



NEW ZEALAND INSTITUTE OF
ARCHITECTS
INCORPORATED



ENVIRONMENT CANTEBURY

APPROVED

SUBJECT TO CONDITIONS

TO BE KEPT ON SITE

21 DECEMBER 2021

Building Code Clause(s)

PRODUCER STATEMENT – PS1 – DESIGN

(Guidance notes on the use of this form are printed on the reverse side*)

ISSUED BY: Damwatch Services Limited
(Design Firm)

TO: Waimakariri Irrigation Limited
(Owner/Developer)

TO BE SUPPLIED TO: Environment Canterbury
(Building Consent Authority)

IN RESPECT OF: Waimakariri Irrigation Ponds
(Description of Building Work)

AT: Western side of the intersection of Dixons Road and Wrights Road, Eyrewell Forest
(Address)

Identifier CB8K/1478 LOT 1 DP 27020 SO N/A

We have been engaged by the owner/developer referred to above to provide Detailed design (of storage ponds, low level outlets, crump weirs, spillways and steel penstock line) and Specification services in respect of the requirements of Clause(s) B1 Structure and B2 Durability in accordance with NZSOLD Guidelines of the Building Code for
(Extent of Engagement)
☒ All or ☐ Part only (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:

☐ Compliance Documents issued by Department of Building & Housing
(verification method / acceptable solution) or

☒ Alternative solution as per the attached schedule in accordance with NZSOLD Guidelines

The proposed building work covered by this producer statement is described on the drawings titled Waimakariri Irrigation Ltd., Waimakariri Irrigation Ponds and numbered WIL1125/30/1-13, 21-24, 101-183, 201-206, 211-217 together with the specification, and ~~other documents set out in the schedule attached to this statement.~~ **design report.**

On behalf of the Design Firm, and subject to:

- (i) Site verification of the following design assumptions as detailed in the Design Report and Drawings
- (ii) All proprietary products meeting their performance specification requirements;
- (iii) **Embankment trials, and geomembrane placement.**

I believe on reasonable grounds the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code.

I, Nigel Aldrich Connell am: ☒ CPEng 64147 #
(Name of Design Professional)

☐ Reg Arch #

I am a Member of: ☒ IPENZ ☐ NZIA and hold the following qualifications: BE (Civil); Dip HE (Delft)

The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than \$200,000*. The Design Firm is a member of ACENZ ☒ YES ☐ NO

SIGNED BY Nigel Aldrich Connell ON BEHALF OF Damwatch Services Limited
(Design Firm)

Date 11/02/2012 (signature) *NACConnell*

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of \$200,000*.

This form is to accompany Form 2 of the Building (Forms) Regulations 2004 for the application of a Building Consent.

GUIDANCE ON USE OF PRODUCER STATEMENTS

ENVIRONMENT CANTEBURY

Producer statements were first introduced with the Building Act 1992. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects, Institution of Professional Engineers New Zealand, Association of Consulting Engineers New Zealand in consultation with the Building Officials Institute of New Zealand. The original suite of producer statements has been revised at the date of this form as a result of enactment of the Building Act (2004) by these organisations to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with reasonable grounds for the issue of a Building Consent or a Code Compliance Certificate, without having to duplicate design or construction checking undertaken by others.

PS1 Design	Intended for use by a suitably qualified independent design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;
PS2 Design Review	Intended for use by a suitably qualified independent design professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;
PS3 Construction	Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2003 ¹ or Schedules E1/E2 of NZIA's SCC 2007 ²
PS4 Construction Review	Intended for use by a suitably qualified independent design professional who undertakes construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACENZ, IPENZ and NZIA to interpret the Producer Statement.

Competence of Design Professional

This statement is made by a Design Firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its designers.

A competent design professional will have a professional qualification and proven current competence through registration on a national competence-based register, either as a Chartered Professional Engineer (CPEng) or a Registered Architect.

Membership of a professional body, such as the Institution of Professional Engineers New Zealand (IPENZ) or the New Zealand Institute of Architects (NZIA), provides additional assurance of the designer's standing within the profession. If the design firm is a member of the Association of Consulting Engineers New Zealand (ACENZ), this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent design professional".

* Professional Indemnity Insurance

As part of membership requirements, ACENZ requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI insurance minimum stated on the front of this form reflects standard, small projects. If the parties deem this inappropriate for large projects the minimum may be up to \$500,000.

Professional Services during Construction Phase

There are several levels of service which a Design Firm may provide during the construction phase of a project (CM1-CM5)³ (OL1-OL4)². The Building Consent Authority is encouraged to require that the service to be provided by the Design Firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Attached Particulars

Attached particulars referred to in this producer statement refer to supplementary information appended to the producer statement.

