HYDROLOGICAL

DATA

SUMMARY

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SOUTHLAND REGIONAL COUNCIL

Introduction

The purpose of this brief document is to give an overview of hydrological data currently in existence for sites within the Waiau catchment. Its main use will be as a quick reference guide.

Section 1 is a listing of the data which is held in computer archives and which is available for use by the Waiau R. Working Party and its task groups.

All other sections present summaries in one form or another of data for **key** sites within the catchment - these being the lake levels, inflows and outflows and flow information for sites on the upper and lower Waiau Rivers and the Mararoa River. Some information is also presented for Lake Monowai.

By and large the information which is presented has been derived from TIDEDA processes and there has been minimal interpretation applied.

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HYDROLOGICAL DATABASE INDEX

Data held on the Southland Regional Council computer for the Waiau River Working Party

Section 1 - Hydrological Database Index

This section summarises the hydrological data which exists for sites within the Waiau catchment as well as for sites outside of the Waiau catchment but which may be relevant to Waiau studies.

The data has been sourced from both DSIR and WORKS Corporation. DSIR are the agency contracted by Electricorp to collect and record field data such as river and lake levels and flow gaugings. WORKS Corporation are contracted by Electricorp to further process the DSIR data in addition to collection, processing and storage of hydrological data associated with operation of the Manapouri power scheme.

The database index lists sites for which data is available, the type of data (level, flow or stage), the dates at which the data begins and ends, and for flow and level data the size in kilobytes occupied by each site.

Waiau River Working Party
Hydrological Database Index

1. DSIR Supplied Data - stage (or water level)

SITE	LOCATION	START DATE	FINISH DATE	KBYTES
75292	L. Wanaka	1 Feb 1933	17 Jul 1991	801
79701	Waiau at Tautapere	8 Jul 1964	13 May 1991	1510
79702	Te Wae Wae Lagoon	21 Apr 1989	11 Sep 1990	221
79703	L. Manapouri[1]	1 May 1932	10 May 1976	173
79704	L. Te Anau	1 Mar 1932	24 Jun 1991	732
79705	Horseshoe Bend	9 Nov 1973	9 Aug 1976	13
79707	L. Manapouri[2]	19 Feb 1976	2 Jul 1991	699
79708	Queens Reach	3 Mar 1976	2 Jul 1991	2676
79712	Monowai River	2 Sep 1976	25 Jun 1991	906
79713	L. Monowai	13 May 1977	25 Jun 1991	735
79714	Monowai Headrace	18 May 1967	12 Oct 1977	984
79717	Mararoa - Mt York	5 Apr 1963	5 Jul 1967	25
79718	Mararoa Weir HeadW	30 Sep 1977	1 Jul 1991	2726
79719	Mararoa Weir TailW	1 Jun 1977	1 Jul 1991	989
79720	Manapouri Channel	17 Nov 1977	2 Jul 1991	2758
79730	Waiau at Monowai PH	1 Jun 1932	21 Feb 1991	531
79731	Waiau d/s Mararoa	9 Aug 1965	17 Feb 1970	11
79732	Waiau u/s Mararoa	7 Aug 1965	10 May 1979	134
79733	Waiau at Whare Ck	17 Dec 1969	5 Jul 1972	13
79734	Waiau at Excels. Ck	5 Jul 1972	8 Jul 1981	169
79735	Waiau at Sunnyside	10 Feb 1972	2 Jul 1991	2193
79736	Mararoa above Weir	7 Aug 1974	18 Aug 1976	8
79737	Mararoa at Cliffs	15 Apr 1976	1 Jul 1991	1143
80201	Rowallanburn	19 Dec 1969	3 Jul 1991[a]	311
80901	Wairaurahiri	17 May 1967	30 Apr 1991[b]	306
81301	Waitutu	14 Aug 1967	19 Jan 1978	66
84701	Cleddau at Milford	1 Jan 1963	17 Jun 1980	603

[1] Pearl Harbour
[2] Supply Bay
[a] No record from 10 Jun 1980 to 28 Mar 1989
[b] No record from 24 Jan 1978 to 5 Dec 1989

2. DSIR Supplied Data - stage to discharge ratings

SITE	LOCATION	FIRST RATING	LAST RATING
75292	L. Wanaka	1 Jan 1933	16 Nov 1989
79701	Waiau at Tuatapere	12 May 1960	18 Feb 1991
79703	L. Manapouri	21 Jun 1926	10 Apr 1971
79704	L. Te Anau	1 Mar 1932	9 Nov 1973
79705	Horseshoe Bend	8 Nov 1973	8 Nov 1973
79708	Queens Reach	3 Mar 1976	5 Feb 1980
79712	Monowai River	2 Sep 1976	12 Dec 1989
79717	Mararoa at Mt York	12 Feb 1963	2 Jun 1966
79719	Mararoa Weir tailwater	1 Jun 1977	4 Nov 1988

79730	Waiau at Monowai PH	1 Jun 1932	16 May 1970
79731	Waiau d/s Mararoa	10 Aug 1965	1 Apr 1969
79733	Waiau at Whare Ck	17 Dec 1969	17 Dec 1969
79734	Waiau at Excelsior Ck	21 Feb 1971	9 Feb 1977
79735	Waiau at Sunnyside	20 Jan 1972	19 May 1990
79736	Mararoa above Weir	6 Aug 1974	6 Aug 1974
79737	Mararoa at Cliffs	14 Apr 1976	4 Sep 1989
79750	Morley at Ohai	10 Mar 1987	10 Mar 1987
80201	Rowallanburn	3 Mar 1971	8 Feb 1990
80901	Wairaurahiri	17 May 1967	5 Dec 1989
81301	Waitutu	2 Oct 1955	2 Oct 1955
84701	Cleddau at Milford	1 Mar 1963	29 Dec 1978

3. DSIR Supplied Data - flow gaugings

SITE	LOCATION	FIRST GAUGING	LAST GAUGING
75292	L. Wanaka	16 Jan 1968	12 Jun 1991
79701	Waiau at Tuatapere	12 May 1960	3 Jul 1991
79703	L. Manapouri	27 Aug 1952	28 Mar 1972
79704	L. Te Anau	26 Aug 1952	8 Nov 1973
79705	Horseshoe Bend	29 Nov 1973	18 Sep 1975
79708	Queens Reach	5 May 1976	21 May 1991
79712	Monowai River	4 Nov 1976	25 Jun 1991
79714	Monowai headrace	25 May 1965	12 Nov 1969
79717	Mararoa - Mt York	12 Feb 1963	2 Mar 1967
79719	Mararoa Weir TailW	22 Sep 1977	16 Jan 1991
79730	Waiau at Monowai PH	25 May 1965	6 Dec 1972
79731	Waiau d/s Mararoa	10 Feb 1966	6 Jan 1970
79733	Waiau at Whare Ck	6 Jan 1970	17 Feb 1981
79734	Waiau at Excelsior Ck	21 Feb 1971	17 Feb 1981
79735	Waiau at Sunnyside	20 Jan 1972	21 May 1991
79736	Mararoa above Weir	4 Dec 1974	3 Nov 1977
79737	Mararoa at Cliffs	20 May 1976	22 May 1991
79750	Morley at Ohai	25 Aug 1989	22 May 1991
80201	Rowallanburn	25 Mar 1970	3 Jul 1991
80901	Wairaurahiri	14 Jun 1972	21 Feb 1991
81301	Waitutu	3 Oct 1955	12 Dec 1975
84701	Cleddau at Milford	2 Mar 1963	27 May 1980

4. WORKS Corporation Supplied Data

SITE	LOCATION	START DATE	FINISH DATE	KBYTES
9150	L Wanaka inflow	8 Dec 1929	16 Jan 1991	943
9155	L Wanaka adjusted level	7 Dec 1929	16 Jan 1991	536
9550	L Manapouri inflow	1 May 1932	15 Jan 1991	1276
9552	L Manapouri spill	9 Aug 1965	8 Feb 1991	1054
9553	L Mana. power stn flo	8 Sep 1969	24 Feb 1991	310
9554	L Manapouri total outflo	1 May 1932	16 Jul 1991	624
9555	L Manapouri adj. level	1 May 1932	17 Jul 1991	862
9570	L Te Anau inflow	14 Jan 1926	17 Jul 1991	697
9574	L Te Anau total outflow	15 Jan 1926	17 Jul 1991	537
9575	L Te Anau adj. level	14 Jan 1926	17 Jul 1991	742

69555	L Manapouri natural lev	11 Jan 1926	17 Jul 1991	629
69575	L Te Anau natural level	14 Jan 1926	17 Jul 1991	543
89155	L Wanaka unadj. level	7 Dec 1929	23 Jan 1991	438
89555	L Manapouri unadj. lev	11 Jan 1926	17 Jul 1991	617
89575	L Te Anau unadj. lev	14 Jan 1926	17 Jul 1991	502

89155 L Wanaka outlet rating at 1 Jan 1929
89555 L Manapouri outlet ratings at 11 Jan 1926, 1 Dec 1964, 8 Sep 1969
89575 L Te Anau outlet ratings at 14 Jan 1926, 9 Nov 1973

NB. Natural (simulated) lake levels are provisional

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TABLES

of

MONTHLY MEAN

FLOWS

and

LEVELS

Lake inflows

Lake levels

River flows

Power Station flows

Spill flows

Section 2 - Tables of Monthly Mean Flows and Levels

This section presents average calendar monthly and average annual flows or levels for each year of record. This data has been obtained via the TIDEDA process PCAL. While means are given for each calendar month the last three lines of each table summarise the highest and lowest values as well as the overall means for the entire period of record.

Question marks (?) for any month indicate that data for that particular month is incomplete. ? at the end of a line indicates the annual mean was calculated from incomplete data for that particular year.

Monthly means 1926 to 1991 site 9570 Lake Te Anau Inflow (cumecs)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1926	?	366	144	310	196	220	195	218	306	371	528	390	294?
1927	391	230	407	491	184	122	203	80	135	397	294	214	263
1928	155	191	142	397	230	140	243	193	431	749	374	210	288
1929	353	157	310	94	78	279	125	189	316	260	296	338	234
1930	310	178	218	164	248	137	119	108	147	281	313	277	209
1931	610	366	180	136	213	246	254	178	165	442	368	283	287
1932	428	246	127	230	184	132	94	160	234	269	432	219	229
1933	233	467	358	562	522	95	169	270	304	447	240	283	328
1934	226	89	312	370	398	179	218	309	403	402	193	187	275
1935	579	128	304	225	254	186	125	230	98	377	165	206	241
1936	236	173	191	319	301	131	182	419	409	618	527	277	316
1937	390	232	224	403	258	123	199	162	175	159	232	175	228
1938	315	178	202	154	179	230	104	248	271	499	247	357	249
1939	314	351	103	311	238	338	163	129	293	209	364	412	267
1940	177	720	283	259	346	271	99	186	248	529	234	288	302
1941	297	235	224	264	341	199	193	96	249	198	543	192	252
1942	313	166	324	352	460	228	296	274	398	432	396	254	325
1943	247	354	335	359	246	206	157	119	214	229	290	206	246
1944	171	323	185	359	158	325	238	157	256	403	381	270	268
1945	337	319	556	352	183	113	125	285	310	247	664	259	312
1946	282	603	140	159	122	119	211	357	429	540	211	458	301
1947	179	162	86	96	201	303	173	210	392	314	273	207	216
1948	208	132	352	136	234	165	261	178	363	459	445	464	284
1949	182	492	398	406	148	92	353	275	184	426	186	335	289
1950	427	207	199	184	264	205	240	189	252	178	179	325	238
1951	121	109	111	168	159	94	424	138	330	308	374	205	212
1952	368	399	308	231	334	291	128	80	265	436	134	134	258
1953	54	62	218	423	226	133	206	268	358	149	395	360	238
1954	212	264	392	205	72	407	293	210	233	364	336	179	264
1955	300	318	263	183	366	291	110	241	354	168	314	223	260
1956	145	87	139	363	188	299	207	235	258	227	320	395	239
1957	352	204	186	328	386	236	281	186	151	394	679	566	330
1958	395	631	425	427	691	389	99	184	214	357	248	231	356
1959	119	235	165	187	169	354	195	120	422	220	436	219	236
1960	236	301	124	159	171	237	214	344	236	162	185	201	214
1961	107	137	189	382	184	281	262	186	194	423	426	228	250
1962	269	173	126	132	298	308	355	218	343	307	220	154	242
1963	240	259	258	182	312	157	90	244	258	283	346	186	234
1964	498	104	361	226	394	106	195	264	292	285	426	367	295

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Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1965	264	180	261	200	360	328	144	97	342	334	464	294	272
1966	306	328	203	379	119	248	111	135	170	188	267	315	230
1967	340	342	360	619	297	78	194	326	203	288	535	470	337
1968	253	360	431	200	341	106	133	273	339	606	467	276	316
1969	208	109	362	287	159	161	223	301	611	324	176	395	277
1970	244	226	206	309	69	142	409	479	602	347	321	382	312
1971	123	76	153	149	165	206	89	236	510	464	356	297	236
1972	279	100	571	311	279	151	265	103	697	375	403	190	311
1973	155	245	188	456	407	277	101	149	210	391	415	159	262
1974	104	257	188	168	110	222	293	65	160	238	154	179	178
1975	168	289	353	600	509	198	308	330	304	334	294	316	334
1976	165	108	121	171	329	343	196	126	80	143	188	284	188
1977	341	264	183	477	250	260	114	83	200	411	312	214	259
1978	238	141	302	300	540	141	139	385	177	400	395	178	279
1979	508	367	177	273	296	249	246	138	421	313	195	555	311
1980	396	312	276	141	292	225	162	534	521	372	343	266	320
1981	182	221	227	328	200	173	194	94	287	454	155	357	239
1982	434	425	405	143	523	170	110	337	211	247	749	347	341
1983	756	126	442	266	379	263	225	298	454	291	338	312	348
1984	553	246	207	328	278	257	222	311	272	523	303	446	330
1985	631	144	133	263	228	274	229	229	232	143	158	211	240
1986	344	237	219	384	210	434	254	167	234	323	202	310	276
1987	307	415	371	279	320	389	190	280	300	484	206	239	314
1988	292	256	208	201	187	344	334	323	566	1017	430	438	384
1989	187	166	316	155	194	305	202	204	78	233	385	384	235
1990	280	129	254	308	528	363	243	167	123	286	147	590	287
1991	407	413	105	301	164	182	?	?	?	?	?	?	260?
Min.	54	62	86	94	69	78	89	65	78	143	134	134	178
Mean	296	255	254	283	271	225	202	220	295	355	332	294	273
Max.	756	720	571	619	691	434	424	534	697	1017	749	590	384

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1926 to 1991 site 89575 Te Anau level (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1926	?	202424	202235	201802	202131	201864	201698	201940	201898	202309	203196	203064	202232?
1927	202573	202591	202079	203039	202556	201736	201626	201424	201247	201963	202440	202086	202109
1928	201710	201645	201469	202110	202377	201748	201785	201697	202301	203914	203097	202226	202175
1929	202262	202128	201875	201872	201290	201750	201529	201494	202080	202102	202108	202347	201901
1930	202402	201984	201843	201869	201670	201750	201498	201159	201388	201849	202135	202075	201800
1931	203113	203000	?	?	201481	202050	202084	201753	201609	202279	202593	202450	202235?
1932	202634	202438	201899	201626	201777	201539	201387	201215	201826	202026	202257	202356	201913
1933	202010	202444	202753	203161	203433	202252	201609	202029	201958	202682	202462	202026	202401
1934	202149	201665	201757	202331	202751	202232	201930	202060	202232	203081	202184	201753	202181
1935	202658	202467	201820	202404	201942	201906	201590	201678	201458	202165	201865	201710	201969
1936	201690	201902	201701	202197	202368	201650	201677	202159	202653	203499	203306	202834	202304
1937	202551	202318	202078	202472	202337	201827	201557	201646	201512	201588	201719	201700	201940
1938	202273	201747	201743	201652	201490	201787	201582	201631	202006	202843	202384	202483	201970
1939	202390	202368	201981	201828	202123	201980	202217	201516	201885	201926	202310	202628	202095
1940	202085	202945	203090	202426	202336	202393	201646	201417	201806	202435	202818	202335	202307
1941	202092	202175	201945	202203	201945	202315	201897	201436	201479	201822	202591	202507	202031
1942	202230	201795	202169	202539	202829	202167	202466	202048	202321	203068	202770	202428	202407
1943	201948	202446	202523	202259	202536	201927	201671	201365	201668	201789	202109	201920	202010
1944	201715	202086	201904	202246	202002	201979	202192	201793	201745	202285	202667	202458	202089
1945	202422	202256	203006	203084	202242	201597	201376	201609	202282	202166	202947	202958	202328
1946	202097	203222	202409	201731	201467	201271	201437	202277	202660	203035	202435	202696	202222
1947	202330	201770	201414	201246	201394	201789	202004	201874	202009	202559	202311	201816	201878
1948	202087	201557	202067	201910	201464	201924	202011	201943	201915	202687	203516	202865	202164
1949	202320	202581	202758	203032	202012	201535	201921	202121	202007	202320	202244	202110	202244
1950	202865	202316	201882	201767	201622	202166	201907	201813	201893	201800	201608	202162	201982
1951	201713	201410	201275	201333	201396	201445	201869	202153	201984	202204	202711	202196	201810
1952	202295	202911	202113	202308	202305	202057	202037	201326	201450	202765	201969	201505	202084
1953	201205	200940	201310	201930	202444	201896	201613	202019	202441	201826	202081	202784	201879
1954	202288	201989	202246	202252	201562	201985	202575	201774	201924	202351	202524	202091	202131
1955	202053	202137	202265	201915	202357	202343	201716	201537	202117	202186	201983	202330	202078

1956	201611	201328	201259	201698	202186	202034	202151	201837	201974	201914	202186	202252	201871
1957	202721	202437	201775	201903	202757	202253	202389	201775	201491	202130	203214	203671	202378
1958	203077	203498	203083	203250	203421	203472	202008	201639	201432	202190	202458	201989	202619
1959	201698	201748	201686	201477	201712	202092	202041	201611	202113	202253	202561	202319	201943
1960	201867	202197	201781	201601	201452	201891	201766	202400	202095	201652	201620	201708	201834
1961	201558	201310	201547	202150	201893	202039	202058	202087	201715	202305	202742	202392	201986
1962	202276	201780	201579	201445	201866	202081	202330	202230	202461	202278	202015	201795	202013
1963	201676	201906	202194	201965	202076	201844	201362	201553	202040	201947	202469	201998	201917
1964	202708	202173	201909	202139	202642	201937	201712	201835	202040	202270	202252	202959	202216
1965	202446	201875	202005	201750	202134	202508	202016	201457	201702	202447	202790	202504	202138
1966	202526	202491	201804	202459	201923	201762	201685	201418	201344	201596	201767	202411	201929
1967	202004	202726	202719	202651	203271	201838	201481	202173	201936	202083	202774	203266	202409
1968	202599	202213	203031	202169	202195	201821	201396	201833	202198	202929	203264	202812	202372
1969	202196	201602	202043	202312	201895	201483	201817	202136	203209	202532	202221	202159	202136
1970	202400	202049	201843	202066	201737	201333	201979	202869	203567	202963	202468	202797	202341
1971	201882	201397	201265	201516	201506	201630	201445	201450	202596	203084	202723	202418	201911
1972	202409	201810	202485	202565	202538	201961	201876	201660	202725	203075	203030	202091	202353
1973	201840	202001	201569	202096	202975	202598	201800	201434	201712	202176	202738	202168	202091
1974	201681	201669	201847	201706	201377	201238	202309	201958	201308	201673	201495	201507	201649
1975	201835	202294	202956	203929	203618	202827	202035	203246	202858	202971	203131	202785	202875
1976	202342	202066	201781	201325	201802	203152	202199	201463	201071	201082	201472	202302	201838
1977	202518	203053	201842	202642	203080	202856	201899	201121	201074	202080	203324	202765	202347
1978	202124	201557	201702	202771	202245	202980	201578	202254	201855	202381	202604	202657	202228
1979	203093	203420	202858	201980	203075	202759	202560	201745	201752	202673	202456	203318	202639
1980	203048	202855	202552	202326	201727	202203	201634	202207	203138	202890	202518	202725	202483
1981	202903	202994	202619	202249	202986	202025	201535	201259	201437	202991	202827	202543	202361
1982	202885	203207	202784	201956	202245	202755	201396	201634	201948	201895	203248	203376	202437
1983	203845	202588	202352	203168	203087	202432	202464	202939	202522	203165	202957	202831	202866
1984	202818	202814	202271	202182	202613	202095	201730	202520	202397	202838	202997	203430	202559
1985	203683	202376	201557	201668	201948	201695	202039	202215	203022	202646	201714	201802	202197
1986	202975	202432	202544	202599	202865	202862	202368	202081	201415	202418	201720	202046	202362
1987	202175	203086	203075	202723	201767	203026	203080	202812	202601	202718	202043	201779	202569
1988	202297	202062	202238	202109	201639	201732	202095	202533	203335	204081	203840	202703	202556
1989	201915	201676	202150	202696	201861	202000	201727	201712	201253	201569	202434	202481	201957

