLUVIOMETER DATA
18 MARCH 1990

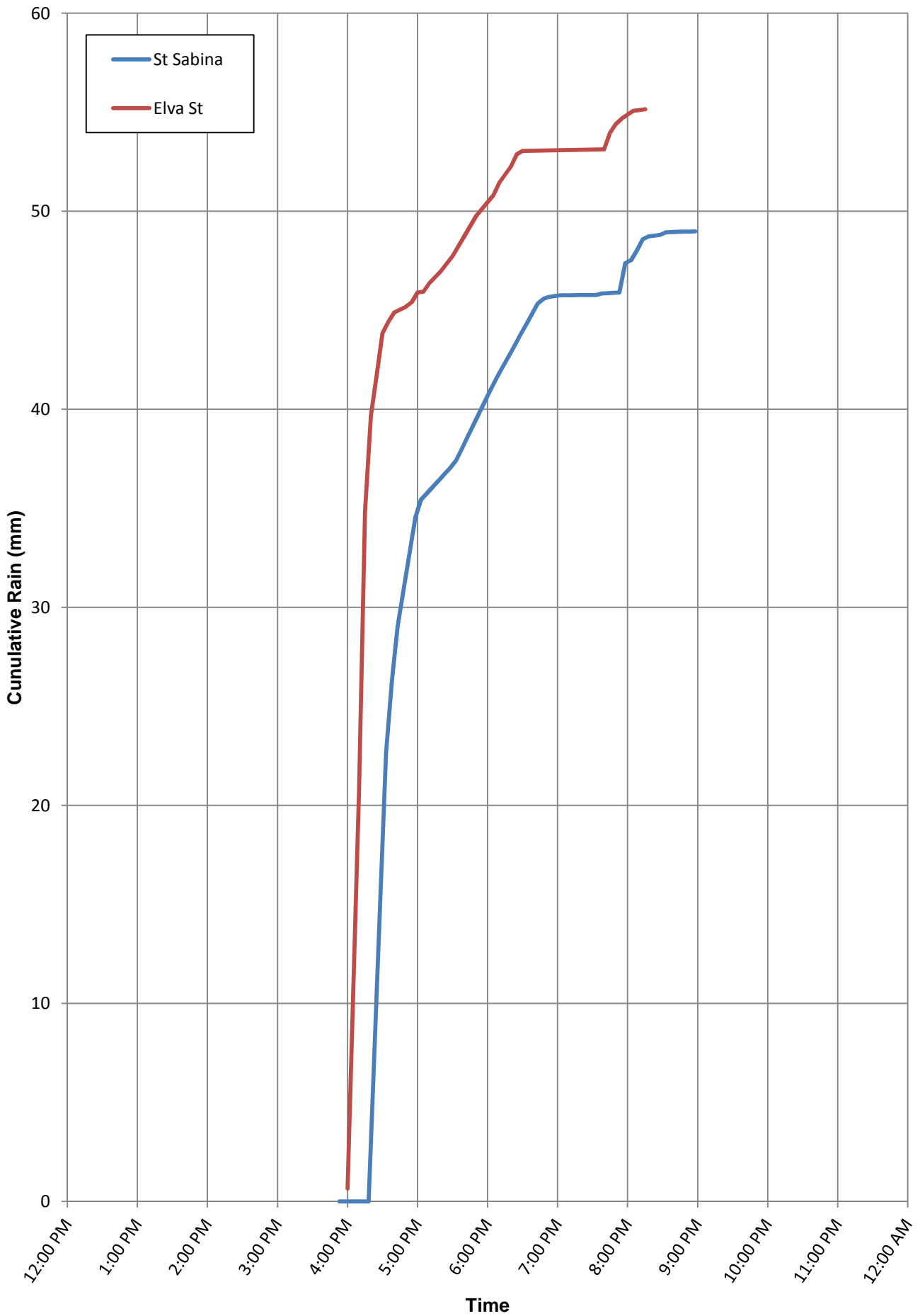


FIGURE 9g
PLUVIOMETER DATA
2 JANUARY 1996

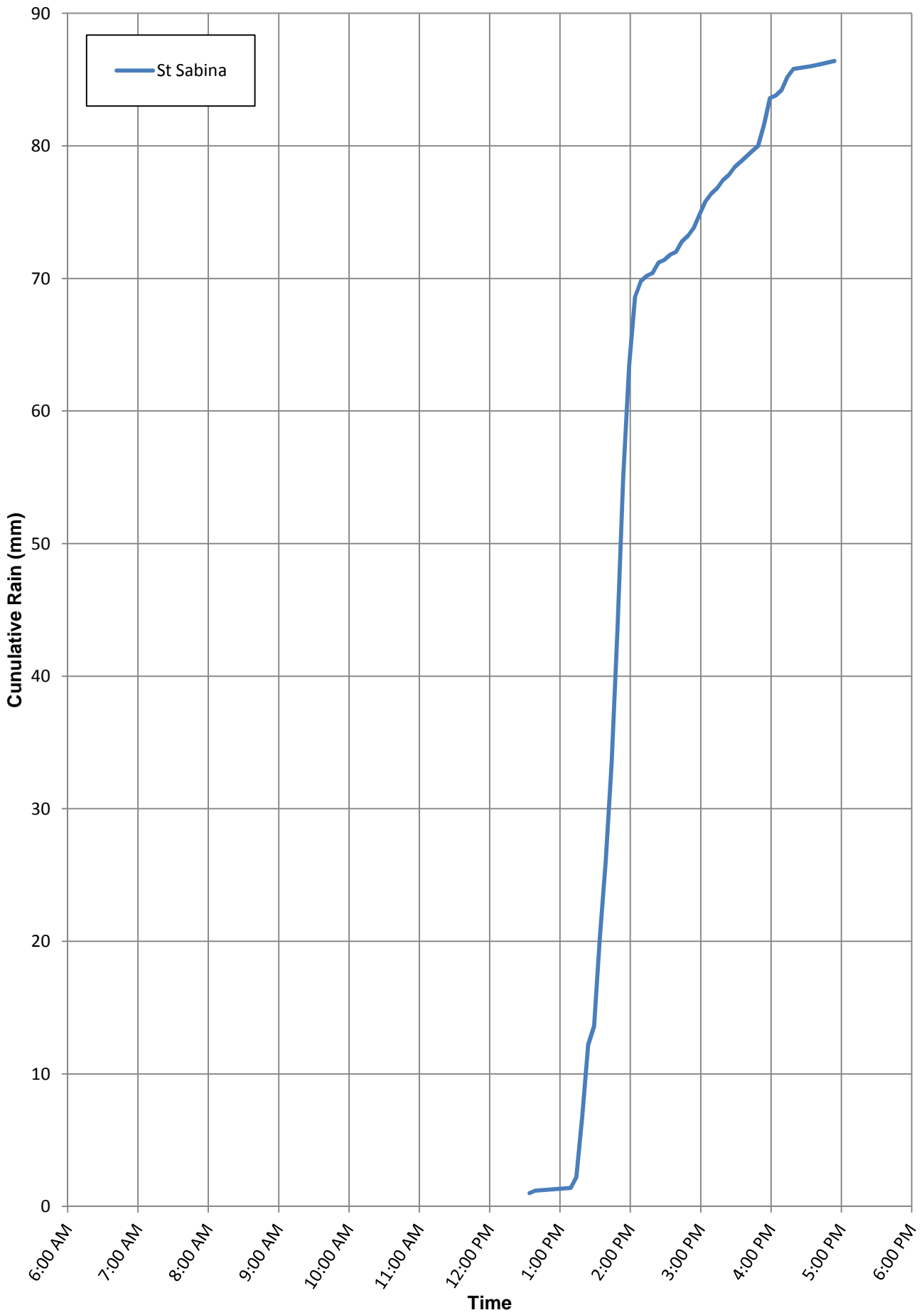


FIGURE 10
DRAINS SUBCATCHMENTS

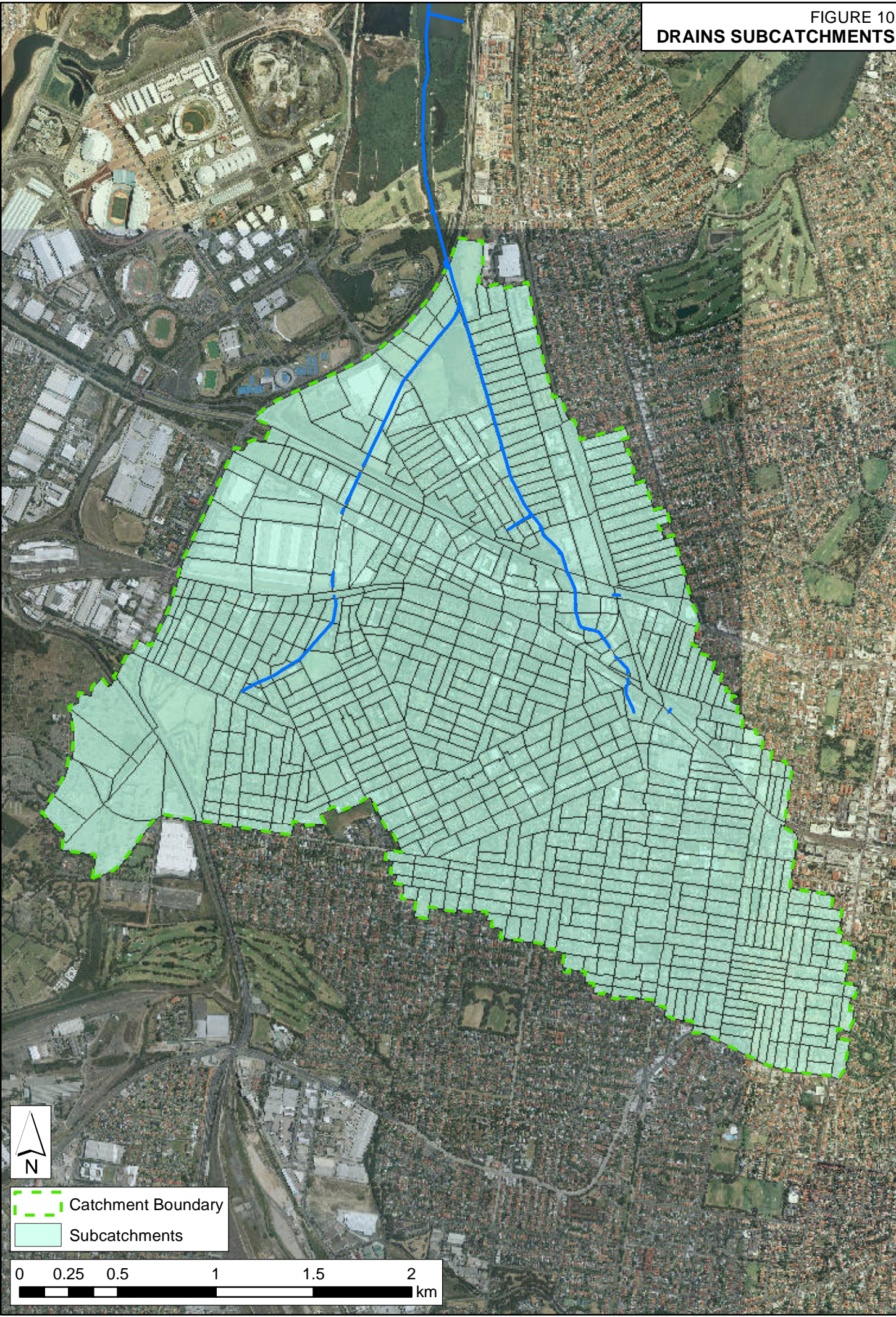


FIGURE 11
TUFLOW PITS AND PIPES

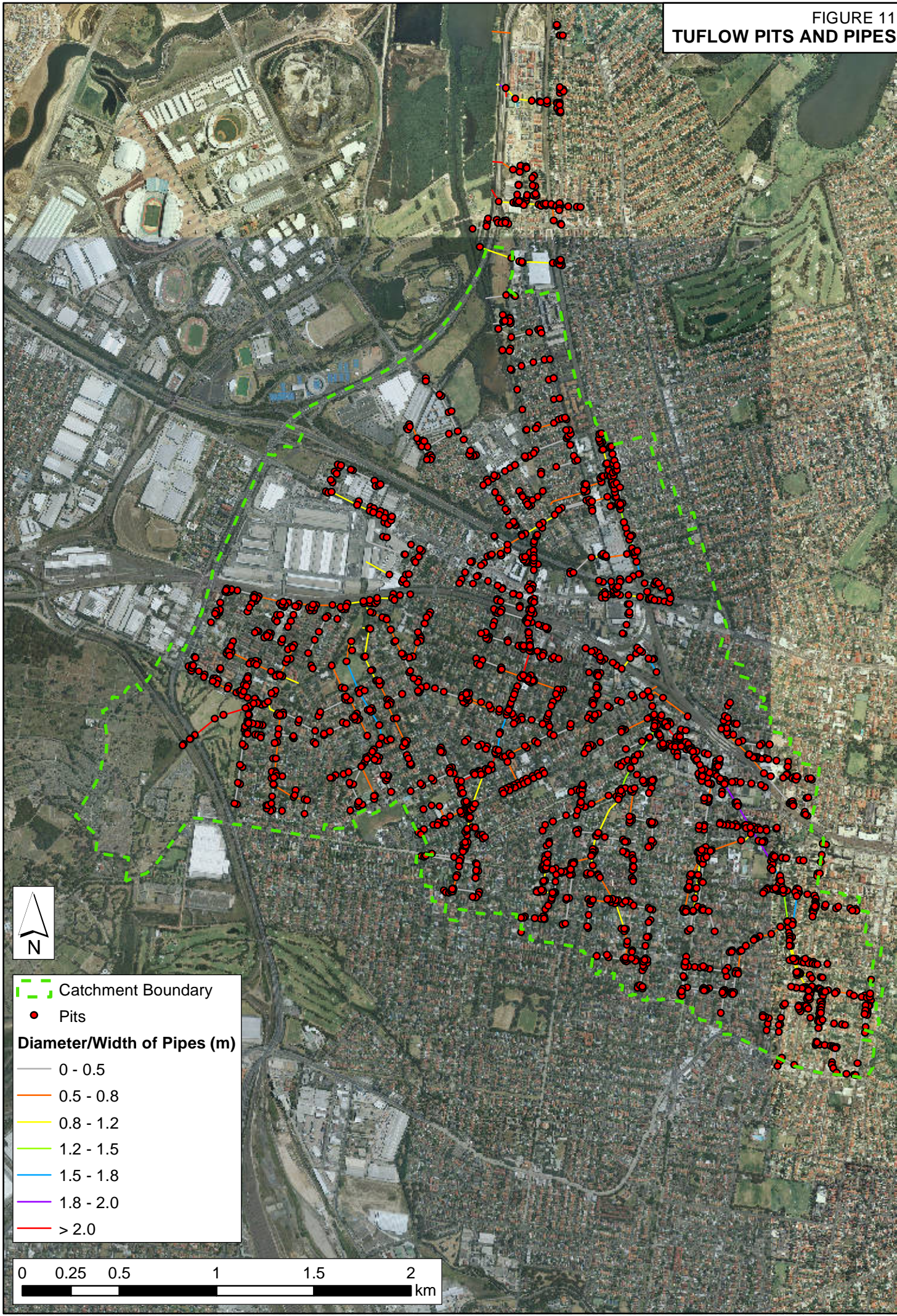


FIGURE 13a
CALIBRATION RESULTS--ELVA STREET GAUGE
3 FEBRUARY 1990

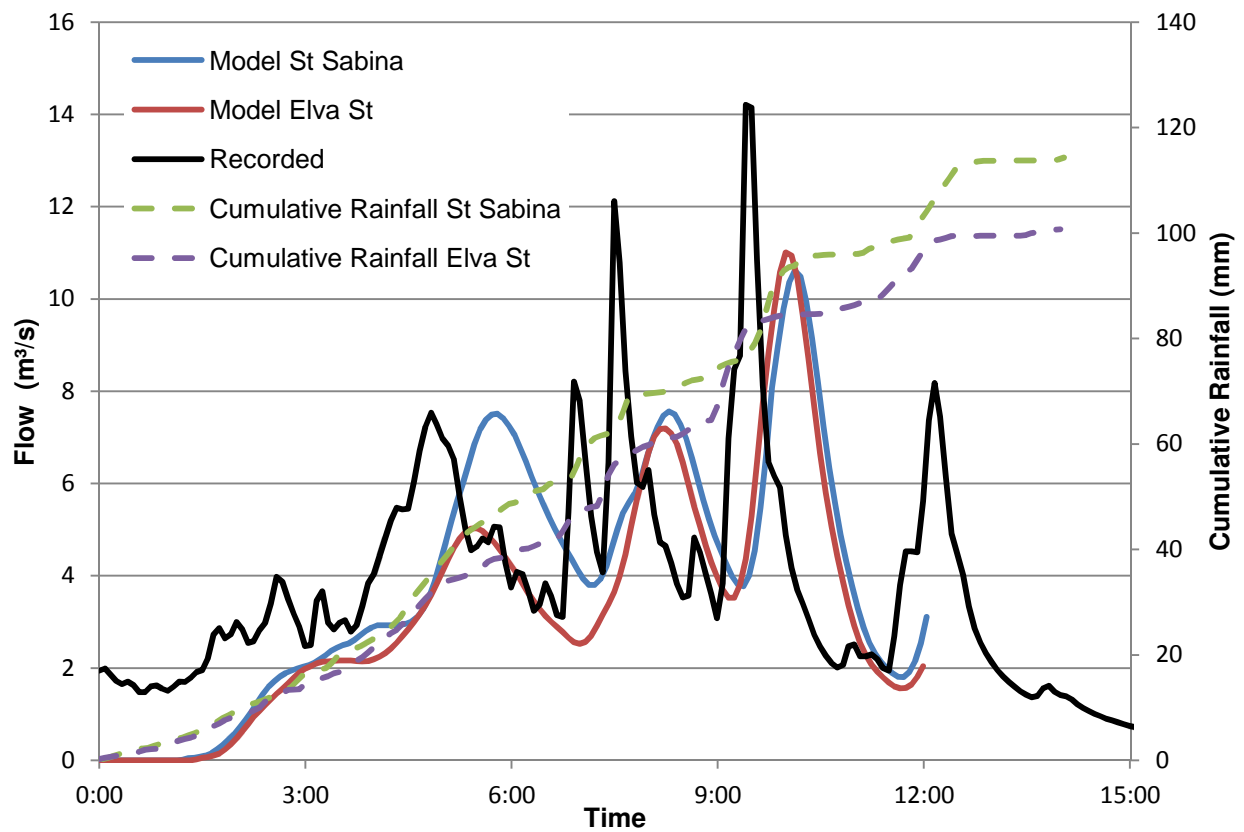
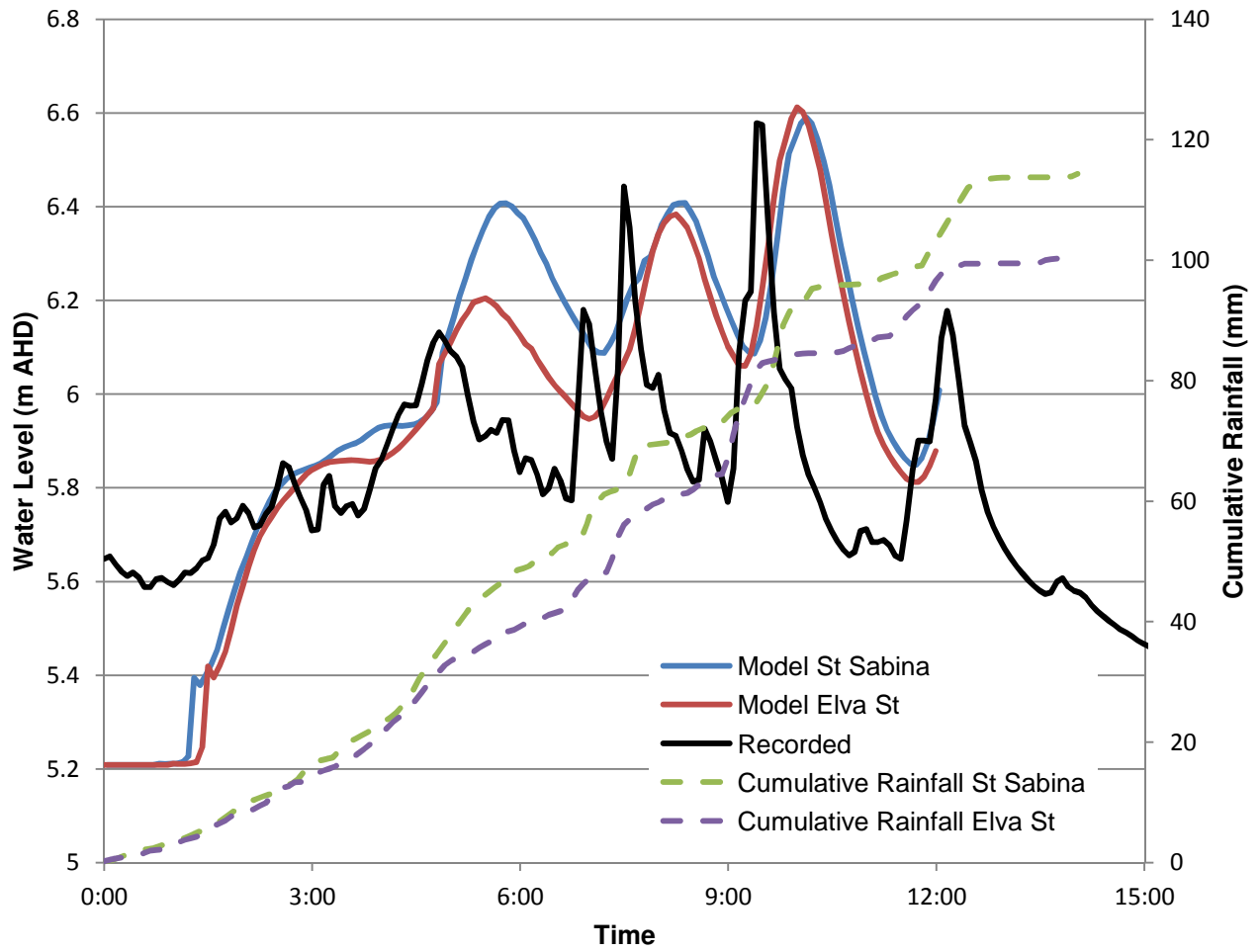


FIGURE 13b
CALIBRATION RESULTS--ELVA STREET GAUGE
7 FEBRUARY 1990

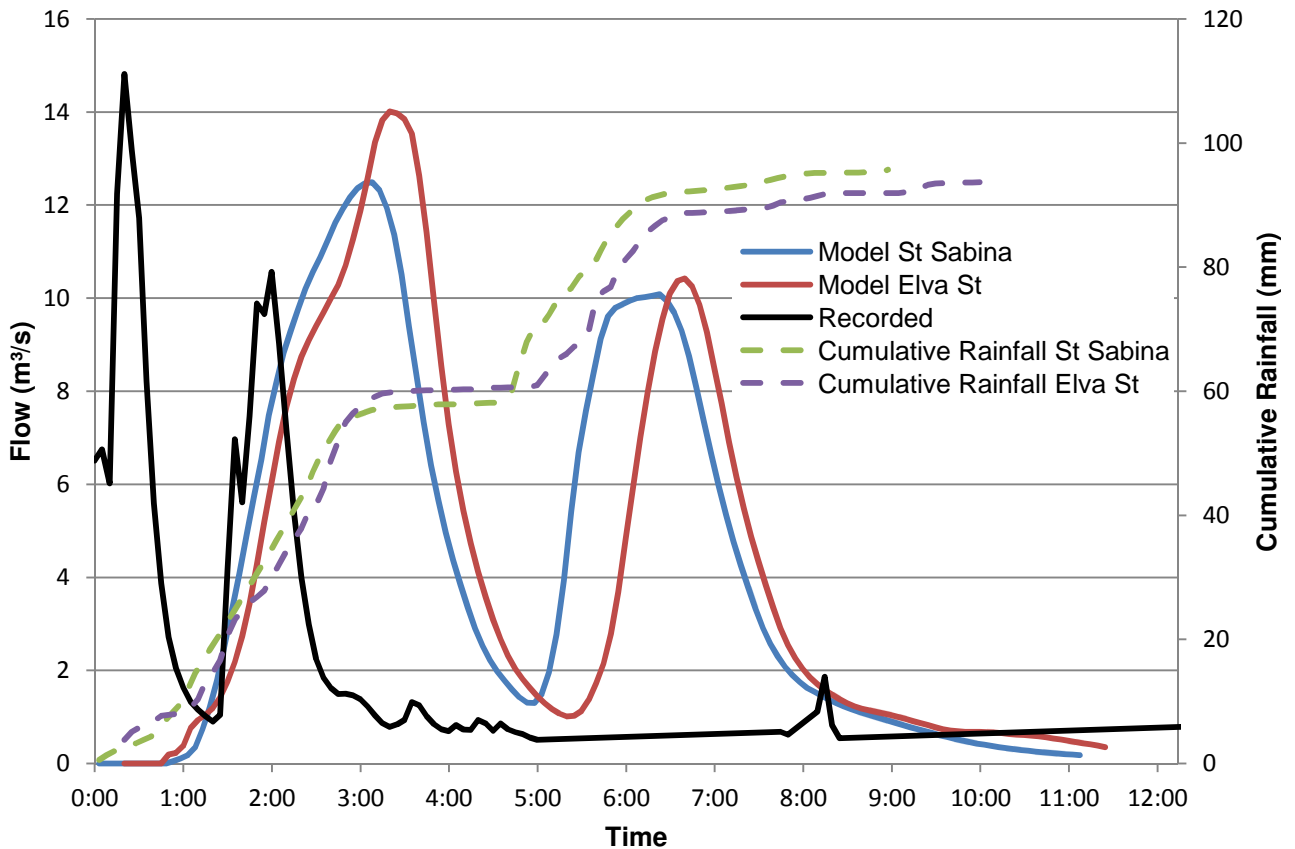
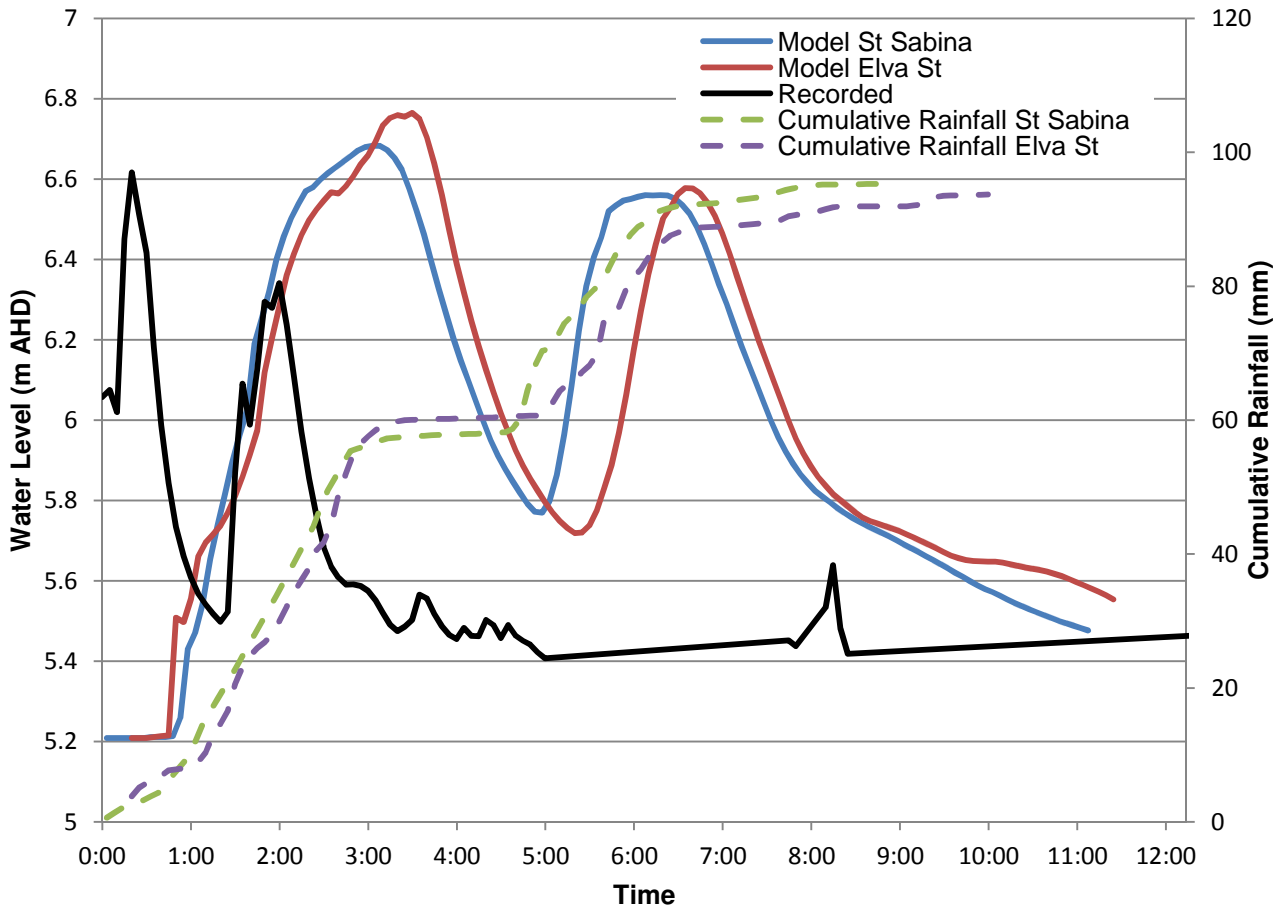


FIGURE 13c
CALIBRATION RESULTS--ELVA STREET GAUGE
10 FEBRUARY 1990

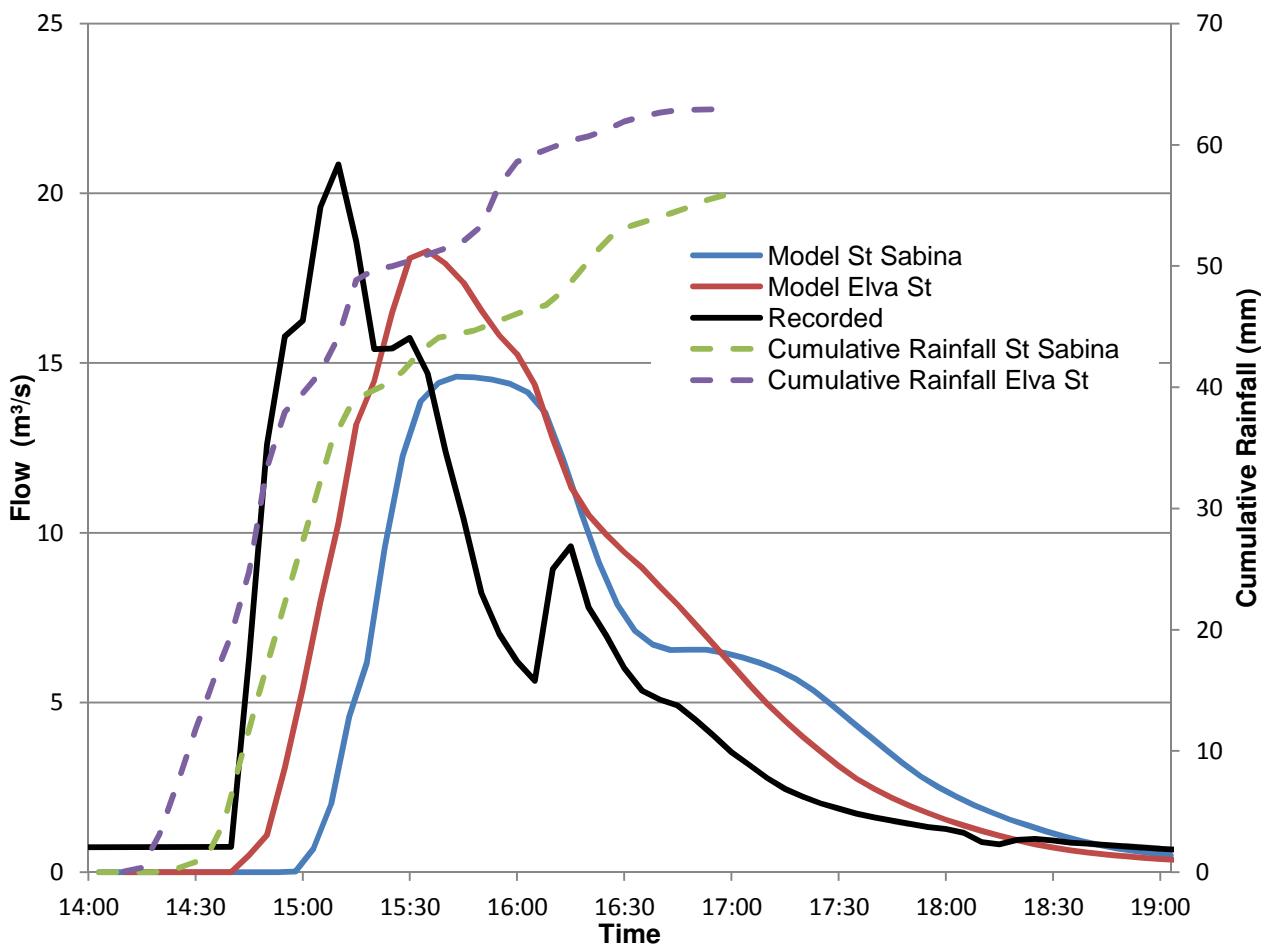
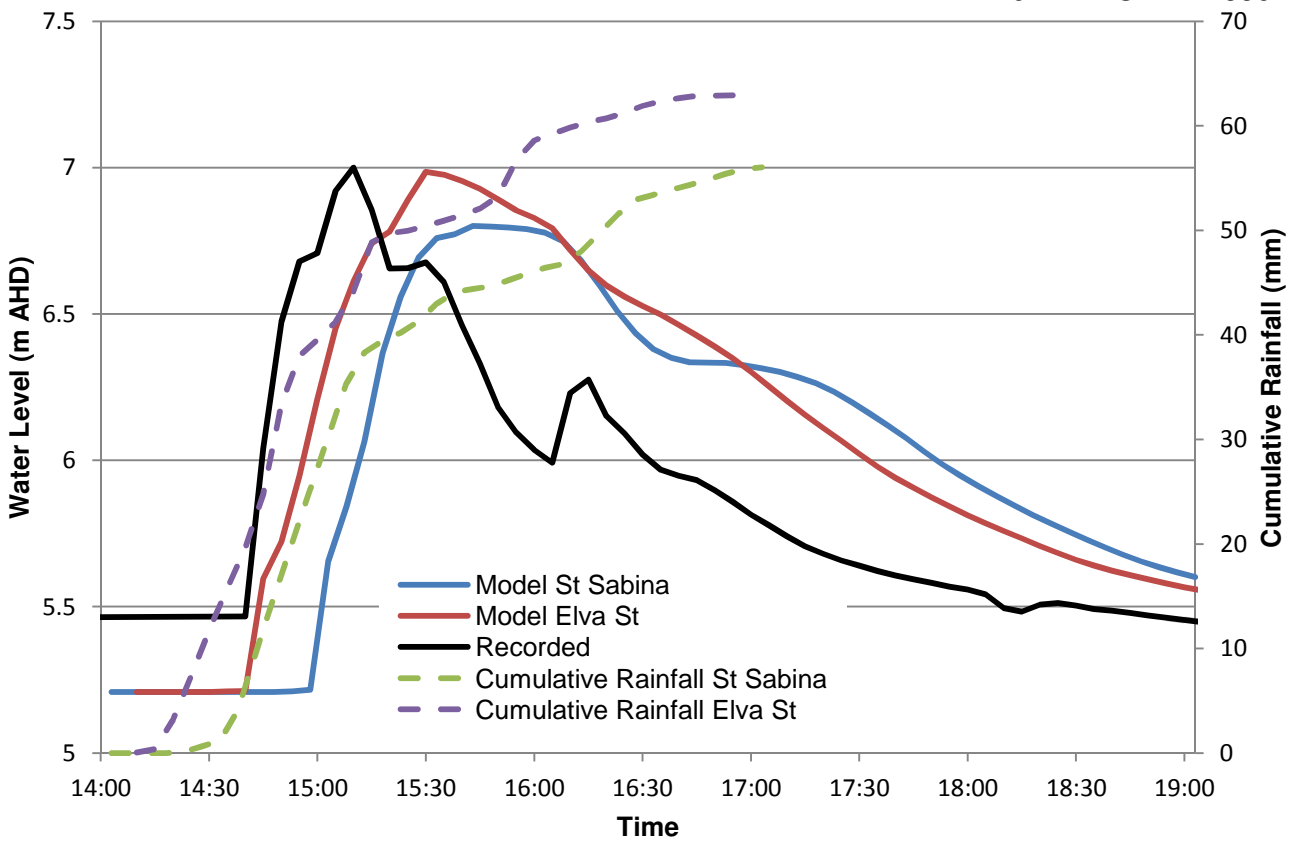


FIGURE 13d
CALIBRATION RESULTS--ELVA STREET GAUGE
17 FEBRUARY 1990

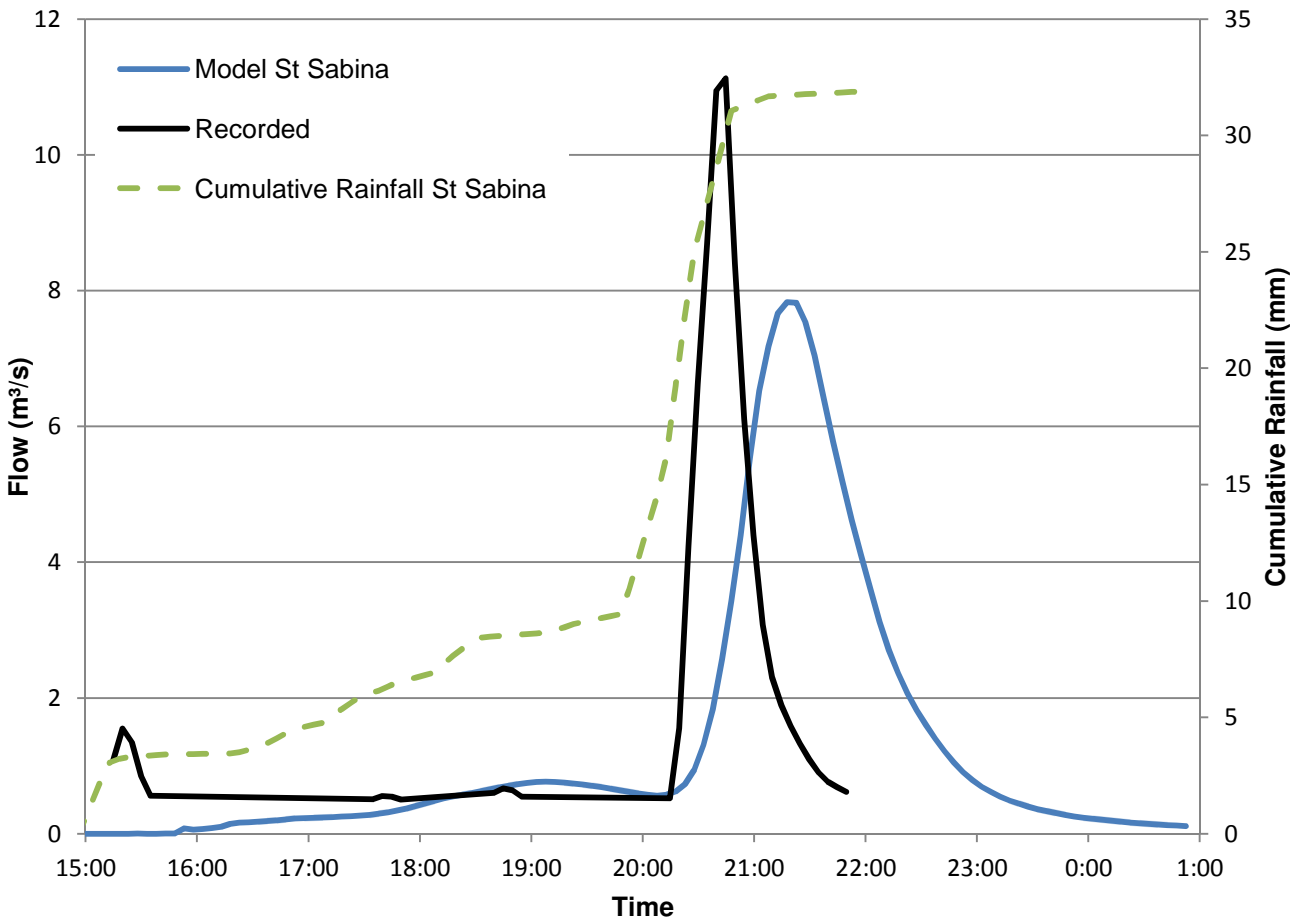
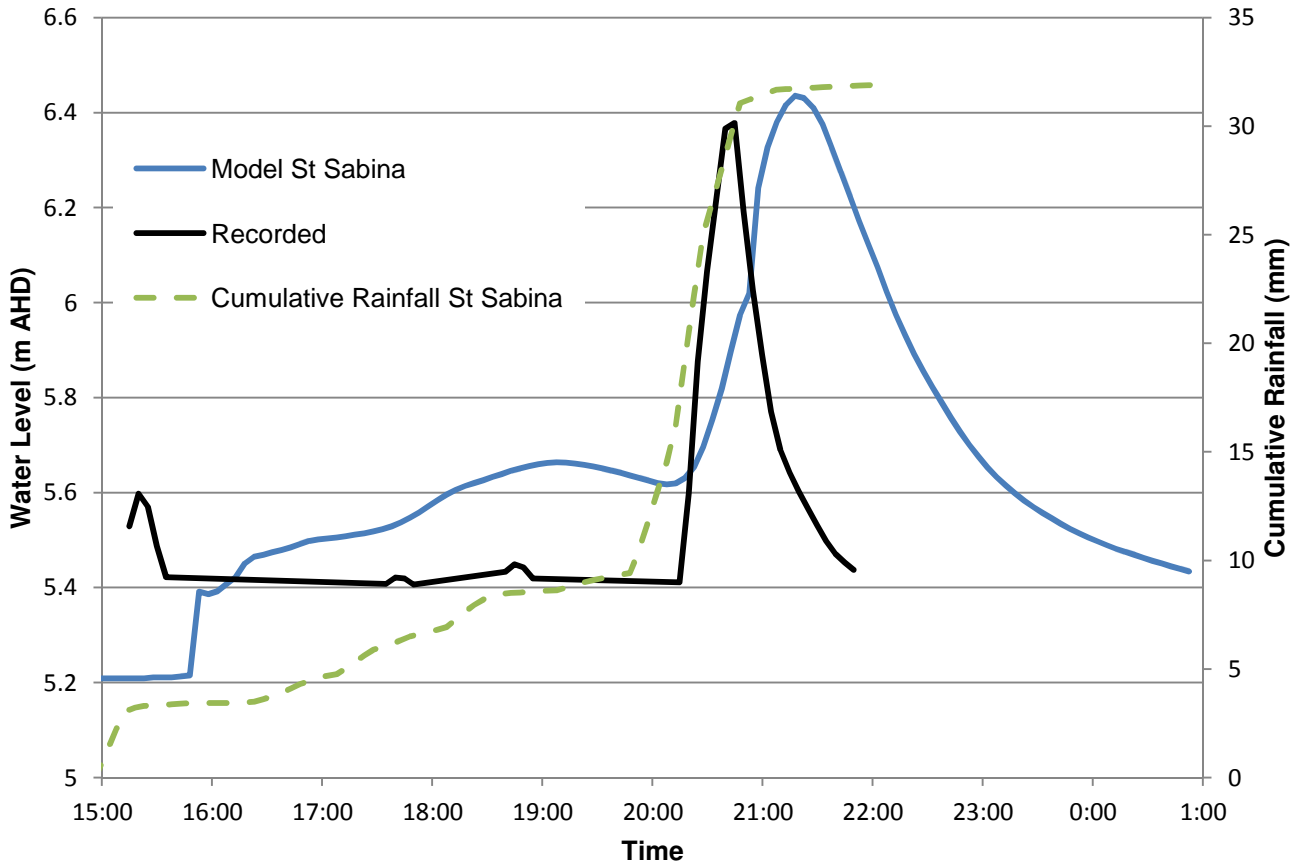


FIGURE 13e
CALIBRATION RESULTS--ELVA STREET GAUGE
18 MARCH 1990

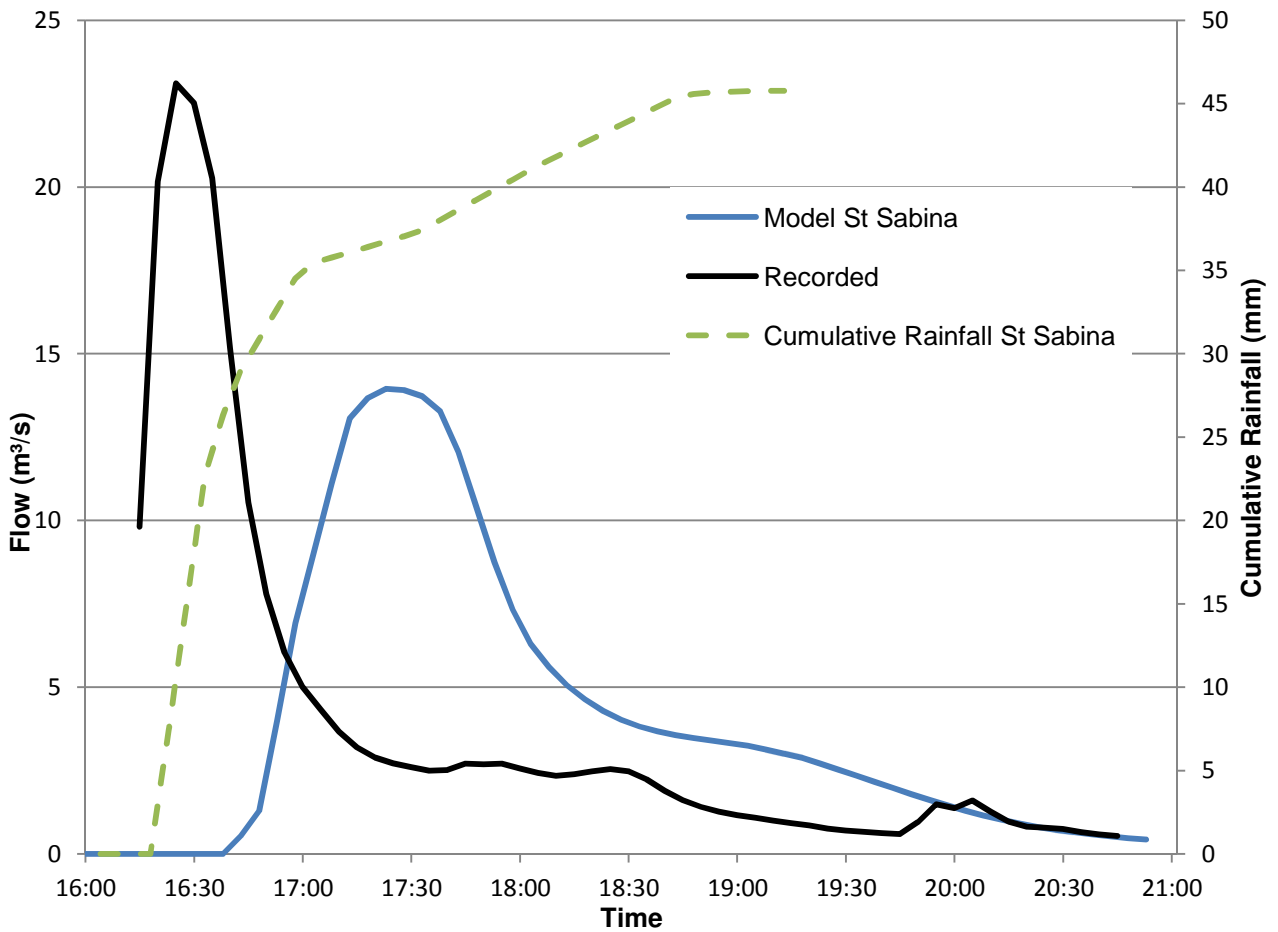
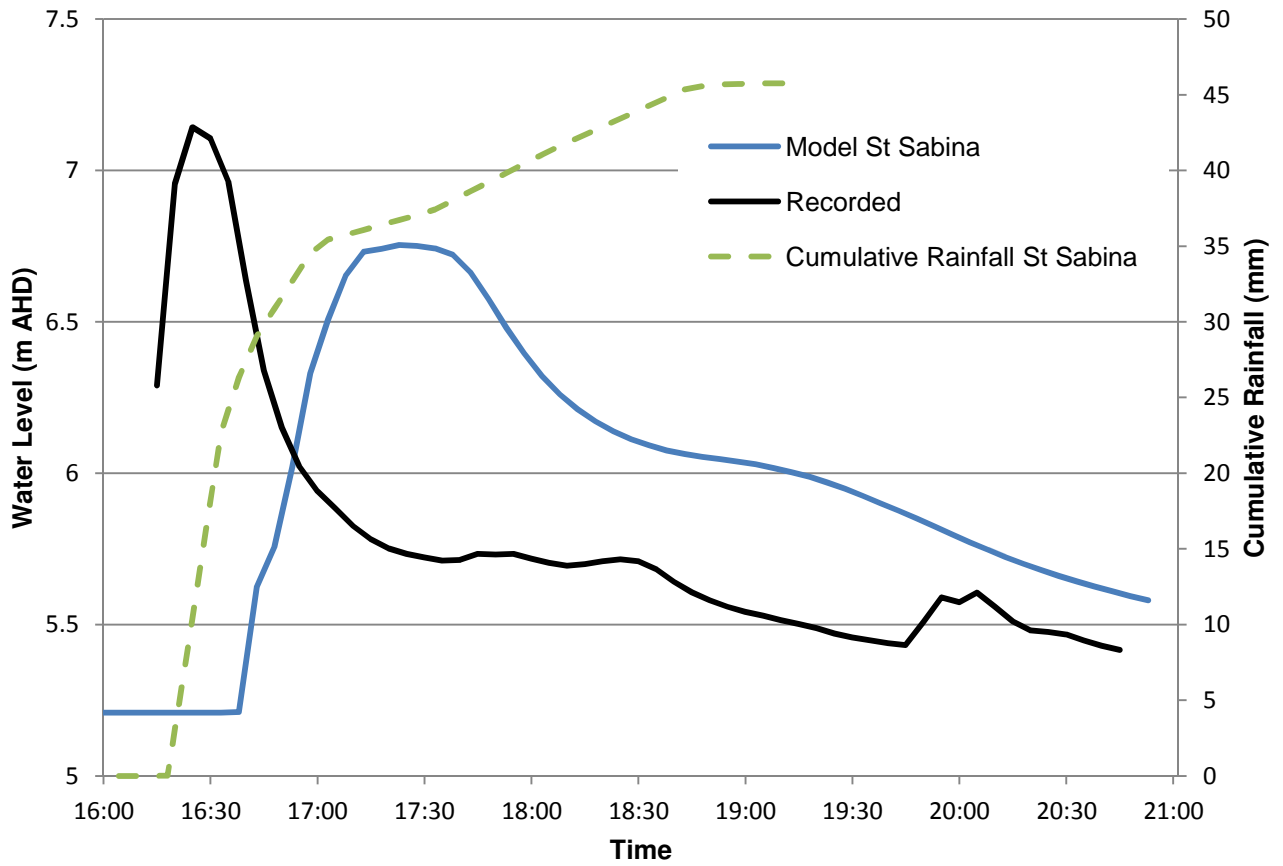
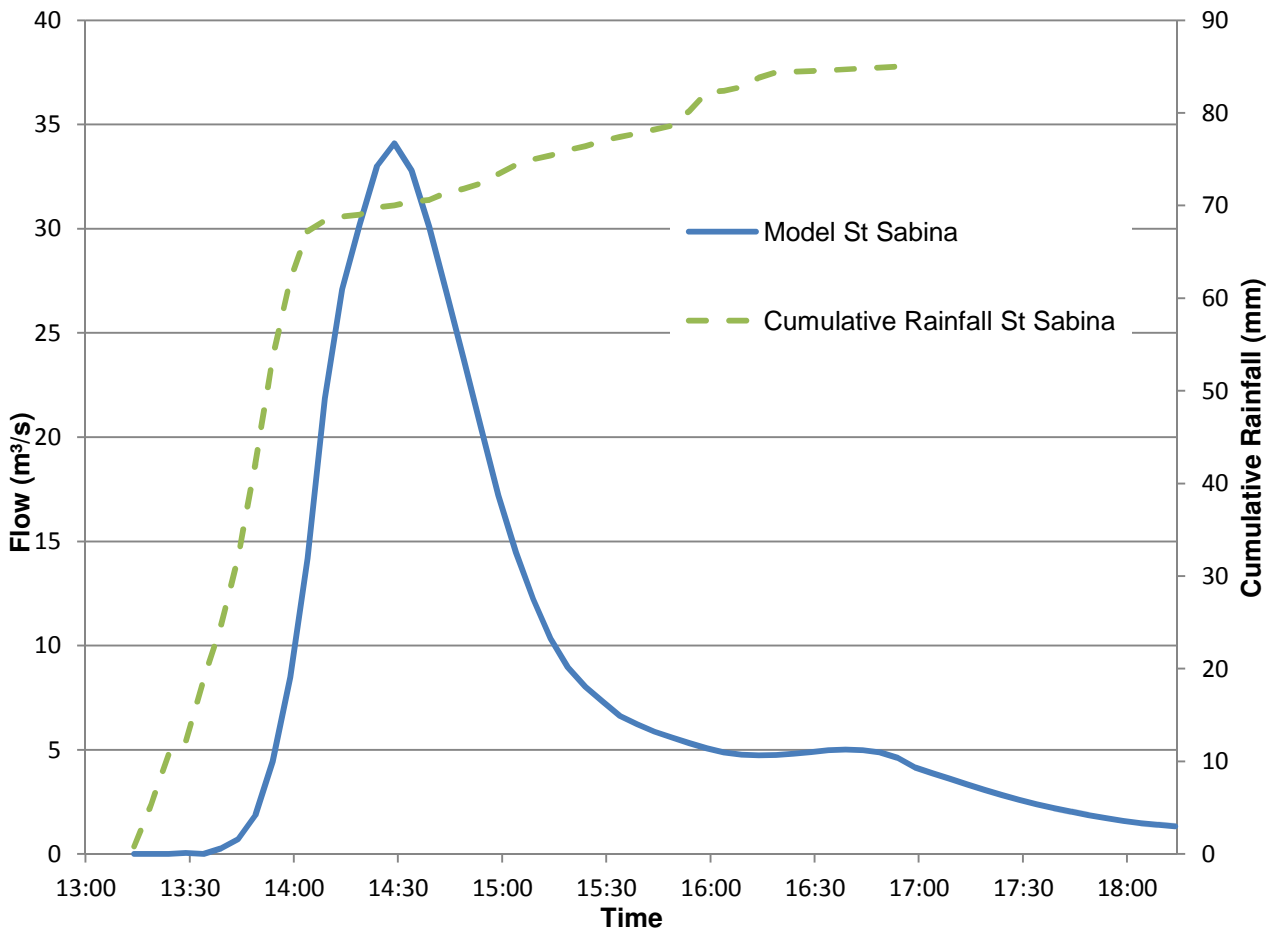
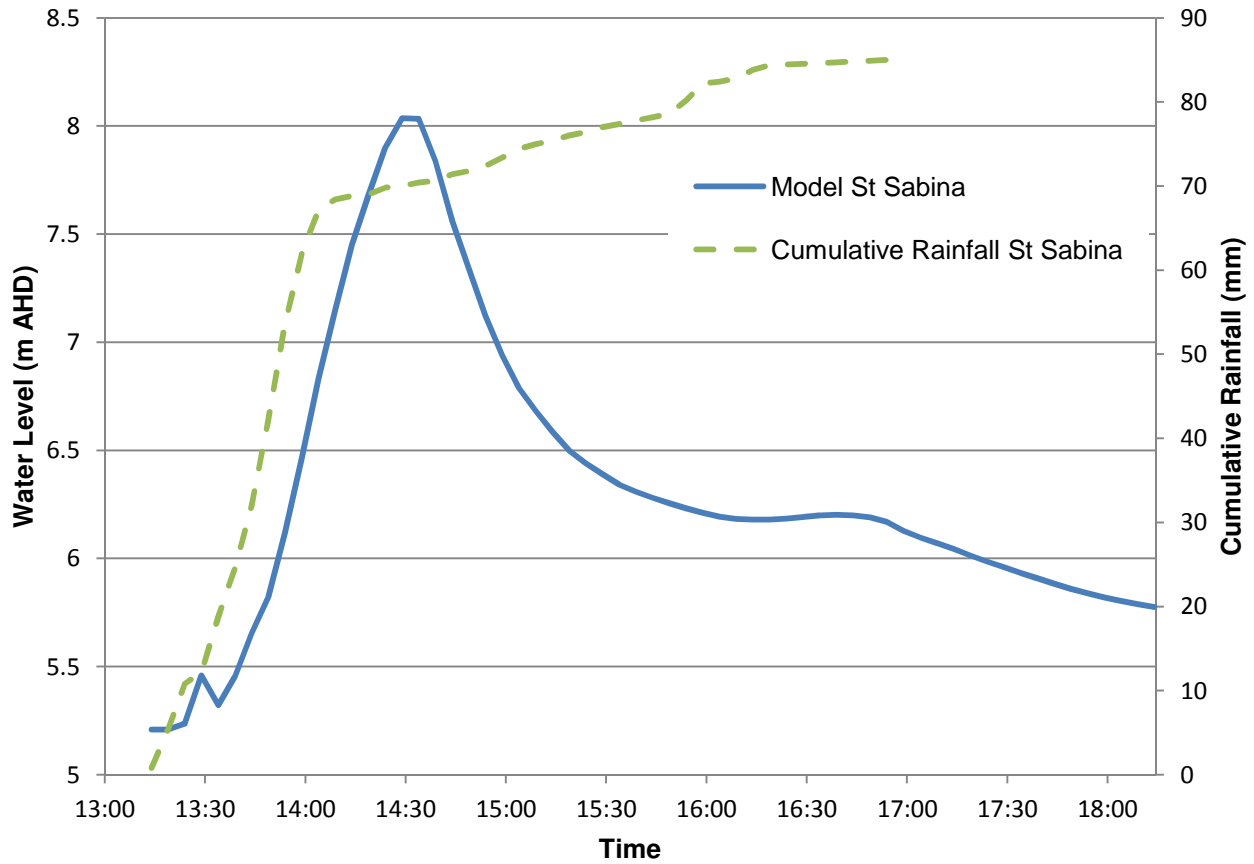
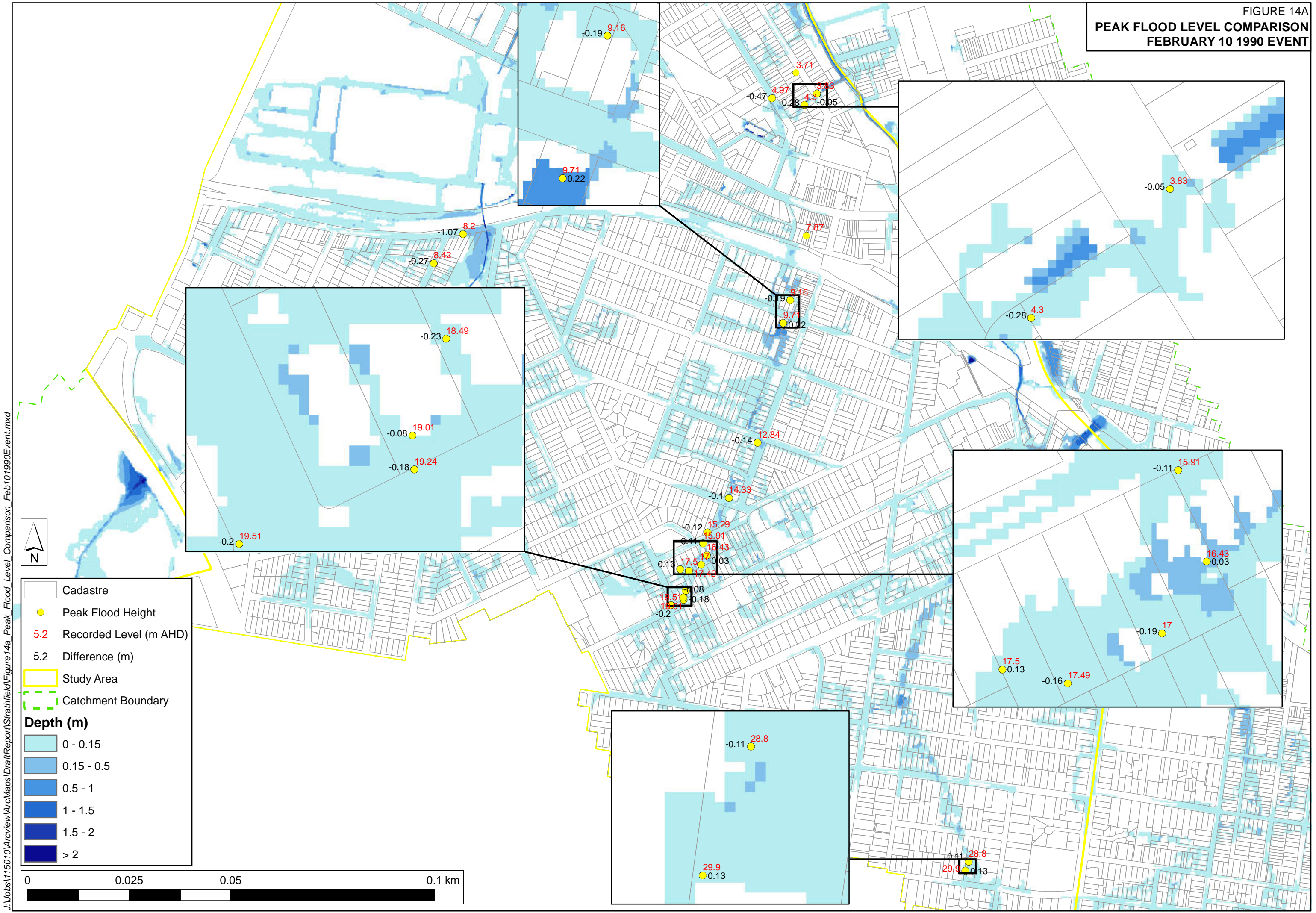


FIGURE 13f
CALIBRATION RESULTS--ELVA STREET GAUGE
2 JANUARY 1996

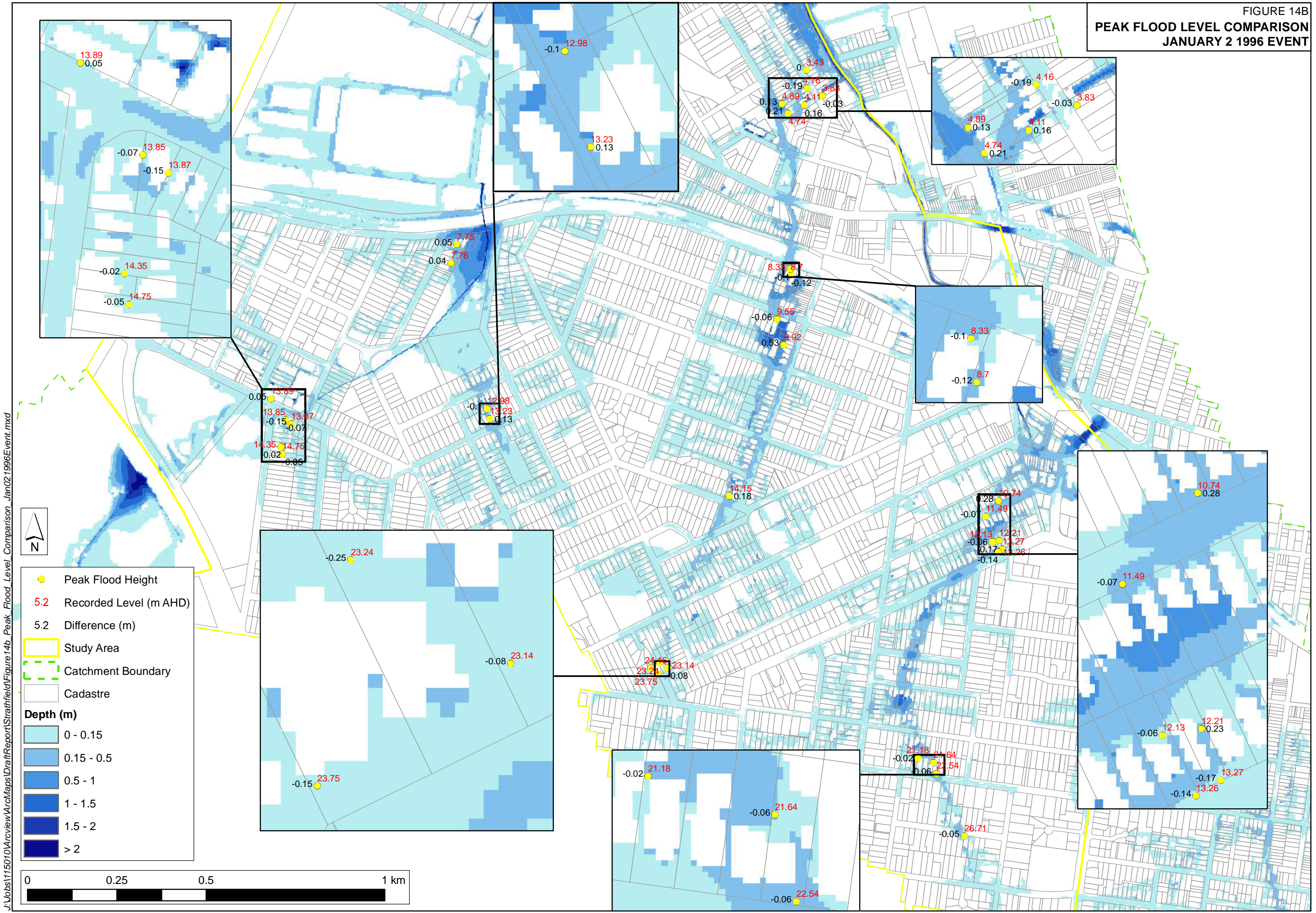


PEAK FLOOD LEVEL COMPARISON
FEBRUARY 10 1990 EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure14a_Peak_Flood_Level_Comparison_Feb101990Event.mxd

PEAK FLOOD LEVEL COMPARISON
JANUARY 2 1996 EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure14b_Peak_Flood_Level_Comparison_Jan02_1996Event.mxd

