IN THE MATTER OF	the Resource Management Act 1991
AND	
IN THE MATTER OF	applications by Central Plains Water Trust to: Canterbury Regional Council for resource consents to take and use water from the Waimakariri and Rakaia Rivers and for all associated consents required for the construction and operation of the Central Plains Water Enhancement Scheme Selwyn District Council for resource consents to construct and operate the Central Plains Water Enhancement Scheme
AND	
IN THE MATTER OF	a notice of requirement by Central Plains Water Limited to: Selwyn District Council for the designation of land for works associated with the construction and operation of the Central Plains Water Enhancement Scheme

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SUPPLEMENTARY EVIDENCE OF PAUL CAMERON KENNEDY

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INTRODUCTION

1. My name is Paul Cameron Kennedy. My qualifications and experience, and the basis on which I am preparing this brief, are set out in my previous brief of evidence prepared for this hearing. I have prepared this supplementary brief of evidence to address:

   - Matters raised in the Section 42A report of Shirley Ann Hayward.

   - Matters raised in the Section 42A report of Dr Adrian Meredith.

   - Compliance of activities with the water quality aspects of the Rakaia River Conservation Order (RCO), the Waimakariri River Regional Plan (WRRP) and the Proposed Natural Regional Resources Plan (PNRRP).

2. I have also read the S42A report of Mr Carl Hanson as his report has a bearing on much of the material presented in the reports of Shirley Ann Hayward and Dr Adrian Meredith.

S42A RESPONSE OF SHIRLEY HAYWARD

3. In paragraphs 17 and 18 Ms Hayward notes that she largely agrees with the conclusions drawn in the Applicants studies (Kingett Mitchell 2006b, 2006d) that "*increased land use intensification is likely to result in increased contamination of adjacent waterways, and that appropriate land use management practices can mitigate most of these effects to acceptable levels*". Ms Hayward does note that a greater level of detail of the proposed farm management plans are needed to provide confidence that they will be effective mitigation. I will come back to discuss these plans further later in this section of evidence.

4. In paragraphs 19 through 40 Ms Hayward discusses changes in flow and the effects that it increased flows may have on waterway flows and quality. There is general concurrence that the most significant changes in flows will occur in those waterways draining the central part of the scheme. In paragraphs 25 and 26 of the S42A it is noted that the Lake Ellesmere/Te Waihora stream have been adversely affected by reduced flows (through abstraction) and that increased flows derived from groundwater will provide some benefit from higher base flows. In paragraph 31 Ms Hayward identifies one of key negative of the increased flow in her opinion as being increased management of drainage

networks including widening and maintenance. Ms Hayward notes that this work may have adverse effects on water quality in lowland waterways. To some extent this is speculative as drain and waterway clearance occurs now and the precise nature of any possible changes in drain management are not known. Ms Hayward goes on in paragraph 33 to note that increased drainage will result in increased loads of a number of contaminants as drains are typically unprotected from stock access and fertiliser applications. This assumes that there will be no progress made in the education of farm managers to improve stock interaction with waterways and improve fertiliser management. As noted above I will discuss 'farm plans' in a later section of this supplementary evidence.

5. The relationship between increased drainage in lowland streams and "increased sediment, nitrogen, phosphorous and microbial contaminants' is complex. In the absence of all other factors, the response is in my view not just a proportional one between drainage and contaminants. To result in increased amounts of contaminants entering those waterways, the 'available load' must also increase. In areas there is mounding but no irrigation, this may not be the case.

6. In Paragraph 33 Ms Hayward also makes the observation that "*In urban areas, increased drainage can also result in increased input of urban contaminants such as sediment, metals and hydrocarbons to urban streams*". I have assumed that the comment has been in relation to areas where groundwater recharge may result in the 'drawing down' of contaminants in surface soils within urban area. However, evidence has been put forward (and noted in Mr Hanson's S42A report) that the interaction with Christchurch City groundwater is relatively minor even though there may be some uncertainty associated with that. To result in increased input of contaminants to urban streams will in my view require very localised changes in surface water geohydrology as this interaction has to occur at or very close to the ground surface (the source of the bulk of those contaminants). No specific urban areas have been identified where this may occur and it is my view that even in small urban areas within the zone of influence of the irrigation scheme, there are unlikely to be any effects of any significance of this nature.

