

Before the Hearings Commissioners
at Christchurch

in the matter of: a submission on the proposed Canterbury Land and
Water Regional Plan under the Resource Management
Act 1991

to: **Environment Canterbury**

submitter **Hunter Downs Irrigation**

Brief of evidence of Brian Neil Ellwood

Dated: 2 April 2013

BRIEF OF EVIDENCE OF BRIAN NEIL ELLWOOD

- 1 My full name is Brian Neil Ellwood.
- 2 I am a Water Infrastructure Project Manager at Meridian Energy Limited (Meridian) and have held the role of Project Manager for Hunter Downs Irrigation Scheme (HDIS) since 2006. I have worked in the area of irrigation and water infrastructure since 1998 in both consultancy and regional council roles. I have been employed by Meridian since 2003.
- 3 My roles within Meridian since that time have included;
 - 3.1 Development of Project Aqua irrigation infrastructure mitigation plans and mitigation agreement negotiations with Lower Waitaki Irrigation companies.
 - 3.2 In relation to Meridian's involvement in North Otago Irrigation Company Limited (NOICL), involvement in:
 - (a) the technical studies;
 - (b) design build tender preparation;
 - (c) interactive tendering;
 - (d) contractor selection; and
 - (e) Meridian's underwriting agreement negotiations.
 - 3.3 I also managed Meridian's shareholding and exit from an ownership interest in NOICL.
 - 3.4 Involvement in the consideration of irrigation options in South Canterbury.
- 4 I am authorised to give this evidence for Hunter Downs Irrigation (HDI) on behalf of South Canterbury Irrigation Trust (SCIT).

QUALIFICATIONS AND EXPERIENCE

- 5 I have the following qualifications: MAppISC (Hons) (1997) in agricultural engineering and a BTech (Hons) (1996) in environmental engineering both from Massey University, and post graduate certificate in Irrigation from Charles Sturt University of

New South Wales (2007). I hold an intermediate level certificate in Sustainable Nutrient management from Massey University.

6 In preparing my evidence I have reviewed:

6.1 The HDI submission on the Land and Water Plan (LAWP);

6.2 The evidence of Mr Ian Moore and Mr Ken Gimblett.

SCOPE OF EVIDENCE

7 I am providing evidence for HDI (on behalf of SCIT)¹ on the following:

7.1 Background on the proposed HDI scheme and the consents held;

7.2 A summary description of the HDI scheme and the proposed management methods;

7.3 Outline the HDI development programme;

7.4 Discussion of Scheme and Farm management Plans and possible duplication of requirements under rules in the Land and Water Plan.

BACKGROUND TO THE HUNTER DOWNS IRRIGATION PROPOSAL

The beginnings of HDI

8 Meridian have been involved in the development of irrigation options for the South Canterbury region since around 2001 when it began investigating options for irrigating South Canterbury. These studies identified the enhancements to the previous Waihao North Scheme as being viable.

9 From this previous work and an optimisation study completed in 2004 (which investigated the opportunities of the Waihao Downs Irrigation area and the southern part of the coastal plains from

¹ I note that although Meridian Energy Limited has provided submissions and further submissions to LAWP, I have not been involved in that submission process. My evidence is being provided for HDI on behalf of SCIT.

Waimate north to Otipua merging), the project moved forward to engage with existing irrigation companies, future irrigation scheme developers, and land owners within the proposed irrigable area.

- 10 A general outline of the HDI timeline is set out in **Figure 1**.
- 11 As can be seen from **Figure 1**, applications for 'water only' resource consents for HDIS were lodged in October 2006. By 'water only' I mean the application for resource consent to take water from the Waitaki River for irrigation use. The other consents needed for the scheme, namely construction and operation, are still to be applied for.
- 12 The application to take and use water (CRC071029) then advanced to hearing in October 2007. A decision on the HDI Scheme was provided on 27 April 2010 and the Environment Consent order was issued on 17 November 2011 after agreement was reached with the appellants.

