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To: Joanna Gilroy/Hillary Lennox, **Environment Southland**

From: Greg Ryder, **Ryder Consulting**

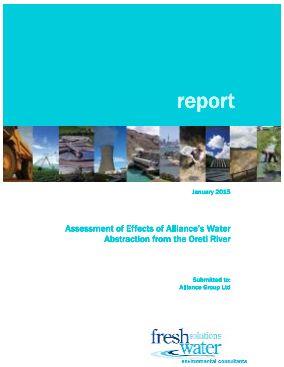
Date: 21 January 2016

Subject: **Review of application documents relating to reconsenting of the Alliance Group's Lorneville Plant discharges**

Attached are our comments in relation to the application report titled:

Yours faithfully,

Dr Greg Ryder
Environmental Scientist/Director



Assessment of Effects of Alliance's Water Abstraction from the Oreti River

Submitted to: Alliance Group Ltd

Freshwater Solutions

January 2015

The main findings of the review are:

- That there was a lack of information provided on freshwater communities downstream of the existing Alliance water take, which hindered preparation of a comprehensive assessment of effects. In this situation it would have been appropriate to undertake a field survey to obtain this information. It is stated in the updated report (November 2015) that an assessment of the ecological values of the lower Oreti River will be undertaken in summer 2016, with the results of the water quality and ecology survey above/below the abstraction to be included in the final assessment of effects of the abstraction. No further detail is provided as to the method of the planned survey, so it is not possible to determine at this stage if this additional information will address our concerns.
- Not enough detail on river flow variation downstream of the take was provided to justify the conclusion that, due to tidal water level fluctuations, communities in only a 1 km length of the river will be affected by the abstraction. More information on the extent and magnitude of the tidal influence and how communities within the tidal reach will be affected by the abstraction during low tide periods is required. It is anticipated that this will be covered in the discussion of the results from the summer 2016 sampling downstream of the take.
- The conclusion that the potential for fish entrainment into the intake is low, and therefore a minor effect, is incorrect. The design of the pump intake structure will

not prevent fish from being drawn into the intake and this may be a more than minor adverse effect and so may require mitigation. The conclusion made in the January 2015 report that the potential for entrainment is a minor effect has been removed, and replaced in the November 2015 report with the note that Alliance is currently investigating options for reducing the risk of fish being impinged on the screen or entrained in the water take.

- There is not sufficient information provided to thoroughly assess the potential effects of intake channel maintenance activities, and the measures for avoidance of effects and mitigation proposed are not adequate. The recommendation that maintenance activities avoid key migration and spawning periods has been added to the November 2015 report, however no information is provided as to when these periods are.

Section 1: Introduction (page 1)

The introduction of the report is brief, but clearly states what the purpose of the report is and provides enough background to put the report in context. It is also appropriately acknowledged here that another company (Raineffects Ltd.) were responsible for the hydrological assessment presented in the report. The aim of the report as stated in the introduction is to assess the effects of Alliance Group Ltd.'s (Alliance) water abstraction from the Oreti River and maintenance of the intake channel.

Section 2: Assessment methodology (page 1)

The main focus of the assessment as detailed in the method relates to the calculation of ecologically relevant flow statistics and relating these to existing ecological information to assess the effects of water abstraction.

No explanation is given of how the effects of intake channel maintenance have been assessed. This was addressed in the updated report (November 2015, pages 4 and 5), which states that the assessment of maintenance effects was based on existing observations by Alliance staff, knowledge of fish behaviour and information on the extent of intake channel cleaning activities.

The method includes justification as to why a desktop assessment approach was taken, and what information was used for the desktop assessment (page 1). The list of information/reports used for the desktop assessments includes those expected and does not appear to have any major omissions.

What would be involved in an alternative approach to a desktop assessment is not discussed in the report, however a typical approach would involve surveying water quality and periphyton and benthic macroinvertebrate communities downstream of the existing take and comparing those to upstream in order to assess existing effects, then relating these to any proposed changes to the take. The desktop approach used in the report is limited by the relevance of existing information. This is discussed in more detail in later sections of the review.

Our concerns regarding the limitations of the desktop assessment approach were addressed in the updated report (November 2015) with the inclusion of the intention to undertake an assessment of the ecological values of the lower Oreti River in summer 2016 (page 1). It was also stated that when completed the results of the water quality and ecology survey above/below the abstraction are to be included in the final assessment of effects of the abstraction (page 4). No further detail is provided as to the method of the planned survey, so it is not possible to determine at this stage if this additional information will address our concerns.

