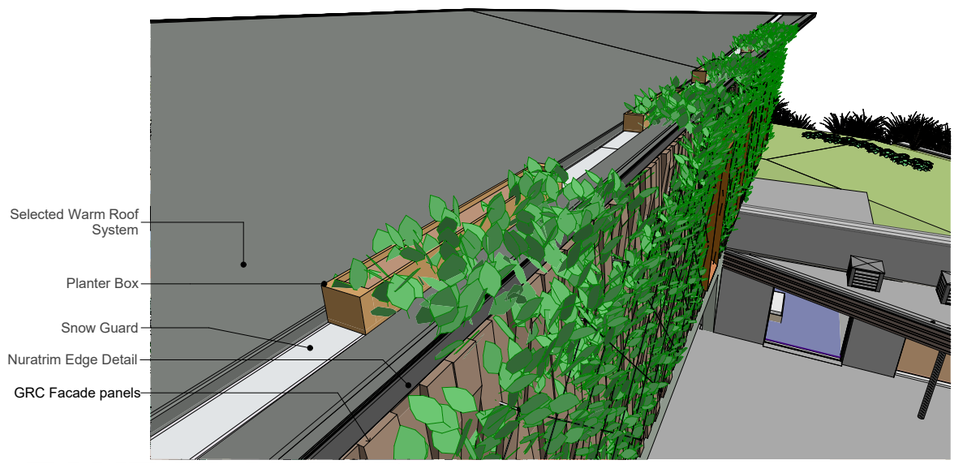
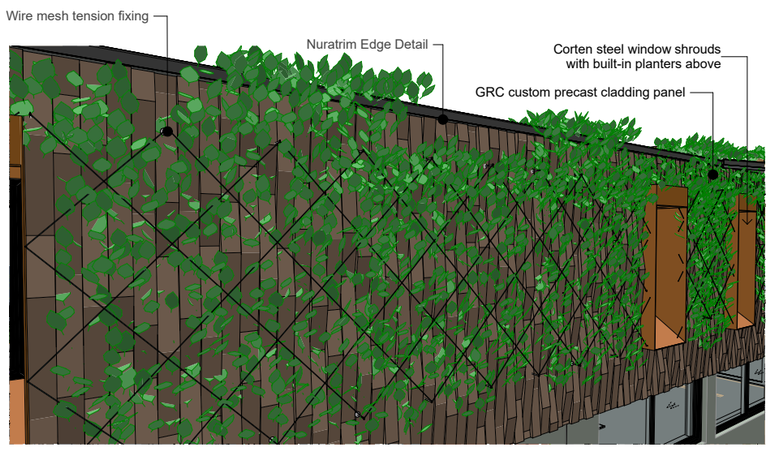


EAVE PLANTER

NTS



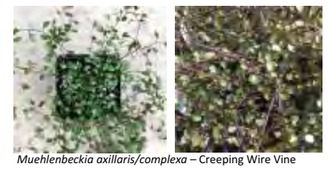
WINDOW PLANTER

NTS

Clematis panicula 'Purity' – Clematis

Metrosideros perforata – Climbing Rata

Coprosma kirkii or Coprosma depressa – Coprosma



Muehlenbeckia axillaris/complexa – Creeping Wire Vine

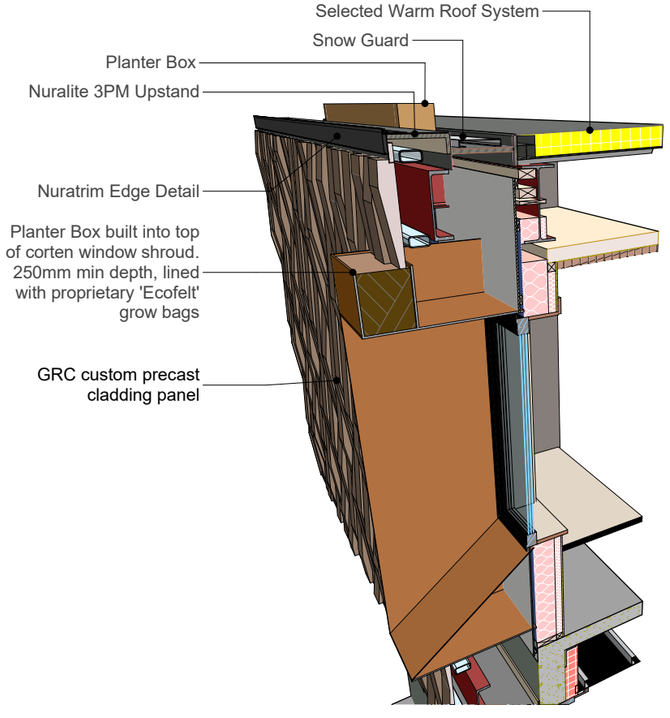
Rosmarinus officinalis 'Prostratus' – Creeping Rosemary

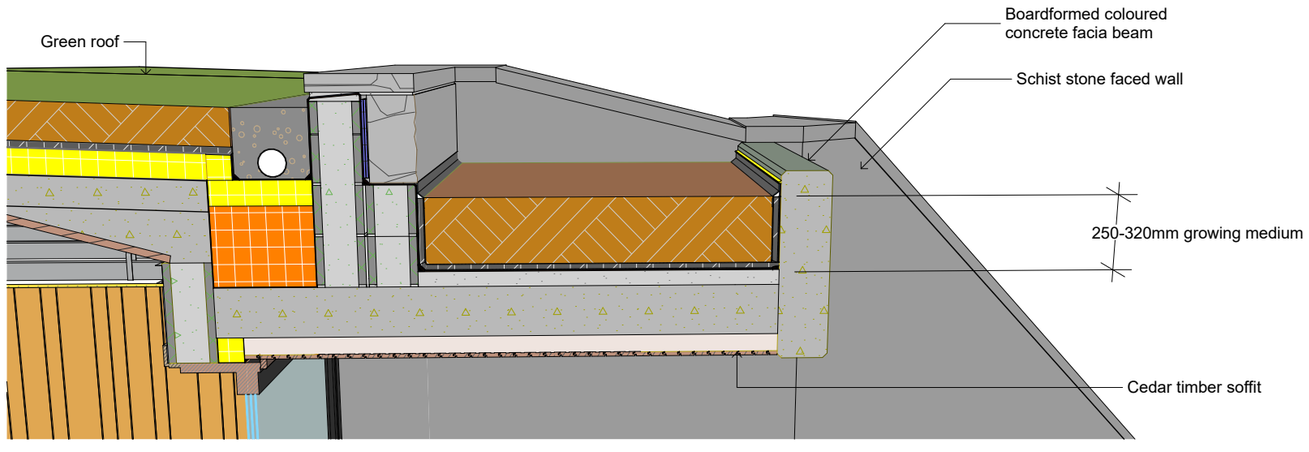
Trachelospermum jasminoides – Star Jasmine

Parsonsia heterophylla - Kaihua/NZ Jasmine

PLANT SPECIES

Proposed plants to be selected from the above list.





NO7(6:

1) OULJLQ Rf LHYHOV I6 1 5L = 343.96m.
2) AHULDO PhRWR LV fRU LQdLFDWLYH puUpRVHV RQOy.

(DUWhZRUkV QuDQWLWLHV

&uW	18,800m³
)LOO	18,800m³
7RWDO VROumH	37,600m³
AUHD	17,000m²
MDx &uW	7.6m
MDx)LOO	6.0m

LRW 1
'P 24004
29.576hD
3097502

LRW 2
'P 395762
76664m²
382239

LRW 5
'P 303826
40332m²
15295

LRW 1
'P 395762
75276m²
382238

LDkH WDQDkD

6HF 18
BORFk XIII
LRZHU WDQDkD 6'

6HF 12
BORFk XIII
LRZHU WDQDkD 6'

7LH LQWR HxLVWLQJ dULYHZDy
5HWDLQ HxLVWLQJ WUHHV
5HWDLQ HxLVWLQJ EHHFh WUHHV
5HWDLQ HxLVWLQJ LVODQd Rf WUHHV
PURpRVHd WDVWHfLHOd DQd VHpWLF WDQk ORFDWHd hHUH
7HUUDFH
PURpRVHd PRRO
'ULYHZDy
PURpRVHd UHWDLQLQJ ZDOO DORQJ dULYHZDy (mDx hHLJhW 2m)
4W' WUDFk
&uW WR ZDVWH mDWHULDO WR EH pODFHd RYHU pDddRFk
MDx &uW
MDx)LOO
5HWDLQ HxLVWLQJ VFhLVW RuWFURp
PURpRVHd GDUDJH
PURpRVHd 'ULYHZDy
5HWDLQ HxLVWLQJ WUHHV
PURpRVHd 6hHd
5HWDLQ HxLVWLQJ VFhLVW RuWFURp
(xLVWLQJ ERUH
(xLVWLQJ 5RDd
A
A'
B
B'
&
&'
60°34'00"
237.00
60°33'50"
85.00
174°01'50"
342.21
60°33'40"
(82.36)
75.15
7.21
316°00'00"
141.11
235°38'
4.91
240°15'
21.06
239°14'
5.59
89.10
296°59'00"
(98.87)
296°59'
9.77
265°21'30"
37.45
280°58'00"
65.66
271°28'40"
72.72

L(G(N'

6LWH BRuQdDUy
'HpWh &RQWRuUV (DW 0.5m LQWHUYDO)
(xWHQW Rf (DUWhZRUkV 6HFWLRQV

&U7/)ILL

5.0m +
4.0 - 5.0m
3.0 - 4.0m
2.0 - 3.0m
1.0 - 2.0m
0.5 - 1.0m
0 - 0.5m &U7

0 - 0.5m)ILL
0.5 - 1.0m
1.0 - 2.0m
2.0 - 3.0m
3.0 - 4.0m
4.0 - 5.0m
5.0m +

5HYLVLRQ	AmHQdmHQWV	'DWH
B	(DUWhZRUkV WHUUDFH, WUDFkV UHmRYHd DQd quDQWLWLHV	20/01/2021
&	(DUWhZRUkV RYHU VLWH DQd quDQWLWLHV	17/01/2021

C. HUGHES & ASSOCIATES LTD
6uUYHyLQJ DQd 5HVRuUFH MDQDJHmHQW &HQWUDO OWDJR

CROMWELL
17A MU55AY 7(55A&(
P.O. BOX 51
03 445 0376

WANAKA
L\V(L 3, 80 A5'MO5(67
P.O. BOX 599
03 443 5052

ZZZ.FhDVuUYHyRUV.FR.Qz

PURjHFW:
7H(6AN&7UA5Y P5OJ(&7
(A57HWO5K6 '(6IGN
LO7 2 'P 395762
494 WANAKA-M7 A6PI5ING 5OA'

7LWOH:
P5OPO6(' (A57HWO5K6
'(P7H POLYGON6

P5(LIMINA5Y

&RpyULJhW Rf WhLV dUDZLQJ LV YHVWHd LQ &. HuJhHV & AVVRFLDWHV LLmLWHd. 7hH &RQWUDFWRU VhDOO YHULfy DOO dLmHVLRQV RQ YLWH.

&AU7ION - 7hH LQfRUmDWLRQ VhRZQ RQ WhLV pODQ hDV EHHQ pUHpDUHd uQdHU VpHFLfIC LQVWUuFWLRQ fURm WhH FOLHQW DQd LV LQWHQdHd VRQHOy fRU WhH FOLHQWV uVH. 7hH LQfRUmDWLRQ LV YDOLd DV DW WhH dDWH Rf VuUYHy. &. HuJhHV & AVVRFLDWHV LLmLWHd ZLOO DFFHpW QR OLDBILOLWy fRU DQy FRQVHquHQFH DULVLQJ RuW Rf WhLV pODQ, RU WhH LQfRUmDWLRQ WhHUHRQ ZhHWhHU LQ hDUd FRpy RU HDHFWURQLF fRUmDW Ey DQy RWhHU pDUWy fRU DQy puUpRVH ZhDWVRHYHU.

6FDOH:
1:1500 (A3)

JRE NR:	'UDZQ By:	'Wum:	
5450	65	)AL6(	
'UDZLQJ NR:	6hHW NR:	5HYLVLRQ	'DWH &UHDWHd:
&1538	3	&	23/11/2020

rough & milne landscape architects

Proposed Dwelling Earthworks
Data Source: C. Hughes & Associates LTD

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 19

KEY NATIVE PLANTS

Kanuka shrubland mix
Aristotelia fruiticosa
Coprosma crassifolia
Coprosma propinqua
Coprosma rugosa
Corosma tayloriae
Coprosma virescens
Kunzea ericoides (Kanuka)
Olearia avicenniaefolia
Olearia hectorii
Olearia lineata
Olearia odorata
Pittosporum tennufolium
Sophora microphylla

Tall plant mix
Cordyline australis
Fuscospora solandri var. cliffotioides (Mountain beech)
Kunzea ericoides (Kanuka)
Prumnopitys taxifolius
Pittosporum tennufolium

Broadleaf Plant Mix
Coprosma lucida
Cordyline australis (Cabbage tree)
Hebe salicifolia
Griselina littoralis
Melicytus lanceolatus (Large leaf mahoe)
Pittosporum tennufolium
Phormium cookianum (Mountain flax)

Groundcovers
Coprosma kirkii
Muehlenbeckia complexa

Key

- Proposed building underground
- Existing building to be removed
- Proposed building
- Driveway
- Pool
- Existing mixed grass scrub
- Grass areas - mown grass/ curtilage
- Grass areas - unmown
- Existing exotic vegetation
- Te Kakano planting
- Kanuka shrubland mix
- Tall / beech dominated plant mix
- Broadleaf plant mix
- Native groundcovers
- Existing rocks
- Stone paving at GL in front of portals
- Indicative rock placement as informal retaining between portals
- Existing amenity tree to be retained
- Douglas fir
- Existing native vegetation
- Exotic woodlot
- Fences
- Boundary
- Cross sections
- Refer detailed planting area - cave portals

0 5 10 15 20m
Scale 1:750 @ A1

Vectorworks file: Sanctuary Proj - REV PLANS 21-04-2021

The Sanctuary Project
Resource Consent Planting Plan

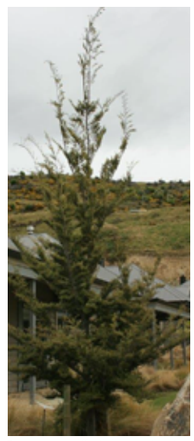
ANNABEL RILEY
LANDSCAPE ARCHITECT
021 1803 746 annabel@plotlandscape.co.nz 19 Tyndall Street, Wanaka 9305
PARKS • GARDENS • PLAYGROUNDS • DESIGN • SITE PLANNING • PROJECT MANAGEMENT

rough & milne landscape architects

Key Native Plant Species


Saphora microphylla (Kowhai tree) to 5-7 metres


Pittosporum tennufolium, native shrub to 3-4metres


Fuscospora cliffortioides native tree to 10-15 metres


Coprosma propinqua, native shrub to 4-5 metres

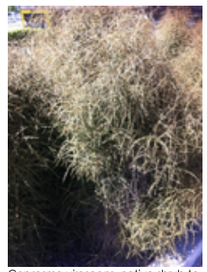

Aristotelia fruticosa, native shrub to 3 metres


Olearia odorata, native shrub to 4 metres

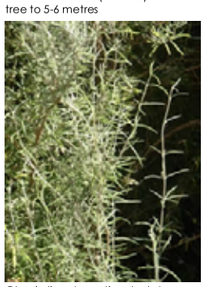

Muehlenbeckia complexa, climbing ground cover


Coprosma kirkii, tough spreading evergreen groundcover


Coprosma tayloriae (Dumosa), native shrub to 7 metres


Coprosma virescens, native shrub to 3-4 metres


Kunzea ericoides (Kanuka) Native tree to 5-6 metres


Olearia lineata, native shrub to 3-4 metres


Coprosma virescens, native shrub to 4 metres

Planting Guidelines

Planting
All plants are ecosourced from the Wanaka area and supplied locally. Location of plants is indicative only. New plants to be grouped around existing native vegetation and planted at 1.0 - 1.5 metre centres. Groups of existing rocks where practical to remain exposed.

Mulching
Individual plants protected with a biodegradeable Nature guard and mulch mat.

Fertiliser
Each plant to be planted with Koch slow release fertiliser.

Rabbit proofing
The property is rabbit proofed with a wire mesh fence along boundary and an ongoing programme of trapping for rabbits and stoats.

On Going Maintenance
On going maintenance / weeding of the planting would be required until established.

Irrigation
Overhead irrigators to irrigate plants for first 2-3 years to get planting established.

Scale1:250@ A2

Key

Proposed Beech trees (where soil depth allows)

Indicative rock placement as informal retaining between portals

Existing native remnant vegetation

Grass mown

Grass unmown

Existing rocks

Stone paving at G.L in front of portals

NOTE
Large Fuscospora cliffortioides (Mountain Beech) trees to be planted after construction

For planting over portals refer to Architects details

Plant Schedule

ID	Quantity	Latin Name	Common Name	Scheduled Size	Notes
Ari fru	15	Aristotelia fruticosa	Wineberry	2.5 Litre	1.5 metre spacing
Cop kir	29	Coprosma Kirkii		Pb 5	1.2 metre centres
Cop pro LG	19	Coprosma propinqua LG	Mingimingi	2.5 Litre	1.5 metre centres
Cop prop	69	Coprosma propinqua	Mingimingi	35 F	1.5 metre centres
Cop prop LG	13	Coprosma propinqua LG	Mingimingi	2.5 Litre	1.5 metre centres
Cop tay	10	Coprosma tayloriare		2.5 Litre	1 metre centres
Cop vir	53	Coprosma virescens		35F	1.5 metre centres
Cop vir LG	6	Coprosma virescens LG		2.5 Litre	1.5 metre centres
Fus cli	18	Fuscospora cliffortioides	Mountain Beech	35 Litre	5 metre centres
Kun er	62	Kunzea ericoides	Kanuka	2 Litre	1.5 metre centres
Kun eri LG	61	Kunzea ericoides LG	Kanuka	Pb 8	1.5 metre centres
Mueh com	16	Muehlenbeckia complexa		1 Litre	1 metre
Ole lin	6	Olearia lineata		2.5 Litre	1 metre spacings
Ole odo	12	Olearia odorata		2.5 Litre	1 metre centres
Pitt 'LB'	7	Pittosporum 'Little Burger'		PB3	1.0 metre centres
Pitt ten	42	Pittosporum tenufolium	Pittosporum	1.5 Litre	1.5 metre centres
Sop mic	3	Sophora microphylla	Kowhai	25 Litre	As per plan

Vectorworks file; Sanctuary Proj - REV PLANS 14-06-2021

plot
ANNABEL RILEY
LANDSCAPE ARCHITECT
021 1803 746 annabel@plotlandscape.co.nz 19 Tyndall Street, Wanaka 9305
PARKS • GARDENS • PLAYGROUNDS • DESIGN • SITE PLANNING • PROJECT MANAGEMENT

The Sanctuary Project

Screening Cave Portals - Planting Plan

Screening Cave Portals - Planting Plan
Data Source: Plot Landscapes
Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021
SHEET 21

rough & milne landscape architects

Scale 1:500 @ A1
Indicative locations only

Key

- Proposed building underground
- Existing building to be removed
- Proposed building
- Driveway
- Pool
- Existing mix grass scrub
- Grass areas - mown grass/curtilage
- Grass areas - unmown
- Existing exotic vegetation
- Te Kakano - planting areas
- Plant mix - kanuka / shrubland mix
- Plant mix - tall / beech dominated
- Plant mix - native broadleaf plant
- Native groundcovers
- Rocks
- Stone paving at GL in front of portals
- Existing amenity tree to be retained
- Existing Douglas fir tree
- Existing remnant native vegetation
- Fences
- Boundary
- Weka planting areas - stages
- Refer Area G - cave portal detail planting area

WEKA PLANTING GUIDELINES

Plants
All plants are ecosourced plants from the Wanaka area.
Plants to be planted at 1.0 - 1.5 metre centres.
All plants to be planted with a mulch mat and bamboo stake.
Planting to be grouped around existing native vegetation to give shelter to new plants.
Groups of rocks where practical to be left in open areas to allow habitat for lizards and geckos.

Track
2 metre wide track to be marked, confirmed on site and then slashed.
Track to go around exposed rock areas.

Fertiliser
Each plant to be planted with Apex Field Grow Fertiliser.

Rabbit proofing
Property is rabbit proofed with a wire mesh fence along the boundary and a continuing programme of trapping.

On Going Maintenance
On going maintenance of the planting would be handed to Weka.

Irrigation
A new bore is being investigated.

Te Kakano Planting
All Te Kakano planting areas will be irrigated (where practical) using the Weka Project irrigation.

WEKA PLANTING

STAGE 1

AREA A & B, PLANTED IN AUTUMN 2017 Total 1967 M2 approx
Kanuka shrubland mix on exposed dry rocky sites
Kunzea ericoides (Kanuka) - 470 x 35 F
Coprosma propinqua - 300 x 35 F
Pittosporum tennufolium - 275 x Pb3,
Olearia odorata - 75 x 35 F
Olearia lineata - 75 x 35 F
Olearia avicenniaefolia - 75 x Pb5
Olearia hectorii - 45 x Pb 5
Coprosma rugosa - 30 x 35 F
Coprosma tayloriae - 155 x Pb 5

AREA B
Tall tree mix
Fuscospora cliffortioides (Mountain beech)- 125 x Pb5
Prumnopitys taxifolius - 25 x Pb5
Pittosporum tennufolium - 100 x 35 F
Kunzea ericoides (Kanuka) - 150 x 35 F
Hebe salicifolia - 15 x Pb 3
Cordyline australis - 90 x Pb 5

STAGE 2

AREA C & D, PLANTED IN MAY 2019 Total 1800 M2 approx
Kanuka shrubland mix
Kunzea ericoides (Kanuka) - 620 x 35F, 21 x Pb8,1 x Pb5,
Coprosma crassifolia - 50 x 35F, 2 x 2.5Litre
Coprosma propinqua - 150 x 35F
Coprosma virescens - 100 x 35F, 2 x 2.5 Litre
Pittosporum tennufolium - 187 x 35F, 10 x 2.5 Litre, 55 x 1.5 Litre, 133 x Pb3
Coprosma rugosa - 35F x 30, 10 x 2.5 Litre
Coprosma rotundifolia 2 x 2.5 Litre
Aristotelia fruticosa - 15 x 2.5 Litre
Fuscospora cliffortioides - 125 x 2.5 Litre
Hebe salicifolia - 50 x 2.5 Litre
Olearia avicennifolia - 37 x 2.5 Litre, 38 x Pb5,
Olearia hectorii - 45 x 2.5 Litre
Olearia lineata - 77 x 2.5 Litre
Olearia odorata - 85 x 2.5 Litre, 1 x Pb 12, 1 x Pb 18
Plaginathus regius - 25 x 2.5 Litre
Prunmnopitys taxifolia 25 x Pb 5
Sophora microphylla - 77 x 2.5 Litre, 1 x 25 Litre, 1 x Pb 18, 44 x 1.5 Litre
Coprosma tayloriae 30 x 35F, 155 x Pb 5, 10 x 2.5 Litre
Melicytus lanceolatus - 10 x Pb5

STAGE 3

AREA E - PLANTING TO BE UNDERTAKEN IN SPRING 2021
AREA F - POST EARTHWORKS
AREA G - POST CONSTRUCTION OF PORTALS

Vectorworks file; Sanctuary Proj - REV PLANS 21-04-2021

The Sanctuary / Weka Project

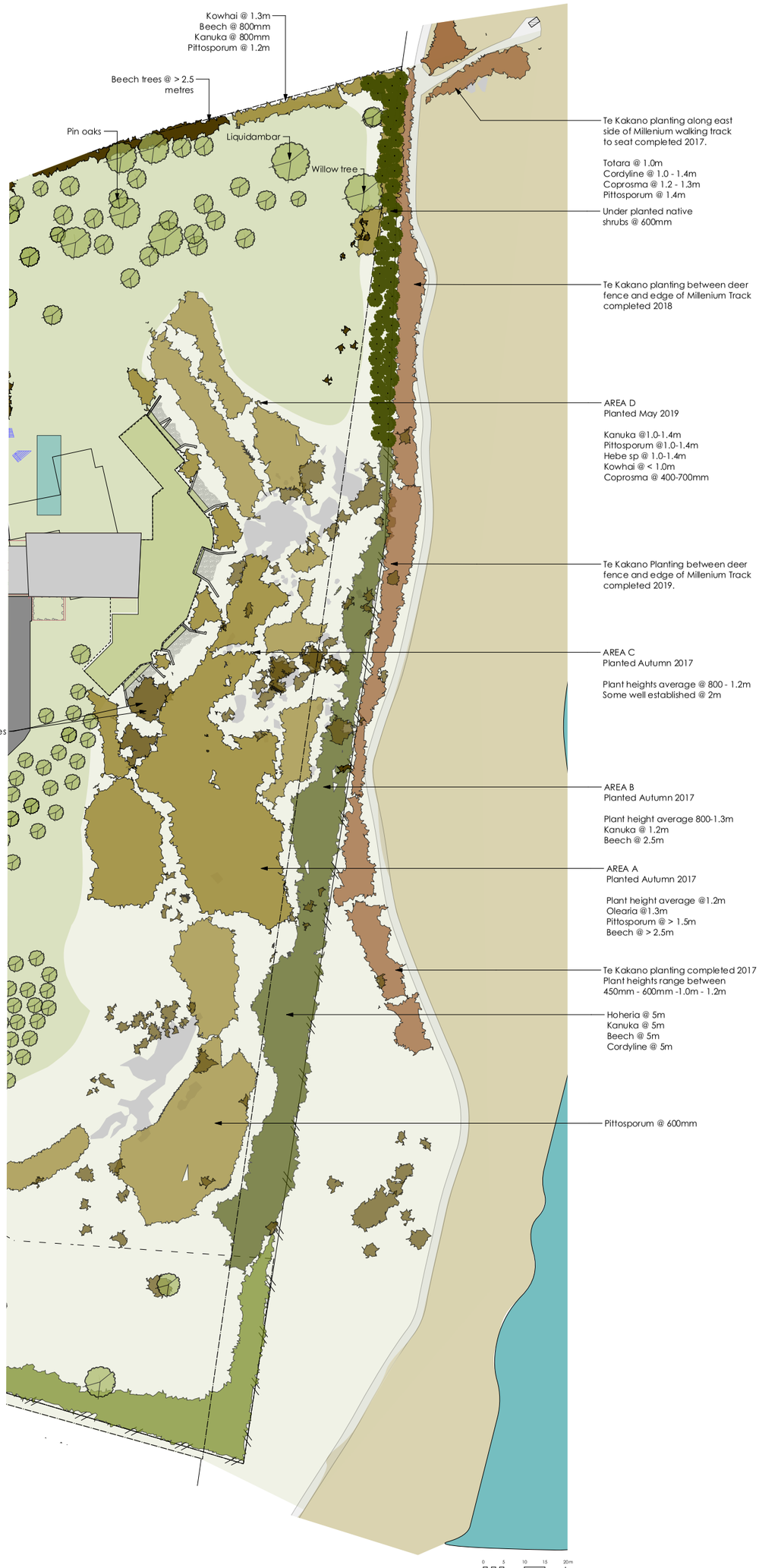
Existing and Proposed Planting Areas - Staging Plan

plot landscapes
ANNABEL RILEY
LANDSCAPE ARCHITECT
021 1803 748 annabel@plotlandscape.co.nz 10 Tyndall Street, Wanaka 9305
PARKS • GARDENS • PLAYGROUNDS • DESIGN • SITE PLANNING • PROJECT MANAGEMENT

N

Existing and Proposed Planting Areas - Staging Plan
Data Source: Plot Landscapes
Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021
SHEET 22

rough & milne landscape architects



Scale 1:500 @ A1

Key

- Proposed building underground
- Existing building to be removed
- Proposed building
- Driveway
- Pool
- Existing mix grass scrub
- Grass areas - mown grass/curtilage
- Grass areas - unmown
- Existing exotic vegetation
- Te Kakano - planting areas
- Plant mix - kanuka / shrubland mix
- Plant mix - tall / beech dominated
- Plant mix - native broadleaf plant
- Native groundcovers
- Rocks
- Stone paving at G.L in front of portals
- Existing amenity tree to be retained
- Existing Douglas fir tree
- Existing remnant native vegetation
- Fences
- Boundary

Plant heights as at Feb 2021 measured on site by N Smethan
Indicative locations only

ANNABEL RILEY
Landscape Architect
021 1803 748 annabel@plotlandscape.co.nz 19 Tyndall Street, Wanaka 9305
PARKS • GARDENS • PLAYGROUNDS • DESIGN • SITE PLANNING • PROJECT MANAGEMENT