GENERAL DESCRIPTION OF HUNTER DOWNS IRRIGATION SCHEME

- 13 HDIS has consent with the capacity to irrigate the equivalent of 40,000 hectares from within a total command area of 60,000 hectares (**Figure 2**). The command area includes land such as those parts of properties, roads, river bed land and steep land not suitable for irrigation.
- 14 Under the consent HDIS can take water from the Waitaki River at a location referred to as Stonewall. At this location there is an existing irrigation intake for Morgen Glenavy Ikawai Irrigation Company (MGII). The MGII intake is currently designed for a take of 6 m³/second and to allow the two schemes to operate simultaneously, the existing intake will need to be enlarged. HDI have a heads of agreement with MGII to ensure that this is able to occur.
- 15 To date, the main delivery infrastructure studies have identified a range of suitable canal and pump station locations. The two primary options include:
 - 15.1 A gravity canal from Stonewall, following the contour to a tunnel beneath Mt Harris. From Mt Harris the canal would traverse across the Waihao Downs area and Waimate Gorge emerging on the plains behind Waimate and proceeding

northwards along the foot of the Hunter Hills to end just north of the Pareora River in the district called Otipua.

- 15.2 A gravity supply to a pump station located near Makikihi lifting water approximately 70 metres to discharge into a canal which distributes water in a northern and southern direction.
- 16 Both options would include further small booster pump stations to take water from the canal and deliver water to the higher elevation farm land along the edge of the Hunter Hills.
- 17 The layout of the secondary canal network (i.e. that to take water from the main canal(s) to individual farmers) is dependent on the selection of the primary network and farmer demand. These issues will be resolved in the detailed engineering phase of the project.
- 18 Overall, the concept of the HDIS is similar to the existing Rangitata Diversion Race (RDR) irrigation scheme in Mid Canterbury. The RDR abstracts water from the Rangitata River and delivers water north via a large primary head race which follows a near flat contour, secondary races and pipes deliver water from the head race to the RDR's 64,000 ha irrigable area. The RDR is a gravity supply scheme from the river to the farm.
- 19 The RDR example shows that irrigation of this scale is possible. Once constructed, HDIS would be the third largest irrigation scheme in New Zealand after the RDR and the fully developed Central Plains Water Scheme.

Scheme development timeframe

- 20 HDIS is a large development with considerable lead time required for the design, financing, further consenting of secondary infrastructure and scheme construction. The water consents are subject to a 10 year lapsing period which allows for this long lead time.
- 21 The rationale for adopting a 'staged approach' on the resource consenting is to reduce the risk. Considerable financial commitment in order of \$7m is required to undertake the comprehensive design and engineering studies required to determine the final layout of the scheme.
- 22 By ensuring that the water take and use are secured in the first instance, a key project risk was managed and justified seeking the

capital to undertake the detailed design work required for the 'next stage' of developing HDIS.

- 23 **Figure 1** outlines the development phases of HDIS from engineering design, consenting (construction and operation elements), land access and commercialisation being completed by 2017, allowing the three year construction programme to commence.

HDIS nutrient resource consent conditions

- 24 HDIS has been granted consent with detailed conditions relating to nutrient management. Both nitrogen and phosphorus are included with the requirements for all properties receiving water to produce a nutrient budget. Phosphorus is managed with the use of physical measures to limit sediment transport, maintaining soil structure, avoiding pugging and overwater soils.
- 25 Nitrogen and the leaching of nitrates is specifically managed by condition 20 (f):

That, for each property, for each 12 month period ending 30 June:

- (i) *either, it is demonstrated, via the nutrient budget required in (c) above, that the average total nitrogen (fertiliser and effluent) application has been less than 200 kgN/ha/yr; or*
- (ii) *or, approved methods are used to undertake calculations or measurements of the average annual concentration of nitrate nitrogen in the soil drainage below the plant root zone and the actions in (iii), (iv) or (v) below are implemented depending on the calculated or measured nitrate concentration. For the purposes of this rule, approved methods shall be:*
 - *Calculations using either the most recent version of the OVERSEER® model or the most recent version of the Soil Plant Atmosphere Model (SPASMO); or*
 - *Any other method of calculation or measurement approved by the Canterbury Regional Council.*
- (iii) *where the average annual concentration of nitrate nitrogen in the soil drainage water below the plant root zone as calculated in accordance with clause (ii) or measured, for the property exceeds 8 grams per cubic metre, management practices are implemented to reduce the loss*

of nitrate nitrogen to soil drainage water. These may include but not be limited to:

