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21 March 2016

KF111027:C013

The Development Manager  
 Toplace  
 121 Majors Bay Road  
 CONCORD NSW 2137

Attention: Mr David Krepp

Dear David,

Re Cardno Letters Dated 2 Mar 2016 and 18 Mar 2016- 189 Macquarie Street,  
 Parramatta

I have reviewed the Cardno letters dated 2 March 2016 and 18 March 2016 and offer the following comments in relation to the Planning Proposal.

Dot Point #1 (2/3/16 p5)

Levels B1 – B3 will provide 389 parking spaces. Level B4 and B5 will provide additional parking for approximately 225 vehicles (Krikis Taylor). The number of car parking spaces in the basement levels will be 614 vehicles.

In the absence of accurate demographic information, reference is made to the profile.id Community profile web site for Parramatta City and for inner Sydney

Area: City of Parramatta | Benchmark area: New South Wales | Data type: Enumerated | Comparison year: 2006 | reset

Car ownership | export | reset

City of Parramatta	2011			2006			Change 2006 to 2011
	Number	%	New South Wales %	Number	%	New South Wales %	
<b>a</b> No motor vehicles	8,119	13.6	10.2	8,222	15.1	11.2	-103
1 motor vehicle	23,978	40.1	36.5	21,154	38.8	36.7	+2,824
<b>a</b> 2 motor vehicles	17,046	28.5	32.6	14,724	27.0	31.4	+2,322
3 or more motor vehicles	6,130	10.3	13.9	5,069	9.3	12.3	+1,061
Not stated	4,503	7.5	6.8	5,316	9.8	8.3	-813
Total households	59,776	100.0	100.0	54,485	100.0	100.0	+5,291

Source: Australian Bureau of Statistics, Census of Population and Housing 2006 and 2011. Compiled and presented by id, the population experts.

Area: City of Sydney | Benchmark area: Inner Sydney Regio | Data type: Enumerated | Comparison year: 2006 | reset

### Car ownership

export | reset

City of Sydney	2011			2006			Change
Number of cars	Number	%	Inner Sydney Region %	Number	%	Inner Sydney Region %	2006 to 2011
a No motor vehicles	29,539	34.7	21.1	23,171	29.4	20.6	+6,368
1 motor vehicle	33,154	38.9	41.4	26,580	33.7	38.9	+6,574
a 2 motor vehicles	8,831	10.4	21.4	7,442	9.4	19.9	+1,389
3 or more motor vehicles	1,489	1.7	5.6	1,212	1.5	5.2	+277
Not stated	12,142	14.3	10.4	20,393	25.9	15.4	-8,251
Total households	85,155	100.0	100.0	78,798	100.0	100.0	+6,357

The Inner Sydney Region is made up from 3 Statistical Subdivisions (Eastern Suburbs, Inner Sydney & Inner Western Sydney) & consists of the following LGAs; Ashfield (A), Botany Bay (C), Burwood (A), Canada Bay (A), Leichhardt (A), Marrickville (A), Randwick (C), Strathfield (A), Sydney (C), Waverley (A) & Woollahra (A).

Source: Australian Bureau of Statistics, [Census of Population and Housing 2006 and 2011](#). Compiled and presented by [.id](#), the population experts.

Given the proximity to public transport, it is likely that car ownership in this building will be closer to that of inner Sydney in that not all future residents will have a vehicle to occupy the allocated car parking space. It is therefore assumed that up to 25% of car parking spaces will be permanently vacant.

The public car parking allows for 715 car parking spaces. There remains the potential for vehicles parked in the basement levels to be evacuated, in the event of an extreme flood, to a vacant car parking space or an allocated 'double parked' space on the flood free public car parking levels.

Additional time will be required in order to drive the vehicles from level B4 and B5 to the allocated flood refuge space. The evacuation trigger point may have to be revised in order to provide the additional evacuation time.

It is probable that not all residents will be in a position to evacuate their vehicle in the event of an extreme flood. The reasons for this include but are not limited to:

- Being unaware of the situation (eg asleep, under the influence of intoxicating substance)
- Being incapacitated and/or incompetent to drive (eg intoxicated)
- Not receiving the SMS flood warning (eg asleep, flat battery)
- Flood rise being more rapid than reaction time
- Being away from the building (eg at work, on holidays, visiting others, overseas)

Flood evacuation drills and flood risk education conducted by the building manager, at least annually, would contribute to the residents of the building being aware of and responsive to the residual flood risk.

In any case, being aware of the current and future weather conditions will facilitate pre-positioning vehicles in the event that the BOM has issued a flood warning for Parramatta CBD.

#### Dot Point #2 (2/3/16 p5)

It is self evident that the two additional basement levels will potentially increase the number of vehicles within the site.