Vectorworks file; Sanctuary Proj - REV PLANS 21-04-2021

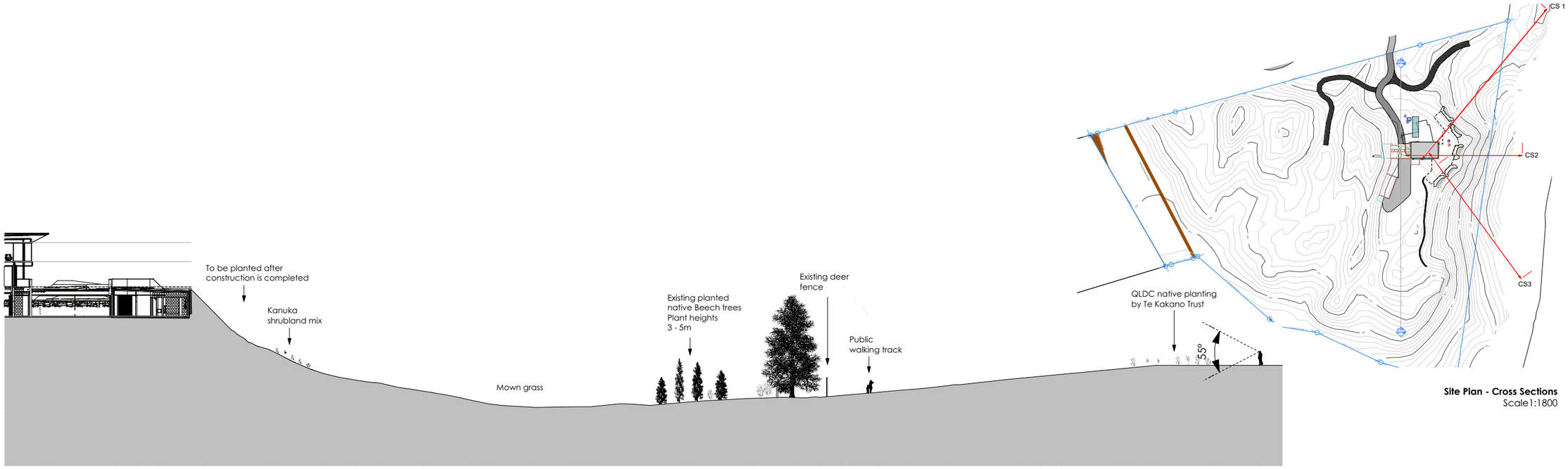
The Sanctuary / Weka Project

Existing Planting Areas - Heights

Existing Planting Areas - Heights
Data Source: Plot Landscapes

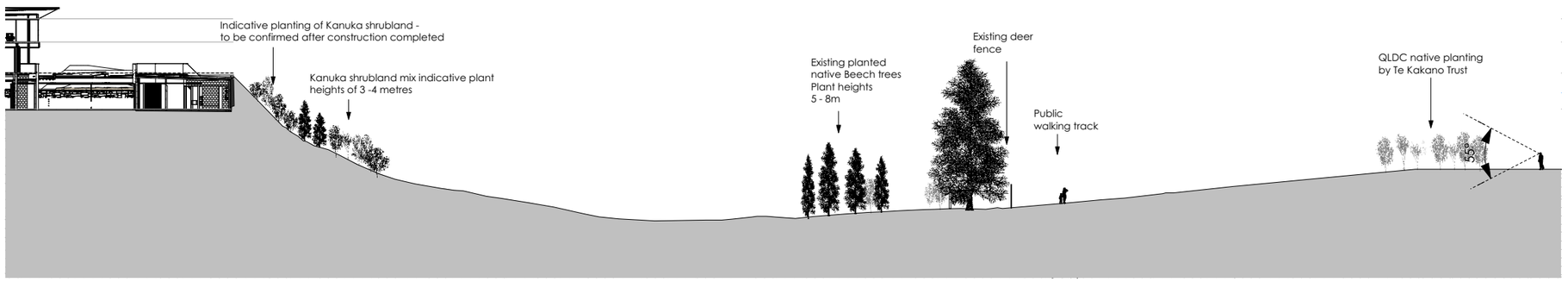
Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 23

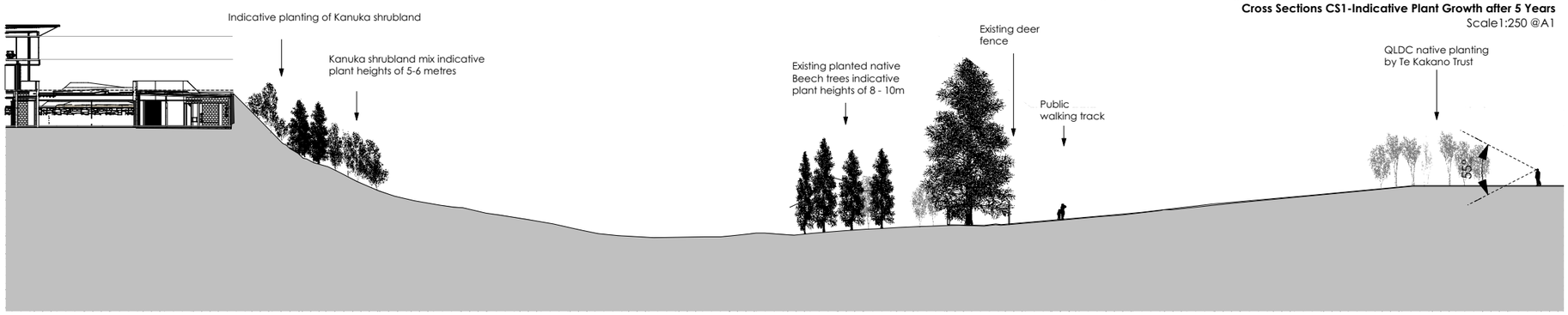


Site Plan - Cross Sections
Scale1:1800

Cross Sections CS1 - Existing Indicative Plant Heights
Scale1:250 @A1



Plant growth based on existing heights plus 400-500mm growth per year when irrigated.
Cross Sections CS1-Indicative Plant Growth after 5 Years
Scale1:250 @A1



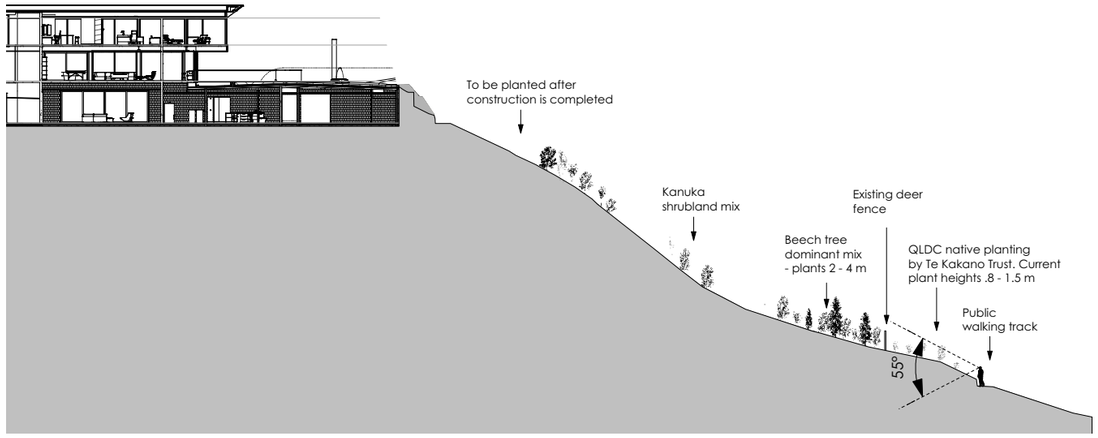
Plant growth based on current heights plus 400-500mm growth per year when irrigated.
Cross Sections CS1-Indicative Plant Growth after 10 Years
Scale1:250 @A1

Vectorworks file; Sanctuary Proj REV PLANS 23-02-2021

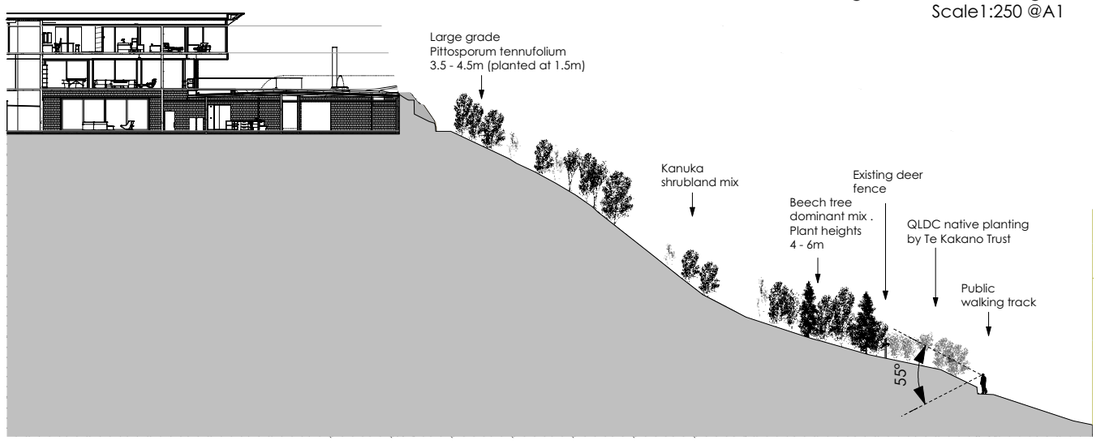
ANNABEL RILEY
LANDSCAPE ARCHITECT
021 1803 748 annabel@plotlandscape.co.nz 19 Tyndall Street, Wanaka 9305
PARKS • GARDENS • PLAYGROUNDS • DESIGN • SITE PLANNING • PROJECT MANAGEMENT

The Sanctuary Project

Cross Section 1 - Existing & Indicative Plant Growth 5 and 10 years

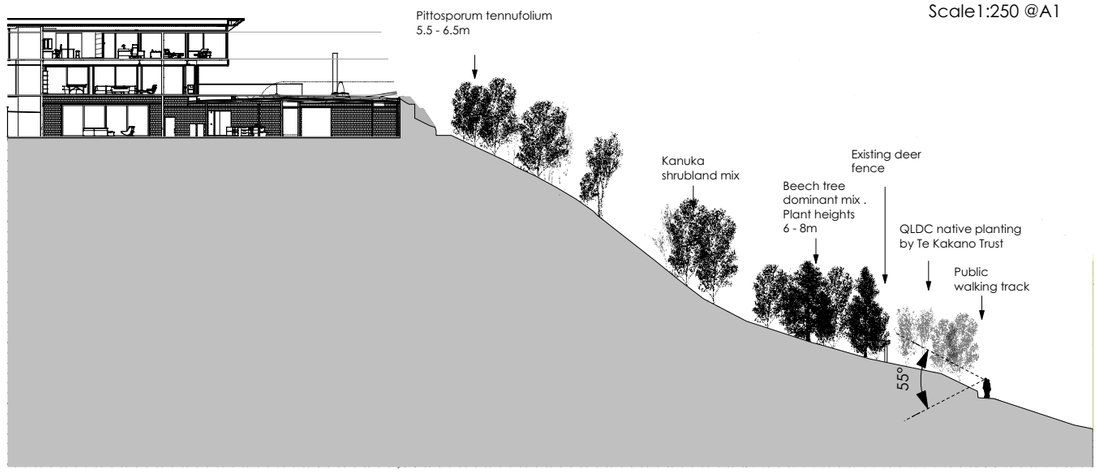


Cross Sections CS2 - Existing Indicative Plant Heights
Scale1:250 @A1



Plant growth based on existing heights plus 400-500mm growth per year when irrigated.

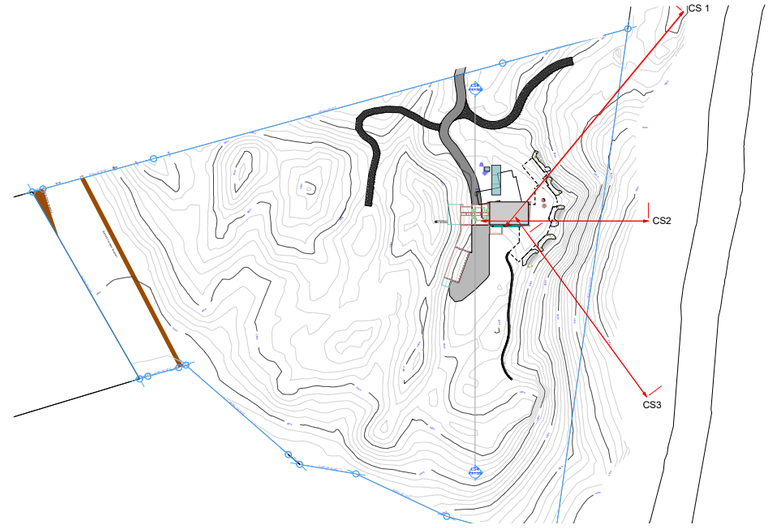
Cross Sections CS2-Indicative Plant Growth after 5 Years
Scale1:250 @A1



Plant growth based on current heights plus 400-500mm growth per year when irrigated.

Cross Sections CS2-Indicative Plant Growth after 10 Years
Scale1:250 @A1

ANNABEL RILEY
LANDSCAPE ARCHITECT
021 1803 746 annabel@plotlandscape.co.nz 19 Tyndall Street, Wanaka 9305
PARKS • GARDENS • PLAYGROUNDS • DESIGN • SITE PLANNING • PROJECT MANAGEMENT

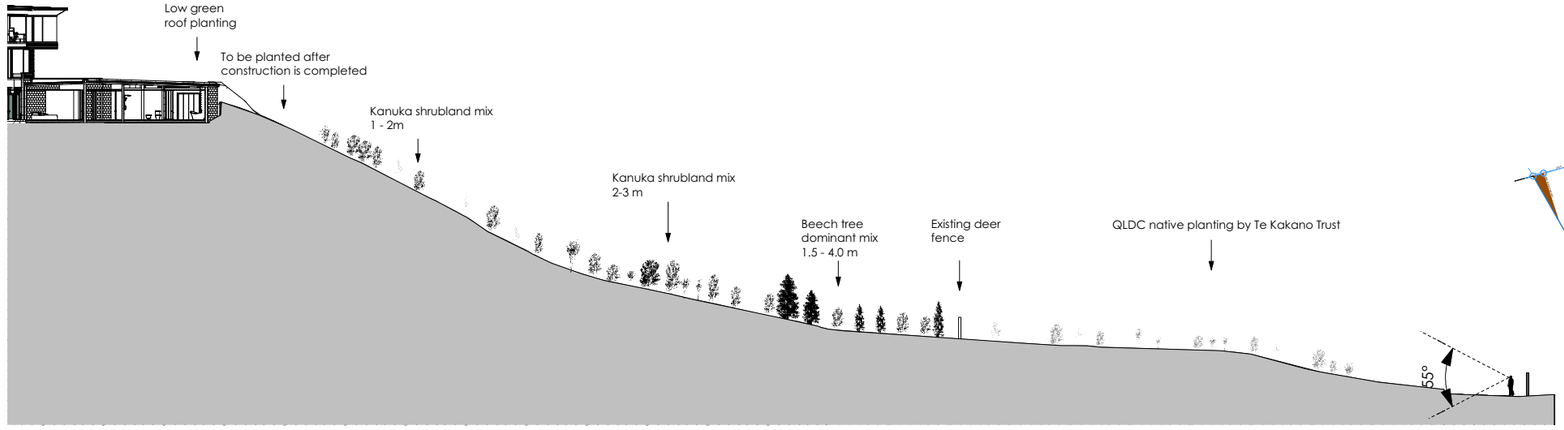


Site Plan - Cross Sections
Scale1:1800

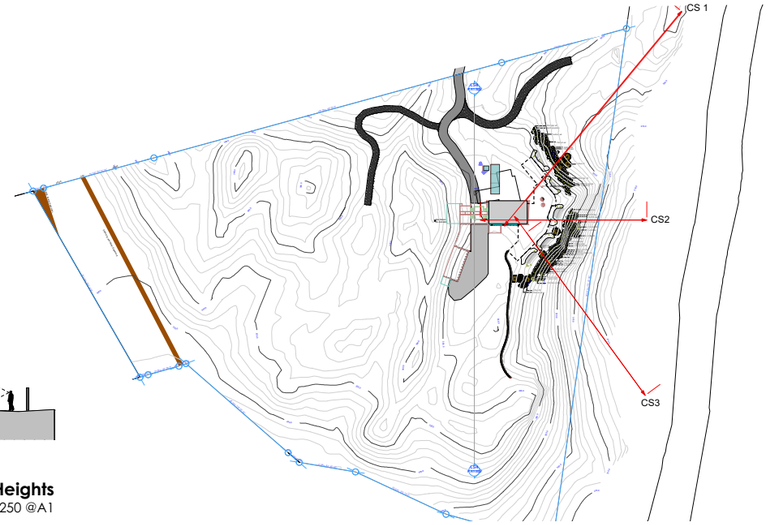
Vectorworks file; Sanctuary Proj REV PLANS 12-02-2021

The Sanctuary Project

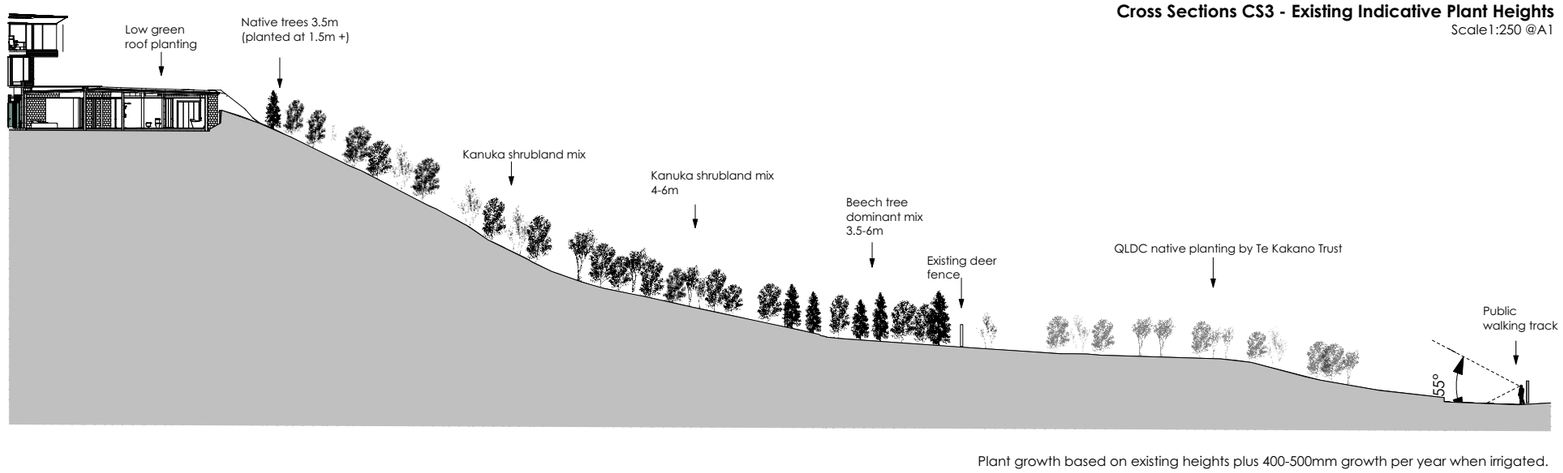
Cross Section 2 - Existing & Indicative Plant Growth 5 and 10 years



Cross Sections CS3 - Existing Indicative Plant Heights
Scale1:250 @A1

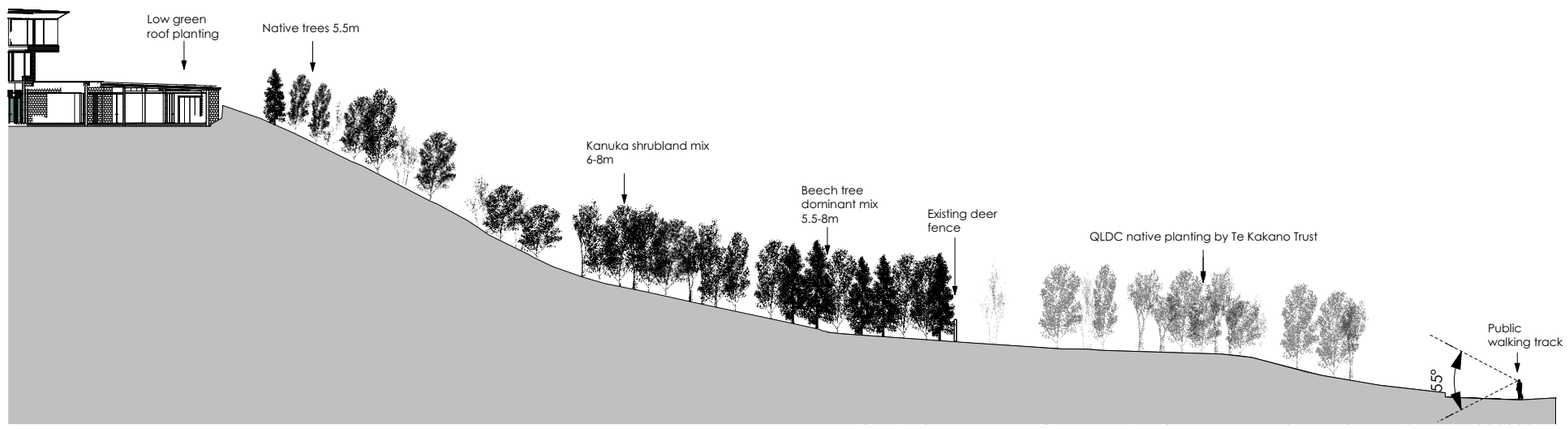


Site Plan - Cross Sections
Scale1:1800



Plant growth based on existing heights plus 400-500mm growth per year when irrigated.

Cross Sections CS3-Indicative Plant Growth after 5 Years
Scale1:250 @A1



Plant growth based on current heights plus 400-500mm growth per year when irrigated.

Cross Sections CS3-Indicative Plant Growth after 10 Years
Scale1:250 @A1

ANNABEL RILEY
LANDSCAPE ARCHITECT
021 1833 748 annabel@plotlandscape.co.nz 19 Tyndall Street, Wanaka 9305
PARKS • GARDENS • PLAYGROUNDS • DESIGN • SITE PLANNING • PROJECT MANAGEMENT

Vectorworks file; Sanctuary Proj REV PLANS 23-02-2021

The Sanctuary Project

Cross Section 3 - Existing & Indicative Plant Growth 5 and 10 years

rough & milne landscape architects

PD - Cross Section Indicative Plant Growth
Data Source: Plot Landscapes

N

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 26

LEGEND

- SITE
- SECTION OF GLENDHU BAY TRACK WALKED
- VIEWPOINT LOCATION
- VIEWPOINT LOCATION AND VISUAL SIMULATION LOCATION

rough & milne landscape architects

Viewpoint Location Aerial

Data Source: http://qldc.maps.arcgis.com

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 27

Viewpoint 1: Looking north towards site from boat ramp car park at 1.046km.
Date: 6 October 2020 **Time:** Between 10:00am and 3:00pm.

Viewpoint 2: Looking north towards site from beach at 956m.
Date: 6 October 2020 **Time:** Between 10:00am and 3:00pm.

Print full image at 1317mm wide for accurate viewing at 350mm reading distance

Refer to RD 500mm version for accurate viewing of this portion of image at 500mm reading distance

VIEWPOINT 3 - WALKING TRACK - EXISTING

VIEWPOINT 3 - WALKING TRACK - PROPOSED - 5 YEARS REVEGETATION

Proposed large grade beech trees, as per *Screening Cave Portals - Planting Plan* by Plot Landscape Architecture, shown at 10 years estimated growth. All other proposed planting shown at 5 years estimated growth. Estimated plant heights obtained from published information by Southern Woods Nursery, Canterbury.

Relative height / maturity of various planting areas may vary due to staging and interplanting with existing native vegetation, as indicated on *Existing and Proposed Planting Areas - Staging Plan* by Plot Landscape Architecture.

PHOTOGRAPH DETAILS: Rectilinear panorama composed of 21 frames (7 horizontal x 3 vertical). Horizontal FOV 124°, Vertical FOV 55°
CAMERA DETAILS: Canon 7DMkII, Sigma 30mm F1.4 Art Series Lens. Camera Sensor Crop Factor 1.6. FFS equivalent focal length of individual frames 48mm

CAMERA LOCATION: Northing 805394.6, Easting 370306.7 (Lindis Peak 2000), Elevation 297.1m (NZVD2016), Camera Height 1.55m above existing ground
VIEW DIRECTION: north-west
PHOTOGRAPH TAKEN: 7th October 2020, 10:54am

For correct viewing keep head pointed towards centre of photograph, and move eyes only to view periphery

rough & milne landscape architects

Viewpoint 3 Existing and Proposed

Camera: Canon EOS 7D Mark II **Focal Length:** 50mm **Print Size:** A3

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

For accurate reading distance of 500mm, print on A3 at actual size (do not 'fit' 'shrink' or scale)
For best results print with laser printer on high quality coated paper, minimum weight 170gsm

rough & milne landscape architects

Viewpoint 3 Existing View @ RD 500

Camera: Canon EOS 7D Mark II **Focal Length:** 50mm **Print Size:** A3

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 30

For accurate reading distance of 500mm, print on A3 at actual size (do not 'fit' 'shrink' or scale)
For best results print with laser printer on high quality coated paper, minimum weight 170gsm

rough & milne landscape architects

Viewpoint 3 Visual Simulation @ RD 500

Camera: Canon EOS 7D Mark II **Focal Length:** 50mm **Print Size:** A3

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 31

Viewpoint 4: Looking north towards site from track - views include Dippeys earthworks at 638m.
Date: 6 October 2020 **Time:** Between 10:00am and 3:00pm.

Viewpoint 5: Looking north towards site from track at 500m.
Date: 6 October 2020 **Time:** Between 10:00am and 3:00pm.

Viewpoint 6: Looking north towards site from track - below site at 162m.
Date: 6 October 2020 **Time:** Between 10:00am and 3:00pm.

Print full image at 1317mm wide for accurate viewing at 350mm reading distance

Refer to RD 500mm version for accurate viewing of this portion of image at 500mm reading distance

VIEWPOINT 7 - LOOKOUT - EXISTING

VIEWPOINT 7 - LOOKOUT - PROPOSED - 5 YEARS REVEGETATION

Proposed large grade beech trees, as per *Screening Cave Portals - Planting Plan* by Plot Landscape Architecture, shown at 10 years estimated growth. All other proposed planting shown at 5 years estimated growth. Estimated plant heights obtained from published information by Southern Woods Nursery, Canterbury.

Relative height / maturity of various planting areas may vary due to staging and interplanting with existing native vegetation, as indicated on *Existing and Proposed Planting Areas - Staging Plan* by Plot Landscape Architecture.

Height and spread of existing mature trees along site boundary have been digitally advanced in proposed view to represent 2.5 years estimated growth, at a rate of 500mm per year as advised by large-grade tree propogator and supplier Easy Big Trees, Southland.

PHOTOGRAPH DETAILS: Rectilinear panorama composed of 21 frames (7 horizontal x 3 vertical). Horizontal FOV 124°, Vertical FOV 55°
CAMERA DETAILS: Canon 7DMkII, Sigma 30mm F1.4 Art Series Lens. Camera Sensor Crop Factor 1.6. FFS equivalent focal length of individual frames 48mm

CAMERA LOCATION: Northing 806152.0m, Easting 369936.0m (Lindis Peak 2000), Elevation 305.0m (NZVD2016), Camera Height 1.55m above existing ground
VIEW DIRECTION: south-south-west
PHOTOGRAPH TAKEN: 6th October 2020, 2:36pm

For correct viewing keep head pointed towards centre of photograph, and move eyes only to view periphery

rough & milne landscape architects

Viewpoint 7 Existing and Proposed

Camera: Canon EOS 7D Mark II **Focal Length:** 50mm **Print Size:** A3

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 34

For accurate reading distance of 500mm, print on A3 at actual size (do not 'fit' 'shrink' or scale)
For best results print with laser printer on high quality coated paper, minimum weight 170gsm

rough & milne landscape architects

Viewpoint 7 Existing View @ RD 500

Camera: Canon EOS 7D Mark II **Focal Length:** 50mm **Print Size:** A3

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 35

For accurate reading distance of 500mm, print on A3 at actual size (do not 'fit' 'shrink' or scale)
For best results print with laser printer on high quality coated paper, minimum weight 170gsm

rough & milne landscape architects

Viewpoint 7 Visual Simulation @ RD 500

Camera: Canon EOS 7D Mark II **Focal Length:** 50mm **Print Size:** A3

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 36

Viewpoint 8: Looking west towards site and track from Ruby Island jetty at 1.34km.
Date: 6 October 2020 **Time:** Between 10:00am and 3:00pm.

