

Appendix B. Water Quality

Measured water quality data were filtered to identify datasets appropriate for the constituent model development process (described in **Section 7**). Sites meeting the following criteria were used for constituent calibration:

- Located at or near the outlet of a SOURCE sub-catchment;
- Locations which provided a good representation of a watershed;
- A monitoring record comprising of at least 5 or more discrete samples; and
- A semi-continuous monitoring record with no large gaps in the sampling regime (i.e. if a site was measured twice in 1990 and then measured again three times in 2015 it was excluded).

Primary sites were defined as sites that best represented a watershed boundary and had more than 30 sample points.

Table B1 to **Table B-8** detail the water quality monitoring sites utilised for constituent calibration for each of the four constituents across the two WMAs. Sites are listed in ascending order of number of data points available.

Table B-1. Total nitrogen water quality monitoring sites in the Kaituna WMA.

| Site Name | Type | Site Code | SC# | Latitude | Longitude | Start Date | End Date | Count (n) |
|---------------------------------|-----------|-----------|-----|----------|-----------|------------|------------|-----------|
| Morepara at u/s Pikowai Road | Secondary | HM688516 | 110 | -37.94 | 176.61 | 10/11/2015 | 05/12/2016 | 11 |
| Paraiti (Mangorewa) at Saunders | Secondary | FN448171 | 10 | -37.88 | 176.35 | 12/01/2016 | 05/12/2016 | 12 |
| Waitahanui at u/s Campbell Road | Secondary | HM319871 | 105 | -37.91 | 176.56 | 10/11/2015 | 05/12/2016 | 12 |
| Puanene at SH2 | Secondary | GN561803 | 77 | -37.82 | 176.47 | 10/11/2015 | 05/12/2016 | 14 |
| Pokopoko at Black Rd | Secondary | GN178816 | 73 | -37.82 | 176.43 | 10/11/2015 | 05/12/2016 | 14 |
| Pongakawa at Pumphouse | Primary | GM781934 | 96 | -37.90 | 176.50 | 07/10/1999 | 12/01/2017 | 68 |
| Waitahanui at Otamarakau Marae | Primary | HN674689 | 114 | -37.83 | 176.60 | 02/10/1995 | 12/01/2017 | 94 |
| Pongakawa at Old Coach Rd | Primary | GN849464 | 96 | -37.85 | 176.51 | 14/07/1999 | 12/01/2017 | 95 |
| Kaituna at Te Tumu | Primary | GO089653 | 57 | -37.75 | 176.42 | 16/09/1993 | 12/01/2017 | 117 |
| Kaituna at Clarkes | Primary | FO497605 | 53 | -37.76 | 176.35 | 22/02/1996 | 12/01/2017 | 131 |
| Pongakawa at SH2 | Primary | GN922883 | 98 | -37.82 | 176.51 | 11/07/1989 | 12/01/2017 | 145 |
| Kaituna at Maungarangi Rd | Primary | FN834668 | 22 | -37.84 | 176.39 | 19/11/1990 | 12/01/2017 | 156 |
| Kaituna at Te Matai | Primary | FO620177 | 26 | -37.79 | 176.36 | 28/08/1990 | 12/01/2017 | 188 |

Table B-2. Total nitrogen water quality monitoring sites in the Rangitāiki WMA.

| Site Name | Type | Site Code | SC# | Latitude | Longitude | Start Date | End Date | Count (n) |
|----------------------------------------|-----------|-----------|-----|----------|-----------|------------|------------|-----------|
| Waihua at Galatea Rd | Secondary | Jl485995 | 32 | -38.25 | 176.83 | 20/11/2015 | 11/01/2017 | 11 |
| Pokairoa at Upstream Forestry Culvert | Secondary | Il631304 | 73 | -38.31 | 176.73 | 19/11/2015 | 08/12/2016 | 14 |
| Ngatamawahine u/s Kopuriki Rd | Secondary | Ih701900 | 70 | -38.35 | 176.74 | 19/11/2015 | 08/12/2016 | 14 |
| Rangitāiki at Boat Ramp | Secondary | KM083686 | 38 | -37.91 | 176.88 | 15/07/2015 | 11/01/2017 | 18 |
| Otamatea at Wairere Rd | Secondary | FD445529 | 6 | -38.75 | 176.39 | 20/01/2010 | 17/01/2017 | 41 |
| Rangitāiki at Matahina Dam | Primary | JK491452 | 34 | -38.12 | 176.82 | 22/08/1995 | 17/01/2017 | 60 |
| Rangitāiki at SH5 | Primary | FC231176 | 1 | -38.87 | 176.37 | 26/03/1999 | 17/01/2017 | 61 |
| Rangitāiki at Inlet to Aniwhenua Canal | Primary | Jl148319 | 30 | -38.31 | 176.79 | 30/07/1990 | 17/01/2017 | 94 |
| Rangitāiki at Murupara | Primary | IG265664 | 26 | -38.46 | 176.70 | 15/02/1989 | 08/12/2015 | 309 |
| Whirinaki River at Galatea Bridge | Primary | IG619428 | 47 | -38.48 | 176.74 | 15/02/1989 | 08/12/2015 | 316 |

