goodearthmatters
sustainable solutions enabling communities

Project Ref: 27019

16 April 2021

Horizons Regional Council
via email

Attention: Sara Westcott

By Email: sara.westcott@horizons.govt.nz

Dear Sara

APP-2017201547.00 HDC NORTH-EAST LEVIN STORMWATER RESPONSE TO S92 REQUEST FOR FURTHER INFORMATION DATED 8 MARCH 2021

As you are aware, in responding to queries raised by Horizons technical experts in the preparation of their s42a reports for the hearing of the above matter, it became evident that some incorrect peak flow information was included in the June 2019 AEE for the North-East Levin stormwater discharge to the Koputaroa Stream tributary. The incorrect information relates to the peak inflows and outflows of Coley Pond in both the pre- and post-development scenarios. On identification of this error, HDC engaged GHD Ltd to undertake remodelling, assess the pre- and post-development discharges to the Koputaroa Stream tributary and model the proposed attenuation areas including preliminary design of attenuation areas to ensure that hydraulic neutrality is achieved. We note that the impact of correcting the inflows into the Coley Pond system is that the baseline assessment of existing flows into Coley Pond (i.e. existing discharges to the Koputaroa Stream tributary) is increased. However, the overall assessment of the effects of the proposal remains consistent with the outcomes concluded in the June 2019 AEE.

The modelling undertaken by GHD Ltd is detailed in the attached GHD Ltd report entitled "Stormwater Modelling Report. Northeast Levin Stormwater Discharge Resource Consent" and dated 13 April 2021.

This letter details the outcomes of this modelling and addresses the specific matters raised in Horizons Regional Council's s92 request dated 8 March 2021.

For the absence of doubt, we confirm that:

- There has been no actual change to the area of land which contributes stormwater to the system. The changes relate to previous underestimates of the inflow to Coley Pond, and not to any physical change within the catchment area or to any change to the proposed area that will contribute to the system.
- There is no change to the area of land which is proposed to be developed (i.e. change in land use from rural to residential). The reason for the consent application is to authorise the discharges associated with management of stormwater resulting from rural land use changing to residential land use as per the District Plan zoning. There has been no change to the proposal in this regard. The land area which is to be developed is as shown in Figure 2.5 of the June 2019 AEE and in the pond design fact sheet provided to submitters in December 2020.
- The proposal is to provide sufficient attenuation within the Koputaroa Stream tributary such that peak flows post-development are the same as, or less than, the existing peak flows. This is unchanged.

  In the June 2019 AEE, hydraulic neutrality was understood to have been achieved with the attenuation provided by Coley Pond alone, but the application also sought consent to construct downstream attenuation areas 2, 3

and 4. The information presented in the June 2019 AEE stated that the increase in peak flows could be fully attenuated within Coley Pond, however, as noted above, this was incorrectly based on assessment of only one of the contributing inflows to the Pond. The revised modelling undertaken has correctly included all inflows to Coley Pond and has identified that, based on the conservative modelling assumptions, the downstream attenuation areas are required to achieve hydraulic neutrality. The modelling undertaken has included preliminary design of the downstream attenuation areas and has confirmed that hydraulic neutrality can be achieved for all design flood events (2-, 5-, 10-, 50- and 100-year events). The attenuation areas proposed as per the preliminary design (refer attached GHD Ltd report) are as follows:

- **Coley Pond:** Volume of 13,430 m^3; crest level of 34.0 m and invert of 31.0 m. Cut volume required is 13,600 m^3. This is an increase in the volume from the 10,000 m^3 included in the June 2019 AEE, however, the scope and extent of earthworks is of the same scale and effects as the June 2019 AEE. The pond is located on land owned by the applicant.
- **Attenuation Area 2:** The preliminary design has identified that there was only minor storage in this area, and therefore this attenuation pond is no longer proposed.
- **Attenuation Area 3:** Proposed excavation of 10,000 m^3 to create total attenuation volume of 12,500 m^3. This is consistent with the scale earlier proposed as per information in the June 2019 AEE which stated that there is a potential for 10,000 m^3 excavated volume. The proposed crest level of 27.5 m is marginally higher than the 27.0 m in the June 2019 AEE and the footprint is largely the same in keeping with landowner requests that the attenuation area be outside of the productive land use areas. The current proposal for attenuation area 3 is therefore similar in scope and scale to that which was notified.
- **Attenuation Area 4:** Proposed excavation of 4,000 m^3 to create total attenuation volume of 5,700 m^3. This is an increase from the 1,500 m^3 volume in the June 2019 AEE, however, the area affected, and potential effects are similar to those notified.

