Regional Plan: Water for Otago

Proposed Plan Change 5A (Lindis: Integrated water management)

Section 32 Evaluation Report

Consideration of alternatives, benefits and costs

This Section 32 Report should be read in conjunction with Proposed Plan Change 5A (Lindis: Integrated water management) to the Regional Plan: Water for Otago.

Otago Regional Council

August 2015

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Abbreviations

Council	Otago Regional Council
l/s	Litres per second
MAR	Mean annual recharge
MALF	Mean annual low flow
Mm^3/yr	Million cubic metres per year
NNN	Nitrate-nitrite nitrogen
NPSFM	National Policy Statement for Freshwater Management 2014
RMA	Resource Management Act 1991
Proposed plan change / plan change	Proposed Plan Change 5A (Lindis: Integrated water management)
SH8	State Highway 8
Water Plan	Regional Plan: Water for Otago*
Note: use of section/Section:	
section	A reference to another section in this report.
	A reference to a section of the Water Plan.
Section	A Section of the RMA.

* Operative as at 1 June 2015.

1. Introduction

Proposed Plan Change 5A (Lindis: Integrated water management) builds on existing provisions of the operative Regional Plan: Water for Otago (Water Plan) for managing surface water and groundwater by:

- Setting a management regime (allocation limits and minimum flow) for surface water and connected groundwater in the Lindis catchment;
- Setting maximum allocation limits for specified aquifers within the Bendigo-Tarras Basin (Ardgour Valley, Bendigo, and Lower Tarras aquifers);
- Mapping the minimum flow catchment boundaries and monitoring site associated with the Lindis River in the B-series of the Water Plan maps; and
- Mapping the boundaries of the Bendigo-Tarras Basin aquifers and amending the boundaries of the Lindis Alluvial Ribbon Aquifer in the C-series of the Water Plan maps.

This report assesses the appropriateness of Proposed Plan Change 5A, as required by Section 32 of the RMA, and should be read in conjunction with the proposed plan change.

2. Background

2.1 The NPS for Freshwater Management 2014

The National Policy Statement for Freshwater Management 2014 (NPSFM) requires Council to reduce and prevent further over-allocation and safeguard the life-supporting capacity, ecosystem processes and indigenous species of freshwater, by making sure the freshwater objectives within the Water Plan give effect to the NPSFM objectives and by establishing environmental flows and/or levels for all freshwater management units. The NPSFM also calls for Council to provide plan provisions that maximise the efficient allocation and efficient use of water.

The Water Plan objectives give effect to the NPSFM by recognising the need to protect the natural and human use values, which include cultural values, amenity and natural character of rivers, while enabling the sustainable and efficient use of this resource to the benefit of Otago's industries and communities. The Water Plan achieves this by:

- setting minimum flows and allocation limits for surface water bodies;
- establishing maximum allocation limits and aquifer restriction levels for groundwater resources; and
- promoting the efficient use and sharing of the water resource.

2.2 Water management and allocation under the Water Plan

Surface water

Primary allocation is the amount of water that can be taken from a catchment under primary allocation consents. The primary allocation limit is set to provide for socio-economic and cultural wellbeing, while also enabling reliable access to the resource.

Minimum flows are set to maintain the aquatic ecosystems and natural character of surface water bodies at times when flows in the catchment are low. When the flow drops below the primary allocation minimum flow, most primary consented and some permitted takes have to cease.

Schedule 2A of the Water Plan identifies minimum flows and primary allocation limits for specified catchments in Otago. Catchments that are not listed in Schedule 2A have no minimum flow, but new takes will be subject to a minimum flow. The taking of surface water in these

catchments is limited through the “default” primary allocation limit, 50% of the mean annual low flow (MALF).

In catchments where the sum of consented maximum instantaneous takes exceeds either 50% of MALF or the primary allocation limit included in Schedule 2A, no more water can be allocated as primary allocation. When there is no more primary allocation available, further water can be taken as supplementary allocation, subject to progressively higher minimum flows. Such higher minimum flows result in supplementary takes ceasing sooner and more often than primary allocation takes.

Groundwater

The maximum allocation limit for specified aquifers is set in Schedule 4A of the Water Plan. The maximum allocation limit sets a limit to the volume of water that can be taken annually from an aquifer by consents. The maximum allocation limit is set to maintain long-term groundwater levels and avoid aquifer compaction. When no limit is set in Schedule 4A, the maximum allocation limit is determined as 50% of the mean annual recharge (MAR) of the aquifer. The groundwater allocation limit is expressed in million cubic metres per year (Mm^3/yr).

2.3 Current management regime for the water resources in the Lindis

Currently, Schedule 2A does not include a primary allocation limit or minimum flow for the Lindis River. However, the catchment is considered over-allocated as the sum of consented maximum instantaneous takes within primary allocation (4,002 l/s) exceeds 50% of MALF (930 l/s).

Groundwater takes from the Lindis Alluvial Ribbon Aquifer, which is listed in Schedule 2C of the Water Plan, are managed as surface water and are included within primary allocation from the Lindis River.

No maximum allocation limits have been set in Schedule 4A for the Ardgour Valley, Bendigo or Lower Tarras aquifers. Therefore, the maximum allocation limit for each of these aquifers is currently determined as 50% of MAR. Further water can be allocated from the Ardgour Valley, Bendigo and Lower Tarras aquifers as the consented allocation from each of these aquifers (8.38 Mm^3/yr from the Bendigo Aquifer and 11.05 Mm^3/yr from the Lower Tarras Aquifer) is less than 50% of their MAR values.

3. Description of the Lindis catchment and Bendigo-Tarras Basin

This section summarises the hydrological characteristics of the surface and groundwater resources of the Lindis catchment and Bendigo-Tarras Basin. A more detailed hydrological overview is included in the Information Sheet prepared for workshops.

3.1 Lindis River hydrology

Flows in the Lindis River are generally high during spring due to rainfall and snow-melt, but are greatly reduced during summer due to a combination of low natural flows, water taking and losses to groundwater.

Recorded mean annual low flows in the upper catchment at the Lindis Peak flow monitoring site average 1,550 l/s, while flows in the lower catchment at the Ardgour Road flow monitoring site, regularly drop below 250 l/s most years. If no water was taken the natural mean annual low flow of the Lindis River at the Ardgour Road monitoring site would be approximately 1,860 l/s.

3.2 Aquifer hydrology

The Bendigo-Tarras Basin comprises four aquifers with distinct hydrology: the Ardgour Valley Aquifer, the Bendigo Aquifer, the Lindis Alluvial Ribbon Aquifer and the Lower Tarras Aquifer.

