

IN THE MATTER of the Resource
Management Act 1991

AND

IN THE MATTER of Notices of Requirement
by Central Plains Water
Limited

AND

IN THE MATTER of Applications for Resource
Consent by the Central
Plains Water Trust

Statement of William Alan Nicholas Brown

1. INTRODUCTION

Qualifications and Experience

1. My name is William Alan Nicholas Brown. I am a Consulting Economist of Wanaka.

2. A brief resume of my educational qualifications and career history is that I hold a Masters Degree from the University of Canterbury (Lincoln College), and a Ph.D. from the University of Manitoba where my specialist field was regional and resource economics. I was employed at Lincoln University from 1976 to 1978. Although I have been a consulting economist in the private sector since 1979, I continued with periodic lecturing commitments at the University in the areas of regional and resource economics. I have also been involved in a number of hearings before Councils, Commissioners and the Environment Court on Resource Management Act related matters, and most recently was appointed by the Minister of the Environment to be a member of the Waitaki Water Allocation Board.

3. With respect to the economic analysis of irrigation schemes, I have been involved in studies on the economics of schemes in Central Otago (Manaherikia), South Canterbury (Levels Plains and Opihi River), Mid Canterbury (Lower Rakaia and RDR Schemes), and North Canterbury (Ashley Waimak and Amuri Plains), as well as investigations on water resource options for the Rakaia River. Overseas, I have been team leader for a number of multi-disciplinary feasibility studies on large-scale irrigation projects in Pakistan (five separate assignments), Nepal, Bangladesh and the Philippines. I have also presented papers to Treasury on Benefit Cost Analysis, and have been commissioned by the Ministry of Agriculture to review methodologies/procedures adopted by the Crown in valuing its interests in Community Irrigation Schemes.

4. My Ph.D. thesis involved modeling the regional economic impacts generated by rural development projects. On return to New Zealand, I initiated research into the regional economic impacts of irrigation schemes with a study on the Morven Glenavy Scheme, and followed this with the first set of regional input output tables, and regional impact multipliers, for application in New Zealand. Subsequent to this, I have been involved in a number of regional impact assessment studies.

Background

5. In relation to this hearing, I have been retained by the Selwyn District Council to provide professional comment on the aspects of the Notice of Requirement and Consent Application that relate to economic matters relevant to their processing of these two applications under the RMA. The background information provided by the Applicant in this regard, and which I initially reviewed, encompassed:

- The Notice of Requirement by Central Plains Water Limited, dated June 2006
- The Application for Resource Consent by the Central Plains Water Trust dated June 2006

6. On the basis of this I prepared a component of the Request for Further Information (RFI) relating to "Economic Assessment" which formed part of the comprehensive RFI forwarded to the Applicant on 25 August 2006.

7. Subsequent to this, the Applicant responded with a letter from Buddle Findlay on the RFI ("Social Effects and Economic Consideration") dated 20 September 2006, and provided a report entitled:

- Analysis of Central Plains Water On-Farm Impacts prepared by Macfarlane Rural Business Ltd. dated 24 April 2006

8. The Council's solicitors then wrote to the Applicant on 8 November 2006 reinforcing the need for the economic information sought in the RFI. In April 2007 the Applicant lodged additional resource consent applications and an additional Notice of Requirement relating to an alternative reservoir supply option utilizing a 10km tunnel directly to the Waianiwaniwa Valley instead of the 15.5km open canal described in the original AEE. A separate AEE was provided¹. Then in May 2007, two further reports relating to economic matters were provided by the Applicant:

- Central Plains Water On-Farm Profitability prepared by Macfarlane Rural Business Ltd., dated 30 April 2007
- Economic Impact and Cost Benefit Assessment. Central Plains Irrigation Scheme, prepared by Philip Donnelly and Associates Ltd., dated May 2007

¹ Central Plains Water Trust. Central Plains Water Enhancement Scheme: Assessment of Effects on the Environment for Long Tunnel. 24 April 2007

9. I then comprehensively reviewed these latter two documents, and prepared comment on the adequacy of this information base in the light of the detail requested under the RFI. Two papers on this matter were then forwarded to the Applicant – one entitled “SDC Comment on Further Economic Information Provided” on 22 June 2007 and one entitled “Central Plains Water: Comment on Whether “Financial Viability” is a Key Issue in the RFI” on 4 July 2007.

10. The Applicant responded with two letters dated 4 July 2007 and 9 July 2007, and noted that this information, and the information which would be provided at a meeting programmed for 10 July 2007, would “constitute the extent of further information to be supplied on the economic issues by Central Plains prior to the hearing”.

11. I then attended a meeting with the Applicant’s consultants – Hugh Eaton of Macfarlane Rural Business Ltd. (MRB) and Philip Donnelly of Philip Donnelly and Associates Ltd. – in Christchurch on 10 July 2007. Both Mr Donnelly and Mr Eaton brought additional material to this meeting which they provided me. A number of matters were canvassed at that meeting, and both Mr Donnelly and Mr Eaton then provided me with further information by email over 11 and 12 July 2007.

12. The information provided at the meeting by Mr Donnelly comprised 3 tables of economic impact information, disaggregating regional impacts into direct and indirect components. Mr Eaton’s information comprised a letter dated 10 July 2007, and three attached files – “Price sensitivity July 07”, “Central Plains Analysis Jul 07” and two dairy farm budgets (Model 3 Dairy Farm Pre CPW; and Model 7 Dairy Farm Post CPI).

13. The subsequent email information provided by Mr Donnelly on 11 July 2007 comprised two files – firstly, the economic impact information referred to above, and secondly an excel spreadsheet comprising his main worksheet for the Benefit Cost Analysis. On 12 July, Mr Eaton supplied revised and amended information summarized in a memorandum “Response to Questions from ..”, and two files on “Price Sensitivity” and “Central Plains Analysis”.

14. While, in my opinion, there remain unresolved issues with respect to the adequacy of the information supplied by the Applicant on economic issues as well as the resolution of the issues first raised in the RFI in August 2006, further exchange of information and discussion between Messrs Donnelly, Eaton and me was not possible in the timeframe required for the preparation of this statement. This statement therefore depends on the information base described above.

Scope of this Statement

15. The next section in this statement provides the background to the place of economic considerations in the RMA. Section 3 summarizes the irrigation and land use changes that the Applicant expects to occur as a result of the proposed Central Plains (CP) Scheme. The next section discusses the impact of the CP scheme on farm profitability, and Section 5 the economic impacts anticipated to arise as a result of the scheme. Section 6 addresses the Benefit Cost Analysis provided by the Applicant and the cost of alternative scenarios is addressed in Section 7. Section 8 provides an overall assessment of the economic effects of the proposal in terms of the RMA, and Section 9 concludes the statement.

2. ECONOMIC ISSUES

16. It is my understanding that in terms of the Notice of Requirement, this report should, in terms of s171(1) “consider the effects on the environment of allowing the requirement”, subject to Part II of the Act. “Environment” is defined in Section 2 of the Act, and “Effect” in Section 3. Similarly, in terms of the Consent Application, the primary matter to address (s104) is to have regard to “any actual and potential effects on the environment of allowing the activity”, again subject to Part II of the Act. In particular, the consent Authority “shall recognize and provide for” s6 matters, and shall “have particular regard to” s7 matters.

Economic Wellbeing and the RMA

17. The purpose of the RMA is the promotion of the sustainable management of natural and physical resources, and economic considerations are intertwined within this purpose. In particular, part of the meaning of “sustainable management” in section 5(2) is enabling “people and communities to provide for their ... *economic* ... well being”. Therefore, promotion of “economic well being” is part of the purpose of the RMA. Section 5 also refers to “people and communities”. In my opinion, this reference highlights that in assessing the economic effects of any proposed resource use and development, the economic impacts on the community, not just the applicant or particular individuals or organisations, should also be addressed.

Efficient Use of Resources and the RMA

18. Section 7(b) of the RMA requires that in achieving the purpose of the RMA, all persons exercising functions and powers under it shall have particular regard to “the efficient use and development of natural and physical resources”. In my opinion, this relates to the concept of economic efficiency. This interpretation was supported by the Environment Court in *Marlborough Ridge Ltd v Marlborough District Council* [1998] NZRMA 73, where the Court noted that all aspects of efficiency are “*economic*” by definition because economics is about the use of resources generally. Judge Jackson then went on to consider whether it was the broad aspects of economics and/or the narrower issues of financial viability that were relevant. He did note the comments by Greig J in *NZ Rail v Marlborough District Council* [1994] NZRMA 70, 88 on this matter, but then concluded “we consider both are relevant”.

19. In that same judgement, the Court accepted the evidence from Mr Donnelly that “from an economist’s perspective I see section 7(b) as a key to achieving the enabling aspects of section 5”. I also concur with Mr Donnelly’s view on this relationship – an issue that I return to later in this statement (see para 69).

20. Economic efficiency can be defined as:

“the effectiveness of resource allocation in the economy as a whole such that outputs of goods and services fully reflect consumer preferences for

*these goods and services as well as individual goods and services being produced at minimum cost through appropriate mixes of factor inputs”.*²

21. More generally economic efficiency can be considered in terms of:

- Maximising the value of outputs divided by the cost of inputs;
- Maximising the value of outputs for a given cost of inputs;
- Minimising the cost of inputs for a given value of outputs; and
- Minimising waste.