Refer Also:

- ¹ *Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2003*
- ² *NZIA Standard Conditions of Contract SCC 2007 (1st edition)*
- ³ *Guideline on the Briefing & Engagement for Consulting Engineering Services (ACENZ/IPENZ 2004)*

www.acenz.org.nz
www.ipenz.org.nz
www.nzia.co.nz



PRODUCER STATEMENT – PS2 – DESIGN REVIEW

(Guidance notes on the use of this form are printed on the reverse side*)

ISSUED BY: Pickford Consulting Limited.....
 (Design Review Firm)

TO: Damwatch Services Limited
 (Owner/Developer)

TO BE SUPPLIED TO: Environment Canterbury.....
 (Building Consent Authority)

IN RESPECT OF: Waimakariri Irrigation Ponds
 (Description of Building Work)

AT: Western Side of the Intersection of Dixons Road and Wrights Road, Eyrewell Forest.....
 (Address)

.....Identifier CB8K/1478..... **LOT**.....1..... **DP**..... 27020..... **SO**N/A.....

We,Pickford Consulting Limited, have been engaged by Damwatch Services Limited
 (Design Review Firm)

to review the design documents for this project in respect of the Building Act 2004 and Building (Dam Safety) Regulations 2008, and the recommendations included in NZSOLD's Dam Safety Guidelines dated November 2000.

The Review is for Part only of the design work prepared by..... Damwatch Services Limited.....
 (Design Firm)

as described in the Design Report, Drawings and Technical Specifications set out in the schedule attached to this statement according to which the building is proposed to be constructed.

The Review is in respect of the Design Report, Drawings and Technical Specifications set out in the attached schedule.
 (aspects of design)

The Review confirms that these aspects of the design are in accordance with:

Compliance Documents issued by Dept of Building & Housing Building Act 2004 and the Building (Dam Safety) Regulations 2008.....
 (verification method / acceptable solution)

Alternative Solution as per the attached schedule ...NZSOLD's Dam Safety Guidelines 2000.....

On behalf of the firm undertaking this review, on the basis of the review undertaken, and subject to:

- (i) site verification of the design assumptions relating to the site materials and conditions detailed in the Design Report, Drawings and Technical Specifications, as assessed by a suitably qualified person;
- (ii) all proprietary products meeting their performance specification requirements; and
- (iii) verification of acceptable results from the embankment and geomembrane trials

I believe on reasonable grounds the building, if constructed in accordance with the Design Report, Drawings and Technical Specifications listed in the attached schedule, dated 11 February 2013, will comply with the relevant provisions of the Building Act 2004 and Building (Dam Safety) Regulations 2008, and the recommendations included in NZSOLD's Dam Safety Guidelines, November 2000.

I, Anthony John Pickford.....am: CPEng 39010.....#
 (Name of Design Professional)

I am a Member of : IPENZ and hold the following qualifications: BE (Civil), CPEng, FIPENZ.....

The Design Review Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than \$200,000*.

SIGNED BYAnthony John Pickford..... ON BEHALF OF Pickford Consulting Limited.....
 (Name of Design Review Firm)

Date.... 11/2/2013..... (signature).....

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Review Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of \$200,000.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.
PRODUCER STATEMENT PS2 1 May 2007



February 11, 2013

Waimakariri Irrigation Ponds

Producer Statement 2 – Document Schedule

As attached to Producer Statement - PS2 – Design Review, Pickford Consulting Limited, 11 February 2013

The documents to which the above Producer Statement refers are listed in the tables below.

Documents	Revision
Waimakariri Irrigation Ponds, Design Report, sections 1 to 7 inclusive and sections 11 to 14 inclusive	February 2013, Issue 3

Technical Specifications	Revision
Waimakariri Irrigation Ponds, Appendix F Technical Specification, sections 1 to 8 inclusive and sections 12 to 14 inclusive.	February 2013, Issue 3