The Clutha River/Mata-Au is the dominant recharge source for the Lower Tarras and Bendigo Aquifers. Both aquifers also receive a modest volume of infiltration from rainfall, irrigation and smaller surface streams. The Bendigo Aquifer contains a zone of high permeability sediments associated with an old Clutha River /Mata-Au channel. Therefore, increased groundwater taking will generally result in increased levels of infiltration from the Clutha/Mata-Au. Permeability in the Lower Tarras Aquifer is generally lower, except for locations close to the Clutha River/Mata-Au.

The Ardgour Valley Aquifer receives most of its inflows through rainfall, whereas the Lindis Alluvial Ribbon Aquifer hydrology is dominated by the Lindis River.

3.3 Interaction between groundwater and the Lindis River

The Lindis River strongly interacts with the Lindis Alluvial Ribbon Aquifer. Downstream from the State Highway 8 (SH8) bridge the river consistently loses surface flow to groundwater all year round. Upstream of the SH8 bridge, the river has a mixture of both gaining and losing reaches.

The rates of flow loss to groundwater can vary depending on the groundwater level, the degree of connectedness between the river and the underlying aquifer, and the wetted perimeter and permeability of the river bed. Groundwater takes from the Lindis Alluvial Ribbon Aquifer and Ardgour Valley Aquifer also contribute to stream depletion downstream from the SH8 bridge.

In January 2015, the rate of flow loss to groundwater in the 3 km long river stretch between the Ardgour Road flow monitoring site and the Clutha River/Mata-Au confluence was estimated to be 550 l/s.

Under natural conditions the river would typically flow the entire way to the Clutha throughout the year. However, due to a combination of low summer flows, losses to groundwater and water taking, the river now generally flows intermittently upstream of the Ardgour Road flow recorder, and is completely dry downstream from the SH8 bridge, from January through to the end of April.

4. Identified values and uses of the Lindis River

In the period 2009-2015, the ORC undertook a comprehensive community consultation process to identify the values and uses that are supported by the Lindis River. This section summarises the values and uses that were recorded during this process. A more comprehensive overview of these values is included in the workshop Information Sheet.

Availability of water for irrigation during the growing season

Water takes from the river provide for wine making, frost fighting and pasture irrigation. Currently, over 4,000 l/s is allocated from the river, but generally no more than 2,300 l/s can be taken due to low river flows and limitations to existing water supply infrastructure. Most years the reliability of supply is further reduced as the water deficit in the catchment increases throughout summer.

Provision of domestic, communal and stock water supplies

The Lindis River not only supports economic activity in the Lindis Valley, but also contributes to the well-being of the local community and animal welfare through the provision of domestic, communal water supplies and stock water supply.

Trout spawning, juvenile trout rearing and retention

The river plays an important role for juvenile recruitment to the nationally important Lake Dunstan and Upper Clutha fisheries, while its middle and upper reaches also support a small adult brown trout fishery.

Habitat and access for native fish

The Lindis catchment provides habitat for the “Nationally Critical” Clutha flathead galaxiid, longfin eel (classified as “in decline”), and common and upland bully.

Cultural values

The Lindis was an important source of mahika kai for Maori, The river contains longfin eel, a taoka species that forms a key component of Kai Tahu’s tribal identity. Kai Tahu promote a holistic management approach that provides for aquatic ecosystems, natural character, cultural and recreational values over the entire length of the river.

Small stream recreation and safe and family-oriented camping

The Lindis can be easily accessed and provides a peaceful setting for camping, picnicking and angling. The river also provides a safe location for swimming and paddling due to its small size.

Water quality and stream health

Water quality is good throughout the catchment, although nitrogen concentrations in the lower reaches of the river have increased in recent years. Concerns have also been raised around the risk of algal blooms in the lower Lindis during extended periods of low flows over summer.

Wildlife habitat

The lower reaches of the river provide habitat for waterfowl and wading birds, including the endangered black fronted tern, paradise shelduck, black shag, black-backed gull, South Island pied oystercatcher and spur-wing plover.

Amenity and natural character

The Lindis River is an important landscape feature, contributing to the overall amenity and scenic value of the surrounding environment.

5. Section 32 evaluation – Analysis of management options

Section 32 of the RMA requires the consideration of alternatives and an assessment of the benefits and costs of adopting any objective, policy, rule, or method in the Water Plan. The sections below provide an overview and analysis of the different options for managing the water resources of the Lindis River and Bendigo-Tarras Basin:

- Section 5.1: Options for managing surface water in the Lindis catchment.
- Section 5.2: Options for managing groundwater in the Bendigo-Tarras Basin.
- Section 5.3: Options for mapping the Lindis catchment and its connected water resources.

5.1 Options for managing surface water in the Lindis catchment.

5.1.1 Overview of options

In developing the proposed plan change the following options were considered for managing the surface water resources of the Lindis catchment:

OPTION 1: STATUS QUO

Option 1 describes the current situation which does not have a set minimum flow for primary allocation takes. Surface water and connected groundwater are managed by the "default" primary allocation limit and supplementary allocation blocks set by Policy 6.4.2 and Method 15.8.1A.1 of the Water Plan.

Primary allocation (sum of consented takes) Primary allocation limit	4,002 l/s 930 l/s
Primary allocation minimum flow	No minimum flow
Supplementary allocation blocks (size)	500 l/s
Supplementary allocation minimum flow	4,502 l/s

OPTION 2: FLOWS AT STATE HIGHWAY 8 BRIDGE

Option 2 provides for the protection of ecosystems, cultural and recreational values upstream of the SH8 bridge. This minimum flow option ensures flows at the SH8 bridge at all times, but does not guarantee permanent connection with the Clutha River/Mata-Au.

Primary allocation limit	1,000 l/s
Primary allocation minimum flow	750 l/s (October to November) 450 l/s (December to April) 750 l/s (May) 1,600 l/s (June to September)
Supplementary allocation blocks (size)	500 l/s
Supplementary allocation minimum flow	2,200 l/s (May to November) 1st block 1,600 l/s (December to April) 1st block 2,700 l/s (May to November) 2nd block 2,100 l/s (December to April) 2nd block

OPTION 3: FLOW CONTINUITY – FISH PASSAGE

Option 3 provides for flow continuity and fish passage. This option protects the natural character, cultural and recreational values of the river's upper, middle and lower reaches.

Primary allocation limit	1,000 l/s
Primary allocation minimum flow	750 l/s (October to May) 1,600 l/s (June to September)
Supplementary allocation blocks (size)	500 l/s
Supplementary allocation minimum flow	2,200 l/s (May to November) 1st block 1,600 l/s (December to April) 1st block 2,700 l/s (May to November) 2nd block 2,100 l/s (December to April) 2nd block

OPTION 4: FLOW CONTINUITY – FISH HABITAT

Option 4 provides for fish habitat and the protection of cultural, natural character and recreational values along the entire river's length.