22. The impacts of any proposal in terms of economic efficiency (and community economic well being) need to be assessed by comparing two scenarios. These are described as what is likely to occur “with” the proposal, as against what is likely to occur “without” the proposal. This “with versus without” approach contrasts with an “after versus before” approach, with the former being the more accepted and logical approach. Therefore, the economic efficiency and economic well being implications of the proposed development have to be considered relative to the implications of the most likely alternative use of resources in the absence of the project.

23. As with economic well being, economic efficiency effects have to be considered from the viewpoint of the community at large and not just from the perspective of the Applicant. In having regard to the efficient use of resources, it is necessary to adopt a district or region-wide perspective. In some circumstances it may even be appropriate to adopt a nation-wide perspective if a proposal has impacts beyond the immediate district or region. In this case it appears that a district viewpoint is appropriate, since consents are being sought from the Selwyn District Council. That is not to say that a wider perspective is irrelevant – rather, that the District perspective should be the main focus in terms of the viewpoint from which to assess economic effects.

3. THE CENTRAL PLAINS SCHEME

The CP Scheme Area

24. The total area encompassed by the Central Plains (CP) Scheme, from the boundaries on the Waimakariri River to the north and the Rakaia River to the south, is 101,800ha³. The total effective area “within the boundary of the scheme is assumed to be 85,000 ha.”, of which 60,000 ha will be irrigated by scheme water⁴.

The Impact of the CP Scheme on Irrigation

25. The irrigation changes that the Applicant foresees resulting from the introduction of the CP scheme are best summarised as follows:

² Pass C and Lowes B. 1993. Collins Dictionary of Economics (2nd edition). Harper Collins. Page 148

³ Application for Land Use Consent (Darfield), June 2006:8

⁴ Notice of Requirement, June 2006:85

- a) The CP scheme will provide surface water supply to 60,000ha of irrigated farm land
- b) Of this, half (30,000 ha.) is currently irrigated by groundwater. Dairying (100 % irrigated) occupies an estimated 22,000 ha of this area, and mixed livestock systems (100% irrigated) the remaining 8,000 ha.
- c) With the advent of the scheme, all the above groundwater users will convert to surface supply and relinquish their consents across 30,000 ha.. This will allow other landowners in the general vicinity to apply for, and receive, consents for groundwater development to occur on an additional 15,000 ha of land adjacent to the scheme area – which I term “reallocated groundwater”. The total area of irrigation therefore increases from 30,000 ha before the scheme, to 75,000 ha after the scheme (60,000 ha being supplied with surface water through the CP scheme, and 15,000 being supplied via new groundwater development made available through consents surrendered from existing holders and reallocated through the issuance of new consents).
- d) In addition to the above irrigated area, there is an allowance of 10,000 ha for “non-effective” areas (areas which cannot be farmed such as lanes, tree blocks, buildings etc.). There is also an additional 10,250 ha of land which receives what the Applicant terms “association benefits” from its proximity to nearby irrigated farmland.
- e) The total land area impacted by the scheme development is therefore 95,250 ha, comprising 60,000 ha irrigated by CP water, 15,000 ha irrigated by “reallocated groundwater”, 10,000 ha of non-effective area, and 10,250 ha of land which has “association benefits”.

The Impact of the CP Scheme on Land Use

26. The land use changes that the Applicant foresees as a result of the irrigation developments (both with the CP scheme and new groundwater development) described in para 25 above, can be summarised as follows:

27. Current land use in the area (95,250ha) is made up as follows:

- a) 22,000 ha of dairying, fully irrigated from groundwater sources
- b) 8,000 ha of mixed livestock and crop systems, fully irrigated from groundwater
- c) 55,250 ha of dryland livestock systems with no irrigation
- d) 10,000 ha of non effective land

28. With the advent of the CP scheme, land use across this same area (95,250 ha) will change to:

- a) 46,500 ha of dairying, fully irrigated. 22,000 ha of this will be existing dairy units that have converted from groundwater to CP surface water supply. By implication, the remaining 24,500 ha will comprise “new” dairy development.
- b) 3,000 ha of intensive livestock finishing systems, fully irrigated.
- c) 15,250 ha of arable and process crop systems, fully irrigated.
- d) 20,500 ha of mixed livestock and crop systems, of which half of each property is irrigated⁵.
- e) 10,000 ha of non-effective land

29. The irrigation that occurs on these land uses reflects the area supplied by the CP scheme (60,000 ha) together with the 15,000 ha which is able to be developed for irrigation using newly developed groundwater sources – the “reallocated groundwater”.

30. The Application and the April 2006 MRB report exhibit some confusion as to the possible impact on land use as a result of the introduction of the scheme, particularly as it relates to “a further 10,250 ha outside the scheme boundary whose economic return is expected to be enhanced by irrigation on land within the boundary”⁶. This arises from MRB’s budgets for “Mixed Livestock” which “Pre-CPI” is fully irrigated, and “Post-CPI” is only half irrigated. Mr Eaton has now explained in his memo dated 12 July 2007 that MRB has chosen to demonstrate the “association” benefits from having irrigated land in close proximity through a “Mixed Livestock” budget for a 400 ha farm, half of which is irrigated. The total area being covered by this farm type is 20,500 ha.

Submissions on the CP Notice of Requirement and Consent Application

31. Other reports will address the detail of the submissions made in respect of the Notice of Requirement by Central Plains Water Ltd. and the Application for Land Use Consent made by the Central Plains Water Trust. However, in the context of this statement it is appropriate to highlight those aspects of the submissions that related to economic matters.

32. As a general observation, economic matters did not receive a high level of attention in the public submissions received. One submitter noted that “no benefit-cost analysis had been supplied to identify the true cost and benefits (of the proposal)”, and similar observations were made by other parties. Others noted that the Applicant had failed to supply sufficient information on which to make informed judgments about the financial or economic effects of the proposed scheme, or that it was “affordable” to farmers. One submitter was “extremely concerned that the economic benefits of the scheme appear to be overstated”, and others expressed the opinion that a piped

⁵ The total area irrigated within this land use class is therefore 10,250 ha. Pre Scheme, this land use class involved 8,000 ha which was fully irrigated from groundwater. The Applicant assumes that all the relevant groundwater consents associated with this land class would be surrendered with the advent of the scheme. Half of this area, or 4,000 ha, then becomes available for new groundwater development as “reallocated groundwater”.

⁶ Notice of Requirement. June 2006:85

reticulation system would have considerable advantages over an open channel reticulation system. Some submitters affected by the designation also pointed out that the restrictions on them imposed by the designation incurred a significant private cost.

33. The concern expressed by submitters that the AEE contained little material on which they could comprehensively assess the effects of the proposal on economic matters has foundation in my opinion. The detail of the analysis which formed the basis for the AEE was subsequently delivered to the Council as a result of the RFI dated September 2006 and related discussion and exchange of correspondence, but without this elaboration submitters would have had difficulty in comprehensively understanding the assumptions underlying those sections of the AEE that addressed economic matters.

34. In my view, it is also correct that this consent and designation process is generating economic and social costs that are not being borne by the Applicant, but are being borne by affected parties. Land use and development options are being constrained on land within the designation, and this can involve economic cost to these private land owners. This cost escalates as consent processing times becomes extended.

4. FARM PROFITABILITY

The MRB Analysis

35. The Applicant, though the reports by MRB, have provided estimates of the likely impacts of the scheme on farm finances through two reports⁷ and correspondence⁸. This material incorporates seven comprehensive farm budget models, three relating to the "Pre Scheme" situation and 4 relating to "Post Scheme" circumstances. These models are:

Pre Scheme:

- a) Model 1. Livestock – dryland
- b) Model 2. Mixed Livestock and Crop – 100 percent irrigated from groundwater
- c) Model 3. Dairy – 100 percent irrigated from groundwater

Post Scheme

- a) Model 4. Mixed Livestock and Crop – 50 percent irrigated
- b) Model 5. Intensive Livestock Finishing – 100 percent irrigated
- c) Model 6. Arable and Process Crop – 100 percent irrigated
- d) Model 7. Dairy – 100 percent irrigated

⁷ MRB 2006. Analysis of Central Plains Water On-Farm Impacts; and MRB 2007 Central Plains Water On-Farm Profitability.

⁸ Correspondence to the Council dated 10 July 2007 and 12 July 2007.

36. MRB then assess earnings before interest and tax (EBIT) by farm type “Pre” and “Post” across the whole 95,250 ha, and then apply this to assess a marginal return on capital (MROC) by farm type. Rather than repeat this information, it is assumed that the reader has access to the relevant MRB documentation.

Assessment of the MRB Analysis

(a) General Comment

37. The MRB models do not appear to clearly differentiate between farms which are supplied with irrigation water from the scheme, as against those that access irrigation water from newly developed groundwater sources through “reallocated groundwater”. For example, the off farm capital costs of the proposed CP scheme (assessed as \$6,826/ha) are spread over the 75,000 ha of land receiving irrigation water (surface water supply ex CP and reallocated groundwater⁹) whereas, in reality, both these sets of farmers will face different investment decisions – (i) those within the CP command will ask the question – “do I invest in the CP scheme?”; and (ii) those outside the CP command will ask a different question – “will I invest in groundwater development using the “reallocated groundwater” supply?”

38. It is also somewhat disconcerting to compare the MRB farm budget information prepared on 30 April 2007, with that delivered less than two and a half months later (10 July 2007). These latter budgets exhibit an increase in dairy product prices of over 30 percent compared with the April figures, and therefore have significant implications for the estimates of the profitability associated with increased dairying output. This concern is compounded because it is these figures that feed into the benefit-cost analysis (BCA) undertaken by Philip Donnelly and Associates. This BCA should be based on long term average prices – commodity price scenarios that are expected to prevail over the 35 years analysis period. It is these prices that run through the project “benefit” stream, and they should not exhibit significant volatility in response to short term price fluctuations.

