From: Philip Barrett
Sent: 5 Dec 2019 14:52:29 +1300
To: Cameron Aplin;malcolm.brown@waidc.govt.nz
Cc: Sharon Singleton;Graham Singleton
Subject: G & S Singleton -Extra Flood Hazard Analysis and Waikato Regional Council Consultation Reply
Attachments: IMG_0160.JPG, IMG_0162.JPG, IMG_0161.JPG, SWMP Issues Memo.pdf

Dear Cameron,

Following our meeting last week, Tuesday 26 November, we took away the following understanding in terms of replying to Beca second round of review comments dated 8 November 2019 items 1 – 9 inclusive.

Item 1
Undertake further flood modelling which includes climate change and impervious cover change. Check effect on flood levels.
number of scenarios are:
Existing rainfall vs. Existing land-use
Climate change rainfall vs. existing land-use
Existing rainfall vs. changed land-use
Climate change rainfall vs changed land-use
This will establish impact of land-use change relative to climate change. Depth increase in flooding is more critical than volumes generated.

Item 2
Will get clues from item 1 and expect to write a short narrative. No analysis of rain tanks sizes expected - just guidance for WDC engineers. Water tanks will be required irrespective of flood minor effect outcome because no Council water infrastructure is located at or near the development site.

Item 3
Short narrative about potential storm water attenuation methods for the ROWs.

Item 4
Check that the ROW / Access road is at or above 100-year level. Steven suggest it is the climate change option. Will draw profiles and check "blockage" of road on flood levels if necessary.
Suggest culvert sizes if necessary either 10-year size if road raising is minimal or 100-year if more pronounced.

Item 5
Potentially OLFP (over land flow paths) past each new house causing flooding. I can use my flood levels as downstream control if necessary.
Will calculate flows to each property and estimate flow depth and provide advice of OLFP channel if necessary. Agreed.

With regard to items 1 -5 and 7 above please see Golovin report attached.

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Item 6
Provide a narrative on the state of the drain with photos and cross-sections: On Wednesday 4 December a meeting was held onsite with Regional Council officers Russell Powell, Steve Edwards & Debra Hayer and WaiDC engineer Malcolm Brown. Steve Edwards noted the western Regional drain was cleaned about 3.5 to 4 years ago and is not due for clearance for another 10 years plus. The attached photos show a deep drain with well vegetated verges with approximately 30mm of water at base. The average stream cross section is - Vertical 1.6m x Width 1.5m X Base 0.4m .

Item 7
Almost a summary of previous items. Just needs summarising (see Golovin report). I recall an agreement at the meeting that offsite upstream and downstream flood assessment is not required.

Item8
The Regional Council commented that the policy document Land Drainage Management Plan 29 August 2019 seeks to ensure that all lots less than 5ha has adequate connection to a Regional maintained drain with easements in place. This is regional policy only. The applicant prefers not to have any lateral drains over the site and in particular over Lot 10 that contains the Regional drain. Drains would be an anathema to the long term park vision of the site. These drains would severe the site and contain standing water for much of the year. It is highly debatable if drains from each lot to the western drain are indeed necessary since most small lots drain to residual Lot 10. The water then drains to: ground; pond system; or internal drain that eventually makes its way to the western drain via Lot 10. Lot 7 has direct access to the northern boundary Regional drain.

The flood and SW evidence to dates suggests there are no SW / flood effects on adjoining properties and where the ROW is raised above the 100 year flood level. Dwelling platforms are all above the 100 year flood (50% culvert blockage) level and dwellings will be subject to FFL's. Russell was concerned that long term owners of the small allotments may complain that drainage is poor. This can only result from their own earthworks or earthworks within Lot 10 that disrupts overland flows to cause nuisance. The most elegant solution discussed was that Lot 10 be subject to a consent notice. This CN will require Lot 10 to maintain overland flow paths to the regional drain. Should a small lot owner undertake their own on site works that causes themselves a nuisance that is a matter to be resolved by the land owner.

The other issue raised by Russell was the need for an easement over the western drain within Lot 10. However, according to the Regional Land Drainage Management Plan, easements are not required for lots in excess of 5ha. In any case an easement would be pointless given the historical golf course plantings along the boundary, digger access is constrained. Lot 7 northern boundary includes the regional drain. An easement is sought by Russell over Lot 7. Again, the easement is impracticable given the presence of golf course mature trees along the drain edge access, is constrained. Access is available on the adjoining land. No easement is proposed over Lot 7.

