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Mixed-Use Development

90-96 Phillip Street, Parramatta

Flood Study Report
Issue B

Prepared for PTI Architects

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Revision Table

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B	21.09.2018	Final	Selh	Selh	

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1 Executive Summary

1.1 General

This document is a flood risk management report for the planning proposal located at 90-96 Phillip Street, Parramatta.

The proposed development is a mixed-use high rise. The Concept Plans prepared by PTI Architects show five (5) levels of basement car parking, three (3) commercial levels, a podium level and fifty nine (59) residential levels.

The site is located on the northern side of Phillip Street and is bounded by Parramatta River to the north. Refer Figure 1-1 below.

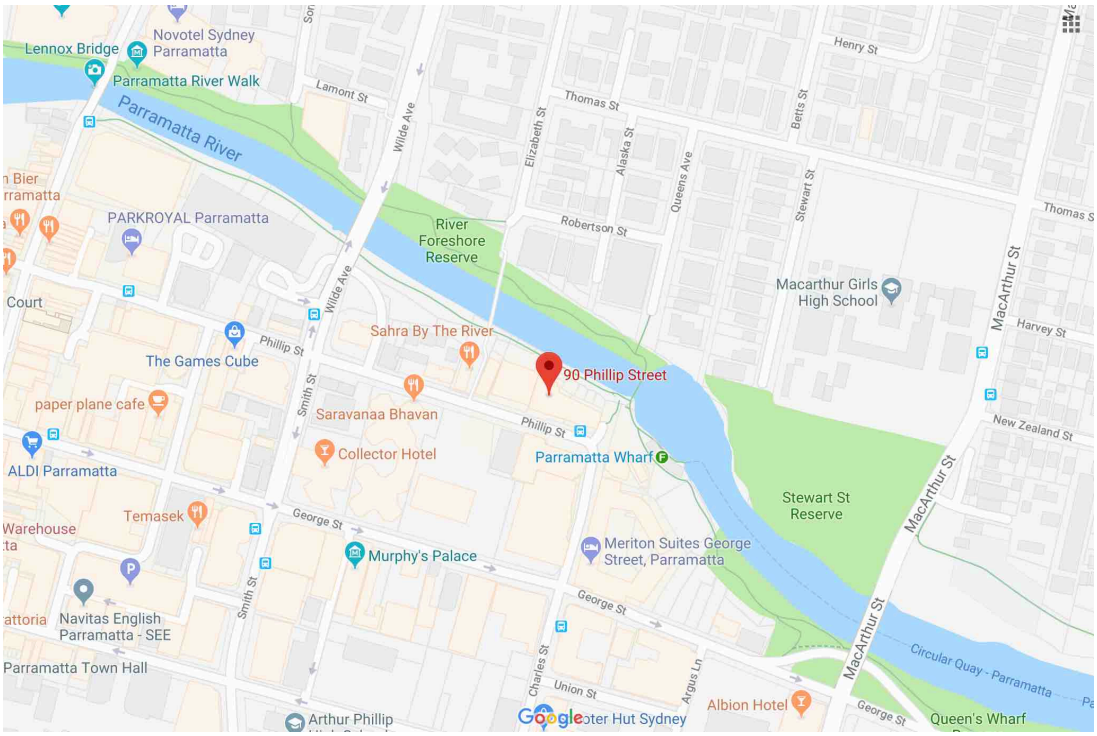


Figure 1-1 Locality Plan

The flood risk management and emergency response plan:-

- Addresses the requirements of the NSW Floodplain Development Manual (2005) in relation to flood hazard and flood risk from Parramatta River;
- Provides a flood evacuation procedure; and
- Addresses the requirements of Parramatta City Council's DCP 2011.

The flood levels associated with the Upper Parramatta River are given in Table 1-1 below.

Table 1-1 Flood Levels (Upper Parramatta River Flood Study)

Location	5% AEP	1% AEP	PMF
Phillip Street Frontage	8.2	8.3	11
Rear Site Boundary	5.1	5.6	11

1.2 Flood Risk Management Plan

A flood risk management plan outlines and discusses the measures to mitigate the flooding impacts on the proposed development and its users. These measures are specific to the site and should be used as a complement to the floodplain risk management plan and study prepared and adopted by Council.

The purpose of this plan is:

- To address existing, future and continuing flood risks on the site;
- To establish a program for the implementation of the plan; and
- To allow the stakeholders of the site to adopt this plan.

As indicated in the 2010 Parramatta DISPLAN, it is expected that Building Owners and Managers (in accordance with existing OH&S requirements, the Building Code of Australia and relevant City of Parramatta regulations) are to have a building Emergency Management Plan which complies with the provisions of AS 3745.

1.3 Flood Emergency Response Plan

The flood emergency response plan is site specific and outlines the procedure to follow in the event of an extreme flood such as the PMF.

The initial plan outlines the flood warning triggers, the actions to be taken in the likelihood of a flood including the preparation for a flood, actions during a flood and after the flood.

A detailed plan will be prepared for the future stages of the design that will incorporate additional considerations such as rate of rise of floodwaters, duration of inundation and assessment of persons at risk within the development. This will require an understanding of the flooding behaviour associated with the Parramatta River.

2 Introduction

2.1 Brief

S&G Consultants Pty Ltd (SGC) have been engaged by Academy Construction & Development & Buildup Development (The Client) through PTI Architects to prepare a flood risk management and a flood emergency response plan for the proposed mixed-use development at 90-96 Phillip Street in Parramatta.

The following tasks were carried out:-

- A site visit was undertaken on the 24th of May 2018 to ascertain on-site conditions and familiarise with the catchment;
- Supplied documents and previous studies were reviewed;
- A conceptual flood evacuation strategy is proposed; and
- This report has been compiled.

2.2 Limitations

This report is intended solely for Academy Construction & Development & Buildup Development and their architect PTI Architects as the Client of SGC and no liability will be accepted for use of the information contained in this report by other parties than this client.

This report is limited to visual observations and to the information including the referenced documents made available at the time when this report was written.

This report does not imply that the site is not subject to flooding. The stakeholders should be aware that there are current and continuing risks of flooding. This report is proposing measures to manage these flooding incidences.

2.3 Reference Documents

The following documents have been referenced in this report:-

1. Architectural drawings prepared by PTI ref. P389;
2. NSW Government The Floodplain Development Manual – The management of Flood Liable Land (2005);
3. Engineers Australia, *Australian Rainfall & Runoff* (AR&R 1999) and AR&R 2016;
4. Parramatta City Council DCP 2011 Section 2.4.2 “Water Management”;
5. Flood information letter received from Parramatta Council ref. FL/53/2018 dated 30/4/2018; and
6. Upper Parramatta River Flood Study – Draft 8 by UPRCT.

3 Local and Regional Context

3.1 Natural and Built Environment

The site adjoins Parramatta River just upstream of Charles Street weir and is located just after the bend of Phillip Street and Charles Street and is identified as 90-96 Phillip Street in the suburb of Parramatta, 18kms West of Sydney CBD. The site falls in the Local Government Area of Parramatta City Council (PCC).

The site is bounded by adjoining properties to the East and to the West. The site is currently developed and has a commercial offices' building.

The site has a trapezoidal shape with a flat gradient. Figure 3-1 shows the location of the site.

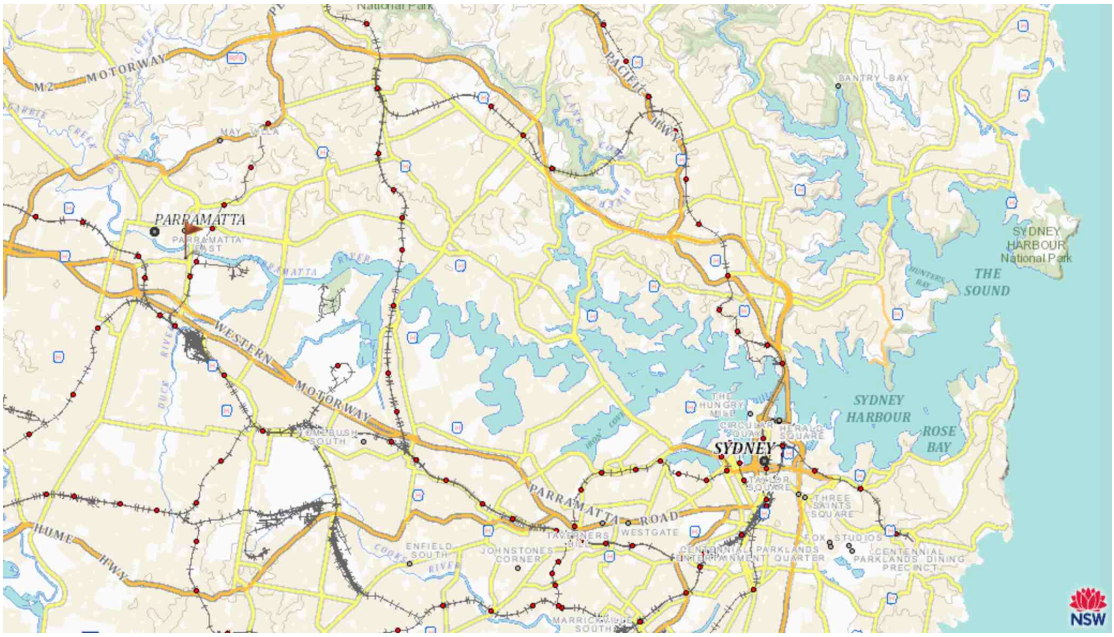


Figure 3-1 Locality Map

The site is located in a flood prone land as identified by PCC and falls in the jurisdiction of the Upper Parramatta River Catchment Trust (UPRCT).