(b) Reallocated Groundwater

39. One of the major issues that is not expressly addressed by the Applicant to date, despite requests from the Council, is the assumption that existing groundwater irrigators within the scheme area (22,000 ha of dairying and 8,000 ha of mixed land uses) will immediately surrender their consents and convert to CP supply. The letter sent to the Applicant dated 22 June 2007 included the following observation on this point:

The (RFI of August 2006) included (a request for) further information to support the assumption that 100% of the scheme area currently spray irrigated from groundwater supply sources will convert to scheme supply. From a planning perspective this would require CPW to force existing holders of groundwater takes applying to 30,000ha of irrigated land within

⁹ See Memo from MRB dated 12 July 2007 para 18. There is additional confusion in the information on this point, in that Table 9 reflects this “weighted average” approach whereas Table 8 incorporates the unadjusted figures.

the scheme area to surrender/transfer existing consents. If these consents were not surrendered/transferred then effectively that water is not 'released' for ECAN to approve other takes elsewhere in that groundwater allocation zone. The Buddle Findlay letter of 27 March 2007 states that conversion will occur due to the cheaper cost of accessing water from the scheme and the greater reliability of supply associated with the scheme. The Council is concerned that no information has been provided to support these conclusions. With regard to water "costs", for example, the 2006 Macfarlane Rural Business Ltd Report (Macfarlane Report) includes two one-page budgets entitled "Dairy Pre CPI" and "Dairy Post CPI" with no associated discussion, this being the only basis on which it is assumed by the Applicant that 22,000ha of the scheme currently under irrigated dairy units will switch to scheme supply¹⁰.

40. These complete Dairy Budgets were supplied to the Council on 10 July 2007, but do not answer the core of the question raised above. For example Budget "Dairy Farm Pre CPW" dated 8 July 2007 depicts the average current financial situation across some 22,000 ha of dairying within the proposed CP supply area – all irrigated from groundwater sources. With the advent of the CP scheme, these farmers then individually will face the question – (i) will I swop my irrigation water supply from my consented groundwater source to the CP surface water supply network (i.e. become a shareholder in CP); and (ii) if I do this, will I relinquish my consent?

41. It would seem logical that that farmer would, in part, base these decisions on the financial advantages accruing from the switch, as well as the risk associated with the change. The pre-scheme budget (Model 3 - a 400 ha unit) shows that this farmer is currently paying around \$190,000 annually in electricity charges for irrigation pumping and pressurisation costs from his groundwater supply. Should this farmer switch supply sources to the CP network, then the budget (Model 7 – same size) shows that electricity charges will drop to an estimated \$64,000. In addition, there will be \$28,400 in water charges to pay to CP, for a total cost in electricity and CP water charges of \$92,400. The operational savings from switching to CP supply are therefore \$97,600 annually for a 400 ha unit - or \$61,000 for a 250 ha unit¹¹. So the Applicant's comment that it is cheaper to access water from the CP scheme is correct, but this must be weighed against the capital cost of accessing that water.

42. The capital cost associated with the switch, adopting the approach taken by MRB, is an additional capital expenditure of \$1.7 million for a 250 ha unit¹². Would this farmer spend \$1.7 million for an annual benefit of \$61,000, equivalent to a rate of return on incremental investment of less than four percent? This seems unlikely. And if they did, would they also voluntarily surrender their consent? This is also unlikely, since there would appear to be no downside, either from a financial or risk perspective, to that farmer retaining his consent – at least until the end of its current term.

¹⁰ The 2007 MRB Report as provided was missing a complete Dairy Post CPI budget.

¹¹ It is not clear why MRB adopt 400 ha as the basis for the detailed budget, and 250ha as the basis for the assessment of capital returns. It is assumed that the average per hectare relationship in the budget remains constant for 250 ha as for 400 ha.

¹² See MRB 10 July 2007, Table 8.4 "With Scheme" Dairy investment. To participate in the scheme, MRB assume a capital contribution from farmers of \$6,826/ha, or \$1.7 M for a 250 ha unit. This MRB approach to assessing the "profitability" of the scheme from an individual farmer's viewpoint does not reflect what would happen in practice, but is adequate to make the point of the paragraph.

43. The experience of the proposed Barhill-Chertsey Irrigation scheme is informative on this point. It has been reported¹³ that the original irrigation proposal received insufficient farmer's buy-in, with its chairman, John Wright, being reported as saying "that this was partly due to some farmers believing their bore-well water was more affordable. It was a cheaper alternative for farmers to do their own thing". This comment clearly shows the importance of the Applicant being able to clearly demonstrate the financial advantages accruing to farmers from a switch from groundwater to CP surface supply. If these financial advantages cannot be demonstrated, it calls into question the basis for the assumptions surrounding "released groundwater" across 30,000 ha of the CP area.

44. This leads on to appreciating the drivers for the "profitability" of investing in the scheme, as assessed by MRB. The key driver is that MRB assume that the existing cohort of farmers – with their "average" level of management ability and skill – are replaced by what MRB term as farmers "at the top end of performance levels"^{14 15}. They point to the fact that farmers will need to be "top operators" to take on the debt levels associated with the scheme. But will existing farmers change because of the scheme? The dairy budgets (Models 3 and 7) Pre and Post Scheme show that MRB assume that productivity per cow will increase from 380 kg MS/cow to 430 kg MS/cow (up 13%), land use productivity will increase from 1,330kg MS/ha to 1,613 kg MS/ha (up 21%), and milk yield will also increase by 21 percent. The analysis therefore assumes that these productivity increases will occur across the 22,000ha of existing dairy farmers that are assumed to switch to CP supply. But what is the financial driver that generates this increased productivity? Should they take on the CP debt, they certainly will need to increase production. But the financial incentives for current dairy farm operators to make that switch are not at all clear.

45. MRB do concede, in the text, that:

*Note that our dairy farm budgets assume an increase in milk solids production of 279kg/ha. For a number of existing farms with an existing allocation of reliable water (well) such an increase will not occur. Their gain from the scheme will be in pump and electricity running costs only."*¹⁶

46. On the one hand, MRB appear to acknowledge in the text that the budgeted productivity increases will not occur across all farms, but then the budgets do not reflect this. Similarly, it is these same budgets that are used by Philip Donnelly in his benefit-cost and impact analyses, which has the effect of overstating the net benefits attributable to the scheme. The text and the budgets would therefore appear to be contradictory. Furthermore, an analysis from the budgets (see para 41-42 above) would suggest that "their gain will be in pump and electricity costs only" is not adequate to compensate farmers for the capital expenditure involved.

¹³ See The Press, Saturday June 30, 2007. Page D2

¹⁴ MRB April 2007:para 4.4

¹⁵ While MRB comment that current farmers are "average" operators, Taylor Baines report for the same cohort of farmers that dairy "productivity is well above the national average, indicating current operators are using the latest technology and science in their farming business". Taylor Baines et al. 2007. Central Plains Water Enhancement Scheme. Social Impact Assessment. Prepared for URS/Central Plains Water Trust. Page 20

¹⁶ MRB April 2007:para 2.3

47. A related issue is the MRB assumption that the extent of consent surrender (across 30,000 ha of groundwater irrigated land within the CP command) will allow a further 15,000 ha to be consented and irrigated by new groundwater development. The note to the Applicant dated 22 June 2007 commented as follows:

There is no assessment as to why this figure shouldn't be higher or lower. Further to the matter raised above, the ability to irrigate an additional 15,000ha of land on the fringe of the scheme area depends on further consents being approved by ECAN. This effectively means that such benefits are dependant on a further consent process, the outcome of which is unknown and uncertain. In the Council's view this reduces the weight to be placed on such benefits being put forward by the Applicant.

48. The Applicant responded¹⁷ noting that "while it is possible to assume that potentially 30,000 ha could be irrigated, it was considered appropriately conservative to assume that not all relinquished consents would be taken up elsewhere, noting it is probably not feasible to capture all "released water" ". The Applicant went on to note that "while Central Plains agrees that this would require ECan to grant new consents, it is a reasonable assumption that, if groundwater becomes available (through a combination of additional groundwater resource created by the Central Plains Scheme, plus freed up existing groundwater resource), and given the economic benefits which flow from irrigation, consents would inevitably be sought and in due course granted for the use of this water resource".

49. This response does not assuage the concerns raised in the original letter. The concerns remains because: (i) the Applicant has not established that all of the farmers within the CP command area who currently irrigate from groundwater will switch to scheme supply; (ii) that all of these farmers will immediately surrender their consents; (iii) that half of the area covered by these consents (15,000 ha) will be able to obtain new groundwater take and use consents from ECan; (iv) that these new consents will be expeditiously processed and on-farm irrigation development occur quickly; and (v) that this will all occur within the timing for project benefits assumed in the benefit-cost analysis (see para 95).