Primary allocation limit	1,000 l/s
Primary allocation minimum flow	900 l/s or more (October to May) 1,600 l/s (June to September)
Supplementary allocation blocks (size)	500 l/s
Supplementary allocation minimum flow	2,200 l/s (May to November) 1st block 1,600 l/s (December to April) 1st block 2,700 l/s (May to November) 2nd block 2,100 l/s (December to April) 2nd block

5.1.2 Analysis of options

Option 1	Status Quo
BENEFITS:	ECONOMIC • Scope to increase productivity in local primary sector through the use of alternative water sources and efficient irrigation systems. SOCIAL • No need to change the way water users work together.
COSTS/RISKS:	ECONOMIC • Administrative inefficiencies and increased consent processing costs through assessment to impose individual residual flows on a case-by-case basis with every application to take water. ECOSYSTEMS • Dry river bed reduces available fish habitat, prevents fish migration and leaves fish stranded (unable to move upstream or retreat to the Clutha River/Mata-Au). High fish mortality in lower Lindis due to heat stress or predation.

	WATER QUALITY • Low flows combined with irrigation run-off and land use intensification is likely to result in high Nitrate-nitrite nitrogen (NNN), dissolved reactive phosphorus and *Escherichia coli* concentrations. Increased risk of algal blooms in the flowing sections of the lower Lindis over summer. CULTURAL • No protection for mahika kai, taoka and other species of importance to Kai Tahu. Conflicts with "ki uta, ki tai" (mountains to sea) philosophy. RECREATION • No protection for the recreational values. NATURAL CHARACTER • Dry stretches of river bed in the lower and middle reaches of the Lindis River have an adverse impact on natural character and amenity values. AQUIFER RECHARGE • Reduced aquifer recharge during the irrigation season. The subsequent lowering of the groundwater table is likely to increase surface flow loss.
Option 2	**Flows at SH8 bridge**
BENEFITS:	ECONOMIC • Scope to increase productivity in local primary sector through the use of alternative water sources and efficient irrigation systems. SOCIAL • Group management approaches towards water taking and use offer more benefits when water is short. ECOSYSTEMS • Better opportunities for fish to retreat to safety when the lower Lindis dries. • Fish habitat upstream of SH8 bridge improved. • Possible benefits for wading bird and water fowl habitat in the lower Lindis. RECREATION • Improved recreational opportunities at and upstream of the SH8 bridge. NATURAL CHARACTER • Flows at the SH8 bridge at all times. AQUIFER RECHARGE • Increased recharge over summer may lessen flow loss to groundwater.
COSTS/RISKS:	ECONOMIC • Likely to result in about a 3% reduction in gross margin and employment. • Investment in efficient irrigation and use of alternative water sources needed to mitigate the impacts of the minimum flow restriction on irrigators. ECOSYSTEMS • Unlikely to provide for ecosystem health downstream from the SH8 bridge. • High mortality rates and poor/interrupted fish passage in the lower Lindis due to predation, lack of depth and bank habitat, high water temperature. • No suitable trout habitat in large sections of the lower Lindis. WATER QUALITY • Risk of algal blooms remains in the flowing sections of the lower Lindis. CULTURAL • Does not protect mahika kai, taoka and other species of importance to Kai Tahu. Conflicts with "ki uta, ki tai" (mountains to sea) philosophy. RECREATION • No meaningful improvement to the recreational values of the lower Lindis. NATURAL CHARACTER • Surface flows near the Clutha confluence may cease.

Option 3	Flow continuity – Fish passage
BENEFITS:	ECONOMIC • Scope to increase productivity in local primary sector through the use of alternative water sources, water storage and efficient irrigation systems. SOCIAL • Group management approaches towards water taking and use offer more benefits when water is short. ECOSYSTEMS • Provides for brown/rainbow trout spawning habitat and juvenile brown trout habitat upstream of the Ardgour Road monitoring site. • Native fish habitat throughout the catchment. • Unimpeded fish passage along the entire river. • Possible benefits for wading bird and water fowl habitat in the lower Lindis. WATER QUALITY • Higher minimum flow is likely to improve water quality, although effects on water temperature are uncertain in the lower Lindis. CULTURAL • Sustains the needs of mahika kai, taoka and other species of importance to Kai Tahu. Allows iwi to develop a meaningful relationship with the river. RECREATION • Improved recreational opportunities along the entire river. NATURAL CHARACTER • Flow continuity along the entire river length at all times. AQUIFER RECHARGE • Minimum flow ensures greater aquifer recharge throughout the irrigation season and is likely to reduce flow losses to groundwater.
COSTS/RISKS:	ECONOMIC • Likely to result in about a 5% reduction in gross margin and employment. • Reduced access to a reliable water supply from the Lindis may result in need to invest in land use change towards economic activities requiring less irrigation. Where property holders choose to continue more intensive farming, investment will be needed in efficient irrigation and/or, alternative water sources, to mitigate the impacts of a minimum flow restriction. ECOSYSTEMS • Some risk to instream values downstream from SH8 bridge. • No suitable trout habitat downstream from the SH8 bridge.

Option 4	Flow continuity – Fish habitat
BENEFITS:	ECONOMIC • Scope to increase productivity in local primary sector through the use of alternative water sources, water storage and efficient irrigation systems. SOCIAL • Group management approaches towards water taking and use becomes increasingly important when water is short. ECOSYSTEMS • Provides for brown/rainbow trout spawning habitat and juvenile brown trout habitat upstream of the Ardgour Road monitoring site. • More habitat for juvenile trout downstream from the Ardgour Road monitoring site. • Provides for native fish habitat throughout the catchment. • Provides for unimpeded fish passage along the entire river.

	• Possible benefits for wading bird and water fowl habitat in the lower Lindis. WATER QUALITY • Higher minimum flow likely to further improve water quality, although effects on water temperature are uncertain in the lower Lindis. CULTURAL • Protects the needs of mahika kai, taoka and other species of importance to Kai Tahu. Allows iwi to develop a meaningful relationship with the river. RECREATION • A wide range of recreational opportunities along the entire river. NATURAL CHARACTER • Flow continuity along the entire river length at all times. AQUIFER RECHARGE • Higher minimum flow ensures more aquifer recharge throughout the irrigation season and is likely to further reduce flow losses to groundwater.
COSTS/RISKS:	ECONOMIC • Likely to result in about a 5% or greater reduction in gross margin and employment. • Greater shift in land use change and/or need for more investment in mitigating measures (efficient irrigation, alternative water source, water storage) than under previous options.