UPRCT has identified the following flood levels for the site:

- The 5% AEP flood level for the site is RL5.1mAHD at the rear and RL8.2mAHD at the front; and
- The 1% AEP flood level for the site is RL5.6mAHD at the rear and RL8.3mAHD at the front; and
- The PMF flood level for the site is RL11mAHD.

The Client is proposing a mixed-use development which comprises five (5) levels of basement car parking, three (3) commercial levels, a podium level and fifty nine (59) residential levels.

Reference should be made to the architectural drawings prepared by PTI Architects for more details on the proposed development.

3.2 Objectives

The main objectives of this report are:

1. Implement the requirements of Parramatta Council's DCP (2011) to the proposed development;
2. Assess the sensitivity of the development to flooding;
3. Discuss the effects of the 1% AEP event flooding on the proposed development;
4. Mitigate the flooding risk by preventing personal danger and reducing the damage to the property and the equipment on site;
5. Increase awareness of stakeholders to the flooding issue;
6. Prepare a conceptual flood emergency and evacuation response strategy; and
7. Outline the measures to be undertaken to ensure that damage caused by property inundation during storms in excess of 1% AEP event is minimised as much as possible.

3.3 Council's Requirements

3.3.1 Parramatta City Council

The requirements of Parramatta City Council (PCC) are outlined in Section 2.4.2 of DCP 2011 with parts extracted in Appendix 2.

These requirements are addressed in Section 7 of this report.

4 Glossary

Annual Exceedance Probability (AEP)

The chance of a flood of a given or a larger size occurring in any one year, usually expressed as a percentage.

Australian Height Datum (AHD)

A common national surface level datum approximately corresponding to mean sea level.

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.

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.

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.

Flood Liable Land or Flood Prone Land

Land susceptible to flooding by the PMF.

Flood Planning Levels (FPLs)

Are the combinations of flood levels and freeboards selected for floodplain risk management purposes.

Freeboard

Is a factor of safety typically used in relation to the setting of floor levels.

Habitable Room

In industrial or commercial situation: an area used for offices or to store valuable possessions susceptible to damage in the event of a flood.

Peak Discharge

The maximum discharge occurring during a flood event.

Probable Maximum Flood

PMF is the largest flood that could conceivably occur at a location, usually estimated from probable maximum precipitation.

Probable Maximum Precipitation

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.

Runoff

The amount of rainfall which actually ends up as stream flow.

5 Flood Risk Management

This section of the report outlines and discusses the measures to mitigate the flooding impacts on the proposed development and its users. These measures are specific to the site and should be used as a complement to the floodplain risk management plan and study prepared and adopted by Council.

The purpose of this plan is:

- To address existing, future and continuing flood risks on the site;
- To establish a program for the implementation of the plan; and
- To allow the stakeholders of the site to adopt this plan.

As indicated in the 2010 Parramatta DISPLAN, it is expected that Building Owners and Managers (in accordance with existing OH&S requirements, the Building Code of Australia and relevant City of Parramatta regulations) are to have a building Emergency Management Plan which complies with the provisions of AS 3745.

5.1 Flood Risk

Flood hazard can be defined as the risk to life and limb caused by a flood. The hazard caused by a flood varies both in time and place across the floodplain.

The *Floodplain Development Manual* (NSW Government, 2005) describes various factors to be considered in determining the degree of hazard. These factors are:-

- Size of the flood;
- Depth and velocity of floodwaters;
- Effective warning time;
- Flood awareness;
- Rate of rise of floodwaters;
- Duration of flooding;
- Evacuation problems; and
- Access.

Hazard categorisation based on all the above factors is often referred to as ‘true hazard’. The scope of the present study calls for determination of ‘provisional’ flood hazards only. The provisional flood hazard is generally considered in conjunction with the above listed factors as part of the Floodplain Risk Management Study (the next stage of the Floodplain Risk Management process after the Flood Study) to provide a comprehensive analysis of the overall flood hazard.

5.2 Provisional Flood Hazard

Provisional flood hazard is determined through a relationship developed between the depth and velocity of floodwaters (Figure L2, NSW Government, 2005). The Floodplain Development Manual (2005) defines two categories for provisional hazard - High and Low (Figure 5-1).

The provisional hazard was determined utilising the model results of flood level and velocity. Provisional flood hazard was prepared for the 5% and the 1% AEP design events and the PMF. The provisional hazard is based on the envelope of the hazard at each location.

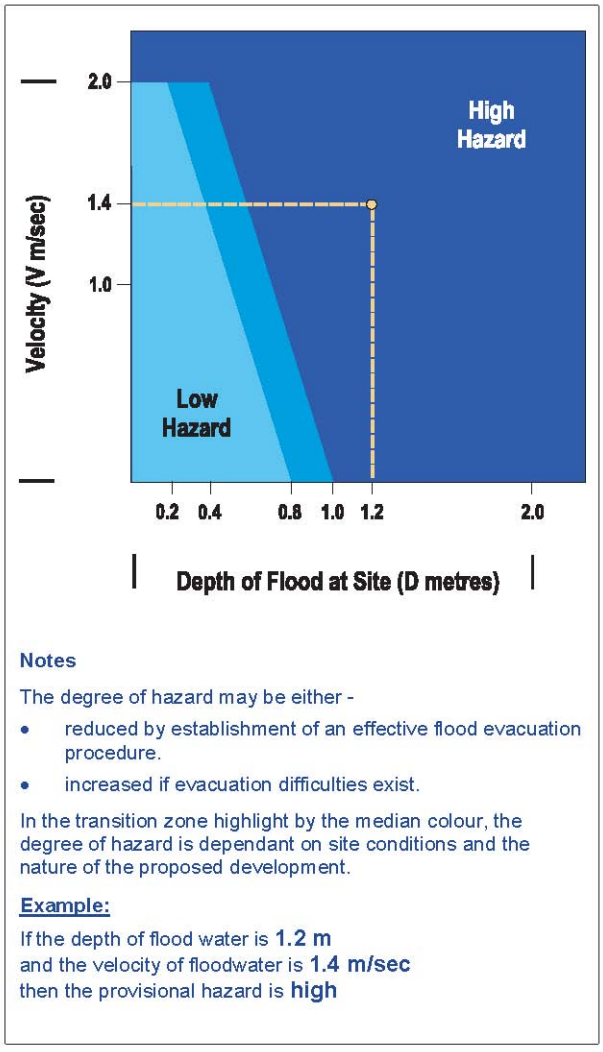


FIGURE L2 - Provisional Hydraulic Hazard Categories

Figure 5-1 Provisional Hydraulic Hazard

Figure A 1-1 (Appendix 1) indicates that the majority of the site is within a Low Flood Hazard (Upper Parramatta).

5.3 Flood Planning Level

The Flood Planning Level (FPL) recommended in the NSW Floodplain Development Manual (2005) is 0.5m above the calculated 1% AEP flood level across the site.

Table 5-1 Flood Planning Level

Storm Event	Flood Level (m AHD)	Flood Planning Level (m AHD)
Phillip Street Frontage	8.3	8.8
Rear Site Boundary	5.6	6.1

Parramatta City Council's DCP 2011 sets some controls for land uses on flood prone land as follows:-

All proposals are to have regard to the planning matrix at Table 2.4.2.1.2. The procedure to determine which design standards apply to the proposed development involves;

- Step 1: identify the land use category of the development from Table 2.4.2.1.1;
- Step 2: determine which flood risk category applies to the land (refer to Catchment Management Unit of Council for the Flood Risk Precincts and relevant flood risk mapping); and
- Step 3: apply the objectives and design principles as outlined in this section and then the design standards in the planning matrix at Table 2.4.2.1.2 as applicable to the floodplain and land use category.

With the exception of a small area of the site, the provisional flood hazard (Velocity x Depth) across the site is below 0.4m^2/s as determined by Council's study. The hazard classification across the site is low.

Based on the above, the Medium Risk Hazard requirements and design principles apply for the proposed development under Table 2.4.2.1.2. Refer to Section 7 for detailed assessment of the objectives and design principles of the matrix.

5.4 Additional Considerations

The following additional considerations will be addressed in the future stages of the design process:

- Rate of rise of floodwaters;
- Duration of Inundation; and
- Persons at risk (PAR).

6 Emergency Planning

6.1 North West Metropolitan District Disaster Plan

On 27th June 2012, the Interim Version of the "North West Metropolitan District Disaster Plan (DISPLAN)" was endorsed by Chairman, State Emergency Management Committee. The DISPLAN was prepared by the North West Metropolitan District Emergency Management Committee in compliance with Section 23 (1) of the State Emergency and Rescue Management Act, 1989, (as amended). The Parramatta LGA is one of the LGAs covered by this plan.

The Plan details emergency preparedness, response and recovery arrangements for the North West Metropolitan Emergency Management District, Local Emergency Management Areas and local government. It recognises that many of the details contained in the plan are similar to those contained in Local Plans and therefore this Plan may be utilised and applied at a local level in conjunction with a Local DISPLAN.