(c) The Adequacy of the Breadth of Financial Information Provided

50. In the August 2006 RFI, the Council requested, inter alia, additional information with respect to the financial viability of the CP scheme from the perspective of individual farmers within the command area and who, CP suggested, would participate in the proposed scheme. The specific request encompassed:

A Financial Analysis from the perspective of the individual farmer (or farmer types, grouped by land-use) evaluating the revenue and cost implications of joining the "scheme" or being "associated" with the scheme. It would include an analysis of scheme funding, financing and operations and maintenance costs, so as to derive an initial capital

¹⁷ See Buddle Findlay letter dated 4 July 2007:para 6

contribution and associated annual water charge that will be levied on farmers. Water affordability calculations would then be derived for a range of land uses and irrigation modalities (i.e. conversion from dryland to irrigation, conversion from groundwater supply to surface water supply, and “associated” dryland benefits) in order to assess how attractive an investment it is (i.e. affordability) from a landowner’s perspective. Such an analysis gives insight into probable rates of uptake. To a large extent, this material was included in the 2002 Feasibility Report, but now needs to be updated and made available for consideration as part of this consent process;

51. Counsel for the Applicant disputed the need for this information, but the Applicant did subsequently supply two reports by MRB¹⁸ which partially responded to the questions raised. The need for further elaboration was again raised in the Council’s letter to the Applicant dated 22 June 2007, with the Applicant again responding that, in their view, the issue of “affordability” “is not relevant for consent purposes”¹⁹. They did acknowledge “that the scheme is on the cusp of farmer affordability”, but went on to note that “assuming the scheme proceeds, there will be increased earnings from every hectare of irrigated farmland, and therefore the downstream benefits to the community of those increased earnings will be present regardless of the initial profitability for the individual farmer. .. Either the scheme will be financed and will proceed, with the regional economic benefits that flow from that, or it will not.”²⁰

52. Clearly, the legal arguments for having this type of information available for consent purposes will not be canvassed here. It is important, however, to clarify why this information is seen to be important from an economic perspective, and why it impinges on any conclusions that may be drawn on the Applicant’s proposal in terms of the s7(b) test²¹.

53. The Applicant is claiming a number of economic impacts stemming from the implementation of the CP project. The Applicant is also claiming that the economic benefits from this project exceed the economic costs as asserted by the Donnelly report²². Both these conclusions depend on: (i) how farmers within the scheme area individually respond to the financial proposals put to them as a condition of taking up CP supplied irrigation water; (ii) whether these farmers within the scheme area then make the land use changes predicted by the MRB reports; (iii) whether farmers currently irrigating from groundwater will relinquish their consents and take water contracts with the CP scheme; and (iv) the speed with which these farmers make these land use and irrigation water supply source changes. The only way to respond to these questions, and therefore provide some level of comfort to the conclusions reached by the Applicant as regards economic impacts and net benefits, is to comprehensively address issues surrounding (i) scheme affordability from the perspective of the individual farmer; (ii)

¹⁸ Dated April 2006 and April 2007.

¹⁹ Buddle Findlay letter 4 July 2007:para 25

²⁰ Buddle Findlay letter 4 July 2007:para 26

²¹ Is the proposed use and development of natural and physical resources “efficient”?

²² Philip Donnelly and Associates. May 2007

scheme financing; and (iii) reliability of supply. Each of these issues is addressed in the following paragraphs²³.

(d) Affordability

54. The issues surrounding the question of “affordability” have not been comprehensively addressed by the Applicant. The MRB analysis includes a capital charge on the farm units for off-farm and on-farm works associated with either conversion from groundwater irrigation to surface supply, or from dryland to irrigated land uses. It then estimates a return to total capital for the pre development and post development situation for each farm type and in aggregate across the scheme. However, as the report notes, this is not a true reflection of the financial implications to farmers within the scheme area. Firstly, those who take up CP supply will face a different capital investment decision than those who decide to exploit “reallocated groundwater”. Secondly, scheme costs will be financed by a combination of debt and equity capital with scheme costs including interest during construction. Equity will largely be provided by water users, or those who hold some form of water access rights within the scheme. Debt will be raised against the cashflow likely to be generated through water charges over the life of the scheme. Water charges to users will then be set to recover this debt funding on an annual basis (depending on finance rates and loan terms), as well as including the normal allowance for operational and maintenance²⁴ costs. Assumptions relating to inflation, taxation and depreciation are included in the financial model used to derive prospective water charges. This approach was adopted in the 2002 Feasibility Report (pages 5-24 on), and is particularly informative in providing information as to the potential affordability of the scheme to farmers.

55. The major concern on this matter is the fact acknowledged by the Applicant that the proposed scheme is on the cusp of farmer affordability²⁵. The 2002 report concluded that “it appears that the proposed cost of the scheme is at the upper range of affordability”²⁶, and this related to a scheme capital costs of around \$2,600 to \$2,800 per ha²⁷. Scheme capital costs have since risen over 2.5 fold, and now stand at over \$6,800/ha. The affordability issued is emphasised in the 2007 MRB report where it is concluded that:

We do believe however, that any costings above that sum (i.e. \$6,826/ha) will be outside most farmers psychological comfort zone and very difficult for them to service unless running costs can be reduced²⁸.

²³ Council did write to the Applicant on 4 July 2007 explaining further why it saw the issue of “financial viability” of relevance to the consent process. An extract from that correspondence is included as Attachment 1. The Applicant chose not to respond to this request for elaboration, noting that “we record that the explanations given to date, and the further information to be provided (at the meeting on 10 July 2007) constitute the extent of the further information to be supplied on the economic issues by Central Plains prior to the hearing”.

²⁴ “Maintenance” should include not only annual operational costs and R&M but also an allowance for periodic maintenance and extraordinary maintenance.

²⁵ See Buddle Findlay letter dated 4 July 2007: para 26

²⁶ URS 2002. Central Plains Water Enhancement. Feasibility Study. Page 5-45.

²⁷ Base scheme costs of \$219M to \$234M to supply 84,000 ha of land for irrigation. Op.cit. page 2

²⁸ MRB April 2007: para 3.2

56. The Applicant takes the view that “the downstream benefits to the community of (the) increased earnings will be present regardless of the initial profitability for the individual farmer”²⁹. This statement is disputed. The Applicant needs to show that the proposed scheme is affordable to farmers as a first step. Only then can the regional impacts be claimed to occur, because these same impacts are dependent on the farmers “buying into” the CP scheme, and making all the associated land use and productivity changes assumed by MRB.

(e) Scheme Financing

57. MRB notes that, in their opinion, the scheme will need to access finance at less than market rates to ensure implementation. For example, they comment that:

With a 10% return not significantly exceeding current market interest rates, a significantly lower cost of funds than current market rates will need to be accessed, with very long repayment terms. Financing structures are possible to achieve low cost starts of funding options³⁰.

58. Elsewhere, MRB observe:

For this project to proceed successfully, the cost of debt and equity will need to be low, accounting for community benefits outside the group of primary producers committing to the overhead cost³¹.

59. They also note that:

Community input (via councils or other community funding entities) can have a major influence on cashflow because of their ability to reduce interest costs, (higher quality guarantees for lenders) extend loan repayment terms, and/or help bridge the gap between initial farmer uptake and long term needs. Such assistance from the Waitaki District Council and Meridian energy with the North Otago Downlands Scheme was, in my view, a key factor in the scheme proceeding³².

60. It is important that the financial analysis address these issues, and draws conclusions as to the level of debt required, the likely sources of this debt, and its likely costs. Only through such a detailed analysis can conclusions be reached about scheme viability and the need, if any, for subsidised finance.

(f) Reliability of Supply

61. Reliability of supply is clearly a key issue in both farmer uptake and the likelihood the potential land use and productivity changes will occur with the advent of irrigation. The Notice of Requirement related to a reservoir with a capacity of 280Mm³, but the

²⁹ Buddle Findlay letter 4 July 2007: para 26.

³⁰ MRB April 2007: para 2.2

³¹ MRB April 2007: para 3.7

³² MRB April 2007: para 3.4

current proposal (as evaluated in the 2007 MRB and Donnelly reports) is for a capacity of 240Mm³ with no pumping. There is no discussion on how this change affects on-farm reliability of supply, although MRB notes that:

Off farm capital costs have been increased to \$6,826/ha. This cost as supplied by URS, is the total for a gravity (tunnel) supply to the reservoir with 240 MCM of storage. Our understanding is that this option will generate 97% reliability. Some farms may require higher reliability. Our budgets assume 97% reliability. In our experience, once water duty exceeds 0.45l/sec/ha, reliability assumes a greater importance than the marginal duty³³.

62. In this comment, MRB express some concerns about reliability associated with the preferred option, particularly when he notes that “some farmers may require higher reliability”. Similarly, the Applicant notes that “most farms will be able to achieve close to full potential on this (level of reliability)”³⁴. The concern is that the Applicant appears to express reservations that the land use and productivity assumptions made in the MRB reports, and which flow onto Donnelly’s benefit-cost and impact analyses, are predicated on a higher level of reliability than the proposed scheme, in this configuration, can deliver. The Applicant must show that the reliability of supply estimates are totally consistent with budget productivity and costs estimates. For example, if farms do require higher level of supply reliability, and this depends on provision of on-farm storages, then the costs for these need to be included in the farm budgets.

5. ECONOMIC IMPACTS

The Donnelly Analysis

63. The Application for Land Use Consent dated June 2006 included paragraph 6.5 (page 47) entitled Economic Effects referring the reader to the CRC Application for fuller information. In summary, the 35 year “operations” period for the scheme is “estimated to directly and indirectly increase regional output by \$30B (\$7.4B NPV), added value by around \$13B (\$3 NPV) and to create 91,000 job years of work. This is considered to be a significant positive effect associated with the scheme”.

64. The Notice of Requirement lodged by the Applicant contained more detail under section 5.3.6 Economic Effects (pages 99-105), the same level of detail as included in the CRC Application. This summarised the forecast land use changes with the advent of the scheme, and then assessed the likely flow-on economic impacts resulting from the scheme’s construction and operation.

