

1 Resource Consent Application



This application is made under Section 88 of the Resource Management Act 1991.

(For Office Use Only)

Deposit Paid: \$

Charges / Deposits

A deposit **must** accompany the application (see page 8 for amounts). The applicant will be invoiced for all costs incurred in processing this application that exceed the deposit.

Council can accept electronic lodgement of applications if sent to consents.applications@orc.govt.nz. Include "consent application" in the subject line.

Please complete the application in pen. For questions marked with an * you will find notes on page 4

1.* Applicant(s) Details

Applicant(s) name(s) in full: ARROW IRRIGATION COMPANY LIMITED

OR Company Name (in full) _____

OR Names of Trustees (in full) if Applicant is a Trust _____

or Name of Incorporation _____

Postal Address 16 FINDEX NZ LIMITED

P.O. BOX 123

QUEENSTOWN

Post Code 9300

Street Address (not a P O box number) 13 CAMP STREET

QUEENSTOWN

Post Code 9300

Phone Number Business 03 450 1888 Private _____

Mobile _____ Fax _____

Email Address craig.benington@findex.co.nz

Please provide a valid and clear email address. Otago Regional Council is moving to a paperless consenting process – therefore any correspondence including decision documents and consent (if granted) will be sent via email, unless you request a paper copy.

If you do not prefer contact by electronic means, please tick

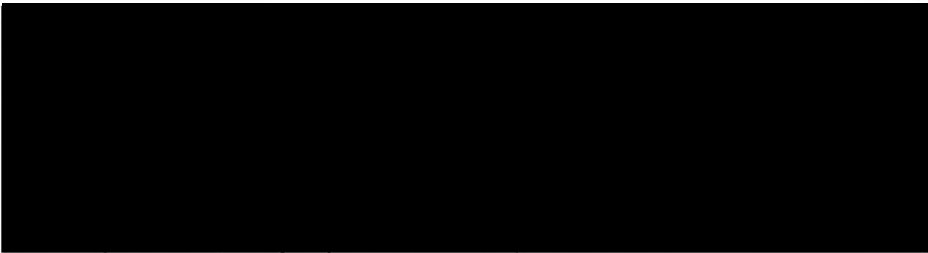
1(a). Key Contact for Applicant Details

If the applicant consists of multiple parties (e.g. multiple consent holders, Trust etc) please outline who the key contact for the consent will be, if granted.

Key contact name(s) in full: _____

PETER GERALD McLEOD

Street Address
(not a P O box number)



Phone Number

Email Address

petermcleodqt@gmail.com

Please provide a valid and clear email address. Otago Regional Council is moving to a paperless consenting process – therefore any correspondence including decision documents and consent (if granted) will be sent via email, unless you request a paper copy.

If you do not prefer contact by electronic means, please tick

2.* Consultant/Contact Details (if not applicant)

Name of Consultant/ Contact Person:

Nick Geddes

Postal Address

40 Clark Fortino McDonald + Associates
P.O. BOX 553
QUEENSTOWN Post Code 9348

Phone Number

Business 03-4416071 Private _____
Mobile 0210527311 Fax _____

Email Address

ngeddes@cfma.co.nz

Please provide a valid and clear email address. Otago Regional Council is moving to a paperless consenting process – therefore any correspondence including decision documents and consent (if granted) will be sent via email, unless you request a paper copy.

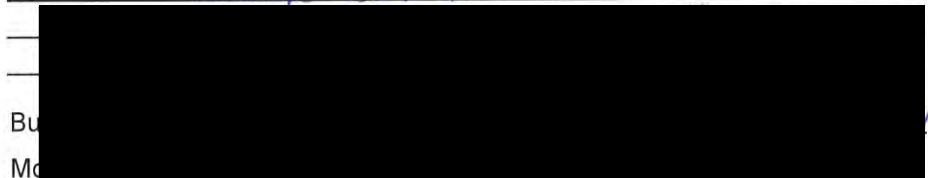
If you do not prefer contact by electronic means, please tick

3. On Site Supervisor/Manager Contact Details (if applicable)

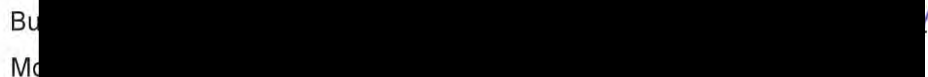
Name of On Site Supervisor/Manager Person:

NIGEL BLACK

Postal Address



Phone Number



Email Address

nigelandheather@xtra.co.nz

Please provide a valid and clear email address. Otago Regional Council is moving to a paperless consenting process – therefore any correspondence including decision documents and consent (if granted) will be sent via email, unless you request a paper copy.

If you do not prefer contact by electronic means, please tick

4.* a) Are there any current or expired resource consents relating to this proposal?

Yes No

If yes, give Consent Number(s) and Description: DEEMED PERMIT
NO. WR 1440 AR

b) Do you agree to your current consent automatically being surrendered should a replacement consent be issued.

Yes No

c) Has there been a previous application for this activity that was returned as incomplete?

Yes No

If yes, give Consent Number(s) and Description: _____

d) Have you a pre-application lodged with Council for this activity?

Yes No

If yes, give pre-application Number(s) and Description: _____

e) Have you spoken to a Council staff member about this application prior to lodging this application?

Yes No If yes, please state name of staff member LISA HAWKINS, NUMEROUS OTHERS

5. The applicant is (tick one): owner leasee prospective purchaser of the land on which the activity occurs. NONE OF ABOVE

6*. Who is the owner of the land on which the activity occurs/is to occur? (only complete if applicant is not the landowner)

Name of landowner: TWO HUNDRED AND FORTY NINE INDIVIDUAL

Postal Address SHAREHOLDERS. DETAILS OF ADDRESS'S ARE ATTACHED TO THIS APPLICATION

Post Code _____

Phone Number Business _____ Private _____

Mobile _____ Fax _____

Email Address _____

7*. Who is the occupier of the land on which the activity occurs/is to occur? (only complete if the applicant is not the land occupier)

Name of land occupier DETAILS OF OCCUPIERS ARE ATTACHED TO

Postal Address THIS APPLICATION

Post Code _____

Phone Number Business _____ Private _____

Mobile _____ Fax _____

Email Address _____

8*. Who leases the land on which the activity occurs/is to occur? (only complete if land is leased and it is not leased to the applicant)

Name of land leasee _____ N/A _____
Postal Address _____
_____ Post Code _____
Phone Number Business _____ Private _____
Mobile _____ Fax _____
Email Address _____

9. Tick the consents required in relation to this proposal:

Water

- Take Surface Water Divert
 Take Groundwater Dam

Discharge onto or into:

- Land Water Air

Land Use:

- Bore construction Bore alteration
 Activities in or on beds of lakes or rivers or floodbanks
 Disturbance of contaminated land

Coastal: Activities in the coastal marine area (i.e., below mean high water spring tide)?

Where you have indicated the type of consent that is required, you must complete the appropriate Application Form before your application can be processed. Application Forms can be found on the Council's website: www.orc.govt.nz.

10. What is the maximum term of consent you are seeking? _____ 35 _____ years

11. Territorial Local Authority in which activity is situated?

- Dunedin City Council Queenstown Lakes District Council
 Clutha District Council Waitaki District Council
 Central Otago District Council

12*. Do you require any other resource consent from any local authority for this activity?

- Yes No

If Yes, please list: _____

Have these consents been applied for/issued? Yes No If Yes

If Yes, please give the date applied for or issued: _____

Notes on Application Form Details

1. Applicant(s) Details

A resource consent can only be held by a legal organisation or fully named individual(s). A legal organisation includes a limited company, incorporated group or registered trust. If the application is for a trust the full names of all trustees are required. If the application is not for a limited company, incorporated group or trust, then you must use fully named individual(s).

2. Consultant/Contact Details

If you are using a consultant/agent for this application put their details here. If you are not, leave question 2 blank.

4 Previous Consent

Do you currently have a resource consent to do the activity that you are applying to renew with this application? If so, please enter the permit number if known and a brief description including the date of issue and the expiry date.

6-8 Landowner, occupier and leasee

If you are not the landowner, land occupier or leasee of the land where the activity will be undertaken, you may be required to obtain their unconditional written approval to your application. On pg 6 there is a form that can be used.

12. Additional Consents

If you are carrying out earthworks or building work you may need other consents from either the ORC or your Territorial Local Authority.

Declaration

Before signing the declaration below, in order to provide a complete application have you remembered to:

Fully completed this Form 1 and the necessary Application Forms

Attached the required deposit.(or pay on line) (see page 8 for deposit that is payable)
Cheques payable to Otago Regional Council


Please note: your deposit may not cover the entire cost of processing your application. At the end of the application process you will be invoiced for any costs that exceed the deposit. Interim invoices may be sent out for applications, where appropriate.

If the required deposit does not accompany your application, staff will contact you on the phone number provided on this form to request payment, and after 3 working days your application will returned if no payment is made for the required deposit.

I/we hereby certify that to the best of my/our knowledge and belief, the information given in this application is true and correct.

I/we undertake to pay all actual and reasonable application processing costs incurred by the Otago Regional Council.

Name/s NICK GEDDES
(BLOCK CAPITALS)

Signature/s 
(or person authorised to sign on behalf of applicant)

Designation consultant.
(e.g., owner, manager, consultant)

Date 22.01.20

Otago Regional Council Postal Address: 70 Stafford St, Private Bag 1954, Dunedin 9054

Consultation

– (consultation is not compulsory, but it can make a process easier and reduce costs).

Under Section 95E of the Resource Management Act 1991 (the Act) the Council will identify affected parties to an application and if the application is to be processed on a non-notified basis the unconditional written approval of affected parties will be required. Consultation with potentially affected parties and interested parties can be commenced prior to lodging the application.

Consultation may be required with the appropriate Tangata Whenua for the area. The address of the local Iwi office is: Aukaha, 258 Stuart Street, P O Box 446, Dunedin, Fax (03)477-0072, Phone (03) 477-0071, email: info@aukaha.co.nz. If you require further advice please contact the Otago Regional Council.

Good consultation practices include:

- Giving people sufficient information to understand your proposal and the likely effects it may have on them
- Allowing sufficient time for them to assess and respond to the information
- Considering and taking into account their responses

Written approval forms are appended to this form on Page 9.

Information Requirements

In order for any consent application to be processed efficiently in the minimum time and at minimum cost, it is critical that as much relevant information as possible is included with the application. **Where an application is significantly incomplete, the Consent Authority may decide not to accept the application for processing.**

Resource Management Act 1991

FOURTH SCHEDULE—ASSESSMENT OF EFFECTS ON THE ENVIRONMENT

(Below are the provisions of the 4th schedule of the Act, which describes what must be in an application for resource consent, as amended in 2015.)

1 Information must be specified in sufficient detail

Any information required by this schedule, including an assessment under clause 2(1)(f) or (g), must be specified in sufficient detail to satisfy the purpose for which it is required.

2 Information required in all applications

- (1) An application for a resource consent for an activity (the activity) must include the following:
 - (a) a description of the activity;
 - (b) a description of the site at which the activity is to occur;
 - (c) the full name and address of each owner or occupier of the site;
 - (d) a description of any other activities that are part of the proposal to which the application relates;
 - (e) a description of any other resource consents required for the proposal to which the application relates;
 - (f) an assessment of the activity against the matters set out in Part 2;
 - (g) an assessment of the activity against any relevant provisions of a document referred to in section 104(1)(b). (*“document” includes regional & district plans, regulations, national policy statements, iwi plans*)
- (2) The assessment under subclause (1)(g) must include an assessment of the activity against—
 - (a) any relevant objectives, policies, or rules in a document; and
 - (b) any relevant requirements, conditions, or permissions in any rules in a document; and
 - (c) any other relevant requirements in a document (for example, in a national environmental standard or other regulations).
- (3) An application must also include an assessment of the activity's effects on the environment that—
 - (a) includes the information required by clause 6; and
 - (b) addresses the matters specified in clause 7; and
 - (c) includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

3 Additional information required in some applications

An application must also include any of the following that apply:

- (a) if any permitted activity is part of the proposal to which the application relates, a description of the permitted activity that demonstrates that it complies with the requirements, conditions, and permissions for the permitted activity (so that a resource consent is not required for that activity under section 87A(1));

Set out below are details of the amounts payable for those activities to be funded by fees and charges, as authorised by s36(1) of the Resource Management Act 1991.

Resource Consent Application Fees (from 1 July 2018)

Note that the fees shown below are a **deposit** to be paid on lodgement of a consent application and applications for exemptions in respect of water metering devices. This deposit will not usually cover the full cost of processing the application, and further costs are incurred at the rate shown in the scale of charges. GST is included in all fees and charges.

If you wish to make a payment via internet banking, or on line, the details are below. Please note the applicants name and "consent application" should be used as reference when paying the deposit -

For on line payments go to www.orc.govt.nz and go to Home/ Rates/ Way to Pay and follow prompts

Publicly Notified Applications: ³	\$
First application	5,000.00
Concurrent applications	225.00

Non Notified Applications and Limited Notified Applications: ³	\$
First application (except those below)	1,000.00
Concurrent applications ¹	50.00
Variation to conditions – s127	1,000.00
Administrative variation – s127	500.00
Exemptions from water measuring Regulations	200.00
Bores	500.00
Gravel	500.00

Hearings	Per Note 2 below
Payment for Commissioner request – s100A	Per Note 4 below

Objections	
Payment for Commissioner request – s357AB	Per Note 4 below

Transfers and Certificates Deposits:	\$
Transfer of permits and consents	100.00
Priority Table	100.00
Section 417 Certificate	200.00
Certificate of Compliance	200.00
Section 125 – Extension of lapse date	100.00
All Other Costs	As per Scale of Charges

Scale of Charges:	From 1 July 2018
	\$
Staff time per hour:	
* Executive staff	235.00
* Senior Technical/Scientist	170.00
* Technical/Scientist	125.00
* Field Staff	100.00
* Administration	85.00
Disbursements	Actual
Additional site notice	Actual
Advertisements	Actual
Vehicle use per kilometre	0.70
Travel and accommodation	Actual
Testing charges	Actual
Consultants	Actual
Commissioners	Actual
Photocopying and printing	Actual
Councillor hearing fees per hour	
*Chairperson	100
*Member	80
*Expenses	Actual

Notes

- For additional permits in respect of the same site, activity, applicant, time of application, and closely related effect as the first application.
- The deposit payable shall be 90% of the cost of a hearing as calculated by Council in accordance with information contained in the application file and using the scale of charges. The amount payable will be due at least 10 working days before the commencement of the hearing. If the amount is not paid by the due date, then the Otago Regional Council reserves the right under S36 (7) of the Resource Management Act to stop processing the application. This may include cancellation of the hearing.

(b) if the application is affected by section 124 or 165ZH(1)(c) (which relate to existing resource consents), an assessment of the value of the investment of the existing consent holder (for the purposes of section 104(2A)); (c) if the activity is to occur in an area within the scope of a planning document prepared by a customary marine title group under section 85 of the Marine and Coastal Area (Takutai Moana) Act 2011, an assessment of the activity against any resource management matters set out in that planning document (for the purposes of section 104(2B))

4 (relates to subdivisions- not included here as subdivisions not ORC jurisdiction.)

5 Additional information required in application for reclamation

An application for a resource consent for reclamation must also include information to show the area to be reclaimed, including the following:

- (a) the location of the area;
- (b) if practicable, the position of all new boundaries;
- (c) any part of the area to be set aside as an esplanade reserve or esplanade strip.

Assessment of environmental effects

6 Information required in assessment of environmental effects

(1) An assessment of the activity's effects on the environment must include the following information:

- (a) if it is likely that the activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity;
- (b) an assessment of the actual or potential effect on the environment of the activity;
- (c) if the activity includes the use of hazardous substances and installations, an assessment of any risks to the environment that are likely to arise from such use;
- (d) if the activity includes the discharge of any contaminant, a description of—
 - (i) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and
 - (ii) any possible alternative methods of discharge, including discharge into any other receiving environment;
- (e) a description of the mitigation measures (including safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effect;
- (f) identification of the persons affected by the activity, any consultation undertaken, and any response to the views of any person consulted;
- (g) if the scale and significance of the activity's effects are such that monitoring is required, a description of how and by whom the effects will be monitored if the activity is approved;
- (h) if the activity will, or is likely to, have adverse effects that are more than minor on the exercise of a protected customary right, a description of possible alternative locations or methods for the exercise of the activity (unless written approval for the activity is given by the protected customary rights group).

(2) A requirement to include information in the assessment of environmental effects is subject to the provisions of any policy statement or plan.

(3) To avoid doubt, subclause (1)(f) obliges an applicant to report as to the persons identified as being affected by the proposal, but does not—

- (a) oblige the applicant to consult any person; or
- (b) create any ground for expecting that the applicant will consult any person.

7 Matters that must be addressed by assessment of environmental effects

(1) An assessment of the activity's effects on the environment must address the following matters:

- (a) any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or cultural effects;
- (b) any physical effect on the locality, including any landscape and visual effects;
- (c) any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity;
- (d) any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations;
- (e) any discharge of contaminants into the environment, including any unreasonable emission of noise, and options for the treatment and disposal of contaminants;
- (f) any risk to the neighbourhood, the wider community, or the environment through natural hazards or the use of hazardous substances or hazardous installations.

(2) The requirement to address a matter in the assessment of environmental effects is subject to the provisions of any policy statement or plan.

Should a hearing be cancelled or postponed due to the non payment of the charge, the applicant will be invoiced for any costs that arise from that cancellation or postponement.

Following completion of the hearing process, any shortfall in the recovery of hearing costs will be invoiced, or any over recovery will be refunded to the applicant.

Under Section 100A of the RMA, one or more submitters may make a request to have a resource consent application heard by one or more hearing commissioners who are not members of Council. In this case the applicant will pay the amount that Council estimates it would cost for the application to be heard had the request not been made, and the submitter(s) who made the request will pay, in equal shares, the cost of the application being heard that exceeds that amount payable by the applicant.

Further, the applicant may request to have a resource consent application heard by one or more hearing commissioners who are not members of Council. In this case, the applicant will pay the full costs.

3. Where actual and reasonable costs are less than the deposit paid, a refund will be given.
4. Where an applicant requests under s100A (for a consent hearing) or under s357AB (for the hearing of an objection) an independent commissioner(s); the applicant will be required to pay any increase in cost of having the commissioner(s).

Where a submitter(s) requests under s100A an independent commissioner(s) any increase in costs that is in addition to what the applicant would have paid shall be paid by the submitter. If there is more than one submitter who has made such request the costs shall be evenly shared.

Administrative Charges

The following one-off administration charges shall apply to all resource consent applications received:

Publicly Notified and Limited Notified Applications	\$
First application	100.00
Concurrent applications	50.00
Non-Notified Applications	\$
First application	50.00
Concurrent applications	25.00
Other	\$
Certificate of Compliance	25.00
Section 417 Certificate	25.00
Exemptions from water metering regulations	25.00

Review of Consent Conditions

Following the granting of a consent, a subsequent review of consent conditions may be carried out at either request of the consent holder, or, as authorised under Section 128, as a requirement of Council. Costs incurred in undertaking such reviews will be payable by the consent holder at the rates shown in the Scale of Charges above.

Reviews initiated by Council will not be charged to consent holders.

Compliance Monitoring Charges (from 1 July 2017)

1. Performance Monitoring

The following charges will apply to the review of performance monitoring reports for all consent holders, except those listed in section 1.6 below. The charges shown are annual fixed fees per performance monitoring report or plan, and are inclusive of GST.

		From 1 July 2017
1.1 Discharge to Air Consent		\$
Measurement of contaminants from a Stack report		86.00
Ambient air quality measurement of contaminants report		100.00
Management plans and maintenance records		33.50
Annual Assessment report		66.50
1.2 Discharge to Water, Land and Coast		\$
• Effluent Systems	Environmental Quality report	46.50
	Installation producer statements	60.00
	Return of flow/discharge records	60.00
• Active Landfills	Environmental Quality report	58.00
	Management Plans	130.00
• Industrial Discharges	Effluent quality report	42.00
	Environmental report	92.50
	Return of flow/discharge records	60.00
Annual Assessment report		50.00
Management Plans – minor environmental effects		130.00
Management Plans – major environmental effects		260.00
Maintenance records		30.00

1.3 Water Takes

Verification reports	60.00
Annual assessment report	50.00
Manual return of data per take	80.00
Datalogger return of data per take sent to the ORC	50.00
Telemetry data per consent	35.00
Administration fee – water regulations	100.00
Low flow monitoring charge*	
- Kakanui at McCones	327.00
- Unnamed Stream at Gemmels	1,431.00

*Charge for monitoring sites established by the ORC specifically to monitor consented activities in relation to river flows.

1.4 Structures

Inspection reports for small dams	130.00
Inspection reports for large dams	260.00
Structure integrity reports	80.00

1.5 Photographs

Provision of photos	60.00
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1.6 Set Fees for Specific Consent Holders

Performance monitoring fees will be charges as 75% of actual costs for the following consent holders

Dunedin City Council
Central Otago District Council
Clutha District Council
Queenstown Lakes District Council
Waitaki District Council
Ravensdown
Contact Energy
Trustpower
Pioneer Generation

Additional charges may be incurred for new consents granted during the year.

2. Audit

Audit work will be charged at half of the actual cost incurred, with the actual costs being calculated using the Scale of Charges.

3. Non-Compliance, Incidents and Complaints

Enforcement work on consent conditions, and remedying negative effects from permitted activities – Scale of Charges.

Gravel Inspection and Management

Gravel extraction fee – \$0.66 per cubic metre (incl. GST). Where more than 10,000 cubic metres of gravel is extracted within a prior notified continuous two month period, the actual inspection and management costs will be charged, as approved by the Director Corporate Services.

Written Approvals of Persons Likely to be Adversely Affected

I/We (Please print full name/s) _____

of (Address) _____

I /we have read the full application for the proposal by (Applicant)

for a Resource Consent (Number) _____ to _____

_____ and give my/our written approval to the proposed activity/activities.

In signing this written approval I/we understand that:

- The consent authority must decide that I/we am/are no longer an affected person, and disregard adverse effects on me/us
- That /we I may withdraw my/our written approval in writing before the hearing, or if no hearing before a decision is made on the application.

Signature/s _____ Date _____
(or person authorised to sign on behalf of affected party/parties)

Phone _____ Fax _____ Email _____

Please note: If this application is subsequently notified the above approval does not constitute a submission as required under Section 96 of the Resource Management Act 1991.

Written Approvals of Persons Likely to be Adversely Affected

I/We (Please print full name/s) _____

of (Address) _____

I /we have read the full application for the proposal by (Applicant)

for a Resource Consent (Number) _____ to _____

_____ and give my/our written approval to the proposed activity/activities.

In signing this written approval I/we understand that:

- The consent authority must decide that I/we am/are no longer an affected person, and disregard adverse effects on me/us
- That /we I may withdraw my/our written approval in writing before the hearing, or if no hearing before a decision is made on the application.

Signature/s _____ Date _____
(or person authorised to sign on behalf of affected party/parties)

Phone _____ Fax _____ Email _____

Please note: If this application is subsequently notified the above approval does not constitute a submission as required under Section 96 of the Resource Management Act 1991.

Resource Consent Application Form 4

To take and use surface water

This application is made under Section 88 of the Resource Management Act 1991.

1. Note to applicants

The purpose of this form is to provide applicants with guidance on information that is required for your application under the Resource Management Act 1991. This form acts as a guide only and Otago Regional Council reserves the right to request additional information.

Please ensure that you fully complete this form **as well as** a fully completed resource consent application form (form 1) in support of your application, **and** preparation of an **Assessment of Environmental Effects** in terms of the Fourth Schedule of the Resource Management Act 1991. Failure to do so may result in Council rejecting your application, requesting further information, or publicly notifying your application, leading to delays in the processing of your application and potential increases in processing costs.

Acceptance of your application for processing does not constitute a guarantee that water allocation is available.

2. General

2.1 This application is for (please tick any applicable box):

- A new surface water take
- An application to replace a current Water Permit
Water permit number: _____ *Expiry date:* _____
- An application to replace a Deemed Permit / Mining Privilege
Deemed permit number: WR1440Ar *Expiry date:* 2021

2.2 A lapse period of Nil is sought. Provide reasons in application attached.

Note: This is the timeframe within which the consent must be given effect to. The default timeframe is 5 years after the date of commencement of the consent unless stated otherwise.

2.3 A consent term of 35 yrs is sought. Provide reasons in application attached.

Note: This is the timeframe from the date of commencement of the consent which the consent will expire.

2.4 Provide a map or coloured aerial photograph which outlines the following details (as applicable):

- The location of the existing and proposed point(s) of take and all associated infrastructure
- The location of the water measuring device(s) or system(s)
- The total property area boundary
- The area(s) to be irrigated (if relevant) by water applied for under this application
- The area of the community supply (if relevant)
- Distances to any discharge activities
- Other surface water bodies and wetlands, and distances from the point of take(s) to them
- The coastline and the distance to it (if relevant)
- The location of any dairy shed(s)
- The location of any known recreational activities, other water takes, areas of significance to iwi and areas where food is obtained from the water body.

3. Volume and rates of take applied for

3.1 Quantity and rate of take

Note: 1,000 litres = 1 cubic metre

- | | | |
|----------------------------|-----------|------------------------|
| a. Maximum rate of take: | 870 | litres per second |
| b. Maximum monthly volume: | 2,254,120 | cubic metres per month |
| c. Maximum annual volume: | 8,802018 | cubic metres per year |

*Note: Some deemed permits refer to hourly/weekly rates. Water permits are issued in litres per second, m³ per month and m³ per year. Should you wish to seek hourly or weekly rates **in addition** to those listed on the form, please provide this information including justification for any variances.*

3.2 Frequency of take

Note both the maximum and estimated average take.

	Average	Maximum
How many hours per day?	24	24
How many days per week?	7	7
How many weeks per month?	4	4

3.2.1 In your application describe the timing of your take, including which months of the year you expect to take water in both an average year and a dry year, and what part of day the water take will generally occur.

3.2.2 In your application describe whether the take is from re-charge or is an augmented take, along with whether your activity provides re-charge back into the catchment.

3.3 Storage

3.3.1 Do you intend to store your water before subsequent use?

- Yes
 No

3.3.2 If yes, what/how much storage will be provided?

m³

3.3.3 In your application outline the type of storage facilities that are proposed.

Note: You may need a building consent and/or additional resource consents for the construction of storage facilities. If the reservoir is in a water body or captures catchment runoff, you may require resource consents for damming and associated activities.


4. Point(s) of take description

4.1 What are the GPS coordinates of the point(s) you propose to take water from?

Note: if there are more than two points of take, please provide these details on a separate sheet.

Point 1: NZTM 2000 E: 1273781.738 N: 5018291.738

Point 2: NZTM 2000 E: N:

4.2 Please provide photographs of the proposed point(s) of take 

4.3 What is the name of the water body/ies from which the proposed take(s) is/are to occur? Arrow River

Note: if the water body is unnamed please note this and note the water body it flows into.

4.4 If the take is from a river, stream, spring, drain or modified water body, in your application please provide a full description of the water course, including:

- The average channel width and depth at various locations including at the point of take and upstream and downstream of the point of take.
- Average flow water velocity including source of flow data and any changes to flow velocity above and below the point of take.
- Any flow gauging of the water body. A flow gauging report with photographs of the site and methodology to be attached.
- Bed of the water body at the point of take and upstream and downstream of the point of take.

Please also answer the following:

4.4.1 What type of water body will the take/s occur from?

- River
- Stream
- Modified water body
- Spring
- Drain

4.4.2 Is the water course perennial (flows all year round) or ephemeral?

- Perennial
- Ephemeral

4.5 If the take is from a lake, pond or wetland please answer the following:

- Lake
- Pond
- Wetland

4.5.1 If the take is from a wetland, is the wetland classed as a Regionally Significant Wetland identified in Schedule 9 of the Regional Plan: Water for Otago?

- Yes (list the name and provide an assessment of effects on the wetland)
- No

4.5.2 Has the wetland been formed by artificial means?

Artificial

Natural

4.5.3 What is the surface area of the lake/pond/wetland?

4.5.4 How deep is the lake/pond/wetland?

4.5.5 Does the lake/pond/wetland have an outlet? i.e. does water flow out of it?

Yes

No

4.5.6 What is the main source of water that fills the lake/pond/wetland?

Groundwater

Springs

Runoff from surrounding land

Direct rainfall

Stream/river (list name)

Other (provide details)

5. Historical water use

5.1 Water abstracted over at least the last 5 years

Note: if you are applying to replace an existing water permit for primary allocation, or an existing deemed permit or mining privilege you must provide evidence of the amount of water abstracted under that permit for at least the last five years.

The following usage evidence is provided in support of this application:

Water metering records, attached to this application with historical water use summarised and assessed

Water metering records sent to Council electronically or recorded on file by Council with historical water use summarised and assessed

Detail on alternative water use information, attached to this application

5.2 In your application please analyse and assess the historical volumes and pattern of water use based on the water use evidence.

5.3 Provide a summary of your analysis below:

- a. Maximum rate of take: 576 litres per second
- b. Maximum monthly volume: 1,494,800 cubic metres per month
- c. Maximum annual volume: 9,250,870 cubic metres per year

5.4 For which years have these rates and volumes been recorded? Last five years

6. Water use and management

6.1 For what purpose(s) will the water be used?

- Stock water and/or dairy shed use
- Irrigation (provide detail of irrigation use in your application attached)
- Community supply
- Commercial/industrial
- Other Flushing Lake Hayes

6.2 Will the water take be managed as part of an existing water allocation committee or water management group?

- Yes (name of committee of group): Co-operative Coy. employs full time manager who is responsible for water allocation and management.
- No

6.3 If yes, have you described how the allocation committee/management group operates in your application?

- Yes
- No

6.4 In your application describe any water rationing regime that operates in the catchment.

6.5 Will the take applied for be operated in accordance with the rationing regime you have described in question 6.4?

- Yes
- No

6.6 Will you or others “re-take” water from your take (i.e. via a water race)? If yes, please provide details of such re-takes in your application.

- Yes
- No

7. Measuring and reporting

7.1 In your application describe the type of water metering system that is installed or proposed to be installed.

Note: If currently installed provide proof of installation or note below if proof has already been provided to Council.

7.2 Provide information in your application demonstrating that the installation of the measuring device or system shall be undertaken in accordance with Council guidelines.

Note: If the installation is not able to meet these guidelines, you need to fill out and attach to this application form a Non-Standard Installation Form for Water Measuring Devices, available on our website or through the environmental services unit of the Council.

Tick if completed

Tick if completing a Non-Standard Installation Form for Water Measuring Devices

7.3 Is your water measuring device or system installed or proposed to be installed at the point(s) of take?

Note: The council considers the point of take to be within a 100 metre radius of the physical take point. If your answer is No, you need to apply for a Water Measuring Exemption (WEX) by filling out Application Form 24 – Application for Exemption to use a device or system near the location from which water is taken. A fully completed Form 24 should be lodged at the same time as this application to enable dual processing.

