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Tel: +61 3 8620 6100
Fax: +61 3 8620 6105

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ABN 54 010 830 421

www.bmtwbm.com.auTGM Group
Level 1, 27-31 Myers Street
Geelong 3220
Victoria

Attention: Chris Marshall

Dear Chris

RE: 130 – 150 FOREST ROAD, LARA – RESPONSE TO MATTERS RAISED BY COUNCIL

In November 2013, BMT WBM Pty Ltd (BMT WBM) prepared an Addendum 8 report (BMT WBM, 2013) that provides advice on hydrological and hydraulic matters for the proposed extension of the residential development area of Lara, south of the existing Grand Lakes Estate. This Addendum 8 Report was prepared for TGM Group Pty Ltd (TGM) on behalf of L.Bisnella Developments Pty Ltd.

The City of Greater Geelong (Council) provided a response to TGM on 26th February 2014 that sought further clarification of a number of matters presented in the Addendum 8 Report. This letter seeks to provide the clarification. The letter follows the format whereby Council's specific clarification has been reproduced in italics, with BMT WBM response following in normal text.

(Part 1/2) The existing conditions (or pre-Grand Lakes) 100 year ARI flood mapping on Fig 7-1 shows the depression at the eastern end of Canterbury Rd West overflowing into the established residential area to the north of the depression. This shouldn't happen as the depression has a lower overflow level & path to the west along the north side of Canterbury Rd West.

The two-dimensional hydraulic model is based on the terrain data provided by Council for the modelling originally undertaken as part of the Grand Lakes hydraulic assessment (WBM 2009). It is understood that this terrain data was derived from photogrammetry captured as part of the Heales Road Industrial Area Flood Study (Stage 2) undertaken by SKM in 1999. A two-dimensional model determines flow paths and flood extent based on the underlying terrain data. At this particular location the model indicates a flow path to the west along Canterbury Rd West as suggested by Council, but it also indicates that the flood level at this location will rise to a level sufficient to spill into the residential area to the north. It is noted that Figure 7-1 is of existing conditions prior to the Grand Lakes development, and as such, flooding into this residential area is not a consequence of the Grand Lakes development. It is further noted that the proposed Grand Lakes development, including the development to the south of Canterbury Rd West will eliminate the flooding of this residential area in events up to and including the 100 year as shown in Figure 7-5.

(Part 2/2) It's noted that the BMT WBM model directs all the overland flow along the west side of Forest Road into the depression when in fact there is a flow split SE of the depression that sees most of the Forest Rd overland flow continuing along Forest Road (northwards). It needs to be clarified whether the BMT WBM model is showing unrealistically high existing conditions flood levels at & near the depression due to this modelling assumption. Obviously when existing condition flood levels are artificially increased it's easier to demonstrate a reduction or no increase in flood levels post-development.

For the existing condition modelling catchment C157H (see Figure 5-2) is assumed to flow to the northwards as suggested by Council and hence is not input as an inflow boundary in the hydraulic model. Section 5.3 of BMT WBM (2013) details that under developed conditions, the portion of catchment C157H that lies west of Forest Road and south of Canterbury Road (see Figure 5-2) will be drained into the storage basin. The report goes on to say "Whilst this might not ultimately happen, it provides maximum flexibility with regards to the detailed design of the drainage system assuming that flooding in Grand Lakes and downstream is not worsened".

To summarise, the modelling is conservative in terms of the flood impact as no catchment C157H flows entering the site under existing conditions, but under developed conditions all runoff west of Forest Road and south of Canterbury Road is assumed to enter the site.

Fig 4-1 shows an external flow boundary north of the industrial area & extending nearly to Broderick Rd, but there isn't a flood extent directly downstream of the flow boundary on Fig 7-1.

TUFLOW (the adopted hydraulic modelling package) does not necessarily apply water along the full width of an inflow boundary but instead applies the flow at each time step to the flood extent determined in accordance with the local hydraulic conditions. To further explain, at the start of the simulation the inflow is applied at the lowest point along the boundary line, and then as the flow increases, the subsequent flood height and flood extent increases along the boundary line. As shown in Figure 1, there is floodwater located immediately downstream of both the southern external inflow boundaries (located north of the industrial estate), although not along their full widths.