Print full image at 1317mm wide for accurate viewing at 350mm reading distance

Refer to RD 500mm version for accurate viewing of this portion of image at 500mm reading distance

VIEWPOINT 9 - RUBY ISLAND BBQ AREA - EXISTING

VIEWPOINT 9 - RUBY ISLAND BBQ AREA - PROPOSED - 5 YEARS REVEGETATION

Proposed large grade beech trees, as per *Screening Cave Portals - Planting Plan* by Plot Landscape Architecture, shown at 10 years estimated growth. All other proposed planting shown at 5 years estimated growth. Estimated plant heights obtained from published information by Southern Woods Nursery, Canterbury.

Relative height / maturity of various planting areas may vary due to staging and interplanting with existing native vegetation, as indicated on *Existing and Proposed Planting Areas - Staging Plan* by Plot Landscape Architecture.

PHOTOGRAPH DETAILS: Rectilinear panorama composed of 21 frames (7 horizontal x 3 vertical). Horizontal FOV 124°, Vertical FOV 55°
CAMERA DETAILS: Canon 7DMkII, Sigma 30mm F1.4 Art Series Lens. Camera Sensor Crop Factor 1.6. FFS equivalent focal length of individual frames 48mm

CAMERA LOCATION: Northing 805780.2m, Easting 371180.0m (Lindis Peak 2000), Elevation 268.1m (NZVD2016), Camera Height 1.55m above existing ground
VIEW DIRECTION: west north-west
PHOTOGRAPH TAKEN: 7th October 2020, 9:13am

For correct viewing keep head pointed towards centre of photograph, and move eyes only to view periphery

rough & milne landscape architects

Viewpoint 9 Existing and Proposed

Camera: Canon EOS 7D Mark II **Focal Length:** 50mm **Print Size:** A3

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 38

For accurate reading distance of 500mm, print on A3 at actual size (do not 'fit' 'shrink' or scale)
For best results print with laser printer on high quality coated paper, minimum weight 170gsm

For accurate reading distance of 500mm, print on A3 at actual size (do not 'fit' 'shrink' or scale)
For best results print with laser printer on high quality coated paper, minimum weight 170gsm

rough & milne landscape architects

Viewpoint 9 Visual Simulation @ RD 500

Camera: Canon EOS 7D Mark II **Focal Length:** 50mm **Print Size:** A3

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 40

Viewpoint 10: Looking west towards site and track from Ruby Island lookout at 1.197km.
Date: 6 October 2020 **Time:** Between 10:00am and 3:00pm.

Viewpoint 11: Looking west towards site and track from Lake Wanaka - at a distance of 326.7m.
Date: 6 October 2020 **Time:** Between 10:00am and 3:00pm.

Viewpoint 12: Looking west towards site and track from Lake Wanaka - at a distance of 430m.
Date: 6 October 2020 **Time:** Between 10:00am and 3:00pm.
NB: Single Frame taken with wide angle lens. Panorama not possible due to boat movement. Refer to sheet 43 for printing and reading distance.

Print this page at A3 (image 400mm wide) for accurate viewing at 300mm reading distance

Refer to RD 500mm version for accurate viewing of this portion of image at 500mm reading distance

VIEWPOINT 12 - LAKE WANAKA - EXISTING

PHOTOGRAPH DETAILS: Single frame photograph. Horizontal FOV 68° 40', Vertical FOV 48°
CAMERA DETAILS: Canon 7DMkII, Canon EF-S 17-55mm f/2.8 IS USM Lens set to shortest focal length. Camera Sensor Crop Factor 1.6. FFS equivalent focal length 27.2mm

CAMERA LOCATION: Northing 805898.6m, Easting 370280.9m (Lindis Peak 2000), Elevation 270.0m (NZVD2016)
VIEW DIRECTION: west-north-west
PHOTOGRAPH TAKEN: 7th October 2020, 10:01am

rough & milne landscape architects

Viewpoint 12 Existing View @ RD 500

Camera: Canon EOS 7D Mark II **Focal Length:** 50mm **Print Size:** A3

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 43

Print this page at A3 (image 400mm wide) for accurate viewing at 300mm reading distance

Refer to RD 500mm version for accurate viewing of this portion of image at 500mm reading distance

VIEWPOINT 12 - LAKE WANAKA - PROPOSED - 5 YEARS REVEGETATION

Proposed large grade beech trees, as per *Screening Cave Portals - Planting Plan* by Plot Landscape Architecture, shown at 10 years estimated growth. All other proposed planting shown at 5 years estimated growth. Estimated plant heights obtained from published information by Southern Woods Nursery, Canterbury.

Relative height / maturity of various planting areas may vary due to staging and interplanting with existing native vegetation, as indicated on *Existing and Proposed Planting Areas - Staging Plan* by Plot Landscape Architecture.

PHOTOGRAPH DETAILS: Single frame photograph. Horizontal FOV 68° 40', Vertical FOV 48°
CAMERA DETAILS: Canon 7DMkII, Canon EF-S 17-55mm f/2.8 IS USM Lens set to shortest focal length. Camera Sensor Crop Factor 1.6. FFS equivalent focal length 27.2mm

CAMERA LOCATION: Northing 805898.6m, Easting 370280.9m (Lindis Peak 2000), Elevation 270.0m (NZVD2016)
VIEW DIRECTION: west-north-west
PHOTOGRAPH TAKEN: 7th October 2020, 10:01am

rough & milne landscape architects

Viewpoint 12 Visual Simulation @ RD 500

Camera: Canon EOS 7D Mark II **Focal Length:** 50mm **Print Size:** A3

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

SHEET 44

Viewpoint 13: Looking west towards site and track from Lake Wanaka - at a distance of 551.8m.
Date: 6 October 2020 **Time:** Between 10:00am and 3:00pm.

Viewpoint 14: Looking west towards site and track from Lake Wanaka - at a distance of 955.39m.
Date: 6 October 2020 **Time:** Between 10:00am and 3:00pm.

Viewpoint 15: Looking northeast towards site from Roys Peak track.
Date: 1 February 2021 **Time:** 4pm.

rough & milne landscape architects

Viewpoint Location Photographs
Camera: Canon EOS 7D Mark II **Focal Length:** 50mm **Print Size:** A3

Proposed Replacement Dwelling, 492 Wanaka - Mt Aspiring Road, Wanaka
June 2021

BATCHELAR McDOUGALL CONSULTING
Structural & Civil Engineers

The Sanctuary Project – 492 Mount Aspiring Road, Wanaka

INFRASTRUCTURE REPORT

Client Name: Nature Preservation Trustee Ltd

BMC Reference: 1908-2728

Date Issued: 16/02/2021

Christchurch Office: Level 3, 335 Lincoln Road, Addington, Christchurch, 8024 +64 3 338 3351

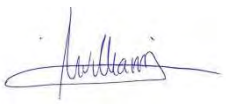
Wanaka Office: 2 Sir Tim Wallis Drive, Wanaka, 9305 +64 3 443 4531

Quality Statement and Document Control

This Infrastructure Report has been prepared for Nature Preservation Trustee Ltd by Batchelar McDougall Consulting Ltd. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other parties.

This disclaimer shall apply notwithstanding that the documents may be made available to other persons for an application for permission or approval to fulfil a legal requirement.

Issue Register:

Revision	Date	Description		
D	16/02/2021	Description: The Sanctuary Project - 492 Mount Aspiring Road, Wanaka		
		Prepared by	Reviewed by	Approved by
	Name	Peter Hall	Matthew John Williams	Graham McDougall
	Signature	 *Senior Technician / Structural Engineer* *BSc(Hons)*	 *BE(Hons) PGCert(Eng) CMEngNZ*	 *Director*

Revision History:

Rev. No	Date	Issue Description	Prepared by	Reviewed by
C	18/07/2018	Issued for Resource Consent	PJH	MJW
B	29/05/2018	Issued for Resource Consent	PJH	MJW
A	22/11/2017	Issued for Resource Consent	HCS	MJW
		(note – Rev A to C issued under project 1612-2116)		

TABLE OF CONTENTS:

1 Scope of Our Engagement

BMC have been engaged by Nature Preservation Trustee Ltd to design the stormwater drainage system and on-site wastewater systems for the proposed Sanctuary Project in Wanaka, New Zealand (Lot 2 DP 395762).

2 Site Description

2.1 **Location / setting**

The proposed dwelling is to be located at 492 Wanaka - Mt Aspiring Road, Wanaka (Lot 2 DP 395762).

Figure 1: Location map

2.2 **Geotechnical Investigation**

Refer to separate Geotechnical Report for the site, issued February 2021 from Geosolve Ltd.

3 The Development

House Plan Dimensions:	950m^2
Paved landscape / driveway area	2100m^2
Total Plan Area:	3050m^2
(including all floor areas but excluding roof)	3830m^2
No. Bedrooms:	5-6

Figure 2: 492 Mt Aspiring Rd, Wanaka - Topographic Plan

4 Water Supply

There is no existing mains water supply servicing the development. The existing supply is through an easement from the adjacent LOT however, this is to be terminated with the proposal to construct a bore on site for purpose of accessing ground water to supply to the proposed development. This has been granted consent from Otago Regional Council (Consent No. RM18.062.01), refer to Section 9 Appendix – ORC Bore Consent.

The proposed site of the bore is >50m from any effluent dispersal bed.

5 Stormwater

As there is no reticulated stormwater drainage system, all stormwater runoff will be collected in Cirtex 'SmartSoak' Residential Stormwater Management System modules, providing for stormwater soakage into the ground. Refer to Section 10 Appendix – Stormwater Calculations & HIRDS Analysis.

6 Firefighting

The proposed dwelling has fire truck access to within approximated 110m from a fire hydrant. The building has a Fire water classification of FW2 in accordance with SNZ PAS 4509:2003: New Zealand Fire Service Firefighting Water Supplies Code of Practise.

6.1 **Firefighting water demand**

For a building with classification of FW2, 45m3 of water is required for firefighting. This will be provided by three Promax 30,000ltr underground water tanks for firefighting and irrigation, of which 45m^3 (45,000l) shall be dedicated to fire fighting

There will also need to be a firefighting hardstand adjacent to the fire tanks. Refer to Section 13 Appendix – Topographical Plan & On-site Drainage & Wastewater Disposal Plan for locations of tanks and hardstand.

7 On-site Wastewater (OSWW)

As the proposed use of the site does not exceed 2,000 Litres of waste water per day, discharge of human waste is a permitted activity in this area in accordance with rule 12.A.1.4 of the Otago Regional Council Regional Plan: Water, therefore, will not require consent from the Otago Regional Council.

The proposed dwelling will have 5 - 6 bedrooms. In accordance with AS/NZS1547:2012 this equates to a maximum design occupancy of 10 people. This would produce a daily wastewater flow of up to 2,000L / day (based on 200 L / person / day, ASNZS1547:2012 table H3).

Refer to Section 11 Appendix – On-site Wastewater Disposal Application

7.1 Proposed Wastewater Treatment System

We recommend that a secondary treatment system is used. This system will provide two stages: the initial septic tank stage will allow heavy solids to undergo anaerobic digestion, whilst the second stage will provide treatment through physical and aerobic biological processes.

The proposed system uses an Innoflow treatment system comprised of an initial 6,000 L tank followed by 2 x Advantex AX20 treatment units (see Section 12 Appendix – AdvanTex AX20 Design Criteria, Owner's Manual for specifications) which meets this requirement, however alternative / equivalent systems can be negotiated provided that they meet this requirement and are certified for a minimum of 2000 L/day.

7.2 Proposed Effluent Dispersal System

BMC propose that a pump-dosed dispersal to a conventional bed system is used to distribute the treated wastewater to the ground. Refer to Section 11 Appendix – On-site Wastewater Disposal Application for design information, and Section 13 Appendix – Topographical Plan & On-site Drainage & Wastewater Disposal Plan for a proposed system layout.

The disposal area will be located to the terraced area at the northeast corner of the site and will take up approximately 40m^2 of area, adjacent to the Innoflow treatment tanks. This terraced area also allows for a 100% reserve area.

8 Appendix - Geotechnical Report

(Not appended as per previous reports – please refer to separate Geotechnical Report, issued from GeoSolve in February 2021)

9 Appendix – ORC Bore Consent

Otago Regional Council

Our reference: A1091920 Consent No. RM18.062.01

LAND USE CONSENT

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

Name: Nature Preservation Trustee Limited

Address: Aspiring Law Limited, 62 Ardmore Street, Wanaka

To construct up to two bores including one production bore

For the purpose of accessing ground water

For an unlimited term

Location of consent activity: Site 1: Wanaka, approximately 1.4 kilometres southeast of the intersection of Wanaka-Mount Aspiring Road and Ruby Island Road
Site 2: Wanaka, approximately 1.4 kilometres southeast of the intersection of Wanaka-Mount Aspiring Road and Ruby Island Road

Legal description of consent location: Lot 2 DP 395762

GPS location: Within a 20 metre radius of Site 1: NZTM 2000: E1289861 N5045009
Site 2: NZTM 2000: E1289921 N5045002

Conditions

Specific

1. If this consent is not given effect to within a period of two years from the date of commencement of this consent, this consent shall lapse under Section 125 of the Resource Management Act 1991. The consent shall attach to the land to which it relates.
2. Any bore tag provided to the consent holder by the Consent Authority must be attached to the production bore within two weeks of completion of the bore construction. The consent holder shall ensure the bore tag is attached to the bore and in good condition at all times.
3. Copies of the results of any water quality analyses performed on the groundwater shall be forwarded to the Consent Authority within two weeks of the analysis being undertaken.
4. Work carried out during the construction of the bore shall be to the New Zealand Standard "Environmental Standard for Drilling of Soil and Rock" NZS 4411:2001.
5. In each bore there shall be adequate facility and access for future vertical lowering of a 20 millimetre diameter electric plumb bob for the purpose of measuring water level, or a facility which allows pressure readings.

6. In each bore there shall be adequate facility and access for future water quality sampling such as a hand operated tap/valve that is sourced from the direct pump outlet, before the reticulation encounters pressure tanks/reservoir/treatment plant. Where there is reticulation back pressure at the bore head, a one way valve shall be fitted for maximum efficiency and in that case, the water sampling point shall be on the bore pump side of the one way valve.

Performance Monitoring

7. At the completion of drilling, of the production bore and any abandoned, backfilled and sealed drill holes, the consent holder shall forward the following information to the Consent Authority:
   (a) A clear color photograph of the bore diameter, including a measuring device to show scale,
   (b) Clear colored photographs showing compliance with condition 2, 5, 6 and 8,
   (c) An accurate site map showing the location of all drill holes and site access,
   (d) Clear colored photographs showing the GPS location at each drill hole,
   (e) Fully completed bore log forms for each drill hole, and
   (f) Copies of the results of any pumping tests carried out.

General

8. The bore's head casing and reticulation shall be suitably constructed and sealed to avoid ingress of surface water and other foreign matter.
9. This consent only authorises the construction of one production bore. The bore's integrity shall be maintained at all times unless abandoned. If a bore is abandoned, or any drill holes not required, the bore shall be appropriately sealed/grouted and backfilled, and any drill holes not required shall be backfilled, to prevent contaminants from entering the bore or drill hole at any level.

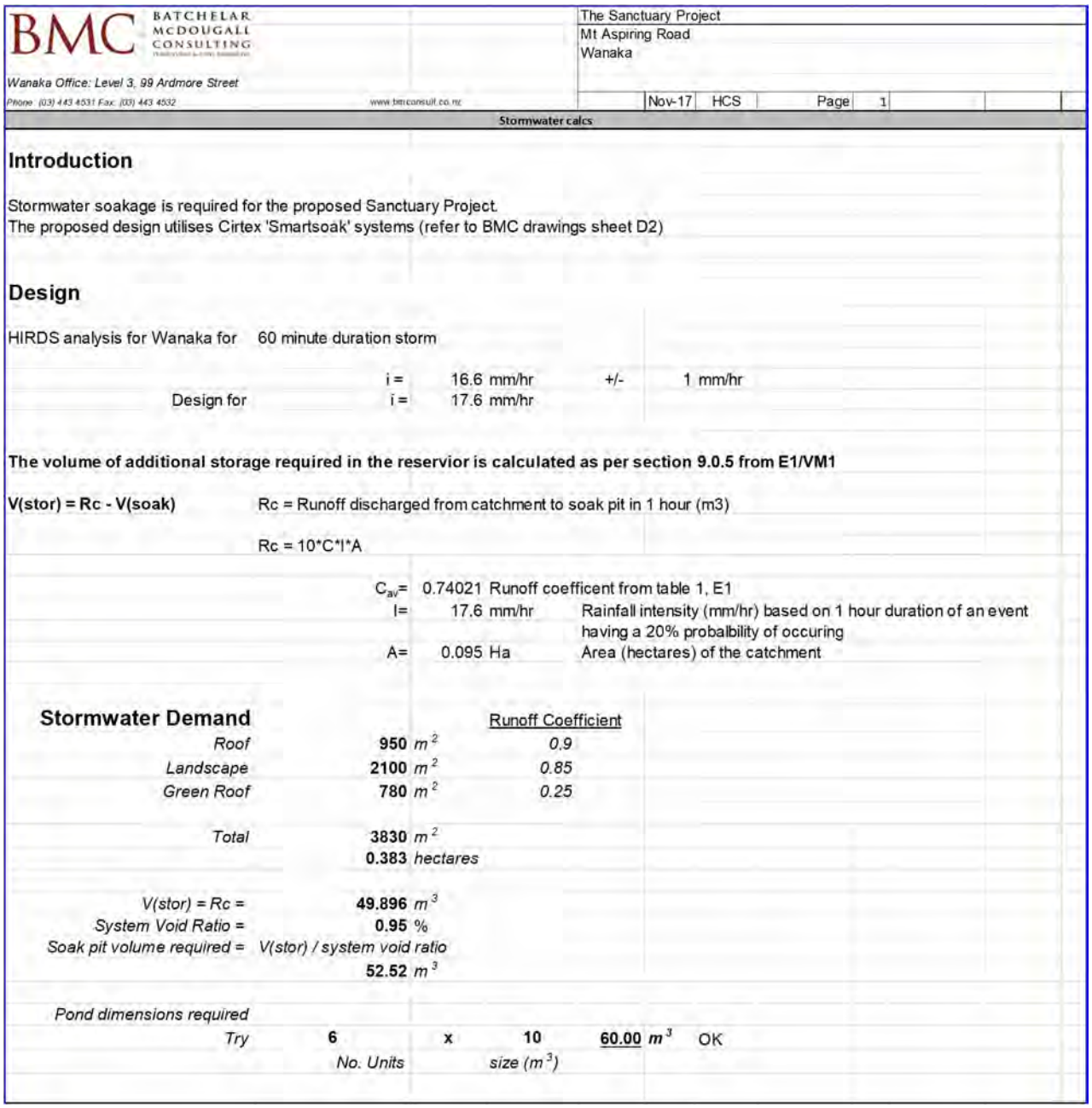
Notes to Consent Holder

1. *If there is a discharge of contaminants, including human sewage, onto land within 50 metres of a bore used to supply water for domestic purposes or drinking water for livestock, a resource consent may be required for the discharge under the Regional Plan: Water for Otago.*
2. *If there is a discharge of contaminants, including contaminants from offal pits, farm landfills, silage production and greenwaste landfills, onto land within 100 metres of a bore used to supply water for domestic purposes or drinking water for livestock, a resource consent may be required for the discharge under the Regional Plan: Waste.*
3. *The granting of this bore permit does not infer or guarantee that water will be available for abstraction once the bore is constructed*

Issued at Dunedin this 1st day of March 2018

Marian Weaver
Resource Manager Procedures & Protocols

10 Appendix – Stormwater Calculations & HIRDS Analysis



BMC BATCHELAR McDOUGALL CONSULTING

Wanaka Office: Level 3, 99 Ardmore Street
Phone (03) 443 4531 Fax (03) 443 4532 www.bmconsult.co.nz

The Sanctuary Project
Mt Aspiring Road
Wanaka

Nov-17 | HCS | Page 1

Stormwater calcs

Introduction

Stormwater soakage is required for the proposed Sanctuary Project.
The proposed design utilises Cirtex 'Smartsoak' systems (refer to BMC drawings sheet D2)

Design

HIRDS analysis for Wanaka for 60 minute duration storm

i = 16.6 mm/hr +/- 1 mm/hr
Design for i = 17.6 mm/hr

The volume of additional storage required in the reservior is calculated as per section 9.0.5 from E1/VM1

V(stor) = Rc - V(soak) Rc = Runoff discharged from catchment to soak pit in 1 hour (m3)

Rc = 10*C*I*A

C_{av} = 0.74021 Runoff coefficent from table 1, E1
I = 17.6 mm/hr Rainfall intensity (mm/hr) based on 1 hour duration of an event having a 20% probalbility of occuring
A = 0.095 Ha Area (hectares) of the catchment

Stormwater Demand		Runoff Coefficient
Roof	**950** m^2	*0.9*
Landscape	**2100** m^2	*0.85*
Green Roof	**780** m^2	*0.25*
Total	**3830** m^2	
	0.383 *hectares*	

V(stor) = Rc = **49.896** m^3
System Void Ratio = **0.95** %
Soak pit volume required = *V(stor) / system void ratio*
52.52 m^3

Pond dimensions required

Try	**6**	**x**	**10**	**60.00** m^3	OK
	No. Units		*size* (m^3)		

Figure 3: Stormwater Design Calculation

NIWA Taihoro Nukurangi

High Intensity Rainfall System V3

Calculator Help

Results for The Sanctuary Project

Intensity-Duration-Frequency results (produced on Monday 20th of November 2017)
Sitename: The Sanctuary Project
Coordinate system: NZMG
Easting: 2199756
Northing: 5606727

Rainfall intensities (mm/h)

		Duration									
ARI (y)	**aep**	**10m**	**20m**	**30m**	**60m**	**2h**	**6h**	**12h**	**24h**	**48h**	**72h**
1.58	0.633	16.8	12.9	10.8	8.2	6.2	4.0	3.0	2.3	1.4	1.1
2.00	0.500	18.6	14.1	11.8	8.9	6.8	4.3	3.2	2.4	1.5	1.1
5.00	0.200	24.6	18.3	15.6	11.7	8.7	5.4	4.0	2.9	1.8	1.4
10.00	0.100	29.4	21.9	18.6	14.0	10.2	6.2	4.6	3.3	2.0	1.5
20.00	0.050	34.8	26.1	22.0	16.6	12.0	7.2	5.2	3.8	2.3	1.7
30.00	0.033	38.4	28.8	24.4	18.3	13.2	7.8	5.6	4.0	2.5	1.9
40.00	0.025	40.8	30.9	26.0	19.6	14.1	8.3	5.9	4.2	2.6	2.0
50.00	0.020	43.2	32.4	27.4	20.7	14.8	8.7	6.2	4.4	2.7	2.0
60.00	0.017	45.0	33.9	28.8	21.6	15.4	9.0	6.4	4.6	2.8	2.1
80.00	0.012	48.6	36.3	30.8	23.1	16.4	9.5	6.7	4.8	2.9	2.2
100.00	0.010	51.0	38.4	32.4	24.4	17.2	10.0	7.0	5.0	3.0	2.3

Coefficients

c1	c2	c3	d1	d2	d3	e	f
-0.0004	-0.0215	-0.0002	0.5911	0.5981	0.2941	0.2373	2.1033

log(h(D))

10m	20m	30m	60m	2h	6h	12h	24h	48h	72h
1.792	1.099	0.693	0.000	-0.693	-1.792	-2.485	-3.178	-3.871	-4.277

Standard errors (mm/h)

		Duration									
ARI (y)	**aep**	**10m**	**20m**	**30m**	**60m**	**2h**	**6h**	**12h**	**24h**	**48h**	**72h**
1.58	0.633	3.1	1.5	1.0	0.5	0.3	0.1	0.1	0.0	0.0	0.0
2.00	0.500	3.1	1.6	1.0	0.5	0.3	0.1	0.1	0.0	0.0	0.0
5.00	0.200	3.1	1.6	1.1	0.6	0.3	0.2	0.1	0.1	0.0	0.0
10.00	0.100	3.2	1.7	1.2	0.7	0.4	0.2	0.1	0.1	0.0	0.0
20.00	0.050	3.5	2.0	1.5	1.0	0.5	0.3	0.2	0.1	0.1	0.0
30.00	0.033	3.8	2.2	1.7	1.2	0.5	0.3	0.2	0.1	0.1	0.1
40.00	0.025	4.0	2.5	1.9	1.4	0.6	0.4	0.3	0.2	0.1	0.1
50.00	0.020	4.3	2.7	2.2	1.5	0.7	0.4	0.3	0.2	0.1	0.1
60.00	0.017	4.5	2.9	2.3	1.7	0.7	0.5	0.3	0.2	0.1	0.1
80.00	0.012	5.0	3.3	2.7	1.9	0.8	0.5	0.3	0.2	0.1	0.1
100.00	0.010	5.3	3.6	3.0	2.2	0.9	0.6	0.4	0.2	0.1	0.1

Figure 4: HIRDS analysis for the Sanctuary Project

11 Appendix – On-site Wastewater Disposal Application

AF OSW Onsite Wastewater Disposal Application Form

INTRODUCTION

The objective of this form is to collate the required information that will support QLDC with evaluating the risk of the proposed Onsite Wastewater Disposal system in terms of Building Code compliance (G13), RMA Act and Environmental and Public Health requirements.

REFERENCES

The design standard for waste water treatment and effluent disposal systems is **AS/NZS 1547:2012**. All references within this form relate to this standard.

RISK BASED APPROACH

QLDC has adopted a risk based approach which involves evaluating key factors relating to the system design and site and soil features to ensure that any risk to environment or public health is fully mitigated. The key potential risks that QLDC will consider include, but are not limited to, the following:

High risks

- Pathogen risks

Moderate risk

- Odours
- Loss of amenity service due to technology failure, power outage
- High capital and/or operating costs

Minor risks

- Slope instability on the steeper sites
- Noise
- Risk to cultural values
- Nutrients (nitrogen and phosphorus) and emerging contaminants

HIGH RISK APPLICATIONS

Throughout this application form there are a number of information fields that are highlighted in red. These relate to key risk factors that the system designer must consider during their design process. If these risks are present then an explanation of what design mitigations have been taken is required.

For systems that breach the requirements of Section 3, you will be required to raise an application with the Otago Regional Council for a Resource Consent. Once the ORC Resource Consent has been granted it can be referenced as part of the QLDC Building Consent Application.

QLDC reserves the right to engage expert peer review of applications that are either very high risk, or system designs which appear to have inadequate design mitigations in place. The cost of this will be on-charged to the applicant as part of their building consent fees.

APPLICATION FORM CONTENTS

1 SITE DESCRIPTION

Property Owner:	Nature Preservation Trustee Ltd
Location Address:	492 Wanaka-Mt Aspiring Rt, Wanaka
Legal Description (e.g. Lot3 DP1234) :	Lot 2 DP 395762
List any existing consents related to waste disposal on the site:	No information available on QLDC eDocs however, we note that there is an existing house on the site so there should be existing consents.
General description of development and describe all sources of wastewater:	New 5-6 bedroom dwelling

2 SITE ASSESSOR, DESIGNER AND INSTALLER DETAILS

2.1 SITE ASSESSOR

Company	Geosolve Ltd		
Contact Name	Fraser Wilson	Phone	03 451 0172
Qualifications/Technical Experience	Senior Engineering Geologist		

2.2 SYSTEM DESIGNER

Company	Innoflow		
Contact Name	Click here to enter primary contact name	Phone	09 426 1027
Qualifications/Technical Experience	Click here to enter relevant qualifications or brief summary of technical experience that verifies they are suitably qualified to perform the role		

2.3 SYSTEM INSTALLER

Company	To be confirmed		
Contact Name	Click here to enter primary contact name	Phone	Phone Number
Qualifications/Technical Experience	Click here to enter relevant qualifications or brief summary of technical experience that verifies they are suitably qualified to perform the role		

2.4 SERVICING TECHNICAN/COMPANY

Company	To be confirmed	Phone	Phone Number

3 ORC RESOURCE CONSENT REQUIREMENTS:

Please complete below checklist to confirm whether an Otago Regional Council (ORC) resource consent will be required to discharge domestic waste water in the Queenstown Lakes District:

Yes	No	System Requirement
☐	☒	Daily discharge volume exceeds 2,000 litres per day
☐	☒	Discharge will occur in a groundwater protection zone or in the Lake Hayes catchment
☐	☒	Discharge will occur within 50 metres of a surface water body
☐	☒	Discharge will occur within 50 metres of an existing bore/well used to supply water for domestic needs or drinking water for livestock
☐	☒	There will be a direct discharge into a drain, water race or groundwater
☐	☒	Discharge may runoff onto another persons' property

If any of these apply then you will need to make an ORC resource consent application for domestic wastewater discharges to land with a maximum volume of 14,000 litres. The application form for this is Form 6A.