1990	202937	201995	201956	201826	202884	203058	202628	202030	201202	201558	201581	202756	202206
1991	203231	203098	201804	202107	201687	201581	?	?	?	?	?	?	202242?
Min.	201205	200940	201259	201246	201290	201238	201362	201121	201071	201082	201472	201505	201649
Mean	202338	202234	202093	202180	202187	202071	201888	201862	202005	202384	202477	202406	202174
Max.	203845	203498	203090	203929	203618	203472	203080	203246	203567	204081	203840	203671	202875

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1926 to 1991 site 9574 Lake Te Anau Outflow (cumecs)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1926	?	327	287	211	268	220	191	233	228	304	488	457	292?
1927	357	357	266	454	350	196	179	143	115	244	327	259	270
1928	192	182	152	270	314	198	207	191	306	671	465	286	286
1929	296	267	224	220	121	202	161	156	260	263	265	311	228
1930	320	241	216	220	188	199	156	101	138	219	270	259	210
1931	474	443	294	196	155	253	260	200	176	302	359	329	286
1932	369	327	225	180	204	163	137	111	213	250	297	310	232
1933	246	333	391	485	545	290	175	250	240	379	331	250	326
1934	271	183	204	309	392	287	232	258	291	461	277	200	281
1935	382	332	216	320	234	226	171	188	149	278	219	193	242
1936	190	226	191	282	314	181	187	279	372	562	515	406	309
1937	351	303	258	336	307	212	167	181	159	171	195	191	236
1938	298	199	198	182	155	207	170	181	247	413	316	337	242
1939	318	316	239	218	266	243	284	159	225	230	304	367	264
1940	259	444	466	325	310	318	181	144	211	340	403	307	308
1941	262	276	234	282	238	302	225	145	155	212	369	339	253
1942	289	207	277	348	409	275	333	254	308	461	396	324	324
1943	235	330	345	296	346	231	185	134	186	207	265	229	249
1944	193	262	226	292	243	244	279	206	200	301	374	331	262
1945	325	293	451	461	289	172	136	178	298	275	442	435	313
1946	263	499	321	196	151	119	148	298	376	463	327	385	294
1947	305	202	141	114	140	210	244	221	250	351	302	211	225
1948	260	166	259	227	153	230	247	238	240	381	567	418	282
1949	303	361	394	451	246	162	234	267	245	308	289	267	293
1950	417	302	222	202	180	274	228	210	226	208	175	276	243
1951	192	141	119	129	140	147	230	271	245	283	383	280	214
1952	301	428	267	302	302	256	250	127	152	395	237	157	264
1953	107	66	127	241	328	225	177	248	330	212	264	397	228
1954	298	243	294	290	166	249	356	204	231	313	345	260	271
1955	255	271	294	228	314	309	192	165	270	278	243	307	260
1956	175	127	117	197	277	253	272	215	240	229	280	295	223
1957	385	326	204	229	392	291	319	204	155	272	506	601	324
1958	461	562	464	500	547	552	245	180	147	282	330	242	374
1959	190	200	188	154	193	267	251	175	272	291	355	303	237
1960	221	281	204	174	149	225	203	323	262	182	177	193	216
1961	166	125	165	276	225	253	255	260	193	306	390	318	245
1962	296	204	169	148	222	260	308	286	333	297	247	207	248
1963	188	228	280	237	259	215	133	167	252	236	335	243	231
1964	386	275	233	270	370	231	193	216	253	295	296	435	288

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Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1965	328	221	246	200	273	341	246	149	196	330	401	340	273
1966	345	338	210	332	231	202	189	143	131	173	203	323	234
1967	247	387	386	382	510	217	154	278	233	260	397	507	329
1968	360	285	454	276	280	213	139	214	281	431	503	405	320
1969	281	174	253	303	226	154	211	270	497	347	287	276	274
1970	321	254	216	256	199	129	244	416	577	436	334	402	316
1971	224	140	118	159	158	178	148	149	361	463	386	324	234
1972	322	211	345	355	348	238	222	185	398	461	451	262	316
1973	216	246	168	266	438	361	210	146	193	279	400	283	267
1974	184	187	212	202	141	110	210	248	172	177	201	124	181
1975	120	192	177	711	507	332	253	299	284	322	328	373	325
1976	167	222	124	178	201	321	306	201	138	117	143	164	190
1977	217	394	304	251	267	332	278	121	93	189	338	342	260
1978	286	183	160	347	335	413	224	247	293	230	323	317	280
1979	318	431	323	195	246	300	292	263	279	271	261	435	300
1980	395	385	226	337	211	292	243	249	559	435	362	213	325
1981	220	208	311	199	309	278	213	162	197	259	315	301	248
1982	335	535	453	263	282	373	182	204	288	185	512	486	340
1983	700	352	291	310	360	309	238	305	352	341	340	308	351
1984	433	464	241	279	303	263	226	222	331	390	287	458	324
1985	630	341	210	205	240	263	187	125	158	345	157	121	248
1986	314	230	263	227	364	336	321	292	221	266	239	200	273
1987	348	301	313	473	291	280	262	274	332	473	327	180	321
1988	205	278	264	253	200	225	332	261	502	777	739	463	375
1989	287	133	173	249	295	270	252	210	109	143	315	328	231
1990	291	278	251	241	396	344	384	272	177	211	141	376	281
1991	433	482	249	230	235	215	?	?	?	?	?	?	305?
Min.	107	66	117	114	121	110	133	101	93	117	141	121	181
Mean	297	283	254	275	276	252	226	213	254	314	333	311	273
Max.	700	562	466	711	547	552	384	416	577	777	739	601	375

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1932 to 1990 site 9550 Lake Manapouri inflow (cumecs)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1932	?	?	?	?	?	236	196	198	330	350	467	386	309?
1933	316	497	558	727	842	350	237	371	386	565	434	352	469
1934	369	208	355	488	586	367	333	326	483	676	340	258	400
1935	582	367	381	423	357	316	240	309	213	464	303	295	355
1936	312	308	282	412	460	257	282	470	587	863	729	551	460
1937	513	430	398	505	472	303	290	282	256	263	321	297	360
1938	428	283	268	217	240	309	262	287	368	653	434	466	352
1939	490	464	287	330	383	374	373	254	428	338	477	545	395
1940	357	797	607	461	484	469	249	227	332	549	534	427	456
1941	348	405	335	438	399	427	315	207	302	305	611	456	378
1942	426	289	416	532	593	398	485	392	498	657	582	471	480
1943	315	465	520	441	494	327	282	191	308	331	414	316	366
1944	279	397	313	469	314	410	385	285	330	488	561	459	390
1945	479	398	735	671	432	240	205	300	467	394	709	586	468
1946	359	749	378	291	206	176	247	479	623	731	465	609	441
1947	411	274	175	155	228	346	344	340	437	525	427	326	333
1948	368	235	421	299	276	318	378	296	482	618	783	641	427
1949	389	538	602	664	312	209	426	400	345	522	355	397	429
1950	622	415	297	283	250	388	366	307	350	295	271	433	356
1951	246	181	177	193	252	258	467	400	431	457	563	397	336
1952	531	585	420	427	459	425	344	176	299	615	313	228	401
1953	135	104	248	456	462	293	295	398	512	304	440	565	352
1954	416	356	460	430	218	518	486	325	379	520	497	343	412
1955	431	398	386	334	491	493	275	289	455	386	403	398	394
1956	232	176	189	332	373	402	411	336	398	343	426	483	342
1957	569	427	312	386	628	500	472	310	241	486	867	876	507
1958	644	809	647	740	894	797	311	276	272	422	443	344	548
1959	252	305	256	253	322	471	383	240	488	426	588	419	366
1960	339	444	277	251	220	372	314	512	375	277	293	333	333
1961	278	242	240	450	339	419	431	364	268	517	631	461	387
1962	459	372	342	313	395	440	483	438	533	452	407	334	414
1963	335	359	395	345	430	312	203	300	398	413	557	370	368
1964	634	354	403	412	572	326	296	358	413	441	510	614	445
1965	412	299	340	280	456	523	325	190	371	505	598	480	399
1966	483	456	295	518	298	310	249	201	183	252	306	453	333
1967	356	507	509	627	677	249	214	411	313	394	634	712	467
1968	474	431	623	346	402	261	233	353	449	719	742	529	464
1969	370	224	408	443	292	246	320	405	885	619	415	453	424

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Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1970	442	337	299	399	231	207	456	653	972	666	460	564	475
1971	262	152	198	245	251	262	196	252	577	648	514	392	330
1972	398	235	581	500	511	362	368	241	787	681	639	332	470
1973	288	366	232	465	654	504	254	210	288	466	577	371	389
1974	237	284	287	242	207	228	370	291	250	278	274	181	261
1975	197	287	337	1003	742	479	411	538	425	454	413	442	478
1976	243	268	265	242	373	519	440	272	180	188	249	275	293
1977	383	550	369	469	453	462	334	154	195	414	529	429	393
1978	394	252	255	452	540	505	311	468	387	427	510	398	409
1979	585	609	403	344	432	448	434	351	505	429	338	661	461
1980	577	548	361	407	370	442	335	573	845	629	565	332	498
1981	320	309	396	373	434	384	328	236	393	525	415	493	384
1982	565	750	638	358	582	484	282	422	413	347	953	665	536
1983	1072	453	505	465	518	482	388	450	593	488	489	475	532
1984	721	596	335	482	508	429	339	407	492	678	440	623	504
1985	887	428	275	349	361	413	329	252	288	447	242	209	373
1986	492	375	381	442	505	581	487	414	371	458	361	346	435
1987	499	513	507	661	435	532	401	439	517	756	446	265	497
1988	455	436	398	377	335	438	547	455	828	1354	1035	657	610
1989	383	205	333	353	367	451	351	300	149	239	484	498	344
1990	433	345	343	401	719	531	528	360	269	371	214	653	432
Min.	135	104	175	155	206	176	196	154	149	188	214	181	261
Mean	427	394	378	420	432	389	344	338	422	493	491	446	416
Max.	1072	809	735	1003	894	797	547	653	972	1354	1035	876	610

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1926 to 1991 site 89555 Manapouri level (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1926	?	178030	177756	177219	177244	177270	177295	177518	177915	178312	178709	178533	177798?
1927	177952	177810	177685	177556	177427	177299	177170	177119	177143	177167	177190	177214	177392
1928	177238	177261	177284	177307	177331	177354	177378	177402	177426	177449	177473	177496	177367
1929	177520	177543	177566	177589	177613	177636	177660	177684	?	?	?	?	177602?
1930	?	?	?	?	?	?	?	?	?	?	?	?	?
1931	?	?	?	?	?	?	?	?	?	?	?	?	?
1932	?	?	?	?	177129	176914	176636	176286	177230	177397	177689	177858	177141?
1933	177354	177727	178433	178873	179487	177944	176882	177399	177434	178265	178106	177370	177940
1934	177638	176946	177057	177946	178493	177804	177381	177250	177745	178956	177651	176979	177658
1935	177985	178000	177247	178042	177420	177371	176938	177028	176818	177719	177327	177088	177411
1936	177075	177362	177066	177649	177981	177063	177059	177643	178453	179444	179054	178592	177871
1937	178164	178007	177739	178028	178138	177448	176997	177117	176844	176979	177107	177170	177475
1938	177771	177178	176988	176751	176617	177112	177148	176876	177405	178589	178030	177967	177371
1939	178080	177963	177479	177029	177647	177358	177783	176933	177627	177505	177909	178289	177632
1940	177625	178796	178914	178123	177965	178116	177188	176561	177161	177881	178618	177906	177899
1941	177535	177663	177396	177837	177443	178026	177422	176722	176818	177249	178151	178299	177544
1942	177745	177311	177663	178210	178540	177742	178131	177616	177931	178851	178516	178158	178040
1943	177391	177863	178211	177780	178300	177429	177116	176631	176999	177237	177699	177368	177499
1944	177034	177559	177352	177844	177493	177494	177741	177216	177141	177845	178392	178133	177603
1945	178041	177815	178714	179022	178105	177057	176569	176891	177868	177736	178637	178776	177935
1946	177603	178841	177991	177211	176693	176348	176591	177813	178520	178920	178222	178452	177760
1947	178038	177192	176574	176213	176477	176993	177587	177407	177519	178304	177937	177298	177297
1948	177702	176879	177533	177398	176795	177403	177485	177220	177673	178495	179423	178662	177724
1949	177916	178030	178492	178924	177589	176803	177435	177689	177560	178006	177763	177498	177808
1950	178587	178017	177237	177094	176684	177656	177444	177326	177347	177223	176958	177715	177438
1951	177083	176537	176334	176269	176681	177027	177453	177985	177674	177914	178457	177857	177278
1952	178061	178647	177699	178004	177885	177698	177725	176583	176652	178551	177527	176811	177650
1953	176259	175790	176388	177429	178196	177375	177027	177631	178111	177394	177567	178472	177312
1954	177969	177465	177701	178013	177011	177629	178312	177315	177571	178115	178194	177638	177746
1955	177701	177629	177749	177402	177949	178156	177294	176874	177697	177880	177522	177896	177645

1956	176896	176475	176328	176830	177682	177572	177839	177378	177609	177476	177712	177848	177307
1957	178505	178076	177325	177362	178631	178230	178183	177282	176886	177704	179217	179651	178090
1958	178902	179232	178883	179112	179437	179538	177653	177027	176729	177677	178032	177467	178299
1959	177093	177057	176949	176731	177297	177757	177764	177014	177657	177969	178340	178030	177473
1960	177329	177820	177280	176947	176597	177402	177253	178112	177639	177114	177065	177277	177318
1961	177150	176934	176664	177582	177480	177697	177871	177708	176970	177907	178625	178181	177568
1962	177993	177646	177450	177289	177529	177807	178056	177968	178262	177970	177774	177494	177771
1963	177237	177452	177732	177521	177707	177390	176720	176895	177598	177650	178350	177717	177495
1964	178487	177862	177354	177822	178402	177631	177151	177348	177660	177922	177863	178898	177868
1965	178021	177354	177442	177117	177785	178379	177701	176779	177104	178281	178562	178277	177736
1966	178261	178107	177263	178183	177541	177207	177194	176667	176411	176806	177077	178065	177395
1967	177366	178289	178358	178307	179283	177362	176718	177570	177425	177673	178557	179136	178002
1968	178363	177809	178777	177725	177654	177331	176781	177392	177898	178776	179246	178688	178038
1969	177809	177063	177477	178031	177448	176829	177373	177727	178887	178194	177558	177049	177623
1970	177951	177298	176985	177296	176617	176166	177077	178482	179360	178787	177993	178302	177696
1971	177300	176329	175951	176087	176508	177096	176940	176103	177735	178380	178007	177519	176999
1972	177354	176267	176888	177760	177621	176738	176144	175770	177281	177907	177909	176946	177049
1973	177143	177314	176142	176513	178490	177775	176457	176143	176157	176806	178338	177337	177048
1974	176256	176439	176650	177177	176623	176349	177151	176660	176816	176912	176936	177159	176763
1975	177020	177036	177087	179693	178700	178166	177033	178398	177262	177259	177481	177620	177731
1976	177101	176939	176945	176914	177080	177820	177024	176996	176757	176464	176830	177483	177029
1977	177841	178435	177702	177897	178196	178072	177740	176777	176110	177457	178635	178054	177738
1978	177927	177035	176974	177988	177586	178401	177239	177683	177651	177672	178104	178060	177695
1979	178725	178821	178203	177643	178534	178178	178004	177288	176868	178046	177879	179171	178113
1980	178402	179023	177908	177668	177368	177849	177341	177893	179320	178622	178131	178172	178136
1981	178006	178092	178222	177875	177939	177862	177432	177289	177734	178320	177916	178267	177912
1982	178447	178913	178840	177780	177943	178521	177245	177686	178009	176759	178799	179113	178164
1983	179860	178471	178161	178454	178540	178380	178141	178092	178373	178474	178447	178401	178484
1984	178591	178948	178205	177889	177999	177990	178056	178014	177943	178635	178226	178789	178273
1985	179401	178443	177862	177549	177299	176684	177864	178122	177942	177971	176875	176767	177731
1986	178259	178056	177953	178108	178282	178149	178242	177785	177184	177960	177030	176308	177776
1987	177883	178508	178377	178797	178177	178524	178004	178173	178289	179052	178400	177015	178262
1988	177683	177589	177847	177577	176478	176326	177648	178181	179035	180086	179970	178434	178072
1989	177210	176105	176648	178084	177355	177797	177456	177271	176099	176005	177454	177711	177105

1990	178139	177114	176479	176551	178315	178491	178616	177777	176404	176291	176551	177938	177395
1991	178734	178832	177909	177399	177311	176909	?	?	?	?	?	?	177840?
Min.	176256	175790	175951	176087	176477	176166	176144	175770	176099	176005	176551	176308	176763
Mean	177802	177667	177515	177651	177684	177561	177396	177320	177506	177877	177995	177901	177657
Max.	179860	179232	178914	179693	179487	179538	178616	178482	179360	180086	179970	179651	178484

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1932 to 1991 site 9554 L Manapouri total outflow (cumecs)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1932	?	?	?	?	?	261	220	174	314	343	405	432	307?
1933	335	415	565	684	851	454	256	345	358	527	485	339	468
1934	386	266	291	457	581	424	339	317	416	698	388	271	404
1935	483	464	327	473	347	337	265	281	246	412	329	290	354
1936	289	335	286	391	460	285	285	402	571	839	726	601	456
1937	501	463	408	473	494	352	276	294	251	271	295	303	364
1938	419	303	273	236	218	294	299	259	347	608	468	457	349
1939	482	459	358	286	389	338	418	264	390	361	447	531	394
1940	386	674	689	492	460	488	306	210	304	458	608	442	458
1941	367	393	343	430	356	467	347	232	251	316	516	530	378
1942	413	327	394	513	591	408	492	386	455	671	585	497	479
1943	340	436	512	421	531	347	294	219	277	316	401	336	369
1944	281	374	333	433	359	368	408	310	300	437	554	492	387
1945	473	422	647	713	489	284	210	261	438	406	626	650	468
1946	379	676	462	309	227	180	216	431	594	704	515	577	438
1947	471	305	210	163	199	283	376	345	372	532	449	327	336
1948	399	255	373	342	245	343	359	311	402	582	832	626	423
1949	444	478	584	688	378	243	359	399	372	470	412	364	432
1950	605	467	313	290	229	392	352	329	336	311	269	407	358
1951	288	205	178	171	228	279	375	460	401	445	569	431	337
1952	481	620	402	464	439	403	405	212	233	595	366	245	405
1953	168	112	191	366	506	338	281	387	492	340	382	573	346
1954	457	354	408	464	277	408	536	328	375	493	506	388	416
1955	402	387	409	343	457	499	323	258	408	436	369	441	394
1956	258	196	178	259	395	380	430	338	383	356	404	437	335
1957	582	479	329	340	614	515	507	322	257	412	788	894	504
1958	682	777	678	740	840	862	392	279	236	398	469	354	557
1959	290	285	267	235	325	425	411	276	411	455	547	468	367
1960	331	426	321	266	214	345	317	496	388	293	286	322	333
1961	299	262	225	387	358	402	435	403	270	452	613	503	385
1962	461	388	351	322	369	423	476	455	524	456	414	359	417
1963	316	353	405	364	404	340	231	261	382	392	547	403	366
1964	583	435	345	427	560	386	300	335	394	446	443	659	443
1965	447	317	333	278	405	527	383	227	282	504	572	503	399
1966	500	465	303	483	353	293	292	210	176	230	272	456	335
1967	323	507	524	524	767	323	217	362	330	375	572	724	462
1968	525	403	628	386	372	316	226	324	422	630	749	605	466
1969	402	270	343	448	335	233	320	386	831	631	499	378	424

continued on next page

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1970	479	362	310	366	304	197	348	635	950	703	495	550	476
1971	327	189	198	253	214	229	248	242	492	627	540	422	333
1972	414	327	418	533	547	432	335	319	589	735	655	331	470
1973	340	364	256	330	664	570	307	208	286	391	542	460	393
1974	261	262	264	229	255	172	382	310	247	272	265	181	259
1975	194	295	291	940	721	622	360	575	412	402	454	432	475
1976	278	277	259	231	350	553	444	271	221	156	250	234	294
1977	323	597	407	393	490	453	374	206	162	301	581	438	392
1978	398	290	237	448	459	584	350	415	438	379	472	437	409
1979	513	626	449	321	416	468	444	416	425	431	352	614	456
1980	540	619	375	432	338	462	373	436	839	701	551	355	500
1981	319	314	405	366	446	388	345	250	338	511	447	472	384
1982	522	808	622	435	487	514	343	371	440	380	766	722	532
1983	1051	559	463	486	511	481	382	479	551	501	499	478	537
1984	622	691	350	472	529	421	329	432	476	662	428	606	501
1985	872	501	310	313	428	390	284	243	312	435	326	173	382
1986	417	397	383	403	552	552	489	467	355	468	412	294	433
1987	454	518	487	663	443	544	419	433	466	771	520	271	498
1988	414	417	431	424	380	370	500	441	786	1240	1186	675	605
1989	474	233	215	361	422	405	401	315	188	219	430	445	343
1990	462	410	357	353	634	533	545	449	311	350	206	532	429
1991	641	693	413	341	387	374	?	?	?	?	?	?	473?
Min.	168	112	178	163	199	172	210	174	162	156	206	173	259
Mean	433	415	374	409	434	399	355	339	398	479	492	453	416
Max.	1051	808	689	940	851	862	545	635	950	1240	1186	894	605