The Plan's aim is to ensure a controlled response to emergencies by all agencies having responsibilities and functions in emergencies, (Section 12 (2) of the SERM Act), and it reflects and applies in conjunction with arrangements agreed to at State level and detailed in the State Disaster Plan.

6.2 Parramatta DISPLAN

The Parramatta Disaster Plan (DISPLAN) released in 2010 details arrangements for preparing for, responding to and recovering from emergencies within the City of Parramatta.

The DISPLAN generally advocates an approach of Shelter-In-Place/stay at work rather than evacuation. If required, safe sites for evacuation have been designated in the plan as follows:

- Ollie Webb Reserve;
- Macarthur Girls High School; and
- Parramatta Golf Course.

The *Draft Update of Parramatta Floodplain Risk Management Plans* (Molino Stewart, 2016), identified that the majority of Parramatta CBD would fall within the category of 'low flood island', which is where the evacuation route (typically the road network) is cut by flooding before the area itself is inundated. The draft plan supports a "shelter in place" strategy for the CBD due to the short time to peak for major flood events. This applies also to the area of the site which is similar to the CBD in terms of its development.

As described in the plan, it encompasses arrangements for:

a) Incidents controlled by combat agencies;

b) Emergencies controlled by combat agencies and supported by the Local Emergency Operations Controller;
c) Emergency operations for which there is no combat agency; and
d) Circumstances where a combat agency has passed control to the Local Emergency Operations Controller.

The area covered by the plan comprises the whole of the City of Parramatta.

Transportation of people will be by either government/private transport or by private vehicle, with numbers and method dependant on circumstances and location of emergency. Each agency with a statutory role has in place arrangements which detail that agency's response. Each Emergency Service Organisation and Functional Area has in place an appropriate supporting plan/operational procedure which detail that agency's response.

It is expected that, in the Parramatta CBD, Building Owners, Managers and Tenants will be provided with education regarding their responsibilities in both evacuation and general building emergency management. It is accepted that all buildings where required will have in place a practised Emergency Management Plan in line with AS 3745 and as per NSW OH&S Regulation 2001

The following section of the report discusses the “Shelter In Place” operation of the DISPLAN.

In the event of an emergency which severely cuts off the route in front of the site, it is recommended that occupants and visitors remain within the proposed development as previously discussed because the warning times are very short. The risk to life and limb is more severe if the site users try to escape as the whole precinct is severely flood affected in extreme storm events such as the PMF.

6.2.1 Shelter in Place

This is used because it is assessed that for safety of the occupants and the visitors of the building(s) or for control reasons, it is safer for occupants to remain in the building than to be on the streets. The time required to Shelter in Place will depend on the nature of the emergency.

Building Owners and Managers

It is accepted that Building Owners and Managers in accordance with existing OH&S requirements, the Building Code of Australia and relevant City of Parramatta regulations, are to have a building Emergency Management Plan which complies with the provisions of AS 3745.

It is expected that all building Emergency Management Plans are to contain details of the most relevant Parramatta Safety Site. All wardens trained under the building emergency plan are to be aware of the Parramatta Safety Sites, routes to the site and how to liaise with the building occupants at the site.

It is accepted that all building Emergency Management Plans are to contain detail of how the information regarding an evacuation will be disseminated from the Chief Warden to occupants of the building.

It is noted also that the 2010 Parramatta DISPLAN, states in part that:-

i) The intent is to minimize the area of the CBD that is evacuated, noting that some emergencies may require the evacuation of some sections or large sections, if not all of the CBD; and
ii) Shelter in place is used when it is assessed that for safety of the occupants of a building(s) or for control reasons that it is safer for occupants to remain in the building than to be on the streets.

It is expected that this is also the intent for the all other areas within the LGA outside the CBD.

In the case of the planning proposal at 90-96 Phillip Street, a shelter in place strategy is adopted to reduce the flood risk on the occupants of the building. By sheltering in place, the occupants:

- are not in the High Risk area in front of the site;
- are above the flood level and dry at all times;
- are sheltered from the storm;
- are in a controlled environment where there is no need to take unnecessary risks; and
- can remain in the building for few hours only where food and other essentials are available during this time. No need to leave the site.

6.3 Sizing Temporary Flood Refuge

Two primary sources of information were located when considering the size of a temporary flood refuge:-

- Building Code of Australia (2008); and
- US Flood Emergency Management Authority (FEMA) (2000).

As outlined above, the Building Code of Australia (2008) stipulates that an area of public assembly such as halls or theatres should have a maximum density of 1m2 per person (BCA, 2008). FEMA (2000) recommends a minimum of 0.45m2 per person for tornado shelters.

For the proposed development at 90-96 Phillip Street, a maximum density of 2m2 per person will be adopted in view of the length of time visitors and/or residents may be required to shelter in place.

6.4 Flood Warning

Discussions with the NSW SES have previously identified the following status of flood warnings for the Parramatta CBD:

- The Bureau of Meteorology does not prepare flood predictions for the Parramatta River;
- Only a Draft Flood Warning Plan has been prepared to date by the NSW SES. This draft was prepared a number of years ago and while it is planned that it will be updated this does not have a high priority in view of the level of flood protection in the Parramatta CBD that has been achieved by various works undertaken in the upper catchment including the Loyalty Road basin; and
- Trigger levels for flood warning have not been identified for the Parramatta CBD.

Other sources of information regarding approaching severe weather conditions which could cause potential flooding at the site including:

- The Bureau of Meteorology through their website (www.bom.gov.au);
- Observation of local rainfall;
- The local SES (http://parramatta-ses.com);
- Parramatta City Council Emergency Management Officer;
- Local television stations; and/or
- Local radio stations.

An important indication of likely imminent flood activity would be intense local rainfall and residents, retail workers and visitors should take notice of extreme rainfall warnings issued by the Bureau of Meteorology and disseminated by local media.

6.5 Existing, future and continuing risks

As outlined earlier in the report, the site is located within a flood prone land. The site is affected by the 5%, 1% and the PMF flood levels. The flood study carried out by UPRCT identified that the majority of the site is subject to a LOW flood hazard and small areas by HIGH flood hazard.

It should be noted that the proposed development is consistent with Council's land use objectives for the area.

The continuing flood risk on the site is identified as the full submergence of the basement car park levels during the PMF flood event. The ground floor level would also be inundated during the PMF. The first floor level is completely flood free because it is set above the PMF flood level. As such, the proposed development does not result in an unacceptable increase in risk to human life during an extreme flood event exceeding the 1% AEP.

Triggers for a likely flood emergency may come in the form of:-

- The Bureau of Meteorology issuing a flood warning;
- The Bureau of Meteorology issuing a Severe Weather Warning or a Severe Thunderstorm Warning indicating a likelihood of a flash flooding;
- The State Emergency Service issuing a Flood Bulletin;
- Rising floodwaters; and

- Heavy rainfall.

These triggers do not mean that the business should cease immediately but are important for the assigned warden/deputy to:-

- Keep watch on the flood levels in Parramatta River and the surrounding areas in the vicinity of the site;
- Inform the site users of these triggers; and
- Listen to the local media for update and advice.

It is recommended that flood compatible materials are used in the basement and the ground floor levels to minimise the cost of the damage during rare flood events (i.e. PMF). The structural engineer should certify the building structure is able to withstand the shear forces of the floodwaters up to the flood level in a 100-year ARI plus 1m and up to the PMF level.

Flood warning signs, flashing probes and audible alarms are to be installed at the entry and inside the basement car park. The alarm and the flashing light will be set to activate when the water level in the basement carpark has reached a depth of 100mm. The audible alarm will be on a timer and should be set at 10 minutes at most. However, the flashing probe will continue to operate until the flood levels in the basement garage drop below 100mm.

For that purpose, depth gauges should be placed inside the basement at regular intervals (to manufacturer's recommendations) around the perimeter and also upon the exit from the basement. Signs should also be placed next to the depth gauges informing the basement users of the risk of flooding and the depth of water at the same time.

Perimeter fencing is to be constructed in a manner that does not affect the direction and the velocity of the floodwaters. It is recommended to install fencing that allows the flow to pass through without obstruction. A structural engineer's certificate is required to confirm that the proposed fence and footings can withstand the shear forces of floodwaters.

The additional economic and social costs, which may arise from damage to property as a result of flooding, can be fully managed by the stakeholders of the site.

A detailed flood emergency response and risk management plan should be adopted and implemented by the operators of the development, which increases the awareness of the stakeholders and the users of the site to the flooding issues and outlines the procedures of control and evacuation from the site in flooding events. This will be done at the later stages of the design process.

