Tonkin+Taylor

Job No: 1003185
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Hastings District Council
Private Bag 9002
Hastings 4156

Attention: Rowan Wallis

Dear Rowan

Middle and Iona Rd Proposed Development, Havelock North - Stormwater Assessment Summary

This document has been prepared to summarise the findings and recommendations of Tonkin + Taylor's (T+T) stormwater assessments completed for the proposed Middle and Iona Rd development in Havelock North.

1 Initial assessment

T+T prepared a draft report[1] that assessed the potential flood-related effects that may be caused by the proposed Middle and Iona Rd development, and identified mitigation controls that would adequately address these adverse effects. Conclusions from this initial assessment included the following:

- The proposed development has the potential, without mitigation, to increase peak runoff from site due to the increase in impervious area and proposed re-contouring.
- The unmitigated increase was particularly significant at the outlet locations in the southern corner of the Triangle site (Outlets D and E) due to downstream ponding issues and at the northern section of the Triangle site (Outlet G) due to large increases in peak flows.
- The proposed mitigation option for Outlets E and G is a wetland with peak flow attenuation to pre-development levels.
- The proposed mitigation option for the Outlet D catchment is an on-line storage pond located immediately upstream of the 'Spine' road which attenuates peak flows at Outlet D to pre-development levels.
- No formal mitigation was specified for upstream of Outlet I.
- The mitigation options proposed achieved the target peak flows[2] for the development.

[1] Tonkin + Taylor, "DRAFT Middle and Iona Road Proposed Development, Havelock North – Stormwater Flood Effects Assessment", Prepared for Lowe Corporation Ltd, dated October 2017.
[2] As per the Hawkes Bay Regional Councils Waterway Guidelines Stormwater Management (May 2009).

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2 Peer review

A peer review of the T+T draft report was undertaken by Christensen Consulting Ltd (CCL) on 17 November 2017. The main conclusions stated in this peer review can be summarised as below:

- The curve numbers used in the assessment should be reviewed as the actual soil is likely more permeable than represented.
- Higher intensity short duration events affecting the lower developed areas (i.e. C1 and C2) have not been adequately addressed and direct mitigation to these areas need to be explored. The upstream mitigation currently proposed won't provide sufficient benefit during these events.
- The effects of large scale gully/floodplain filling that is proposed has not been assessed.

3 Addendum

Following consideration of these review comments, an addendum report[3] was prepared by T+T. This also followed discussions with Kyle Christensen (CCL), Matthew Kneebone (HDC) and Craig Goodier (HBRC) on 5 December 2017 to address the peer review comments. Conclusions of the addendum can be summarised below:

- The hydrological model was re-run with the Curve Numbers (CN's) shifted up a soil class (to higher permeability) for undisturbed areas (both in the pre and post developed case) and the CN's unchanged for any disturbed areas (in the post developed case).
- The footprint of the wetland for Outlet E and G was increased by 10% and 25% respectively but can still be contained within the development or Lowe family owned land.
- There was no change to the previous recommended mitigation approach upstream of Outlet D.
- An alternative option for a wetland upstream of Outlet D was considered as a means of providing direct runoff mitigation to the lower developed areas at catchments C1 and C2. Sizing for this option was presented, but was T+T's least preferred option because it likely requires diversion of the existing stream and filling in the existing floodplain, both of which are likely to have greater effects than the preferred option (and would probably require separate resource consent).

4 Current position

A peer review of the T+T Addendum report was undertaken by Christensen Consulting Ltd (CCL) on 19 March 2018 and was discussed in a teleconference with CCL, HDC and T+T on 28 March 2018. These discussions and the current position is summarised below:

- The assessment and proposed mitigation options at Outlet E, G and I are generally agreed as per the T+T Addendum report.
- No agreement has been reached in regard to the assessment and proposed mitigation option at Outlet D.
- HDC prefer that developed areas C1 and C2 are directly mitigated. It is understood that HDC are of the opinion that higher intensity short duration rainfall events affecting only the lower developed areas (i.e. spatially varied rainfall) will result in adverse effects downstream of the development.

[3] Tonkin + Taylor, "Addendum Report to Stormwater Flood Effects Assessment", Prepared for Lowe Corporation Ltd, dated March 2018.

- T+T are of the opinion that it is unnecessary to consider different design rainfall (recurrence interval or duration) across the catchment for the effects assessment given the small size of the catchment (~1.5km^2).
- T+T are of the opinion that whilst it may be possible to directly mitigate developed areas C1 and C2 by providing an additional pond upstream of Outlet D, there are significant disadvantages in comparison to the proposed mitigation. The disadvantages in comparison to the proposed mitigation are primarily due to the potential effects caused by filling in the floodplain and diverting the stream. Secondarily, the quantum of earthworks required to construct an offline-pond at Outlet D would be greater than other options, the cost is likely to be higher and there may be a reduction in properties yielded by the Plan Change.

5 Applicability

This report has been prepared for the exclusive use of Hastings District Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

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