FIGURE 15A
DESIGN RESULTS
PEAK HEIGHT PROFILES - POWELLS CREEK

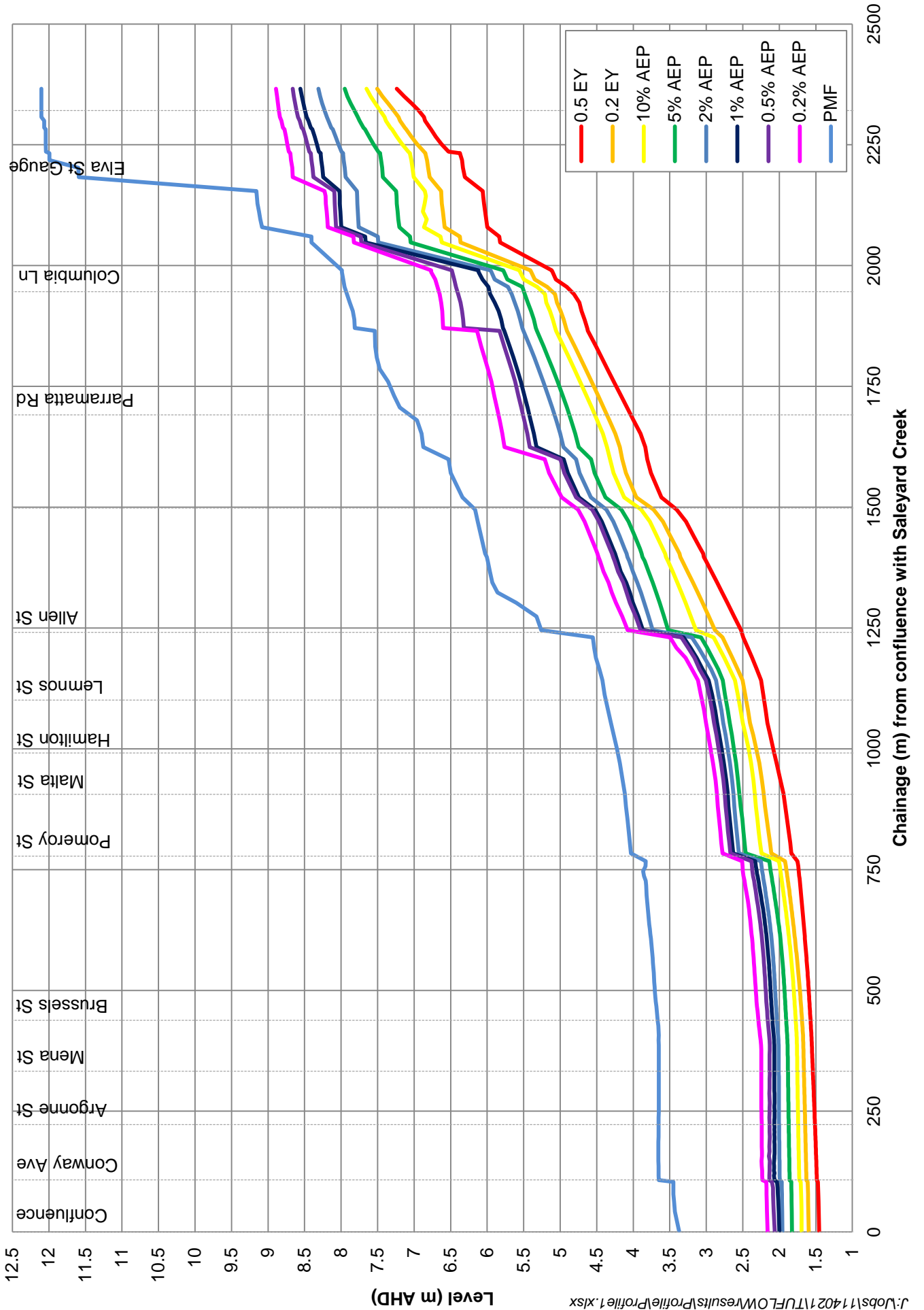


FIGURE 15B
DESIGN RESULTS
PEAK HEIGHT PROFILES - SALEYARDS CREEK
CREEK

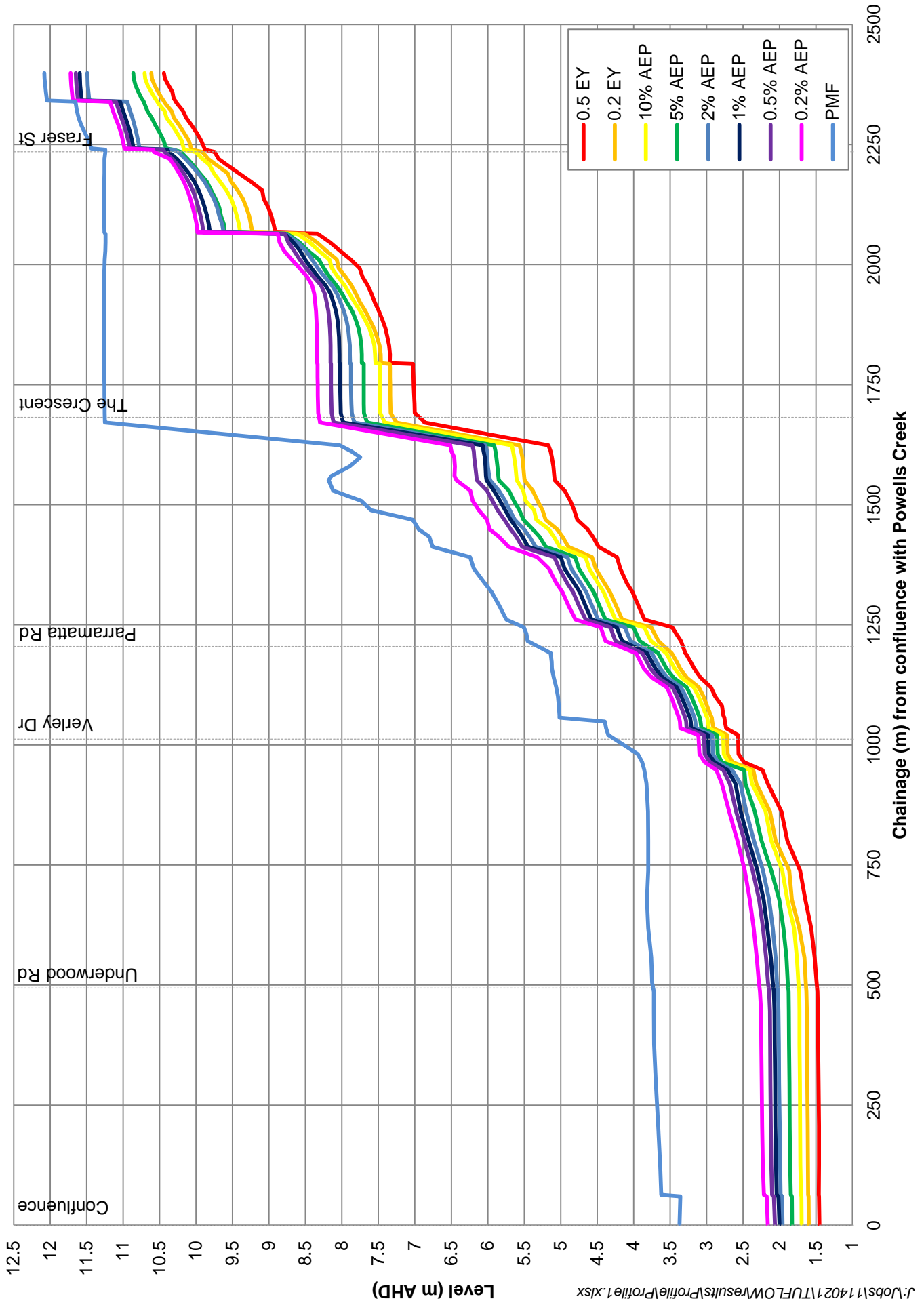


FIGURE 15C
DESIGN RESULTS
PEAK HEIGHT PROFILES - EDGAR ST SUB BRANCH



FIGURE 15D
DESIGN RESULTS
PEAK HEIGHT PROFILES - STRATHFIELD CREEK BRANCH

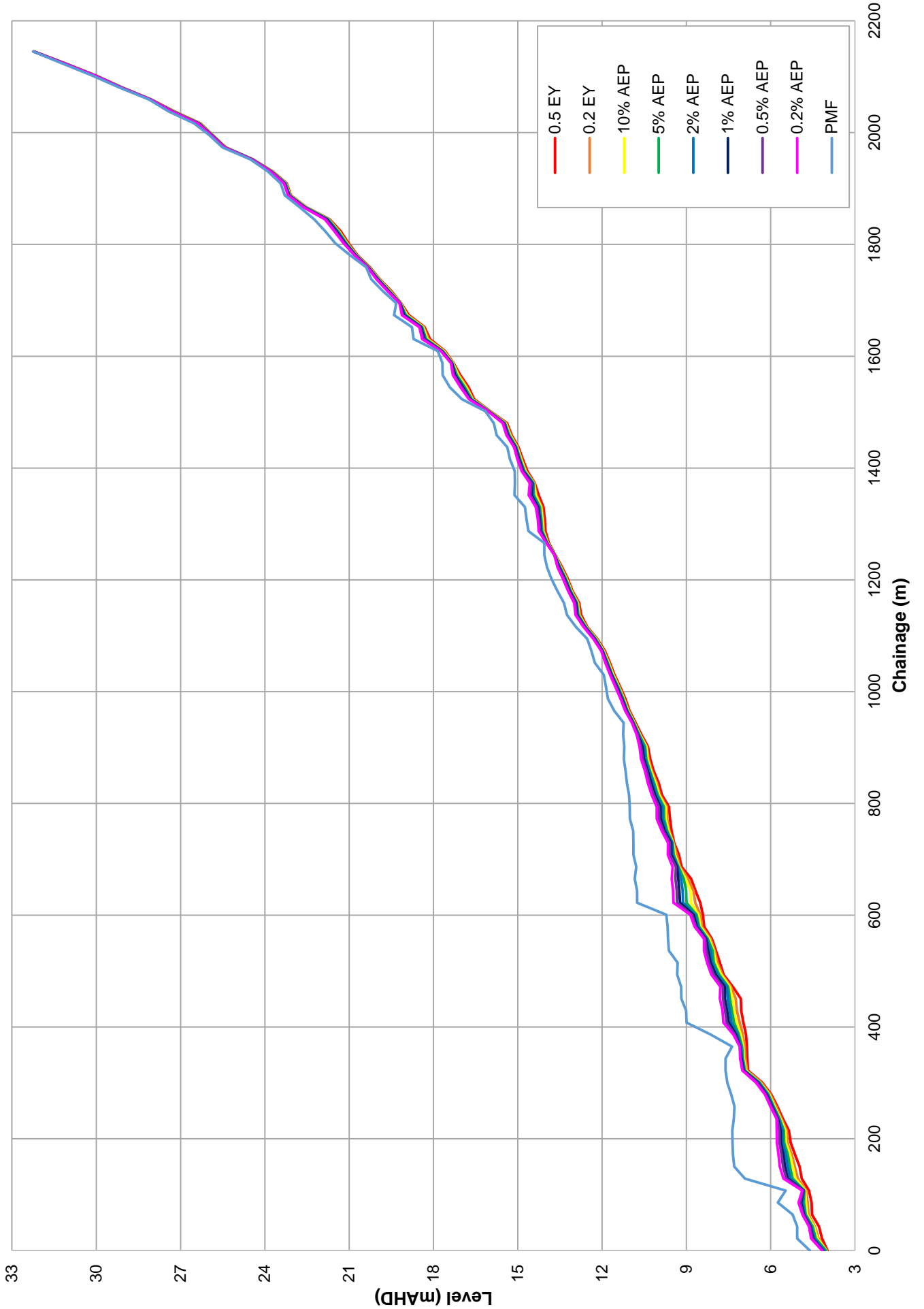


FIGURE 15E
DESIGN RESULTS
PEAK HEIGHT PROFILES - FLORENCE BRANCH



FIGURE 15F
DESIGN RESULTS
PEAK HEIGHT PROFILES - ALBYN BRANCH

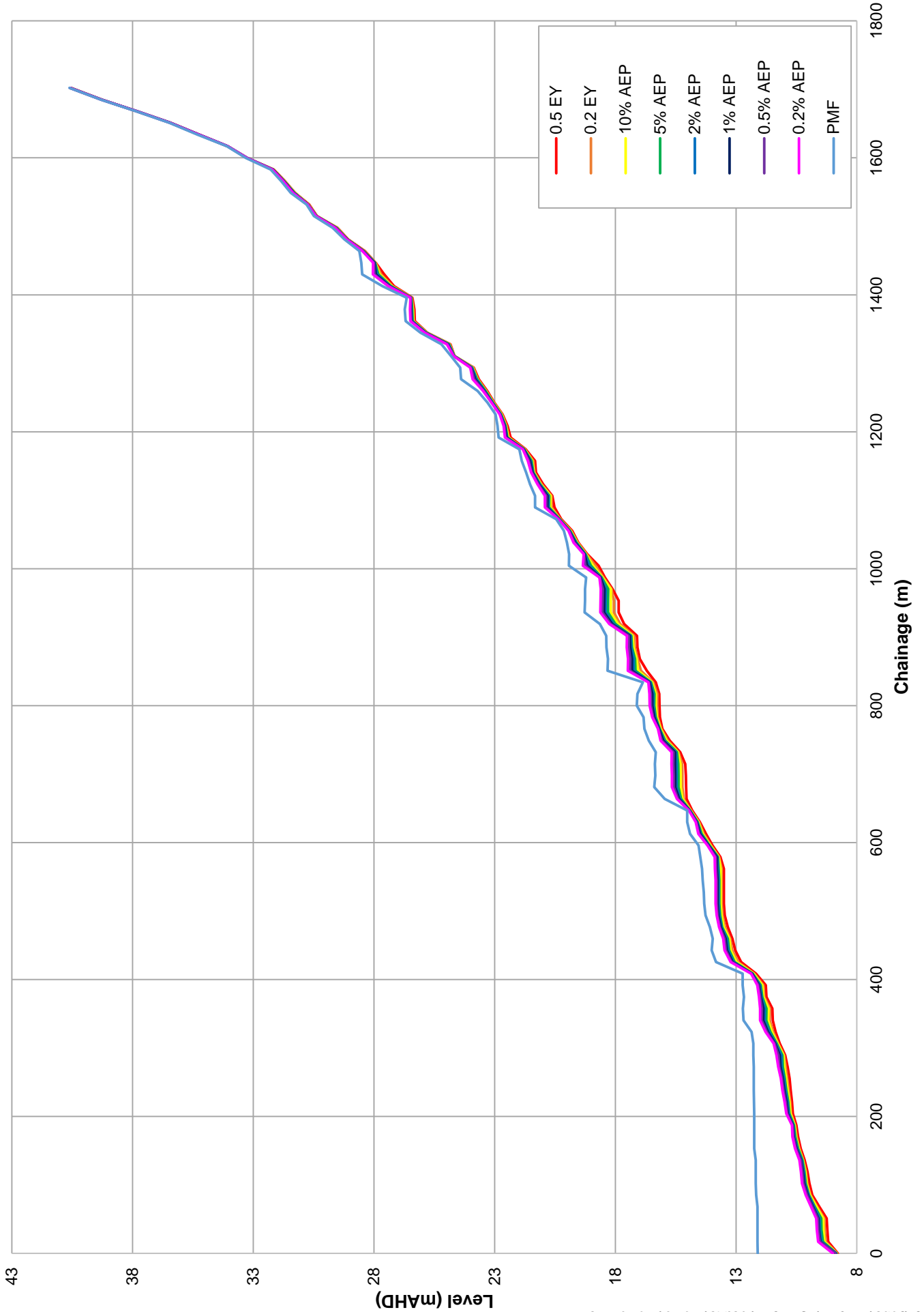


FIGURE 15G
DESIGN RESULTS
PEAK HEIGHT PROFILES - BURWOOD SUB BRANCH 2

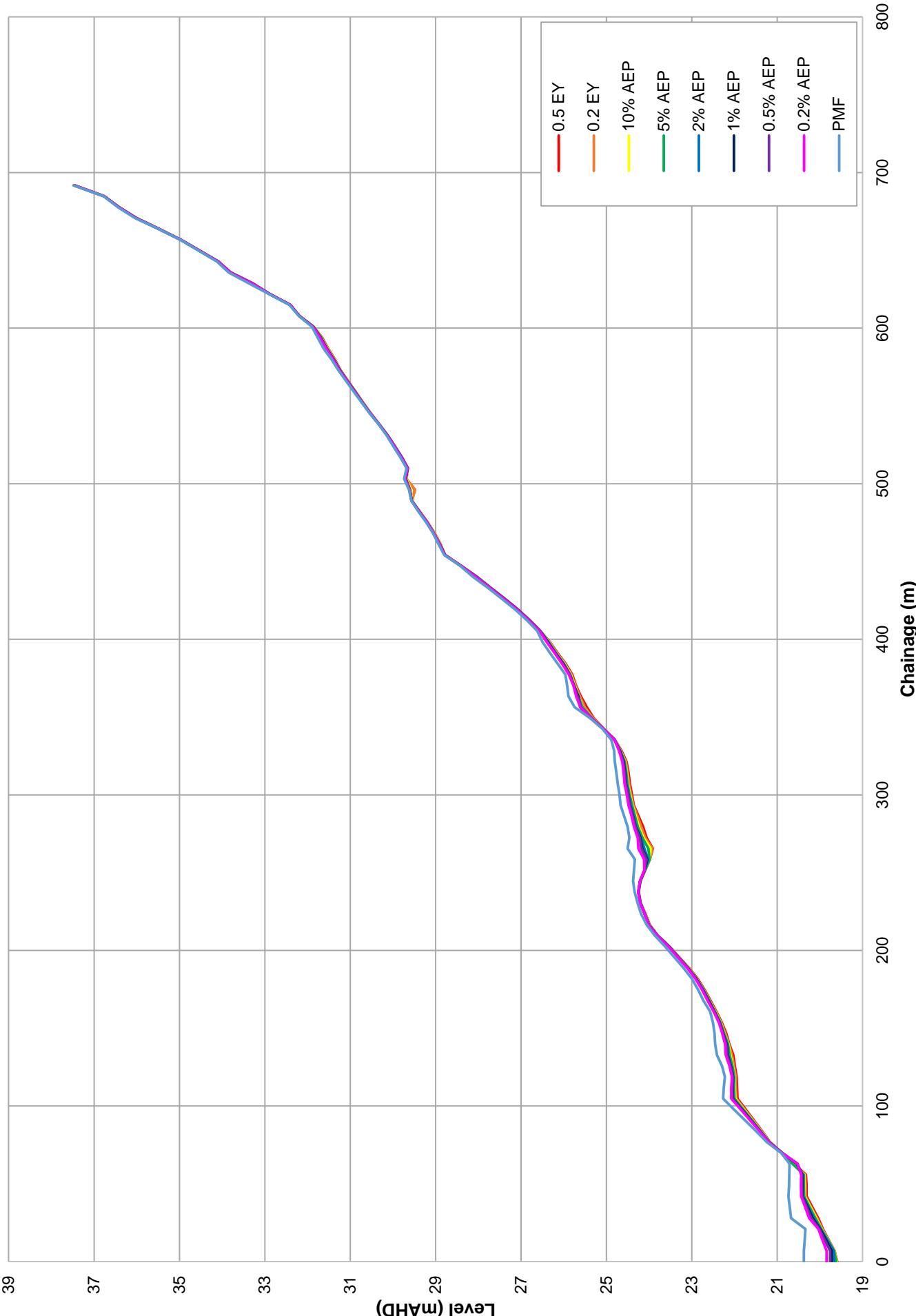


FIGURE 15H
DESIGN RESULTS
PEAK HEIGHT PROFILES - BURWOOD SUB BRANCH 1

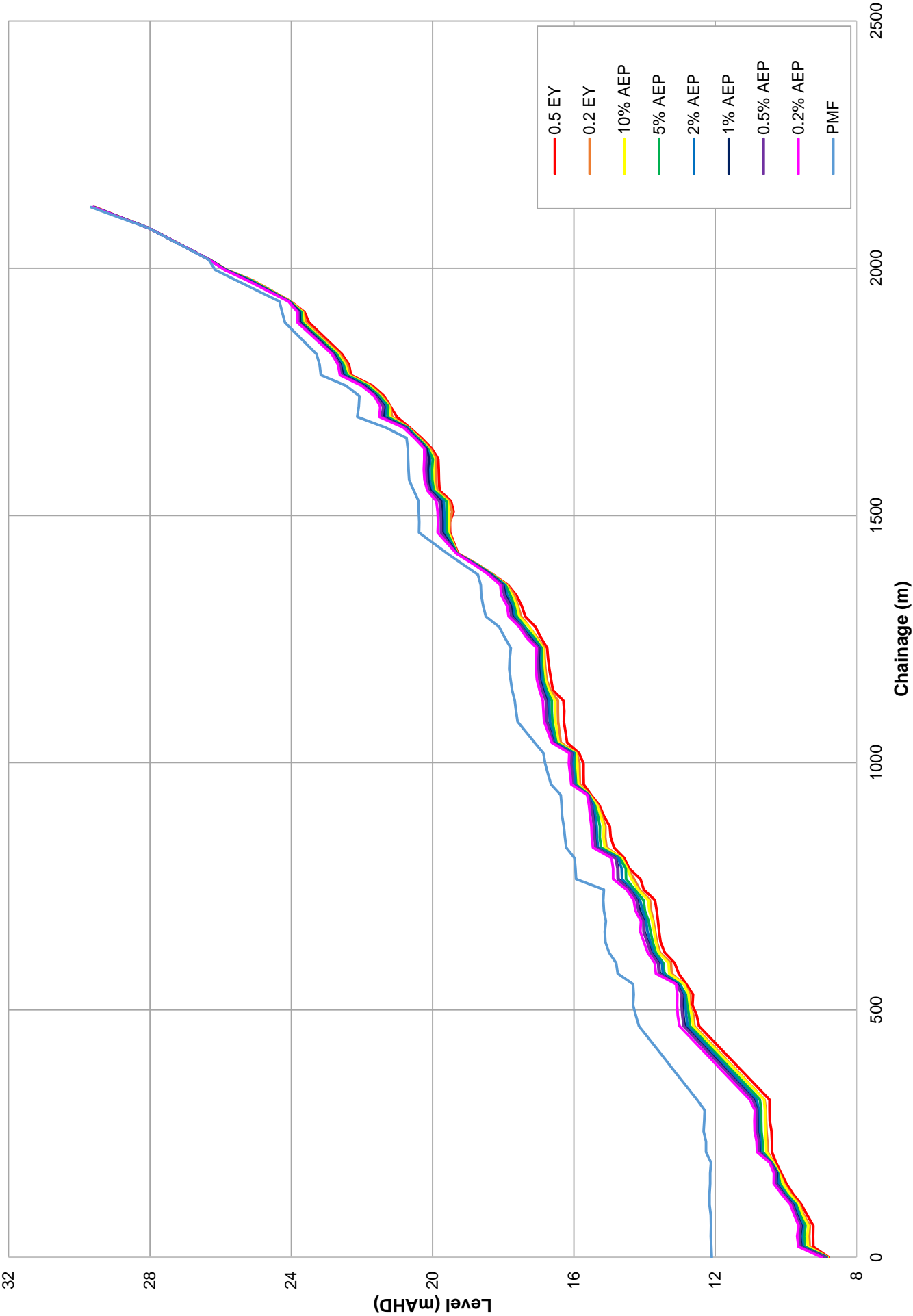
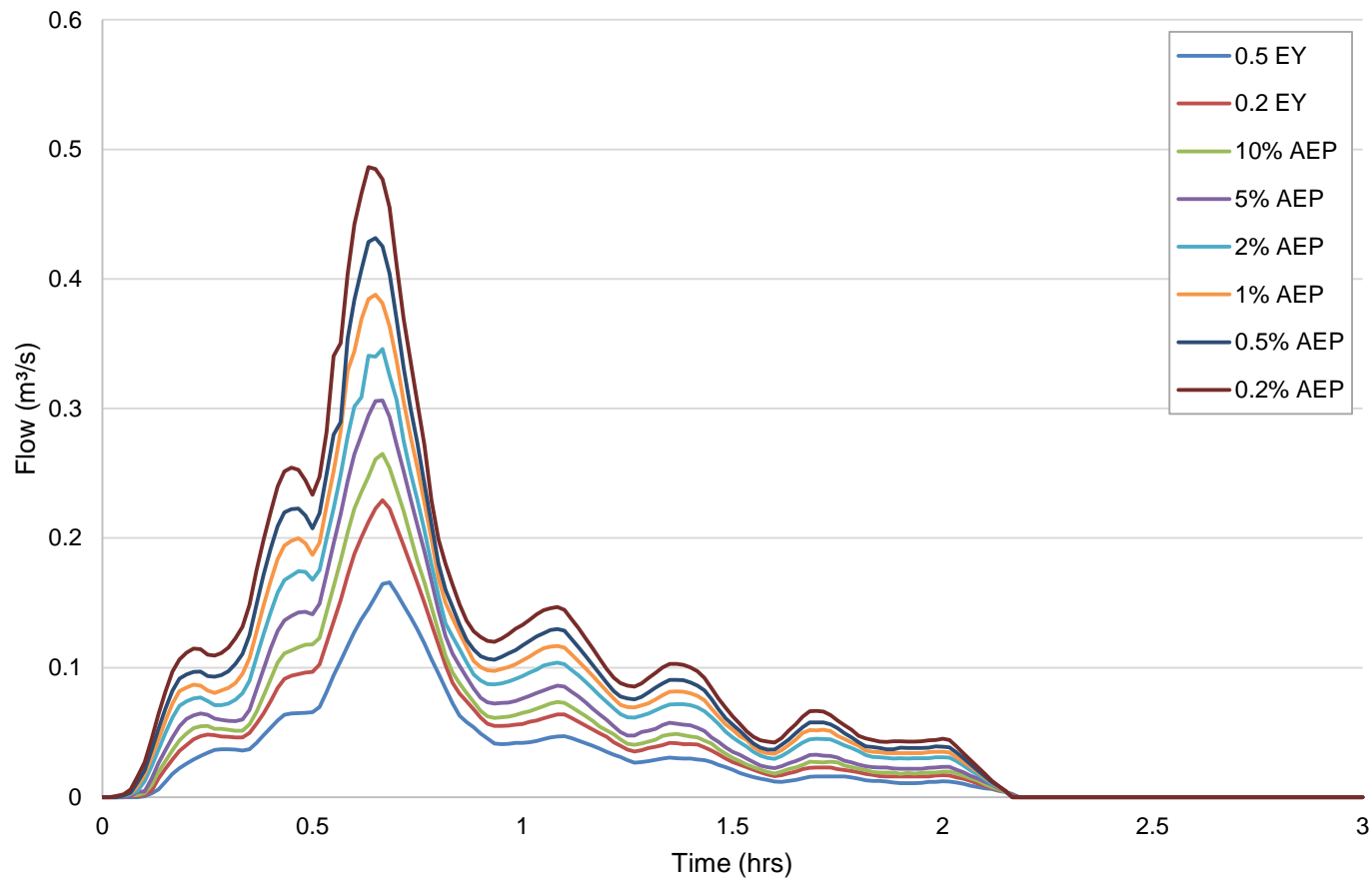


FIGURE 16A
FLOW AND LEVEL HYDROGRAPHS

Torrington Road



Brunswick Avenue

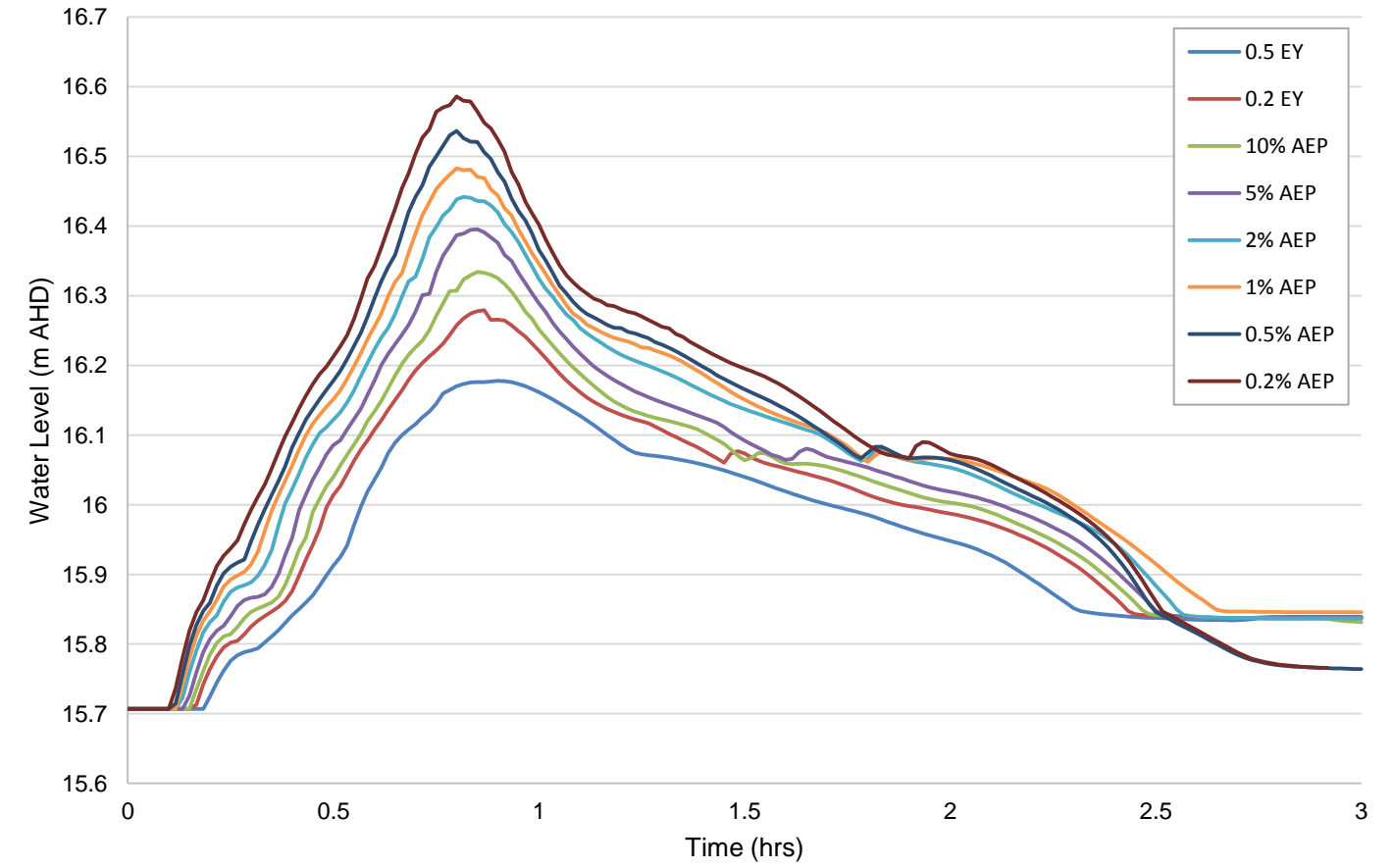
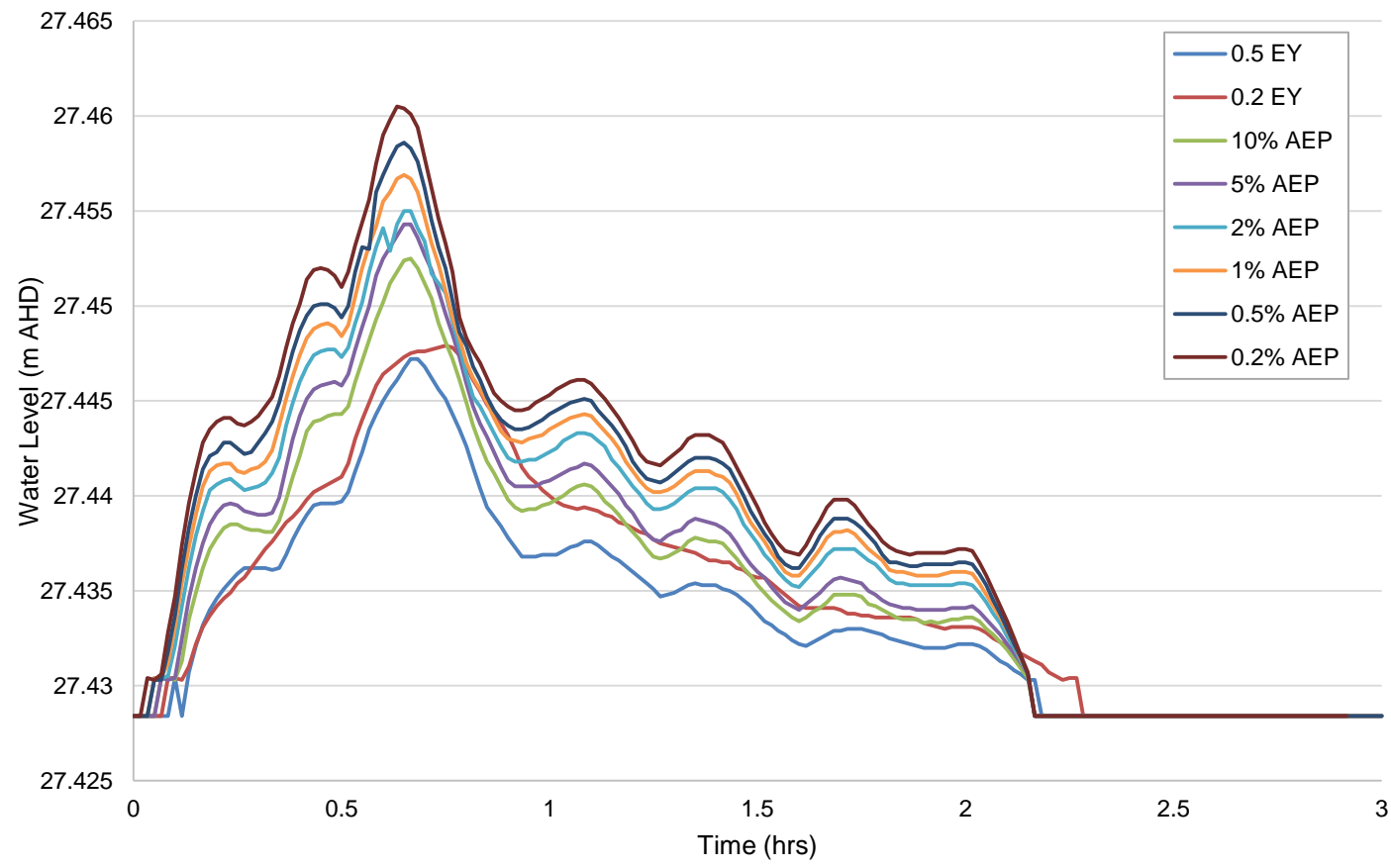
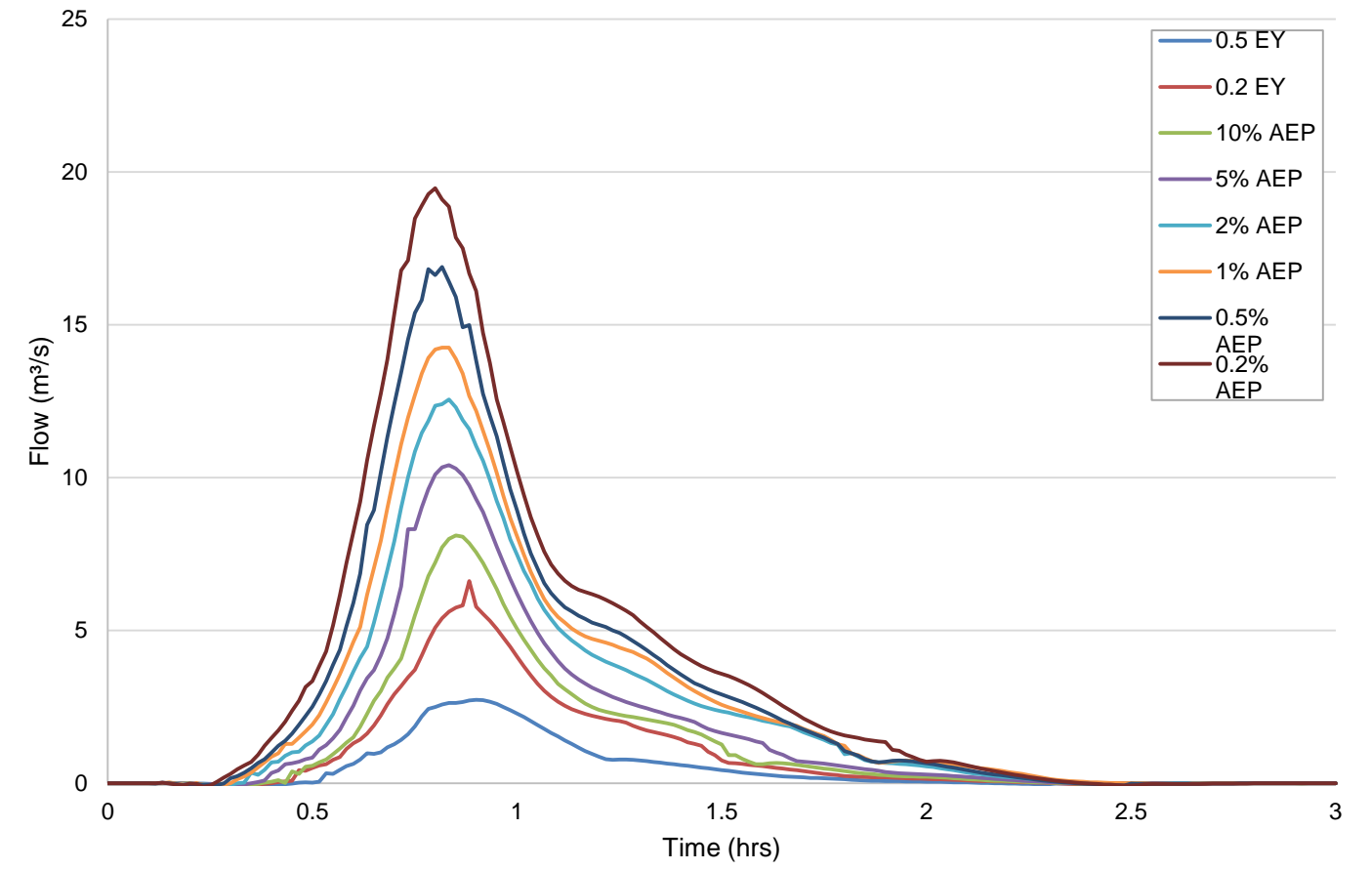
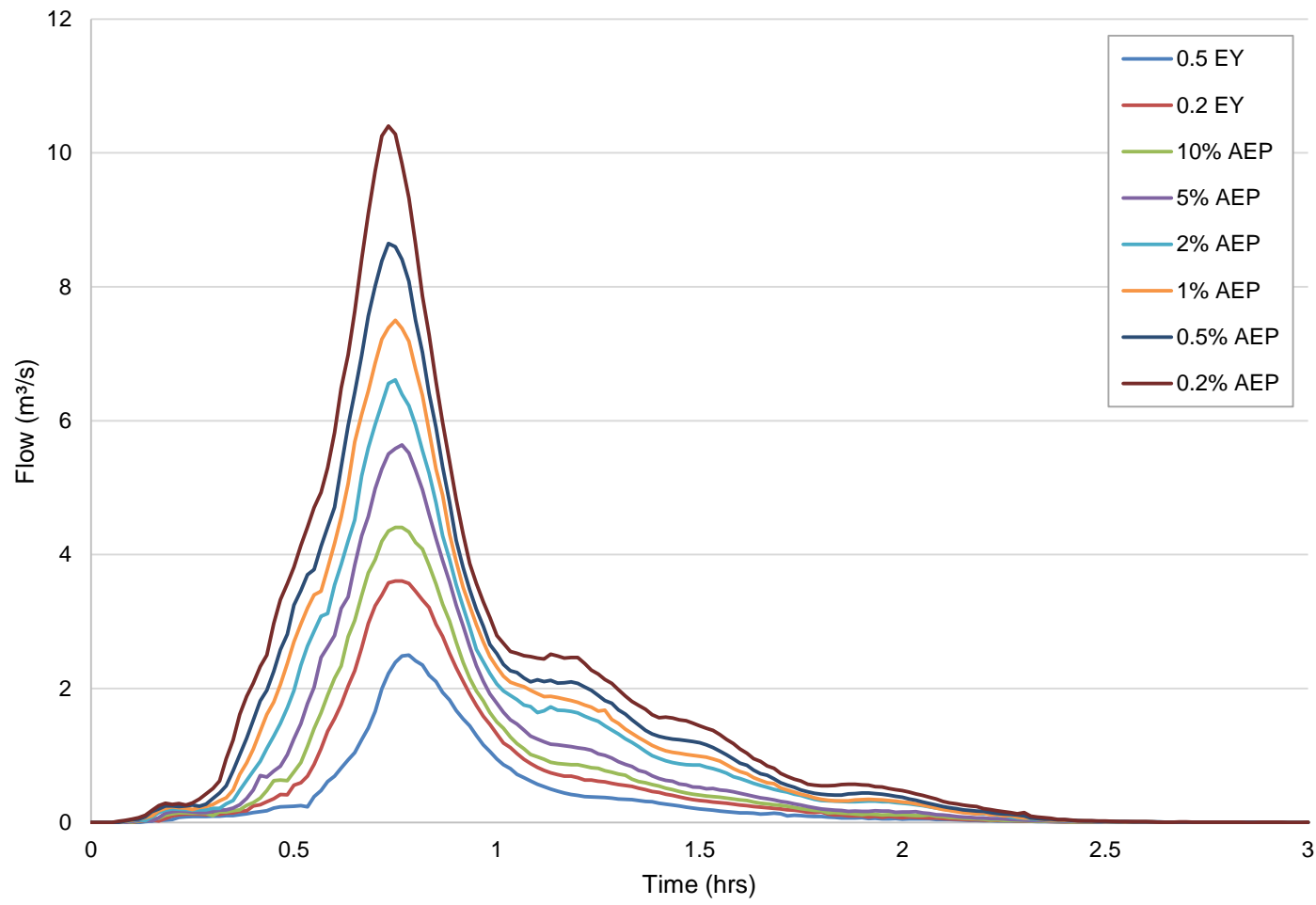
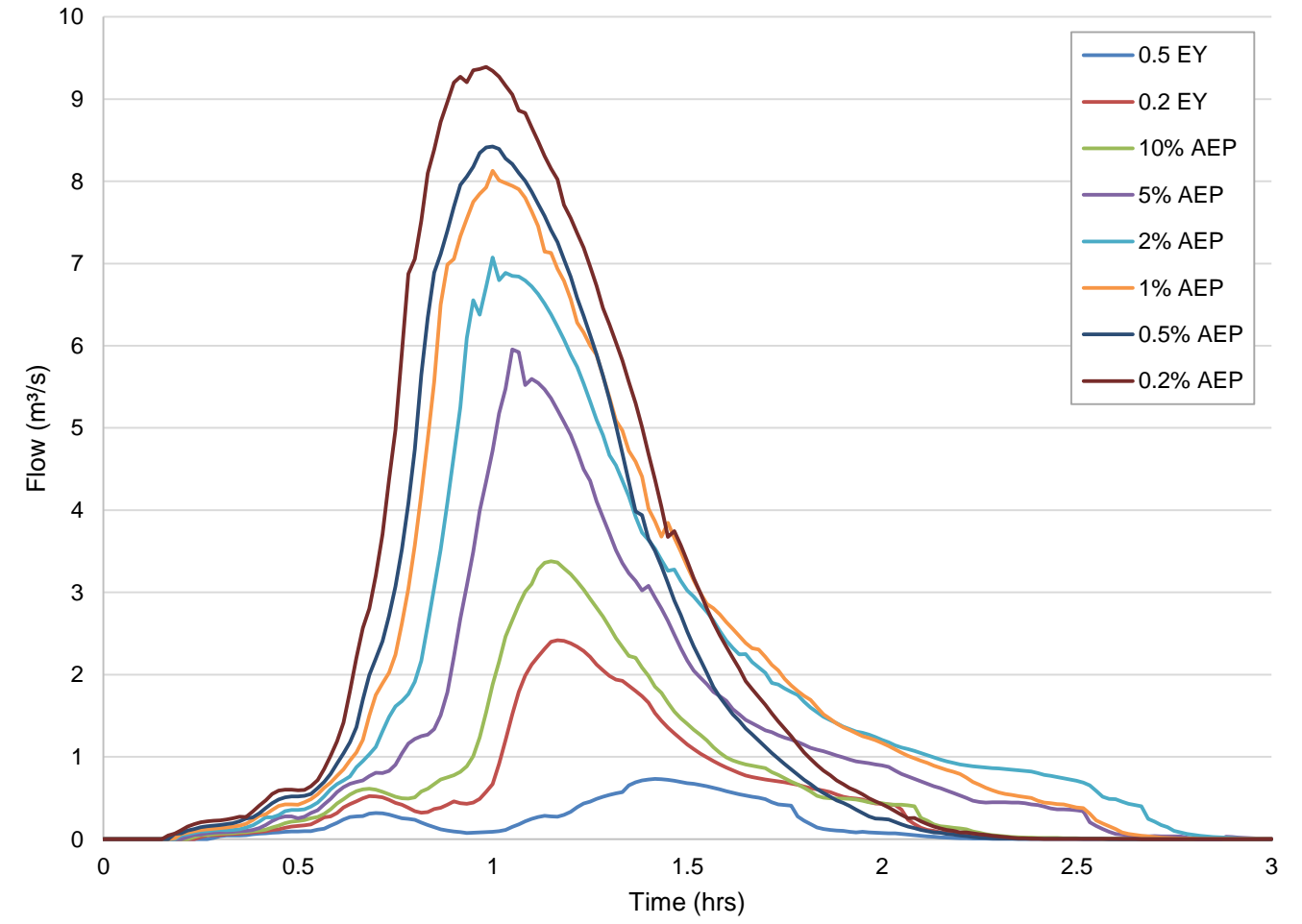


FIGURE 16B
FLOW AND LEVEL HYDROGRAPHS

Beresford Road

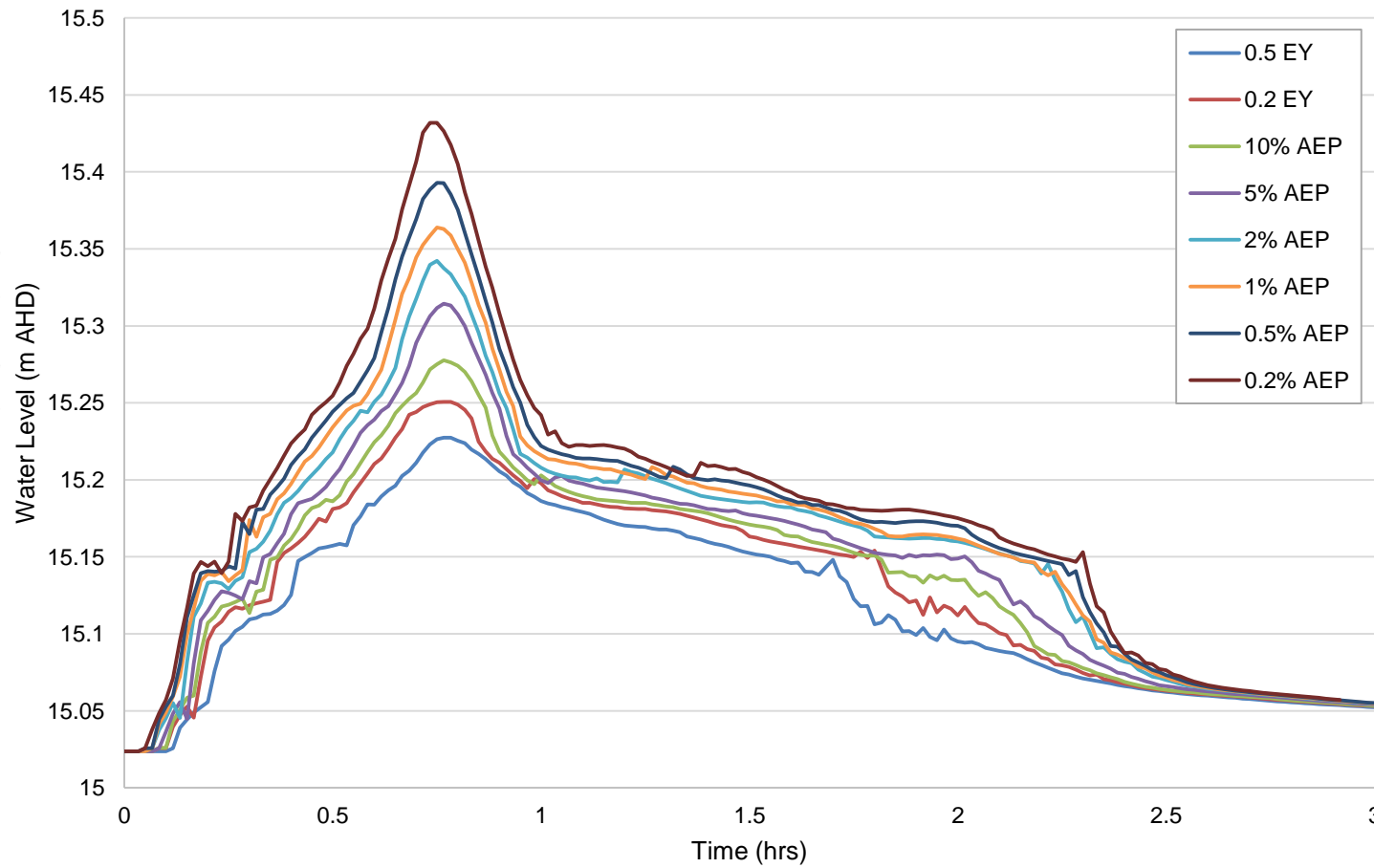


Redmyre Road



J:\Jobs\114021\TUFLOWresults\Level_and_Flow_HydrographHydrograph.xlsx

Beresford Road



Redmyre Road

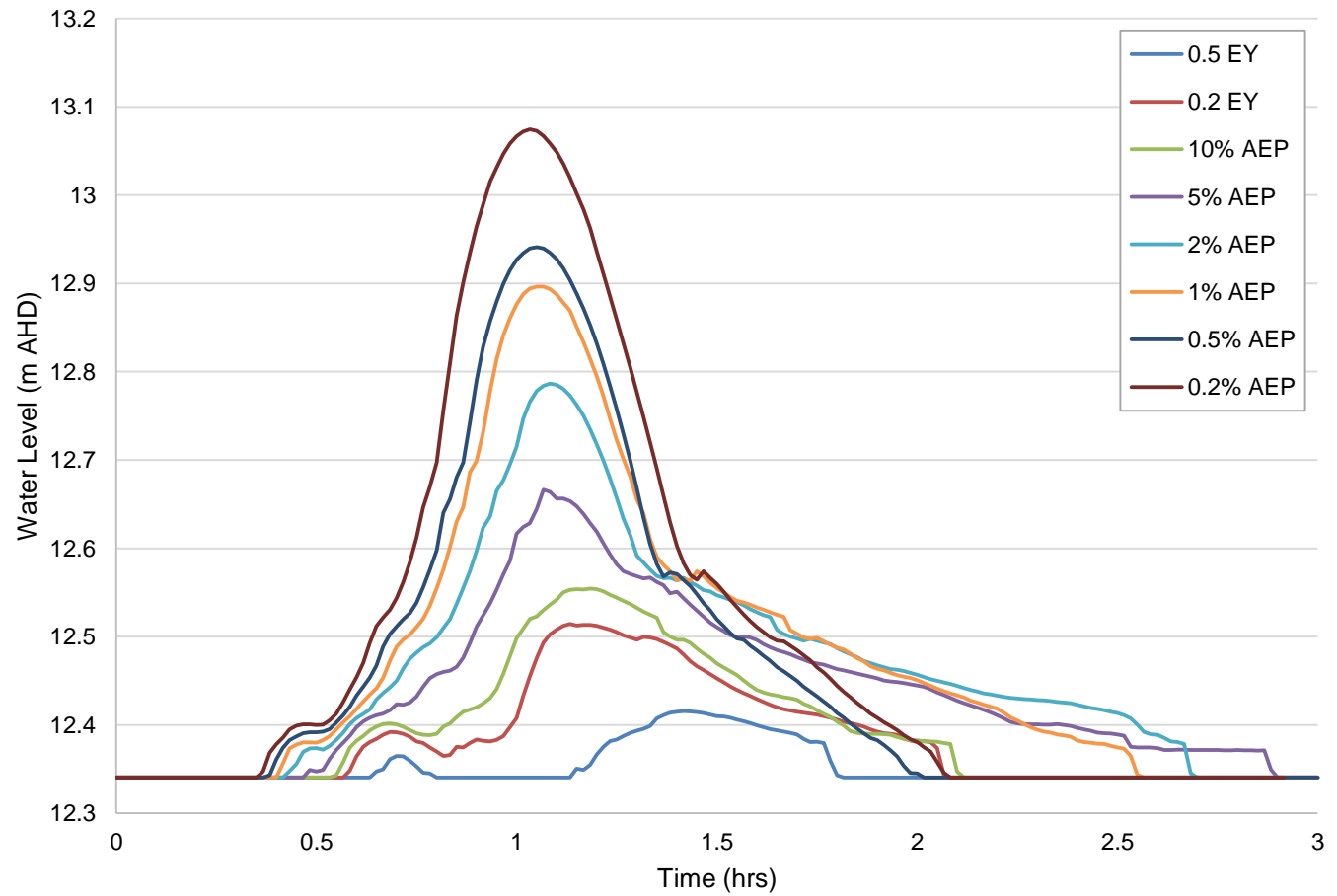
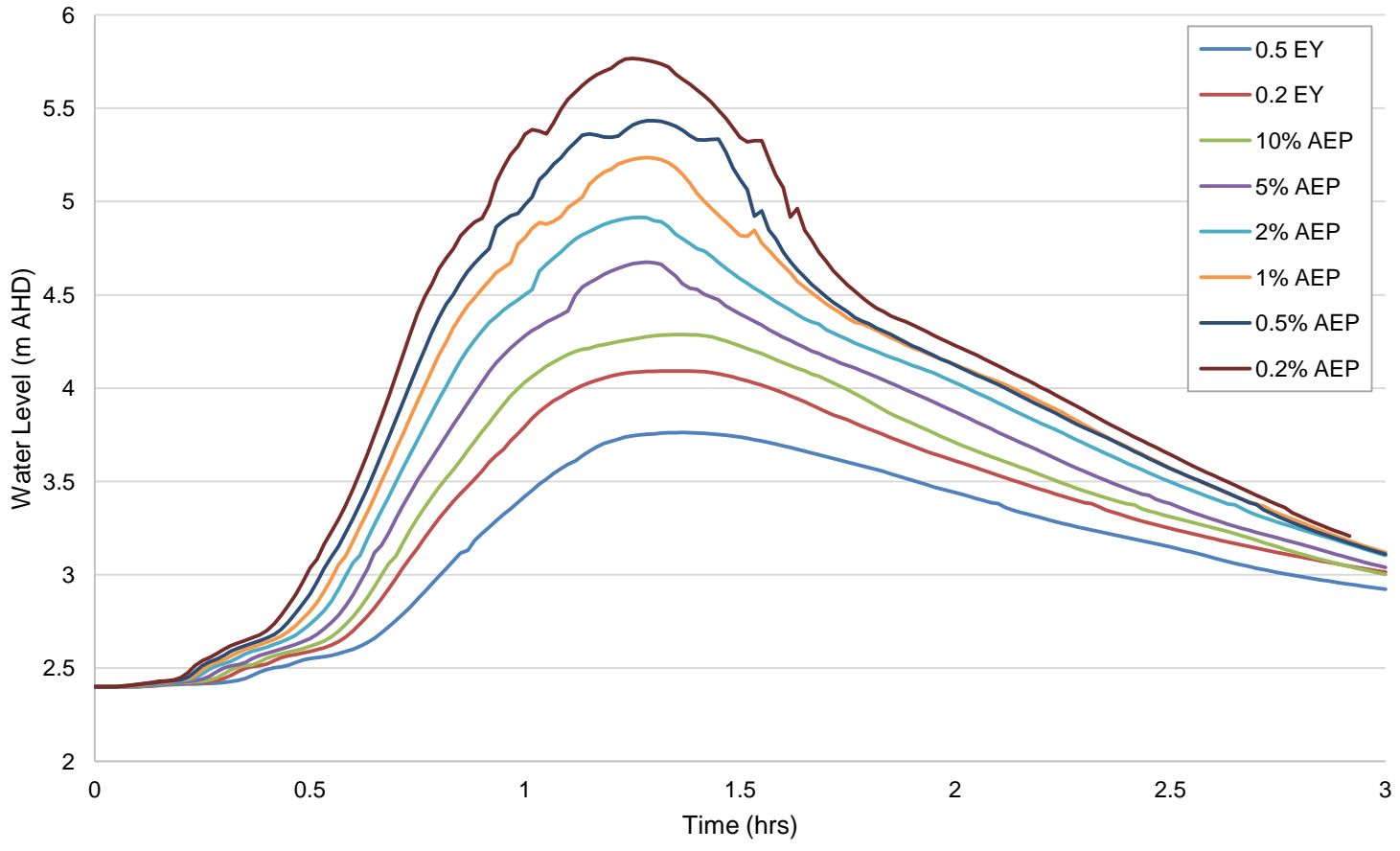
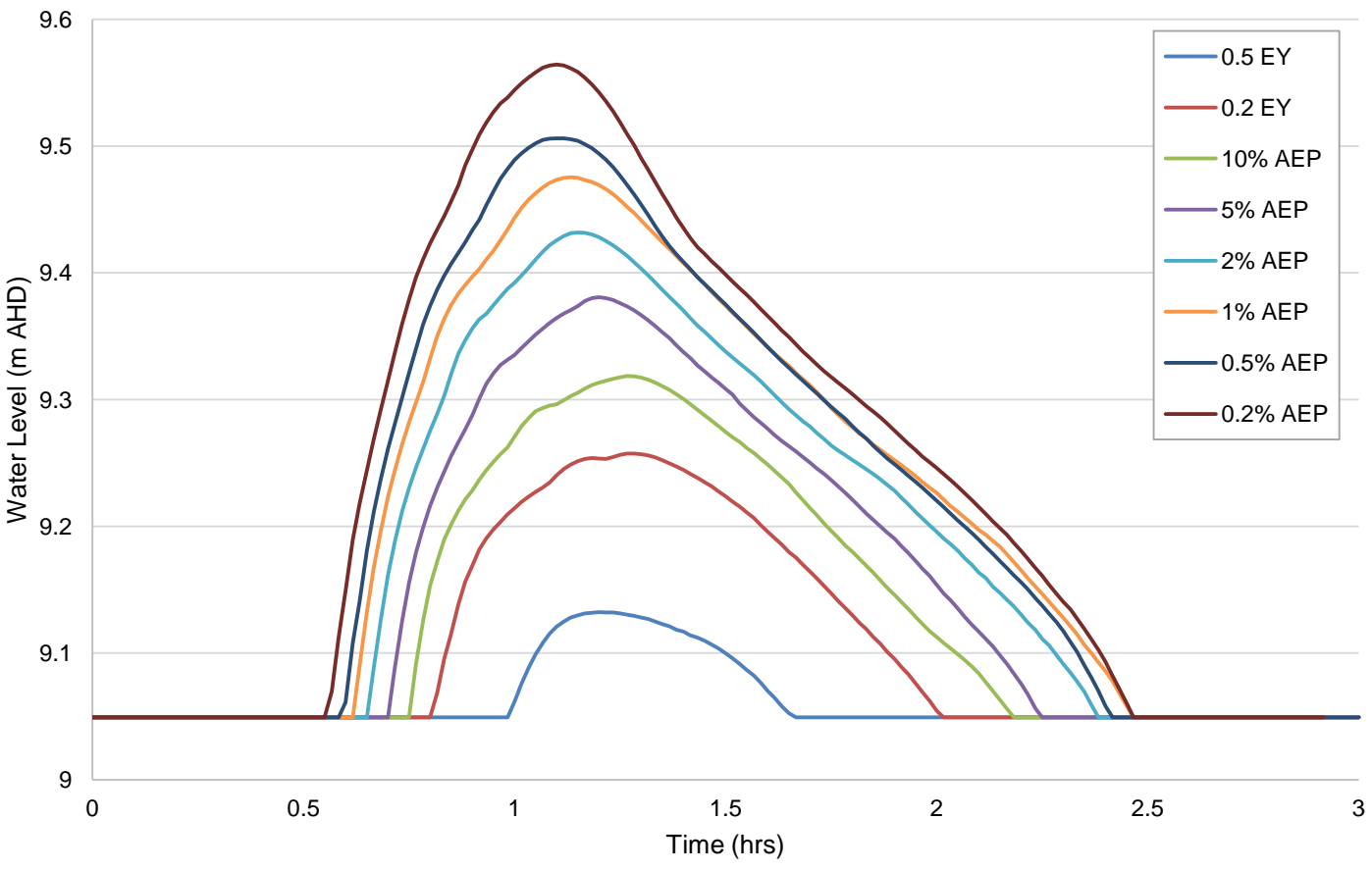
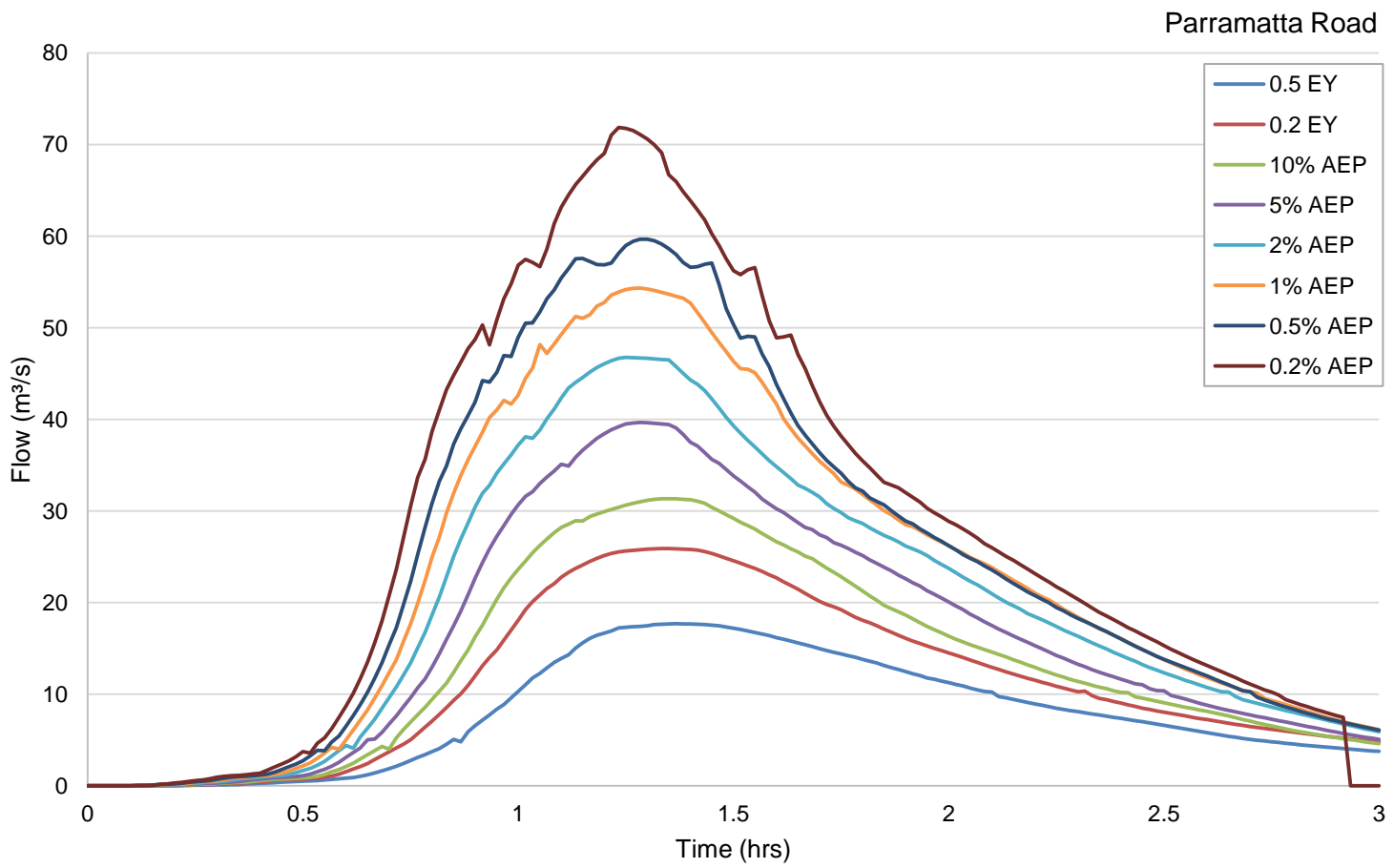
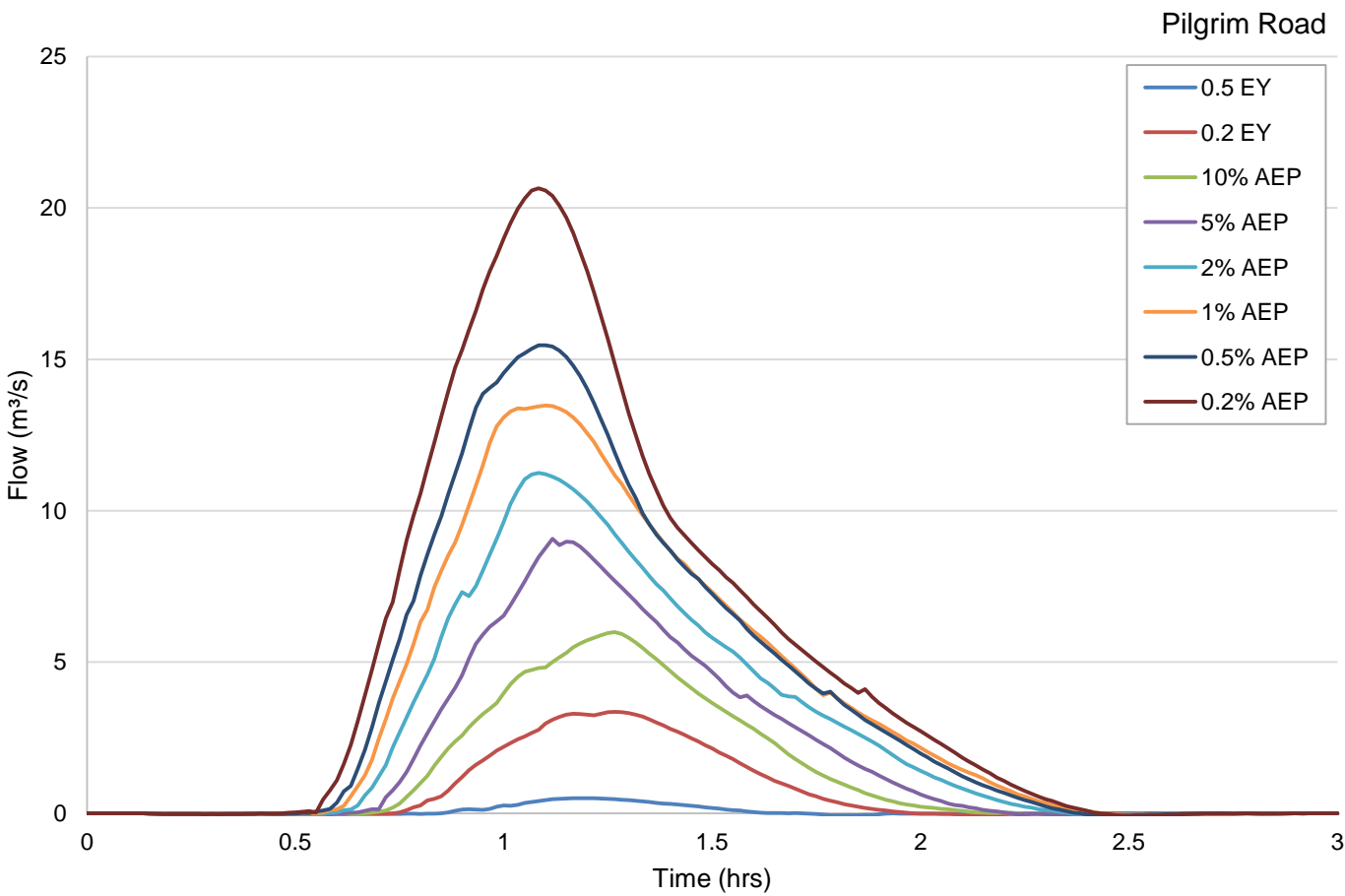
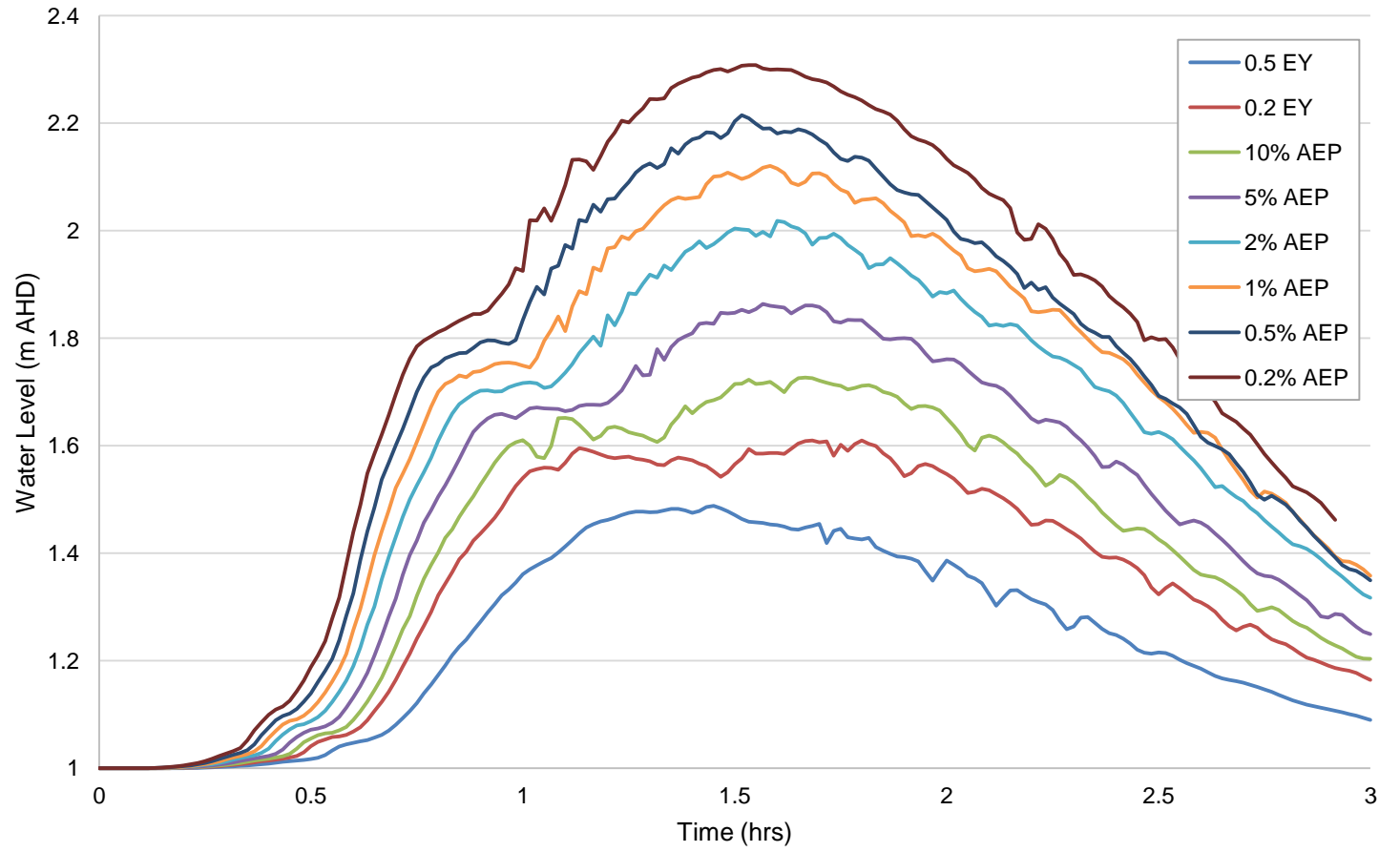
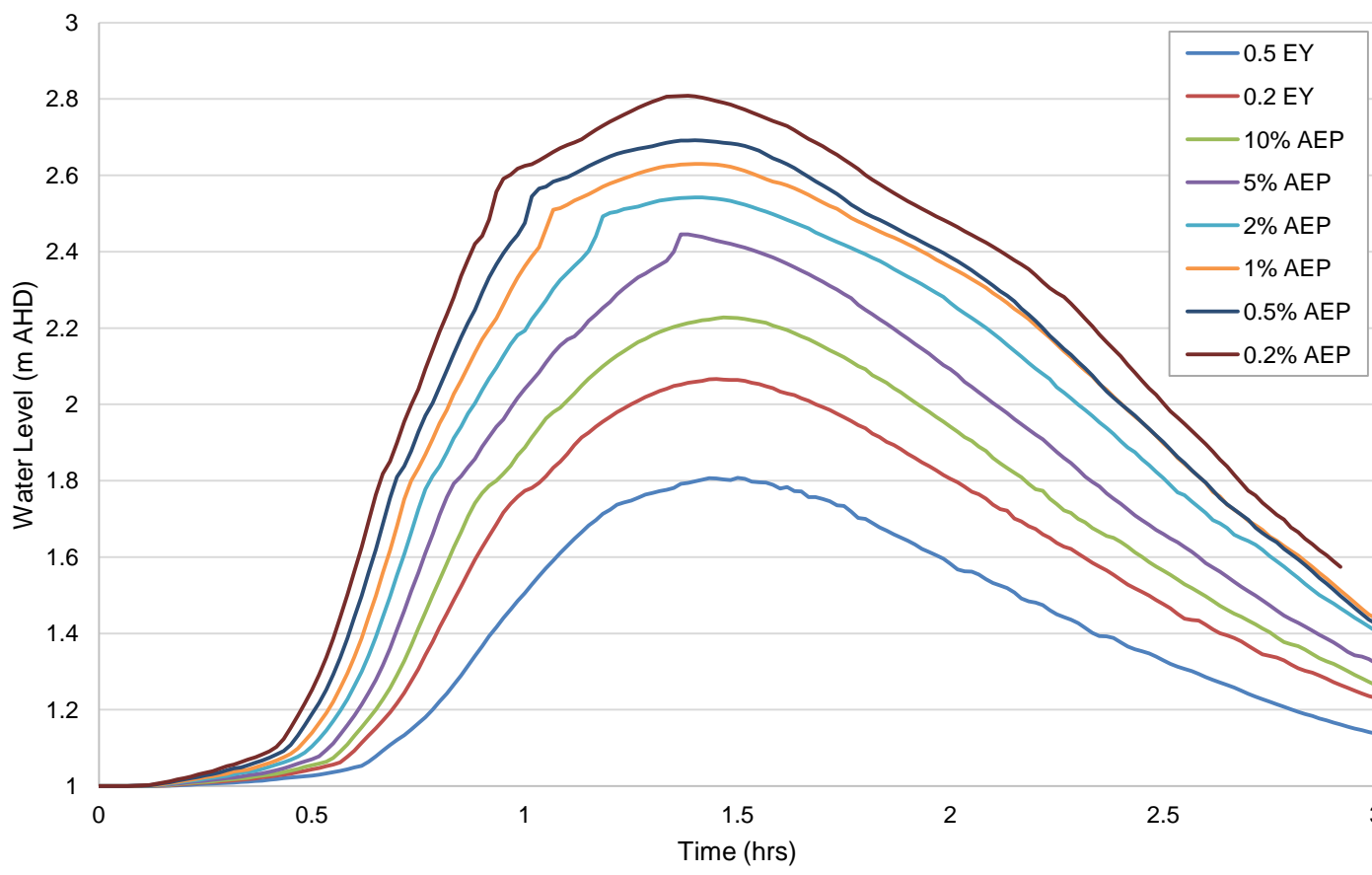
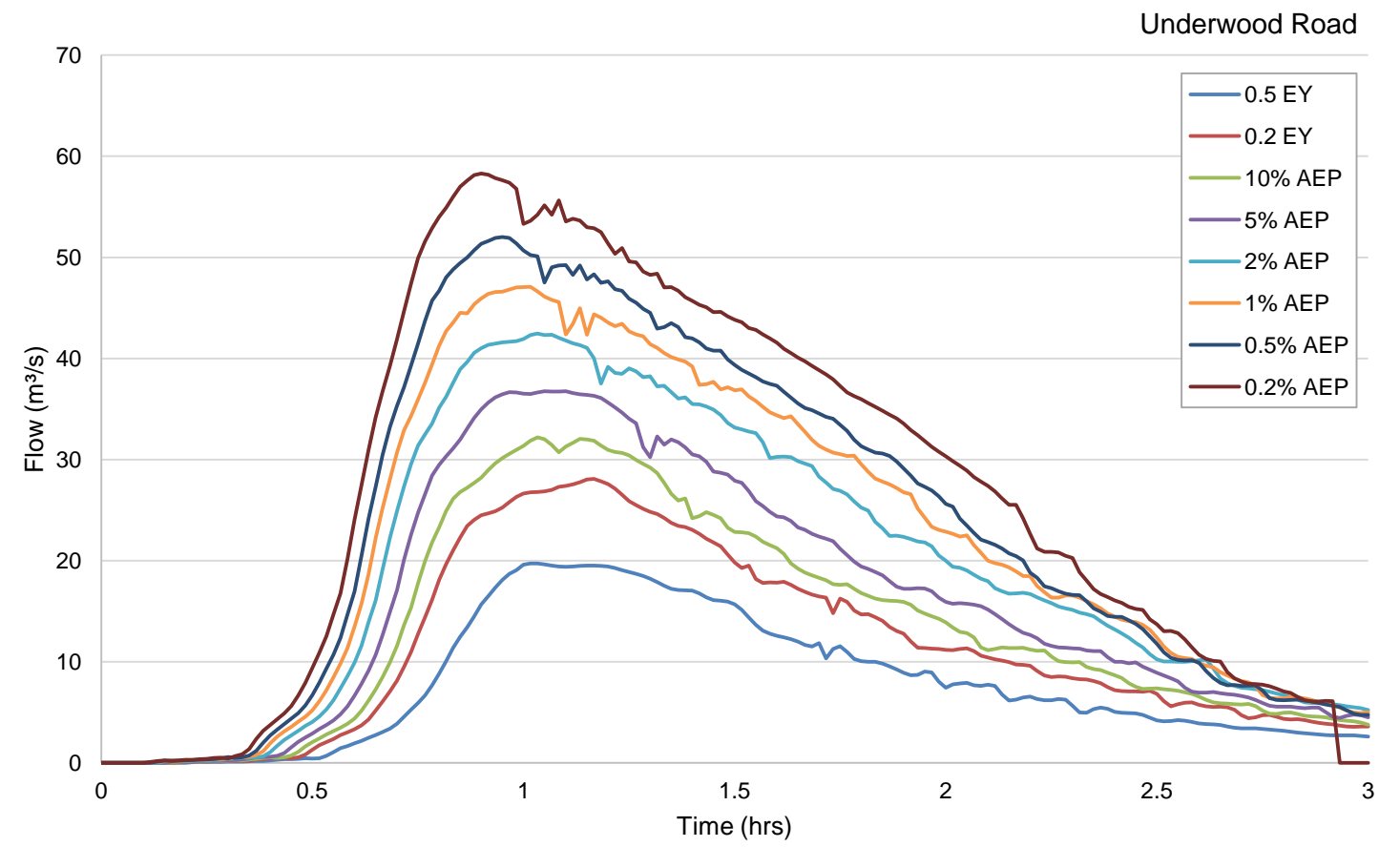
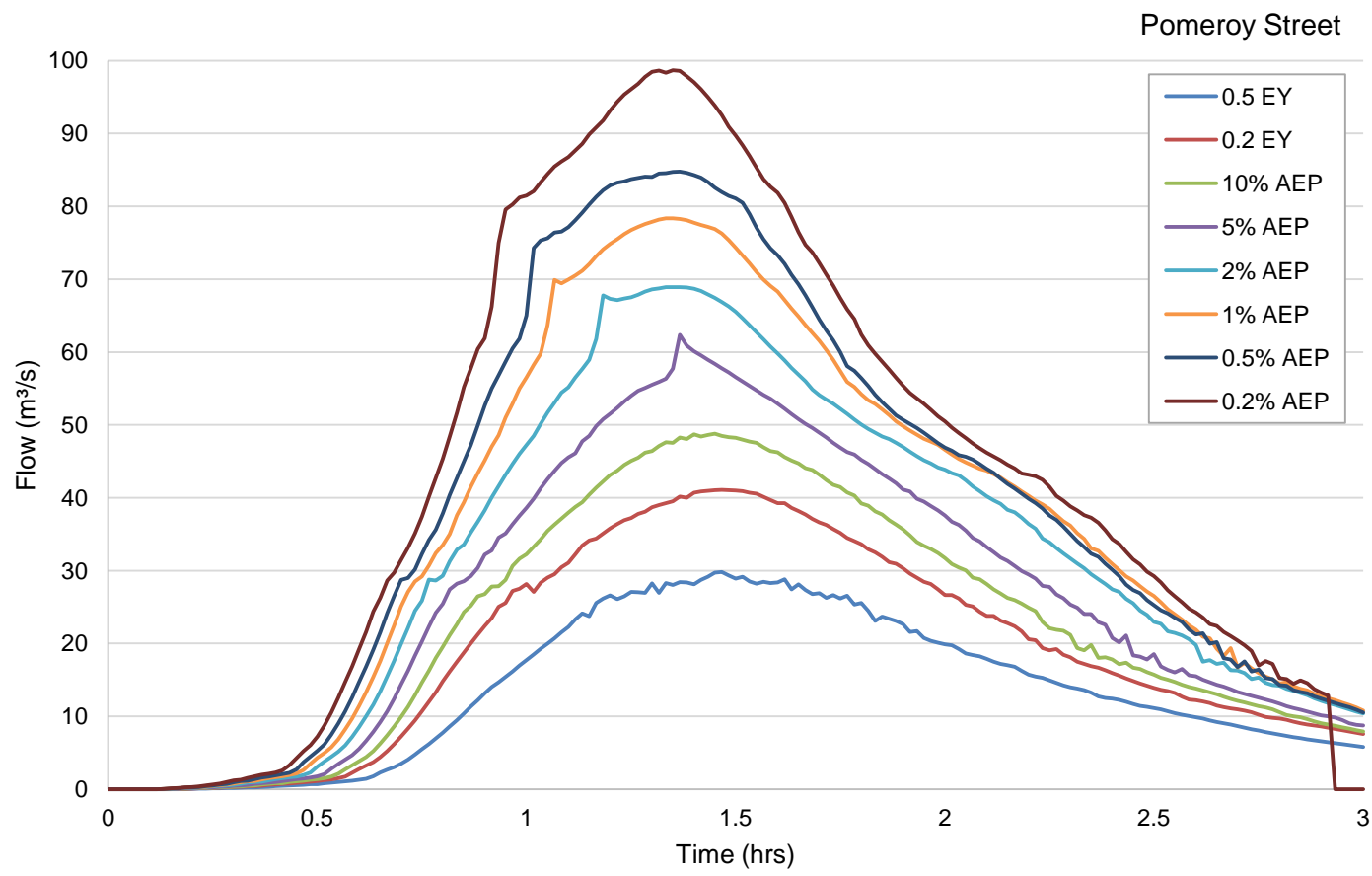