The NSW SES Community Flood Safe Guides should be printed and made available within the premises. For further details, refer to:

https://www.ses.nsw.gov.au/disaster-tabs-header/flood

6.6 Preparation for a Flood Emergency

In preparation for a flood emergency, the following should be done:-

- Ensure all staff, visitors and residents are aware of the flooding situation and that isolation and confinement to upper levels of the building is a real possibility;
- Encourage employees to participate in the development, implementation and review of future flood risk management plans;
- Keep an up-to-date list of emergency contact numbers in a prominent location;
- Incorporate flood awareness to the induction and training programs;
- Ensure that there are at least two capable and willing employees nominated as wardens and deputy at any one time, who will receive training in emergency procedures;
- Maintain a record of the individual employee training programmes;
- The warden and the deputy will maintain in their possession an up-to-date listing of the after hours contacts for the members of the Emergency committee;
- The night supervisor (if there is one) will receive same training as the warden and the deputy and will act in their capacity in their absence;
- Maintain a record of all site attendance on a daily basis;
- Maintain a register of all visitors and contractors within the premises at any given point in time;
- Ensure that all records are copied and backed up on a daily basis;
- Assess the capability of the Site to provide short to medium term catering for the persons evacuated to upper levels;
- Identify those systems which can be shut down in the event of a flood emergency;
- Establish the foyers of the upper levels as the meeting point when a flood emergency is called during business hours; and
- Prepare a coloured notice of reasonable size that informs persons within the site of the procedures if a flooding above the 100-year ARI flood event occurs and a flood emergency is called as outlined in the following section.

6.7 Actions in the likelihood or during a Flood

The following actions should be listed on the notice to be displayed on site at key locations.

- Warden to advise persons within the site of the likelihood of a flood, heavy rainfall and/or if a flood is occurring;
- The warden will obtain the register of all people on site including residents, staff, employees, visitors and contractors;
- Evacuate the site if safe to do so when the rising floodwaters inundate the lower part of the site. The warden who is keeping watch on the flood levels should advise the site occupiers to evacuate if the floodwaters reach this level. The evacuation should be directed towards flood free areas;
- If it is not safe to evacuate, i.e. the flood levels are rising too quickly and site evacuation becomes dangerous, vacate and clear the basement levels and elevate everyone with their personal items to the designated upper levels;

- Try as much as practical to seal doors and openings on ground floor to minimise the damage to property and equipment;
- Move any hazardous material (if any) into level 1 to avoid it getting washed by the floodwaters;
- Contact the emergency services on 000 and the SES on 132500 alerting them to the situation;
- Continue to monitor the local radio stations, generally the ABC, to keep updated on any flooding;
- Confirm the availability of staff to assist the warden and the deputy with evacuating all personnel to upper levels;
- Shut down computers and all non-essential equipment;
- Maintain a watch on the flood levels in the basement and the ground floor;
- Maintain contact with the emergency services;
- Do not permit anyone to leave the site by foot or vehicle;
- Keep everyone on upper levels at all times;
- Have all personnel maintain a calm outlook;
- In the event of a medical emergency, contact the emergency services by phone 000 and advise them of the need for assisting and follow their instructions;
- Further shut down all systems not required; and
- Maintain an ongoing count of persons at all times and report any missing.

6.8 After the Flood

Once the all clear has been given by the emergency services and the surrounding roads have been reopened, the following actions can occur:

- Do not enter floodwaters;
- Ensure that everyone is safe and accounted for;
- Undertake an assessment of any damage before occupying or allowing others to occupy the premises;
- Remove any debris and clean around all entrances and access points;
- Except when inundated, ensure that facilities such as computers, lights etc are functioning to enable activities to resume;
- If any electrical items have been inundated, these should be checked by an appropriately qualified electrician before use;
- Make an assessment of the facility to resume normal operations;
- Consult with the emergency services and the SES to obtain feedback of the operation of the plan;
- As soon as possible after resumption of normal business, the Emergency Group will meet to debrief and establish any areas for review and change;

- Amend the plan appropriately and issue replacement plans to employees and public locations; and
- Update employee and visitor inductions and training programmes to reflect the changes.

6.9 Emergency Contact Details

The following contact list, or similar is to be kept on site at all times.

Table 6.1 Emergency Contact List

Organisation	Telephone	Contact
State Emergency Services	132500	
Gas		
Sydney Water		
Fire Brigade	000	
Police	000	
Ambulance	000	
Electricity		

6.10 Flood Emergency Kit

For flooding emergencies, the following kit should be available and stored in the first level refuge area:

- A portable radio and torch with fresh batteries;
- Candles and water proof matches;
- Reasonable stocks of fresh water;
- A first aid kit and basic first aid knowledge; and
- Emergency contact details.

6.11 Integration with local flood and catchment plans

The operators of the site should obtain a copy of the latest local flood plan from Council. This plan may be subject to reviews on a regular basis, possibly every five (5) years.

The site's flood risk management plan should complement the local plan and is intended to give the stakeholders of the site an additional level of information on how to manage and respond to flooding within the site's boundaries.

The stakeholders should make themselves informed of the requirements and the procedures outlined in the local flood plan, which would generally be available from Council.

6.12 Program

The following program is recommended to allow the implementation of the measures outlined in this management plan.

Table 6.2 Implementation, Maintenance and review program

Measure Description	When	By Who	Maintenance/Review
Flood compatible materials	During construction	Builder/Owner	Cleaning after flooding
Flood warning system	Prior to occupation	Builder/owner	As recommended by manufacturer (Every 6 months)
Perimeter fencing	During construction	Builder	As required
Evacuation procedure	Occupation	Site Operator	Yearly
Induction course	Occupation	Site Operator	Yearly
SES contact	Occupation	Site Operator	Yearly
Flood Risk Management Plan	During design period	Consultant/Owner	Every 5 years or when more Flooding information is available

7 Assessment of Council Requirements

7.1 Parramatta DCP 2011

Section 2 of the Parramatta DCP 2011 describes site planning considerations including design objectives, design principles and design controls. The development is located in a Medium Flood Risk Precinct.

Consequently, the development has been assessed against the planning and development controls that apply to "Residential" in a Medium Flood Risk Precinct. These controls are identified and are discussed in this section of the report.

Table 2.7: FLOODPLAIN MATRIX

Planning & Development Controls

Planning Consideration	Flood Risk Precincts (FRP's)																											
	Low Flood Risk									Medium Flood Risk										High Flood Risk								
	Sensitive Uses & Facilities	Critical Uses & Facilities	Subdivision	Filling	Residential*	Commercial & Industrial	Tourist Related Development	Open Space & Non-Urban	Concessional Development	Sensitive Uses & Facilities	Critical Uses & Facilities	Subdivision	Filling	Residential*	Commercial & Industrial	Tourist Related Development	Open Space & Non-Urban	Concessional Development	Sensitive Uses & Facilities	Critical Uses & Facilities	Subdivision	Filling	Residential*	Commercial & Industrial	Tourist Related Development	Open Space & Non-Urban	Concessional Development
Floor Level		3			2, 5	2, 5	2, 5							2, 5	2, 5	2, 5	1, 5	4, 5								1, 5	4, 5
Building Components		2												1	1	1	1	1								1	1
Structural Soundness		2												1	1	1	1	1								1	1
Flood Affectation		2	2	1	2	2	2					1		1	1	1	2	1								1	1
Car Parking & Driveway Access		1, 3, 5, 6			1, 3, 5, 6	1, 3, 5, 6	1, 3, 5, 6	2, 4, 6, 7						1, 3, 5, 6, 7	1, 3, 5, 6, 7	1, 3, 5, 6, 7	2, 4, 6, 7	1, 5								2, 4, 6, 7	1, 5
Evacuation		2, 4, 6	5		3, 4	4	4					5, 3, 4		3, 4, 6	3, 4, 6	3, 4, 6	1, 4	3, 6								1, 4	3, 4 6
Management & Design		2, 3, 4	1									1		2, 3, 4	2, 3, 4	2, 3, 4	2, 3, 4	2, 3, 4								2, 3, 4	2, 3, 4

Not Relevant Unsuitable Land Use * For redevelopment of an existing dwelling refer also to ' Concessional Development' provisions

i. Freeboard equals an additional height of 500mm.

ii. The Parramatta LEP 2011 identifies development permissible with consent in various zones. Notwithstanding, constraints specific to individual sites may preclude Council granting consent for certain forms of development on all or part of a site. The above matrix identifies where flood risks are likely to determine where certain development types will be considered "unsuitable" due to flood related risks.

iii. Filling of the site, where acceptable to Council, may change the FRP considered to determine the controls applied in the circumstances of individual applications.

iv. Any fencing that forms part of a proposed development is subject to the relevant Flood Effects and Structural Soundness planning considerations of the applicable land use category.

v. Development within the floodplain may be subject to Clause 6.7 Foreshore Building Line in the Parramatta LEP 2011.

Figure 7-1 Extract from Table 2.7 of Parramatta DCP 2011

7.1.1 Floor Levels

Habitable floor levels to be equal to or greater than the 100 year ARI flood level plus freeboard

The proposed floor levels are RL5.6m and RL8.8m AHD for the rear and for Phillip Street frontage respectively, which provide 500 mm freeboard above the estimated 1% AEP flood level.

A restriction is to be placed on the title of the land, pursuant to S.886 of the Conveyancing Act, where the lowest habitable floor area is elevated more than 1.5 m above finished ground level, confirming that the subfloor space is not to be enclosed.

This requirement will be reflected in the future stages of the design.

7.1.2 Building Components

All structures to have flood compatible building components below the 100 year ARI flood level plus freeboard.

It is proposed that flood compatible building components be used in accordance with this requirement.

7.1.3 Structural Soundness

An engineer's report is required to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year ARI flood level plus freeboard.

A statement addressing this issue will be prepared separately by a practising Structural Engineer to accompany the future stages of the design.