7. In the lowland streams, the most significant environmental issue noted by Ms Hayward in her S42A report is the possible increase in nitrate-N concentration.

There is considerable discussion on nitrate-N concentration changes in groundwater and streams in the S42A reports. Mr Hanson indicates that he disagrees with a number of aspects of the recent assessment carried out by URS (2007). Mr Hanson concluded in paragraph 88 that "*if nitrate-nitrogen concentrations in the shallow groundwater increase, then nitrate concentrations in the spring-fed, lowland streams will also increase because these comprise various proportions of discharge from shallow and deep groundwater*". He follows this in paragraph 129 of his Report by noting that he "*cannot quantify the increases in mass loading and nitrate-concentrations in groundwater. There is to much uncertainty associated with almost all of the factors that influence nitrate concentrations in groundwater*" and concludes that "the scheme is likely to cause nitrate (nitrate-N) concentrations in at least some parts of the Central Plains to increase by more than 2 mg/L, the limit set by Objective WQL2". Objective WQL2 sets a benchmark based upon the protection of the health of infants from the intake of excess nitrate-N. This limit corresponds to no more 2 g/m^3 higher than the maximum concentration recorded between 1996 and 2001 but cannot be higher than the nitrate-N MAV of 11.3 g/m^3. Although, the limit applies to only a small subset of the drinking water community it is a valid one.

8. Based on what I have presented above, there are two matters that require further comment. The first is Farm Management Plans (FMP) (as they relate to water quality) and nitrate-toxicity as it relates to the potential increases in nitrate-N concentration increases in downstream waters. I will comment on both of these.

9. Firstly in concluding his S42A Report Mr Hanson states the following and I have reproduced the statements in full because of its importance "*It is my opinion that the CPW scheme will cause nitrate (nitrogen) concentrations in groundwater to increase, and in some cases, these increases will exceed acceptable limits. However, given the uncertainties that I have discussed in my report, it is also possible that overall, increases in nitrate (nitrogen) concentrations will be within acceptable limits. The chances for this outcome will be greatest if nutrients on farms are managed to minimise nitrate (nitrogen) leaching*". I concur with Mr Hanson's comments about the management of nutrients on farms and that this should be dealt with through conditions of consent.

10. Farm management plans are considered to be an important aspect of the Central Plains Scheme. It is recognised that there is sensitivity in relation to farming intensification. When considered from a water quality/environment point of view there has been a considerable amount of forward momentum in relation to managing non-point source agricultural sources and runoff in New Zealand. However, when Officers such as Ms Hayward comment that uncontrolled farm management practices will result in environmental problems as a consequence of the scheme in areas that are not irrigated by the scheme reflects that we are a long way from having definitive and well managed New Zealand wide farm practices that prevent/minimise such issues. As such it is my opinion that the Central Plains Scheme provides an opportunity to firstly establish FMPs that can potentially be applied Canterbury wide. If this were successful this would provide widespread benefit to the region.

11. As I noted earlier Ms Hayward raised concerns about the lack of detail available to date in relation to the Sustainability Protocol. This is a typical resource consent dilemma for applicants that I have been involved in many times when dealing with environmental issues. However both Ms Hayward (Paragraph 40 of S42A Report) and Mr Hanson indicate that should consent be granted that FMPs be a subject of consent conditions. I would concur with this. However the Central Plains Scheme would also include monitoring conditions to ascertain changes in water quality (and ecology) in downstream environments.

12. I would now like to comment briefly on nitrate-nitrogen toxicity. As has been raised (e.g., in the evidence of Dr Mike Fitzpatrick at the PNNRP Chapter 4 submissions hearing) there are concerns about the direct use of ANZECC water quality triggers as standards and in their accuracy. With respect to nitrate-nitrogen Hickey (2002) published a revision to the ANZECC (2000) nitrate-N trigger values. The values were adjusted from 0.7 g/m^3 (as nitrate) to 7.2 g/m^3 as nitrate-nitrogen at a 95% level of protection. For a 80% level of protection, the concentration was identified as 12.0 g/m^3 (similar to the Health MAV). These values do not prescribe that if in-stream concentrations rise above these concentrations that adverse effects would occur. They may not. There is evidence of streams within the area of interest that do have elevated concentrations of nitrate-nitrogen but appear to have healthy stream fauna. It is evident that further work is required to define the likelihood of nitrate-nitrogen toxicity on freshwater fauna in Canterbury waterways (even in the absence of

the irrigation scheme). Dr Burrell deals with this in more detail in his supplementary evidence.