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1965 to 1991 site 9552 L Manapouri spill flow (= MLC flow)
(cumecs)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1965	?	?	?	?	?	?	?	?	308	534	637	537	504?
1966	539	487	312	515	367	309	305	235	210	251	284	481	357
1967	?	?	?	?	?	?	?	?	?	?	?	?	?
1968	?	?	?	?	?	?	?	?	?	?	?	?	?
1969	?	?	?	?	?	?	?	453	845	590	415	301	519?
1970	436	295	239	260	153	100	239	526	868	645	423	487	390
1971	273	130	94	96	24	33	19	0	222	392	300	208	149
1972	193	57	166	251	241	98	2	1	263	373	352	84	174
1973	74	39	0	21	232	133	4	0	0	13	205	63	65
1974	0	0	0	0	0	0	1	0	0	0	0	0	0
1975	0	0	0	519	301	189	0	201	1	1	40	14	106
1976	2	0	0	0	0	98	1	0	0	0	0	1	8
1977	3	140	0	0	28	0	0	0	0	8	120	0	24
1978	0	0	0	0	15	129	3	20	1	40	28	1	20
1979	161	181	15	6	44	13	2	2	16	22	0	386	71
1980	192	291	5	10	23	26	0	120	414	266	129	53	126
1981	0	9	46	30	4	0	1	4	13	70	0	27	17
1982	54	350	283	1	103	59	1	0	0	5	308	297	120
1983	591	136	39	71	61	32	35	11	89	49	47	19	98
1984	163	232	23	32	65	3	2	52	26	198	13	169	81
1985	407	81	1	20	14	13	31	22	21	10	0	2	52
1986	43	10	2	26	88	105	28	28	0	40	9	8	32
1987	24	88	84	196	30	162	22	12	53	306	69	0	87
1988	26	21	5	9	9	19	35	42	324	773	718	217	183
1989	44	2	17	9	7	50	0	2	0	0	4	14	12
1990	3	0	3	0	181	65	74	0	0	8	0	148	41
1991	173	?	?	?	?	?	?	?	?	?	?	?	173?
Min.	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	148	116	61	94	90	74	37	75	153	191	171	147	101
Max.	591	487	312	519	367	309	305	526	868	773	718	537	390

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1969 to 1991 site 9553 Manapouri Power Stn flow (cumecs)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1969	?	?	?	?	?	?	?	?	?	42	84	77	67?
1970	44	67	71	107	151	97	109	109	82	58	72	63	86
1971	54	60	104	157	189	196	229	242	271	236	240	214	183
1972	220	270	252	282	306	334	333	318	326	362	302	247	296
1973	266	325	256	309	432	437	303	208	285	378	337	397	328
1974	261	262	264	228	255	172	381	310	247	272	265	181	259
1975	194	295	291	421	420	433	359	374	411	401	413	418	369
1976	276	276	259	231	350	455	443	270	221	156	250	234	285
1977	320	457	407	393	462	452	374	206	161	293	461	438	368
1978	398	290	236	448	444	454	348	395	438	339	443	436	389
1979	352	445	434	315	372	455	442	414	408	409	352	228	385
1980	348	329	370	422	315	437	372	316	425	435	422	302	374
1981	318	305	359	336	442	388	344	246	325	441	447	445	367
1982	468	458	338	433	384	455	342	370	439	375	458	424	411
1983	460	423	424	416	450	449	347	467	462	452	451	459	438
1984	460	459	327	439	464	417	326	380	450	464	414	438	420
1985	466	420	309	292	415	376	254	221	291	426	326	171	330
1986	375	386	381	378	463	447	460	439	354	428	403	285	400
1987	430	430	403	468	413	382	398	421	413	465	451	271	412
1988	388	397	426	415	372	351	465	399	462	467	468	457	422
1989	429	231	197	352	415	355	401	313	188	218	426	431	331
1990	459	410	354	352	453	468	471	449	311	342	206	384	389
1991	468	?	?	?	?	?	?	?	?	?	?	?	468?
Min.	44	60	71	107	151	97	109	109	82	42	72	63	86
Mean	339	333	308	343	379	381	357	327	332	339	350	318	345
Max.	468	459	434	468	464	468	471	467	462	467	468	459	438

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1976 to 1991 site 79737 Mararoa R at Cliffs (cumecs x 10)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1976	?	?	?	?	303	540	436	235	157	155	250	320	299?
1977	168	243	102	221	581	?	182	83	190	488	449	163	261?
1978	125	65	86	211	382	466	227	613	254	589	414	229	307
1979	398	421	149	207	630	338	303	265	390	467	245	591	367
1980	430	426	244	237	322	426	306	973	601	377	410	276	419
1981	116	80	174	389	287	224	217	214	353	456	153	323	250
1982	288	565	464	180	732	329	197	412	338	277	870	364	417
1983	847	151	303	343	443	519	418	551	645	444	381	308	448
1984	654	247	224	304	?	?	211	426	330	725	256	321	371?
1985	508	174	100	182	269	352	328	?	?	?	135	169	247?
1986	292	172	163	267	257	644	345	383	217	385	258	218	301
1987	255	435	701	476	299	1086	362	303	352	593	217	144	434
1988	212	190	186	219	208	338	357	406	725	1170	?	?	402?
1989	173	120	?	197	208	549	309	?	?	130	170	233	233?
1990	176	?	169	207	817	497	476	?	97	288	129	490	336?
1991	396	473	105	383	233	251	?	?	?	?	?	?	304?
Min.	116	65	86	180	208	224	182	83	97	130	129	144	250
Mean	336	269	226	268	398	469	312	405	358	467	310	296	368
Max.	847	565	701	476	817	1086	476	973	725	1170	870	591	448

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1972 to 1991 site 79735 Waiau R at Sunnyside (cumecs)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1972	?	?	240	304	272	136	43	24	358	432	414	125	234?
1973	96	57	11	47	285	175	31	23	27	52	249	86	95
1974	14	22	14	15	15	30	42	31	26	35	21	15	23
1975	17	21	28	611	375	244	47	273	44	40	75	43	151
1976	17	12	12	13	39	159	34	35	30	28	34	30	37
1977	32	188	16	30	89	37	30	22	32	55	157	21	58
1978	22	18	16	19	42	147	33	84	46	97	72	41	53
1979	204	206	28	31	98	43	33	37	60	58	21	427	104
1980	251	347	30	32	53	93	40	224	493	320	160	78	176
1981	18	24	58	61	31	26	28	45	70	129	27	59	48
1982	85	359	293	24	154	95	28	46	48	55	406	311	157
1983	656	137	57	88	112	79	78	90	129	79	71	49	136
1984	?	?	50	94	116	37	?	101	71	257	29	182	105?
1985	457	95	12	37	30	44	58	50	48	30	15	18	75
1986	60	?	?	58	113	?	?	?	33	80	49	47	63?
1987	60	143	157	188	?	?	?	?	84	393	106	45	147?
1988	50	42	?	?	41	63	79	88	400	843	745	225	258?
1989	55	25	47	36	36	110	50	26	20	23	37	41	42
1990	27	12	28	17	257	108	113	24	19	?	21	208	77?
1991	213	275	33	42	54	32	?	?	?	?	?	?	106?
Min.	14	12	11	13	15	26	28	22	19	23	15	15	23
Mean	130	117	63	92	116	92	48	72	107	167	143	108	89
Max.	656	359	293	611	375	244	113	273	493	843	745	427	176

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1964 to 1991 site 79701 Waiau R at Tuatapere (cumecs)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1964	?	?	?	?	?	?	?	455	529	?	593	890	618?
1965	608	445	480	382	612	757	559	342	431	724	792	667	567
1966	658	593	391	672	483	424	390	293	255	315	?	?	446?
1967	?	622	660	?	928	430	300	?	448	?	789	936	640?
1968	654	502	875	574	508	434	352	453	612	912	1005	778	639
1969	529	?	?	607	428	?	450	494	928	654	457	432	552?
1970	543	384	340	350	221	136	300	580	1015	718	462	549	467
1971	303	159	142	168	97	175	68	42	400	591	495	337	248
1972	339	122	291	379	341	223	88	72	492	516	480	139	290
1973	105	63	17	68	345	207	?	?	68	84	278	103	134?
1974	21	42	24	29	36	71	100	73	48	68	63	?	52?
1975	?	38	59	638	400	277	98	314	81	73	98	63	195?
1976	26	18	17	20	82	244	130	92	56	63	74	49	73
1977	?	?	?	63	161	70	37	24	?	?	161	?	86?
1978	36	27	23	37	68	197	102	129	76	126	94	83	83
1979	232	248	46	74	240	76	80	79	103	97	32	448	146
1980	311	406	59	69	106	171	103	312	554	364	202	104	229
1981	28	32	75	78	62	59	65	90	102	161	37	83	73
1982	115	406	324	46	245	154	81	94	89	94	470	?	191?
1983	750	197	108	153	201	188	150	152	200	120	101	94	202
1984	299	317	105	127	174	67	66	159	112	319	61	214	168
1985	510	136	30	77	80	90	98	95	82	52	41	47	112
1986	98	68	56	93	165	234	138	?	69	120	82	73	109?
1987	79	168	269	?	?	287	142	?	148	431	115	63	189?
1988	67	71	39	60	73	100	124	?	?	874	797	270	248?
1989	116	83	95	67	68	198	82	46	37	41	48	70	79
1990	38	18	36	31	286	141	156	?	33	91	31	211	99?
1991	240	351	53	?	?	?	?	?	?	?	?	?	210?
Min.	21	18	17	20	36	59	37	24	33	41	31	47	73
Mean	279	221	185	203	256	216	170	209	279	317	302	291	241
Max.	750	622	875	672	928	757	559	580	1015	912	1005	936	639

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1977 to 1991 site 79713 Lake Monowai level (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1977	?	?	?	?	?	3892	3584	3010	3108	3912	4007	3272	3539?
1978	2855	2270	1953	2049	2142	2668	2784	3693	4070	4024	3656	3402	2968
1979	3444	3612	3624	3538	3896	3444	3365	2849	2751	3293	2996	3118	3327
1980	3138	3427	2953	2800	2656	3754	3474	3584	4000	3835	3490	3293	3365
1981	2768	2471	2258	2304	2596	2136	1783	1891	2102	3054	2799	2811	2415
1982	2889	3078	2769	2738	3180	3457	3000	3020	2983	2873	3968	3972	3160
1983	4098	3623	3837	3964	?	?	3939	3762	3469	3362	2782	2607	3545?
1984	2761	3247	3020	2923	3385	3361	2860	2795	2374	2956	3258	3210	3012
1985	3618	3141	2381	2528	2828	2811	2788	2421	1999	?	?	1961	2645?
1986	2623	2799	3214	2921	2966	3303	3064	3245	2841	3172	2453	2141	2896
1987	2548	3389	3580	3261	3167	3329	3245	3012	2717	?	?	2529	3074?
1988	2399	2458	3543	3560	2949	2619	3018	2981	3183	3710	3652	2700	3066
1989	2565	2763	3314	3771	3309	3252	2927	2230	1816	1948	2114	2317	2693
1990	2751	2663	2141	2101	3196	3312	3007	2416	2181	2664	2857	3099	2700
1991	3125	3511	3097	3300	3272	?	?	?	?	?	?	?	3256?
Min.	2399	2270	1953	2049	2142	2136	1783	1891	1816	1948	2114	1961	2415
Mean	2970	3032	2977	2983	3042	3180	3060	2922	2828	3234	3169	2888	2960
Max.	4098	3623	3837	3964	3896	3892	3939	3762	4070	4024	4007	3972	3365

The Min Mean and Max of Annual means are for complete years only.

Monthly means 1976 to 1991 site 79712 Monowai River (cumecs x 10)

Year	Jan	Feb	Mar	Apr	May	Jun	Jly	Aug	Sep	Oct	Nov	Dec	Mean
1976	?	?	?	?	?	?	?	?	?	75	113	109	99?
1977	?	?	?	?	166	166	153	82	58	118	275	129	143?
1978	130	114	79	74	71	89	70	113	143	186	148	177	116
1979	148	105	80	89	287	121	153	181	133	130	113	117	139
1980	123	174	133	121	89	175	169	189	253	237	163	159	165
1981	104	98	64	61	143	135	109	120	119	172	125	112	114
1982	?	129	114	61	134	174	124	?	159	120	277	197	149?
1983	295	135	87	146	130	152	180	184	185	173	153	116	162
1984	134	?	?	127	129	159	133	172	158	98	131	89	133?
1985	156	182	103	68	136	108	150	145	162	120	45	18	116
1986	99	55	160	137	159	167	168	184	190	196	175	82	148
1987	57	83	349	111	156	182	190	188	155	231	139	?	168?
1988	92	32	41	153	183	151	179	202	192	321	346	146	170
1989	73	21	?	104	158	156	183	113	90	37	111	68	102?
1990	93	54	168	23	161	191	179	138	81	56	99	161	118
1991	151	186	120	?	166	?	?	?	?	?	?	?	155?
Min.	57	21	41	23	71	89	70	82	58	37	45	18	114
Mean	127	105	125	98	151	152	153	155	148	151	161	120	139
Max.	295	186	349	153	287	191	190	202	253	321	346	197	170

The Min Mean and Max of Annual means are for complete years only.

3

GRAPHS

of

MEAN

FLOWS

and

LEVELS

Annual means

or

6 monthly means

5 yearly mean levels for

Lakes Te Anau and Manapouri

Section 3 - Graphs of Mean Flows and Levels

For the sites with long records bar graphs of annual means are presented. For sites with shorter periods of record bar graphs of 6 month means are presented.

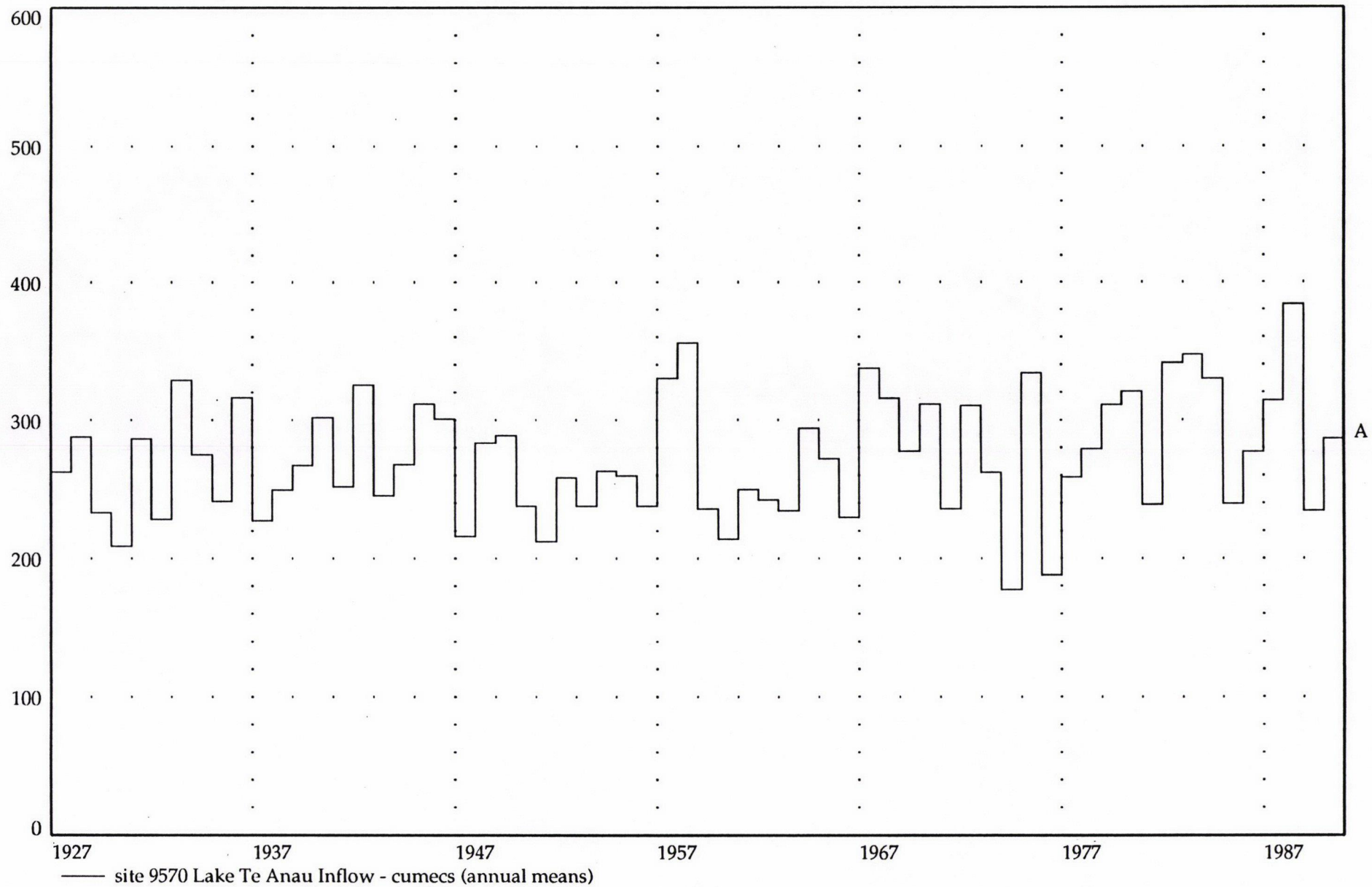
For Lakes Manapouri and Te Anau 5 yearly mean levels are depicted in the form of bar charts.

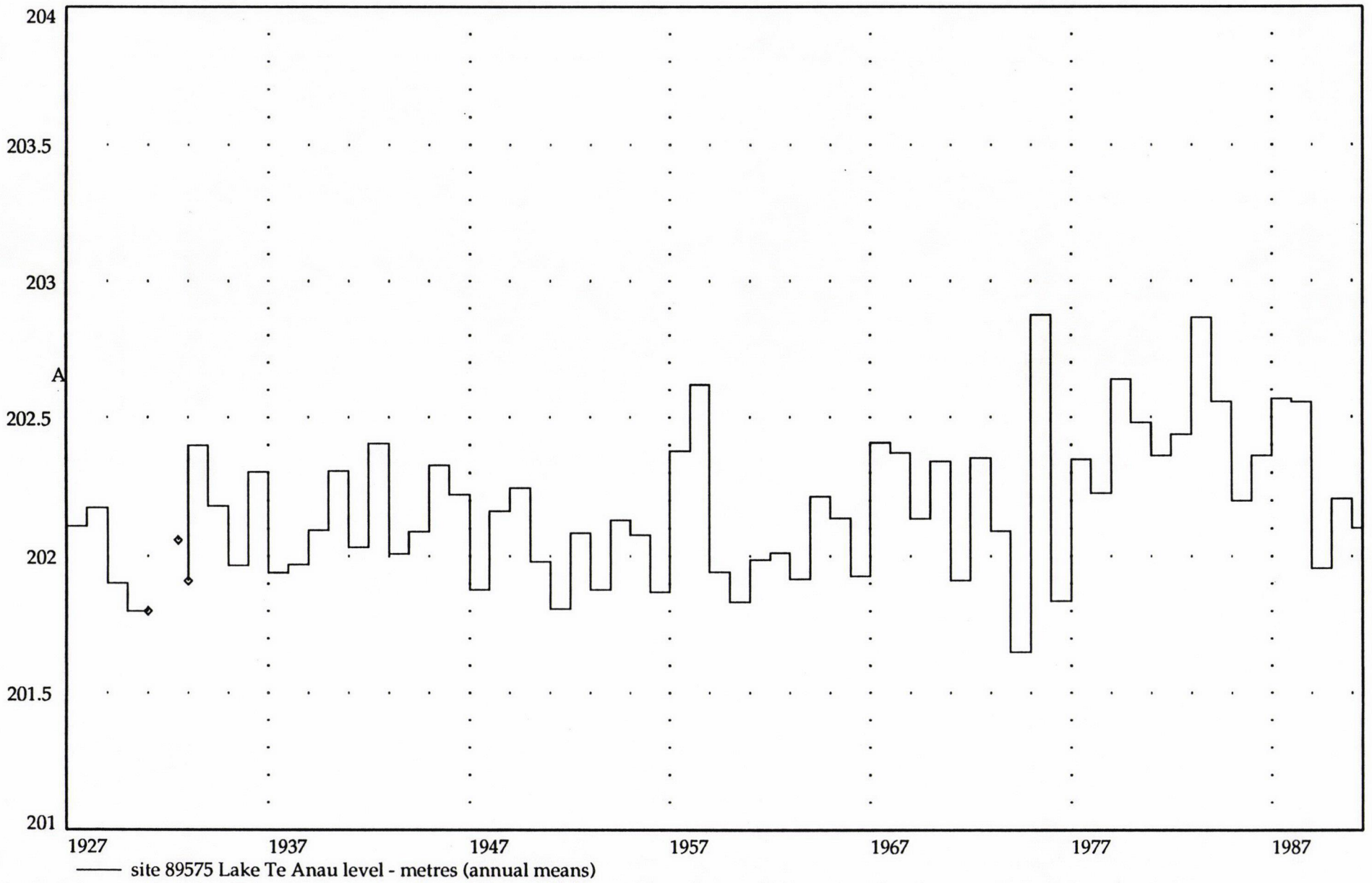
For Manapouri power station flows daily means are presented together with 6 monthly means.