Yes

No – complete an Application Form 24 – Application for Exemption

8. Location and Efficiency of Water Use

8.1 Provide details of point/area of use (include legal description(s) and grid references.

Yes (attached to application)

No (please outline reasons why this has not been provided)

8.2 Provide a description of any existing works/infrastructure in place, including value, in your application.

Yes (attached to application)

No (please outline reasons why this has not been provided)

8.3 Provide a description of proposed works/infrastructure to give effect to consent sought, including value of investment, in your application.

Yes (attached to application)

No (please outline reasons why this has not been provided)

8.4 Provide an assessment of the proposed use against the Aqualinc report for reasonable water requirements¹.

Completed

Not Completed (provide details of alternative assessment and justification for that)

8.5 If you propose to use water to irrigate land, please outline:

a. How many hectares of land will be irrigated? 1295

b. What is the soil type(s) of the land being irrigated? Various -see attached report

c. What will you be irrigating (i.e. crop, pasture etc in ha)? Pasture/lifestyle blocks/golf courses

d. What is the target application rate (mm/day and mm/year)? Variable depending on soil type

See attached report

8.6 What type of irrigation system is proposed to be used or is currently being used?

K-line

Centre pivot

Travelling irrigator

Border-dyke/flood irrigation

Other – provide details Trickle and sprinkler on lifestyle blocks

8.7 Do you have any water distribution infrastructure in place (for example pipes, storage tanks, open races etc.)?

Yes

No

If yes, in your application please describe the type of infrastructure in place and how you intend to ensure that it is maintained in good working order (e.g. do you intend to have a

¹ "Guidelines for reasonable irrigation water requirements in the Otago Region", Aqualinc, 2017. Note that while this document provides a basis for assessing efficiency of use, other matters may be applicable.

8.9.2 How much water do you require for your dairy shed?

litres/head/day

8.9.3 If you are seeking more water for stock and/or dairy shed use than that recommended by the Council please state why this is in your application.

Note: please provide the source of any data provided. Also include details of stock water transportation if relevant.

8.10 If you propose to use water for industrial use – in your application state what type of industry will be using the water and how will the water be used.

8.11 If you propose to use water for community/domestic supply – please answer the following:

- a. For households, the number of households to be supplied:
- b. For camping grounds, the maximum number of visitors and staff per year:
- c. For schools, the maximum number of students and staff per year:
- d. For motel units, the number and expected occupancy:
- e. Other uses (please describe): Used for amenity planting in the Lake Hayes Estate, Shotover Country, and Quail Rise residential subdivisions

8.12 For all uses, demonstrate in your application how have you calculated the amount of water you need?

Note: Please note that the Council will only grant volumes that have been assessed as efficient, and will assess the volumes sought for efficiency, taking into consideration the local climate, soils, and crop type.

Tick if completed.

8.13 In your application please describe any other sources of water available for the property. How much water is available and what it is used for.

8.14 In your application please describe any measures you are proposing to minimise wastage of water and maximise its efficient use.

9. Assessment of Environmental Effects

Note: Pursuant to Schedule 4 of the Resource Management Act, 1991, there are a number of matters that must be addressed by an assessment of environmental effects. These matters are listed in Form 1, with additional or specific matters relating to water permits are listed below.

9.4 Provide an independent ecological assessment/instream assessment of the water body. It is recommended that all takes not from the main stem of a catchment have this assessment carried out.

- Yes (attached to application)
- No (please outline reasons why an independent ecological assessment has not been undertaken in your application)

9.5 Outline any physical effect on the locality, including any landscape and visual effect.

- Yes (attached to application)
- No (please outline reasons why this has not been provided)

9.6 Outline any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity of the point of take.

- Yes (attached to application)
- No (please outline reasons why this has not been provided)

9.7 Does the taking of water from the water body cause it to dry up during summer or does the water body naturally dry up downstream of the take?

- Yes
- No

If Yes, your application should explain approximately how far downstream from your this occurs and in approximately which month in a wet year, average year and dry year this happens.

Note: Please discuss and attach any evidence to the application (e.g. photographs of water body downstream):

9.8 Assess effects on cultural values.

- Yes (attached to application)
- No (please outline reasons why this has not been provided)

9.8 Assess any effect on other water users or other human use values.

- Yes (attached to application)
 No (please outline reasons why this has not been provided)

9.9 Describe any positive effects from the take.

- Yes (attached to application)
 No (please outline reasons why this has not been provided)

9.10 Outline the mitigation you propose in your application. This should include a consideration of the following:

- A residual flow
 Fish screening on water intakes
 Measures for management where there are low flows
 Flow sharing measures
 Whether base flow is necessary to maintain the water race
 Any other applicable measures

9.10 Outline if your instantaneous abstraction rate (litres per second) will be reduced by increasing the length of time over which water is taken.

- Yes (attached to application)
 No

9.11 Provide a description of any possible alternative water sources or methods for undertaking the activity and why these alternatives have not been selected.

- Yes (attached to application)
 No (please outline reasons why this has not been provided)

10. Consultation

10.1 Include evidence of any consultation undertaken for this application.

Dept.of Conservation,KTKO,and Fish and Game have been contacted.

10.2 Identify persons affected by this application.

10.3 Which persons approval have been provided to the application (attach copies of approvals)?

*Note: This **may** include (but not be limited to) consultation with adjoining landowners, other consent holders in the immediate area such as downstream permit holders, iwi (e.g. Te Rūnanga O Ngāi Tahu, Aukaha, Te Ao Marama Inc.), government departments/ministries (e.g. DOC), territorial authorities and recreational associations. To reduce costs and processing times, we recommended that written approval is obtained and submitted with the application for parties which may be affected. Such approval must be unconditional to avoid notification.*

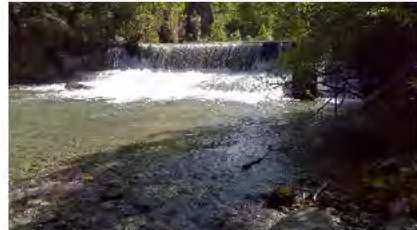
11. Statutory Assessment

Please note that in accordance with Schedule 4 of the RMA, you are also be required to provide an assessment against the relevant provisions of the following documents (if relevant):

- National Policy Statement for Freshwater Management.
- National Policy Statement for Renewable Electricity Generation.
- Resource Management (Measurement and Reporting of Water Takes) Regulations 2010.
- National Environmental Standard for Sources of Human Drinking Water.
- New Zealand Coastal Policy Statement.
- Operative Regional Policy Statement 1998, Proposed Regional Policy Statement and Partially Operative Regional Policy Statement 2019.
- Regional Plan: Water for Otago (including description of permitted activities and compliance with permitted activity standards).
- Kai Tahu ki Otago Natural Resource Management Plan 2005.
- Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan 2008 (for takes from the south side of the Clutha River/Mata-Au)
- Any other relevant plan, proposed plan and any other relevant regulations.

Replacement of Existing Water Permit

Arrow Irrigation Company Ltd



February 2020

Prepared by: Nick Geddes



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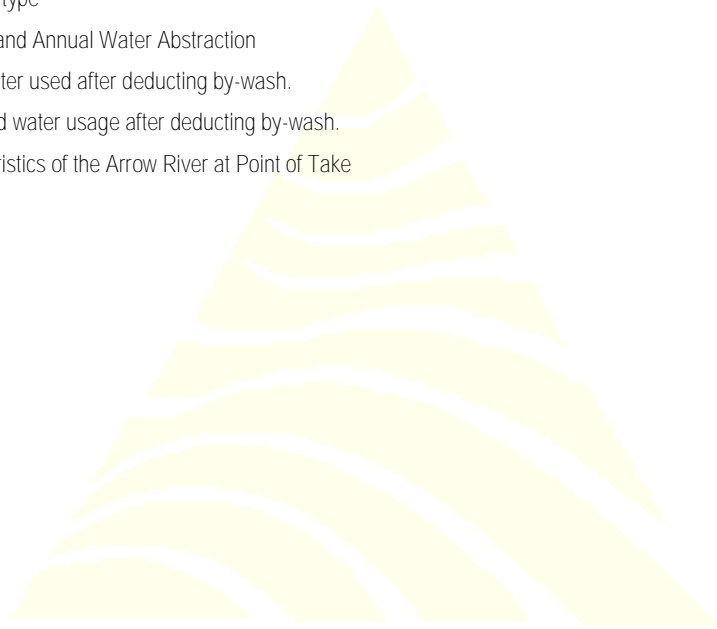
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1.0 Description of Activity

1.1 Arrow Irrigation Company Ltd

The Ministry of Works relinquished its ownership of infrastructure, assets and control of a water scheme (original scheme) in 1990 which was taken over by the schemes water users. Arrow Irrigation Company Limited (AIC) was established by the existing water users to administrate the scheme. The company's constitution and water supply agreements govern the management of the scheme and distribution of water amongst its shareholders.

Shareholders are allocated shares depending on the amount of "quota" they hold. The annual connection fee entitles the shareholder to a 1ha quota, which in terms of volume of water, allows 9000m³ annually over 1ha (or 900mm over 1ha). If a shareholder wishes to irrigate more than 1ha they can apply for additional quota which provides the same amount of water per ha but is charged at a different rate. Generally, a shareholder is allocated shares proportionate to the quota held. The quota allocated is not specific to a defined area. For example, a shareholder with a 1ha quota can choose to apply 900mm to 1ha, 300mm to 3ha, or permutations in between.

AIC abstracts water from the Arrow River and distributes it to 249 shareholders holding 889ha of quota. Shareholder details are contained in Appendix 1 and include:

- Landowners name;
- Legal description of where the water is used;
- Physical property address.

1.1.1 Water Intake

The water take is situated in the Arrow River Gorge, approximately 5km north of Arrowtown, Central Otago, and water is distributed to a large part of the geographical area known as the Wakatipu Basin, from Arrowtown in the east, Frankton in the west and south to the Kawarau River.

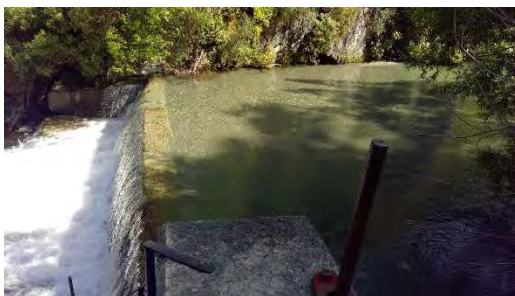


Figure 1: Weir



Figure 2: Intake

The intake is a 1.9 metre concrete weir with head gates feeding a 100m covered race leading to a concrete 3 hopper grit trap. The remainder of river water spills over the weir, and surplus water from the grit trap is returned to the river immediately below the weir. The valves, gates and grit trap at the intake are manually operated as there is no power supply. Access to the intake is via unbridged river crossings over steep terrain. The difficult access coupled with manual intake controls makes any fine tuning of daily water take problematic.

1.1.2 Reticulation

A 5.5km *delivery* pipeline conveys water from the grit trap down the Arrow Gorge where it discharges into the open race system elevated on the hillside behind Arrowtown. There are two primary races and numerous secondary races branching off the two main races which convey water via open elevated hillside races, piped sections and lower valley syphons. The *Morven Ferry* race carries water from Arrowtown south east to Morven Ferry while the *Frankton* race carries water south west to the Frankton Flats.

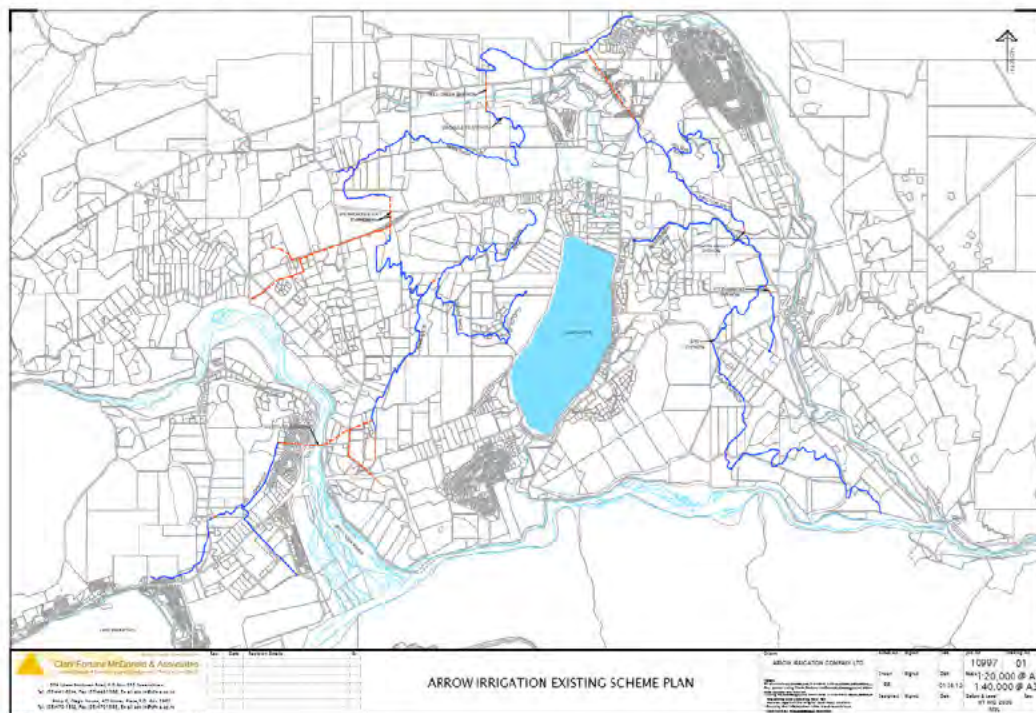


Figure 3: AIC Scheme, Appendix 6A.

Secondary race systems include piped water to the residential developments of Lake Hayes Estate, Shotover Country and Quail Rise for the purposes of irrigation (amenity water) while a new pumped system supplies amenity water to the rural living development of Bendemeer.



Figure 4: Amenity Water - Bendemeer



Figure 5: Amenity Water - Morven Ferry

Table 1.1 – Infrastructure overview

Delivery Pipeline	5.5km
Open Race	40 km
Piped Race & Syphons	7.9km
Pressurised pipe	7.3 km
Total	60.7 km

1.1.3 By-Wash

There are four main by-wash points within the primary reticulation network:

- (a) The *delivery* pipeline from the Arrow Gorge weir can discharge into Bush Creek which is a tributary of the Arrow River. This discharge (by-wash) point is above the primary races which enables the control of water volume into the primary and secondary races without the necessity to travel all the way up the gorge to adjust the intake gate. As such, this discharge point operates as a management tool by allowing the “throttling” of the delivery pipeline.
- (b) Similar to the *delivery* pipeline discussed above, the *Frankton* race affords a discharge point at Mooney Road which then flows into Mill Creek which enables the diversion of surplus water from the main race if demand reduces.
- (c) The *Frankton* race terminates at the Frankton Arm of Lake Wakatipu where a discharge point delivers water into the Lake.
- (d) The *Morven Ferry* race terminates at the Kawarau River where a discharge point delivers water into the river.

To illustrate, photographs of each by-wash point are contained in Appendix 2.

Prior to the 2017 / 2018 irrigation season each main by-wash point was installed with a measuring device which has ascertained the summer volumes as an offset to the total seasons take heron. These calculated volumes are recorded and discussed further in part 1.2.3 of this application document.

1.1.4 Operation & Management

From the AIC owned reticulation, shareholders reticulate water within their properties. Each AIC shareholder is responsible for taking the appropriate amount of water according to their quota. AIC employ a full-time manager who is responsible for the day to day functioning of the scheme and

monitors individual water usage closely. Active monitoring reduces the potential for any shareholder to take more than their share, and very few issues have been experienced to date.

In times of drought, and low river flows, the manager requests shareholders to conserve water, and in the worst-case scenario, a water rostering regime can be imposed. The manager also undertakes water quality tests at by-wash points twice a year to confirm land uses are not affecting water quality and if so, the manager assists landowners in land management practices to ensure water quality is maintained.

Shareholders with larger allocations generally have water meters and AIC have a policy of insisting all new shareholders fit meters at their connection points which allows for a more accurate measure of each individual take.

The AIC owned scheme operates on an “on demand” basis meaning the races are constantly running, and as a result water unused at the end of the races is discharged via by washes. It is necessary to operate this way to ensure stock water is provided and to deliver irrigation water to the shareholders who are located on the downstream end of the reticulation network. The alternative to running the scheme on an “on demand” basis would result in an unreliable stock water supply and also result in a considerable amount of water is lost each time the race is dried and refilled.

The irrigation season generally runs from October through to April.

Notwithstanding, the scheme runs generally from September through to May, severity of the winter period dictating actual opening and closing dates. This extended season is done for two reasons:

1. The provision of stock water;
2. The provision of water for artificial ponds & water features on shareholder properties along with several wetland / wildlife areas.

1.1.5 Stock Water

Many AIC shareholders are absentee owners or resident owners who have their properties managed / grazed by contractors or neighbours and for this reason it is difficult to assess actual annual stock numbers and an arbitrary assessment has been made:

Table 1.2 – Stock

Class	Stock #
Horses	120
Deer	1100
Cattle	180
Sheep	3500

Water requirements for these stock are calculated at 12,500 m³/annually by using ORC guidelines and this typology of water use has been included in our requested abstraction volume.

1.1.6 Land Use

Table 1.3 – Land use summary

Land Use category properties	Property Area (ha)	Irrigated Area (ha)	No. of shareholder
A - Amenity areas	105	87	8
C – Curtilage / Lifestyle	400	222	117
G - Golf courses	370	207	3
P - Pastoral	1886	753	118
P+V - Pastoral + Vineyard	45	26	3
TOTAL	2806	1295	249

Amenity areas include public (common) areas around residential subdivisions including street frontages etc. *Curtilage / Lifestyle* areas include rural residential properties where there is no stock grazing or other productive land uses. Some of these rural residential properties are as large as 6-8ha where the entire property comprises of gardens and lawns. *Pastoral and Vineyard* includes three properties where there is pastoral usage and small areas of non-commercial vineyards and/or olive groves.

The *Curtilage / Lifestyle* category comprises of almost half (117) of the total number of properties but accounts for less than 1/5th of the total irrigated area. The *Pastoral* category makes up almost half (118) of the total number of properties but accounts for, by some margin, the greatest irrigated area at 753 ha.

The Queenstown Lakes District is recognised as being one of the highest growth areas in New Zealand where the Wakatipu Basin experiences the highest growth rate within the District. This is accurately reflected in the high demand for all typologies of housing including rural residential. As such, AIC expects an increase in the number of subdivisions from pastoral land uses to rural residential land uses which will increase the area land allocated to *Curtilage / Lifestyle* in table 1.2 above.

1.1.7 Irrigation Systems

Table 1.4 – Irrigation type

Irrigation Type Properties	Area Irrigated (ha)	No. of Shareholder
S -Sprinkler	612	134
M- Mixed system	258	77
K - K-Line	176	22
G – Gun	97	7
F – Wild Flood	29	2
T -Trickle	18	5

F+G – Flood +Gun	55	1
F+K – Flood +K-Line	50	1
TOTAL	1295	249

1.2 Water Use

Water from the scheme is used for a number of purposes. A substantial but much reduced pastoral area uses water to irrigate pasture, lucerne, hay crops and for stock water to support traditional farming practices. A large and growing rural lifestyle area utilises water for residential garden and lawn surrounds, water features, ornamental ponds, and in some cases larger ponds / wildlife sanctuaries. These properties may also irrigate tree lanes and small paddocks, grazing horses or a few sheep. A number of these properties also operate tourist accommodation ventures with the need for green and attractive surrounds. Several residential subdivisions make use of irrigation water for street plantings and grass along street verges. Golf courses are a substantial user of water for fairways, greens, and amenity areas around resort facilities. Lastly, a small amount of water is used by vineyards. Other uses include top up water provided to wetlands / wildlife refuges and proposed flushing water for Lake Hayes as discussed further in part 1.2.2 below.

1.2.1 Efficiency

When the original scheme was completed in the 1930s, the predominate Irrigation System utilised was wild flooding. AIC has actively encouraged all its shareholders to elect alternative irrigation systems which present more controlled delivery of water to land. As depicted in Table 1.2 above, most of the land is now irrigated through controlled systems and there is very little wild flooding. As a result, the abstraction rate has fallen from the maximum take of 1840 l/s in the 1930s to current maximum take of 870 l/s.

When AIC took over the original scheme in 1990 the infrastructure was in a very degraded state, with very poor reliability of supply and a large amount of water loss. This loss was primarily associated with the delivery pipeline where the main focus of AIC since its conception has been to upgrade infrastructure in general but concentrate on the delivery pipeline. This has largely been completed and AIC is now in a financial position to look at increased efficiency in other parts of its reticulation network.

With 40 km of open race there is unavoidable water loss from both evaporation and seepage. In the 2019 season a start was made on open race piping programme and over 1 km of main race has been completed. This will continue as finances permit with emphasis on sections of race known to have seepage issues. Water quality will also benefit from this programme by keeping stock away from the race.

The automation of the intake mechanism is an obvious efficiency consideration which AIC have deliberated in detail over its tenure of the scheme. Automation would enable more control of the daily demand / supply requirement at the point of take in the Arrow Gorge. However, this

consideration must be balanced against the understanding that the by wash system delivers surplus water back into the Arrow River and directly / indirectly the Kawarau River as discussed in part 1.1.3 above. Importantly, automation has been precluded by the absence of power, and telemetry at the at the point of take coupled with its accessibility.

1.2.2 Additional & Winter Use of Water

Discussions have been held between the Otago Regional Council (ORC), Friends of Lake Hayes Society (FLHS), and AIC over the possibility of AIC providing water to act as a flushing mechanism in Lake Hayes to improve water quality.



Figure 6: Lake Hayes



Figure 7: Millbrook Syphon

The ORC has funded the installation of a valve in the Millbrook syphon which allows water to be discharged into Mill stream and onward to Lake Hayes. To improve flushing, this water would preferably be as cold as possible. As such, water is provided to the Lake in spring / autumn and this period can potentially extend into early and late winter months at a time when river flows are higher. The seasonal volume for this flushing has expected to be up to 2,000,000 cubic metres and although this is not yet an existing annual use, AIC request that this volume be taken into account when assessing annual and monthly allocation limits.

There is some demand for water over the winter months and AIC intends to eventually supply year-round water. There are engineering and technical difficulties associated with winter operation, due to freezing conditions in the Arrow Gorge, but these are not insurmountable. Therefore, AIC requests that the allocation be on a year-round basis.

1.2.3 Abstraction & Water Monitoring

AIC's monitoring device is situated approximately 3.6km below the intake due to lack of telemetry at the intake site. An exemption was obtained for this monitoring site (WEX 0149). The monitoring meter was first installed in 2009 and in the earlier years problems were encountered with the functioning / accuracy of the readings. These problems have been solved and the last 5 years of readings present an accurate record of monthly and annual abstraction as shown in Table 1.4 below:

Table 1.5 – Monthly and Annual Water Abstraction

	2014 / 2015	2015 / 2016	2016 / 2017	2017 / 2018	2018 / 2019	Ave / Month
Sept	608,516	213,494	255,124	150106	418295	329107
Oct	915,484	778,002	800,206	820056	679855	798,720
Nov	701,780	921,024	705,720	1,117,208	833,200	855,786
Dec	1,066,590	1,330,690	998,290	1,380,450	710,410	1,097,286
Jan	1,494,800	1,472,830	1,140,850	1,483,360	1,112,530	1,340,874
Feb	1,334,520	1,064,470	999,780	917,160	1,049,110	1,073,008
March	1,078,640	1,111,720	987,350	1,171,760	847,040	1,039,302
April	936,920	630,340	568,120	950,620	618,480	740,896
May	702,700	276,260	131,330	225,330	47760	276,676
June	410,920	9,820	51,080	2,240	-	94,812
Totals	9,250,870	7,808,650	6,637,850	8,218,290	6,316,680	7,646,468

As depicted in Table 1.4 above, the average monthly take over the five seasons peaks in January (1,494,800m³), followed by December (1,097,286 m³), and February (1,073,008 m³). The monthly peak for the 5 seasons occurred in January 2018, at 1,494,800m³. As previously mentioned, AIC only have by-wash records for the 2017 / 2018 and 2018 / 2019 seasons.

Table 1.6 - Actual water used after deducting by-wash.

	2017 / 2018	2018 / 2019
Total Take	8,218,290	6,316,680
Total By-Wash	2,275,550	2,321,843
Water Consumed	6,042,740m ³	3,994,837m ³

By-wash for the above two seasons was very consistent, averaging about 2,300,000m³. It is reasonable to assume that by wash for the preceding three seasons would be similar and give a water consumed figure for the preceding 3 seasons as depicted in Table 1.6 below:

Table 1.7 – Estimated water usage after deducting by-wash.

2016 / 2017	4,337,000
2015 / 2016	5,508,000
2014 / 2015	6,950,000m ³

Annual water use ranged from 4,000,000m³ to 6,900,000m³ depending on the seasonal requirements. Since the high rate of abstraction in 2014 / 2015 AIC has improved their water delivery so are able to operate the scheme on 6,300,000m³.

AIC have engaged Dr Anthony Davoren, Manager, Soil Water & Irrigation Management Services to calculate Seasonal Irrigation Demands and Dr Davoren's report is contained in Appendix 3. Dr

Davoren estimates AIC's demand requirement is 6,789,518m³. Therefore, in terms of average and peak use, AIC is well within its limit and is considered to be using water efficiently.

Stock water demand has been calculated at 12,500m³ annually which is an insignificant amount. However, to deliver this water to stock throughout the Wakatipu Basin and shareholders at the downstream end of the race, requires races to be running permanently and to achieve this there has to be a level of by-wash spill at the end of the races. The by-wash system is therefore an integral and vital part of the overall scheme.

In assessing what is a reasonable volume of by-wash spill the 2017 / 2018 season (Table 1.5) provides a guide as it was a very dry season and because of low river levels rationing was in place. By-wash spill was therefore being kept at a minimum, but still totalled 2,275,550m³, which would be an operationally acceptable figure for AIC. An abstraction of 6,789,518m³ for irrigation purposes, 12,500m³ for stock water, and 2,000,000m³ as by-wash, is therefore suggested as reasonable and adequate.

With regard to the monthly maximum volume, Dr Davoren's report recommends a figure of 2,254,120m³ based on Millbrook Resort golf course usage, where they use up to one third of annual water in the driest month. However, AIC maximum monthly take over the five seasons has been somewhat less. The difference can be explained by noting that Millbrook monitors soil moisture deficits daily and irrigates accordingly, whereas many shareholders do not measure soil moisture deficits and therefore tend to underestimate and under irrigate in dry periods.

1.2.4 Summary of Abstraction Requested

AIC have an established history of use of water from its Arrow River abstraction. AIC use water efficiently for irrigation, as calculated by Dr Davoren and also for stock water. Accordingly, AIC are seeking:

- A maximum instantaneous take of 870 litres/sec.
- A maximum annual volume 8,802,018m³.
- A maximum monthly volume of 2,254,120m³.
- Provision for an additional 2,000,000 m³ in shoulder seasons and in periods of high river flow to provide for Lake Hayes flushing water.

Under its existing permit AIC could abstract up to 50 head 1416 l/sec which over a 240-day irrigation season equates to approximately 30,000,000m³. The maximum annual volume sought under this application represents a 70% reduction in this annual paper allocation.

Pattern of use: As a scheme that supplies 249 shareholders AIC abstract water 24hours a day 7 days a week. Some shareholders are on continual supply and other shareholders are on a roster system receiving their water on a rolling schedule through the weeks.

In addition, AIC is the biggest single abstractor of water from the Arrow, with increasing demand from additional shareholders and a reduction in take volumes due to management practices and the volumes of water sought represent a reduced yet realistic future allocation of the water resource.

2.0 Existing Environment

2.1 Hydrology of Arrow River

The Arrow River has a catchment area above the AIC intake of 153.1 square kilometres ,199.1 sq/km above the Cornwall St meter, Arrowtown, and a total catchment area of 237.57 sq/km, at the point where the Arrow flows into the Kawarau River.

There is no flow monitoring site at the AIC intake and the only monitoring site currently on the river is the ORC site at Cornwall street, some 7km below the AIC intake. The ORC flow records from Cornwall St generally show that the Arrow has low flows over summer months, interspersed with sharp peaks, due to rain events, with increasing flows in Autumn. Winter flows are moderate, but can fall during prolonged freezing periods, and spring has higher sustained flows, due to rain and snowmelt.

2.2 Climate

The area is characterised by short, hot, dry summers and very cold winters. Rainfall is variable within the catchment, ranging from 1000-1250mm in the mountain headwaters,700-750mm in western and northern parts of the Wakatipu Basin, and 650-700mm heading south east toward Morven Ferry.

In very dry summers (Jan. to Feb.), rainfall can be 120-140mm or less, in 1 out of 5 summers. (source [http/ growtago.orc.govt.nz](http://growtago.orc.govt.nz)). These periods are when peak demand for irrigation water occurs.

2.3 Soils

A summary of areas of each soil type is shown in the Seasonal Irrigation Demand Report, prepared by Dr Tony Davoren, which is included in Appendix 3 of this application.

3.0 Status of Activity

This application includes the replacement of an existing water permit to take and use water from the Arrow River as primary allocation under deemed permit WR1440 AR.

The taking and use of surface water as primary allocation from the Arrow River is a **restricted discretionary** activity under Rule 12.1.4.5 of the RPW. The matters to which the consent authority has restricted its discretion in relation to the taking of water is listed under Rule 12.1.4.8, and includes:

- i. The primary and supplementary allocation limits for the catchment; and*
- ii. Whether the proposed take is primary or supplementary allocation for the catchment; and*
- iii. The rate, volume, timing and frequency of water to be taken and used; and*
- iv. The proposed methods of take, delivery and application of the water taken; and*
- v. The source of water available to be taken; and*
- vi. The location of the use of the water, when it will be taken out of a local catchment; and*
- vii. Competing lawful local demand for that water; and*
- viii. The minimum flow to be applied to the take of water, if consent is granted; and*
- ix. Where the minimum flow is to be measured, if consent is granted; and*
- x. The consent being exercised or suspended in accordance with any Council approved rationing regime; and*
- xi. Any need for a residual flow at the point of take; and*
- xii. Any need to prevent fish entering the intake and to locate new points of take to avoid adverse effects on fish spawning sites; and*
- xiii. Any effect on any Regionally Significant Wetland or on any regionally significant wetland value; and*
- xiv. Any financial contribution for regionally significant wetland values or Regionally Significant Wetlands that are adversely affected; and*
- xv. Any actual or potential effects on any groundwater body; and*
- xvi. Any adverse effect on any lawful take of water, if consent is granted, including potential bore interference; and*
- xvii. Whether the taking of water under a water permit should be restricted to allow the exercise of another water permit; and*
- xviii. Any arrangement for cooperation with other takers or users; and*
- xix. Any water storage facility available for the water taken, and its capacity; and*
- xx. The duration of the resource consent; and*
- xxi. The information, monitoring and metering requirements; and*
- xxii. Any bond; and*
- xxiii. The review of conditions of the resource consent.*

4.0 Consideration of Alternatives

After the flood of 1999 when the AIC delivery pipeline was badly damaged, alternative water supplies were investigated. The only alternative considered worth pursuing was to pump water from Bush Creek or the aquifer adjoining. This was discounted in favour of repairing the existing pipeline, because of the high capital cost involved but more so because of the high ongoing pumping costs compared with the existing gravity supply. The same financial considerations would apply today but in addition QLDC have extended their borefield in the Bush Creek aquifer for the Arrowtown domestic supply, and so both supply and consenting could be issues.