5.2 Options for managing groundwater in the Bendigo-Tarras Basin.

5.2.1 Overview of options

In developing the proposed plan change the following options were considered for managing the groundwater resources of the Lindis catchment and Bendigo-Tarras Basin:

OPTION 1: STATUS QUO

The Lindis Alluvial Ribbon Aquifer is managed as surface water under Policy 6.4.1A. The groundwater resources of the Bendigo-Tarras Basin are managed by relying on the default maximum allocation limits as set by Policy 6.4.10A of the Water Plan.

Aquifer	**Maximum Allocation Limit**
Ardgour Valley	0.19 Mm^3/yr
Bendigo	18.80 Mm^3/yr
Lower Tarras	19.49 Mm^3/yr

OPTION 2: TAILORED MAXIMUM ALLOCATION LIMITS

The Lindis Alluvial Ribbon Aquifer is managed as surface water under Policy 6.4.1A. The maximum allocation limit for Ardgour Valley Aquifer is set to limit stream depletion in the Lindis River. The maximum allocation limits proposed for the aquifers in the Bendigo-Tarras Basin give greater recognition to their distinct hydrological characteristics. Restrictions are set for groundwater takes from the Bendigo and Lower Tarras aquifers for the purpose of irrigation, in order to provide greater protection for existing hydro-electricity operations on the Clutha River/Mata-Au.

Aquifer	**Maximum Allocation Limit**	**Irrigation Take Restriction**
Ardgour Valley	0.19 Mm^3/yr	Not applicable
Bendigo	29.00 Mm^3/yr	No groundwater is taken for the purpose of irrigation between 1 May to 31 August

Lower Tarras	18.80 Mm^3/yr	No groundwater is taken for the purpose of irrigation between 1 May to 31 August

5.2.2 Analysis of options for managing groundwater

Option 1	Status Quo
BENEFITS:	ECONOMIC • Allows for more groundwater to be allocated and for economic growth in the lower Lindis and on the Clutha River/Mata-Au terraces to occur.
COSTS/RISKS:	ECONOMIC • The default maximum allocation limit for the Bendigo Aquifer unnecessarily limits taking from this aquifer. ENVIRONMENTAL • Risk of drawdown in the Lower Tarras Aquifer.
Option 2	**Tailored maximum allocation limits**
BENEFITS:	ECONOMIC • Overall, more groundwater can be allocated and provides greater stimulus for economic growth in the lower Lindis and on the Clutha River/Mata-Au terraces. • Provides greater protection for existing hydro-electricity generation on the Clutha River/Mata-Au. • Reduces the need for Contact Energy to be involved in the consenting process for individual takes from the Bendigo and Lower Tarras aquifers, which are characterised by a strong hydraulic connection to the Clutha River/Mata-Au.
COSTS/RISKS:	ECONOMIC • Slight reduction in the volume of water that can be taken from the Lower Tarras Aquifer in order to reduce the risk for drawdown and avoid impacts on existing bores. • Restrictions are placed on groundwater takes from the Bendigo and Lower Tarras aquifers for the purpose of irrigation. However, the impact of these restrictions is considered minimal as the restrictions are currently already imposed on every new take from an aquifer that is hydraulically connected to the Clutha River/Mata-Au as a standard consent condition. ENVIRONMENTAL • Provides for a more sustainable management regime than Option 1, by avoiding long-term adverse effects on the Lower Tarras Aquifer.

5.3 Options for mapping the catchment and aquifer boundaries

5.3.1 Overview of options

In developing the proposed plan change the following options were considered for mapping the Lindis catchment and aquifer boundaries:

OPTION 1 – INCLUDE TARRAS CREEK CATCHMENT & RETAIN EXISTING BOUNDARIES OF THE LINDIS ALLUVIAL RIBBON

The Tarras Creek sub catchment is considered an integral part of the Lindis River Catchment and the management of groundwater takes form the Lindis Alluvial Ribbon Aquifer could remain based on the mapping of this resource as shown in Map C1b of the Water Plan.

OPTION 2 – EXCLUDE TARRAS CREEK CATCHMENT & INCLUDE LOWER LINDIS ALLUVIAL FAN ZONE

This option recognises that at low flows Tarras Creek does not contribute to the flows in the Lindis River and does not recharge the Lindis Alluvial Ribbon Aquifer. The boundaries of the Lindis Alluvial Ribbon Aquifer are amended to exclude the Tarras Creek catchment and include the lower Lindis alluvial fan zone.

5.3.2 Analysis of options

Option 1	**Include Tarras Creek catchment & retain existing boundaries of the Lindis Alluvial Ribbon Aquifer**
BENEFITS:	ECONOMIC • No restriction on groundwater takes in the lower Lindis alluvial fan zone which are not located within 100 m of the Lindis River.
COSTS/RISKS:	ECONOMIC • Unnecessary restriction on surface water takes in the Tarras Creek sub catchment. ENVIRONMENTAL • Stream depletion in the lower Lindis caused by the cumulative effect of groundwater takes in the lower Lindis alluvial fan zone.

Option 2	**Exclude Tarras Creek catchment & include Lower Lindis alluvial fan zone**
BENEFITS:	ECONOMIC • Avoids surface water takes in the Tarras Creek sub-catchment being unduly restricted by the Lindis minimum flow and allocation limits. ENVIRONMENTAL • Protects the values of the lower Lindis River against the cumulative impacts of groundwater takes.
COSTS/RISKS:	ECONOMIC • Minimum flow restriction applies to groundwater takes in the lower Lindis alluvial fan zone. ENVIRONMENTAL • Provides for a more sustainable management regime than Option 1, by avoiding long-term adverse effects of groundwater takes on surface flows in the lower Lindis.