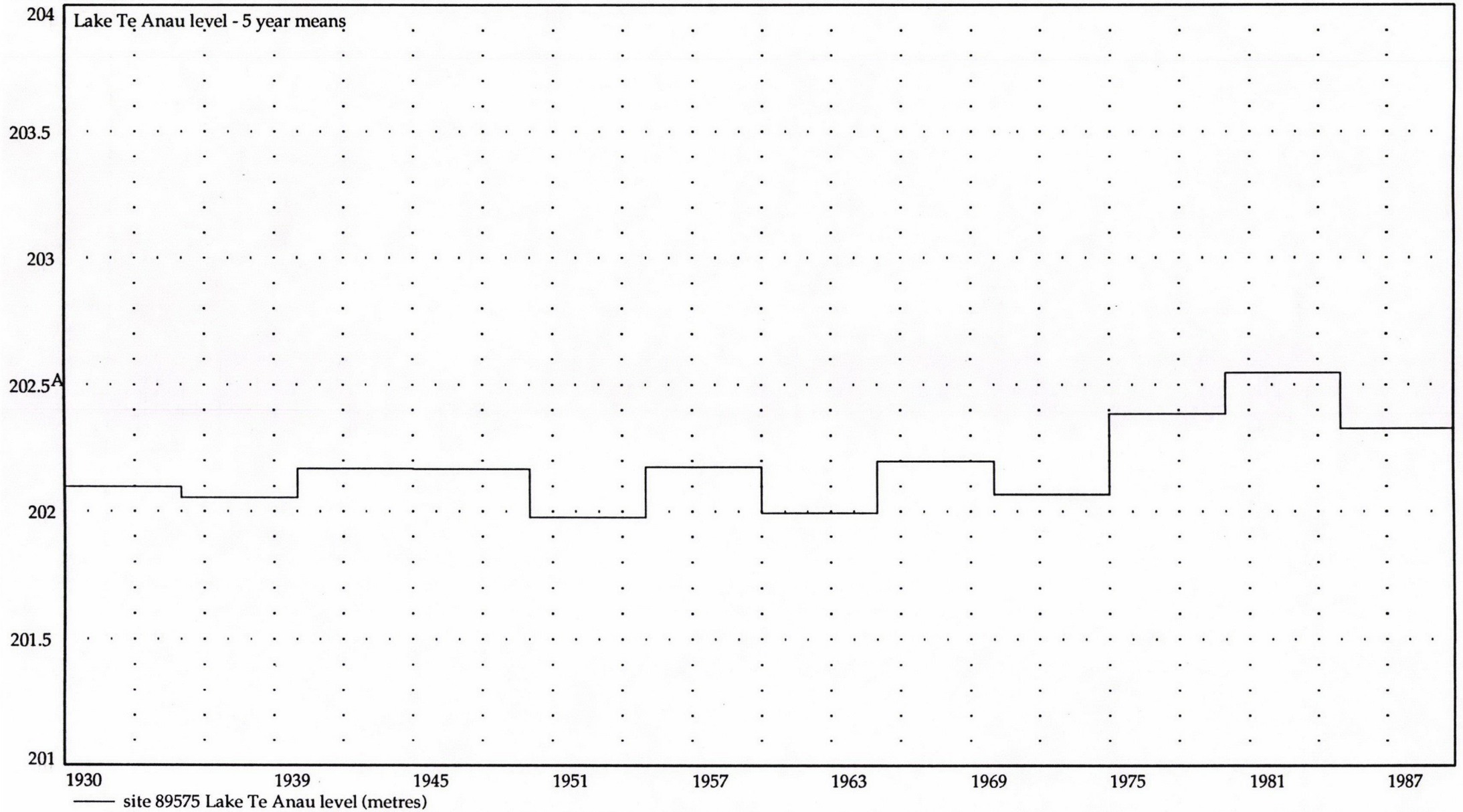
Graphs of annual (or 6 monthly means) simply show the variations from year to year with features such as wet and dry periods being clearly visible. 5 yearly means show the longer term trends associated either with climatic or operational phenomena.

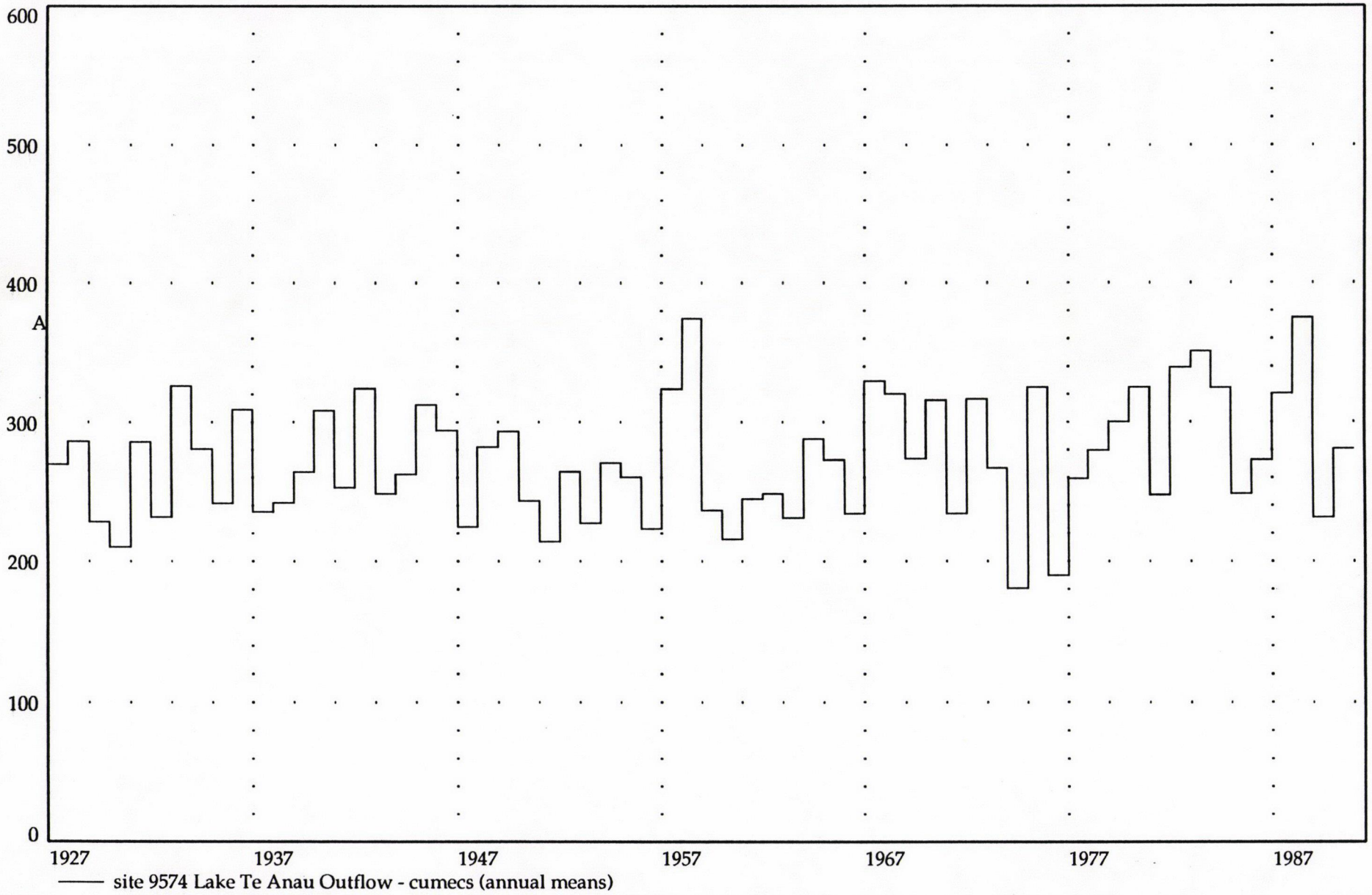
6 monthly means of Tuatapere flows depict clearly the changes pre- and post-control of Lake Manapouri for power generation.

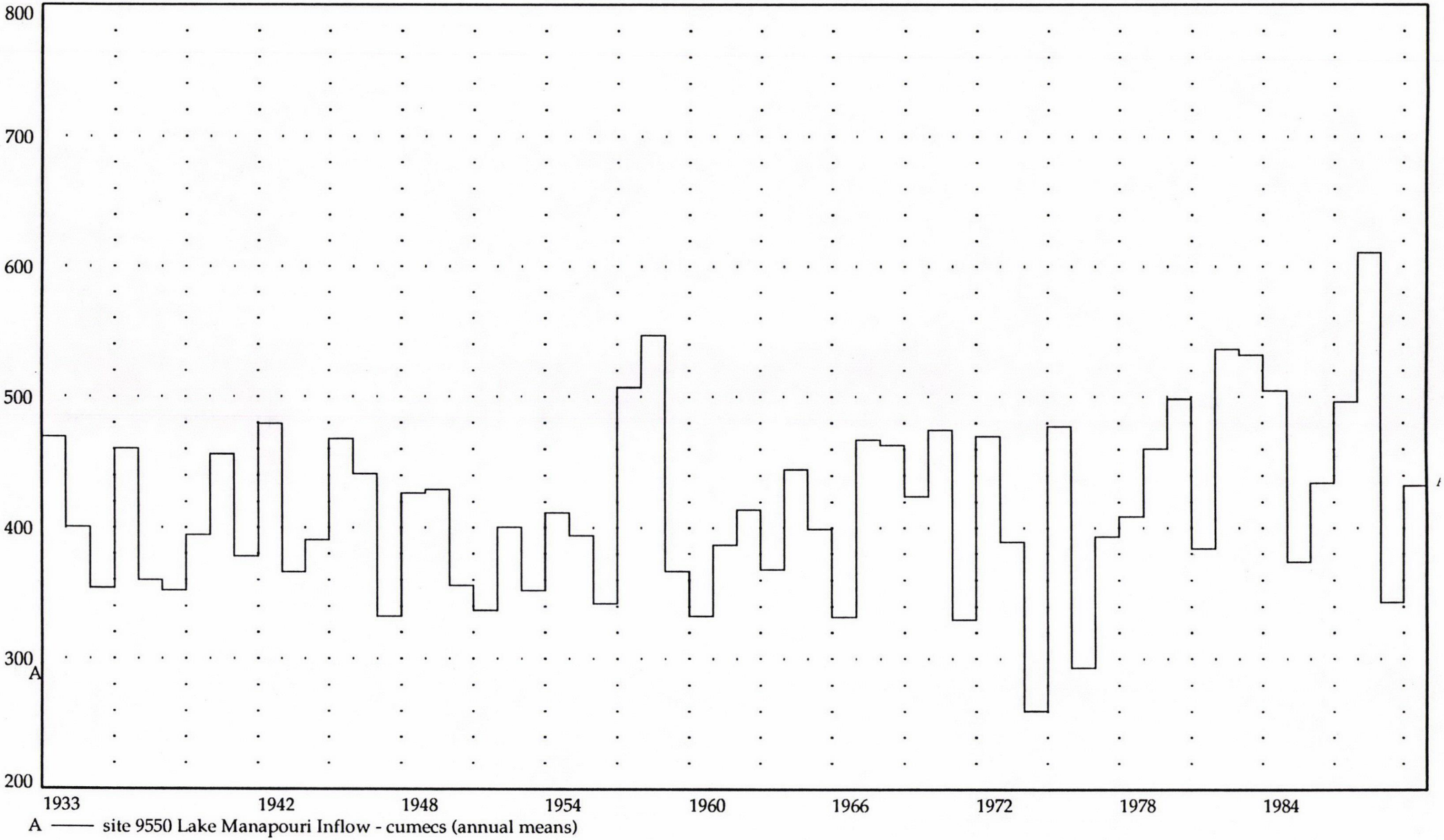
6 monthly means of Manapouri Lake Control flow depict periods of little or no spill (eg 1974) and periods of high spill (eg latter part of 1988).

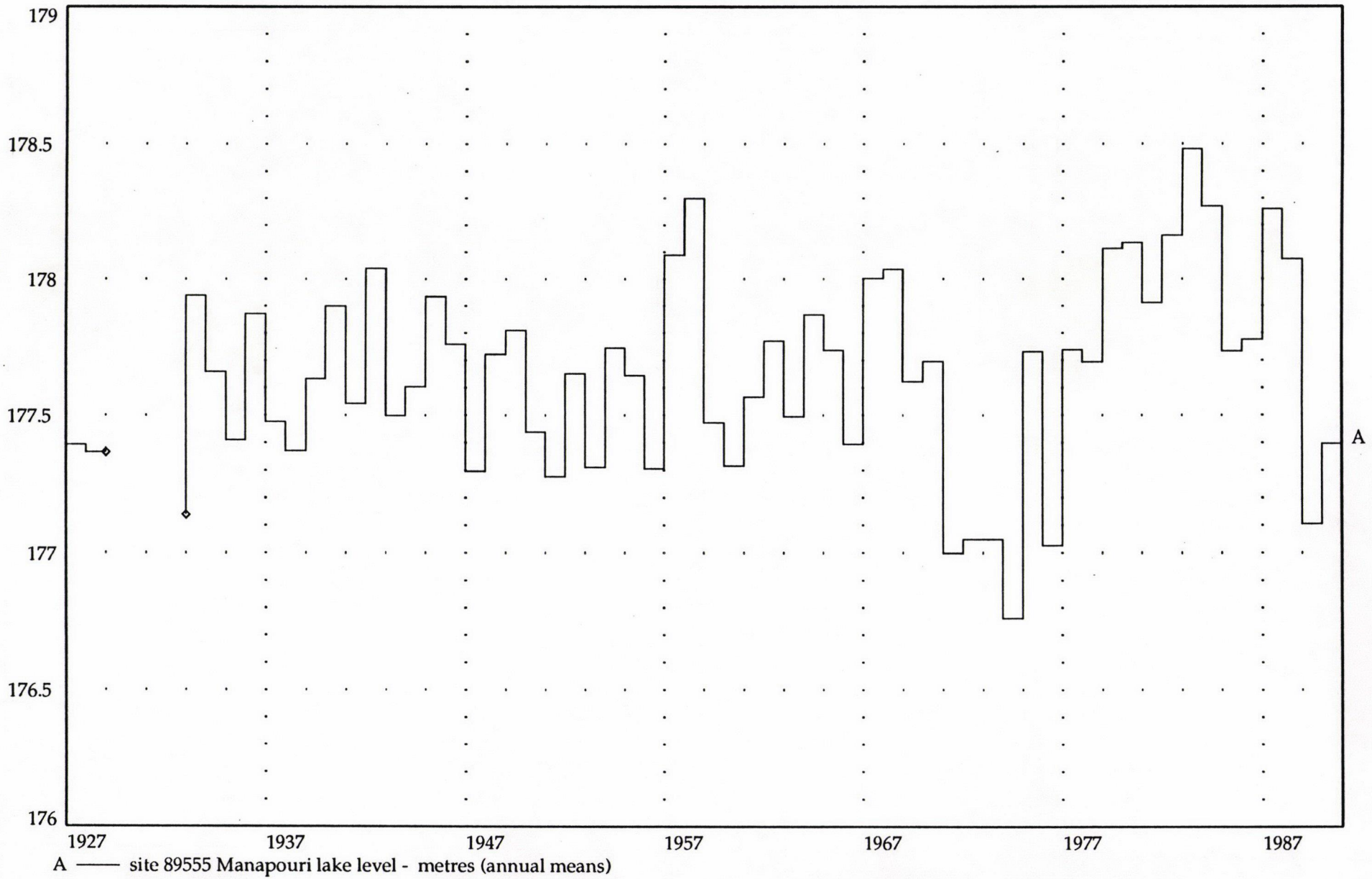

600
500
400
300
200
100
0
1927
1937
1947
1957
1967
1977
1987
A
site 9570 Lake Te Anau Inflow - cumecs (annual means)

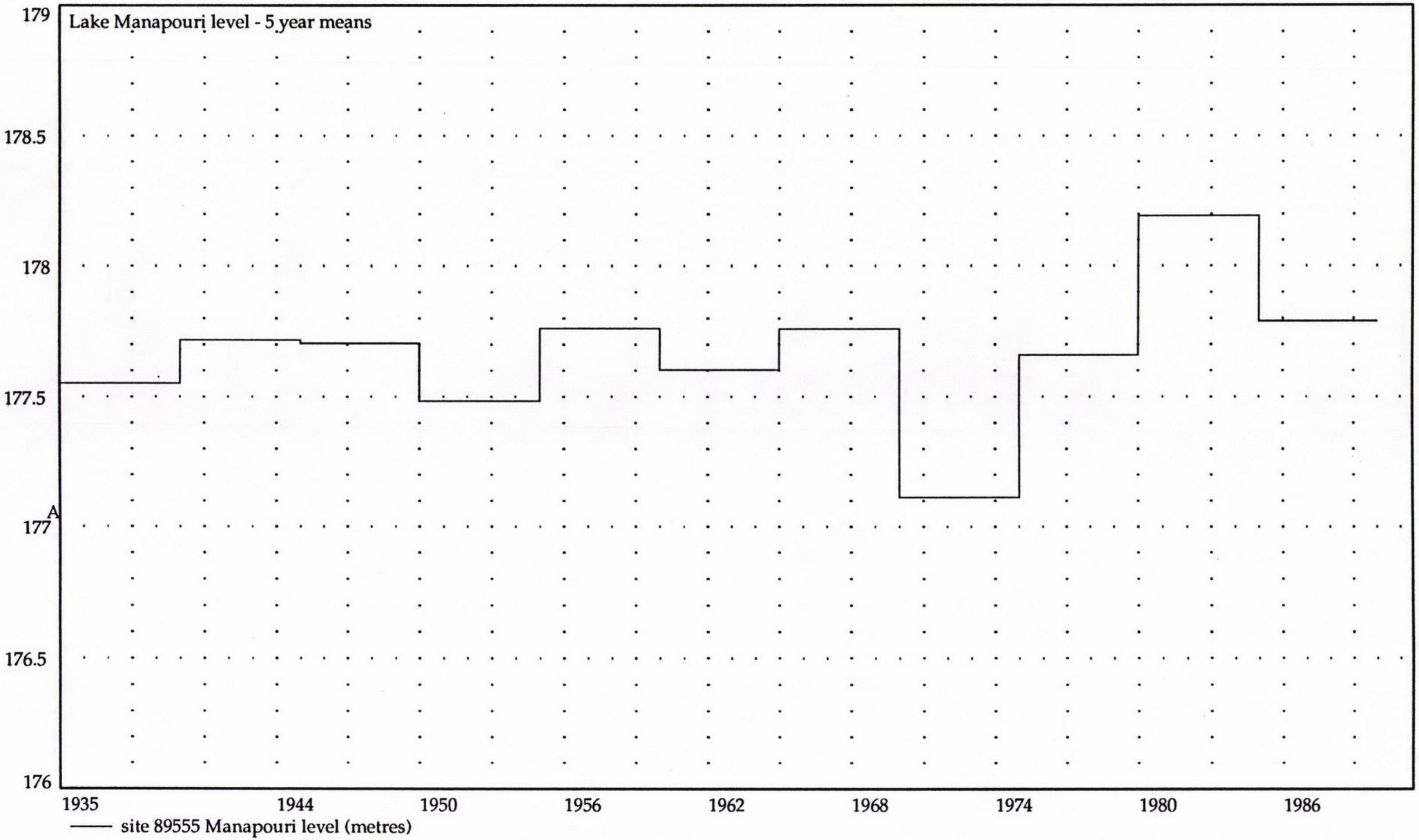

204
203.5
203
A
202.5
202
201.5
201
1927
1937
1947
1957
1967
1977
1987
site 89575 Lake Te Anau level - metres (annual means)