Pumping from Mill Creek is not an option because, as previously discussed, the desire is to increase the flow of water through Lake Hayes, not reduce it.

The Kawarau River offers a reliable alternative source of water via a pumped pipeline to Arrowtown. However, without doing any feasibility studies, it would obviously be a hugely expensive exercise, when considering the volume, head, length of pipeline required, and the cost of negotiating easements, and the expense would be far beyond the resources of AIC.

AIC does not have a storage facility, but some shareholders have limited storage in tanks / ponds, and Millbrook resort have two onsite storage reservoirs. Potential storage opportunities for AIC have not been researched or discussed, as it is considered this is of more relevance to minimum flow, rather than abstraction, discussion.

Based upon the above, it is considered that there are no other reliable and feasible sources of water which represent alternatives to the current scheme.

5.0 Consultation with Affected Parties

AIC is aware that the ORC is developing guidance documentation for the replacement of water permits and that it will make this publicly available at a future time. The Application is therefore being lodged without the written approval of affected parties. Consultation with affected parties will occur based on the ORC's determination of who is an affected party according to any new streamlined processes embedded into Council practices.

6.0 Term of Consent & Lapse Period

Rule 12.1.4.8 of the RWP lists the matters that may be considered in relation to any resource consent for the taking and use of water, and the duration of the resource consent is a key matter the ORC considers under this Rule.

The capital investment made by the Applicant in recent years to utilise the water efficiently is substantial. Expenditure on improving scheme reliability and water use efficiency has averaged \$120,000.00 annually over the last 15 years. In the late 1980's the Ministry of Works, the operators of the scheme at that time, commissioned a replacement cost valuation of the entire irrigation scheme, which totalled \$60million dollars. A current valuation of the scheme is not available, but despite its age, the scheme represents an extremely large infrastructure investment. A longer-term permit is requested to acknowledge the considerable level of existing investment, and the ongoing investment required to achieve the benefits of better water use efficiency and farming practices.

Further, as established in the Assessment of Environmental Effects, any effects of the proposal are less than minor and can be adequately addressed through appropriate consent conditions.

Taking this into account, and to provide sufficient surety and confidence for AIC and future investment decisions, the applicant requests a term of 35 years for the replacement consent.

7.0 Assessment of Environmental Effects

7.1 Introduction

The Regional Plan: Water primarily focuses on the effects of water abstraction on the water body that the water is taken from, particularly in relation to ecological values, natural character, amenity and iwi values. As per Form 4, the following matters are addressed in the following Assessment of Environmental Effects:

- Effects on ecological / instream values
- Physical effects on the locality, including landscape and visual effects
- Effects on ecosystems, including effects on plants or animals, and any physical disturbance of habitats in the vicinity of the point of take
- Effect of the taking of water from the water body
- Effects on cultural values
- Effects on other water users or other human use values
- Positive effects
- Summary of proposed mitigations
- Whether instantaneous rate of abstraction will be reduced over time
- Alternative water sources or methods

7.2 Effects on Ecological Values

Schedule 1A of the Regional Plan Water recognises “ecosystem values” in relation to the Arrow River and describes the physical, habitat and species characteristics:

- *Size* – “Psize”, refers to a large water body supporting high numbers of particular species, or habitat variety, which can provide for diverse life cycle requirements of a particular species, or a range of species.
- *Substrata* – “Psand & Pgravel”; refers to the bed composition of importance for resident biota as Sand & Gravel.
- *Unimpeded Access* – “Ppass”; refers to access within the main stem of a catchment through to the sea or a lake unimpeded by artificial means, such as weirs, and culverts.
- *Spawning Areas* – “Hspawn”; refers to presence of significant fish spawning areas: (t)=trout; (s)=salmon.
- *Juvenile rearing areas* – “Hjuve”; refers to presence of significant areas for development of juvenile fish: (t)=trout; (s)=salmon.
- *Freedom from biological nuisances* – “Weedfree”; refers to absence of aquatic pest plants (eg Lagarosiphon) identified in the Pest Management Strategy for Otago 2009.
- *Exotic game fish: trout, salmon* – “Trout”; refers to significant presence of trout.

Schedule 1A of the Regional Plan Water recognises the Arrow River above 900 metres asl has a high degree of naturalness. The AIC intake is the most elevated part of the AIC scheme at approximately 520 metres asl.

Schedule 1A of the Regional Plan Water does not recognise the Arrow River as having any attributes of Outstanding Natural Feature or Landscape or any significant indigenous vegetation or significant habitat of indigenous fauna.

It should be noted that the assessment and recognition of values listed in Schedule 1A above has been undertaken whilst the AIC scheme has been in operation.

Residual Flow

The Arrow River drops steeply down directly below the AIC intake for approximately 500m, an area historically known as The Falls. This section of river is very narrow, steep and rocky with no foot track and as such is almost inaccessible. Access further up the Arrow is via the Macetown road, high on the hillside above. Because of the steepness of the falls, with the AIC weir at the top, it is also inaccessible to migratory aquatic life. The steepness, inaccessibility and lack of telemetry in the area would make finding a suitable flow monitoring site below the weir extremely difficult.

A large tributary, Brackens Gully, enters the river from the east at the base of the falls. Brackens Gully is a perennial stream and therefore, regardless of the amount of abstraction at the intake, there is always a flow maintained below the Brackens Gully junction. In addition, there are at least seven other creeks entering the gorge between Brackens and Arrowtown. Anecdotal evidence suggests that four of these streams are perennial with the balance probably ephemeral. No flow monitoring has been carried out on any of these tributaries, but their combined flow has historically provided an adequate flow through the gorge, for aquatic eco-system values.

Dr Dean Olsen, Ryder Environmental Ltd, assessed the periphyton community in the Arrow River and he concludes that the level of allocation from the Arrow catchment is not expected to affect the frequency of high-flow events that are large enough to substantially reduce periphyton biomass¹.

Mr Matt Hickey, Water Resource Management Ltd assessed the instream ecology and undertook a residual flow recommendation in his report which is contained in Appendix 4. Mr Hickey recommends a residual flow of 500 l/s to protect juvenile and adult trout habitat during times of low flow retaining 85% and 77% habitat protection.

Based upon the recommended residual flow and the relative infrequency that flows fall to this level along with the very short duration of such low flows means that the effect of the AIC take is likely to be no more than minor.²

7.3 Physical effects on the locality

The Arrow gorge has a level of amenity and natural character, which has been modified by the AIC pipeline and support structures, but also by the Macetown road. Although the pipeline could be

¹ Paragraph 5, page 1, "Arrow River Periphyton Assessment", Ryder Consulting Ltd, December 2019 – Appendix 5.

² Paragraph 3, page 16, "Assessment of Effects on Instream Ecology and Residual Flow Recommendation for Arrow Irrigation Companies Mainstem Take", Water Resource Management Ltd, January 2020 – Appendix 4.

considered aesthetically, to be a blot on the natural landscape, this needs to be viewed from an historical perspective. The intake weir and pipeline were installed almost a century ago and are on a route which is rich in gold mining history and relics. The majority of visitors venturing up the gorge, or on to Macetown, have an interest in this history, and the pipeline, although not associated with gold mining, is a part of the overall human-interest factor.

The proposed abstraction represents an existing take with existing infrastructure. As such, the current application is not considered to represent any additional physical effect on the locality above or beyond that which already exists.

7.4 Effects on Cultural Values

Schedule 1D of the RPW identifies spiritual or cultural beliefs, values or uses associated with water bodies of significance to Kāi Tahu. The following values and customary use interests for the Arrow River and tributaries are identified:

- *Kaitiakitanga – the exercise of guardianship by Kai Tahu in accordance with tikanga Maori in relation to Otago’s natural and physical resources; and includes the ethic of stewardship.*
- *Mauri – life force; for example, the mauri of a river is most recognisable when there is abundance of water flow and the associated ecosystems are healthy and plentiful; a most important element in the relationship that Kai Tahu have with the water bodies of Otago.*
- *Waahi taoka – treasured resource; values, sites and resources that are valued and reinforce the special relationship Kai Tahu has with Otago’s water resources.*
- *Mahika kai – places where food is procured or produced. Examples in the case of waterborne mahika kai include eels, whitebait, kanakana (lamprey), kokopu (galaxiid species), koura (freshwater crayfish), freshwater mussels, indigenous waterfowl, watercress and raupo.*
- *Kohanga – important nursery/spawning areas for native fisheries and/or breeding grounds for birds.*
- *Trails – sites and water bodies which formed part of traditional routes, including tauraka waka (landing place for canoes).*
- *Cultural materials – water bodies that are sources of traditional weaving materials (such as raupo and paru) and rongoa (medicines).*

The values of importance to iwi in the Arrow River and tributaries are not anticipated to be adversely affected as a result of this proposal provided appropriate conditions of consent are included on any consent granted.

The proposed replacement take is an existing use occurring in a catchment with a long history of water abstraction. The current application does not seek to increase the volume currently abstracted from the Arrow River and as discussed in part 1.2.3, this volume is appropriate and efficient.

The values listed in Schedule 1D were identified and recognised in the Plan at a time when the AIC were abstracting more volume due to wild flooding irrigation practices (part 1.1.5 Irrigation Systems).

Since the Plan became Operative, improvements in the AIC scheme have been made and abstraction rates have dropped (part 1.2.3 Abstraction & Water Monitoring). Based upon historical abstraction and the volume applied for under the current application it is considered highly unlikely this could be considered to diminish the values listed above.

7.5 Effects on other water users or other human use values

The proposed abstraction represents an existing take with primary allocation status. Continuation of this take will not result in any new adverse effects on the primary allocation abstraction by other users within the catchment.

The Arrow River is used extensively for recreational purposes. The river environs adjacent to Arrowtown are very popular with local residents, holidaymakers and tourists for swimming, picnicking, walking and especially in Autumn, photography. Arrowtown has a range of walking / hiking / biking tracks some of which run adjacent to the river and/or gorge.

Gold panning is also a popular tourist activity. The road up the gorge from Arrowtown, which is accessible by 4-wheel drive vehicles only, continues past the intake and on to Macetown, which is a deserted historic gold mining town. This is a popular destination for visitors on foot, bicycles, or 4-wheel drive vehicles.

The Arrow River is not regarded as a prolific trout fishing river, but some large spawning fish are taken in the lower reaches and the reaches below Arrowtown provide easily accessible, safe, fishing for children and beginners. There are no commercial activities on the river itself, but several commercial operators run river related, bicycle hire, gold pan hire, and 4-wheel drive trips up the gorge.

It is accepted that recreational values must be protected, and it is important that visitors experience a natural and accessible river. However, from a multitude of meetings concerning proposed minimum flows on the river, overwhelming feedback, from a recreational user's viewpoint, favour lower flows over summer months. Lower flows downstream of, and bordering Arrowtown, make the river safer and more accessible for swimming, gold panning, and angling. Lower flows upstream of Arrowtown make fording the river in the gorge safer for cyclists, hikers, and vehicles.

In summary, although the river has important recreational values, continued abstraction will have very minimal, if any adverse effects on other water users or other human use values.

7.6 Positive Effects

Conventional irrigation systems almost solely provide for primary production. Stock numbers and land uses have been described and discussed in part 1 of this report. AIC accepts that the stock numbers supported by the scheme's water delivery are the equivalent of only one large farming unit.

However, the Operative and Proposed District Plans have mapped the majority of the Wakatipu Basin as a section 7(c) landscape for its character and associated amenity value while the Wakatipu Basin contains a number of section 6(b) outstanding natural landscapes and features. Both District Plans also recognise that tourism is a key driver of the local economy and these landscapes are the “jewels in the crown” of Queenstown’s international reputation as a tourist attraction.

The AIC scheme is the only irrigation system available in the Wakatipu Basin. It is considered to support the continued pastoral and arcadian appearance of these landscapes which are highly valued.

The two largest users of irrigation water, Millbrook and The Hills golf courses, contribute substantially to the local economy by providing premier tourist facilities as venues for tournaments (NZ Open), conferences, and weddings. They both also represent organisations which employ a significant number of staff directly and indirectly through local contractors and tradespeople. These facilities have gained international recognition for their landscaped settings. This recognition would not have been possible without irrigation water from the AIC scheme and their continued operation is reliant upon AIC.



Figure 8: Hole 9, Millbrook Resort



Figure 9: Hills Golf Course

Millbrook in conjunction with the Hills golf course have been co-hosting the NZ Open golf tournament for the past eight years. The Post Event Report from the 2019 indicated national economic benefits of just under \$10m with much of that being a regional benefit to the Queenstown area.

As discussed in part 1, almost half of the shareholder properties are occupied by rural residential land uses and local government projections provided as part of the District Plan Review expect the recent increase in demand for this typology of land use to continue³. These existing properties rely solely upon AIC irrigation to support the expansive landscape garden areas which occupy a majority of these rural residential land uses. Future growth in rural residential land use will also rely solely upon AIC for irrigation water supply.

³ Part 4.2, Page 12-13, Wakatipu Basin Land Use Planning Study, Final Report, March 2017.

Indirectly, rural residential land uses support local contractors who manage and maintain these properties while the owners of these properties and their families contribute to the local economy by utilisation of other local services.



Figure 10: Rural Living



Figure 11: Section 6(b) & 7(c) Landscape

As discussed in part 1, the AIC scheme is expected to be used to improve the water quality of Lake Hayes by flushing through the value in the Millbrook syphon which is supported by ORC.

Amenity use of the water on lifestyle blocks is highly valued by the people who live and work in the catchment. The accessibility and flight frequency at the local Queenstown airport has resulted in many professional people working remotely in the catchment and commuting to meetings and functions. The water supports the enhancement of the command area to be the attractive visitor and local recreation space that it has become. There is a popular walking and biking trail through the catchment that is enhanced by hedges, gardens, tree plantings and lifestyle holdings all supported by AIC water. The popular Queenstown marathon utilised this pathway. There are small hospitality and tourism businesses in the shareholder group that use the water to create a desirable outdoor area. The AIC water has been instrumental for the development and recreational enhancement of the catchment area.

7.7 Summary

Overall, the proposed taking and use of water results in positive effects for the applicant, their shareholders, local businesses, local, national and international visitors and the local community.

The amount of water requested represents volumes and instantaneous rates of take that will provide an efficient amount of water for the proposed use.

There are no adverse effects anticipated as a result of the proposal provided conditions covering the rate, volume and a minimum flow are included on any consent granted.

8.0 Legislative Analysis

8.1 Resource Management Act 1991

The Resource Management Act provides for the sustainable management of New Zealand's natural resources and sets out the roles and responsibilities of central and local government in doing so.

Under the s14 of the Resource Management Act the taking and use of surface water can be authorised by a rule in a regional plan or by a resource consent.

Section 104 of the Act sets out the matters to be considered when assessing an application for a resource consent. Those matters which should be considered for this application are addressed in the following sections.

8.2 Part 2 RMA 1991

For completeness, consideration is given to the ability of the proposal to meet the purpose of the Act, which is to promote sustainable management of natural and physical resources. Other resource management issues require consideration when exercising functions under the Act. The relevant sections are set out in Section 5, 6, 7 and 8 of the Act.

5 Purpose

- (1) *The purpose of this Act is to promote the sustainable management of natural and physical resources.*
- (2) *In this Act, sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—*
 - (a) *sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
 - (b) *safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
 - (c) *avoiding, remedying, or mitigating any adverse effects of activities on the environment.*

With regard to Section 5(2)(a)-(c) the nature and location of the take will safeguard the life-supporting capacity, ecosystem processes and indigenous species of the Arrow River, as described in part 7 (Assessment of Environmental Effects) of this report.

The Applicant seeks to replace an existing permit to take surface water as primary allocation and the proposed rate and volumes sought represents an efficient allocation and efficient use of water.

Providing the recommended conditions of consent are imposed, the proposed take will have no more than a minor effect on the ability of the waterway to meet the reasonably foreseeable needs of future generations, or on the life-supporting capacity of the waterways or any ecosystems associated with them. The proposed taking of water from the Arrow River for the purpose of stock water, irrigation and flushing Lake Hayes is therefore consistent with the purpose and principles set out in Section 5 of the Act.

6 Matters of national importance

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:

- (a) *the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:*
- (b) *the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development:*
- (c) *the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:*
- (d) *the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers:*
- (e) *the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga:*
- (f) *the protection of historic heritage from inappropriate subdivision, use, and development:*
- (g) *the protection of protected customary rights:*
- (h) *the management of significant risks from natural hazards.*

With regard to **s.6(a)**, the attributes of natural character are listed in Schedule 1A of the Regional Plan for Water which notes the Arrow River above 900 metres asl has a high degree of naturalness and the existing AIC take is 520 metres asl. Based upon part 7.2 above, it is considered that any adverse effects associated with the current application upon the level of natural character of the Arrow River are acceptable.

In addition, the proposed replacement take is an existing use occurring in a catchment with a long history of water abstraction. The current application does not seek to increase the volume currently abstracted from the Arrow River and as discussed in part 1.2.3, this volume is appropriate and efficient.

Given the above, the continuation of abstraction from this point of take is not anticipated to compromise the natural character amenity of the Arrow River environment.

With regard to **s.6(b)**, Schedule 1A of the Regional Plan for Water confirms the Arrow River is not considered to be an outstanding natural feature. However, as discussed in part 7.6, the AIC scheme indirectly supports s.6(b) and s.7(c) landscapes.

With regard to **s.6(c)**, Schedule 1A of the Regional Plan for Water confirms the Arrow River is not considered as having any significant indigenous vegetation or significant habitat of indigenous fauna. Based upon part 7.2 above, it is considered that any adverse effects associated with the current application upon ecological values are acceptable.

With regard to **s.6(d)** the proposed activity will not result in any changes to the existing level of public access to and along any water body.

With regard to **s.6(e)**, the values of importance to iwi in these water bodies are not anticipated to be adversely affected as abstraction rates have lowered since these values were identified.

With regard to **s.6(f)**, the protection of historic heritage from inappropriate subdivision, use, and development, there are no known heritage values relevant to this application.

With regard to **s.6(g)**, there are no known protected customary rights relevant to this application.

With regard to **s.6(h)**, there are no known risks from natural hazards relevant to this application.

7. Other matters

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—

- (a) kaitiakitanga:*
- (aa) the ethic of stewardship:*
- (b) the efficient use and development of natural and physical resources:*
- (ba) the efficiency of the end use of energy:*
- (c) the maintenance and enhancement of amenity values:*
- (d) intrinsic values of ecosystems:*
- (f) maintenance and enhancement of the quality of the environment:*
- (g) any finite characteristics of natural and physical resources:*
- (h) the protection of the habitat of trout and salmon:*
- (i) the effects of climate change:*
- (j) the benefits to be derived from the use and development of renewable energy.*

The application is consistent with the requirements of s.7 of the Act, with particular regard given to, the efficient use and development of natural and physical resources, maintenance and enhancement of amenity values, intrinsic values of ecosystems maintenance and enhancement of the quality of the environment and the finite characteristics of natural and physical resources.

Summary

The application is consistent with Part 2 of the Act, given the nature of the proposed activities and subject to the continued adherence to the residual flow as recommended.

8.3 Section 104(1)

The remaining matters of Section 104(1) to be considered when assessing an application for a resource consent are as follows:

104 Consideration of applications:

- (1) When considering an application for a resource consent and any submissions received, the consent authority must, subject to Part 2, have regard to—*
 - a) any actual and potential effects on the environment of allowing the activity; and*
 - b) any relevant provisions of—*

- i. a national environmental standard:*
 - ii. other regulations:*
 - iii. a national policy statement:*
 - iv. a New Zealand coastal policy statement:*
 - v. a regional policy statement or proposed regional policy statement:*
 - vi. a plan or proposed plan; and*
- c) *any other matter the consent authority considers relevant and reasonably necessary to determine the application.*

...

(2A) When considering an application affected by section 124 or 165ZH(1)(c), the consent authority must have regard to the value of the investment of the existing consent holder.

With regard to s104(1)(a), the actual and potential environmental effects of the proposed activity have been considered in part 6 of this report where there are no adverse effects which are considered to be more than minor.

With regard to s104(1)(b)(i) there are no national environmental standards relevant to this application.

In terms of any other regulations under s104(1)(b)(ii) the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 are directly relevant to this application. The regulations impose minimum requirements on the holders of certain water permits to keep and provide records of fresh water taken under the permits. As discussed in part 1, the applicant is committed to achieving compliance with the relevant measurement requirements imposed by these regulations.

With regard to s104(1)(b)(iii), the National Policy Statement on Freshwater Management is relevant to this application. The relevant provisions of this document are considered in part 7.4 below and within the report from Dr Dean Olsen⁴.

Under s104(1)(b)(v) and (vi), the ORC Regional Policy Statement (RPS) and Proposed Regional Policy Statement (PRPS) are both relevant to this application, as is the Regional Plan: Water for Otago (RPW). The relevant provisions of these documents are considered in in part 7.5 and 7.6 below.

In terms of s104(2A), this application is affected by section 124, as it involves the replacement of existing consents within the ambit set out by section 124(1). This means that the value of the investment of the existing consent holders is a matter to which regard must be had in considering this application.

In recent years the applicant has upgraded and invested significant funds on its scheme to ensure that its operation meets modern expectations of water use and efficiency.

⁴ "Arrow River Periphyton Assessment", Ryder Consulting Ltd, December 2019 – Appendix 5.

8.4 National Policy Statement on Freshwater Management (2014)

A key planning instrument under the RMA is the National Policy Statement on Freshwater Management (NPSFM). The NPSFM aims to recognise the national significance of fresh water by promoting the sustainable use of water, through the setting of environmental limits based on a more nationally consistent approach that is scientifically robust.

The ORC has not fully implemented the NPSFM, however applications should still be considered against the objectives of the NPSFM to ensure they are not inconsistent with it.

8.4.1 Water Quantity

Objectives of the NPSFM include:

Objective B1: To safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems of fresh water, in sustainably managing the taking, using, damming, or diverting of fresh water.

Part 6.3 of this report has considered effects upon ecological values where any adverse effects are considered to be acceptable. For the reasons discussed in part 6.3, the proposal is considered to be consistent with Objective B1.

Objective B2: To avoid any further over-allocation of fresh water and phase out existing over-allocation.

This application does not seek any further primary allocation water and will result in a reduction in the volume abstraction limit. This represents a 70% reduction in the paper allocation within the catchment and reduction in the physical allocation. On this basis, the proposal is consistent with Objective B2.

Objective B3: To improve and maximise the efficient allocation and efficient use of water.

In recent years the applicant has upgraded and invested significant funds on the existing scheme to ensure a continued reduction in water use and increased efficiencies as discussed in part 1.2. For the reasons listed in part 1.2 the application is considered to be consistent with Objective B3.

Objective B5: To enable communities to provide for their economic well-being, including productive economic opportunities, in sustainably managing freshwater quantity, within limits.

As discussed in part 6, the AIC scheme directly supports the economic well-being of its shareholders and indirectly the Wakatipu Basin's landscapes, rural residential developments and the quality of water in Lake Hayes while sustainably managing the use of water within freshwater quantity limits. The Applicant is seeking to replace an existing permit to take surface water, and the proposed rate

and volumes sought represents an efficient allocation and efficient use of water. As such, the application is considered to be consistent with Objective B5.

8.4.2 Water Quality

In setting objectives and limits in accordance with the National Objectives Framework (Objective CA1 and corresponding policies of the NPSFM) regional councils must manage for two compulsory values - ecosystem health and human health and can also recognise and manage freshwater for a range of other national values. In doing so, the objectives and limits in regional plans must be set at an attribute state (as contained in Appendix 2 of the NPS, required by Policy CA2) at or above the minimum acceptable state for that attribute (CA2(d)). In addition, Policy CA3 requires regional councils to ensure that freshwater objectives (and corresponding limits) for the compulsory values (eco-system health and human health for recreation) are set at or above the national bottom lines for all FMUs.

In the case of water quality this means the ORC must set targets for contaminant levels that are at or better than the minimum acceptable state or national bottom line as contained in Appendix 2 and 6 of the NPSFM while also ensuring that values already identified for a FMU will not be worse off when compared to existing freshwater quality (Policy CA2).

The ORC has assessed all the contaminant limits contained in Schedule 15 of the RPW as being more restrictive than the national bottom lines specified in the NPSFM. While Schedule 15 does not include limits for all attributes specified in Appendix 2 of the NPSFM (of which Periphyton and Dissolved Oxygen are relevant to rivers), the ORC state these will be monitored in the future to assess compliance with the NPSFM.

Notwithstanding the above, Dr Dean Olsen has considered water quality and periphyton in detail within his report contained in Appendix 5. Based upon the assessment of Dr Olsen coupled with the assessment contained in part 7 of this document, it is considered that the proposal remains consistent with relevant water quality standards.

Objective A1: To safeguard:

- a) *the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems, of fresh water; and*
- b) *the health of people and communities, as affected by contact with fresh water; in sustainably managing the use and development of land, and of discharges of contaminants.*

Objective A2

The overall quality of fresh water within a freshwater management unit is maintained or improved while:

- a) *protecting the significant values of outstanding freshwater bodies;*
- b) *protecting the significant values of wetlands; and*
- c) *improving the quality of fresh water in water bodies that have been degraded by human activities to the point of being over-allocated.*

Objective A3

The quality of fresh water within a freshwater management unit is improved so it is suitable for primary contact more often, unless:

- a) regional targets established under Policy A6(b) have been achieved; or*
- b) naturally occurring processes mean further improvement is not possible.*

The AIC scheme draws from the Arrow River catchment. ORC seeks to work with the community to agree on local values that sit alongside national values for human and ecological health that will eventually inform the setting of water quality and quantity objectives within the Freshwater Management Unit. AIC has participated in community consultation in developing options for managing water in the catchment and aquifers.

However, the AIC is not aware that any formal objectives have been released. Until such time, the applicant is committed to achieving compliance with the relevant water quality limits that apply.

Objective A4

To enable communities to provide for their economic well-being, including productive economic opportunities, in sustainably managing freshwater quality, within limits.

As discussed in part 6, the AIC scheme directly supports the economic well-being of its shareholders and indirectly the Wakatipu Basin's landscapes, rural residential developments and the quality of water in Lake Hayes while sustainably managing the use of water within freshwater quantity limits. The Applicant is seeking to replace an existing permit to take surface water, and the proposed rate and volumes sought represents an efficient allocation and efficient use of water.

8.5 Otago Regional Council Regional Policy Statement

Both the RPS and the Proposed RPS include objectives which focus on enabling sustainable and efficient use while also maintaining, enhancing and protecting values associated with waterways, including iwi values, and include policies to achieve these.

The Proposed Regional Policy Statement (PRPS) was notified on 23 May 2015. The Council released its decision on Saturday 1 October 2016. The PRPS was made partially operative on 14 January 2019 given the limited range of provisions still subject to appeal.

As Chapter 3 is not included, the 'mediation version' of these provisions (dated 27 October 2017) are referred to here as it is the most up to date version of these provisions and is understood to be generally accepted by parties to the appeal on the PRPS.

Objective 3.1 of the mediation version of the PRPS reads:

The *functions and values of Otago's ecosystems and natural resources are recognised, maintained and or enhanced where degraded.* (the track changes are the result of mediation on the PRPS and have been retained here).

Several other objectives and policies in the RPS and PRPS are also relevant. In terms of productive use, economic and social well-being, the application seeks to be consistent with, or implement the provisions of the RPS and PRPS, by:

- *providing for economic well-being of Otago's people and communities by enabling the resilient and sustainable use and development of natural and physical resources (Partially Operative RPS Policy 1.1.1):*
- *ensuring the efficient allocation of water, including by encouraging the development or upgrade of infrastructure that increases efficiency (mediation version PRPS Policy 3.1.3)*
- *encourage a collective approach to water management in the catchment, including rationing during low flows (mediation version PRPS Policy 3.1.4).*

The functions and values of the ecosystems and natural resource relating to the Arrow River and the AIC scheme have been discussed in detail within part 6 of this application document. Any adverse effects in this regard are considered to be acceptable.

The duty set out in Objective 3.1 above is the *maintenance or enhancement where degraded.* AIC are unaware of any evidence which suggests that any attributes of the Arrow River are degraded.

The AIC scheme's abstraction pre-dates the Operative and Proposed Regional Policy Statements. Improvements in the AIC scheme have been made and abstraction rates have dropped (part 1.2.3 Abstraction & Water Monitoring). Based upon historical abstraction and the volume applied for under the current application the functions and values of Otago's ecosystems and natural resources are considered to be maintained.

As discussed in part 6, the AIC scheme directly supports the economic well-being of its shareholders and indirectly the Wakatipu Basin's landscapes, rural residential developments and the quality of water in Lake Hayes while sustainably managing the use of water within freshwater quantity limits. The Applicant is seeking to replace an existing permit to take surface water, and the proposed rate and volumes sought represents an efficient allocation and efficient use of water.

In terms of natural and cultural values, the application seeks to be consistent with or implement the following RPS and PRPS objectives and policies:

- Safeguard the life-supporting capacity of the Arrow River and its tributaries (RPS Objective 6.4.3):
- Enhance:
 - ecological and intrinsic values of waterways within this catchment (RPS Objective 6.4.4):
 - ecosystem health, indigenous species, habitats and migratory patterns (mediation version PRSP Policy 3.1.9); the range and extent of habitats provided by fresh water,

the natural functioning of waterbodies and riparian margins (mediation version PRSP 3.1.1)

o *The habitat of trout and salmon unless detrimental to indigenous biological diversity (PRPS Policy 3.1.1 and PRPS Policy 3.1.9):*

- Provide for the relationship that Kai Tahu have with these waterways (Policy 6.5.1).
- Enhance the cultural values associated with the waterways within this catchment (RPS Objective 6.4.4), provide for cultural wellbeing, (Partially Operative RPS Policy 1.1.2) support Kai Tahu well-being (PRPS Policy 2.2.1) and recognising and provide for the protection of wāhi tupuna (Partially Operative RPS Policy 2.2.2)
- Protect the natural character of the waterways within this catchment (RPS Objective 6.4.8) or enhance the natural character and amenity values associated with these waterways; as far as practicable (mediation version PRPS Policy 3.1.2).

The nature and location of the proposed takes will safeguard the life-supporting capacity, ecosystem processes and indigenous species of the Arrow River, as described and discussed throughout the Assessment of Environmental Effects, part 6 of this application document.

The Applicant is seeking to replace an existing permit to take surface water and the proposed rates and volumes sought represent an efficient allocation and efficient use of water. This application is considered to be consistent with the relevant objectives and policies listed above.