The effect on the properties subject to the attenuation areas is as per the June 2019 AEE. The attenuation areas are within the same footprint area, are outside of the productive land uses of those properties and provide the same extent of beneficial access across the tributary in times of high flows / flood events. The effects of the works on the affected properties are the same as the June 2019 AEE and there are no effects on properties beyond the immediately affected properties. Therefore, the effects of construction and operation of the attenuation areas are considered to be less than minor.

The proposed attenuation areas were included within the proposal included in the June 2019 AEE and the modelling report attached confirms that hydraulic neutrality is able to be achieved downstream of Pond 4 with the above attenuation. The effects downstream of attenuation areas are the same as assessed in the June 2019 AEE given that the proposal ensures that the post-development peak flows are the same or less than the existing peak flows. As the changes to the proposal are within the same locations for which consent was initially sought, do not involve a significant difference in the scale and intensity of the proposed activities or the character of the environmental effects, and do not prejudice any person, they are within the scope of the original application.

- Technical reports in the June 2019 AEE relating to ecological effects (Aquanet) and the hydraulic modelling of the Koputaroa Stream (Barnett & MacMurray Ltd) were carried out independently of the flow information relating to the Coley Pond inflows and outflows. That is those assessments were undertaken without the use of, or reliance on, the Coley Pond inflow and outflow data which has now been found to be incorrect. The findings of these technical reports are therefore not affected by the incorrect Coley Pond inflows and outflows included in the June 2019 AEE and their conclusions remain valid.

ITEMS RAISED IN S92 REQUEST

The following addresses the matters raised in the s92 request as per your email dated 8 March 2021. The information request is presented in bold and italics and the response follows each of the individual request items.

The new inflow and outflow from Coley Pond appears to be extremely high. The first question is this number correct?

The inflow and outflow referred to in the query is that as advised via email from Good Earth Matters dated 5 March 2021 which were:

- Pre-development inflow to Coley Pond in 100-year event: 3.4 m^3/s
- Post-development inflow to Coley Pond in 100-year event (full development): 8.25 m^3/s
- Post-development outflow from Coley Pond in 100-year event (full development): 4.2 m^3/s

The s92 request to confirm the validity of these numbers has resulted in the network model being reassessed and additional modelling of the pond performance and attenuation being modelled and analysed as per the GHD modelling report attached.

In response to your question, these numbers are correct as set out in Table 3.1 and Figure 3.10 of the GHD report attached. Table 3.1 of GHD report shows pre-development inflows to Coley Pond in the 100-year ARI event as 3.42 m^3/s and the post-development total inflow to Coley Pond in the 100-year ARI event as 8.25 m^3/s. Figure 3.10 shows that in the 100-year event, the peak discharge from Coley Pond is 4.21 m^3/s. This peak flow is further attenuated by Ponds 3 and 4 for a peak discharge of 3.30 m^3/s downstream of all proposed attenuation (being 97% of the pre-development peak flow).

Can you please provide an explanation as to why the peak inflow of 3.4m3/s has increased to 8.25m3/s? Are there additional catchment areas to be included? Or has something changed that results in an increase in runoff areas? We have questions around how the catchment could generate and convey these flows given the size and low lying nature of the area.

- **Contributing Area**
  There has been no change in the physical area contributing to the Koputaroa Stream tributary discharge point at the corner of Fairfield Road and Roslyn Road. Through refinement of the model, there has been some change in the assessed area (as modelled) which has resulted in a more conservative (higher) estimate of contributing area and flows into the system. This is summarised in Table 1 below.

