Tabled at Hearing 30/09/2014

Submission on Variation 1 to the proposed Land and Water Regional Plan

Background

1. My name is Ian McIndoe. I have prepared this document to support the submission I made on Variation 1 of the proposed Land and Water Regional Plan.

2. In 1981, I purchased 8 ha of land at 102 Tricketts Road, West Melton and have been living there since 1984. Also in 1984, I had a bore drilled (M35/3393, 55.8 m deep) to provide water for domestic, stockwater and irrigation and have irrigated my land from that bore since 1986 (28 years).

3. I obtained a water right from the North Canterbury Catchment Board (NCCB) in 1986 to irrigate with an average daily flow rate of 5 l/s. The water right had to be renewed about three years later because it had been mistakenly placed in the wrong zone (an NCCB administrative error). When renewed as NCY890622, it was granted for a ten year period. That was subsequently renewed as CRC010875, which expires in 2039.

4. NCY890622 was granted with conditions that required the take to be reduced according to restrictions that became known as the West Melton trigger levels.

5. I opposed the trigger levels in 2001 when I applied to Canterbury Regional Council to renew consent NCY890622. In my application, I had met all CRC requirements except agreeing to the trigger levels. Even though I had been irrigating since 1986, I was required to get written approval from neighbours potentially affected by localised interference from my pumping, some of whom had moved into the district many years after I began irrigating.

6. In 2004, after I had been operating under S124 continuation for about three years, Mr Leo Fietje from CRC rang me and asked me if I would agree to the trigger levels, so he could process my consent. Although I was prepared to go to a hearing over the issue, I agreed to the restrictions provided that my opposition was recorded in my file and that at the appropriate time, the matter would be appropriately addressed by CRC.

7. I actually supported the removal of trigger levels in the 2002 draft Natural Resources Regional Plan, on my own behalf and on behalf of the West Melton Residents Association. The trigger level removal was proposed by CRC at that time as I remember.

The history of the trigger levels

8. I have read Variation 1, the S42a report and the Section 32 report and the only reason that that I can see that CRC is proposing to formalise the trigger levels into the Plan is one of convenience. It is the easiest option for Council. The policies and rules in the Plan already address the issues as I will outline below. None of the authors of Variation 1, the S32A report

and the S42a report including Dr Williams Appendix D, have explained why the trigger levels were imposed in the first place and what problem is being addressed by retaining them. All that is stated is that West Melton is a "hot spot" and that the trigger levels were implemented to protect bores used for domestic, stockwater and community water supply from interference effects and impacts on reliability caused by irrigation.

9. The trigger levels were first introduced in 1990 or 1991. Also introduced in the Transitional Regional Plan (TRP) was the complete removal of a permitted take for irrigation in the West Melton Special Zone (WMSZ). Any take, no matter how small, required a resource consent. I am pleased to see that in Variation 1, a permitted take of 10 m^3/day has been reintroduced. In my view, there was absolutely no justification for removing it in the first place.

10. While the WMSZ did get a mention in the TRP, that was only in reference to not allowing a general authorisation for irrigation takes in the zone. The trigger levels were not included in the TRP.

11. The trigger levels were not included in either the Natural Resources Regional Plan or in the proposed Land and Water Regional Plan.

12. A draft Christchurch-West Melton Groundwater Management Plan was prepared by CRC in 1993 and circulated for comment, but it was never completed. It stated that the trigger levels were derived primarily from the consideration of individual water right applications, with no opportunity for widespread public consultation. This was noted by the Planning Tribunal when considering one of the Applefields applications for consent for irrigation in Yaldhurst.

13. The 1993 draft Christchurch-West Melton Groundwater Management Plan proposed conservation levels for groundwater management in the Christchurch-West Melton area. Following an analysis of bore depths and water levels, the Zone boundaries were redrawn, some bores no longer used for level monitoring (such as M35/5696) and the low water level limits on the ones that were retained were lowered.

14. I supported those changes at the time, but the Plan was not implemented as far as I know.

The introduction of the trigger levels

15. Three things led the NCCB to introduce trigger levels.

16. The first was the development of apple orchards by Applefields on the outskirts of Christchurch in 1986-1988. There was a large amount of public fear that Applefields irrigation takes would seriously deplete the aquifers in the Yaldhurst region, and affect Christchurch water supply. The Applefields applications for water had gone through a notified water right process, including in one case, the Planning Tribunal, as mentioned above.

17. The second was that Central Canterbury experienced a 1:100 year drought in 1988/89. There had been little or no groundwater recharge in 1987 or in 1988 and groundwater levels fell to unprecedented lows. It was the first time that many residents had experienced such low groundwater levels. Groundwater levels were at record highs in the late 1970's. Many of the lifestyle blocks in places like West Melton had been created in the late 1970's and early 1980's and wells were only drilled as deep as they needed to be at the time. A significant number of bores went dry during the 1989 drought. Irrigators got the blame for the decline in groundwater levels.