Once the ORC consent has been granted please enter the reference number below and provide a copy of the approved ORC consent.

ORC Resource Consent Number:	Click here to enter resource consent number.

4 SITE ASSESSMENT DETAILS

For the areas where the treatment plant and land application system and reserve area are to be located, please provide the following information:

Land use description:	Residential Section
Topography:	-
Slope angle:	Site slopes to the East
Vegetation cover:	Grass
Are there areas of potential ponding?	None
Are there risks associated with drainage patterns and overland flow paths?	Nil

Does site have Flood potential? (show with return period on site plan)	☐ **Yes** ☒ **No** If Yes, please provide information below on what design considerations have been adopted to mitigate this risk (e.g. elevated tanks, sealed lids etc.)	
	Click here to enter design mitigations.	
Is the system within 100m distance to nearest open water bodies, emphemeral streams and wetland?	☐ **Yes** ☒ **No** If Yes, please provide information below on what design considerations have been adopted to mitigate this risk.	
	Click here to enter design mitigations.	
Is the system within 50m distance to stormwater drains and stormwater soakage areas?	☐ **Yes** ☒ **No** If Yes, please provide information below on what design considerations have been adopted to mitigate this risk.	
	Click here to enter design mitigations.	
Are Water bores within 50m? (reference ORC Maps)	☐ **Yes** ☒ **No** If Yes then an ORC resource consent is required	
Are there are other key site features that may affect the system design?	Nil	
Slope stability assessment- For land slopes greater than 15° (25%) summarize any areas unsuitable for waste water irrigation.	Dispersal field not located on slopes greater than 15° - New replaced existing in same location.	
What is the depth to the highest potential ground water level:	Summer:	Click here to enter text.
	Winter:	Click here to enter text.
	Information Source:	Water at 24m, 48m with main flow at 57-62m
Is there potential for waste water to short circuit through permeable soils to surface and / or ground water?	☐ **Yes** © **No** If Yes, please provide information below on what design considerations have been adopted to mitigate this risk.	
	Click here to enter design mitigations.	

5 SOIL INVESTIGATION

For the areas where the land application system and reserve area are to be located, provide the following information

Has a Site Specific Field investigation been completed? Is Report attached?	☑ Yes ☐ No Note: Report shall include a plan showing test pit or bore location, and a detailed soils report in accordance with Table B2 and Figure B1 or and equivalent format and detail. Photos of the profiles and soils shall be included including photos of soil ribbon tests (Section E4.1)
Field investigation date:	07/02/2017
Number of test pits or bores:	11
If fill material was encountered during the soil investigation, describe the fill material and explain how this will impact on the waste water land application system design and performance?	Nil
Has the soil permeability beneath the proposed land application field been tested?	☐ Yes ☑ No If Yes please provide details of test method and results (e.g. Percolation test method (refer to B6 for applicability):
	Click here to enter design mitigations.

6 SOIL CATEGORY

Based on the site investigation report please confirm the soil category that is present for the land application system.

Select One	Soil Category (Table 5.1)	Soil Texture *(Appendix E)*	Drainage Characteristic	Risk limits for Groundwater Setback
☐	**1**	Gravel and sands	Rapid	**5m**
☐	**2**	Sandy loams	Free	**5m**
☒	**3**	Loams	Good	**1.5m**
☐	**4**	Clay loams	Moderate	**1.5m**
☐	**5**	Light clays	Moderate to slow	**0.6m**
☐	**6**	Medium to heavy clays	Slow	**0.6m**

Is the groundwater level (refer section 4) within the above risk limits for the site?	☐ Yes ☒ No If Yes, please provide information below on what system design considerations have been adopted to mitigate the risk to groundwater. For example: • Secondary treatment • Tertiary UV treatment • Modified trench or bed details for category 1 soils to ensure even distribution
	Click here to enter design mitigations.

Note: The soil category and groundwater level will determine the required loading rate for the land application system. This needs to be specified in section 7.2 and should be referenced from L1, M1 or N1 tables.

7 SYSTEM DESIGN

7.1 SYSTEM INPUT INFORMATION

Property Water Supply	☐ Council reticulation ☒ Water bore ☐ Rainwater collection ☐ Other- please provide details: Click to enter text.
Total number of bedrooms that will be serviced by the system	5-6
Maximum design occupancy	10

Flow allowance litres / day per person: Refer to Appendix H, Table H3 and H4. Justify variations.	200
List any water conservation devices or water recycling details and volume estimates (Table H3):	Nil
Specify flow allowance for any other activity on the site such as spa baths, luxury showers etc:	Nil
List any allowance for seasonal variations and loads:	Nil
Total design flow allowance (litres per day):	2000 Note: If above 2,000 litres per day an ORC resource consent is required

7.2 SYSTEM SELECTION & CAPACITY

Select One	Proposed Treatment System	Manufacturers Details	No. of Chambers and Capacity (litres)	Emergency Storage (litres)
☐	Primary System (e.g. Septic tank)	Click here to enter text.	Chambers & Litres	Litres
☒	Secondary Treatment system[1]	AdvanTex AX20 Treatment system (2 Units)	12000 liter, 2 compartments	3000
☐	Tertiary Treatment System	Click here to enter text.	Chambers & Litres	Litres
☐	Other:	Click here to enter text.	Chambers & Litres	Litres
Rated treatment capacity of the system (litres/day):				
Details of effluent filter:		AdvanTex AX20 filter		

[1] For on-site wastewater management systems requiring secondary or better treatment, QLDC strongly recommends that applicants select treatment plants certified by the On-site Effluent Treatment National Testing Programme (OSET NTP), or an equivalent or better independent certifying organisation. These have been verified as meeting the secondary effluent treatment requirements of AS/NZS 1547.

Select One	Proposed Land Application System	Design Description. Please attach site plans/drawings	Design Loading Rate mm/day (DLR or DIR)
☐	~~Surface dripper irrigation~~	NOT PERMITTED IN QLDC DUE TO FREEZING	N/A
☐	Sub-surface dripper irrigation	NOTE: MUST BE MINIMUM OF 300mmTO PREVENT FREEZING	
←	Conventional Bed	40 sq.m area bed, 2.5m wide x 16m long	50 mm/day for secondary
☐	Conventional trench	Click here to enter text.	Click to enter DLR or DIR
☐	Deep trench	Click here to enter text.	Click to enter DLR or DIR
☐	Discharge control bed or trench	Click here to enter text.	Click to enter DLR or DIR
☐	Mound system	Click here to enter text.	Click to enter DLR or DIR
☐	Other (specify):	Click here to enter text.	Click to enter DLR or DIR

Note: The land application system site plans/drawings are to include dimensions, location, layout and component labels, cross-section details (with dimensions) and where appropriate; filter cloth, material type, structural details, flushing points, venting, valving, special fittings, intercepting drains and other detail specific to the design.

Select One	Proposed Loading Method	Details
☐	Trickle load, gravity	Click here to enter text.
☐	Gravity dosing: Flout, siphon or other	Click here to enter text.
☑	Pump	Orenco Biotube Pump Package
☐	Other	Click here to enter text.

7.3 ADDITIONAL SYSTEM REQUIREMENTS

Select One	Additional design considerations	Details
☐	Specify details or alarm system(s)	Click here to enter text.
☒	Specify available reserve area (5.5.3.4)	100% reserve area
☐	Specify fencing, warning signs and vegetation and planting requirements	Click here to enter text.
☐	Storm / surface water management:	Click here to enter text.
☐	Depths pipes to buried:	Click here to enter text.
☐	Flood protection:	Click here to enter text.
☐	Cut off / diversion drains (show on site plan):	Click here to enter text.
☐	Other:	Click here to enter text.

8 ATTACHMENTS CHECKLIST

Select One	Required Documents
☐	Copy of any existing QLDC or ORC consents
☐	Copy of QLDC Site & Soils Assessment (if previously completed)
☐	Copy of slope stability geotechnical report (if required)
☐	Copy of flood hazard assessment (if required)
☒	Site Specific Field Investigation Report. *Ensure it covers information requirements covered in sections 5 &6*
☒	Detailed plans of system layout showing treatment unit, drains/pipes and land application field including cross-section detail *Ensure it covers information requirements covered in sections 7*
☒	For secondary treatment units provide evidence of OSET NTP (or equivalent) certification
☐	Independent certification of in-ground tanks in terms of AS/NZS 1546.1 2008, or an equivalent standard. Provide details of performance criteria to which certification applies.
☐	Design Producer Statement of the on-site wastewater management service
☐	Loading certificate in accordance with Section 7.4.2 (d)
☒	Operation & Maintenance guidelines for the treatment plant and land application system

☒	Homeowner's operation manual for the treatment plant and land application system
☐	To scale site plan. The following must be included on the plan: • Buildings Boundaries • Treatment system components Reserve disposal area Retaining Walls • Embankments • Cutoff drains / diversion bunds Water bodies • Stormwater drains, discharge points or soakage facilities • Flood risk areas • Other wastewater treatment units and discharge systems • Water bores • Direction of ground water flow • Existing and proposed trees and shrubs • North arrow

9 APPLICANT STATEMENT:

I believe to the best of my knowledge that the information provided in this application is true and complete. I have the necessary experience and qualifications to design the above proposed waste water treatment system in accordance with the requirements of AS/NZS 1547:2012:

Company: Batchelar McDougall Consulting Ltd

Email: Helen@bmconsult.co.nz

Phone number: 03 443 4531

Name: Helen Wightman

Signature:

Date: 11/02/2021

Please scan this completed document to PDF and upload along with supporting Building Consent application information to the QLDC Sharefile portal:

http://www.qldc.govt.nz/planning/building-consents/apply-online/

12 Appendix – AdvanTex AX20 Design Criteria, Owner's Manual & OSET-NTP Certification

AdvanTex® Design Criteria

Orenco Systems® Incorporated
800-348-9843

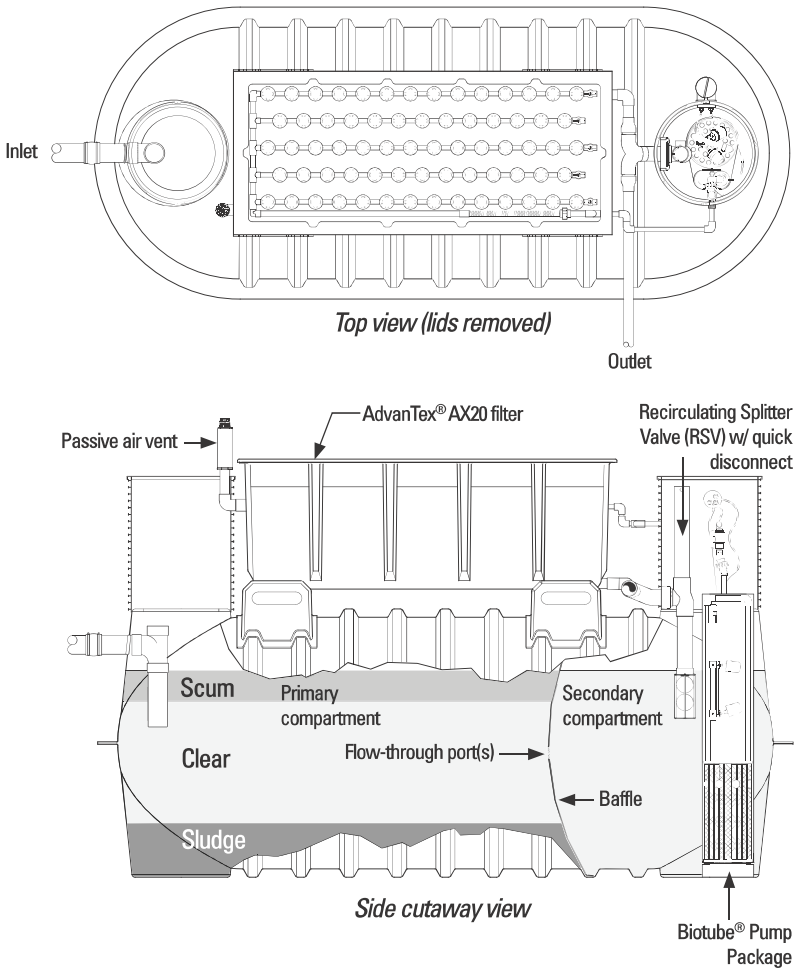
*For Residential Applications — International**

System Description and Treatment Process

The AdvanTex® Treatment System is a multiple-pass, packed-bed aerobic wastewater treatment system specifically designed and engineered for long-term processing of residential strength wastewater. The treatment media is an engineered textile, which has an extremely high void capacity, moisture-holding capacity, and surface area per unit volume. Consequently, AdvanTex Treatment Systems are capable of processing residential strength wastewater to better than "secondary standards" (see Figure 3, page 4).

Here's how it works in our standard configuration (see Figure 1). Raw sewage enters the two-compartment Processing Tank through its inlet tee. In the first compartment, the raw sewage separates into three distinct zones: a scum layer, a clear layer, and a sludge layer. A flow-through port or ports in the tank's baffle wall allows effluent from the clear layer to flow into the second compartment of the tank. The Biotube® Pump Package in the second compartment pumps filtered effluent to a distribution manifold in the AdvanTex filter. Effluent percolates down through the textile media and is collected in the bottom of the filter pod. The treated effluent flows out of the filter pod through the filtrate return line, which returns the treated effluent to the recirculating splitter valve (RSV). The RSV automatically splits or diverts the flow between the processing tank and the final discharge. The RSV also controls the liquid level within the processing tank. During extended periods of no flow, 100 percent of the treated filtrate effluent is returned to the processing tank. Residential AdvanTex filters have a passive vent system and do not require the use of a fan.

Figure 1. AdvanTex Treatment System
(with 6000-liter, two-compartment processing tank)



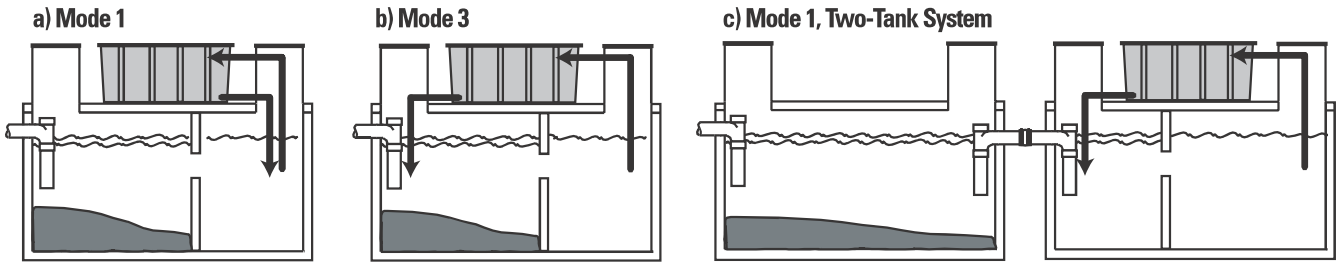
System Selection: Models and Configurations

Typically, residential-sized AdvanTex Treatment Systems include one or two AdvanTex AX20 filter pods. The AdvanTex Treatment System can be configured in several modes (See Figure 2). Mode 1 is the operating configuration used most frequently. In Mode 1, the filtrate recirculates through the second compartment of the processing tank. In Mode 3, a portion or all of the filtrate may be recirculated through the primary chamber of the tank to enhance nutrient removal.

** This document is for residential applications only. For commercial applications, call Orenco's Engineered Systems Department.*

Some of the systems in Mode 1 incorporate two tanks: a primary tank and a recirculation tank. In the primary tank, sludge and scum are separated from liquid effluent, which then flows into a separate recirculation tank, into which the AdvanTex filtrate is recirculated (see Figure 2, example c). Refer to the AdvanTex Treatment System drawings in the Design/ Engineering Package for Residential Applications Binder for further details on mode and discharge options.

Figure 2. AdvanTex Treatment System Configurations



Effluent recirculates into secondary compartment

Effluent recirculates into primary compartment for improved denitrification

Effluent recirculates into primary compartment of second tank in a Mode 1 two-tank system

System Requirements: Residential Strength Wastewater

Residential wastewater must meet the criteria in Table 1, below. Consult Orenco or your AdvanTex Dealer for larger system designs.

Table 1. Residential Strength Wastewater (Influent Characteristics)[1]

Characteristic	Average (mg/L)	Weekly Peak (mg/L)	Rarely Exceed (mg/L)
$CBOD_5$	130	200	300
TSS	40	60	150
TKN	65	75	150
G&O	20	25	25

[1] *AdvanTex® Treatment Systems are typically expected to receive residential-strength wastewater from typical primary septic tanks. Residential-strength wastewater is defined as primary sewage effluent from a septic tank that does not exceed the parameters in this table.*

System Requirements: Processing Tank

Homes with four or fewer bedrooms require a minimum two-compartment, 6000-liter (nominal) tank with a flow through port or ports equaling a minimum flow-through area of not less than 77 cm^2 (12 in^2) at 60 to 70 percent of the lowest normal liquid level (see "Appendix 3: RSV and Float Level Diagram" in the *Residential AX Installation Manual*, NIM-ATX-AX-1, for typical liquid level positions). In larger residential systems, the first compartment should be sized at approximately ⅔ to ¾ of the total processing tank volume.

All tank designs must be approved by Orenco before use. Each tank must meet Orenco's minimum structural and configuration requirements. In addition, each tank will be required to pass a 24-hr in-ground watertight test (including the riser/ tank connection), and be covered under a written warranty.

Table 2 defines the minimum required tankage for residential AdvanTex applications (unless otherwise approved by both Orenco and the local regulatory body).

Table 2. ecommended Tankage: Single and Dual Tank Configurations

Number of Bedrooms[1]	=	Processing Tank[2]	or	Septic Tank	Recirculation Tank[3]
4 (or fewer)		6000 L		4000 L	4000 L
5		10000 L		6000 L	4000 L
6		12000 L		8000 L	4000 L

[1] *In jurisdictions where the calculated peak hydraulic loading rate does not exceed 2000 L/day (500 gpd) nominal, a 6000-liter tank may be used as long as the system's anticipated treatment levels (see Figure 3) meet local requirements. For homes with more than six bedrooms or homes that are larger than 500 m² (5380 ft²), contact Orenco Systems, Inc*

[2] *Processing tank = a single, two-compartment tank that includes a primary (septic) and a secondary (recirculation) compartment (see Figure 2, examples a and b).*

[3] *The 4000 liter minimum is due to float settings and reserve requirements.*

System Requirements: Filter Units

Orenco's suggested design loading rates are based on typical per capita flow rates — 190 to 230 L/day per person (50 to 60 gpd/person) — and average strength characteristics expected from residential type installations, as shown in Table 1. Orenco's requirements assume that peak daily flows (Q_p) from a residence are typically twice the average daily flows (Q_a). System design must meet local regulations governing flow-to-bedroom ratios.

Performance is a function of the expected hydraulic and organic loads, with periodic weekly peaks. Typically, the daily mass loading is based on the expected daily flows and actual strength. Figure 3 shows periodic peak loading capacity at a 95 percent confidence level. If the loading rate (or mass load) needs to be reduced to meet discharge limits, it's a simple matter of adding additional treatment units.

Because calculated flows can vary greatly between jurisdictions, Table 3 can be used to determine the recommended number of units per bedroom.

Table 3. Recommended Number of Treatment Units[1]

Number of Bedrooms	AX Units Recommended
4 (or fewer)	1 (AX20)
5	2 (AX20)
6	2 (AX20)

[1] *The hydraulic loading rate for all residential AX units is 1184 L/m²/day (29.1 gpd/ft²). The nominal hydraulic application rate is 1017 L/m²/ day (25 gpd/ft²). In jurisdictions where the calculated peak hydraulic loading rate does not exceed 2000 L/day (500 gpd) nominal, a single AX20 pod may be used as long as the system's anticipated treatment levels (see Figure 3) meet local requirements. For homes with more than six bedrooms or homes that are larger than 500 m² (5380 ft²), contact Orenco Systems, Inc*

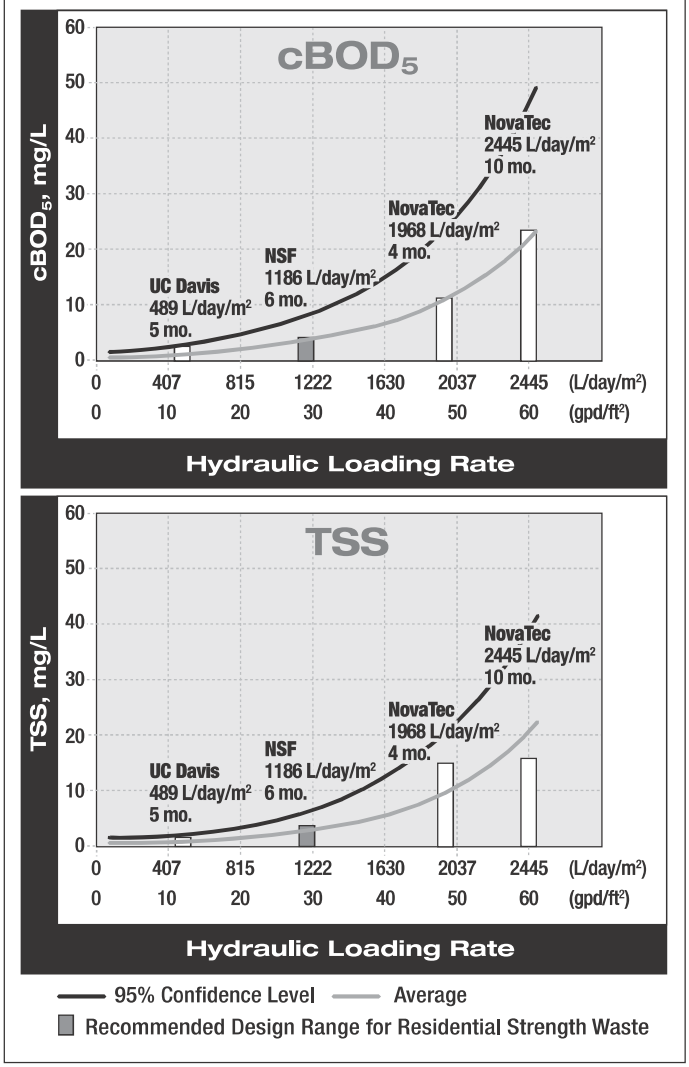
Typical Effluent Quality

Effluent quality is dependent on a number of factors, including influent characteristics and loading rates. Figures 3a and 3b below show third party, NSF/ANSI Standard 40 testing results. The results demonstrate that low-to-moderate loading rates typically produce cBOD and TSS of <5 mg/L, while higher loading rates produce cBOD and TSS in the range of 15-25 mg/L. Field testing of systems in real-world conditions shows similar results, with cBOD and TSS of <10 mg/L. (See *AX Performance Summary*, AHO-ATX-PERF-1.)

Nitrogen reduction in Mode 1 will typically exceed 60 percent, with total nitrogen in the filtrate ranging between approximately 25 and 35 mg/L. In Mode 3, nitrogen reduction can reach 70 percent or better, depending on wastewater strength and other characteristics like grease and oils, pH, and alkalinity concentrations. Nitrification can be inhibited if the buffering capacity (alkalinity) of the wastewater is too low. On a theoretical basis, 7.14 mg/L of alkalinity as $CaCO_3$ is needed to nitrify 1 mg/L of $NH4^+$.

Figure 3. Effluent Quality vs. Hydraulic Loading Rates

Third Party, NSA/ANSI Standard 40 Testing Results



Pumping Equipment: Recirculation Pump

The integrated treatment package includes an Orenco Biotube® pump package.

Residual Head Pressures

A residual pressure of 1.5 m (5 ft) is used to determine the initial timed-dosing settings. (Residual pressure may vary depending on system hydraulics and/or special treatment requirements.) Consulting with Orenco is required when the residual pressure dosing falls outside the typical range of 0.9 to 1.8 meters (3 to 6 feet).

Recirculation Ratios and Timer Settings

The AdvanTex Treatment System's initial timer settings should be established based on the expected average daily flow and a 4:1 recirculation ratio (filter recirculation ratio). If flows vary significantly from expected flows, timer settings can easily be recalculated and adjusted. See "Appendix 1: AX20 Timer Settings Worksheet" in the *Residential AX Installation Manual*, NIM-ATX-AX-1, for more information.

AdvanTex Control Systems

Critical to the success of the AdvanTex Treatment System is the method in which the effluent is loaded onto the AdvanTex textile filter. Over the past three decades, timer-controlled applications have proven to play an essential role in optimizing the performance of both fixed and suspended growth biological systems. A timer-controlled pump in the processing tank periodically doses effluent to a distribution system on top of the AdvanTex filter. Each time the filter is dosed, effluent percolates through the filter media and is treated by naturally occurring microorganisms that populate the filter. During periods of high flow, a timer override float will temporarily modify the timer settings to process the additional flow. Conversely, during periods of low flow, the timer settings can be modified to reduce loading onto the AdvanTex filter. Orenco offers two timed-dose control panels with the AdvanTex Treatment System.

Orenco's MVP (Most Versatile Panel) series control panels include an easy-to-use programmable logic unit that incorporates many timing and logic functions. The units have built-in screens that show time and date, elapsed pump run times, pump cycle counts, high-level alarm and override cycle counts, and low-level alarm counts, as well as power fault information and operating hours. In addition, there are separate screens that show the status of the panel's digital inputs and outputs. These features give operators and maintenance providers the ability to monitor individual systems on site. Alarm events active the panel's audible and visual alarms.

In some markets, Orenco offers our VeriComm® (VCOM) remote telemetry control panels as alternatives to the MVP series panels. Orenco's VCOM control panels give wastewater system operators and maintenance organizations the ability to monitor and control each individual system's performance remotely. There are several additional operational benefits associated with telemetry-based controls, including Advanced Control Logic — functions that activate in the event of component malfunction to diagnose the system using pre-established trend data and, if necessary, modify the operation of the system until it can be serviced. VCOM panels also provide additional alert and alarm functions to notify the operator/designer in the event that trend data indicate potential problem conditions (e.g., high flows or frequent alarms).

Surge Volume

For most residential applications, the recommended surge volume is approximately 570 to 950 L (150 to 250 gallons). The actual surge volume used should be approximately 50 to 100 percent of the actual average daily flow. The surge volume is the volume between the normal low liquid level and the override timer float. The normal low liquid level is the level at which 100 percent of the filtrate returns to the tank. For most residential installations, the low liquid level will be approximately 130 to 150 mm (5 to 6 inches) below the top of the RSV cage. Refer to the *Residential AX Installation Manual*, NIM-ATX-AX-1, for more information.

AdvanTex Control Systems

for details.

Reserve Volume

A typical AdvanTex Treatment System on a four-bedroom home has a 6000-L processing tank. There are about 1,500 L (400 gallons) of emergency storage between the normal operating liquid level and the inside top of the tank. Assuming that the average home produces about 950 L/day (250 gpd), the emergency storage volume in an AdvanTex system is sufficient for 1.5 days.