S42A RESPONSE OF DR ADRIAN MEREDITH

Clarity effects in Waimakariri River

13. In his Section 42A report, Dr Meredith raised concerns about effects of the CPW take on water clarity in the Waimakariri River (Paragraph 62) (particularly in relation to angling). Dr Meredith stated that extensive in-river gravel extraction causes localised reductions in clarity for several km upstream of the State Highway bridge, and that: *"The KMA discussion* [concerning predicted clarity effects] *is therefore flawed and unlikely to be correct."* Dr Meredith further asserted that the Waimakariri River is *"…likely to increasingly clear at lower flows, as sediments will increasingly settle out at lower flows down the length of the river"*, and that this would result in sedimentation and affect river "fishability". I will now briefly discuss why my assessment of clarity effects differs from Dr Meredith's.

14. The main point of my evidence in chief regarding clarity effects was to show that there is a close relationship between clarity at upstream and downstream sites (monitoring sites CH3 and CH4) and that this relationship does not alter as flows decrease. If gravel extraction did have a significant impact on clarity at downstream site CH4 (over an extended period covering sampling occasions), then I would expect the clarity relationship between upstream and downstream sites to be much weaker than it is (or non-existent). However, the clarity relationship between the two monitoring sites is very strong (r^2=0.86, on log-transformed data). I therefore disagree with Dr Meredith's comments regarding confounding effects of gravel extraction.

15. Attached to my evidence is a map showing the location of consented gravel extraction operations in the lower Waimakariri River. Of the nine consents identified in the Appendix, seven have conditions restricting gravel extraction to areas outside of channels with flowing water, and so are not of concern here. Of the two consents that allow gravel extraction to occur in flowing water, one consent has a clarity related condition which limits the change in downstream clarity to less than 20%, beyond a 200 m mixing zone. The effective monitoring of this is limited by the location of the monitoring sites. With sites such as CH4

being so far downstream from the activity the effects of the activity on water clarity would be unlikely to be picked up.

16. Overall, I consider that a greater issue is the potential for the CPW take to reduce flow variability and increase sedimentation in the Waimakariri River. This potential effect is discussed in evidence of Dr Mabin and in Dr Burrell's supplementary evidence. In summary, Dr Burrell concludes that the proposed mitigation of CPW ceasing abstraction during freshes at low flow periods will be sufficient to mitigate potential sediment build up in the river.

Temperature effects in Waimakariri River

17. Dr Meredith reported that the changes in water temperature at low flows in the Waimakariri River were incorrectly assessed and that the longer periods of low flow will increase the duration of periods where water temperatures are outside the environmental preferences of species and communities.

18. A number of studies have assessed the relationship between river flow and water temperature in Canterbury braided rivers (Mosley 1983; Ryder 2003; Jowett 2006). Of these studies, perhaps the best comparison with the CPW take is an assessment of the effects of the Rangitata Diversion Race (RDR) water take on flows of the Rangitata River (Ryder 2003). The Rangitata River has a mean flow of about 100 m^3/s (i.e., about half that of the Rakaia), and the RDR maximum rate of take is 30.7 m^3/s, subject to monthly varying minimum flows. Using temperature loggers placed upstream and downstream of the RDR intake, Ryder (2003) found that average and maximum water temperatures were higher downstream of the RDR intake, and variability was lower. However, the higher mean temperatures downstream did not exceed the 80th percentile of upstream temperatures, and therefore did not exceed ANZECC guidelines for protection of aquatic ecosystems. The relationship between low summer river flows and water temperature was not particularly strong; high flows were generally associated with low river temperatures, although some days with low flows also had low water temperatures (Ryder 2003). In the Rangitata River study it was concluded that biological communities are strongly structured by frequent flood disturbance events, and that flood disturbance would limit any potential temperature effects. It was also suggested that spring-fed pools or side channels may provide thermal refuges for temperature-sensitive salmonids, although the author was uncertain about the ability of fish to actively sought thermal refuges.