The basements will be protected from inundation for floods of magnitude up to and including 1% AEP. This complies with the NSW Flood Plain Development Manual concept of flood planning level.

As stated in the NSW Flood Plain Development Manual:

*“The PMF or extreme event provides an upper limit of flooding and associated consequences for the problem being investigated. It is used for emergency response planning purposes to address the safety of people.”*

*“Therefore the full range of flood sizes, up to and including the PMF, need to be assessed with particular an emphasis on danger to personal safety and critical infrastructure rather than property protection.”*

*“As the PMF is unlikely to be adopted for protecting development from flooding, a continuing risk of flooding remains. This is principally a concern for personal safety which generally needs to be managed through emergency response and community education.”*

The residual flood risk which would result in damage to vehicles can be managed by a vehicle evacuation strategy and by vehicle insurance.

It must be recognised that comprehensive vehicle insurance covers incidents such as road accidents, hail damage, fire, theft etc all of which have a much higher frequency of occurrence than an extreme flood.

#### Dot Point #3 (2/3/16 p5)

It is accepted that some additional time will be required to evacuate personnel from the two additional basement levels due to simple time and space relationships.

Assuming that lifts are not in service, there are two pedestrian routes for evacuation from the basement, being via vehicle ramps and via stairs.

#### Vehicle Ramps

Using the current approved development as a base case for comparison, the maximum distance a person would have to walk from the most remote corner of B3 to the Macquarie Street lobby is approximately 350m. The route would be via vehicle access ramps. At a moderate walking pace of 3.5 km/h (1.0 m/s) it would take approximately 5.6 minutes for a person to walk from the most remote corner of B3 to the Macquarie Street lobby.

The additional two basement levels will increase this distance to approximately 480m.

At a moderate walking pace of 3.5 km/h (1.0 m/s) it would take approximately 8.0 minutes for a person to walk from the most remote corner of B5 to the Macquarie Street lobby.

The additional basement levels will add 2.4 minutes to the time taken for a pedestrian to reach the lobby from level B5.

#### Stairs

There are three stair wells providing egress from the basements.

Using the current approved development as a base case for comparison, the vertical distance from B3 to a Level #2 (above RL 9.5) is approximately 15m. At a climbing rate of 250m per hour, it would take 3.6 min for a person to evacuate level B3.

The vertical distance from B5 to Level #2 (above RL 9.5) is approximately 20m. At a climbing rate of 250m per hour, it would take 4.8 min for a person to evacuate level B5.

The additional basement levels will add 1.2 minutes to the time taken for a pedestrian to reach Level 2.

#### Pedestrian Evacuation Warning

The estimated 1% AEP flood level in Macquarie Street is RL 6.16 AHD.

The basement levels are flood proofed to RL 6.66 AHD.

During an extreme flood, the rate of flood water rise from RL 6.66 to RL 9.44 is likely to be in the order of 90mm/minute.

Evacuation of basements should occur prior to the depth of water over the driveway crest exceeding 250 mm, that is RL 6.91 AHD.

In order to ensure that personnel have at least eight minutes to evacuate the basements, the basement evacuation alarm should be initiated at the time at which flood water depth in Macquarie Street reaches RL 6.19 AHD. At this point, 470 mm freeboard is available prior to the driveway crest being overtopped.

#### Dot Point #1 (2/3/16 p6)

The risk of a foreseeable health emergency does not increase in the event of an extreme flood.

The warrant for the installation of medical equipment, such as defibrillators, within the building and basements would be based on the 'sunny day' risk of a health emergency occurring.

#### Dot Point #2 (2/3/16 p6)

Installation of flood gate to completely seal the building from a PMF is not consistent with the NSW Flood Plain Development Manual.

The basement is protected from inundation for floods of magnitude up to and including 1% AEP.

#### Dot Point #3 (2/3/16 p6)

Alarm systems would in any case be provided with backup electrical supply in order to ensure that the alarm system is operational during loss of electricity from the grid.

The building is not a critical public building. An alternative electricity supply to provide 'full' electricity supply during an extreme flood is not warranted as a means of reducing flood risk.

Preventing lifts from entering flood waters was recommended in the KFW May 2014 report. Incorporating water level sensors in lifts is a feasible way of achieving this outcome.

#### Additional Measures

Additional measures to enhance the evacuation procedure are listed below:

- a. Floodwater Level Monitoring - External  
In order to minimise the occurrence of unnecessary vehicle evacuation, the vehicle evacuation trigger will need to consider the following:
  - i. BOM warnings and advice will inform the building manager on the potential for an extreme flood occurring. The option for sending initial warning via SMS and manual initiation of the evacuation alarm exists.
  - ii. Flood level and Rate of flood water rise in Macquarie Street

Flood level and rate of rise sensor will provide data to the alarm system and compute the likely time at which the FPL will be exceeded.