Table 1: Areas Contributing to Discharge point at Corner of Fairfield & Rosyln Roads

Area	As per June 2019 AEE	As per GHD Model Report (April 2021)
Total catchment area contributing to discharge at corner of Fairfield & Rosyln Road	131 ha Represents approx. 2.2% of total Koputaroa Stream catchment.	168 ha Represents approx. 2.8% of total Koputaroa Stream catchment. Change is <30% increase and results from more accurate mapping of catchment and not from any change in the actual area contributing to the Koputaroa Stream tributary.
Increase in area contributing directly to pipe network as a result of development.	Approx. 62 ha representing 1.1% of the total Koputaroa Stream catchment.	Approx. 75 ha representing 1.25% of the total Koputaroa Stream catchment[1]. Change from June 2019 AEE is approx. 20% and results from more accurate mapping of catchment.

The catchment which contributes to the discharge point at Fairfield / Roslyn Road is shown in Figures 2.2 and 2.3 of the GHD report attached. Note that, in respect of Figure 2.3, the diagram shows the catchment area in terms of the contributing area for each of the two pipe networks contributing to the discharge. The "Development Area" being the area which is changing in land use from rural to residential (and therefore resulting in an increase in stormwater such that a resource consent is required) is as per Figure 2.5 of the June 2019 AEE.

1 *This is the difference between the pre-developed and post-developed area identified as "undeveloped with no considerable inflows into pipe network" in Table 2.2 of GHD report.*

- **Peak Inflow and Outflow to Coley Pond in 100-year event**

  There are two changes in peak inflow that require further explanation, as follows:

  a. **change in pre-development inflow to Coley Pond from June 2019 AEE to current modelling as reported in GHD report for the 100-year event.**
  In the June 2019 AEE it was reported that the capacity of pipework entering the Coley Pond was calculated as 3,800 L/s or 3.8 m^3/s. This was noted as a theoretical pipe capacity and the stormwater estimates in the 100-year event were estimated at 2.23 m^3/s as per Figure 3.2 of the AEE.

  These figures compare to the modelled pre-development inflow to the Coley Pond as per the GHD report of 3.25 m^3/s. This is within the pipe capacity estimate as reported in the June 2019 AEE.

  Unfortunately, the information presented in Figure 3.2 of the AEE represented the outputs of consideration of only one of the inflows into Coley Pond and for this reason, it underestimated the inflow to Coley Pond in the 100-year event. Notwithstanding, the 3.4 m^3/s inflow in the 100-year event modelled in the GHD model report is within the envelope of inflows estimated in the June 2019 AEE. For reasons set out herein, it is considered that the under-estimation in Figure 3.2 of the AEE does not impact on the conclusions as to the proposal achieving hydraulic neutrality with respect to peak flows.

  b. **Change in pre-development inflow to Coley Pond of 3.4 m^3/s (as per GHD model report) and post-development inflow to Coley Pond of 8.25 m^3/s in the 100-year event (also as per GHD model report).**
  This change is a consequence of the change in land use which will result in an increase in peak flow and represents the fully developed catchment scenario as per the development zones in the District Plan. Increases in peak flows also occur due to the allowance for climate change in the post-development scenario. The 8.25 m^3/s represents the estimated fully developed inflows into Coley Pond without any attenuation. The model assumptions and scenarios which have resulted in this estimate are included in the GHD model report. This is considered by GHD to reflect a conservative assessment of stormwater conditions resulting from development.

  As set out above, there is an increase in the area contributing directly to the pipe network of approximately 75 ha. This increase to the pipe network is from land which currently drains to the Koputaroa Stream tributary via overland or other flow paths and does not represent additional area from outside of the existing catchment. There is also change of land use within the existing area that contributes to the network, such that there is an approximate increase of residential land of 100 ha. As set out in the GHD report, the predicted increase in peak 100-year flows from 3.4 to 8.25 m^3/s "is a reasonable increase in runoff peak flow considering the magnitude of potential development in the catchment. No additional catchment area is being diverted to Coley Pond as a result of development".

While we have received the numbers of the modelling output, can you please provide the model including both the inputs and underlying assumptions. This may help explain the changes in the numbers and the extent of the changes including predevelopment and post development.

Please refer to the GHD model report attached.

The proposed changes also changes the peak outflow from Coley pond and this may change the conclusions reached by our team. The previous information demonstrated the development would see a reduction in the peak discharge downstream of the Coley Pond. The proposed change suggests this will have a major increase in peak discharges. Please provide an assessment of the range of actual and potential effects from this change?