19. In the Rakaia and Ashley Rivers, Mosley (1983) found that water temperatures in small side channels were several degrees cooler than in major braids. These small side channels typically made up 30-40% of the total wetted area, and they are the preferred habitat of many native and introduced fish (Glova & Duncan 1985). A recent review of salmonid responses to low river flows found that fish are typically found in cooler side braids and spring-fed channels, and that a number of studies have found trout and salmon seeking refuge in these habitats when water temperatures in the main stem are elevated (Hay 2004). Based on these studies, and that of Ryder (2003), it is concluded that while low river flows may result in elevated water temperatures in the Waimakariri River, thermal refuges will remain, and temperature-sensitive species will be able to use these refuges to avoid thermal stress.

20. Potential effects of increased temperatures on fish are addressed further in evidence by Dr Glova and Dr Allibone.

PPCS Discharge into Waimakariri River

21. Dr Meredith criticised the Kingett Mitchell assessment of the effects changes in river flow on point source discharges such as the PPCS discharge as simplistic and that the assessment failed to acknowledge the tidal nature of the receiving environment and thus the ANZECC (2000) trigger values used in the assessment were inappropriate.

22. The model was revised in the S92 response (Golder Associates 2007) where ammoniacal nitrogen was the only parameter that could be modelled with certainty, due to the inconsistency between parameters monitored in the PPCS discharge and in the receiving environment. Compliance data provided by PPCS to ECan indicates that for the most part in-river concentrations of contaminants are well below the consent limits.

23. The tidal nature of the receiving environment in the lower Waimakariri River was acknowledged in the description of river habitats in the Waimakariri River report (Kingett Mitchell Limited 2006f) (I would note that to avoid confusion the reference identifiers used here are the same as those used by Dr Meredith in his report).

24. The ANZECC (2000) trigger values used in the water quality assessment were appropriate to the majority of sites assessed in the water quality report (Kingett

Mitchell Limited 2006d). No discussion was made directly comparing ANZECC (2000) trigger values with water quality in the lower Waimakariri River. I therefore do not agree with Dr Meredith's comments regarding inappropriate use of the ANZECC (2000) guidelines. Notwithstanding this fact, I consider the primary issue at hand is potential adverse effects of the discharge, which I will now discuss further.

25. Dr Meredith refers to the complaints made by recreational users of the lower Waimakariri River regarding "growths and discolourations" due to localised and widespread nutrient enrichment effects. Dr Meredith does not specify whether these complaints were directly attributable to the PPCS discharge or the time periods when they were made. It is worth noting that until April 2006, both the Rangiora and Kaiapoi wastewater treatment plants discharged into the lower reaches of the Waimakariri River. Kingett Mitchell undertook the biomonitoring of these discharges between 2005? and 2007, including several months following the cessation of the discharges and we are well aware of the potential for growths to occur in the lower reach of the river. However, without further analysis of the complaints made, locations of the growths (PPCS and the former WWTP discharges occur on opposite sides of the river) I cannot concur with Dr Meredith's statement.

26. It had been hoped that the 2007 PPCS compliance data/report would have been available from ECan prior to the preparation of this evidence. However, an initial look at data from October 2004 and January 2006 shows that in river concentrations at compliance monitoring sites are well below consent limits, except for several occasions in January 2006 when faecal coliform numbers were up, attributed to problems with the Kaputone Woolscour Ltd effluent treatment, whose effluent combines with PPCS prior to discharge.

Reservoir Water Quality

27. Dr Meredith identifies a range of concerns in his S42A report in relation to the formation of the Waianiwaniwa reservoir. He specifically discusses the following matters in his report: stratification and anoxia; nutrient enrichment, algal blooms, turbidity, and coal mine inundation. Dr Meredith also provides comments on water quality monitoring in the reservoir. I will comment below.

Oxygen

28. Dr Meredith states that the likelihood and consequences of reservoir water stratification and deoxygenation have been under-estimated and inadequately planned for. He also states that monitoring and treatment systems need to be more explicit.

29. The water quality report (Kingett Mitchell 2006d) reports that the reservoir is expected to stratify during most years. It then describes when stratification is most likely to occur (spring and summer) and explains that the volume of deoxygenated waters, as a result of stratification, will be greatly reduced as the reservoir water levels will be lowest in summer, thus reducing the volume of stratification.

30. I do not agree with Dr Meredith's comments that water quality issues in the reservoir have been under-estimated. The water quality report clearly states that issues with water quality, especially in the first 5-10 years of operation, can be expected. The water quality can be expected to be of an adequate level for irrigation, but that enhancement measures would be likely to be required should the reservoir be managed for other purposes, such as aquatic ecosystems and recreation.