18. The third was in response to a consent application submitted by Mr Robin Wilson for 26 l/s of water to irrigate 88 ha of land in West Melton and the fear that such a 'large' take would significantly affect neighbouring properties and groundwater levels in general.

19. Judging by the reporting in the Christchurch Press and in the local newspapers in 1989, there was a very strong public perception that not only was irrigation the cause of the low water levels and wells going dry, but that Christchurch City water supply was being threatened by irrigators from Yaldhurst and West Melton. That was despite the fact that during 1988/89, irrigated area in the district was relatively small. As a result, property values dropped, and real estate agents warned people away from the district because West Melton was "seriously short of water".

20. Another reason was anecdotal and often discussed in the district. It was that the existence of catchment boards was under threat, that they would disappear or be amalgamated into the local councils. The perception was that the NCCB used the water issue to show that they were "managing the water situation" and protecting Christchurch's water supply. In public meetings held to announce the implementation of trigger levels, the NCCB "laid down the law". We were told by NCCB staff that all irrigators had to accept the trigger levels, and if they didn't, they would be prosecuted. The trigger levels were forced upon us. There was no public consultation.

Groundwater level patterns in the zone

21. The Technical Review of the effectiveness of the existing groundwater management regime operation in the West Melton Special Zone carried out by Pattle Delamore and Partners in 2011 (CRC Report R11/125) describes the concerns that were raised with respect to drawdown interference issues in the Yaldhurst, West Melton and Weedons area. The report also says that the level of concern was enhanced by a declining pattern of groundwater levels from 1974 to the mid 1980's.

22. The problem with that statement is that it is highly dependent on the data selection period. To illustrate the problem, I present the bore water levels for M35/1080 for the period 1974 to 1885 in Figure 1 and then from 1971 to 1992 in Figure 2. I have chosen this bore because it has a long record (back to 1952 in fact) and is located between West Melton and Yaldhurst.

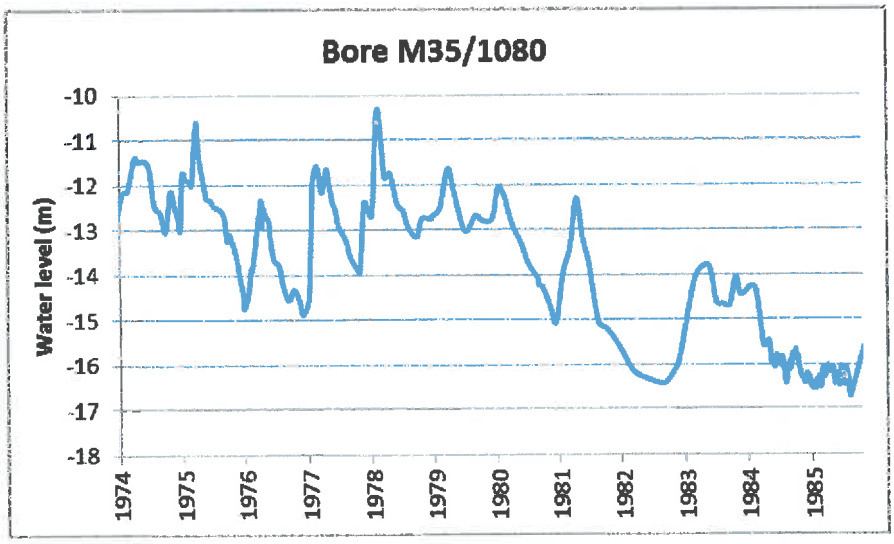


Figure 1: Bore water levels from 1974 to mid 1980's as per PDP report

23. This record shows a declining trend in groundwater levels and is typical of data presented at the time by NCCB to support their view that water levels were declining. One of the problems was that water level measurement in many bores in Canterbury only began in 1974. Bore M35/1080 actually has a longer record (which NCCB had at the time).