FIGURE 16C
FLOW AND LEVEL HYDROGRAPHS



J:\Jobs\114021\TUFLOW\results\Level_and_Flow_Hydrograph\Hydrograph.xlsx

FIGURE 16D
FLOW AND LEVEL HYDROGRAPHS



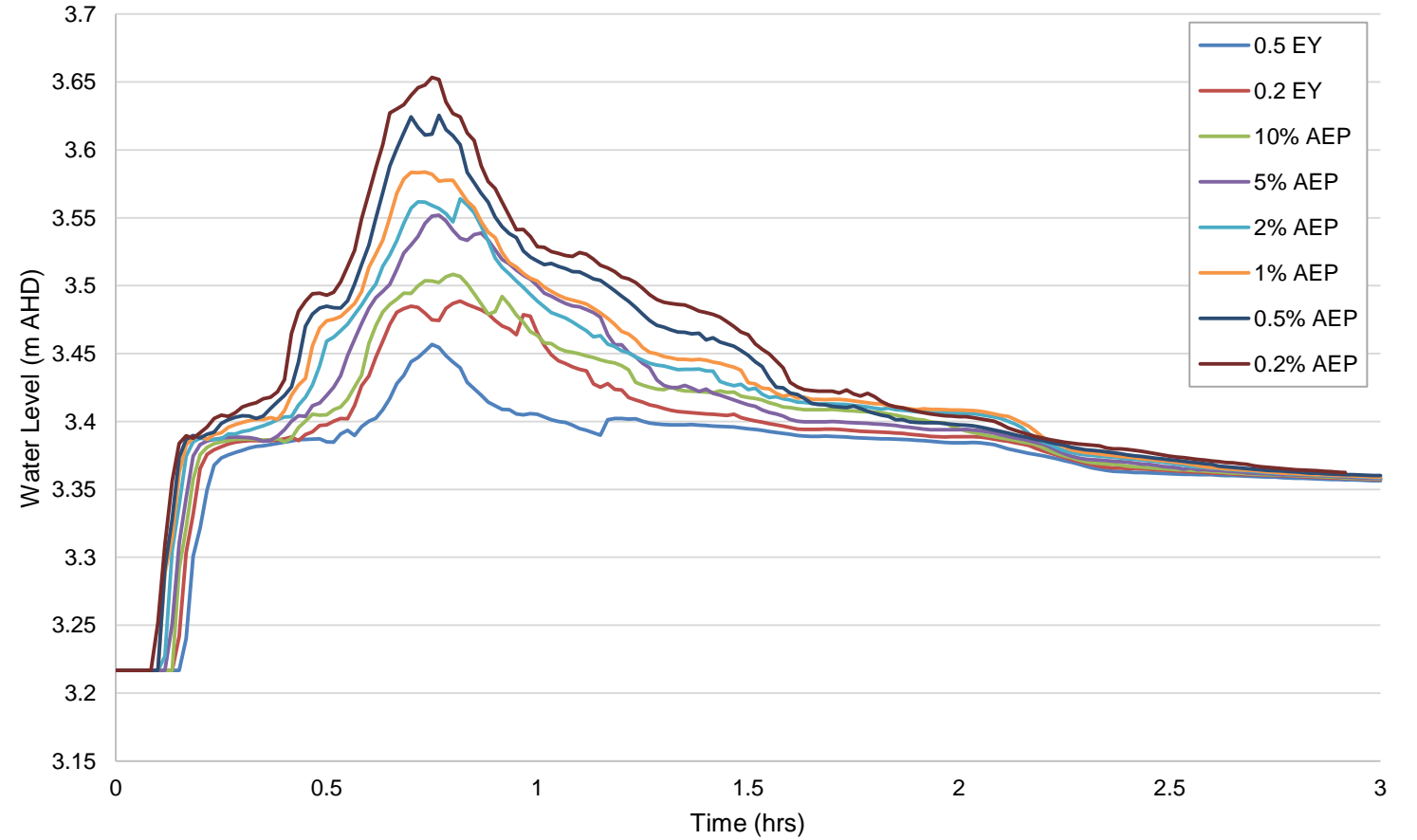
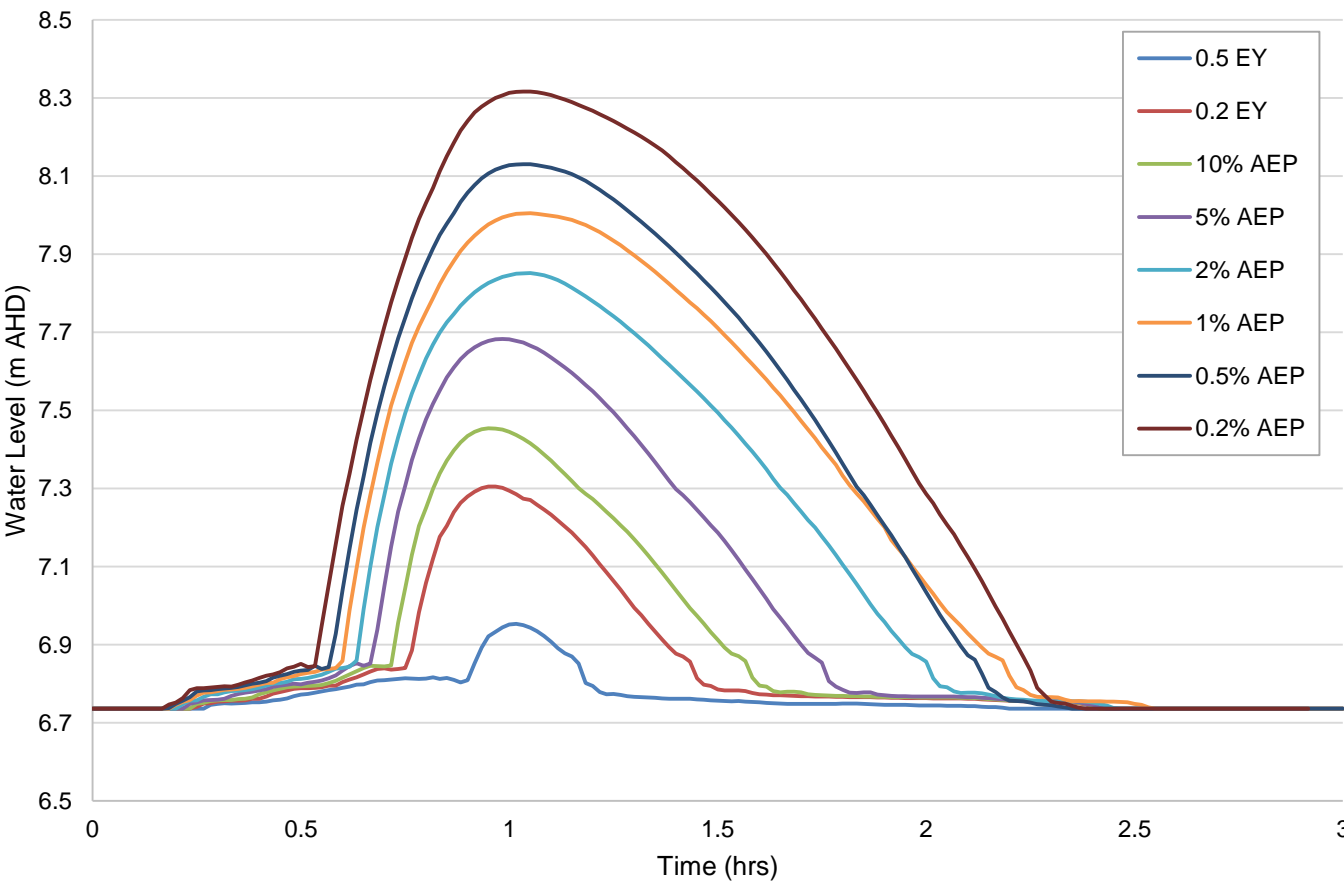
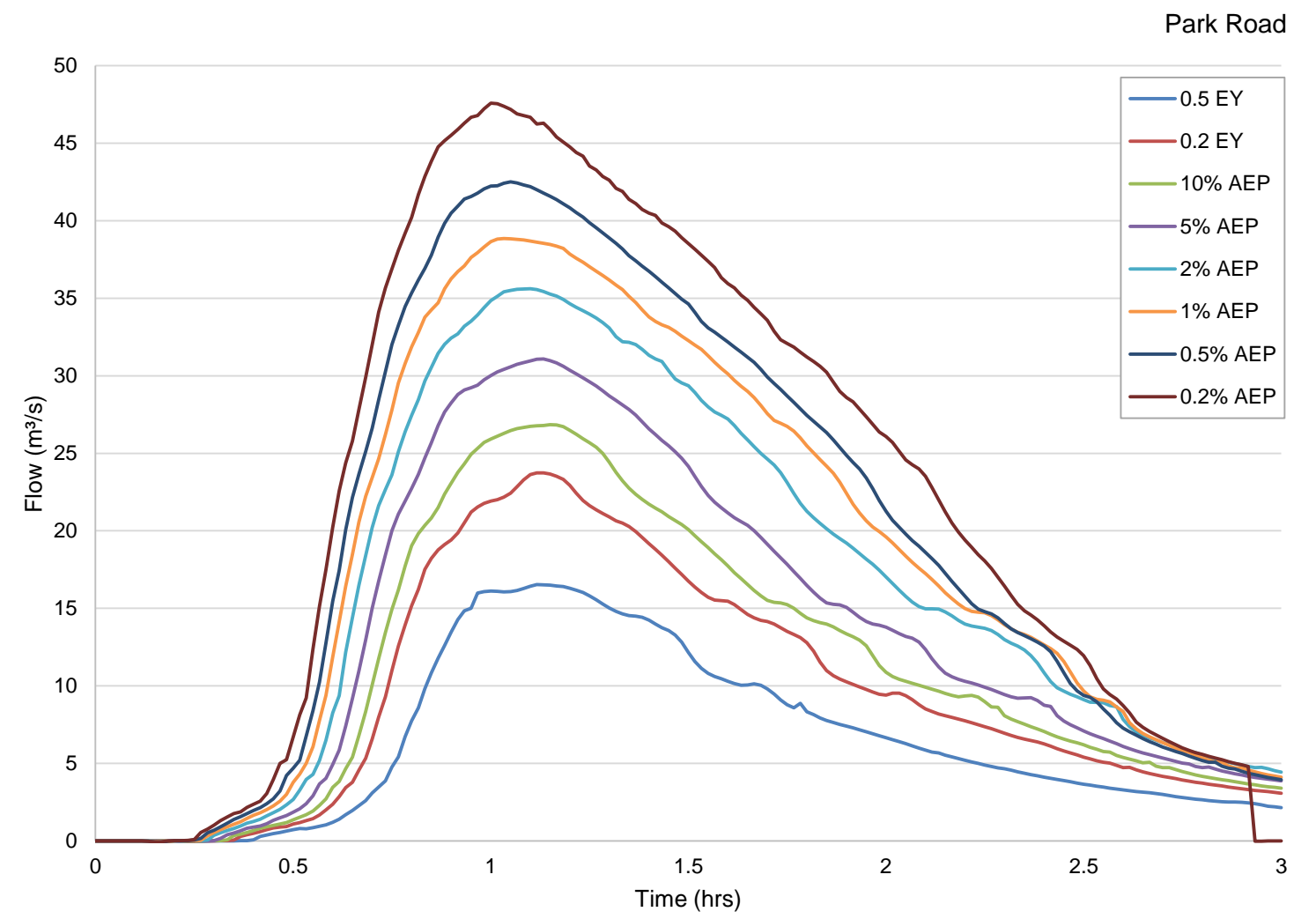
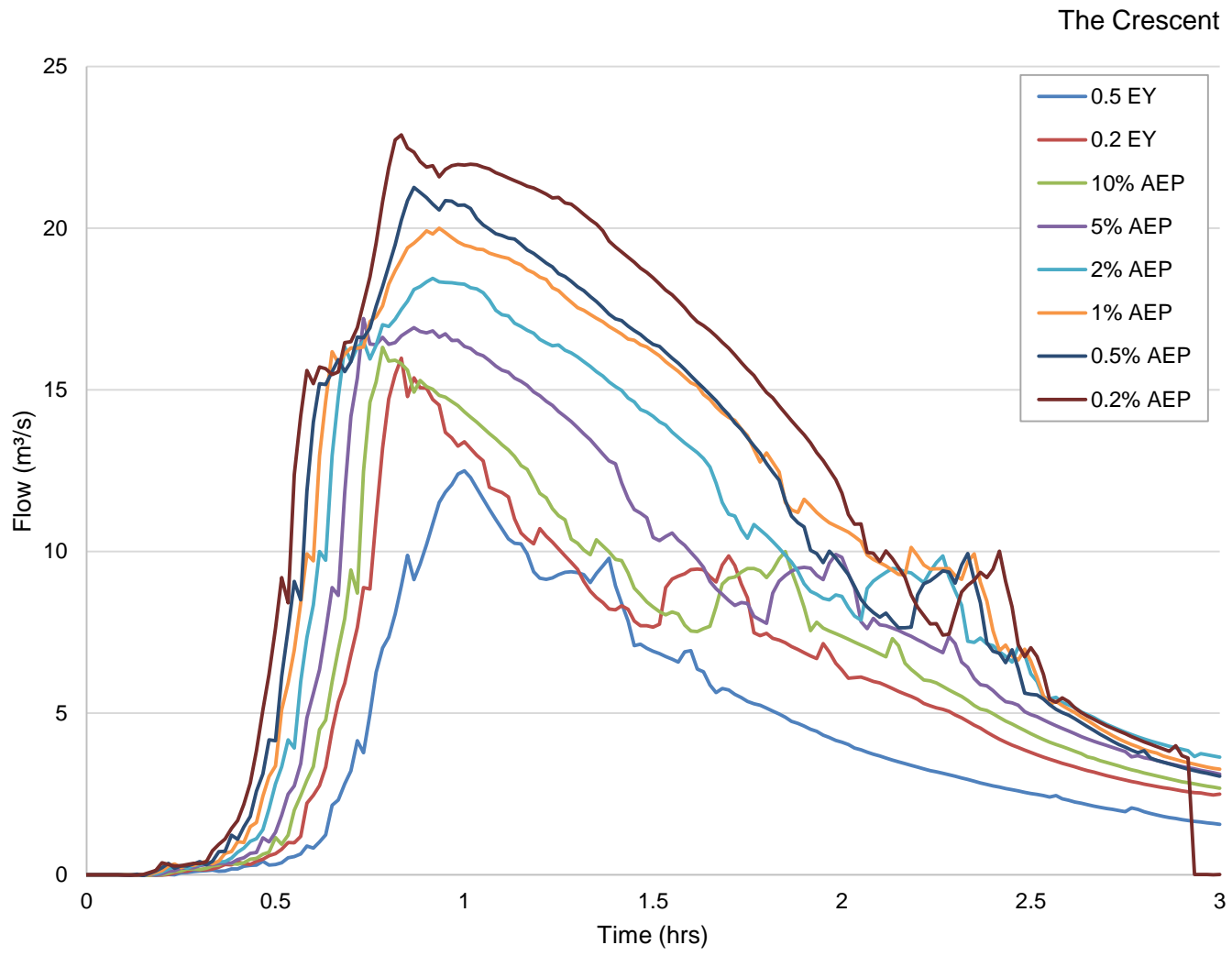


FIGURE 16F
FLOW AND LEVEL HYDROGRAPHS

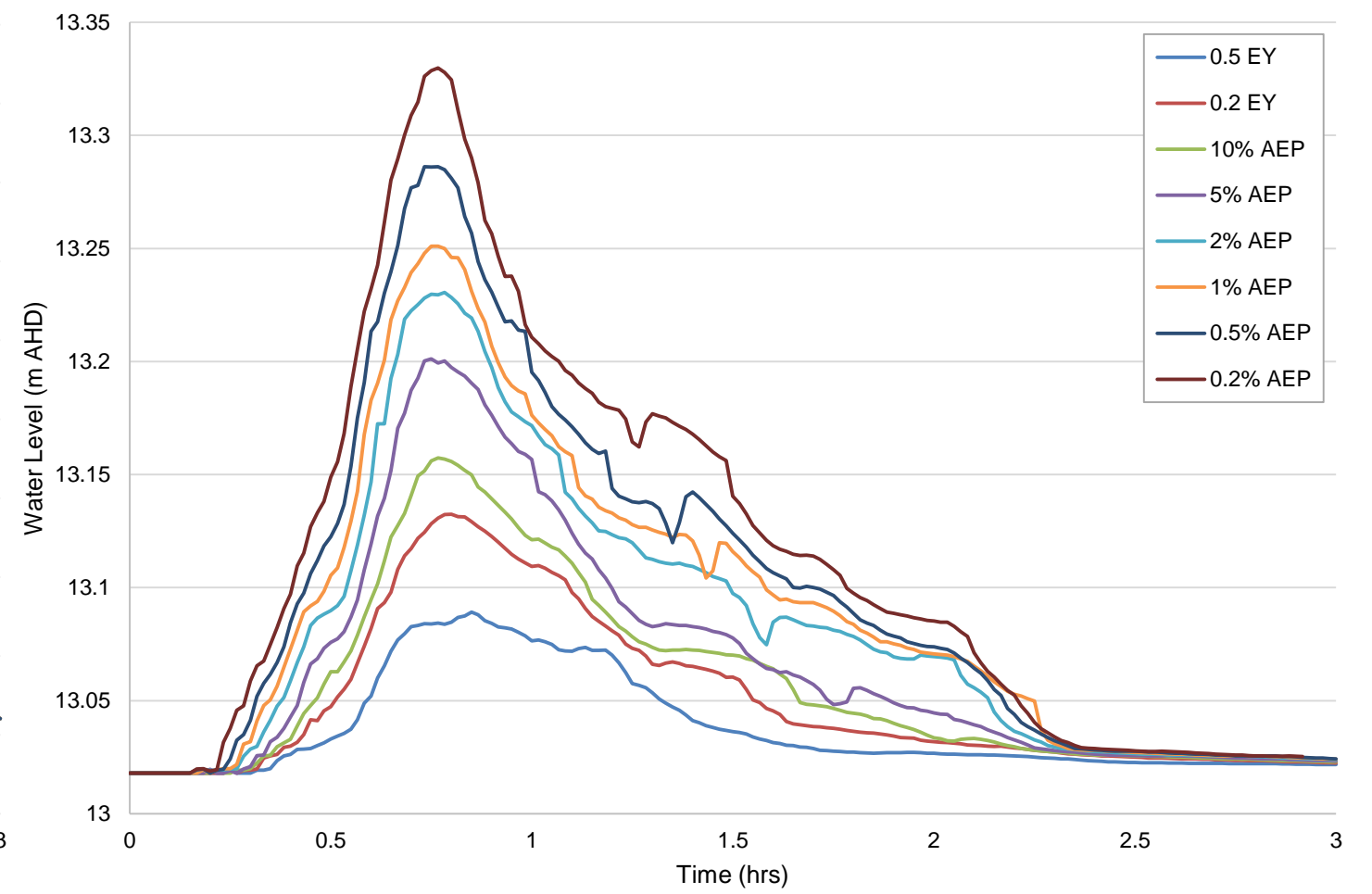
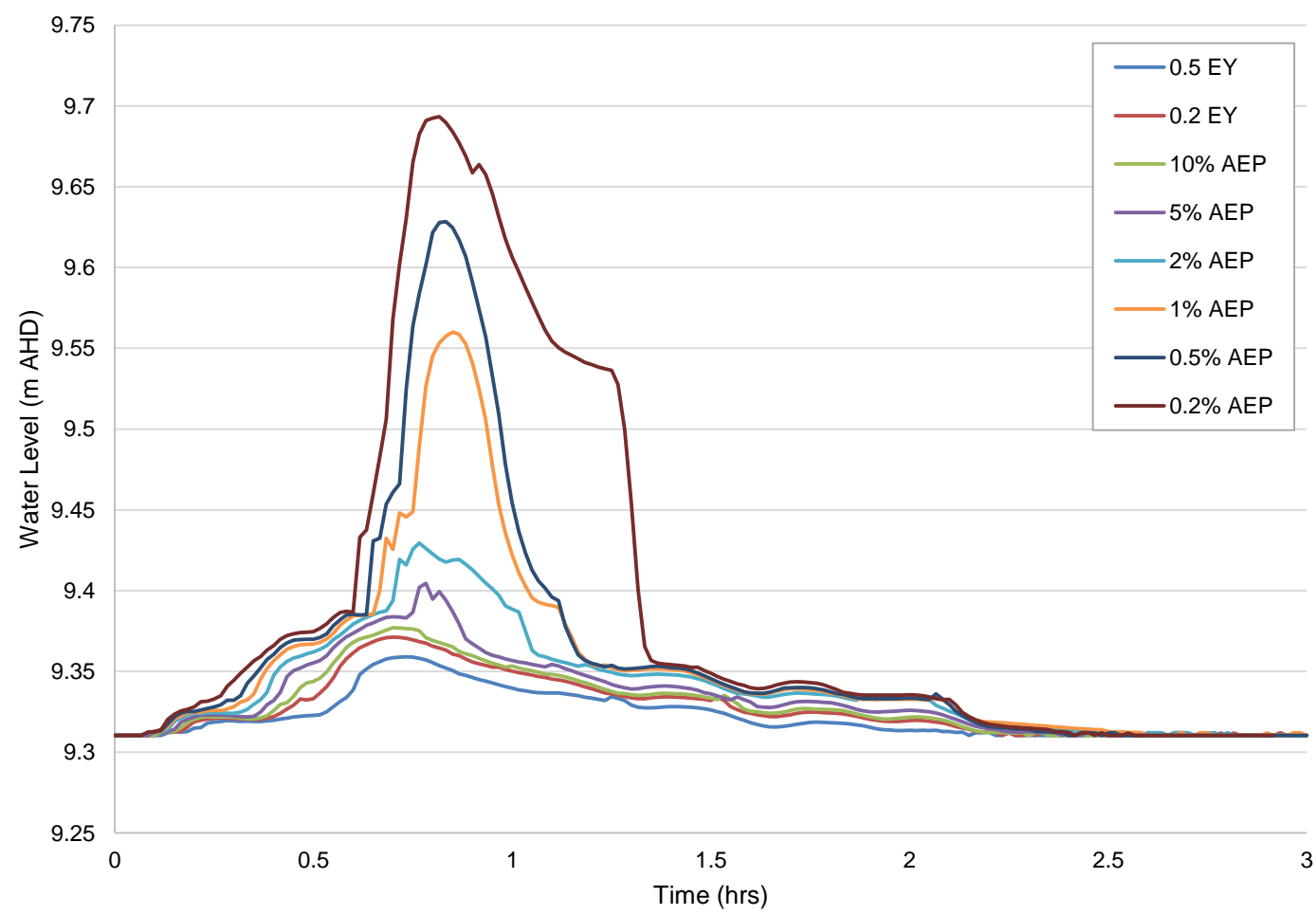
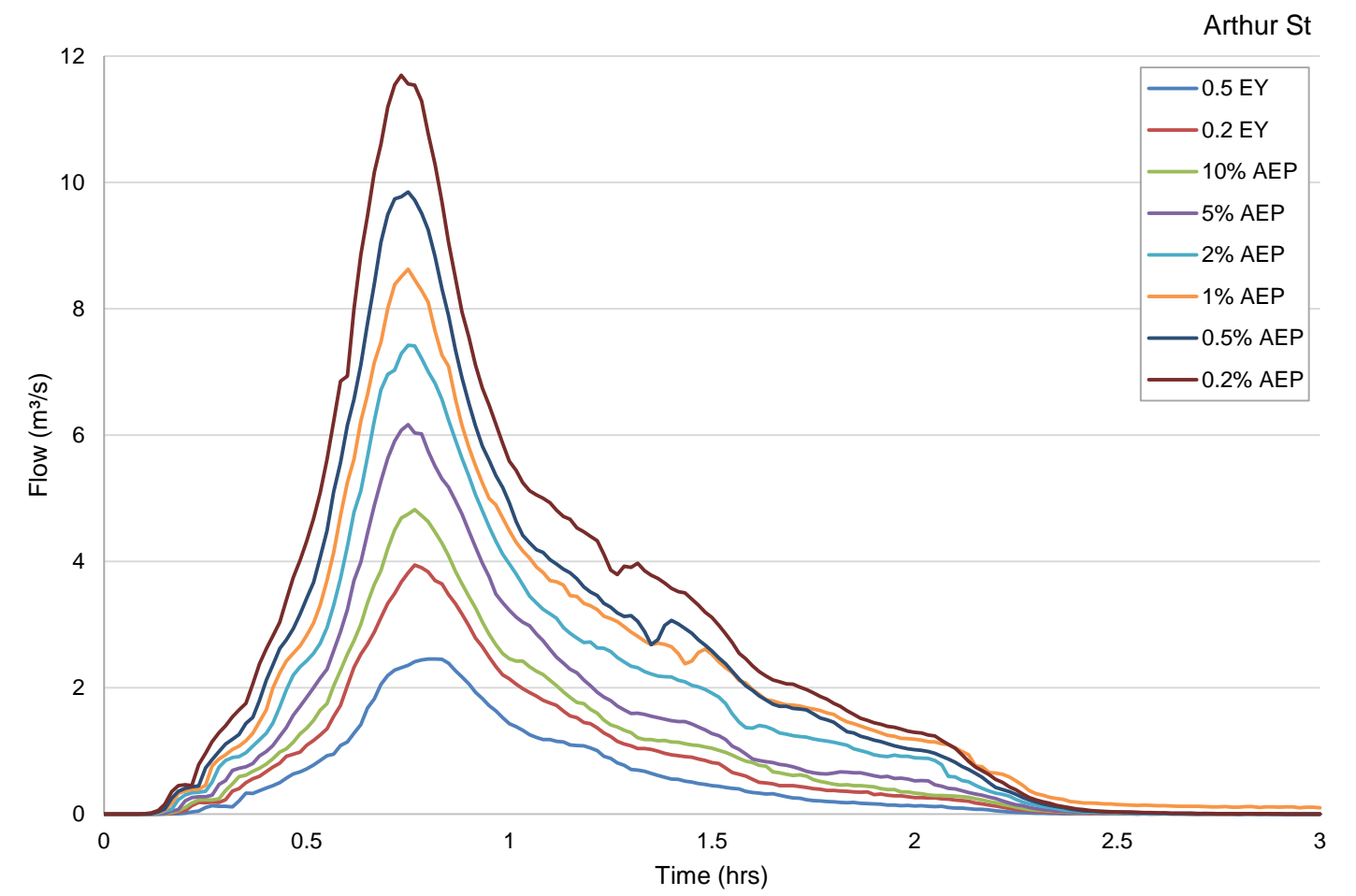
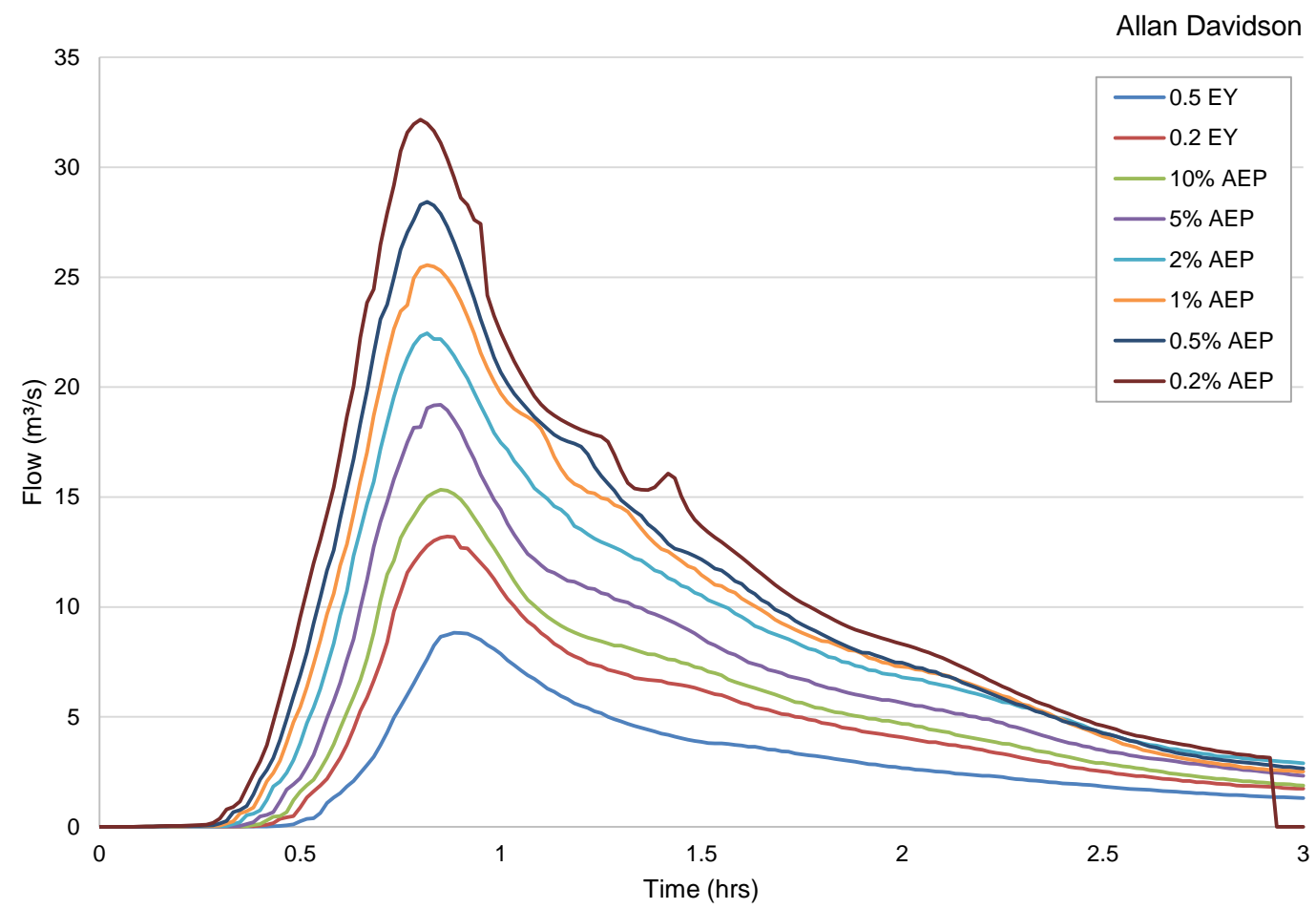


FIGURE 17Ai
 PEAK FLOOD CONTOURS AND DEPTHS
 0.5 EY EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17a1_Peak Flood Depths & Levels_0021.mxd

FIGURE 17Aii
PEAK FLOOD CONTOURS AND DEPTHS
0.5 EY EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17a2_Peak Flood Depths & Levels_0021.mxd

- Study Area
- Catchment Boundary
- Peak Flood Contours**
- Major Contours (1.0m Interval)
- Minor Contours (0.5m Interval)
- Depth (m)**
- 0.0 - 0.3
- 0.3 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- > 2.0

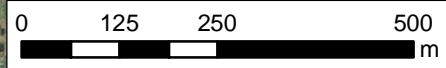
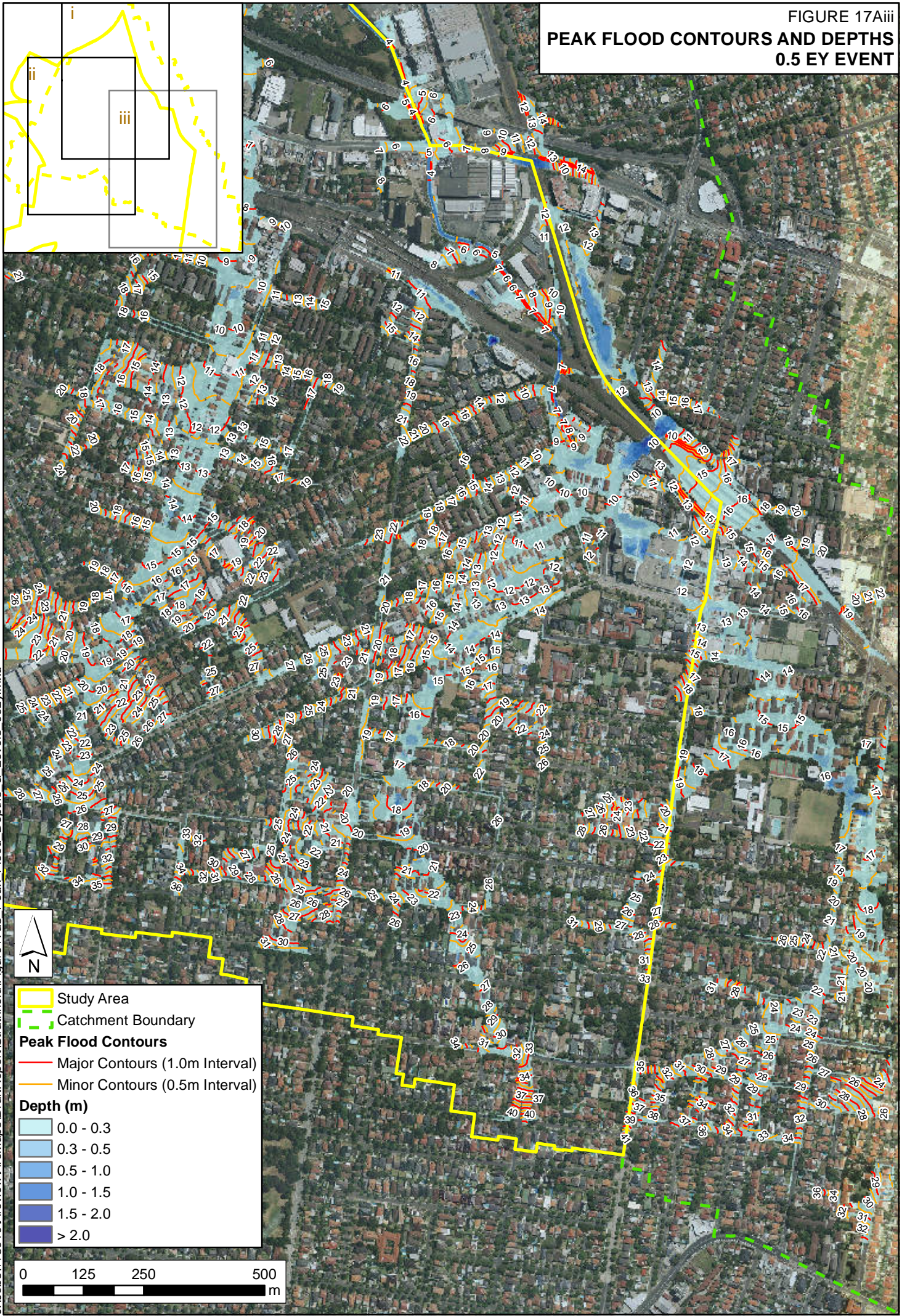


FIGURE 17Aiii
PEAK FLOOD CONTOURS AND DEPTHS
0.5 EY EVENT



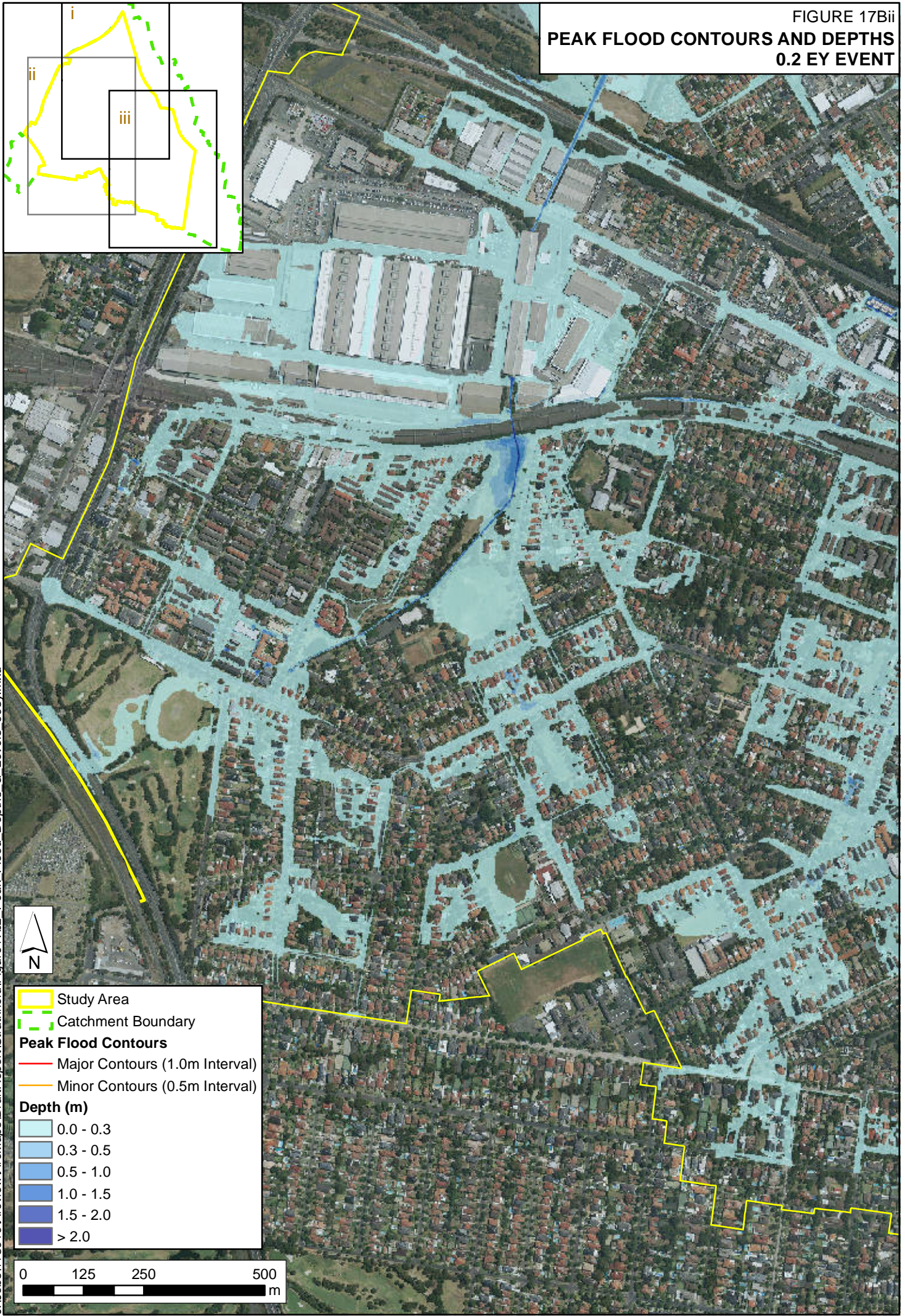
J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17a3_Peak Flood Depths & Levels_0021.mxd

FIGURE 17Bi
 PEAK FLOOD CONTOURS AND DEPTHS
 0.2 EY EVENT



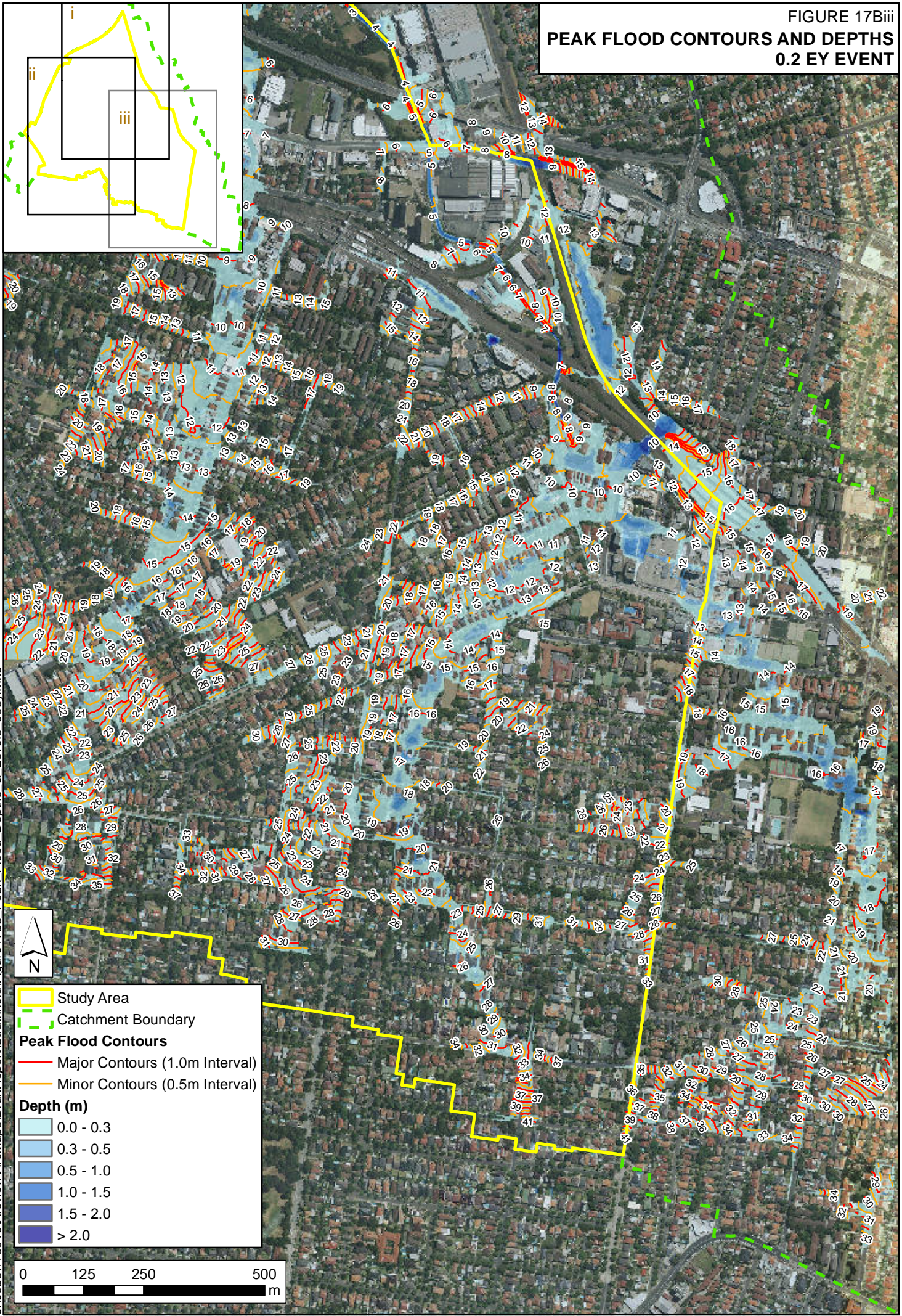
J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure17b1_Peak Flood Depths & Levels_005y.mxd

FIGURE 17Bii
PEAK FLOOD CONTOURS AND DEPTHS
0.2 EY EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 17b2_Peak Flood Depths & Levels_0051.mxd

FIGURE 17Biii
PEAK FLOOD CONTOURS AND DEPTHS
0.2 EY EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17b3_Peak Flood Depths & Levels_005v.mxd

FIGURE 17Ci
 PEAK FLOOD CONTOURS AND DEPTHS
 10% AEP EVENT



Study Area
 — Yellow line

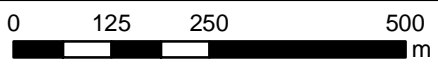
Catchment Boundary
 - - Green dashed line

Peak Flood Contours

- Red line: Major Contours (1.0m Interval)
- Orange line: Minor Contours (0.5m Interval)

Depth (m)

- Light Blue: 0.0 - 0.3
- Medium Light Blue: 0.3 - 0.5
- Medium Blue: 0.5 - 1.0
- Dark Blue: 1.0 - 1.5
- Very Dark Blue: 1.5 - 2.0
- Black: > 2.0



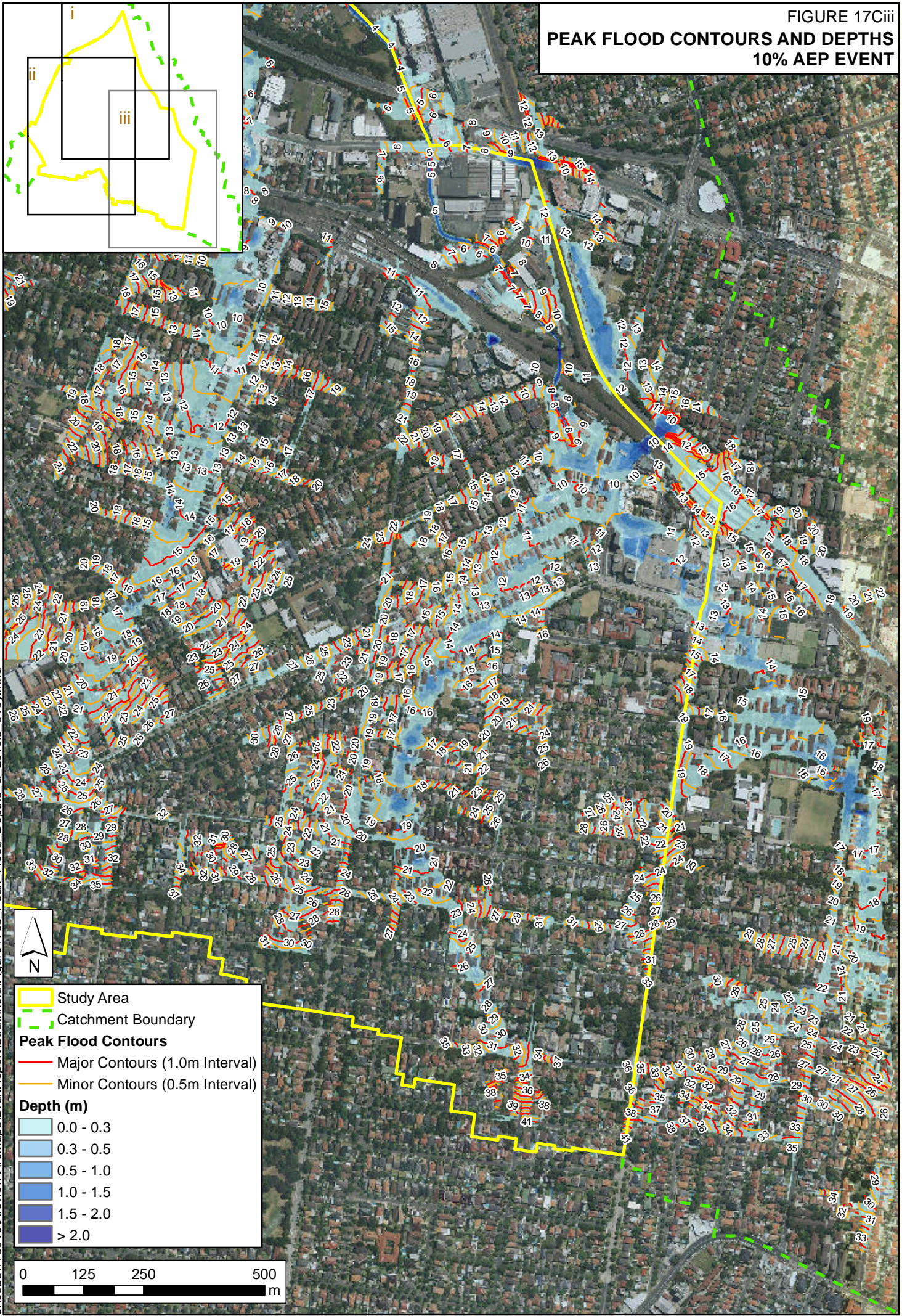
J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure17c1_Peak Flood Depths & Levels_010\mxd

FIGURE 17Cii
PEAK FLOOD CONTOURS AND DEPTHS
10% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure17c2_Peak_Flood_Depths & Levels_010v.mxd

FIGURE 17Ciii
PEAK FLOOD CONTOURS AND DEPTHS
10% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17c3_Peak_Flood_Depths & Levels_010\mxd

Study Area
 [Yellow outline]

Catchment Boundary
 [Green dashed line]

Peak Flood Contours
 [Red line] Major Contours (1.0m Interval)
 [Orange line] Minor Contours (0.5m Interval)

Depth (m)
 [Light blue] 0.0 - 0.3
 [Medium light blue] 0.3 - 0.5
 [Medium blue] 0.5 - 1.0
 [Dark blue] 1.0 - 1.5
 [Very dark blue] 1.5 - 2.0
 [Darkest blue] > 2.0

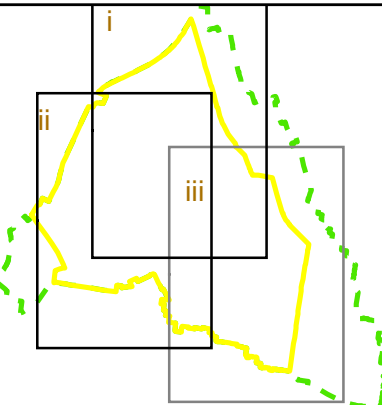
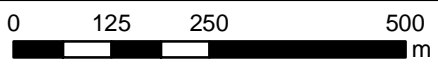