Table B-3. Total phosphorous water quality monitoring sites in the Kaituna WMA.

| Site Name | Type | Site Code | SC# | Latitude | Longitude | Start Date | End Date | Count (n) |
|---------------------------------|-----------|-----------|-----|----------|-----------|------------|------------|-----------|
| Morepara at u/s Pikowai Road | Secondary | HM688516 | 110 | -37.94 | 176.61 | 10/11/2015 | 05/12/2016 | 11 |
| Paraiti (Mangorewa) at Saunders | Secondary | FN448171 | 10 | -37.88 | 176.35 | 12/01/2016 | 05/12/2016 | 12 |
| Waitahanui at u/s Campbell Road | Secondary | HM319871 | 105 | -37.91 | 176.56 | 10/11/2015 | 05/12/2016 | 12 |
| Puanene at SH2 | Secondary | GN561803 | 77 | -37.82 | 176.47 | 10/11/2015 | 05/12/2016 | 14 |
| Pokopoko at Black Rd | Secondary | GN178816 | 73 | -37.82 | 176.43 | 10/11/2015 | 05/12/2016 | 14 |
| Pongakawa at Pumphouse | Primary | GM781934 | 96 | -37.90 | 176.50 | 07/10/1999 | 12/01/2017 | 69 |
| Waitahanui at Otamarakau Marae | Primary | HN674689 | 114 | -37.83 | 176.60 | 02/10/1995 | 12/01/2017 | 95 |
| Pongakawa at Old Coach Rd | Primary | GN849464 | 96 | -37.85 | 176.51 | 14/07/1999 | 12/01/2017 | 97 |
| Kaituna at Clarkes | Primary | FO497605 | 53 | -37.76 | 176.35 | 09/04/1991 | 12/01/2017 | 132 |
| Pongakawa at SH2 | Primary | GN922883 | 98 | -37.82 | 176.51 | 11/07/1989 | 12/01/2017 | 146 |
| Kaituna at Maungarangi Rd | Primary | FN834668 | 22 | -37.84 | 176.39 | 28/08/1990 | 12/01/2017 | 158 |

| Site Name | Type | Site Code | SC# | Latitude | Longitude | Start Date | End Date | Count (n) |
|---------------------|---------|-----------|-----|----------|-----------|------------|------------|-----------|
| Kaituna at Te Tumu | Primary | GO089653 | 57 | -37.75 | 176.42 | 12/09/1985 | 12/01/2017 | 159 |
| Kaituna at Te Matai | Primary | FO620177 | 26 | -37.79 | 176.36 | 28/08/1990 | 12/01/2017 | 192 |

Table B-4. Total phosphorous water quality monitoring sites in the Rangitāiki WMA.

| Site Name | Type | Site Code | SC# | Latitude | Longitude | Start Date | End Date | Count (n) |
|---------------------------------------|-----------|-----------|-----|----------|-----------|------------|------------|-----------|
| Waikokopu at Galatea Rd | Secondary | JJ632257 | 32 | -38.22 | 176.84 | 20/11/2015 | 12/01/2017 | 9 |
| Horomanga at Galatea Rd | Secondary | IH893640 | 52 | -38.37 | 176.76 | 23/10/2015 | 11/01/2017 | 10 |
| Waihua at Galatea Rd | Secondary | JL485995 | 32 | -38.25 | 176.83 | 20/11/2015 | 11/01/2017 | 11 |
| Pokairoa at Upstream Forestry Culvert | Secondary | IL631304 | 73 | -38.31 | 176.73 | 19/11/2015 | 08/12/2016 | 14 |
| Ngatamawahine u/s Kopuriki Rd | Secondary | IH701900 | 70 | -38.35 | 176.74 | 19/11/2015 | 08/12/2016 | 14 |
| Waikuku d/s Galatea Rd | Secondary | JJ633547 | 32 | -38.20 | 176.84 | 19/11/2015 | 08/12/2016 | 14 |
| Rangitāiki at Boat Ramp | Secondary | KM083686 | 38 | -37.91 | 176.88 | 15/07/2015 | 11/01/2017 | 18 |
| Otamatea at Wairere Rd | Primary | FD445529 | 6 | -38.75 | 176.39 | 20/01/2010 | 17/01/2017 | 41 |
| Rangitāiki at SH5 | Primary | FC231176 | 1 | -38.87 | 176.37 | 26/03/1999 | 17/01/2017 | 61 |
| Rangitāiki at Matahina Dam | Primary | JK491452 | 34 | -38.12 | 176.82 | 22/08/1995 | 17/01/2017 | 62 |
| Rangitāiki at Inlet to Aniwenua Canal | Primary | JL148319 | 30 | -38.31 | 176.79 | 30/07/1990 | 17/01/2017 | 95 |
| Rangitāiki at Murupara | Primary | IG265664 | 26 | -38.46 | 176.70 | 15/02/1989 | 08/12/2015 | 322 |
| Whirinaki River at Galatea Bridge | Primary | IG619428 | 47 | -38.48 | 176.74 | 15/02/1989 | 08/12/2015 | 325 |