8.6 The Otago Regional Council: Regional Plan Water for Otago

The Otago Regional Council's Regional Plan: Water for Otago (RPW) contains objectives, policies and rules addressing the taking and use of water in Otago, including rules which require a resource consent for the taking and use of water in certain circumstances. The RPW objectives, policies and rules relating to water use and management form a framework that aims to recognise existing use of water, reduce over-allocation, increase efficiency of use and safeguard the life-supporting capacity and natural character of Otago's water resources. Key objective and policy provisions in the RPW that are of relevance to this application are discussed below.

8.6.1 Schedule 1 Values, Natural Character & Amenity

Schedule 1A lists the natural values identified for this catchment, while 1D lists the spiritual and cultural beliefs, values and uses of significance to Kāi Tahu. The key objectives and policies in relation to these values include:

Objective 5.3.1 To maintain or enhance the natural and human use values, identified in Schedules 1A, 1B and 1C, that are supported by Otago's lakes and rivers.

Objective 5.3.2 To maintain or enhance the spiritual and cultural beliefs, values and uses of significance to Kai Tahu, identified in Schedule 1D, as these relate to Otago's lakes and rivers.

Policy 5.4.2 In the management of any activity involving surface water, groundwater or the bed or margin of any lake or river, to give priority to avoiding, in preference to remedying or mitigating:

(1) Adverse effects on:

- (a) Natural values identified in Schedule 1A;*
- (b) Water supply values identified in Schedule 1B;*
- (c) Registered historic places identified in Schedule 1C, or archaeological sites in, on, under or over the bed or margin of a lake or river;*
- (d) Spiritual and cultural beliefs, values and uses of significance to Kai Tahu identified in Schedule 1D;*
- (e) The natural character of any lake or river, or its margins;*
- (f) Amenity values supported by any water body; and*

(2) Causing or exacerbating flooding, erosion, land instability, sedimentation or property damage.

Policy 5.4.8 To have particular regard to the following features of lakes and rivers, and their margins, when considering adverse effects on their natural character:

- (a) The topography, including the setting and bed form of the lake or river;*
- (b) The natural flow characteristics of the river;*
- (c) The natural water level of the lake and its fluctuation;*
- (d) The natural water colour and clarity in the lake or river;*
- (e) The ecology of the lake or river and its margins; and*
- (f) The extent of use or development within the catchment, including the extent to which that use and development has influenced matters (a) to (e) above.*

Policy 5.4.9 To have particular regard to the following qualities or characteristics of lakes and rivers, and their margins, when considering adverse effects on amenity values:

- (a) Aesthetic values associated with the lake or river; and*
- (b) Recreational opportunities provided by the lake or river, or its margins.*

As discussed in the Assessment of Environment Effects, the proposed taking and use of water will not result in any adverse effects that are more than minor on natural, human use, spiritual or cultural values.

The AIC scheme's abstraction pre-dates the Operative and Proposed Regional Policy Statements. Improvements in the AIC scheme have been made and abstraction rates have dropped (part 1.2.3 Abstraction & Water Monitoring). Based upon historical abstraction and the volume applied for under the current application the functions and values of Otago's ecosystems and natural resources are considered to be maintained.

As discussed in part 6, the AIC scheme directly supports the economic well-being of its shareholders and indirectly the Wakatipu Basin's landscapes, rural residential developments and the quality of water in Lake Hayes while sustainably managing the use of water within freshwater quantity limits.

The Applicant is seeking to replace an existing permit to take surface water, and the proposed rate and volumes sought represents an efficient allocation and efficient use of water.

Based upon the above, this application is considered to be consistent with the relevant objectives and policies listed above.

8.6.2 Access to Water

The key policies directing access to water as primary allocation of relevance to this application include:

Policy 6.4.0A - *To ensure that the quantity of water granted to take is no more than that required for the purpose of use taking into account:*

- (a) How local climate, soil, crop or pasture type and water availability affect the quantity of water required; and*
- (b) The efficiency of the proposed water transport, storage and application system.*

As discussed in part 1.2 of this application document, the applicant is requesting a total annual volume which has been determined as an efficient volume of water. The quantity of water requested under this permit reflects the actual quantity required for the proposed purpose of use.

In recent years the applicant has upgraded and invested significant funds on its scheme to ensure that its operation meets modern expectations of water use and efficiency.

Based upon the above, this application is considered to be consistent with Policy 6.4.0A.

Policy 6.4.2A - *Where an application is received to take water and Policy 6.4.2(b) applies to the catchment, to grant from within primary allocation no more water than has been taken under the existing consent in at least the preceding five years, except in the case of a registered community drinking water supply where an allowance may be made for growth that is reasonably anticipated.*

As discussed, the proposed rates and volume of water sought is based on a demonstrated history of water use. As such, this application is considered to be consistent with Policy 6.4.2A.

6.4.0B - *To promote and support shared use and management of water that: (a) Allows water users the flexibility to work together, with their own supply arrangements; or (b) Utilises shared water infrastructure which is fit for its purpose.*

The AIC is not aware of any other relevant water users which share the subject resource. This may be due to the continued ability of AIC to accommodate additional shareholders within the schemes existing capacity which has resulted in their being no additional water takes from the Arrow River similar to the AIC scheme. As such, the current application is considered to be consistent with Policy 6.4.0B.

8.6.3 Application of Minimum and Residual Flows

Policy 6.4.7 directs the need for residual flows where necessary to provide for the aquatic ecosystem and natural character of the source water body.

Policy 6.4.7 - The need to maintain a residual flow at the point of take will be considered with respect to any take of water, in order to provide for the aquatic ecosystem and natural character of the source water body.

Residual flow has been discussed in part 7.2 of this application where a residual flow is recommended by Mr Matt Hickey in his report (Appendix 4), and that monitoring and compliance with this at Cornwall St provides adequate protection for the section of river above.



Appendix 1 - AIC Shareholders Details

Shareholder	Legal Description	Irrigation Quota (ha)	Total Area (ha)	Area Irrigated	Soil Type
1 Dan Reid (Director)	Lot 1 DP484986	1	4.72	2	Wp
2 Abbis, Justin & Caroline	Lot 43 DP443715	1	2.5	2.3	Bl
3 Long River Consulting	Lot 6 DP325721	2	4	4	Wp
4 Aitken, Grant	Lot 8 DP501343	1	0.9	0.8	Sh
5 Allan, Jack D	Lot 1 DP301404	2	2	1.9	Sh
6 Allen, WK & FL	Lot 2 DP478112	6	11.95	2	Wp+Bl
7 Andrew, Donald William	Lot 20 DP372119	3	34	6	Pa
8 Andrew, Benjamin	Lot 9 DP372001	5	4	4	Wp
9 Andrew, Tom	Lot 12 DP372001	4	6.3	6	Ao+Bl
10 Arnestedt, Hans	Lot 2 DP22913	1	0.4	0.3	Sh
11 Arnott, Peter R	Lot 1 DP512581	4	3.5	3.5	Gd
12 Austin, George & Diane	Lot 1 DP441851	2	1.14	1.14	Sh
13 Bagrie, Joe & Lu	Lot 1 DP473343	2	3.54	3.4	Sh
14 Bailey, Anne M & John Hart	Lot 3 DP420442	1	15.7	2	Wp
15 Barrington, Murry	Lot 2 DP416007	4	3.19	3.1	Sh
16 Beckingsale, Jonathon	Lot 31 DP486000	2	0.89	0.7	Sh
17 Bell, Ashly & Maisy Chee	Lot 1 DP359142	2	4.59	4.5	Sh
18 Bendemeer	Lot1 -42 DP359527	41	120	42	Bl
19 Bird, William HP & Mary M	Lot 1 DI22936	1	4.05	2	Wp
20 Clark, Mark	Lot 1 DP453236	1	5	2	Bl
21 Blair, Noel John	Lot 1 DP20834	3	4.5	4.4	Sh+Ao
22 Bloxson, Robert	Lot 2 DP425385	1	2.8	2	Gd
23 Botherway, Simon	Lot 2 DP25298	2	3.56	3.4	Wp
24 Boyd, John	Lot 1 DP325561	2	4.1	4	Sh+Ao
25 Bradley, Susan E	Lot 3 DP23443	2	3.18	3.1	Sh
26 Bramwell, Scott	Lot 9 DP325561	2	2.2	2	Sh
27 Brent/Haywood, Steven & Sheena	Lot 8 DP325561	2	2	2	Sh
28 Brial, Michael	Lot 2 DP22936	2	4.1	4	Wp
29 Brinsley, Andrew Winston	Lot 1 DP23077	1	2.1	2	Bl
30 Brimmicombe, Greg	Lot 32 DP450052	1	1	0.9	Sh
31 McKeown, Geoff	Lot 3 DP22550	4	0.8	0.7	Wp
32 Foggo, Daniel	Lot 2 DP453236	2	4.9	4.6	Bl
33 Buchanan, Nigel	Lot 4 DP372000	1	4.2	2	Pa
34 Buckham, Victoria	Lot 1 DP22310	1	13.47	3	Gd
35 Burdon, M A	Sec 41, Block 5	4	4.68	4.5	Sh
36 Burgess, Michael & Cordelia	Lot 1 DP425385	4	7.9	7.8	Gd
37 Allan, Craig	Lot 2 DP417550	2	1.67	1.67	Sh
38 Caird, Neville & Miranda	Lot 4 DP478112	6	4.6	4.5	Wp
39 Campbell, Pete & Tiffany	Lot 3 DP308629	3	2.27	2.26	Sh
40 Campbell, TJ & AA	Lot 24 DP440308	1	1.5	1.4	Sh
41 Cameron, John	Lot 3 DP312744	4	0.6	0.6	Gd
42 Cassidy, Edward	Pt Lot 2 DP21410	1	6.8	2	Sh
43 Catterick, DJ & NJ	Lot 3 DP427059	2	5.5	4	Wp
44 Young, Charlotte	Lot 2 DP301404	3	2.3	2.2	Sh
45 Chisholm, Justin	Lot 1 DP17388	1	0.6	0.5	Sh
46 Christianakis, Leonidas	Lot 25 DP440308	1	1.3	1.1	Sh
47 Cole-Bailey, Mitzi & Dan	DP 3394 DP 7365	1	0.1	0.1	Sh
48 Copeland, Craig & Amanda	Lot 3 DP464891	1	1	0.9	Sh
49 Coyle, John & Andrea	Lot 1 DP402712	2	1.8	1.7	Sh
50 Davies, Michael John & Bridget Sycan	Lot 1 DP25533	1	1.25	1.1	Bl
51 Dowling, Dennis & Sarah	Lot 17 DP440308	1	1	0.9	Sh
52 Doyle, Peter F	Lot 1 DP374111	1	2.4	2.3	Sh
53 Dublin, Nominees Ltd	Lot 2 DP21705	3	10.1	6	Ao
54 Duncan, Dave	Lot 1 + 2 DP372803	5	4.8	4.7	Bl

Appendix 1 - AIC Shareholders Details

55	Dunlop, KT & SA	Lot 1 DP478112	2	3.5	3.4	Bl
56	Dunstan, Trustees Ltd	Lot 3 DP407786 +	6	9	8.8	Wp
57	Dumarchand, Rob	Lot 3 DP336908	3	3.5	3.4	Wp
58	Ebbinge, Eduard & Rebecca	Lot 2 DP441466	2	0.9	0.8	Gd
59	Eden, Kaye Linda	Lot 2 DP23630	6	18.2	12	Wp+Bl
60	Moffat, DS	Lot 2 DP24001	4	3.8	3.7	Gd
61	Elworthy, Tom	Lot 1 DP305713	2	2.8	2.6	Wp
62	Emerson, Hamish	Lot 2 DP402712	1	1.1	1	Sh
63	Faesenkloet, Eric	Lot 2 DP306888	3	9.2	3	Wp
64	Faulks, Adrian Tony	Lot 1 DP22110	2	0.8	0.7	Bl
65	Fergusson, Georgina	Lot 3 DP400639	1	1.4	1.3	Sh
66	Fig Speculative Investments Ltd	Lot 1 DP304280	8	17.1	12.0	Wp
67	Firgrove Farm - Bunn	multiple	25	145	55	Wp+Sh
68	Flacks, Patricia	Lot 2 DP22781	4	4	3.9	Sh
69	Flood, Simon	Lot 2 + 3 DP25520	7	40.4	18	Sh
70	Foo, Alison Ahjau	Lot 3 DP498951	1	0.8	0.7	Sh
71	Gallagher, Donna	Lot 3 DP416007	4	4.4	4.4	Sh
72	Galloway, PJ & GL	Lot 6 DP309880	1	0.5	0.4	Sh
73	George, Phillip	Lot 1 DP377980	2	5	4	Sh
74	Green, Ross	Lot 29 DP486000	1	0.9	0.8	Sh
75	Greenslade, Margaret Kay	Lot 2 +3 DP364425	1	11.77	3	Gd
76	Guillot, Cyrille & Yvonne	Lot 10 DP443715	2	14.2	3.5	Bl
77	Gumsey, Jonathan	Lot 2 DP305713	2	2.7	2.6	Wp
78	Hale, Peter	Lot 2 DP417059	3	7.5	5	Bl
79	Hamilton, Suzy	Lot 1 DP477369	2	1.6	1.5	Sh
80	Hamilton, William AG	Lot 1 DP411193 +	31	191	50	Wp+Bl
81	Hamlin, K	Lot 6 DP23443	4	3.06	3	Sh
82	Hancock, Stanley	Lot 1 DP24136	1	1.15	1	Wp
83	Harris, Erika & Mark	Lot 2 DP26173	1	4.29	2	Wp
84	Harrison, Brian	Lot 3 DP301618	1	0.5	0.4	Sh
85	Arnott, Peter and Margaret	Lot 28 DP486000	1	1	0.9	Sh
86	Hazeldine, Sam	Lot 4 DP407786	1	4	2	Wp
87	Heatley, Craig	Lot 3 DP475822	13	29	13	Wp
88	Henry, Michael Paul	Lot 2 DP458502 +	6	18.5	12	Ao
89	Hill, Rohan & Diane	Lot 2 DP442784	2	1.6	1.6	Wp
90	Fermer, Megan & Raymond	Lot 4 DP498951	1	0.7	0.6	Sh
91	Hood, Victor & Kamile	Lot 2 DP461478	1	1.9	1.5	Bl
92	Huckins, Lesley	Lot 1, DP7707	1	0.3	0.2	Sh
93	Huse, Donald & Margreate	Lot 26 DP486000	1	1	0.9	Sh
94	Huse, Robert	Lot 20 DP440308	1	0.7	0.6	Sh
95	Hutchinson, Anna	Lot 2 DP516751	1	1.2	1.1	Sh
96	Hutton, Ian Gerald & Wendy M	Lot 5 DP441851	6	2.4	2.3	Sh
97	Hylton, Jeffery	Lot 1 DP372120	2	4.1	4	Wp
98	James, CE	pt Lot 1 DP22781	2	6.1	4	Wp
99	Johnston, John	Lot 3 DP372000	2	4.7	4	Wp
100	Jones, Trevor	Lot 2 DP307112	3	4.7	4.5	Bl
101	Wikstrom, John	Lot 4 DP22781	1	4.1	2	Sh+Wp
102	Stalker, Kaye	Lot 1 DP304273	2	3.3	3.1	Wp
103	Kang, Elisa	Lot 22 DP440308	1	1.2	1.1	Sh
104	Kelly, Russell & Jan	Lot 4 D 325561	1	3.3	2	Sh
105	Kerr, VT	Lot 1 DP22095	1	0.7	0.6	Sh
106	Key, R&J	Lot 1 DP27866	1	0.9	0.8	Sh
107	Khoo, Bee Lian	Lot 2 DP 23443	2	3	2.9	Sh
108	Kiddle, Nicholas & Mill, Charlotte	Lot 2 DP498951	1	1.2	1.1	Sh
109	Kilkenny, Matt	Lot 1 DP503601	2	34.9	4	Wp
110	Kinloch Downs Ltd	Sect 51, Pt Sec 45,46,50	1	6.3	2.5	Sh

Appendix 1 - AIC Shareholders Details

111	French, Wayne	Lot 2 DP359142	2	3.3	3.3	Sh
112	Ladies Mile Partnership / Shotover Co	Shotover Country	1	2	2	Sh
113	Laurel Hills Ltd	Lot 2 DP325561	2	4.8	4.8	Sh
114	Lakes Hayes Estate Ltd	Lake Hayes Estate	8	8	8	Sh
115	Lakes Hayes Estate Properties Ltd	Lot 2 DP301351	1	18	4	Bl
116	Lakes Hayes Ltd	Lot 101 DP314349	16	21.2	16	Bl+Sh
117	Ligett, Russell	Lot 7 DP506684	7	6.7	6.6	Sh
118	Logez, MJ & VJ	Lot 2 DP473769	3	4.4	4	Sh
119	Macauley, Ian Gordon & Phillipa A	Lot 2 DP304280	2	43.2	2	Wp
120	Manata Green	Lot 100 DP351843	1	1	1	Sh
121	Wingfield, Simon	Lot 1 DP22136	1	0.9	0.8	Wp
122	Corbett, Barbara & McCall, Frederick	Lot 17 DP310210	1	4.8	2.5	Wp
123	Matthews, Alastair & Jackie	Lot 9 DP416007	1	0.3	0.2	Sh
124	Mauvenay, Hermine	Lot 2 D26690	4	2.2	2.1	Sh
125	Mauvenay, Hermine	Lot 1 DP22302	2	2.17	2.1	Sh
126	McChesney, SM & AR	Lot 1 DP27507	1	17.8	3	Wp
127	McKenzie, Gordon	Lot 8 DP329110	1	0.6	0.5	Bl
128	McLeod, Peter G & Jennifer B	Lot 2 DP425546	2	1.92	1.8	Sh
129	McLeod, Richard & Sonia	Lot 1 DP425546	1	0.82	0.7	Sh
130	McPike, Julian	Lot 9 DP430577	1	1.2	1.1	Sh
131	Mellor, A	Lot 8 DP24802	2	2.95	2.8	Sh
132	Williamson, Skipp	Lots 1-2 DP27112	3	4.7	4	Wp
133	Middleton, AA		1			
134	Millbrook Country Club Ltd	various	63	267	160	Gd+Bl
135	Miller, Phillipa Margaret Woods	Lot 2 DP484986	1	1.4	1.3	Wp
136	Miller, Scott	Lot 1 DP26605	2	3.54	3.4	Wp
137	Moen, Erik	Lot 5 DP372000	2	4	4	Wp
138	Moloney, DS	Lot 1 DP22163	1	4	2	Wp
139	Moonlight Stables - Geoffrey Clear	Lot 2 DP504424	4	8.35	8.1	Bl
140	Morgans, Brent	Lot 5 DP407786	4	6.8	6.7	Wp
141	Gardiner-Chien	Lot 10 DP430577	1	1.2	1.1	Sh
142	Morven Ferry Ltd	various	11	54	11	Wp
143	Murfin, David John	Lot 4 DP317834	2	1.55	1.45	Sh
144	Murray, Scott Geoffrey & Jacques, Jul	Lot 12 DP308773	4	3.5	3.5	Wp
145	Nancekivell, Patricia Anne	Lot 2 DP21206	2	4.5	4.1	Wp
146	Nelson, Leslie R & Judith A	Lot 1 DP442784	1	9.4	3	Wp
147	AJ Nicholson, AR Gerry	Pt Sec 80, BLK 5	2	21	4.5	Wp
148	Oaks, R&J	Lot 1 DP22913	1	0.5	0.4	Sh
149	O'Hare, Michael & Fiona	Lot 3 DP318450	2	1.3	1.2	Sh
150	O'Neill, Abby & DC Joynes	Lot 7 DP309880	1	0.5	0.4	Sh
151	Owen, John & Sally	Lot 2 DP23626	1	0.4	0.3	Bl
152	Page, George H	Sec 1 5022444	9	15	14	Wp+Bl
153	Pannett, Barry & Helen & Shand Tho	Lot 2 DP317834	3	2.3	2.2	Sh
154	Paterson, Anthony & Susan	Lot 3 DP453236	2	4.6	4.4	Bl
155	Petersen Investments Co Pty Ltd	Lot 7 DP 24802	2	2.9	2.8	Sh
156	Petit, R&G	Lot 1 DP 301351	3	4	3.9	Wp
157	Price, Harry & Margaret	Lot 3 DP 22666	3	4.1	4	Sh
158	Price, Malcolm Edward	Lot 2 DP482478	2	5	4	Sh+Kl
159	Purvis, Robert	Lot 15 DP430577	1	0.6	0.5	Sh
160	Quail Rise	Quail Rise	1	1	1	Sh
161	Queenstown Country Club Ltd	Lot 2 DP510256	21	37.2	21	Sh
162	QLDC - Cemetary Block	Pt Sec 62 + 888R	1	3.1	1	Sh
163	R&H Trust Co	Various	1	111	3	Pr+Wp
164	Rangitutia, Michelle & Max	Lot 2 DP 381857	2	0.7	0.6	Sh
165	Reid, Julia	Lot 5 DP325721	1	4.5	2.5	Wp
166	Remarkable Vets Property Ltd	CT 656979	2	13	4	Pg

Appendix 1 - AIC Shareholders Details

167	Remarkables Park Ltd	various	51	82	51	Gb+Sh
168	Robbie, Ben & Thompson, Rosie	Lot 15 DP310210	2	4	4	Wp
169	Robertson, Paul & Cheryl	Lot 30 DP486000	1	1.15	1	Sh
170	Robinson, Margot	Lot 2 DP400639	1	1.45	1.35	Sh
171	Rodger JA & Clarkson TM	Lot 1 DP22734	1	0.8	0.7	Sh
172	Rodwell, Bonnie	Sec 119 Blk V	1	0.43	0.4	Wp
173	Rodwell, Graeme H	Lot 2+3 DP502589	4	6.8	6	Sh
174	Rogers, Denis	Lot 1 DP414182	4	15	8	Wp
175	Rouse, Woodford	Lot 3 DP12923	1	4	3	Wp
176	Russell, D&K	Lot 3 DP368650	1	1	1	Sh
177	Shallard, RJ & GM	Lot 1 DP381857	1	2.4	2.3	Bl
178	Shearer, Diane & Terry	Lot 21 DP440308	1	1.1	1	Sh
179	Sim, Graeme D	Pt Sec 119 Blk 111	2	4.5	4.4	Sh
180	Simpson, Iain & Jan	Lot 1 DP400639	1	1.1	1	Sh
181	McLean, Mark & Jacqueline	Lot 4 DP317790	2	4.4	4	Sh+Ki
182	Smith, Catherine & Jackson, Olive - K	Lot 19 DP440308	1	0.6	0.5	Sh
183	Smith, P & Malcolm, L	Pt Lot 1 DP26173+	1	5.7	3	Sh
184	Spary, Alistair James	Lot 1 DP21914	6	7.3	6	Wp
185	Spary, RD & BJ	Lot 1 DP27846	1	2.3	2.1	Wp
186	Speargrass Farms Ltd - Kampman	Lot 2 DP503601	4	8.9	8	Gd
187	Speargrass Holdings Ltd - Chris Meeh	Lots 1+3 DP 441466	3	1.8	1.7	Gd
188	Springbank Partnership	Lot 4 DP 398999	2	0.2	0.2	Sh
189	Stalker, Grant William	various	17	125	24	Sh+Ao
190	Stock, David	Lot DP 329110	1	0.4	0.3	Bl
191	Stonebridge Management Ltd		2	2	2	Sh
192	Story, Timothy & Elder, Norman	Lot 23 DP440308	2	0.7	0.6	Sh
193	Strain, Anthony John	Sec 2 SO451735	5	54	15	Wp+BL
194	Greer Seeto	Lot 3 DP303124	1	10.8	3	Wp
195	Tait, Lady Philippa	Lot 6 DP 300531	1	6.1	2	Sh
196	Taquet, JF	Lot 1 DP 312744	1	1.4	1.3	Gd
197	Robertson, Paul & Cheryl	Lot 27 DP486000	1	1	0.9	Sh
198	Teele, David W	Pt Lot 3 DP15648	4	6.9	6.6	Bl
199	Tezkate Pty Ltd	Lot 2 DP368650	2	0.8	0.7	Sh
200	Hill, Emma	various	26	101.59	45	Wp+Bl
201	Bestwick, Jenn	Lot 7 DP372000	2	4.7	4.5	Wp
202	Evans, Wayne & Nicola					
203	Thorsen, John	Lot 2 DP301618	1	0.4	0.3	Sh
204	Thompson, D&P	Lot 4 DP 368650	1	0.7	0.6	Sh
205	Threepwood Custodians Ltd	Lots 24,26,28,30 DP3782	36	151	72	Wp
206	Tisch, Ross	Lot 3 DP416335	2	5	4	Sh+Ki
207	Todd, Graeme & Jane	Lot 1 DP25659	1	0.8	0.7	Wp
208	Todd, Ian J	Lot 6 DP509082	3	4.9	4.6	Wp
209	Tunncliffe, Bruce	Lot 13 DP430577	1	1	0.9	Sh
210	Twin River Holdings Ltd - Jones	Pt Lot 2 DP15648	8	12.6	12	Bl
211	Universal Developmetsn Ltd	Lot 2 DP497316	3	9	6	Gd+Sh
212	Van Brandenburg, Fred	Lots 2+3 DP359067	8	8	8	Sh
213	Vining, Barry & Pauline	Lot 1 DP417550	2	1.9	1.8	Sh
214	Eaton - Wakatipu Equities Ltd	Lot 1-7 DP301330	19	129	19	GbAoWp
215	Wales, Rob & Maree	Lot 4 DP302775	1	5	2.5	Sh
216	Walker, Bruce R	Lot 2 DP483365	1	2.9	2	Wp
217	Tapper, Nicholas & Charlotte	Secr. 25D BKL VII	1	0.4	0.3	Bl
218	Wang, Zhang Min	Lot 1 Dp496761	1	4	2	Sh
219	Ward, Scobie	Lot 1 DP475576	3	14.3	6	Wp
220	Watson, BJ	Lot 3 DP22781	2	4	4	Wp
221	Weber, Warrick & Heather	Lot 6 DP472821	1	3	2	Bl
222	Wendel Moet Raikes FT	Lot 2 DP464891	1	1	0.9	Sh

Appendix 1 - AIC Shareholders Details

223	Ying Wang		Lot 4 DP427059	2	7.5	4	Wp
224	Whiting, Danny		Lot 3 DP441851	1	0.8	0.7	Sh
225	Wilkinson, Graham		Lot 1+4 DP464891	1	2	1.9	Sh
226	Whyte, RL & DG		Sect. 21 Blk XVII	5	3.5	3.5	Wp
227	Wilett, CE		Lot 10-12 DP22550	5	22	20	Sh
228	William, Hamish & Nolan, Kristin		Lot 1 DP480634	3	6.3	6	Wp+Bl
229	Wills, Andrew JC		18 DP310210	1	4.1	2	Wp
230	Wilsher Investements		Lot 1 DP482478	2	4	3.9	Sh
231	Wilson, Peter		Lot 2 DP414182	3	3.2	3	Sh+Bl
232	Woelders, John & Helen		Lot 1 DP21222	2	1.8	1.7	Wp
233	Jaguar Nominees Ltd		Lot 4 DP21444	2	0.8	0.7	Wp
234	Wood, Karl H		Lot 403, DP495767	1	6.9	2	Sh
235	Wood, Tim		Lot 7 DP325721	1	4	2	Wp
236	Woodfield Properties Ltd		Lot 1 DP412992	3	3	2.8	Sh
237	Woodlot Properties Ltd		Lot 1 DP473899	2	29	4	Ao
238	R&H Trust Co.		Lot 1 DP21960	1	13.6	3	Wp
239	Cartmell, Brian		Lot 2 + 101 DP475822	13	57	26	Wp
240	Hamilton, Lyn		Sect. 17 + Pt 18,19 Block	3	5	4.9	Sh
241	Johns, David & Hamilton, Annie		Sect. 17 + Pt 18,19 Block	3	5	4.9	Wp
242	Hill, Tony		Lot 1 DP 498591	1	1	0.9	Sh
243	Atomic Trust - Melville, Simon & Kath		Lot 4 DP472821	1	1.2	1.1	Bl
244	Davies, Michael & Bridget		Lot 4 DP453236	1	9	2	Bl
245	Stalker, Grant		Lot 5 DP438514	1	7	2	Sh
246	Giverny Art Ltd		Lot2,DP339864	2	3.1	3	Sh
247	Mahon, Stewart		Lots7+8,DP22550	1	14.7	3	Sh
248	Dormand Blake, Linette Lee		Lot 1,DP26690	1	2.6	2.4	Sh
249	Pearson,Simon		Lot 1,DP318450	1	2	1.9	Sh
250	Ballan		Lot 4 DP318450	1	1.6	1.5	Sh

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Appendix 2

Photograph Gallery



Plate 1: Weir



Plate 2: Weir



Plate 3: Weir



Plate 4: Above Weir



Plate 5: Weir



Plate 6: Intake



Plate 7: Above Silt Trap - Arrow Gorge

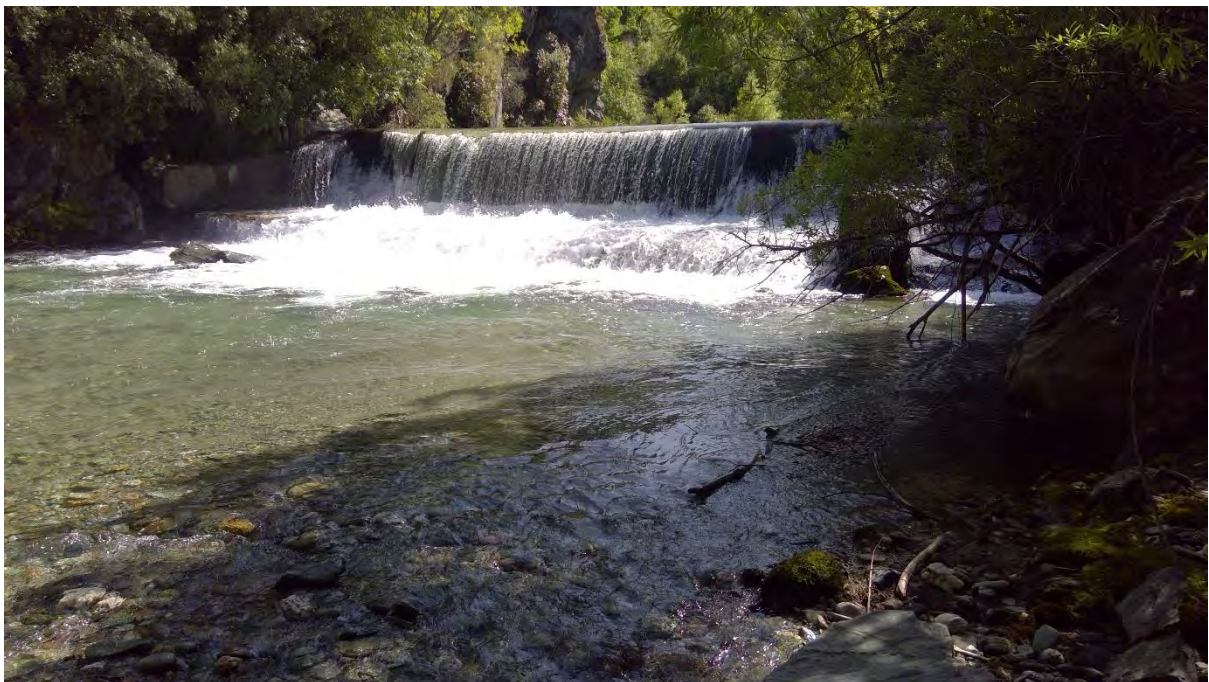


Plate 8: Below Weir



Plate 9: Arrow Gorge



Plate 10: Arrow Gorge below Weir



Plate 11: Arrow River above Arrowtown



Plate 12: Water Meter, delivery pipeline



Plate 13: Probe in Weir at Bush Creek



Plate 14: Weir at Bush Creek



Plate 15: Butterfly Valve at Bush Creek



Plate 16: By wash at Bush Creek



Plate 17: Weir on Mooney Road Pipeline



Plate 18: Junction Branch to Morven Ferry Pipeline



Plate 19: 9th Hole at Millbrook Resort



Plate 20: Millbrook Resort



Plate 21: Millbrook Resort



Plate 22: Hills Golf Course



Plate 23: Hills Golf Course



Plate 24: Hills Golf Course



Plate 25: Rural Living Shareholders



Plate 26: Rural Living Shareholders



Plate 27: Lake Hayes



Plate 28: Morven Ferry



Plate 29: Bendemeer



Plate 30: Junction Race By Wash

Memorandum

To: Arrow Irrigation Co. Ltd. Of: _____
From: Dr Anthony Davoren Date: 5 December 2019
Subject: Seasonal Irrigation Demand, Arrow Irrigation Company

Arrow Irrigation Company Ltd. water take WR1440AR expires 1 October 2021. Otago Regional Council (ORC) requires “all replacement resource applications for surface water takes include a monthly as well as a seasonal/annual volume on the consent” (*pers. comm.* Rebecca Jackson, Consent Officer at Otago Regional Council).

