22-09-21
Variation 3 – Taiwawe Catchment Structure Plan – supplementary s42A

Dear Martin

I provide my response to S42A authors comments by Elisabeth Resl dated 9 September 2021.

Stormwater

8.
I have re-calculated peak flow rates and developed a HEC HMS hydrological model of the catchment and adjacent larger catchment to compare peak flows and support/underpin the original spreadsheet calculations. Runoff hydrographs are provided below from the HEC HMS outputs.

9.
a. I have not used Auckland Council (AC) TP108 for my assessment and I have not referenced TP 108 in my evidence including Appendix A.

I have used the TR 20-06 and TR 20-07 WRC guidance. Both AC and WRC guidance are based on the same underlying US Soil Conservation Service (SCS) rainfall-runoff procedures and TR-20-06 incorporates those current SCS procedures – I state clearly I use the 'SCS' runoff method and reference the WRC guidance in my evidence.

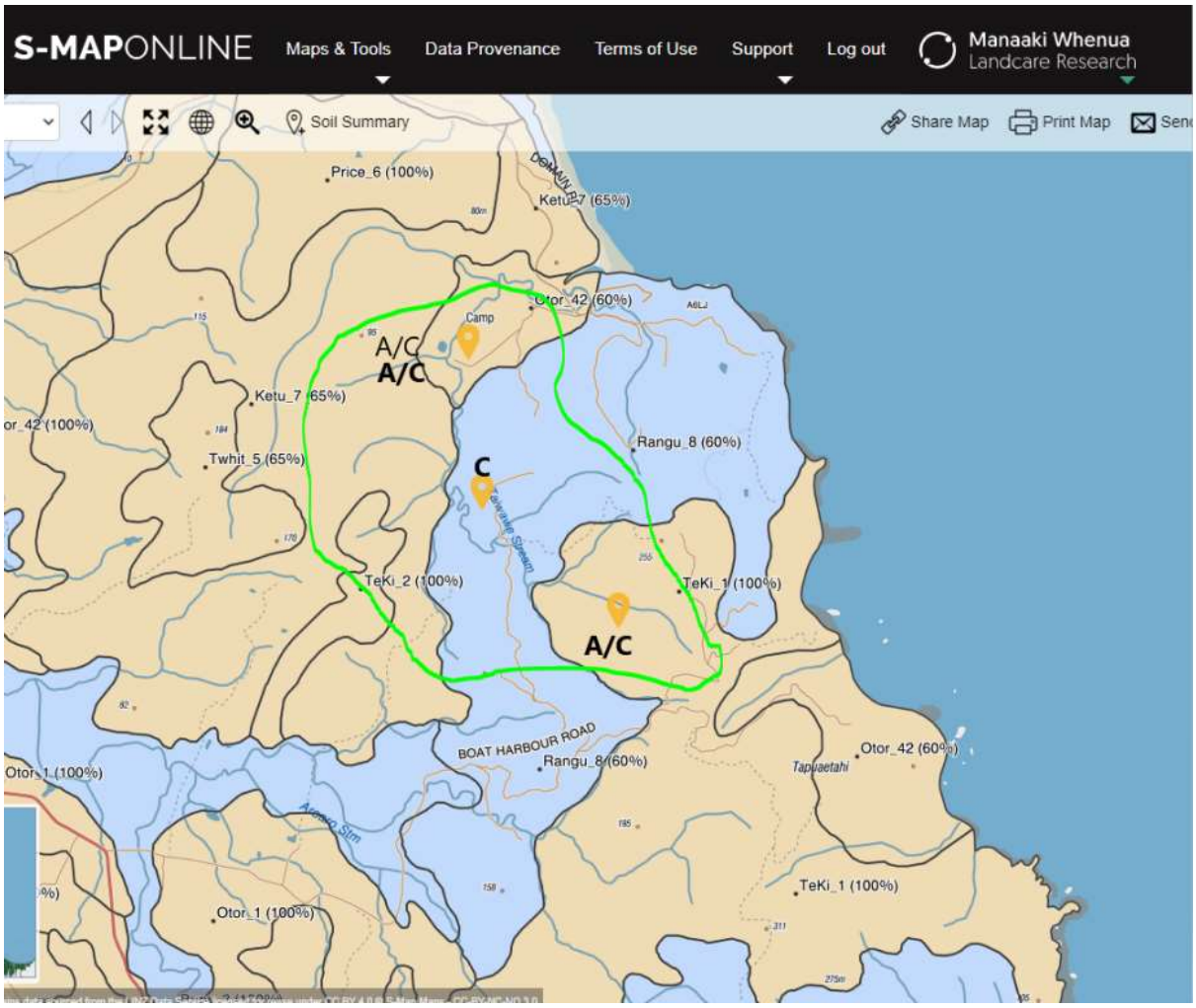
b. Landcare research S-Map for this catchment (Figure 1) shows a range of soil types from Soil type A (more permeable) through to C (less permeable) which is consistent with Mr Kelsey's evidence which essentially describes different soils on site transitioning from alluvial flats up into hill country ash deposits overlaying weathered ignimbrites. I used Soil type B (midway between the range of values shown in s map). Soil type B is not inconsistent with Mr Kelsey's evidence as supported by 'Point 21 Ground Conditions' which states 'favourable drainage for hill country' with well-developed stiff clay and silt soils. Typically, on moderately sloping hills well-structured ash soils can display good drainage at the surface. The 'moderate to slow drainage' statement by Mr Kelsey is related to AS/NZS 1547 wastewater guidelines and is not directly applicable or transferable to assessing soil type hydrological groups impacting runoff.