5.4 Recommended management regime

The recommended regime for the integrated management of the surface and groundwater resources of the Lindis entails the following options:

- Surface water: Option 3 – Flow continuity - species migration
- Groundwater: Option 2 – Tailored maximum allocation limits
- Mapping: Option 2 – Exclude Tarras Creek catchment and include the lower Lindis alluvial fan zone

This is shown in the tables below:

Surface water management regime: Lindis catchment (excluding Tarras) & alluvial aquifer

Primary allocation limit	1,000 l/s
Primary allocation minimum flow	750 l/s (October to May) 1,600 l/s (June to September)

Supplementary allocation blocks	500 l/s
Supplementary allocation minimum flow	2,200 l/s (May to November) 1st block 1,600 l/s (December to April) 1st block 2,700 l/s (May to November) 2nd block 2,100 l/s (December to April) 2nd block
Lindis Alluvial Ribbon Aquifer, including the lower Lindis alluvial fan zone.	Managed as surface water, above

Groundwater management regime: Ardgour Valley, Bendigo & Lower Tarras

Aquifer	**Maximum Allocation Limit**	**Irrigation Take Restriction**
Ardgour Valley	0.19 Mm^3/yr	Not applicable
Bendigo	29.00 Mm^3/yr	No groundwater is taken for the purpose of irrigation between 1 May to 31 August
Lower Tarras	18.80 Mm^3/yr	No groundwater is taken for the purpose of irrigation between 1 May to 31 August

This management regime is recommended for the following reasons:

- The natural character, cultural and recreational values associated with the upper, middle and lower reaches of the Lindis River are maintained, and aquatic ecosystems are protected by ensuring species migration at all times along the river's entire length.
- The use of groundwater from the Bendigo and Lower Tarras aquifers is maximised while long-term impacts on aquifers and connected surface water bodies are avoided and adequate protection is provided for existing hydro-electricity generation on the Clutha River/Mata-Au.
- The wellbeing of the local community is maintained. The economic impact of a minimum flow on the local and regional economy is likely to be relatively small in an average year. Environmental conditions in the Lindis catchment have a greater impact on the availability of water for irrigation, and therefore on the local and wider economy, than a minimum flow restriction.
- Irrigators are given sufficient time to implement measures to mitigate the impacts of a minimum flow restriction.
- Investment in measures to mitigate the impact of a minimum flow (efficient irrigation, provision of water storage infrastructure, and the transition towards the use of an alternative water source), will provide irrigators in the lower catchment (that have access to an alternative water source) as well as those in the upper Lindis catchment (that do not have access to an alternative water source) with a more reliable water supply, allowing them to increase their productivity. This creates scope for positive spin-off effects.
- The recommended management regime gives effect to the objectives of the NPSFM by safeguarding the life-supporting capacity, ecosystem processes and indigenous species of the Lindis catchment, maintain the connections between freshwater bodies, avoiding and, where necessary, phasing out over-allocation, and promoting the efficient use of water.

6. Detailed analysis of the recommended management regime

The table below outlines the expected outcomes of the recommended management regime against the values and uses that have been identified in section 4 as important to the local and wider community.

Availability of water for irrigation during the growing season
• In an average year, negative economic impacts of the minimum flow restriction are likely to be relatively small. A more detailed overview of the economic impacts of the minimum flow on irrigators for different allocation scenarios and environmental conditions is shown in the Appendix. • Water is naturally restricted within the catchment. The impact of fluctuations in environmental conditions on water availability for irrigation is greater overall than those of the proposed minimum flow on the availability of water for irrigation, and therefore on the local and wider economy irrigation. • To mitigate the potential impacts of a minimum flow regime, there is a need for investment in water supply infrastructure (e.g. provision of water storage, infrastructure to supply water from alternative sources, shift to more efficient irrigation practices). • The proposed primary allocation limit is considered sufficient to efficiently irrigate 87% of the irrigated land that currently has access only to water sourced from the Lindis River, at 98% surety of supply during an average year. • The proposed primary allocation limit does not affect existing consent holders who have been using water efficiently and who do not have access to an alternative water supply source. The Water Plan policies allow for consideration of historic water use and irrigation footprint under the existing consent (provided the water has been used in an efficient manner) during consent renewal processes. • Under this proposal, no completely new takes can be granted for primary allocation from the Lindis River and the Lindis Alluvial Ribbon Aquifer until the sum of consented primary allocation takes has been reduced to less than 1,000 l/s. However, the granting of new resource consents to take water from the Ardgour Valley, Bendigo and Lower Tarras aquifers is enabled. For irrigators in the lower Lindis catchment with no access to groundwater, the Clutha remains an alternative source of water supply. • A “sinking lid “applies to primary allocation in the Lindis catchment. This means that the consideration of various policies in the Water Plan that seek to avoid the reallocation of unutilised or inefficiently used primary allocation will, over time, result in a gradual increase in the level of surety of supply for existing primary allocation consent holders. • The proposed supplementary minimum flow for the Lindis River enables access to water for storage at moderate flows. • The investment in water storage and in the use of alternative sources (Clutha, Bendigo-Tarras Basin) will result in greater reliability of supply and may, in some instances, allow for the further expansion of the land under irrigation. The resulting productivity gains and increased farm output are likely to generate new jobs in primary sector and investment in ancillary industries and will contribute to the growth of regional GDP, while the pressure for water takes comes off the Lindis River. • Off- and on-farm capital investments in water storage, water supply and efficient application infrastructure increase capital value of the land.
Domestic water use and stock water supplies
• Taking of water for domestic use and stock drinking is not subject to the minimum flow, because RMA Section 14(3) allows individuals to take freshwater for the purpose of domestic use or stock drinking water purposes at all times as long as the take does not, or is not likely to, have an adverse effect on the environment.

Trout (including spawning, juvenile rearing and retention)
• Fish migrate to and from the Lindis River at all times throughout the year. • The river's role in recruitment to the Upper Clutha fishery is looked after. • Brown trout and rainbow trout spawning is protected. • Minimum flow provides for some juvenile rearing habitat in the lower reach of the river, but flows in this part of the river during summer do not provide habitat for adult trout. • There is still some threat to trout populations downstream from the SH8 bridge.
Native fish (including eels) and macro-invertebrates
• Instream habitat for native fish (eels, bullies) and macro-invertebrate communities in the lower and middle reaches of the Lindis River is improved. • Remaining populations of Clutha flathead galaxiid in the Lindis River's tributaries are not expected to suffer from increased trout predation because of the presence of natural and human-made trout migration barriers. • There is still some threat to aquatic ecosystems downstream from the SH8 bridge as the minimum flow will reduce, but not eliminate the risk of algal blooms and high temperatures.
Cultural values
• Mauri (life-force of river) improved along entire river length. • Protects the habitats and the wider needs of mahika kai (food-gathering), taoka species (ells, or tuna) and other species of importance for Kāi Tahu along the river's entire length. • Recognises the relationship Kai Tahu have with the Lindis River, its healing and health giving powers and its role in providing cultural materials. • Reflects the Kāi Tahu philosophy of holistic resource management, "ki uta ki tai" ("from the mountains to the sea"), allowing them to develop a meaningful relationship with the river.
Small stream recreation, safe and family oriented camping, tourism
• Increased river flows will provide better opportunities for local community members and tourists to actively engage in water-based recreational activities (e.g. fishing, paddling or swimming) along the entire river's length. • Positive effects on the amenity and natural character make the river margins more attractive as a destination for passive recreation (walking, picnicking/camping, sightseeing/photography). • Possible increases to tourist activity given the area's accessibility, the presence of some hospitality businesses (visitor accommodation, café, gift shop) and the improved recreational opportunities and amenity of the Lindis Valley.
Water quality and stream health

• Increased river flows over summer and use of more efficient irrigation methods would typically assist with good water quality and a reduced risk of algal blooms by:
  o Reducing irrigation run-off
  o Reducing water temperature in the lower river during summer
  o Reducing *E. coli* and dissolved reactive phosphorous concentrations in the river.
• Limiting the impacts from increased NNN discharges due to land use intensification.
• Water take restrictions imposed by the minimum flow are likely to stimulate investment in more efficient irrigation methods and water storage, which in turn may result in land use intensification and increased nutrient outputs.