Drawings		
Waimakariri Irrigation Limited, Irrigation Storage Ponds		
Drawing	Drawing Title	Revision
WIL1125/30/2	General Arrangement, Storage Ponds and Features	Rev 2
WIL1125/30/3	General Arrangement, Flow Concept	Rev 3
WIL1125/30/5	General Arrangement, Permanent Access	Rev 2
WIL1125/30/11	General Arrangement, Civil Structure Locations	Rev 2
WIL1125/30/12	General Arrangement, G2 Penstock and R2C Crump Weir Area - Layout	Rev 3
WIL1125/30/13	Measuring Weir Structures, G3 Outlet and R3C Crump Weir Area - Layout	Rev 3
WIL1125/30/21	General Arrangement, Plan Set Out – Ponds and Tub	Rev 3
WIL1125/30/22	General Arrangement, Typical Cross Sections – Ponds and Tub – Sheet 1	Rev 3
WIL1125/30/23	General Arrangement, Typical Cross Sections – Ponds and Tub – Sheet 2	Rev 3
WIL1125/30/24	General Arrangement, Location for Double Layer of Geomembrane	Rev 0
WIL1125/30/101	Control Structures, G1 Inlet Structure – Inlet and Outlet Details	Rev 3
WIL1125/30/102	Control Structures, G1 Inlet Structure – Inlet and Outlet Concept Isometrics	Rev 2
WIL1125/30/103	Control Structures, G2 Penstock Structure – Inlet Details	Rev 3
WIL1125/30/104	Control Structures, G2 Penstock Structure – Outlet Pipework Layout	Rev 3
WIL1125/30/105	Control Structures, G2 Penstock Structure – Inlet and Outlet Concept Isometrics	Rev 1
WIL1125/30/106	Control Structures, G2 Penstock Structure – Outlet Details	Rev 3
WIL1125/30/110	Control Structures, G3 Outlet Structure – Inlet Details	Rev 2
WIL1125/30/111	Control Structures, G3 Outlet Structure – Outlet Details	Rev 3
WIL1125/30/112	Control Structures, G3 Outlet Structure – Inlet and Outlet Concept Isometrics	Rev 2
WIL1125/30/113	Control Structures, G4 Interpond Structure – Inlet and Outlet Details	Rev 3
WIL1125/30/114	Control Structures, G4 Interpond Structure – Inlet and Outlet Concept Isometrics	Rev 3
WIL1125/30/115	Control Structures, G5 Interpond Structure – Inlet and Outlet Details	Rev 2

WIL1125/30/116	Control Structures, G5 Interpond Structure – Inlet and Outlet Concept Isometrics	Rev 2
WIL1125/30/117	Control Structures, G6 Outlet Structure – Inlet Details	Rev 3
WIL1125/30/118	Control Structures, G6 Outlet Structure – Outlet Details	Rev 3
WIL1125/30/119	Control Structures, G6 Outlet Structure – Inlet and Outlet Concept Isometrics	Rev 3
WIL1125/30/120	E1 Emergency Spillway, Pond 1 to Buffer Pond – Plan and Sections	Rev 2
WIL1125/30/121	E1 Emergency Spillway, Pond 1 to R3 Race – Plan and Sections	Rev 1
WIL1125/30/122	E2 Emergency Spillway, Buffer Pond 1 to MR4 Area – Plan and Sections	Rev 1
WIL1125/30/123	Service Spillway Area, Buffer Pond to Pond 2 – Chute Details	Rev 1
WIL1125/30/124	S1 Service Spillway, Buffer Pond to Pond 2 - Plan	Rev 3
WIL1125/30/125	S1 Service Spillway, Buffer Pond to Pond 2 - Sections	Rev 3
WIL1125/30/126	S1 Service Spillway, Buffer Pond to Pond 2 – Concept Isometrics	Rev 3
WIL1125/30/129	Inlet and Outlet Structures, Typical Geomembrane Connection Details	Rev 2
WIL1125/30/130	Inlet and Outlet Structures, Typical Lining Ballast	Rev 0
WIL1125/30/132	Access to Gate Structures, Typical Details	Rev 0
WIL1125/30/133	Access to Inlet Structures, Typical Details	Rev 0
WIL1125/30/134	Inlet and Outlet Structures, Typical Pipe Trench Details	Rev 0
WIL1125/30/135	Pump Structures, Dixon Road Pump Station – Inlet through Embankment Details	Rev 1
WIL1125/30/136	Pump Structures, Dixon Road Pump Station – Inlet Isometrics	Rev 0
WIL1125/30/137	Pump Structures, Dixon Road Pump Station – Outlet through Embankment Details	Rev 0
WIL1125/30/138	Pump Structures, Dixon Road Pump Station – Outlet Isometrics	Rev 0
WIL1125/30/139	Pump Structures, Buffer Pond Pump Station – Outlet through Embankment Details	Rev 1
WIL1125/30/140	Pump Structures, Buffer Pond Pump Station – Outlet Isometrics	Rev 1
WIL1125/30/141	Structural Standards, Reinforced Concrete Sheet 1 of 2	Rev 0
WIL1125/30/142	Structural Standards, Reinforced Concrete Sheet 2 of 2	Rev 0
WIL1125/30/143	Structural Standards, Steelwork	Rev 0
WIL1125/30/146	Services Control Building and Survey Marks, Shed Foundation and Survey Mark Details	Rev 0
WIL1125/30/151	Control Structures, G1 Inlet Structure Inlet – Reinforcement Details, Sheet 1 of 2	Rev 1
WIL1125/30/152	Control Structures, G1 Inlet Structure Inlet – Reinforcement Details, Sheet 2 of 2	Rev 1
WIL1125/30/153	Control Structures, G1 Inlet Structure Outlet – Reinforcement Details, Sheet 1 of 2	Rev 3
WIL1125/30/154	Control Structures, G1 Inlet Structure Outlet – Reinforcement Details, Sheet 2 of 2	Rev 2
WIL1125/30/155	Control Structures, G2 Penstock Structure Inlet – Reinforcement Details, Sheet 1 of 2	Rev 2
WIL1125/30/156	Control Structures, G2 Penstock Structure Inlet – Reinforcement Details, Sheet 2 of 2	Rev 2
WIL1125/30/157	Control Structures, G2 Penstock Structure Outlet – Reinforcement Details, Sheet 1 of 2	Rev 1
WIL1125/30/158	Control Structures, G2 Penstock Structure Outlet – Reinforcement Details, Sheet 2 of 2	Rev 1
WIL1125/30/159	Control Structures, G3 Outlet Structure Inlet – Reinforcement Details, Sheet 1 of 2	Rev 2
WIL1125/30/160	Control Structures, G3 Outlet Structure Inlet – Reinforcement Details, Sheet 2 of 2	Rev 2
WIL1125/30/161	Control Structures, G3 Outlet Structure Outlet – Reinforcement Details, Sheet 1 of 2	Rev 1
WIL1125/30/162	Control Structures, G3 Outlet Structure Outlet – Reinforcement Details, Sheet 2 of 2	Rev 1