Section 3: The Oreti River (page 5)

This section begins with a physical description of the Oreti River. A map of the Oreti catchment is provided in Figure 4 to support the information in the text. However, the reason for the black and red outlining of the catchments is not clearly labelled and the rivers are not identified in the figure. As a result it is not easy to see from Figure 4 the differences that are discussed in the text between parts of the catchment. Information has been added to the updated report (November 2015) to address this, with the black and red labelling explained on page 5 of Section 3.

There is some inconsistency in the report as to the location of the water take in relation to the extent of tidal influence in the river. In the method (page 1) it is noted that only a small section (approximately 1 km) of the river is potentially affected by the take. The reason for this conclusion is not explained at this point, however further discussion is included further on in Section 3.

Section 3 page 5 states:
"*The tidally influenced section of the river extends 25.7 km upstream from the New River Estuary to approximately 2.8 km downstream of the Alliance water take*."

However, later on page 8 it is stated:
"*The tidal influence (length of river where water level is influenced by the tide) extends 25.7 km up the Oreti River from the New River Estuary to approximately 1 km downstream of the Wallacetown Bridge (Chris Jenkins, pers. comm.).*"

As the location of the take is identified in the Introduction of the report (page 1) to be 1 km downstream of the Riverton-Wallacetown Highway Bridge, it is not clear from these two contradicting statements where the take is exactly in relation to the tidal influence. A clearer explanation would be helpful.

The location of the take has been clarified in the updated report (November 2015) with the location of the take in relation to the extent of tidal influence being changed in the method

(page 1) to approximately 400 m downstream of the take, which is now consistent with Section 3.

The discussion of tidal effects (page 8) goes on to explain that although the river water level rises and falls depending on the tide, there is no saltwater intrusion as far upstream as the take. The upstream limit of saltwater intrusion is not identified. It would however be useful if it could be identified (even approximately), as water salinity influences the composition of aquatic communities. This information has been provided in the updated report (November 2015, page 7).

Both measured and naturalised flow statistics for the Oreti River are presented in Table 3 (page 9). Flow data from 1977 to the present is stated as being available, however only records up to the 2 September 2012 were used in the calculation of naturalised flow. Confusingly, later on in this section the flow record period used is stated as 1977 to 1 October 2012 (page 11), rather than 2 September 2012 (page 9).

It is not explained why the full flow record was not used in the analysis (i.e., why 2013 and 2014 data were not included). A brief look at past weather reporting indicates that the 2012/2013 summer was noted as being particularly dry in Southland, with the Oreti River at very low levels. It would therefore be useful to know what effect this had on the flow statistics presented in the report.

Flow statistics have been updated for the November 2015 report to include the full flow record, from 1 July 1977 to 31 August 2015, and also new information from a review of the record ratings (undertaken by Environment Southland). This has resulted in slight changes to some of the flow statistics presented in Tables 2 and 3 in the January 2015 and November 2015 reports.

Table 4 (page 11) presents the number of days for given years that flows were below 50% of the MALF and 39% of the MALF. These are the flows that trigger conservation measures to be employed under the current Alliance consent. It would be helpful if this table included

data from the most recent years, including 2013 and 2014. It is concluded that in most years there are no flows less than the 50% trigger, this is correct but it is important to also note unusual years. The years 1978, 1981, 1999 appear to have been particularly dry, each having at least 25 days when flows were below 50% of MALF. It would be helpful to include more information on these dry years, for example the duration of the low flow events and the time of year (season) that they occurred.

Additional information has been added to Table 4 in the updated report (November 2015), including data from 2013. Additional discussion of unusual years has also been included on pages 11 and 12, with information provided on the timing and duration of low flow events. It is stated here that in 2013 there were no days when the flow was below 39% of 7DMALF flow (the 7DMALF is 7.785 m^3/s). However, the graph for the period 1 January 2013 to 1 June 2013 shown in Appendix 3 indicates that there were periods of several days when flows were below 3.036 m/s (i.e., 39% of 7DMALF). It is possible we may have interpreted this incorrectly.

A summary is provided on page 12 of the key findings of the analysis of hydrology. However the summary data presented is for the *measured* flow (e.g., 7-day MALF 7.38 m^3/s) rather than the *naturalised* flow (e.g., 7-day MALF 7.73 m^3/s). It is not clear why the measured flow data is presented in the summary when it is stated on page 8 that the Regional Water Plan for Southland generally requires naturalised flows to be used for hydrology statistics when applying for abstraction permits. The page 12 summary has been subsequently updated in the November 2015 report to include both the measured and naturalised flow information.

