

Civil Engineering Memo – Ohoka Flooding

Project Name: Ohoka Village Flooding Assessment **Project Number:** S2003119
From: Andrew Congalton **Date:** 23/07/2024
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The following summary provides comment on the Flood Modelling used in the assessment of the Waimakariri Proposed District Plan a subdivision at Mill Road, Ohoka. The statements are made based on information available online and documents provided by your group.

EXISTING FLOOD MODELS

1. Waimakariri District Council (WDC) & Environment Canterbury (ECan) flood models are based on 1:100, 1:200 and 1:500yr events. We believe that the latest Flood Modelling information relates to the May 2020 Report by DHI for WDC - *Flood Hazard Models Update, District and Urban and MIKE FLOOD models*. This work is an update from previous modelling work in 2015, and includes for Climate Change adjustments using the NIWA HIRDS RCP8.5 emissions scenario for the period 2081 – 2100 (80 year projection).
2. There is no specific modelling for Ohoka – it falls outside the extents of both Rangiora and Kaiapoi extents, therefore it is only included as part of the district wide flooding assessments.
3. The District wide models have a larger level of error, however the DHI work appears to be comprehensive and well done for the urban areas. It provides the following information with regard to limitations of the modelling which are relevant:

As will all models one of the main limitations of this modelling is the data availability, especially with regard to calibration data and the length of any data records that are available. The following is a list of limitations that DHI have identified in the modelling.

 - *Lack of calibration data and short records limit the ability to calibrate the models, and to estimate the flood frequency to a high level of accuracy.*
 - *As identified when comparing the urban models to the district models the model mesh size does impact on the conveyance of flow through the catchment. As such the results from the district models should be considered as a lower level of accuracy than the urban models.*
 - *In areas where new development terrain data was not complete or did not tie in well with the existing terrain there are some discontinuities in the model results. One of these areas is the Ravenswood development. Results in these areas should be assessed with care and an understanding of the underlying terrain used to build the model.*
 - *Sump, manhole and pipe data was not surveyed as part of this upgrade and it is assumed that the data provided by WDC is correct, however there is the possibility that data was missing, especially for stormwater inlets, this may impact on the amount of water able to enter the stormwater network, and connecting basins.*
4. The following is a list of recommended future improvements for the models:
 - *Sensitivity testing could be performed to assess the impact of key parameters on the model results. Including roughness, infiltration and rainfall. The aim of the sensitivity testing would*

be to build a better understanding of any uncertainty in the model parameters especially given the lack of calibration data.

- When new LiDAR survey data becomes available this should be incorporated into the model domain.
 - Update pipe networks and terrain data for new developments as they are built and data becomes available to ensure the models are always up to date.
5. Soil maps have been used to consider soil infiltration, and we interpret from the report that it is likely that a “deep” ECan Soil classification has been used. While this is likely appropriate, it doesn’t include consideration of groundwater data in the model. It would be worthwhile getting comment from the modeller as to whether this will accurately reflect the limited infiltration due to high groundwater that you have in your localised area (ECan groundwater recordings within 500mm of the surface).
 6. There is no validation assessment for land parcels near Ohoka, the two areas which were assessed relate to land north of the Ashley River and do not represent the situation in Ohoka which is low-lying swampy land and drained by narrow waterways which are subject to tidal influence.
 7. The ability for rural drains to function properly rely on consistent maintenance of the drains so that trees and vegetation do not impede flow significantly. This is difficult to integrate into the model, other than changing the roughness factor locally. The inter-linking nature of low-lying narrow stream channels is also hard to capture with Lidar data and large mesh size grids.
 8. Anecdotal evidence from Ohoka residents suggests that repeat flood events occurring in storms rated less than 1:100 have caused damage to dwellings and buildings, these should be considered more than ‘nuisance’ flood events. The results of modelling for storms rated less than 1:100yr ARI are not provided in the modelling, however this information would be most useful to determine the likely impact of the proposed development in short-duration, high intensity storms.
 9. ECan Flood modelling shows water above ground in a 1:100yr event for the period of 2081-2100 – this suggests that most of the land in the block between Whites Road – Mill Road – Bradleys Road north of the Ohoka South Stream is under water. Filling in this area to facilitate development will have an adverse effect on adjacent properties.

EVIDENCE PRESENTED FOR PROPOSED DISTRICT PLAN

10. Evidence presented by Chris Bacon (WDC) suggests that there is insufficient evidence to conclusively say that there are no adverse effects on neighbouring properties. This is particularly relevant for properties which may be close to the freeboard threshold required by WDC for buildings affected by flooding.
11. Colin Roxburgh (WDC) states that: *Groundwater will be the main challenge to ensuring viable stormwater infrastructure can be provided across the plan change area to ensure stormwater neutralityPost-development stormwater neutrality must be achieved and no nuisance effect on neighbouring properties can be created.*
12. Development in the subject site area would need to build up ground to mitigate flood risk to new properties, and as a result the overland flowpath gradient will flatten off. This would likely displace floodwater onto adjacent land unless the development could maintain capture all of the

upstream flow crossing the site and provide additional storage for the increased impervious coverage. We understand that this is not the intention, evidence from Eoghan O'Neill (Pattle Delamore Partners) suggests that:

Proposed areas of relatively medium to high development have been modelled as a platform above the flood level. Therefore, these areas of development are "blocked out" of the model (i.e. no water can flow over or into the proposed development area). For this density, the entire lot parcel was blocked out of the model which is a conservative assumption. No allowance was made for conveyance or storage that may be available in roadside swales or stormwater detention facilities. This assumption is considered conservative. Proposed areas of relatively low development density (average of 3300 m² lots) have been modelled to include an assumed 400 m² building platform within each lot. "blocked out" of the model (i.e. no water can flow over or into the proposed development area).

13. The northern portion of the site is located in a Groundwater Protection zone, and therefore to discharge stormwater in this area would need to ensure there is at least 1m separation with groundwater levels. It is not clear from the applicants information as to how the ground will be re-contoured to avoid adverse effects on adjacent properties.

CONCLUSION

We believe that there is sufficient doubt that the modelling completed in 2020 accurately represents the physical environment which leads to flooding situations in Ohoka. We note that the PDP modelling uses the WDC 2020 model data, and therefore is likely to be subject to the same limitations and lack of local validation assessment. On this basis the current modelling should not be relied upon to accurately assess the flood risk for Ohoka.

Based on information from 2023 flood events provided by residents in Ohoka we consider that flood scenarios in 20-100yr ARI events should be equally considered for the post-development effects of the Plan Change proposal.

We recommend that DHI are engaged to review the model and advise if it is possible to improve the local data for site specific modelling of various ARI scenarios at Ohoka so that the potential impacts of the application can be more accurately assessed.

For Kotahi Studio Limited



Andrew Congalton
Senior Civil Engineer, Principal
CPEng, CMEngNZ