In our email dated 3 March 2021, we advised that the peak outflow from Coley Pond was 4.2 m^3/s representing an increase from the pre-development peak inflow of 3.4 m^3/s. The peak outflow from Coley Pond is at the outlet of Coley Pond and prior to attenuation within Ponds 3 and 4. These figures are confirmed in the GHD report attached.

The proposal as per the June 2019 AEE and as notified required the construction of Coley Pond and noted that the proposed downstream attenuation areas may not be required but would be constructed at the Council's discretion in order to provide additional attenuation and improved access across the tributary for downstream landowners.

Given that the revised modelling confirms that the downstream attenuation areas are required to achieve hydraulic neutrality, HDC seek to include the downstream attenuation areas to be constructed concurrently with Coley Pond.

Peak Flow Effects Downstream of Pond 4

The peak flows at various stages of the system and for various storm events are summarised in Table 3.2 of the GHD report and repeated below.

Table 3.2 Summary of Peak Flows and Attenuation Pond Performance

ARI Event	Pre-Development Peak Flow (m^3/s)	Post-Development Peak Flow at Coley Pond Inlet (m^3/s)	Post-Development Peak Flow at Coley Pond Outlet (m^3/s)	Post-Development Peak Flow at Pond 4 Outlet (m^3/s)
2-year *	1.88	4.28	2.50	2.16
5-year *	2.21	4.83	2.83	2.34
10-year	2.64	5.38	3.11	2.49
50-year	3.26	7.66	3.85	2.94
100-year	3.42	8.25	4.21	3.30

*Note *: The conceptual attenuation facilities Pond 3 and Pond 4 were not specifically designed at this stage to limit the 2-year and 5-year post-development peak flows, as the focus has been on larger (100-year) flood flows. However, there is ample storage capacity at these lower flows to mitigate peaks through effective pond outlet design which will be completed at the detailed design stage.*

For all events, there is an increase in peak flow in the Koputaroa Stream tributary between Coley Pond outlet and attenuation Pond 4. The effects of this increase across this stretch of the tributary are discussed below.

In the 2- and 5- year event, there is an increase in peak flow downstream of the attenuation system (ie, downstream of Pond 4) in the order of 6-15%. However, as noted by GHD, this is a consequence of the outlet structure for Ponds 3 and 4 not yet being fully designed. GHD notes that there "is ample storage capacity at these lower flows to mitigate peaks through effective pond outlet design which will be completed at the detailed design stage.". To ensure this occurs, the applicant offers the following consent condition:

> *Offered Consent condition for pond outlet design*
> *Prior to construction of Ponds 3 and 4, the consent holder shall submit detailed design drawings for the outlet structures including a statement from a suitably qualified person as to the hydraulic performance of the outlet structure that confirms that fish passage is provided across the outlet structures and embankments of Ponds 3 and 4 and that the peak discharge outlet from Pond 4 shall be less than or equal to:*
>
> *- 2 year event: 1.88m^3/s*
>
> *- 5 year event: 2.21 m^3/s*
>
> *- 10-year event: 2.64 m^3/s*
>
> *- 50-year event: 3.26 m^3/s*
>
> *- 100-year event: 3.42 m^3/s*

In the 10-year and greater events, the peak flow in the tributary downstream of Pond 4 is less than the existing pre-development peak flows (i.e., there is a reduction in peak flows downstream of Pond 4 as a result of the proposed attenuation).

Therefore, based on the above and attached assessment, it is considered that the proposal does not have an effect on peak flows downstream of the attenuation areas. As the peak flow is the same, or reduced, downstream of the attenuation areas in all flood events, there is also no effect on velocities and therefore no scour or erosion effects within the tributary downstream of the attenuation areas as a result of the increase of stormwater from residential development in the catchment.

Further, as peak flows following attenuation are the same or less than existing, it is considered that the activity for which consent is sought does not have any effect on the ability of the Koputaroa Stream or the Koputaroa Drainage Scheme to convey flood flows. Effects of additional stormwater volumes on downstream floodable areas are discussed below.

Peak Flow & Velocity Effects between Attenuation Areas
As the effect of the development on stormwater flows is not fully attenuated with just Coley Pond, there is some increase in peak flow and therefore also velocity between Coley Pond and Ponds 3 and 4.

