Our Ref: W4884:BCP/bcp
Contact: Dr Brett C. Phillips

4th August 2011

Cardno (NSW) Pty Ltd
ABN 95 001 145 035

Level 3
Cardno Building
910 Pacific Highway
Gordon NSW 2072
Australia

Phone: 61 2 9496 7700
Fax: 61 2 9499 3902

www.cardno.com.au

The Manager
Sincorp Properties Pty. Ltd.
PO Box 1089
HUNTERS HILL NSW 2110

Attention: Mr Craig Sinclair

Dear Craig,

ADDENDUM TOFLOOD RISK ASSESSMENT FOR 449 VICTORIA STREET, WETHERILL PARK

Further to our discussion, we are pleased to provide further advice in response to Council's comments on our supplementary Flood Investigation of planned development at 449 Victoria Street, Wetherill Park which were received on 14 July 2011.

Each of Council's queries is discussed in turn as follows

1. *In the 1D component, a free outflow (i.e. weir-like, waterfall flow) has been assumed at the downstream boundary. This has resulted in extremely low water levels (and high velocities) in the lower reaches of the open channel and also in very high head losses over the bridge crossing just downstream of the Victoria Street/Newton Road roundabout. The use of normal flow depth as the downstream model boundary is recommended to allow for a more accurate representation of the bridge crossing downstream of the roundabout, which presently appears to be producing unrealistically high head losses. The use of normal flow depth at the downstream boundary would provide more accurate flood levels as well as influencing the interchange of flow between the open channel and the floodplain in this area*

In response to Council's comments a stage hydrograph for the critical 100 yr ARI event was created at the downstream channel boundary and input into the TUFLOW model. This stage hydrograph was generated by creating a simple xpswmm1D model of the channel in the vicinity of the model boundary and inputting the 100 yr ARI flow hydrograph from the TUFLOW model in the channel close to the downstream model boundary. This model was run with a normal depth boundary condition and generated the stage hydrograph given in **Figure 33**.

The downstream boundary condition for overland flows along roads was a Q-H boundary condition that was calculated internally within TUFLOW.

The impact of the changed downstream boundary condition under Future Conditions was assessed by re-running the TUFLOW model and plotting the differences in peak 100 yr ARI flood levels. It can be seen from **Figure 34** that differences are minimal.

The models of Existing Conditions and Future Conditions were then re-run to estimate 100 yr ARI flood levels with the modified downstream boundary condition. The estimated peak 100 yr ARI flood levels and flood depths under Existing and Future Conditions are given in **Figures 35, 36, 37** and **38** respectively.

The estimated 100 yr ARI level differences under Future Conditions with 0% blockage of the Victoria Street culvert in comparison with Existing Conditions with 0% blockage of the Victoria Street culvert are plotted in **Figure 39**.

2. *The development needs to be designed such that there is no flood impact. The submitted flood information shows an increase in flood levels of up to 30mm on surrounding properties and up to 40mm along Victoria Street.*

We were somewhat surprised by Council's comment because it was our understanding that Council had previously indicated flood levels in the order of 30-40mm would be acceptable.

It is noted from **Figure 39** that local impacts of 0.03 m to 0.04 m along the overland flowpath down Victoria Street are unaffected by the changed downstream boundary condition.

In response to Council's changed position in relation to the severity of small local increases in 100 yr ARI flood levels along Victoria Street a further option was developed iteratively to limit impacts on any downstream properties to no more than 0.01 m. This was achieved by strategically locating several sections of wall along the site boundaries (with provision for driveway entries) to modify the flood behaviour in a 100 yr ARI event.

The wall locations are indicated in **Figure 40**.

The Future Conditions model with walls was re-run for the cases of 0% blockage and 50% blockage of the Victoria Street culvert.

The estimated 100 yr ARI level differences under Future Conditions (With Walls) with 0% blockage of the Victoria Street culvert in comparison with Existing Conditions with 0% blockage of the Victoria Street culvert are plotted in **Figure 40**. It was that the impacts within the site were generally up to around 0.06 m with the greatest local increase within the site beside the planned northwest building where the impact is nearer 0.18 m.