FIGURE 17Di
PEAK FLOOD CONTOURS AND DEPTHS
5% AEP EVENT



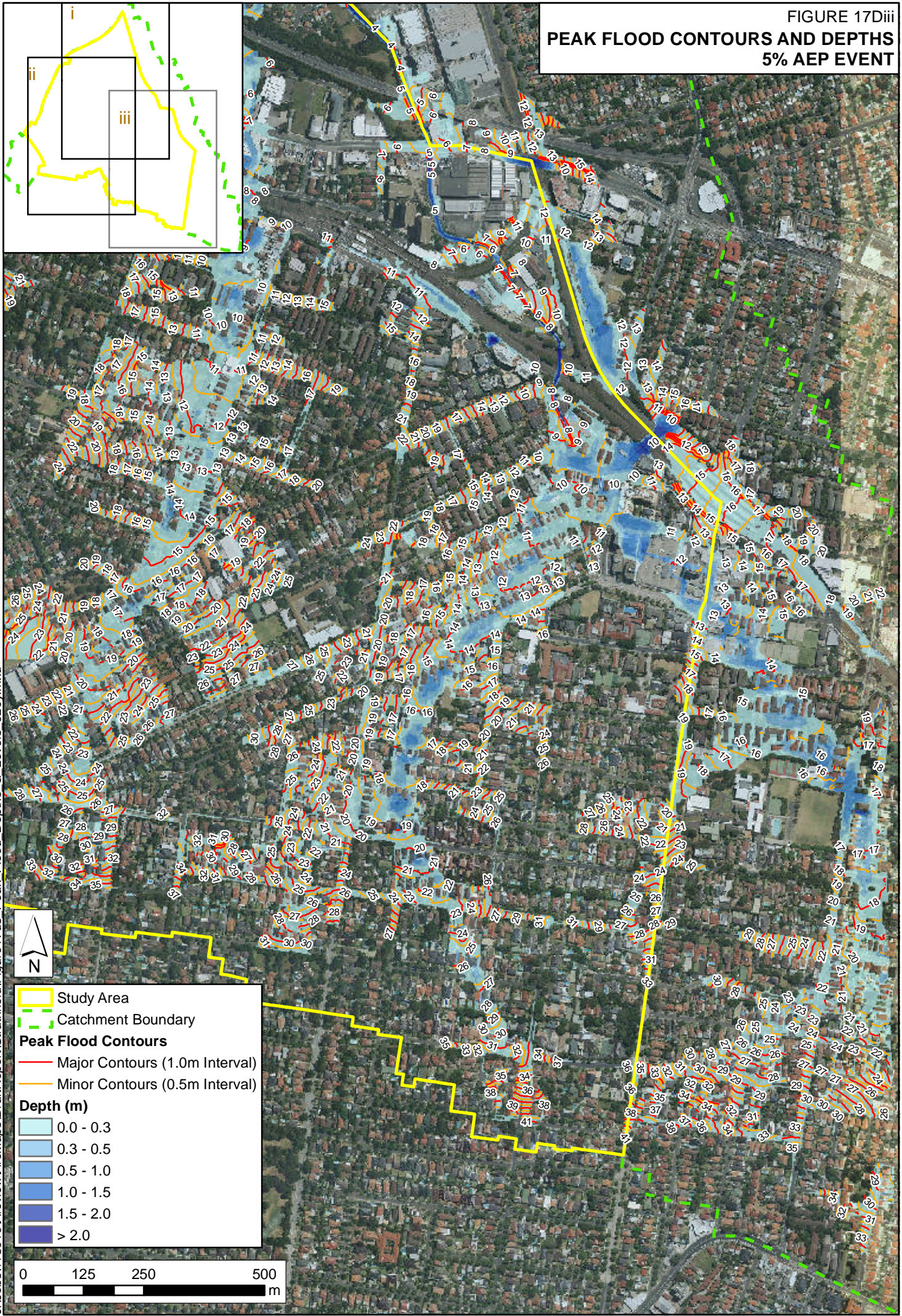
J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure17d1_Peak Flood Depths & Levels_020y.mxd

FIGURE 17Di
PEAK FLOOD CONTOURS AND DEPTHS
5% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17Di_Peak Flood Depths & Levels_0201.mxd

FIGURE 17Diii
PEAK FLOOD CONTOURS AND DEPTHS
5% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17d3_Peak Flood Depths & Levels_020\mxd

FIGURE 17Ei
 PEAK FLOOD CONTOURS AND DEPTHS
 2% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure17e1_Peak Flood Depths & Levels_050y.mxd

FIGURE 17Eii
PEAK FLOOD CONTOURS AND DEPTHS
2% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure17e2_Peak_Flood_Depths & Levels_050v.mxd

Study Area
 [Yellow outline]

Catchment Boundary
 [Green dashed line]

Peak Flood Contours
 [Red line] Major Contours (1.0m Interval)
 [Orange line] Minor Contours (0.5m Interval)

Depth (m)
 [Light blue] 0.0 - 0.3
 [Medium blue] 0.3 - 0.5
 [Dark blue] 0.5 - 1.0
 [Very dark blue] 1.0 - 1.5
 [Purple] 1.5 - 2.0
 [Dark purple] > 2.0

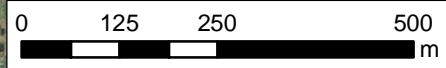
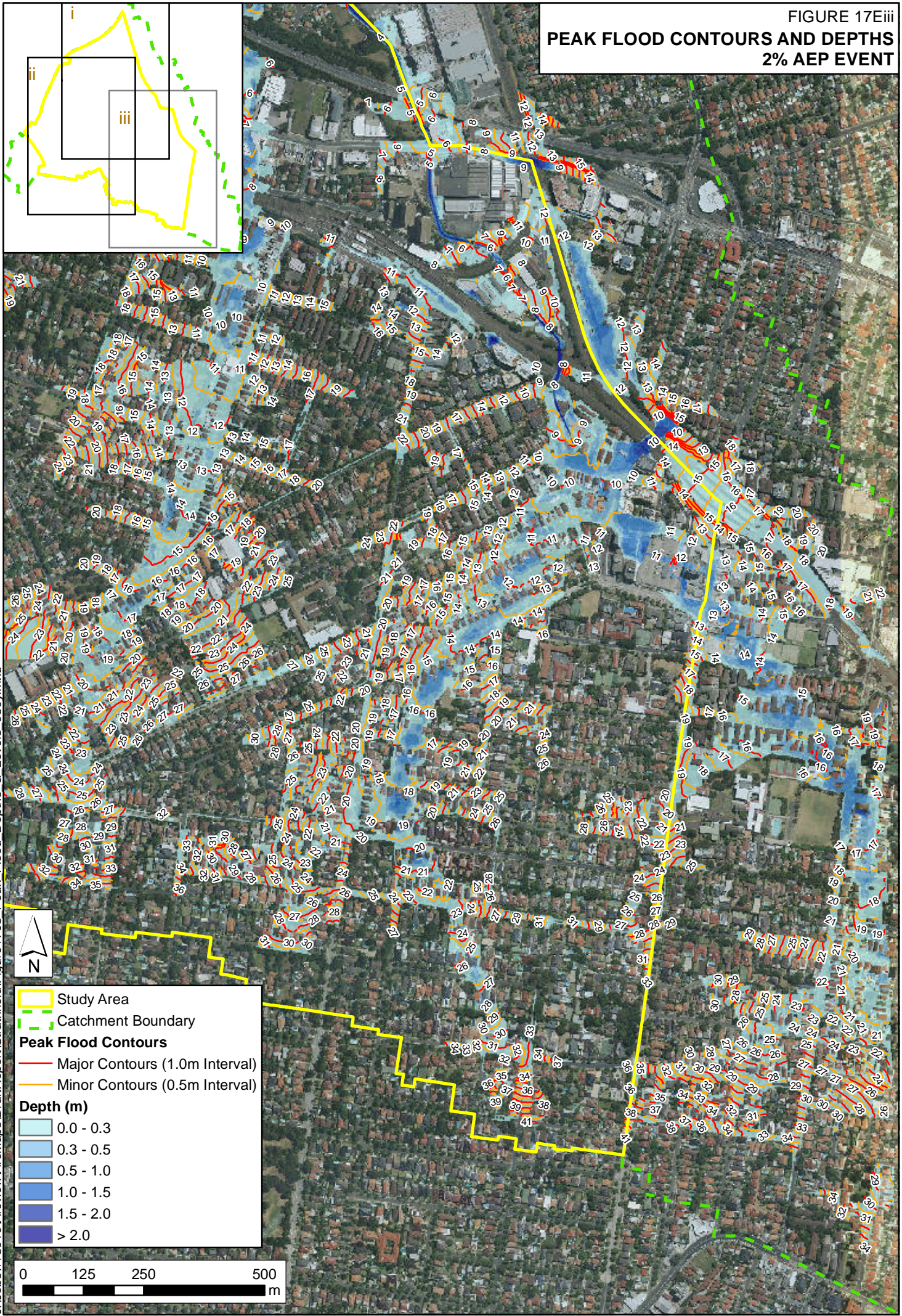


FIGURE 17Eiii
PEAK FLOOD CONTOURS AND DEPTHS
2% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure17e3_Peak Flood Depths & Levels_050y.mxd

FIGURE 17Fi
 PEAK FLOOD CONTOURS AND DEPTHS
 1% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure17Fi Peak Flood Depths & Levels 100y.mxd



Study Area
 [Yellow line symbol]

Catchment Boundary
 [Green dashed line symbol]

Peak Flood Contours
 [Red line symbol] Major Contours (1.0m Interval)
 [Yellow line symbol] Minor Contours (0.5m Interval)

Depth (m)

[Lightest blue swatch]	0.0 - 0.3
[Light blue swatch]	0.3 - 0.5
[Medium blue swatch]	0.5 - 1.0
[Dark blue swatch]	1.0 - 1.5
[Darkest blue swatch]	1.5 - 2.0
[Black swatch]	> 2.0

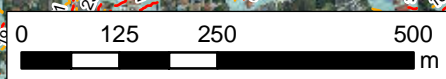
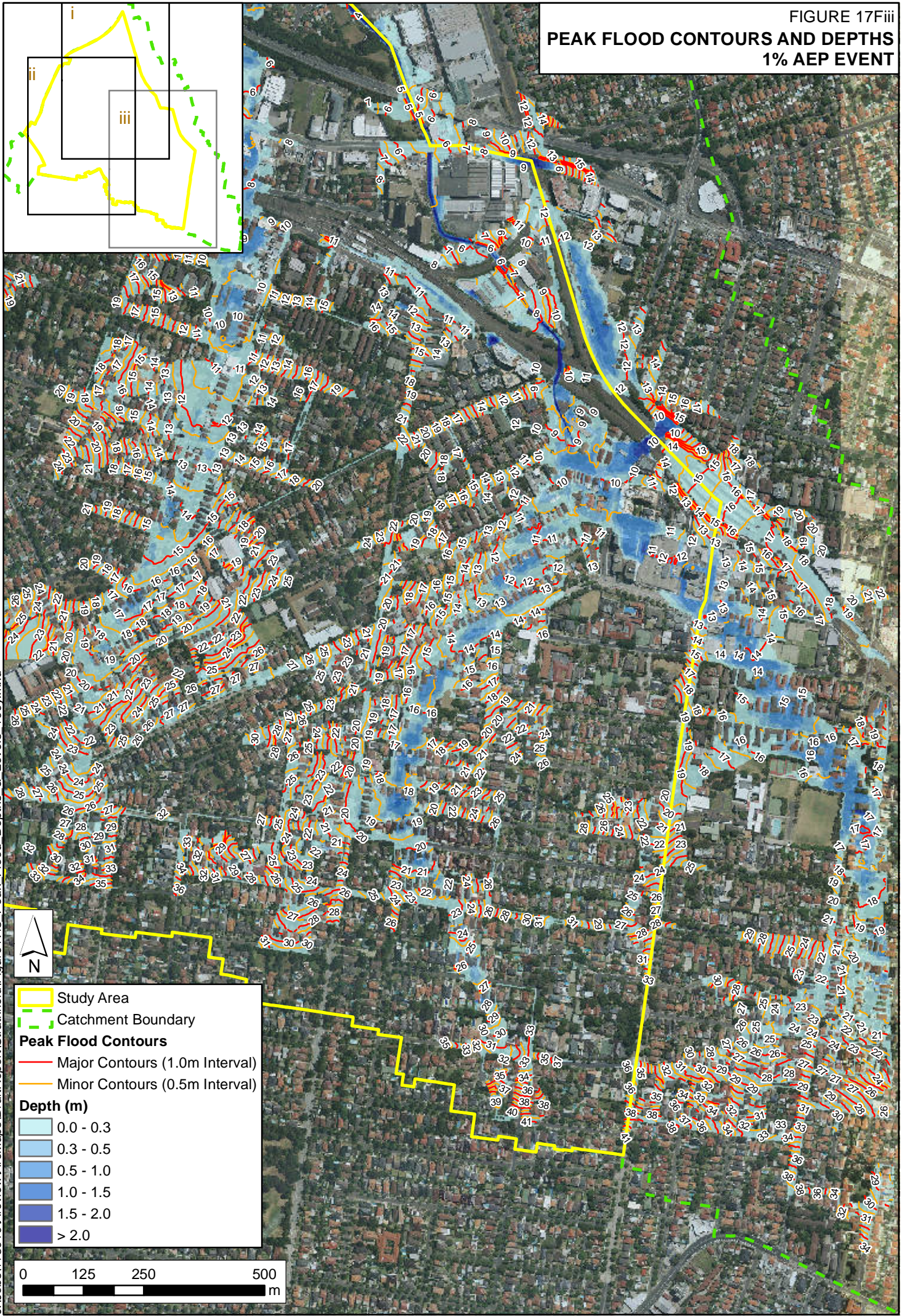


FIGURE 17Fii
PEAK FLOOD CONTOURS AND DEPTHS
1% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17Fii Peak Flood Depths & Levels 100y.mxd

FIGURE 17Fiii
PEAK FLOOD CONTOURS AND DEPTHS
1% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure17F3 Peak Flood Depths & Levels 100y.mxd

FIGURE 17Gi
PEAK FLOOD CONTOURS AND DEPTHS
0.5% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure17g1_Peak Flood Depths & Levels_200y.mxd

FIGURE 17Gii
PEAK FLOOD CONTOURS AND DEPTHS
0.5% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17g2_Peak Flood Depths & Levels 200y.mxd

Study Area
 [Yellow outline]

Catchment Boundary
 [Dashed green line]

Peak Flood Contours
 [Red line] Major Contours (1.0m Interval)
 [Orange line] Minor Contours (0.5m Interval)

Depth (m)
 [Light blue] 0.0 - 0.3
 [Medium blue] 0.3 - 0.5
 [Dark blue] 0.5 - 1.0
 [Very dark blue] 1.0 - 1.5
 [Purple] 1.5 - 2.0
 [Dark purple] > 2.0

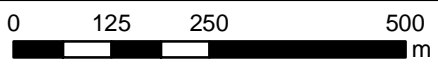


FIGURE 17Giii

**PEAK FLOOD CONTOURS AND DEPTHS
0.5% AEP EVENT**

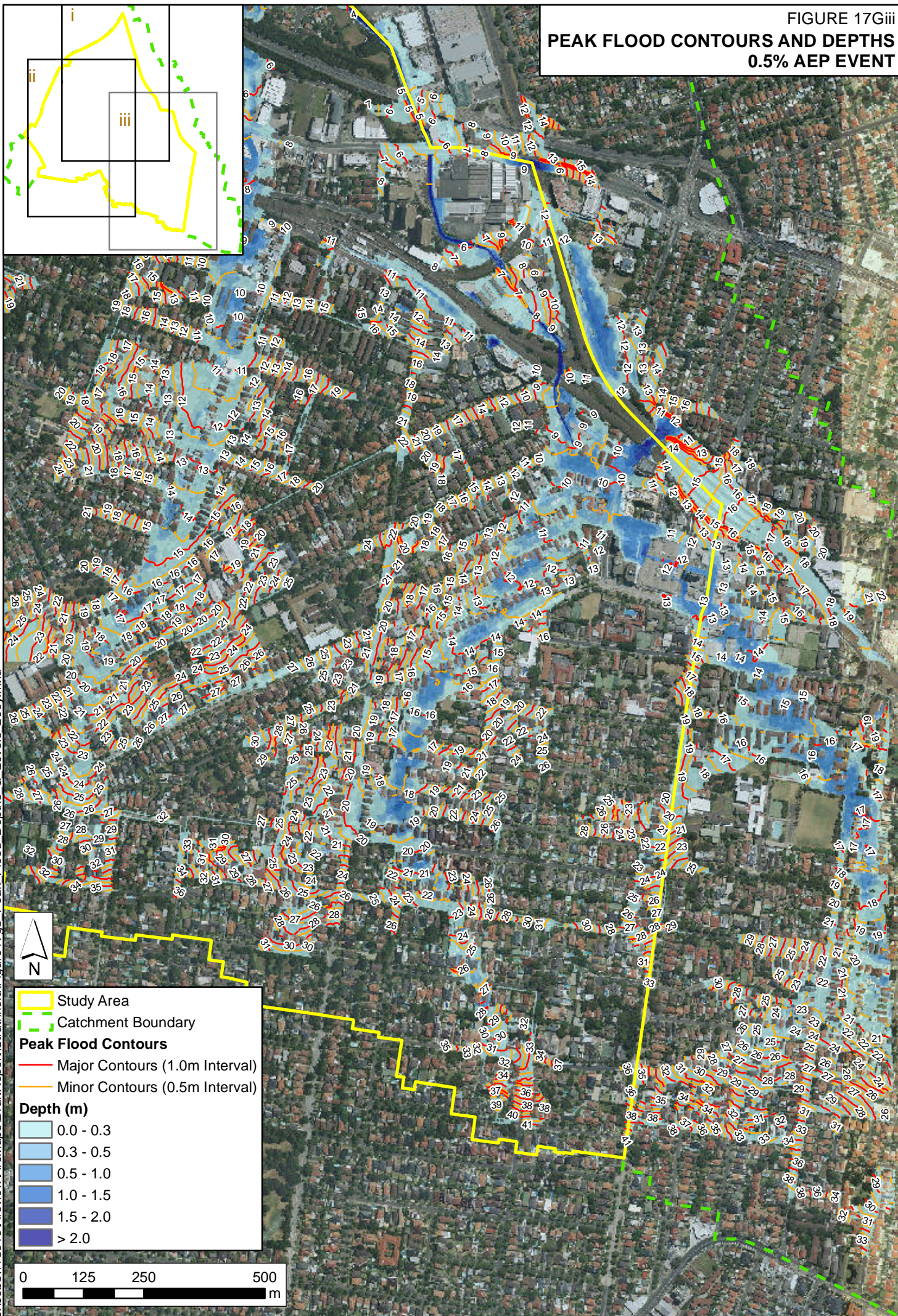


FIGURE 17Hi
 PEAK FLOOD CONTOURS AND DEPTHS
 0.2% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17Hi_Peak Flood Depths & Levels_500y.mxd

FIGURE 17Hii
PEAK FLOOD CONTOURS AND DEPTHS
0.2% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17H2_Peak Flood Depths & Levels_500v.mxd

Study Area
 [Yellow outline]

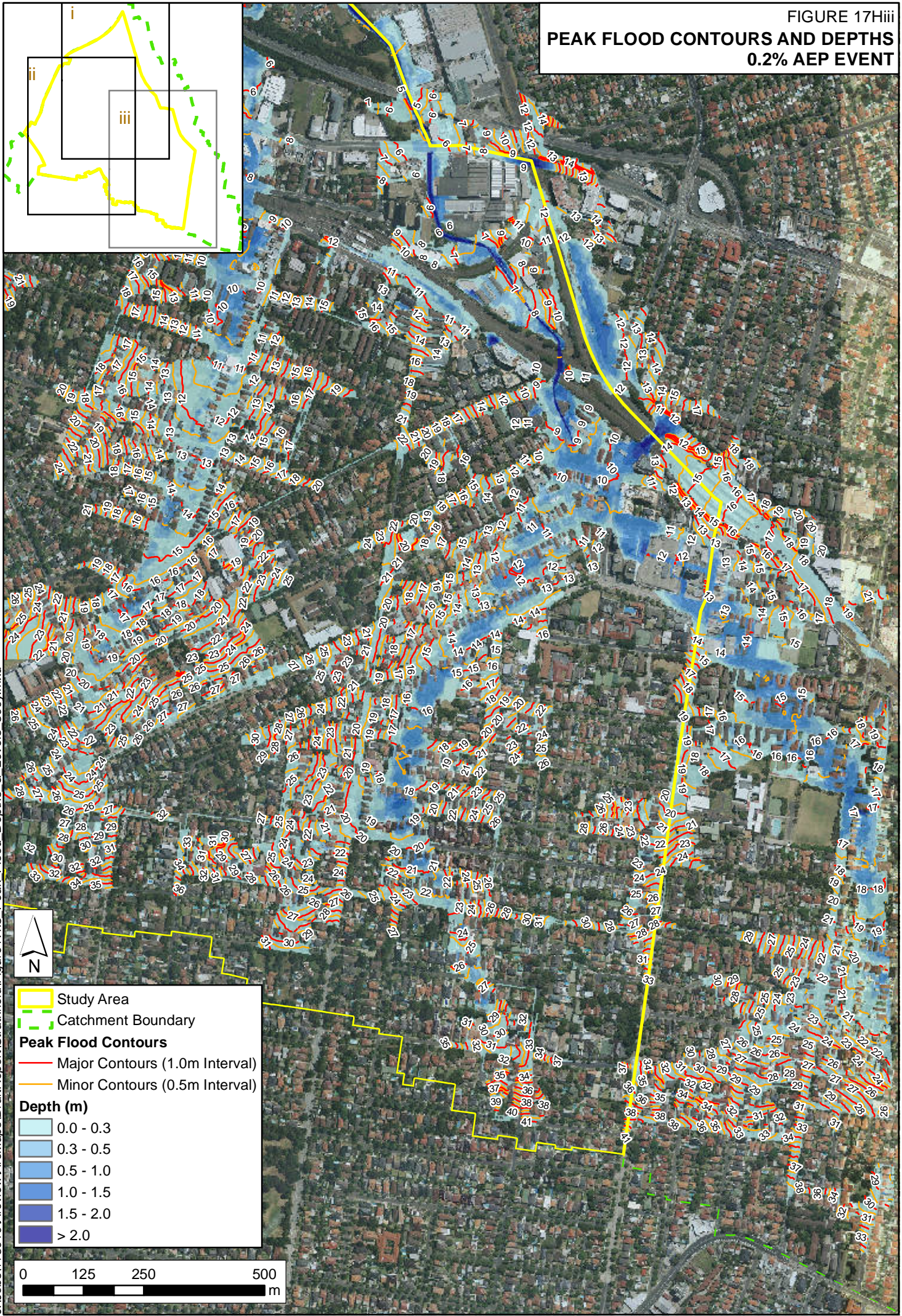
Catchment Boundary
 [Dashed green line]

Peak Flood Contours
 [Red line] Major Contours (1.0m Interval)
 [Orange line] Minor Contours (0.5m Interval)

Depth (m)
 [Light blue] 0.0 - 0.3
 [Medium blue] 0.3 - 0.5
 [Dark blue] 0.5 - 1.0
 [Very dark blue] 1.0 - 1.5
 [Purple] 1.5 - 2.0
 [Dark purple] > 2.0



FIGURE 17Hiii
PEAK FLOOD CONTOURS AND DEPTHS
0.2% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure17h3_Peak Flood Depths & Levels_500v.mxd

Study Area
 — Yellow outline

Catchment Boundary
 - - Green dashed line

Peak Flood Contours
 — Red line: Major Contours (1.0m Interval)
 — Orange line: Minor Contours (0.5m Interval)

Depth (m)

Light Blue	0.0 - 0.3
Medium Blue	0.3 - 0.5
Dark Blue	0.5 - 1.0
Very Dark Blue	1.0 - 1.5
Purple	1.5 - 2.0
Dark Purple	> 2.0

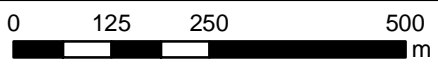
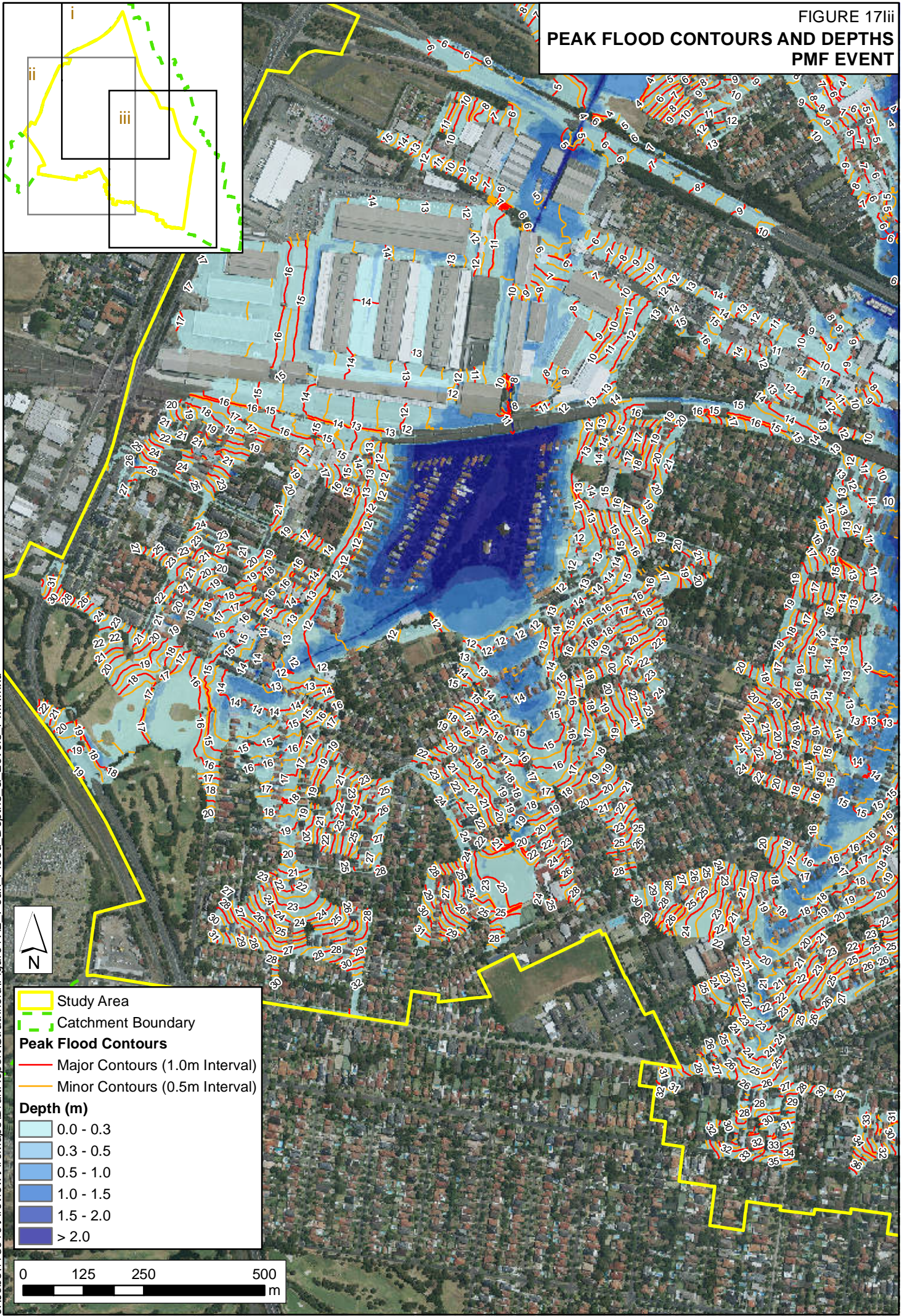


FIGURE 17ii
 PEAK FLOOD CONTOURS AND DEPTHS
 PMF EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure17ii Peak Flood Depths & Levels_PMF.mxd

FIGURE 17ii
PEAK FLOOD CONTOURS AND DEPTHS
PMF EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17ii Peak Flood Depths & Levels PMF.mxd

Study Area
 [Yellow outline]

Catchment Boundary
 [Dashed green line]

Peak Flood Contours
 [Red line] Major Contours (1.0m Interval)
 [Orange line] Minor Contours (0.5m Interval)

Depth (m)
 [Light blue] 0.0 - 0.3
 [Medium blue] 0.3 - 0.5
 [Dark blue] 0.5 - 1.0
 [Very dark blue] 1.0 - 1.5
 [Darkest blue] 1.5 - 2.0
 [Black] > 2.0

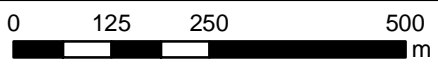
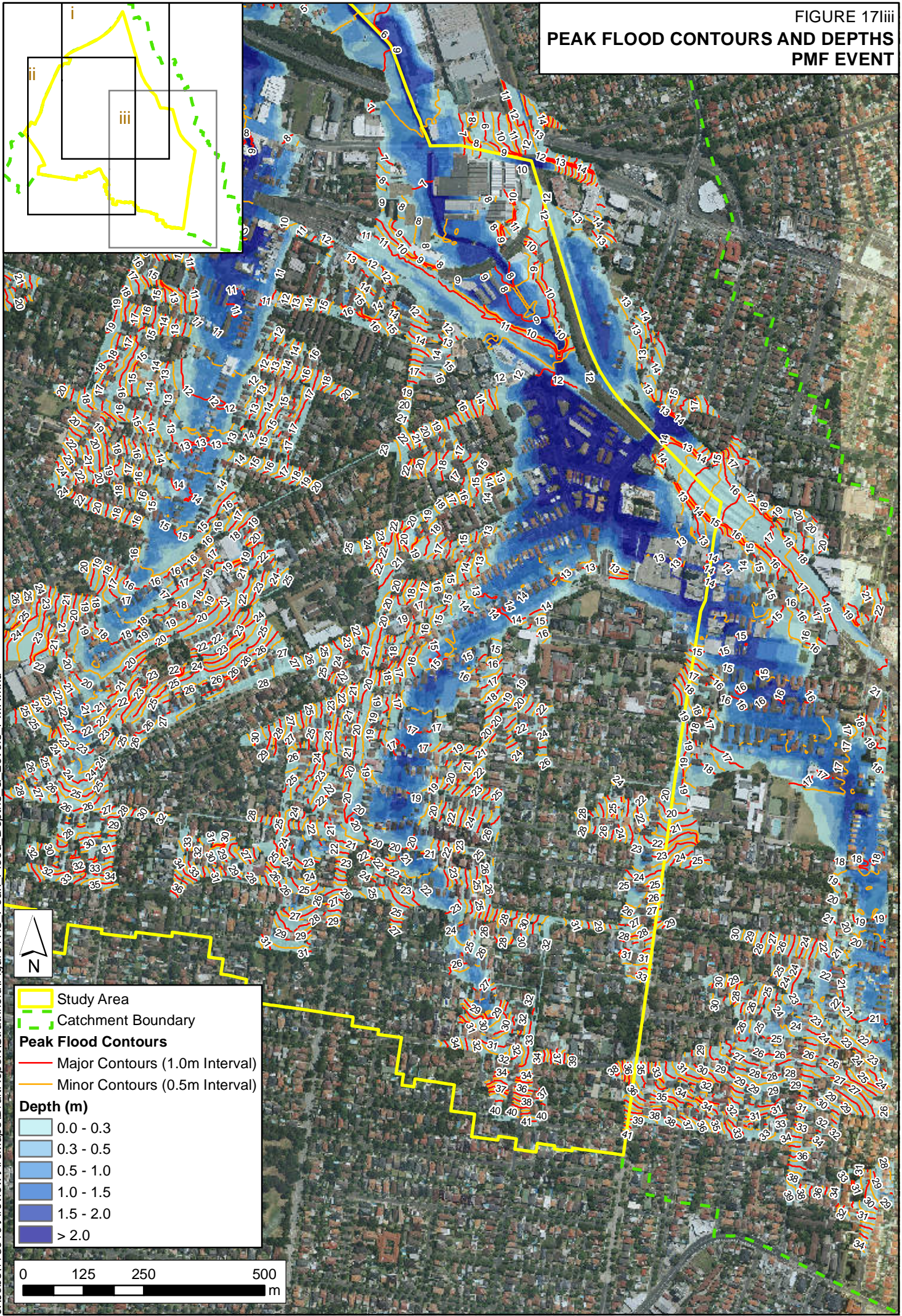
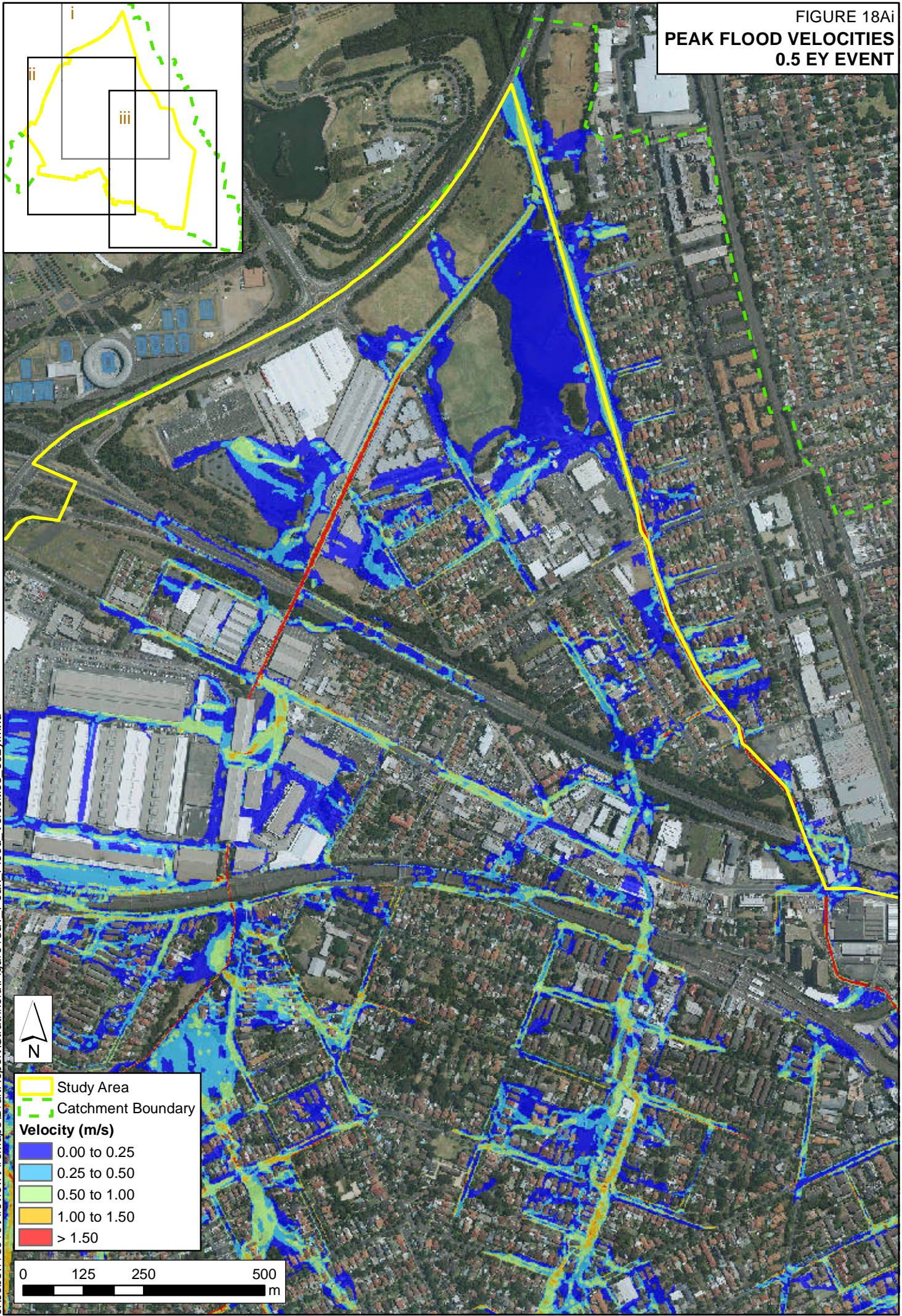


FIGURE 17liii
PEAK FLOOD CONTOURS AND DEPTHS
PMF EVENT



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure17iii Peak Flood Depths & Levels PMF.mxd

FIGURE 18Ai
PEAK FLOOD VELOCITIES
0.5 EY EVENT



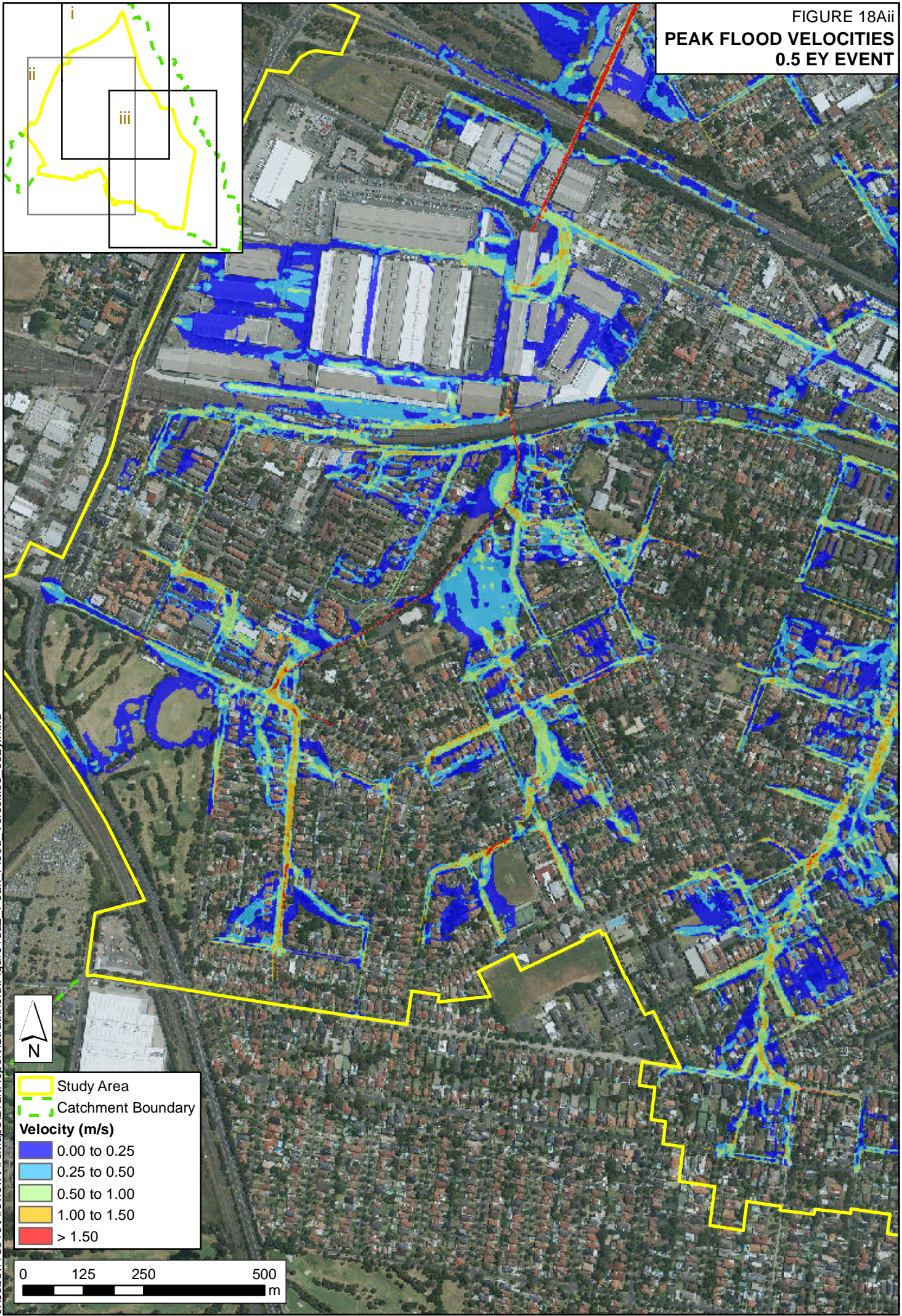
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18a1_Peak Flood Velocities_002y.mxd



- Study Area
- Catchment Boundary
- Velocity (m/s)**
- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- > 1.50

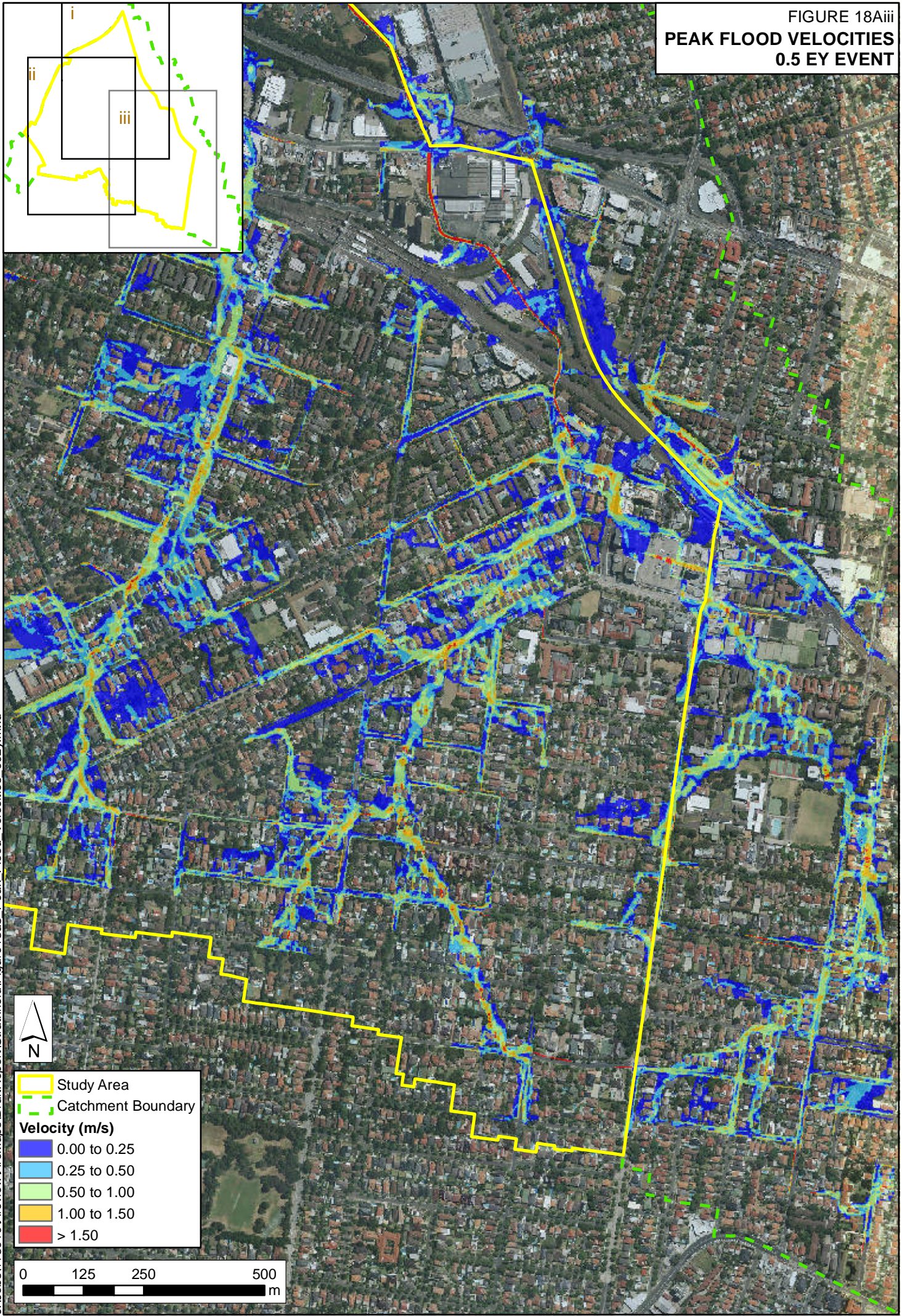
0 125 250 500 m

FIGURE 18Aii
PEAK FLOOD VELOCITIES
0.5 EY EVENT



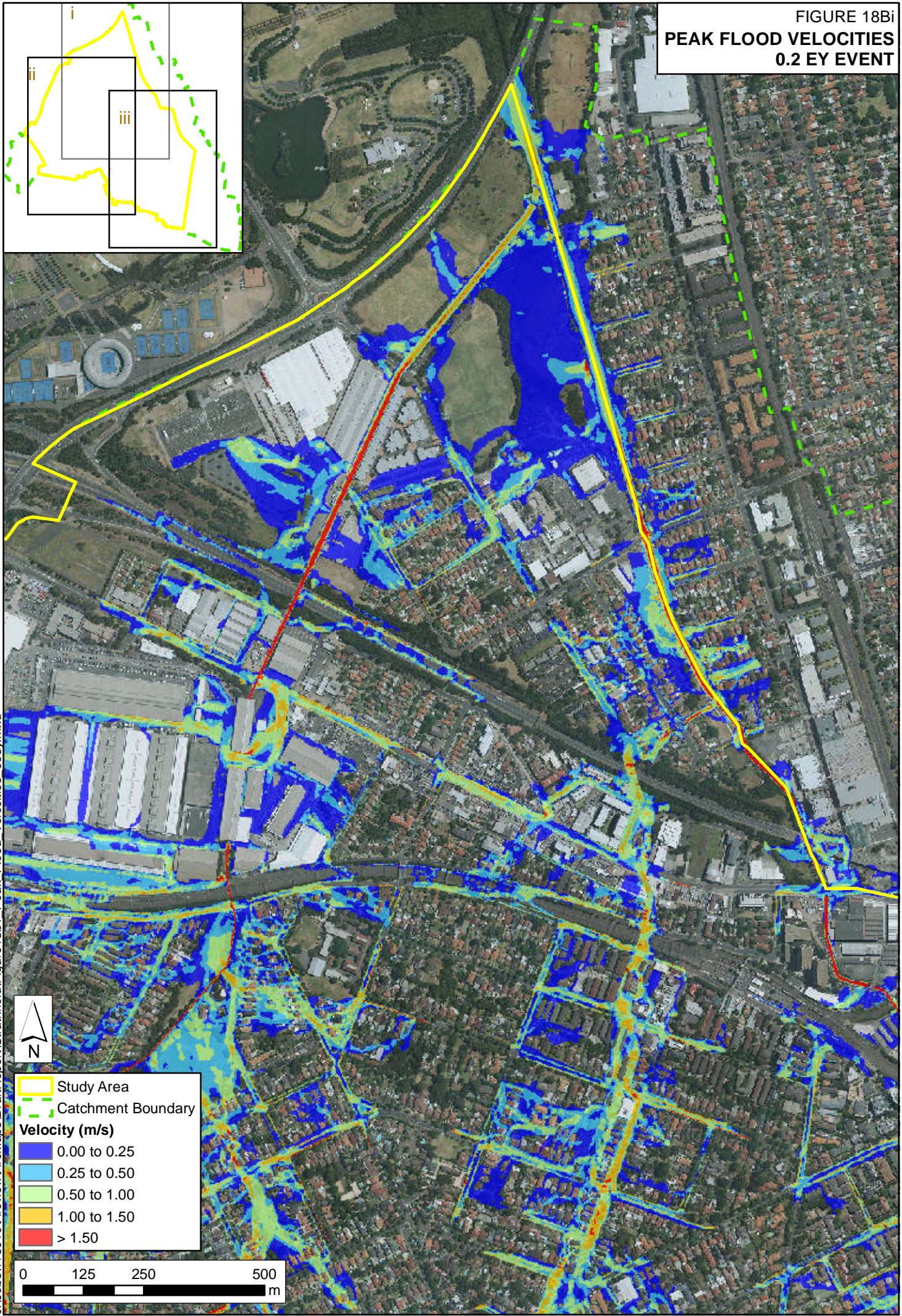
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 18a2_Peak Flood Velocities_002y.mxd

FIGURE 18Aiii
PEAK FLOOD VELOCITIES
0.5 EY EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18a3_Peak Flood Velocities_002y.mxd

FIGURE 18Bi
PEAK FLOOD VELOCITIES
0.2 EY EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 18b1_Peak Flood Velocities_005y.mxd



- Study Area
- Catchment Boundary
- Velocity (m/s)**
- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- > 1.50

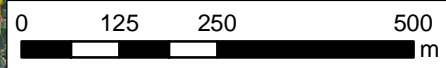
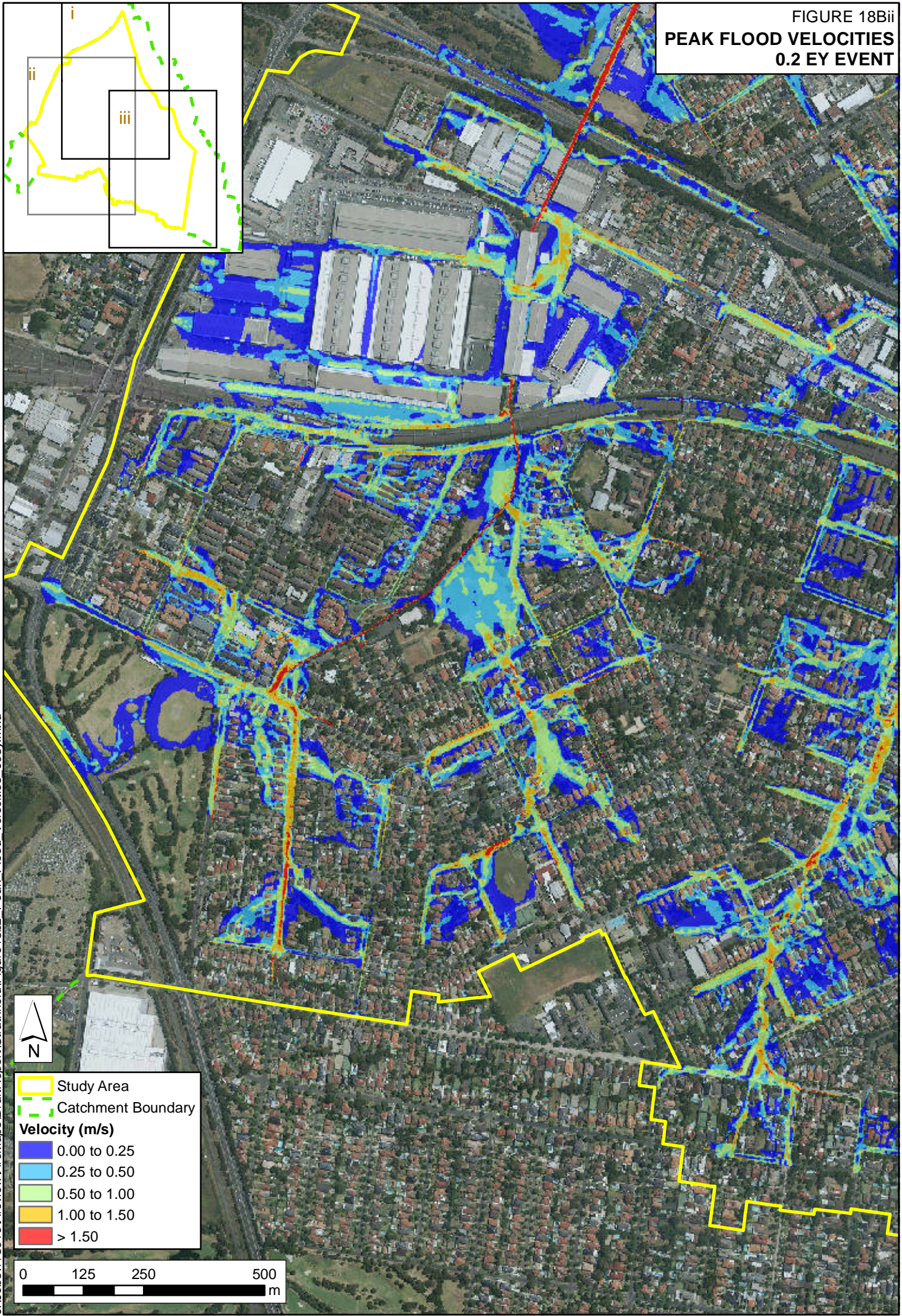


FIGURE 18Bii
PEAK FLOOD VELOCITIES
0.2 EY EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 18b2_Peak Flood Velocities_005y.mxd



Study Area
Yellow outline

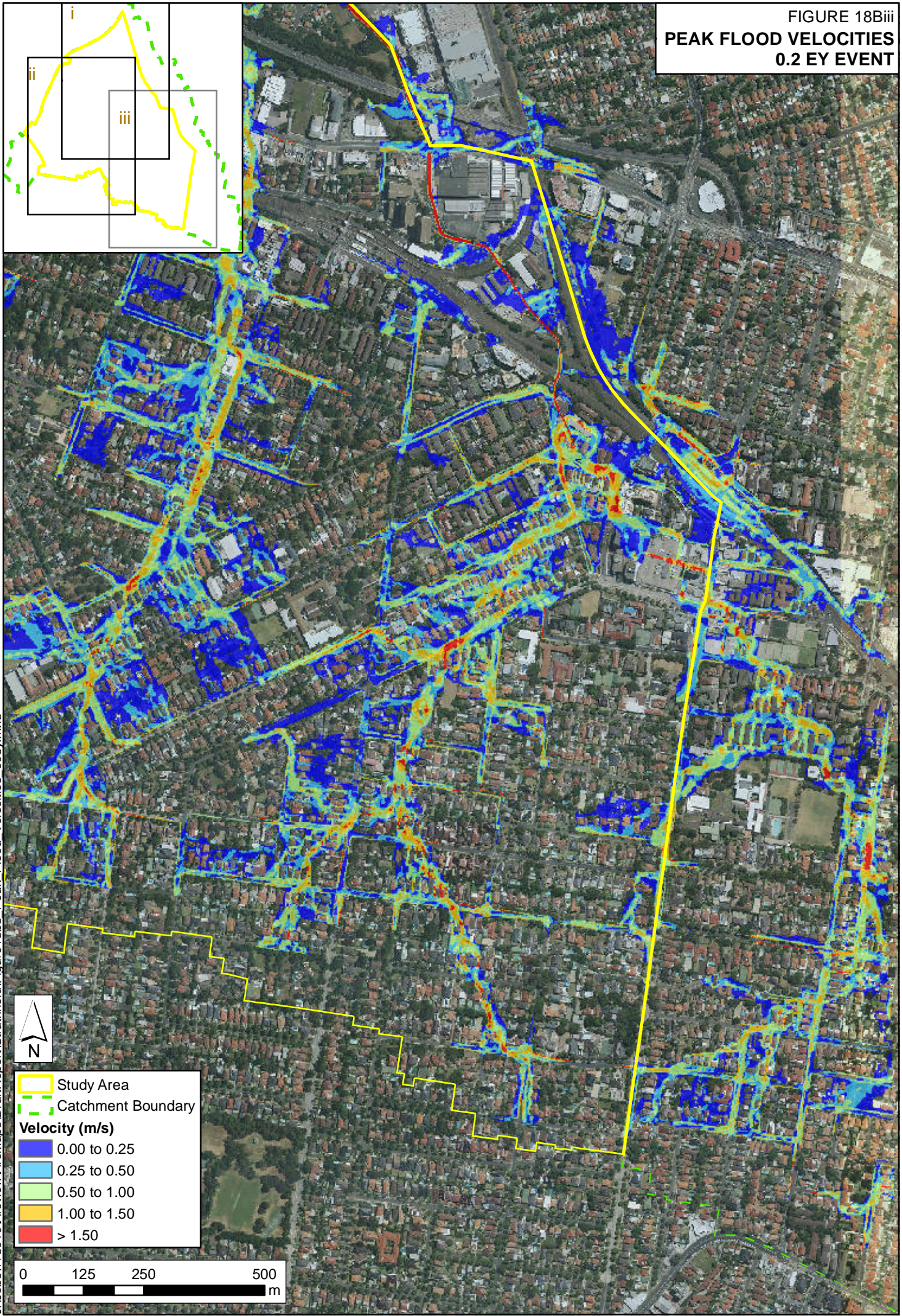
Catchment Boundary
Dashed green line

Velocity (m/s)

Blue	0.00 to 0.25
Light Blue	0.25 to 0.50
Light Green	0.50 to 1.00
Yellow	1.00 to 1.50
Red	> 1.50



FIGURE 18Biii
PEAK FLOOD VELOCITIES
0.2 EY EVENT



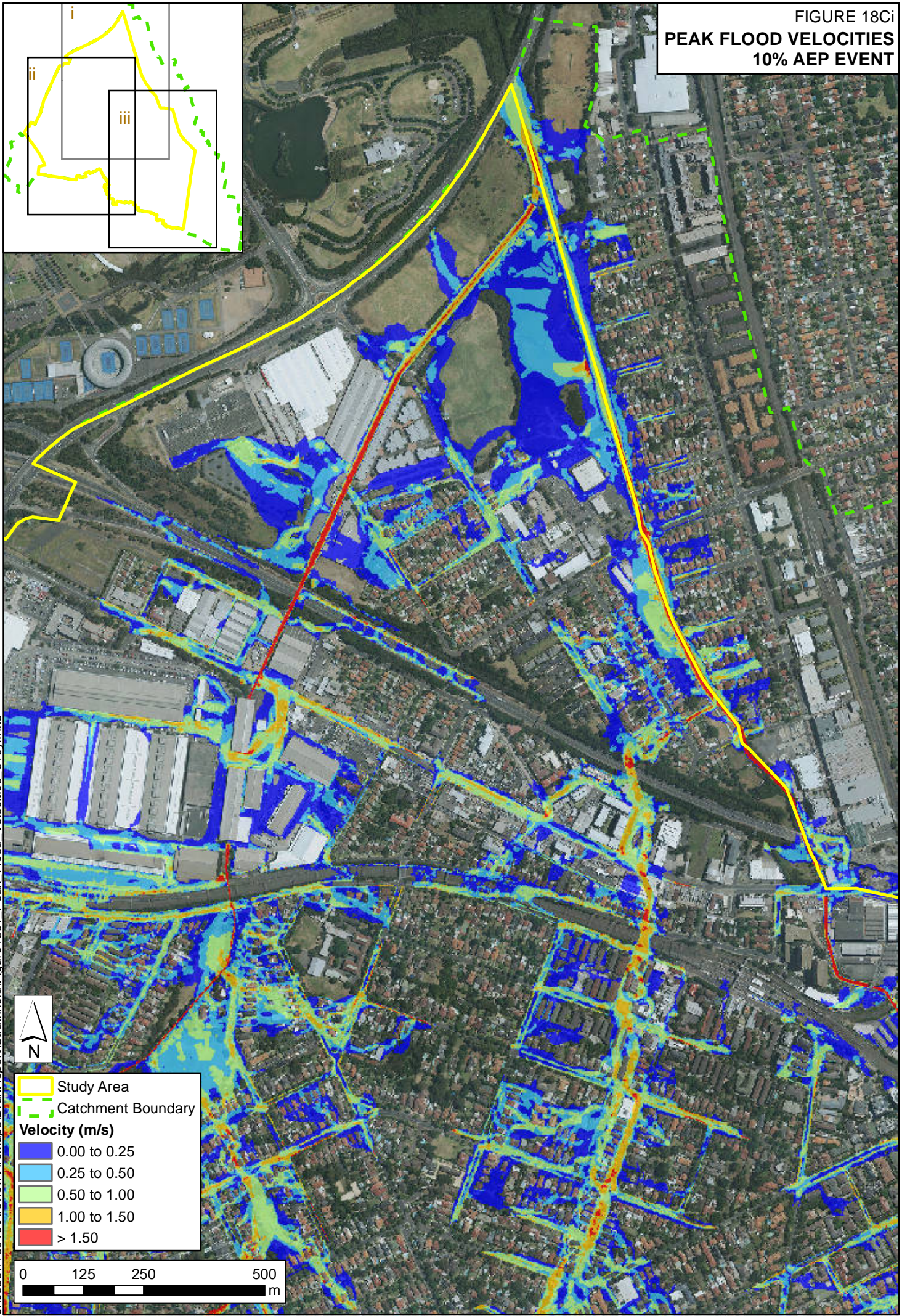
J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure 18b3_Peak Flood Velocities_005y.mxd



- Study Area
- Catchment Boundary
- Velocity (m/s)**
- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- > 1.50

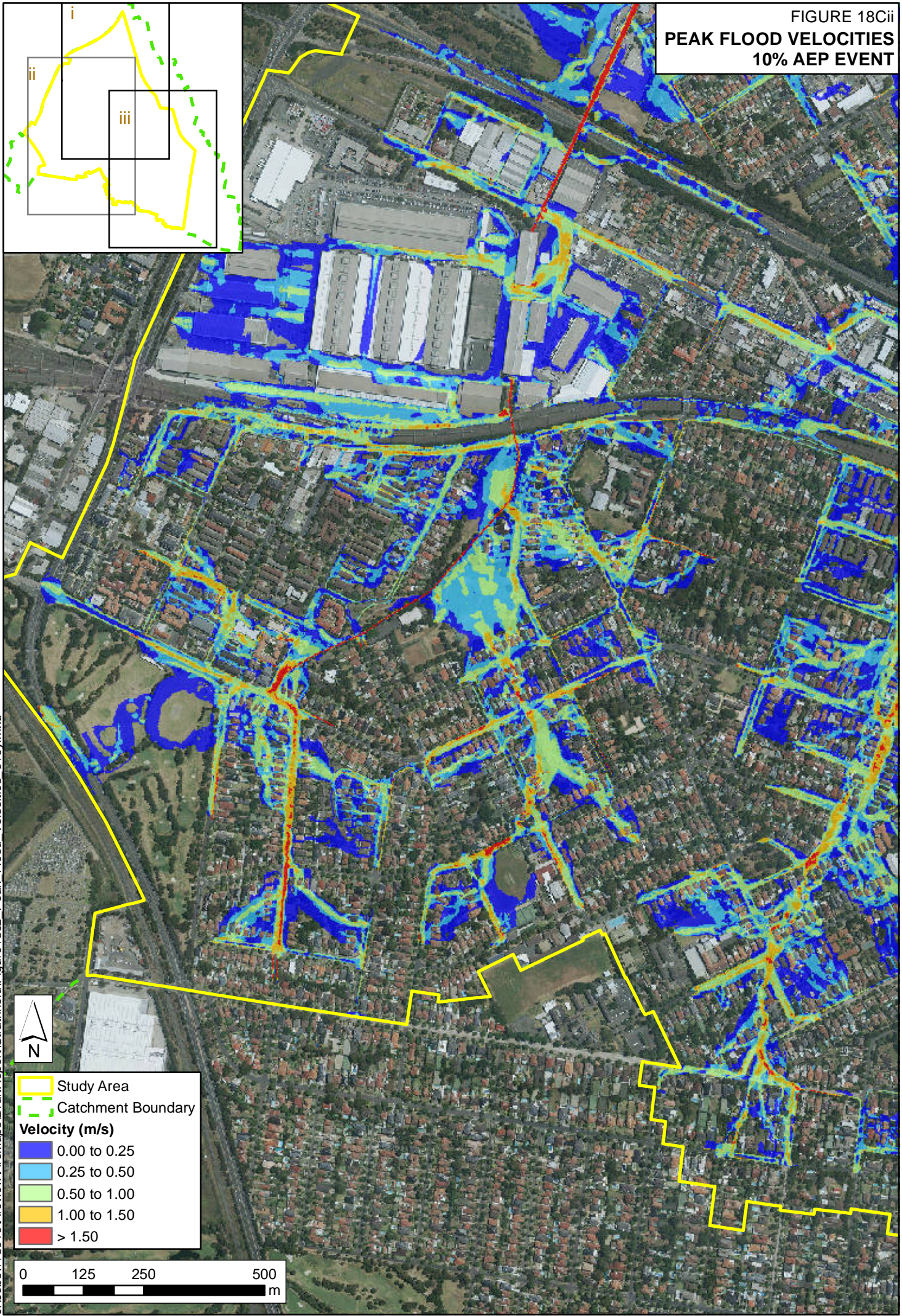


FIGURE 18Ci
PEAK FLOOD VELOCITIES
10% AEP EVENT



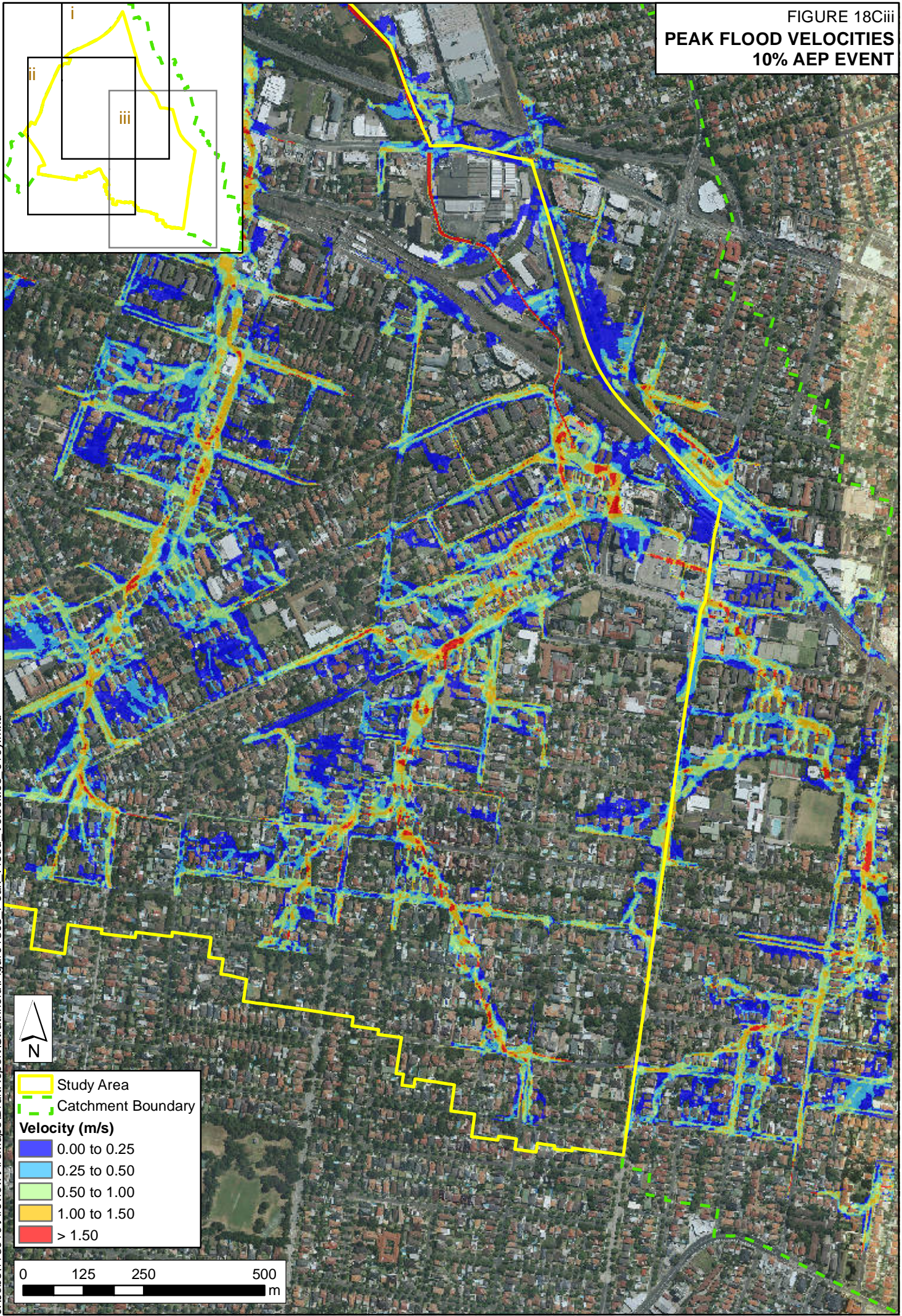
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18c1_Peak Flood Velocities_010y.mxd

FIGURE 18Cii
PEAK FLOOD VELOCITIES
10% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 18c2_Peak Flood Velocities_010y.mxd

FIGURE 18Ciii
PEAK FLOOD VELOCITIES
10% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18c3_Peak Flood Velocities_010y.mxd



- Study Area
- Catchment Boundary
- Velocity (m/s)**
- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- > 1.50



FIGURE 18Di
PEAK FLOOD VELOCITIES
5% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18d1_Peak Flood Velocities_020y.mxd