Section 4: Water quality and ecology (page 12)

Section 4 (page 12) begins with a summary of Environment Southland water quality data for a site located approximately 1 km upstream of the water take (Wallacetown Bridge). Presenting data for upstream of the take would be more useful if there was also data for downstream of the existing take to compare with (in order to assess the effect of the existing take on water quality), but none is presented.

The most recent water quality and periphyton data for the Wallacetown Bridge site has not been included in the assessment of effects analysis, with the data included only being from between 2005 and 2010. Presumably the most recent data would have been available from Environment Southland if requested.

The November 2015 report indicates that an assessment of the ecological values of the lower Oreti River will be undertaken in summer 2016. It is stated on page 12 that the description of the current water quality of the lower Oreti River will then be updated with more recent data, including from Environment Southland (SRC) following the proposed summer 2015–2016 water quality and ecological survey of the river.

Information on periphyton communities 1 km upstream of the take is discussed, including the occurrence in some summers of potentially toxic cyanobacteria growths and of periphyton biomass exceeding Ministry for the Environment guidelines on 40% of occasions. No information is however presented on existing periphyton communities downstream of the take. It is noted on page 14 that "*The lack of shallow riffle areas with stable cobble substrates downstream of the abstraction point is likely to limit the diversity and abundance of periphyton and significantly reducing the likelihood to nuisance algal growths occurring downstream of the abstraction point*." There is insufficient information presented to support this statement and a field assessment of periphyton communities downstream of the take would have been helpful, especially to confirm that nuisance growths are not already present downstream of the take given their presence 1 km upstream. Further, in our experience, cyanobacteria mats are capable of establishing on soft bottom environments in slow flowing river reaches. It is noted in the November 2015 report (page 14) that to assess these concerns collection of instream habitat data will be included in the summer 2016 assessment.

As for water quality and periphyton, there has also been no field assessment of benthic invertebrate communities (page 14) downstream of the take. Benthic communities upstream of the take are identified as being dominated by *Deleatidium* mayflies and Elmidae

beetles. It is noted on page 14 that "*The lack of shallow riffle areas and tidal influence downstream of the abstraction point is likely to limit the diversity and abundance of mayflies and caddisflies significantly reducing the overall sensitivity of the benthic invertebrate community to water level changes*." There is no field data presented to support this conclusion. At a minimum, sampling of benthic invertebrate communities downstream of the take should have been undertaken as part of the assessment. As noted above for periphyton the November 2015 report (page 15) states that to assess these concerns collection of benthic invertebrate data will be included in the summer 2016 assessment.

Information on fish communities is discussed on page 15. Existing information on fish communities is reviewed with a range of sources used to evaluate what fish species are likely to be present in the Oreti River in the vicinity of the take. Fish species that at classified as threatened are identified, with reference to Allibone *et al.* (2010). This is not the most recent reference of threat classification. The correct reference to use is Goodman *et al.* (2014[1]). This reference should be checked to confirm whether the threat classification of the fish species listed has changed. This has been corrected in the updated report (November 2015, page 16) with the most recent threat classification stated, however lamprey have incorrectly been listed twice. Their correct classification is 'Threatened – Nationally Vulnerable' (i.e., not 'At Risk'). Alpine galaxias were identified as present in the January 2015 report but are absent from the November 2015 report.

Recreational values are only considered briefly and the information presented is not recent and is also quite general to the wider Oreti River catchment rather than being specific to the intake site. The lack of recreational information is acknowledged in the updated report (November 2015, page 16), with the addition of the comment that no information about recreational use of the section of river where the intake is located was identified and the extent and nature of the recreational use is therefore unknown. Consequently, the assessment of recreational effects has been removed from the November 2015 report.

[1] Goodman, J.M., Dunn, N.R., Ravenscroft, P.J., Allibone, R.M., Boubée, J.A.T., David, B.O., Griffiths, M., Ling, N., Hitchmough, R.A., and Rolfe, J.R. 2014. Conservation status of New Zealand freshwater fish, 2013. New Zealand Threat Classification Series 7. Department of Conservation, Wellington. 12p.

To summarize, no surveys were undertaken of aquatic communities downstream of the existing take as part of the preparation of this report. The information presented on water quality and benthic invertebrate and periphyton communities is for a site located approximately 1 km upstream of the water take, and based on the statements made in the report, the habitat at this site is different than that downstream of the take. This therefore limits the usefulness of this information for assessing the effects of the take on the river downstream. The updated report (November 2015) indicates that this lack of information will be addressed, with a downstream survey being undertaken in summer 2016. No further detail is provided as to the method of the planned survey, so it is not possible to determine at this stage if this additional information will address our concerns.