The modelling undertaken by GHD assessed flow and velocity at cross-sections along the tributary between the attenuation ponds (refer Figure 2.1 and section 3.3 of the GHD report). As stated in the GHD report, this area was originally identified as Attenuation Pond 2 in the June 2019 AEE, however attenuation in this area is no longer preferred and the current channel morphology is retained.

As set out in the GHD report, the increase in velocity in the tributary between the Coley Pond and Ponds 3 and 4 is 6-7% in the 2- and 5-year events and less 5% in the 10–100-year events. The change in water level in the tributary in the same area is 3-6cm in depth. The predicted water level in all events is maintained within the existing channels and do not cause flooding outside of the existing channels (refer drawing A1 in section 4.1 of GHD report).

The changes in flow velocity and depth between Coley Pond and Ponds 3 and 4 are considered to be less than minor and therefore the effects on channel morphology, habitat, scour and erosion are also considered to be less than minor.

As a result of the changes, it is unclear how the affects will affect the frequency, extend, duration of flooding. Please provide an assessment of these effects. We have concerns that the changes will have a negative effect and is over and above what has been assessed.

The activity for which consent is sought, and the proposed mitigation (attenuation areas) will not have any impact on the frequency of flooding. The flood frequency is relative to the frequency of rain events and, as shown in Figures 3.6 to 3.10 of the GHD report, the attenuation extends the release of flows from the attenuation pond by no more than 12 hours. It is considered that this delay in release of flows will not significantly alter the frequency or duration of flooding experienced downstream.

With respect to extent of flooding downstream, given that peak flows are attenuated, the discharge will not have any impact on extent of flooding experienced downstream where flood flows are being conveyed (ie, prior to reaching the downstream area near the confluence with the Manawatu River where flood flows create ponding due to the inability of the scheme to discharge to the Manawatu River).

Table 3.1 of the GHD report includes modelled stormwater volumes for the various rainfall events in the pre and post development scenarios. This has been assessed in order to understand the effect of the increased stormwater volume on landowners at the downstream end of the Koputaroa Drainage Scheme Area who currently experience ponding on their properties as a result of the low level of service (return period protection) currently provided by the Koputaroa Drainage Scheme and the inability of flows from the Koputaroa Stream to be discharged when the Manawatu River is in flood.

For the purpose of this assessment, the additional stormwater volumes have been compared to the peak flows estimated in the Koputaroa Stream at the Jackson Road Confluence as estimated in the Barnett & MacMurray Ltd

hydraulic report included in the June 2019 AEE. The Jackson Road confluence is a point on the Koputaroa Stream which is approximately 4.5 km downstream of the North-East Levin stormwater discharge and includes flows from the wider Koputaroa Stream catchment but is not at the downstream most extent of the catchment. This means that the flows from the entire catchment will be greater than those estimated at the Jackson Road confluence and the effect of the increased stormwater volumes will be less than estimated by the comparison to the Jackson Road peak flows.

This assessment is provided in Table 2 below and is provided to put the increased stormwater flows into context. As can be seen, the additional stormwater volumes from residential development within the North East Levin catchment represent the peak flows contributing to ponding in the lower catchment continuing for an additional 13-15 minutes. It is therefore considered that any effects on the downstream flooding areas are de minimus in relation to the effects currently experienced from flooding as a result of flood flows from the Koputaroa Stream catchment (of which the urban area contributes less than 3% of the catchment area, while the increased residential area is less than 1.5% of the total catchment area).

Table 2: Assessment of Increased Stormwater Volume in Relation to Peak Flows arising within the Koputaroa Stream Catchment

Event	Increased stormwater volume as a result of residential development in the contributing catchment (m^3)	Estimated Pre-Development Koputaroa Stream Flow at Jackson Road Confluence (Barnett & MacMurray report, Table 6)	Additional time Stream would flow at peak flows (Jackson Road confluence) to convey increased stormwater volume
5-year	40,433	43.6 m^3/s	15 minutes
10-year	45,683	55.0 m^3/s	14 minutes
50-year	64,662	85.0 m^3/s	13 minutes
100-year	76,906	93.7 m^3/s	14 minutes

The above analysis has been provided to give context as to the additional stormwater volume compared to the likely peak flows from the larger catchment in the rainfall events. Note that the additional stormwater volume will not be released within a 15-minute period but will be released typically over a 12 hour period as a consequence of the attenuation to be provided. It is therefore considered that the effect of the stormwater discharges on flood frequency, extent and duration are less than minor.