- Study Area
- Catchment Boundary
- Velocity (m/s)**
- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- > 1.50

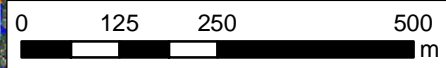
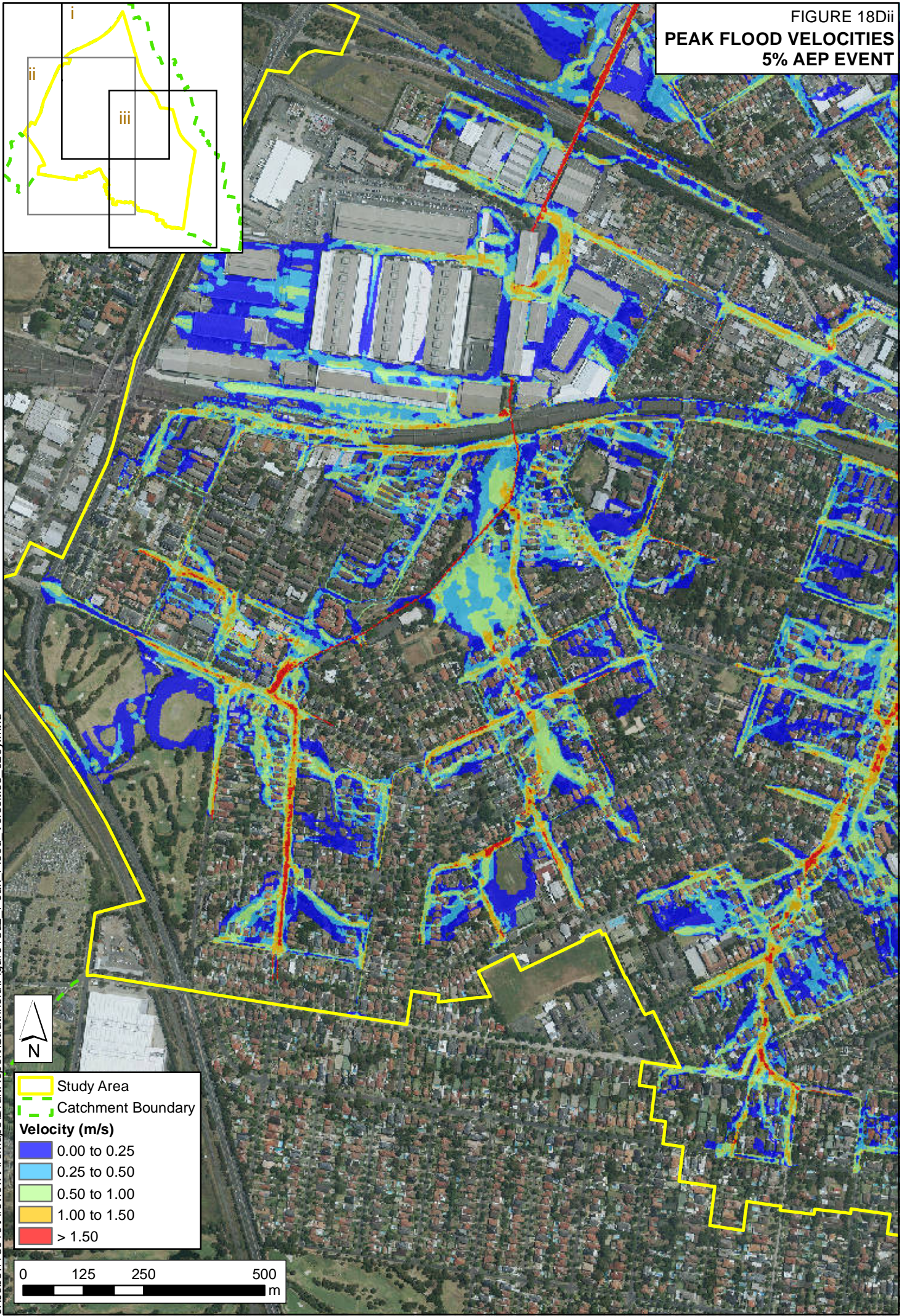


FIGURE 18Dii
PEAK FLOOD VELOCITIES
5% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 18d2_Peak Flood Velocities_020y.mxd

FIGURE 18Diii
PEAK FLOOD VELOCITIES
5% AEP EVENT

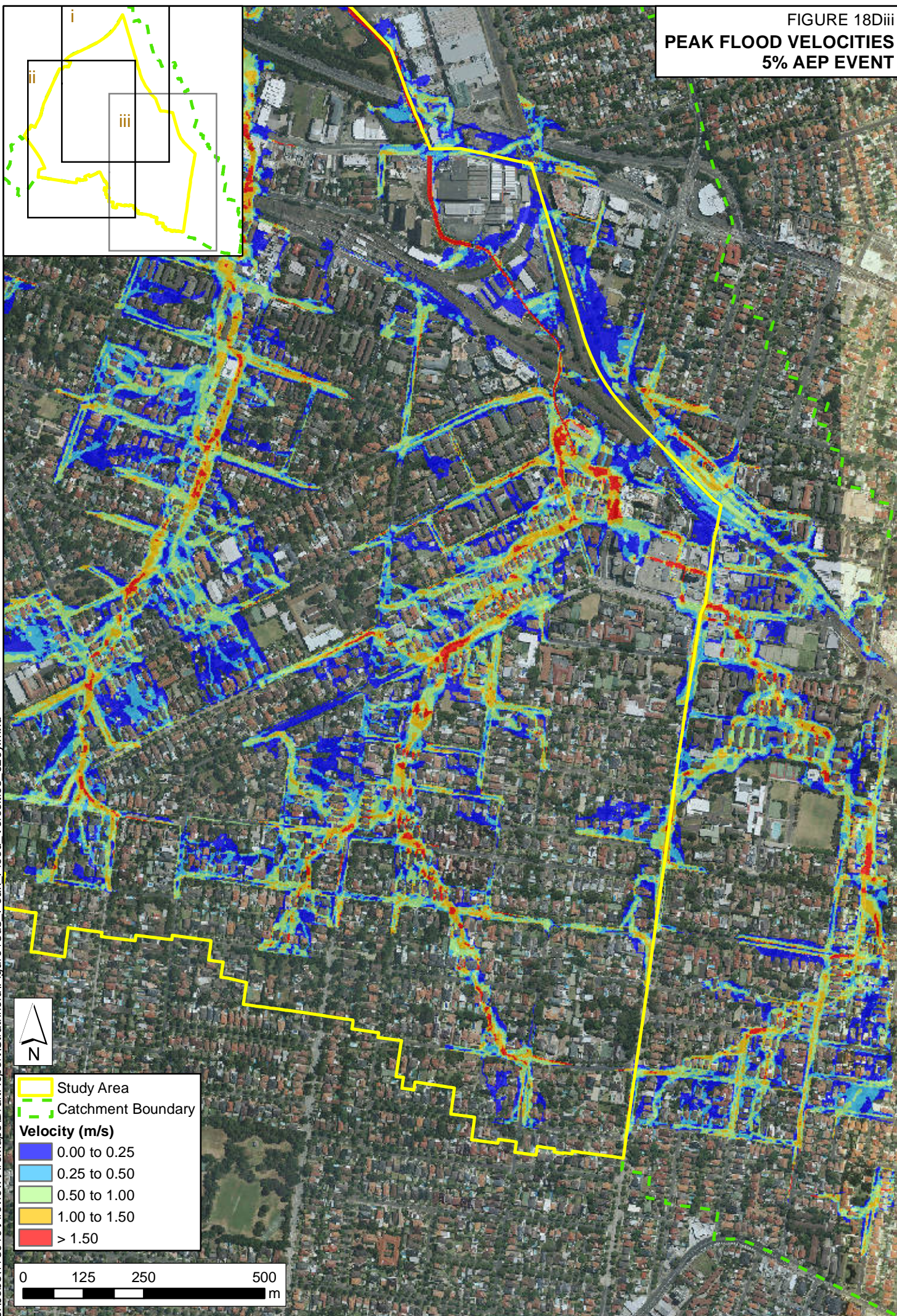
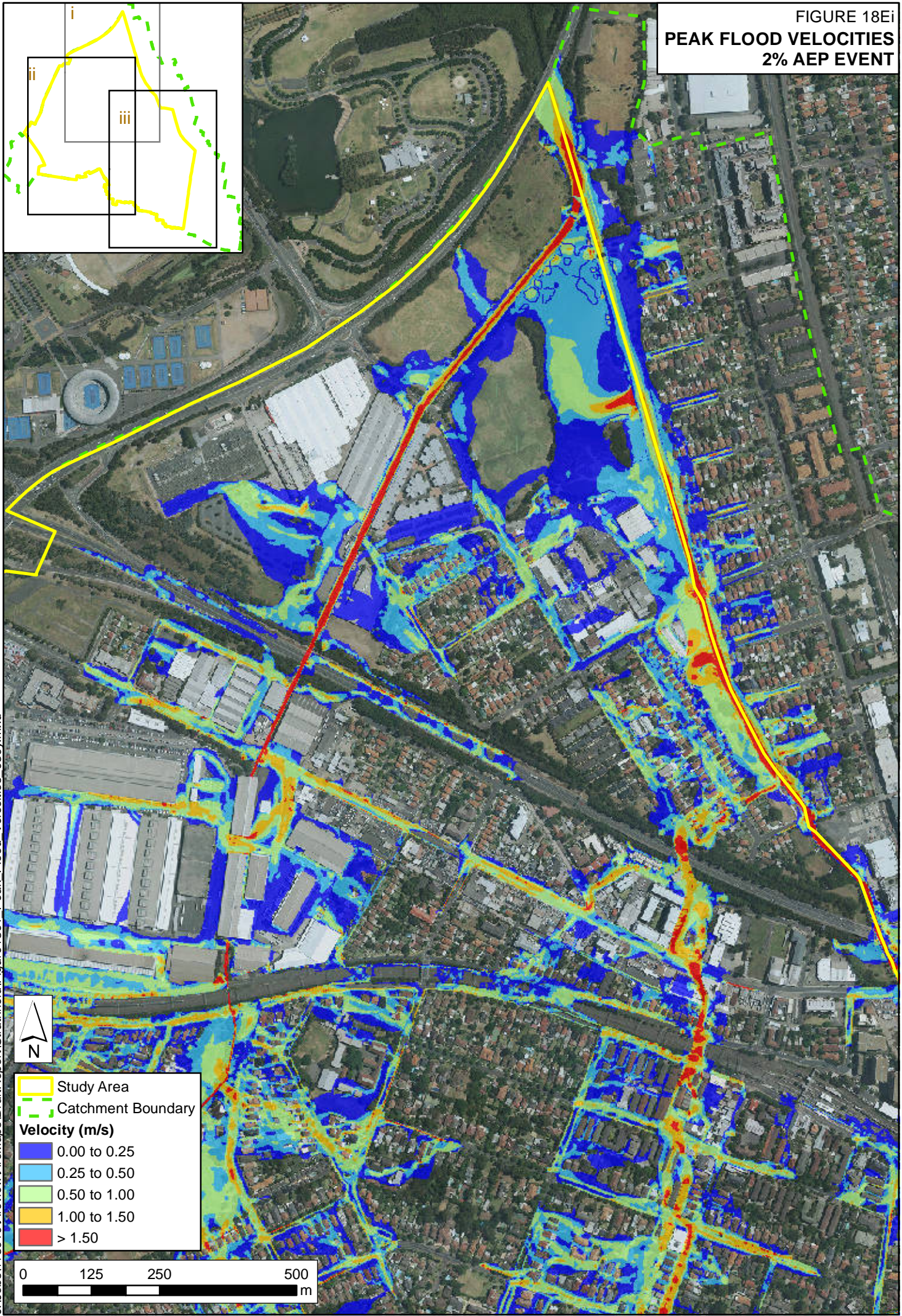


FIGURE 18Ei
PEAK FLOOD VELOCITIES
2% AEP EVENT



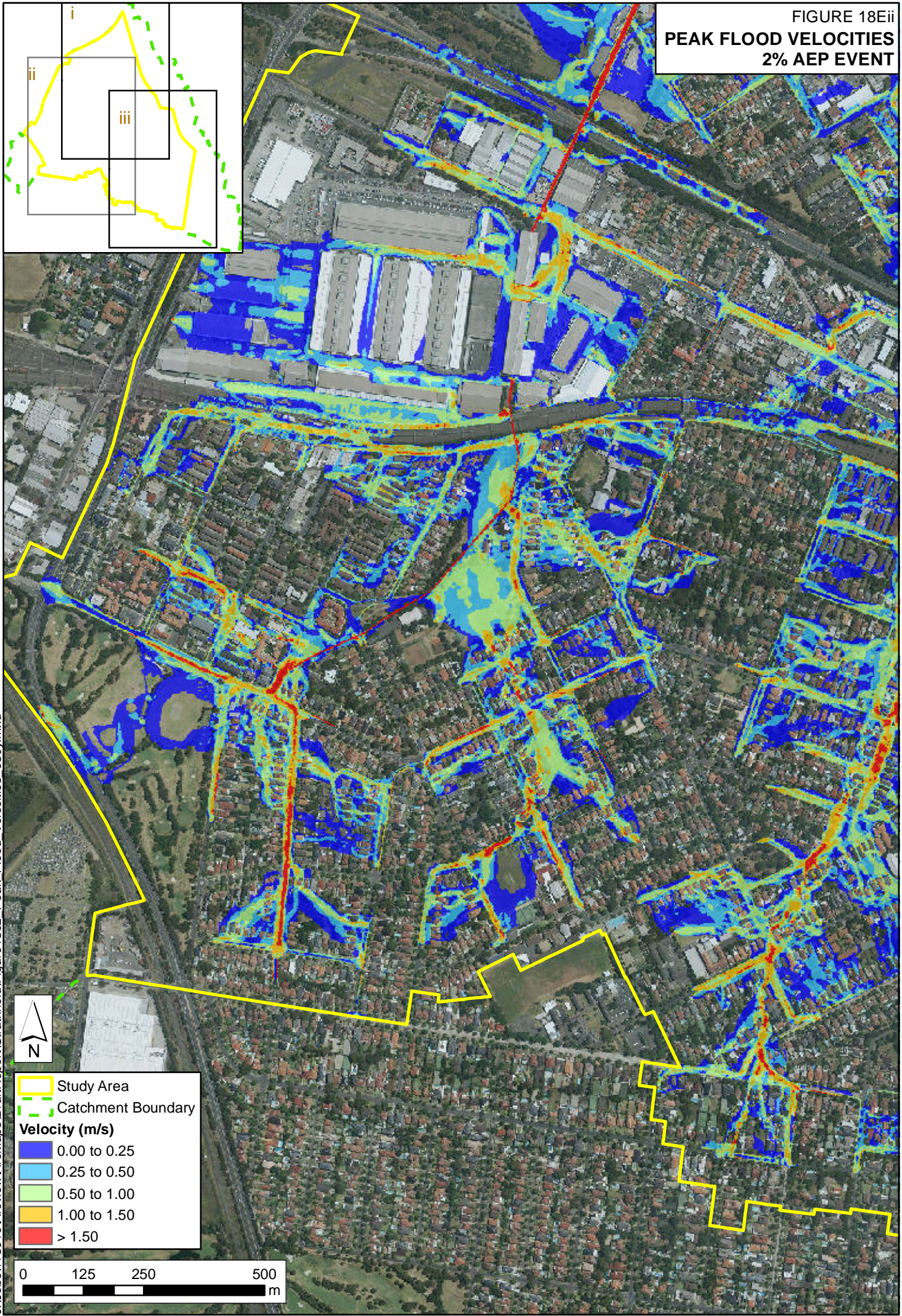
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 18e1_Peak Flood Velocities_050y.mxd



- Study Area
- Catchment Boundary
- Velocity (m/s)**
- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- > 1.50



FIGURE 18Eii
PEAK FLOOD VELOCITIES
2% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 18e2_Peak Flood Velocities_050y.mxd



Study Area
Yellow outline

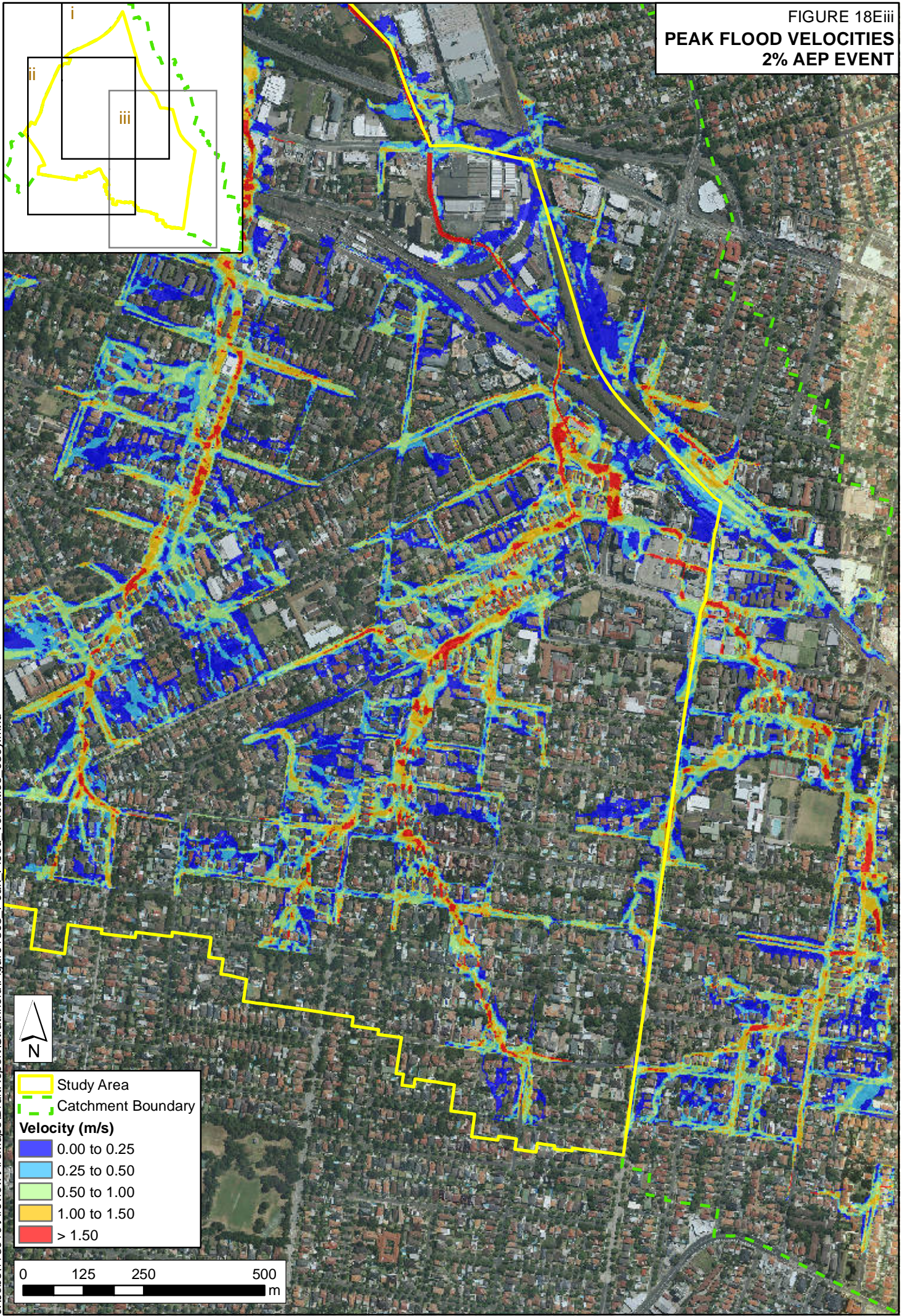
Catchment Boundary
Dashed green line

Velocity (m/s)

Blue	0.00 to 0.25
Light Blue	0.25 to 0.50
Light Green	0.50 to 1.00
Yellow	1.00 to 1.50
Red	> 1.50










FIGURE 18Eiii
PEAK FLOOD VELOCITIES
2% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18e3_Peak Flood Velocities_050y.mxd



-  Study Area
-  Catchment Boundary
- Velocity (m/s)**
-  0.00 to 0.25
-  0.25 to 0.50
-  0.50 to 1.00
-  1.00 to 1.50
-  > 1.50

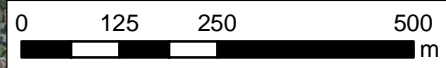


FIGURE 18Fi
PEAK FLOOD VELOCITIES
1% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18f1 Peak Flood Velocities 100y.mxd

FIGURE 18Fii
PEAK FLOOD VELOCITIES
1% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 18f2 Peak Flood Velocities 100y.mxd



Study Area
Yellow outline

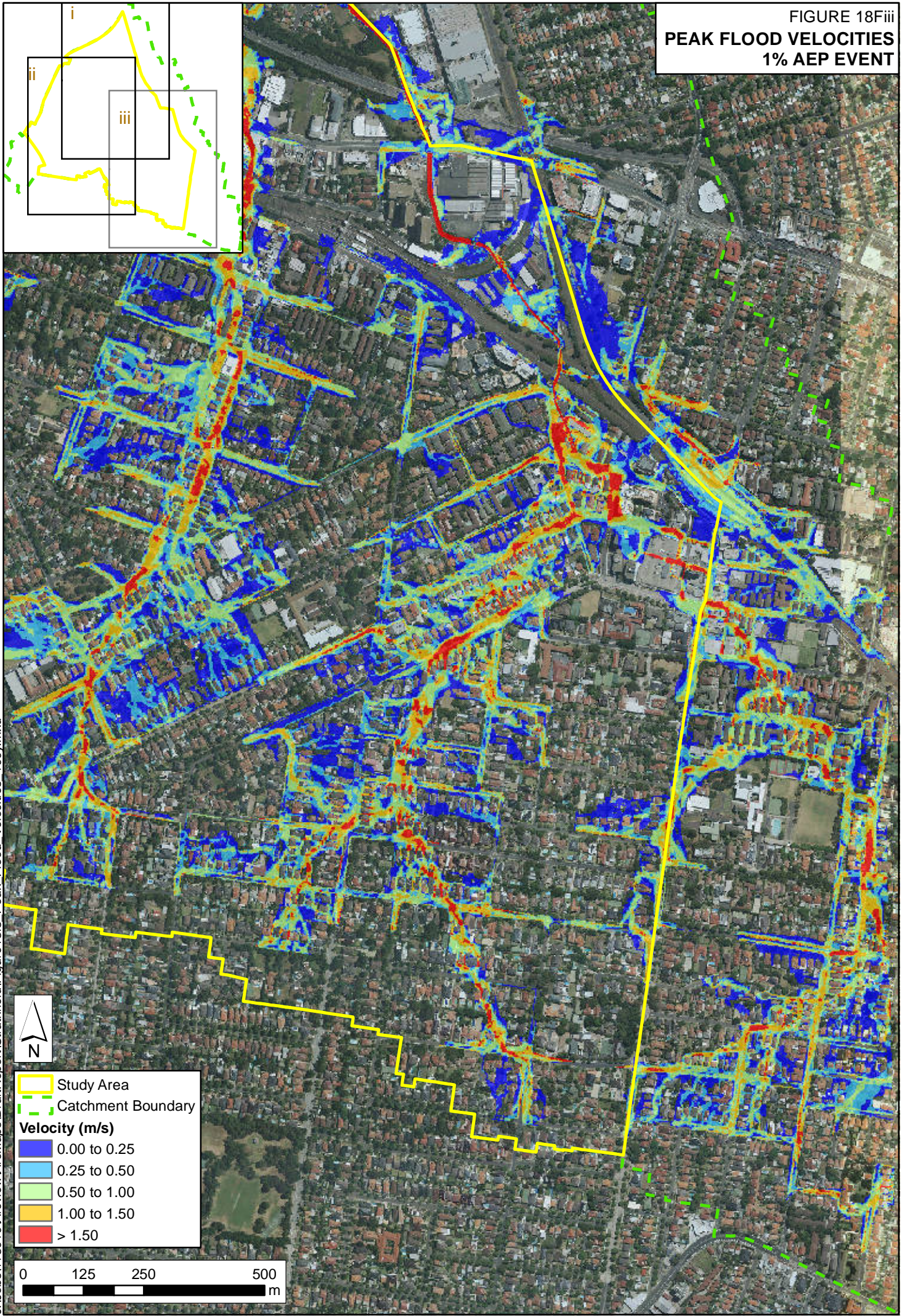
Catchment Boundary
Green dashed line

Velocity (m/s)

Blue	0.00 to 0.25
Light Blue	0.25 to 0.50
Light Green	0.50 to 1.00
Yellow	1.00 to 1.50
Red	> 1.50



FIGURE 18Fiii
PEAK FLOOD VELOCITIES
1% AEP EVENT



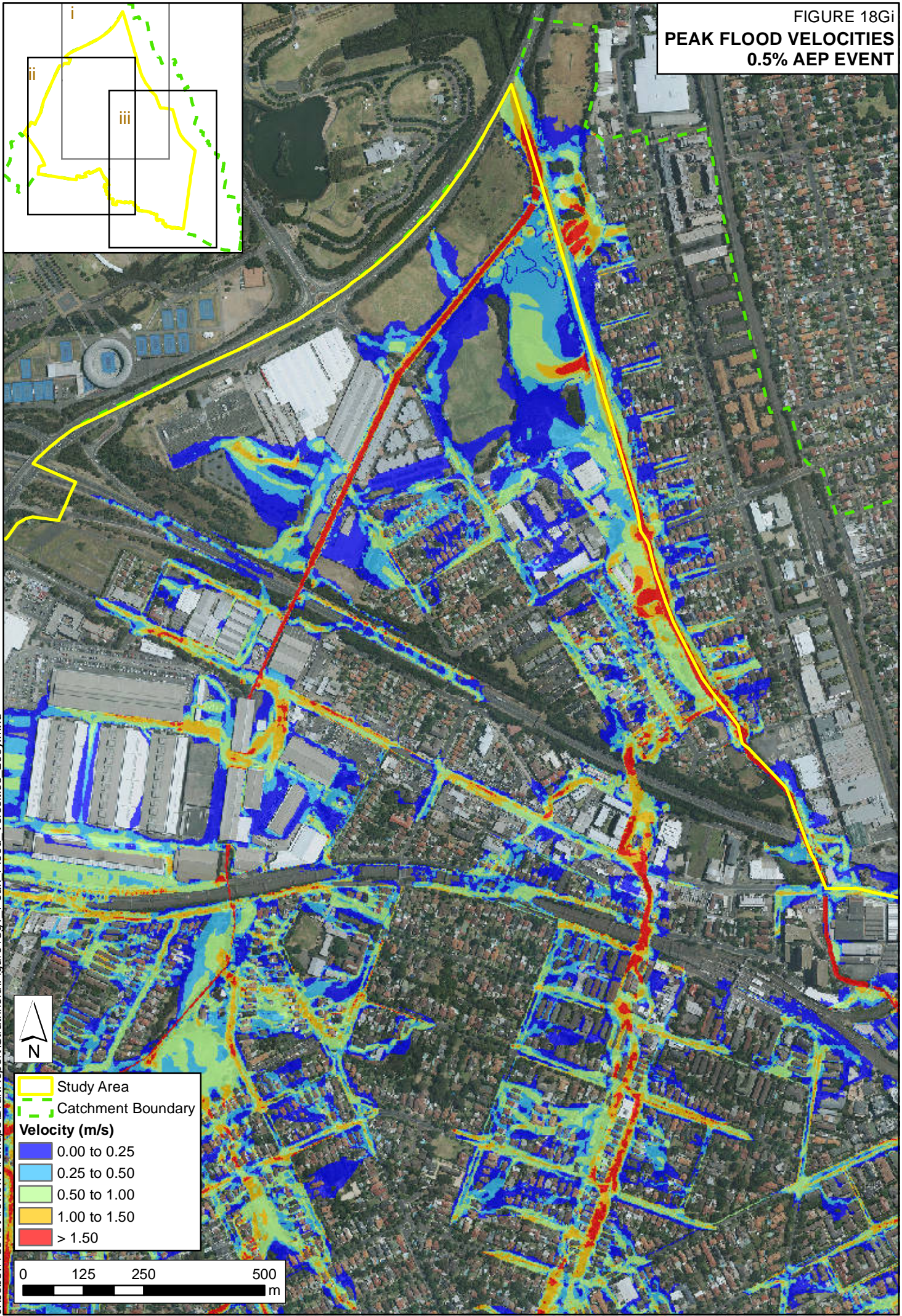
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18f3 Peak Flood Velocities 100y.mxd



- Study Area
- Catchment Boundary
- Velocity (m/s)**
- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- > 1.50



FIGURE 18Gi
PEAK FLOOD VELOCITIES
0.5% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 18g1_Peak Flood Velocities_200y.mxd



Study Area
Yellow outline

Catchment Boundary
Green dashed line

Velocity (m/s)

Blue	0.00 to 0.25
Light Blue	0.25 to 0.50
Light Green	0.50 to 1.00
Yellow	1.00 to 1.50
Red	> 1.50

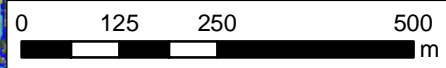
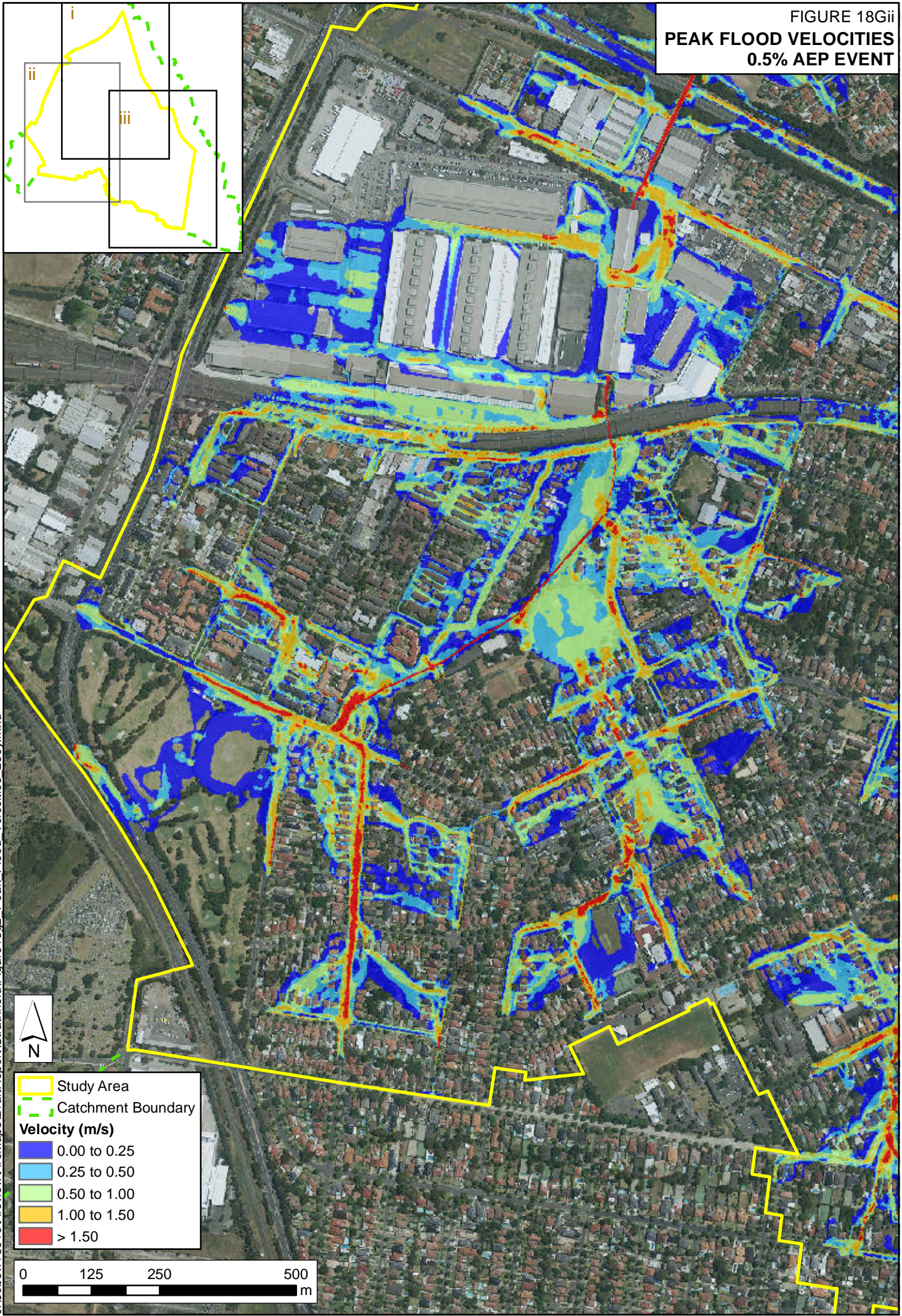
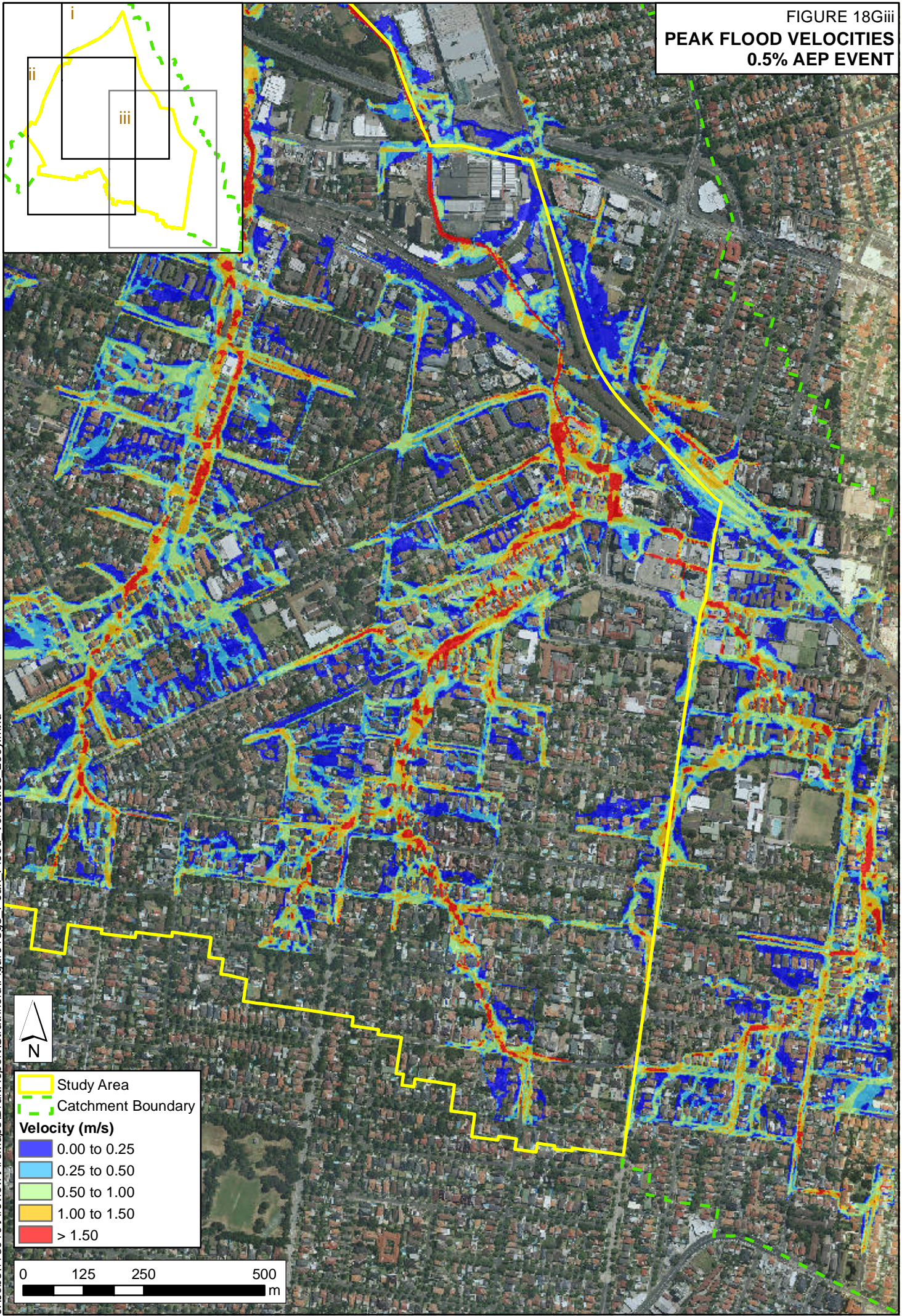


FIGURE 18Gii
PEAK FLOOD VELOCITIES
0.5% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18g2_Peak Flood Velocities_200y.mxd

FIGURE 18Giii
PEAK FLOOD VELOCITIES
0.5% AEP EVENT



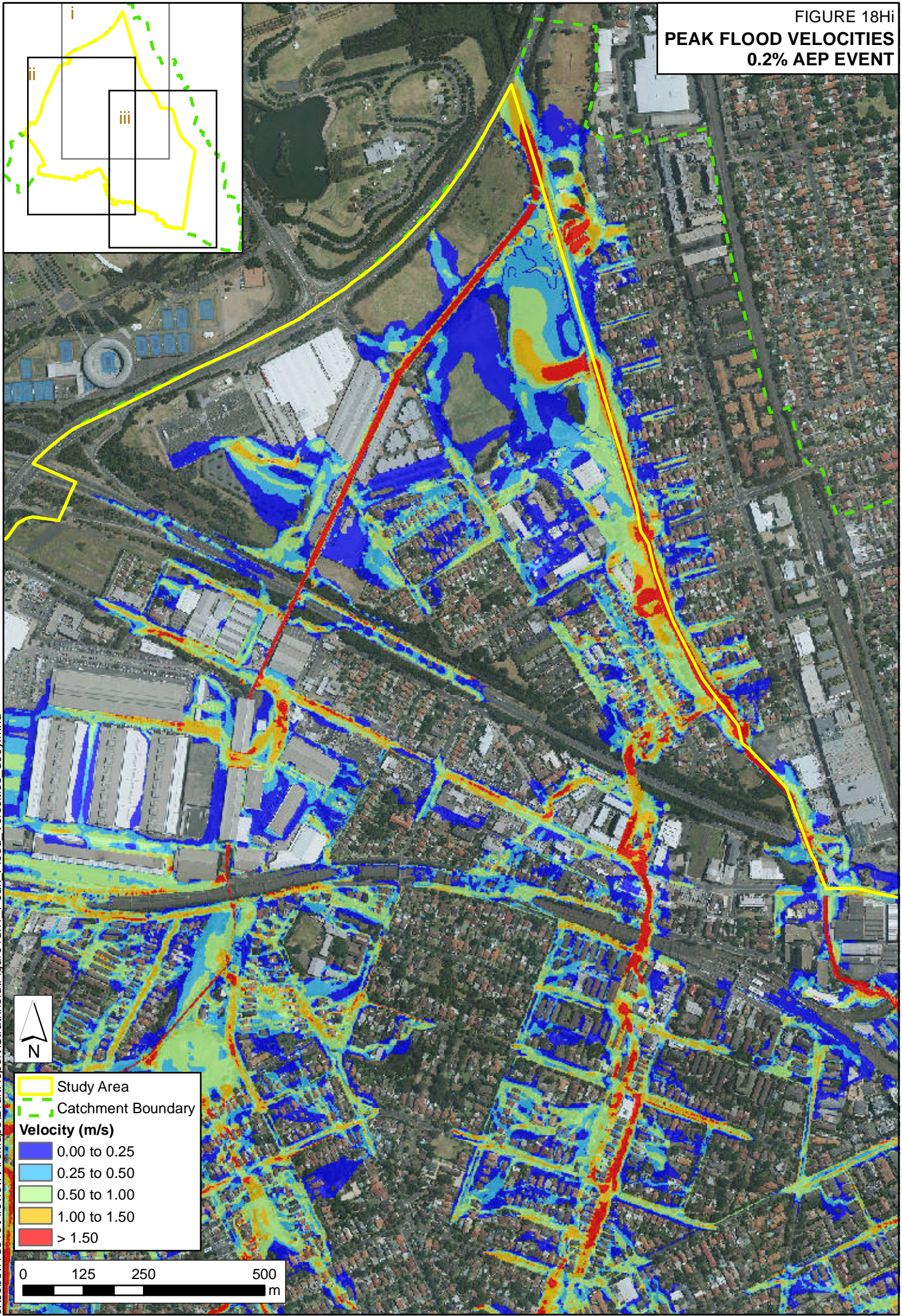
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18g3_Peak Flood Velocities_200y.mxd



- Study Area
- Catchment Boundary
- Velocity (m/s)**
- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- > 1.50



FIGURE 18Hi
PEAK FLOOD VELOCITIES
0.2% AEP EVENT



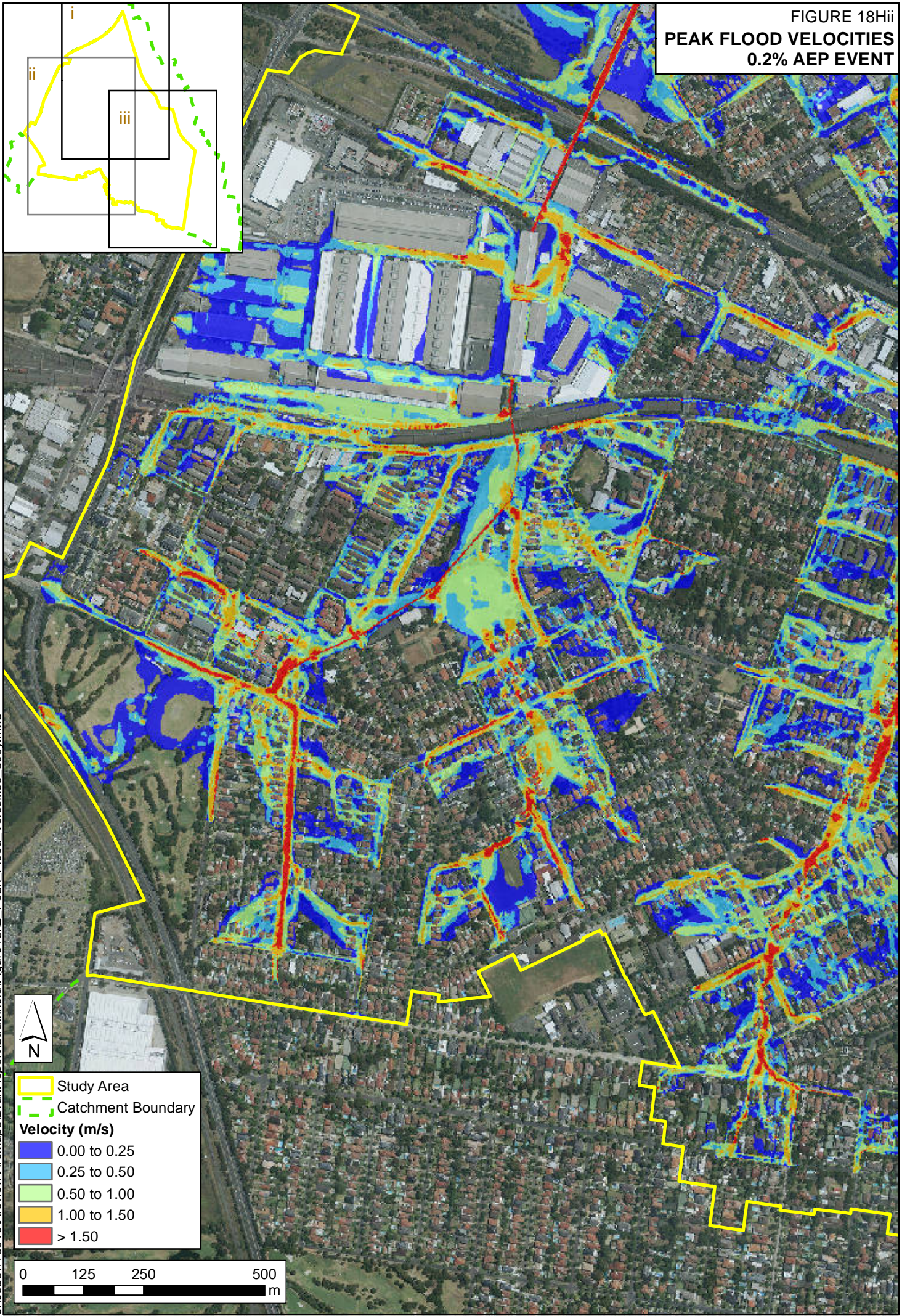
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18h1_Peak Flood Velocities_500y.mxd



- Study Area
- Catchment Boundary
- Velocity (m/s)**
- 0.00 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- > 1.50

0 125 250 500 m

FIGURE 18Hii
PEAK FLOOD VELOCITIES
0.2% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 18H2_Peak Flood Velocities_500y.mxd



Study Area
Yellow outline

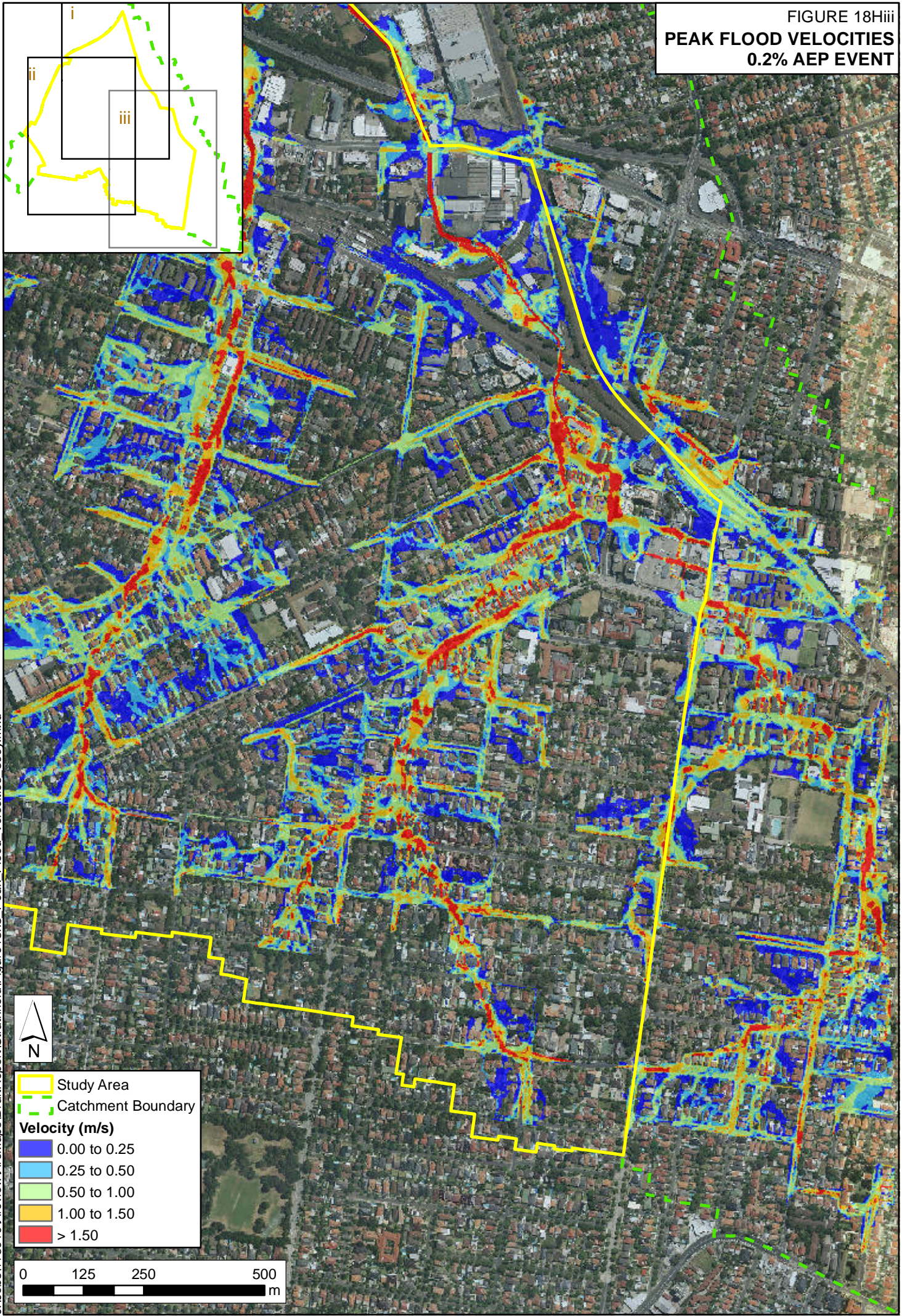
Catchment Boundary
Dashed green line

Velocity (m/s)

Blue	0.00 to 0.25
Light Blue	0.25 to 0.50
Light Green	0.50 to 1.00
Yellow	1.00 to 1.50
Red	> 1.50










FIGURE 18Hiii
PEAK FLOOD VELOCITIES
0.2% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18h3_Peak Flood Velocities_500y.mxd



-  Study Area
-  Catchment Boundary
- Velocity (m/s)**
-  0.00 to 0.25
-  0.25 to 0.50
-  0.50 to 1.00
-  1.00 to 1.50
-  > 1.50

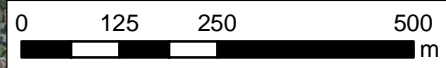
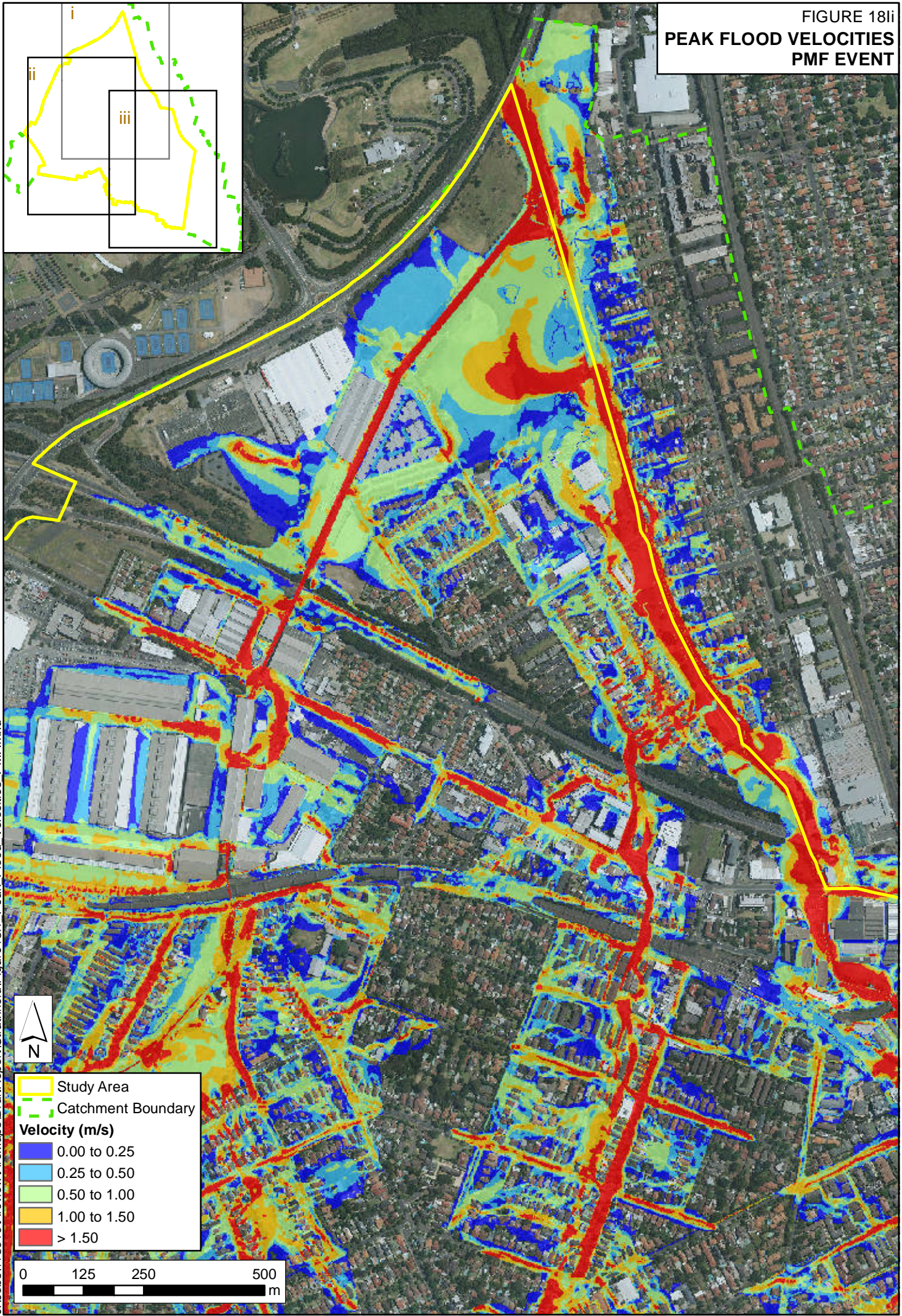


FIGURE 181i
PEAK FLOOD VELOCITIES
PMF EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 181i Peak Flood Velocities PMF.mxd

FIGURE 18lii
PEAK FLOOD VELOCITIES
PMF EVENT

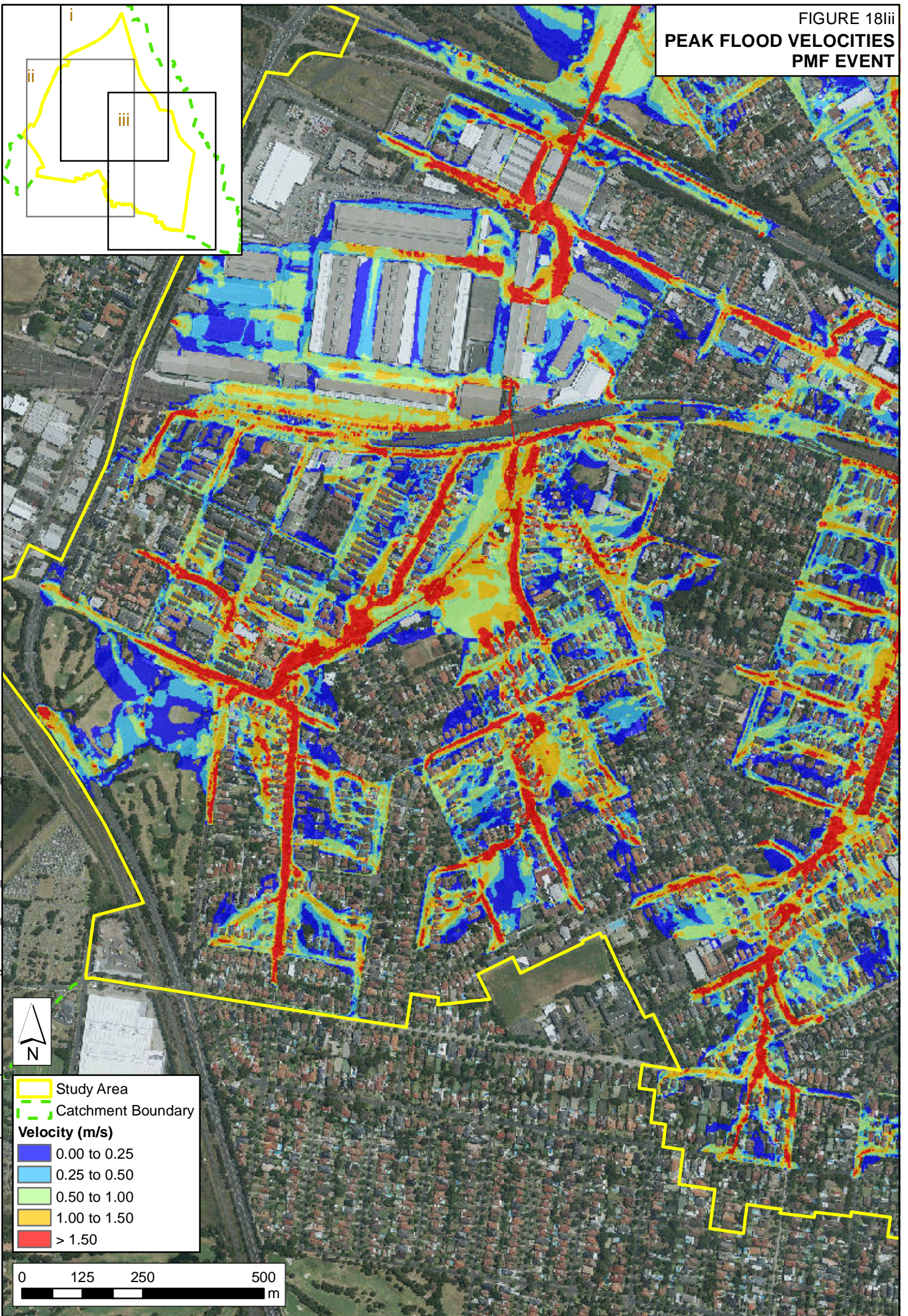
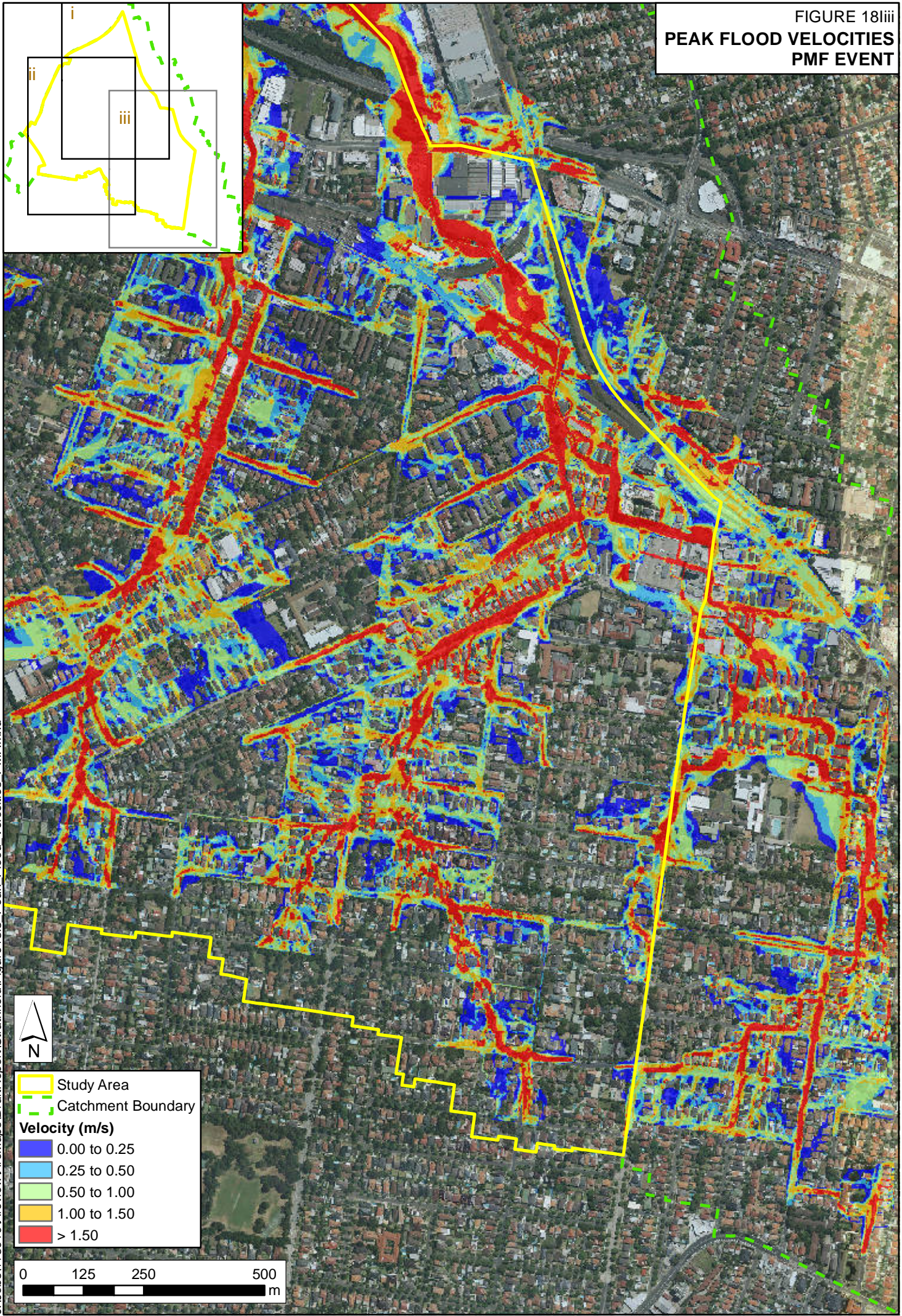









FIGURE 18liii
PEAK FLOOD VELOCITIES
PMF EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 18i3 Peak Flood Velocities PMF.mxd



-  Study Area
-  Catchment Boundary
- Velocity (m/s)**
-  0.00 to 0.25
-  0.25 to 0.50
-  0.50 to 1.00
-  1.00 to 1.50
-  > 1.50

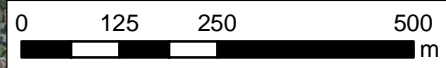
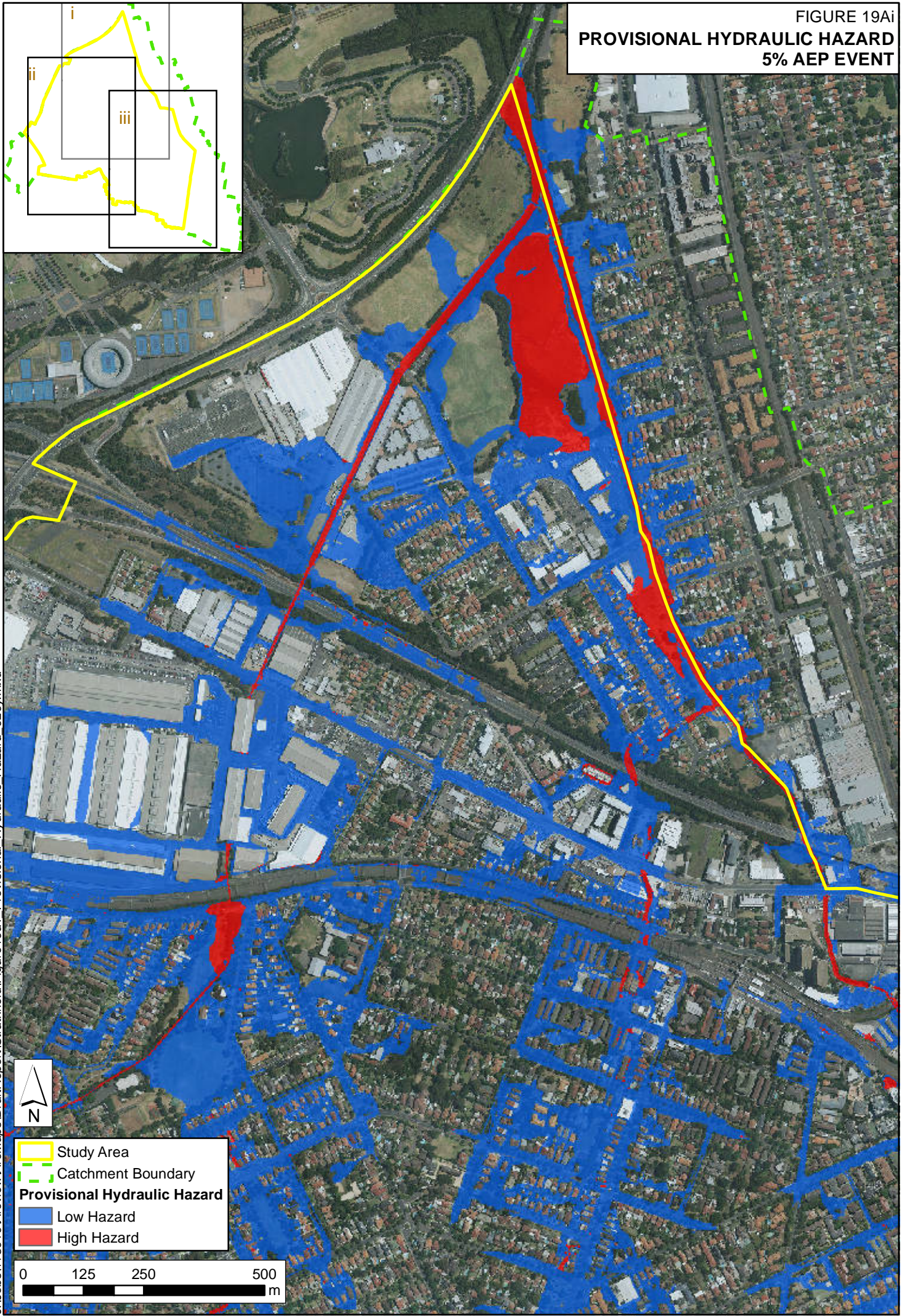