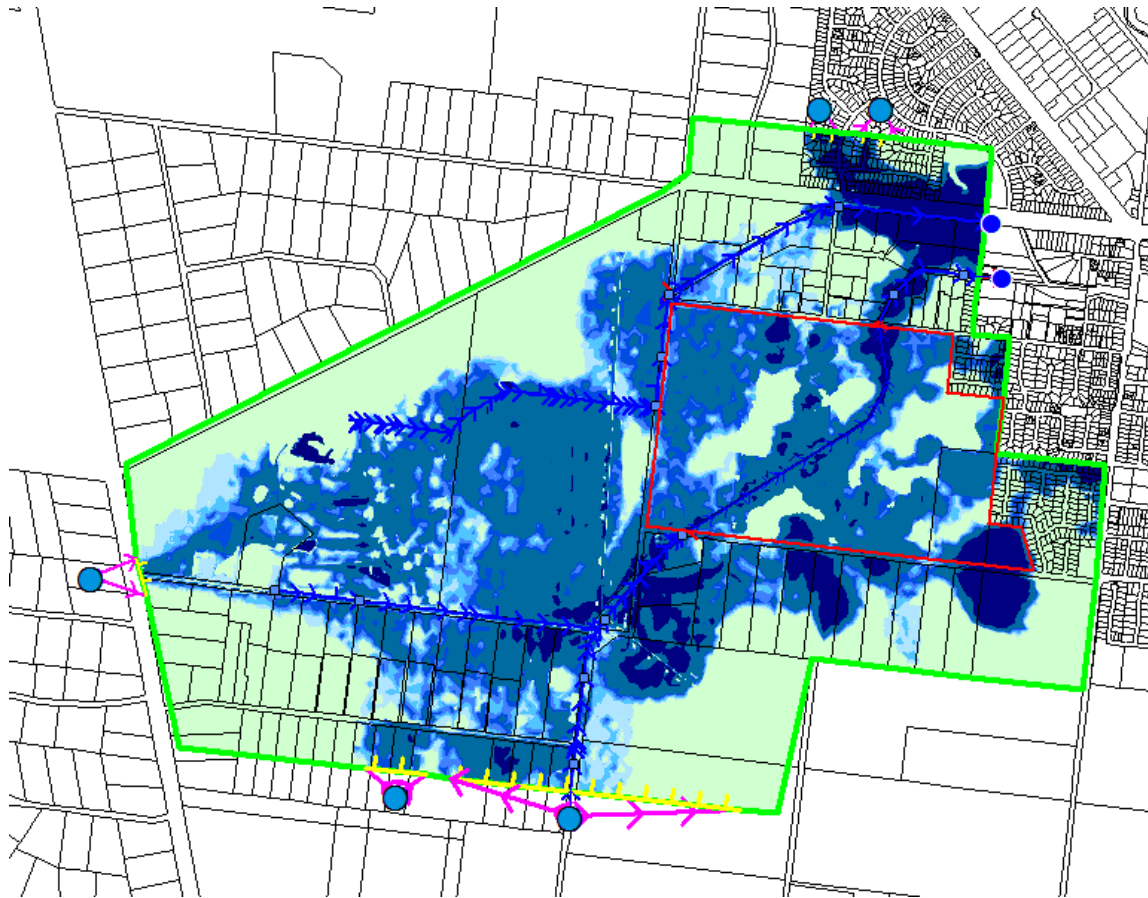


Figure 1 Boundary Location and Existing 100 year ARI flood extent

The post-development flood mapping shown on Fig 7-5 shows the flood storage at the eastern end of Canterbury Rd covering private properties & the proposed wetland/soccer pitch retarding basin. It's problematic when this storage becomes part of the main drainage system, rather than a rural floodplain, & covers a number of private properties.

As shown in Fig 7-1, these private properties are already subject to flooding during the 100 year ARI flood event under pre-development conditions, i.e., prior to the Grand Lakes development. Fig 7-3 shows that the flood levels on these properties are unchanged (change in flood levels less than 0.03 metres) as a result of the proposed development. Flood levels on these properties are also unchanged during the 10 year ARI flood event. The only formal floodplain storage is located within the boundary of the proposed Forest Road development site. Additional floodplain storage exists external to the proposed development; however, this storage is identical in both pre-development and post-development scenarios.

The proposed soccer pitch detention storage appears to be a 'slow response' type system (i.e. slow to empty) as the water levels within Grand Lakes and the soccer pitch storage can be expected to be elevated at the same time with minimal head difference

BMT WBM understands that the soccer pitches has been removed from the proposed storage, however, this will not adversely impact the modelled behaviour of the storage. The storage will take an extended period to drain as it is linked to the floodplain storage in Grand Lakes via the proposed underground pipe

network. The relatively similar water levels in the two storages, combined with the relatively flat gradient of the connecting pipe network will result in the storage taking a longer period to drain than some similar sized detention storages elsewhere in Council. However, there may be other Council storages that exhibit similar drainage behaviour due to similar conditions.

If all the overland flow along the west side of Forest Road South is to be directed into the soccer pitch detention storage, then the area between the storage & Forest Rd needs to be designed to achieve this outcome. It should be noted that if this overland flow was to be allowed to continue northwards along Forest Rd there would be an adverse flood impact due to the proposed filing SW of Canterbury Rd West/Forest Rd South

BMT WBM agrees with Council's opinion that the area between Forest Road South and the detention storage would need to be designed in a manner to ensure that the overland flow is directed towards the basin. This would be undertaken as part of the detailed design of the development.

The finished surface contours along the western side of the propose wetland don't match between Sheets 3 & 5 of the TGM drawings.

BMT WBM's modelling is based upon the design surface provided on 11th October 2013. TGM has advised that the provided design surface is consistent with the ODP plans provided to Council. It would appear that the issue is due to different contour intervals being shown on Sheet 3 and Sheet 5 of the TGM drawings.

In addition to the specific points of clarification detailed above, Council has indicated that the proposed sub-division layout must '*be updated to include an east-west road connection*'. At the location of the proposed east-west road connection, the 100 year flood level is approximately 12.05 m AHD and the width of the drainage channel is approximately 25 metres. Whether the proposed drainage structure at this location is a bridge or a series of culverts, the flood impact of the proposed structure will be minimised provided that the area of the structure is similar to the current waterway area. Flood velocities within the drainage channel are less than 0.5 metres/second and hence it is expected that any afflux due to obstructions in the waterway (bridge piers, culvert walls) will be minor. The exact impact of any proposed drainage structure will need to be determined through modelling at the time of detailed design, however, BMT WBM is confident that a structure can be designed that will not have an adverse impact on the flood levels.

If you have any further questions, please don't hesitate to contact the undersigned

Yours Faithfully
BMT WBM



Joel Leister
Senior Environmental Engineer

References

BMT WBM (2013), Grand Park Hydraulic Modelling Impact Report – Addendum Number 8, BMT WBM Pty Ltd, November 2013, Report No. R.M820140.001.03.ModellingReport.pdf

WBM (2009), Grand Park Hydraulic Modelling Impact Report – Addendum Number 5, WBM Pty Ltd, September 2009, Report No. R.6884.002.006.ModellingReport.doc