This is conventional technology for which detailed design can be prepared for a subsequent DA and CC.

This issue should not delay the assessment of the planning proposal.

b. Floodwater level sensors - Internal

In order to prevent lifts descending into flooded basement levels water level sensors should be incorporated into the lift control system for those lifts serving levels which may be flooded in the event of an extreme flood.

This is conventional technology for which detailed design can be prepared for a subsequent DA and CC

This issue should not delay the assessment of the planning proposal.

c. Provision for Foreseeable Medical Emergency

The installation of medical equipment, such as defibrillators, based on the 'sunny day' risk of a health emergency occurring will address Council's concern in this regard.

This is conventional technology for which detailed design can be prepared for a subsequent DA and CC.

This issue should not delay the assessment of the planning proposal.

Feasibility of Evacuating Additional Vehicles

The following is based on the following assumptions:

- Total No of car parking spaces: 614
- Maximum No of vehicles used: 460
- Maximum of vehicles occupying basement levels at any one time (85% occupancy): 391

Assuming that 25% of the vehicles can be evacuated at any one time, it will take approximately 9 minutes to evacuate 100 vehicles from the basement levels (assuming exit speed of 7 km/h and 1.5 sec gap between veh).

In Macquarie Street, the estimated rate of rise of flood water approaching the peak of a 1% AEP flood will be in the order of 33mm / minute.

In Macquarie Street, the estimated rate of rise of flood water approaching the peak of a PMF% will be in the order of 90mm / minute.

In order for the evacuation to be feasible, vehicle evacuation will have to be completed prior to flood water in Macquarie Street exceeding RL 6.30, after which Macquarie Street will be un-trafficable.

Parramatta Council have previously expressed concern that the trigger point of floodwaters reaching RL6.0 m may result in the evacuation plan being discredited because of vehicles being evacuated at frequent intervals.

As stated in the KFW Flood Report (Dec 2013) the initial vehicle evacuation action is a warning of severe flooding from BOM. Upon this warning, residents should move their vehicle from the basement to the allocated public car parking level.

Pre-positioning resident vehicles to a location above the PMF is the preferred and primary measure.

The vehicle evacuation warning system will therefore be a secondary measure. The warning system will have to assess the flood water level and the rate of rise of flood water in order to estimate the 'magnitude' of the flood.

In any case the vehicle evacuation warning should be initiated when one of the following criteria is met:

- Flood water level rise up to 33mm/min:  
initiate vehicle evacuation warning when flood water in Macquarie Street reaches RL 5.9 AHD
- Flood water level rise up to 90mm/min:  
initiate vehicle evacuation warning when flood water in Macquarie Street reaches RL 5.5 AHD
- Flood water level RL 6.19 AHD:  
initiate basement evacuation alarm

It is improbable that all car owning residents will be on site in the event of an extreme flood developing. Sufficient warning time to evacuate all vehicles from the basement is therefore unlikely to be available.

It is feasible for a proportion of vehicles to be evacuated from the basements.

Notwithstanding that providing a flood barrier to protect the basements from an extreme flood is not warranted, a flood gate introduces latent risk by providing a false sense of security. Residents may feel safe in the basement during an extreme flood event.

A catastrophic failure of the flood barrier restraining some 3 m head of floodwater water will most likely result in sudden inundation and would not allow insufficient time to evacuate the basements.

#### Increase in Flood Damages

This is a leading question from Cardno and indicates that the concept of the PMF is suffering from 'mission creep'.

The NSW Flood plain Development Manual 2005 defines the PMF as follows:

*'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 building and basements have been designed to comply with the Parramatta Council flood planning level which provides flood protection against floods of magnitude up to and including 1% AEP.

For the reasons stated above, it will not be possible to evacuate all vehicles which may be in the basement in the event of an extreme flood of magnitude greater than 1% AEP.

In any case it is not desirable to encourage personnel to enter the basement during an extreme flood. The residual flood risk which would result in damage to vehicles can be managed by vehicle insurance.

It must be recognised that vehicle insurance covers incidents such as road accidents, hail damage, fire and theft, all of which have a much higher frequency of occurrence than an extreme flood.

Ramifications for Evacuation Strategy

The additional basement levels will require additional 2.4 minutes for personnel to evacuate the basements.

This additional warning time will not impose unreasonable constraints for the evacuation of personnel who may be in the basement in the event of an extreme flood.

Yours faithfully,

**K F WILLIAMS & ASSOCIATES PTY LTD**



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