Item 9
Healthy Rivers narrative: WRC Plan Change 1 only applies to farming activity. Already addressed in the application where it is stated the site is not returning to a productive farm so that nitrogen loading is no longer an issue; The site will not therefore contain livestock (no requirement to exclude livestock from waterways). Moreover, onsite planting undertaken by the applicant exceeds 70,000 plus trees and shrubs and improved wetlands that will have positive effects on water quality.

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We will be closed from Friday the 20th of December and re-opening on the 6th of January, we would like to thank you for your continued custom and wish you a safe festive season.

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Response to Stormwater Management Plane Issues

Westlands Subdivision

A meeting was held on Monday 25th November 2019 to discuss the nine issues raised by the Beca Review. This is a summary of the extra work undertaken by Golovin.

ITEM 1

• Impact of the extra imperviousness of the development.

The development is in the north-east subcatchment. The Cn value is 77 and Initial abstraction 3.8mm. However when the development imperviousness was included the Cn value is 77.3 and the initial abstraction 3.7mm. This is based on the following assumptions.

- Each house footprint is 300m^2 (total of 3,000m^2)
- Each driveway away is 100m^2 (total of 1,000m^2)
- The road-way is 1.3km long and 4m wide.

The total estimated area of imperviousness is 9,200m^2 and the total catchment is 0.66km^2.

HEC-HMS was re-run to generate a new hydrograph for north-east and input into HEC-RAS. The peak flow increased from 10.10 to 10.15m^3/s. The volume increase was from 78,790m^3 to 79,250m^3 (460m^3).

The new flood level at the downstream ponding area upstream of the culvert did not change compared to the un-developed scenario reported earlier. Figure 1 shows a screenshot from HEC-RAS for the lower ponding area. At RS5 the flood level is RL24.84m for both. The scenario is for a 50% blocked culvert with climate change rain.

Another scenario was run with the existing land-use and historical rain depth. The 24-hour rain depth is 145mm. For this scenario the flood level dropped by 0.46m at RS5.

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In conclusion the impact of climate change will affect the flood levels by about 0.5m at the ponding area while the development will have no impact.

Figure 1 – Comparison of flood levels in lower area, existing and proposed land-use

Reach	River Sta	Profile	Plan	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)
Stream	6	Max WS	Update-EX-Q100-CC-50%blocked	1.87	23.00	24.84
Stream	6	Max WS	Update-Q100DEV-B	1.90	23.00	24.84
Stream	5	Max WS	Update-EX-Q100-CC-50%blocked	2.71	22.40	24.84
Stream	5	Max WS	Update-Q100DEV-B	2.71	22.40	24.84
Stream	4	Max WS	Update-EX-Q100-CC-50%blocked	3.63	22.00	24.84
Stream	4	Max WS	Update-Q100DEV-B	3.63	22.00	24.84
Stream	3	Max WS	Update-EX-Q100-CC-50%blocked	3.63	22.00	24.84
Stream	3	Max WS	Update-Q100DEV-B	3.63	22.00	24.84
Stream	2.5			Culvert		

ITEM 2

• *Rainwater tank attenuation*

The volume generated due to the development for the 100-year storm is 460m^3. The house contribution is 150m^3, the driveway contribution is 50m^3 and the roadway is 260m^3. Itemised this is 15m^3 per house, 5m^3 per driveway and 0.2m^3/m run for the roadway.

Although the extra run-off generated will not affect flood levels in the WRC drain as shown in Item 1, there is a case for 15m^3 (above ground) and 5m^3 (below ground) detention tanks for each new house. If the 10-year storm is the design criteria is required the volumes will be generally 10% less. It is however understood that the owner wants to create a sustainable development and water tanks will be used for retention anyway.

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ITEM 3

• Road run-off treatment

The estimated extra run-off from the roadway is 0.2m^3 per m length over a 24-hour period. It is understood that plantings on the drain side of the roadway will be undertaken to absorb this extra volume and encourage soakage and improve water quality. Agreed that it can be finalised at Engineering Approval stage.

ITEM 4

• The effect of the ROW. Does it flood in the 100-year event? If it needs to be built up what impact does it have on the floodplain?

There are two locations where the roadway is within the 100-year floodplain. It is Waikato District Council desire that the roadway be at or above this level.

At the northern end in Lot 10 the general cross-section is RS4. The 100-year level is RL25m. Based on LiDAR the typical ground level is RL24m. Therefore it would seem that the roadway needs to be built up to RL25m. This creates a 1m barrier for the flood to spread. To assess the effect of this barrier RS4 was amended. This was by reducing the width by 30m and creating a vertical wall in the HEC-RAS model. This caused the 100-year, climate change, 50% blocked culvert, water level to rise by 30mm. This suggests the finished floor level for Lot 1 should be raised by 30mm.