Monitoring

31. It has been proposed that two monthly monitoring of water quality will be carried out for a range of key parameters. This data will provide useful long term data on lake status. Dr Meredith has identified his concerns that monitoring of the actual state of the reservoir water body is required. Monitoring requirements must fulfil the objectives that are identified for the monitoring programme that they have established for. Dr Meredith has noted that there are a wide range of water quality changes and conditions that may occur in deep waterbodies that might in themselves initiate changes in water quality within the reservoir and hence in discharges from the reservoir or changes in the biological conditions within the reservoir. These scenarios are acknowledged. As noted by Dr Meredith, reservoir management in New Zealand has a relatively long history. It is acknowledged that water management in the reservoir needs to be responsive. As noted in the S42a Report, although water abstraction strategies may be valuable in the extraction of better quality water from within the reservoir (e.g., using variable height abstraction), water quality monitoring (other than that proposed as a part of the

two monthly programme) may be required to assist in this management. This additional monitoring will need to be a condition of consent. The specific design of the monitoring/management system will require to be evaluated as a condition of consent.

Nutrients

32. In Section 134 of the S42A Report, Dr Meredith comments on the effects of nutrient enrichment in the reservoir. This was a matter identified and considered. A range of mitigation measures were identified (and summarised by Dr Meredith) and Dr Meredith then stated that there was a contradiction between removal of trees and the cessation of grazing. I would note that the strategy is one of limiting as far as possible the pool of available nutrients to enter in he short and long term the waters in the reservoir. The strategies identified all aim at extracting nutrients and removing them out of the existing catchment nutrient pool (both in terms of total mass and the readily available pool). As such undertaking cut and carry operations following cessation of grazing is considered a further active mitigation measure. It is recommended that a specific reservoir catchment management plan prepared that deals with the works/management required to prepare the catchment environment for flooding to minimise environmental issues that might arise and maximise environmental benefits.

Blooms

33. Dr Meredith identifies the risks associated with cyanobacterial blooms in waterways. This was acknowledged in previous reports and has been recognised. There are a number of options for monitoring. Any monitoring that is carried out needs to be able to recognise the presence of cyanobacterial blooms via algal recognition or chemistry. As stock may have access to the water derived from the reservoir the potential for such blooms will need to be recognised and built into monitoring.

Turbid events

34. Dr Meredith raises in paragraph 139 of his S42A report the possibility that through a turbid event in the Waimakariri River that the intake may discharge turbid water to the reservoir. This may well occur but I am of the opinion that this is unlikely to be a significant occurrence both in terms of frequency of

occurrence and scale. As noted by Dr Meredith it is likely that operating levels will influence the extent or turbidity (in conjunction with wave/wind climate on the lake). I concur with Dr Meredith that management of lake level drawdown will assist significantly in managing lake turbidity. As such I would recommend that a reservoir level management plan be developed as a condition of consent. This level management plan would not be developed till the reservoir had been constructed as it will require real data to develop a robust pragmatic plan.

35. In addition, I agree with Dr Meredith that as proposed by the Applicant that access to the reservoir by stock and any activity that would result in disturbance of the lake edge should be limited.

Coal mine effects

36. Coal mine effects were identified in the assessment of effects for completeness. As noted in the S42A report the issues presented by the historic mining activity lead to the need for further emphasise on the management of water quality and environment. Overall, it is unlikely that significant water quality issues will ensue from the presence of historic mining in the reservoir catchment.

Overview

37. Overall, Dr Meredith notes in Paragraph 153 of his S42A report that there are a variety of ways that water quality in the reservoir can be degraded and that the applicant has not proposed any mitigation to deal with these concerns (but notes mitigation to deal with other aspects of water quality). This is not the case, both Dr Meredith in his S42A report has discussed mitigation and the Applicant has discussed a number of mitigation options. As noted by Dr Meredith, the Applicant will need to produce and distribute irrigation water of sufficient quality that it can be distributed through the reticulation system and be irrigated to pasture/crops. The ANZECC (2000) irrigation standards may be of assistance but may not be sufficient in relation to the reservoir usage – this should be confirmed. In addition, as described earlier some further monitoring may be required to ensure that sufficient monitoring data is available to ensure that the data can be utilised for reservoir water quality management.