7.1.4 Flood Affectation

An engineer's report is required to certify that the development will not increase flood affectation elsewhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels, flows and velocities caused by alterations to flood flows; and (iii) the cumulate impact of multiple potential developments in the vicinity.

In 2013, Council undertook a cumulative impact assessment of development across Parramatta/Rosehill/Camellia. Initially, building footprints (Option 1 in SKM, 2013)) were assessed for flood impacts using the TUFLOW model. Updated building footprints (Option 2 in SKM, 2013) were provided subsequently by Council to lower flood impacts. The results of the flood study supports the development of the CBD.

Hence, it is anticipated that a site specific flood study will not be required for this proposal.

7.1.5 Car Parking and Driveway Access

The minimum surface level of open spaces or carports shall be as high as practical, but no lower than 0.1m below the 100 year ARI flood level. In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 100 year ARI flood level.

This requirement is not applicable to the proposed development.

Garages capable of accommodating more than 3 motor vehicles on land zoned for urban purposes, or enclosed car parking, must be protected from inundation by floods equal to or greater than the 100 year ARI flood. Ramp levels to be no lower than 0.5 m above the 100 year ARI flood level.

The proposed development will comply with this requirement. More specifically, the crest level of the driveway ramp will provide the necessary freeboard above the 1% AEP flood level.

The level of the driveway providing access between the road and parking spaces shall be no lower than 0.2 m below the 100 year ARI flood level.

This requirement will be addressed in the future design stages.

Enclosed car parking and car parking areas accommodating more than 3 vehicles, with a floor below the 100 year ARI flood level, shall have adequate warning systems, signage, exits and evacuation routes.

These systems and information are to be incorporated in the building emergency plan and will be specified in the future design of the building.

Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 100 year ARI flood.

While this requirement is noted it is not expected to be an issue for the proposed development because all parking is located underground within the multi-storey car park and any vehicles which are floated by floodwaters will be trapped within the basement levels.

7.1.6 Evacuation

Reliable access for pedestrians and vehicles is required from the site to an area of refuge above the PMF level, either on site (eg. second storey) or off site.

Based on the available warning times in the event of extreme floods (to be determined in the future stages), an assessment of the most suitable evacuation procedure will be carried out and will determine if off-site evacuation or shelter in place is more appropriate.

Applicant to demonstrate the development is consistent with any relevant flood evacuation strategy or similar plan.

This requirement is addressed in Section 6 of this report.

Adequate flood warning is available to allow safe and orderly evacuation without increased reliance upon SES or other authorised emergency services personnel.

This requirement is discussed in Section **Error! Reference source not found.** of this report.

7.1.7 Management & Design

Site Emergency Response Flood plan required where the site is affected by the 100 year ARI flood level, (except for single dwelling-houses).

An initial Flood Emergency Response Plan for the development at 90-96 Phillip Street, Parramatta is included in this report.

Applicant is to demonstrate that area is available to store goods above the 100 year flood level plus freeboard.

This requirement will be addressed in coordination with the architect.

No storage of materials below the 100 year ARI flood level.

This requirement is noted. Due to the nature of the proposed development, it is not envisaged that there will be any storage of hazardous materials on site. Other storage of materials in the car park basement will be assessed on a merit-based approach. The risk associated with the storage of materials will be communicated to the occupants.

8 Plan Adoption

This flood risk management plan prepared for the development at:

90-96 Phillip Street, Parramatta

Has been adopted by

_____

Being the strata managers of the building on the _____ / _____ / _____.

Table 8.1 Flood Risk management Plan Review

Review No.	Date	Prepared by	Signed by

_____

A1 Appendix 1

Flood Information

Figure A 1-1Flood Information – Upper Parramatta River Draft 8

Flood Enquiry Information Issued - 30 April 2018

Mainstream Flooding

Is this property affected by mainstream flooding? **90 Phillip Street, Parramatta**		☒ Yes ☐ No
Flood Levels	Closest Cross Sections: *(Please refer to Flood Study):* **Refer to Flood Map**	
☒ 5% AEP	Varies – RL 8.2m AHD at Phillip Street frontage to RL 5.1m AHD at rear property Boundary	**Comments**: **See Note on Flood/Hazard Map**
☒ 1% AEP	Varies – RL 8.3m AHD at Phillip Street frontage to RL 5.6m AHD at rear property Boundary	
☒ PMF	RL 11m AHD	
☒ Refer to flood maps provided for detailed flood levels.		
Flood information is obtained from the following flood study report: **Upper Parramatta River Flood Study – Draft 8 (UPRCT)**		

Note: Flood inundation can be verified by detail survey to AHD undertaken by a Registered Surveyor.

Local Flooding

Is the property located within a Hatched Grey Area? *Properties located within a **Hatched Grey Area** are subjected to flooding from the local catchment.*	☐ Yes ☒ No
Is the property located within a Grey Area? *Properties located within a **Grey Area** are subjected to additional site drainage controls to manage flooding in the local catchment.*	☐ Yes ☒ No
Is the property likely to be affected by overland stormwater run-off from the local catchment? ***Note:** No site inspection conducted for this assessment. Based solely on the information supplied for this flood enquiry application.*	☐ Yes ☒ Subject to Detailed Investigation
***Note:** You are required to contact Council's Development Service Engineer for any details and requirements relating to development that is affected by local flooding.*	

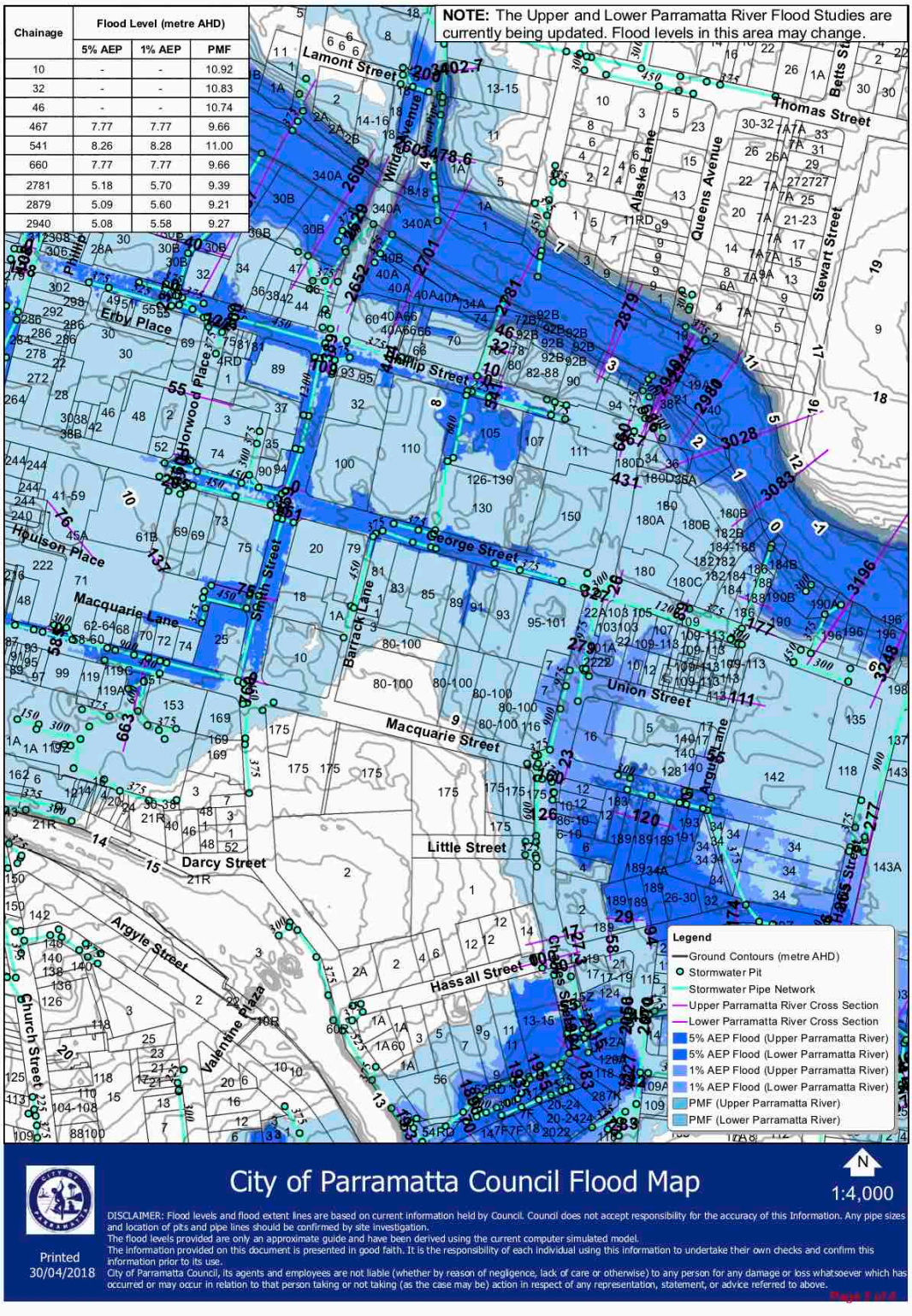
Additional Recommended Actions

☒	The Applicant needs to discuss the proposal to re-develop this site with Council's Town Planner and Development Services Engineer.
☒	The Applicant needs to contact Council's Town Planner and organise a pre-lodgement meeting to discuss any proposal to redevelop this property.
☒	The Applicant needs to refer to Council's Local Floodplain Risk Management policy for details relating to developing a land affected by flooding.