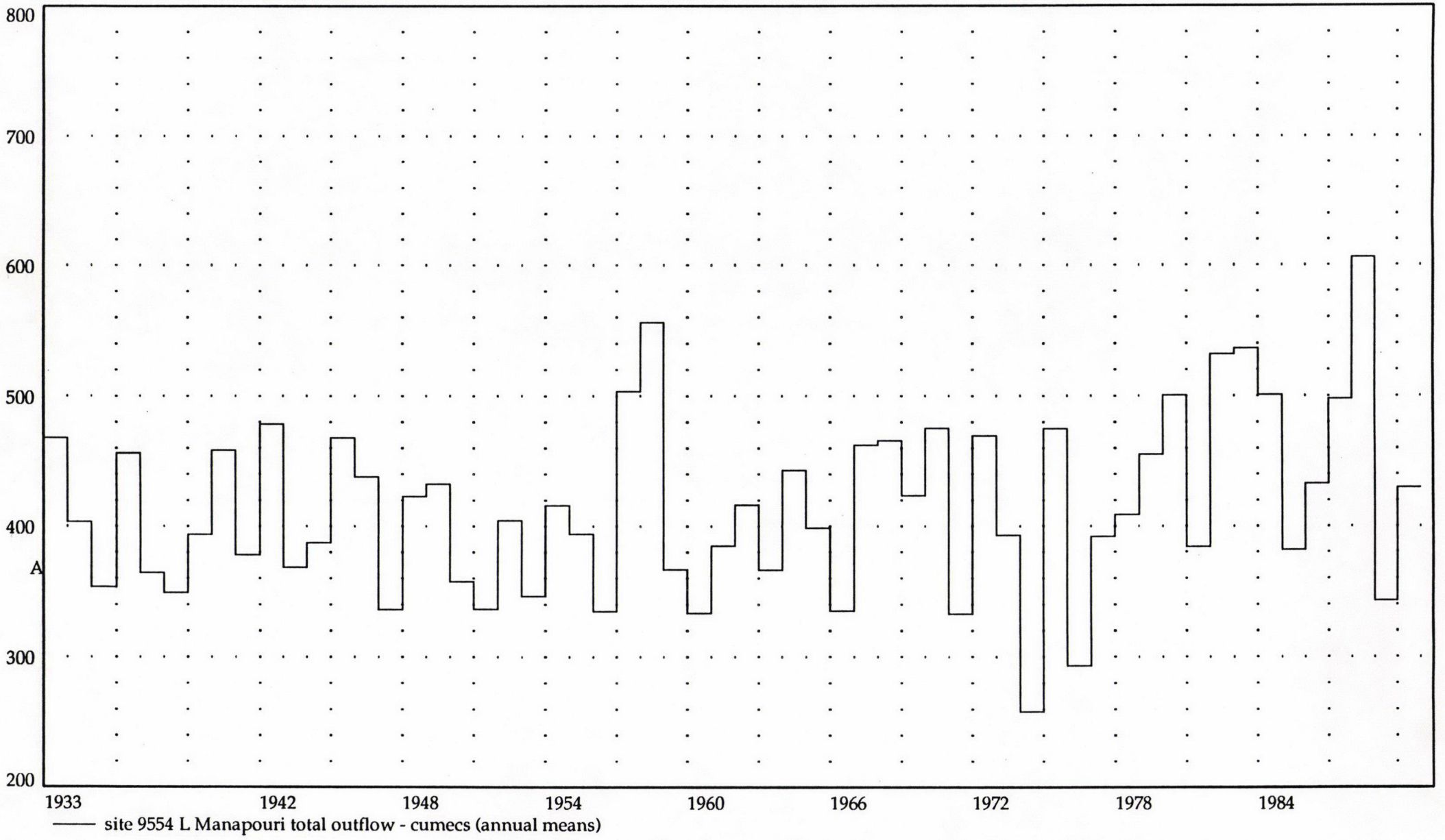

Lake Te Anau level - 5 year means
204
203.5
203
202.5A
202
201.5
201
1930
1939
1945
1951
1957
1963
1969
1975
1981
1987
site 89575 Lake Te Anau level (metres)

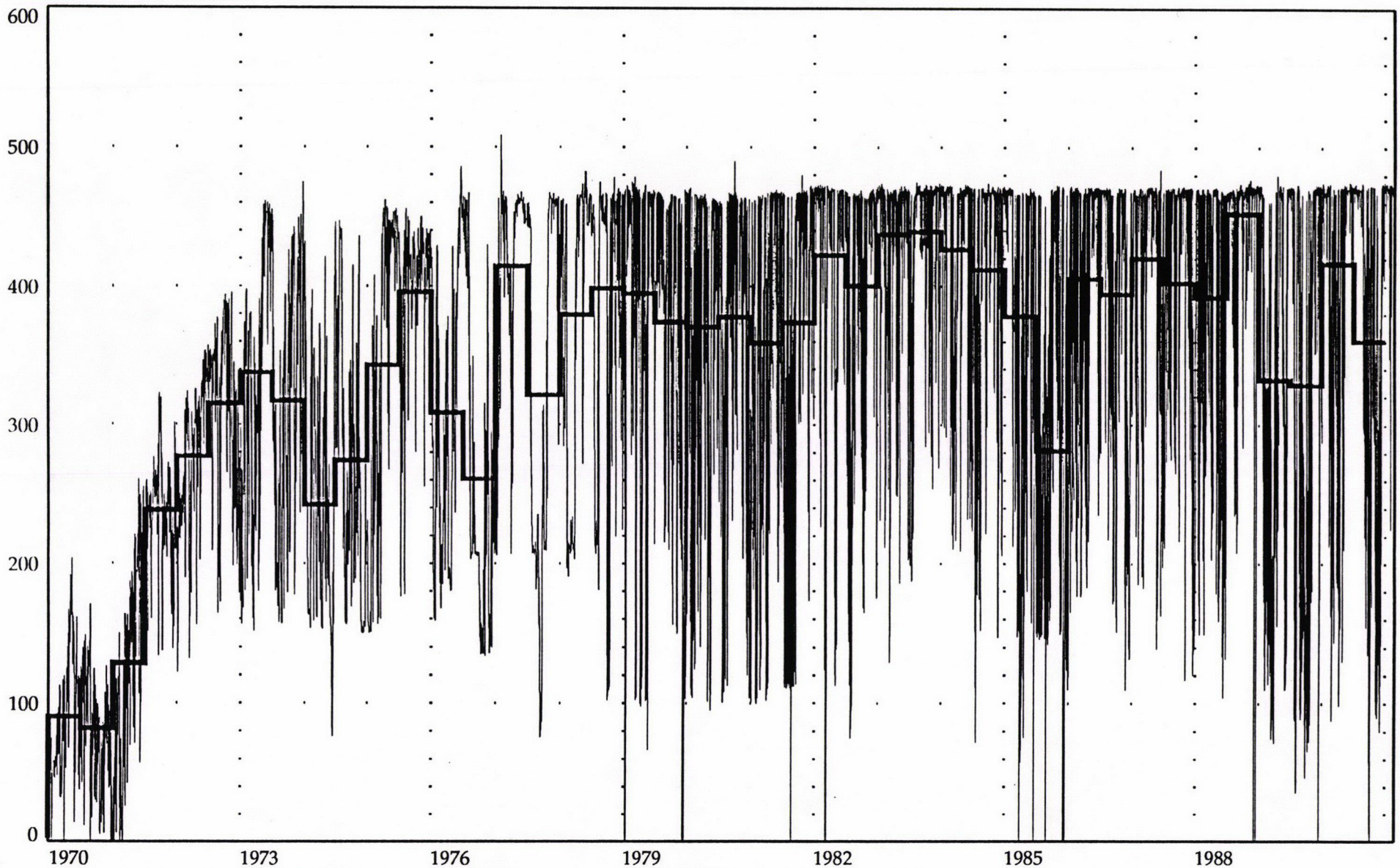

600
500
400
A
300
200
100
0
1927
1937
1947
1957
1967
1977
1987
site 9574 Lake Te Anau Outflow - cumecs (annual means)

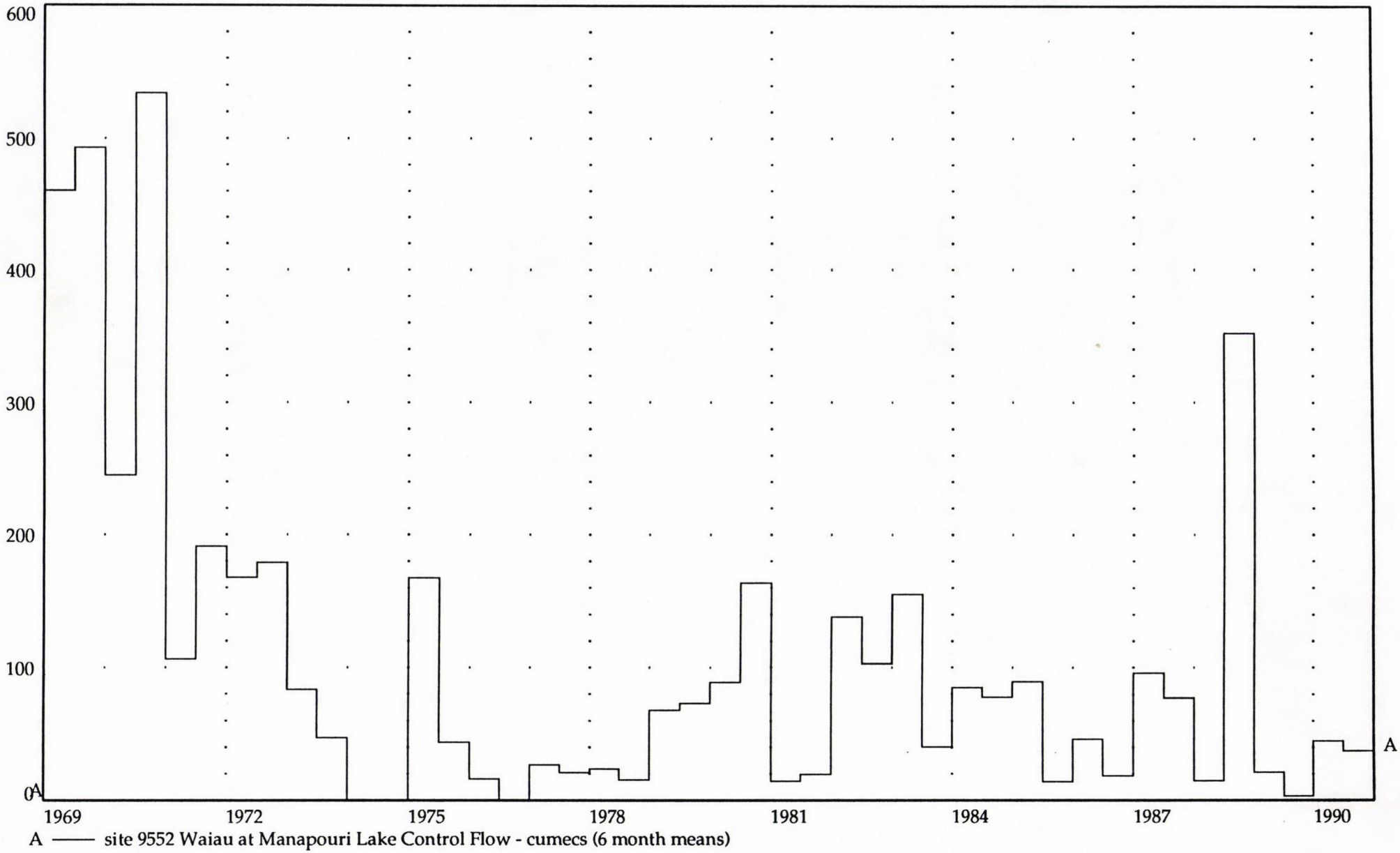

800
700
600
500
400
300
200
A
1933
1942
1948
1954
1960
1966
1972
1978
1984
A —— site 9550 Lake Manapouri Inflow - cumecs (annual means)

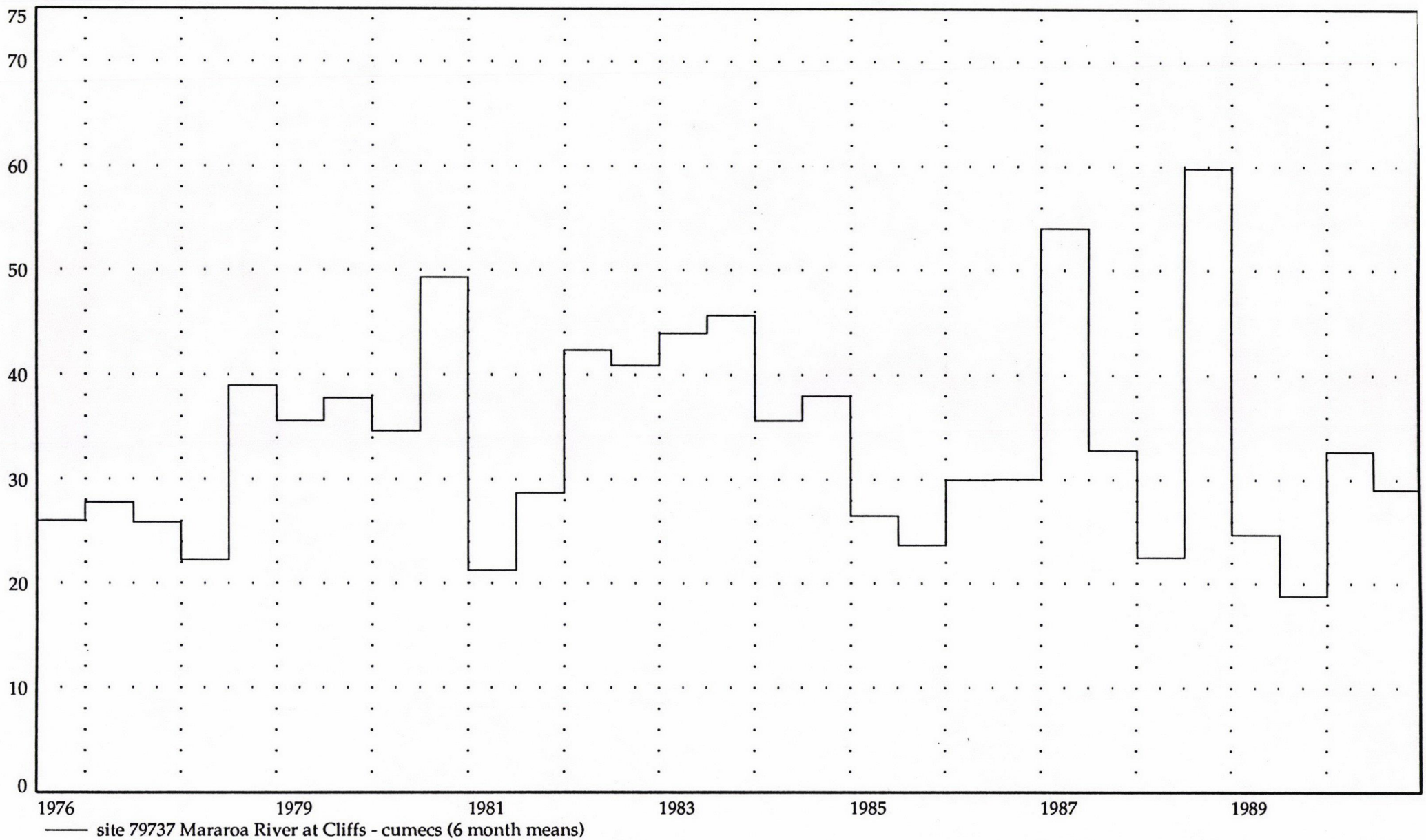

179
178.5
178
177.5
177
176.5
176
1927
1937
1947
1957
1967
1977
1987
A
A —— site 89555 Manapouri lake level - metres (annual means)

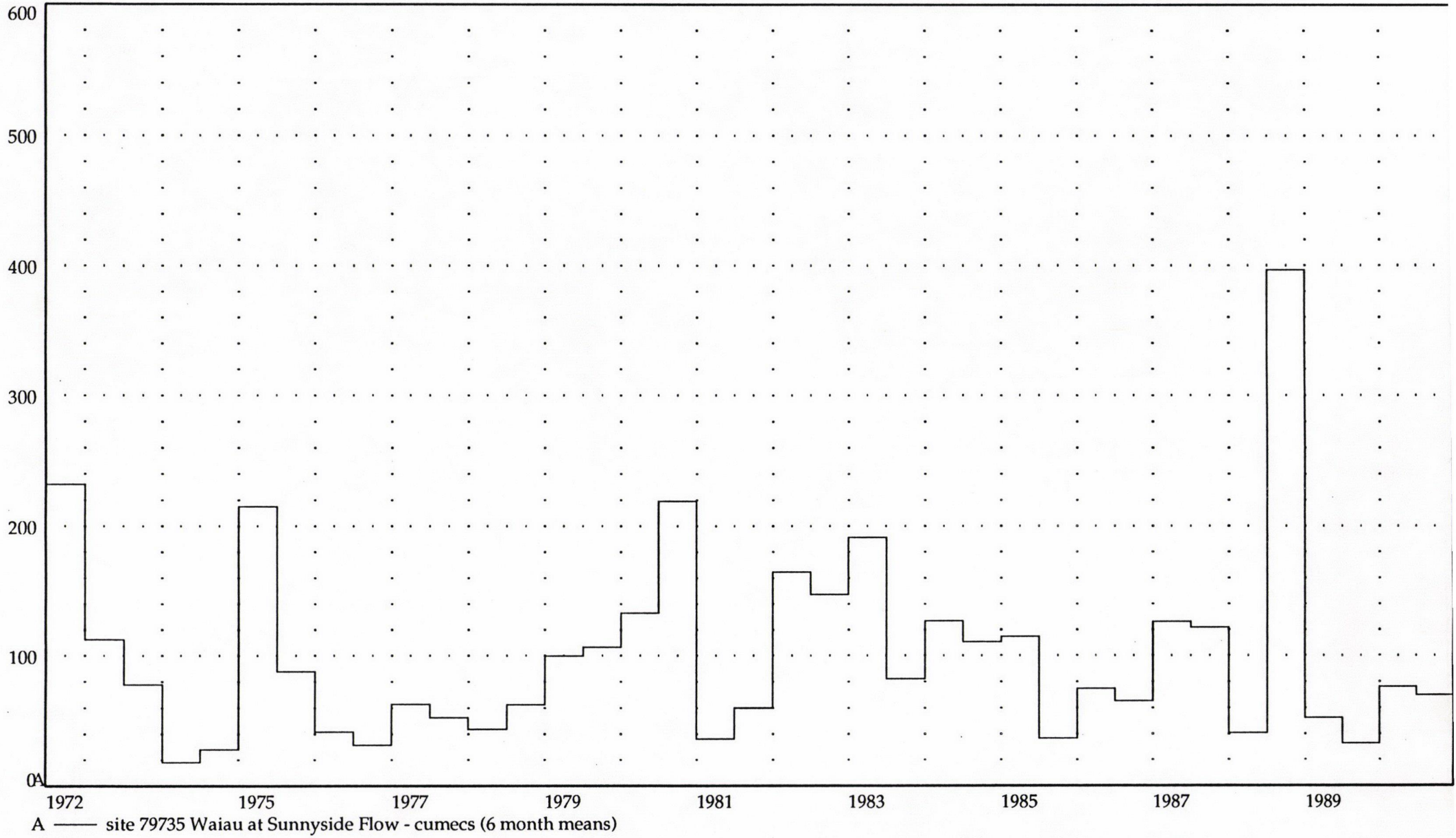

Lake Manapouri level - 5 year means
179
178.5
178
177.5
A
177
176.5
176
1935
1944
1950
1956
1962
1968
1974
1980
1986
site 89555 Manapouri level (metres)