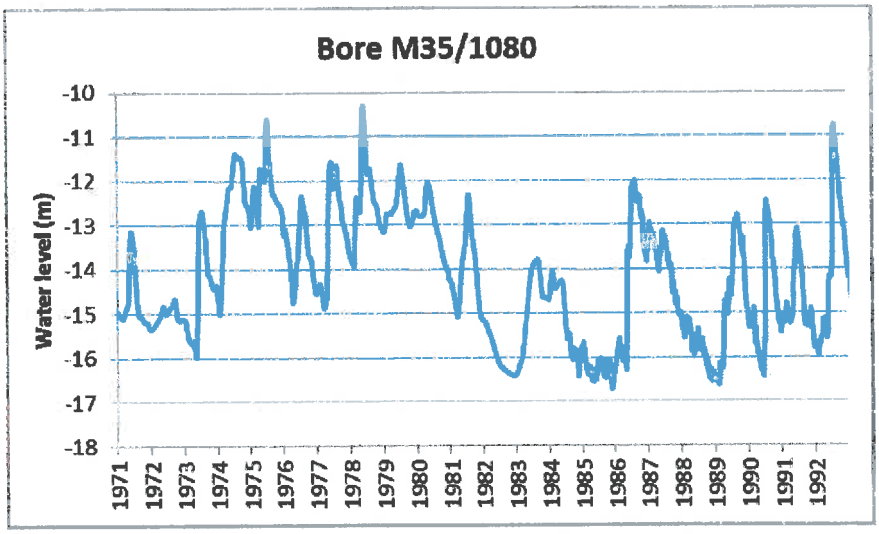


Figure 2: Bore water levels from 1971 to 1992

24. A completely different perception is gained by considering a longer record. Water levels were in fact at record highs in 1978, and near record lows in 1989 during the 1988/89 drought. But, they had recovered by the time the trigger levels were implemented.

25. At the time the trigger levels were proposed, I had formed a very good understanding of the groundwater situation. I have been recording water levels in my bore since about 1988, sometimes daily for several months and had gained an extremely good insight into what caused water levels to rise and fall. I have also been recording rainfall since 1986.

26. In about 1990 when trigger levels were first proposed, I provided some of my early bore and rainfall data to Dr Vince Bidwell and he ran the data through his newly developed eigenmodel. Dr Bidwell and I concluded that climate, or more correctly recharge, was driving groundwater levels in West Melton, as it does over most of Canterbury. Irrigation was having very little effect.

27. It was obvious to me that it would have only been a question of time until shallow bores in the district went dry. The natural water level fluctuations in the West Melton – Aylesbury – Kirwee regions are substantial and much greater than I expected – 20 m in the deeper bores in West Melton, 30 m in Aylesbury and 40 m in Kirwee.

28. I concluded that even though West Melton was known as an area with relatively low yielding bores, there was no shortage of water provided that bores properly penetrated the aquifers to overcome the naturally high fluctuations in water levels.

29. I also concluded that some of the problems were due to direct localised interference effects of irrigation pumping on neighbouring bores but if bores properly penetrated the aquifer, there would not have been a problem.

30. I had many lively discussions over these issues with NCCB staff at the time. I was chairman of the local water users group and advising the West Melton Residents Association. I wrote articles in local papers such as the West Melton News where I presented the facts on the water situation to reassure West Melton residents that the district was not "short" of water and that if wells were deepened, there would not be a problem. As you can imagine, I did not receive any support from NCCB for my views.

31. The reasons given in the PDP (2011) report for the trigger level management approach included:

32. *"It allowed for future development of the groundwater resource."* I would have thought that restrictions/ potential unreliability would have discouraged development of the resource for irrigation.
33. *"It provided certainty and protection of domestic and stockwater bores."* In fact it didn't because lack of recharge could still result in shallow bores going dry regardless of irrigation restrictions.
34. *"It provided a clear statement as to the standard of construction required for any new bore."* I don't see how trigger levels would do that. If the statement is a reference to installing bores to an appropriate depth, most people putting in bores for domestic and stockwater supply would not have heard of the trigger levels. The well drillers have been the ones that have largely controlled the depths of bores in the region.

35. *"It prevented the possibility of long-term depletion of the groundwater resource due to over abstraction."* That would only be true if irrigation pumping is solely responsible for groundwater depletion. That is not the case, particularly given the residential development that has occurred in places like West Melton.

36. I don't believe that West Melton district warrants its "special" status. Bore density for domestic takes and public water supplies is relatively high, but it is similarly high in other parts of Canterbury. The majority of irrigation consent holders in the district are lifestyle block holders, who practise what I call strategic irrigation – only irrigate when they really have to, because the cost of pumping is high.

37. The main purpose of irrigation in the Zone is to maintain small horticultural crop areas (nuts are grown in the district for example) and to grow grass to feed livestock. The Applefields orchards have been converted into residential subdivisions. The 32 ha of black currents that were irrigated on Tricketts Rd have long gone and the area divided into 4 ha lifestyle blocks. The market gardens in the district have largely gone.

38. The shallow bores have been deepened; I have not heard of bores going dry in recent years. I know there are one or two bores that are still too shallow and they may go dry in the future.

39. There is no evidence whatsoever of a continuing decline in groundwater levels. I present water levels for my bore M35/3393 in Figure 3 below.