WIL1125/30/163	Control Structures, G4 Interpond Structure Inlet – Reinforcement Details, Sheet 1 of 2	Rev 2
WIL1125/30/164	Control Structures, G4 Interpond Structure Inlet – Reinforcement Details, Sheet 2 of 2	Rev 2
WIL1125/30/165	Control Structures, G4 Interpond Structure Outlet – Reinforcement Details, Sheet 1 of 3	Rev 2
WIL1125/30/166	Control Structures, G4 Interpond Structure Outlet – Reinforcement Details, Sheet 2 of 3	Rev 2
WIL1125/30/167	Control Structures, G4 Interpond Structure Outlet – Reinforcement Details, Sheet 3 of 3	Rev 2
WIL1125/30/168	Control Structures, G5 Interpond Structure Inlet – Reinforcement Details, Sheet 1 of 2	Rev 2
WIL1125/30/169	Control Structures, G5 Interpond Structure Inlet – Reinforcement Details, Sheet 2 of 2	Rev 2
WIL1125/30/170	Control Structures, G5 Interpond Structure Outlet – Reinforcement Details, Sheet 1 of 2	Rev 1
WIL1125/30/171	Control Structures, G5 Interpond Structure Outlet – Reinforcement Details, Sheet 2 of 2	Rev 1
WIL1125/30/172	Control Structures, G6 Outlet Structure Inlet – Reinforcement Details, Sheet 1 of 2	Rev 2
WIL1125/30/173	Control Structures, G6 Outlet Structure Inlet – Reinforcement Details, Sheet 2 of 2	Rev 2
WIL1125/30/174	Control Structures, G6 Outlet Structure Outlet – Reinforcement Details, Sheet 1 of 2	Rev 2
WIL1125/30/175	Control Structures, G6 Outlet Structure Outlet – Reinforcement Details, Sheet 2 of 2	Rev 2
WIL1125/30/178	Control Structures, Service Spillway – Reinforcement Details	Rev 3
WIL1125/30/179	Pump Structures, Dixon Road Pump Station Outlet, Reinforcement Details	Rev 0
WIL1125/30/180	Pump Structures, Buffer Pond Pump Station Isometric, Reinforcement Section Locations	Rev 1
WIL1125/30/181	Pump Structures, Buffer Pond Pump Station Inlet and Access Stairs, Reinforcement Section Locations	Rev 0
WIL1125/30/183	Pump Structures, Buffer Pond Pump Station Outlet, Reinforcement Details	Rev 1

I have reviewed the above documents. The scope of my review has been limited to:

- Checking that the civil works design proposals, as detailed in the above documents, comply with the relevant provisions of the Building Act 2004 and the Building (Dam Safety) Regulations 2008.
- Checking that the civil works design proposals, as detailed in the above documents, are in accordance with NZSOLD's Dam Safety Guidelines, dated November 2000.

The scope of my review has also been limited to the consideration of dam engineering concepts and principles, and the design criteria adopted in the development of the design proposals for the project. I have not completed any detailed design reviews, including checks on design methods and arithmetical accuracies, and understand that such reviews have been completed by Damwatch Services Ltd.