Definitions: (As per NSW Floodplain Development Manual dated April 2005)

1. **AHD** – a common national surface level datum approximately corresponding to mean sea level.
2. **ARI** – the long term average number of years between the occurrences of a flood as big as or larger than, the selected event.
3. **PMF** – is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation.
4. **AEP** – Annual Exceedance Probability is the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage.

Chainage	Flood Level (metre AHD)		
	5% AEP	1% AEP	PMF
10	-	-	10.92
32	-	-	10.83
46	-	-	10.74
467	7.77	7.77	9.66
541	8.26	8.28	11.00
660	7.77	7.77	9.66
2781	5.18	5.70	9.39
2879	5.09	5.60	9.21
2940	5.08	5.58	9.27



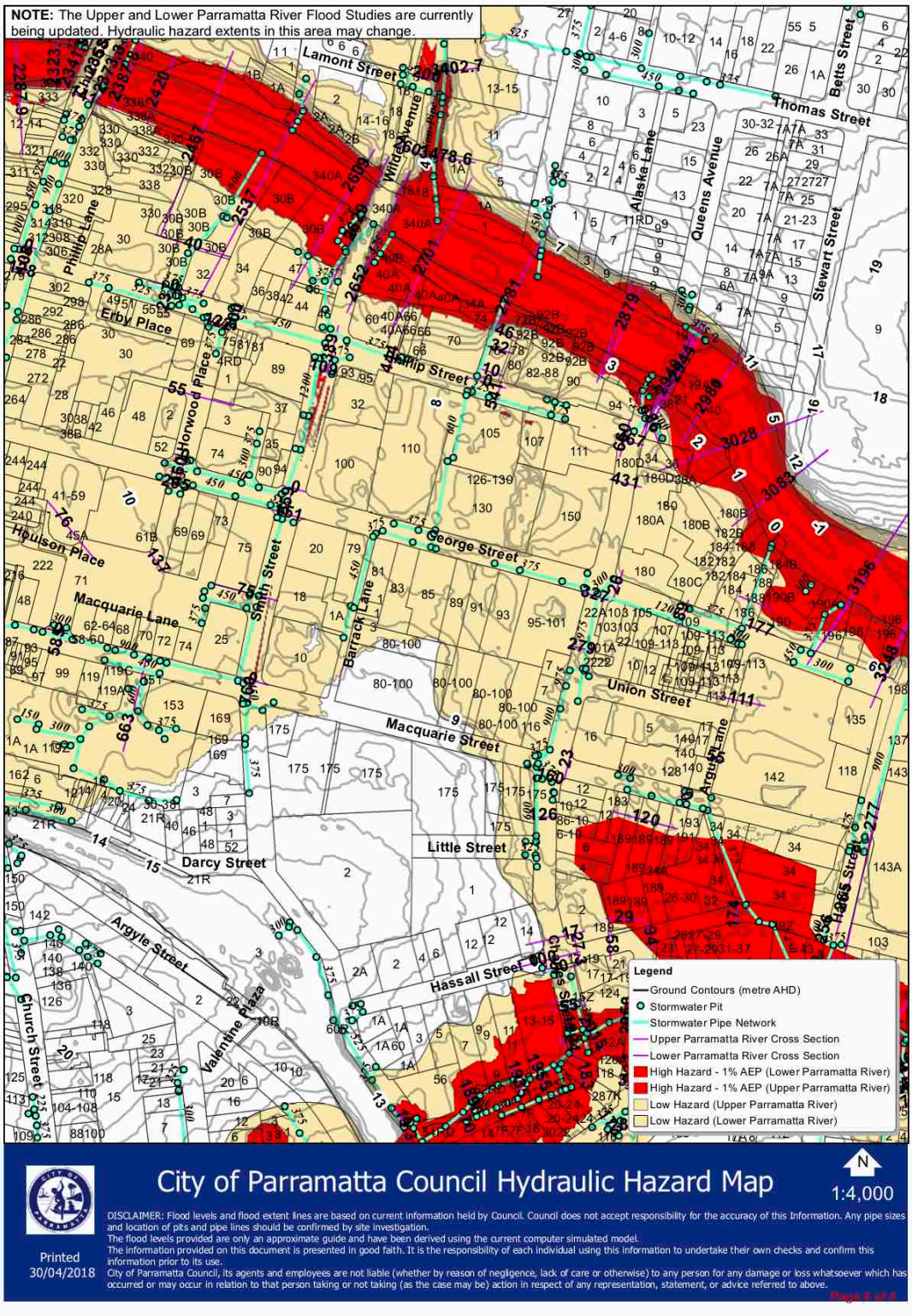


Figure A 1-1 Flood Information – Upper Parramatta River Draft 8

A2 Appendix 2

Flood Planning Matrix

Figure A 2-1Flood Planning Matrix

Table 2.4.2.1.2
Flood Plain Matrix Planning and Development Controls

Flood Risk Precincts (FRP's)	Planning Consideration	Floor Level	Building Components	Structural Soundness	Flood Affectation	Car Parking & Driveway Access	Evacuation	Management & Design
High Flood Risk	Concessional Development	4, 5	1	1	1	1, 5	3, 4, 6	2, 3, 4
	Open Space & Non-Urban	1, 5	1	1	1	2, 4, 6, 7	1, 4	2, 3, 4
	Tourist Related Development	X	X	X	X	X	X	X
	Commercial & Industrial	X	X	X	X	X	X	X
	Residential*	X	X	X	X	X	X	X
	Filling	X	X	X	X	X	X	X
	Subdivision	X	X	X	X	X	X	X
	Critical Uses & Facilities	X	X	X	X	X	X	X
	Sensitive Uses & Facilities	X	X	X	X	X	X	X
Medium Flood Risk	Concessional Development	4, 5	1	1	1	1, 5	3, 6	2, 3, 4
	Open Space & Non-Urban	1, 5	1	1	2	2, 4, 6, 7	1, 4	2, 3, 4
	Tourist Related Development	2, 5	1	1	1	1, 3, 5, 6, 7	3, 4, 6	2, 3, 4
	Commercial & Industrial	2, 5	1	1	1	1, 3, 5, 6, 7	3, 4, 6	2, 3, 4
	Residential*	2, 5	1	1	1	1, 3, 5, 6, 7	3, 4, 6	2, 3, 4
	Filling	X	X	X	X	X	X	X
	Subdivision				1		5, 3, 4	1
	Critical Uses & Facilities	X	X	X	X	X	X	X
	Sensitive Uses & Facilities	X	X	X	X	X	X	X
Low Flood Risk	Concessional Development							
	Open Space & Non-Urban					2, 4, 6, 7		
	Tourist Related Development	2, 5			2	1, 3, 5, 6	4	
	Commercial & Industrial	2, 5			2	1, 3, 5, 6	4	
	Residential*	2, 5			2	1, 3, 5, 6	3, 4	
	Filling				1			
	Subdivision				2		5	1
	Critical Uses & Facilities	3	2	2	2	1, 3, 5, 6	2, 4, 6	2, 3, 4
	Sensitive Uses & Facilities	X	X	X	X	X	X	X

*for redevelopment of existing dwellings refer also to 'Concessional Development Provisions"

Legend

Not Relevant X Unsuitable Land Use

i. Freeboard equals an additional height of 500mm.

ii. The Parramatta LEP 2011 identifies development permissible with consent in various zones. Notwithstanding, constraints specific to individual sites may preclude Council granting consent for certain forms of development on all or part of a site. The above matrix identifies where flood risks are likely to determine where certain development types will be considered "unsuitable" due to flood related risks.

iii. Filling of the site, where acceptable to Council, may change the FRP considered to determine the controls applied in the circumstances of individual applications.

iv. Any fencing that forms part of a proposed development is subject to the relevant Flood Effects and Structural Soundness planning considerations of the applicable land use category.

v. Development within the floodplain may be subject to Clause 6.7 Foreshore Building Line in the Parramatta LEP 2011.