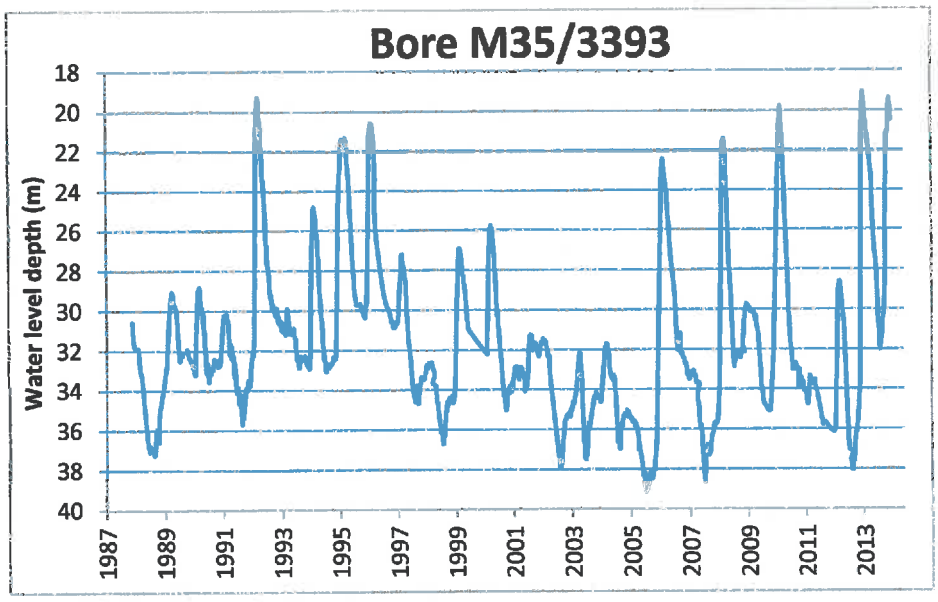


Figure 3: Bore water levels for M35/3393 from 1988 to 2014

40. This record illustrates the impact of rainfall recharge on water levels. In particular, it shows low water levels following little or no recharge in 1988, 2005 and 2007, high levels following the 1992 snow storm, the high recharge in the mid 90's, and high recharge in the last two years for example. There is definitely no downward trend in groundwater levels.

41. Note that the lowest levels I have measured were in 2005 and 2007, driven by the lower than average recharge from about 1999 through to 2006. This trend has been well-documented by groundwater experts. Since 2006, the trend has been up, although the low recharge in 2001 did have an effect on levels. Overall, the groundwater level patterns are entirely consistent with water level patterns seen in most of Canterbury.

42. The water levels in Bore M35/5696, (M35/5696 is the trigger level bore attached to my consent), follow an almost identical pattern to my bore, except that the lowest levels did not occur in 2005. The lowest levels occurred in 2013, which is inconsistent with general water level patterns in the district. This can only be caused by localised interference effects, and is possibly seeing the effects from the public water supply bores. Despite CRC saying that full restrictions have never been reached, the low level in 2013 would have put consented takes tied to that monitoring bore on 100% restriction.

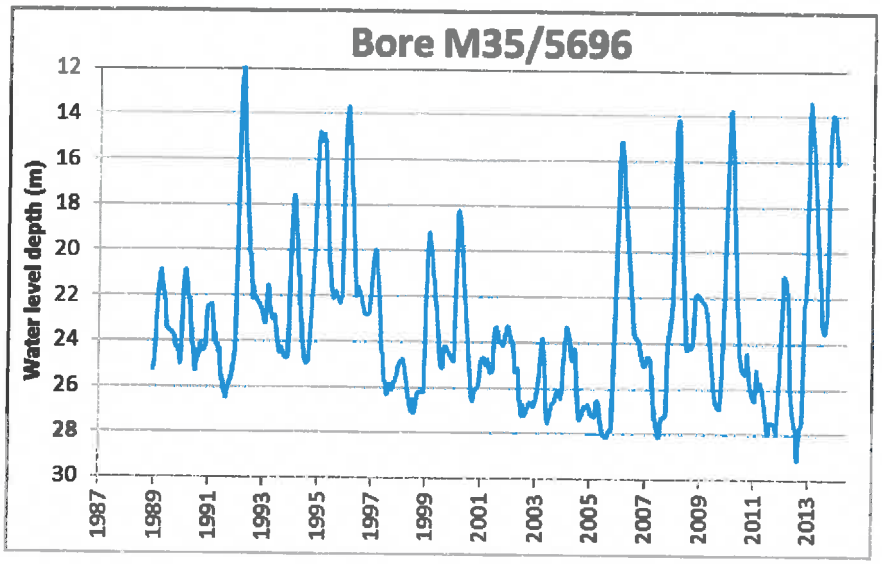


Figure 4: Bore water levels for M35/5696 from 1989 to 2014

Key pLWRP policies relevant to the WMSZ/ trigger levels

43. Three key questions need to be considered.

    a) Are groundwater levels regionally being managed?
    b) Are localised interference effects being addressed?
    c) Are bores properly constructed and fully penetrating the aquifer.