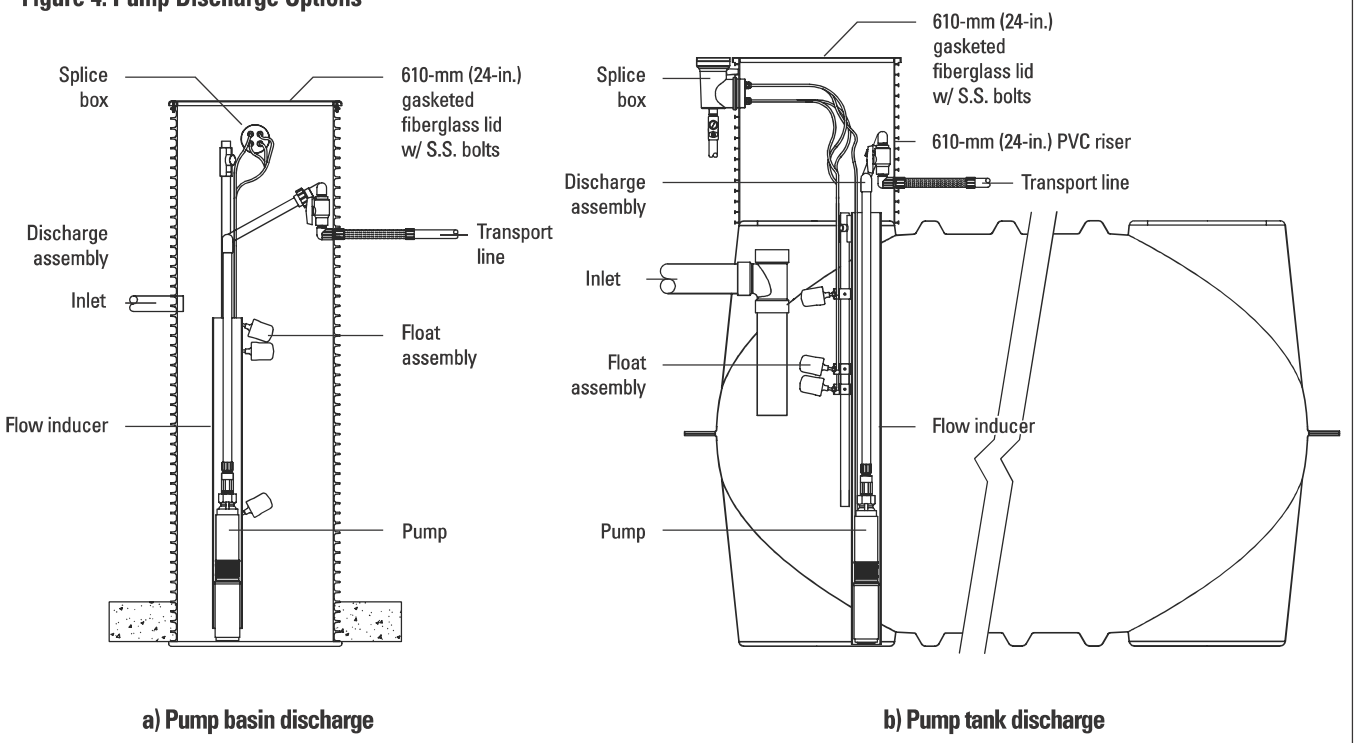
Power outage: During a power outage, water usage will be significantly reduced because water heaters, dishwashers, and laundry equipment will not be used. Under these conditions, it is realistic to estimate that water usage will be reduced by 50 percent to around 473 L/day (125 gpd). Therefore, in a power outage, the emergency storage capacity available in an AdvanTex system increases to approximately three days' worth. Because power outages typically last no more than one day, the emergency storage of an AdvanTex system is adequate.

Mechanical component failure: Failure of a pump or electrical component may cause the system to stop operating, requiring some amount of emergency storage volume. For MVP Series control panels, once an alarm level is detected, the MVP Series panel will immediately activate the local audible and visual alarms. For VCOM control panels, the VeriComm Monitoring System immediately notifies the Service Provider of the alarm condition and indicates the cause of the alarm. This helps Service Providers bring the right replacement components. In most cases, no more than 950 L (250 gallons), or one day's worth of reserve, would be needed for the Service Provider to respond and get the system running again.

Discharge Equipment

There are two discharge options: gravity and pump. When discharging by pump, an Orenco pump basin (Figure 4, example a)

Figure 4. Pump Discharge Options



can be used. Alternatively, some designs may call for pumping out of a tank (Figure 4, example b).

All tanks must meet Orenco's minimum structural requirements, be completely watertight, and pass a watertight test including the riser/tank connection. For detailed specifications, see structural and watertightness criteria in Orenco's General Specifications, NDA-DG-SPEC-1, and tank specifications checklist in Orenco's Concrete Tank Questionnaire, NCL-TNK-TNK-1.

Cold Weather Considerations

AX units are available with 25-mm (1-in.) insulation attached to the bottom of the lid. Installing insulation around the sides of the filter pods themselves is optional and is done on site as needed. Other cold weather considerations include standard practices used with most onsite pump systems, such as allowing all lines to drain, insulating processing tank lids, and back-filling risers with pea gravel if frost-heave is a concern. The filter vent may need to be extended above the highest level of the snowpack during winter months. Consult Orenco if supplementary options need to be considered.

HOMEOWNER'S MANUAL

Onsite Wastewater Collection & Treatment Systems

How to Take Care of Your Wastewater System

Orenco Systems®
Incorporated
www.orenco.com

Orenco products supplied by:

innoflow
wastewater specialists
www.innoflowtechnologies.com

Document Set ID: 6913477
Version: 1, Version Date: 22/06/2021

How to Take Care of Your Wastewater System

Congratulations! Your home includes reliable, carefully engineered equipment — manufactured by Orenco Systems®, Inc. — for the collection and/or treatment of household wastewater.

When properly designed and installed, onsite wastewater treatment does a terrific job of decomposing household waste and recycling precious water resources. Orenco's systems use little energy and frequently outperform municipal sewage treatment plants. The treated effluent is often returned harmlessly to the soil, where it receives final polishing and filtration for groundwater recharge. There's no degrading of our nation's rivers and oceans . . . which is so often the case with municipal sewage.

As with any engineered system, such as your car or your heat pump, your onsite wastewater system will work better and last longer if it is regularly maintained by a qualified service provider. Your service provider should be present during installation, so he or she is familiar with your system, especially those service lines, conduits, and connections that get buried.

And your service provider should have a copy of this manual for his or her records. To order another copy, just e-mail or call Innoflow Technologies at info@innoflowtechnologies.com, 1800 466 635 (AU) or 0800 466 635 (NZ free phone).

Your system will also work better and last longer if you learn what can go into it — and what can not. Little effort is required. Just read and practice the "do's and don'ts" that follow. Every member of your household should be familiar with these. And if you have guests who want to "help out in the kitchen," be sure to tell them, too. With this preventive maintenance, along with periodic inspections, your onsite wastewater system should function for decades. And you'll save water, energy and pumpout costs, too!

There's a place on the back of this Homeowner's Manual to record "Important System Facts." If those have not been filled in for you, please record those now, before you file or shelve this manual. And give a copy of these facts to your service provider, especially if your service provider changes. You'll be glad you did.

Do's and Don'ts for INSIDE the House

There are a number of do's and don'ts that will help ensure a long life and minimal maintenance for your system. As a general rule, nothing should be disposed into any wastewater system that hasn't first been ingested, other than toilet tissue, mild detergents, and wash water. Here are some additional guidelines.

Don't flush dangerous and damaging substances into your wastewater treatment system. (Please refer to the "Substitutes for Household Hazardous Waste," on the next panel.) Specifically, do not flush . . .

- Pharmaceuticals
- Excessive amounts of bath or body oils
- Water softener backwash
- Flammable or toxic products
- Household cleaners, especially floor wax and rug cleaners
- Chlorine bleach, chlorides, and pool or spa products
- Pesticides, herbicides, agricultural chemicals, or fertilizers

Don't ignore leaky plumbing fixtures; repair them. A leaky toilet can waste up to 7500 liters of water in a single day. That's 10-20 times more water than a house-hold's typical daily usage. Leaky plumbing fixtures increase your water bill, waste natural resources, and overload your system.

Don't leave interior taps on to protect water lines during cold spells. A running tap can easily increase your wastewater flow by 4000 to 12,000 liters per day and hydraulically overload your system. Instead, properly insulate or heat your faucets and plumbing.

Don't use special additives that are touted to enhance the performance of your tank or system. Additives can cause major damage to other areas in the collection system. The natural microorganisms that grow in your system generate their own enzymes that are sufficient for breaking down and digesting nutrients in the wastewater.

Do collect grease in a container and dispose with your trash. And avoid using garbage disposals excessively. Compost scraps or dispose with your trash, also. Food by-products accelerate the need for septage pumping and increase maintenance.

Do keep lint out of your wastewater treatment system by cleaning the lint filters on your washing machine and dryer before every load. Installing a supplemental lint filter on your washing machine would be a good precautionary measure. (This normally takes just a few minutes. Lint and other such materials can make a big difference in the frequency and cost of pumping out your primary treatment tank.)

Do use your trash can to dispose of substances that cause maintenance problems and/or increase the need for septage pumping. Dispose of the following with your trash:

- Egg shells, cantaloupe seeds, gum, coffee grounds
- Tea bags, chewing tobacco, cigarette butts
- Condoms, dental floss, sanitary napkins, diapers
- Paper towels, newspapers, candy wrappers
- Rags, large amounts of hair
- "Flushable" wipes, baby wipes, medicated wipes, cleaning wipes

DON'T plumb water softener discharge brine into your wastewater system. (The softened WATER is OK, just not the BRINE that's produced during the regeneration cycle.)

DO route the brine around your wastewater system so it discharges directly into the soil. This is a cost-effective solution that ensures the long-term performance of your system and the biological processes that occur inside it.

Water softener brine interferes with nitrogen removal. And it degrades treatment by interfering with the settling process inside the tank. Without proper settling, solids, grease, and oils are carried through your system, clogging components. This increases your costs by...

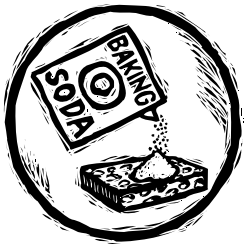
- requiring the tank to be pumped more often (at hundreds of dollars per pumpout)
- requiring filters to be cleaned more often
- fouling drainfields and other downstream equipment

Do's and Don'ts for INSIDE the House

Don't use excessive amounts of water. Using 140-180 litres per person per day is typical. If your household does not practice any of the "water conserving tips" below, you may be using too much water.

Do conserve water:

- Take shorter showers or take baths with a partially filled tub. Be cautious about excessive use of large soaking tubs.
- Don't let water run unnecessarily while brushing teeth or washing hands, food, dishes, etc.
- Wash dishes and clothes when you have a full load.
- When possible, avoid doing several loads in one day.
- Use water-saving devices on taps and showerheads.
- When replacing old toilets, buy low-flush models.



Do use substitutes for household hazardous waste. Replace the following hazardous products with products that are less environmentally harmful. The hazardous cleaners are listed below, followed by the suggested substitute.

Ammonia-based cleaners:

- For surfaces, sprinkle baking soda on a damp sponge.
- Or for windows, use a solution of 30 mL white vinegar to 1 L water. Pour the mixture into a spray bottle.

Disinfectants:

Use borax: 100 g in 4 L of water; deodorizes also.

Drain decloggers:

Use a plunger or metal snake, or remove and clean the trap.

Scouring cleaners & powders:

Sprinkle baking soda on a damp sponge or add 50 g baking soda to 1 L warm water.

Carpet/upholstery cleaners:

Sprinkle dry cornstarch or baking soda on, then vacuum. For tougher stains, blot with white vinegar in soapy water.

Toilet cleaners:

Sprinkle on baking soda, then scrub with a toilet brush.

Furniture/floor polishes:

To clean, use oil soap and warm water. Dry with soft cloth. Polish with 1 part lemon juice and 2 parts oil (any kind), or use natural products with lemon oil or beeswax in mineral oil.

Metal cleaners:

- Brass and copper: scrub with a used half of lemon dipped in salt.
- Stainless steel: use scouring pad and soapy water.
- Silver: rub gently with toothpaste and soft wet cloth.

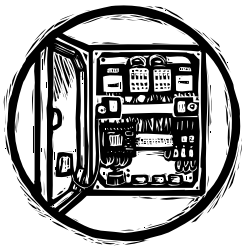
Oven cleaners:

Quickly sprinkle salt on drips; then scrub. Use baking soda and scouring pads on older spills.

Laundry detergents:

Choose a liquid detergent (not a powder) that doesn't have chlorine or phosphates.

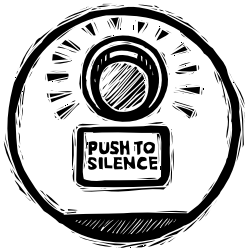
At the Control Panel



Do locate your electrical control panel where it will be protected from potential vandalism and have unobstructed access.

Do familiarize yourself with the location of your wastewater system and electrical control panel. Refer to the panel's model and UL number (inside the door panel) when reporting a malfunction in the system.

Do take immediate action to correct the problem in the event of an alarm condition. Call your system operator or maintenance company immediately whenever an alarm comes on. (It sounds like a smoke alarm.)



Do remember that the audible alarm can be silenced by pushing the lighted button located directly above the "Push to Silence" label on the front of the electrical control panel. With normal use, the tank has a reserve storage capacity good for 24-48 hours.

Don't turn off the main circuit breaker to the wastewater pumps when going on vacation. If there is any infiltration or inflow into the system, the pumps will need to handle it.

IMPORTANT! CAUTION!

Only a qualified electrician or authorized installer/operator can work on your control panel. Before anyone does any work on either the wiring to the level control floats and pumps in the vault or on the control panel itself, it is imperative to first switch the isolation fuse/ breaker and the circuit breakers in the panel to the "Off" positions, then switch "Off" the power to the system at the main breaker!

Do's and Don'ts for OUTSIDE the House

Don't enter your tank. Entering an underground tank without the necessary confined space entry training and procedures can result in death from asphyxiation or drowning. Keep children away from tank openings if lids are off or lid bolts are removed.

Do keep the tank access lid fastened to the riser at all times with stainless steel lid bolts. If bolts are lost or damaged, call Innoflow immediately for replacement at 1800 466 635 or 07 5549 2416 for AU and 0800 466 635 or 09 426 1027 for NZ. If the tank lid becomes detached from the riser or if the lid or riser becomes damaged, BLOCK ACCESS TO THE TANK OPENING IMMEDIATELY AND KEEP CHILDREN AWAY until all repairs are made.

Don't dig without knowing the location of your wastewater system. As much as possible, plan landscaping and permanent outdoor structures before installation. Avoid placing heavy objects on your land application area. Lightweight, easily removable items, such as bird baths and picnic tables, are OK to place on top of your system and land application area.

Don't drive over your tank riser with vehicles or ride-on mowing equipment unless the riser has been equipped with a special traffic lid.

Also, don't drive over the buried components in your system or the land application area. If the system is subject to possible traffic, put up a barricade or a row of shrubs.

Do keep the land application area in good working order, clear of weeds and debris so it can be easily accessed by your service provider.

Don't dump RV waste into your wastewater system. It will increase the frequency of required septage pumping. When dumped directly into the pumping vault, RV waste clogs or fouls equipment, causing undue maintenance and repair costs. (Also, some RV waste may contain chemicals that are toxic or that may retard the biological digestion occurring within the tank.)

Don't ever connect rain gutters or storm drains to the sewer or allow surface water to drain into it. And don't discharge hot-tub water into your system. The additional water will increase costs, reduce the capacity of the collection and treatment systems, and flood the drainfield. It can also wash excess solids through the tank.

Do make arrangements with a reliable service person to provide regular monitoring and maintenance. Place the service person's phone number on or in your control panel!

Do keep a file copy of your service provider's sludge and scum monitoring report and pumpout schedule. This information will be beneficial for real estate transactions or regulatory visits.

Do keep an "as built" system diagram in a safe place for reference.

HOMEOWNER'S MANUAL

Onsite Wastewater Collection & Treatment Systems

Do keep accurate records of maintenance and service calls. Make sure whoever services your tank keeps a complete record, and ask for a copy for your records.

IMPORTANT SYSTEM FACTS

Distributor or Dealer:

Please fill out the following important information before giving out this Homeowner's Manual:

Innoflow Australia
Distributor/Dealer Name

PO Box 263, Ormeau, Queensland 4208
Distributor/Dealer Address

1800 466 635 or 07 5549 2416
Distributor/Dealer Phone Number(s)

Innoflow Technologies NZ, Ltd.
Distributor/Dealer Name

PO Box 300527, Albany, North Shore City 0752
Distributor/Dealer Address

0800 466 635 (freephone)
Distributor/Dealer Phone Number(s)

Authorized Service Provider Name

Authorized Service Provider Phone Number(s)

Authorized Installer Name

Authorized Installer Phone Number(s)

Engineer Name (if applicable)

Engineer Phone Number(s)

Regulatory Agency

Regulatory Contact Name

Regulatory Contact Phone Number(s)

Permit # (if applicable)

Property Address

Property Owner Name(s)

Start-Up Date

Control Panel Model # and UL #

AdvanTex® Model # (if applicable)

AdvanTex® Serial # (if applicable)

Orenco Systems®
Incorporated

Changing the Way the World Does Wastewater®

+1-541-459-4449
www.orenco.com

Orenco products supplied by:

innoflow
wastewater specialists

1800 466 635 (AU)
0800 466 635 (NZ)
www.innoflowtechnologies.com

Certified Product
Australian Standard

AdvanTex® Treatment System complies with AS/NZS Standards 1546.1 and 1546.3, as well as the regulatory codes of your state.

ABR-OM-INTL-1
Rev. 1.1, © 3/10

On-site Effluent Treatment National Testing Programme

TRIAL 5 – November 2009 to August 2010

AdvanTex® AX-20 Mode 3

TESTING RESULTS REVIEW

Prepared By: Ian Gunn, OSET NTP Technical Manager,
Auckland UniServices Ltd
Sam Weiss, OSET NTP Reporting Manager,
Bay of Plenty Regional Council

Reviewed By: SWANS-MAG
Ray Hedgland, Chair, Fraser Thomas Ltd
Dave Anderson, OSET NTP Operations and Laboratory Manager, Rotorua District Council
Andrew Dakers, EcoEng Pacific
Gilles Altner, Global Environmental Engineering

Date: 22 March 2011

Disclaimer

This document reports on the measured ability of a wastewater treatment system to reduce the concentration of a range of wastewater parameters under controlled input conditions. The test results do not represent performance under field conditions. No testing was performed on the integrity, capacity or durability of this system.

The findings of this testing and auditing report apply to the specific treatment unit model tested, and remain current for 5 years from the date of this report.

Summary

The AdvanTex® AX-20 wastewater treatment system participated in Trial 5 of the On-site Effluent Treatment National Testing Programme (OSET NTP). This commenced on 2 November 2009 and ran for over nine months (40 Weeks) during which the treated effluent discharge was monitored generally every six days. The test flow rate was 1,000 L/day equivalent to the daily domestic wastewater flow from a 3-bedroom dwelling of occupancy 5 to 6 persons.

The AdvanTex® AX-20 Mode 3 had originally been submitted by Innoflow Technologies Ltd (Innoflow) for testing under Trial 3, 2007/2008. Due to the unit being un-insulated during that trial, the nitrification and de-nitrification process was affected significantly to the extent that the unit did not perform to the level expected from overseas testing results. The Trial 3 report for the AdvanTex® AX-20 covered AS/NZS 1547 assessment for biochemical oxygen demand (BOD_5) and total suspended solids (TSS) along with benchmarking for all parameters except total nitrogen (TN).

Innoflow therefore joined Trial 5 to re-submit an insulated AX-20 unit to benchmarking of TN, ammonia nitrogen (NH_4-N), BOD_5, TSS and energy use. These parameters were also recorded throughout the pre-benchmarking period as a check on system performance leading up to benchmarking.

A two month (8 Week) media development and settling in period (with 5 samples over Weeks 4 to 8) was followed by the testing programme involving a 3-month 'pre-benchmarking period' (19 samples over Weeks 9 to 22), and a 4-month 'benchmarking period' (19 samples over Weeks 23 to 40). Within each block of 19 samples three extra samples were taken (Weeks 17 and 29) to provide results for two five day consecutive sample periods. A 1-month high load effects period followed in Weeks 36 to 40 (4 samples).

The 16 (six day interval) benchmarking samples were used for rating the performance of the AdvanTex® AX-20 wastewater treatment system in relation to BOD_5, TSS, nitrogen (total nitrogen and ammonia nitrogen), and energy consumption indicators. The OSET NTP assessment rates the indicators to a letter-based scale on their median values. The scale rates effluents from a "D" standard, which is considered a minimal level of treatment or quality for a particular indicator, to an "A+" standard, which is an exceptional level of treatment or quality. The standard deviation is also provided.

The AdvanTex® AX-20 system achieved the following effluent quality ratings:

Indicator Parameters	Median	Std Dev	Rating	Rating System				
				A+	A	B	C	D
BOD_5 (g/m^3)	2.0	0.7	A+	<5	<10	<20	<30	≥30
TSS (g/m^3)	2.5	4.1	A+	<5	<10	<20	<30	≥30
TN (g/m^3)	12.3	1.3	A	<5	<15	<25	<30	≥30
NH_4-N (g/m^3)	0.6	0.21	A+	<1	<5	<10	<20	≥20
Energy (kWh/d) (mean)	0.92	--	A	0	<1	<2	<5	≥5

Requirements for a given standard of treatment are dependent upon the sensitivity of the receiving environment and the policies put in place by the statutory authority.

Contents

Tables

Figures

1 Introduction

This report sets out the results of the benchmark testing of the AdvanTex® AX-20 proprietary wastewater treatment system which has undergone performance testing at the OSET NTP facility in Rotorua, New Zealand. The results of this testing have subsequently been audited by the OSET NTP Management and Audit Group.

The purpose of the trial is to

(a) demonstrate conformity with the secondary effluent quality requirements of standard AS/NZS 1547:2000 for domestic wastewater treatment systems at the specific flow of 1,000L/day; and

(b) provide a treated effluent quality performance rating for six indicator parameters together with an assessment of treatment process energy consumption.

The AdvanTex® AX-20 Mode 3 had originally been submitted by Innoflow Technologies Ltd (Innoflow) for testing under Trial 3, 2007/2008. Due to the unit being un-insulated during that trial, the nitrification and de-nitrification process was affected significantly to the extent that the unit did not perform to the level expected from overseas testing results. The Trial 3 report for the AdvanTex® AX-20 covered AS/NZS 1547 assessment for BOD_5 and TSS along with Benchmarking for all parameters except TN.

Innoflow therefore joined Trial 5 to re-submit the insulated AX-20 unit to TN benchmarking, with the Trial 3 assessment to AS/NZS 1547 secondary effluent quality requirements for BOD_5 and TSS being left to stand. NH_4-N and energy use benchmarking were also sought. BOD_5 and TSS were initially recorded throughout the pre-benchmarking period only as a check on system performance.

During Weeks 23 to 25 (5-25 April) Innoflow asked if Benchmarking could be extended to both BOD_5 and TSS using test results from Week 26 (26 April) onwards. Recognising that there was a three week (four sample) gap in the continuous record, Innoflow proposed that the high load effects test period be extended by one week into Week 40 (2-8 August), and the 16 BOD_5 and TSS test results so obtained be used for Benchmarking. Innoflow held the view that although the high load effects may cause a “spike” in BOD_5 and TSS, the fact that the benchmark rating was based on median values would likely ensure that using results for Weeks 26 to 40 would give very similar rating values to those if BOD_5 and TSS testing had continued without interruption through Weeks 23 to 35.

The testing was carried out over a 40 Week period from November 2009 into August 2010 as per **Appendix 1**. This included a settling in period (Weeks 1 to 8), a pre-benchmarking period (Weeks 9 to 22) followed by a benchmarking period Weeks 23 to 35 for TN, NH_4-N and energy use, and Weeks 26 to 40 for BOD_5 and TSS. A high load effects test was carried out during the five week period at the end of the trial (Weeks 36 to 40). This involved increasing the test flow to 2,000L/day over 5 days of Week 36, then returning to 1,000L/day for a four week recovery period (Weeks 37 to 40).

The background to the development of the Rotorua On-site Effluent Treatment Testing Facility and the OSET NTP is described in the document entitled ‘On-Site Effluent Treatment National Testing Programme, Strand 1 Benchmarking Procedures, 2009-2010’. This document sets out the procedures for testing and evaluation and provides details of the trial set up and methodology, the pre-trial procedures, as well as the management of the testing and auditing programme.

The organisational structure of the OSET NTP and details of key personnel involved in the testing and auditing procedures are set out in **Appendix 2** to this report.

2 System Information

System Name/Model:
AdvanTex® AX-20 Mode 3

Manufacturer:
Orenco Systems Inc (OSI)
Oregon
USA

Supplier:
Innoflow Technologies Ltd (Innoflow)
311A Postman Road
Dairy Flat
PO Box 300 527
Albany
North Shore, AUCKLAND 0752

Phone (09) 426 1027

3 System Specification

Table 1: System Specification Summary

Supplier	System Model	Rated Flow (L/day)	Operating Capacity in litres (L)	Treatment Technology
Innoflow Technologies Ltd	AdvanTex® AX-20 Mode 3	2,000	Total treatment volume: 7,200 L Primary treatment: 4,000 L Aeration treatment Textile surface area ~ 5,019 m^2 Recirculation : 2,000 L Pump chamber 1,200 L Emergency storage: 2,000 L	Recirculating textile packed bed reactor

Innoflow provided a declaration of the specifications for the system submitted for testing. No independent verification of these specifications has been made. The results presented in this report were obtained when dosing at 1,000 litres per day (L/day), approximating the daily volume of domestic wastewater from a 3-bedroom dwelling of occupancy 5 to 6 persons.

4 Testing Regime

4.1 Background

Untreated wastewater has grit removed and is screened to 3 mm before being pumped into a dedicated header tank for each system under test. From each header tank influent is discharged under gravity to the treatment system twice a day. The loading regime is 1,000 L/day per system. Five hundred litres is delivered in the morning from 6.30am and the other 500 litres delivered from 3.30 pm. It takes 4.5 hours to completely deliver the 500 litres. This regime is designed to approximate a typical household wastewater output flow.

The header tank has an overflow pipe set at the level corresponding to 500 litres. It also has a pressure transducer fitted at its base measuring volume. These are used to verify that the header tank is filling and emptying as expected. The data is collected in the Rotorua District Council (RDC) SCADA system. There are two fill and empty cycles per day.

Samples of influent and treated effluent discharge were taken at (generally) six day intervals. In addition to the regular interval sampling, there were two consecutive five day blocks of samples. These were analysed for the parameters set out in the sampling profiles in Section 4.2 below.

Analysis was performed by the RDC Environmental Laboratory (IANZ accredited) in accordance with "Standard Methods for the Examination of Wastewater", APHA, AWWA, WPCF.

Effluent from each wastewater treatment system was discharged into a 20 litre container placed within a 200 litre drum, from where it returned to the sewer.

Samples were taken from the 20 litre container to ensure that completely fresh and representative samples are taken every time. Temperature of the effluent was measured at the time of sampling.

4.2 Sampling Profiles

Appendix 1 depicts the sampling programme. There were two sampling profiles used during the trial. Profiles A and B differ in that profile B does not include BOD_5, TSS alkalinity, pH and temperature. The profiles encompass the key parameters required for the benchmark assessment:

Profile A consists of:
- Biochemical oxygen demand ($cBOD_5$);
- Total suspended solids (TSS);
- Total nitrogen (TN);
- Ammoniacal nitrogen (NH_4-N);
- Total kjeldahl nitrogen (TKN);
- Total oxidised nitrogen (TOXN);
- Nitrate;
- Nitrite;
- Alkalinity;
- pH; and
- Temperature.

Profile B consists of:
- Total nitrogen (TN);
- Ammoniacal nitrogen (NH_4-N);
- Total kjeldahl nitrogen (TKN);
- Total oxidised nitrogen (TOXN);
- Nitrate;
- Nitrite.

5 General Issues Encountered During the Trial

There were no specific issues encountered during the trial relative to the operation of the dosing, sampling and recording systems.

6 Test Results

6.1 Application of Test Results

Flow to the AdvanTex® AX-20 wastewater treatment system commenced on 2 November 2009 (Week 1). Sampling was carried out on a flow rate of 1,000 L/day from 24 November 2009 (Week 4) through to 4 July 2010 (Week 35), and from 12 July to 5 August 2010 (Weeks 37 to 40) following a peak flow event at 2,000 L/day over 5 days 7 to 11 July (Week 36).

The normal pre-determined benchmarking period is a three month period (from 5 April 2010 to 4 July 2010, Weeks 23 to 35 inclusive) during which 16 samples are taken at six day intervals, with the first sample on day two and the last sample on day 91. This follows a media development and settling in period of around two months (Weeks 1 to 8) and a pre-benchmarking period of around three months (Weeks 9 to 22). At completion of the benchmarking period a one month high load effects period occurs where 2,000 L/day is loaded over five days in the first week, with a return to 1,000 L/day for the following 3 weeks. A variation to the benchmarking procedures for the AdvanTex® AX-20 on this occasion was:

- TN, NH_4-N and energy use were benchmarked on results for Weeks 23 to 35; and
- BOD_5 and TSS were benchmarked on results for Weeks 26 to 40.

The five test results for all parameters for the two month settling in period are available to the system supplier to enable minor adjustment to operational procedures prior to 'hands-off' operation through the subsequent 7-month testing programme.

The 16 test results for BOD_5, TSS, total nitrogen, and ammonia nitrogen, from the respective benchmarking periods (Weeks 23 to 35 and 26 to 40) are used to undertake a performance rating assessment for the treatment unit. Power consumption is benchmarked from the results for energy use Weeks 23 to 35.

The four test results for all parameters during the one month high load effects period (Weeks 36 to 40) are used to assess the response of the treatment unit to a 5-day peak load event in Week 36.