- *Split applications of nitrogen fertiliser*
- *Timing of nitrogen fertiliser application to plant growth*
- *Avoiding application of nitrogen fertiliser to saturated soil*
- *Avoiding applying nitrogen fertiliser when the soil temperature at 10 cm depth is less than 10°C*

(iv) *where the average annual concentration of nitrate nitrogen in the soil drainage water below the plant root zone calculated in accordance with clause (ii), exceeds 12 grams per cubic metre of nitrate nitrogen:*

- *Nitrification inhibitors, winter cover crops, or appropriate technology or management practice, implemented to reduce the loss of nitrate nitrogen to soil drainage water.*

(v) *where the average annual concentration of nitrate nitrogen in the soil drainage water below the plant root zone calculated in accordance with clause (ii) or measured, exceeds 16 grams per cubic metre of nitrate nitrogen:*

- *The average total nitrogen (fertiliser and effluent) application to that property is limited to 200 kgN/ha/yr.*

26 This condition implements progressive nutrient mitigation strategies as the nitrate concentration in the soil drainage increases. If soil nitrate drainage exceeds 16 g/m³ a nitrogen input cap is put in place to limit the nitrogen use and therefore leaching.

27 Evidence presented at the hearing showed that for all landuse types if nitrogen was limited to 200 kg/ha/yr then leaching would not exceed 16 g/m³ which was the standard applied in the NRRP under Rule WQL20.

28 The selection of nutrient strategies will vary over time and the adoption of the latest best practice is managed via the scheme and Farm management plans. This ensures that as science develops there is a ready mechanism for this to be applied on farm.

Scheme and Farm Management Plans

29 There are a range of land uses that are suitable for the HDIS area with the use of irrigation. To provide certainty for parties with

differing land uses, the conditions of HDIS require a series of management plans be employed for each property receiving water from HDIS. If the requirement of a specific plan for an individual property is not met by the water user, then consent conditions enable enforcement of the plan. Serious ongoing non compliance can lead to the scheme ceasing to supply water to that property.

- 30 The plans take the current best industry standards and additionally apply the principle of continuous improvement, enabling improvement and maintenance of current practices. For example the use of Nitrification inhibitors, use of OVERSEER nutrient modelling and applying the advances in that model. The purpose is to ensure that potential adverse effects from the scheme are minimised and where possible avoided, while maintaining flexibility of landuse to realise the benefits and opportunities irrigation creates.
- 31 The Scheme Management Plan (SMP) sets out the protocols, policies and procedures that HDI will follow in the development, operation and maintenance of the scheme. The SMP ensures that both the scheme operators and the water users can achieve high environmental standards and sustainable outcomes.
- 32 **Figure 3** shows the relationship between the consent conditions, the SMP and the Farm management plans.
- 33 The SMP's objectives are transferable and enforceable to individual farm properties via a water supply agreement between the HDI water supply company and the individual water user. The water supply agreement approach is used in the North Otago Irrigation Company and the South Canterbury Farmers Irrigation Society which uses water from the Opuha Dam.
- 34 The water supply agreement will be legally enforceable and as a condition of the consent the consent authority can require the consent holder to restrict water supply to an individual farm/s when a serious or continuous breach of SMP objectives and requirements occurs as a result of a serious and continuous breach of an individual Farm Management Plan/s (FMP).
- 35 The FMP will be required to be in place before any water is supplied. Additional requirements prior to receiving water from HDIS include the following to be undertaken on each property:
 - 35.1 Accredited design of irrigation infrastructure that takes into account specific impacts identified for each property and

applying those constraints to the design. E.g. soil water holding capacity, soil water infiltration rates and land slope.