CONSENT COMPLIANCE

38. In the preceding sections of my evidence I have described the activities associated with the CPW scheme. Those activities are required to comply with the Resource Management Act and in particular Section 107 which relates to restrictions on the granting of discharge consents. In assessing compliance with the relevant statutory documents I will consider the activities against the requirements of:

- The National Water Conservation Order (Rakaia River) Order 1988.
- The PNNRP (ECan 2004a).
- The Waimakariri River Regional Plan (ECan 2004b).

RAKAIA RIVER NWCO

39. The Rakaia River National Water Conservation Order (CO) requires that water rights may not be granted for any discharge to the Rakaia River downstream of its confluence with the Wilberforce River or any part of the river specified in the CO if they breach any of the provisions and standards set out in Clause 2(a) and Clause 2(bi) through through 2(bvii) of the CO. I will discuss each of these parts of the CO in respect of the activities that relate to the Rakaia River.

40. Clause 2(a) requires that any discharge be substantially free from suspended solids, grease and oil. Grease and oil might only arise during construction of the intake on the Rakaia River. However good management practices during the operation of machinery will ensure that such losses are managed and I do not see that construction activities will pose any significant risk and as such the discharge will be substantially free from grease and oil. This clause also requires that any discharge be substantially free from suspended solids. During construction of the intake on the Rakaia River, works will be managed to ensure that any pumped water or stormwater discharge is substantially free from suspended solids. Compliance with this clause will be managed through best practice supported by good on-site management (specifically management plans and physical controls).

41. Clause 2(a) also influences the management of the sluicing operation at the Rakaia Intake. It is intended that sluicing would occur using a method similar to that to be used on the Waimakariri intake. That is, sluicing and discharge of sediment removed at the intake at times of high flow in the river when suspended solids concentrations are high. That is, a process whereby

sediment removed from the river is discharged back to the river. It should be noted that the discharge of water back to the river as a part of the sluicing operation does not add through discharge any suspended solids that were not already a part of the suspended solids load in the river. Although this method is the primary option considered for the management of sediment accumulated through the take of river water, the options considered for management are as follows:

- The physical excavation of sediment from the intake, forebay and sedimentation pond.
- The discharge of water and associated accumulated sediment back to the river at appropriate high flows.
- The discharge of water and associated accumulated sediment back to the river via an offline sedimentation pond and wetland prior to entry into the river.

42. It is my opinion that the first and last options would comply with the provisions of clause (2)(a) of the CO.

43. Clause (2)(b) requires that after reasonable mixing that the discharge should not breach standards (2bi-2bvii) for:

- temperature;
- pH;
- tainting and stock use;
- effects on aquatic biota;
- no conspicuous change in colour and clarity;
- maintenance of dissolved oxygen concentrations; and
- maintaining faecal bacterial numbers below 200/100 mL.

44. I have reviewed the standards in clauses 2b1-2bvii and do not consider that the discharge of sluicing water would result in breaches of the standards set out in the CO. I would note however, that clause 2(a) and clause 2(b) both contain reference to suspended matter. As noted above clause 2(a) indicates that all

discharges should be substantially free from suspended solids. Clause 2(b) then indicates hat “the natural colour and clarity of the water shall not be changed to a conspicuous extent”. The former applies to the discharge and the latter to the receiving environment.

45. Sediment management at the intake will need to be carried out in a manner that does not breach the requirements of the CO. In my evidence in chief I discussed sluicing of sediment at high flows to return sediment removed from the river back to the river (The Rakaia or the Waimakariri). It was concluded that sediment return at high flows would be the most appropriate approach. I note that it may be necessary to utilise pond/wetlands to manage discharge as is the case with bywash. In addition some mechanical removal may also be required at times when flood flows are not available for sluicing. The removal of sediment collected from the intake water can be carried out using a variety of options including passive removal and active mechanical removal.

WAIMAKARIRI RIVER REGIONAL PLAN OCTOBER 2004

46. The Waimakariri River Regional Plan (2004) which was developed to achieve integrated management of resources especially in relation to discharges into the Waimakariri River. The Plan contains a range of policies that aim to protect water quality in the Waimakariri River. These include Policy 6.2 which promotes better land management practices as an aid to water quality improvement.