6.2 Presentation and Discussion of Test Results

The test results are presented and discussed in five sections as follows:

6.3 sets out the raw influent quality for 41 test results for BOD_5, TSS, TN and NH_4-N for Weeks 9 to 39 (Figure 1). The temperature variation between raw influent and treated effluent for Weeks 9 to 40 is presented in Figure 2.

6.4 sets out the raw influent (41 test results) and treated effluent quality for BOD_5 and TSS 38 results), TN and NH_4-N (42 results) for Weeks 9 to 40 (Figures 3 to 6).

6.5 examines the relationships between TN, NH_4-N, temperature and alkalinity relative to nitrification/de-nitrification processes for Weeks 9 to 40 (Figures 7 and 8).

6.6 sets out the daily energy use for Weeks 9 to 39 (Figure 9).

6.7 sets out the treated effluent quality for 16 test results for benchmarking BOD_5, TSS, TN, NH_4-N, and daily energy use for Weeks 23 to 35 (Figure 10).

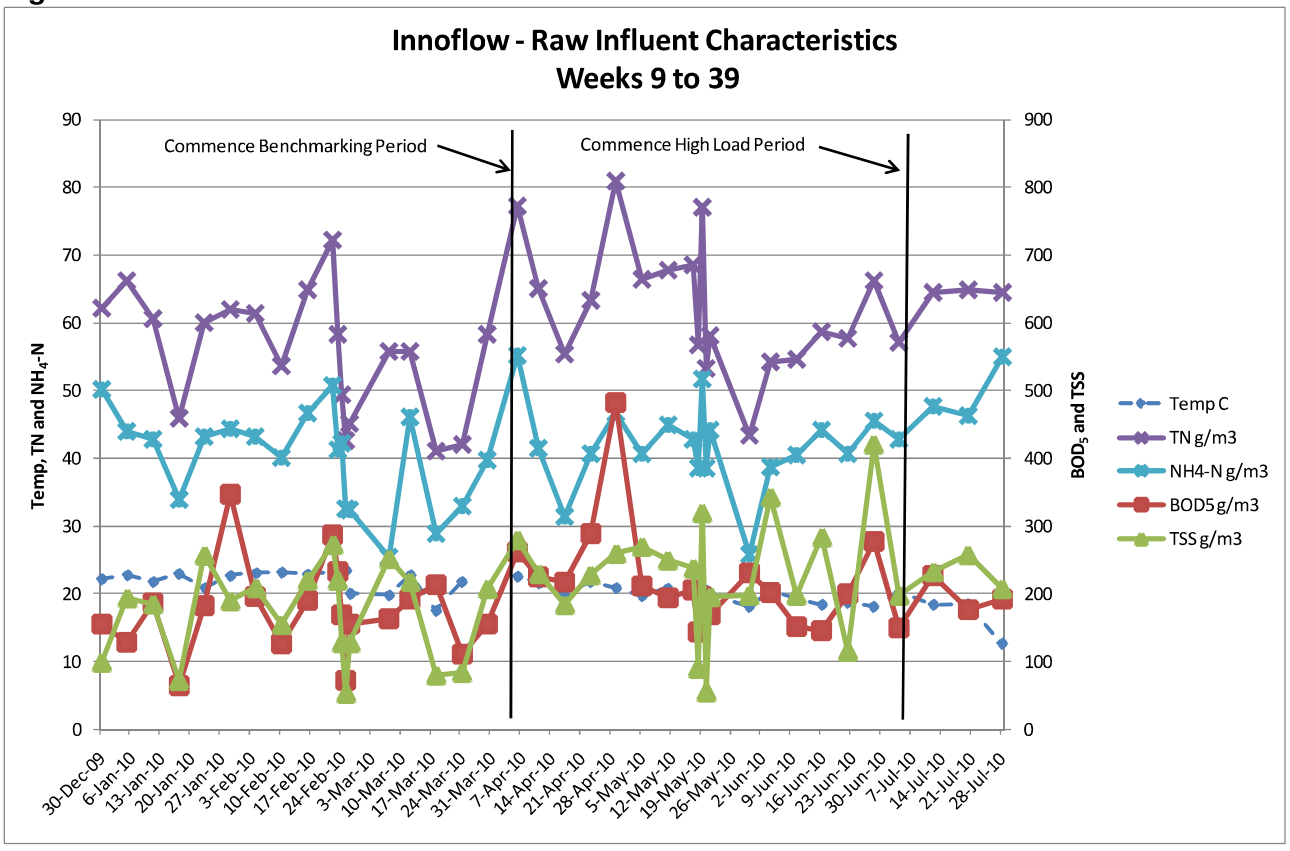
6.3 Raw Influent Quality (BOD_5, TSS, TN, NH_4-N) Weeks 9 to 39

Figure 1 illustrates the variation in raw influent characteristics throughout the trial. The individual data points are discrete values at 6-day intervals. The plot lines between points are intended to provide clarity in following the data – they are not intended to indicate "trends".

All four main quality parameters fluctuate quite significantly from time to time, which provides opportunity to examine the resulting effects on treatment process stability. There are clear spikes in BOD_5 on two particular occasions (29 January and 29 April) and in TSS at various times. Total nitrogen also varies significantly, although its peaks do not necessarily correspond to the peaks in BOD_5 and TSS concentrations.

During the two five day consecutive results [Week 17 (22-26 February) and Week 29 (17-21 May)] both BOD_5 and TSS varied significantly from day to day.

Figure 1:



It is noted that the testing protocols under AS/NZS 1546.3:2008 recommend the following range of raw influent characteristics:

- BOD_5 150 to 300g/m^3
- TSS 150 to 300g/m^3
- TN 20 to 100g/m^3

In this instance the Trial 5 ranges were generally:

- BOD_5 90 to 350g/m^3 (with one spike of around 480g/m^3)
- TSS 80 to 300g/m^3 (with three spikes above 300g/m3)
- TN 40 to 80g/m^3

Overall raw influent quality was:

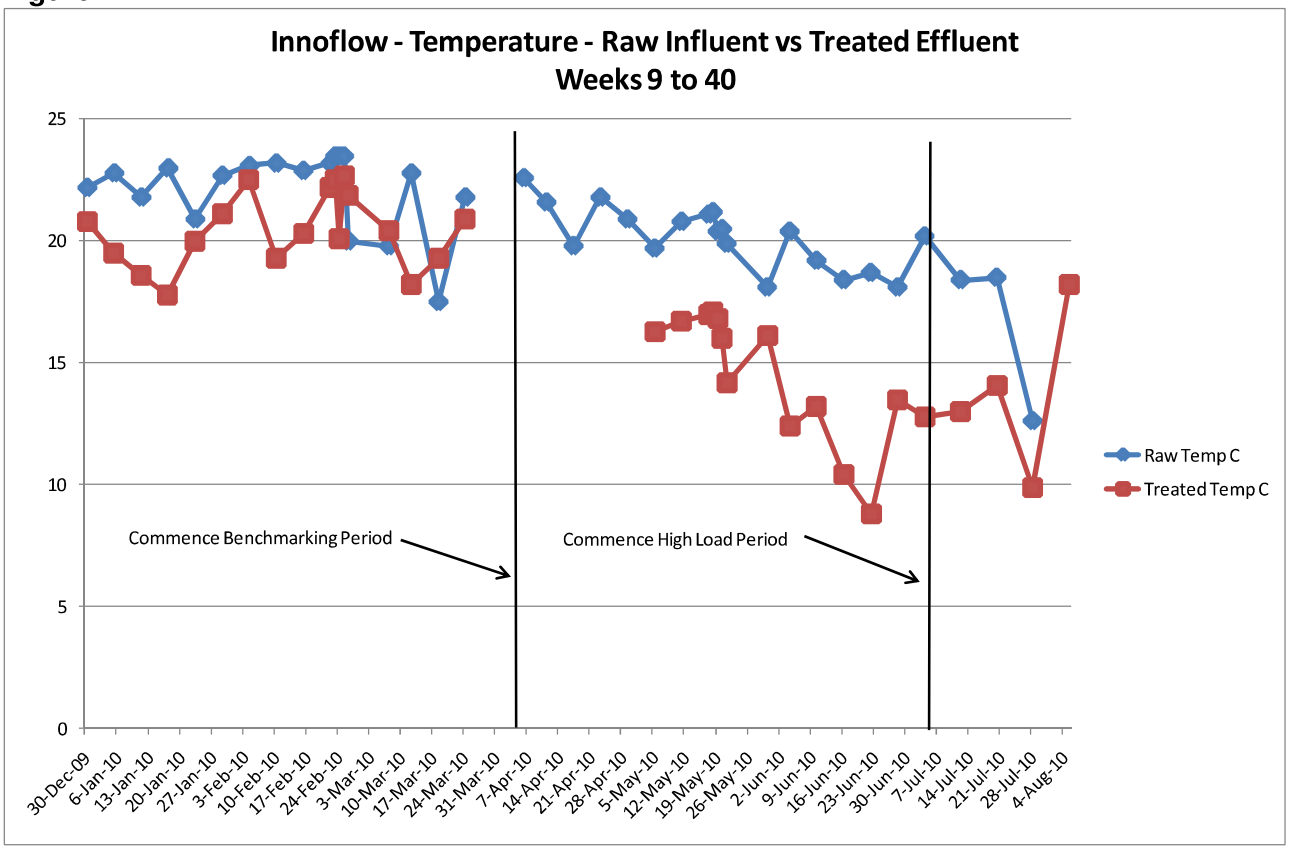
Parameter	Median	Std Dev	Mean
$cBOD_5$	192g/m^3	7.1	192g/m^3
TSS	208g/m^3	7.7	203g/m^3
TN	59.8g/m^3	9.0	59.5g/m^3

Figure 2 shows the relationship between raw influent temperature and the temperature of the treated effluent.

Overall raw influent temperature variation was modest, increasing slowly November through to March before declining to a low point in July.

Treated effluent temperature declined rapidly in early June from 15^{O}C down to below 10^{O}C before recovering and levelling off between 12 to 13 ^{O}C for a few weeks, becoming erratic right at the end of the trial.

Figure 2:



6.4 Raw Influent and Treated Effluent Quality (BOD_5, TSS, TN and NH_4-N) Weeks 9 to 40

Figure 3 shows the BOD_5 relationship. Out of 38 results 32 were at 2 g/m^3, 4 at 3 g/m^3 and two (in the high load recovery period) at 4 g/m^3.

Figure 4 shows the TSS relationship. Overall TSS ranges from 1 g/m^3 to 5 g/m^3 right through the per-benchmarking and benchmarking periods, rising briefly to 17 g/m^3 following the high load event before dropping right back to 5 g/m^3 at the end of Week 40 (5 August).

Figure 3:

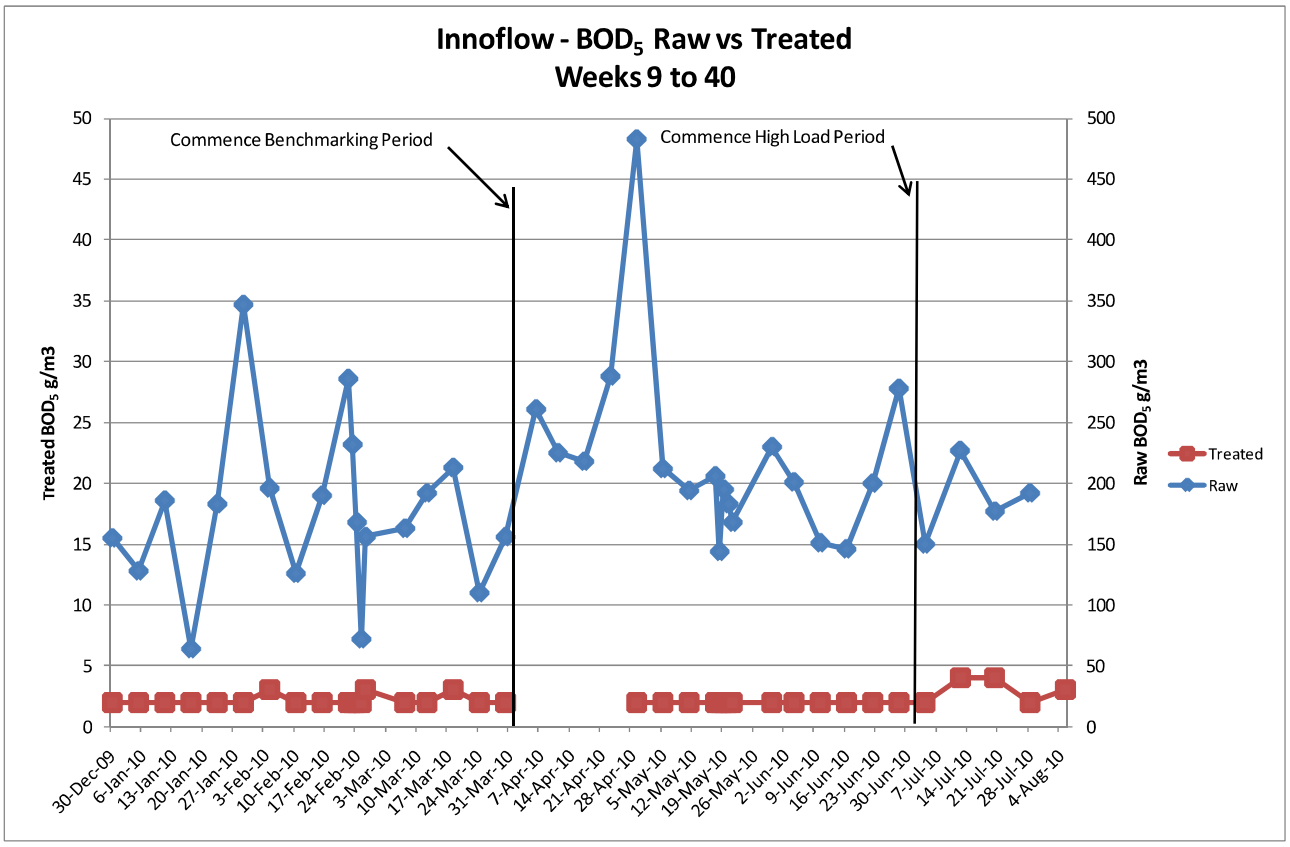


Figure 4:

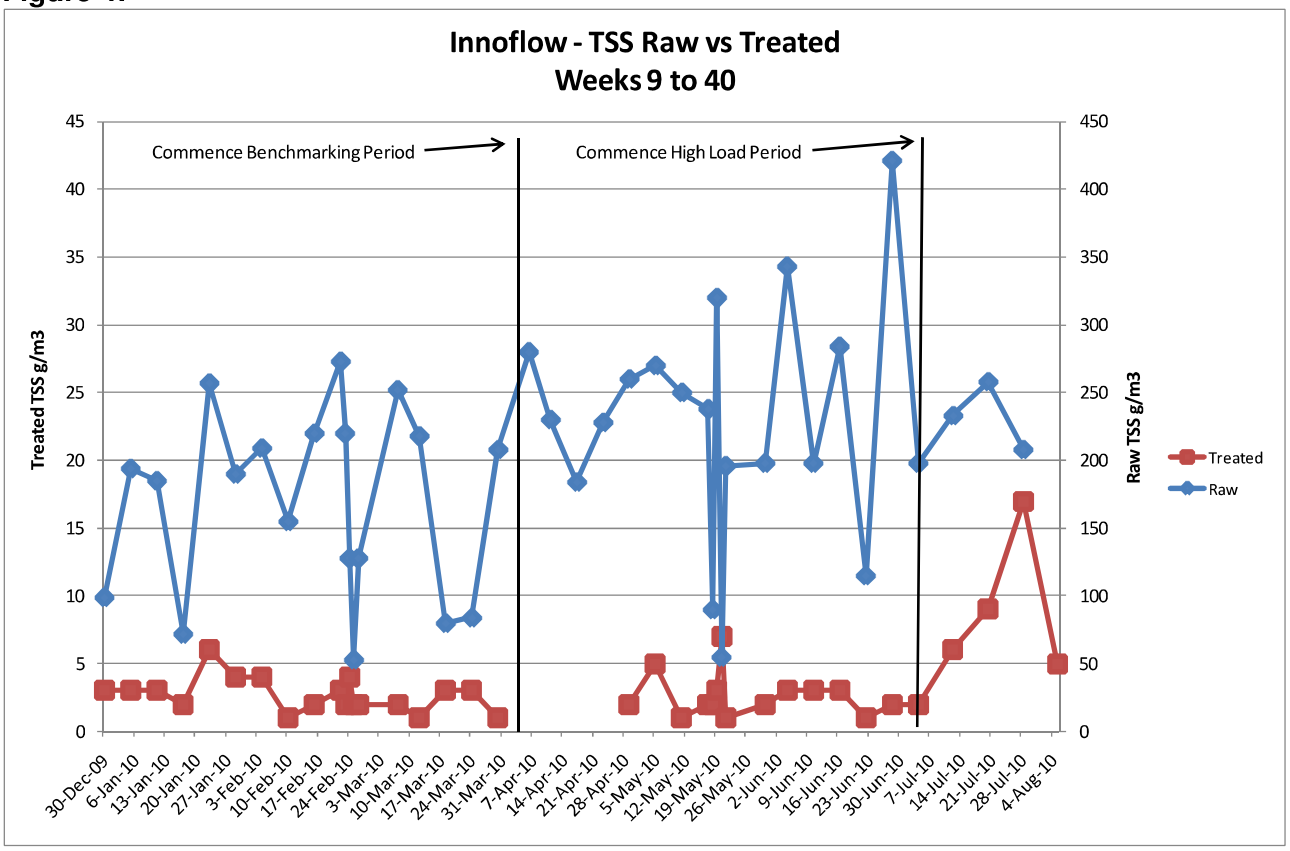


Figure 5 shows the TN relationship. A high level reduction to between 10 g/m^3 and 12 g/m^3 in TN is maintained throughout the 6-months to the commencement of the high load period when a minor "spike" to 22 g/m^3 occurs before returning to 12 g/m^3.

Figure 6 shows the NH_4-N relationship. Nitrification effectiveness settles down within a very short time of treatment unit commissioning (within 4 weeks) to almost total oxidation of ammonia (<1.0 g/m^3). This very high level of performance is maintained throughout the 6-months to the commencement of the high load period when NH_4-N spikes to above 8.0 g/m^3 before dropping right back to around 1.0 g/m^3.

Figure 5:

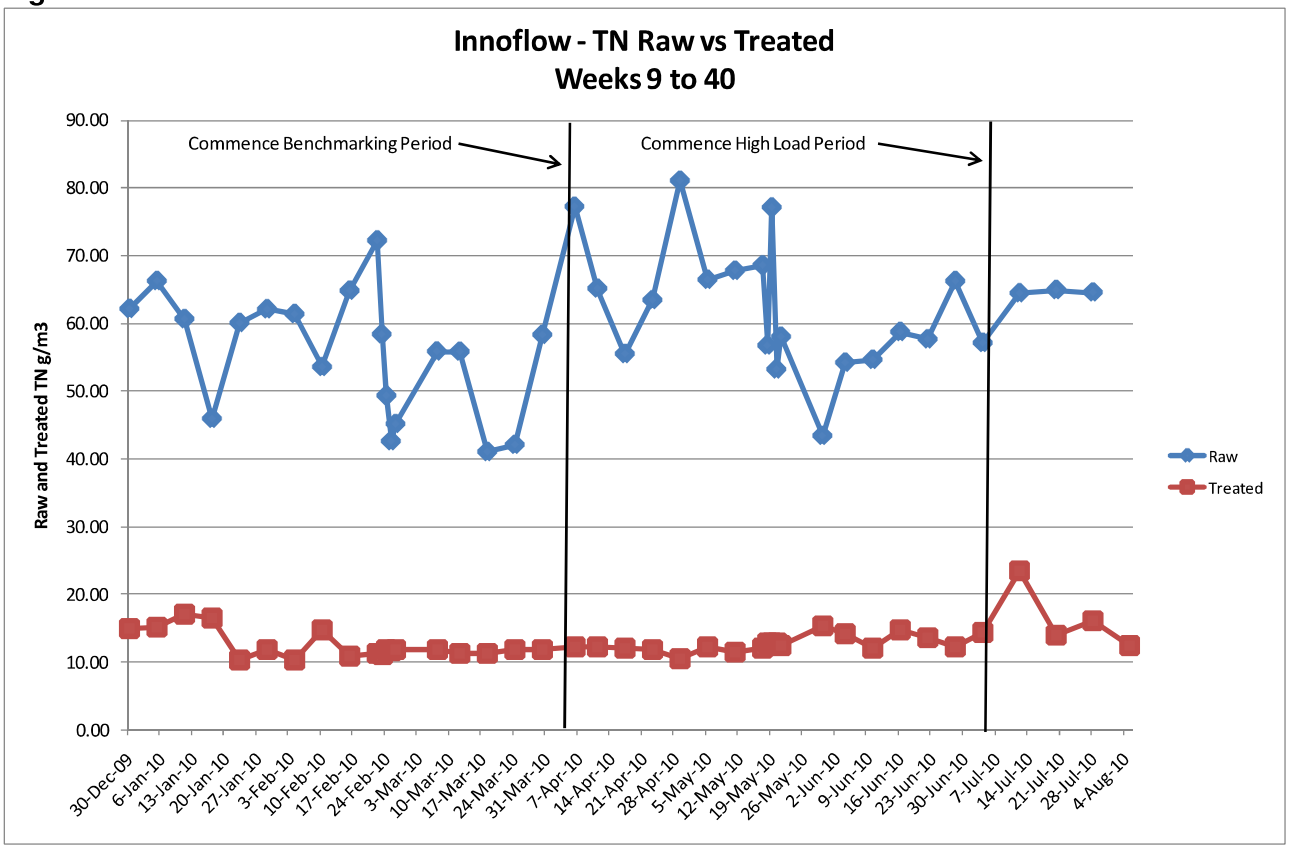
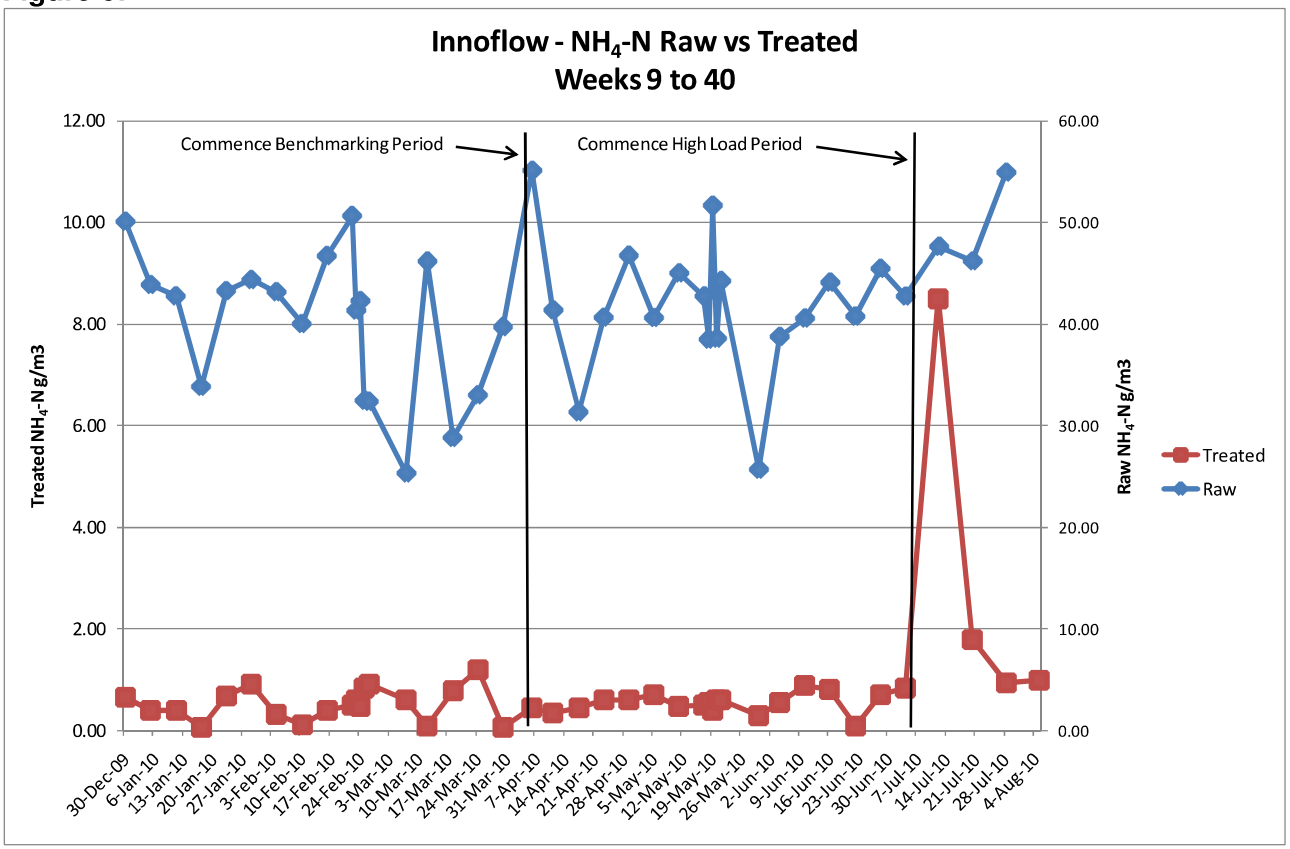


Figure 6:



6.5 Treated Effluent Alkalinity, TN, NH_4-N and Temperature, Weeks 9 to 40

Consideration of the various forms of nitrogen during aerobic biological treatment provides an important indicator of how well a system is operating and how much the system is sensitive to variations in temperature, pH, loading variations and start-up operations. Good conversion of ammonia to nitrate (nitrification) indicates effective aeration and maintenance of high levels of aerobic activity. Reduced total nitrogen levels (along with good nitrification) indicates effective de-nitrification during which nitrate is converted under anoxic conditions to nitrogen gas as denitrifying microorganisms strip oxygen from the nitrate.

Alkalinity is required as a buffer to deal with the acid generated by nitrification. During de-nitrification alkalinity is produced but at approximately half the rate that is consumed during nitrification.

Figure 7 shows the relationship between raw influent and treated effluent alkalinity. Clearly raw influent alkalinity is not limiting in supporting the nitrification process. Treated effluent alkalinity in the AdvanTex® AX-20 remains at a moderate and steady level throughout the test period. This indicates that the balance between alkalinity consumption during nitrification and the release of alkalinity during de-nitrification is consistent with a stable nitrification/de-nitrification relationship.

Figure 8 shows the relationship between TN, NH_4-N and temperature. Temperature has a significant influence on the ability of an advanced treatment system to reduce nitrogen levels. Cooler temperatures impact on the effectiveness of nitrification/de-nitrification processes. Winter temperatures in Rotorua are quite low, and in large measure reflect cold weather winter conditions throughout southern regions of the country.

Where systems are buried in the ground, as is typical, the impact of seasonal temperature fluctuations are far less than where the treatment systems are positioned above ground, such as was the case for this trial. To simulate in-ground conditions the AdvanTex® AX-20 was insulated for the benchmarking period.

The AdvanTex® AX-20 Mode 3 is specifically configured for high level reduction of nitrogen. This is achieved by rapid acclimatisation (five weeks to reach less than 1g/m^3 NH_4-N) followed by steady nitrogen reduction down to consistently below 15g/m^3 from Week 12 (18 January). TN then fluctuated between 10g/m^3 and 15g/m^3 from Weeks 12 to 35 (18 January to 4 July). Although the de-nitrification performance becomes more variable once the treatment unit temperature drops below 15 degrees centigrade, overall the unit performs well from the onset of colder conditions.