44. The pLWRP has policies and rules that address these issues.

45. Regional groundwater levels are dealt with through groundwater allocation limits and consent allocations (Schedule 13). The WMSZ straddles two groundwater allocation zones –

the Selwyn Waimakariri zone (Table 11 pLWRP) and the Christchurch West Melton zone. Both are fully allocated, so there will not be any new consents granted.

46. The majority of the WMSZ is in the Christchurch-West Melton groundwater zone where water supply is sustained by the Waimakariri River. Groundwater allocation limits and management in the Christchurch West Melton sub-region will be reviewed in due course, I'm sure.

47. I note that the S32 report (p190) states: *"The proposed water allocation limits to be introduced by Variation 1 into the Selwyn Waihora section of the pLWRP (see section 11.7.1) are set to ensure a sustainable level of groundwater abstraction to deliver improved flows in the lowland streams. The West Melton Special Zone groundwater management regime may become redundant once the water balance in the area is restored."*

48. The S32 report also states *"Interventions for improving the water balance in the Selwyn Waihora sub-region – importing Alpine water and replacing deep groundwater takes in the upper plains – is a long term solution to address over-allocation of groundwater and will not deliver improvements in the short term."*

49. The water supply zone to Christchurch City has been conservatively mapped by CRC and it is no accident that it forms the boundary between the Selwyn-Waimakariri and Christchurch-West Melton groundwater allocation zones. In my view, while I agree that the introduction of Alpine water will certainly increase lowland stream flows, it is unlikely that it will have more than a very minor effect on West Melton groundwater levels because of the location of recharge and the general direction of groundwater flow. We will know in due course.

50. The West Melton trigger levels are nothing to do with allocation. Very few consents in the WMSZ currently have allocation limit conditions, but water use by irrigators in the district is so small that it is unlikely that any of the takes will ever reach their allocation limits even if they had them. The fact is, with a very few exceptions, the majority are for lifestyle blocks and lifestyle blocks do not require allocation limits of the same magnitude as properties that are fully irrigated. I expect that when consents are renewed, Schedule 10 – Reasonable Use Test will result in many of these consents receiving reduced allocations.

51. Localised interference effects are addressed in the pLWRP under Schedule 12. Adequate penetration of the aquifer is also addressed in Schedule 12. Because specific depths for adequate penetration are not presented in the pLWRP, Clause 2 (a) and (b) applies, as follows.

"For a bore to adequately penetrate the aquifer, an adequate penetration depth shall be determined as follows:

2. For aquifers where the depth is not specified in Sections 6 to 15:

a. either a depth below the calculated minimum water level, or below the level to which 50% of bores within 2 km penetrating the aquifer are already established at 1 January 2002, whichever is the deeper; or

b. *a depth determined by the application of the best available technical information and/or advice to be an adequate penetration depth.*

Where an existing bore inadequately penetrates an aquifer, the interference effect of a new bore will be assessed as if the existing bore is also adequately penetrating."

52. For my bore, the CRC calculated minimum water level (Calcmin) is 29.80 m. If I had installed my bore to say 32 m in Aquifer 1, it would have gone dry in 14 of the last 27 years. Clearly Calcmin is an unreliable guide to appropriate bore depths, as are the trigger levels.

53. I don't know what the 50 percentile depth of bores within 2 km of my bore would be, but I know that most are in Aquifer 2 at 55-65 m depth. Interestingly, the PDP (2011) report, Table 4, states that 93% of bores in the M35/5696 zone are below the 3rd trigger level. In fact significantly more than 50% of bores in all of the zones are below the trigger levels. The lowest percentage is for M36/0217, which has 74% below the 3rd trigger level. The 50th percentile level as per Schedule 12 2(a) will be substantially deeper than the M35/5696 3rd trigger level. What that tells me is that if Clause 2(a) (excluding Calcmin, which is unreliable) was applied, the adequately penetrating bores would be all in Aquifer 2 and would not have any issues with low groundwater levels and very unlikely to have any issues with interference. It seems that using trigger levels as an indication of adequate penetration is highly likely to be inconsistent with Schedule 12 2(a).

54. I would say that Schedule 12, 2(b) has been the default for the region.

55. I see that the S32 report (p190) states that the approach for managing bore drawdown interference in the pLWRP (Schedule 12) could be seen to supersede the need for low groundwater level triggers in the West Melton Special Zone (PDP 2011). The S32 report then states that an argument against this is that the well interference policy in the pLWRP is not retrospective so would not be applied to existing consents when they are renewed. I don't know whether that is correct, but I do know that all groundwater consent applications go through a rigorous interference effects assessment when applications are made.