I note S Map is not highly accurate and should always be supported by site testing where available. So, there are arguments both ways for whether to adopt B or C or indeed A in some places. However, I agree there is merit in using Soil type C and for the avoidance of doubt, I have also undertaken an assessment of peak runoff using Soil type C.I have found the peak flows are still less for the post development scenario compared to the existing landuse irrespective of whether soil type B or C is used.

Table 1 shows peak flows decrease post development by between 10%-15% under both soil type B and soil type C conditions. This isn't unexpected given the comparison in flow is relative between land use changes – absolute flow and volume values between soil B and C indeed change but the differences and conclusions that there is a reduction in flow still applies in relative terms.

c. Group C soils therefore match parts of the assessment from P Kelsey, for example some of the hill country clay soils but it's important to note there are range of soil types which cross soil types from A-C. however as above- for the avoidance of doubt, I have also undertaken a peak flow assessment using soil type C which shows a reduction in peak flow still.

Figure 1: S Map Online – Displaying a range of soil types as expected given the change in slope and elevation from ash to alluvial deposits



10.
No comments

11.
no comments

12.
No comments

13.
It is my understanding talking to Nick Goldwater that plantings 'fill in' reasonably well within the first 0-05 years. Certainly, reduced runoff would be occurring well before 10-15years as soon as plants establish leave growth. Noting also the entire 25 lots are unlikely to be developed in one go.

General comments

I wish to reinforce that revegetation alone is not the only solution provided for Taiwawe. I have previously stated that accessways will have planted swales to manage and water quality treat runoff with check dams for slopes greater than ~10%. Furthermore, roof areas will go to rainwater tank re-use and overflows dispersed to ground over moderately sloping lot areas which is supported by Mr Kelsey's evidence. There are to be no point source connections to any stream such as PVC pipe overflows from rain tanks. Indeed, for the 2-year event is likely roof runoff will be contained within the re-use tanks and certainly won't reach directly to any stream (however I have assumed flows do reach the stream in the HEC HMS model which still shows a reduction). Likewise, the 100yr (assuming gutter overflow) and again loaded directly to the stream, also shows a reduction in flow between pre and post development.

The HEC HMS model shows peak flow hydrograph are reduced for the developed scenario and also show the smaller peak from the site arriving at the outlet point slightly earlier than the main peak from the larger catchment. The time of concentration from the larger 'catchment 1' is ~45minutes compared to the time of concentration for Taiwawe in the order of 20minutes.