The estimated 100 yr ARI level differences under Future Conditions (With Walls) with 50% blockage of the Victoria Street culvert in comparison with Existing Conditions with 50% blockage of the Victoria Street culvert are plotted in **Figure 41**. It was noted that the impacts within the site were generally up to around 0.1 m.

The estimated 100 yr ARI level differences under Future Conditions (With Walls) with 50% blockage of the Victoria Street culvert in comparison with 0% blockage of the Victoria Street culvert are plotted in **Figure 41**. It was noted that the impacts within the site were generally up to around 0.41 m while the greatest local increase beside any planned building was up to 0.36 m.

This indicates that a freeboard of 500 mm should ensure that the floor levels of the new building would not be inundated by 50% blockage of the culvert during a 100 yr ARI event.

It should be also noted that in the case of 50% blockage of the Victoria Street culvert that the assessed impacts within the site are conservative because that walls were assumed to be higher than 100 yr ARI flood levels under all conditions. If the height of the wall was limited to the 100 yr ARI flood level under 0% blockage of the Victoria Street culvert then these walls would overtop under conditions of 50% blockage of the Victoria Street culvert which in turn would reduce the impacts of culvert blockage within the site.

3. *Very little documentation is provided on the structure of the TUFLOW model. There are no details on the assumed flow rates, critical storm duration, the 1D/2D structure of the model, etc...*

Model inflows appear to be based on a 2 hour design storm. The peak 100 year inflow at the upstream boundary of the model is 78.6 m3/s. The Prospect Creek floodplain management Plan Review suggests that the 25 minute duration storm is critical in the Wetherill Park channel, upstream of Widemere Road (81 m3/s for the 25 minute storm).

In the absence of the provision of any flow hydrographs and/or a copy of any hydrological model held by Council, the xprafts model of the Prospect Creek catchment previously assembled for Council was adopted to estimate the 20 yr ARI and 100 yr ARI inflow hydrographs at the upstream boundary (Node A3) and the local inflow within the study area (Node 449VicSt). These hydrographs were input into the TUFLOW model at the locations given in **Figure 43**.

In response to the suggestion by Council's reviewer that the 25 minute duration storm is critical the peak 100 yr ARI flows generated by the xprafts model for 15 minute, 25 minute, 30 minute, 45 minute, 1hour, 1.5 hour, 2 hour, 3 hour, 4.5 hour, 6 hour and 9 hour storm burst durations were summarised as given in **Table 1**.

Table 1 Estimated Peak 100 yr ARI Inflows

Storm Burst Duration	Node		
	A3	449VicSt Local	449VicSt Combined
15min	74.1	12.6	77.0
25min	65.5	10.3	70.2
30min	62.9	9.8	68.8
45min	71.4	11.8	78.5
1hr	68.7	10.9	75.2
1.5hr	74.1	12.0	79.9
2hr	78.8	13.1	84.5
3hr	52.1	8.4	58.8
4.5hr	49.9	7.8	57.4
6hr	44.6	7.2	50.6
9hr	44.6	7.0	50.8

It can be seen from Table 1 that the 2 hour storm is critical and that the combined peak 100 yr ARI inflow (which takes account of timing differences between the channel flow and local inflows) is around 84.5 m^3/s. This compares favourably with the peak 100 yr ARI flow upstream of Widemere Road of around 81 m3/s suggested by Council's reviewer.

> *In any case, a detailed flood assessment report outlining all model input data and assumptions will be required.*

We were surprised by Council's comment that the reports, results and models provided previously are insufficient for Council's assessment purposes. It is our view that the reports, results and models previously provided to Council in combination with the additional information contained herein is more than sufficient for Council to form a view of the merits of the planned development.

Yours faithfully

Brett C. Phillips

.....

Dr Brett C. Phillips
Director, Water Engineering
for **Cardno**