56. The S32 report (p190) states: *"The main reason why terminating the WMSZ groundwater management regime is not an effective option for achieving community outcomes is because the risks to domestic, stock water and community supply bores are not easily quantified. These takes may be inadequately protected if the trigger level restrictions for consented takes are removed."*

57. First of all, the risks to domestic, stockwater and community supply bores are easily quantified. We have about 30 years of water level data, so we know what the highs and lows are. Numerous aquifer tests have been completed. We have a very good understanding of the groundwater system. Community supply bores are adequately penetrating the aquifers. Trigger levels in general won't protect shallow bores that do not adequately penetrate the aquifer. Interference effect assessments, due to the methodology used, will always significantly over-predict interference effects in areas like West Melton and

Yaldhurst, as CRC groundwater experts know. Applicants for consents will probably have to carry out aquifer tests to prove that assessed effects are over-estimated.

The trigger levels

58. I now turn to the issue of the trigger levels themselves. The PDP report p7 states that *"the lowest trigger levels appear to be reasonably based ....."*. The report also states that *"The trigger levels therefore seem to support a depth at which domestic bores can achieve a realistic water supply"*.

59. It is important to understand that there is absolutely no issue in obtaining enough water for a domestic water supply in this zone or in fact anywhere else on the Canterbury Plains. It is just a question of how deep to install the bores. In the West Melton area, there are two aquifers. Aquifer 1 is shallow, typically 20-30 m deep. Aquifer 2 is deeper at 55-65 m. Since the 1988 drought, bores have generally been installed into Aquifer 2. If they haven't, they should have been.

60. Natural water level fluctuations increase with increasing distance from the coast and usually with depth. Figure 5 presents water level fluctuations versus distance for each of the monitoring bores.

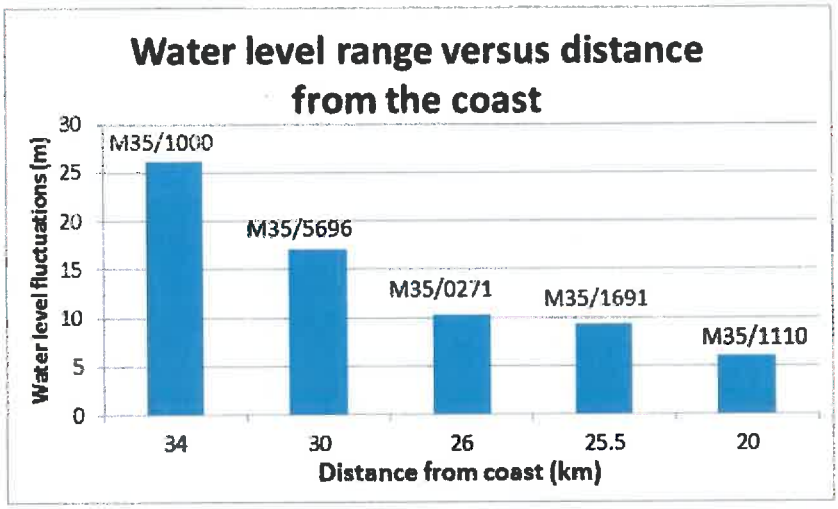


Figure 5: Water level fluctuations for trigger level bores

61. The water level in my own bore M35/3393 fluctuates 20.6 m and is about 32 km from the coast, so is entirely consistent with the observed pattern. Given this relationship, and given that obtaining a domestic water supply is not limited by the availability of water in the aquifers, it would be reasonable to expect that the trigger levels would follow a similar pattern to water level fluctuations and lowest water levels if they were intended to control the effects of irrigation pumping on domestic bores. However, they do not follow any particular pattern.

62. Figure 6 presents the relationship between trigger level range (the difference between the 1st and 3rd trigger levels) and natural water level fluctuations.

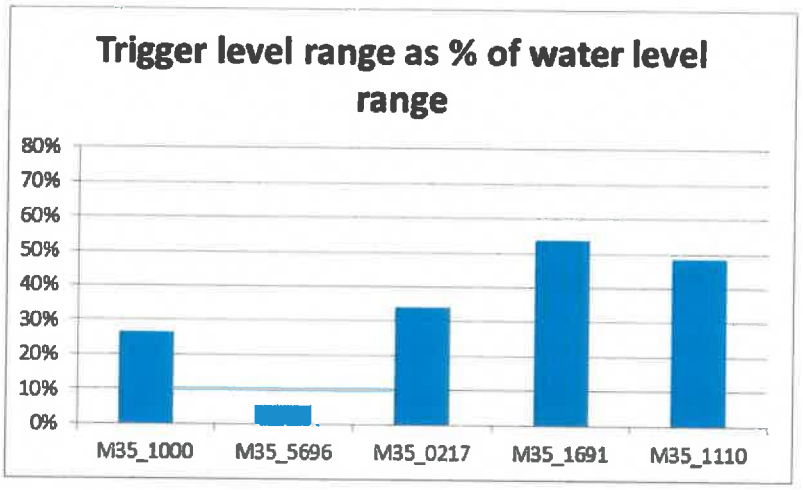


Figure 6: Comparison of water level range and trigger level range

63. It shows that there is no pattern between water level fluctuations and trigger level range. M35/5696 has a very small trigger level range compared to the other bores.