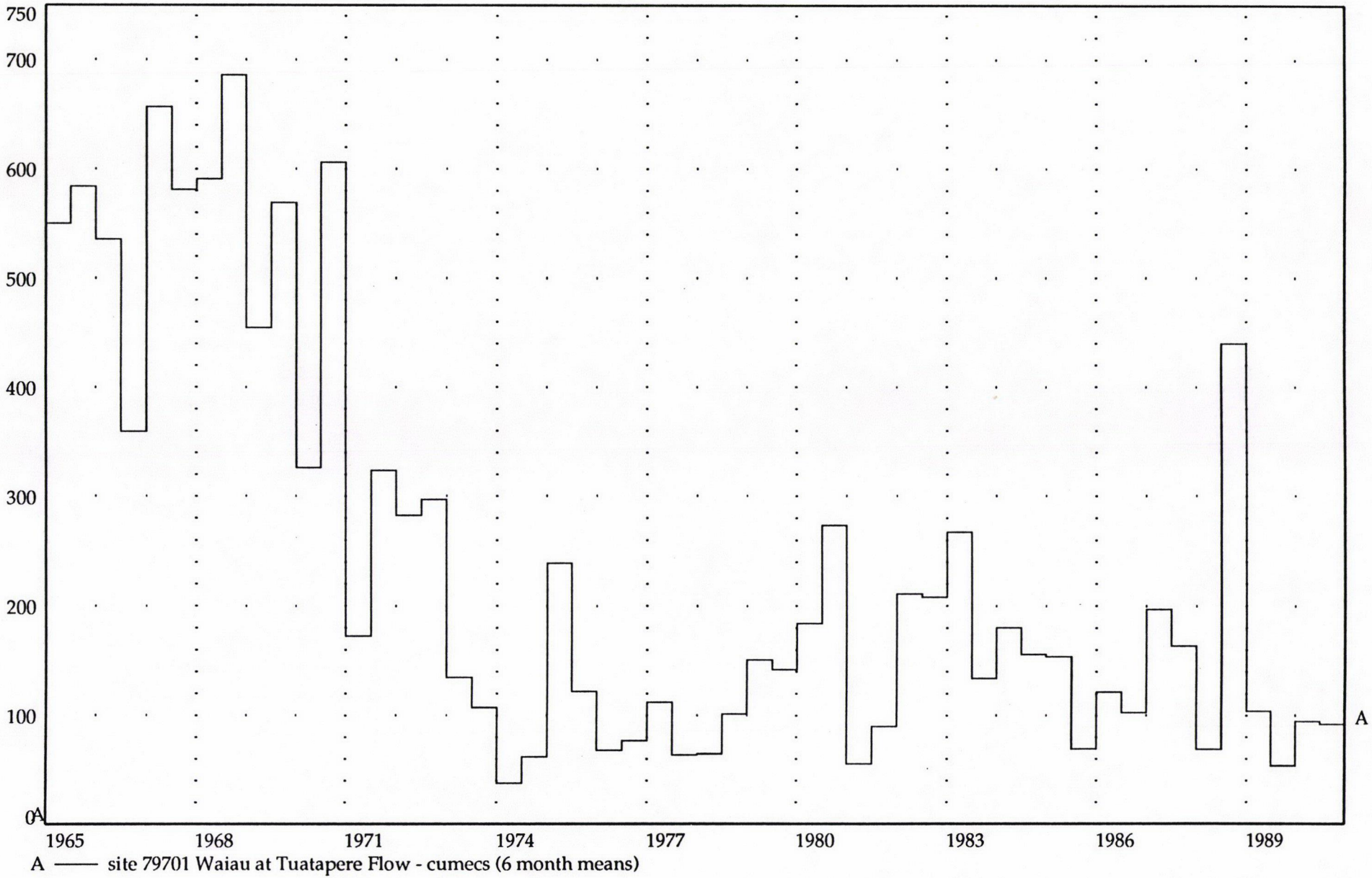

800
700
600
500
400
A
300
200
1933
1942
1948
1954
1960
1966
1972
1978
1984
site 9554 L Manapouri total outflow - cumecs (annual means)


600
500
400
300
200
100
0
1970
1973
1976
1979
1982
1985
1988
site 9553 Manapouri P. Stn flow - cumecs (Daily means until Sept 1978, then 3 hourly means)
site 9553 Manapouri P. Stn flow - cumecs (6 month means)


600
500
400
300
200
100
0
A
1969
1972
1975
1978
1981
1984
1987
1990
A
A —— site 9552 Waiau at Manapouri Lake Control Flow - cumecs (6 month means)


75
70
60
50
40
30
20
10
0
1976
1979
1981
1983
1985
1987
1989
site 79737 Mararoa River at Cliffs - cumecs (6 month means)


600
500
400
300
200
100
0
1972
1975
1977
1979
1981
1983
1985
1987
1989
A —— site 79735 Waiau at Sunnyside Flow - cumecs (6 month means)


750
700
600
500
400
300
200
100
0
A
1965
1968
1971
1974
1977
1980
1983
1986
1989
A —— site 79701 Waiau at Tuatapere Flow - cumecs (6 month means)

4

GRAPHS

of

FLOW

and

LEVEL

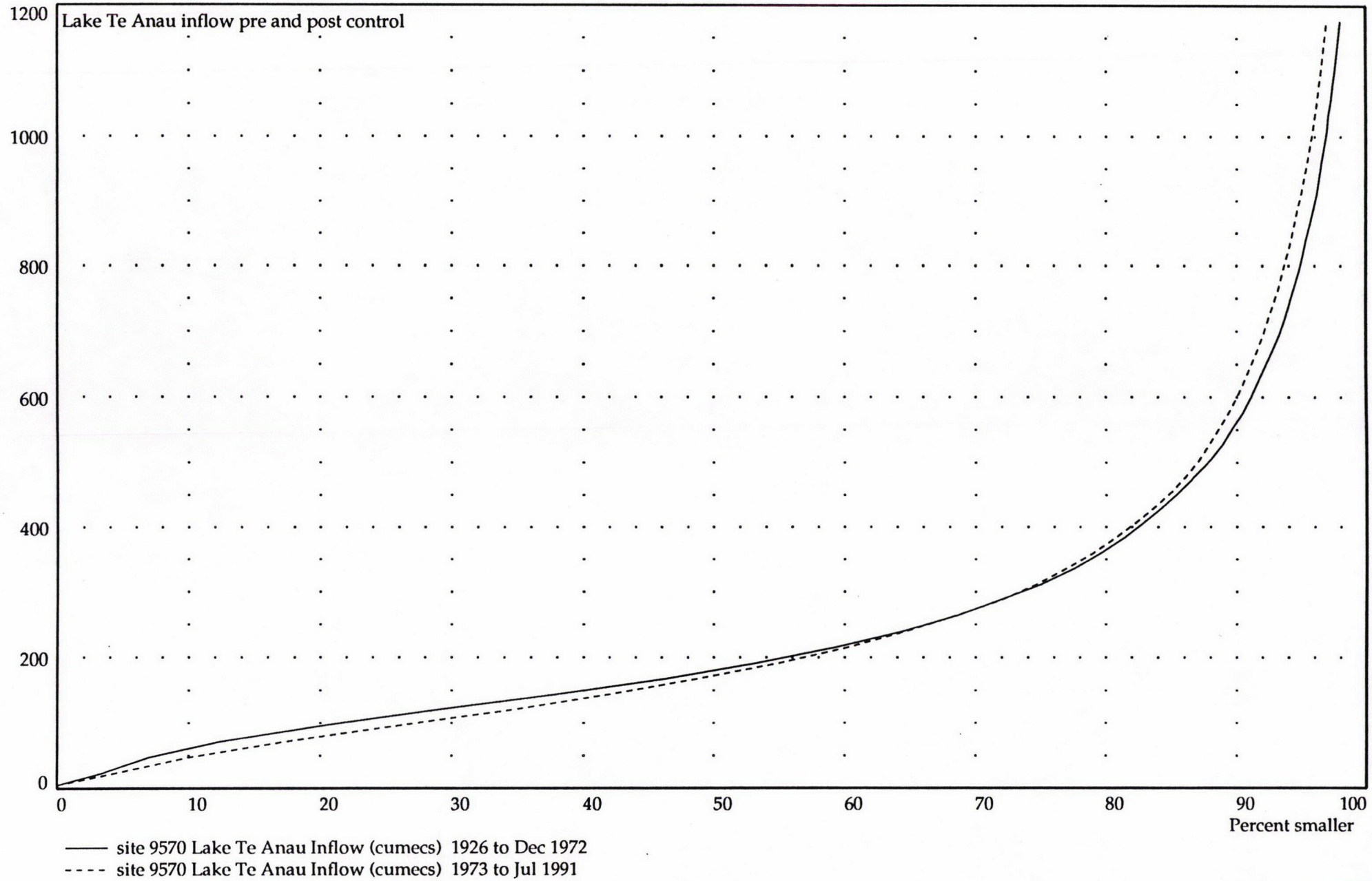
DISTRIBUTIONS

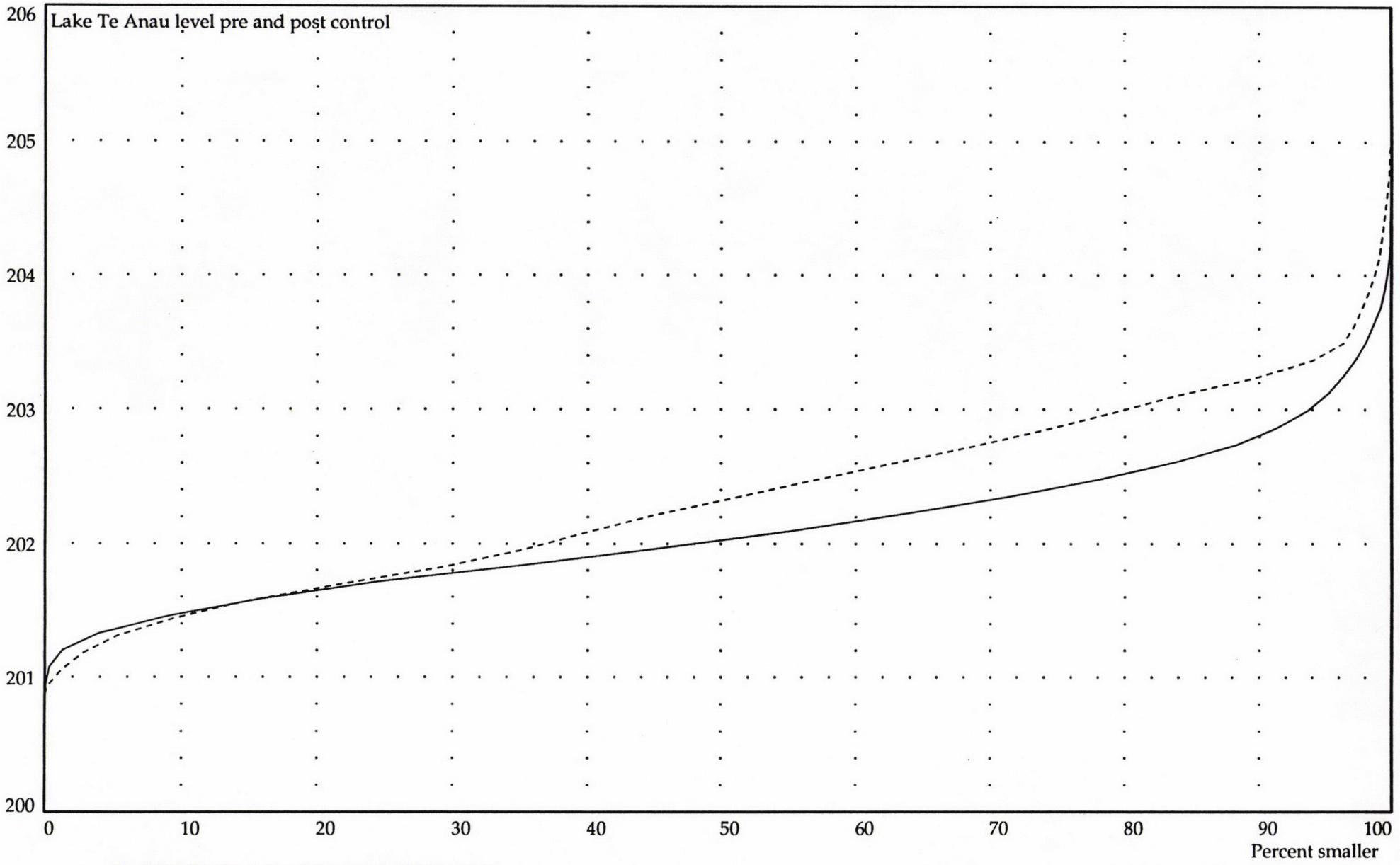
Including pre- and post-control

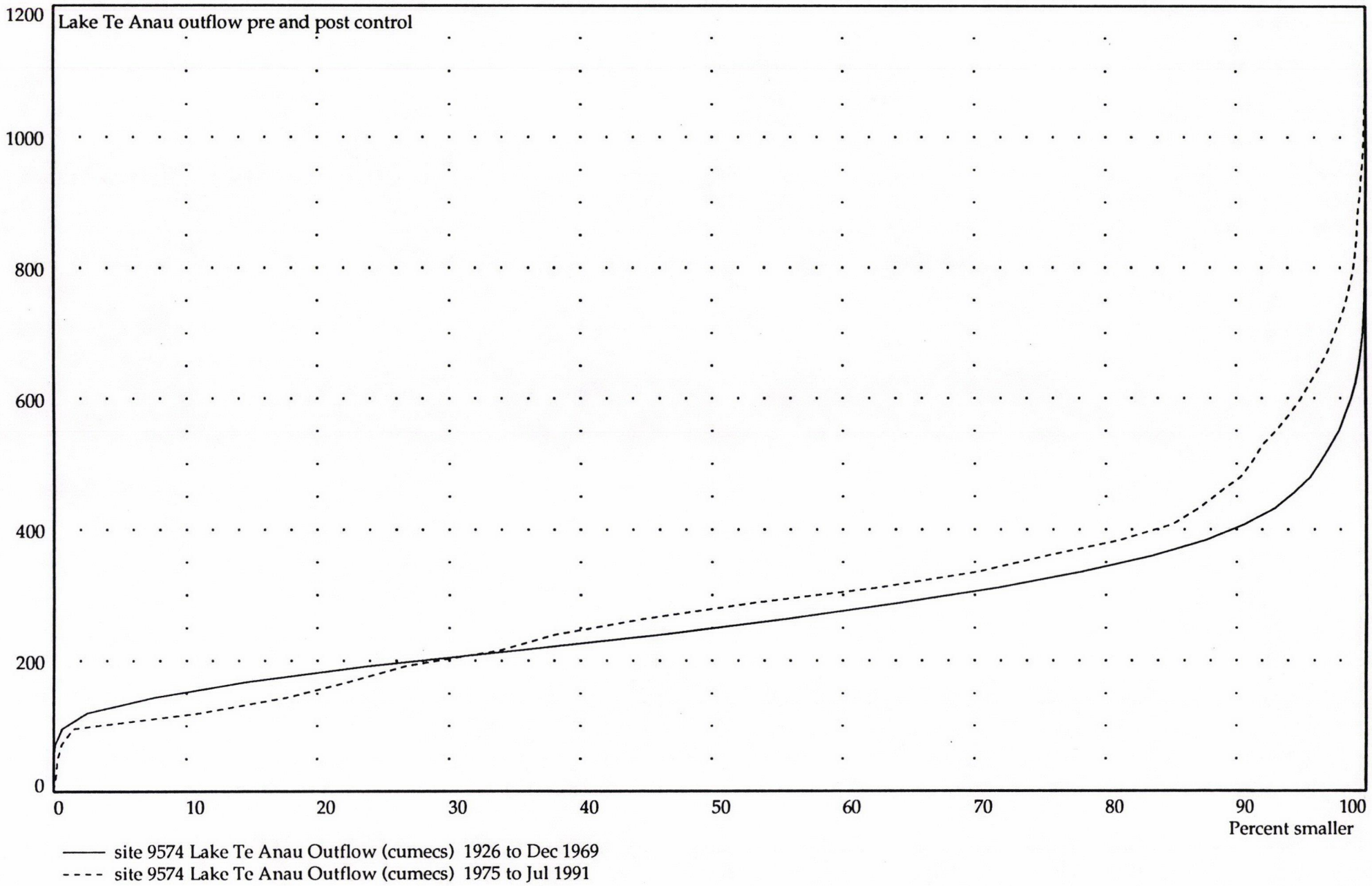
comparisons where applicable

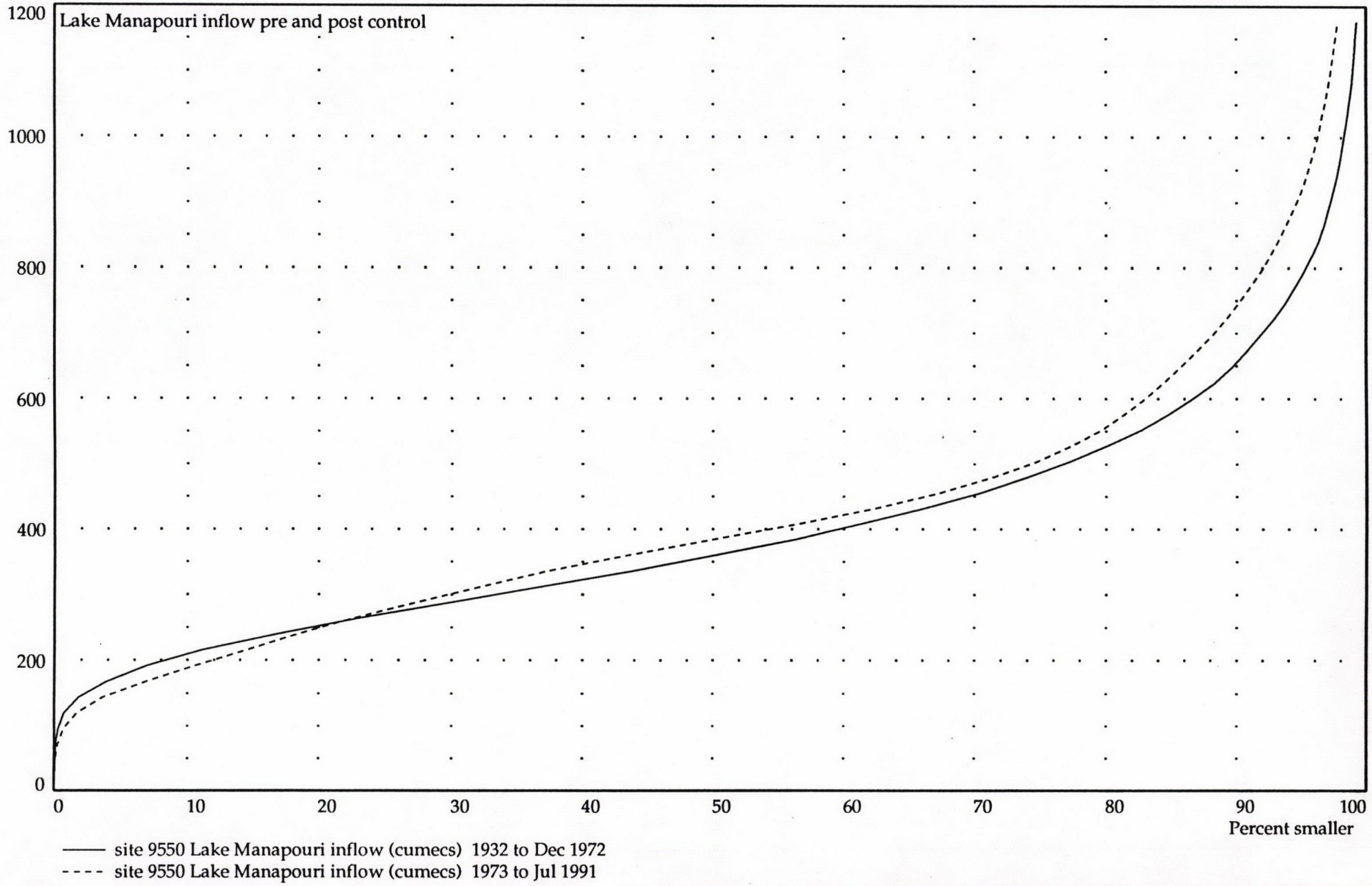
Section 4 - Graphs of Flow and Level Distributions

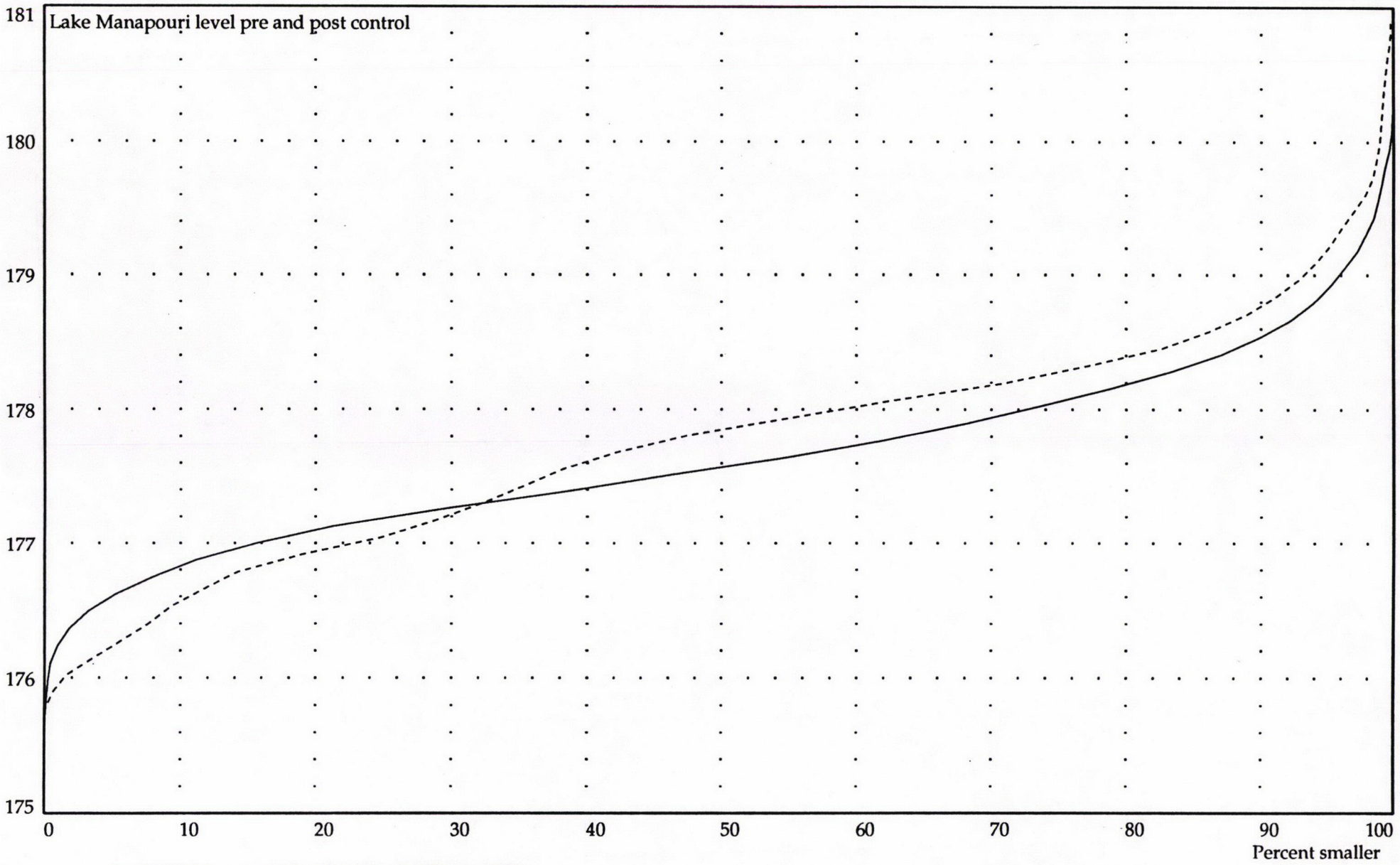
Graphs in this section illustrate the percentages of time that flows or levels are equalled or exceeded. Where appropriate pre- and post-control comparisons are provided. Some graphs have at the bottom an example of how the distribution should be interpreted.