The potential adverse effects on the 1% AEP event are discussed however it may also need to outline the potential impact from other sized events. If the change in runoff occurs then the floods in the Koputaroa catchment may occur more often and be larger than the existing events e.g. a 20% AEP event might become the mean annual flood etc. Please provide an assessment on how the system reacts during smaller events.

The above analysis has included assessment at smaller events. Please refer to the discussion above.

The potential effects on the peak discharge is discussed however there is likely to be changes on the depth and velocity of flow. The velocity of the flow is likely to increase. The increase in velocity is likely to have a potential effect. Please provide an assessment of the increase in velocity and in particularly the potential increase in channel instability, erosion and sedimentation. Please provide an assessment of the potential effects on the risk of erosion, the ability of the channels to take the additional capacity and if there are any proposed erosion measures.

Refer to the discussion above. As stated, there will be no increase in peak flows downstream of Pond 4 in all of the rainfall events assessed (subject to detailed design of the outlet structures to ensure hydraulic neutrality int eh smaller 2- and 5-year events). As there is no increase in peak flows downstream of Pond 4, there is also no effect in terms of velocity, depth or channel instability, erosion and sedimentation.

Between the Coley Pond and Ponds 3 and 4, there is a minor increase in velocity and depth as discussed above. However, flows are retained within the existing channel and the minor increase in velocity is unlikely to cause an effect on channel stability, erosion or sedimentation. As noted in the GHD report, any effects can be mitigated with appropriate stabilisation measures if needed and as necessary.

This increase in flow would almost certainly require the existing channel to be enlarged to provide greater capacity and for erosion protection to be provided. This would likely be the case down to the outlet of attenuation area 4 but perhaps also downstream from here as well with regard to erosion protection works due to the significant increase in volume. The information to date from the Applicant states the channel can covey this additional water with "no apparent issues". Please demonstrate how the change does not result in a change in the existing channels.

Refer to above discussion. The increase in flow downstream of Coley Pond and prior to Ponds 3 and 4 is able to be conveyed within the existing channel morphology. Downstream of Ponds 3 and 4, the peak flows are less than the existing pre-development peak flows.

Alternatively, if the proposed numbers are correct, the increased flow would require all the ponds to be utilised to attenuate the flows. This is different from the existing consent whereby the downstream ponds provide a contingency to the existing system. Given the proposal will rely on the downstream ponds please provide details on the pond outlet structures and how the engineering design of the attenuation structures will be sufficient to mitigate the effects of the development.

This s92 response confirms that all attenuation ponds are required to be constructed. Details of the downstream attenuation areas are provided in the GHD report. The downstream ponds have been developed to sufficient detail to confirm that sufficient attenuation can be provided to achieve hydraulic neutrality and that the structures are able to be constructed and operated in an appropriate and safe manner. The design of Ponds 3 and 4 is subject to detailed design, and it is recommended that a condition be placed on consent requiring the submission of detailed design drawings for technical certification prior to construction.

In terms of freshwater ecology effects, the basis of the assessment is there were to be no alterations made to the existing stream channel (with the exceptions of installations of the new embankments). If the Pond is to now have a peak flow under full development conditions, then there is a risk of a change to the channel morphology. Please provide information on whether the existing channel can accommodate such flows without having adverse impacts on freshwater ecology or will some kind of channel capacity upgrade be required?

Between Coley Pond and Ponds 3 and 4, no physical works are required and there is no modification to the channel morphology required to convey the flows. A channel capacity upgrade is not required.

Within the reach of the tributary where Ponds 3 and 4 will be created, there are some earthworks required to achieve the necessary attenuation (refer Drawing 4.1 in GHD report, section 4)). For the majority of Ponds 3 and 4 the earthworks are outside of the existing channel and create attenuation above normal flow levels as a consequence of the attenuation structure to be created. As stated in the GHD report, the earthworks will be undertaken to increase storage "within the existing floodplain storage areas beside the tributary". Therefore, in these areas, the proposed earthworks will not affect the channel morphology as they are outside of the normal wetted channel area and in-stream habitat / vegetation.