64. Figure 7 compares the trigger levels for each bore with lowest measured water levels.

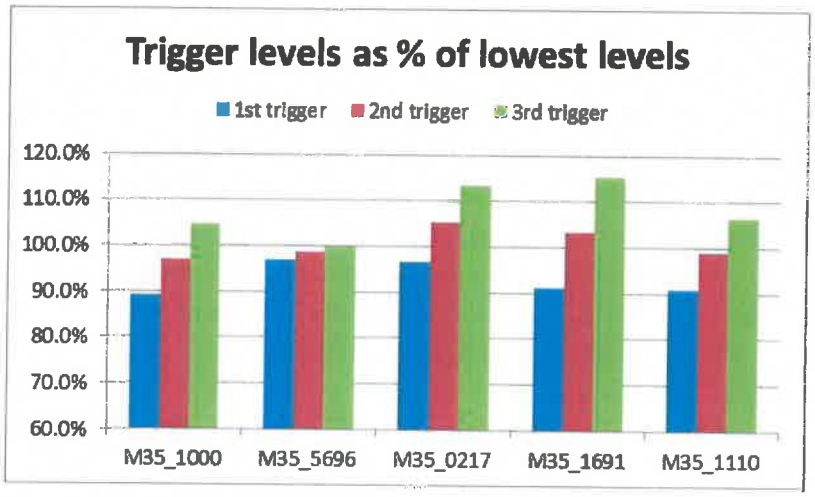


Figure 7: Trigger levels relative to lowest measured water levels

63. This graph shows very clearly that again, there is no consistent pattern between the trigger levels, with M35/5696 being the only bore with the 3rd level (the point at which irrigation takes must completely cease) being equal to the lowest measured water levels.

The problem with M35/5696

64. So why are irrigation takes attached to bore M35/5696 totally restricted much sooner than the other bores? Why do the restriction levels on that bore have little or no correspondence

with natural water level fluctuations? Why are they out of step with the other monitoring bores?

65. Monitoring bore M35/5696 is a shallow 33 m deep bore used for a domestic and stockwater supply for a property on Weedons Ross Road. A farmer (Mr Robin Wilson) who owns 92 ha of land on the opposite side of Weedons Ross Road applied in 1989 to NCCB to take 26 l/s from an 83 m deep bore (M35/6201) for irrigation. A neighbour (who may have owned M35/5696 – I can't remember) objected very strongly to the application on the grounds that the take would dry up his water supply. Bore M35/6201 is only 400 m away from M35/5696.

66. NCCB (Peter Callander) carried out an aquifer test in early 1990, aquifer parameters were determined, interference effects calculated and from that, trigger levels set on M35/5696 to protect it from the effects of pumping M35/6201. The trigger level difference of 0.9 m corresponded exactly to the calculated interference effects of 0.9 m from pumping M35/6201 at 26 l/s. The setting of the bottom trigger was set by taking into account an allowance for a screen, pump length and pumping drawdown. The trigger levels were therefore set to accommodate a specific localised interference effect on a neighbouring shallow bore, nothing more.

67. If I consider my situation, I had carried out an aquifer test on my bore in Nov 2002 following being asked by CRC to get written approval from about 50 people at the time I was renewing my consent. CRC had carried out their own assessment of the effect of my pumping on neighbouring bores and assumed that I would adversely affect bores up to 2 km away. Using actual test data, I determined that there could be small interference effects on the closest neighbouring bore (up to 0.4 m at 60 m distance), and less than 0.1 m, which is the threshold for more than minor effect, at about 350 m. Beyond about 500 m, I would say that interference effects would not be able to be detected. Because neighbouring bores are all in Aquifer 2, and because of the nature of the aquifer (leaky confined), pumping of my bore will have no adverse effects on neighbouring bores at all.

68. Mr Wilson's property has recently been sold, and is being subdivided into about 200 lots (Wilfield Estate). Over the last 10 years or so, Mr Wilson had rarely irrigated the property as he has other irrigated properties in Selwyn. I presume bore M35/6201 will become the public water supply for Wilfield Estate, and will not have trigger level restrictions (they were removed for public supplies in Variation 1).

69. Until Variation 1 was notified, the public water supplies for the West Melton subdivisions were subject to trigger level restrictions on M35/5696. Selwyn District Council (SDC) was becoming very concerned about that, as M35/5696 had reached the 100% cut-off point in 2013. SDC was considering steps to try to get them removed or altered. They no doubt realised that M35/5696 could be increasingly affected by pumping for community water supply, placing those supplies on restriction. I see that SDC now supports the trigger levels.