FIGURE 19Ai
PROVISIONAL HYDRAULIC HAZARD
5% AEP EVENT

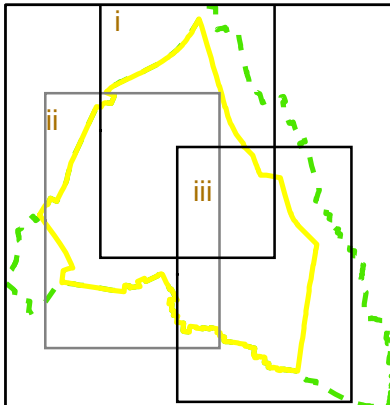
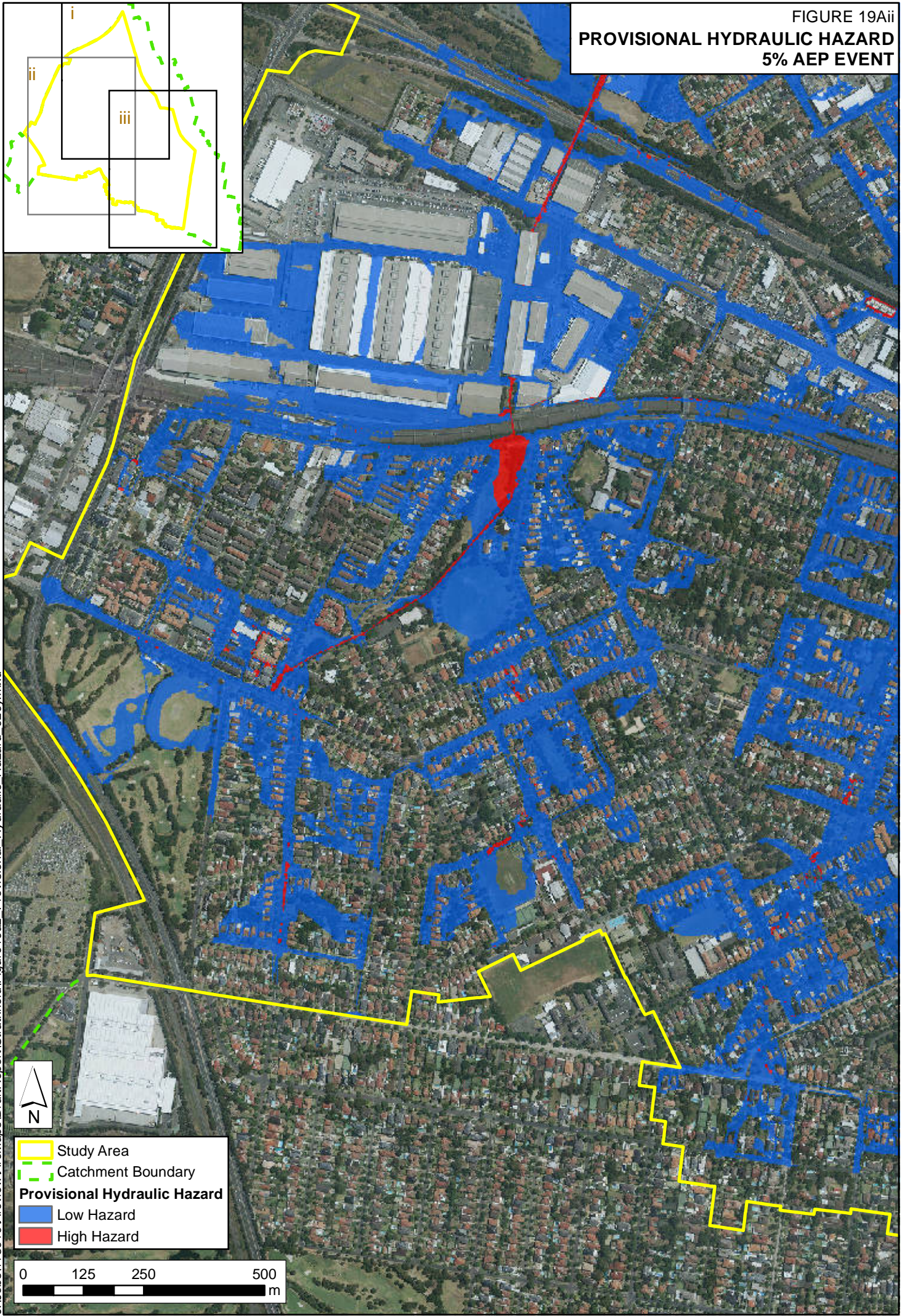


J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 19a1_Provisional_Hydraulic_Hazard_020y.mxd

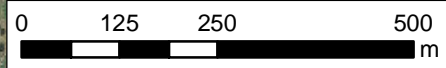
- Study Area
- Catchment Boundary
- Provisional Hydraulic Hazard**
- Low Hazard
- High Hazard

0 125 250 500 m

FIGURE 19Aii
PROVISIONAL HYDRAULIC HAZARD
5% AEP EVENT

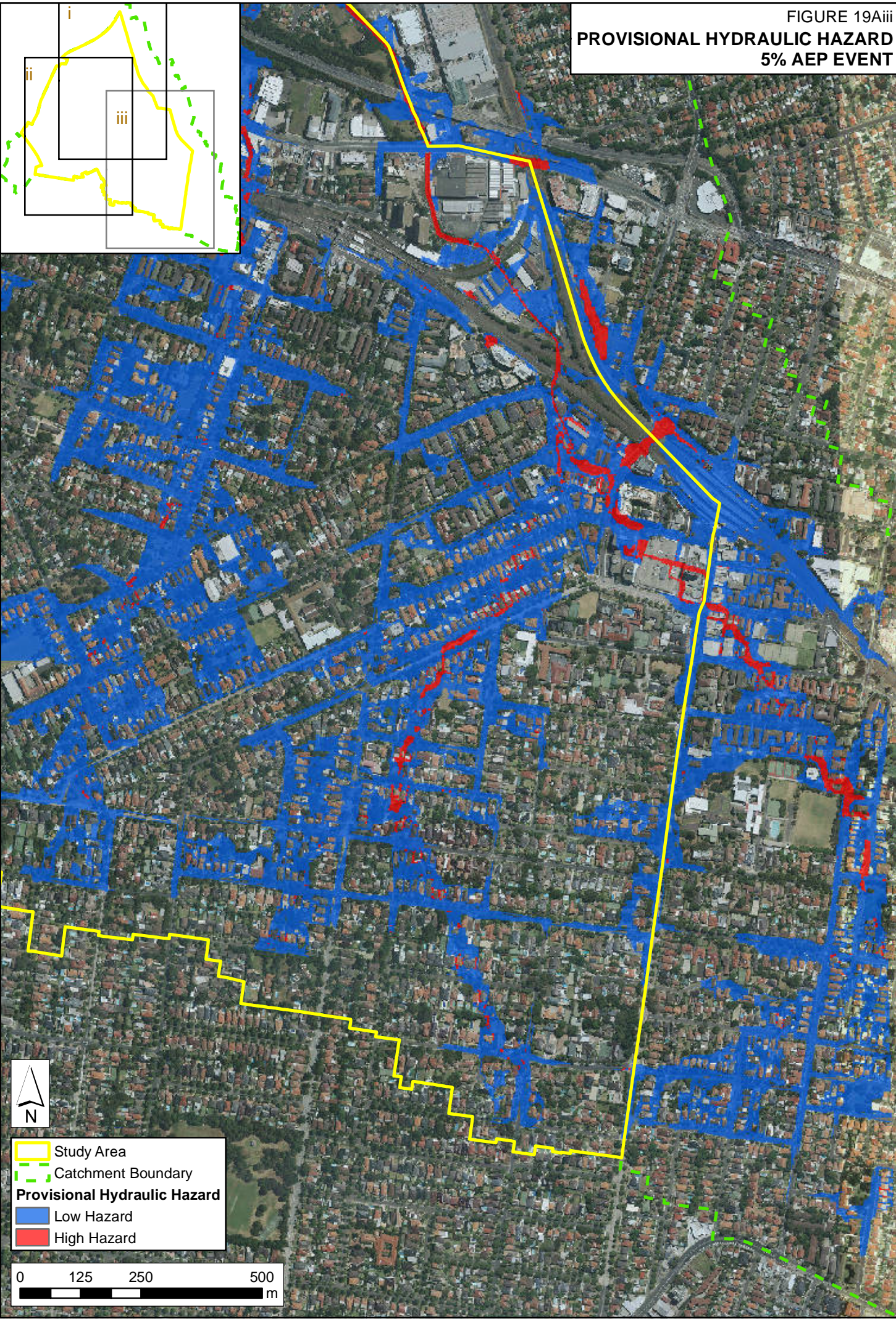


- Study Area
- Catchment Boundary
- Provisional Hydraulic Hazard**
- Low Hazard
- High Hazard



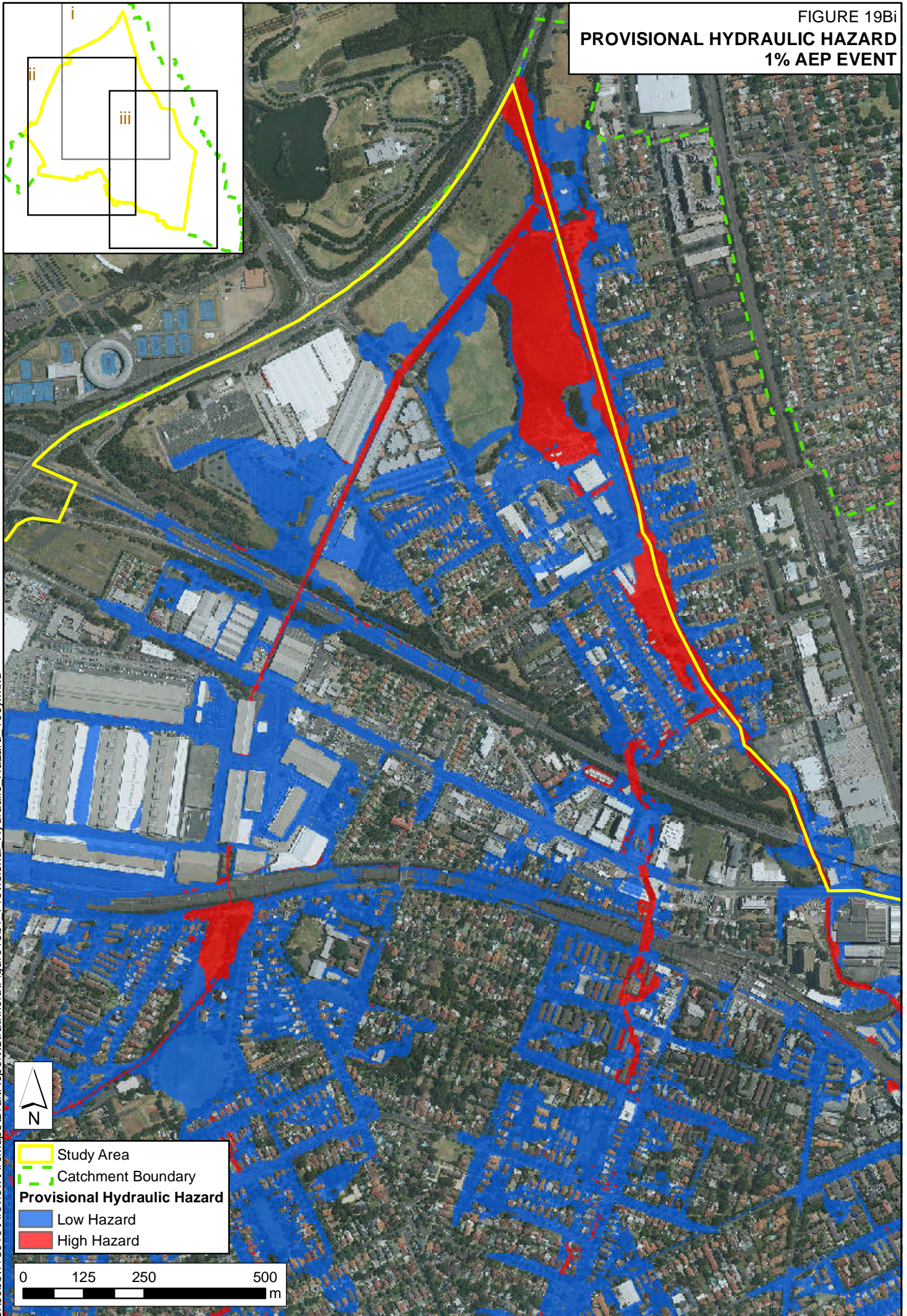
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 19a2_Provisional_Hydraulic_Hazard_020y.mxd

FIGURE 19Aiii
PROVISIONAL HYDRAULIC HAZARD
5% AEP EVENT



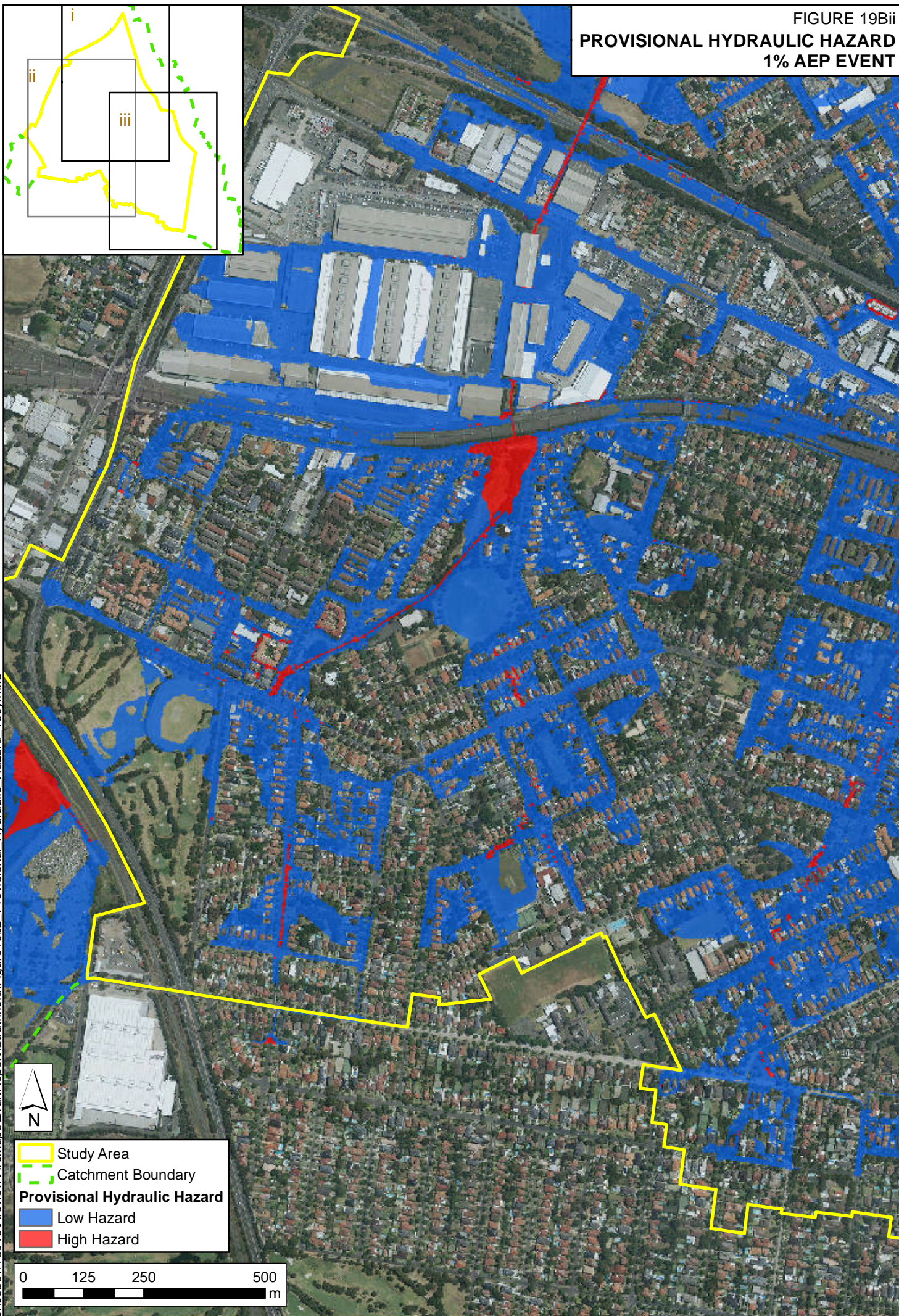
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 19a3_Provisional_Hydraulic_Hazard_020y.mxd

FIGURE 19Bi
PROVISIONAL HYDRAULIC HAZARD
1% AEP EVENT



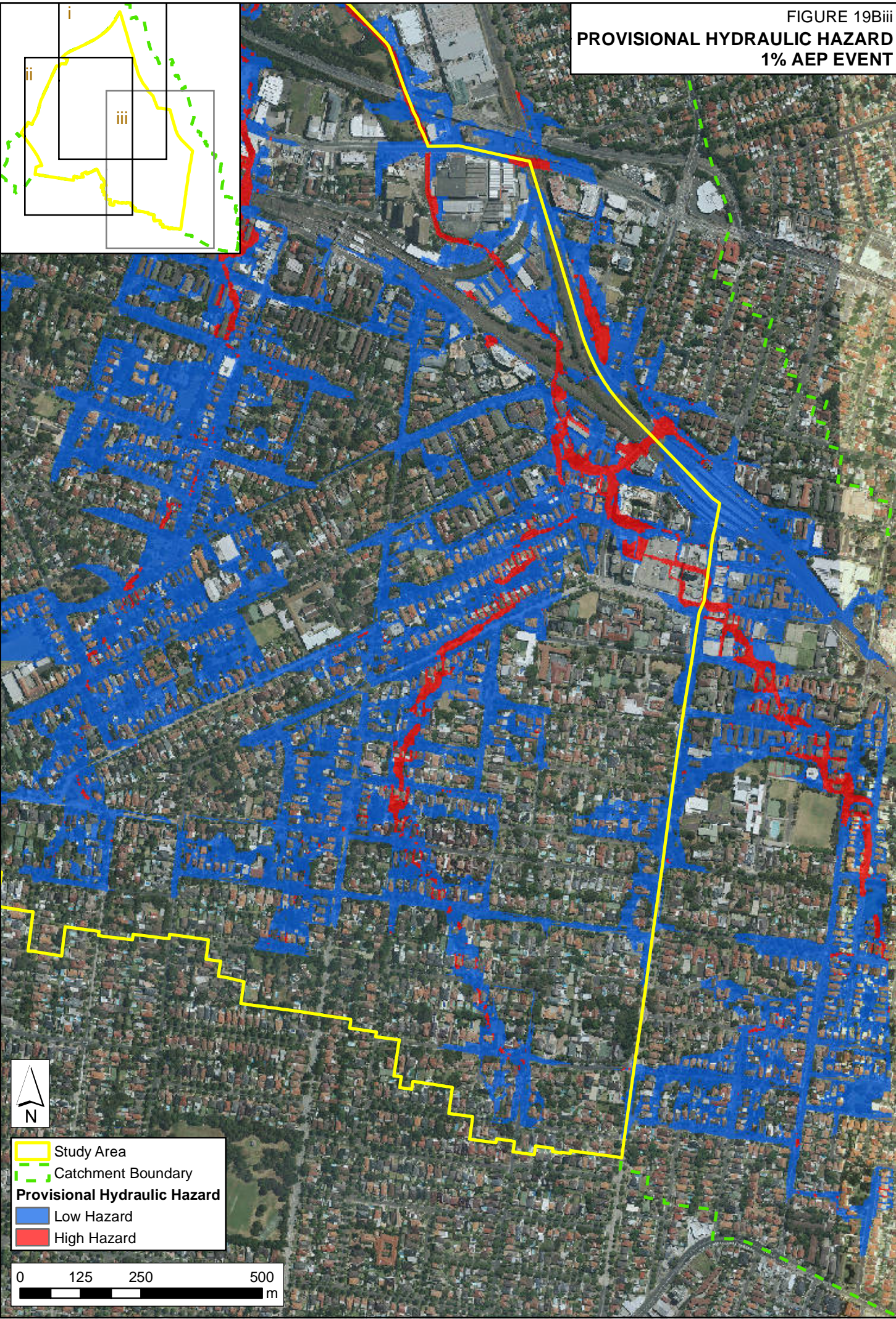
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 19b1_Provisional_Hydraulic_Hazard_100y.mxd

FIGURE 19Bii
PROVISIONAL HYDRAULIC HAZARD
1% AEP EVENT



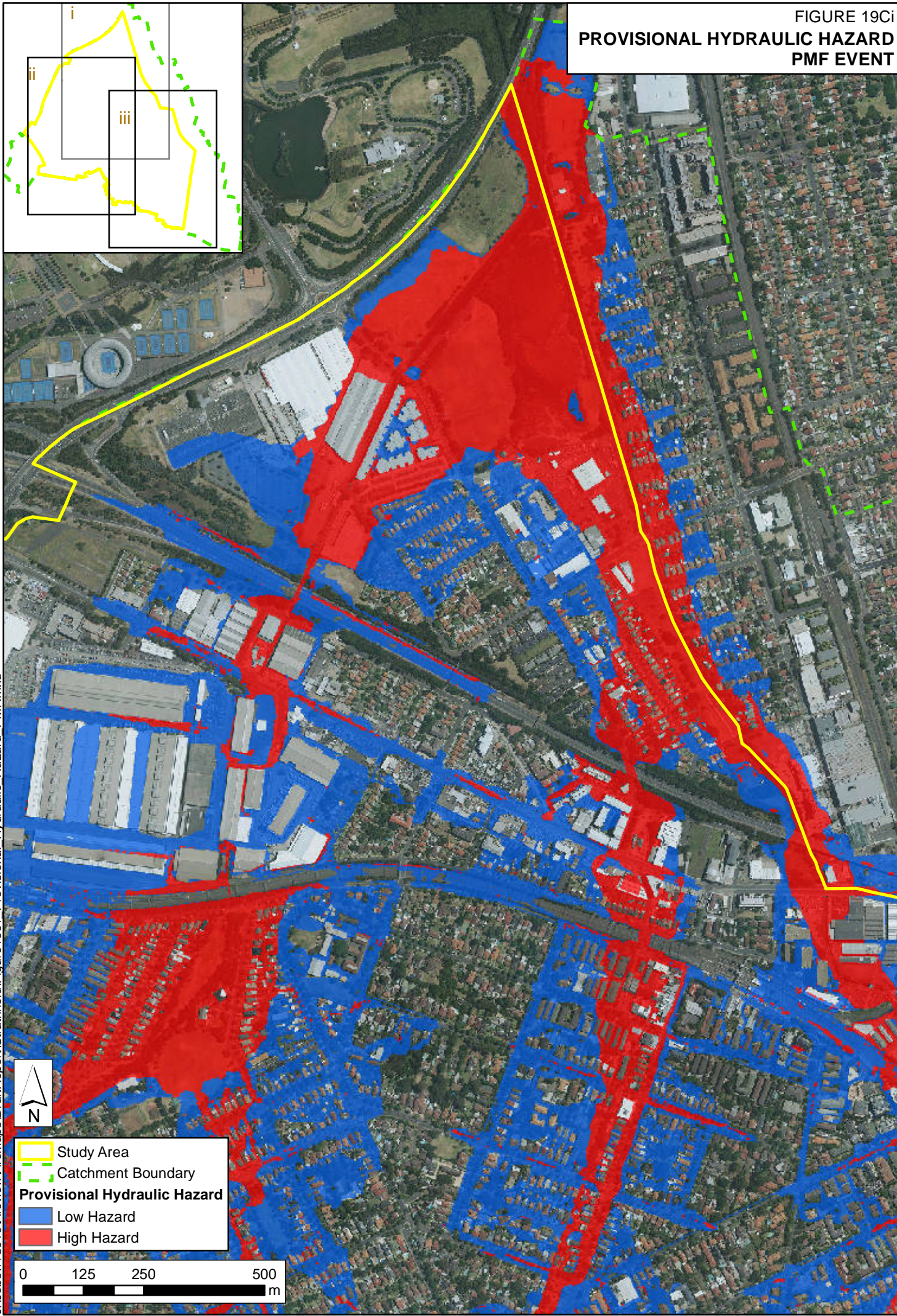
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 19b2_Provisional_Hydraulic_Hazard_100y.mxd

FIGURE 19Biii
PROVISIONAL HYDRAULIC HAZARD
1% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 19b3_Provisional_Hydraulic_Hazard_100y.mxd

FIGURE 19Ci
PROVISIONAL HYDRAULIC HAZARD
PMF EVENT

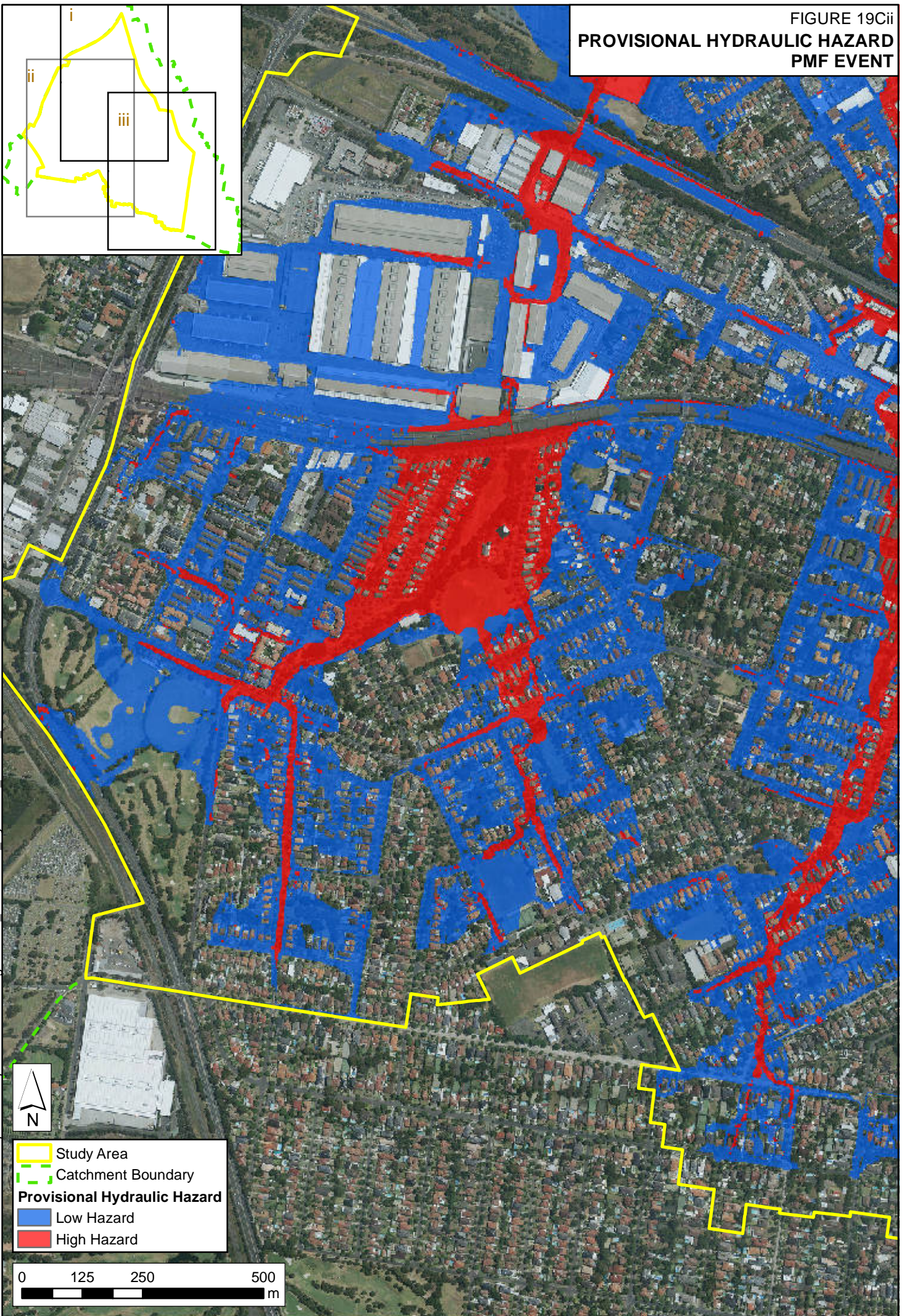


J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure 19c1_Provisional_Hydraulic_Hazard_PMF.mxd

- Study Area
- Catchment Boundary
- Provisional Hydraulic Hazard**
- Low Hazard
- High Hazard

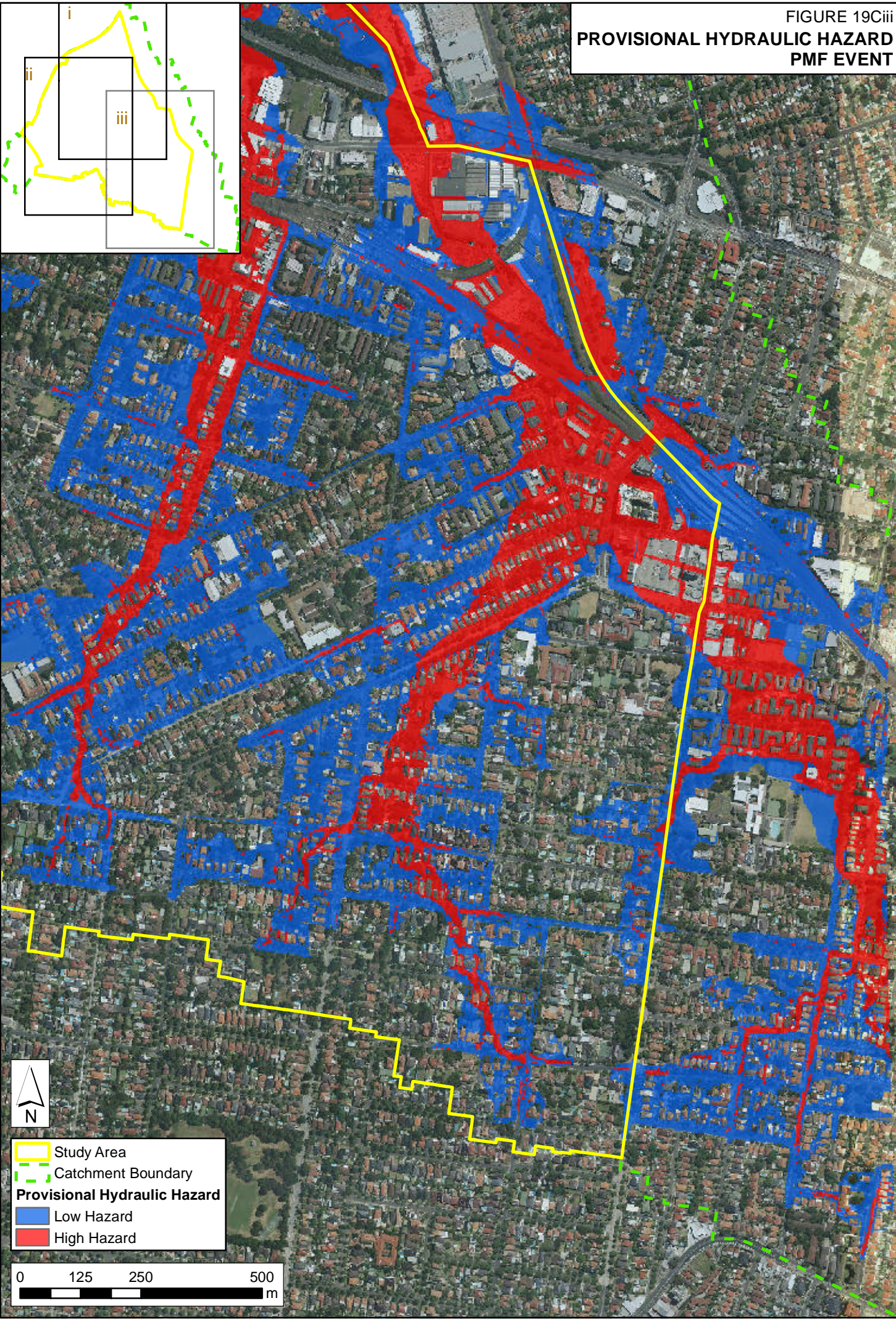
0 125 250 500 m

FIGURE 19Cii
PROVISIONAL HYDRAULIC HAZARD
PMF EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 19c2_Provisional_Hydraulic_Hazard_PMF.mxd

FIGURE 19Ciii
PROVISIONAL HYDRAULIC HAZARD
PMF EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure 19c3_Provisional_Hydraulic_Hazard_PMF.mxd

FIGURE 20Ai
PROVISIONAL HYDRAULIC CATEGORISATION
5% AEP EVENT

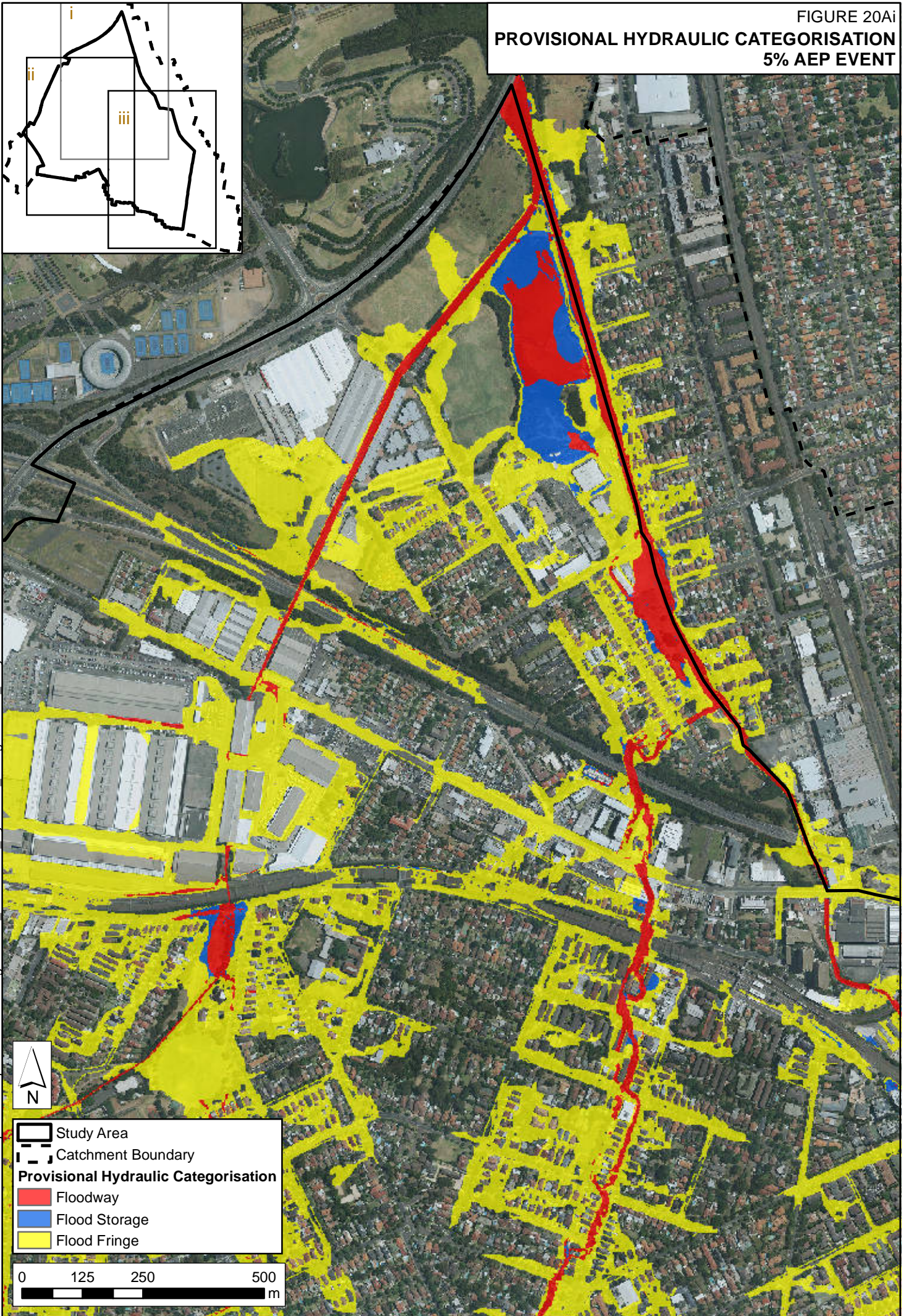
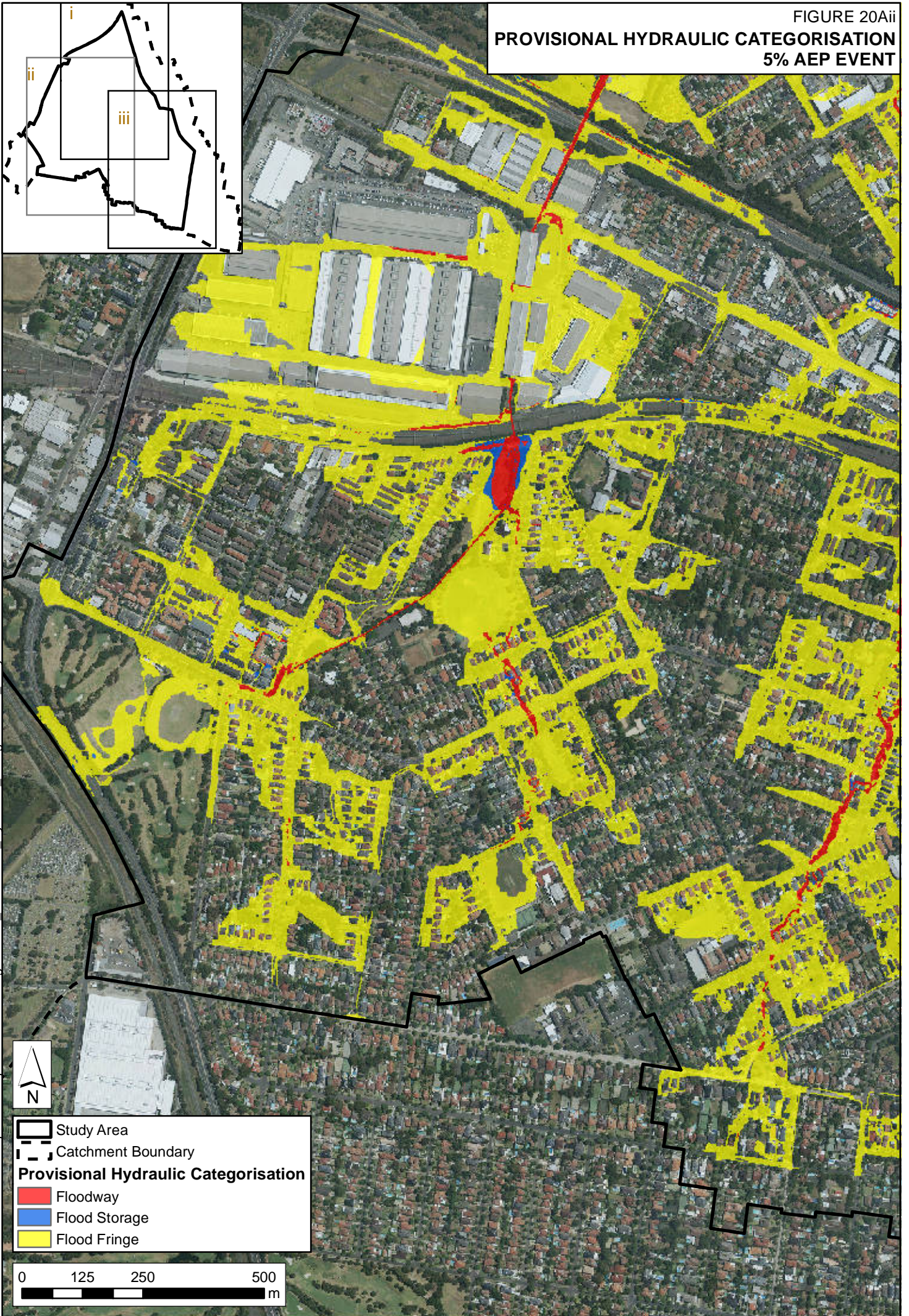
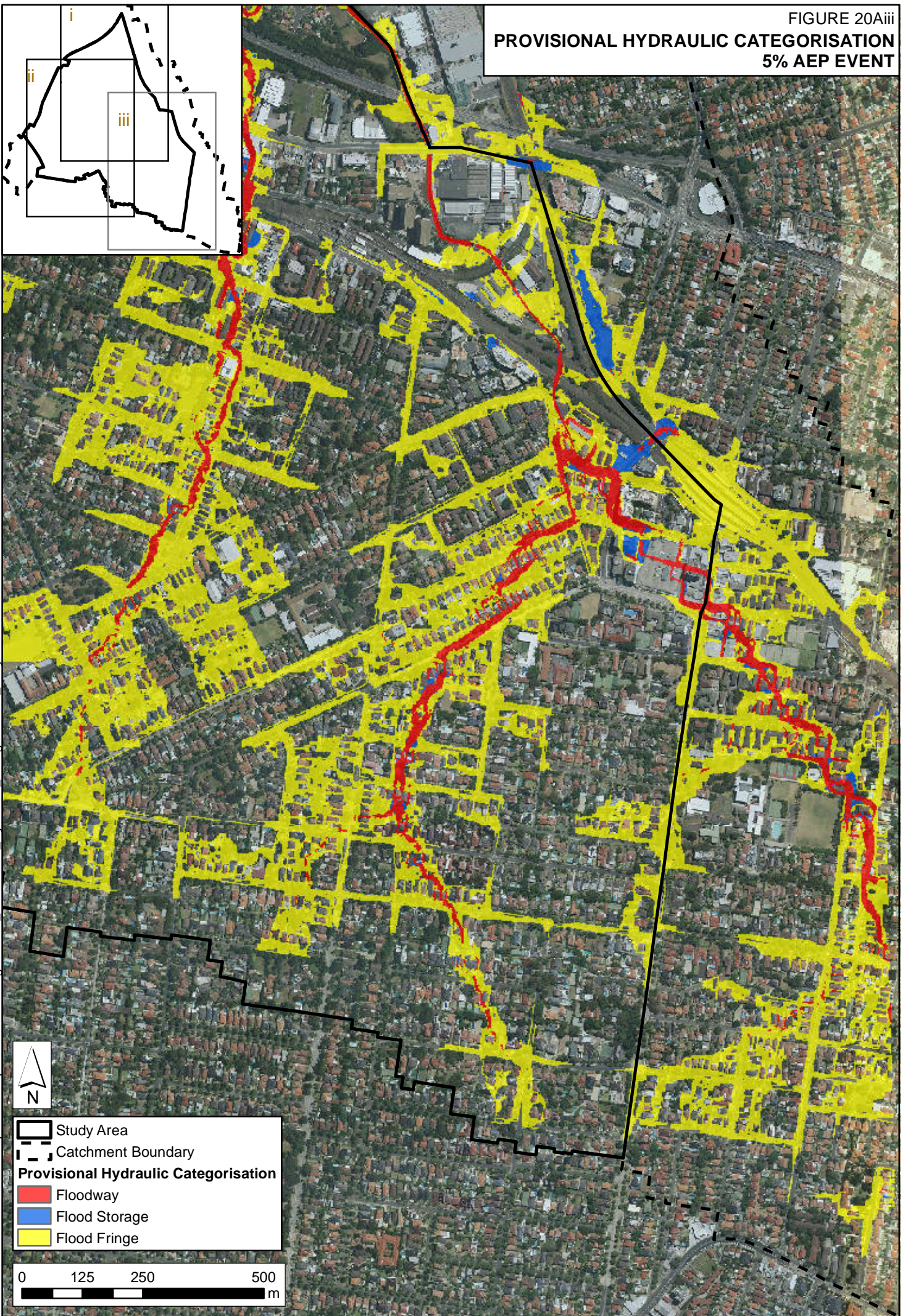


FIGURE 20Aii
PROVISIONAL HYDRAULIC CATEGORISATION
5% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure20a2_Provisional_Hydraulic_Categorisation_020y.mxd

FIGURE 20Aiii
PROVISIONAL HYDRAULIC CATEGORISATION
5% AEP EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure20a3_Provisional_Hydraulic_Categorisation_020y.mxd



- Study Area
- Catchment Boundary
- Provisional Hydraulic Categorisation**
- Floodway
- Flood Storage
- Flood Fringe

0 125 250 500
m

FIGURE 20Bi
PROVISIONAL HYDRAULIC CATEGORISATION
1% AEP EVENT

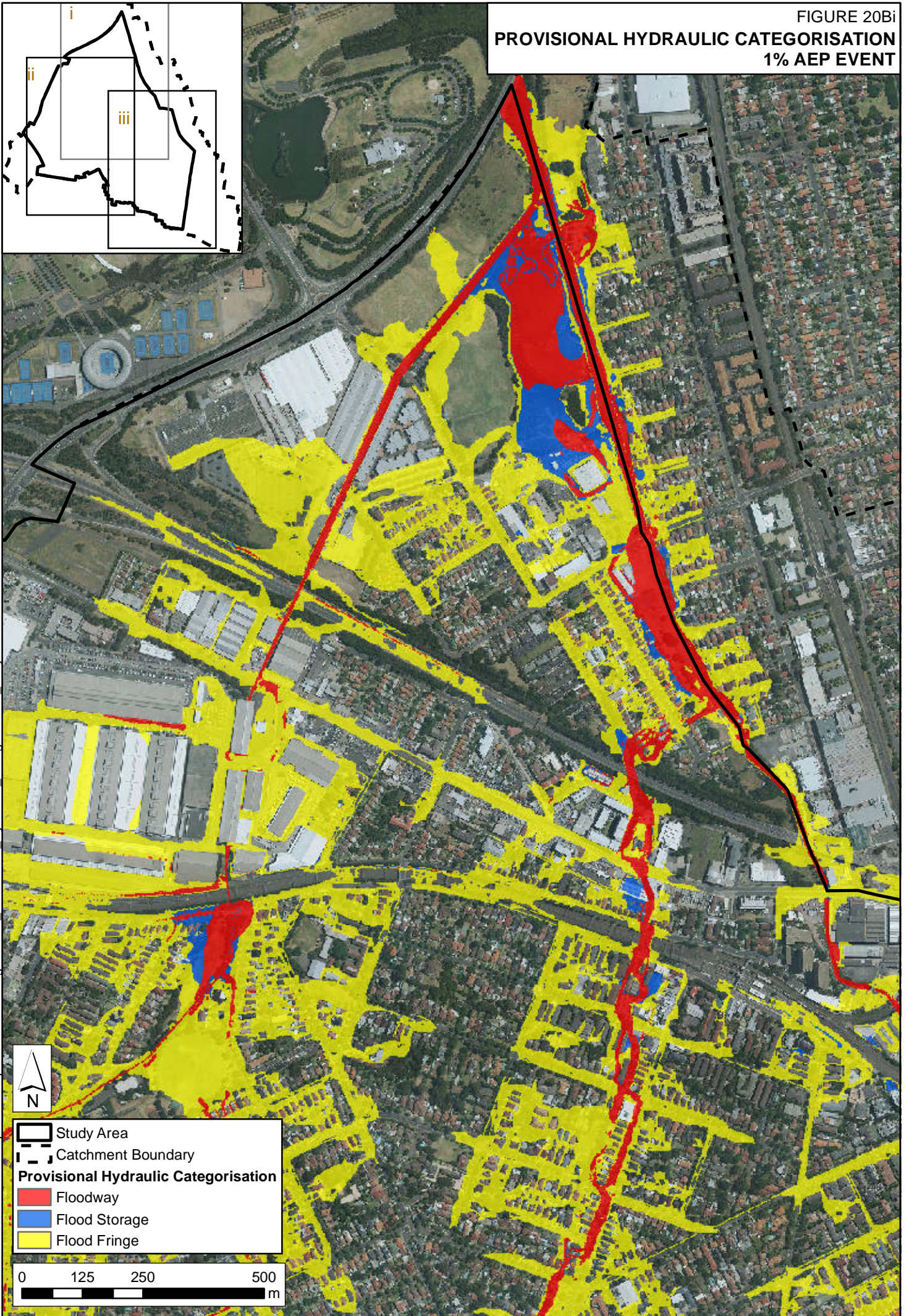


FIGURE 20Bii
PROVISIONAL HYDRAULIC CATEGORISATION
1% AEP EVENT

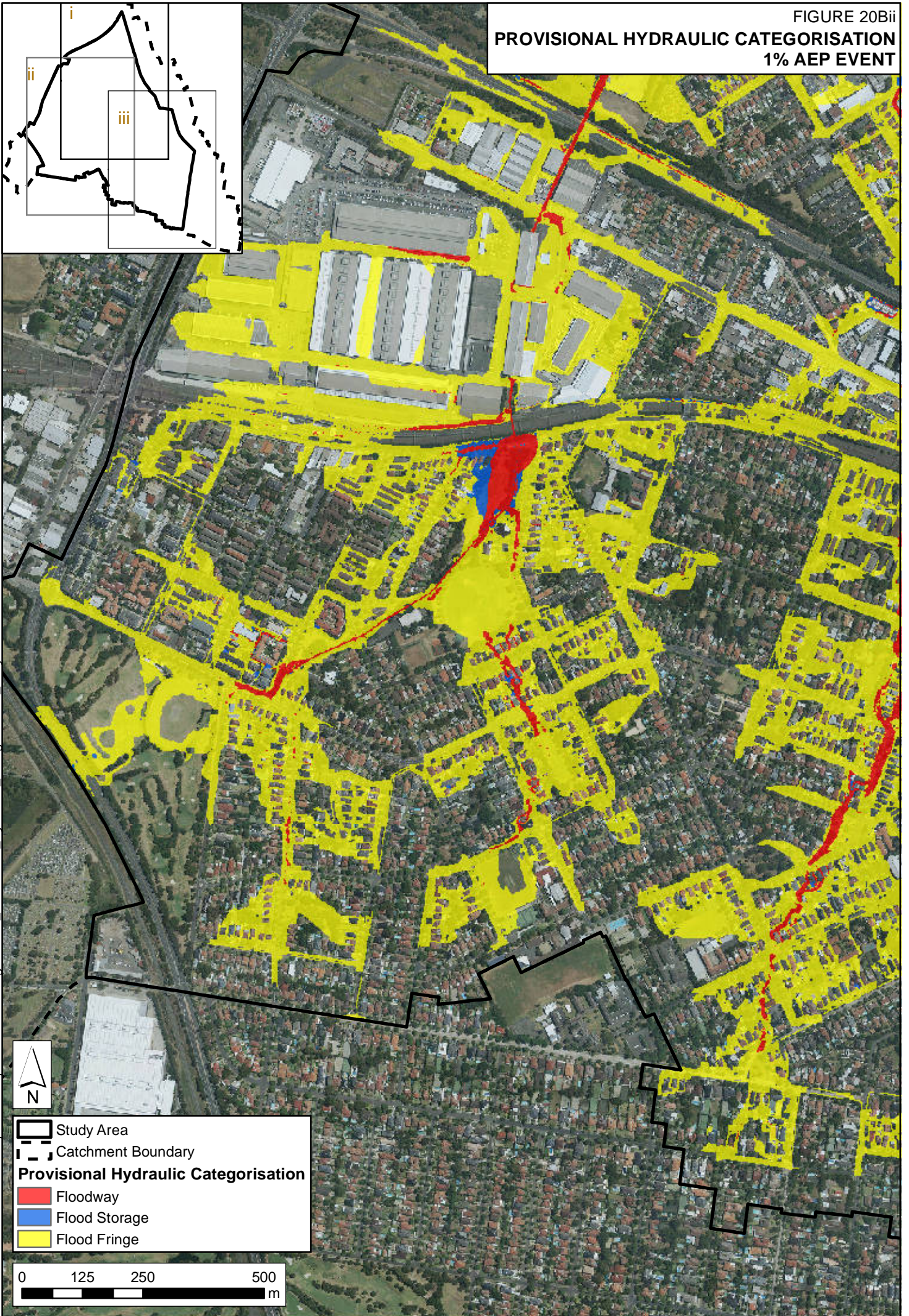
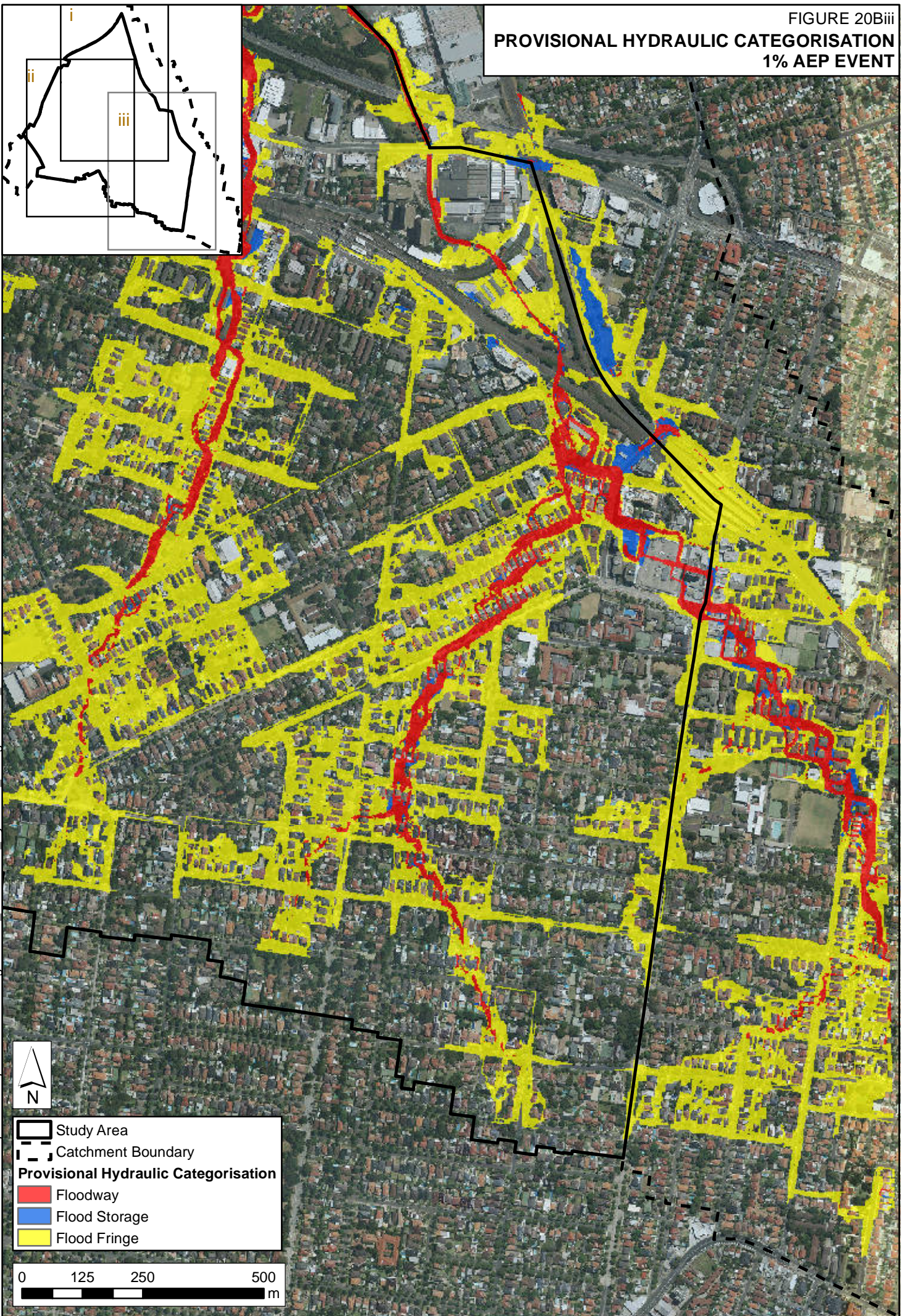


FIGURE 20Biii
PROVISIONAL HYDRAULIC CATEGORISATION
1% AEP EVENT



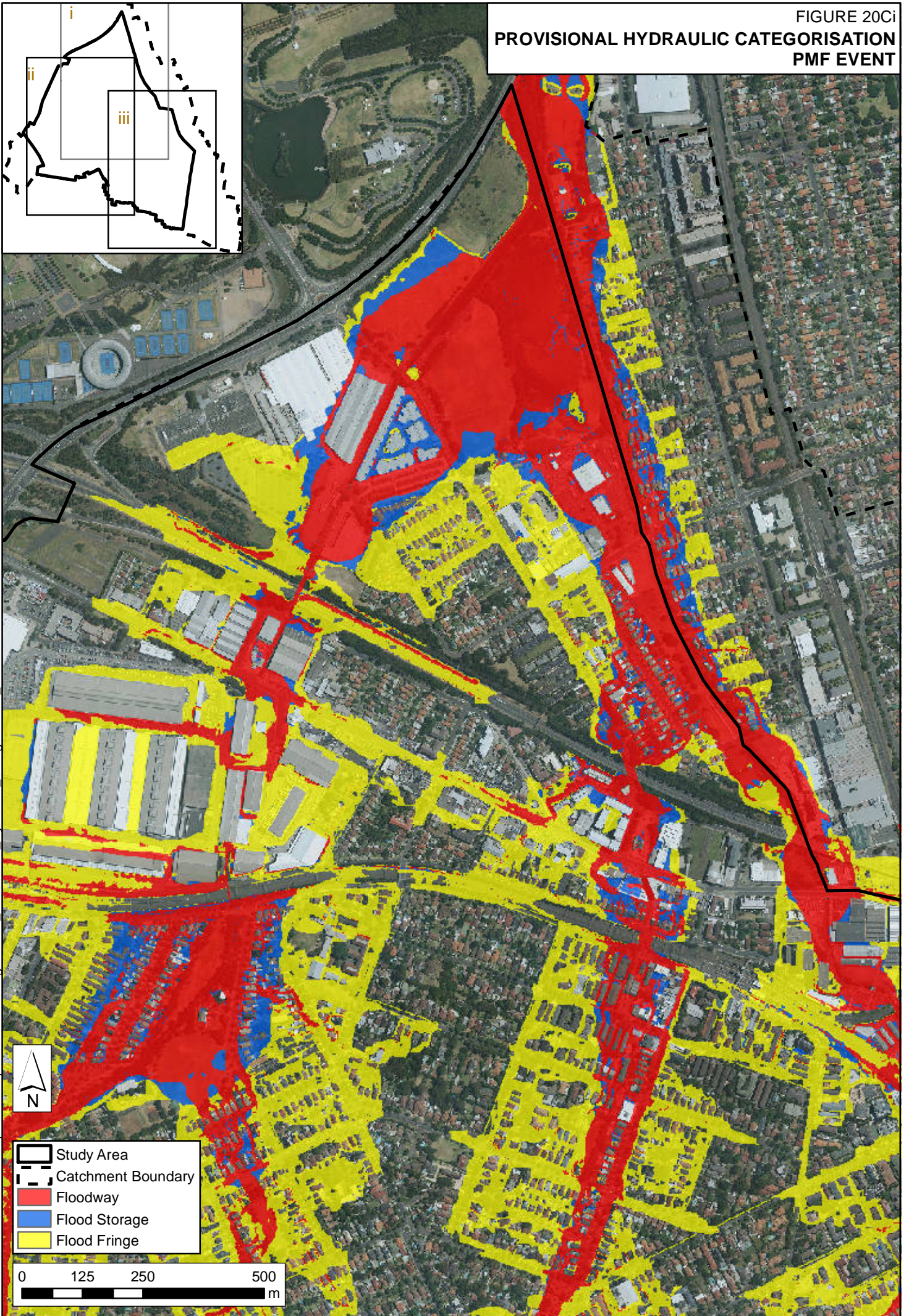
J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure20b3_Provisional_Hydraulic_Categorisation_100y.mxd



- Study Area
- Catchment Boundary
- Provisional Hydraulic Categorisation**
- Floodway
- Flood Storage
- Flood Fringe

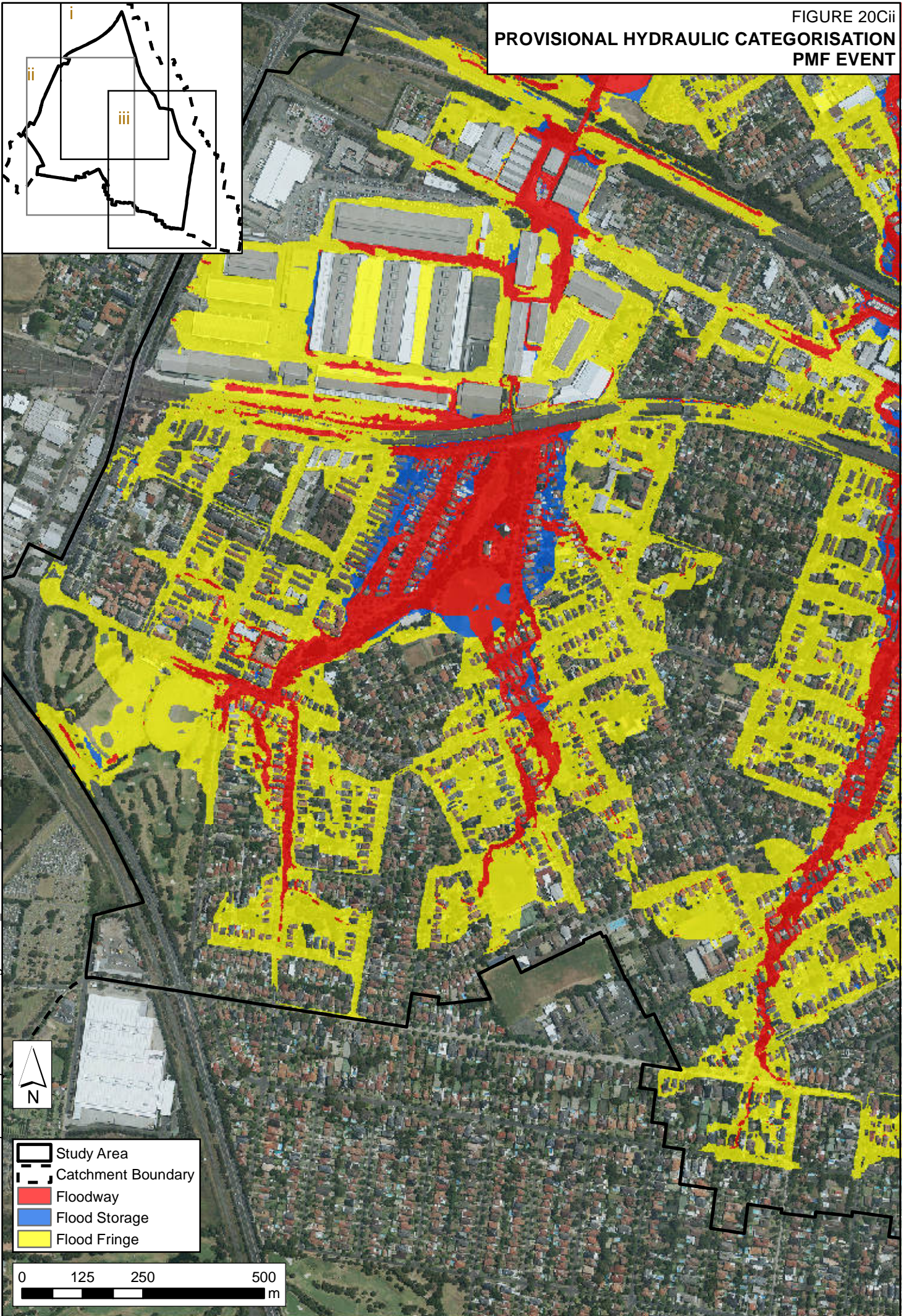
0 125 250 500
m

FIGURE 20Ci
PROVISIONAL HYDRAULIC CATEGORISATION
PMF EVENT

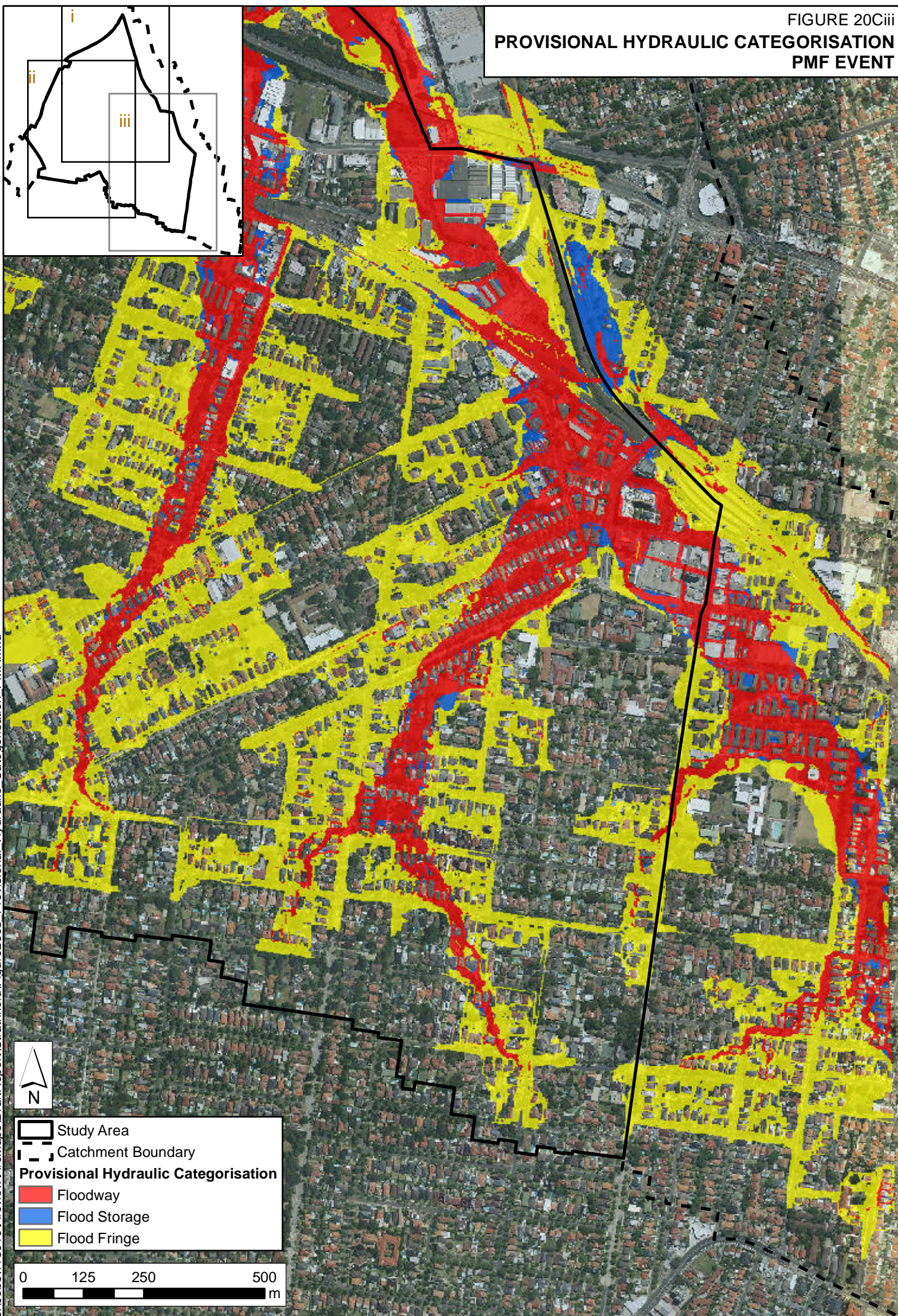


J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Strathfield\Figure20c1_Provisional_Hydraulic_Categorisation_PMF.mxd

FIGURE 20Cii
PROVISIONAL HYDRAULIC CATEGORISATION
PMF EVENT



PROVISIONAL HYDRAULIC CATEGORISATION
PMF EVENT



J:\Jobs\115010\Arcview\ArcMaps\Draft\Report\Stratfield\Figure20c3_Provisional_Hydraulic_Categorisation_PMF.mxd



- Study Area
- Catchment Boundary
- Provisional Hydraulic Categorisation**
- Floodway
- Flood Storage
- Flood Fringe