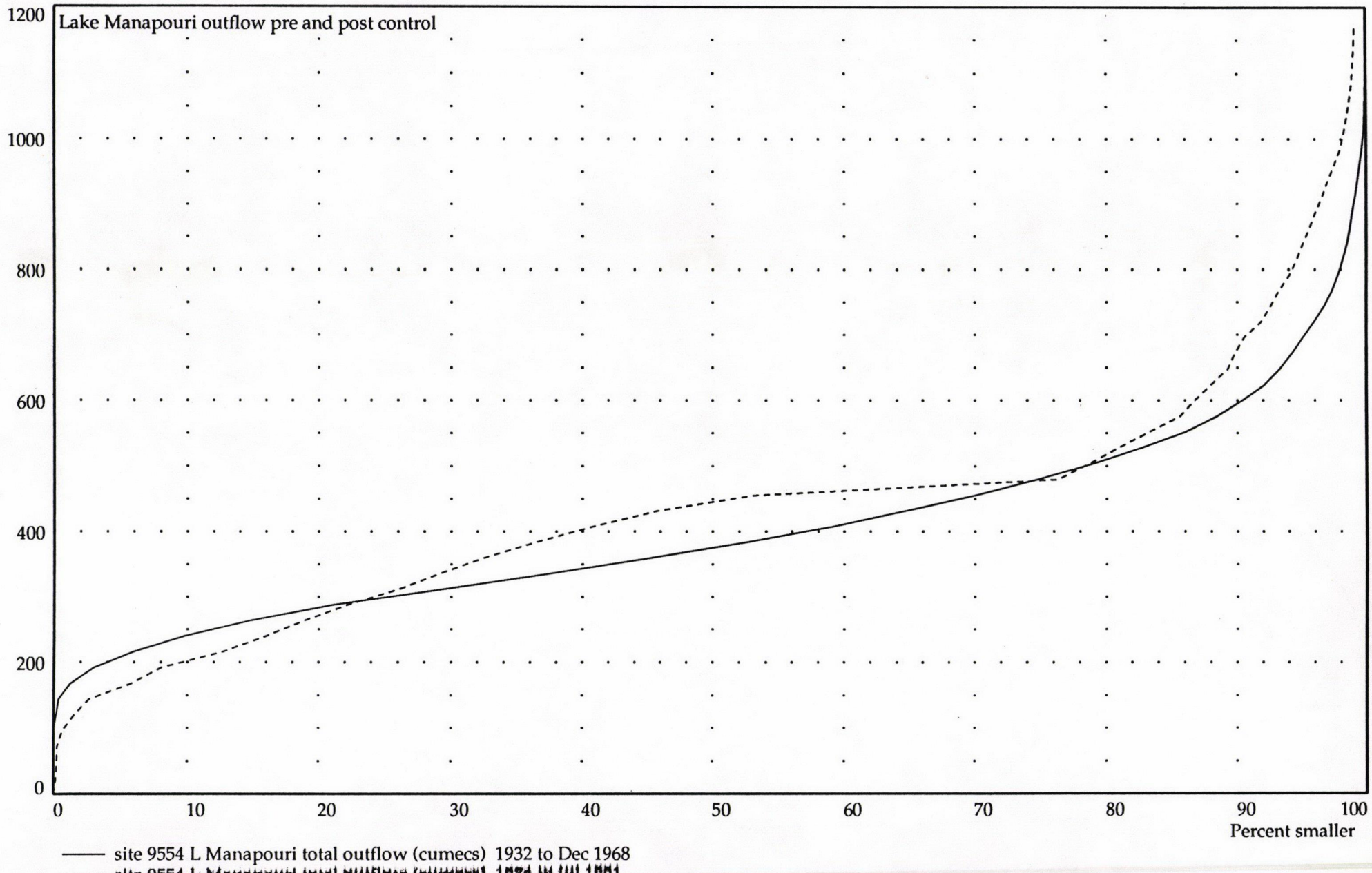

Lake Te Anau inflow pre and post control
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
80
90
100
Percent smaller
site 9570 Lake Te Anau Inflow (cumecs) 1926 to Dec 1972
site 9570 Lake Te Anau Inflow (cumecs) 1973 to Jul 1991

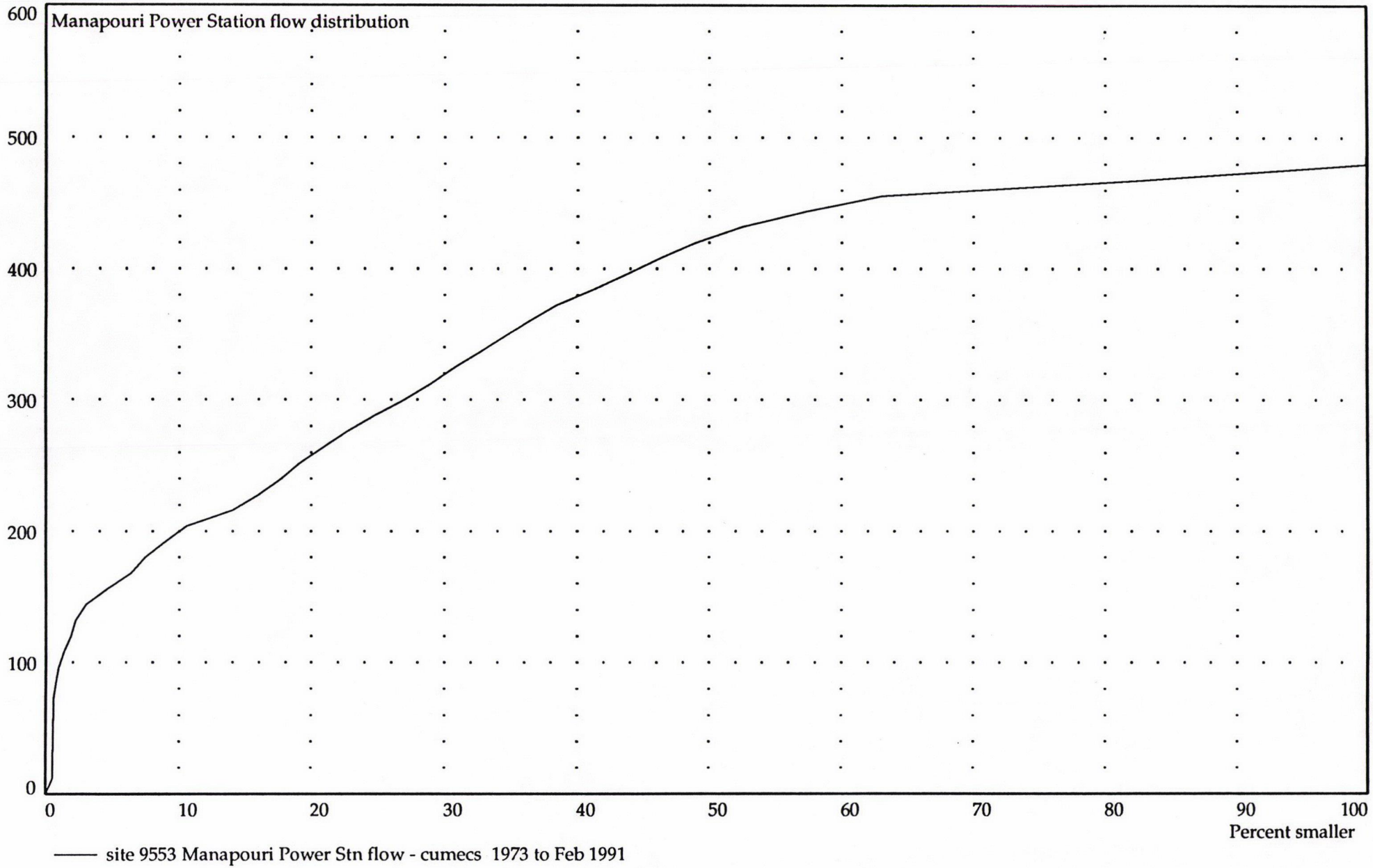

Lake Te Anau level pre and post control
206
205
204
203
202
201
200
0
10
20
30
40
50
60
70
80
90
100
Percent smaller
site 89575 Te Anau level (metres) 1926 to 1969
site 89575 Te Anau level (metres) 1973 to July 1991
Example interpretation: Pre-control level was less than 203m for about 93.5% of time cf. 80% of the time post-control (ie. post-control levels are higher)

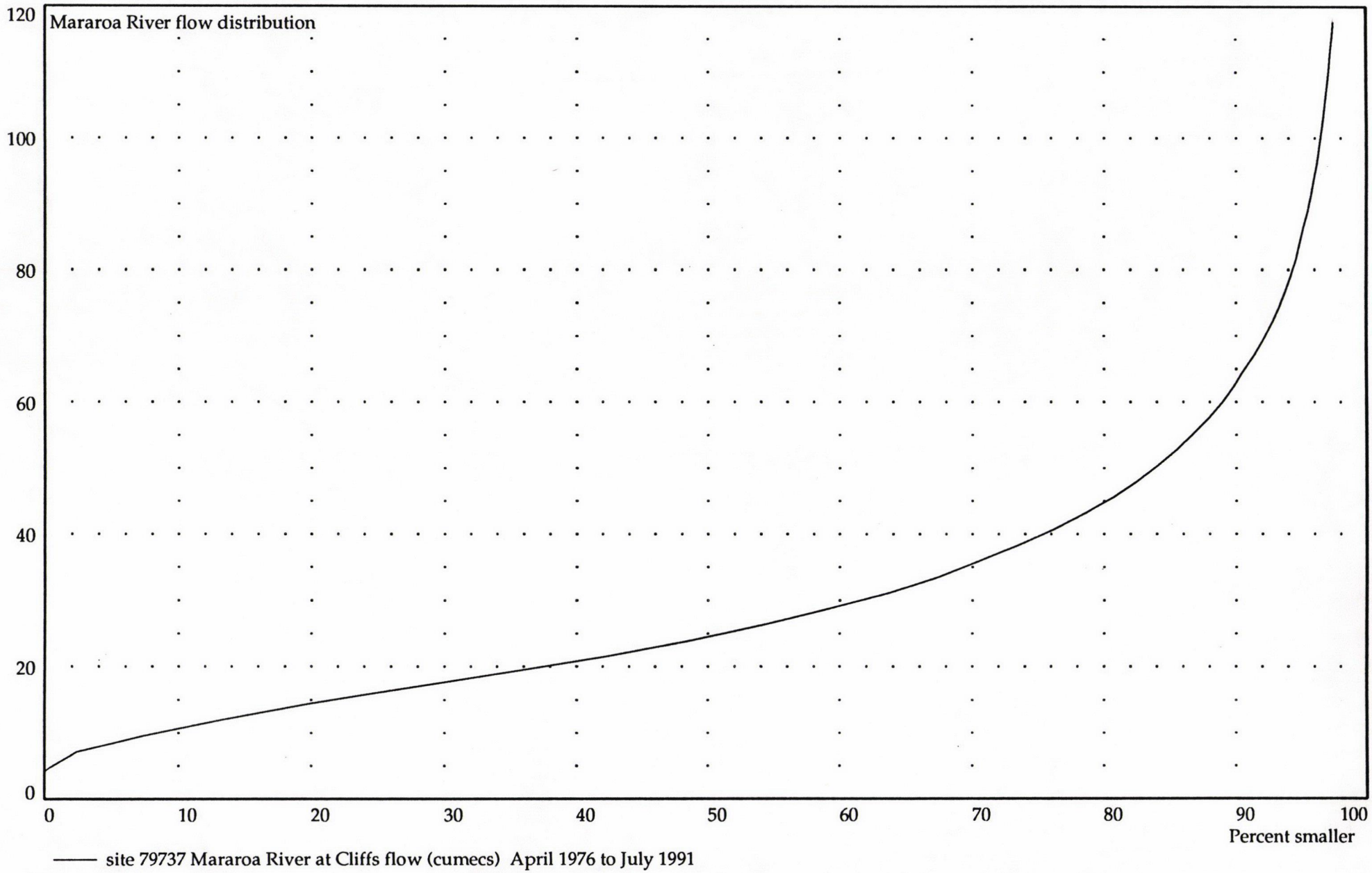

Lake Te Anau outflow pre and post control
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
80
90
100
Percent smaller
site 9574 Lake Te Anau Outflow (cumecs) 1926 to Dec 1969
site 9574 Lake Te Anau Outflow (cumecs) 1975 to Jul 1991

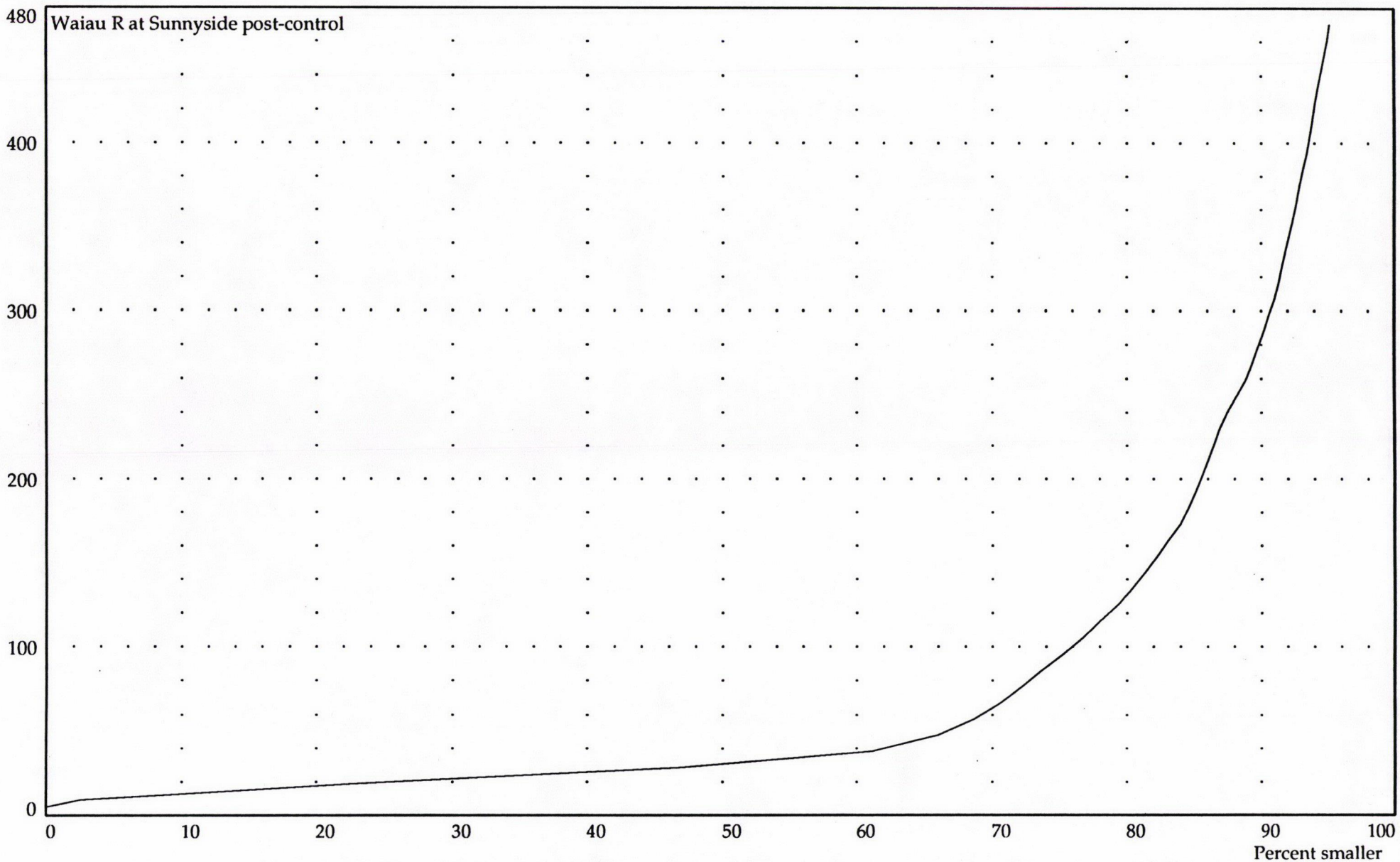

Lake Manapouri inflow pre and post control
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
80
90
100
Percent smaller
site 9550 Lake Manapouri inflow (cumecs) 1932 to Dec 1972
site 9550 Lake Manapouri inflow (cumecs) 1973 to Jul 1991


Lake Manapouri level pre and post control
181
180
179
178
177
176
175
0
10
20
30
40
50
60
70
80
90
100
Percent smaller
site 89555 Manapouri level (metres) 1926 to 1969
site 89555 Manapouri level (metres) 1973 to July 1991
Example interpretation: Pre-control level was less than 178m for about 72% of the time cf about 59% of the time post-control


Lake Manapouri outflow pre and post control
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
80
90
100
Percent smaller
site 9554 L Manapouri total outflow (cumecs) 1932 to Dec 1968
site 9554 L Manapouri total outflow (cumecs) 1974 to Jul 1991