70. As an irrigator, I could be 100% restricted even though my pumping has no adverse effect on shallow bores and even though restricting my take would be of no benefit to shallow bores. That is of great concern to me. I can farm through partial restrictions, but having no water at all for long periods is difficult to deal with. Unlike surface water, which can recover very quickly, groundwater levels continue to fall until substantial recharge, usually in winter, restores them.

71. As far as I can tell, there are 13 active irrigation consents, including Mr Wilsons, in the vicinity of M35/5696. One of those is held by Selwyn District Council for irrigation of the West Melton Domain.

72. Most consented irrigation takes are very small. Generally the larger irrigation takes (still small in Canterbury terms) have been either reduced in size or split off into smaller takes.

73. The *total* flow for the 13 consents, calculated on a 24 hour basis, is 53.9 l/s, with individual consents ranging from 0.2 l/s to 24.9 l/s. A flow of 53.9 l/s would barely irrigate one small (100 ha dairy farm). If Mr Wilsons bore is taken out (it will be used for the subdivision or not used at all), the total flow for 12 consents is only 29 l/s, which on average is less than 2.5 l/s per consent. That is a very small amount. Because all of these takes are for lifestyle blocks, the volume of water used per season will be much smaller than for larger enterprises. The effects on the groundwater system from these takes will barely be detectable. Applying trigger level restrictions to these takes will provide no measurable benefit to domestic and stock water supplies.

74. The largest groundwater takes in the West Melton district are now public water supplies serving the West Melton Village, the Gainsborough subdivision and the Preston Downs subdivision. The public water supply takes are all in Aquifer 2 and are sufficiently deep to not be significantly affected by pumping. It has got to the stage now that the public water supplies, not irrigation, will probably cause M35/5696 trigger levels to be reached sooner than they would have otherwise been.

75. I do not have an issue with the public water supplies and the development of further subdivision. I do have an issue with the trigger levels.

Summary of submission

76. I summarise my submission as follows.

1. I would like to see the WMSZ and Restriction Regime terminated, because;
   - There is nothing particularly special about the zone.
   - Trigger levels and removal of the general authorisation were implemented as an interim measure until a water plan was developed.
   - The pLWRP has been developed and has all the necessary policies and rules to properly address the issues.

- There is no shortage of water in the zone.
- There is no long-term downward trend in groundwater levels.
- Provided the few remaining shallow bores fully penetrate the aquifer, and people are aware of the magnitude of the natural water level fluctuations in their area, all water users should be able to obtain a reliable water supply.
- In West Melton, I can foresee community and public water supplies having a much greater effect on shallow bores than irrigation takes.
- Trigger levels encourage inefficient use of water.

2. If the panel wishes to retain the WMSZ, I would like to see the southern boundary of the zone aligned with the boundary of the Selwyn-Waimakariri groundwater allocation zone, because;
   - It would be administratively more simple.
   - The groundwater allocation zone boundary has been set based on groundwater flow direction and hydrological characteristics of the region, while the boundary of the WMSZ was arbitrarily set.
   - Takes both within the Selwyn-Waimakariri groundwater allocation zone and the WSSZ have little or no impact on Christchurch City water supply.
   - Not having trigger levels on the WMSZ bores south of the groundwater zone boundary will not have a detrimental effect on groundwater levels or permitted or consented takes that can't be addressed by current PLWRP policies.

3. If the panel has a mind to retain the trigger levels for now, as an interim measure I recommend that they be reset to make them consistent with minimum measured water levels, and water level fluctuations. I have recalculated them based on the average of the present trigger levels but adjusted them for the measured minimum water levels and water level variations at each bore (see Table 1).

77. As can be seen from Table 1, some levels increase, and some remain similar to existing levels.

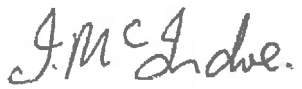
Table 1: Proposed revised trigger levels

Bore	1st trigger		2nd trigger		3rd trigger	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
M35/1000	40	42.2	43.5	45.6	47	48.9
M35/5696	28.2	27.3	28.7	29.6	29.1	31.7
M35/0217	20	20	21.8	21.8	23.5	23.5
M35/1691	19	19.5	21.5	21.5	24	24
M35/1110	17.1	17.7	18.6	19.1	20	20.5

78. My calculated values for M35/0217 and M35/1691 were slightly higher (shallower) than the existing levels, so I have made them the same as the existing levels. Of highest importance is to remove the anomalies relating to M35/5696.

79. It may be that these levels, particularly the 3rd triggers, are still too high and should be lowered. I note that the 1993 proposed Christchurch West Melton Groundwater Management Plan was suggesting 54.0 m for M35/1000, 25.5 m for M35/0217, 26.7 m for M35/1697 and 21.2 m for M35/1110, based on an assessment of bore depths at the time.. A revised level was not provided for M35/5696.

80. If the trigger levels are to be retained in the long term, they should be determined according to pLWRP Schedule 12 2(a).



Ian McIndoe

30 September 2014.