61. The August 2006 RFI to the Applicant requested that “the detailed report on which this information was based (including the report prepared by MacFarlane Business Services Ltd.) need to be made publicly available for consideration as part of the consent process”. Soon after the MRB 2006 report was provided, but the Donnelly impact analysis was not provided until May 2007 – a combined report incorporating

³³ MRB April 2007: para 3.2

³⁴ Letter from Buddle Findlay dated 4 July 2007: para 27

impact analysis and benefit-cost analysis³⁵. The following comments therefore relate to this updated report.

The Economic Effects Advanced by the Applicant

65. The Donnelly report on the economic impacts of the proposed scheme summarised its findings as follows³⁶:

- *The scheme's total off-farm, on-farm (including associated) development expenditure is estimated at \$682M;*
- *Over the construction phase the direct and indirect regional output generated by this capital expenditure is estimated at \$1.53B (\$1,29B NPV), added value is estimated at \$555M (\$470M NPV) and is estimated to generate almost 6000 job years of work;*
- *As a consequence of the scheme, the region's annual direct and indirect agricultural output will increase by \$437M, added value by \$266M and jobs by almost 1300 at full-scheme production;*
- *The net increase in the region's primary sector processing output is estimated at \$590M per annum, added value by \$186M and jobs by almost 1500 at full-scheme production; and*
- *The combined impact of scheme construction and ongoing additional farm activity is estimated to increase direct-plus-indirect regional output over 35-years, the maximum permitted consent period under the RMA, by about \$34B (\$9B NPV) output, \$15B (\$4B NPV) added value and about 91,000 job years of work.*

Economic Impacts in the Context of the RMA

66. The Applicant denotes the economic impacts stemming from the proposed CP project in terms of three indicators – output, value added and employment. Output is the value of sales by businesses. Value Added is equivalent to output (sales) less inputs purchased from other businesses. It thus includes household income (principally wages and salaries), returns to land and capital (including depreciation, interest and profits), and taxes. It is analogous to gross domestic product (GDP). Employment is self explanatory, and is usually expressed in fulltime equivalent labour units.

67. It is important to emphasise that these impacts are not additive – rather they are indicators that are reflective of different measures of economic activity. For example, value added includes household income such as wages and salaries paid to individuals, as well as self employed income, and it is this household income that supports employment. The parameters are therefore interlinked, and it is incorrect to give the impression that one measure of impact is in addition to another.

³⁵ Philip Donnelly and Associates. 2007. Economic Impact and Cost Benefit Assessment. Central Plains Irrigation Scheme. Christchurch

³⁶ Donnelly 2007:2/32

68. Secondly, economics “impacts” are quite different from economic “benefits”. Economic “benefits” typically reflect how much better off an entity is in an economic sense, and when economic benefits exceed economic costs, it is concluded that there are net welfare gains to society from a particular use of resources. Thus net economic benefits (benefits exceeding costs) includes consideration of all costs, actual costs and opportunity costs. These economic effects are typically addressed using Benefit Cost Analysis (BCA). Economic impacts, on the other hand, are a scalar reflection of the scale of economic activity, and do not reflect the costs of generating that particular level of activity.

69. Economic impacts are therefore not relevant to any considerations under s6 of the RMA (matters of national importance). Neither are economic impacts generally relevant to considerations pertaining to the “efficient” use and development of natural resources (a s7(b) consideration)³⁷, nor any other s7 matters. There is argument that economic impact analysis contributes to an assessment of whether natural and physical resources are being utilised in a manner which promotes “sustainable management” in that it can assist in demonstrating that this resource use is enabling “people and communities to provide for their social (and) economic wellbeing” as per s5 of the RMA. However, I would argue that the best way for people and communities to provide for their social and economic wellbeing, from an economic perspective, is to firstly demonstrate that the proposed resource use meets the s7(b) test – the efficient use and development of natural and physical resources. This interpretation was supported by the Environment Court in *Marlborough Ridge Ltd v Marlborough District Council* [1998] NZRMA 73, where the Court agreed with the evidence of Mr Donnelly when he stated that “from an economist’s perspective I see section 7(b) as a key to achieving the enabling aspects of section 5”.

70. As noted above, economic impact analyses do not reflect any consideration of the resource costs of achieving the levels of output, value added or employment which the analysis concludes is likely to be generated by the proposed project. This being the case, it is not reflective of the assessment of the “efficient” use of natural resources, and in my opinion, if it is not efficient, it does not, by itself, demonstrate a contribution to “social and economic wellbeing”.

71. The relevance of economic impacts generally only relate to their connection with any matters that pertain to levels of economic activity which are given prominence in a District or Regional Plan. For example, in cases where a District Plan has a “social” objective of encouraging employment in particular areas or sub regions within the District, and economic impacts analysis can demonstrate that employment is likely to be generated in that locality by that resource use, then impact analysis can contribute to an overall assessment of that project when assessed against Plan objectives.

72. When assessing the relevance and weight to be placed on economic impact assessments, it is also important to appreciate that a proposed project does not occur in isolation. If that particular project does not proceed, other projects will absorb that investment capital and these will proceed, although not necessarily in the same locality.

³⁷ Circumstances where economic impacts can have efficiency implications are where it can be demonstrated that (i) there are economies of scale in provision of public (and sometimes private) services – e.g. health, education and local government services; and/or (ii) increased economic activity will promote increased inter-firm competition.

Each of these alternate investment projects will, themselves, generate economic impacts on output, household income and employment. The economic impacts generated by one project are therefore not necessarily contributing more to “economic and social wellbeing” than the alternative suite of investment projects. The only case where this may be true is where the impacts are location and resource use specific, and increased economic activity in that particular location is adjudged to be socially desirable. In the absence of that rationale, then all investment generates economic impacts, and an assessment of the gross impacts of one investment fails to account for the fact that other investments using the same capital may generate greater or lesser impacts.

73. In the light of the above comment, it is particularly important to clearly identify what is likely to occur over the project area in the absence of the proposed project – the “Without-Project” scenario. For example, if the project will result in an increase in a land use change toward dairy development using irrigation from a network of open channels installed under the project, but in the absence of the project some dairy land use conversion would still occur either from groundwater development for irrigation or from alternative surface water supply options, then the gross economic impacts attributable to the project are likely to clearly overstate the net economic impacts in that a large proportion of these would occur even without the first project proceeding. This issue is further elaborated on paras 82-85.

Assessment of the Donnelly Impact Analysis

74. Firstly, it is likely that these estimates of impacts due to the proposed CP project are overstated. This is because what has been assumed for the Without-Project scenario (see para 73 above). It is not immediately clear what Donnelly has assumed in this regard, although I understand from correspondence and discussion that the analysis assumes continuation of the status quo – in other words, existing farming operations with their associated land use, irrigation and productivity continue at the same level as now over the next 35 years. As noted before, this approach neglects to take account of the fact that land use change is on-going in the Project area and its environs, and these changes are likely to continue in the absence of the proposed scheme. If that were the case, then there is a likelihood that the economic impacts attributable to the project as gauged by Donnelly will be overstated since they do not fairly represent the net increment in economic activity that results from the scheme.

75. Secondly, in a footnote to Table 3, Donnelly correctly notes that:

If the proposal does not proceed other regional activities may use the resources the scheme requires.

This underlines the generic point made in para 72 above, in that the investment that is expected to be channelled into this project will fund other developments in the absence of this project. To the extent that this “alternative” investment is made in the same region, it will also generate economic impacts with concomitant effects on output, household income and employment. No conclusions can be made about whether the magnitude of the economic effects from this “alternative” investment will be higher or lower than the figures calculated for the proposed CP scheme.

76. The analysis combines the assessed “construction” impacts with the “irrigation and processing” impacts to generate some of the quantum’s of economic impacts noted above. It should be emphasised that, in some situations, the economic impacts from construction activity can be responsible for some quite negative social impacts, particularly on smaller communities. Construction workforces are typically transient, and they generate a sharp increase in economic activity for a relatively short period of time (construction is noted to take three years, compared with the following 32 years of operation). This sudden boost can be disruptive, as businesses in smaller communities invest capital to cope with additional demand, and then suffer from excess capacity post-construction. The same effect can be felt in the provision of social services to a transient population.

77. Finally, the analysis does not assist in assessing what economic impacts are likely to be generated from the perspective of Selwyn District. The Donnelly report does not define the “region” used in the analysis, but presuming it is the Canterbury region, this includes 10 districts from Kaikoura in the north to Waitaki in the south, as well as Christchurch City. It seems probable that the direct impacts of the proposed project from CP operation would likely largely be experienced in the Selwyn District, since they will largely be “on farm”. However, the indirect effects are more likely to be largely concentrated in or around Christchurch City.

6. BENEFIT COST ANALYSIS (BCA)

78. The August 2006 RFI included the following request with respect to an economic evaluation of the proposed project:

A Benefit Cost Analysis (undertaken from the national perspective), detailing all associated benefits and costs of the project. Benefit cost analysis compares the total costs and benefits of the development, from societies’ perspective, quantified in monetary values where possible, and estimates the Net Benefit of the project to society. Externalities (such as environmental effects) are included in the analysis. Such a Benefit Cost Analysis would address the question as to whether, from society’s perspective, the costs associated with the proposed resource development are exceeded by the benefits generated.