Table B-5. Total suspended solids water quality monitoring sites in the Kaituna WMA.

| Site Name | Type | Site Code | SC# | Latitude | Longitude | Start Date | End Date | Count (n) |
|---------------------------------|-----------|-----------|-----|----------|-----------|------------|------------|-----------|
| Morepara at u/s Pikowai Road | Secondary | HM688516 | 110 | -37.94 | 176.61 | 10/11/2015 | 05/12/2016 | 11 |
| Paraiti (Mangorewa) at Saunders | Secondary | FN448171 | 10 | -37.88 | 176.35 | 12/01/2016 | 05/12/2016 | 12 |
| Puanene at SH2 | Secondary | GN561803 | 77 | -37.82 | 176.47 | 10/11/2015 | 05/12/2016 | 14 |

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| Site Name | Type | Site Code | SC# | Latitude | Longitude | Start Date | End Date | Count (n) |
|--------------------------------|-----------|-----------|-----|----------|-----------|------------|------------|-----------|
| Pokopoko at Black Rd | Secondary | GN178816 | 73 | -37.82 | 176.43 | 10/11/2015 | 05/12/2016 | 14 |
| Pongakawa at Old Coach Rd | Primary | GN849464 | 96 | -37.85 | 176.51 | 14/07/1999 | 13/03/2017 | 98 |
| Waitahanui at Otamarakau Marae | Primary | HN674689 | 114 | -37.83 | 176.60 | 02/10/1995 | 13/03/2017 | 98 |
| Kaituna at Clarkes | Primary | FO497605 | 53 | -37.76 | 176.35 | 09/04/1991 | 13/03/2017 | 129 |
| Pongakawa at SH2 | Primary | GN922883 | 98 | -37.82 | 176.51 | 11/07/1989 | 13/03/2017 | 149 |
| Kaituna at Maungarangi Rd | Primary | FN834668 | 22 | -37.84 | 176.39 | 28/08/1990 | 13/03/2017 | 159 |
| Kaituna at Te Tumu | Primary | GO089653 | 57 | -37.75 | 176.42 | 17/12/1985 | 13/03/2017 | 159 |
| Kaituna at Te Matai | Primary | FO620177 | 26 | -37.79 | 176.36 | 28/08/1990 | 13/03/2017 | 192 |

Table B-6. Total suspended solids water quality monitoring sites in the Rangitāiki WMA.

| Site Name | Type | Site Code | SC# | Latitude | Longitude | Start Date | End Date | Count (n) |
|----------------------------------------|-----------|-----------|-----|----------|-----------|------------|------------|-----------|
| Pokairoa at Upstream Forestry Culvert | Secondary | II631304 | 73 | -38.31 | 176.73 | 19/11/2015 | 08/12/2016 | 14 |
| Ngatamawahine u/s Kopuriki Rd | Secondary | IH701900 | 70 | -38.35 | 176.74 | 19/11/2015 | 08/12/2016 | 14 |
| Rangitāiki at Boat Ramp | Secondary | KM083686 | 38 | -37.91 | 176.88 | 15/07/2015 | 09/02/2017 | 19 |
| Otamatea at Wairere Rd | Primary | FD445529 | 6 | -38.75 | 176.39 | 20/01/2010 | 02/03/2017 | 43 |
| Rangitāiki at SH5 | Primary | FC231176 | 1 | -38.87 | 176.37 | 07/07/1999 | 02/03/2017 | 62 |
| Rangitāiki at Matahina Dam | Primary | JK491452 | 34 | -38.12 | 176.82 | 22/08/1995 | 02/03/2017 | 65 |
| Rangitāiki at Inlet to Aniwhenua Canal | Primary | J1148319 | 30 | -38.31 | 176.79 | 30/07/1990 | 02/03/2017 | 99 |
| Rangitāiki at Murupara | Primary | IG265664 | 26 | -38.46 | 176.70 | 10/04/2001 | 14/03/2017 | 150 |
| Rangitāiki at Te Teko | Primary | JL350292 | 37 | -38.04 | 176.80 | 30/07/1990 | 15/03/2017 | 167 |
| Whirinaki River at Galatea Bridge | Primary | IG619428 | 47 | -38.48 | 176.74 | 15/02/1989 | 08/12/2015 | 316 |