Figure 7:

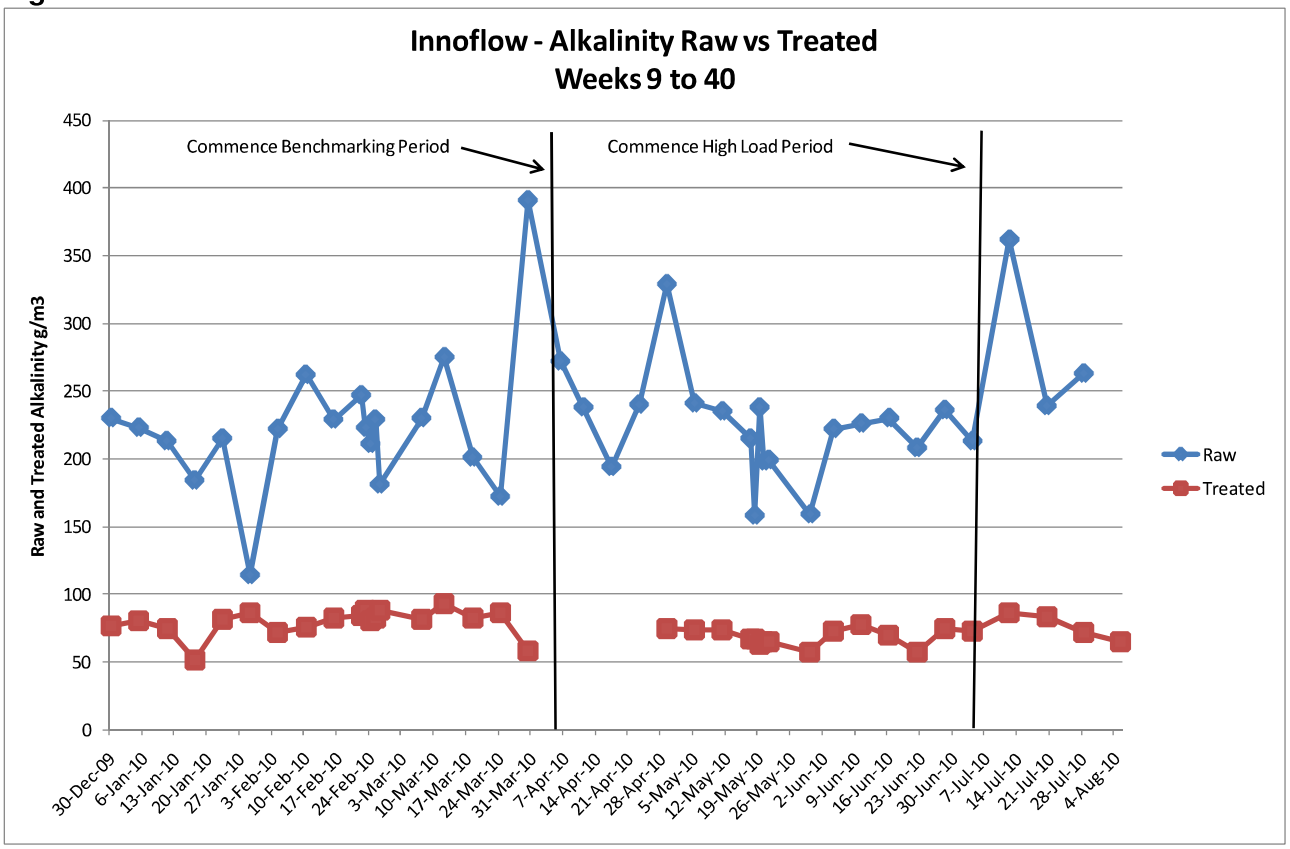
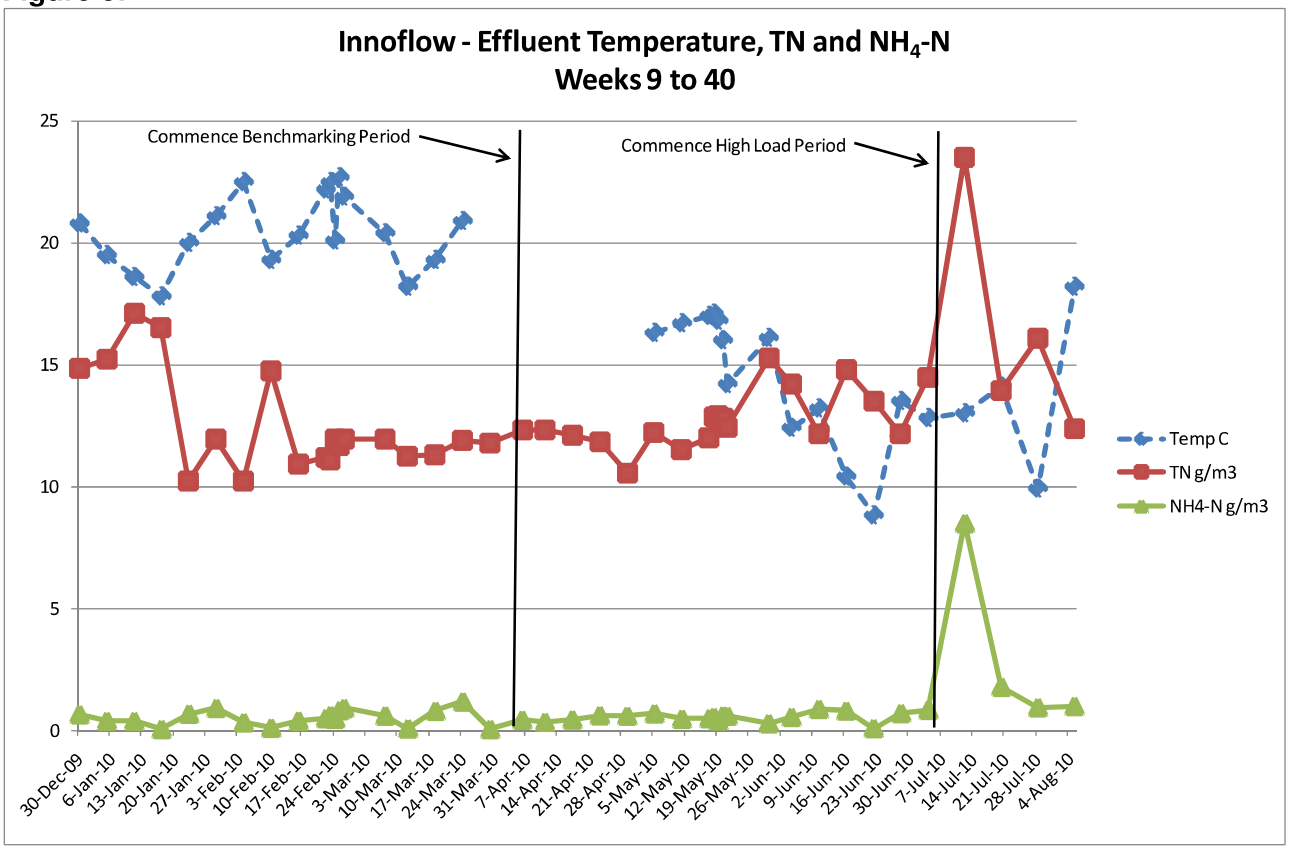


Figure 8:



6.6 Daily Energy Use, Weeks 9 to 39

Figure 9 provides a record of the daily energy use. Power consumption is recorded for recirculation pumping together with that for the effluent pumping. The treated effluent pump has to deliver against a 10m head (representing distribution through a drip irrigation system). The AdvanTex® AX-20 has a recirculation pump for distributing flow over the textile media, and a second pump (nominal flow of 36 litres/minute at 28m head) for discharge to drip irrigation. The overall energy consumption is very low for an advanced treatment system.

6.7 Treated Effluent Benchmarking for all Parameters, Weeks 23 to 35

Figure 10 sets out the treated effluent quality for 16 test results for benchmarking BOD_5, TSS, TN, NH_4-N, and TP, as well as daily energy use for Weeks 23 to 35 (5 April to 4 July).

The AdvanTex® AX-20 has shown a consistently high performance for all tested parameters. Because of four missed BOD_5 and TSS results at the commencement of the benchmarking period, Innoflow requested that four samples taken through the High Load effects period be used for benchmarking. This has resulted in an increase in the mean and standard deviation compared to the likely results if the four missed samples had been retained.

Figure 9:

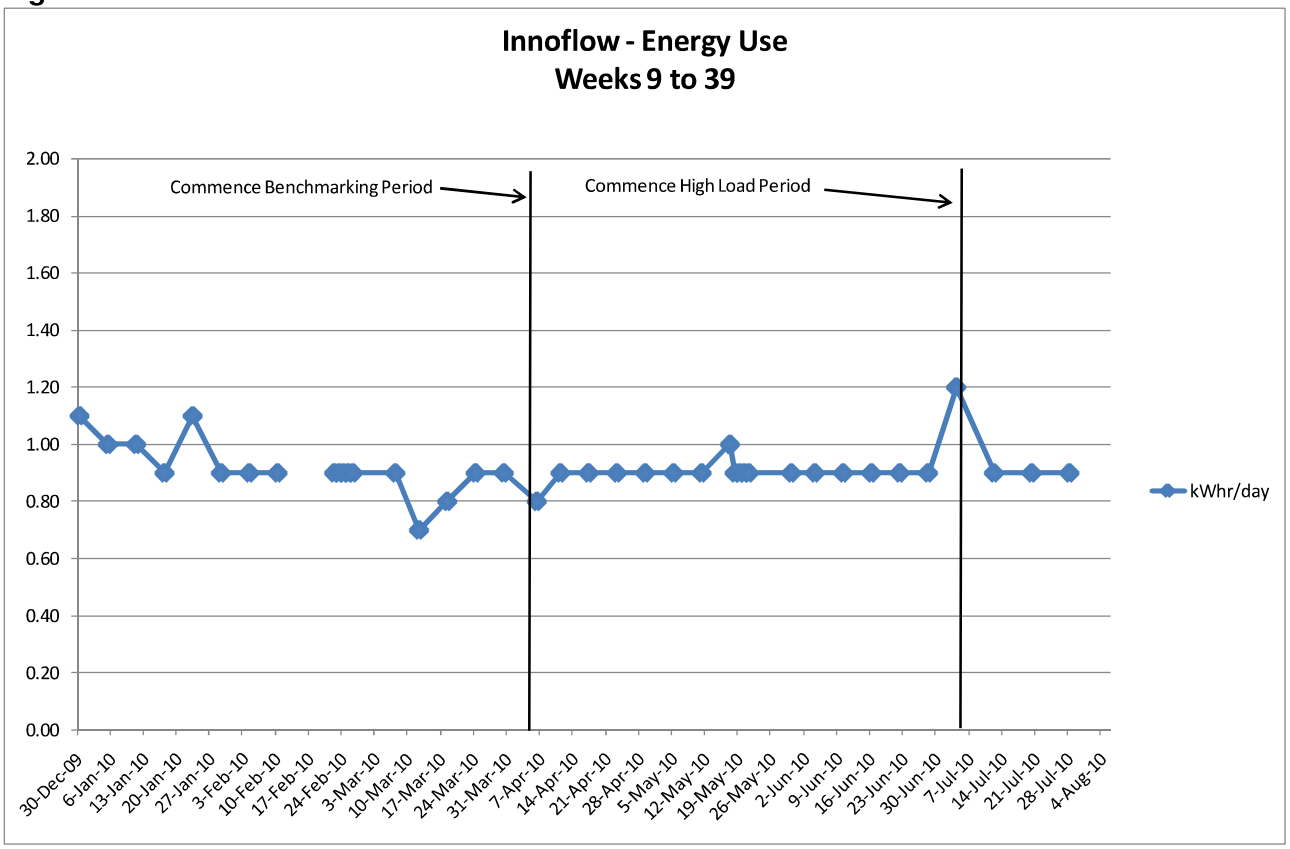
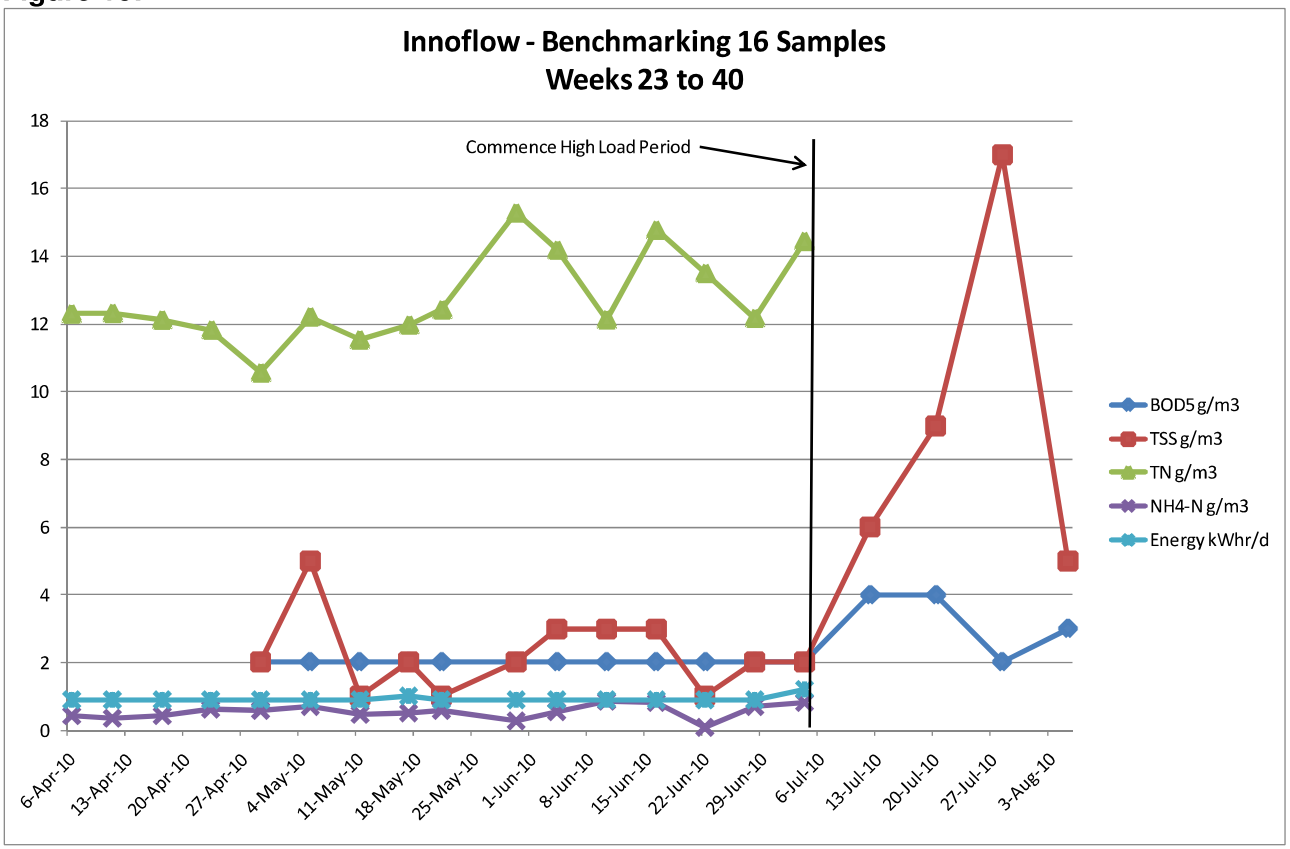


Figure 10:



7 Performance Evaluation – Benchmark Ratings

To provide a simple, quantitative benchmark rating that is transferable across all possible effluent qualities, a system has been developed that rates the measured constituents, or ranked indicators, on a letter-grade based on the quality of effluent produced (or the quality of that particular indicator within the effluent produced). Table 2 below sets out the basis of this rating system.

Table 2: Benchmark Rating Indicators

Rated Indicators for Median Value	Rating Letters and Corresponding Levels				
	A+	A	B	C	D
Biochemical oxygen demand (BOD_5 g/m^3)	<5	<10	<20	<30	≥30
Total suspended solids (TSS g/m^3)	<5	<10	<20	<30	≥30
Total nitrogen (TN g/m^3)	<5	<15	<25	<30	≥30
Ammonia nitrogen (NH_4-N g/m^3)	<1	<5	<10	<20	≥20
Total phosphorus (TP g/m^3)	<1	<2	<5	<7	≥7
Faecal coliforms (FC cfu/100ml)	<10	<200	<10,000	<100,000	≥100,000
Energy (kWh/d) (mean)	0	<1	<2	<5	≥5

The benchmarking evaluation for the AdvanTex® AX-20 was carried out on 16 samples for five parameters throughout the benchmarking test period. The results are rated as per Table 3 below.

Table 3: AdvanTex® AX-20 Effluent Quality Performance Ratings:

Indicator Parameters	Median	Std Dev	Rating	Rating System				
				A+	A	B	C	D
BOD_5 (g/m^3)	***2.0***	***0.7***	**A+**	***<5***	***<10***	***<20***	***<30***	***≥30***
TSS (g/m^3)	***2.5***	***4.1***	**A+**	***<5***	***<10***	***<20***	***<30***	***≥30***
TN (g/m^3)	***12.3***	***1.3***	**A**	***<5***	***<15***	***<25***	***<30***	***≥30***
NH_4-N (g/m^3)	***0.6***	***0.21***	**A+**	***<1***	***<5***	***<10***	***<20***	***≥20***
Energy (kWh/d) (mean)	***0.92***	**--**	**A**	***0***	***<1***	***<2***	***<5***	***≥5***

8 Audit Group Comments

This re-test of the AdvanTex® AX-20 was carried out to specifically assess the nitrogen reduction performance for an insulated unit to simulate in-ground conditions. The main difference in treatment unit hardware has been the substitution of an OSI high performance pump for the recirculation pump used in Trial 3. This has achieved the lower energy consumption for this Trial 5 unit compared to the Trial 3 unit.

Overall the AdvanTex® AX-20 as tested achieved a very high quality secondary effluent plus consistently high nitrogen reduction performance and very low energy use.

Ian Gunn
Technical Manager, OSET NTP

Ray Hedgland
Chairman, Audit Group, OSET NTP

Appendices

Appendix 1: Trial 5 – AdvanTex® AX-20 Testing Timeline
Appendix 2: OSET NTP Organisational Structure

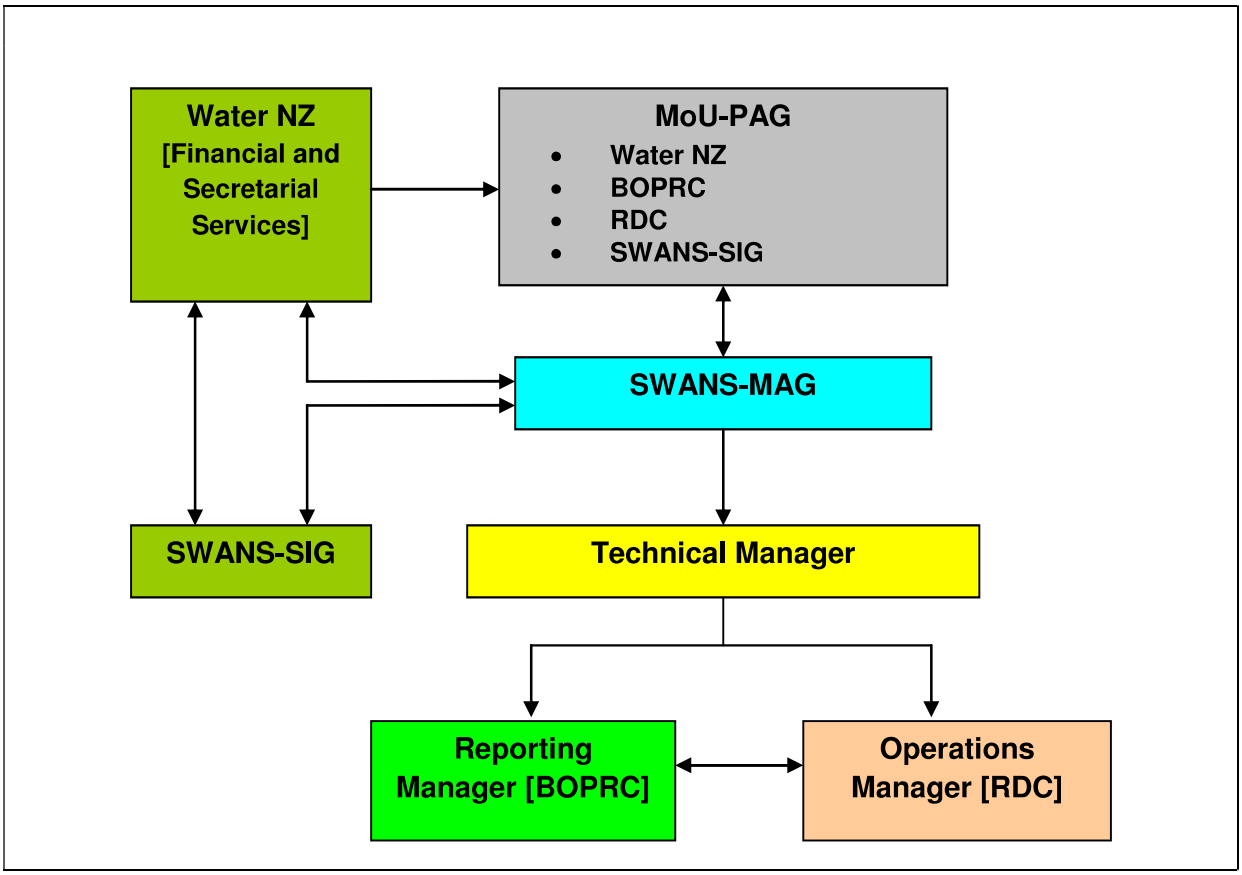
Appendix 1: TRIAL 5 – AdvanTex® AX-20 Testing Timeline

2009-2010		Day of Week								
Start Date	WEEK	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday		
02-Nov-09	1								Media Development and Pre-Benchmarking Phase	Sampling Profile A
09-Nov-09	2									$cBOD_5$
16-Nov-09	3									TSS
23-Nov-09	4									TN
30-Nov-09	5									NH_4-N
07-Dec-09	6									TKN
14-Dec-09	7									TOXN
21-Dec-09	8									NO_3-N
28-Dec-09	9									NO_2-N
04-Jan-10	10									Alk
11-Jan-10	11									pH
18-Jan-10	12									Temp
25-Jan-10	13									
01-Feb-10	14									Sampling Profile B
08-Feb-10	15									TN
15-Feb-10	16									NH_4-N
22-Feb-10	17									TKN
01-Mar-10	18									TOXN
08-Mar-10	19									NO_3-N
15-Mar-10	20									NO_2-N
22-Mar-10	21									
29-Mar-10	22									
05-Apr-10	23		1					2	Benchmarking and High Flow Phase	
12-Apr-10	24						3			
19-Apr-10	25					4				
26-Apr-10	26				1, 5					
03-May-10	27			2, 6						
10-May-10	28		3, 7							
17-May-10	29	4, 8				5, 9				
24-May-10	30						6, 10			
31-May-10	31					7, 11				
07-Jun-10	32				8, 12					
14-Jun-10	33			9, 13						
21-Jun-10	34		10, 14							
28-Jun-10	35	11, 15						12 16		
05-Jul-10	36			2,000	2,000	2,000	2,000	2,000		
12-Jul-10	37	13								
19-Jul-10	38		14							
26-Jul-10	39			15						
2-Aug-10	40				16					

Legend

- Profile A
- Profile B
- **1 -16** indicates Benchmarking TN and NH_4-N
- **1-16** indicates Benchmarking BOD_5 and TSS
- Media development
- Pre-benchmarking
- Benchmarking
- High Load Effects Period

Appendix 2: OSET NTP Organisational Structure



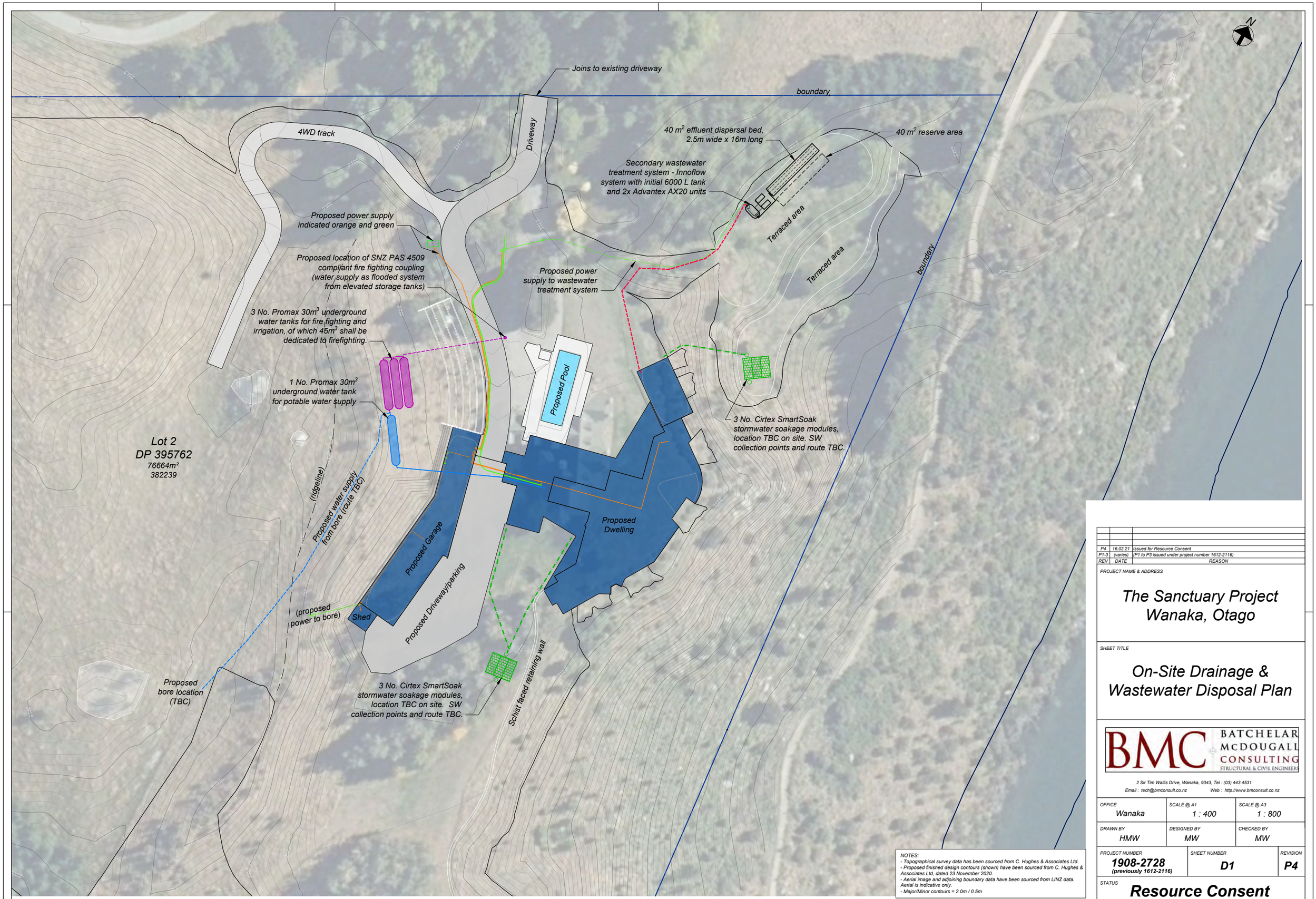
Acronyms

MoU	Memorandum of Understanding
MoU PAG	Partners Advisory Group
BOPRC	Bay of Plenty Regional Council
RDC	Rotorua District Council
OSET	On-Site Effluent Treatment
OSET NTP	National Testing Programme
SWANS	Small Wastewater and Natural Systems
SWANS MAG	Management and Auditing Group
SWANS SIG	Special Interest Group
WATER NZ	Water New Zealand

SWANS-MAG Membership

Technical Manager	Ian Gunn (Auckland UniServices Ltd)
Chairman	Ray Hedgland (Fraser Thomas Ltd)
Operations & Laboratory Manager	Dave Anderson (Rotorua District Council)
Reporting Manager	Sam Weiss (Bay of Plenty Regional Council)
Appointed Member	Andrew Dakers (EcoEng Pacific Ltd)
Appointed Member	Gilles Altner (Global Environmental Engineering Ltd)

13 Appendix – Topographical Plan & On-site Drainage & Wastewater Disposal Plan



REV	DATE	REASON
P4	16.02.21	Issued for Resource Consent
P1-3	(varies)	(P1 to P3 issued under project number 1612-2116)

PROJECT NAME & ADDRESS

The Sanctuary Project
Wanaka, Otago

SHEET TITLE

On-Site Drainage & Wastewater Disposal Plan

BMC BATCHELAR McDOUGALL CONSULTING
STRUCTURAL & CIVIL ENGINEERS

2 Sir Tim Wallis Drive, Wanaka, 9343, Tel : (03) 443 4531
Email : tech@bmconsult.co.nz Web : http://www.bmconsult.co.nz

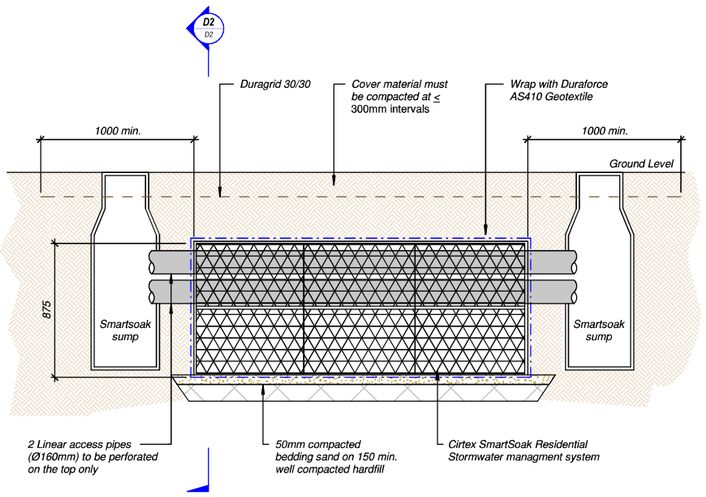
OFFICE	SCALE @ A1	SCALE @ A3
Wanaka	1 : 400	1 : 800
DRAWN BY	DESIGNED BY	CHECKED BY
HMW	MW	MW