- 35.2 Preparation of nutrient budget.
- 35.3 Development of riparian management in accordance with ECan guidelines including certain stock exclusion, uncultivated buffer along streams, race and drainage management.
- 35.4 Identification and protection of known mudfish sites.
- 36 The use of an "umbrella" SMP allows consistent practices and development objectives to be employed across the command area.
- 37 The individual FMP's ensure that the practices undertaken are enforceable by ECan but reduce the complexity and cost of compliance for individual users.
- 38 The associated effects from land used for farming within the HDIS area were assessed cumulatively via the resource consenting of the water take and use. The FMPs, SMP, water supply agreements and consent conditions associated with the take and use of water create a robust regime for managing the change in land use and limiting adverse effects.
- 39 An example of the requirements built into the HDI regime is that all on farm irrigation equipment design is undertaken by an Irrigation NZ accredited designer and has measurable performance criteria that are audited during commissioning. The use of the design code will ensure that factors that influence system performance (e.g. soil type, infiltration rate, water holding capacity and slope) are taken into account at the design stages where corrections are easily made. Getting the equipment design right limits the risk of surface runoff, and overwatering causing increased drainage and nutrient leaching.
- 40 A further example is the requirement for nutrient budgets, as OVERSEER will be used to predict the drainage water nitrate concentration and progressively apply mitigation measures as the concentration increases with a nitrogen input limit of 200kg/ha/yr if the concentration of nitrate exceeded 16 g/m³.
- Impact on HDI of the LAWP**
- 41 The proponents of HDIS are most interested in the application of Rules 5.46 to 5.51, and the reliance on Schedule 8, which is currently unpopulated.

- 42 Prior to 2017 farming and land use change enabled by HDIS is a permitted activity under proposed rule 5.42 due to the HDIS water consent including nutrient management conditions and the SMP and FMP requirements. However due to the long development and operational life of HDIS, the proposed rules relating to post 2017 are most relevant.
- 43 HDIS sits within two nutrient allocation zone classifications, a Red nutrient allocation zone relating to Wainono Lagoon and the remainder of the scheme sitting in Orange zones. The distribution is approximately 1/3 Red and 2/3 Orange.
- 44 The effect of the different zones post 1 July 2017, within:
- 44.1 Wainono Nutrient Allocation Zone - farming is required to meet the requirements of either rule 5.46 to be a permitted activity or rule 5.49 which has non-complying activity status.
- 44.2 Orange Nutrient Allocation Zone – farming is required to meet the requirements of either rule 5.46 for permitted status or rule 5.48 which has a discretionary activity status.
- 45 Proposed Rules 5.46, 5.48 and 5.49 of the LAWP relate to the regulation from 1 July 2017 for the use of land for any farming activity, focussing on the average annual loss of nitrogen. The effects on the receiving environment from the change in nutrients lost from the land with the conversion from dry land to irrigated was the major part of the resource consents hearings for HDIS. Consent was granted based on evidence showing that nutrient losses would increase.
- 46 Furthermore, the lack of detail relating to proposed Schedule 8 means that the scheme proponents cannot yet determine the activity status of the use of land for any farming activity post 2017 (as it relates to the application of rules 5.46, 5.48 and 5.49).
- 47 Aside from the uncertainty with meeting the rates in the unpopulated Schedule 8, the existing requirements for the SMP and FMP meet the conditions of rule 5.46 allowing the activity status to be a permitted activity across the entire command area whether the nutrient lost is less than or greater than 20 Kg/ha/yr.
- 48 The conditions of consent for the HDIS and the requirement to have a water supply agreement linking the scheme conditions to the water users, including an annual volume, nutrient discharge rates,

nutrient budgets and independent farm plan audit conditions achieve the intent of rules 5.46 to 5.49 to control land use effects on water quality.