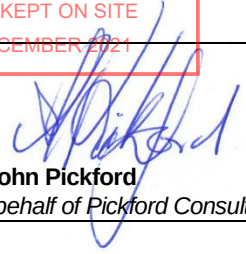
APPROVED

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TO BE KEPT ON SITE

21 DECEMBER 2021

February 11, 2013

Issued by:	 Anthony John Pickford <i>Signed on behalf of Pickford Consulting limited</i>
Date:	11 February 2013



NEW ZEALAND INSTITUTE OF
ARCHITECTS
INCORPORATED

ENVIRONMENT CANTERBURY

APPROVED

SUBJECT TO CONDITIONS
TO BE MET ON SITE
21 DECEMBER 2021
ACENZ

Building Code Clause(s) B.1. & B.2

PRODUCER STATEMENT – PS2 – DESIGN REVIEW

(Guidance notes on the use of this form are printed on the reverse side*)

ISSUED BY: Opus International Consultants Limited.....
(Design Review Firm)

TO: Waimakariri Irrigation Limited.....
(Owner/Developer)

TO BE SUPPLIED TO: Environment Canterbury.....
(Building Consent Authority)

IN RESPECT OF: Waimakariri Irrigation Scheme Storage Pond Gates (sizes 1600, 1800 and 1900 mm) detailed design.....
(Description of Building Work)

AT: Western side of the intersection of Dixons Road and Wrights Road, Eyrewell Forest.....
(Address)

Identifier CB8K/1478..... LOT 1..... DP 27020..... SO N/A.....

We Opus International Consultants Limited..... have been engaged by Waimakariri Irrigation Limited.....
(Design Review Firm)

to review the design documents for this project in respect of the requirements of Clause(s) B.1. Structure & B.2 Durability of the Building Code.

The Review is for ☐ All ☒ Part only of the design work prepared by Rooney Earthmoving Limited.....
(Design Firm)

as described in drawings titled Waimakariri Irrigation Scheme Storage Pond Gate 1 to Gate 6..... and numbered WIL1125/30/201, WIL1125/30/202R1, WIL1125/30/203 to 206..... the specification, and other documents set out in the schedule attached to this statement according to which the building is proposed to be constructed.

The Review is in respect of strength & durability of structures including seismic loading..... or per attached schedule.
(aspects of design)

The Review confirms that these aspects of the design are in accordance with:

☒ Compliance Documents issued by Dept of Building & Housing NZS 3404.1:2009 Steel Structures Standard.....or
(verification method / acceptable solution)

☐ Alternative Solution as per attached schedule.....

On behalf of the firm undertaking this review, on the basis of the review undertaken, and subject to:

(i) site verification of the following design assumptions as detailed in Drawings.....

(ii) all proprietary products meeting their performance specification requirements;

I believe on reasonable grounds the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code.

I, Ken Van Ho..... am: ☒ CPEng 49156.....#
(Name of Design Professional)

☐ Reg Arch.....#

I am a Member of: ☒ IPENZ ☐ NZIA and hold the following qualifications: BE(Mechanical).....

The Design Review Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than \$200,000*. The Design Review Firm is a member of ACENZ ☒ YES ☐ NO

SIGNED BY Ken Van Ho..... ON BEHALF OF Opus International Consultants Limited.....
(Name of Design Review Firm)

Date 12/02/2013..... (signature).....

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This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACENZ, IPENZ and NZIA to interpret the Producer Statement.

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Persons or firms meeting these criteria satisfy the term "suitably qualified independent design professional".

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As part of membership requirements, ACENZ requires all member firms to hold Professional Indemnity Insurance to a minimum level.

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There are several levels of service which a Design Firm may provide during the construction phase of a project (CM1-CM5)³ (OL1-OL4)². The Building Consent Authority is encouraged to require that the service to be provided by the Design Firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Attached Particulars

Attached particulars referred to in this producer statement refer to supplementary information appended to the producer statement.

Refer Also:

- ¹ Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2003
- ² NZIA Standard Conditions of Contract SCC 2007 (1st edition)
- ³ Guideline on the Briefing & Engagement for Consulting Engineering Services (ACENZ/IPENZ 2004)

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www.ipenz.org.nz
www.nzia.co.nz



May 10, 2018

Mr Brent Walton
General Manager
Waimakariri Irrigation Ltd
PO Box 556
Rangiora

Dear Brent

Waimakariri Irrigation Ponds

Peer Review Statement

This statement has been prepared in response to the request included in paragraph 4.2 of the document "Memorandum of Counsel for Waimakariri Irrigation Limited", by B G Williams and dated 22 November 2017.

In addressing the specific items included in paragraph 4.2 we have liaised with Damwatch Engineering and have reviewed the following documents:

- Section 7.9 of the "Waimakariri Irrigation Ponds, Design Report", Issue 4, by Damwatch and dated 9 December 2015.
- Sections 5 and 6 of the "Waimakariri Irrigation Ponds, Technical Specification", Issue 5, by Damwatch, dated 6 December 2016.
- An interface friction test report, completed by TRI Australia and dated 26/4/2018 to 1/5/2018, detailing the results of laboratory tests to determine the friction between the HDPE liner and the underlying geotextile at stress levels that reflect their proposed installation at Waimakariri.