A. WR1440AR

WR1440AR is a mining privilege (Deemed Permit) dating from July 1926 that permits the take and use of water as follows:

The diversion of 65 heads (1807L/s) of water for irrigation and electric power from the Arrow River above the Falls.

The permits does not have any use condition relating to annual, monthly or daily volume.

B. Calculating annual and monthly volume

ORC requires both monthly and annual (seasonal) volumes to be proposed for renewal of resource consents and has previously used the Aqualinc Research Ltd. Irricalc model to estimate seasonal volumes¹.

The Irricalc model has been re-run using two Virtual Climate Station Network (VCNS) sites in the Arrow Irrigation command area (VCNS P056053 and P057053). These stations are considered to have highly reliable data because there are long term climate stations nearby from which the data has been interpolated. The model was rerun to include more current data and because the 2017-18 irrigation season has been recognised as a very high demand season.

Irricalc models irrigation demand based on soil profile available water (PAW) and, rainfall and evapo-transpiration (PET) and applies some basic irrigation rules (e.g. soil moisture deficit and return period) and irrigation efficiency (in this case 80%). Four soil PAW (40mm, 60mm, 90mm and 120mm) were modelled for the period 1972-3 to 2018-19 (47 years).

The annual volumes were ranked (lowest to highest) to determine the ninety (90) percentile season – commonly used to determine the annual allocation/demand for irrigation.

Annual irrigation demand was been determined for each shareholder based on the 90-percentile demand for the appropriate soil type and PAW. The annual demand for each soil type is summarised in Table 1.

¹ Guidelines for Reasonable Irrigation Water Requirements in the Otago Region. July 2015, Report Number C15000, Aqualinc Research Ltd.

There is little actual water use data available to verify the annual volume estimates from the Irricalc modelling because water metering has not been a requirement for these surface takes. James O'Malley (Golf course superintendent, Millbrook Golf Club) has provided actual water use data that has been used to compare the annual volumes from Irricalc and the monthly distribution of water use to determine peak monthly use. These water meter data are only for the irrigation of greens, tees and parts of the fairways.

C. Results

- i. There is little difference between the modelled annual irrigation demand results for the two VCNS stations and for the four soil PAW. Figures 1 and 2 show the annual irrigation demand; Figure 3 shows the ranked demand for soil PAW 40mm; where
 - Irrigation demand is highest for the lowest soil PAW and vice versa;
 - There is very little variation between VCNS P056053 and P057053 although, P056053 has the slightly higher annual volume in those years when there is a difference; and
 - The three highest demand seasons are 1975-76, 1980-81 and 2017-18 with the latter season the second highest demand season for both VCNS stations.
- ii. Annual irrigation demand for P056053 and P057053 are listed in Appendix 1.
- iii. Table 1 summarises the annual demand for each soil type and the irrigated area.
- iv. For Arrow Irrigation Co. to meet demand in the 90-percentile demand season, the volume required is **6,789,518m³/year**.
- v. ORC requires a monthly volume to be included in the condition for use. The daily data (m³/day) provided by Millbrook has been analysed to determine the peak monthly volume (Table 2, Figures 4 and 5). This analysis shows the peak monthly water use is approximately 33.2% of the annual use; i.e. 2,254,120m³.

Soil Type	S-map PAW	Irricalc Demand	Irrigated Area	Seasonal Demand
	mm	m ³ /ha/year	ha	m ³ /year
ArrowBlack	62	5380	47	252,860
Blackstone	62	5380	297.2	1,597,616
Gladbrook	116	4720	41.4	195,408
Shotover	182	4720	325.6	1,540,802
Shotover-ArrowBlack	60	5380	35.4	190,452
Wakatipu	60	5380	521	2,867,540
Paerau	120	4720	12	56,640
Shotover	32	5880	15	88,200
		Total	1,295	6,789,518

Table 1. 90-percentile annual irrigation demand for each soil type, Arrow Irrigation.

Month	2017-18	2018-19	2017-18	2018-19
	m ³	m ³		
October	14,877	1,992	10.5%	3.1%
November	25,984	924	18.3%	1.4%
December	41,309	18,450	29.1%	28.8%
January	47,221	17,270	33.2%	26.9%
February	9,542	13,631	6.7%	21.2%
March	3,267	11,882	2.3%	18.5%
Total	142,199	64,149	100.0%	100.0%

Table 2. Monthly water use (m³ and percent of total water use) from water meter records, Millbrook Golf Resort.

D. Calculating annual and monthly volume

Renewal of the Arrow Irrigation Company Ltd. water take WR1440AR requires both a monthly seasonal/annual volume.

The revised Irricalc modelling (to estimate seasonal irrigation demand volumes) and analysis of Millbrook Golf Resort daily water meter data shows the following volumes to be reasonable:

Monthly volume 2,254,120m³; and
Annual volume 6,789,518m³.



Dr Anthony Davoren
Director, SWIMS Ltd.

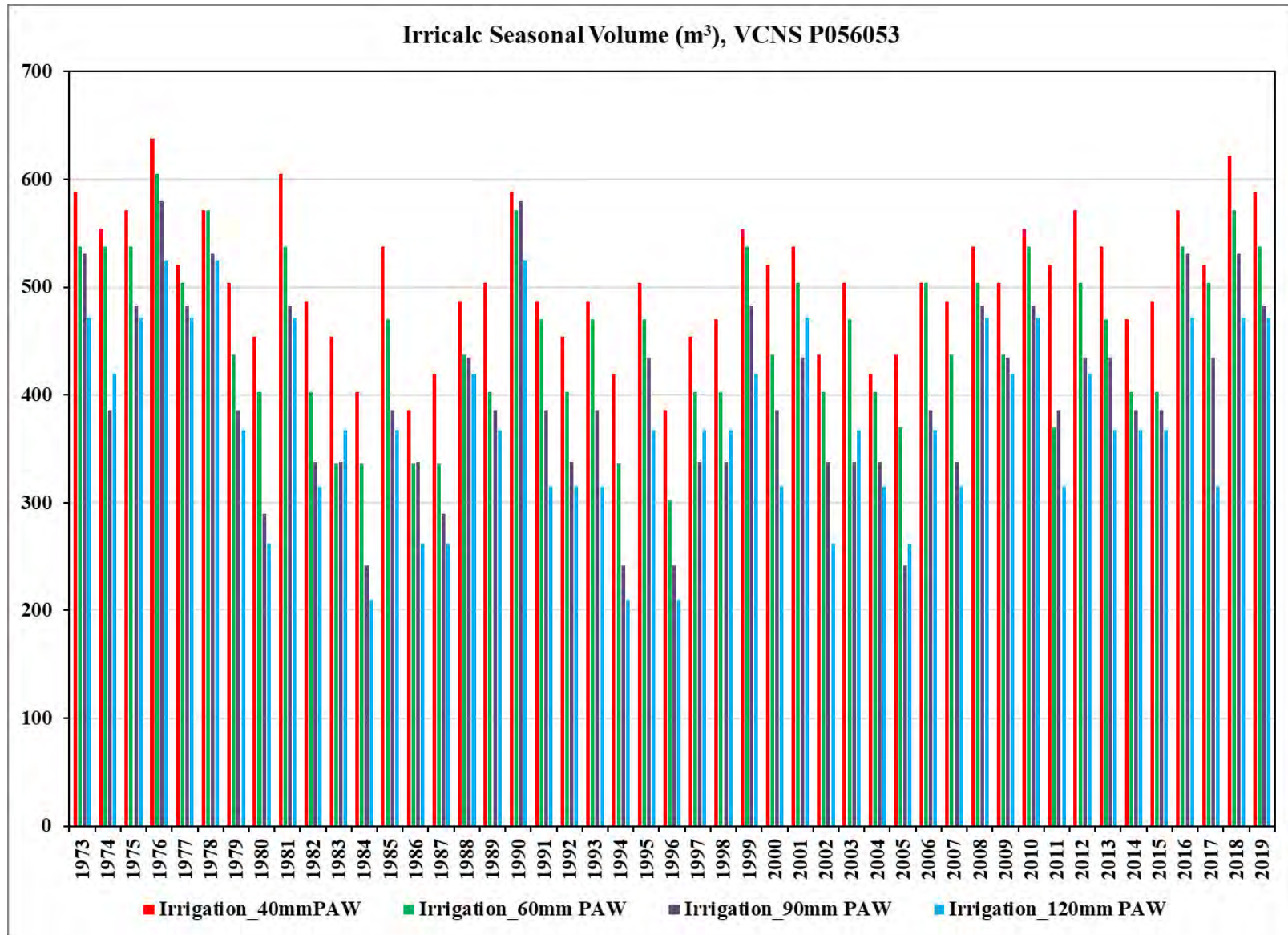


Figure 1. Seasonal volume (m³/year) for VCNS P056053.

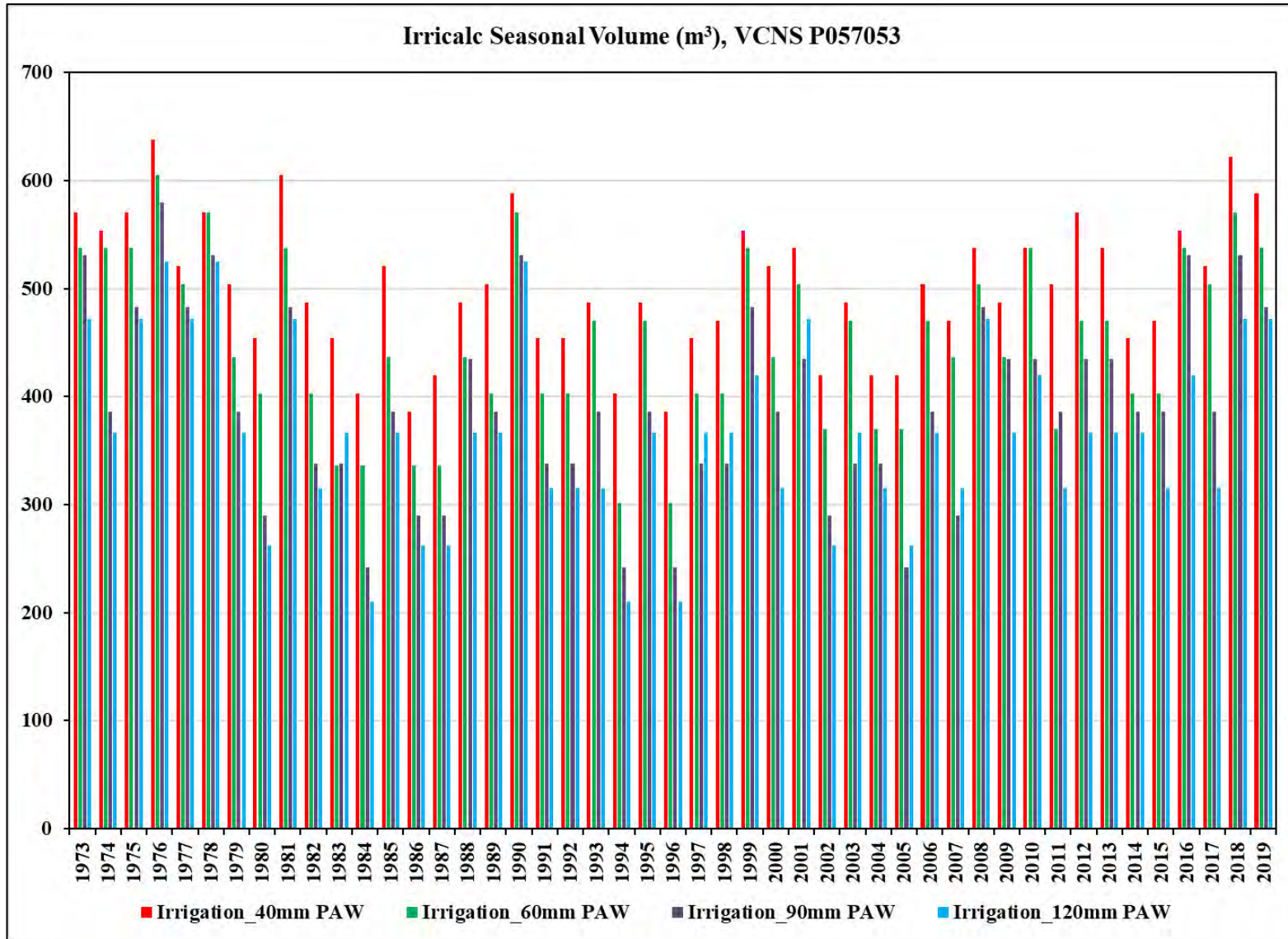
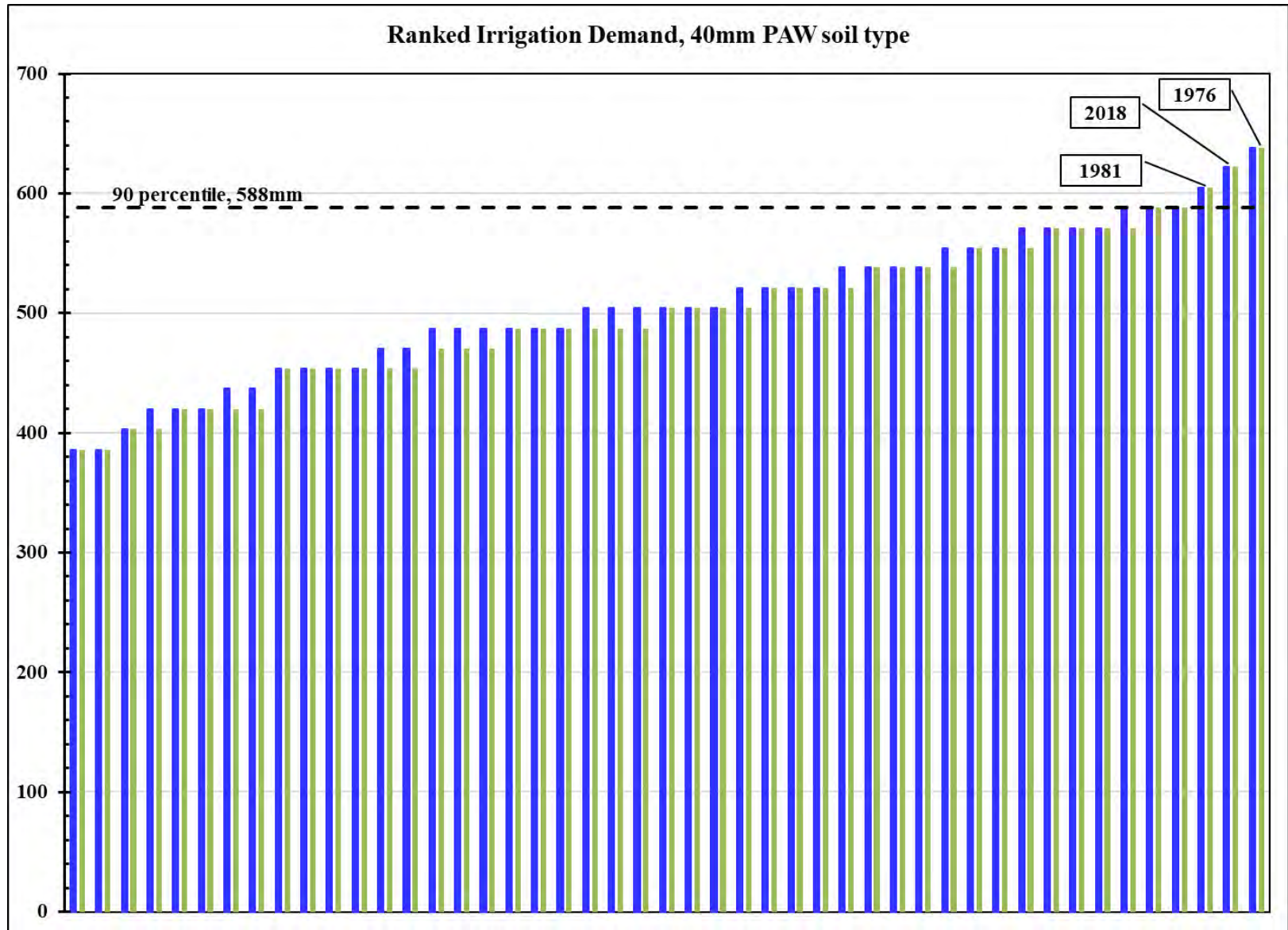


Figure 2. Seasonal volume (m3/year) for VCNS P057053.



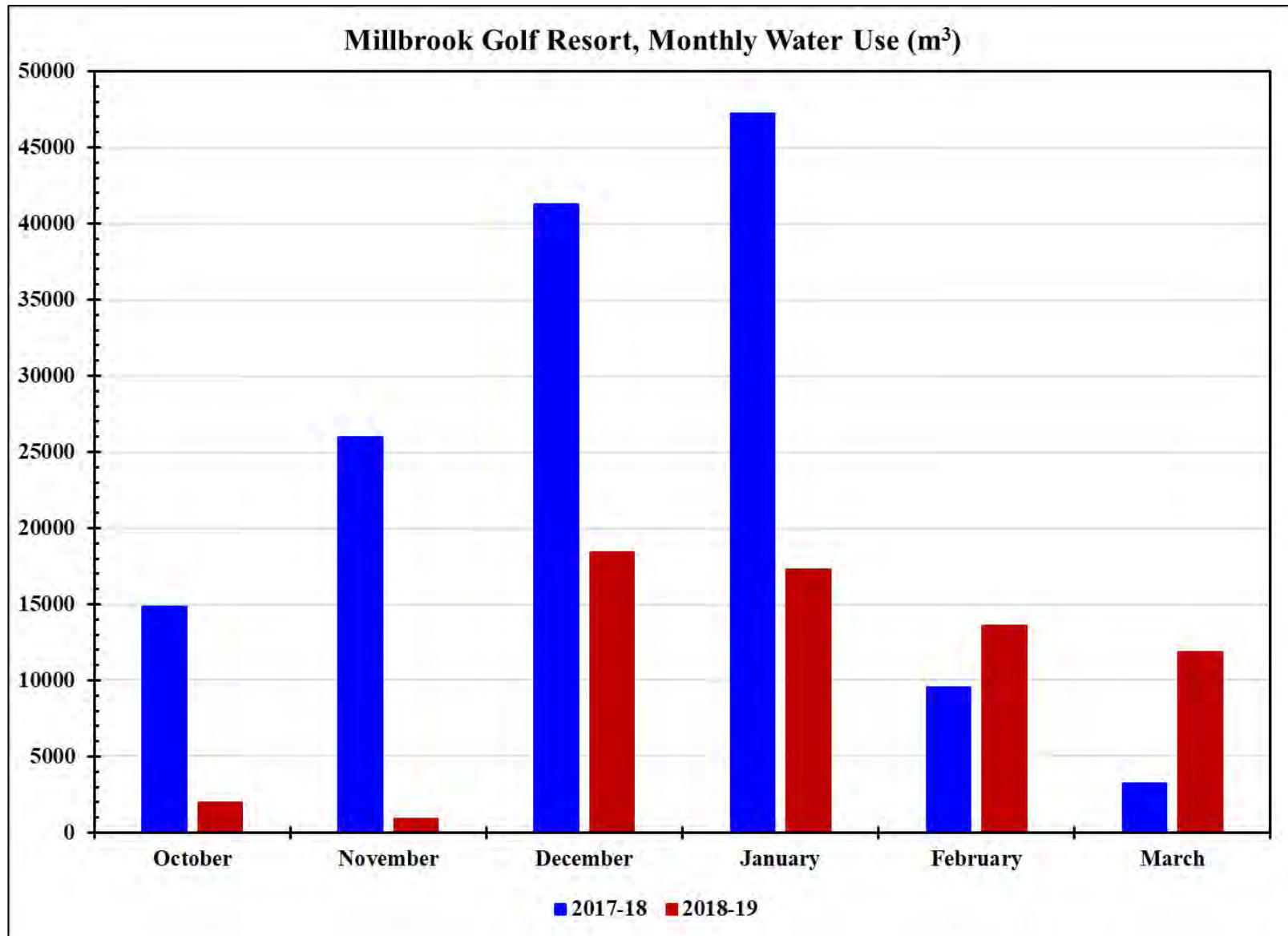


Figure 4. Monthly water use (m³) from water meter records, Millbrook Golf Resort.

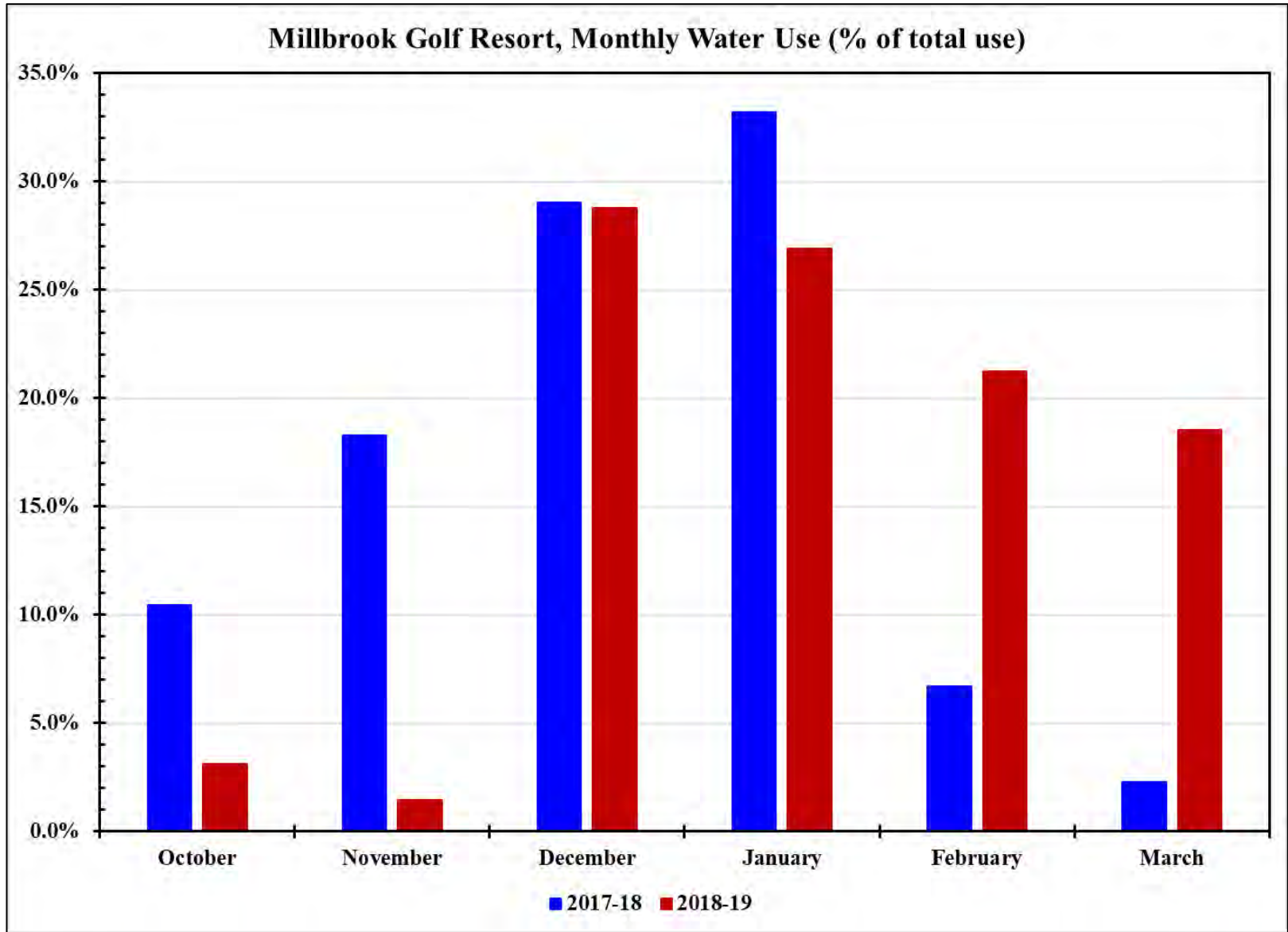


Figure 5. Monthly water use (as percentage of total water use) from water meter records, Millbrook Golf Resort

Appendix 1

Annual demand results for each year modelled for VCNS P056053 and P057053

Annual Demand, P056053				
Year	Irrigation_40mmPA W	Irrigation_60mm PAW	Irrigation_90mm PAW	Irrigation_120mm PAW
1973	588	538	531	472
1974	554	538	386	420
1975	571	538	483	472
1976	638	605	580	525
1977	521	504	483	472
1978	571	571	531	525
1979	504	437	386	367
1980	454	403	290	262
1981	605	538	483	472
1982	487	403	338	315
1983	454	336	338	367
1984	403	336	242	210
1985	538	470	386	367
1986	386	336	338	262
1987	420	336	290	262
1988	487	437	435	420
1989	504	403	386	367
1990	588	571	580	525
1991	487	470	386	315
1992	454	403	338	315
1993	487	470	386	315
1994	420	336	242	210
1995	504	470	435	367
1996	386	302	242	210
1997	454	403	338	367
1998	470	403	338	367
1999	554	538	483	420
2000	521	437	386	315
2001	538	504	435	472
2002	437	403	338	262
2003	504	470	338	367
2004	420	403	338	315
2005	437	370	242	262
2006	504	504	386	367
2007	487	437	338	315
2008	538	504	483	472
2009	504	437	435	420
2010	554	538	483	472
2011	521	370	386	315
2012	571	504	435	420
2013	538	470	435	367
2014	470	403	386	367
2015	487	403	386	367
2016	571	538	531	472
2017	521	504	435	315
2018	622	571	531	472
2019	588	538	483	472
90%-ile	588	538	531	472
80%-ile	571	538	483	472
Mean	507	455	402	374
Median	504	470	386	367

Annual Demand, P057053				
Years	Irrigation_40mm PAW	Irrigation_60mm PAW	Irrigation_90mm PAW	Irrigation_120mm PAW
1973	571	538	531	472
1974	554	538	386	367
1975	571	538	483	472
1976	638	605	580	525
1977	521	504	483	472
1978	571	571	531	525
1979	504	437	386	367
1980	454	403	290	262
1981	605	538	483	472
1982	487	403	338	315
1983	454	336	338	367
1984	403	336	242	210
1985	521	437	386	367
1986	386	336	290	262
1987	420	336	290	262
1988	487	437	435	367
1989	504	403	386	367
1990	588	571	531	525
1991	454	403	338	315
1992	454	403	338	315
1993	487	470	386	315
1994	403	302	242	210
1995	487	470	386	367
1996	386	302	242	210
1997	454	403	338	367
1998	470	403	338	367
1999	554	538	483	420
2000	521	437	386	315
2001	538	504	435	472
2002	420	370	290	262
2003	487	470	338	367
2004	420	370	338	315
2005	420	370	242	262
2006	504	470	386	367
2007	470	437	290	315
2008	538	504	483	472
2009	487	437	435	367
2010	538	538	435	420
2011	504	370	386	315
2012	571	470	435	367
2013	538	470	435	367
2014	454	403	386	367
2015	470	403	386	315
2016	554	538	531	420
2017	521	504	386	315
2018	622	571	531	472
2019	588	538	483	472
90%-ile	578	538	531	472
80%-ile	568	538	483	472
Mean	501	450	394	366
Median	504	437	386	367

Assessment of Effects on Instream Ecology and Residual Flow Recommendation for Arrow Irrigation Companies Mainstem Take.

*Assessment undertaken by Matt Hickey
Water Resource Management Ltd
January 2020*



Prepared for Arrow Irrigation Company

January 2020

by Matt Hickey



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1. Introduction

The Arrow River is a significant tributary of the Upper Kawerau River entering on the true left downstream of lake Wakatipu. The Arrow River carries good flows in summer as it drains from high yielding tussock country. There is a continuous flow site on the Arrow River at Cornwall Street downstream of the Arrow Irrigation Company (AIC) existing take, with no other mainstem takes between the flow site and the AIC take (Figure 1).