TABLE 1: Revised peak flow values below – note Soil type B and/or C result in reduced peak flows between 10%-15% for both 2yr and 100yr events

Summary by Mike Chapman	22/09/2021					
Site catchment 38ha						
SCS graphical method - Peak Flow and Runoff Volume Assessment						
Based on runoff from 38ha site area only						
	Soil Type B		Soil Type C			
	Peak Flow (m^3/s)	Runoff Volume (m^3)	Peak Flow (m^3/s)	Runoff Volume (m^3)	Land Use Type Areas (ha)	
2 year existing	3.7	24,659	5.3	34,027	Total site area	38.00
2 year future	3.3 ↓	25,884	4.50 ↓	34,931	Ex bush	9.20
100 year existing	14.3	92,351	16.8	109,622	Ex farmland	28.33
100 year future	12.1 ↓	94,845	14.2 ↓	111,070	Ex Gravel Road	0.47
Rainfall Total	24hr Total (HIRDS)				Proposed re-vegetation (13.6) + Ex bush (9.2)	22.8
2 year	151mm				Proposed total new impervious	2.75
100 year	367mm				Balance remaining farmland	12.0
					Total site area	38.0
Soil Type B	Soil Type B CN	Soil Type C CN				
Pervious Bush or Re-Vegetation	55	70				
Pervious Farmland	61	74				
Impervious road/house	98	98				

Figure 2 shows peak flows from the 38ha site arriving earlier at the outlet compared to the Wider Taiwawe Catchment and western catchment. This is expected given the shorter time of concentration and location lower in the catchment. The HEC HMS model highlights the significant difference in peak flows arriving from the wider catchment area compared to the site.

Figure 2: HEC HMS hydrograph based on catchment wide model - the existing site catchment = 38ha (catchment 3 grey line) compared to the larger Taiwawe catchment (catchment 1 blue line) and adjacent catchment (catchment 2 orange line).