79. The Applicant initially declined to provide this information to the Council. In a letter dated 20 September 2006, the Applicant noted that “When Project Aqua was notified, the cost benefit analysis which was done was not provided by the applicant..”. This is incorrect, and the Applicant is referred to Appendix AM of the Project Aqua AEE containing an 11 page document entitled “A Preliminary Assessment of the Economic Benefits of Project Aqua” prepared by Taylor Duigan Barry dated March 2003.

80. In any event, the Applicant did subsequently provide a benefit-cost analysis prepared by Philip Donnelly and Associates³⁸. The conclusions of that report are summarised by Donnelly as follows:

The analysis shows that discounted at 10 percent the gross farm gate benefits of the scheme over the 35 years, the maximum consent period, are \$2159M NPV while costs are \$1,741M NPV. Thus, the irrigation scheme is estimated to generate a net welfare gain to society of \$417M NPV. However, that estimate excludes the scheme's non-market costs and benefits. Regardless, for the scheme to be judged inefficient (i.e. welfare reducing), non-market costs would have to exceed non-market benefits by \$417M NPV. This proposition seems very unlikely given the apparent potential to avoid, remedy or mitigate some potential adverse effects (e.g. increased wetness and nitrate levels) by good farm management practices while still capturing prospective non-market gains³⁹.

81. The Donnelly report was provided to the Council by the Applicant in May 2007 and Council comments were relayed to the Applicant in a letter dated 22 June 2007. The Applicant responded, in part, to those comments in a letter dated 4 July 2007⁴⁰. The following sections describe the background to the conclusions that are later drawn as to the weight that should be attached to this information in the consent process.

Assessment of the Donnelly BCA

(a) The Without Project Situation

82. Benefit Cost Analysis (BCA) evaluates the differences between two scenarios over the analysis period – the situation that is likely to transpire WITH the project, compared with the situation that is likely to transpire WITHOUT the project. This “With-Without” comparison differs from a “before-after” analysis. The approach adopted by Donnelly assumes that in the absence of the CP project, there will be a continuation of existing farming operations – the “status quo” or a “no change” situation.

83. However, this is an unlikely scenario over the next 35 years (the analysis period) given that land use change and expansion of groundwater irrigation seems to be ongoing – and is a trend that may well continue in the absence of the scheme. If this is the case, then there is a possibility that net benefits attributable to the project will be overstated.

84. The Applicant acknowledged this situation, pointing to the fact that “in the absence of the scheme, existing farming will evolve”⁴¹. However the Applicant declined to reflect this in the analysis because such predictions “would involve a huge amount of

³⁸ Philip Donnelly and Associates Ltd. Economic Impacts and Cost Benefit Assessment. Central Plains Irrigation Scheme. May 2007.

³⁹ Philip Donnelly and Associates. 2007:18

⁴⁰ Buddle Findlay letter 4 July 2007.

⁴¹ Buddle Findlay 4 July 2007: para 10

speculation with little defensible basis for those predictions of land use changes⁴². This response is puzzling, in that the Applicant appears to be comfortable with predicting changes in land use over the next 35 years that are considered likely to occur with the advent of the scheme, but is not comfortable predicting change in the absence of the scheme. Given that the assumptions about land use change in the absence of the scheme will have a significant bearing on the final analysis, it would be expected that the Applicant would undertake such an analysis.

85. The recent Taylor Baines report⁴³ highlights the fact that irrigation development and dairy conversions are continuing the CP area, and these trends are likely to continue in the absence of the proposed scheme. It notes that “most (farmers with groundwater irrigation) had contingency plans to extend irrigation from that source should the CPW scheme not proceed⁴⁴. Dairy cow numbers have nearly trebled in the CP area since 2000’01, and this rate of increase is continuing into the 2007’08 season⁴⁵. The situation, both with irrigated area and dairy development, is not static therefore, and is likely to continue to expand in the absence of the CP proposal. This trend should be reflected in the Without-Project scenario, for otherwise project net benefits are being overstated.

(b) Opportunity Cost of Water

86. In social BCA, it is commonly assumed that market prices for particular resources reflect their social costs or benefits at the margin. However, sometimes social costs or benefits can vary from market prices, and in this case, the BCA adopts what is termed a “shadow price” to more properly reflect the social cost/benefit of the particular resource. In the Donnelly 2007 BCA, it is assumed in the analysis that the opportunity cost of the water taken from the rivers under the relevant consents is zero. In comment on the Donnelly report in July, the Council noted that there is intense competition amongst potential users for these consents, and if there were a “market” for these consents they would be traded at above a zero price. All these factors suggest that the shadow price attached to the resource itself (in this case, the water), may well be greater than zero in which case resource costs would be understated, and net benefits overstated.

87. Put another way, it is likely that if the proposed CP scheme does not go ahead, at least some of the water resource allocated to CP will be utilised by other parties. Mr Doug Marsh, chairman of the CP Trust, acknowledges this when he notes” the bottom line is that, whatever happens with the (CP) scheme, the water will be used anyway. Other schemes are lining up for it⁴⁶. The water used by the CP scheme is therefore not “free”, but is depriving other parties of the opportunity for its use. The “net benefit” that these other parties could extract from this water resource represents the opportunity cost of the water.

88. The Applicant responded that, in its view, the takes constitute such a small part of the total mean annual flow that “the waters of the two rivers are free goods and the

⁴² Buddle Findley letter dated 4 July 2007: para 11

⁴³ Taylor Baines et al 2007. Central Plains Water Enhancement Scheme. Social Impact Assessment. Prepared for URS/Central Plains Water Trust

⁴⁴ op. cit. page 19

⁴⁵ *ibid.*

⁴⁶ As reported in The Press, Saturday June 30 2007. Page D2.

assumed zero price is justified"⁴⁷. The Applicant went on to say that "the potential supply of water from the two rivers substantially exceeds the current and foreseeable demand for it when the river resource is considered in its totality"⁴⁸. However, it is meaningless to compare abstraction volumes with total flow volumes, because it is at times of low flow that the abstraction becomes critical in balancing in-stream and abstractive values. Secondly, abstraction at that point will have its greatest impact on in-stream values, values that are equally important as abstractive values in assessing the society's welfare in different allocation regimes. It is for these reasons that competition exists for the abstractive portion of the flow and therefore, in my opinion, society places a value on the water taken by CP (which, in the absence of the CP scheme, would be taken by another party) above zero. This being the case, the BCA underestimates the value of the water resource, and over-estimates net benefits.

(c) Capital Cost

89. Both Macfarlane and Donnelly use a "revised" capital cost estimate of \$6,826/ha for off-farm scheme capital costs. It is understood that this cost relates to the "240Mm³ reservoir capacity with gravity supply" proposal discussed elsewhere in that report, and if allocated across an irrigable command area of 60,000ha implies an all up capital cost of \$410M⁴⁹ ⁵⁰. Because there is some confusion in interpreting this figure, Council requested the Applicant to provide a detailed cost estimate for the scheme, reflective of the "total" capital cost expected for scheme construction through to commissioning, and including all pre-construction costs (consenting, legal, contract preparation and tendering, liaison with stakeholders etc.), construction costs, land purchase and compensation, commissioning, and interest during construction.

90. The Applicant responded "it is simply not realistic to give any more detailed capital cost estimate until the outcome of the consenting process is known. It is almost certain to vary significantly from any estimate which could be provided now"⁵¹. This raises the very key issue of what weight can be placed on either the Donnelly or the MRB analysis in the situation where, as the Applicant notes, capital cost "is almost certain to vary significantly from any estimate which could be provided now". In my experience, capital cost estimates do vary depending on the stage of the investigation - typically, pre-feasibility estimates have contingency allowances of around 30 percent; feasibility level estimates have contingencies of around 20 percent, and with final design contingencies reduce to 10 percent. It is not clear why the Applicant cannot provide capital cost estimates with appropriate levels of contingency allowances.

91. Both the MRB and the Donnelly analysis are based on a capital cost figure of \$6,826/ha. The analysis, and their results and conclusions, are dependent on the robustness of that number. MRB acknowledge, as does the Applicant, that the "scheme is on the cusp of farmer affordability". Capital cost is thus a critical issue, as well as an assessment of the robustness surrounding that estimate. Without this information, the

⁴⁷ Buddle Findlay 4 July 2007: para 14

⁴⁸ Buddle Findlay 4 July 2007: para 16

⁴⁹ MRB 2007 notes that of the 75,000ha irrigated after the scheme is built, only 60,000ha (80%) is subject to CPI off farm development capital. The balance of 15,000ha is water sourced from underground as a result of 30,000ha of existing underground take being replaced with scheme surface water.

⁵⁰ This can be compared with the capital cost in the Feasibility Study of \$219M-\$234M, and in the prospectus of \$368M.

⁵¹ Buddle Findlay letter 4 July 2007: para 18.

weight that can be applied to the conclusions of either the MRB assessments or the Donnelly assessments is considerably reduced.

(d) Rate of Uptake

92. One of the critical considerations in the BCA analysis of irrigation schemes is the rate at which the new technologies are adopted by farmers (often termed the rate of uptake). The delivery of a surface water supply to an offtake point on the farm boundary does not necessarily coincide with land use conversion/intensification on the subject property. In agricultural development schemes, the rate of uptake traditionally followed an “S” type curve, with slow initial adoption, followed by rapid response and then a slowing response as the upper limits of uptake are reached. This generic pattern appears to have been typically followed in irrigation developments in New Zealand. However, recent experience suggests a more rapid initial uptake rate than historically, resulting from the fact that irrigated technologies are not “new” to many farmers, irrigation already exist in pockets within many of the prospective command areas, and farmers require quick productivity gains to offset the increased debt levels associated with irrigation development.