Section 5: Water take effects (page 16)

Section 5 (page 16) presents the assessment of water take effects, which is identified as having the potential to affect river flow, water quality, the quantity and quality of aquatic habitat, and directly affect fish through the entrainment and impingement of fish on to screens.

Table 4 presents information on the magnitude of the monthly water take and average flow in the river for the period 2007/08 to 2012/13. The way that the information is presented makes it difficult to easily compare the variation between years and months. Presenting the data in a graph would be helpful. It would also be useful to present this information together with the flow in the river, so the volume of the take as a proportion of the river flow can be assessed. Additional information on the relationship between river flow and abstraction over the 2007 to 2014 has been provided within graphs in Appendix 3 of the updated report (November 2015), and it is stated that the abstraction represents a very small proportion of river flow throughout the period. This statement is not entirely correct. For a short period in December 2012 the flow in the Oreti River as very low and consequently the take comprised a large proportion of the river flow. This event should have been identified and discussed in more detail. There are also other periods (e.g., March 2010, March 2013) when the Oreti

River flow was at times around 1 m^3/s and the water take would have represented a considerable proportion of the river flow.

The influence of tidal fluctuations on the extent of potential effects downstream of the take is discussed and it is concluded that by 2.8 km downstream of the take the tidal influence is significant and the effects of the ICC and Alliance abstractions are likely to be significantly or totally negated (page 17). This statement disagrees with that made in the method section (page 1) that only approximately 1 km of river is affected by the take.

Regardless, the conclusion that the tidally affected reach of the river will not be affected by the take is not justified in enough detail. At low tide, when river flow dominates rather than tidal inflows the abstraction will affect most of the reach downstream to the estuary (i.e., approximately 20 km) rather than just a 2.8 km length. The 'worst case scenario' maximum abstraction of 260 L/s equates to a 3.5% reduction in flow when the river is at its actual 7 day MALF of 7,380 L/s, and as there is no minimum flow restriction on the take, the magnitude of the percentage reduction could be even greater at times when the river is below the 7 day MALF. In addition to the potential for a loss of aquatic community habitat at reduced flows, the distance inland that saline water penetrates the freshwater river could increase. This is probably unlikely given the magnitude of the take, but this is not explored in the assessment. These points have not been considered in the updated report (November 2015), however it is expected that they will be included in the discussion of the results from the summer 2016 sampling downstream of the take.

Table 5 (page 19) presents an analysis of the average number of days per year that the flow in the river downstream of the Alliance take would be below the naturalized 7 day MALF (7.73 m^3/s). Table 5 is discussed further on page 20 of the report where it is stated that "*The increase due to Alliance is from a total of 800 days (average 23 per year) for the Oreti with combined irrigation and ICC abstractions to 868 days in total (average 25 days per year) with the Alliance abstraction added*." These numbers differ however from the data presented in Table 5, where it is shown that there are only 733 days or an average of 21 days per year below 7 day MALF with combined irrigation and ICC abstractions (i.e., excluding the Alliance

take), rather than the 800 and 23 days stated in the text. It is not clear which is correct, but if the text is incorrect rather than the information in the table, this has the effect of minimising the magnitude of the effect of the Alliance take on low flows. This information has been updated in the November 2015 report (presented in Table 6, page 20) and the text on pages 20 and 21 corrected to correspond with the information shown in Table 6.

Part of the assessment of effects includes a discussion of the effects on accrual period length, which is related to the potential for nuisance algal growths to develop (page 21). It is concluded that the introduction of full abstraction from the Alliance take will have virtually no effect on accrual periods between FRE3 environmental flows. It would be appropriate to note here though that nuisance algal growths are already a problem in some summers upstream of the take.

The assessment of water quality effects on page 22 is brief and it concludes that as the take is small relative to the river flow, and the effects of the abstraction are not expected to change from the current situation, the take is expected to continue to have a less than minor effect on water quality. As previously discussed however there has been no information presented on existing water quality downstream of the take, so it is not clear how it can be concluded that the take will continue to have a less than minor effect. Additionally, existing water quality upstream of the take already does not meet guideline levels on occasions (page 12) and any abstraction of water will therefore likely exacerbate this. The extent of this effect can be expected to be small due to the magnitude of the take, but regardless, information should be presented to support the conclusion. These points have not been considered in the updated report (November 2015), however it is expected that they will be included in the discussion of the results from the summer 2016 sampling downstream of the take.