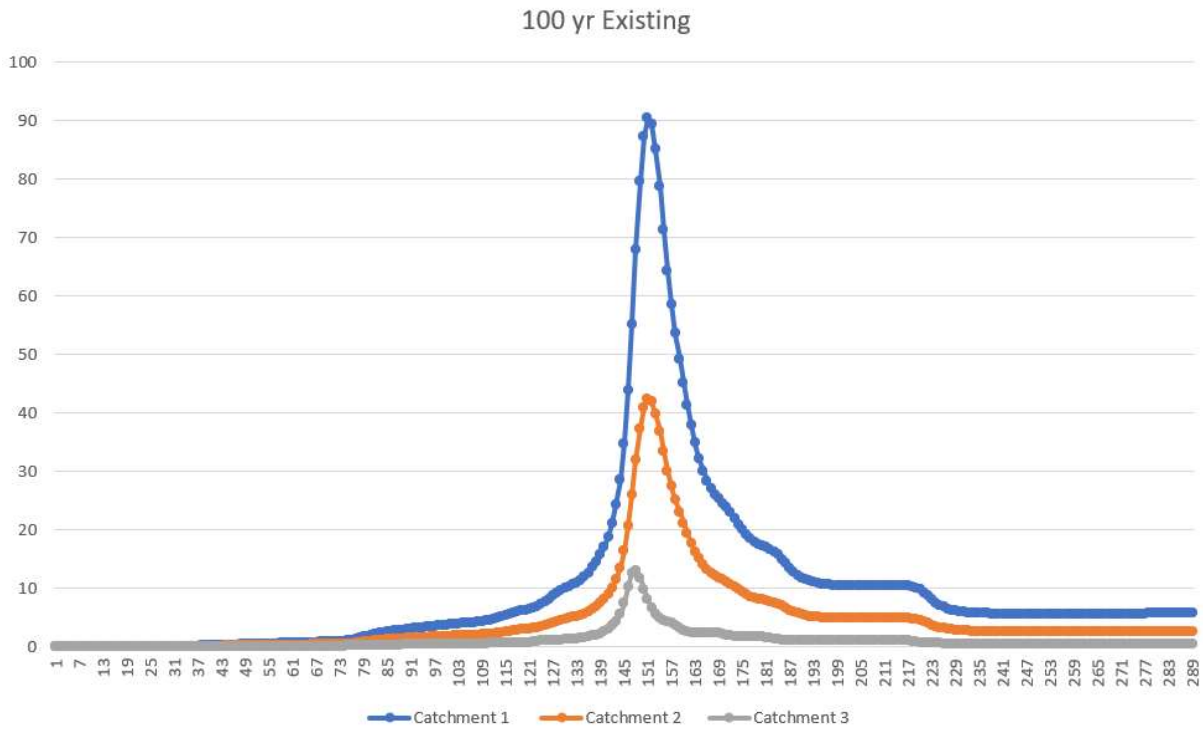


Figure 3: Is for the site only (Catchment 3) Hydrograph shows the post development flows (orange) are lower than the existing flow (blue) due to the re-vegetation and slowing of runoff.

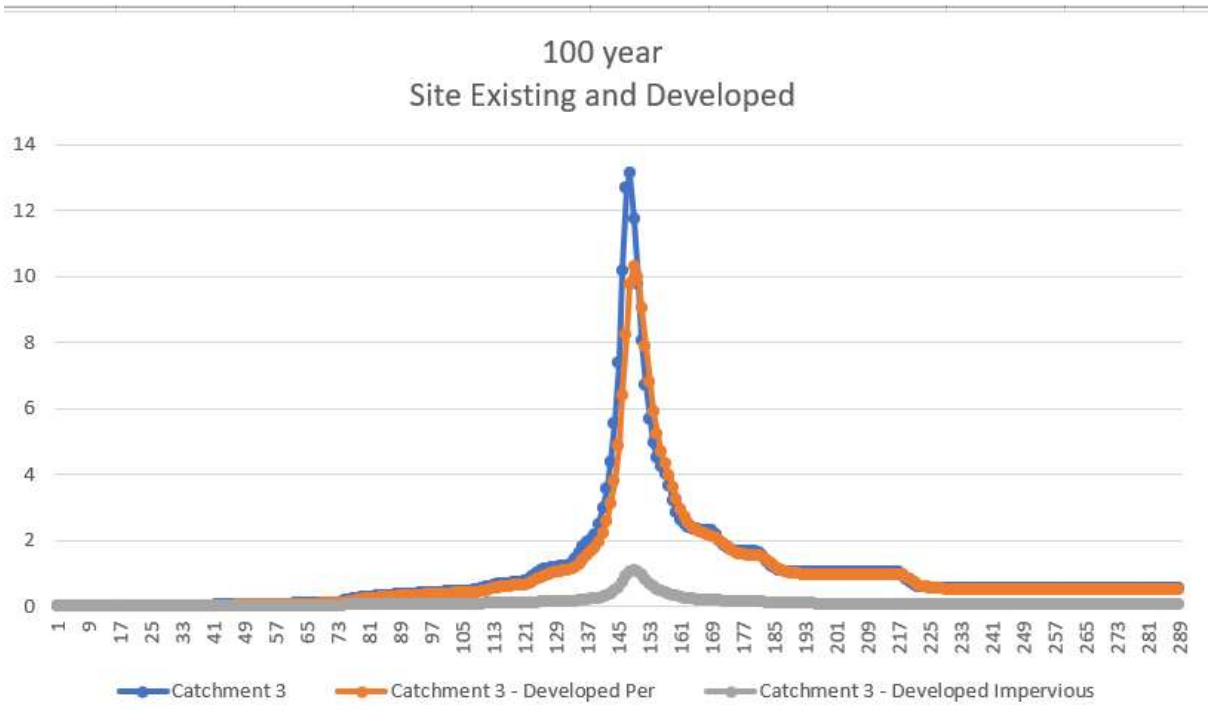


Figure 4 –Map showing catchment 3 (38ha site), Catchment 1 – balance of Taiwawe Stream and Catchment 2 adjacent western catchment.