As for our earlier review, dated 16 December 2015, the scope of this review has been limited to the consideration of dam engineering concepts and principles, the design criteria adopted by Damwatch Engineering in the development of their design proposals, and the in-house review processes completed by Damwatch Engineering to check and verify their design proposals for the project. It is inappropriate for us to complete detailed design reviews, including checks on the application of design methods and the relevant calculations, as such reviews must remain the responsibility of the design consultant.

We offer the following comments on the issues raised by the Counsel for the appellant:

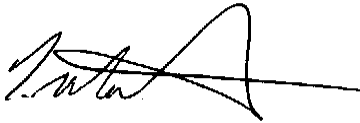
- The methodology utilised by Damwatch Engineering to estimate crack widths reflects current practice and the estimated crack widths are appropriately conservative.
- The methodology developed by Dr J P Giroudin 2012 for analysing the performance of a geomembrane liner over a crack in a canal has been appropriately modified and verified by Damwatch Engineering for the Waimakariri embankment.
- Recent laboratory testing of the proposed HDPE liner and underlying geotextile at Waimakariri has confirmed that Damwatch's design assumptions for the performance of the HDPE liner are appropriate.
- The proposed HDPE liner is capable of safely spanning the conservative crack widths estimated for the Waimakariri embankment.

May 10, 2018

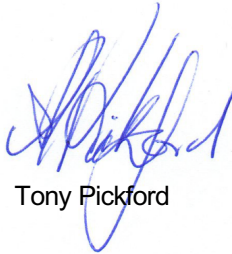
We are satisfied that the estimated crack widths and geomembrane design are appropriate for the project and that Damwatch Engineering has completed appropriate in-house reviews to check and verify their crack width calculations and geomembrane design. In addition, the inclusion of a geotextile beneath the HDPE geomembrane on all embankment slopes, the adoption of an enhanced HDPE geomembrane at all embankment corners, and the detailing at the upstream ends of all conduits that pass through the embankments are resilient features that will improve the post-earthquake performance of the embankments. We believe that the design of the geomembrane has been completed in accordance with good dam engineering practice and the recommendations included in the New Zealand Dam Safety Guidelines published by the New Zealand Society on Large Dams in 2015.

We trust that this letter assists the Environment Court in their decision making for the proposed project.

Yours sincerely,



Trevor Matuschka



Tony Pickford



Michael Sadlier

December 16, 2015

Mr Brent Walton
General Manager
Waimakariri Irrigation Ltd
PO Box 556
Rangiora

Dear Brent

Waimakariri Irrigation Ponds

Final Peer Review Report

This letter report addresses Conditions 6, 5 and 4 in CRC122897, CRC120610 and RC135478. It relates to our earlier letter dated the 15th of April 2015, responses received from Damwatch to comments attached to our earlier letter, and revised documentation for the project completed by Damwatch and received in November and December 2015.

We have reviewed the following revised documentation for the project:

- “Waimakariri Irrigation Ponds, Design Report”, Issue 4, by Damwatch, dated 9 December 2015.
- “Waimakariri Irrigation Limited, Irrigation Storage Ponds”, Drawings Issue 4, by Damwatch, numbered as detailed in the Drawing Register (Sheets 1 to 3) and dated November 2015. We understand that several of these drawings have been (or will be) updated as noted in our Table of Comments.
- “Waimakariri Irrigation Ponds, Technical Specification”, Issue 4, by Damwatch, dated 12 November 2015. We understand that the Technical Specification has been (or will be) updated as noted in our Table of Comments.
- “Waimakariri Irrigation Ponds, Risk Assessment”, by Damwatch, dated 23 July 2015.
- “Additional pga ground-shaking and surface deformation hazard studies for the Wrights Road storage ponds”, GNS Science Consultancy Report 2015/221, December 2015.

The scope of our review has been limited to the consideration of dam engineering concepts and principles, the design criteria adopted by Damwatch in the development of their design proposals, and the appropriateness of the design proposals with respect to the relevant provisions of the Building Act and the recommendations included in NZSOLD's Dam Safety Guidelines. We have not completed any detailed analytical reviews, including checks on design methods and arithmetical accuracies, and understand that such reviews have been completed by Damwatch. We have also had no involvement in the development of the design proposals and, as such, our review is essentially a “review of completed work” as detailed in IPENZ Practice Note 02.