An assessment of the potential loss of aquatic habitat downstream of the take is provided (page 22) based on the IFIM study carried out by Ryder Consulting (2001) relating to the ICC water take upstream. Use of this study is appropriate given the relatively close location of these two takes from the Oreti River and their similar volumes.

There is a transcription error on page 23, "*The results of the RYHABSIM modelling in a nearby more sensitive reach of the Oreti River which showed little, if any, effect from the ICC abstraction coupled with the results of the hydrology assessment indicate that Alliance's discharge …*". The last word should be "abstraction". This has been corrected in the November 2015 report (page 23).

The potential for fish to be entrained at the intake point is discussed on page 24, and it is concluded that the potential for entrainment is low and therefore a minor effect. Our assessment is however that the report does not present sufficient information on the design and operation of the intake structure to reach this conclusion, especially given the good quality of the fish community in the vicinity of the take (as noted on page 15).

The description of the intake structure in this section, as a pump with a metal screen, differs from the statement in the introduction of the report (page 1) that the water take is via a gallery. A gallery intake draws water through a matrix of gravels, which prevents fish from also being drawn into the intake. The existing intake design with a mesh screen is dependent on having a sufficiently small mesh size, low approach velocities and the provision of a bypass to prevent fish being impinged on a screen or drawn into the intake and to safely return to the river. No information is provided on the approach and sweep velocities at the screen or whether or not a bypass is provided, and this limits the ability to assess the potential effects of the take.

Information on mesh size is provided and this indicates that the screens will not prevent fish entering the take. The gap size (50 mm) of the initial coarse mesh screen is not small enough to prevent native fish (including six 'at risk' species, page 15) from entering the take. The 16 mm mesh screen located 2 m behind the coarse screen is sufficiently small to prevent adult eels from entering the take. However, in the absence of a bypass to the screen it is likely that they could be drawn onto and impinged on the screen. This appears to have happened on occasion in the past (page 24). Other native fish (e.g., whitebait) and juvenile trout are sufficiently small to pass through a 16 mm mesh and continue towards the water treatment

plant. For reference a mesh spacing of 3 mm is necessary to exclude adult inanga from entering a pump (Jamieson *et al.* 2007[2]). The statement provided in the report that "*The water take and treatment system allows checks for fish that have been entrained at four points; the intake screen, pump house, water supply reservoir (during annual cleaning operations) and the water treatment plant*." does not provide any reassurance that fish can be detected and returned safely to the river before they enter the treatment plant.

The November 2015 report has been revised (page 24) to acknowledge that "*It is possible that a small number of small fish such as smelt, īnanga, elvers and trout fry could pass through the screen and into the water treatment plant*." (no justification is provided as to why it is considered only a small number of fish could be entrained). The conclusion made in the January 2015 report (page 24) that the potential for entrainment is a minor effect has also been removed, and replaced in the November 2015 report (page 24) with the note that Alliance is currently investigating options for reducing the risk of fish being impinged on the screen or entrained in the water take.

The effect of the take on recreational values is covered very briefly on page 25. It is concluded that the potential for the water take to entrain fish is low and as a result the potential effect of the water take on recreational values is assessed as minor. Given that the assessment of the water take on fish entrainment is incomplete (discussed in the paragraph above) this conclusion is not supported. This section assessing the effect on recreational values is not included in the November 2015 report (i.e., it has been removed).

Section 6: Intake channel maintenance (page 25)

The assessment of the effects of intake channel maintenance (page 25) is very brief and does not provide any information on the frequency of maintenance activities, their timing, or much detail on what maintenance activities involve (aside from sediment and macrophyte removal). This information is necessary in order to fully assess the effect of maintenance on fish communities, in particular given that it has been identified that a small number of eels

[2] Jamieson, D., Bonnett, M., Jellyman, D., and M. Unwin. 2007. Fish screening: good practice guidelines for Canterbury. Prepared for the Fish Screen Working Party by NIWA. NIWA Client Report: CHC2007-092, October 2007.

will be removed during channel maintenance. It is recommended in the report (page 25) that the effect on eels be minimised by ensuring that the contractor is prepared to capture and return any eels, removed during maintenance activities, to the river. Other fish species in addition to eels will also likely be removed from the river, however no recovery of these is recommended. It is suggested that more consideration is given to how works can be timed to avoid fish being removed (e.g., outside migration/spawning periods).

The updated report (November 2015, page 25) includes the information that channel cleaning is taken approximately annually and typically in September, and has added the recommendation that maintenance activities avoid key migration and spawning periods, however no information is provided as to when these periods are.