- 49 I consider that it is unlikely that further consenting and evidence at an individual property scale as required by the LAWP would improve the environmental outcomes over and above what is already required for a property receiving water from HDIS.
- 50 I believe the reduced complexity and cost of compliance achieved for properties receiving water from HDIS will be lost with the implementation of the rules requiring authorisation for the use of land for farming post 2017.
- 51 The proposed requirement for new regulations under the LAWP introduces an uncertainty which is likely to make it harder to gain the financial commitment for investment in the next stage of work or the large capital requirement for scheme construction.
- 52 As discussed in the evidence of **Mr Gimblett**, the proponents of HDIS would like the region wide exemption for irrigation schemes contained in rule 5.42 to apply post 2017. This would make farming activity associated with an irrigation company that has been granted a water permit a permitted activity where the land is subject to conditions that address nutrient management, including the preparation, implementation, and auditing of a farm environment/management plan(s), and specifies the maximum amount of nitrogen that may be leached.

Summary

- 53 HDIS is consented to take 20.5 m³/second which is sufficient to irrigate an area of 40,000 ha within a command area of 60,000ha.
- 54 HDIS is a large scale irrigation scheme in the development phase. The scheme has detailed consent conditions and requirements on the future water users which are designed to create a robust management of environmental effects arising from the change in land use to irrigated agriculture.
- 55 The consent conditions and management plans have created an auditable management system which does not need to be replicated by separate individual consents for each property or water user.