The attached Table of Review Comments lists our initial comments on the documentation we reviewed in March 2015, Damwatch's recent responses to our comments, and our final comments (December 2015) following our review of the revised documentation. We also attach a Table of Supplementary Review Comments that covers additional issues not covered in the other table. In completing our review we have considered:

● Page 2

- The results of the site investigations and the geotechnical parameters adopted for the embankment design.
- The results of seismic hazard studies and the estimates of ground shaking and ground deformation adopted for design.
- Hydrologic and design flood estimates and design assumptions.
- The results of analyses undertaken to assess the performance of the embankments under seismic load conditions.
- The design of the embankments including the embankment type, the design parameters adopted for the embankments, the design to address potential transverse cracks in the corners of the embankments, and the suitability of the proposed liner as detailed in the revised design report, drawings and technical specification.
- The design of the inter-pond and outlet conduits, spillways and pump stations including their design parameters and their proposed details as detailed in the revised design report, drawings and technical specification.

You will note from the attached Table of Review Comments that no progress has been made in addressing our earlier comments on the draft commissioning plan and the draft dam safety management plan, the last of which incorporates a draft emergency action plan. We understand that revisions to both documents will be prepared during the construction of the project and submitted to the Canterbury Regional Council and other agencies as detailed in CRC122897. This is appropriate; however, to provide a suitable timeframe for peer review and meet the time requirements included in CRC122897 for submission and certification of the final documents, both documents should be revised for peer review some six months before any initial filling of the storage ponds.

We have completed our review of the revised design report, drawings and technical specification for the project, as detailed in the attached Tables of Comments, and believe that the proposed works have been designed in accordance with good dam engineering practice and the recommended dam safety criteria included in NZSOLD's Dam Safety Guidelines. While NZSOLD's Dam Safety Guidelines have recently been revised, we are satisfied that the revision incorporates no changes or additions that materially affect the design.

We have also reviewed the recent work by GNS. This includes modelling of ground deformation associated with rupture of the Hororata Fault, review of existing topography to identify evidence of surface deformation due to fault rupture and the sensitivity of ground shaking estimates to the recurrence intervals of several of the local faults, to the modelled locations of the Hororata and Springbank faults and the effects of hanging-wall factors for the Hororata Fault. In the worst case scenario modelling shows that the Hororata Fault could result in some ground surface deformations at the WIL Storage Pond site but they are very small and within tolerable limits. Review of topographic data indicates no direct evidence of ground deformation associated with faulting within the last approximately 18,000 years. The ground motion sensitivity studies demonstrate that the recommended 10,000 year peak ground acceleration (pga) values are insensitive to large changes in the fault-rupture recurrence intervals and enhancement by hanging-wall (or other effects). In the worst case scenario the estimated pga value is 5% greater than the previous estimate. Damwatch has confirmed that this does not affect the proposed design.

December 16, 2015

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In summary, the design for the project is suitably conservative and incorporates a number of resilient features to safely accommodate all loading conditions. Important design improvements and changes include:

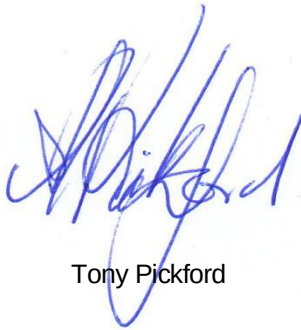
- A more rigorous analysis of the response of the embankments to large earthquake loadings.
- The replacement of the earlier proposed Dixon Road pump station with a pump station that removes the risk associated with a pressurised conduit beneath the embankment.
- The inclusion of a geotextile beneath the HDPE geomembrane on the embankment slopes and the adoption of an enhanced HDPE geomembrane at all embankment corners.
- The enhanced flood protection provided by the proposed fuse plug spillway on the right bank of the canal upstream of the ponds and lowering the crest of the buffer pond spillway.
- The completion of a more detailed risk assessment which provides an improved understanding of potential embankment failure modes and their likelihood of occurrence.

We understand that you will forward copies of this letter, together with the attached table of comments, to the Canterbury Regional Council and the Waimakariri District Council.

Yours sincerely,



Trevor Matuschka



Tony Pickford



Michael Sadlier

18 November 2015

Nigel Connell
Water Resource Specialist
Damwatch Services Limited
Level 8, 80 The Terrace,
Wellington 6140.

Dear Nigel,

Waimakariri Irrigation Scheme

Peer Review of Storage Pond Gates 1, 2 & 3.

Outlined below is my review of three of the gates proposed for the operation of the Waimakariri Irrigation Scheme. The desktop review is based on drawings provided by Damwatch and Rooney Earthmoving Limited.

General

The three gates are identified as 1, 2 and 3 and referenced in Drawings WIL 1125/30/201, WIL 1125/30/202R1 and WIL 1125/30/203, respectively. The Control Structures in which the gates are located are shown in Drawings WIL 1125/30/101, WIL 1125/30/103 and WIL 1125/30/110, respectively.