FIGURE 21
POWELLS CREEK - FLOOD FREQUENCY ANALYSIS
LP3 ANALYSIS - BAYESIAN

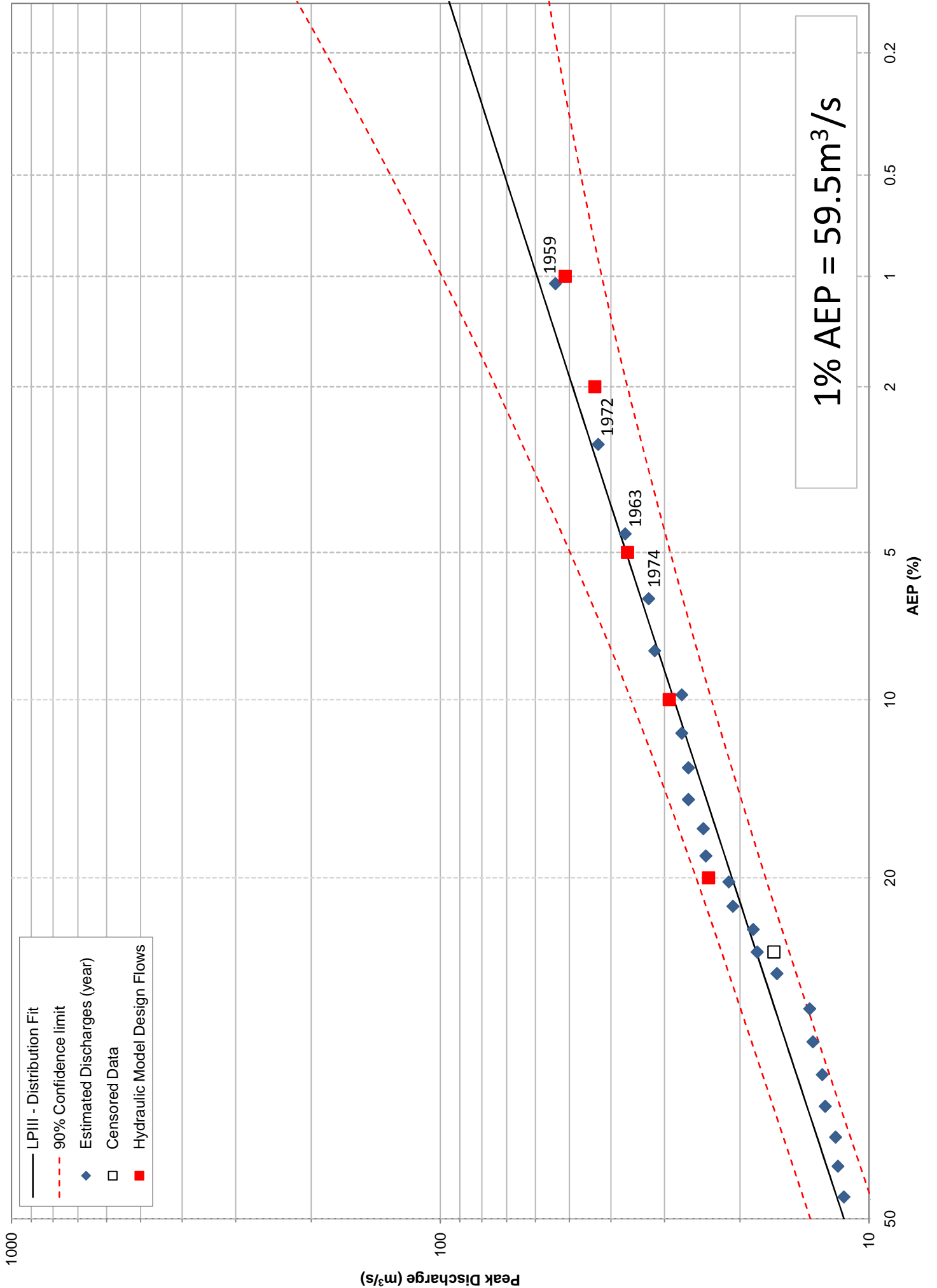


FIGURE 22
**POWELLS CREEK - STRATHFIELD LGA
 HOTSPOT LOCATIONS**

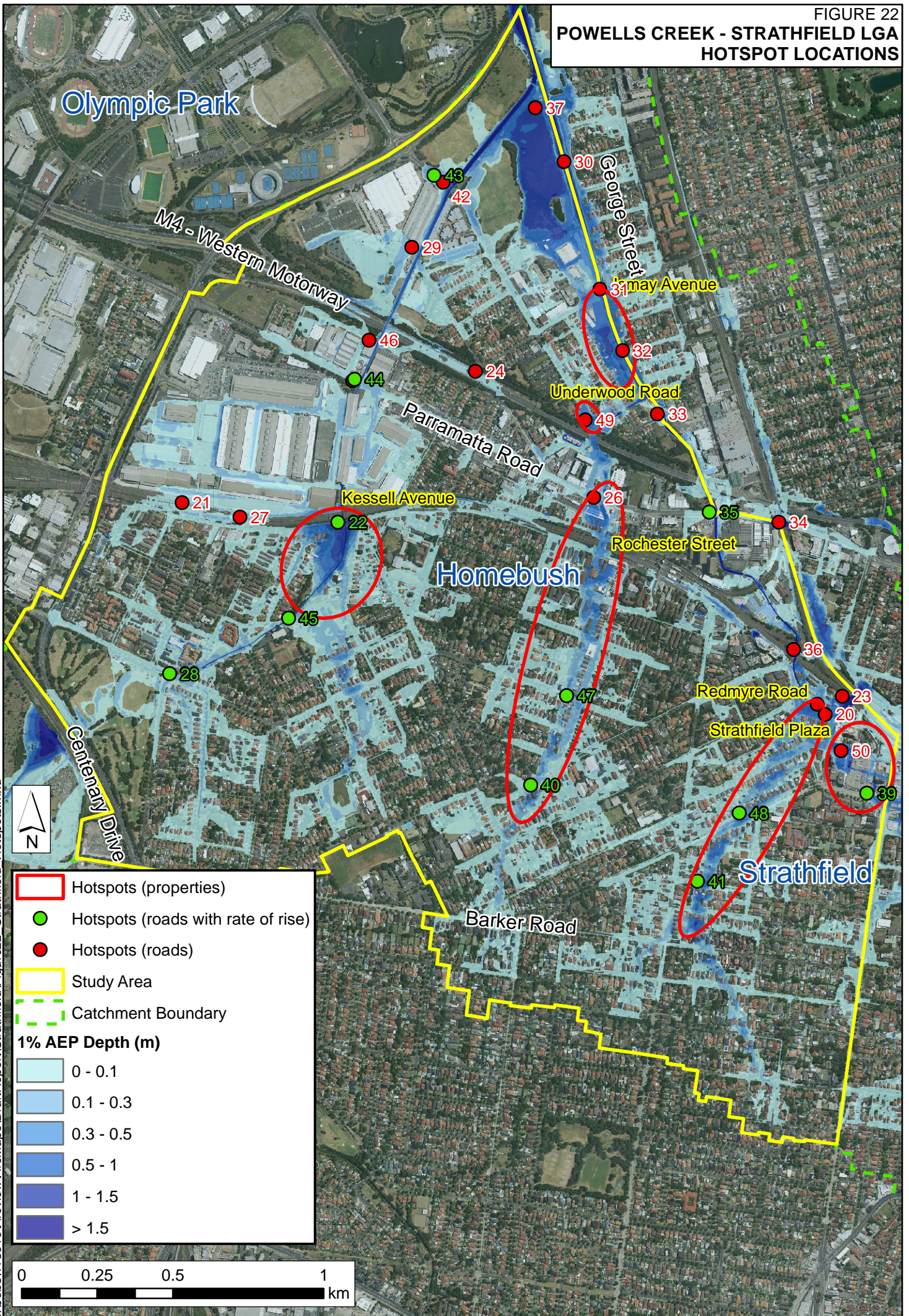


FIGURE 23
 POWELLS CREEK - STRATHFIELD LGA
 DURATION OF INUNDATION
 1% AEP EVENT

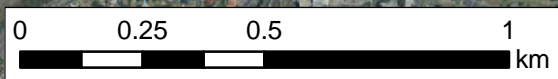


Study Area

Catchment Boundary

Duration for which depth is > 0.3m

- Not inundated above 0.3m
- < 15 mins
- 15 mins - 30 mins
- 30 mins - 1 hour
- 1 hour - 2 hours
- 2 hours - 3 hours



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure23 Strathfield_Duration 1% AEP.mxd

FIGURE 24A
PEAK FLOOD DEPTHS
1% AEP EVENT - 2050 TAILWATER



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure24a Peak Flood Depths & Levels_100y_2050.mxd

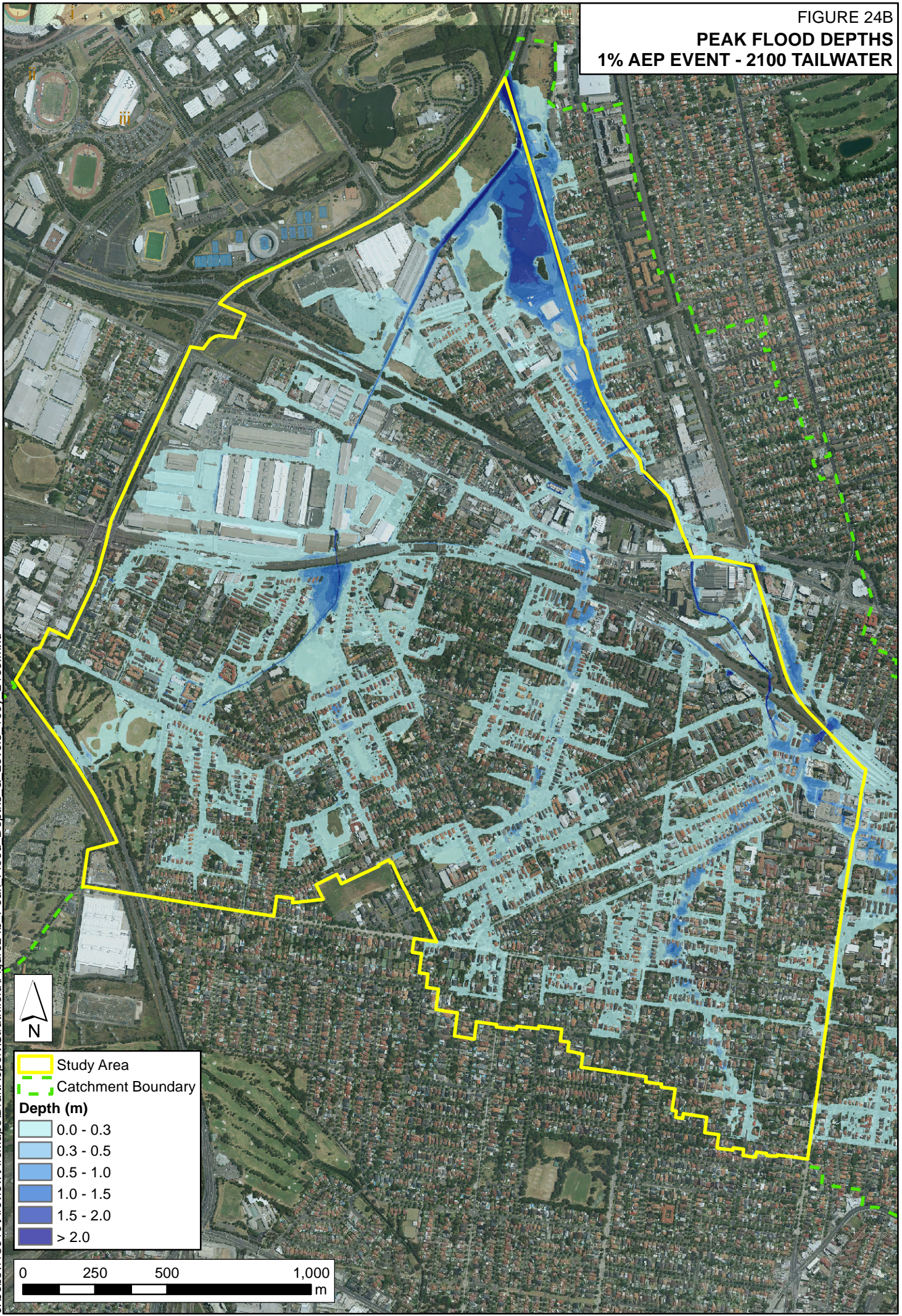
Study Area
Catchment Boundary

Depth (m)

- 0.0 - 0.3
- 0.3 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- > 2.0

0 250 500 1,000
m

FIGURE 24B
PEAK FLOOD DEPTHS
1% AEP EVENT - 2100 TAILWATER



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Stratfield\Figure24b Peak Flood Depths & Levels_100y_2100.mxd

Study Area
Yellow outline

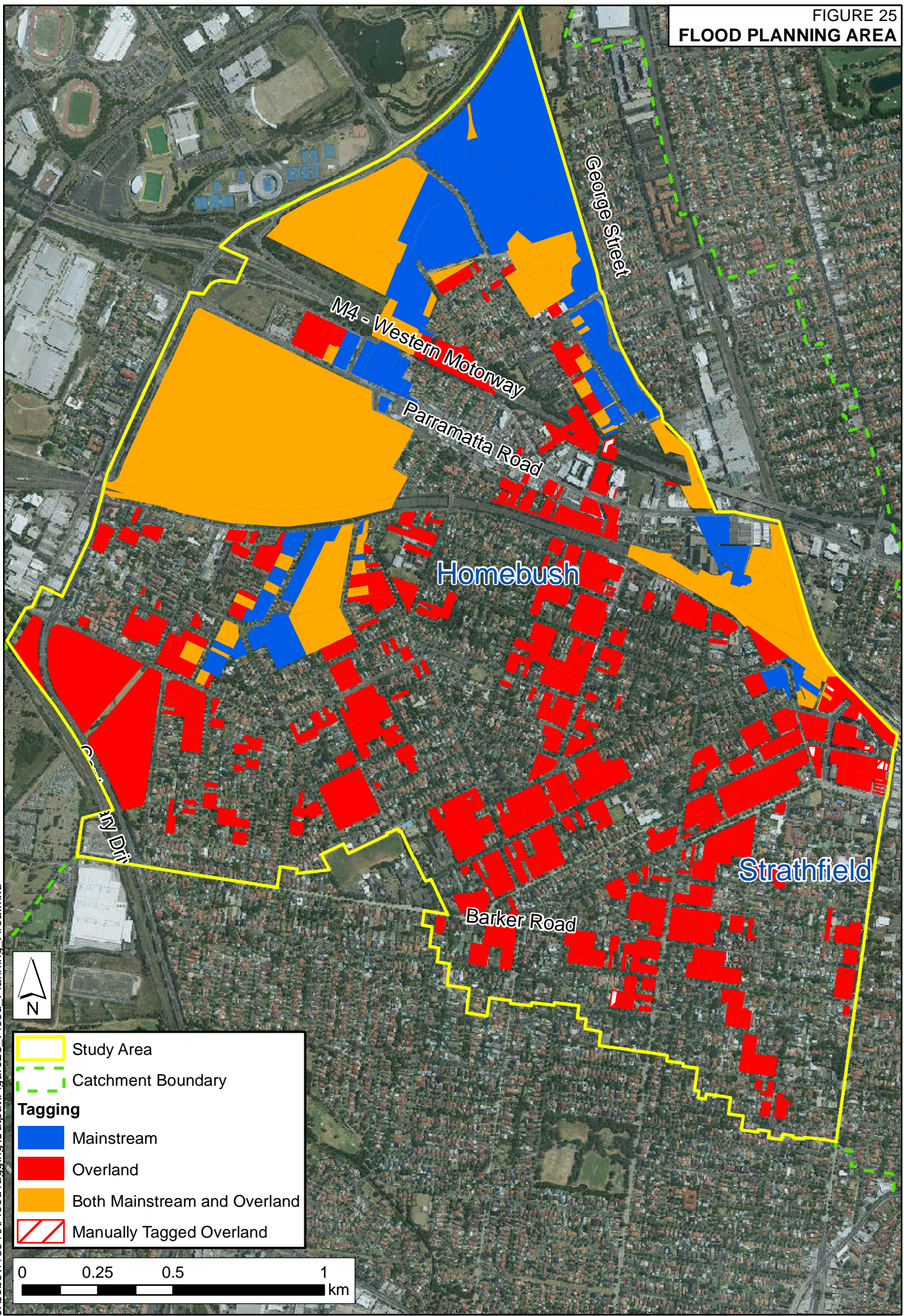
Catchment Boundary
Green dashed line

Depth (m)

- 0.0 - 0.3
- 0.3 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- > 2.0

0 250 500 1,000
m

FIGURE 25
FLOOD PLANNING AREA

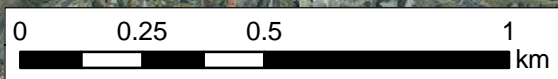


Study Area

- Study Area
- Catchment Boundary

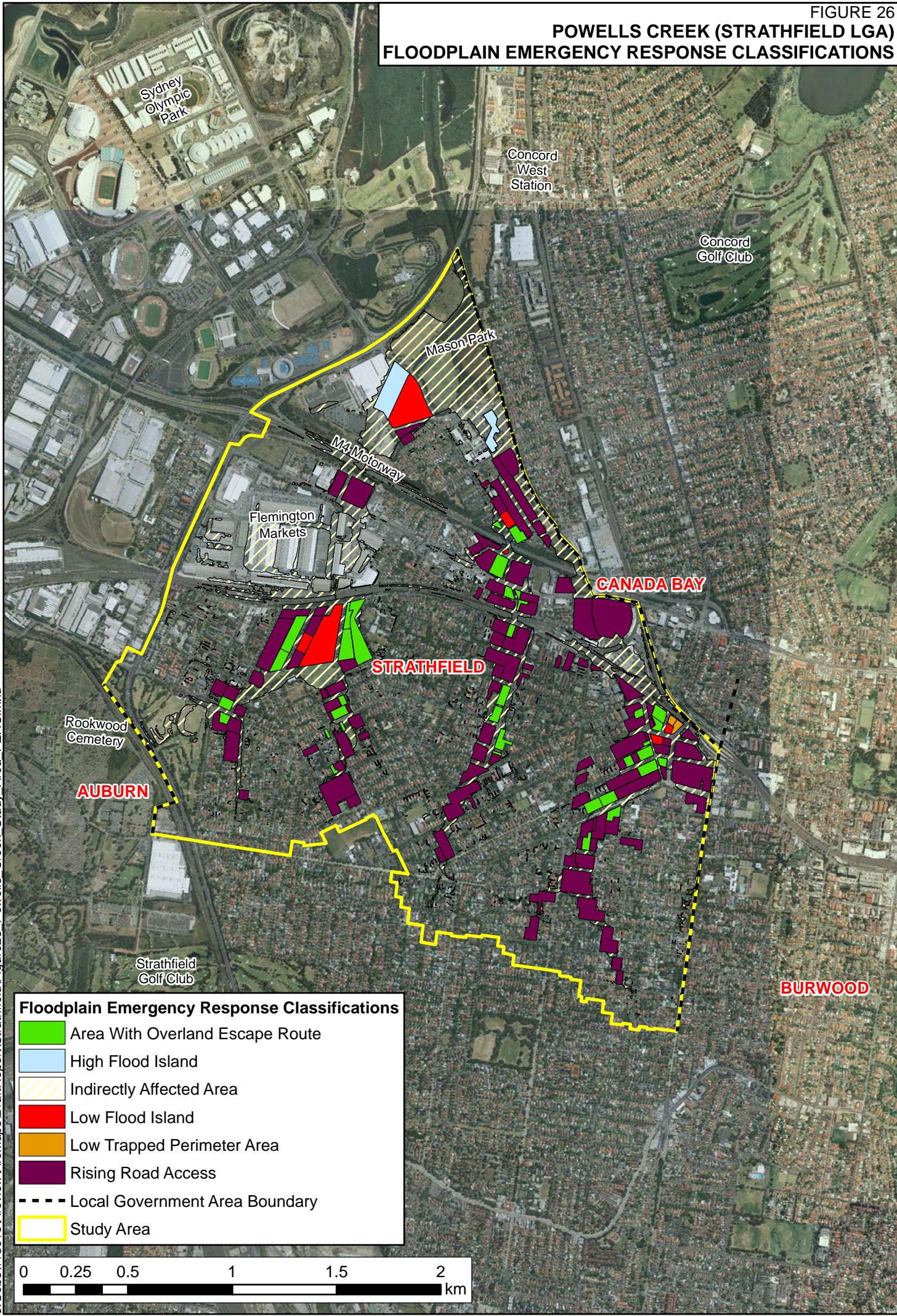
Tagging

- Mainstream
- Overland
- Both Mainstream and Overland
- Manually Tagged Overland



J:\Jobs\115010\FloodTagging\Output\Figure25_Flood_Planning_Area.mxd

POWELLS CREEK (STRATHFIELD LGA) FLOODPLAIN EMERGENCY RESPONSE CLASSIFICATIONS



J:\Jobs\115010\Arcview\ArcMaps\DraftReport\Strathfield\Figure26_Powells_Creek_Study_Area_FERC.mxd



APPENDIX A: GLOSSARY of TERMS

Taken from the Floodplain Development Manual (April 2005 edition)

acid sulfate soils	Are sediments which contain sulfidic mineral pyrite which may become extremely acid following disturbance or drainage as sulfur compounds react when exposed to oxygen to form sulfuric acid. More detailed explanation and definition can be found in the NSW Government Acid Sulfate Soil Manual published by Acid Sulfate Soil Management Advisory Committee.
Annual Exceedance Probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood discharge of 500 m ³ /s has an AEP of 5%, it means that there is a 5% chance (that is one-in-20 chance) of a 500 m ³ /s or larger event occurring in any one year (see ARI).
Australian Height Datum (AHD)	A common national surface level datum approximately corresponding to mean sea level.
Average Annual Damage (AAD)	Depending on its size (or severity), each flood will cause a different amount of flood damage to a flood prone area. AAD is the average damage per year that would occur in a nominated development situation from flooding over a very long period of time.
Average Recurrence Interval (ARI)	The long term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods with a discharge as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event.
caravan and moveable home parks	Caravans and moveable dwellings are being increasingly used for long-term and permanent accommodation purposes. Standards relating to their siting, design, construction and management can be found in the Regulations under the LG Act.
catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.
consent authority	The Council, Government agency or person having the function to determine a development application for land use under the EP&A Act. The consent authority is most often the Council, however legislation or an EPI may specify a Minister or public authority (other than a Council), or the Director General of DIPNR, as having the function to determine an application.
development	<p>Is defined in Part 4 of the Environmental Planning and Assessment Act (EP&A Act).</p> <p>infill development: refers to the development of vacant blocks of land that are generally surrounded by developed properties and is permissible under the current zoning of the land. Conditions such as minimum floor levels may be imposed on infill development.</p> <p>new development: refers to development of a completely different nature to that associated with the former land use. For example, the urban subdivision of an area previously used for rural purposes. New developments involve rezoning and typically require major extensions of existing urban services, such as roads, water supply, sewerage and electric power.</p> <p>redevelopment: refers to rebuilding in an area. For example, as urban areas age, it may become necessary to demolish and reconstruct buildings on a relatively large scale. Redevelopment generally does not require either rezoning or major extensions to urban services.</p>
disaster plan (DISPLAN)	A step by step sequence of previously agreed roles, responsibilities, functions, actions and management arrangements for the conduct of a single or series of

	connected emergency operations, with the object of ensuring the coordinated response by all agencies having responsibilities and functions in emergencies.
discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m ³ /s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving for example, metres per second (m/s).
ecologically sustainable development (ESD)	Using, conserving and enhancing natural resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be maintained or increased. A more detailed definition is included in the Local Government Act 1993. The use of sustainability and sustainable in this manual relate to ESD.
effective warning time	The time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to move farm equipment, move stock, raise furniture, evacuate people and transport their possessions.
emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
flash flooding	Flooding which is sudden and unexpected. It is often caused by sudden local or nearby heavy rainfall. Often defined as flooding which peaks within six hours of the causative rain.
flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunamis.
flood awareness	Flood awareness is an appreciation of the likely effects of flooding and a knowledge of the relevant flood warning, response and evacuation procedures.
flood education	Flood education seeks to provide information to raise awareness of the flood problem so as to enable individuals to understand how to manage themselves and their property in response to flood warnings and in a flood event. It invokes a state of flood readiness.
flood fringe areas	The remaining area of flood prone land after floodway and flood storage areas have been defined.
flood liable land	Is synonymous with flood prone land (i.e. land susceptible to flooding by the probable maximum flood (PMF) event). Note that the term flood liable land covers the whole of the floodplain, not just that part below the flood planning level (see flood planning area).
flood mitigation standard	The average recurrence interval of the flood, selected as part of the floodplain risk management process that forms the basis for physical works to modify the impacts of flooding.
floodplain	Area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land.
floodplain risk management options	The measures that might be feasible for the management of a particular area of the floodplain. Preparation of a floodplain risk management plan requires a detailed evaluation of floodplain risk management options.
floodplain risk management plan	A management plan developed in accordance with the principles and guidelines in this manual. Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.

flood plan (local)	A sub-plan of a disaster plan that deals specifically with flooding. They can exist at State, Division and local levels. Local flood plans are prepared under the leadership of the State Emergency Service.
flood planning area	The area of land below the flood planning level and thus subject to flood related development controls. The concept of flood planning area generally supersedes the “flood liable land” concept in the 1986 Manual.
Flood Planning Levels (FPLs)	FPL’s are the combinations of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans. FPLs supersede the “standard flood event” in the 1986 manual.
flood proofing	A combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate flood damages.
flood prone land	Is land susceptible to flooding by the Probable Maximum Flood (PMF) event. Flood prone land is synonymous with flood liable land.
flood readiness	Flood readiness is an ability to react within the effective warning time.
flood risk	<p>Potential danger to personal safety and potential damage to property resulting from flooding. The degree of risk varies with circumstances across the full range of floods. Flood risk in this manual is divided into 3 types, existing, future and continuing risks. They are described below.</p> <p>existing flood risk: the risk a community is exposed to as a result of its location on the floodplain.</p> <p>future flood risk: the risk a community may be exposed to as a result of new development on the floodplain.</p> <p>continuing flood risk: the risk a community is exposed to after floodplain risk management measures have been implemented. For a town protected by levees, the continuing flood risk is the consequences of the levees being overtopped. For an area without any floodplain risk management measures, the continuing flood risk is simply the existence of its flood exposure.</p>
flood storage areas	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. Hence, it is necessary to investigate a range of flood sizes before defining flood storage areas.
floodway areas	Those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flows, or a significant increase in flood levels.
freeboard	Freeboard provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the FPL is actually provided. It is a factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. Freeboard is included in the flood planning level.
habitable room	<p>in a residential situation: a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom.</p> <p>in an industrial or commercial situation: an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.</p>
hazard	A source of potential harm or a situation with a potential to cause loss. In relation to this manual the hazard is flooding which has the potential to cause damage to the community. Definitions of high and low hazard categories are provided in the

	Manual.
hydraulics	Term given to the study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity.
hydrograph	A graph which shows how the discharge or stage/flood level at any particular location varies with time during a flood.
hydrology	Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.
overland flooding (local)	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
local drainage	Are smaller scale problems in urban areas. They are outside the definition of major drainage in this glossary.
mainstream flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.
major drainage	<p>Councils have discretion in determining whether urban drainage problems are associated with major or local drainage. For the purpose of this manual major drainage involves:</p> <ul style="list-style-type: none"> • the floodplains of original watercourses (which may now be piped, channelised or diverted), or sloping areas where overland flows develop along alternative paths once system capacity is exceeded; and/or • water depths generally in excess of 0.3 m (in the major system design storm as defined in the current version of Australian Rainfall and Runoff). These conditions may result in danger to personal safety and property damage to both premises and vehicles; and/or • major overland flow paths through developed areas outside of defined drainage reserves; and/or • the potential to affect a number of buildings along the major flow path.
mathematical/computer models	The mathematical representation of the physical processes involved in runoff generation and stream flow. These models are often run on computers due to the complexity of the mathematical relationships between runoff, stream flow and the distribution of flows across the floodplain.
merit approach	<p>The merit approach weighs social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well being of the State's rivers and floodplains.</p> <p>The merit approach operates at two levels. At the strategic level it allows for the consideration of social, economic, ecological, cultural and flooding issues to determine strategies for the management of future flood risk which are formulated into Council plans, policy and EPIs. At a site specific level, it involves consideration of the best way of conditioning development allowable under the floodplain risk management plan, local floodplain risk management policy and EPIs.</p>
minor, moderate and major flooding	<p>Both the State Emergency Service and the Bureau of Meteorology use the following definitions in flood warnings to give a general indication of the types of problems expected with a flood:</p> <p>minor flooding: causes inconvenience such as closing of minor roads and the submergence of low level bridges. The lower limit of this class of flooding on the reference gauge is the initial flood level at which landholders and townspeople begin to be flooded.</p> <p>moderate flooding: low-lying areas are inundated requiring removal of stock</p>

	and/or evacuation of some houses. Main traffic routes may be covered. major flooding: appreciable urban areas are flooded and/or extensive rural areas are flooded. Properties, villages and towns can be isolated.
modification measures	Measures that modify either the flood, the property or the response to flooding. Examples are indicated in Table 2.1 with further discussion in the Manual.
peak discharge	The maximum discharge occurring during a flood event.
Probable Maximum Flood (PMF)	The PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain. The extent, nature and potential consequences of flooding associated with a range of events rarer than the flood used for designing mitigation works and controlling development, up to and including the PMF event should be addressed in a floodplain risk management study.
Probable Maximum Precipitation (PMP)	The PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to PMF estimation.
probability	A statistical measure of the expected chance of flooding (see AEP).
risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of the manual it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
runoff	The amount of rainfall which actually ends up as streamflow, also known as rainfall excess.
stage	Equivalent to “water level”. Both are measured with reference to a specified datum.
stage hydrograph	A graph that shows how the water level at a particular location changes with time during a flood. It must be referenced to a particular datum.
survey plan	A plan prepared by a registered surveyor.
water surface profile	A graph showing the flood stage at any given location along a watercourse at a particular time.
wind fetch	The horizontal distance in the direction of wind over which wind waves are generated.



FIGURE B1
POWELLS CREEK - FLOOD FREQUENCY ANALYSIS
DATA SET #1
LP3 ANALYSIS - BAYESIAN

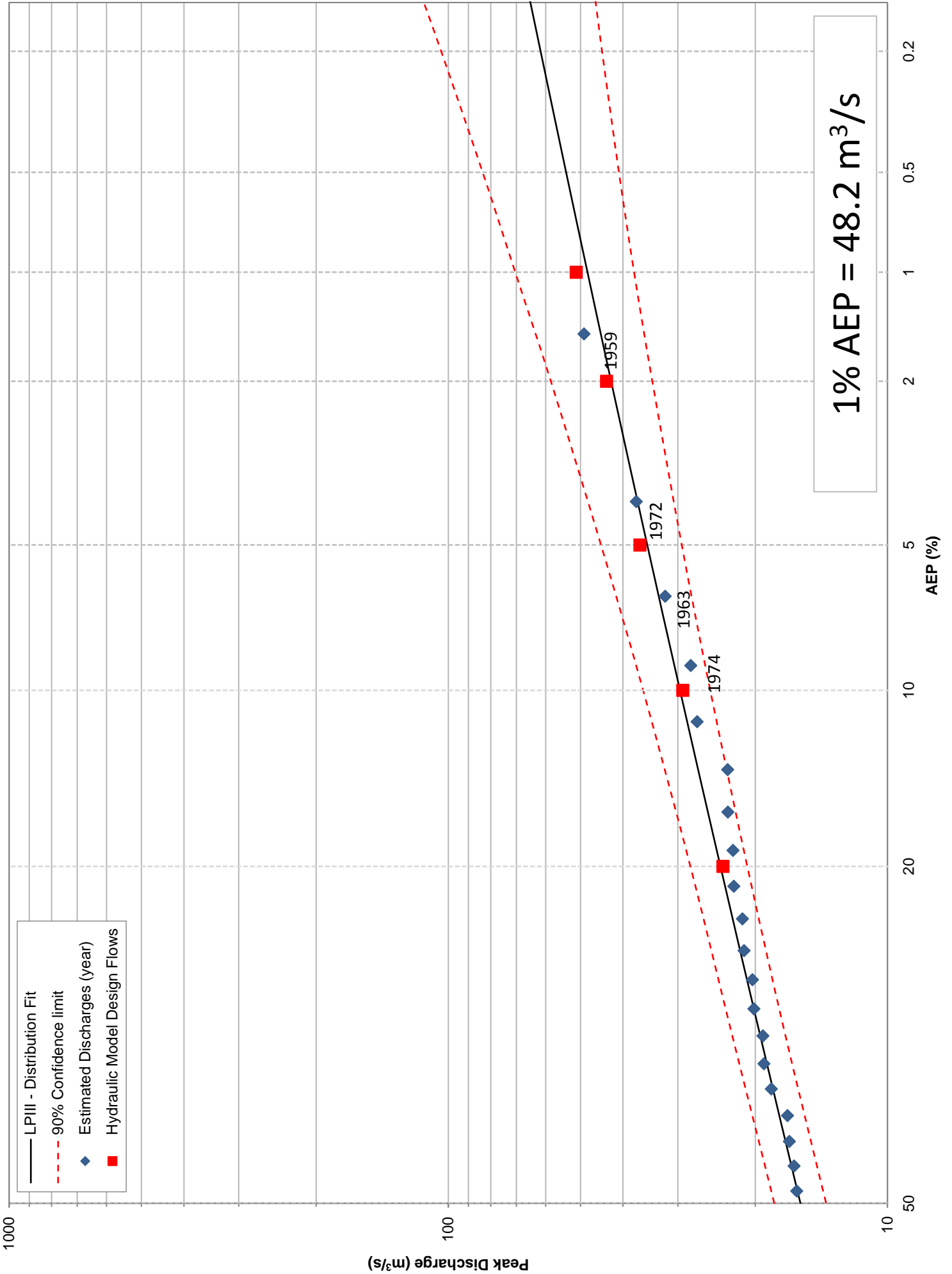


FIGURE B2
POWELLS CREEK - FLOOD FREQUENCY ANALYSIS
DATA SET #2
LP3 ANALYSIS - BAYESIAN

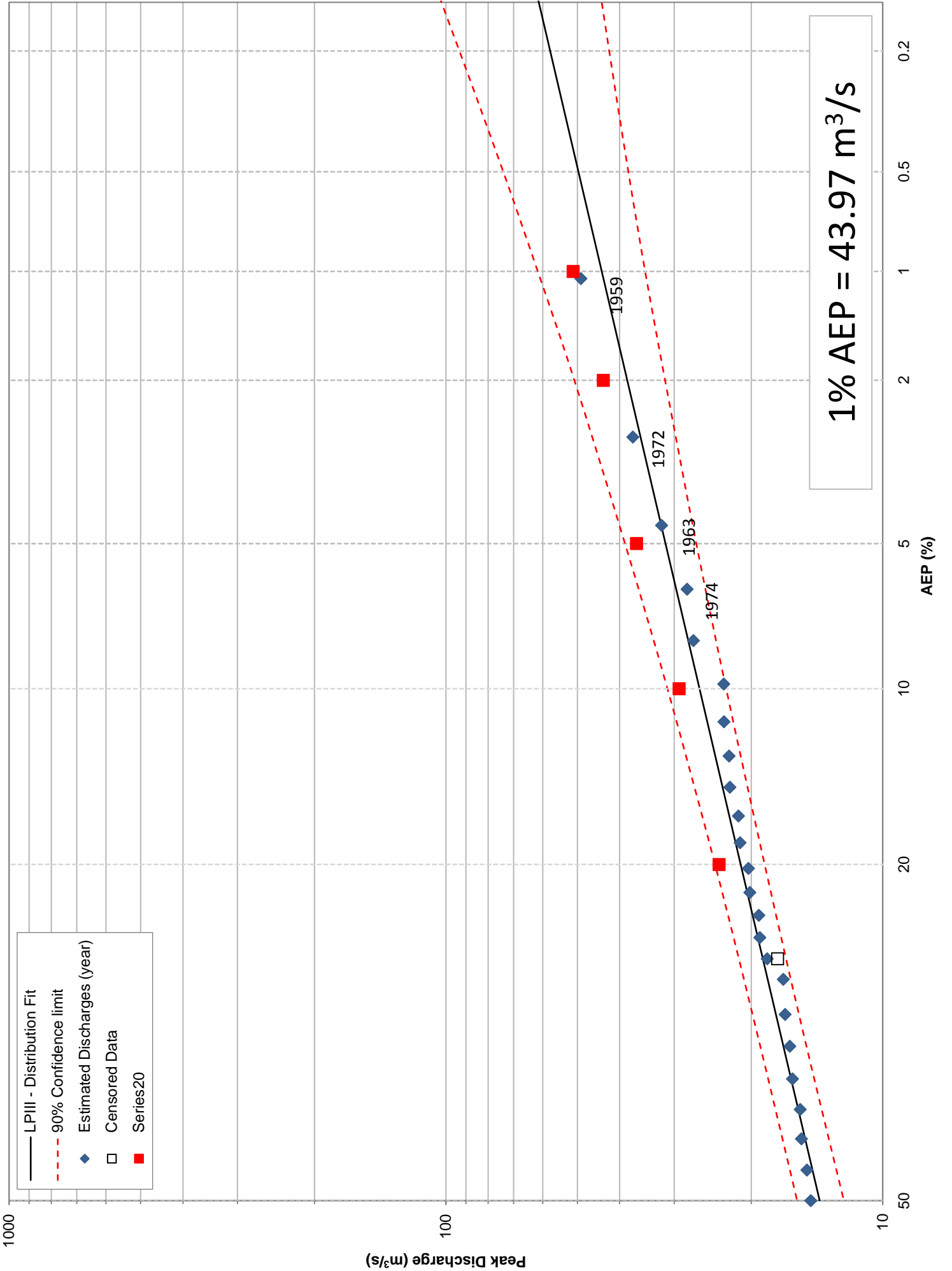


FIGURE B3
POWELLS CREEK - FLOOD FREQUENCY ANALYSIS
DATA SET #3
LP3 ANALYSIS - BAYESIAN

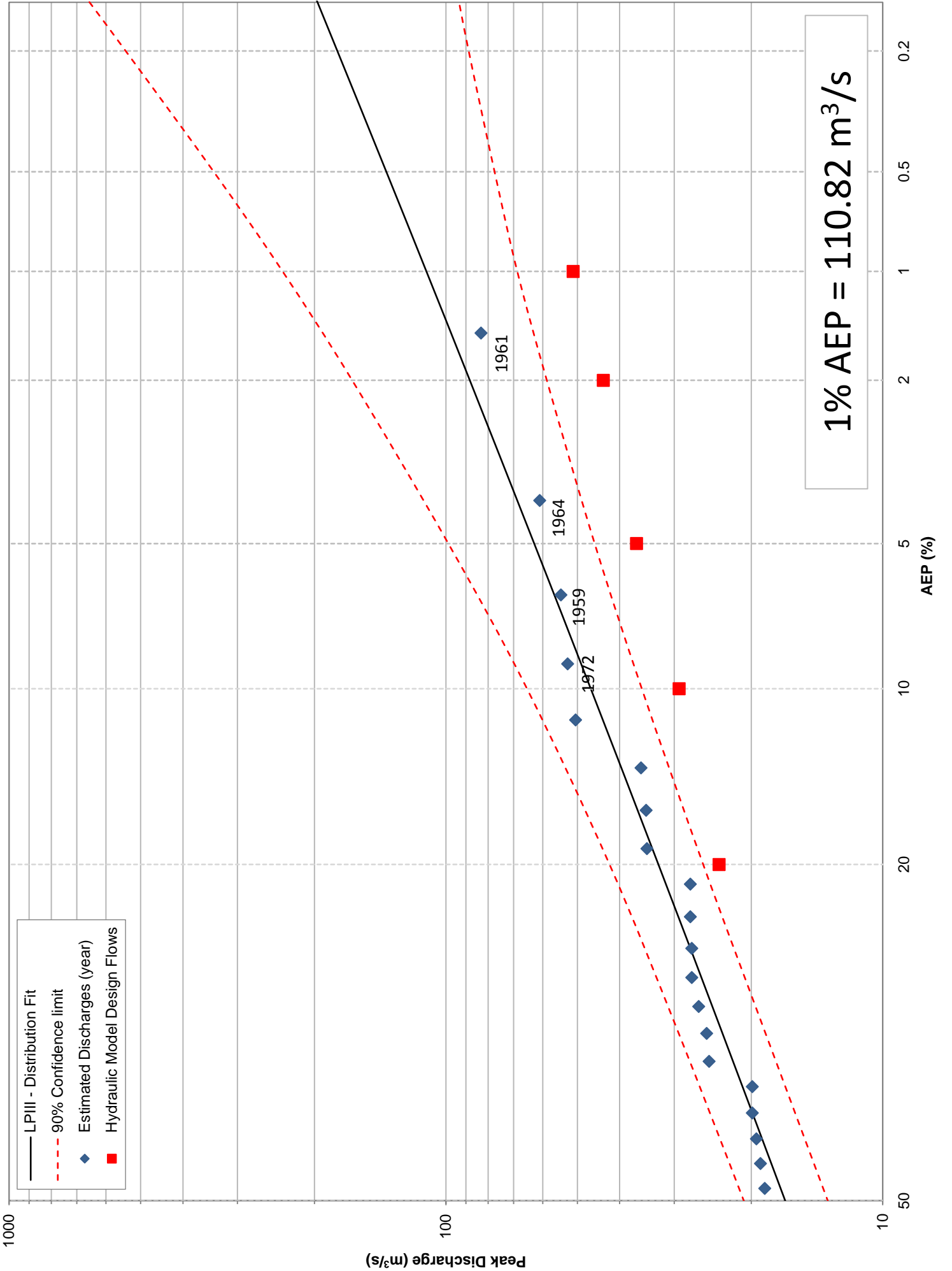


FIGURE B4
POWELLS CREEK - FLOOD FREQUENCY ANALYSIS
DATA SET #4
LP3 ANALYSIS - BAYESIAN

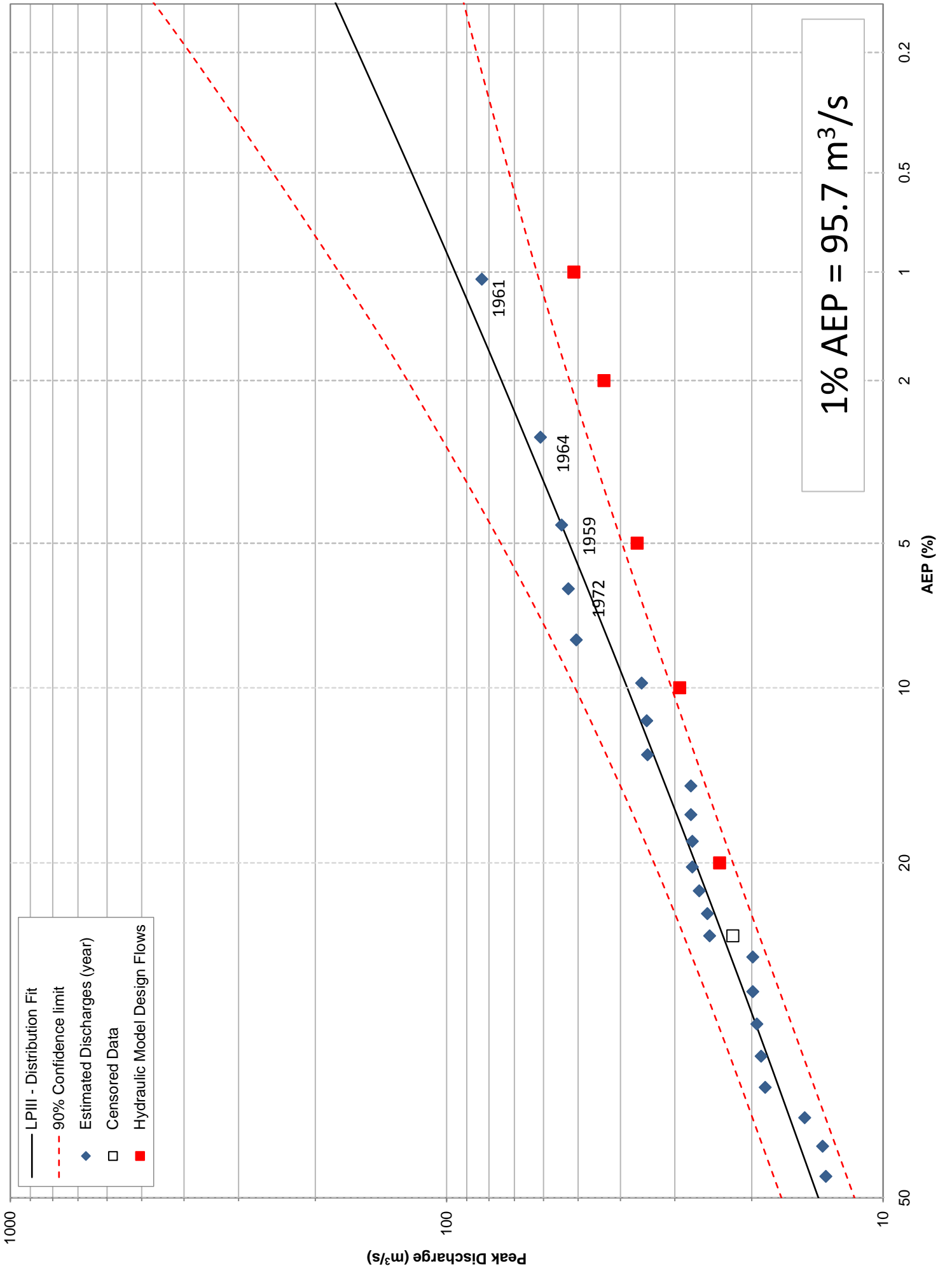


FIGURE B5
POWELLS CREEK - FLOOD FREQUENCY ANALYSIS
DATA SET #5
LP3 ANALYSIS - BAYESIAN

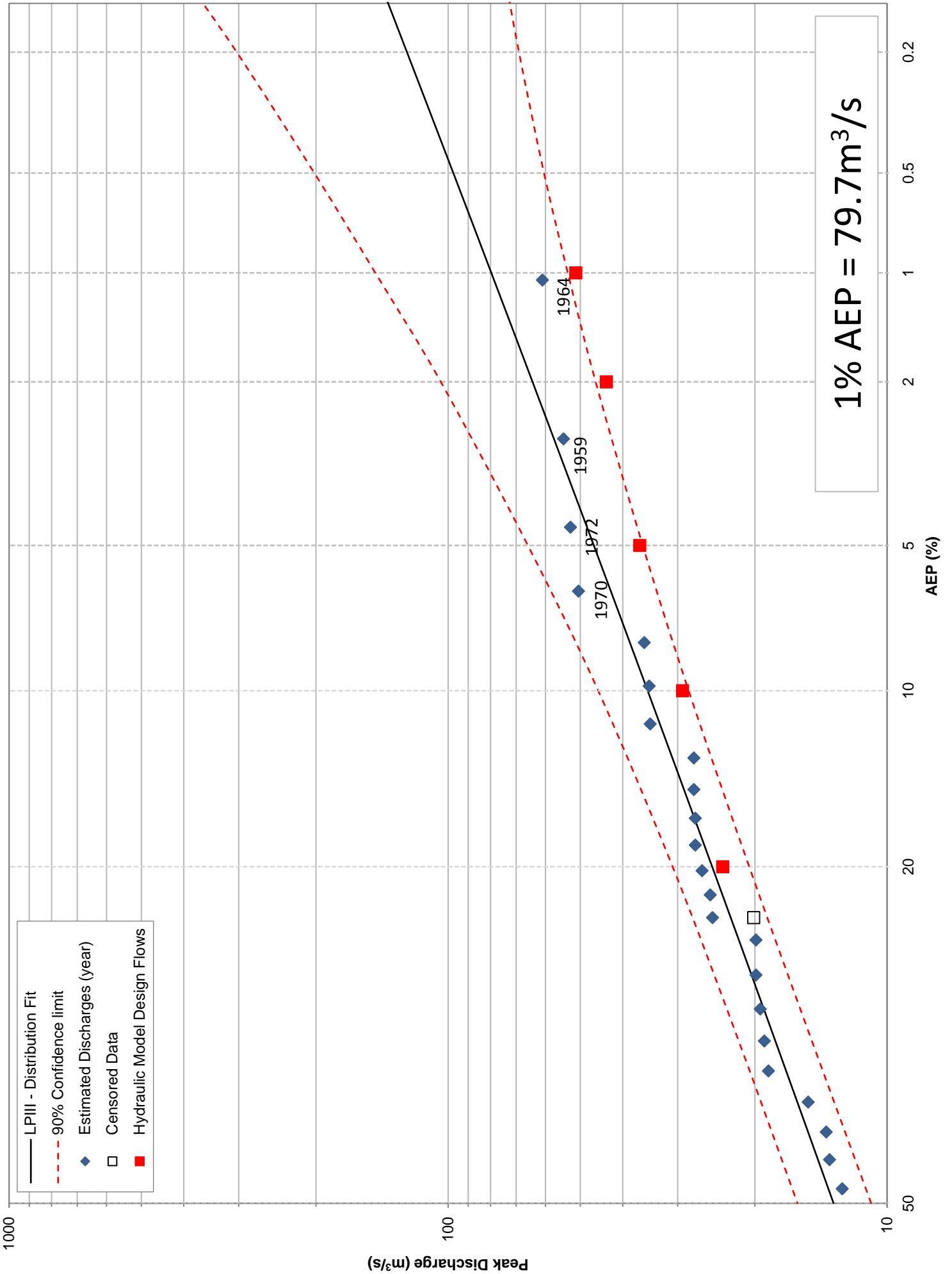


FIGURE B6
POWELLS CREEK - FLOOD FREQUENCY ANALYSIS
DATA SET #6
LP3 ANALYSIS - BAYESIAN

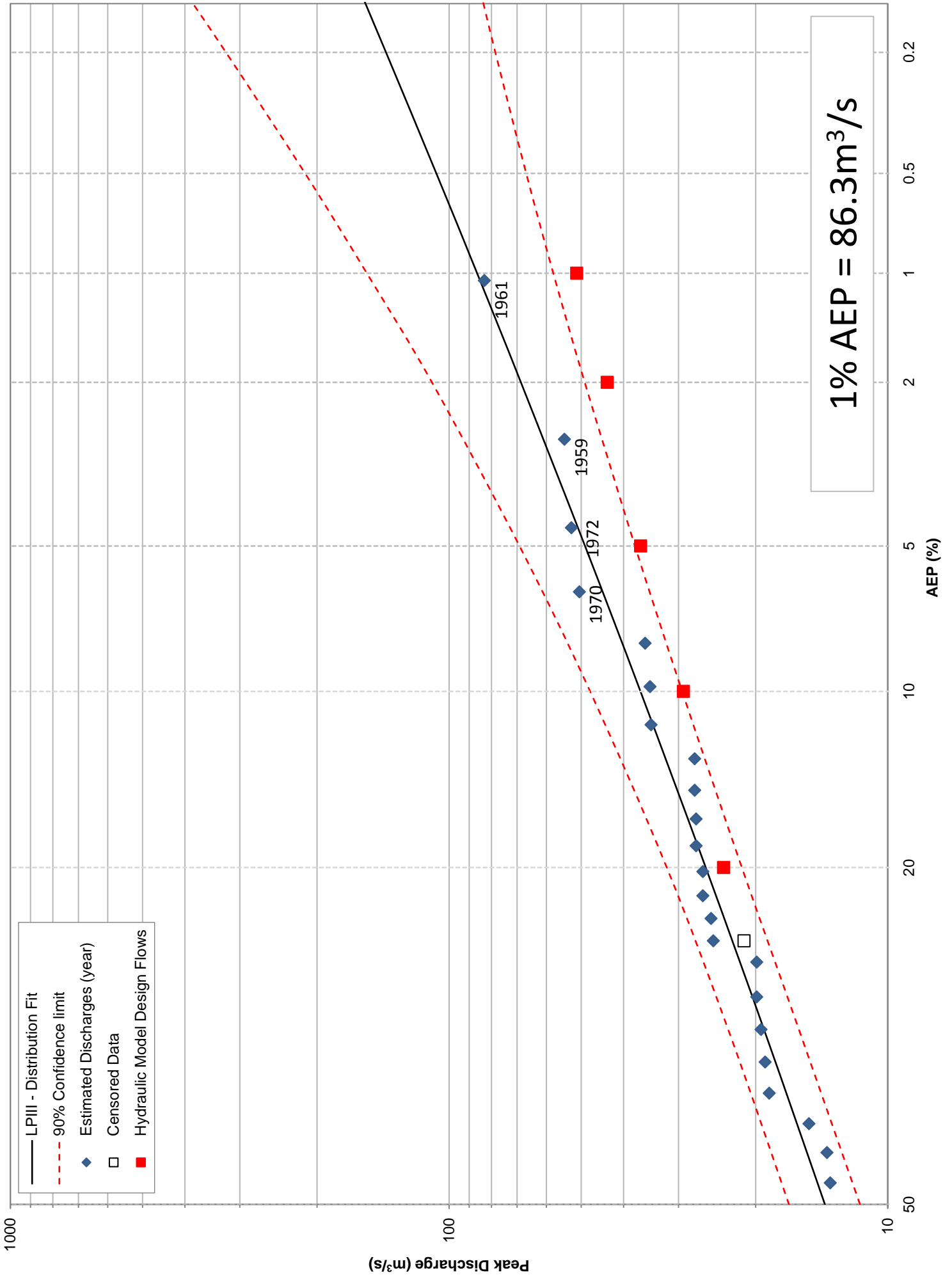


FIGURE B7
POWELLS CREEK - FLOOD FREQUENCY ANALYSIS
DATA SET #7
LP3 ANALYSIS - BAYESIAN

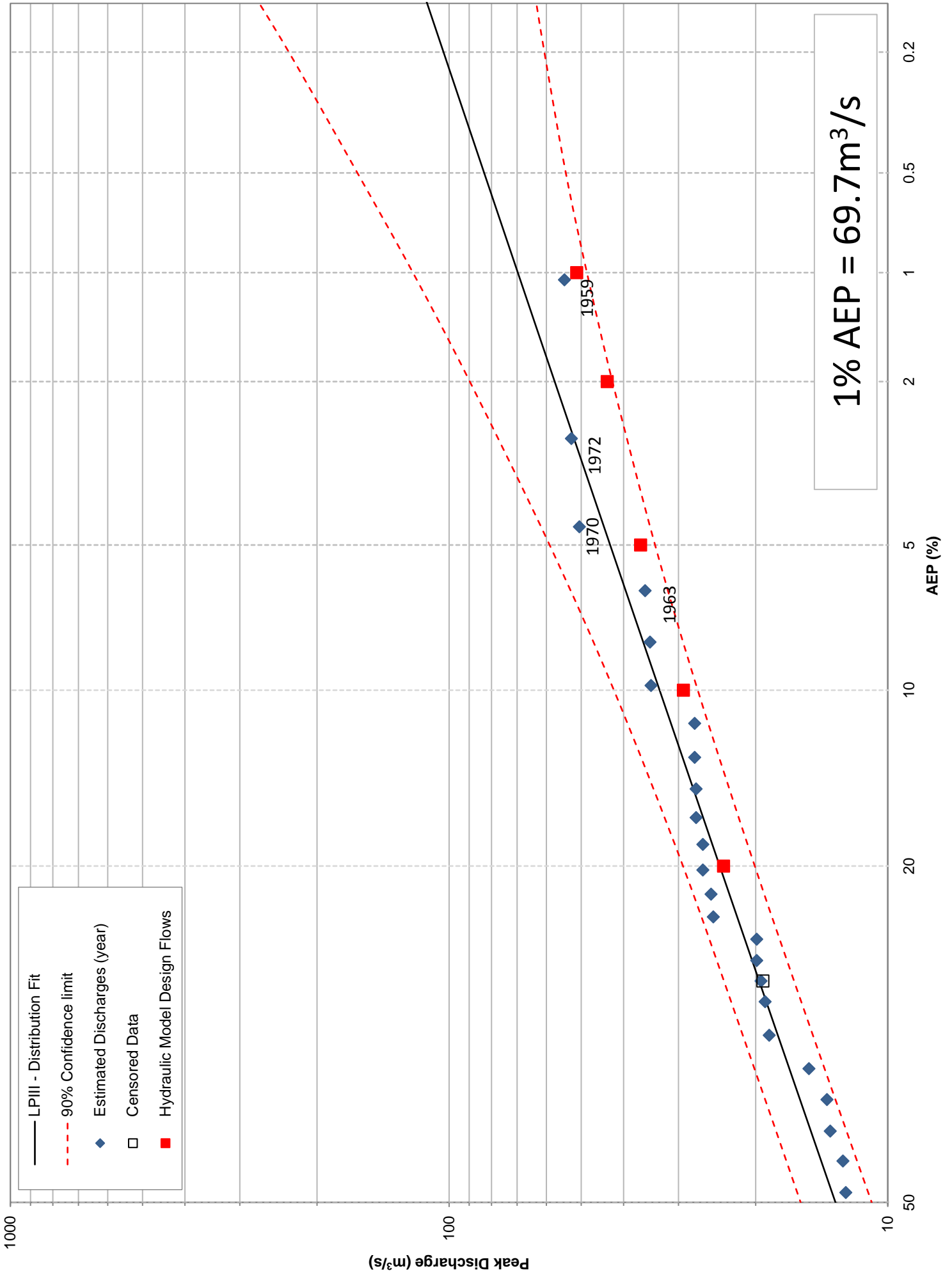
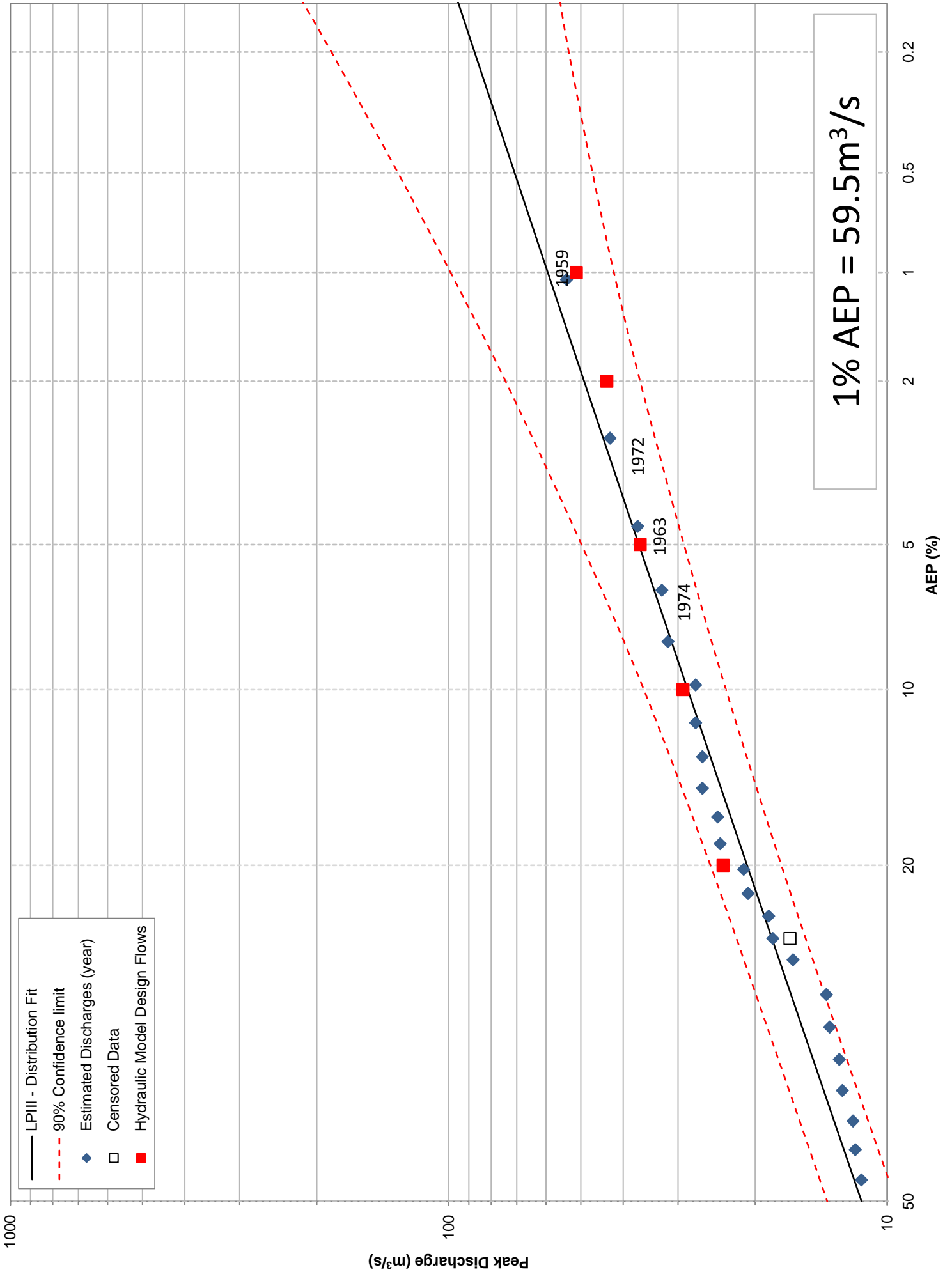


FIGURE B8
POWELLS CREEK - FLOOD FREQUENCY ANALYSIS
DATA SET #8
LP3 ANALYSIS - BAYESIAN





ID No.	Street No.	Street Name	Town	1% AEP Main Channel Flood		1% AEP Main Channel Level		1% AEP Overland Flood		1% AEP Overland Level		1% AEP Overland Velocity		1% AEP Overland Flood Hazard		1% AEP Overland Flood Inundation		1% AEP Main Channel		1% AEP Overland Flood		TAGGING INFO			
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Tag	TagType
102045007	1	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102045009	1	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102045213	1	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102045207	1	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102045156	2	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102045156	3	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
100098730	4	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102049145	4	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102049154	5	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102049144	6	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
151652971	7	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102049141	8	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102049150	9	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102049139	10	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2%	No	In 1% Overland Extent	
102049149	11	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
102049140	12	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.01	19.50	20.02	0.01	0.29	25%	No	No	No	No	No	No	25%	No	No	In 1% Overland Extent	
102049148	13	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.03	18.08	18.30	0.35	0.95	Low	2%	No	No	No	No	No	2%	No	No	In 1% Overland Extent	
102049137	14	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.02	18.88	19.52	0.00	0.28	Low	26%	No	No	No	No	No	26%	No	No	In 1% Overland Extent	
102049147	15	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	12.27	18.06	0.02	0.26	Low	13%	No	No	No	No	No	13%	No	No	Powells Creek	
102049138	16	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.02	18.39	18.98	0.01	0.27	Low	31%	No	No	No	No	No	31%	No	No	In 1% Overland Extent	
102049391	17	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.01	16.69	17.37	0.02	0.05	Low	33%	No	No	No	No	No	33%	No	No	In 1% Overland Extent	
102049158	17	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102049373	18	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	12.52	17.58	0.00	0.28	Low	35%	No	No	No	No	No	35%	No	No	In 1% Overland Extent	
102049389	19	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.02	16.03	16.70	0.01	0.05	Low	37%	No	No	No	No	No	37%	No	No	In 1% Overland Extent	
102049388	21	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.04	15.37	16.01	0.03	0.16	Low	38%	No	No	No	No	No	38%	No	No	In 1% Overland Extent	
103822027	22	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.05	16.07	16.86	0.01	0.08	Low	26%	No	No	No	No	No	26%	No	No	In 1% Overland Extent	
103826202	22	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.04	15.42	16.08	0.00	0.47	Low	27%	No	No	No	No	No	27%	No	No	In 1% Overland Extent	
102049387	23	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.02	16.85	17.13	0.02	0.48	Low	21%	No	No	No	No	No	21%	No	No	In 1% Overland Extent	
102049085	24	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.01	14.68	15.33	0.03	0.49	Low	29%	No	No	No	No	No	29%	No	No	In 1% Overland Extent	
102049086	25	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.09	13.47	14.64	0.01	0.45	Low	26%	No	No	No	No	No	26%	No	No	In 1% Overland Extent	
103966852	26	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.02	14.01	14.65	0.02	0.52	Low	27%	No	No	No	No	No	27%	No	No	In 1% Overland Extent	
102049372	26	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.19	13.95	13.88	0.00	0.77	Low	41%	No	No	No	No	No	41%	No	No	In 1% Overland Extent	
103966856	28	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.13	13.28	14.15	0.00	1.03	Low	62%	No	No	No	No	No	62%	No	No	In 1% Overland Extent	
102049381	29	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.11	12.26	13.19	0.02	0.71	Low	70%	No	No	No	No	No	70%	No	No	Overland	
103966857	30	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.13	12.65	13.69	0.01	1.09	Low	89%	No	No	No	No	No	89%	No	No	Overland	
102049897	31	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.14	11.68	12.56	0.02	0.98	Low	89%	No	No	No	No	No	89%	No	No	Overland	
102049893	31	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.19	11.98	12.91	0.02	0.91	Low	89%	No	No	No	No	No	89%	No	No	Overland	
102049933	33	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.17	11.12	11.86	0.04	0.71	Low	100%	No	No	No	No	No	100%	No	No	Overland	
102049771	34	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.28	11.42	12.17	0.01	0.81	Low	100%	No	No	No	No	No	100%	No	No	Overland	
102048971	34	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.28	10.96	11.67	0.04	1.02	Low	90%	No	No	No	No	No	90%	No	No	Overland	
102048971	35	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.04	10.74	11.48	0.07	0.88	Low	100%	No	No	No	No	No	100%	No	No	In 1% Overland Extent	
162795799	37	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.19	9.69	9.89	0.52	0.05	1.11	High	100%	No	No	No	No	No	100%	No	No	Overland
102048894	38	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.03	9.11	10.49	0.11	1.12	1.44	Low	100%	No	No	No	No	No	100%	No	No	Overland
102048891	40	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.19	10.53	11.26	0.10	0.92	Low	59%	No	No	No	No	No	59%	No	No	Overland	
102048908	41	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.39	9.97	10.53	0.05	1.89	High	100%	No	No	No	No	No	100%	No	No	Overland	
102048907	42	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.09	10.27	10.90	0.01	0.80	Low	100%	No	No	No	No	No	100%	No	No	In 1% Overland Extent	
102048907	43	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.35	9.87	10.73	0.03	1.00	Low	100%	No	No	No	No	No	100%	No	No	Overland	
102048889	44	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.09	11.78	12.32	0.02	0.88	Low	70%	No	No	No	No	No	70%	No	No	In 1% Overland Extent	
102048906	45	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.11	9.87	11.11	0.02	0.95	Low	53%	No	No	No	No	No	53%	No	No	Overland	
102048907	46	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.07	10.38	11.02	0.00	0.98	Low	63%	No	No	No	No	No	63%	No	No	In 1% Overland Extent	
102048905	47	ABBOTTSFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.05	11.09	11.67	0.01	0.93	Low	23%	No									