• The risk of water quality degradation as a result of land use intensification and increased nutrient output will be addressed through the Water Plan provisions that were introduced under Plan Change 6A.
Natural character and amenity
• Increased surface flows in middle and lower reaches of the Lindis River. • Guaranteed flows down to the Clutha confluence. • The combination of a Schedule 2A primary allocation limit and provisions that gradually reduce over-allocation result in greater flow variability and reduce the incidence and duration of low flows. • Minimum flow restriction provides continuous flows in the main river channel but does not guarantee flows in the side braids of the lower Lindis River. • During prolonged drought conditions there is still some risk of algal blooms affecting the amenity values in the lower river reaches.

7. Transition times for implementation of the plan change

Following the formal plan change process, when Proposed Plan Change 5A becomes operative, the maximum allocation limits for the aquifers of the Bendigo-Tarras Basin and the allocation limits for the Lindis River determined through this plan change will come into full effect. However, under Policy 6.4.5 of the Water Plan, the minimum flow will not apply until after a collective review of consents in the Lindis catchment is undertaken. This will occur before 2021 if there is agreement by the holders of deemed permits to adhere to minimum flows, or on the expiry of the deemed permits on 2 October 2021.

Policy 6.4.5 effectively allows for a transition period, enabling local consent holders and other stakeholders to investigate the feasibility of measures that mitigate the effect of a minimum flow on water availability or could result in even greater benefits for the ecosystem, recreational or cultural values supported by the Lindis River. These may include:

- The formation of a catchment-wide water management group
- The use of more efficient irrigation practices
- The supply of irrigation water from alternative sources, either through privately owned or community based irrigation schemes

8. Consultation

A water management regime that is developed in consultation with the local community is more likely to be accepted by water users and other stakeholders. Consequently, in developing the proposed plan change, Council has undertaken extensive consultation with affected consent holders and landowners, statutory bodies and agencies and the wider community.

Between 2009 and 2011, Council hosted four community workshops to discuss the policy framework for managing surface water and groundwater in Otago, shared scientific information about the Lindis River and the aquifers in the Bendigo-Tarras Basin and listened to people's views on what they consider to be important values and uses supported by the area's water resources. The fourth public workshop discussed flow scenarios and management options for the management of the surface and groundwater resources in the Lindis, based on the options of with or without the Tarras Water Irrigation proposal.

During a fifth community workshop in April 2014 ORC staff presented a consultation draft of the proposed Plan Change with a recommended option for managing the Lindis River and the aquifers in the Bendigo-Tarras Basin. Following community feedback on the consultation draft and the gathering of additional information after its release, staff presented a revised management option during a sixth workshop in April 2015.

In the months April - June 2015 ORC staff regularly met with representatives of the local farming community to discuss their outstanding concerns around the implementation of the proposed minimum flow and the replacement of deemed permits with resource consents issued under the RMA, and the ability of the Water Plan to accommodate the need for a transitional period. To address these concerns and provide greater clarity around the replacement of existing water permits in the catchment ORC staff have developed the *Guide to Preparing a resource consent application to take surface water, including replacing a deemed permit,* August 2015.

ORC has also undertaken a consultation process with tangata whenua around the management of these water resources. As part of this process, ORC staff and Iwi representatives undertook a joint site visit to the Lindis in December 2013 to further their understanding about the management issues surrounding the river and identify the cultural values associated with it.

9. Conclusion

The purpose of the RMA is to promote the sustainable management of natural and physical resources. It is considered that Proposed Plan Change 5A (Lindis: Integrated water management) enables the ORC to better manage the water resources of the Lindis catchment and the Bendigo-Tarras Basin, now and for the future.

Overall, given time, the community as a whole should be able to transition successfully into this new regime while maintaining their wellbeing, and safeguarding the values that are important to them.

The preferred option meets the requirements of Section 32 of the Resource Management Act 1991, being an efficient means to improve the management of water taking in the Lindis-Tarras-Bendigo area with the greatest benefits, least costs, and manageable risk.

Main reference material

National Policy Statement for Freshwater Management 2014

Regional Plan: Water for Otago (updated to 1 June 2015)

Resource Management Act 1991

ORC reports to committee

2010/1776: Bendigo-Tarras Allocation Study

2014/764: Consultation Draft Proposed Plan Change 5A (Lindis: Integrated Water Management)

Technical reports

"Bendigo and Tarras Allocation Study", ORC, December 2010

"Economic impacts of minimum flow regimes on the Lindis River", BERL Economics, 2015

"Lindis Catchment: Hydrological analysis to support an economic assessment of the potential impact of a minimum flow regime for the Lindis River", OPUS International Consultants, 2015

"Lindis Catchment Water Resource Study", ORC, June 2014

"Management Flow for Aquatic Ecosystems in the Lindis River", ORC, July 2008

Lindis catchment / ORC workshop material

"Information Sheet: Lindis Catchment and Bendigo-Tarras Basin", ORC, updated to June 2015

Workshop 1, 19 Feb 2009:

"Key themes from small group discussion"

"Minutes"

"Presentation"

Workshop 2, 11 May 2010:

"Comments and feedback"

"Flow matrix assessment"

Workshop 3, 22 Mar 2011

"Presentation 1"

"Presentation 2: Groundwater"

Workshop 4, 30 Nov 2011

"Feedback"

"Presentation"

"Regime Handout"

Workshop 5: 1 April 2014

"Key themes"

"Presentation"

Workshop 6: 1 April 2015

"Key themes"

"Presentation"

"Flow sharing in the Lower Lindis", Lindis Community Think Tank, 2015

"Lindis Think Tanks", Lindis Community Think Tank, 2015

Other material

"Guide to Preparing a resource consent application to take surface water, including replacing a deemed permit", ORC, August 2015.

"Towards Better Tourism Outcomes for Central Otago 2014-2019 – A community owned strategy", Central Otago District Council, 2013.