For Lot 7 the driveway cuts across overland flows. The ground level is about RL26m and the flood level is RL26.4m. This suggests a 400mm raising of the driveway. This may have an impact for the neighbours at Lot 39 DPS 76270 and Lot 1 12807. RS9 was adjusted by inserting a nominal 600mm culvert and driveway at RL26.5m. Figure 2 shows the change in HGL. Although the water level rises to get over the driveway the influence at RS10 diminishes to zero. This location is the neighbouring upstream boundary.

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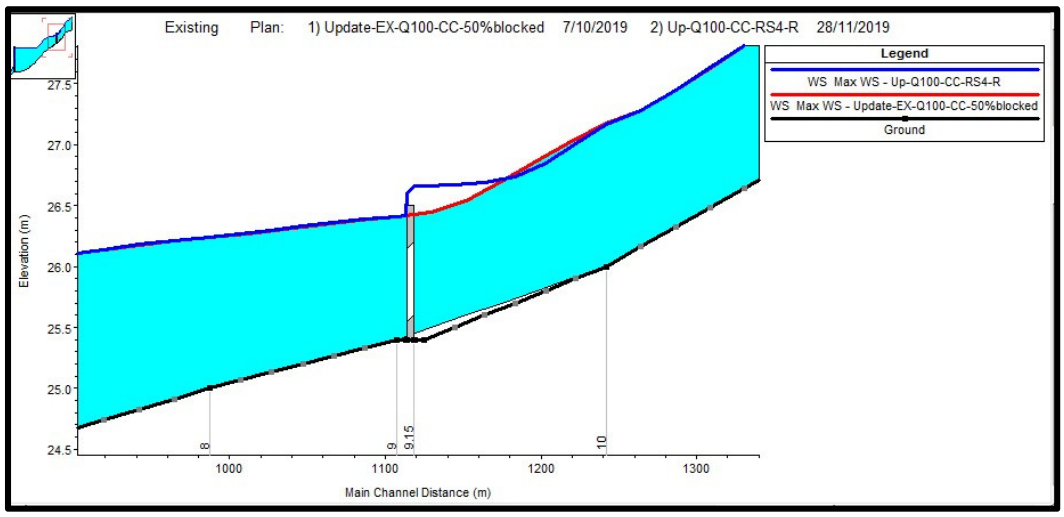
Figure 2 – Lot 7 raised driveway HGL



In conclusion, raising the roadway in Lot 10 requires the FFL of Lot 1 to be raised by 30mm. Within Lot 7 a culvert needs to be under the driveway to drain the area but its design and raised driveway does should not affect neighbouring properties.

ITEM 5

- *Impact for each of the proposed house locations by the overland flowpath. Do the FFLs need to be raised above "normal" ground levels?*

The catchments for Lots 1 and 7 were analysed. The lot 1 catchment is the largest example for houses in Lots 2, 3, 4, 5 and 10. While Lot 7 has a catchment size based on the adjacent drain. These are shown in Figures 3 and 4.