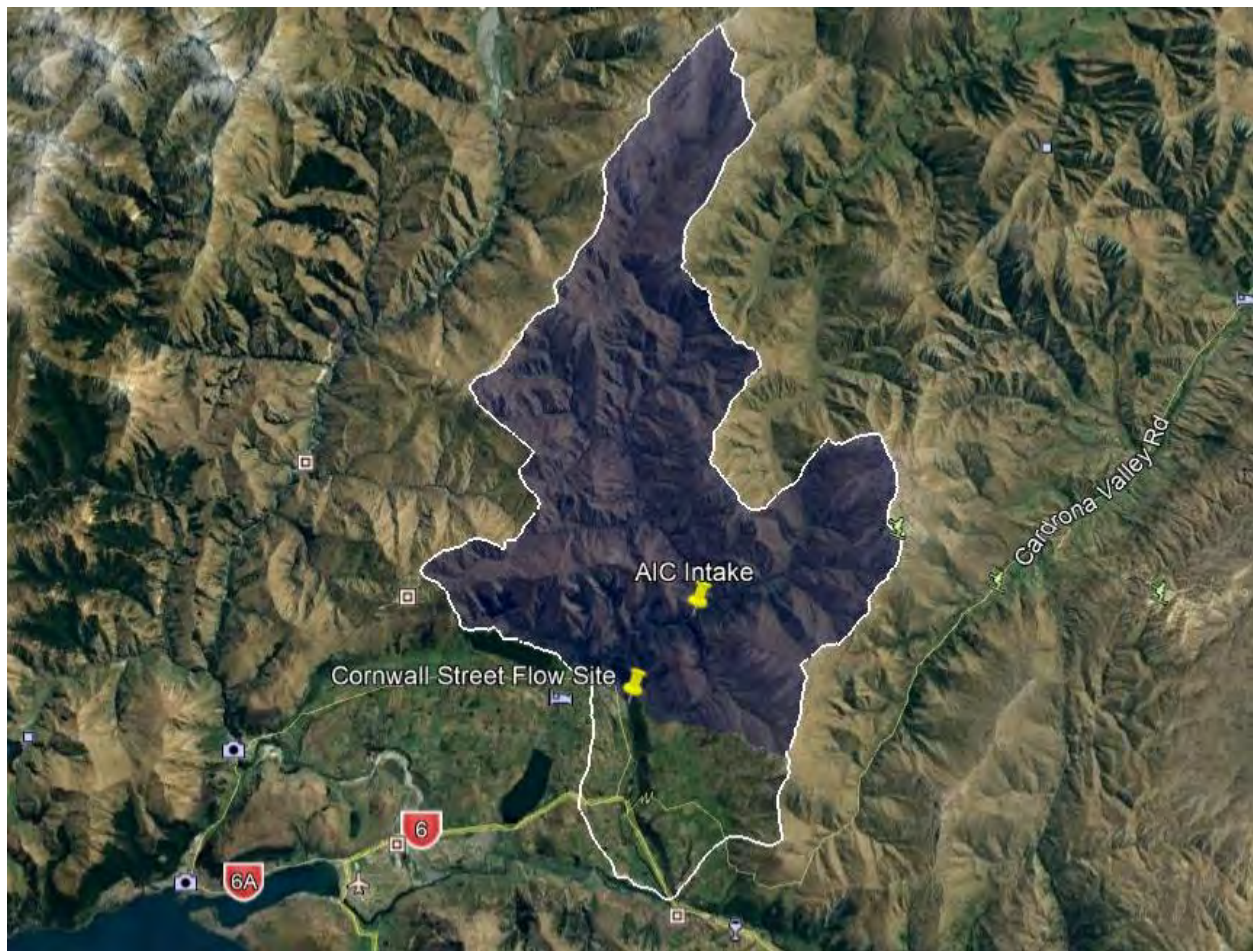


Figure 1. Arrow River Catchment (White outline), the permanent flow site at Cornwall Street (catchment u/s shaded blue) and the existing AIC take.

Construction of AIC began in 1926 and it first delivered water in 1930, at which time 1660 Ha was irrigated¹. The scheme draws water from the Arrow River at a concrete weir constructed at the top of the Arrow Falls. Steel pipes then carry the water 5.4Km's down the gorge to the Arrow flats.

2. Hydrology of the Arrow River at the AIC Intake.

ORC have commissioned NIWA to provide a naturalised flow for the Cornwall Street Flow Site providing a flow record over 43 years (1976 – 2019). This data was taken, and the flows subsequently reduced based on the relative catchment area above the AIC intake. This method assumes that the specific yield per Km² from the Arrow catchment upstream of Cornwall Street are the same and therefore flows can be equally apportioned to catchment area upstream. It is likely that this method is conservative as the upper Arrow catchment is likely to yield more than the lower catchment towards the Cornwall Street Flow Site.

Table 1. Flow Statistics Based on Natural Daily Average Flows During the Irrigation Season (Oct – April Incl.) at the AIC Intake.

Min (l/s)	7-day MALF (l/s)	Median (l/s)	Mean (l/s)	Max (l/s)
563	1371	2428	2974	40875

Since 2013 AIC have recorded their take from the Arrow River and this allows for a comparison of natural flows compared to observed flows². Table 2 provides the observed and natural flow statistics during the irrigation season below the AIC intake for the period October 2013 to April 2019. The 2015/16 irrigation season is the lowest on record for natural low flows, while the 2014/15 season represents the median season based on the 43 years of natural record (Appendix 1).

¹ Pg. 168 of Farley, P. 2013. Irrigation Scheming A History of Government Irrigation in New Zealand.

² Flows that occurred immediately below the abstraction

Table 2. Recorded daily average low flow statistics for below the AIC intake for the Irrigation Season (1st Oct to 30th April) from October 2013 – April 2019.

Irrigation Season	Natural Daily Min (l/s)	Natural 7-day ALF (l/s)	Observed Daily Min (l/s)	Observed 7-day ALF (l/s)
2013/14	1281	1302	757	781
2014/15*	1250	1268	716	758
2015/16 [#]	563	651	192	463
2016/17	1268	1297	1019	1044
2017/18	765	862	145	243
2018/19	1378	1422	1060	1120
Average	1084	1134	648	735

[#] Driest season based on the 7-day annual low flow for the full natural flow record length of 43 yrs.

* Median season based on the 7-day annual low flow for the full natural flow record length of 43 yrs.

Table 2 shows that daily average low flows at the AIC intake can fall to relatively low levels (< 200 l/s) in naturally dry seasons³, however on average there is normally more than 600 l/s passing the intake.

The hydrological data provided in Table 2 confirms that in very dry seasons the natural inflow at the take location can be less than the proposed rate of take by AIC. Although rare these seasons have the potential for flows to fall to levels that risk ecological values being compromised below the AIC take.

3. Arrow River Instream Values

Schedule 1A of the Regional Plan Water lists the presence of, juvenile trout, trout spawning and adult trout as significant ecosystem values being present in the Arrow River⁴.

The NIWA Freshwater Fish Database records only introduced brown and rainbow trout as present downstream of the AIC intake. Only Soho Creek upstream of the AIC intake appears to hold fish

³ 2015/16 season is the driest on record while the 2017/18 season is the 3rd driest on record.

⁴ Otago Regional Council. 2016. Regional Plan Water for Otago. ISBN 978-0-908324-24-8

with brown trout common. Soho Creek also has the only native fish record for the entire Arrow catchment⁵ with one koaro individual documented.

An electric fishing survey was conducted by WRM Ltd and Ryders Consulting in January 2020 immediately downstream of the AIC weir over a 1km reach with both brown trout and rainbow trout recorded (Figure 2). No native fish were recorded or observed. Numerous trout between 150mm – 250mm were observed between Bracken Burn confluence and Arrowtown though no large fish (>400mm) were seen despite excellent clarity.



Figure 2. Rainbow (left) and brown (right) trout caught below the AIC intake.

⁵ The FWFDB incorrectly attributes the site of this Koaro record to the Arrow River when it was in fact caught in Soho Creek.

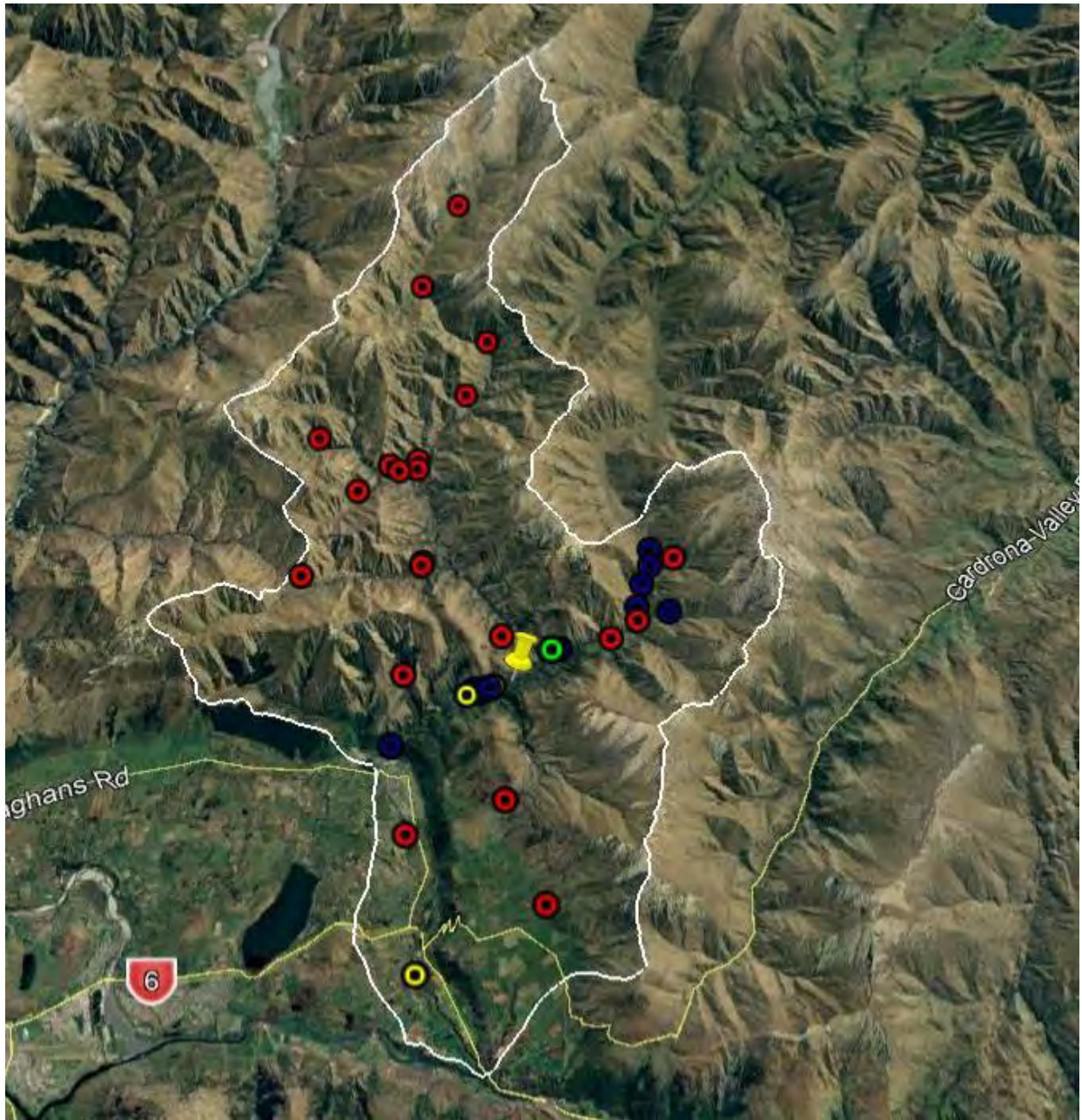


Figure 3. Fish records for the Arrow catchment relative to the AIC Take (yellow pin). Red dots indicate no fish, blue dots are brown trout, yellow dots are rainbow trout and the single green dot is a koaro record.

4. Residual flow Discussion and Recommendation

A residual flow is applied where the minimum flow for the catchment is hydrologically dissimilar or the minimum flow would not provide adequate protection of the values within the relevant stream. In this case there is no minimum flow set for the Arrow River and there are potentially times when flows may fall to low levels below the AIC take due to abstraction, therefore a residual flow is required.

4.1. Instream Habitat Survey Information

In 2004 NIWA were contracted to carry out an instream habitat survey of the Arrow River by ORC. Two survey reaches were completed, one upstream of the existing AIC take and the other upstream of the Arrows confluence with the Kawerau River (Figure 4)⁶.



Figure 4. Habitat Survey Reaches for the Arrow River, also shown is the AIC take and the Cornwall Street flow site.

⁶ I. G. Jowett 2004. Flow requirements for fish habitat in Luggate Creek, Arrow River, Nevis River, Stony Creek, Sutton Stream, Trotters Creek, and Waiwera River. NIWA Client Report: HAM2004-081

For the purpose of this assessment the upper Arrow survey site has been used to assess effects of flow reduction on trout habitat (Figure 5).

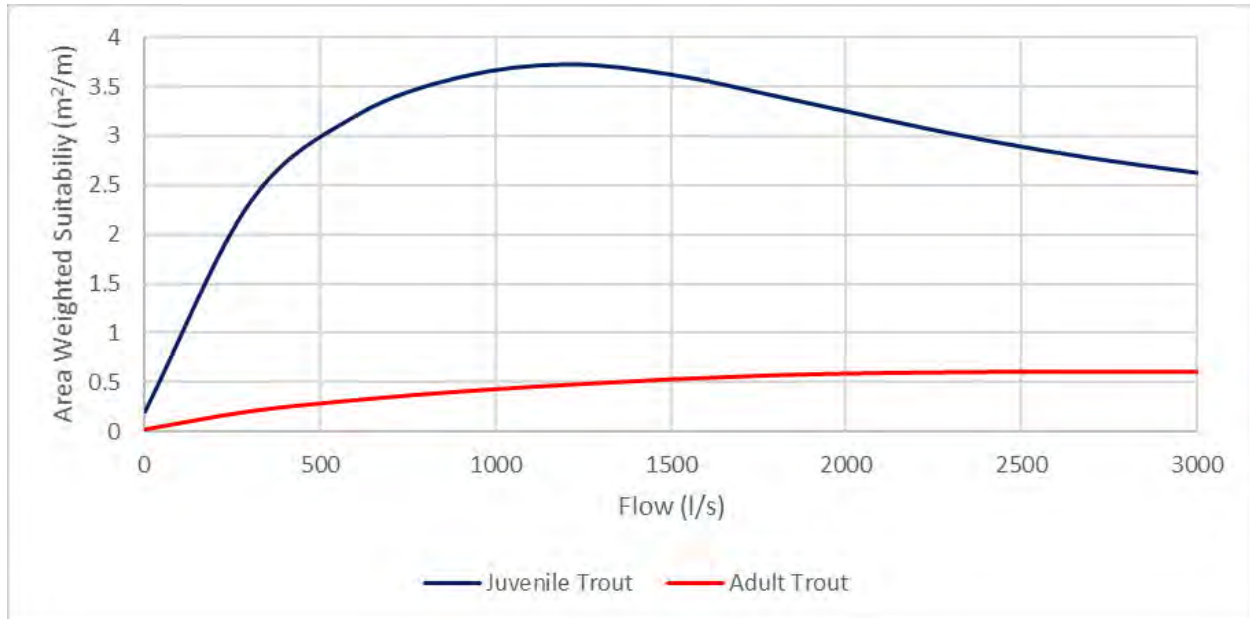


Figure 5. Variation in instream habitat of juvenile and adult trout⁷ relative to flow in the upper Arrow River.

In the recent Lindis Environment Court Decision⁸ it was found that comparing trout habitat to existing flows was a suitable baseline for an assessment of effects⁹. As trout are the only fish species present downstream of the AIC intake habitat retention values have been provided as percentages of MALF compared to the observed 7-day MALF as well as the natural 7-day MALF at the AIC take for completeness (Table 3).

⁷ Juvenile Trout (T1) and Adult Trout (T2) (from Appendix 2 in Wilding, T. K. 2012. Regional methods for evaluating the effects of flow alteration on stream ecosystems. PhD, Colorado State University.

⁸ LINDIS CATCHMENT GROUP INCORPORATED (ENV-2016-CHC-61) Vs OTAGO REGIONAL COUNCIL Decision No. [2019] NZEnvC 166.

⁹ Para 207 of LINDIS CATCHMENT GROUP INCORPORATED (ENV-2016-CHC-61) Vs OTAGO REGIONAL COUNCIL Decision No. [2019] NZEnvC 166.

Table 3. Habitat retention as a percentage of the observed and natural 7-day MALF for the Arrow River at the AIC intake for different flows¹⁰.

Flow (l/s)	Juvenile trout habitat protection based on observed ¹¹ MALF (%)	Adult trout habitat protection based on observed MALF (%)	Juvenile trout habitat protection based on natural ¹² MALF (%)	Adult trout habitat protection based on Natural MALF (%)
0.3	69	57	63	45
0.4	77	68	71	54
0.5	85	77	79	61
0.6	94	88	87	70
0.9	106	112	97	89

Based on the habitat protection levels provided in Table 3 a residual flow of 500 l/s is recommended for the AIC intake to protect the existing trout fishery values for the Arrow River during times of low flow.

Trout spawning is likely to be unaffected by the take during summer as trout spawn in winter. However, A flow of 450 l/s has previously been identified as the optimum flow for spawning adult brown trout¹³ meaning that the residual flow is applicable in winter also.

As observed flows at the AIC intake can fall below 200 l/s (Table 2) a residual flow of 500 l/s represents a significant improvement in low flow conditions during times of the highest risk to ecological values.

¹⁰ Juvenile Trout (T1) and Adult Trout (T2) (from Appendix 2 in Wilding, T. K. 2012. Regional methods for evaluating the effects of flow alteration on stream ecosystems. PhD, Colorado State University.

¹¹ Used 735 l/s as the observed 7-day MALF for the period 2013 – 2019.

¹² Used 1371 l/s as the natural 7-day MALF for the period 1976 – 2019.

¹³ I. G. Jowett 2004. Flow requirements for fish habitat in Luggate Creek, Arrow River, Nevis River, Stony Creek, Sutton Stream, Trotters Creek, and Waiwera River. NIWA Client Report: HAM2004-081

4.2. Expected duration of time spent at a flow of 500 l/s below the AIC take.

A low flow that occurs for long periods of time (months) compared to the same low flow experienced for a short time (days to weeks) can have more severe effects¹⁴.

Based on deducting AIC take data from naturalised flows for the period October 2013 to April 2019 the imposition of a residual flow of 500 l/s during the irrigation season would have meant flows would not fall below 500 l/s downstream of the AIC take. In the driest year on record flows would be held at 500 l/s by AIC for 16 days with a consecutive run length of 10 days (Table 4).

Table 4. Expected total number of days and maximum consecutive days where flows are held at 500 l/s below the AIC intake based on naturalised flows and measured take by AIC.

Irrigation Season	Total days at 500 l/s below the proposed take	Maximum consecutive days at 500 l/s below the proposed take
2013/14	0	0
2014/15*	0	0
2015/16 [#]	16	10
2016/17	0	0
2017/18 [^]	14	12
2018/19	0	0

[#] Driest season based on the 7-day annual low flow for the full natural flow record length of 43 yrs.

[^] 3rd Driest season based on the 7-day annual low flow for the full natural flow record length of 43 yrs.

* Median season based on the 7-day annual low flow for the full natural flow record length of 43 yrs.

Table 4 indicates that long periods where flows are held at the proposed residual flow are unlikely to occur, with most seasons experiencing flow greater than 500 l/s below the AIC intake.

4.3. Bracken Burn Contribution

The Bracken Burn which is a relatively large tributary of the Arrow River enters immediately below the AIC take on the true left (Figure 6)

¹⁴ Hayes J, Hay J, Gabrielsson R, Goodwin E, Jellyman P, Booker D, Wilding T, Thompson M 2018. Review of the rationale for assessing fish flow requirements and setting ecological flow and allocation limits for them in New Zealand—with particular reference to trout. Prepared for NIWA, Envirolink, Greater Wellington Regional Council and Hawke's Bay Regional Council. Cawthron Report No. 3040. 150 p.

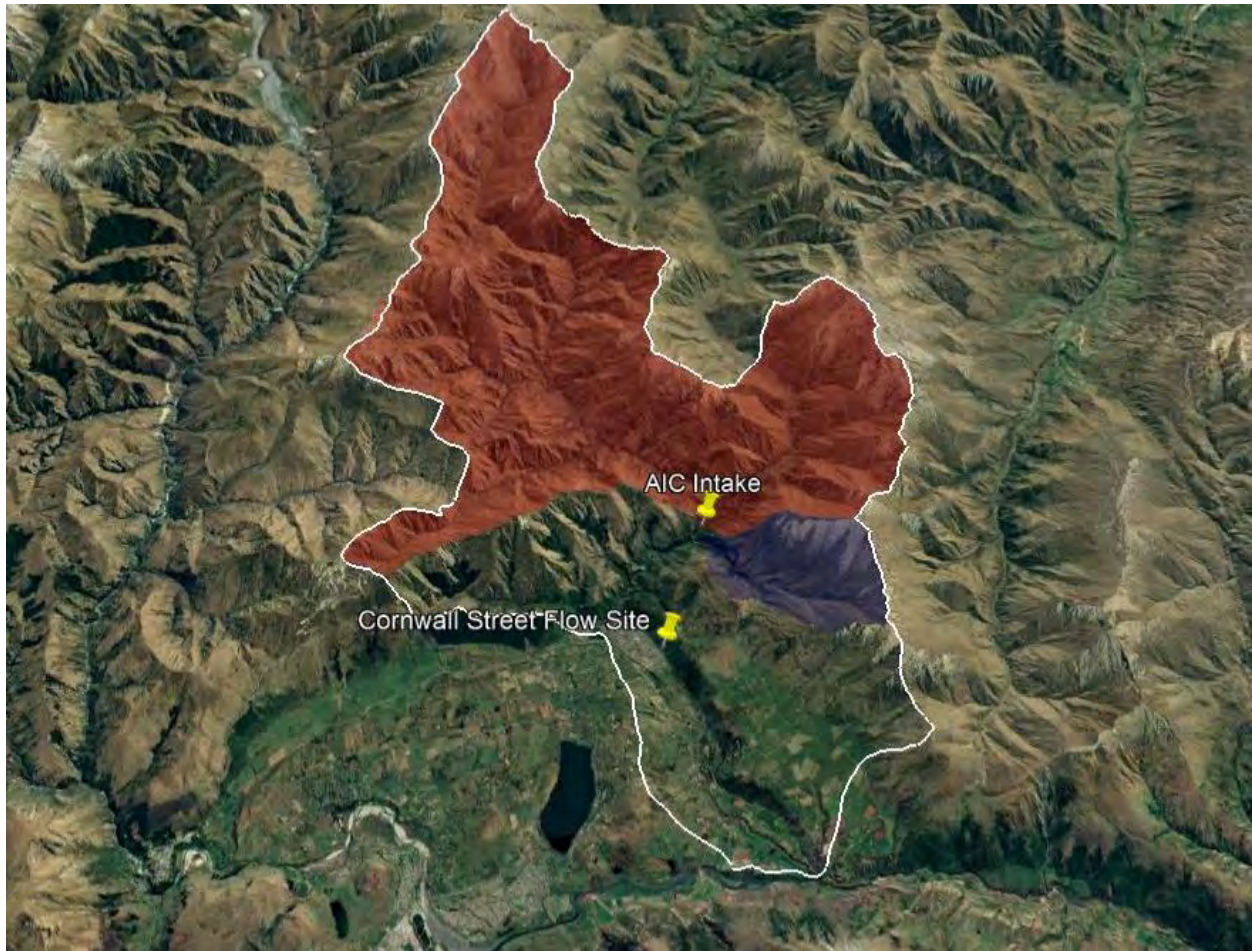


Figure 6. Bracken Burn Catchment (shaded blue) entering the Arrow River immediately below the AIC Take. Also shown is the catchment area upstream of the AIC take (shaded red).

A synthetic flow for the Bracken Burn is provided below for the 2015/16 irrigation season¹⁵ (Figure 7).

¹⁵ The lowest flow season for the period 1976-2019



Figure 7. Synthetic Flows for the Bracken Burn at its confluence with the Arrow River.

Figure 7 shows that even in a very dry season the Bracken Burn contributes ~100 l/s to the Arrow River immediately downstream of the AIC take. This inflow will contribute to mitigating the effects of the AIC take.

5. Fish Screening

There are no native fish populations upstream of the AIC take, nor can large adult trout pass the Arrow Falls and AIC weir to spawn upstream. Therefore, no fish screen is recommended for the AIC take.

6. Conclusion

The proposed residual flow of 500 l/s will protect juvenile and adult trout habitat during times of low flow retaining 85% and 77% habitat protection respectively relative to habitat at the observed 7-day MALF (Table 3).

The duration of flows held at 500 l/s is also very short with the driest year on record since 1976 showing that flows would only be held at 500 l/s for 16 days in the 212 day irrigation season with 10 of those 16 days being consecutive (Table 4). Based on observed flows, low flow durations in the Arrow River are not severe compared to other central Otago rivers¹⁶.

Only in the driest seasons on record does the take appear to have the potential to influence habitat retention levels for trout because the Arrow is a relatively large river at the AIC intake¹⁷.

Given the residual flow of 500 l/s provides significant levels of habitat protection and the relative infrequency that flows fall to this level along with the very short duration of such low flows means that the effect of the AIC take is likely to be no more than minor.

¹⁶ Per Obs. Matt Hickey

¹⁷ Natural MALF of 1.371 m³/s at the AIC intake.

Appendix 1. Seasons Ranked Based on Natural 7-Day Annual Low Flows

Season	Natural 7-day ALF at Cornwall Street (l/s)	Rank (1 = lowest, 43 = highest)
1976/77	1687	23
1977/78	908	2
1978/79	1934	33
1979/80	3235	42
1980/81	1703	24
1981/82	1579	14
1982/83	2220	37
1983/84	2771	41
1984/85	1809	29
1985/86	1742	26
1986/87	1950	34
1987/88	1673	22
1988/89	1634	17
1989/90	1763	27
1990/91	1966	35
1991/92	1239	7
1992/93	1667	20
1993/94	2764	40
1994/95	1381	10
1995/96	3393	43
1996/97	1920	32
1997/98	1714	25
1998/99	1151	6
1999/00	2432	39
2000/01	1642	18
2001/02	1625	16
2002/03	1480	12
2003/04	1792	28
2004/05	2333	38
2005/06	1119	4
2006/07	1400	11
2007/08	1274	8
2008/09	1541	13
2009/10	1131	5
2010/11	2014	36
2011/12	1870	31
2012/13	1366	9
2013/14	1667	21
2014/15	1624	15
2015/16	834	1
2016/17	1661	19
2017/18	1105	3
2018/19	1821	30