93. The AEE talks of the research on the social effects which result from the advent of irrigation, and the experience that “irrigation commonly leads to changes in farm ownership”⁵². It also points out that “the available research shows successive ownership and land use changes coming in waves after the introduction of irrigation”⁵³, with three “waves” being apparent. While the AEE does not discuss the timing of these waves, it clearly highlights that adoption of the new technology, particularly over large areas, will take time.

94. In a similar vein, MRB points to similar concerns about the possible rate of uptake when they note:

Such an outcome is not sufficient for many existing farmers to cashflow the development particularly those with lower land uses at present. As such, some tensions will arise as existing land owners decide against using scheme water, resulting in a lag in scheme uptake as intergenerational transfer and property sales take place over time. Those most likely to stay outside the scheme are older farmers and those who are debt averse⁵⁴.

95. From the BCA worksheet provided to the Council by Donnelly and Associates, the BCA assumes that off-farm scheme construction is completed over years 1 through 3, with equal expenditure of \$136.5M in each year. The incremental farm output, assessed as increased earnings before interest and tax, commences in year 3 (at 25 percent of the total), and increases to 55 percent of the total in year 4, 85 percent of the total in year 5, and 100 percent in Year 6. In other words, the total incremental benefits attributable to the scheme are realised in Year 6. In my experience, this is an extremely

⁵² Urbis 2006. Notice of Requirement under Section 168(2) of the RMA. Central Plains Water Ltd. Page 86

⁵³ ibid

⁵⁴ MRB April 2007: Para 2.2

optimistic development scenario, when it is considered that farmers have to change land use patterns, new “waves” of farm ownership change need to occur, existing groundwater consents need to be relinquished and new groundwater consents issued, productivity gains realised, and so on. Should the rate of uptake not be as fast as anticipated by Donnelly and more reflective of the MRB cautionary note in terms of a “lag” in scheme uptake, net benefits will be reduced. If, in fact, some farmers delay uptake, the postponement of the “benefits” of irrigation to a later period in the analysis will reduce the net welfare gains estimated by Donnelly.

(e) Sensitivity Analysis

96. BCA is typically accompanied by a sensitivity analysis which tests the robustness of the conclusions against a variation in key assumptions. The Donnelly report includes a sensitivity analysis, but only in respect of a variation in discount rates⁵⁵. Council suggested to the Applicant that broader sensitivity testing be undertaken across a range of parameters, and was informed that Mr Donnelly would supply such analysis. In the event, Mr Donnelly supplied Council with his worksheets, which do give a good understanding of the assumptions behind the BCA. They also include some sensitivity testing along the lines suggested, and I assume that the Applicant will report on this work to the hearing so that conclusions can be drawn as to the robustness of the model against varying base assumptions.

97. As noted above, no BCA was supplied to the Council by the Applicant until May 2007 and this was based on “updated” farm financial models supplied by MRB in April 2007. The original MRB report dated April 2006 was the basis for some of the sections of the AEE. It is informative to therefore insert this original set of farm financial information into Donnelly’s BCA model to test whether the assumptions used in the original AEE application produce a result similar to that now contained in the 2007 Donnelly report. My calculations are that the reverse is the case – in other words, using the 2006 MRB financial data, the net market benefits are less than market costs at a 10 percent discount rate by around \$1.1 billion, and the internal rate of the project is around 8.3 percent, significantly below the “threshold” of 10 percent. This demonstrates that the BCA results are very dependent on the changes in product price and expenditure assumptions made by MRB between April 2006 and April 2007.

(f) Social Costs and Benefits

98. The BCA framework incorporates all costs and benefits to society, acknowledging that only some of these can be ascribed dollar values. The non-monetary costs and benefits are described and quantified where possible, but included in the framework to help decision makers evaluate all cost and benefits.

99. The Council therefore commented to the Applicant that it was surprised that the Donnelly report did not include any discussion on the negative and positive effects of the project on social values. The Applicant responded that “in our view, the obvious adverse effects that may be perceived as social effects are in fact included in the scheme’s economic cost”, referring to the inclusion of the costs of compensation and mitigation

⁵⁵ Donnelly 2007. Page 19/32

measures. Since the Applicant has not provided Council with any detailed cost estimate, I cannot comment on the extent to which these provisions have been included in a comprehensive manner, or whether the provisions themselves adequately reflect the breadth of the social costs that are likely to arise. I do note, however, that the recent social impact assessment⁵⁶ does highlight a number of social costs to the community which are likely to be unmitigated. These include the climate of fear and uncertainty which the announcement of the CP proposal has generated in some households in the community, the “considerable social and psychological disruption” that the proposed change will cause, and the sense of social injustice that is being generated from the fact that “those who gain economically from the project are, for the most part, not the same people who stand to suffer significant negative social effects”⁵⁷. Taylor Baines conclude that the long term effects of this are a degree of “community polarisation, social conflict, and loss of social cohesion” which need to be overcome. These social costs are real, and together with social benefits, need to be considered in any evaluation which assesses the extent to which the proposed project is likely to result in a net welfare gain to society.

7. THE COST OF ALTERNATIVES

100. In Section 2 of this submission, it was noted that economic efficiency, and therefore the efficient use and development of resources (as per s7 (b) of the RMA), involves a number of components (see para 21). A close assessment of the cost of alternative options to ensure that the “least cost” option is adopted is one important component of such an assessment. The Council brought this to the Applicants’ attention in the August 2006 RFI, noting that the Applicant should provide:

An assessment of the net cost implications (from a national and individual farmer perspective) of any significant alternative resource allocation options (i.e. scheme design options). This would cover issues such as alternative dam locations, piped vs open-channel conveyance systems, the comparative financial effects of including service to “pump-supply” areas etc. Similarly, these considerations were canvassed in the 2002 Feasibility Report, but now need to be updated and made available for consideration as part of this consent process.

101. No information has been provided to the Council on this matter, apart from the April 2007 amendment lodged by the Applicant relating to the 10km tunnel option – an option which the Applicant notes to be “an economically viable alternative” to the 15.5 km reservoir supply canal⁵⁸. I cannot comment further on this topic, apart from reiterating the importance of this information in the context of assessing whether the proposed resource development and use proposals are “efficient”. I do note, however, that the letter received from Buddle Findlay dated 20 September 2006, commented that

⁵⁶ Taylor Baines et al 2007. Central Plains Water Enhancement Scheme. Social Impact Assessment. Prepared for URS/Central Plains Water Trust.

⁵⁷ Op. cit. page 73

⁵⁸ See Central Plains Water Enhancement Scheme: Assessment of Effects on the Environment for Long Tunnel. Section 1.1. No comparative information was provided supporting the cost reasons for the long tunnel option being a more economically viable option.

the Applicant would be providing updated information on this request “for the hearing”. For example, a number of submitters noted that in their opinion, a piped reticulation system for the CP scheme offered considerable advantages over an open channel reticulation system. Presumably the Applicant will provide information on this comparison to the hearing as one aspect of demonstrating that the least cost option has been adopted.

102. It is also important to note s171 considerations when considering a requirement. This appears to provide that the territorial authority shall have particular regard to “whether adequate consideration has been given to alternative sites, routes, or methods of undertaking the work”. To date from an economic perspective, apart from consideration of the long tunnel reservoir supply option, the Applicant has not provided the depth of comparative option assessments for me to be able to conclude that adequate consideration has been given to these matters which effect both s171 and s7(b) evaluations.

8. THE “EFFECTS” OF THE PROPOSED CENTRAL PLAINS SCHEME

103. Based on reports provided by the Applicant – in particular the MRB reports of April 2006 and April 2007, together with the Donnelly report of May 2007 – the Applicant concludes that farmers will participate in the scheme at the levels suggested, the projected land use and productivity changes will occur within the timeframes, the “market” benefits emanating from the scheme exceed the “market” costs, when considering non-market benefits and costs the proposed scheme is likely to be assessed as “efficient”, and the proposed scheme will substantially increase key (regional) economic activities.

104. After reviewing this material, coupled with further correspondence and discussion with the Applicant, I am not convinced about the robustness of these conclusions. My assessment has been constrained because of the uncertainty surrounding a number of issues discussed in the preceding paragraphs encompassing such matters as land use change, utilization of “reallocated groundwater”, irrigation uptake, farm profitability, economic impacts and benefit cost analysis. In particular, I have concerns about the following matters:

- According to the Applicant, capital cost is almost certain to vary “significantly” from any estimates that are provided now. If this is the case, it severely compromises the robustness of any conclusions that can be drawn as to any of the financial or economic analysis undertaken for the project;
- The preliminary estimates used by the Applicant’s consultants put the cost of the scheme at the “cusp” of farmer affordability and even then, require a significant shift in farm productivity to service increased farm debt⁵⁹. In many cases, this will only occur with a change in farm ownership and yet the BCA assumes that 100 percent of incremental production due to the project will be realized within 6 years of the start of capital works;

⁵⁹ This increased debt (together with equity injections) is required to finance off-farm and on-farm development costs associated with the CP scheme.