PROJECT NUMBER	SHEET NUMBER	REVISION
1908-2728 (previously 1612-2116)	D1	P4

STATUS

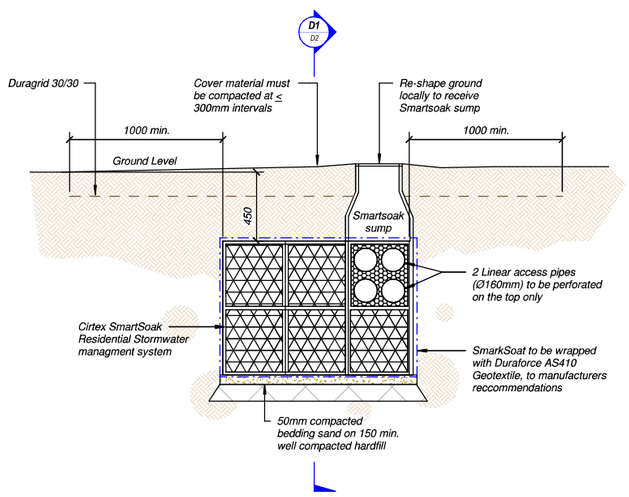
Resource Consent

NOTES:
- Topographical survey data has been sourced from C. Hughes & Associates Ltd.
- Proposed finished design contours (shown) have been sourced from C. Hughes & Associates Ltd, dated 23 November 2020.
- Aerial image and adjoining boundary data have been sourced from LINZ data. Aerial is indicative only.
- Major/Minor contours = 2.0m / 0.5m



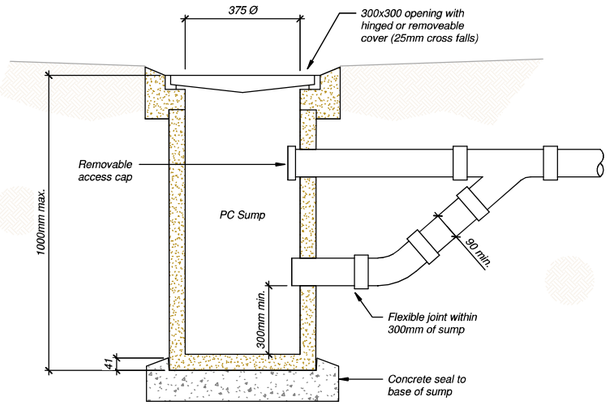
D1 Typical Citex Section 1

SCALE 1 : 20



D2 Typical Cirtex Section 2

SCALE 1 : 20



D3 Type 1 Surface Water Sump

SCALE 1 : 10

(Type-one surface water sump, in accordance with Building Code document E1:2017, Acceptable Solution E1/AS1, clause 3.6.2)

REV	DATE	REASON
P3	18.07.18	Issued for Resource Consent
P2	29.05.18	Issued for Resource Consent
P1	22.11.17	Issued for Resource Consent

PROJECT NAME & ADDRESS

The Sanctuary Project
Wanaka, Otago

SHEET TITLE

Drainage Details - Sheet 1

BMC BATCHELAR McDOUGALL CONSULTING
STRUCTURAL & CIVIL ENGINEERS
Level 3, 99 Ardmore Street, Wanaka, 9343, Tel : (03) 443 4531
Email : tech@bmconsult.co.nz Web : http://www.bmconsult.co.nz

OFFICE	SCALE @ A1	SCALE @ A3
Wanaka	1 : 20 / 1 : 10	1 : 40 / 1 : 20

DRAWN BY	DESIGNED BY	CHECKED BY
CDM	HS	MW

PROJECT NUMBER	SHEET NUMBER	REVISION
1612-2116	D2	P3

STATUS **Resource Consent**

Otago Regional Council

Our reference: A1092436

1 March 2018

Nature Preservation Trustee Limited
492 Wanaka-Mount Aspiring Road
Wanaka 9382

Dear Sir/Madam

Decision on Resource Consent Application No. RM18.062: To construct up to two bores including one production bore for the purpose of accessing ground water, Wanaka

I advise that a decision has been given on your application for resource consent. A copy of the staff recommending report is enclosed along with the consent.

The decision is:

That Council grants to **Nature Preservation Trustee Limited**

Land Use Permit – Bore: RM18.062.01
To construct up to two bores including one production bore for the purpose of accessing ground water

Reasons for decision
These are set out at the end of the enclosed recommending report under the heading "Recommendation".

Objection Rights
Section 357 of the Resource Management Act 1991 provides you with the right to lodge an objection with the Council in respect of this decision and/or any associated conditions. Any such objection must be made in writing setting out the reasons for the objection and must be received by the Council within 15 working days of receiving this letter.

Alternatively, in accordance with s.120 of the Act, this decision is subject to a statutory right of appeal directly to the Environment Court, P O Box 2069, Christchurch, which must be lodged with the Environment Court and served on the Council within 15 working days of receiving this letter.

This resource consent has been granted on a non-notified application, therefore the consent commences on the date you receive this letter unless a condition in the consent states otherwise, or an appeal is lodged.

If an appeal is lodged the consent cannot be exercised until the Court has determined the appeal, or the appeal is withdrawn, or a determination of the Court states otherwise.

Conditions of Consent
It is important that you check the conditions of your consent carefully as some of them may require you to surrender your current consent or provide information and/or plans to the Council before you may commence your activity. In addition, in some cases you may also require other permits or consents for your proposed activity and these must be obtained before you can commence your activity.

Bore Tag Numbers for Bores
The enclosed tag must be attached to your bore with the cable tie within two weeks of completion of the bore construction. This tag is provided to you at Council's cost, however, if it is stolen, damaged or lost, the Council can provide a new tag, but a replacement fee will apply.

Lapse of Consent
Please note that under s.125 of the Act this consent shall lapse in two years unless you have given effect to it before then.

Consent Charges
At this stage the Council has not calculated the final costs of processing your application. Should the final costs exceed the deposit already paid, then as previously advised, you will be invoiced separately for these costs. Should the final costs be less than the deposit already paid then you will receive a refund.

Compliance Fees and Charges
Council's Environmental Services Unit will monitor your consent to ensure you have complied with the conditions of your consent. If you have any query about these charges, please contact the Environmental Data Team at Council.

Please contact **Rebecca Jackson** at this office should you require clarification of any matter relating to this decision letter.

Yours sincerely

Marian Weaver.

Marian Weaver
Resource Manager Procedures and Protocols
Encl

Otago Regional Council

Our reference: A1091920 Consent No. RM18.062.01

LAND USE CONSENT

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

Name: Nature Preservation Trustee Limited

Address: Aspiring Law Limited, 62 Ardmore Street, Wanaka

To construct up to two bores including one production bore

For the purpose of accessing ground water

For an unlimited term

Location of consent activity: Site 1: Wanaka, approximately 1.4 kilometres southeast of the intersection of Wanaka-Mount Aspiring Road and Ruby Island Road
Site 2: Wanaka, approximately 1.4 kilometres southeast of the intersection of Wanaka-Mount Aspiring Road and Ruby Island Road

Legal description of consent location: Lot 2 DP 395762

GPS location: Within a 20 metre radius of Site 1: NZTM 2000: E1289861 N5045009
Site 2: NZTM 2000: E1289921 N5045002

Conditions

Specific

1. If this consent is not given effect to within a period of two years from the date of commencement of this consent, this consent shall lapse under Section 125 of the Resource Management Act 1991. The consent shall attach to the land to which it relates.
2. Any bore tag provided to the consent holder by the Consent Authority must be attached to the production bore within two weeks of completion of the bore construction. The consent holder shall ensure the bore tag is attached to the bore and in good condition at all times.
3. Copies of the results of any water quality analyses performed on the groundwater shall be forwarded to the Consent Authority within two weeks of the analysis being undertaken.
4. Work carried out during the construction of the bore shall be to the New Zealand Standard "Environmental Standard for Drilling of Soil and Rock" NZS 4411:2001.
5. In each bore there shall be adequate facility and access for future vertical lowering of a 20 millimetre diameter electric plumb bob for the purpose of measuring water level, or a facility which allows pressure readings.

6. In each bore there shall be adequate facility and access for future water quality sampling such as a hand operated tap/valve that is sourced from the direct pump outlet, before the reticulation encounters pressure tanks/reservoir/treatment plant. Where there is reticulation back pressure at the bore head, a one way valve shall be fitted for maximum efficiency and in that case, the water sampling point shall be on the bore pump side of the one way valve.

Performance Monitoring

7. At the completion of drilling, of the production bore and any abandoned, backfilled and sealed drill holes, the consent holder shall forward the following information to the Consent Authority:
   (a) A clear color photograph of the bore diameter, including a measuring device to show scale,
   (b) Clear colored photographs showing compliance with condition 2, 5, 6 and 8,
   (c) An accurate site map showing the location of all drill holes and site access,
   (d) Clear colored photographs showing the GPS location at each drill hole,
   (e) Fully completed bore log forms for each drill hole, and
   (f) Copies of the results of any pumping tests carried out.

General

8. The bore's head casing and reticulation shall be suitably constructed and sealed to avoid ingress of surface water and other foreign matter.

9. This consent only authorises the construction of one production bore. The bore's integrity shall be maintained at all times unless abandoned. If a bore is abandoned, or any drill holes not required, the bore shall be appropriately sealed/grouted and backfilled, and any drill holes not required shall be backfilled, to prevent contaminants from entering the bore or drill hole at any level.

Notes to Consent Holder

1. *If there is a discharge of contaminants, including human sewage, onto land within 50 metres of a bore used to supply water for domestic purposes or drinking water for livestock, a resource consent may be required for the discharge under the Regional Plan: Water for Otago.*
2. *If there is a discharge of contaminants, including contaminants from offal pits, farm landfills, silage production and greenwaste landfills, onto land within 100 metres of a bore used to supply water for domestic purposes or drinking water for livestock, a resource consent may be required for the discharge under the Regional Plan: Waste.*
3. *The granting of this bore permit does not infer or guarantee that water will be available for abstraction once the bore is constructed*

Issued at Dunedin this 1st day of March 2018

Marian Weaver
Resource Manager Procedures & Protocols

ORC STAFF RECOMMENDING REPORT

Document ID: A1091906
Objective File No: RM18.062
Consent No: RM18.062.01
Prepared for: Staff Consents Panel
Prepared by: Rebecca Jackson, Consents Officer
Date: 28/02/2018
Subject: **Land Use Consent Application RM18.062.01 by Nature Preservation Trustee Limited to construct up to two bores with a maximum of one production bore, Wanaka**

---

1. Purpose

To report and make recommendations on the determination of the above application to construct up to two bores with a maximum of one production bore under the non-notified provisions (Section 95A) of the Resource Management Act 1991 (the Act).

2. Application Details

Applicant/s full name/s	Nature Preservation Trustee Limited
Location of bore/s	Wanaka, approximately 960 metres east southeast of the intersection of Wanaka-Mount Aspiring Road and Ruby Island Road
No of proposed bores:	Two, with a maximum of one production bore
Map reference of location/s (NZTM 2000)	Bore 1: E1289861 N5045009 Bore 2: E1289921 N5045002
Proposed depth of bore/s	66 metres
Proposed rate of take and daily volume	25 cubic metres per day at a rate of 1.38 litres per second
Intended use of water	Domestic (one house)
Proposal meets permitted activity rule: **12.2.2.1** **12.2.2.2** **12.2.2.4** **12.2.2.6 of RPW for the proposed rate and volume of take**	Yes
Name of aquifer	Unknown
Status of the application	Controlled (Rule 14.1.1.1 RPW)
Written approvals required? **If yes, full names of all affected parties who have given written approval and why approval required**	No

3. Assessment of Effects on the Environment

1.1.1.1.1.1 Effects due to construction of the bore	To minimise effects, the following conditions are recommended: • Construction is in accordance with the New Zealand Standard "Environmental Standard for Drilling of Soil and Rock" NZS

	4411:2001 • Sealing and backfilling of the bore when it is no longer being used. • Facility for groundwater quality testing.
Could this bore have a significant adverse effect on any existing water takes from a bore within 100 metres of the proposed bore/s?	No
What is the name of and how far is the nearest surface water body from the bore?	Lake Wanaka is 160 metres east of the proposed sites.
Will the proposed abstraction have any significant adverse effect on the surface water body?	No
Are there any known septic tank/on-site wastewater discharges within 50 m of the site of the proposed bore	No
Are there any consented wastewater discharges within 500 m of the site of the proposed bore	No
Are there any known potentially contaminated sites within a 1 kilometre radius of the proposed bore site.	No

4. Statutory Considerations (Sections 5– 8 of the Act)

Is granting the consent consistent with Sections 5, 6, 7 and 8 of the Act?	Yes – due to the minor nature of the activity and proposed conditions of consent.

5. National Environmental Statements, National Policy Statements, Regional Policy Statements, and Regional Plan – Water

Is granting the consent consistent with Policy 5.5.5 and Objective 6.4.2 of the RPS and the relevant policies of the proposed RPS (Policies 2.1.1, 2.3.1)	Yes, conditions of consent will minimise the adverse effects of land use activities through avoiding, remedying or mitigating the degradation of groundwater resources caused by the introduction of contaminants
Is granting the consent consistent with Policies 6.4.10AC, 6.4.10C and 9.4.14 of the RPW	Yes, conditions of consent will relate to the appropriate siting, construction and operation of new groundwater bores to maintain artesian pressure in confined aquifer conditions, and to prevent contaminants from entering an aquifer and contamination of one aquifer by another aquifer.

6. Recommendation

That the Otago Regional Council grants to Nature Preservation Trustee Limited Land Use Consent RM18.062.01 subject to the terms and conditions set out in the consent because

(a) The effects of constructing the bore are expected to be minor, and the activity is consistent with the relevant statutory requirements.

(b) The application falls within the non-notification provisions of Section 95A of the Act.

Rebecca Jackson
Consents Officer

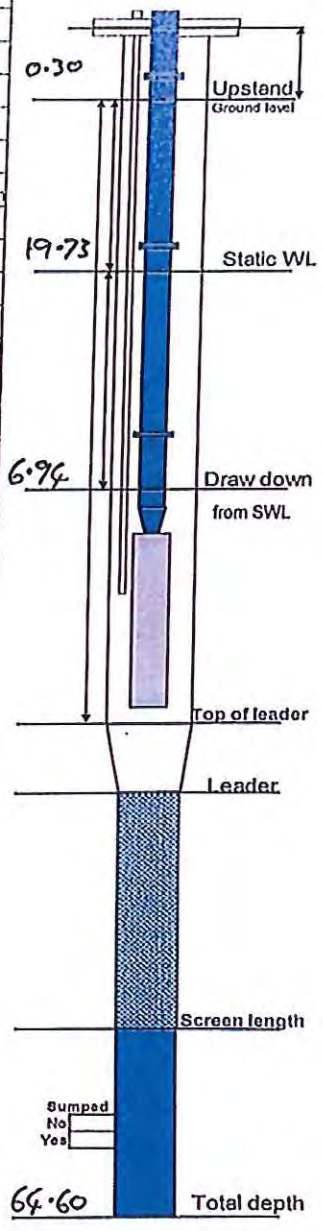
mcneill

Client Name:	presbie tikau	Home No.	
		Cell No.	
Address	442 wanaka-mount Aspiring Rd wanaka	Consent No.	Rm18.062.01
Grid Reference	E. 1289861	N. 5045009	
Driller	Neil Simmons		
Machine/Rig:	DR24	Fleet No. 232	
Drill Method:	Dual rotary / Dth Hammer		
Bore diameter mm	150 mm		
Start date:	16-4-18	Finish Date:	17-4-18
Development Hours:	1.25	Development Method:	air lift
Screen Slot:	mm	ID mm	OD mm
PVC slotted	3m	Top 60.85 m	Bottom 63.85 m
Total casing used:	5.17 m	Total Depth:	64.60 m
Sump length:	— n	Sump Diameter:	— mm
Test Pumping	Air lifted	Pumped ✓	Rate: 2.00 LPS
Test Pump period	2.5 Hrs	Pump Intake:	60 m

Bacterial Water test	Yes	✓	No		
Chemical Water test	Yes	✓	No		
Casing top sealed	Yes	✓	No		
Impervious seal at ground	Yes	✓	No		
Over Drilled	Yes		No	✓	m
Photo of bore diameter	Yes		No		
Photo of bore tag	Yes		No		

Comments: total 100mm PN12 pvc 64.00m

log
0-1.1 Silts Gravel
1.1-2 Gravel
2.0-64.6 schist rock
water at
24m
48m
57-62m main flow



Version: 1, Created 16 October 2014

- Sample - 24840 P Tihan MD 37131 – Bore water Batch 72007

Determinants	Results (mg/L or specified)	MAV[1] or GV[2]	Target range	Comments
Acidity	15	-	Low	Ok
Alkalinity	200	-	Low	High*
Bromide	<0.1	-	Low	Ok
Chloride	0.96	250	<250	Ok
Colour	<2.5	-	<5.0	Ok
Conductivity	42	-	<40, low	Sightly high*
Fluoride	0.1	-	Low	Ok
Total hardness	210	200	50-80	Quite hard*
pH	7.49	7.0 to 8.5	7.0 to 8.0	Ok
Phosphate	<0.2	250	Low	Ok
Sulphate	16	250	<125	Ok
Total arsenic	0.0032	0.01	0.005	Ok
Turbidity	9.1	2.5	<5	Turbid*
Total calcium	76	-	40	High*
Total iron	0.72	0.2	<0.2	High*
Total magnesium	5.5	-	10	Ok
Total manganese	0.190	0.4	<0.04 for appearance	High*
E.coli	<1.0	<1.0	<1.0	Ok
Nitrate	0.12	50	<25	Ok

[1]MAV means Maximum Acceptable Values quoted from Drinking Water Standards for New Zealand 2008. [2]GV means Guideline Values from the same source above.
mg/L equals to g/m³ and is often referred to as ppm (parts per million). < means less than.

The water was deemed **SUITABLE** for drinking purpose in general according to most local councils' requirements and the 2008 guidelines of The New Zealand Drinking Water Standards. No extra tests should be conducted unless specifically required by the local council.

The high total calcium had produced high alkalinity and had rendered the water quite hard. This high water hardness will cause major detergent deficiency and scaling problems under all normal circumstances. It is strongly recommended that an appropriate water "softening" treatment system be installed to eliminate these problems. The water was turbid and had high total iron and manganese, they will cause staining to laundries and cooking utensils. An appropriate filtration system can lower the turbidity and possibly the total iron and manganese.

Dr. Frank Ho

CITILAB, Box 781, Dunedin. Ph:03-4557938 Fax:03-4557940 Email: mail@citilab.co.nz

I N T E R I M REPORT ONLY

#72007

McNeill Drilling - INGL
(Cnr SH 1 & Clapham Road)
PO Box 542
INVERCARGILL 9840

This emailed HTM or PDF report is "interim" - and should be followed by a full (signed) Laboratory Analysis Report by post.

ATTENTION: Invercargill, Brad, Chris Order #:- DRL67627

LAB REF	Sample Taken:	Job Start:	Client Ref.	ANALYSIS	RESULT	Comments
24840	18/04/18 11:00:00	19/04/18 09:17:15	Presbie Tihan MD37131 ~ Bore Water			.... (Citilab to include explanatory notes with report).
				Acidity	15 g/m³ as CaCO3	Requires CO2
				Alkalinity to pH 4.5	200 g/m³ as CaCO3	
				Alkalinity to pH 8.3	<1 g/m³ as CaCO3	
				Bromide (IC)	<0.1 g/m³	
				Chloride (IC)	0.96 g/m³	
				Colour (Hazen) *	<2.5 Hazen	
				Conductivity @ 25°C	42 mS/m	
				Fluoride (IC)	0.1 g/m³	
				Total Hardness	210 g/m³ as CaCO3	By Calculation
				pH	7.49 @ 20°C	
				Phosphate (IC) *	<0.2 g/m³	
				Phosphate-P (IC) *	<0.1 g/m³	
				Sulphate (IC)	16 g/m³	
				Turbidity - class 1	9.1 NTU	
			>>> Referral test: Hill Laboratories, Hamilt	Arsenic-Total *	0.0032 g/m³	
			>>> Referral test: Hill Laboratories, Hamilt	Calcium-Total (ICP) *	76 g/m³	
			>>> Referral test: Hill Laboratories, Hamilt	Iron-Total (ICP) *	0.72 g/m³	
			>>> Referral test: Hill Laboratories, Hamilt	Magnesium-Total (ICP) *	5.5 g/m³	
			>>> Referral test: Hill Laboratories, Hamilt	Manganese-Total (ICP) *	0.190 g/m³	
				Nitrate (IC)	0.12 g/m³	
				Nitrate-N (IC)	0.03 g/m³	
				E. coli (Quanti-Tray)	<1.0 MPN/100 mL	

These samples were collected by yourselves and analysed as received at the laboratory.

==========LAST PAGE OF REPORT==========

Citilab
Analysts Consultants

LABORATORY ANALYSIS REPORT

#72007

Tuesday, 8 May 2018

McNeill Drilling - INGL
(Cnr SH 1 & Clapham Road)
PO Box 542
INVERCARGILL 9840

ATTENTION: Invercargill, Brad, Chris

Your Order #:- DRL67627 .

Job Start: 19/04/18 09:17:15

LAB. REF.	Sample Taken:	Sample Description / Test start:	Test complete:	ANALYSIS	RESULT	comments: Analytical Method	Detection Limits
						.... (Citilab to include explanatory notes with report).	
24840	18/04/18 11:00	Presbie Tihan MD37131 ~ Bore Water					
		28/04/18 14:10:19	29/04/18 08:46:40	Acidity Requires CO2	15 g/m³ as CaCO3	APHA 2310, B	5 g/m³ as CaCO3
		19/04/18 14:02:51	19/04/18 15:43:45	Alkalinity to pH 4.5	200 g/m³ as CaCO3	APHA 2320, B	1 g/m³ as CaCO3
		19/04/18 14:02:52	19/04/18 15:43:47	Alkalinity to pH 8.3	<1 g/m³ as CaCO3	APHA 2320, B	1 g/m³ as CaCO3
		19/04/18 09:46:59	4/05/18 14:29:03	Bromide (IC)	<0.1 g/m³	APHA4110, B	0.03 g/m³
		19/04/18 09:47:01	4/05/18 14:29:04	Chloride (IC)	0.96 g/m³	APHA4110, B	0.05 g/m³
		20/04/18 09:54:01	4/05/18 10:09:03	Colour (Hazen) *	<2.5 Hazen	Lovibond Comparator	2.5° Hazen
		19/04/18 14:03:01	24/04/18 16:23:03	Conductivity @ 25°C	42 mS/m	APHA 2510, B	0.03 mS/m
		19/04/18 09:46:58	4/05/18 14:29:05	Fluoride (IC)	0.1 g/m³	APHA4110, B	0.03 g/m³
		19/04/18 10:02:01	7/05/18 15:24:03	Total Hardness By Calculation	210 g/m³ as CaCO3	APHA 2340, C	1 g/m³ as CaCO3
		19/04/18 14:02:49	24/04/18 17:10:25	pH	7.49 @ 20°C	APHA 4500 - H+, B	0.02 pH unit
		19/04/18 09:46:56	4/05/18 14:29:09	Phosphate (IC) *	<0.2 g/m³	APHA4110, B	0.4 g/m³
		4/05/18 10:37:29	4/05/18 14:29:10	Phosphate-P (IC) *	<0.1 g/m³	APHA4110, B	0.2 g/m³
		19/04/18 09:47:03	7/05/18 15:26:02	Sulphate (IC)	16 g/m³	APHA4110, B	0.03 g/m³
		20/04/18 09:53:52	20/04/18 17:08:06	Turbidity - class 1	9.1 NTU	APHA 2130, B	0.05 NTU
>> Referral: Hill Laboratories, Hamilton.		19/04/18 10:02:21	7/05/18 15:24:33	Arsenic-Total *	0.0032 g/m³	APHA 3125, B	0.001 g/m³
>> Referral: Hill Laboratories, Hamilton.		19/04/18 10:02:13	7/05/18 15:24:20	Calcium-Total (ICP) *	76 g/m³	APHA 3125, B	0.001 g/m³
>> Referral: Hill Laboratories, Hamilton.		19/04/18 10:02:02	7/05/18 15:24:10	Iron-Total (ICP) *	0.72 g/m³	APHA 3125, B	0.005 g/m³
>> Referral: Hill Laboratories, Hamilton.		19/04/18 10:02:15	7/05/18 15:24:23	Magnesium-Total (ICP) *	5.5 g/m³	APHA 3125, B	0.002 g/m³
>> Referral: Hill Laboratories, Hamilton.		19/04/18 10:02:06	7/05/18 15:24:14	Manganese-Total (ICP) *	0.190 g/m³	APHA 3125, B	0.0003 g/m³
		19/04/18 09:46:54	4/05/18 14:29:16	Nitrate (IC)	0.12 g/m³	APHA4110, B	0.03 g/m³
		4/05/18 10:37:28	4/05/18 10:37:36	Nitrate-N (IC)	0.03 g/m³	APHA4110, B	0.01 g/m³
		20/04/18 15:34:52	23/04/18 12:09:52	E. coli (Quanti-Tray)	<1.0 MPN/100 mL	APHA 9223 B	1.0 MPN/100 mL

Citilab

Analysts Consultants

Analyst's Comments:
These samples were collected by yourselves and analysed as received at the laboratory.
The detection limits given are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.
Units: In accordance with modern practice the previous 'mg/L' is now expressed as the equivalent 'g/m³'.

IANZ
ACCREDITED LABORATORY

Citilab is accredited by International Accreditation New Zealand (IANZ). The tests reported here have been performed in accordance with its terms of accreditation - with exception of any marked *, which are not within Citilab's scope.

Dr. Frank Ho
Lab Services Manager

Naomi Pelet
Microbiology Technician (KTP)

10 Tahuna Rd, PO Box 781, Dunedin 9054
Telephone (03) 455 7938, Fax (03) 455 7940
Email: mail@citilab.co.nz
Website: www.citilab.co.nz

Citilab

Analysis Consultants

- Sample - 24840 P Tihan MD 37131 – Bore water Batch 72007

Determinants	Results (mg/L or specified)	MAV[1] or GV[2]	Target range	Comments
Acidity	15	-	Low	Ok
Alkalinity	200	-	Low	High*
Bromide	<0.1	-	Low	Ok
Chloride	0.96	250	<250	Ok
Colour	<2.5	-	<5.0	Ok
Conductivity	42	-	<40, low	Sightly high*
Fluoride	0.1	-	Low	Ok
Total hardness	210	200	50-80	Quite hard*
pH	7.49	7.0 to 8.5	7.0 to 8.0	Ok
Phosphate	<0.2	250	Low	Ok
Sulphate	16	250	<125	Ok
Total arsenic	0.0032	0.01	0.005	Ok
Turbidity	9.1	2.5	<5	Turbid*
Total calcium	76	-	40	High*
Total iron	0.72	0.2	<0.2	High*
Total magnesium	5.5	-	10	Ok
Total manganese	0.190	0.4	<0.04 for appearance	High*
E.coli	<1.0	<1.0	<1.0	Ok
Nitrate	0.12	50	<25	Ok

[1]MAV means Maximum Acceptable Values quoted from Drinking Water Standards for New Zealand 2008. [2]GV means Guideline Values from the same source above.
mg/L equals to g/m³ and is often referred to as ppm (parts per million). < means less than.

The water was deemed **SUITABLE** for drinking purpose in general according to most local councils' requirements and the 2008 guidelines of The New Zealand Drinking Water Standards. No extra tests should be conducted unless specifically required by the local council.

The high total calcium had produced high alkalinity and had rendered the water quite hard. This high water hardness will cause major detergent deficiency and scaling problems under all normal circumstances. It is strongly recommended that an appropriate water "softening" treatment system be installed to eliminate these problems. The water was turbid and had high total iron and manganese, they will cause staining to laundries and cooking utensils. An appropriate filtration system can lower the turbidity and possibly the total iron and manganese.

Dr. Frank Ho
Laboratory Services Manager

Frank Ho

10 Tahuna Rd, PO Box 781, Dunedin 9054
Telephone (03) 455 7938, Fax (03) 455 7940
Email: mail@citilab.co.nz
Website: www.citilab.co.nz