Table 2.4.2.1.3
Development Controls

Floor Level	
1	All floor levels to be equal to or greater than the 20 year Average Recurrence Interval (ARI) flood level plus freeboard.
2	Habitable floor levels to be equal to or greater than the 100 year ARI flood level plus freeboard.
3	All floor levels to be equal to or greater than the Probable Maximum Flood (PMF) level plus freeboard.
4	Floor levels to be equal to or greater than the 100 year ARI flood level plus freeboard. Where this is not practical due to compatibility with the height of adjacent buildings, or compatibility with the floor level of existing buildings, or the need for access for persons with disabilities, a lower floor level may be considered. In these circumstances, the floor level is to be as high as practical, and, when undertaking alternations or additions, no lower than the existing floor level.
5	A restriction is to be placed on the title of the land, pursuant to S.88B of the Conveyancing Act, where the lowest habitable floor area is elevated more than 1.5m above finished ground level, confirming that the subfloor space is not to be enclosed.
Building Components & Method	
1	All structures to have flood compatible building components below the 100 year ARI flood level plus freeboard.
2	All structures to have flood compatible building components below the PMF.
Structural Soundness	
1	An engineers report is required to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year ARI flood level plus freeboard.
2	An engineers report is required to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a PMF level.
Flood Affectation	
1	An engineers report is required to certify that the development will not increase flood affectation eleswhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels, flows and velocities caused by alterations to flood flows; and (iii) the cumulate impact of multiple potential developments in the vicinity.
2	The impact of the development on flooding elsewhere to be considered having regard to the three factors listed in consideration 1 above.
Car Parking and Driveway Access	
1	The minimum surface level of open spaces or carports shall be as high as practical, but no lower than 0.1m below the 100 year ARI flood level. In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 100 year ARI flood level.
2	The minimum surface level of open parking spaces or carports shall be as high as practical, but no lower than 0.3m above the 20 year ARI flood level.
3	Garages capable of accommodating more than 3 motor vehicles on land zones for urban purposes, or enclosed car parking, must be protected from inundation by floods equal to or greater than the 100 year ARI flood. Ramp levels to be no lower than 0.5m above the 100 year ARI flood level.
4	The driveway providing access between the road and parking spaces shall be as high as practical and generally rising in the egress direction.
5	The level of the driveway providing access between the road and parking spaces shall be no lower than 0.2m below the 100 year ARI flood level.
6	Enclosed car parking and car parking areas accommodating more than 3 vehicles, with a floor below the 100 year ARI flood level, shall have adequate warning systems, signage, exits and evacuation routes.
7	Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 100 year ARI flood.
Evacuation	
1	Reliable access for pedestrians required during a 20 year ARI peak flood.
2	Reliable access for pedestrians and vehicles required to a publicly accessible location during the PMF peak flood.

3	Reliable access for pedestrians and vehicles is required from the site to an area of refuge above the PMF level, either on site (eg. second storey) or off site.
4	Applicant is to demonstrate the development is consistent with any relevant flood evacuation strategy or similar plan.
5	Applicant is to demonstrate that evacuation in accordance with the requirements of this DCP is available for the potential development resulting from the subdivision.
6	Adequate flood warning is available to allow safe and orderly evacuation without increased reliance upon SES or other authorised emergency services personnel.
Management and Design	
1	Applicant is to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with this the relevant FRMS and FRMP
2	Site Emergency Response Flood plan required where the site is affected by the 100 year ARI flood level, (except for single dwelling-houses).
3	Applicant is to demonstrate that area is available to store goods above the 100 year flood level plus freeboard.
4	No storage of materials below the 100 year ARI flood level.

Further Information

Flood Risk Management Plan, Flood Studies, Sub-Catchment Management Plans and Local Floodplain Risk Management Policy available from the City of Parramatta Council.

NSW Government's *Floodplain Development Manual 2005* – www.dnr.nsw.gov.au/floodplains/manual.shtml

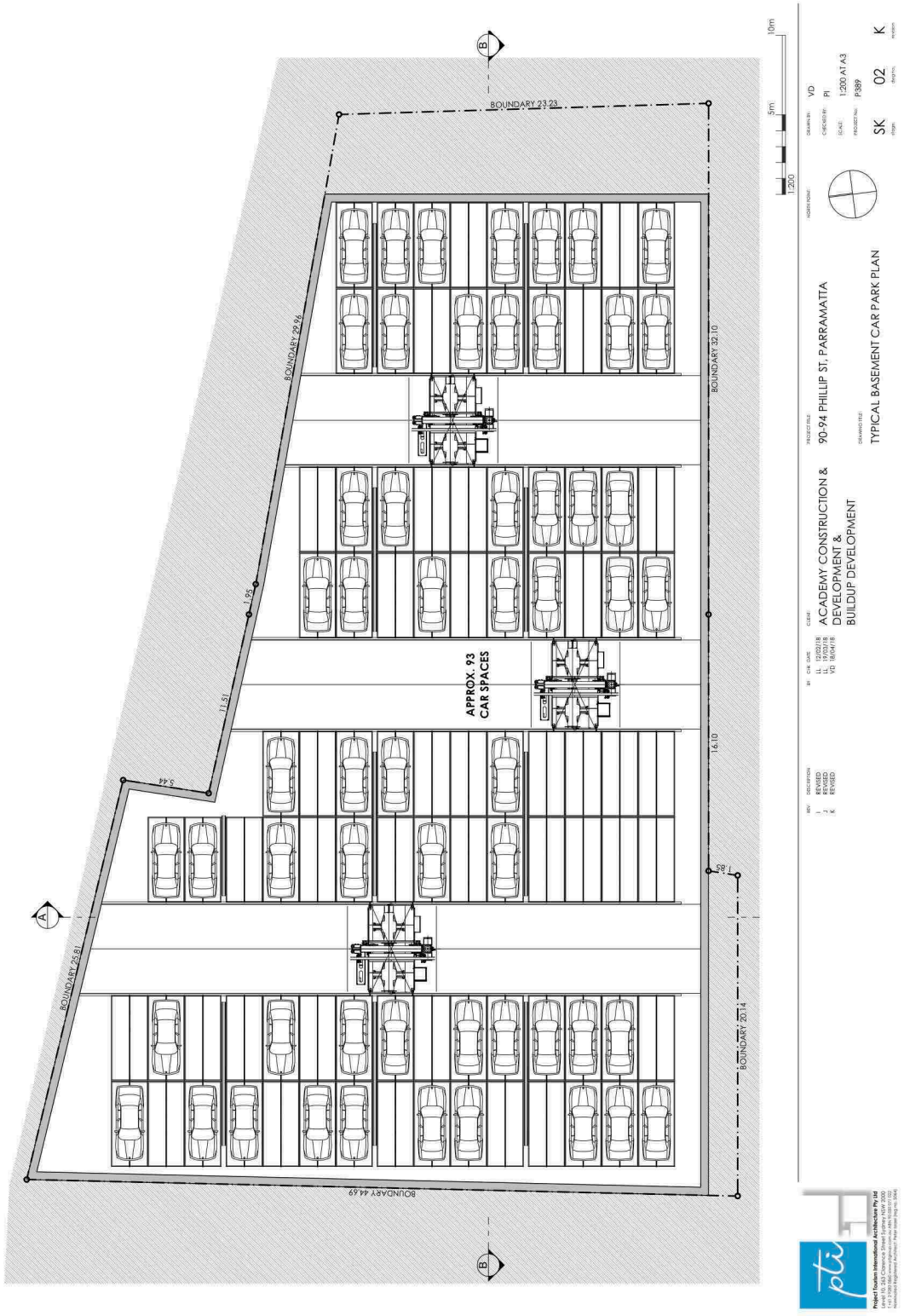
City of Parramatta Council's *Local Floodplain Risk Management Policy*, 2006.