"Otago Economic Overview", BERL, 2012

"Central Otago Outdoor Recreation Strategy 2012-2022 – A community owned strategy", Central Otago District Council, 2012.

All reference material is available online www.orc.govt.nz .

APPENDIX

Restrictions on water availability under the proposed minimum flow

The tables below show the effect of the proposed minimum flow regime over the total period of record since 1976. Table 1 shows the impact of natural restrictions on the availability of water from the Lindis to irrigate the area (est. 2,420 ha)[1] that currently only has access to Lindis water (i.e. excludes the area that is already serviced by water form an alternative source or where consents exist to use water from an alternative source).

Table 1: The effect of natural restrictions on current water availability (no minimum flow and allocation of 2,084 l/s) [2]

	Number of days for rationing (1 October – 31 May)	Greatest number of continuous rationing days (1 October – 31 May)	Number of days when no water is available (1 October – 31 May)	Shortfall of water (in Mm^3/yr) (1 October – 31 May)
Average	**47**	**22**	**0**	**1.73**
Minimum	**0**	**0**	**0**	**0**
Maximum	**133**	**66**	**0**	**7.51**

Table 2 shows the impact of the proposed 750 l/s minimum flow on the availability of water from the Lindis to irrigate the same area.

Table 2: The effect of a 750 l/s minimum flow on water availability (allocation 2,084 l/s)

	Number of days for rationing (1 October – 31 May)	Greatest number of continuous rationing days (1 October – 31 May)	Number of days when no water is available (1 October – 31 May)	Shortfall of water (in Mm^3/yr) (1 October – 31 May)
Average	**81**	**41**	**0**	**5.87**
Minimum	**0**	**0**	**0**	**0**
Maximum	**172**	**130**	**0**	**16.95**

Table 3 shows the impact of the proposed 750 l/s minimum flow if this area was irrigated efficiently.

Table 3: The effect of a 750 l/s minimum flow on water availability under efficient irrigation (allocation 1,146 l/s) [3]

	Number of days for rationing (1 October – 31 May)	Greatest number of continuous rationing days (1 October – 31 May)	Number of days when no water is available (1 October – 31 May)	Shortfall of water (in Mm^3/yr) (1 October – 31 May)
Average	**36**	**16**	**0**	**1.07**
Minimum	**0**	**0**	**0**	**0**
Maximum	**117**	**65**	**0**	**5.64**

[1] The size of the area is based on the findings of the report *Lindis Catchment: Hydrological analysis to support an economic assessment of the potential impact of a minimum flow regime for the Lindis River" by OPUS International Consultants (2015).*

[2] The allocation figure (2,084 l/s) is based on the findings of the report *Lindis Catchment: Hydrological analysis to support an economic assessment of the potential impact of a minimum flow regime for the Lindis River" by OPUS International Consultants (2015).* It should be noted that this figure is relatively consistent with information provided by the local community regarding actual water use.

[3] The allocation (1,146 l/s) is based on the findings of the report *Lindis Catchment: Hydrological analysis to support an economic assessment of the potential impact of a minimum flow regime for the Lindis River" by OPUS International Consultants (2015).*

The graphs shown in Table 4 illustrate the variations in water availability throughout the irrigation season for each of the scenarios described above. The graphs show that even under the current situation without a minimum flow restriction water availability is often reduced to 80% in an average year, and can drop to as low as 40% in a dry year. Without any mitigation measures, such as the use of efficient irrigation or an alternative water source, the proposed minimum flow of 750 l/s during the irrigation season will further reduce water availability. However, if the area that currently has access only to Lindis catchment water were to be irrigated efficiently, water availability under a 750 l/s minimum flow would generally be greater than under the current situation, while the length of the period during which restriction is likely to occur would also be reduced.

Figure 1 shows variations in the level of surety of supply (i.e. percentage of time during the irrigation season when the full water need can be met) for different minimum flow scenarios over the period 1976 – 2015. The graphs show that under the current circumstances (blue line) environmental conditions already restrict current water taking in the Lindis. Setting a minimum flow of 750 l/s (red line) would further decrease the surety of supply. However if efficient irrigation methods were used, water demand could be reduced significantly (green line), resulting in a higher level of surety of supply than what is achieved under the current circumstances. For example, if there was no minimum flow and the allocation was 2,084 l/s (blue line), than the total allocation could be taken 80% of the time during 22 irrigation seasons since records began in 1976. With a minimum flow of 750 l/s and an allocation of 2,084 l/s (red line), surety of supply would drop and the total allocation could be taken 80% of the time during 10 irrigation seasons in the last 39 years. However, with efficient irrigation methods full water demand (1,146 l/s) could be met at least 80% of the time during 28 irrigation seasons since records began in 1976 (green line).