- CP scheme benefits depend, in significant part, on existing groundwater irrigators across 30,000ha converting to surface supply and relinquishing their consents. Scheme benefits also depend on new irrigators taking up 50 percent of these consents across 15,000ha with development of new groundwater abstractions, and reaching full productivity within the same six year period. The basis for these assumptions has not been fully established;
- The economic analysis referred to above is highly dependent on the scheme being constructed in a three year time horizon, with all incremental benefits being realized by Year 6. In my opinion, this is an optimistic implementation and commissioning schedule;
- The economic analysis assumes that there is no on-going development and expansion of irrigation, or productivity and land use changes, in the project area in the absence of the proposed CP scheme over the analysis period – the next 35 years. This assumption leads to an over-estimate of the net benefits attributable to the proposed scheme;
- The economic analysis also assumes that the opportunity cost of the water is zero. This assumption is disputed, and if the opportunity cost of the water is greater than zero, infers that the net benefits attributable to the scheme have been overestimated; and
- Other investment projects will occur in the absence of the proposed CP project. Some will involve expansion of irrigated agriculture within the project area. This “alternative investment profile” will also generate output, household income and employment impacts.

105. In the light of the above, together with the observations made earlier in this statement, I cannot conclude that the proposed CP irrigation scheme has been demonstrated to be an “efficient” use and development of resources – a s7(b) test. Since this s7(b) test is the enabling mechanism for achieving part of the purpose of the Act (in terms of enabling people and communities to provide for their economic well-being), neither has the Applicant demonstrated that the proposal meets that part of the s5 test that relates to economic matters.

9. CONCLUSION

106. In relation to this hearing, I have been retained by the Selwyn District Council to comment on economic matters which are relevant to their processing of the Notices of Requirement and Resource Consents lodged by the Applicant. In particular, I have concentrated on providing my assessment of these Applications in terms of Part II of the Act and, in particular, s7 (b) and s5 matters which are relevant from an economic perspective.

107. After reviewing all the material provided by the Applicant to the Council up to 12 July 2007, I conclude that I cannot confirm that the proposed CP project is an “efficient”

use and development of natural and physical resources – the s7(b) test. Since I see s7(b) as a key to achieving the enabling parts of s5 – enabling “people and communities to provide for their ...economic .. wellbeing”, I likewise conclude that the Applicant has not clearly demonstrated that the proposed CP scheme meets the purpose of the Act in this regard.

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Extract from a paper entitled “Comment on Whether “Financial Viability” is a Key Issue in the RFI”⁶⁰

108. This Application differs from many others in terms of its scale – the proposed scheme will introduce a network of gravity canals allowing potential spray irrigation development across 60,000 ha. The number of farms in this command area is around 300. Additional farmers will be involved in developing groundwater irrigation across 15,000 ha from “released” water, and a further 10,250ha of dryland farms will receive “complementary” benefits. In all, the scheme could potentially affect the farm operations of around 425 farmers⁶¹ across 85,250 ha.

109. In my opinion, the financial analysis to support the assumptions made by the Applicant in terms of (i) the number of farmers who will buy-into the proposed scheme; and (ii) the rate of uptake exhibited by these farmers, is yet to be demonstrated. This level of uptake (magnitude and rate) is the driver that determines the quantum of all the effects – for example, the extent to which landuse changes such as dairy conversions will occur; the incentive that underpins the assumptions that existing groundwater users will switch to surface water supply and surrender their consents; the magnitude and timing of any incremental net economic benefits attributable to the project; the magnitude of environmental externalities attributable to the project; the extent to which flow-on economic and social impacts are likely to occur; etc. etc. There are around 400 individual economic farm “entities” which will separately react to the prospect of irrigation water delivery to an outlet adjacent to their farm boundary. How they react to this, individually and then collectively, determines what the effects of the CPW scheme are likely to be within the command area, adjacent to the command area, and within the larger communities of interest.

110. The approach taken by Macfarlane in his 2007 analysis is to reflect the additional on and off farm costs associated with the scheme under the capital structure of the farm. This means, for example, that the where a “Dryland” property converts to “Arable Process Crop”, the capital investment per hectare increases from \$16,289 to \$28,576 including land value at \$15,000/ha, or from \$1,289/ha to \$13,576/ha if land value is excluded. This reflects off farm capital of \$6,826/ha (the CP scheme cost), on farm irrigation development costs of \$3,000/ha, associated development of \$550/ha, and incremental plant and equipment of \$1,000/ha. Working capital also increases by \$910/ha net of the value of livestock. For a typical 400ha unit, the additional capital involved is around \$4.9 million. Macfarlane then analyses a typical operations budget for these two farm types, and estimates the net revenue (as Earnings before Interest and Tax or EBIT) as a return to farm capital. The change from “Livestock” land use to “Arable Process” land use is then assessed as a marginal return to incremental farm capital. For example, changing from “Livestock” to “Arable Process” results in an incremental EBIT of \$1,577 per ha, which over an incremental capital of \$12,287 per

⁶⁰ This formed part of a note sent to the Applicant on 4 July 2007

⁶¹ Assuming an average farm size of 200 ha which is the average within the command area.

ha⁶² is a return on marginal capital (ROMC) of 12.8 percent. For another prospective land use change, that of dryland sheep and beef systems converting to livestock finishing systems, the ROMC is 5.6 percent⁶³, which is significantly below the cost of debt capital. Is it likely that these farmers will make the switch?

111. But farmers will not be making decision on this basis, and this approach is clearly an oversimplification about what is likely to happen. When Buddle Findlay note that provision of the Macfarlane Rural Business report means that “now you have been supplied with th(e) information” you request, they are clearly not appreciating the detail of the request. Farmers could not totally fund the CP scheme costs, as well as their own incremental capital, solely from equity as assumed by Macfarlane. For example, on the land use conversion noted above, just under \$5 million of additional capital is required per farm, representing 75 percent of the existing farm capital. In such cases, a considerable portion of the funds required would need to be funded from debt – with this debt being raised by the CP Scheme operating entity, and the farmers themselves.

112. For example, the Waimakariri Irrigation Scheme involved a scheme cost of \$7.3 million across an irrigated area of 11,000ha⁶⁴. This was funded by \$4m of equity contribution from 250 landowner shareholders, and \$3.3 million of debt under a 10-yr bank loan. The water charges for the initial year of operation were \$51/ha comprising \$20/ha for opex and \$31/ha for debt servicing. For the Opuha scheme, the initial funding structure was 45 percent debt and 55 percent equity across the required capital of some \$31.0 million⁶⁵. The CP prospectus gave some information on this matter suggesting landowner equity payments of \$2,404 per ha and annual charges varying from \$377 to \$410/ha over the first 25 years of scheme operation⁶⁶.

113. The main driver which determines whether landowners within the 60,000ha CP command area, and those who are predicted to change their farming operations across 25,250ha because of the scheme (those who will develop groundwater and those that will receive association benefits) will react as predicated, is their perception of the financial attractiveness of them incurring more capital debt (on farm and off farm) and increased operating costs in the anticipation of greater net earnings before interest and tax (EBIT). Each of these 400 or so farmers will ask the question – is the change worth it for me? Am I likely to receive additional income which will adequately offset the additional debt and equity capital that I will need to contribute, generate an acceptable return for my incremental risk, and adequately compensate me for the additional managerial effort required? If the answer to this is a resounding yes across all these farmers, then the effects of the proposal will be of the magnitude that the Applicant describes. However, if the buy-in is not at this level (in other words, some farmers don't think that it will be financially attractive enough for them to invest), then the effects will be different.

⁶² Table 9 in MRB 2007 does not seem to reflect the Table 8 data, in that Off Farm development for post CPW is included at \$5,461 per ha compared with Table 8 at \$6,826 per ha. It is assumed that the latter is the correct figure.

⁶³ Adjusted from the 2007 MRB Report to reflect an apparent error in the Table 9 data.

⁶⁴ Original command area. Subsequently extended

⁶⁵ See Deloitte Touche Tohmatsu. 2001. Financial Structures for Community Owned Irrigation Schemes.

⁶⁶ Central Plains Water Limited. 2004. Prospectus and Investment Statement. Pages 28-29.

114. The extent and magnitude of the effects likely to be generated by the CPW proposal depend on the “buy-in” by these farmers to the terms and conditions that CPW will offer them for water access from the proposed Scheme. These terms and conditions will embody a combination of capital charge levied on a “per hectare” basis (possibly as share capital), plus an annual charge for committed delivery of a certain volume of water. The levels of these capital and annual costs will depend on how the development (pre-construction costs, construction, commissioning, operation and maintenance costs) is funded, and will include a combination of equity capital (raised from shareholders) and debt capital which, together with annual O&M costs, will be serviced by the annual water charge. Based on past experience, some farmers will not be persuaded to “buy into” the proposed scheme, and will adopt a “wait and see” attitude. Others will prefer to put their farms on the market, and leave the irrigation development to the “younger” generation. It is this response that leads to the “three waves” of development noted in the AEE. It also leads to the Macfarlane conclusion that the proposed scheme will “encourage a **number of existing farms** to take on significant debt in order to expand the size of their business” (emphasis added). Clearly, they are not confident that all farmers will convert, noting that “those most likely to stay outside the scheme are older farmers and those who a debt averse”. But what proportion will stay out and for how long? What farm types are these likely to be? How long will the “waves” of change take?

115. It is lack of information about this particular generic issue which leads to the concern. Unless we can understand and appreciate the likely response of farmers to the cost profile that they will face, both off farm (equity and water charge) and on farm (equity and debt), we cannot predict the likely level of “buy in” – called rate of uptake – or the likely level of effects that will result from this uptake. We also cannot fully appreciate the specific level of effects on this particular community of interest – the farmers within and adjacent to the command area which may number around 400. Finally, it is also my opinion that we cannot assess whether the proposed investment is likely to be an “efficient” use and development of natural and physical resources in terms of s7 (b).

Nick Brown
3 July 2007