Figure 3 – Lot 1 subcatchment

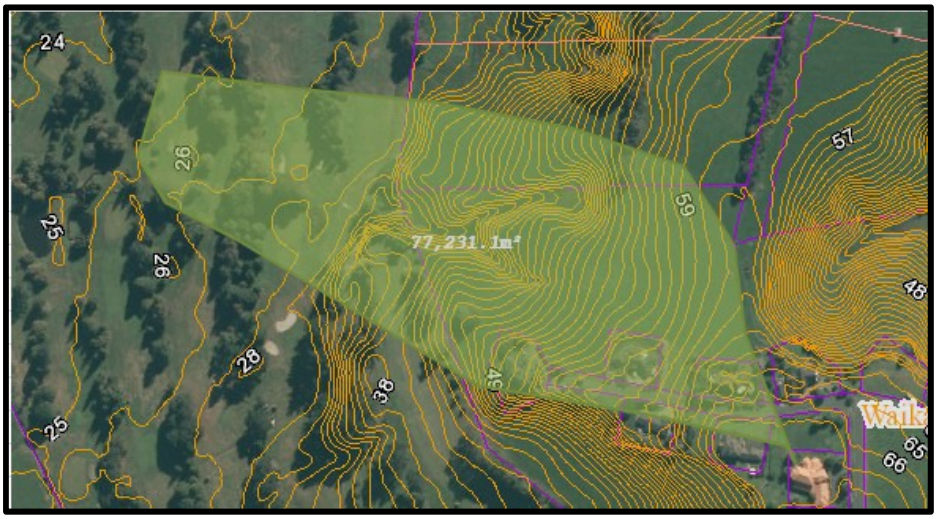


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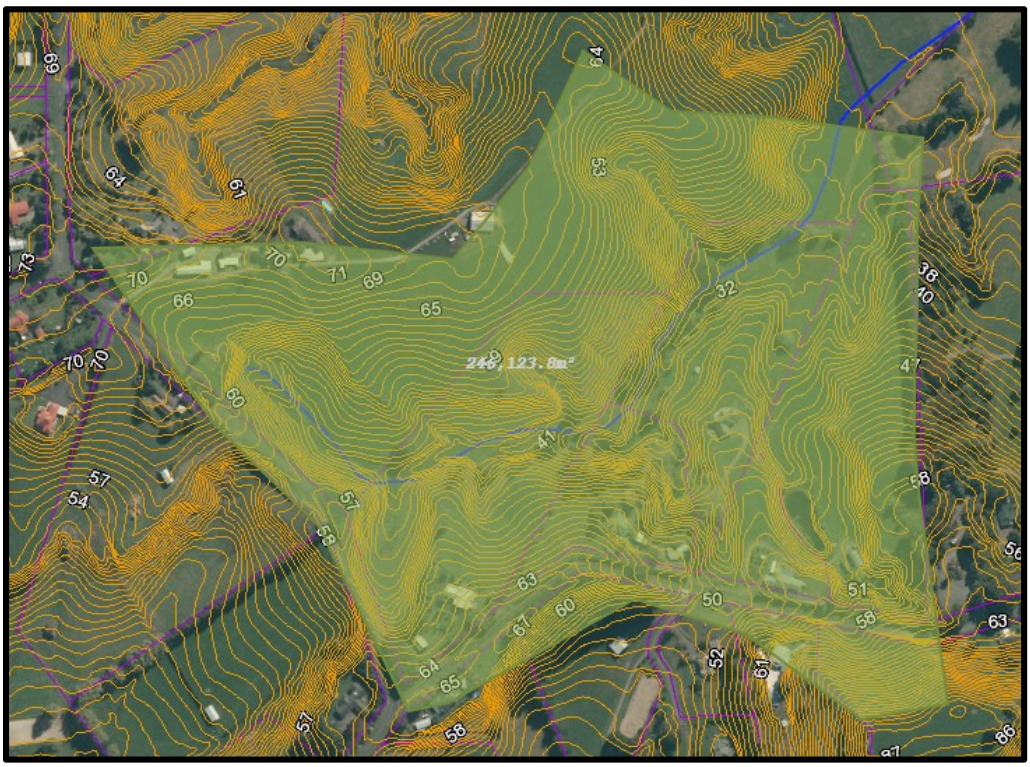
Figure 4 – Lot 7 subcatchment



Using the Rational Method on these small catchments within the whole project area, peak flows were generated based on the times of concentrations. Using Manning's equation and restricting flow depths to 100mm the widths of flow can be determined.

Figure 5 shows the calculations. For Lot 7 we have to account for the drain on the northern side. The estimated capacity is about 1m^3/s. This means the overland flow for Lot 7 is 0.421m^3/s. By adjusting the flow width the FOS for the 100mm depth can be adjusted.

At Lot 1 if the flow width is 24m or more the depth of flow is less than 100mm. For Lot 7 it is 23m. Close examination of the ground profiles there is no concentration of flows but general sheet flow. The widths of the Lots are about 40-50m and therefore the flow depths will be less than 100mm and the allowance for OLFP is within the normal building regulations for ground clearance.

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Figure 5 – OLFP Check

		Lot Number	
		1	7
Area	ha	7.72	24.6
Distance	m	572	926
Top	RL(m)	70	70
Bottom	RL(m)	25	28
Grade		0.08	0.05
%		7.9	4.5
n		0.045	0.045
tc	minutes	24	32
C		0.2	0.2
intensity	mm/hr	104	104
Q	m3/s	0.446	0.421
Overland flow			
		Lot Number	
		5	**18**
Garden slope	1 in	500	500
Garden slope		0.002	0.002
OLFP width	m	24	23
OLFP depth	m	0.1	0.1
Wetted perimeter		24.20	23.20
Area	m2	2.4	2.3
Velocity	m/s	0.190	0.190
Hyd Rad		0.099	0.099
n		0.05	0.05
Qmax		0.456	0.437
Target		0.446	0.421
FOS		1.0	1.0

ITEM 6

Done by Cheal.

ITEM 7

Summary of issues raised earlier.

To summarise:

There is no impact on upstream properties – see item 4

The roadway has to be raised and their hazards has been discussed in item 4.

ITEM 8

Done by Cheal.

ITEM 9

Done by Cheal.

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28th November 2019

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