Figure A 2-1 Flood Planning Matrix

A3 Appendix 3

Architectural Plans

Figure A 3-1Architectural Plans by PTI Architects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A
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DEVELOPMENT &
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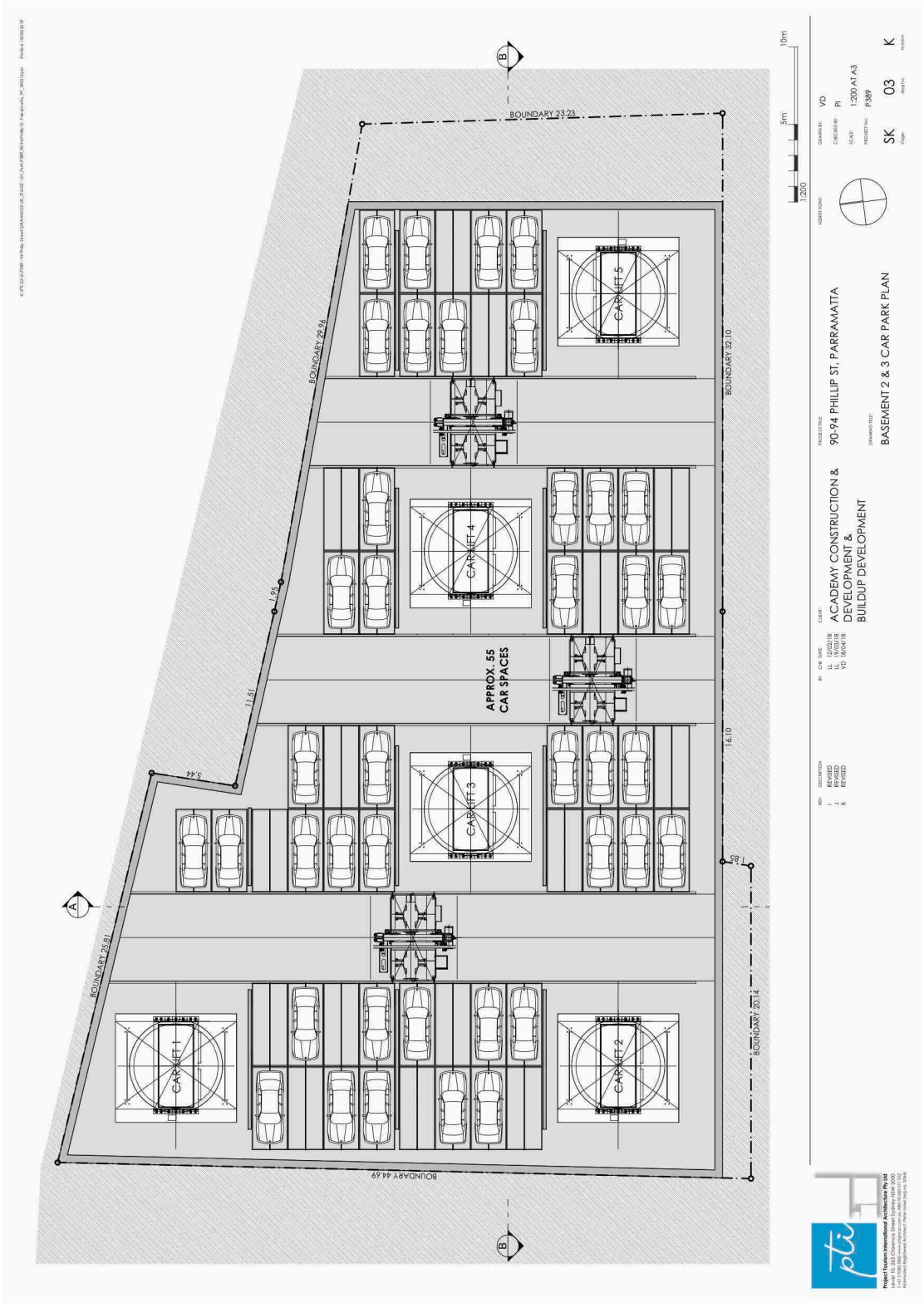
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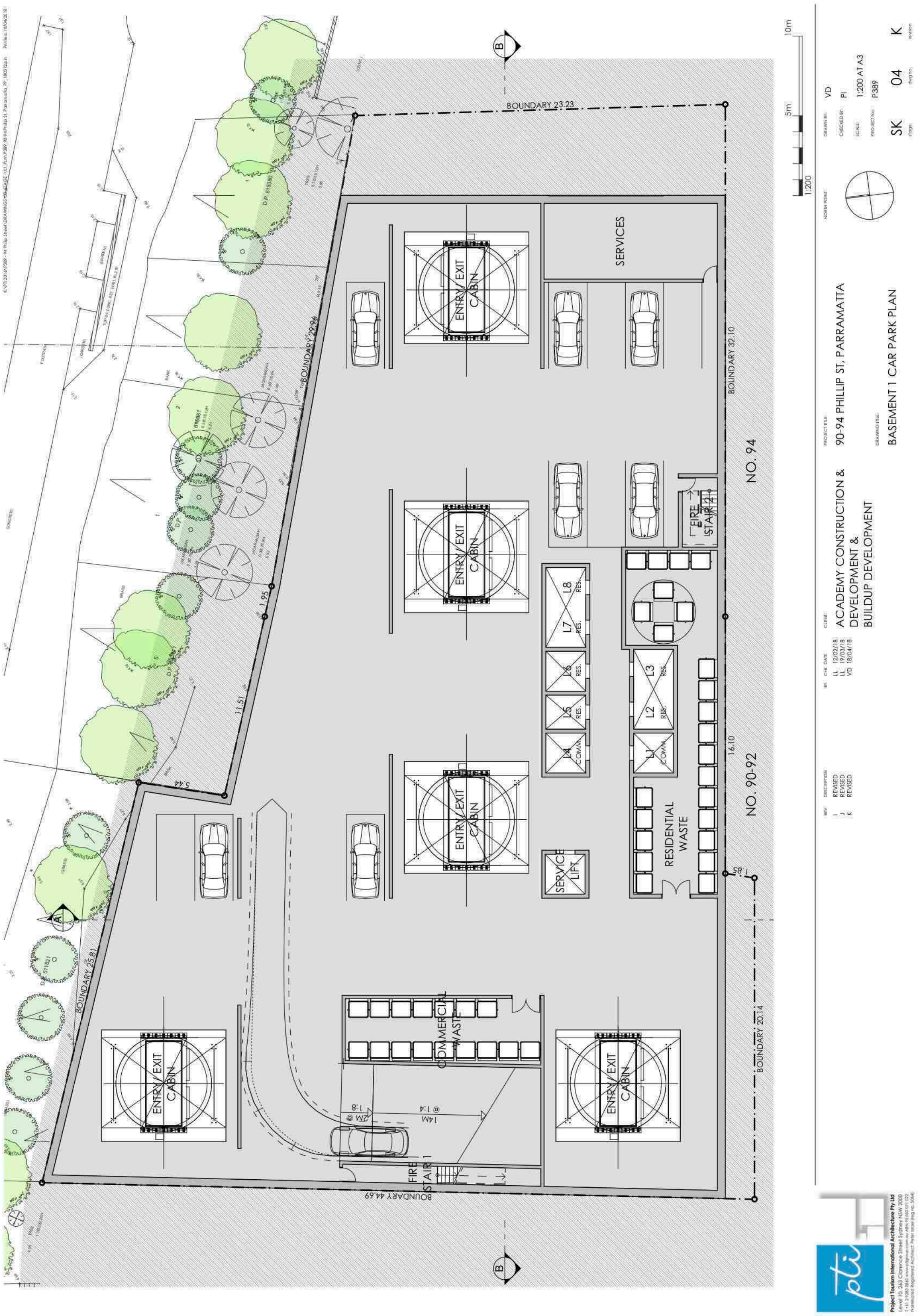
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FIRE STAIR 2
SERVICE LIFT
RESIDENTIAL WASTE
COMMERCIAL WASTE
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NO. 90-92
ACADEMY CONSTRUCTION & DEVELOPMENT & BUILDUP DEVELOPMENT
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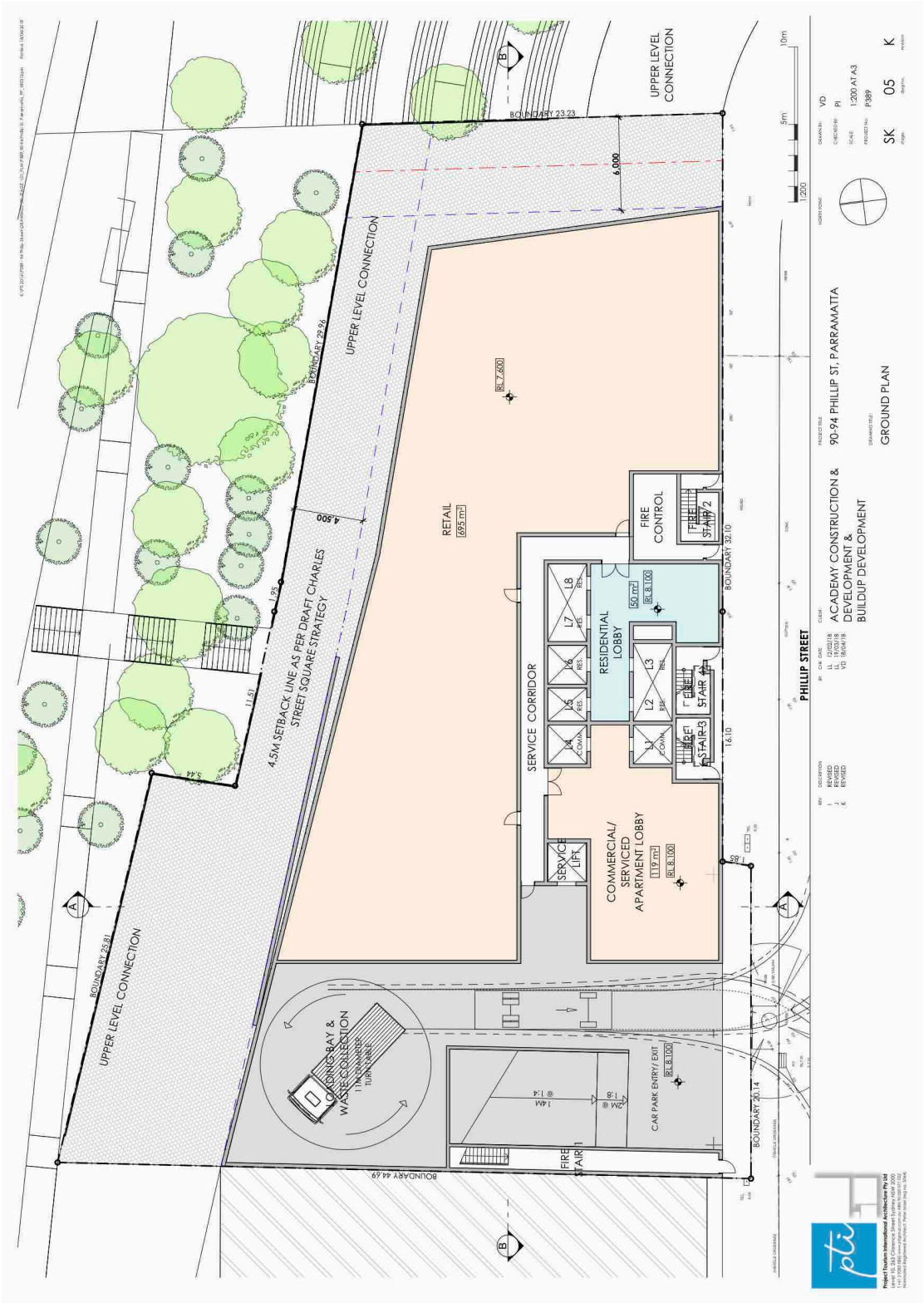

Figure A 3-1 Architectural Plans by PTI Architects

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