ID	Street No	Street Name	Town	1% AEP Main Channel Flood		1% AEP Main Channel Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		TAGGING INFO			
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Tag	TagType
10204325	59	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204351	60	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.38	9.52	9.93	0.01	1.81	Low	100%	No	No	Yes	9.52	9.93	Yes	Overland	Powells Creek
161371250	62	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.37	9.57	10.21	0.00	1.76	Low	100%	No	No	Yes	9.57	10.21	Yes	Overland	Powells Creek
10204334	64	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.42	10.36	11.85	0.00	1.41	Low	52%	No	No	Yes	10.36	11.85	Yes	Overland	Powells Creek
10204344	64	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.42	10.36	11.85	0.00	1.41	Low	52%	No	No	Yes	10.36	11.85	Yes	Overland	Powells Creek
10204337	64	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.46	10.37	10.99	0.00	0.87	Low	94%	No	No	Yes	10.37	10.99	Yes	Overland	Powells Creek
10399164	65	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10204918	71	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10204944	72	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.07	10.44	12.83	0.03	0.96	Low	66%	No	No	No	No	No	In 1% Overland Extent	No	Powells Creek
10204957	73	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10204956	75	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10204967	76	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.05	10.78	12.77	0.00	0.46	Low	100%	No	No	No	No	No	In 1% Overland Extent	No	Powells Creek
10204951	77	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10204920	78	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.17	11.04	12.93	0.01	0.84	Low	100%	No	No	Yes	11.04	14.29	Yes	Overland	Powells Creek
10204950	79	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10204949	81	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.01	21.44	21.44	0.00	0.00	Low	1%	No	No	No	No	No	In 1% Overland Extent	No	Powells Creek
10204939	83	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.13	21.44	24.71	0.00	0.86	Low	59%	No	Yes	21.44	24.71	Yes	Overland	Powells Creek	
10204928	84	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.57	12.92	15.62	0.00	0.77	Low	100%	No	Yes	12.92	15.62	Yes	Overland	Powells Creek	
10204928	87	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.17	20.68	24.65	0.02	1.24	Low	100%	No	Yes	20.68	24.65	Yes	Overland	Powells Creek	
10204938	88	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.06	13.61	17.67	0.00	0.81	Low	30%	No	No	No	No	In 1% Overland Extent	No	Powells Creek	
10204826	91	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.66	21.25	23.70	0.04	1.11	Low	99%	No	Yes	21.25	23.70	Yes	Overland	Powells Creek	
10204936	94	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.56	18.48	21.80	0.00	0.70	Low	9%	No	No	No	No	In 1% Overland Extent	No	Powells Creek	
10429615	95	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.13	21.23	24.63	0.00	1.22	Low	100%	No	Yes	21.23	24.63	Yes	Overland	Powells Creek	
10204985	98	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.47	18.01	21.60	0.00	0.81	Low	68%	No	Yes	18.01	21.60	Yes	Overland	Powells Creek	
10204982	104	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	22.55	23.84	0.02	0.50	Low	23%	No	No	No	No	In 1% Overland Extent	No	Powells Creek	
100098715	105	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.21	17.60	19.87	0.13	1.30	Low	100%	No	Yes	17.60	19.87	Yes	Overland	Powells Creek	
102049123	106	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10204913	107	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.24	21.51	24.01	0.00	1.55	Low	100%	No	No	Yes	21.51	24.01	Yes	Overland	Powells Creek
102049121	108	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
100098712	109	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.23	17.38	19.92	0.01	0.98	Low	100%	No	Yes	17.38	19.92	Yes	Overland	Powells Creek		
102049119	110	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10209925	111	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.18	12.90	14.67	0.06	0.93	Low	100%	No	Yes	12.90	14.67	Yes	Overland	Powells Creek	
102049117	112	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10289554	113	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.13	17.75	19.68	0.03	0.94	Low	100%	No	Yes	17.75	19.68	Yes	Overland	Powells Creek	
102049116	114	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10289552	115	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.07	17.66	19.48	0.01	0.55	Low	99%	No	No	No	No	In 1% Overland Extent	No	Powells Creek		
10289551	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	In 1% Overland Extent	No	Powells Creek		
10289561	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
102899702	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
100098723	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10009875	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
100098719	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
100098716	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
100098717	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10289558	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.06	23.17	24.75	0.03	0.23	Low	96%	No	No	No	No	In 1% Overland Extent	No	Powells Creek		
10289559	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	23.82	25.08	0.43	0.83	Low	100%	No	Yes	23.82	25.08	Yes	Overland	Powells Creek	
10289558	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	23.59	25.26	0.05	0.49	Low	99%	No	No	No	In 1% Overland Extent	No	Powells Creek		
10289623	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.36	21.19	25.68	0.00	1.26	Low	66%	No	Yes	21.19	25.68	Yes	Overland	Powells Creek		
10289586	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.03	22.83	23.63	0.16	0.54	Low	100%	No	No	No	In 1% Overland Extent	No	Powells Creek			
10289591	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10289630	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
10289629	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.03	23.57	24.80	0.01	0.55	Low	89%	No	No	No	In 1% Overland Extent	No	Powells Creek			
10289593	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.06	22.97	24.41	0.04	0.44	Low	98%	No	No	No	In 1% Overland Extent	No	Powells Creek			
100098724	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	Powells Creek
100098734	116	ALBERT RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	In 1% Overland Extent	No	Powells Creek		
100098718	116	ALBERT RD	STRATHFIELD																				

ID	Street No.	Street Name	Town	1% AEP Main Channel Flood		1% AEP Main Channel Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		TAGGING INFO				
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Tag	TagType	Location
10290131	61	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290136	62	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290132	64	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290178	65	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.32	22.62	24.56	0.19	2.06	High	100%	No	Yes	22.62	24.56	Yes	Overland	Powells Creek		
10290131	66	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290177	67	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.16	22.72	25.03	0.17	1.74	Low	100%	No	Yes	22.72	25.03	Yes	Overland	Powells Creek		
10290109	68	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290176	69	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.09	22.82	25.50	0.06	1.16	Low	100%	No	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10290179	70	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.07	25.00	26.78	0.06	0.87	Low	96%	No	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10290173	71	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.17	23.30	25.17	0.13	1.32	Low	100%	No	Yes	23.16	26.01	Yes	Overland	Powells Creek		
10290165	72	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.23	24.91	27.13	0.14	1.50	Low	100%	No	Yes	24.91	27.13	Yes	Overland	Powells Creek		
10290173	74	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.48	25.09	27.13	0.10	2.07	High	100%	No	Yes	25.09	27.12	Yes	Overland	Powells Creek		
10290160	75	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.10	26.62	28.32	0.01	1.37	Low	89%	No	Yes	26.62	28.32	Yes	Overland	Powells Creek		
10290163	76	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.29	25.37	27.17	0.00	1.63	Low	100%	No	Yes	25.37	27.17	Yes	Overland	Powells Creek		
10290168	77	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.27	27.33	29.62	0.01	1.06	Low	100%	No	Yes	27.33	29.62	Yes	Overland	Powells Creek		
10290167	78	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.09	25.89	27.99	0.01	0.56	Low	100%	No	No	No	In 1% Overland Extent	No	No	Powells Creek		
10290150	79	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.12	27.69	30.28	0.05	0.97	Low	100%	No	Yes	27.69	30.28	Yes	Overland	Powells Creek		
10290166	80	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290158	81	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.67	23.20	30.99	0.01	0.91	Low	98%	No	Yes	28.50	30.99	Yes	Overland	Powells Creek		
10290163	82	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290146	83	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.21	28.97	31.56	0.00	0.98	Low	100%	No	Yes	28.97	31.56	Yes	Overland	Powells Creek		
10290164	84	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290145	85	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.42	30.78	32.73	0.00	0.73	Low	100%	No	Yes	30.70	31.65	Yes	Overland	Powells Creek	
10290351	85	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.13	30.18	32.29	0.15	1.17	Low	100%	No	Yes	30.18	32.29	Yes	Overland	Powells Creek		
10290163	86	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290144	87	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.15	30.87	32.84	0.00	0.68	Low	100%	No	Yes	30.87	32.84	Yes	Overland	Powells Creek		
10290161	88	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290143	89	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.08	32.12	33.12	0.00	0.57	Low	98%	No	No	No	In 1% Overland Extent	No	No	Powells Creek		
10290140	90	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290138	92	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290136	94	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290134	95	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290131	96	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10290132	96	ALBYN RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10005557	0	ALLEN ST	HOMEBUSH	0.02	1.96	2.94	2.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Yes	Mainstream	Powells Creek	
10425883	0	ALLEN ST	HOMEBUSH	0.00	1.61	2.94	3.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Yes	Mainstream	Powells Creek	
10290155	0	ALLEN ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Powells Creek
10204701	8	ALLEN ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Powells Creek
10204702	10	ALLEN ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Powells Creek
102899220	1	ALLENBY CR	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.11	24.37	25.51	0.00	0.63	Low	45%	No	Yes	24.37	25.51	Yes	Overland	Powells Creek		
102899245	2	ALLENBY CR	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.30	23.17	24.88	0.07	0.57	Low	83%	No	Yes	23.12	24.38	Yes	Overland	Powells Creek		
102899421	3	ALLENBY CR	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	24.48	24.69	0.27	0.40	Low	10%	No	No	No	In 1% Overland Extent	No	No	Powells Creek		
102899447	4	ALLENBY CR	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.46	22.79	24.41	0.00	0.32	Low	91%	No	Yes	22.79	24.41	Yes	Overland	Powells Creek		
102899340	5	ALLENBY CR	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102899363	6	ALLENBY CR	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	23.10	24.44	0.01	0.22	Low	62%	No	No	No	In 1% Overland Extent	No	No	Powells Creek		
102899239	7	ALLENBY CR	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
10289964	1	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	20.05	20.43	0.01	0.32	Low	23%	No	No	No	In 1% Overland Extent	No	No	Powells Creek		
102902357	2	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	25.25	25.99	0.07	0.57	Low	68%	No	No	No	In 1% Overland Extent	No	No	Powells Creek		
102899762	3	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	19.61	19.98	0.00	0.40	Low	26%	No	No	No	In 1% Overland Extent	No	No	Powells Creek		
102902356	4	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.21	23.32	24.92	0.00	0.77	Low	100%	No	Yes	23.92	25.38	Yes	Overland	Powells Creek		
10290760	5	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102902354	6	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.09	23.35	24.83	0.01	0.42	Low	100%	No	No	No	In 1% Overland Extent	No	No	Powells Creek		
102899757	7	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102902313	8	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.18	22.59	24.10	0.01	0.62	Low	100%	No	Yes	22.59	24.10	Yes	Overland	Powells Creek		
102902312	10	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.11	21.81	23.40	0.00	0.50	Low	92%	No	Yes	21.81	23.40	Yes	Overland	Powells Creek		
102899721	11	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.04	0.26	17.30	17.55	0.02	0.80	Low	32%	No	Yes	17.30	17.55	Yes	Overland	Powells Creek		
102902211	12	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.13	21.16	22.56	0.02	0.39	Low	77%	No	Yes	21.16	22.56	Yes	Overland	Powells Creek			
102899719	13	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.53	21.00	21.00	0.04	1.25	Low	100%	No	Yes	17.30	17.56	Yes	Overland	Powells Creek			
102902210	14	ALVISTON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.02															

GIS ID	Street No	Street Name	Town	1% AEP Main Channel Flood		1% AEP Main Channel Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		TAGGING INFO					
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Tag	TagType	Location	
10204833	93	ARTHUR ST	STRATHFIELD	0.0	0.0	0.0	0.0	0.0	0.25	13.84	15.09	0.30	100%	Low	100%	Yes	12.74	12.76	Yes	13.84	15.09	Yes	Both	Powells Creek	
10204835	95	ARTHUR ST	STRATHFIELD	0.0	0.07	12.24	12.30	0.0	0.27	12.30	13.66	0.11	1.31	Low	100%	Yes	12.74	12.76	Yes	12.30	13.66	Yes	Both	Powells Creek	
10204836	93	ARTHUR ST	STRATHFIELD	0.02	0.04	12.26	12.26	0.0	0.19	12.08	13.30	0.11	1.45	Low	100%	Yes	12.74	12.76	Yes	12.08	13.30	Yes	Both	Powells Creek	
10204758	96	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.19	13.54	14.49	0.00	1.01	Low	100%	No	Yes	13.54	14.49	Yes	13.54	14.49	Yes	Overland	Powells Creek
145101755	97	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	1.90	12.31	13.60	0.00	1.32	High	55%	No	Yes	12.31	13.60	Yes	12.31	13.60	Yes	Overland	Powells Creek
10204795	98	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.14	13.28	14.20	0.05	1.12	Low	100%	Yes	13.28	14.20	Yes	13.28	14.20	Yes	Overland	Powells Creek	
10204754	100	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.02	0.24	13.18	14.13	0.14	1.49	Low	100%	No	Yes	13.18	14.13	Yes	13.18	14.13	Yes	Overland	Powells Creek
15076592	101	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	2.26	13.48	14.30	0.00	2.21	High	86%	No	Yes	13.48	14.30	Yes	13.48	14.30	Yes	Overland	Powells Creek
10204753	102	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.20	13.21	14.06	0.05	1.23	Low	100%	No	Yes	13.21	14.06	Yes	13.21	14.06	Yes	Overland	Powells Creek
10204837	102	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.35	13.36	14.05	0.02	0.96	Low	100%	No	Yes	13.36	14.05	Yes	13.36	14.05	Yes	Overland	Powells Creek
10370865	106	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.35	13.34	13.94	0.02	1.01	Low	100%	No	Yes	13.34	13.94	Yes	13.34	13.94	Yes	Overland	Powells Creek
10204783	107	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
10204792	109	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
10204837	109	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
10458585	113	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
150131207	123	ARTHUR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.25	24.40	25.79	0.03	0.79	Low	41%	No	Yes	24.40	25.79	Yes	24.40	25.79	Yes	Overland	Powells Creek
102026015	129	ARTHUR ST	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
104140067	131	ARTHUR ST	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
102054837	145	ARTHUR ST	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
102024611	159	ARTHUR ST	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
104157625	161	ARTHUR ST	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
102024644	191	ARTHUR ST	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
102024633	191	ARTHUR ST	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
103874128	0	BADGERY AVE	HOMEBUSH	0.00	1.20	8.66	9.63	0.00	0.20	9.45	11.29	0.01	1.51	Low	50%	Yes	9.16	10.13	Yes	9.45	11.29	Yes	Both	Powells Creek	
104434926	1	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.01	0.02	14.33	14.35	0.02	0.02	Low	3%	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek	
10204837	2	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
104434916	3	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
104434917	4	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek	
104434924	5	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
10204877	6	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.06	16.49	18.92	0.02	0.48	Low	100%	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek	
104434915	7	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
104434918	8	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.08	16.38	18.78	0.09	0.58	Low	100%	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek	
104434914	9	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
10204866	10	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.24	16.21	18.40	0.08	0.86	Low	100%	No	Yes	16.21	18.40	Yes	16.21	18.40	Yes	Overland	Powells Creek
104434922	11	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
10204864	12	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.10	15.87	18.17	0.02	0.92	Low	100%	No	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek	
10204865	13	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.08	13.22	13.03	0.01	0.40	Low	0%	No	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek
10204862	14	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.18	15.51	17.88	0.00	0.46	Low	100%	No	Yes	15.51	17.88	Yes	15.51	17.88	Yes	Overland	Powells Creek
104434921	15	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.06	12.77	14.75	0.09	0.63	Low	100%	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek	
10204860	16	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.06	15.16	17.18	0.01	0.22	Low	100%	No	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek	
10204861	18	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	100%	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek	
104434919	19	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.08	11.67	13.81	0.02	0.34	Low	96%	No	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek
10204837	20	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.04	13.94	15.47	0.00	0.00	Low	60%	No	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek
10204836	21	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.21	11.23	12.27	0.03	1.31	Low	100%	No	Yes	11.23	12.27	Yes	11.23	12.27	Yes	Overland	Powells Creek
10204871	22	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	Powells Creek	
10204868	24	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.35	13.28	15.07	0.02	0.42	Low	100%	No	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek
10204870	22	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.01	0.02	12.25	12.41	0.31	0.46	Low	6%	No	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek
10204830	25	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.04	0.36	11.24	12.07	0.72	1.72	High	100%	No	Yes	11.24	12.12	Yes	11.24	12.12	Yes	Overland	Powells Creek
10204868	26	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.09	12.19	12.95	0.01	0.76	Low	71%	No	No	No	No	No	No	No	No	In 1% Overland Extent	Powells Creek	
10204832	28	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.43	11.27	12.13	0.04	1.25	High	100%	No	Yes	11.27	12.13	Yes	11.27	12.13	Yes	Overland	Powells Creek	
10204867	28	BADGERY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.33	12.33	12.95	0.01	1.89	High	97%	No	Yes	12.33	12.95	Yes	12.33	12.95	Yes	Overland	Powells Creek	
10204826	29	BADGERY A																							

ID#	Street No.	Street Name	Town	1% AEP Main Channel Flood			1% AEP Overland Flood			1% AEP Overland Flood Velocity			1% AEP Overland Flood Hazard			1% AEP Overland Flood Inundation			1% AEP Main Channel			1% AEP Overland Flood			TAGGING INFO							
				Min	Max	Depth	Min	Max	Depth	Min	Max	Depth	Min	Max	Depth	Min	Max	Depth	Min	Max	Depth	Min	Max	Depth	Min	Max	Depth	Min	Max	Depth	Min	Max
10204556	0	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	8.73	10.14	0.91	1.38	Low	100%	No	8.73	8.79	9.12	Yes	Yes	14.62	16.43	Yes	Yes	14.62	16.43	Yes	Both	Powells Creek
10204835	1	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.50	14.63	16.43	0.01	1.28	Low	100%	No	8.73	8.79	9.12	Yes	Yes	14.62	16.43	Yes	Yes	14.62	16.43	Yes	Both	Powells Creek	
102046157	2	BATES ST	HOMEBUSH	0.00	0.09	8.10	8.62	0.00	0.10	8.58	9.56	0.03	1.33	Low	80%	Yes	8.60	9.15	Yes	Yes	8.60	9.15	Yes	Yes	8.60	9.15	Yes	Both	Powells Creek			
102048366	3	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.20	14.78	16.60	0.01	0.97	Low	100%	No	8.69	8.79	9.12	Yes	Yes	14.78	16.60	Yes	Yes	14.78	16.60	Yes	Both	Powells Creek	
10204155	4	BATES ST	HOMEBUSH	0.00	0.06	8.19	8.61	0.00	0.30	8.62	9.46	0.05	1.42	Low	80%	Yes	8.69	9.11	Yes	Yes	8.69	9.11	Yes	Yes	8.69	9.11	Yes	Both	Powells Creek			
10409829	5	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.20	15.79	16.85	0.07	1.03	Low	100%	No	8.69	8.79	9.12	Yes	Yes	15.79	16.85	Yes	Yes	15.79	16.85	Yes	Both	Powells Creek	
10409830	5	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.11	15.40	16.65	0.07	0.98	Low	100%	No	8.69	8.79	9.12	Yes	Yes	15.40	16.65	Yes	Yes	15.40	16.65	Yes	Both	Powells Creek		
102048410	6	BATES ST	HOMEBUSH	0.00	0.01	8.38	8.62	0.00	0.14	8.65	9.65	0.10	0.91	Low	100%	Yes	8.88	9.12	Yes	Yes	8.88	9.12	Yes	Yes	8.88	9.12	Yes	Both	Powells Creek			
10409828	7	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.18	15.70	17.47	0.00	0.67	Low	100%	No	8.88	9.12	Yes	Yes	15.70	17.47	Yes	Yes	15.70	17.47	Yes	Both	Powells Creek			
10204837	8	BATES ST	HOMEBUSH	0.00	0.05	8.63	8.73	0.00	0.05	8.63	9.03	0.01	0.71	Low	100%	No	8.99	9.18	Yes	Yes	8.99	9.18	Yes	Yes	8.99	9.18	Yes	Both	Powells Creek			
10204836	9	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.11	16.14	17.40	0.06	0.67	Low	100%	No	8.99	9.18	Yes	Yes	16.14	17.40	Yes	Yes	16.14	17.40	Yes	Both	Powells Creek			
102048401	10	BATES ST	HOMEBUSH	0.00	0.01	8.59	8.70	0.00	0.12	8.69	9.68	0.01	1.08	Low	100%	Yes	9.09	9.20	Yes	Yes	9.09	9.20	Yes	Yes	9.09	9.20	Yes	Both	Powells Creek			
102048437	11	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.07	16.46	17.65	0.01	0.55	Low	100%	No	9.09	9.20	Yes	Yes	16.46	17.65	Yes	Yes	16.46	17.65	Yes	Both	Powells Creek			
102048320	12	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.74	8.71	9.45	0.03	0.18	Low	100%	No	9.24	9.25	Yes	Yes	8.71	9.45	Yes	Yes	8.71	9.45	Yes	Both	Powells Creek			
102048348	13	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.10	16.92	17.61	0.05	1.38	Low	62%	No	9.24	9.25	Yes	Yes	16.92	17.61	Yes	Yes	16.92	17.61	Yes	Both	Powells Creek			
102048399	14	BATES ST	HOMEBUSH	0.01	0.03	8.68	8.75	0.00	0.29	8.77	10.12	0.06	1.55	Low	100%	Yes	9.18	9.25	Yes	Yes	8.68	8.75	Yes	Yes	8.68	8.75	Yes	Both	Powells Creek			
10204839	15	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.28	17.61	18.46	0.00	1.77	Low	83%	No	9.18	9.25	Yes	Yes	17.61	18.46	Yes	Yes	17.61	18.46	Yes	Both	Powells Creek			
102048398	16	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.01	0.28	8.87	10.18	0.19	1.58	Low	100%	No	9.18	9.25	Yes	Yes	8.87	10.18	Yes	Yes	8.87	10.18	Yes	Both	Powells Creek			
102048397	18	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.31	8.92	9.00	0.16	1.00	Low	100%	No	9.18	9.25	Yes	Yes	8.92	9.00	Yes	Yes	8.92	9.00	Yes	Both	Powells Creek			
102048396	20	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.24	8.92	10.09	0.88	1.28	Low	100%	No	9.18	9.25	Yes	Yes	8.92	10.09	Yes	Yes	8.92	10.09	Yes	Both	Powells Creek			
102048390	22	BATES ST	HOMEBUSH	0.03	0.30	8.87	8.92	0.00	0.16	9.00	10.73	0.19	0.96	Low	95%	Yes	9.37	9.42	Yes	Yes	9.00	10.73	Yes	Yes	9.00	10.73	Yes	Both	Powells Creek			
102048388	24	BATES ST	HOMEBUSH	0.03	0.17	8.90	8.93	0.01	0.12	8.92	10.75	0.06	1.05	Low	100%	Yes	9.40	9.43	Yes	Yes	8.92	10.75	Yes	Yes	8.92	10.75	Yes	Both	Powells Creek			
102048387	26	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	100%	No	9.40	9.43	Yes	Yes	8.99	10.84	Yes	Yes	8.99	10.84	Yes	Both	Powells Creek		
104140443	28	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.02	9.17	9.88	0.01	0.32	Low	91%	No	9.41	10.50	Yes	Yes	9.17	9.88	Yes	Yes	9.17	9.88	Yes	Both	Powells Creek			
104140444	28	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.17	9.41	10.90	0.02	0.55	Low	100%	No	9.41	10.50	Yes	Yes	9.41	10.90	Yes	Yes	9.41	10.90	Yes	Both	Powells Creek			
104140442	30	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.05	9.31	10.98	0.02	0.45	Low	100%	No	9.41	10.50	Yes	Yes	9.31	10.98	Yes	Yes	9.31	10.98	Yes	Both	Powells Creek			
102048389	32	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.01	9.69	10.09	0.02	0.14	Low	11%	No	9.41	10.50	Yes	Yes	9.69	10.09	Yes	Yes	9.69	10.09	Yes	Both	Powells Creek			
10443017	34	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00	0.02	0.11	Low	8%	No	9.41	10.50	Yes	Yes	10.00	10.00	Yes	Yes	10.00	10.00	Yes	Both	Powells Creek			
10443017	36	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	10.44	10.59	0.02	0.09	Low	5%	No	9.41	10.50	Yes	Yes	10.44	10.59	Yes	Yes	10.44	10.59	Yes	Both	Powells Creek			
161026580	40	BATES ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.67	11.15	13.16	0.00	0.77	Low	80%	No	9.41	10.50	Yes	Yes	11.15	13.16	Yes	Yes	11.15	13.16	Yes	Both	Powells Creek			
102048350	42	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.06	17.17	20.08	0.00	0.07	Low	70%	No	9.41	10.50	Yes	Yes	17.17	20.08	Yes	Yes	17.17	20.08	Yes	Both	Powells Creek			
102048351	44	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.16	17.27	20.08	0.00	0.20	Low	100%	No	9.41	10.50	Yes	Yes	17.27	20.08	Yes	Yes	17.27	20.08	Yes	Both	Powells Creek			
102048352	46	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.08	17.47	19.73	0.00	0.14	Low	100%	No	9.41	10.50	Yes	Yes	17.47	19.73	Yes	Yes	17.47	19.73	Yes	Both	Powells Creek			
102048343	48	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.09	17.60	19.59	0.00	0.11	Low	70%	No	9.41	10.50	Yes	Yes	17.60	19.59	Yes	Yes	17.60	19.59	Yes	Both	Powells Creek			
102048442	50	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	18.88	19.08	0.01	0.06	Low	5%	No	9.41	10.50	Yes	Yes	18.88	19.08	Yes	Yes	18.88	19.08	Yes	Both	Powells Creek			
102048444	52	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	9.41	10.50	Yes	Yes	0.00	0.00	Yes	Yes	0.00	0.00	Yes	Both	Powells Creek		
102048445	54	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	9.41	10.50	Yes	Yes	0.00	0.00	Yes	Yes	0.00	0.00	Yes	Both	Powells Creek		
102048446	56	BATES ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	9.41	10.50	Yes	Yes	0.00	0.00	Yes	Yes	0.00	0.00	Yes	Both	Powells Creek		
100989696	0	BERESFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.03	19.51	21.20	0.00	0.73	Low	6%	No	9.41	10.50	Yes	Yes	19.51	21.20	Yes	Yes	19.51	21.20	Yes	Both	Powells Creek			
104296504	0	BERESFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.01	0.04	15.64	16.10	0.48	1.08	Low	56%	No	9.41	10.50	Yes	Yes	15.64	16.10	Yes	Yes	15.64	16.10	Yes	Both	Powells Creek			
102049756	0	BERESFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.14	11.17	11.18	0.00	0.20	Low	100%	No	9.41	10.50	Yes	Yes	11.17	11.18	Yes	Yes	11.17	11.18	Yes	Both	Powells Creek			
102049754	0	BERESFORD RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.06	14.69	15.24	0.10	0.88	Low	100%	No																

ID	Street No	Street Name	Town	1% AEP Main Channel Flood		1% AEP Main Channel Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		TAGGING INFO			
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Tag	TagType
10204927	29	BRIDGE RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204928	29	BRIDGE RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.07	14.90	18.83	0.01	0.78	Low	69%	No	No	No	No	In 1% Overland Extent	Yes	Overland	Powells Creek
10204929	29	BRIDGE RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.20	14.11	15.67	0.00	0.96	Low	100%	No	Yes	14.11	15.67	Yes	Overland	Powells Creek	
10204930	29	BRIDGE RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.12	19.20	19.75	0.07	0.58	Low	24%	No	Yes	19.20	19.75	Yes	Overland	Powells Creek	
10204931	29	BRIDGE RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.14	12.22	15.96	0.00	0.63	Low	53%	No	Yes	12.22	15.96	Yes	Overland	Powells Creek	
10204932	29	BRIDGE RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
10204933	29	BRIDGE RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.07	12.22	15.85	0.03	0.65	Low	100%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204934	32	BRIDGE RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.06	14.96	16.08	0.00	0.18	Low	100%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204935	32	BRIDGE RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.06	14.96	16.79	0.09	0.34	Low	96%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204936	39	BRIDGE RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.14	14.20	15.17	0.10	0.27	Low	100%	No	Yes	14.28	16.20	Yes	Overland	Powells Creek	
10204937	41	BRIDGE RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.18	13.78	15.62	0.14	1.64	Low	100%	No	Yes	13.76	15.62	Yes	Overland	Powells Creek	
10204938	0	BROUGHTON RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.10	11.73	13.01	0.01	0.79	Low	94%	No	Yes	11.73	13.01	Yes	Overland	Powells Creek	
10204939	0	BROUGHTON RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.01	0.24	11.10	11.68	0.16	1.26	Low	100%	No	Yes	11.10	11.68	Yes	Overland	Powells Creek	
10204940	0	BROUGHTON RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.01	0.43	11.87	12.42	0.21	0.53	Low	100%	No	Yes	11.82	12.42	Yes	Overland	Powells Creek	
10204941	0	BROUGHTON RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.33	11.52	11.77	0.05	1.24	Low	100%	No	Yes	11.52	11.77	Yes	Overland	Powells Creek	
10204942	0	BROUGHTON RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.01	0.44	11.65	12.01	0.18	1.19	Low	100%	No	Yes	11.65	12.01	Yes	Overland	Powells Creek	
10204943	0	BROUGHTON RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.02	0.27	11.27	11.74	0.30	0.99	Low	100%	No	Yes	11.27	11.74	Yes	Overland	Powells Creek	
10204944	1	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
10204945	1	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
10204946	1	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
10204947	2	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.02	17.28	18.54	0.01	0.59	Low	57%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204948	3	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
10204949	4	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204950	5	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
10204951	8	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	16.05	16.69	0.02	0.38	Low	27%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204952	9	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.06	16.14	16.97	0.01	0.44	Low	100%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204953	10	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	15.69	16.13	0.02	0.30	Low	27%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204954	11	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.12	15.74	16.32	0.01	0.37	Low	69%	No	Yes	15.74	16.32	Yes	Overland	Powells Creek	
10204955	12	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	15.24	15.80	0.01	0.30	Low	23%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204956	13	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	15.12	15.72	0.00	0.37	Low	82%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204957	14	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	1.96	15.01	15.01	0.02	0.29	Low	22%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204958	15	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	14.58	15.20	0.01	0.20	Low	58%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204959	16	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	14.54	14.94	0.00	0.31	Low	37%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204960	17	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.02	14.13	14.74	0.01	0.19	Low	52%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204961	18	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	14.06	14.57	0.01	0.32	Low	28%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204962	19	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.04	13.69	14.14	0.00	0.19	Low	51%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204963	20	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	13.69	14.07	0.03	0.26	Low	90%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204964	22	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	13.38	13.77	0.01	0.22	Low	39%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204965	24	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.02	12.96	13.37	0.00	0.37	Low	69%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204966	25	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.25	12.01	12.01	0.02	0.23	Low	100%	No	Yes	12.03	12.81	Yes	Overland	Powells Creek	
10204967	26	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.24	12.89	13.08	0.00	1.10	Low	100%	No	Yes	12.89	13.08	Yes	Overland	Powells Creek	
10204968	28	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.36	12.76	13.19	0.00	0.42	Low	96%	No	Yes	12.76	13.19	Yes	Overland	Powells Creek	
10204969	29	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.18	12.03	13.32	0.06	1.01	Low	100%	No	Yes	12.03	13.32	Yes	Overland	Powells Creek	
10204970	30	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.05	12.85	13.74	0.01	0.65	Low	70%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204971	32	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.12	12.46	12.92	0.04	0.92	Low	99%	No	Yes	12.44	13.21	Yes	Overland	Powells Creek	
10204972	33	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.27	12.97	14.22	0.02	0.65	Low	100%	No	Yes	12.97	14.22	Yes	Overland	Powells Creek	
10204973	34	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.22	12.77	14.23	0.01	1.16	Low	100%	No	Yes	12.77	14.23	Yes	Overland	Powells Creek	
10204974	35	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.10	13.27	14.70	0.00	0.51	Low	81%	No	Yes	13.27	14.70	Yes	Overland	Powells Creek	
10204975	36	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.06	13.58	14.63	0.00	0.90	Low	95%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204976	38	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	13.66	14.30	0.03	0.28	Low	100%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204977	37	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.06	13.89	15.07	0.01	0.98	Low	100%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204978	38	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	14.23	15.91	0.02	0.27	Low	100%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204979	39	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.09	14.31	15.67	0.01	1.11	Low	77%	No	No	No	In 1% Overland Extent	No	No	Powells Creek	
10204980	40	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.20	14.79	16.29	0.01	0.37	Low	75%	No	Yes	14.79	16.49	Yes	Overland	Powells Creek	
10204981	41	BROUGHTON RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.18	14.64	15.99	0.01	1.10	Low	100%	No							

ID#	Street No.	Street Name	Town	1% AEP Main Channel Flood		1% AEP Main Channel Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		TAGGING INFO	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
10208997	1	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.15	22.27	24.53	0.13	1.51	Low	0%	No	No	22.97	24.93	Yes	Yes	Overland	Powells Creek
10387022	2	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.09	23.52	24.45	0.10	1.19	Low	100%	No	No			No	No	In 1% Overland Extent	Powells Creek
10204647	3	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.20	22.50	23.50	0.24	1.32	Low	100%	No	Yes	22.50	23.50	Yes	Yes	Overland	Powells Creek
10204648	4	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.20	22.50	23.50	0.19	1.47	Low	100%	No	Yes	22.50	23.50	Yes	Yes	Overland	Powells Creek
10204658	4	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102899466	5	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.15	22.07	24.11	0.08	1.44	Low	100%	No	Yes	22.07	24.11	Yes	Yes	Overland	Powells Creek
102048660	6	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102048663	8	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102048661	10	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.16	21.66	22.89	0.01	1.23	Low	100%	No	Yes	17.68	19.20	Yes	Yes	Overland	Powells Creek
102899469	11	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.06	20.78	23.00	0.01	0.51	Low	95%	No	No			No	No	In 1% Overland Extent	Powells Creek
102899512	12	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.28	17.75	19.02	0.06	1.88	High	100%	No	Yes	17.75	19.02	Yes	Yes	Overland	Powells Creek
102899470	15	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.12	19.94	21.99	0.01	0.74	Low	100%	No	Yes	19.94	21.99	Yes	Yes	Overland	Powells Creek	
102899471	17	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.13	19.88	21.93	0.03	1.25	Low	100%	No	Yes	19.88	21.15	Yes	Yes	Overland	Powells Creek	
102899459	19	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.11	19.43	20.90	0.08	1.25	Low	100%	No	Yes	19.43	20.90	Yes	Yes	Overland	Powells Creek	
102899458	21	DICKSON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.23	19.28	20.25	0.03	1.20	Low	100%	No	Yes	19.28	20.25	Yes	Yes	Overland	Powells Creek	
155927443	2	DUKE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102049527	1	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.02	22.25	23.28	0.02	0.24	Low	98%	No	No			No	No	In 1% Overland Extent	Powells Creek
102049534	2	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	75%	No	No			No	No	In 1% Overland Extent	Powells Creek
102049532	3	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.02	23.33	24.39	0.02	0.36	Low	34%	No	No			No	No	In 1% Overland Extent	Powells Creek
102049533	4	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.13	22.74	23.81	0.00	0.82	Low	100%	No	Yes	22.74	23.81	Yes	Yes	Overland	Powells Creek
103796289	5	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.75	24.23	25.64	0.00	1.17	High	47%	No	Yes	24.23	25.64	Yes	Yes	Overland	Powells Creek	
102049525	6	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.16	24.32	25.64	0.00	0.52	Low	100%	No	Yes	24.32	25.64	Yes	Yes	Overland	Powells Creek	
102049524	8	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.16	24.32	25.64	0.00	0.54	Low	100%	No	Yes	24.32	25.64	Yes	Yes	Overland	Powells Creek	
155223236	9	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	1.91	25.59	27.56	0.00	1.33	High	79%	No	Yes	25.59	27.56	Yes	Yes	Overland	Powells Creek	
102049536	10	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102049535	12	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
155899388	13	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
15011157	14	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.07	0.13	23.16	23.17	0.03	0.23	Low	2%	No	No			No	No	In 1% Overland Extent	Powells Creek
15011157	19	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	1.35	26.81	27.88	0.03	0.91	High	16%	No	No	No			No	No	In 1% Overland Extent	Powells Creek
16599476	29	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
155899389	31	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
164655706	37	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
152819665	45	EASTBOURNE RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
104674111	0	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
153222163	2	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102899447	3	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
153222162	4	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102899346	5	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102899319	6	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102899311	7	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102899308	8	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102899329	9	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102899305	10	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102899317	11	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.03	27.13	30.03	0.00	0.12	Low	29%	No	No	No			No	No	In 1% Overland Extent	Powells Creek
102899323	13	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	Overland	Powells Creek
102899316	13	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.03	29.13	30.12	0.00	0.07	Low	27%	No	No	No			No	No	In 1% Overland Extent	Powells Creek
102899315	15	EDGAR ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.16	30.16	30.17	0.04	0.08	Low	2%	No	No			No	No	In 1% Overland Extent	Powells Creek
102049560	0	ELVA ST	STRATHFIELD	0.03	1.56	8.15	8.33	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	Yes	8.65	8.83	Yes	Yes	Mainstream	Powells Creek	
155927447	0	ELVA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No			No	No	In 1% Overland Extent	Powells Creek
155292860	4	ELVA ST	STRATHFIELD	0.01	3.37	8.20	8.93	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	Yes	8.70	9.41	Yes	Yes	Mainstream	Powells Creek	
102049550	5	ELVA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.41	9.91	10.38	0.66	1.28	Low	100%	No	Yes	9.91	10.38	Yes	Yes	Overland	Powells Creek	
10201794	1	ELWIN ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.10	21.12	22.01	0.05	1.26	Low	100%	No	No			No	No	In 1% Overland Extent	Powells Creek	
10201784	2	ELWIN ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.35	21.32	22.92	0.01	2.24	High	100%	No	Yes	21.32	21.92	Yes	Yes	Overland	Powells Creek	
10201779	4	ELWIN ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.12	15.98	17.07	0.03	0.31	Low	85%	No	Yes	15.98	17.07	Yes	Yes	In 1% Overland Extent	Powells Creek	
10201779	4	ELWIN ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.39	21.74	22.76	0.00	2.07	High	10									

ID	Street No	Street Name	Town	1% AEP Main Channel Flood		1% AEP Main Channel Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		TAGGING INFO				
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Tag	TagType	Location
102049127	47	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102049189	48	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
100098720	49	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek	
102899766	51	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.01	20.93	20.93	1.08	1.08	Low	0%	No	No	No	No	In 1% Overland Extent	No	No	No	No	Powells Creek	
102049184	56	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.10	18.71	21.63	0.00	0.00	Low	55%	No	No	No	No	In 1% Overland Extent	No	No	No	No	Powells Creek
102049183	58	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.37	19.72	21.16	0.00	0.00	Low	42%	No	Yes	19.72	21.16	Yes	Yes	Yes	Yes	Powells Creek	
102899695	61	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.24	20.44	24.55	0.01	0.69	Low	100%	No	Yes	20.44	24.55	Yes	Yes	Yes	Yes	Powells Creek	
100098726	62	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.11	18.60	20.64	0.03	0.98	Low	72%	No	Yes	18.60	20.64	Yes	Yes	Yes	Yes	Powells Creek	
100298727	64	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.10	18.17	20.46	0.02	0.79	Low	100%	No	Yes	18.17	20.46	Yes	Yes	No	No	In 1% Overland Extent	No	Powells Creek
102899767	65	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.24	20.43	24.55	0.01	0.20	Low	96%	No	Yes	20.43	24.55	Yes	Yes	Yes	Yes	Powells Creek	
102899751	66	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.24	16.64	18.39	0.02	1.22	Low	100%	No	Yes	16.64	18.39	Yes	Yes	Yes	Yes	Powells Creek	
102899749	66	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.92	17.92	19.93	0.01	2.11	High	100%	No	Yes	17.92	19.93	Yes	Yes	Yes	Yes	Powells Creek	
102899750	66	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.53	17.48	20.05	0.01	1.46	Low	80%	No	Yes	17.48	20.05	Yes	Yes	Yes	Yes	Powells Creek		
102899757	69	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	No	Powells Creek
102899759	71	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.08	19.78	22.37	0.01	0.37	Low	100%	No	Yes	19.78	22.37	Yes	Yes	No	No	In 1% Overland Extent	No	Powells Creek
102899768	73	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.16	19.88	22.88	0.00	0.55	Low	91%	No	Yes	19.88	22.88	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102899744	74	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.21	17.28	19.79	0.02	2.59	High	100%	No	Yes	17.28	19.79	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102899762	75	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.05	19.95	23.17	0.02	0.62	Low	98%	No	Yes	19.95	23.17	Yes	Yes	No	No	In 1% Overland Extent	No	Powells Creek
102899764	77	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	20.89	23.18	0.01	0.39	Low	93%	No	Yes	20.89	23.18	Yes	Yes	No	No	In 1% Overland Extent	No	Powells Creek
102899743	78	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.08	17.01	19.68	0.02	1.31	Low	100%	No	No	No	No	In 1% Overland Extent	No	No	No	No	Powells Creek	
102899643	79	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.08	19.91	24.10	0.00	0.20	Low	77%	No	No	No	No	In 1% Overland Extent	No	No	No	No	Powells Creek	
103845070	80	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.05	17.15	18.41	0.04	0.64	Low	93%	No	No	No	No	In 1% Overland Extent	No	No	No	No	Powells Creek	
103845069	80	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	Yes	18.02	19.65	Yes	Yes	Yes	Yes	Powells Creek	
102899642	81	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.10	19.95	24.01	0.01	0.61	Low	100%	No	Yes	19.95	24.01	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102899668	83	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.16	19.85	22.80	0.00	0.91	Low	84%	No	Yes	19.85	22.80	Yes	Yes	No	No	Powells Creek		
102899690	84	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.10	17.47	19.37	0.03	0.46	Low	78%	No	Yes	17.47	19.37	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102899688	84	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.04	17.49	19.24	0.00	0.50	Low	76%	No	No	No	No	In 1% Overland Extent	No	No	No	No	Powells Creek	
102899644	85	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.74	19.94	23.67	0.01	1.34	Low	100%	No	Yes	19.94	23.67	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102899677	86	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	18.96	19.22	0.02	0.07	Low	9%	No	No	No	No	In 1% Overland Extent	No	No	No	No	Powells Creek	
102899635	87	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.25	19.91	22.45	0.00	1.42	Low	94%	No	Yes	19.91	22.45	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102899676	88	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	No	Powells Creek
102899675	89	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.27	19.96	22.15	0.00	1.57	Low	90%	No	Yes	19.96	22.15	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102899675	90	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.17	17.37	19.31	0.00	0.44	Low	52%	No	Yes	17.37	19.31	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019125	91	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.18	19.86	21.54	0.14	1.72	Low	100%	No	Yes	19.86	21.54	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019124	93	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.25	19.86	21.10	0.01	1.29	Low	100%	No	Yes	19.86	21.10	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102899673	94	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.35	17.90	19.44	0.03	1.09	Low	100%	No	Yes	17.90	19.44	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102899697	95	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	20.05	20.05	0.01	0.75	Low	100%	No	Yes	20.05	20.05	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102899667	96	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.33	18.48	19.56	0.04	1.86	High	100%	No	Yes	18.48	19.56	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019196	97	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.27	20.59	21.43	0.15	1.96	Low	100%	No	Yes	20.59	21.43	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019192	98	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.25	18.47	19.68	0.09	1.94	High	100%	No	Yes	18.47	19.68	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019195	98	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.50	19.08	21.64	0.02	1.48	High	100%	No	Yes	19.08	21.64	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
156739870	100	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.49	18.53	19.75	0.08	2.06	High	100%	No	Yes	18.53	19.75	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019185	101	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.37	21.73	22.28	0.00	1.99	High	94%	No	Yes	21.73	22.28	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019193	102	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.49	18.47	19.76	0.10	2.38	High	100%	No	Yes	18.47	19.76	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019183	103	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.20	22.00	22.78	0.02	1.34	Low	29%	No	Yes	22.00	22.78	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019192	103	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.15	22.76	23.38	0.16	1.77	Low	17%	No	No	No	No	In 1% Overland Extent	No	No	No	No	Powells Creek	
102019192	105	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.15	22.76	23.38	0.16	1.77	Low	17%	No	No	No	No	In 1% Overland Extent	No	No	No	No	Powells Creek	
102019192	106	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.19	18.86	19.83	0.12	1.85	High	100%	No	Yes	18.86	19.83	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019181	107	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.02	0.29	23.46	23.93	0.41	1.78	Low	24%	No	Yes	23.46	23.93	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019197	108	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.19	18.33	20.01	0.02	1.29	Low	84%	No	Yes	18.33	20.01	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019180	109	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.37	23.90	24.60	0.03	1.33	High	26%	No	Yes	23.90	24.60	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019191	110	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	No	No	No	Powells Creek
102019172	111	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.26	25.26	27.37	0.01	1.05	Low	100%	No	Yes	25.26	27.37	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019171	113	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.11	25.92	28.12	0.02	1.43	Low	100%	No	Yes	25.92	28.12	Yes	Yes	Yes	Yes	Yes	Yes	Powells Creek
102019191	114	HOMEBUSH RD	STRATHFIELD	0.00	0.00	0.00	0.00</																			

ID#	Street No	Street Name	Town	1% AEP Main Channel Flood		1% AEP Main Channel Level		1% AEP Overland Flood		1% AEP Overland Level		1% AEP Overland Velocity		1% AEP Overland Flood Hazard		1% AEP Overland Flood Inundation		1% AEP Overland Flood Tagging		TAGGING INFO							
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Tag	TagType	Location			
102048495	18	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek				
102048493	19	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.06	22.73	25.39	0.03	1.30	Low	100%	No	No	100%	No	No	In 1% Overland Extent	No	Powells Creek				
102048494	20	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	25.85	25.93	0.32	1.67	Low	7%	No	No	0%	No	No	In 1% Overland Extent	No	Powells Creek				
102048491	21	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.24	22.27	25.03	0.15	1.98	High	100%	No	No	100%	No	Yes	22.27	25.03	Yes	Overland	Powells Creek		
102048492	22	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102048493	23	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.12	22.11	24.82	0.03	1.53	Low	100%	No	No	100%	No	Yes	22.11	24.82	Yes	Overland	Powells Creek		
102048490	24	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102048429	25	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	22.18	24.46	0.00	0.18	Low	57%	No	No	0%	No	No	In 1% Overland Extent	No	Powells Creek				
102048489	26	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102048419	27	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
100098885	28	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102048418	29	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
100098884	30	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102048416	31	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
100098883	32	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102048415	33	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
100098882	34	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102048413	35	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102098981	36	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102048411	37	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.02	22.81	25.34	0.00	0.04	Low	22%	No	No	0%	No	No	In 1% Overland Extent	No	Powells Creek				
104674350	38	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
103796840	39	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.07	22.54	24.62	0.02	0.71	Low	100%	No	No	100%	No	Yes	24.21	25.83	Yes	In 1% Overland Extent	Powells Creek		
103796841	40	HYDEBRAE ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	28.08	28.76	0.05	0.12	Low	98%	No	No	100%	No	Yes	28.08	28.76	Yes	In 1% Overland Extent	Powells Creek		
102046828	0	ISMAY AVE	HOMEBUSH	0.10	3.11	4.04	4.41	0.06	0.47	4.39	5.00	0.48	1.59	Low	63%	Yes	Yes	63%	Yes	4.54	4.91	Yes	4.39	5.00	Yes	Both	Powells Creek
100098538	0	ISMAY AVE	HOMEBUSH	0.12	1.99	2.87	2.97	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	Yes	Yes	3.37	3.47	Yes	3.37	3.47	Yes	Mainstream	Powells Creek		
102046946	0	ISMAY AVE	HOMEBUSH	0.01	0.41	2.86	3.70	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	Yes	Yes	3.36	4.20	Yes	3.36	4.20	Yes	Mainstream	Powells Creek		
102046933	0	ISMAY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102046765	1	ISMAY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102046773	2	ISMAY AVE	HOMEBUSH	0.00	0.29	2.64	3.13	0.00	0.06	3.37	4.28	0.01	0.54	Low	15%	Yes	Yes	3.14	3.63	Yes	3.14	3.63	Yes	Mainstream	Powells Creek		
102046767	3	ISMAY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102046774	4	ISMAY AVE	HOMEBUSH	0.01	0.56	2.70	3.15	0.00	0.12	3.17	4.30	0.20	0.52	Low	47%	Yes	Yes	3.17	3.63	Yes	3.17	3.63	Yes	Both	Powells Creek		
102046768	5	ISMAY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.03	4.76	7.36	0.01	0.06	Low	46%	No	No	0%	No	No	In 1% Overland Extent	No	Powells Creek				
102046775	6	ISMAY AVE	HOMEBUSH	0.01	0.56	2.75	3.21	0.00	0.22	3.26	4.21	0.08	0.61	Low	46%	Yes	Yes	3.25	3.71	Yes	3.26	4.21	Yes	Both	Powells Creek		
102046771	7	ISMAY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.05	4.65	7.38	0.01	0.05	Low	63%	No	No	0%	No	No	In 1% Overland Extent	No	Powells Creek				
102046776	8	ISMAY AVE	HOMEBUSH	0.01	0.47	2.73	3.34	0.00	0.10	3.84	4.09	0.25	0.75	Low	50%	Yes	Yes	3.23	3.84	Yes	3.23	3.84	Yes	Mainstream	Powells Creek		
102046769	9	ISMAY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102046867	10	ISMAY AVE	HOMEBUSH	0.01	0.65	2.79	3.43	0.00	0.14	3.39	4.02	0.22	0.53	Low	47%	Yes	Yes	3.39	3.93	Yes	3.39	3.93	Yes	Both	Powells Creek		
102046759	11	ISMAY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	0%	No	No	No	No	No	Powells Creek			
102046869	12	ISMAY AVE	HOMEBUSH	0.02	0.76	2.83	3.48	0.01	0.06	3.43	3.84	0.35	0.57	Low	27%	Yes	Yes	3.33	3.98	Yes	3.33	3.98	Yes	Mainstream	Powells Creek		
102046861	13	ISMAY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.15	3.87	0.00	0.00	Low	62%	No	No	0%	No	No	3.87	6.00	Yes	Overland	Powells Creek		
102046857	14	ISMAY AVE	HOMEBUSH	0.01	0.68	2.76	3.51	0.01	0.03	3.50	3.64	0.34	0.72	Low	14%	Yes	Yes	3.26	4.01	Yes	3.26	4.01	Yes	Mainstream	Powells Creek		
102046856	16	ISMAY AVE	HOMEBUSH	0.01	0.67	2.72	3.48	0.01	0.01	3.54	3.54	0.41	0.41	Low	1%	Yes	Yes	3.22	3.98	Yes	3.22	3.98	Yes	Mainstream	Powells Creek		
102046762	17	ISMAY AVE	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.31	3.75	5.38	0.01	1.83	High	100%	No	No	0%	No	Yes	3.75	5.38	Yes	Overland	Powells Creek		
102046858	18	ISMAY AVE	HOMEBUSH	0.00	0.82	2.71	3.52	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	Yes	Yes	3.21	4.02	Yes	3.21	4.02	Yes	Mainstream	Powells Creek		
102046863	19	ISMAY AVE	HOMEBUSH	0.00	0.03	3.14	3.69	0.00	0.00	3.23	3.23	0.41	0.41	Low	0%	Yes	Yes	3.71	4.96	Yes	3.71	4.96	Yes	Mainstream	Powells Creek		
102046859	20	ISMAY AVE	HOMEBUSH	0.03	0.87	2.72	3.40	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	Yes	Yes	3.22	3.90	Yes	3.22	3.90	Yes	Mainstream	Powells Creek		
102046764	21	ISMAY AVE	HOMEBUSH	0.00	0.06	3.49	3.78	0.01	0.21	3.84	4.60	0.02	1.25	Low	63%	Yes	Yes	3.99	4.28	Yes	3.84	4.60	Yes	Both	Powells Creek		
102046860	22	ISMAY AVE	HOMEBUSH	0.02	0.91	2.72	3.36	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	Yes	Yes	3.22	3.86	Yes	3.22	3.86	Yes	Mainstream	Powells Creek		
102046854	23	ISMAY AVE	HOMEBUSH	0.01	0.56	2.85	3.28	0.00	0.00	3.26	3.26	0.00	0.74	Low	78%	Yes	Yes	3.95	4.24	Yes	3.84	4.51	Yes	Both	Powells Creek		
102046861	24	ISMAY AVE	HOMEBUSH	0.03	1.05	2.73	3.32	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	Yes	Yes	3.23	3.82	Yes	3.23	3.82	Yes	Mainstream	Powells Creek		
102046855	25	ISMAY AVE	HOMEBUSH	0.00	0.07	3.35	3.93	0.01	0.22	3.98	4.29	0.06	0.76	Low	68%	Yes	Yes	3.85	4.43	Yes	3.85	4.43	Yes	Both	Powells Creek		

ID	Street No	Street Name	Town	1% AEP Main Channel Flood		1% AEP Main Channel Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		TAGGING INFO				
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Tag	TagType	Location
10289554	18	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0%	No	No	Powells Creek	
10289555	19	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.07	25.09	27.72	0.04	0.93	Low	100%	No	No	No	In 1% Overland Extent	Powells Creek		
10289556	20	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	Powells Creek		
10289557	21	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.05	24.77	27.74	0.01	0.62	Low	79%	No	No	No	In 1% Overland Extent	Powells Creek		
10289558	22	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	Powells Creek		
10289559	23	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.09	24.74	27.78	0.01	0.57	Low	98%	No	No	No	No	In 1% Overland Extent	Powells Creek	
10289560	24	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.01	27.99	28.06	0.11	0.50	Low	3%	No	No	No	No	In 1% Overland Extent	Powells Creek	
10289561	25	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.02	24.83	27.01	0.00	0.19	Low	85%	No	No	No	No	In 1% Overland Extent	Powells Creek	
10289562	26	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289563	27	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.05	27.00	0.05	0.64	Low	100%	No	No	No	No	In 1% Overland Extent	Powells Creek	
10289564	28	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289565	29	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.07	24.38	27.56	0.02	0.66	Low	98%	No	No	No	No	In 1% Overland Extent	Powells Creek	
10289566	30	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289567	31	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	24.47	27.77	0.00	0.29	Low	58%	No	No	No	No	In 1% Overland Extent	Powells Creek	
10289568	32	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289569	33	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	25.75	26.90	0.01	0.06	Low	13%	No	No	No	No	No	In 1% Overland Extent	Powells Creek
10289570	34	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289571	35	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	24.94	27.61	0.01	0.26	Low	14%	No	No	No	No	In 1% Overland Extent	Powells Creek	
10289572	36	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289573	37	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.13	24.23	27.52	0.01	0.69	Low	90%	No	Yes	24.23	27.52	Yes	Overland	Powells Creek
10289574	38	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289575	39	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.77	24.26	27.49	0.01	0.70	Low	87%	No	Yes	24.26	27.49	Yes	Overland	Powells Creek
10289576	40	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
16133311	41	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.70	25.46	27.42	0.02	0.97	Low	88%	No	Yes	25.46	27.42	Yes	Overland	Powells Creek
10289539	42	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289534	44	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289537	45	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.64	23.44	27.11	0.01	0.90	Low	100%	No	Yes	23.44	27.11	Yes	Overland	Powells Creek
10289538	46	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289536	47	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.48	23.02	26.70	0.05	0.72	Low	94%	No	Yes	23.02	26.70	Yes	Overland	Powells Creek
10289529	48	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289535	49	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.14	22.81	26.25	0.08	0.76	Low	100%	No	Yes	22.81	26.25	Yes	Overland	Powells Creek
10289540	50	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289499	51	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.13	22.16	25.95	0.02	0.71	Low	100%	No	Yes	22.16	25.95	Yes	Overland	Powells Creek
10289523	52	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289497	53	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	22.24	25.95	0.02	0.65	Low	85%	No	No	No	No	In 1% Overland Extent	Powells Creek	
10289488	54	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289495	55	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.26	22.00	25.98	0.00	1.01	Low	89%	No	Yes	22.01	25.98	Yes	Overland	Powells Creek
10289486	56	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289493	57	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.41	21.67	25.26	0.04	1.58	Low	99%	No	Yes	21.67	25.26	Yes	Overland	Powells Creek
10289485	58	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289490	59	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.26	21.65	25.08	0.08	0.24	High	100%	No	Yes	21.65	25.08	Yes	Overland	Powells Creek
10370139	60	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10289441	61	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.25	21.19	23.27	0.03	1.69	Low	100%	No	Yes	21.19	23.27	Yes	Overland	Powells Creek
10370138	62	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10418422	63	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.09	22.96	23.67	0.14	0.79	Low	100%	No	Yes	23.67	24.84	No	In 1% Overland Extent	Powells Creek
10289483	64	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.17	23.60	24.30	0.01	0.39	Low	100%	No	Yes	23.60	24.30	Yes	Overland	Powells Creek
10289484	65	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.17	23.60	24.30	0.01	0.39	Low	100%	No	Yes	23.60	24.30	Yes	Overland	Powells Creek
10289482	66	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.10	23.44	25.39	0.06	0.49	Low	100%	No	No	No	No	In 1% Overland Extent	Powells Creek	
10289432	67	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.20	24.18	25.02	0.00	0.99	Low	100%	No	Yes	24.18	25.02	Yes	Overland	Powells Creek
10289431	68	OXFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.15	24.67	25.20	0.00	0.00	Low	79%	No	Yes	24.67	25.20	Yes	Overland	Powells Creek
10450433	0	PARK RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.01	0.20	6.93	8.23	0.38	1.42	Low	48%	No	Yes	6.93	8.29	Yes	Overland	Powells Creek
10451108	0	PARK RD	HOMEBUSH	0.00	0.31	3.22	4.68	0.00	0.10	4.31	5.16	0.03	1.42	Low	19%	Yes	3.72	5.18	Yes	Mainstream	Powells Creek	
10451106	0	PARK RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.09	4.81	5.57	0.02	1.16	Low	10%	No	No	No	No	In 1% Overland Extent	Powells Creek	
10204653	29	PARK RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.01	0.34	5.55	6.19	0.09	1.34	Low	54%	No	Yes	5.55	6.19	Yes	Overland	Powells Creek
10204652	27	PARK RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.26	4.90	5.57	0.00	0.00	Low	0%	No	No	No	No	Mainstream	Powells Creek	
103825116	51	PARK RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10204626	51	PARK RD	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	Powells Creek	
10204629	53																					

ID	Street No.	Street Name	Flow	1% AEP Main Channel Flood		1% AEP Main Channel Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		TAGGING INFO			
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Tag	TagType
10009730	23	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10009736	25	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204576	26	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204576	27	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
15136299	28	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10009730	29	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204571	30	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10009703	31	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10009703	32	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
162757049	34	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10009701	35	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10009700	37	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10009700	38	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
161368973	39	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204560	40	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204587	42	RICHMOND RD	HOMEBUSH WEST	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204907	3	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204907	40	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.06	10.86	12.89	0.00	0.54	100%	No	No	9.27	10.32	Yes	100%	In 1% Overland Extent	
10204907	5	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.30	0.74	9.27	10.32	0.01	0.31	100%	No	Yes	9.27	10.32	Yes	100%	Overland		
10204904	6	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204906	7	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.09	0.67	9.27	9.28	0.00	0.13	100%	No	Yes	9.27	9.28	Yes	100%	Overland		
10204906	8	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204904	9	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.03	0.75	9.27	9.27	0.00	0.11	100%	No	Yes	9.27	9.27	Yes	100%	Overland		
10204906	12	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204904	13	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.21	0.70	9.27	9.27	0.03	0.11	100%	No	Yes	9.27	9.27	Yes	100%	Overland		
10204895	14	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.03	10.80	11.76	0.00	0.05	100%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent		
10204901	15	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.65	9.27	9.28	0.00	0.10	100%	No	No	Yes	9.27	9.28	No	No	In 1% Overland Extent		
10204904	16	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.08	10.73	12.25	0.02	0.16	100%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent		
10204902	17	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.40	0.79	9.27	9.27	0.01	0.74	High	100%	No	Yes	9.27	9.27	Yes	100%	Overland	
10396658	18	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.09	11.48	13.21	0.05	0.86	100%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent		
10396658	20	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.08	11.47	13.13	0.01	0.31	100%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent		
10204907	21	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.19	0.31	9.27	9.27	0.01	0.54	Low	2%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10396655	22	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.32	11.55	14.17	0.00	0.82	Low	87%	No	Yes	11.55	14.17	Yes	100%	Overland		
10204903	23	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.07	0.15	9.28	9.29	0.00	0.10	Low	7%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10204897	24	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.06	11.56	12.86	0.02	0.81	Low	31%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10204897	25	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.16	0.16	9.28	9.28	0.17	0.75	Low	4%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10204891	26	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.02	11.66	12.28	0.02	0.03	Low	8%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10204901	27	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.02	11.66	12.28	0.02	0.03	Low	8%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10204890	28	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	11.84	12.00	0.02	0.04	Low	6%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10204901	29	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.21	9.28	9.33	0.12	0.82	Low	75%	No	Yes	9.28	10.33	No	No	In 1% Overland Extent		
10204898	30	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.06	12.04	14.00	0.00	0.29	Low	74%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10204899	30	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.06	11.87	12.81	0.02	0.14	Low	51%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10204901	31	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.07	0.21	9.37	10.32	0.23	0.77	Low	80%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10204901	31	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.13	0.23	9.44	10.31	0.19	0.40	Low	78%	No	Yes	9.44	10.31	Yes	100%	Overland		
10204895	34	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.11	12.30	13.77	0.00	1.34	Low	68%	No	Yes	12.30	13.77	Yes	100%	Overland		
10204897	36	ROCHESTER ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.14	13.01	13.18	0.00	1.14	Low	100%	No	Yes	13.01	13.18	Yes	100%	Overland		
10204901	37	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.23	9.48	10.30	0.00	0.67	Low	100%	No	Yes	9.48	10.30	Yes	100%	Overland		
10204876	38	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.15	13.15	14.05	0.00	0.84	Low	63%	No	Yes	13.12	14.26	Yes	100%	Overland		
10204875	40	ROCHESTER ST	STRATHFIELD	0.00	0.00	0.00	0.01	0.24	13.94	14.54	0.00	0.74	Low	100%	No	Yes	13.94	14.54	Yes	100%	Overland		
10204901	41	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.02	9.94	10.06	0.15	0.64	Low	23%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10204901	41	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204873	42	ROCHESTER ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.44	13.38	14.72	0.03	1.14	Low	100%	No	Yes	13.38	14.72	Yes	100%	Overland		
10204872	43	ROCHESTER ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.10	13.57	14.07	0.08	0.65	Low	100%	No	Yes	13.57	14.07	Yes	100%	Overland		
10204904	45	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204864	46	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.09	13.64	15.11	0.03	0.63	Low	100%	No	No	No	9.27	9.28	No	No	In 1% Overland Extent	
10204903	47	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204863	48	ROCHESTER ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.14	13.84	14.00	0.01	0.04	Low	100%	No	No	13.84	15.20	Yes	100%	Overland		
10204900	49	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204861	50	ROCHESTER ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.15	13.90	15.52	0.06	1.49	Low	100%	No	Yes	13.90	15.52	Yes	100%	Overland		
10204892	51	ROCHESTER ST	HOMEBUSH	0.00	0.00	0.00	0.00	0.05	9.60	9.90	9.93	0.00	1.09	High	100%	No	Yes	9.60	9.93	Yes	100%		

ID#	Street No	Street Name	Town	1% AEP Main Channel Flood		1% AEP Main Channel Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		1% AEP Overland Flood		TAGGING INFO			
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Tag	TagType
10204580	5	VERLEY DR	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204581	5	VERLEY DR	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
10204582	5	VERLEY DR	HOMEBUSH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	No	No	Powells Creek
15857979	9	VERLEY DR	HOMEBUSH	0.01	0.77	2.67	3.50	0.00	0.10	2.76	6.16	0.00	0.61	Low	14%	Yes	3.17	4.00	No	No	Yes	Mainstream	Powells Creek
10204583	1	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.31	14.96	16.20	0.09	1.51	Low	100%	No	No	Yes	14.96	16.20	Yes	Overland	Powells Creek
102899784	1	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.28	14.58	16.28	0.06	1.67	Low	100%	No	No	Yes	14.58	16.20	Yes	Overland	Powells Creek
104379149	2	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102899783	3	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.32	14.59	16.91	0.03	1.93	High	100%	No	No	Yes	14.59	16.91	Yes	Overland	Powells Creek
102899780	3	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.18	15.54	17.81	0.02	1.44	Low	100%	No	No	Yes	15.54	17.81	Yes	Overland	Powells Creek
102899817	4	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102899816	6	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102899815	8	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102899779	9	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.02	15.91	17.91	0.03	0.50	Low	17%	No	No	No	No	No	In 1% Overland Extent	Powells Creek	
102899810	11	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	In 1% Overland Extent	Powells Creek		
102899778	11	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102899805	12	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.04	17.32	18.99	0.03	0.61	Low	86%	No	No	No	No	No	In 1% Overland Extent	Powells Creek	
102899777	13	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	In 1% Overland Extent	Powells Creek		
102899804	14	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.30	18.69	20.68	0.03	0.97	Low	100%	No	Yes	18.69	20.68	Yes	Overland	Powells Creek	
102899776	15	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102899803	16	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.12	19.17	21.56	0.06	1.13	Low	100%	No	Yes	19.17	21.56	Yes	Overland	Powells Creek	
102899767	17	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102899802	18	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.13	19.72	22.77	0.01	1.28	Low	79%	No	Yes	19.72	22.77	Yes	Overland	Powells Creek	
102899801	20	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	In 1% Overland Extent	Powells Creek		
102899799	22	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.05	20.55	22.57	0.00	0.12	Low	74%	No	No	No	No	In 1% Overland Extent	Powells Creek		
102899798	24	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.04	20.96	24.30	0.00	0.09	Low	67%	No	No	No	No	In 1% Overland Extent	Powells Creek		
102899797	26	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.02	23.60	24.58	0.00	0.04	Low	25%	No	No	No	No	In 1% Overland Extent	Powells Creek		
102899796	28	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102899795	30	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102899794	32	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102899793	34	VERNON ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901759	1	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.03	30.03	30.43	0.11	0.95	Low	35%	No	No	No	No	In 1% Overland Extent	Powells Creek		
102901758	1	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.06	28.09	29.34	0.01	1.08	Low	100%	No	No	No	No	In 1% Overland Extent	Powells Creek		
102901623	2	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901758	3	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.28	26.95	30.10	0.02	2.22	High	100%	No	Yes	26.95	30.10	Yes	Overland	Powells Creek	
102901757	5	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.26	27.06	30.05	0.01	2.61	High	100%	No	Yes	27.06	30.05	Yes	Overland	Powells Creek	
102901621	6	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901620	7	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.47	27.69	30.03	0.03	0.03	High	100%	No	Yes	27.65	30.40	Yes	Overland	Powells Creek	
102901617	8	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901629	9	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.01	0.10	30.15	31.14	0.12	1.21	Low	36%	No	Yes	No	No	No	Manual Tag	Powells Creek	
102901627	11	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901626	12	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901628	13	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901629	14	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901632	15	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901631	16	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901641	17	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901639	19	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901637	21	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901635	23	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901633	25	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102901632	27	VICTORIA ST	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102902071	1	WAKEFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102902070	2	WAKEFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102902069	3	WAKEFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102902068	5	WAKEFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102902067	6	WAKEFORD RD	STRATHFIELD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Low	0%	No	No	No	No	No	No	Powells Creek	
102902066	7	WAKEFORD RD	STRATHFIELD	0.00																			