47. The Plan also identifies a number of water classes within the catchment. Most of the Central Plains Scheme lies with a part of the catchment with a NS (Natural State) classification. However, the majority of the land within the catchment of this area is not in a natural state. The land has been modified predominantly for pastoral activity. As such the water quality is affected by the surrounding land use activity. The NS classification requires that the water quality not be altered. The Plan requires that after reasonable mixing the waters of the Waimakariri River remaining essentially in their natural state. It is my opinion that with significant on-site management practices (embodied in plans) that for construction and operational activities, the NS Water Class can be met after an allowance for reasonable mixing.

48. In contrast the lower part of the Waimakariri River catchment is classified WAIM-TRIB. This classification contains a number of specific management

standards in relation to water quality. These are specified in Rule 6.1(ii) of the Plan. I have reviewed the standards in that section of the Plan and am of the opinion that the Scheme will not result in impairment of those standards where they are not impaired already. Although with respect of one specific item identified under this Class, I am of the opinion that the activities associated with the scheme are not likely to result in “statistically measurable impairment of the reproductive ability of fish”, I am unable to provide evidence to support my comment. I would note that proving that the ‘standard’ has been met is a significant undertaking and I am unsure whether it has ever been undertaken as a requirement of that section of the Plan.

49. I would note that with the formalisation of the PNNRP following resolution of the hearings and appeals will result in the water classes as set out in the PNRRP replacing those that were identified in the Waimakariri River Regional Plan.

PNRRP

50. The Proposed Canterbury Natural Resources Regional Plan (PNRRP) identifies waterways within the area influenced by the proposed Scheme as falling into Class ALPINE, Class HILL or Class INLAND. In the PNRRP Table WQL5 and Schedule WQL1 define the numeric outcomes and standards for the classes. The PNRRP is currently proceeding through the hearing of submissions on the various chapters. The hearing of submissions on Chapter 4 (Water Quality) has already occurred and significant submissions have been made in relation to the content of Chapter 4 in particular the technical content of Table WQL5 and Schedule WQL1. Although, at this stage, my assessment can only compare and assess the activities in relation to what is in the PNRRP, a number of aspects of Chapter 4 including the Class standards are highly likely in my view likely to change.

51. A range of applications have been lodged that involve discharge to a range of waterbodies across the scheme area and also to the Waimakariri and Rakaia Rivers. I have I have reviewed the activities associated with the consent applications lodged and assessed those activities against the standards for the water Classes involved. It is my opinion that with good on-site management practices during construction (including sediment and erosion control plans; stormwater quality plans where required etc.,) that discharge quality from the individual construction sites can be maintained at a high level.

52. Examination of the standards identified under Class ALPINE for example shows that during construction (e.g., of intakes) nearly all standards should be met without recourse to treatment or discharge management. Standard 2.1(e) [visual clarity] will require specific management to ensure that the standard of not more than a 20% reduction in water clarity outside the zone of non-compliance. Standard 2.1(o) will also require good on-site management practices (In terms of hydrocarbon control) to ensure that activities do not result in conspicuous oil or grease films etc. As such, discharges associated with the construction of water intakes (e.g., on the Waimakariri River) would be a discretionary activity in my view. Likewise other construction activity involving HILL or INLAND Classes should also follow the same pattern of compliance with standards.

53. During the operational phase of the project, examination of the activities and the standards in the water Classes indicates that most will be met. I would note that because of concerns regarding the management of bywash water, that bywash discharges all pass through treatment pond/wetland systems to ensure that the requirements of the Plan after mixing are met.

54. The PNRRP has in all water Classes a number of standards relating to nutrient additions to waterways. The primary standards in most classes relate to average annual concentrations of soluble inorganic nitrogen not increasing by more than 0.02 g/m^3 and soluble reactive phosphorous not increasing by more than 0.002 g/m^3. Standards are also included for total ammonia but these are not considered to relate to operational discharges of the scheme (such as bywash). Nutrients may enter the race system but it is intended that Farm Management Planning should assist in minimising the potential for nutrients to enter the races and hence be discharged potentially as bywash. However as I noted earlier a number of questions have been raised in submissions presented to the PNRRP hearing relating to the technical usability of these standards.

55. Although, when assessing many of the activities for which discharge permits have been applied for it was evident that many of the activities would in my opinion be categorised as Discretionary Activities, uncertainty about compliance with those standards in the PNRRP such as the nutrient standards means that the activities are categorised as Non-Complying Activities. This point has been made in the Supplementary evidence of Mr Daniel Murray on behalf of the Applicant.

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