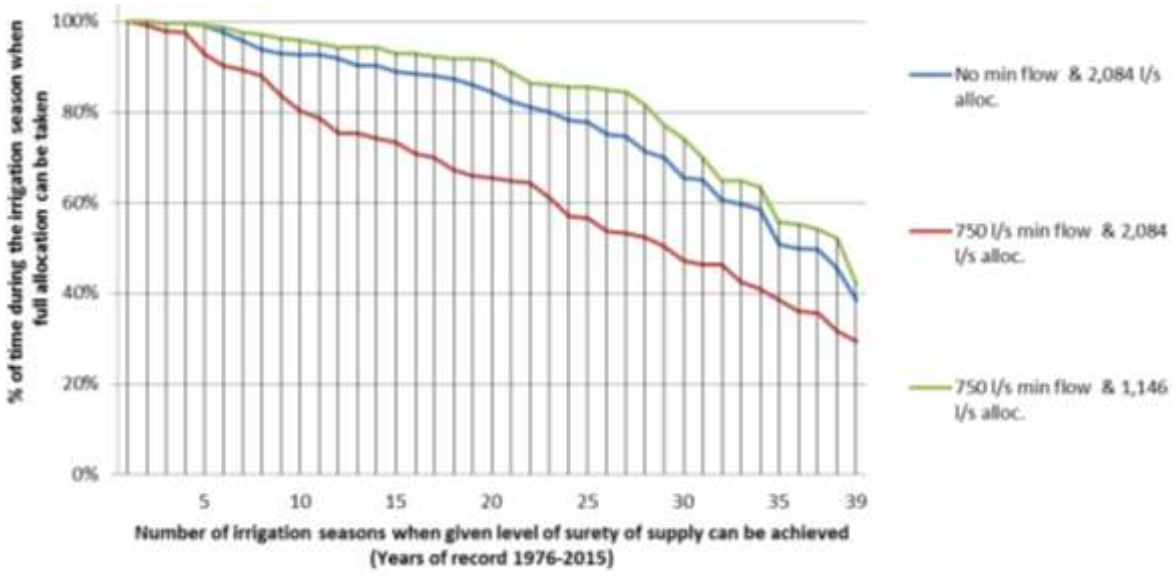
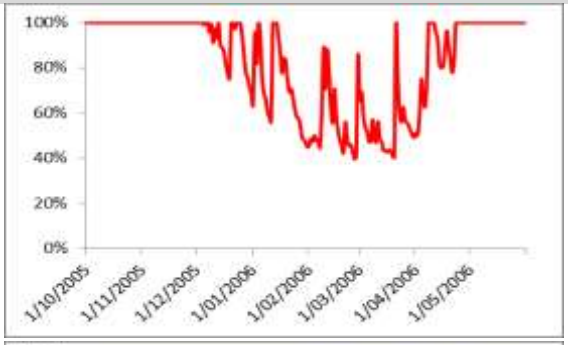
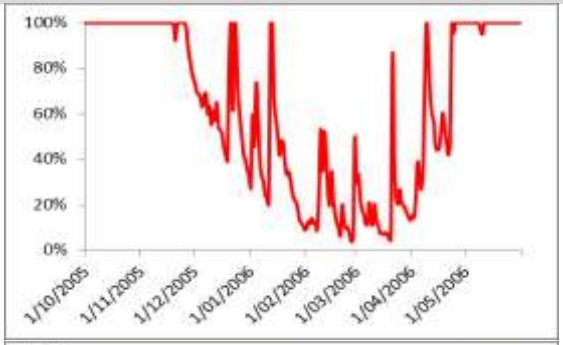
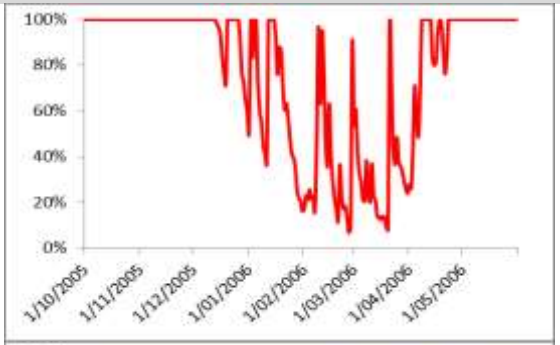
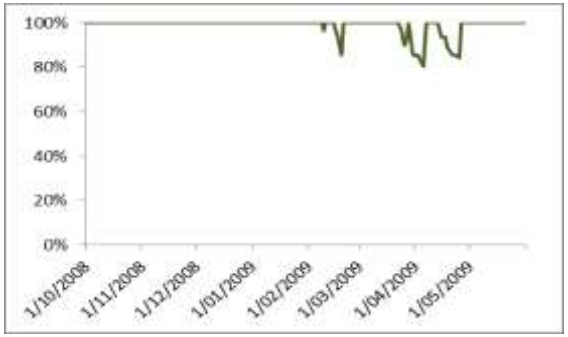
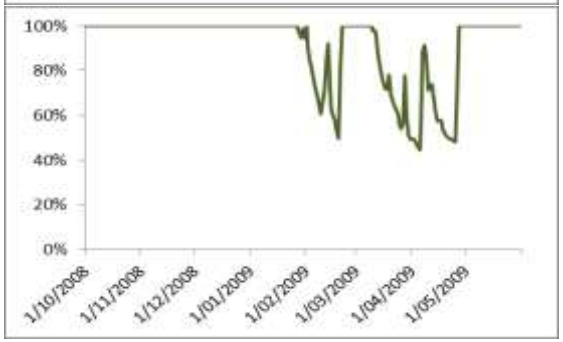
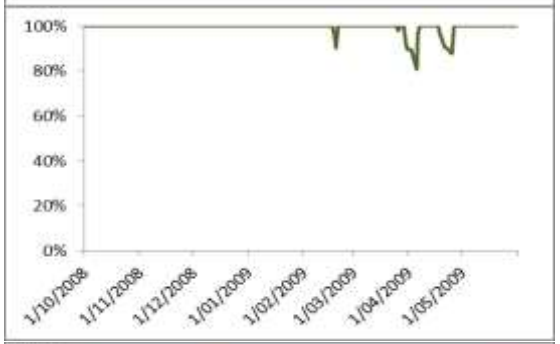
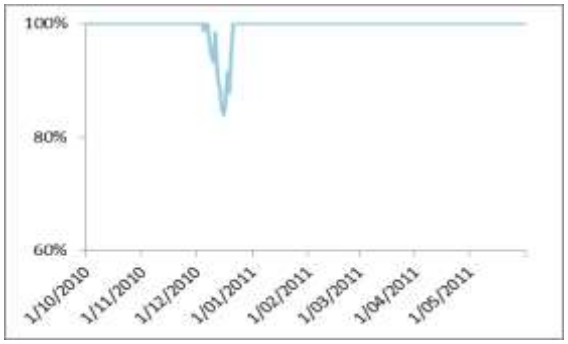
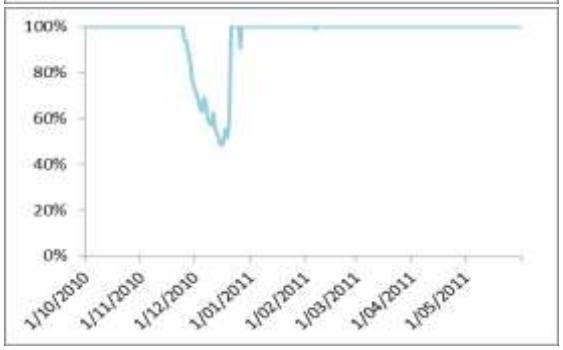
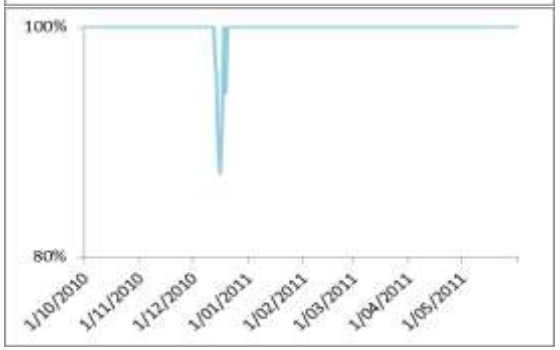


Figure 1: Surety of supply over the period 1976-2015

Table 4: Lindis catchment: Water availability throughout the irrigation season

	no min. flow & allocation 2,084 l/s	750 l/s min. flow & allocation 2,084 l/s	750 l/s min. flow & allocation 1,164 l/s
Dry year 05/06			
Average year 08/09			
Wet year 10/11			

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