There is a section at the upstream end of Pond 3 where channel modification may be required to widen the existing channel (approximately 100-120m). The proposed alignment follows the existing channel and works are limited to battering slopes of the existing channel and are intended to be carried out outside of the area of flowing water. These works will be managed in the same way as proposed and agreed with Horizons' consultant ecologist for the attenuation structures and detailed in the June 2019 AEE, namely:

- Ensuring structures are designed to provide for fish passage. It is proposed that detailed design be provided to Horizons for technical certification prior to construction.
- Compliance with all relevant conditions of Table 17.2 of the One Plan (General conditions for permitted and controlled activities involving the beds of rivers and lakes), specifically:

- Ensuring sediment discharged during construction does not adversely affect the visual clarity or sediment loading of the tributary. This will be achieved by planning works to occur in dry conditions where practicable.
- Ensuring machinery used is clean, free of weeds and pest species and is refuelled away from the watercourse in order to prevent any contaminants entering the watercourse.
- Ensuring the culverts are laid at a grade and level that will provide for fish passage.
- Reinstating any disturbed areas to a natural contour and revegetating with similar species and cover to existing.

- Having a suitably qualified and experienced person on site to undertake fish recovery when any works are undertaken which disturb the bed of the watercourse.
- Undertaking works in accordance with an Erosion and Sediment Control Plan prepared in accordance with the Wellington Regional Council's Erosion and Sediment Control Guidelines.
- Undertaking works in accordance with the relevant provisions of the Regional Council's Environmental Code of Practice for River Works.

As a result of these measures and the short stretch of the tributary, which is potentially affected, it is considered that the proposed works will have a less than minor effect on the Koputaroa Stream tributary.

As a result of the increase in capacity within Areas 3 and 4, what are the impacts on the existing stream channel and including impacts on riparian vegetation.

Refer to response above. The increase in capacity in Areas 3 and 4 are to provide storage within the existing floodplain area adjacent to the tributary and therefore there is no impact on existing stream channel. Any riparian vegetation that may be affected by the earthworks will be reinstated with appropriate riparian planting. As shown in Figures 3.6 to 3.10, the duration of storage in the attenuation areas is less than 24 hours in all events, and therefore any effect on riparian vegetation as a result of stored water within the attenuation areas is considered to be less than minor.

The proposed change may have an impact on the water quality and the water treatment efficiency of Coley Pond. Please provide an assessment as to whether these increased flows will lead to an increased load of urban contaminants to the original AEE. Please provide information to demonstrate the effects of the proposed increase of flows on the instream ecology?

We refer to Appendix F of the June 2019 AEE, being Aquanet's ecological effects assessment. Section 3.5.2 of that document undertook an assessment of the effects of the stormwater discharge on Schedule E targets of the One Plan and potential ecological effects of non-compliance with Schedule E toxicant targets. This assessment was undertaken independent of stormwater flow (quantity) assessments and was based on typical urban stormwater quality without treatment. The findings of Aquanet's assessment therefore remain relevant. Aquanet concluded that while there is a risk that Schedule E targets for copper and zinc may be exceeded:

> *"the ecological effects of the targets not being met are likely to be less than minor for the following reasons:*
>
> - *it is expected that exceedances of targets / guidelines will be limited to the Koputaroa tributary, and will not result in exceedances in the Koputaroa Stream; and*
> - *the resident invertebrate community in the Koputaroa Tributary is comprised of taxa that are not sensitive to pollution. Therefore, it is unlikely that any changes in contaminant concentration cause by additional stormwater discharge will affect the community's composition."*

In conclusion, it is considered that the effects of the increased stormwater arising from residential development within the catchment are considered to be less than minor, given that hydraulic neutrality is achieved downstream of the proposed attenuation; the minor contribution of the urban catchment compared to the overall catchment

site; and that any ecological effects arising from changes in stormwater concentrations are expected to be less than minor.

We trust the enclosed information satisfactorily addresses the matters raised in your s92 request for further information.

Yours faithfully

Annette Sweeney

Enc: GHD Ltd Report; Stormwater Modelling Report. Northeast Levin Stormwater Discharge Resource Consent. 13 April 2021