Dated: 2 April 2013

Brian Ellwood

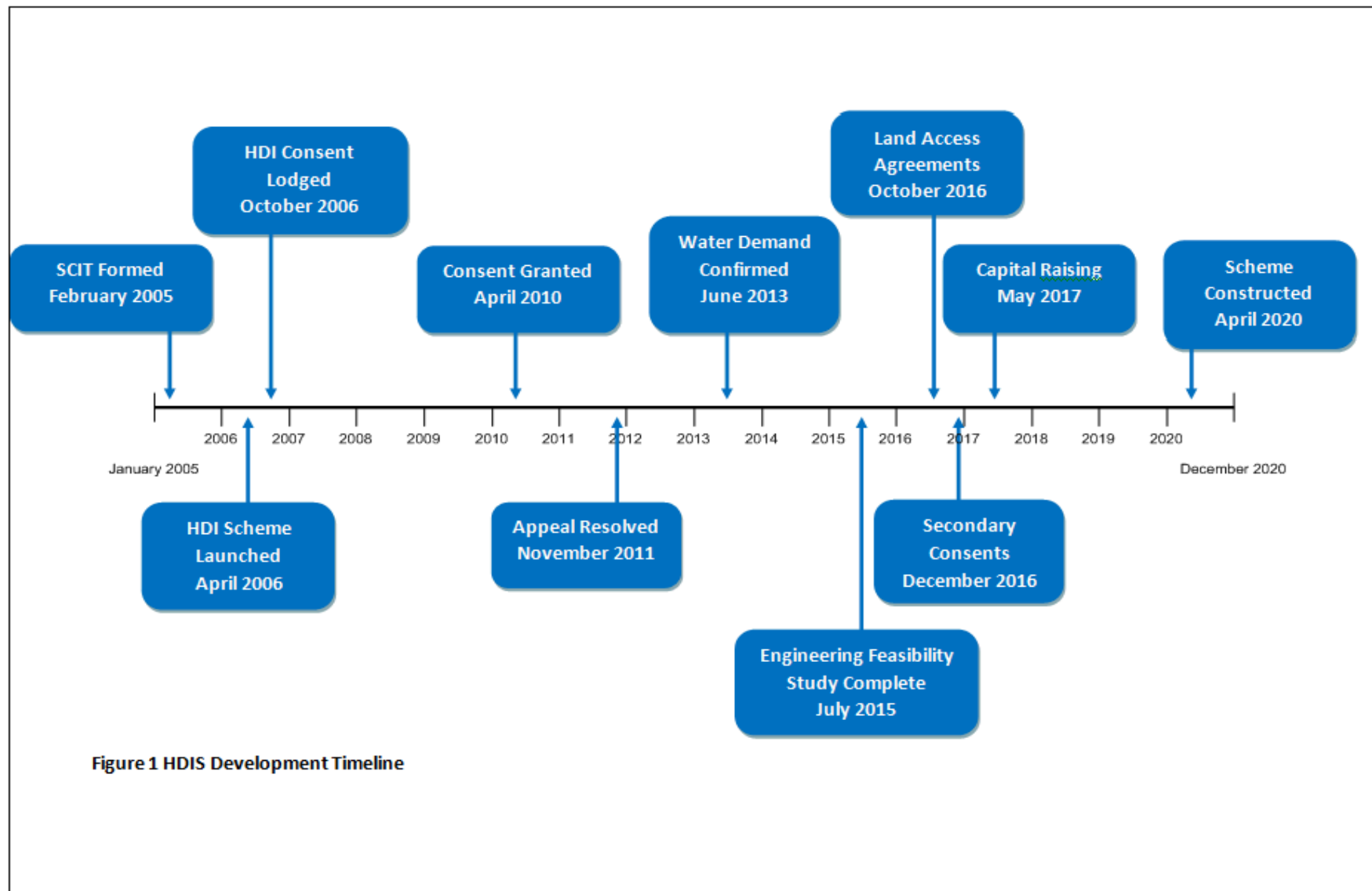




Figure 2 HDI command area

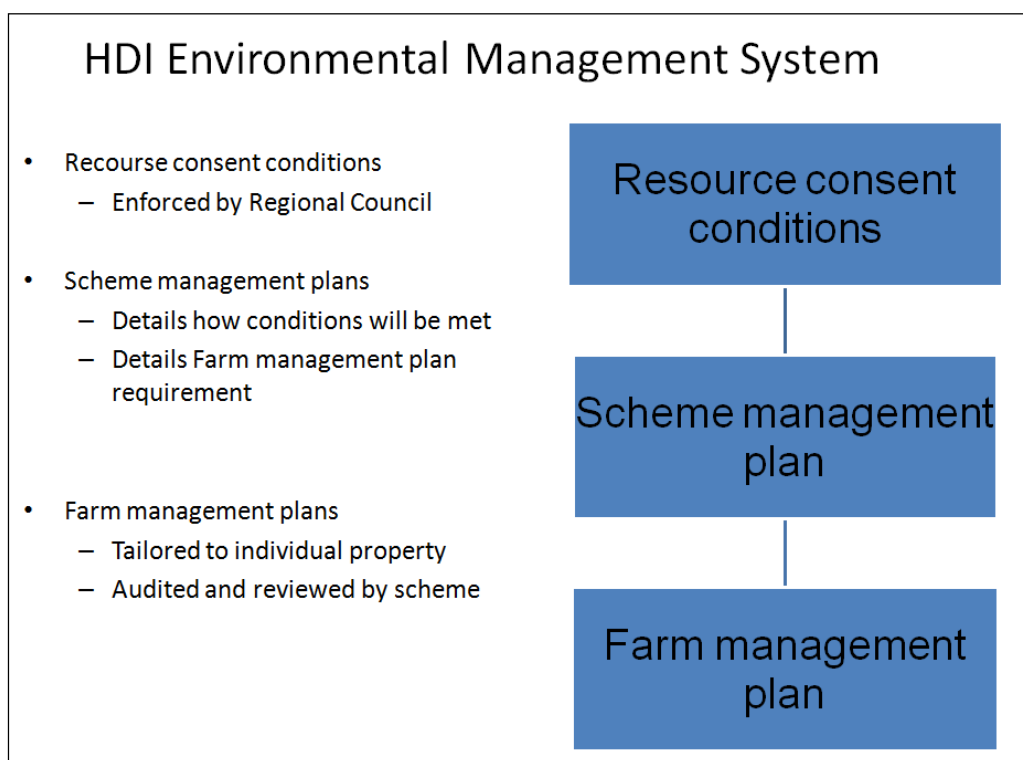


Figure 3 Hierarchy of Management and scheme regulation