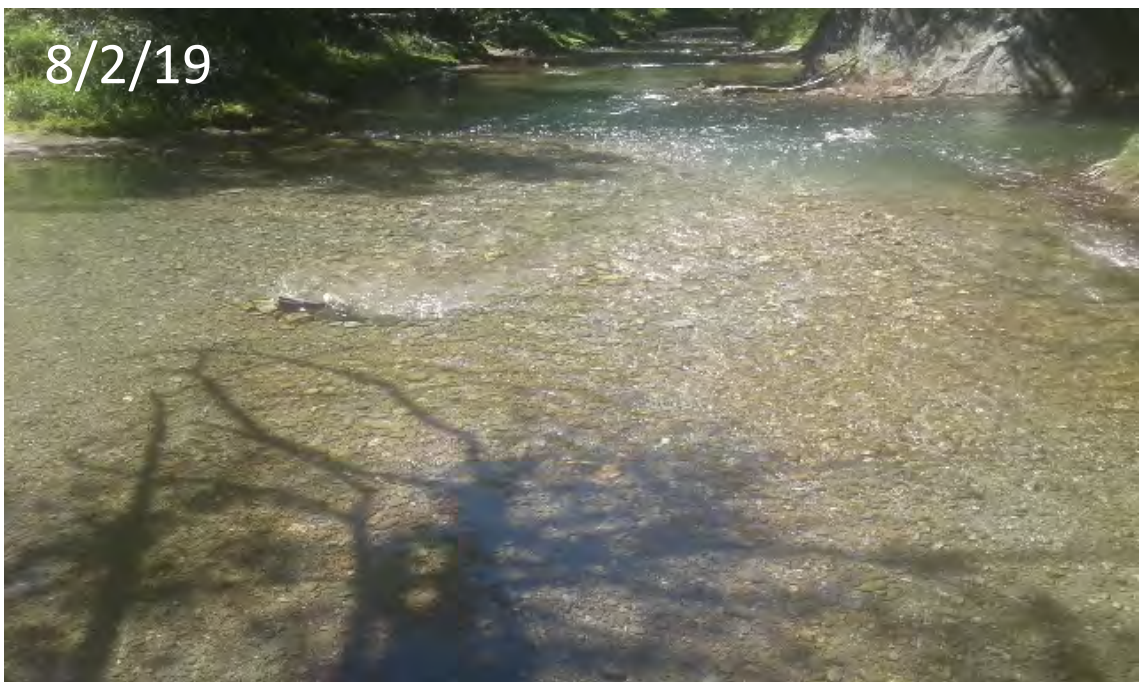


Arrow Junction - riffle





Arrow Junction - downstream



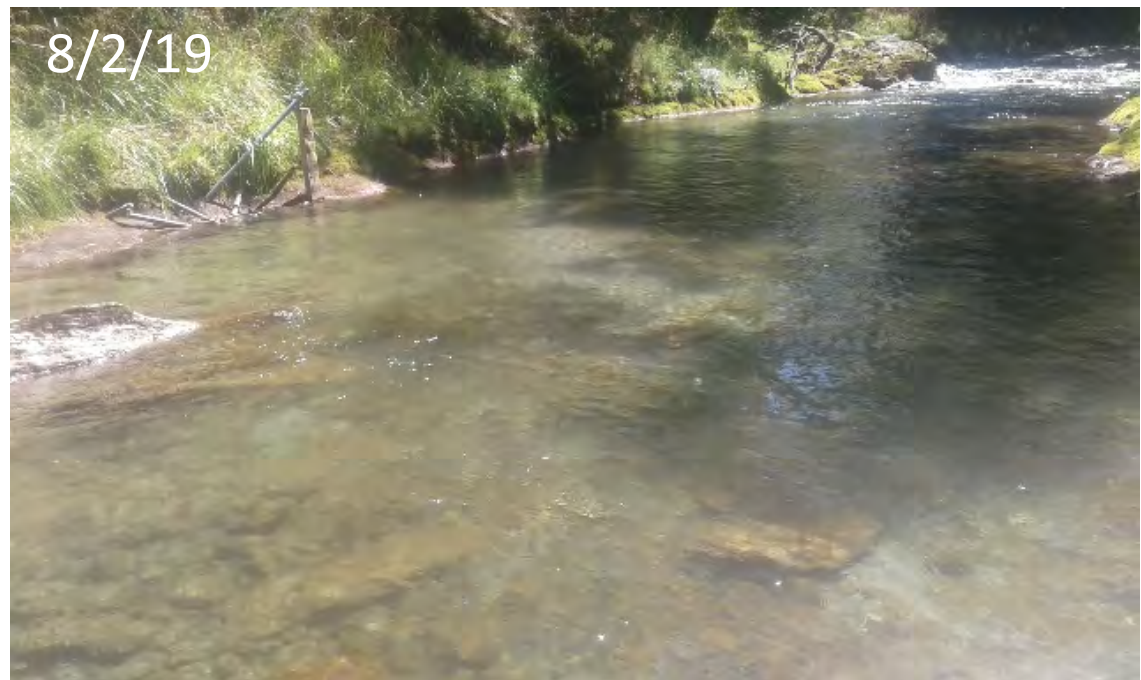


Tobins Track - downstream





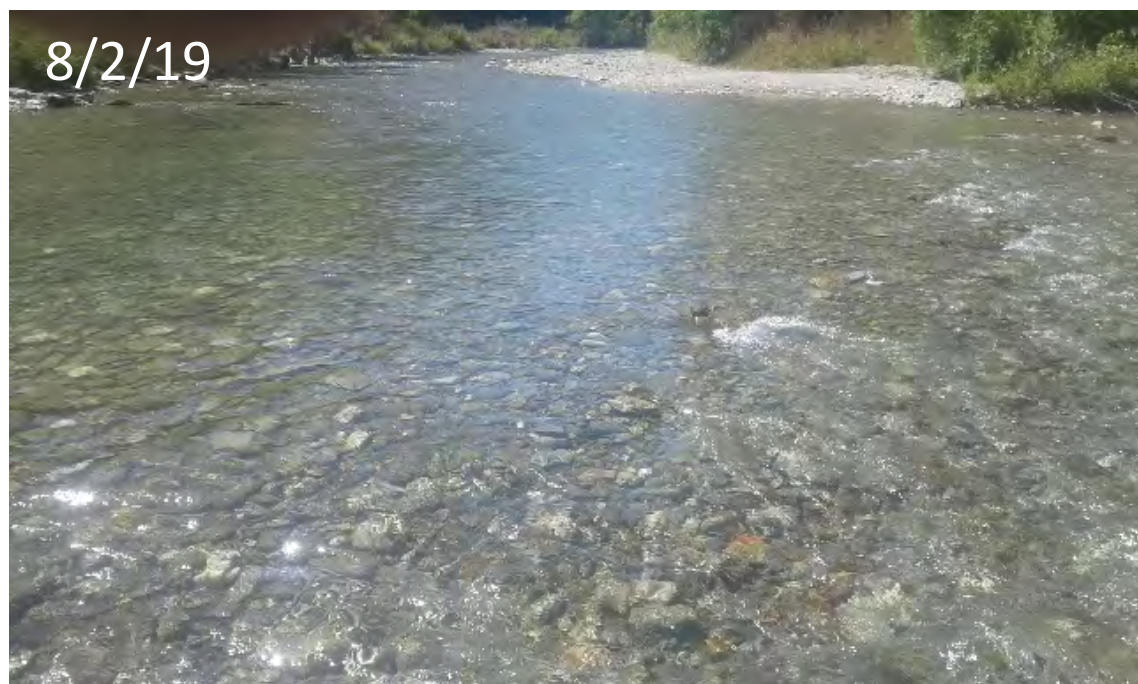
Cornwall Street - upstream

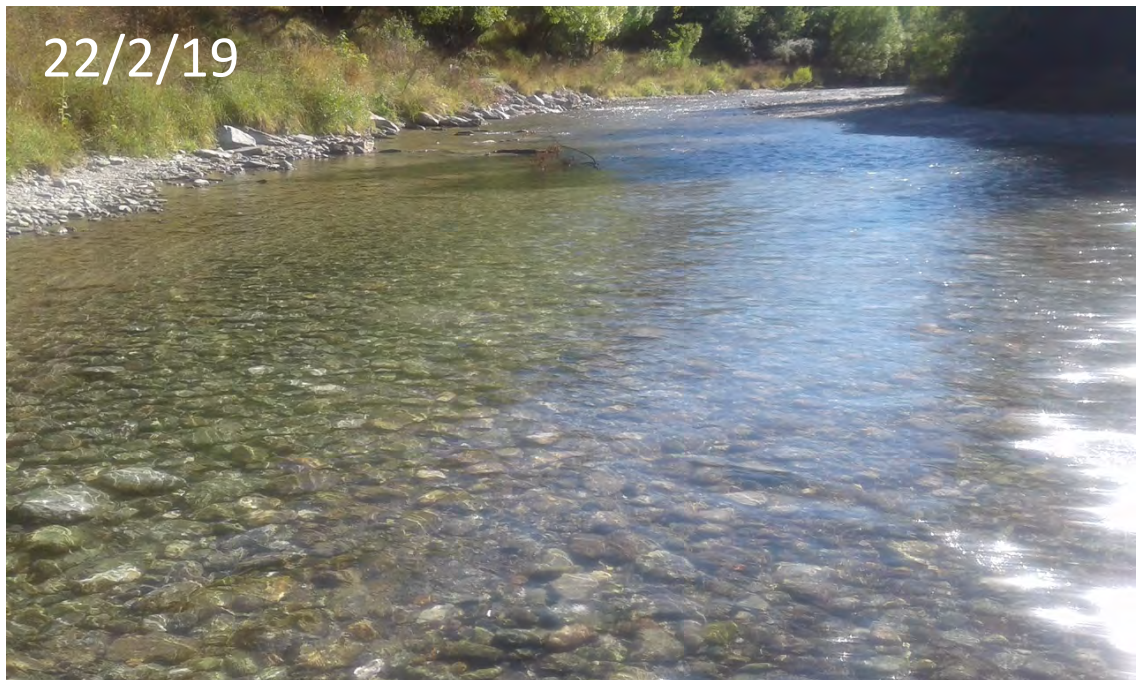






Bush Creek confluence - upstream





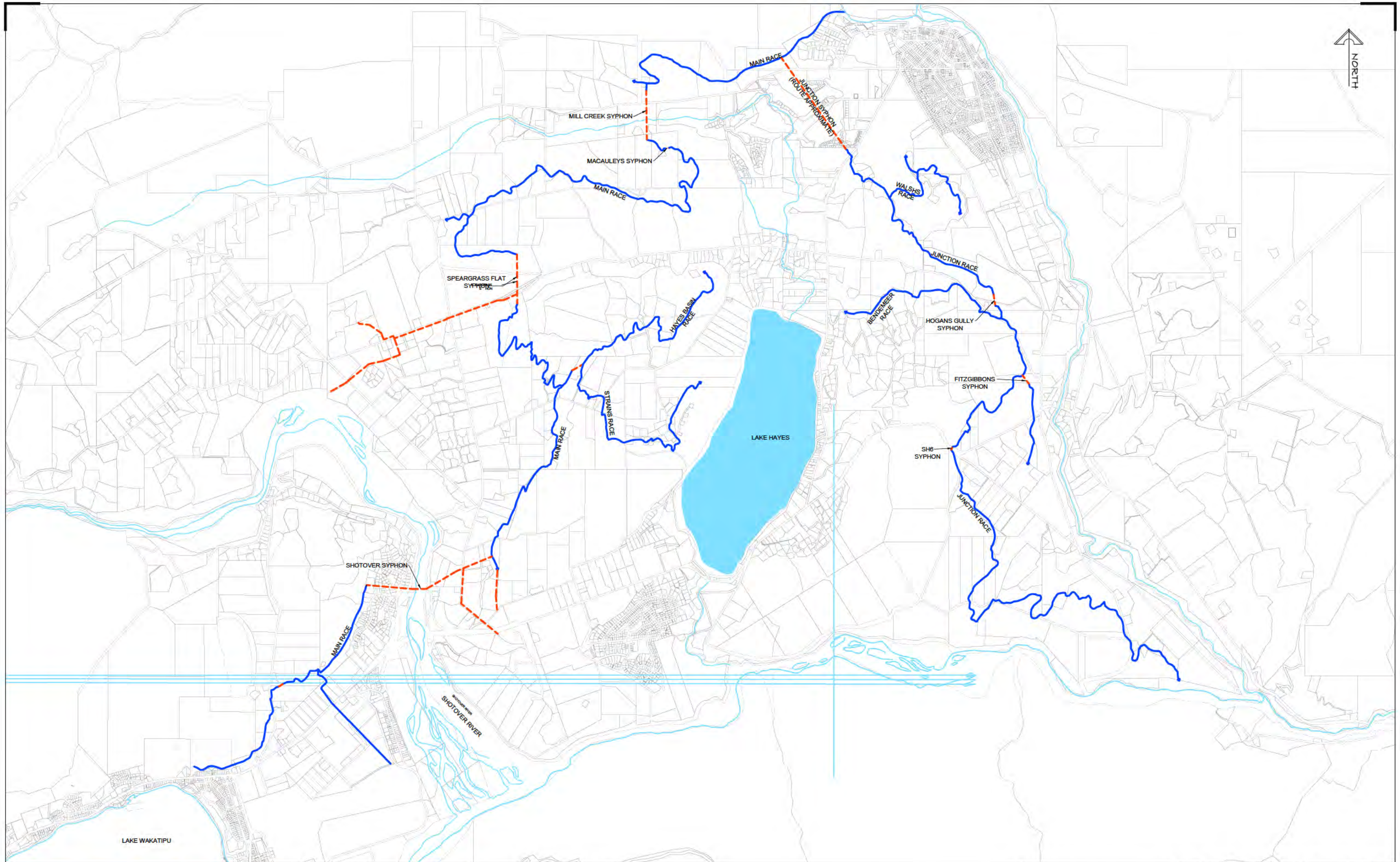


Bush Creek confluence - downstream









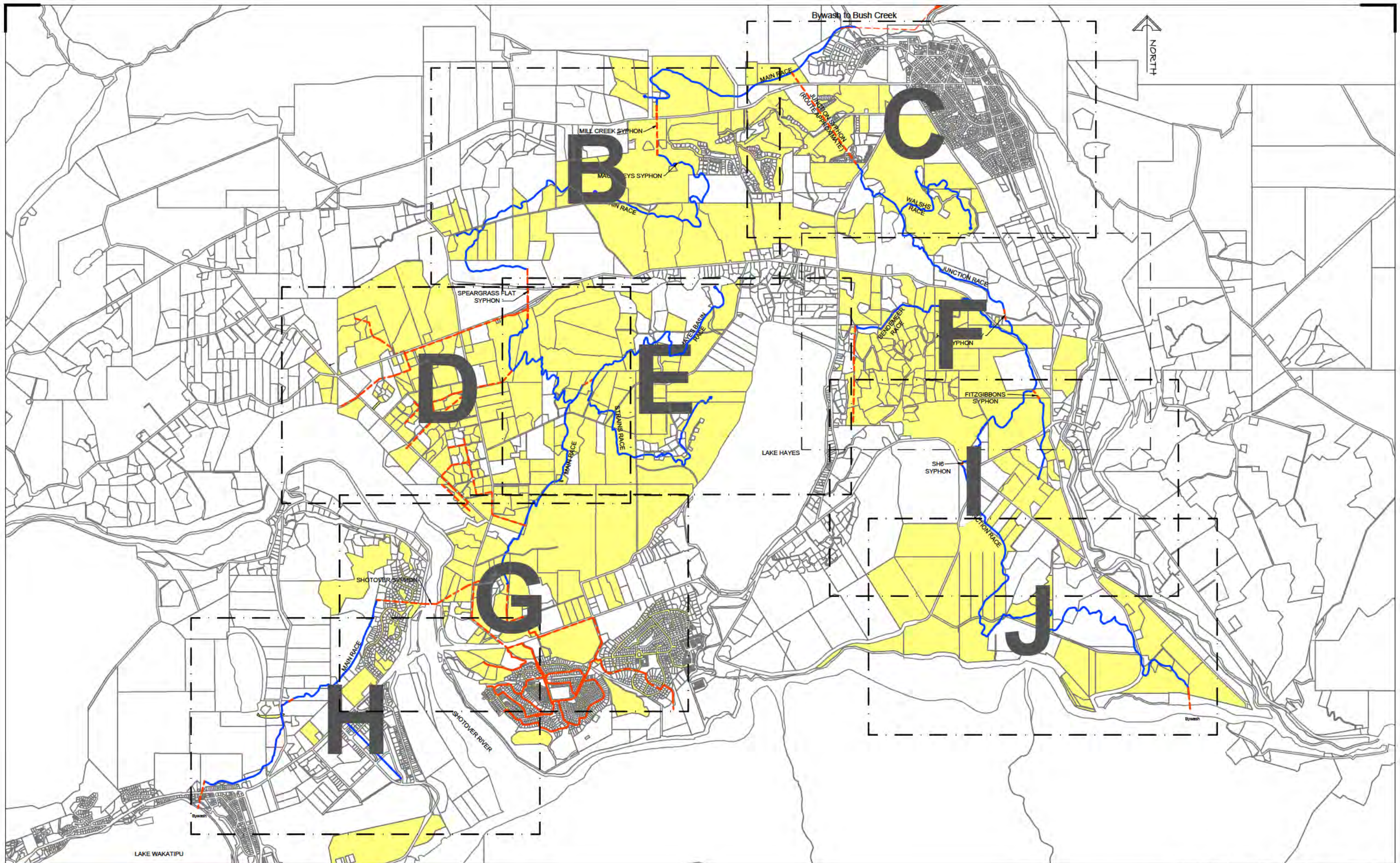
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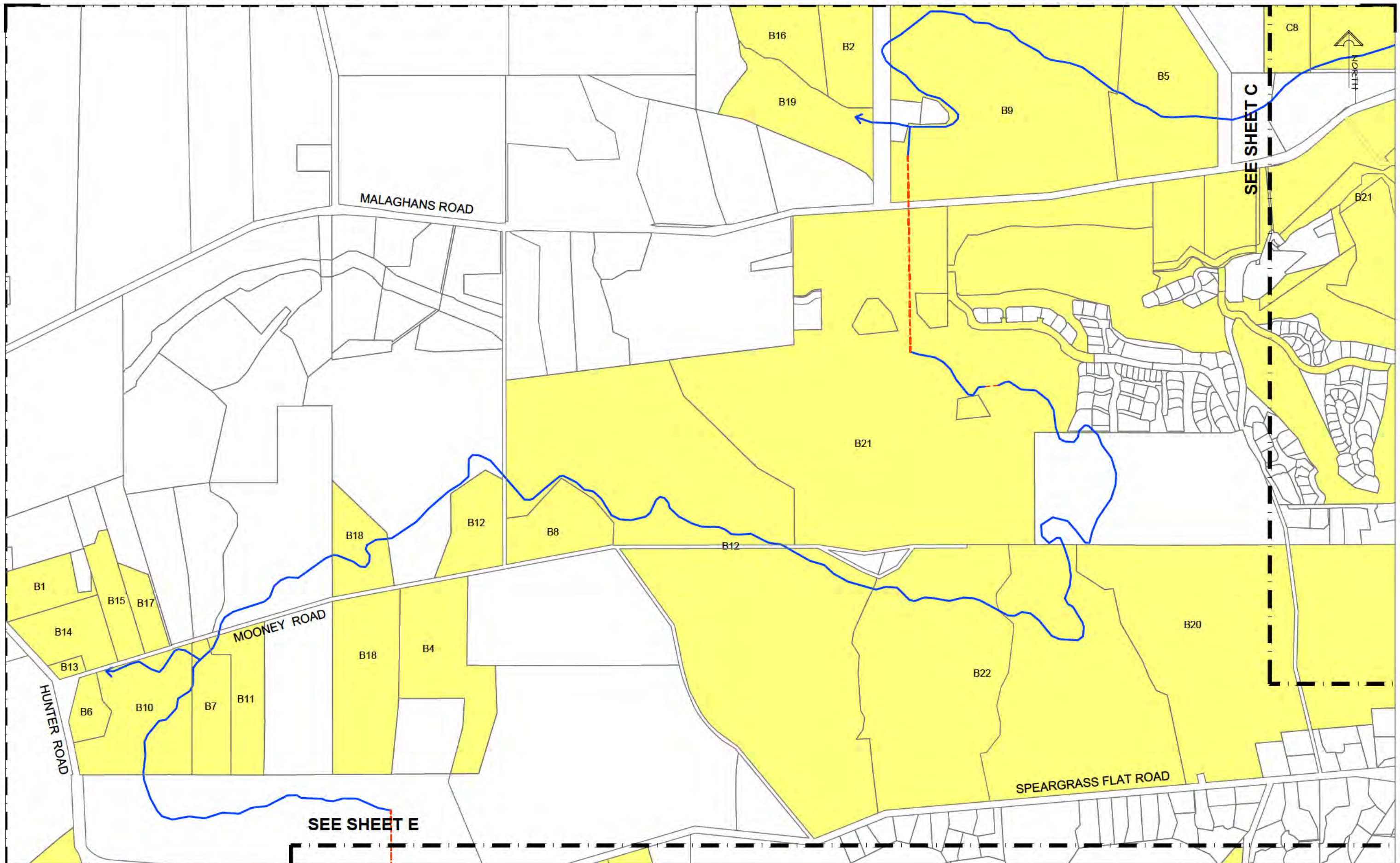




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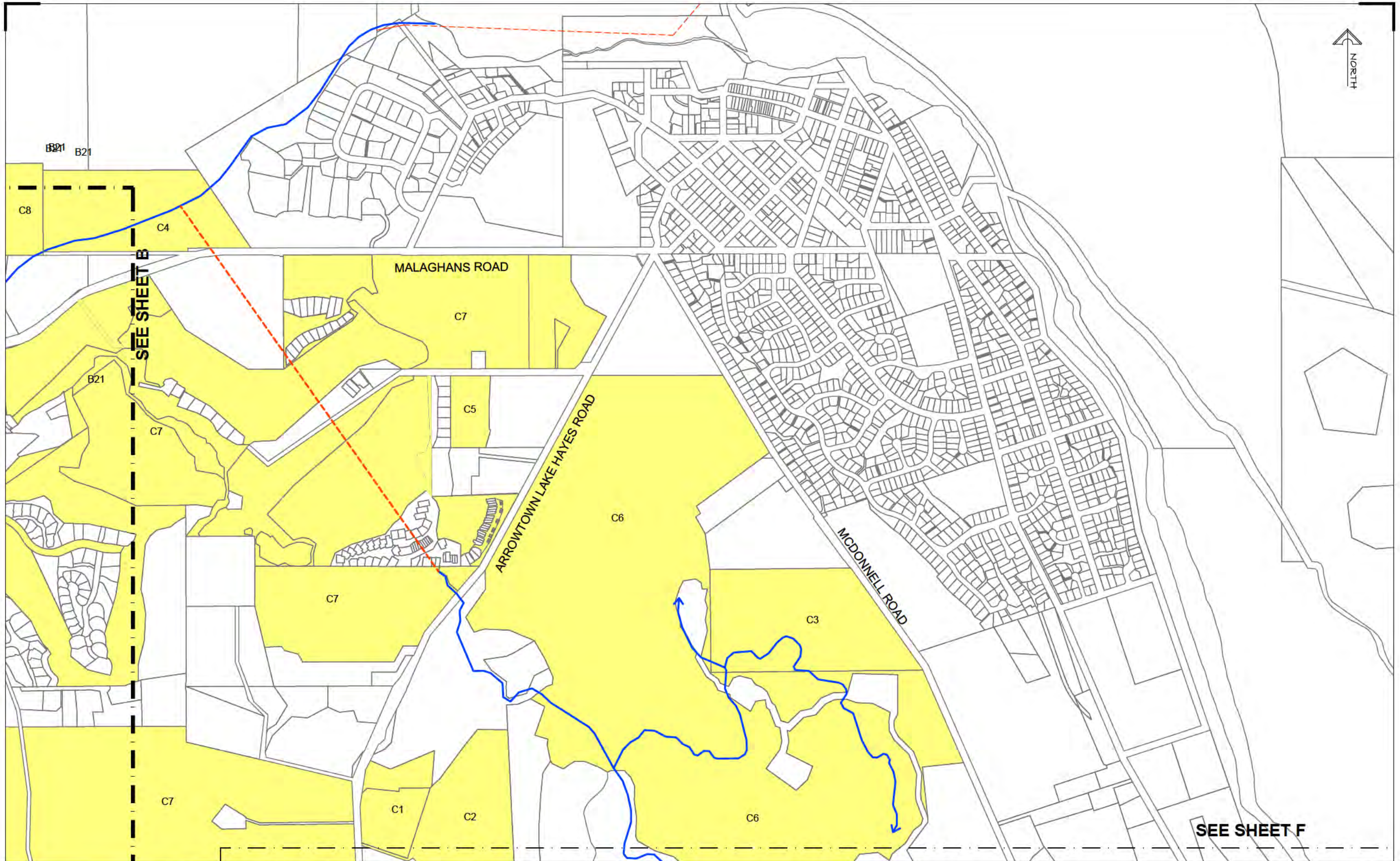
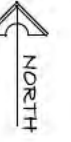




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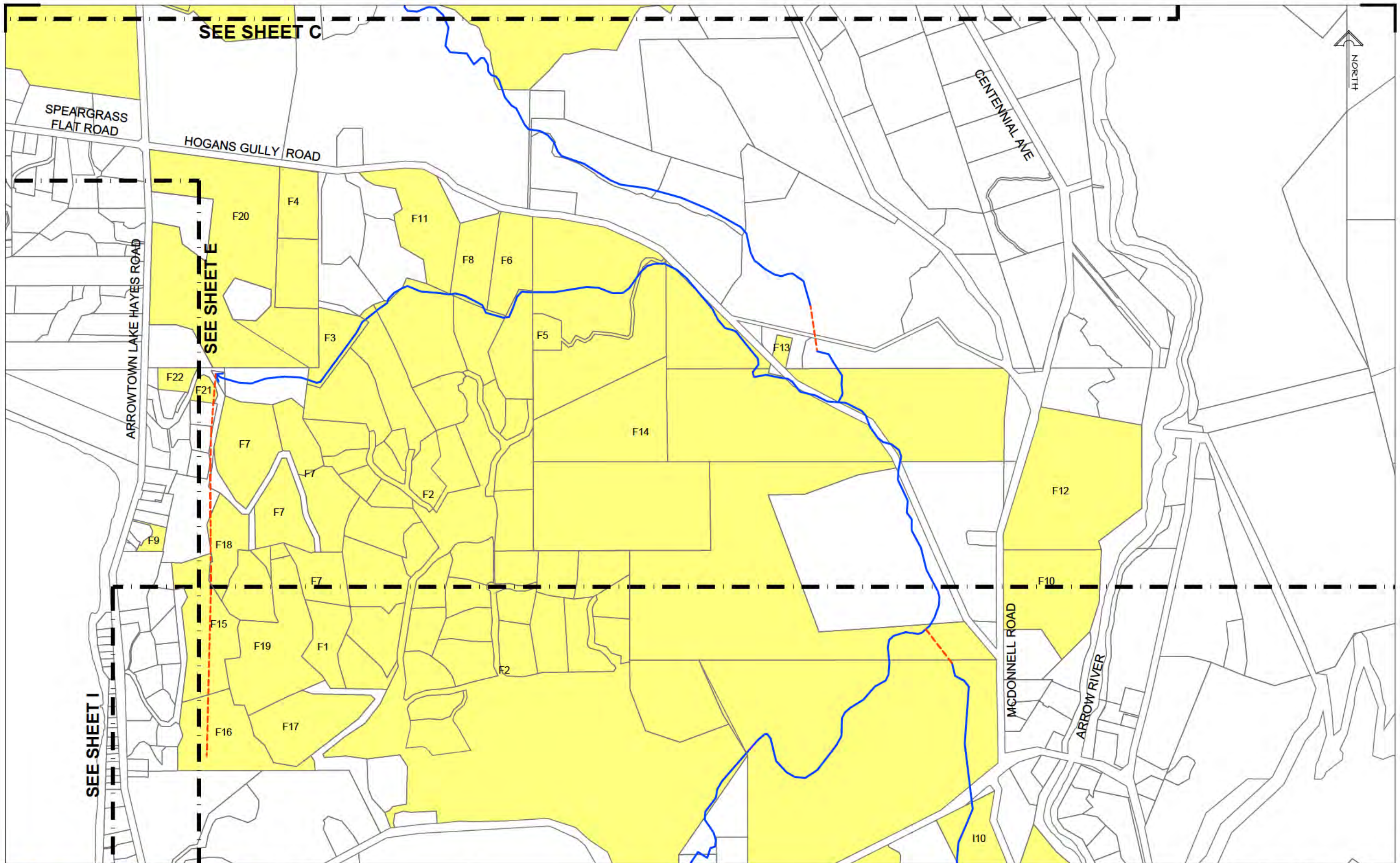




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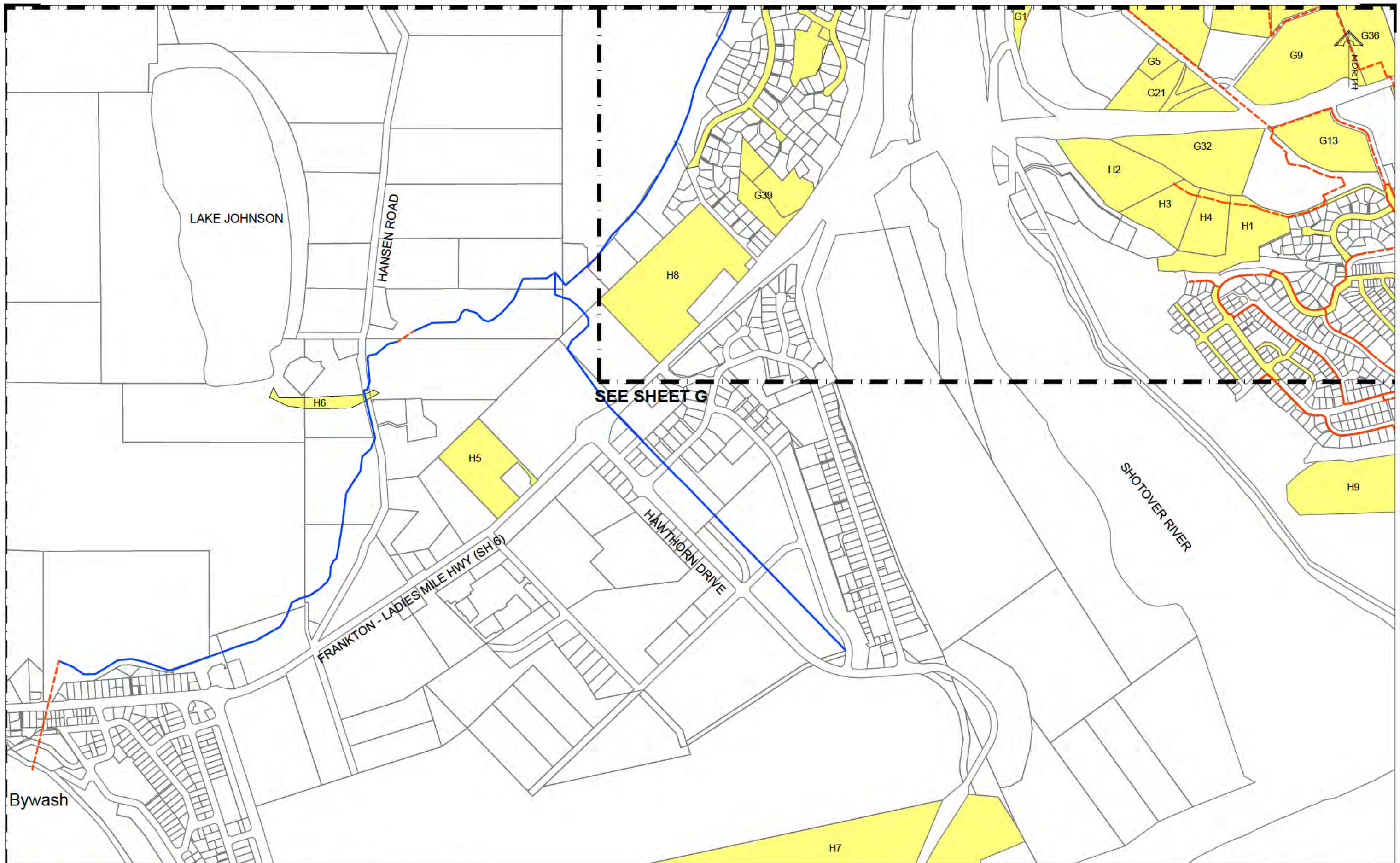