The gates are similar rectangular steel slide units operated with hydraulic rams and cylinders submerged in their intake or outlet concrete structures in the ponds. They feature a 32mm thick skinplate with three horizontal universal columns bolted to it and slide on low friction plastic pads within a fabricated steel frame mounted in front of their inlet or outlet structures. The gates and frames are galvanised for corrosion protection.

The designs have been adapted from constructed gate units for the Rangitata South Irrigation Scheme which are currently being commissioned. A review of those gates was completed by myself in 2009 as being fit for their purpose.

Normal Operation

In general, the three gates are suitable for operating in the environment and the static maximum pond level expected under normal conditions for this Scheme. Stress levels are moderate and their design is robust.

Earthquake Loading

The gates were reviewed for unusual loading such as a major earthquake. The Scheme is classified as High PIC (Potential Impact Category) with respect to the storage dams. The regionally derived peak ground acceleration (pga) for the MDE (Maximum Design Earthquake) is 1.06g.

For Gates 2 & 3 the Control Structures are set and located below the ground line at the bottom of the ponds. The main upstream/downstream hydrodynamic pressure wave would pass above the closed gates and dissipate up the sloping surface of the dam embankment. The only hydrodynamic pressure generated by the small amount of trapped water in the well of the structure would have little significant impact on the gates. This assumes that the pipe downstream of the gate is empty.

For Gate 1 there is static water on both sides of the gate under normal operating conditions. There would be little impact of the main hydrodynamic pressure in the upstream/downstream direction as the gate is shielded by the control structure as for Gates 2 & 3.

However, upstream of the gate (based on Flow Arrow) is a trapped mass of water which is accelerated by the pga to impact the closed gate. Allowing for the resultant negative static pressure between the Buffer and Pond 1 (maximum levels assumed) the force on the gate could amount to almost 1 MN at the maximum. This would yield the upstream surface of the gate plate but more significantly distort or tear the frame and gate off their anchor bolts to the concrete structure.

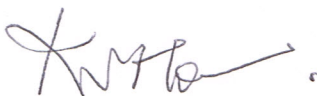
Conclusions

My review of the Waimakariri storage pond gates conclude that:

- a. All three gates are a suitable design and fit for their purpose in the irrigation scheme.
- b. Gates 2 & 3 are unlikely to be affected by the MDE nominated for the region.
- c. Gate 1 is vulnerable to damage and not be functional after the MDE.

Remedial measures would firstly need to address the security of the gate frame's attachment to the structure. Secondly, to minimize the distortion of the gate plate a higher yield strength plate could be considered or the gate be strengthened by an additional beam. A damaged gate which can still be operated after the event would satisfy most safety requirements.

Yours faithfully,



Ken V Ho
Hydro Gate Specialist.

October 31, 2021

Mr Brent Walton
General Manager
Waimakariri Irrigation Ltd
PO Box 556
Rangiora

Dear Brent

Wrights Road Storage Ponds

Peer Review Statement

We understand that the design for the above project has been finalised for construction and that the final design incorporates a number of changes since our last review in May 2018. The design changes are listed as items 1 to 15 inclusive in a design change register titled “WIL – Wrights Road Storage Ponds: Summary of Design Changes, August 2021” prepared by Damwatch Engineering and dated 17 August 2021.

The scope of our review has been limited to reviewing the design changes for the civil engineering and geosynthetic aspects of the project, as listed in the above register and detailed in the following revised documentation for the project:

- “Wrights Road Storage Ponds, Design Report”, Issue 5, by Damwatch Engineering and dated 24 September 2021.
- “Wrights Road Storage Ponds, Technical Specification”, Issue 6, by Damwatch Engineering and dated 24 September 2021.

In addition, the scope of our review has been limited to the consideration of dam engineering concepts and principles, the design criteria adopted by Damwatch Engineering in the development of their design changes, and the in-house review processes completed by Damwatch Engineering to check and verify their design changes for the project. It is inappropriate for us to complete detailed design reviews, including checks on the application of design methods and the relevant calculations, as such reviews must remain the responsibility of the design consultant.

The attached “Wrights Road Storage Ponds - Table of Review Comments”, dated 29 October 2021, lists our initial comments on the design changes, Damwatch Engineering’s responses to our initial comments, our final comments on the design changes, and Damwatch Engineering’s responses to our final comments. We are satisfied that Damwatch Engineering’s responses suitably address our comments and we are satisfied that none of the design changes adversely affect dam safety. As a result of our review Damwatch Engineering updated the design documentation with an Issue 6 of the Design Report dated 26 October 2021, an Issue 8 of the Specification dated 26 October 2021 and Rev 5 of Drawing WIL1125/30/129. We