Table B-7. *E. coli* water quality monitoring sites in the Kaituna WMA.

| Site Name | Type | Site Code | SC# | Latitude | Longitude | Start Date | End Date | Count (n) |
|---------------------------------|-----------|-----------|-----------|----------|-----------|------------|------------|-----------|
| Morepara at u/s Pikowai Road | Secondary | HM688516 | 110 | -37.94 | 176.61 | 10/11/2015 | 05/12/2016 | 11 |
| Paraiti (Mangorewa) at Saunders | Secondary | FN448171 | 10 | -37.88 | 176.35 | 12/01/2016 | 05/12/2016 | 12 |
| Waitahanui at u/s Campbell Road | Secondary | HM319871 | 105 | -37.91 | 176.56 | 10/11/2015 | 05/12/2016 | 12 |
| Puanene at SH2 | Secondary | GN561803 | 77 | -37.82 | 176.47 | 10/11/2015 | 05/12/2016 | 14 |
| Pokopoko at Black Rd | Secondary | GN178816 | 73 | -37.82 | 176.43 | 10/11/2015 | 05/12/2016 | 14 |
| Pongakawa at Pumphouse | Primary | GM781934 | 96 forest | -37.90 | 176.50 | 07/10/1999 | 27/02/2017 | 72 |
| Waitahanui at Otamarakau Marae | Primary | HN674689 | 114 | -37.83 | 176.60 | 26/06/1995 | 13/03/2017 | 97 |
| Pongakawa at Old Coach Rd | Primary | GN849464 | 96 | -37.85 | 176.51 | 14/07/1999 | 13/03/2017 | 99 |
| Kaituna at Clarkes | Primary | FO497605 | 53 | -37.76 | 176.35 | 27/03/1996 | 13/03/2017 | 130 |
| Kaituna at Maungarangi Rd | Primary | FN834668 | 22 | -37.84 | 176.39 | 28/08/1990 | 13/03/2017 | 155 |
| Kaituna at Te Tumu | Primary | GO089653 | 57 | -37.75 | 176.42 | 28/08/1990 | 13/03/2017 | 162 |
| Pongakawa at SH2 | Primary | GN922883 | 98 | -37.82 | 176.51 | 28/08/1990 | 20/03/2017 | 178 |
| Kaituna at Te Matai | Primary | FO620177 | 26 | -37.79 | 176.36 | 28/08/1990 | 13/03/2017 | 188 |

Table B-8. *E. coli* water quality monitoring sites in the Rangitāiki WMA.

| Site Name | Type | Site Code | SC# | Latitude | Longitude | Start Date | End Date | Count (n) |
|----------------------------------------|-----------|-----------|-----|----------|-----------|------------|------------|-----------|
| Waihua at Galatea Rd | Secondary | JI485995 | 32 | -38.25 | 176.83 | 20/11/2015 | 17/03/2017 | 12 |
| Otamatea at Wairere Rd | Secondary | FD445529 | 6 | -38.75 | 176.39 | 21/10/2015 | 16/03/2017 | 13 |
| Rangitāiki at SH5 | Primary | FC231176 | 1 | -38.87 | 176.37 | 21/10/2015 | 16/03/2017 | 14 |
| Pokairoa at Upstream Forestry Culvert | Secondary | II631304 | 73 | -38.31 | 176.73 | 19/11/2015 | 08/12/2016 | 14 |
| Ngatamawahine u/s Kopuriki Rd | Secondary | IH701900 | 70 | -38.35 | 176.74 | 19/11/2015 | 08/12/2016 | 14 |
| Rangitāiki at Matahina Dam | Primary | JK491452 | 34 | -38.12 | 176.82 | 22/08/1995 | 02/03/2017 | 63 |
| Rangitāiki at Murupara | Primary | IG265664 | 26 | -38.46 | 176.70 | 10/04/2001 | 14/03/2017 | 187 |
| Whirinaki River at Galatea Bridge | Primary | IG619428 | 47 | -38.48 | 176.74 | 30/07/1990 | 14/03/2017 | 203 |
| Rangitāiki at Inlet to Aniwhenua Canal | Primary | JI148319 | 30 | -38.31 | 176.79 | 30/07/1990 | 15/06/2016 | 213 |
| Rangitāiki at Te Teko | Primary | JL350292 | 37 | -38.04 | 176.80 | 30/07/1990 | 15/03/2017 | 225 |