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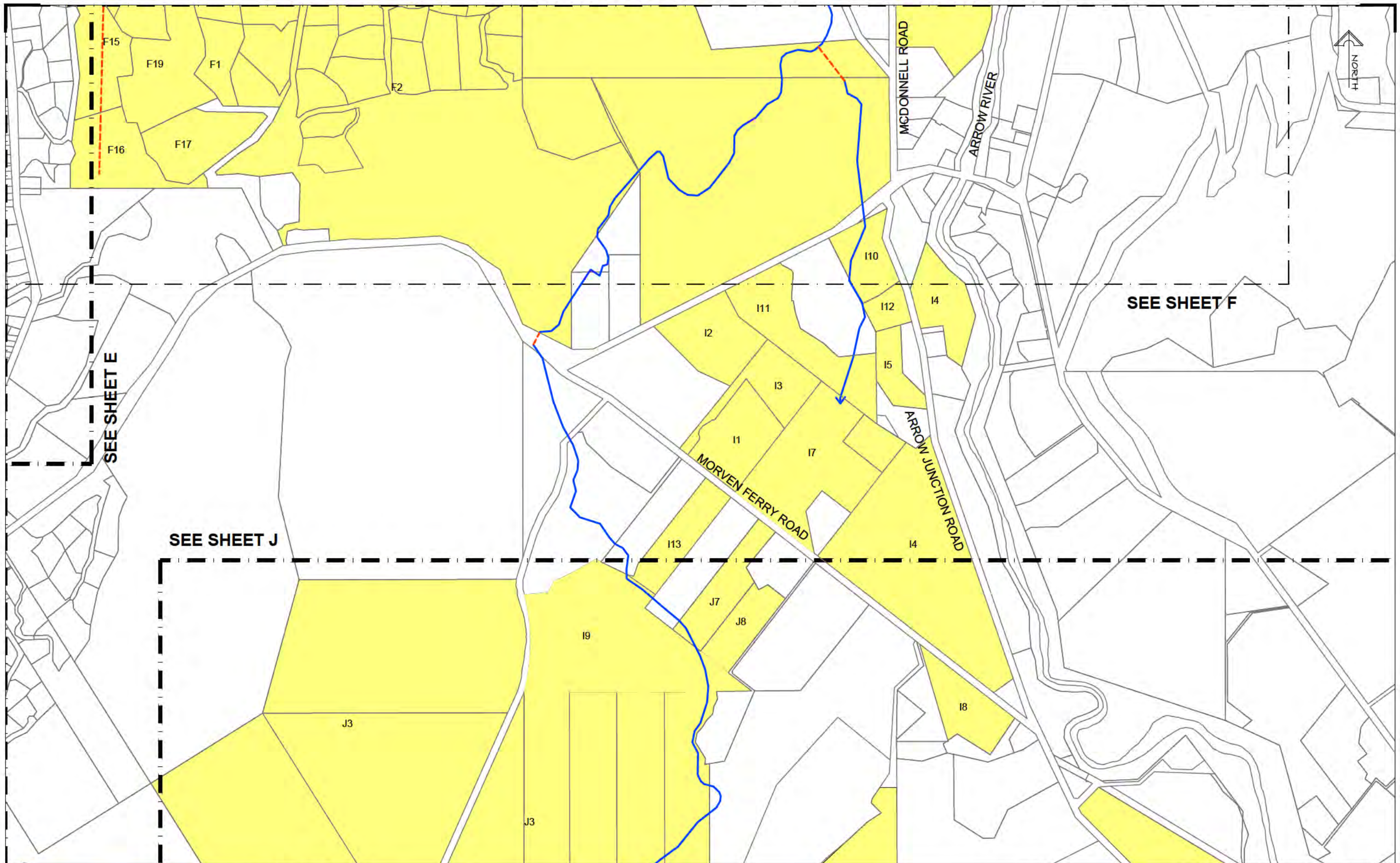
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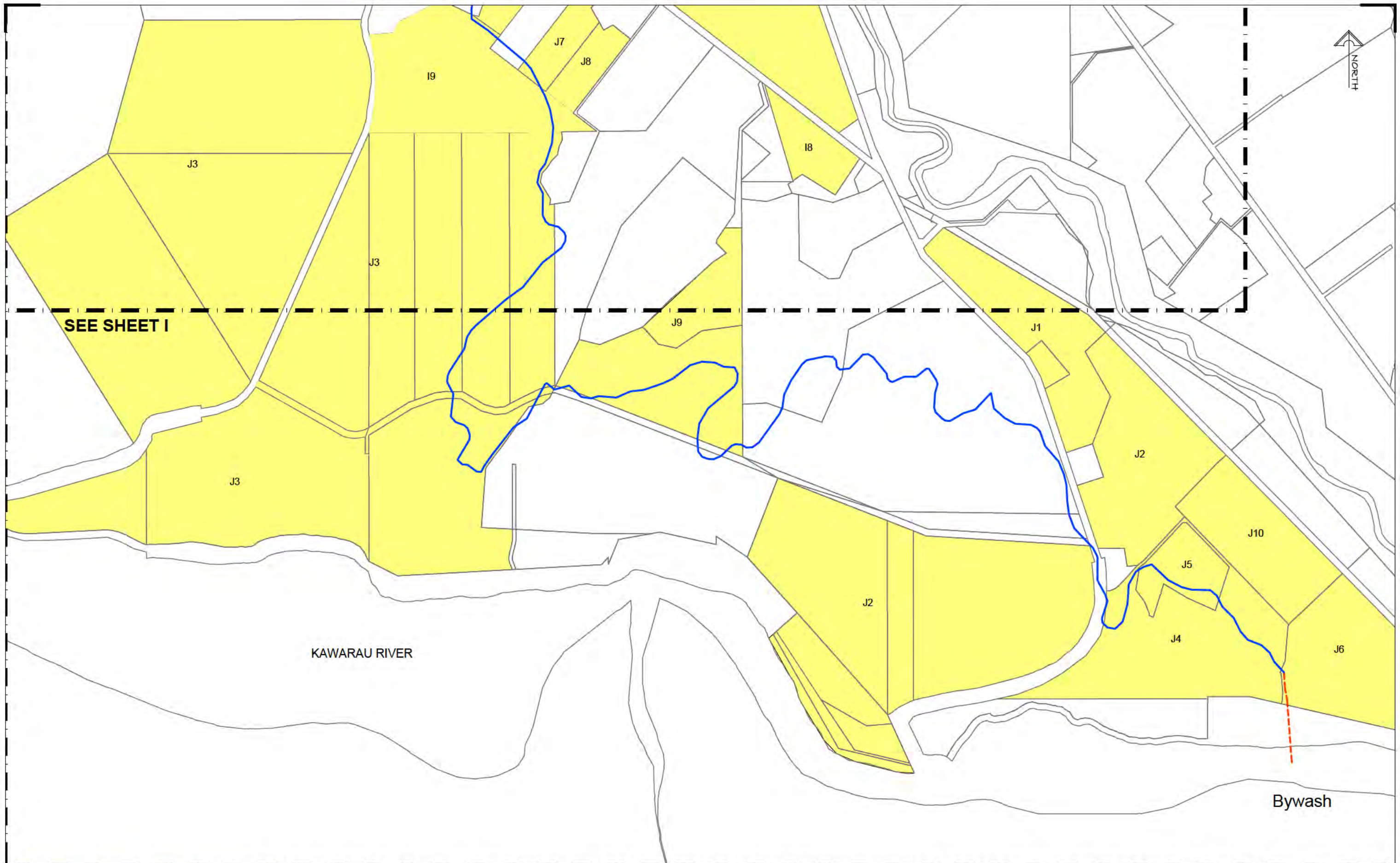



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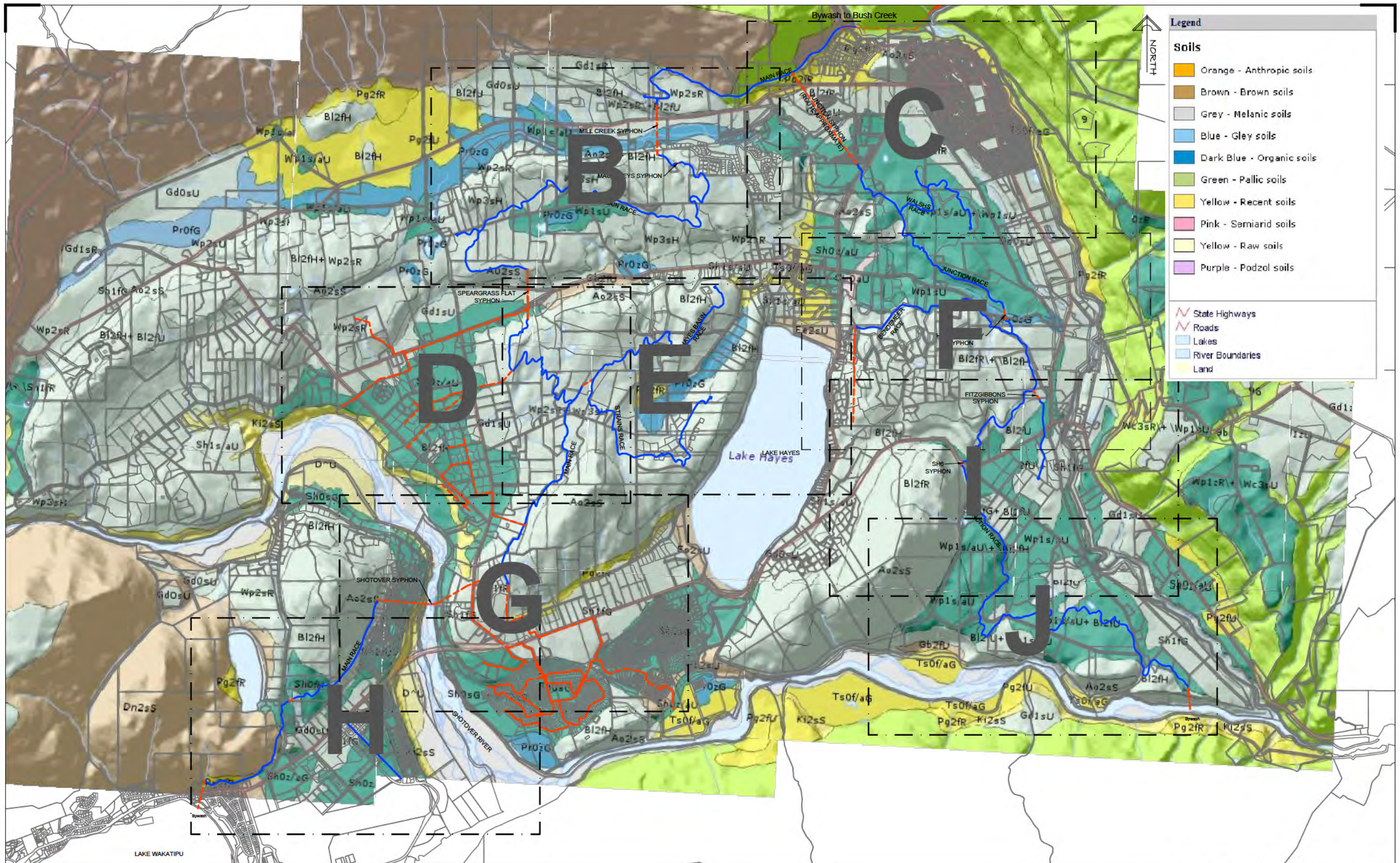



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Legend

Soils

- Orange - Anthropic soils
- Brown - Brown soils
- Grey - Melanic soils
- Blue - Gley soils
- Dark Blue - Organic soils
- Green - Pallic soils
- Yellow - Recent soils
- Pink - Semiarid soils
- Yellow - Raw soils
- Purple - Podzol soils

State Highways
 Roads
 Lakes
 River Boundaries
 Land

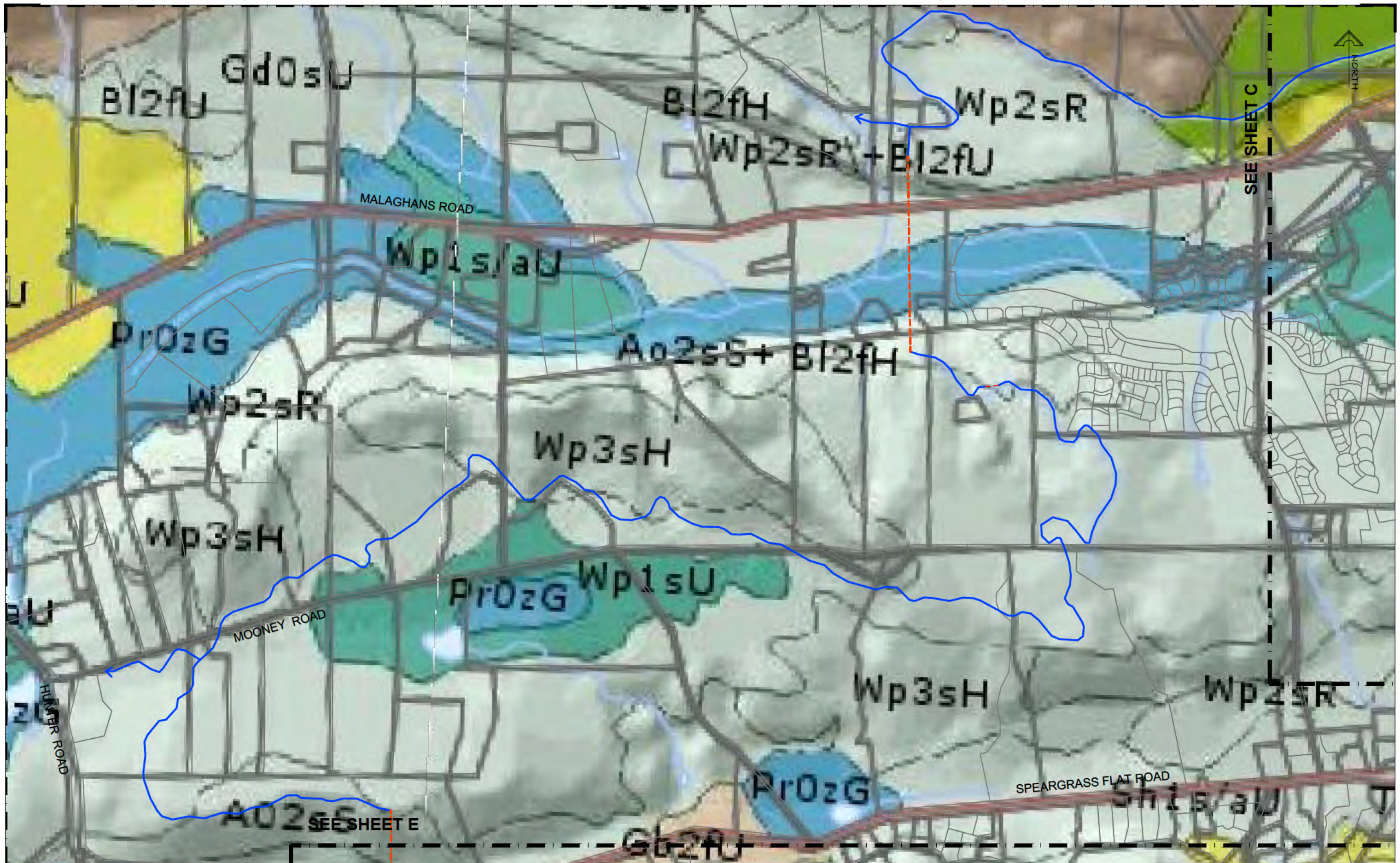
Shotover Design Limited trading as
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 Licensed Cadastral Surveyors - Land Development - Planning Consultants

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ARROW IRRIGATION COMMAND AREA

Client	Surveyed	Signed	Date	Job No.	Drawing No.
ARROW IRRIGATION COMPANY LTD				10997	05
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				MT NIC 2000 MSL	-



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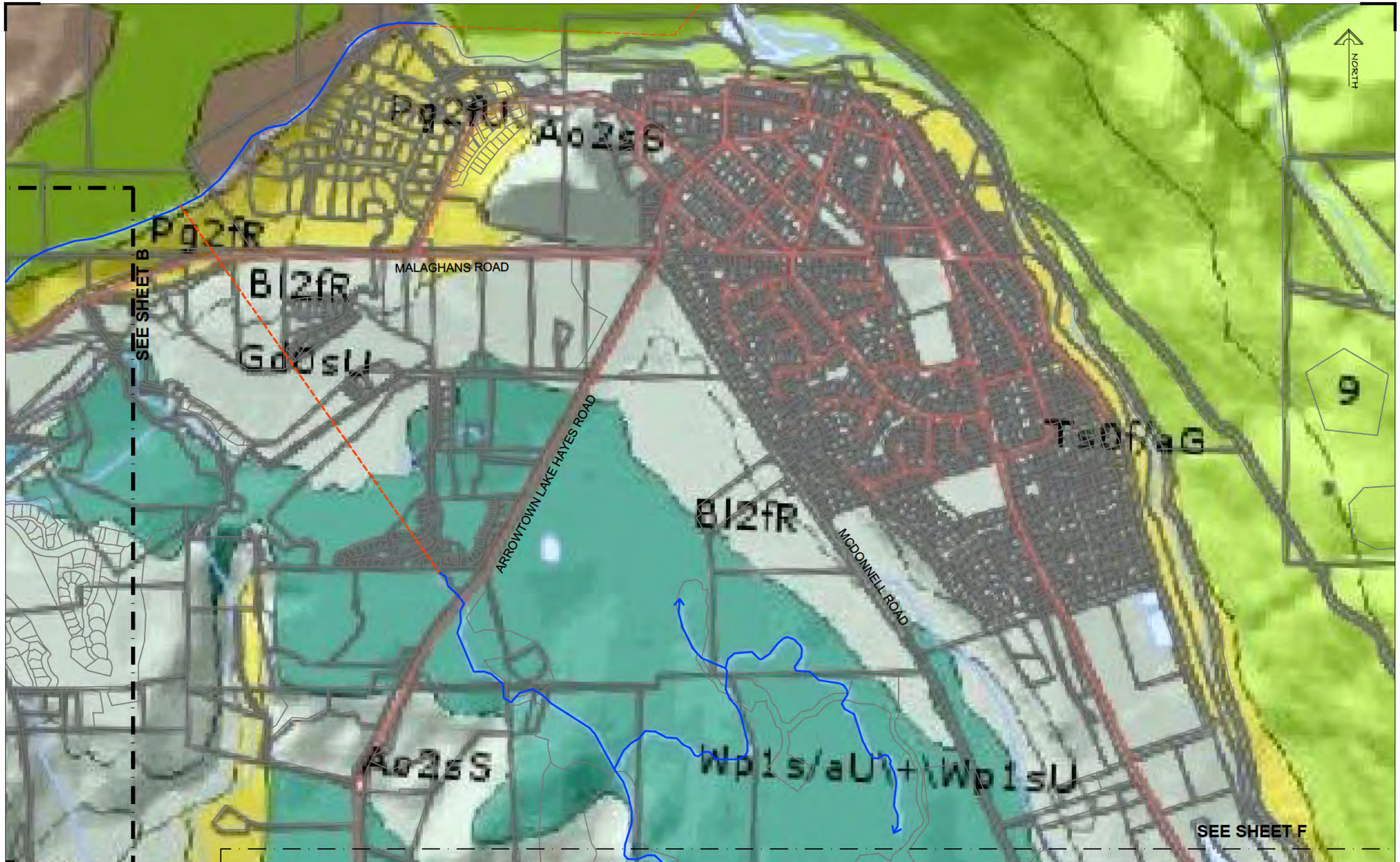
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ARROW IRRIGATION COMMAND AREA
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Client	Surveyed	Signed	Date	Job No.	Drawing No.
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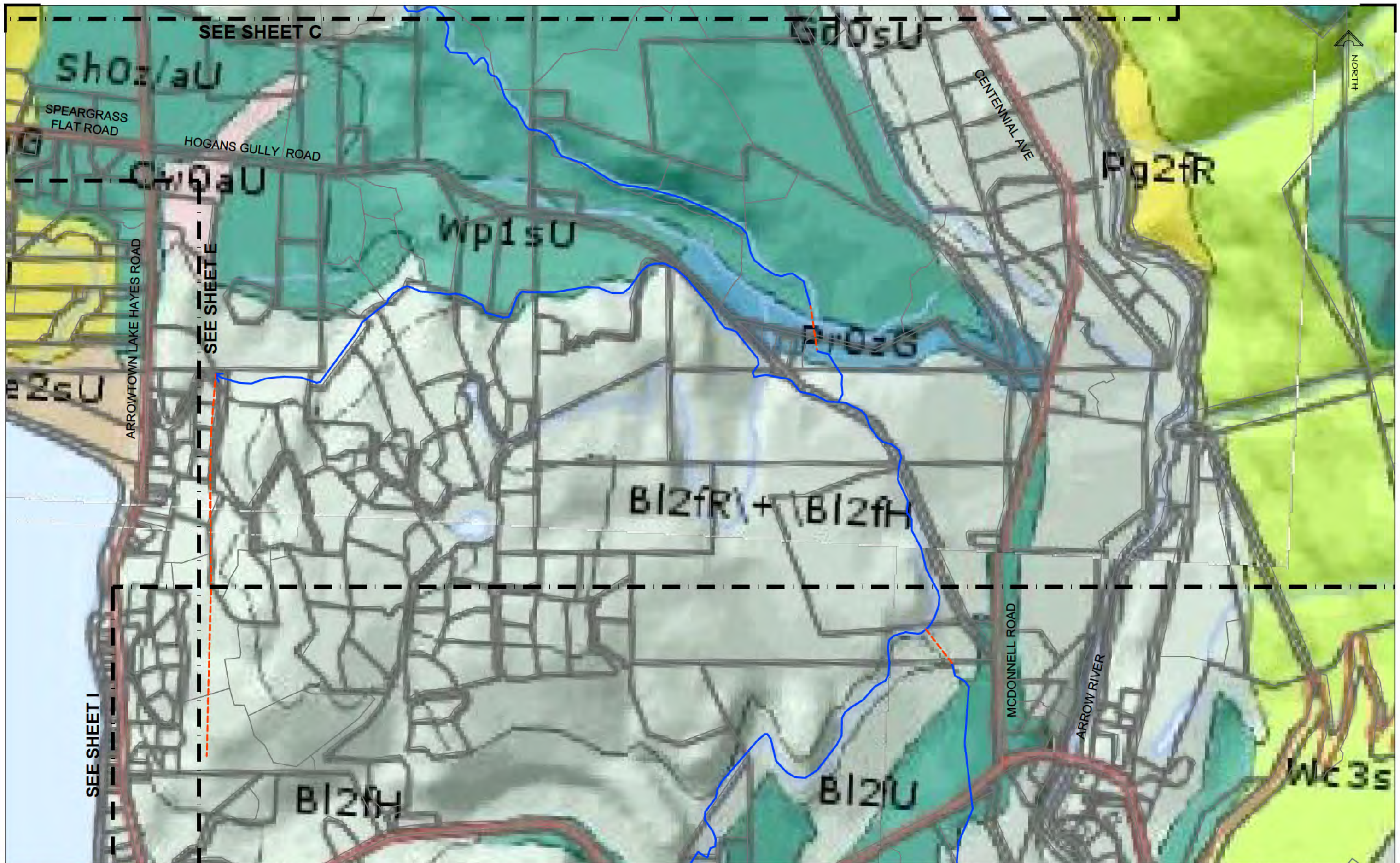



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Client	Surveyed	Signed	Date	Job No.	Drawing No.
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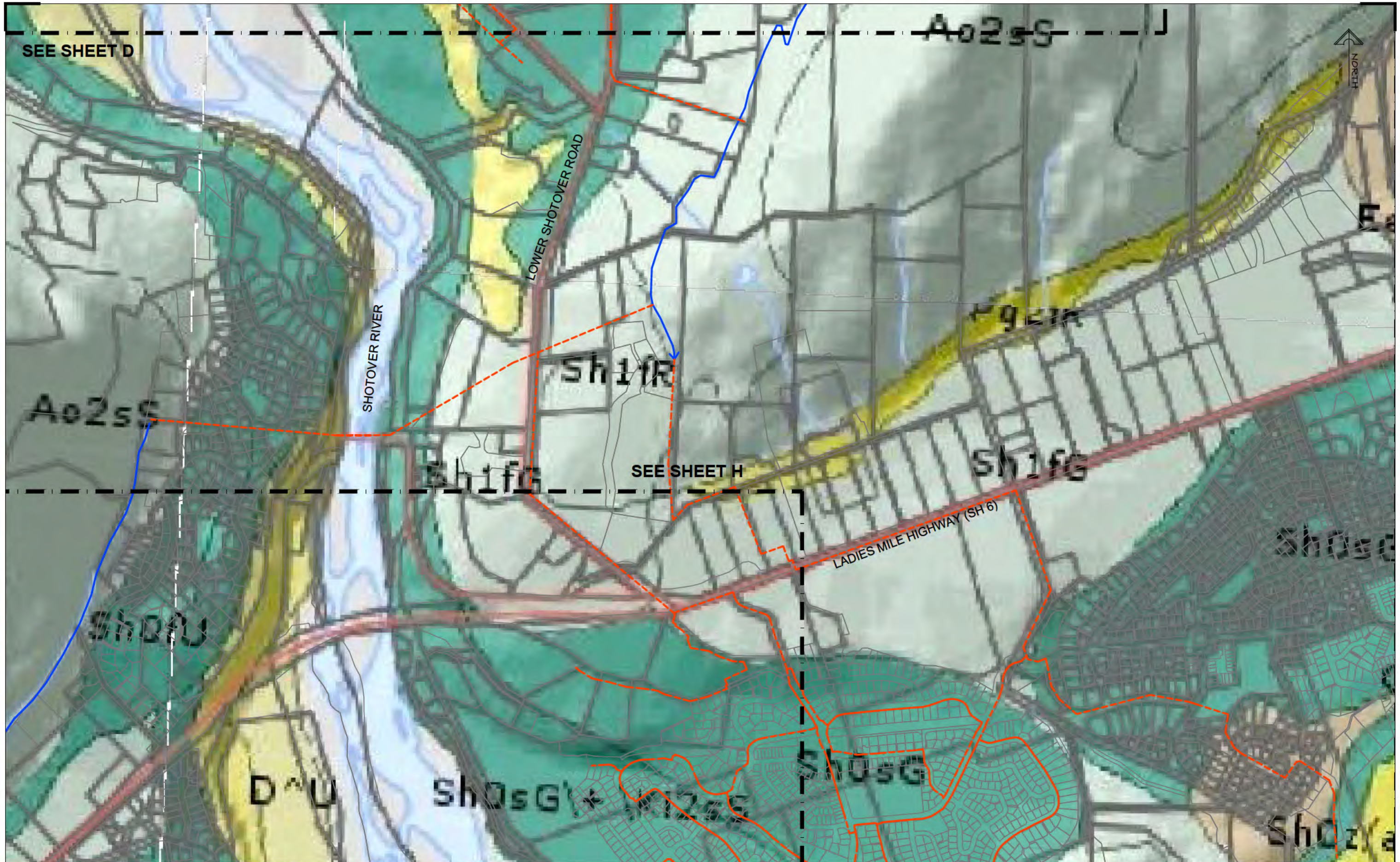
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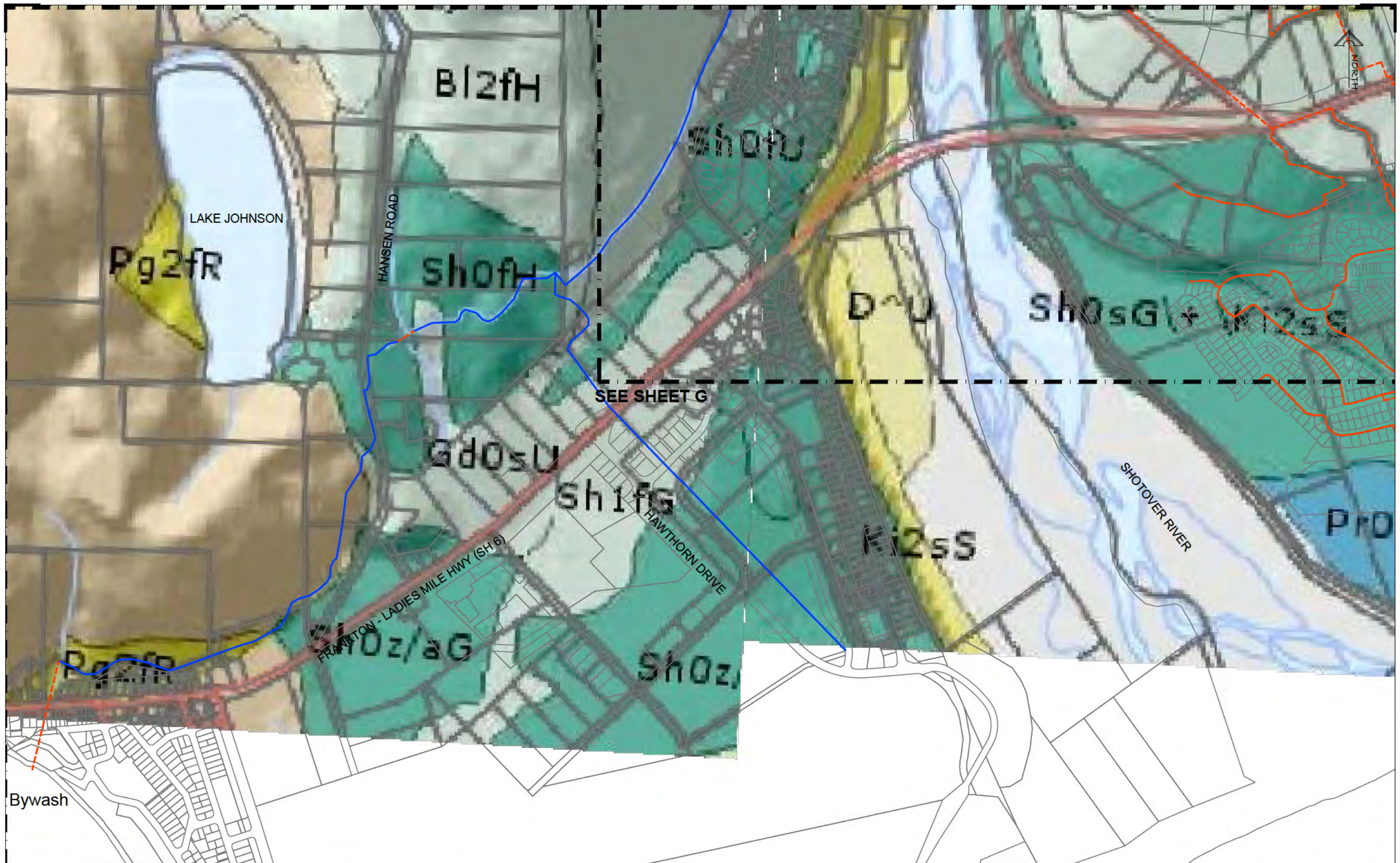



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Client	Surveyed	Signed	Date	Job No.	Drawing No.
ARROW IRRIGATION COMPANY LTD				10997	05
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Client	Surveyed	Signed	Date	Job No.	Drawing No.
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	Designed 	Signed 	Date 	Datum & Level MT NIC 2000 MSL	

Appendix 6

Volunteered Conditions

Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104C of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Applicant: Arrow Irrigation Company Limited

Address: C/o FINDEX NZ Limited, P.O. BOX 123, Queenstown, 9300

Purpose: To take and use surface water as primary allocation for the purpose of irrigation, stock water & flushing of Lake Hayes.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction:

Diversion weir, Arrow River Gorge approx. 5km north of Arrowtown.

Grid reference:

Between NZTM 2000 E1273781.738 N5018291.738

Legal Description of land adjacent to point of take:

Run 26, LT 408940, LT 483009, LT 528850, LT 541221, ROLL INT 1880 RUNS.

Legal Description of land where water will be used:

Please refer to Appendix 1 of Application Documentation.

Conditions

Specific

1. This permit shall not commence until Water Permit 2000.123.V1 has been surrendered or expired.
2. The rate of abstraction must not exceed:
 - a) 870 l/s
 - b) 2,254,120m³/month
 - c) 8,802,018m³/year
3. The intake shall be screened so as to prevent the ingress of small fish and elvers.

Performance Monitoring

4. The consent holder must:

(a) The consent holder shall install a water meter to record the water take, within an error accuracy range of +/- 5% over the meter's nominal flow range, a telemetry compatible datalogger with at least 24 months data storage and a telemetry unit to record the rate and volume of take, and the date and time this water was taken.

(b) The datalogger shall record the date, time and flow in litres per second.

(c) Data shall be provided once daily to the Consent Authority by means of telemetry. The consent holder shall ensure data compatibility with the Consent Authority's time-series database.

(d) The water meter and telemetry device shall be installed according to the manufacturer's specifications and instructions. There shall be enough space in the pipe to allow for verification of the accuracy of the meter under condition (g).

(e) The consent holder shall ensure the full operation of the water meter, datalogger and telemetry unit at all times during the exercise of this consent. All malfunctions of the water meter and/or datalogger and/or telemetry unit during the exercise of this consent shall be reported to the Consent Authority within 5 working days of observation and appropriate repairs shall be performed within 5 working days. Once the malfunction has been remedied, a Water Measuring Device Verification form completed with photographic evidence must be submitted to the Consent Authority within 5 working days of the completion of repairs.

(f) The installation of the water meter, datalogger and telemetry unit shall be completed to full and accurate operation prior to the exercise of the consent. The consent holder shall forward a copy of the installation certificate to the Consent Authority within one month of installing the water meter datalogger and telemetry unit.

(g) (i) If a mechanical insert water meter is installed it shall be verified for accuracy each and every year from the first exercise of this consent.

(ii) Any electromagnetic or ultrasonic flow meter shall be verified for accuracy every five years from the first exercise of this consent.

(iii) Each verification shall be undertaken by a Consent Authority approved operator and a Water Measuring Device Verification form shall be completed and submitted to the Consent Authority within 5 working days of the verification being performed, and at any time upon request.

General

5. The consent holder shall take all practicable steps to ensure that:

(a) there is no leakage from pipes and structures;

(b) the use of water is confined to targeted areas;

(c) there is no run off of irrigation water in irrigated areas either on site or off site;

(d) a backflow preventer device is fitted to prevent any contaminants from being drawn into the source of the water.