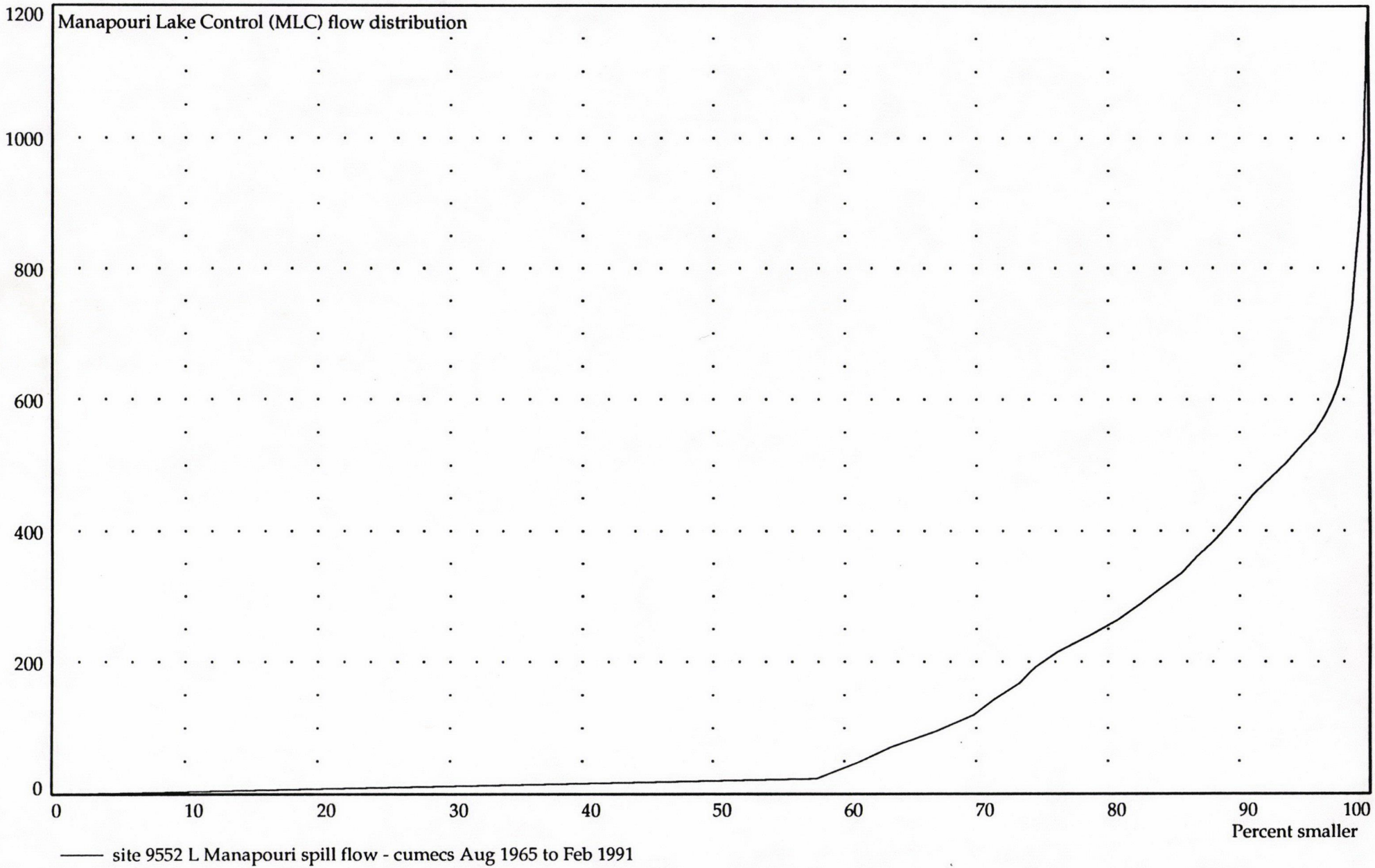

Manapouri Power Station flow distribution
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
80
90
100
Percent smaller
site 9553 Manapouri Power Stn flow - cumecs 1973 to Feb 1991

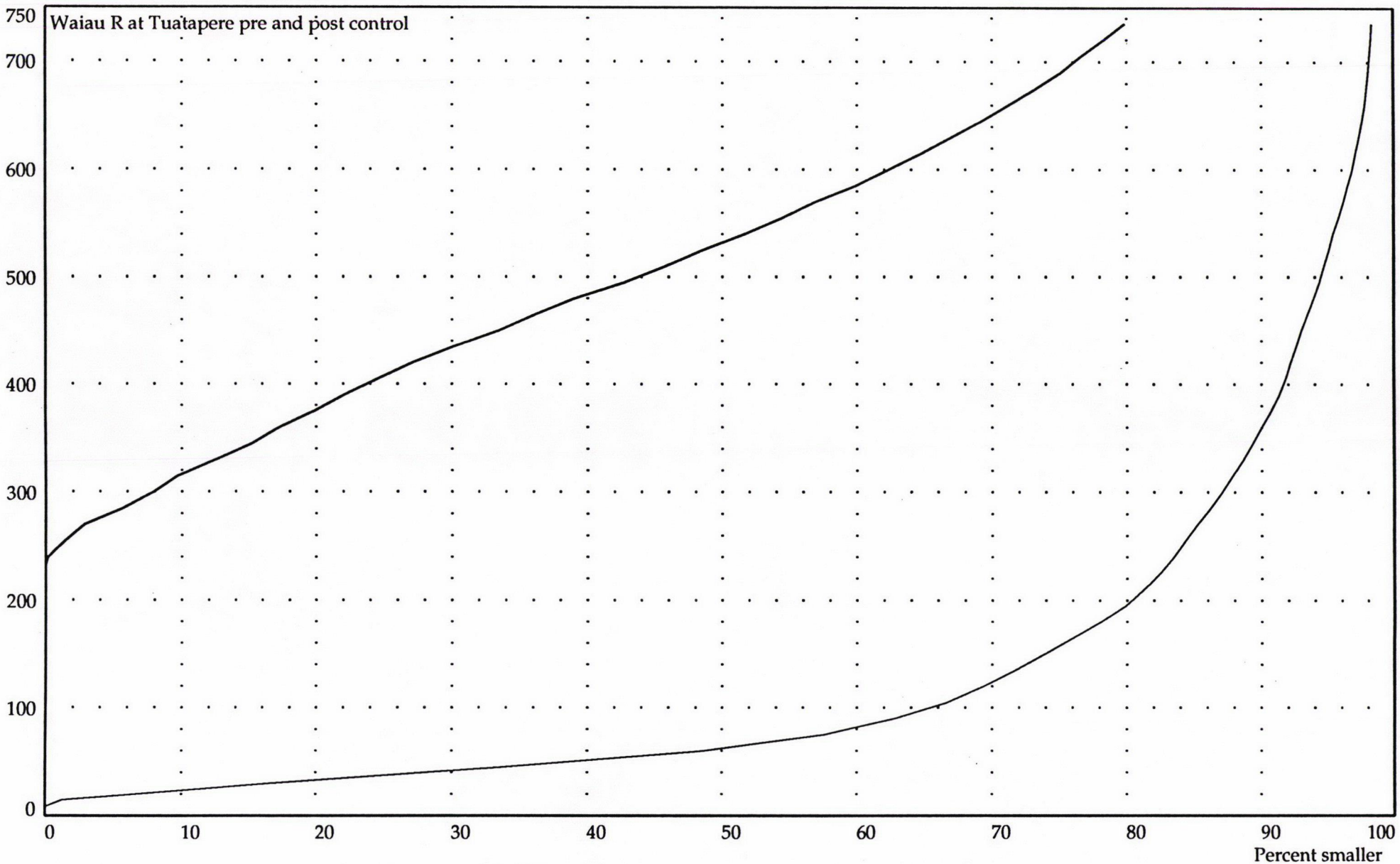

Mararoa River flow distribution
120
100
80
60
40
20
0
0
10
20
30
40
50
60
70
80
90
100
Percent smaller
site 79737 Mararoa River at Cliffs flow (cumecs) April 1976 to July 1991



—— site 79735 Waiau R at Sunnyside flow (cumecs) 1973 to 1991

Example interpretations: Median flow (50 percentile) is 30 cumecs; Flow is less than 100 cumecs for 76% of the time

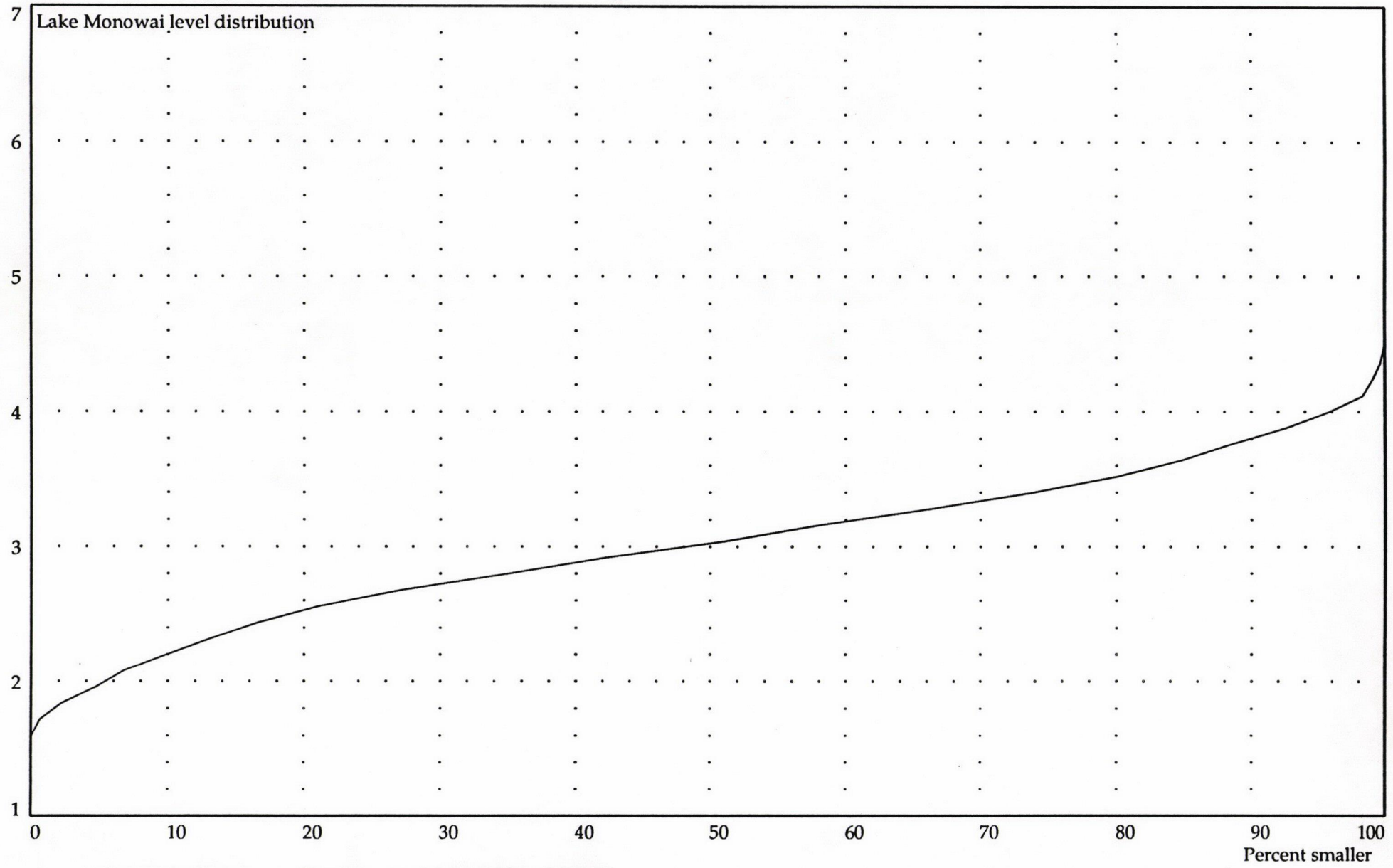

Manapouri Lake Control (MLC) flow distribution
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
80
90
100
Percent smaller
site 9552 L Manapouri spill flow - cumecs Aug 1965 to Feb 1991

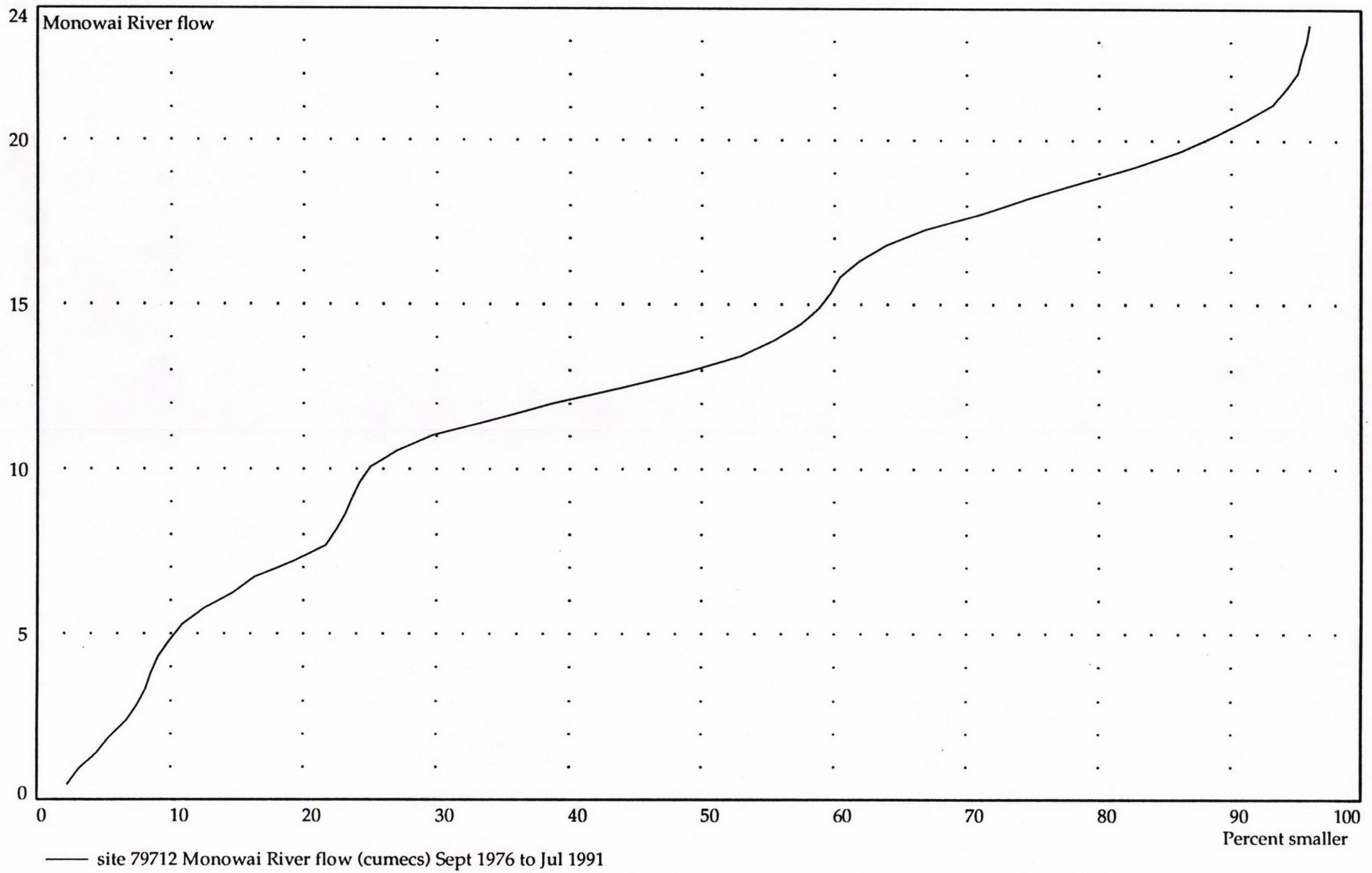


site 79701 Waiau R at Tuatapere flow (cumecs) 1973 to 1991

site 79701 Waiau R at Tuatapere flow (cumecs) Aug 1964 to 1969

Example interpretation: Pre-control the flow was less than 400m3/s for 23.5% of the time cf. 91.5% of the time post-control


Lake Monowai level distribution
7
6
5
4
3
2
1
0
10
20
30
40
50
60
70
80
90
100
Percent smaller
site 79713 Lake Monowai level (metres) May 1977 to Jul 1991


Monowai River flow
24
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Percent smaller
site 79712 Monowai River flow (cumecs) Sept 1976 to Jul 1991

5

TABLES

of

ANNUAL

MEAN, MINIMUM and MAXIMUM

FLOWS

and

LEVELS

Mean (or average) value for each year of record

Smallest value recorded in each year of record

Largest value recorded in each year of record

Section 5 - Tables of Annual Mean, Minimum and Maximum Flows and Levels

For each year of record the mean, minimum and maximum values are presented.
Dates are listed for the extreme values.

Minimum and maximum lake levels, inflows and outflows are presented in the form of daily mean values whereas the remainder are in terms of instantaneous values.

At the bottom of each table is the mean value for the complete period of record and the smallest and highest values for the complete period of record (ie. the smallest and greatest of the annual values).

Lake Te Anau
Annual Mean, Minimum and Maximum Daily Mean Inflows
(Units are cumecs)

Year	Mean	Minimum	Date	Maximum	Date
1926	293.71	24.739	14.10.26	1421.15	12.12.26
1927	262.60	34.835	24.08.27	1737.08	25.04.27
1928	287.94	35.401	02.08.28	2016.47	10.10.28
1929	233.51	14.415	02.11.29	1496.39	05.06.29
1930	208.71	14.832	06.03.30	1500.38	20.01.30
1931	286.69	12.453	12.02.31	1284.55	04.01.31
1932	229.21	5.060	18.03.32	2571.09	24.11.32
1933	328.37	5.202	23.06.33	2608.03	15.05.33
1934	275.12	5.554	25.02.34	2364.65	30.09.34
1935	241.49	5.157	15.02.35	1609.14	17.01.35
1936	315.63	5.710	31.07.36	2608.03	22.11.36
1937	227.64	5.497	23.06.37	1416.72	21.04.37
1938	249.41	5.179	01.02.38	1813.65	15.10.38
1939	267.41	5.123	05.03.39	2607.27	17.04.39
1940	301.59	6.331	20.03.40	3499.18	25.10.40
1941	252.00	5.000	04.08.41	2297.99	19.11.41
1942	325.36	5.757	03.06.42	3362.14	04.10.42
1943	245.63	5.194	19.08.43	1934.64	07.03.43
1944	267.90	5.803	12.03.44	2018.62	04.04.44
1945	311.89	12.438	19.05.45	2540.27	20.11.45
1946	301.07	5.128	09.03.46	3961.43	15.10.46
1947	216.27	5.285	13.04.47	2216.78	31.12.47
1948	283.95	6.268	22.01.48	3459.23	27.09.48
1949	288.85	5.051	02.01.49	1948.29	19.03.49
1950	238.07	6.745	23.01.50	2767.07	09.01.50
1951	212.36	5.145	03.07.51	2671.07	16.07.51
1952	258.49	5.366	04.08.52	3744.21	02.02.52
1953	238.05	5.000	07.01.53	2865.50	24.04.53
1954	263.53	5.083	10.05.54	2942.53	01.07.54
1955	260.06	5.018	30.05.55	2059.57	24.09.55
1956	238.57	5.000	04.03.56	2703.94	25.12.56
1957	329.91	6.045	30.07.57	3511.88	19.11.57
1958	355.77	5.989	26.11.58	3405.18	13.02.58
1959	235.62	5.000	31.03.59	2487.67	14.06.59
1960	213.92	5.014	29.09.60	2838.14	04.08.60
1961	250.17	5.411	26.01.61	1937.26	16.10.61
1962	242.25	5.000	24.04.62	1880.22	05.01.62
1963	234.32	5.000	09.10.63	1766.24	27.08.63
1964	294.61	5.000	25.05.64	1723.34	13.09.64
1965	272.29	5.573	18.01.65	2277.95	23.05.65
1966	229.60	5.134	03.09.66	1640.99	09.04.66
1967	337.42	5.436	13.06.67	3714.82	26.04.67
1968	315.70	7.797	20.06.68	2381.26	05.03.68
1969	277.47	5.720	10.06.69	2551.88	24.12.69
1970	311.67	10.065	14.05.70	2268.45	28.08.70
1971	235.88	6.338	05.02.71	2202.45	11.09.71
1972	310.74	6.742	11.06.72	2219.91	08.09.72
1973	261.89	6.004	27.02.73	1490.99	15.04.73
1974	177.64	5.997	16.06.74	1944.04	15.03.74
1975	333.77	5.000	02.09.75	2826.07	07.04.75
1976	188.12	5.000	04.03.76	2018.67	05.12.76
1977	258.50	6.235	11.09.77	2009.37	29.10.77

1978	279.34	6.531	20.02.78	4839.35	31.05.78
1979	311.25	19.569	25.02.79	4437.76	02.12.79
1980	320.28	17.486	18.04.80	2486.97	27.01.80
1981	239.44	12.546	02.02.81	2342.12	04.10.81
1982	341.40	12.133	23.03.82	3254.43	11.03.82
1983	347.60	21.320	25.02.83	3500.87	11.01.83
1984	329.68	18.663	22.03.84	4658.52	27.01.84
1985	240.34	6.346	22.02.85	1562.24	11.01.85
1986	276.43	23.580	02.04.86	2385.81	01.01.86
1987	314.37	37.888	14.05.87	2745.04	30.03.87
1988	383.57	5.779	22.04.88	3489.39	12.12.88
1989	234.58	5.320	08.03.89	1919.82	15.12.89
1990	286.68	14.922	26.01.90	2049.24	14.12.90
1991	259.83	15.696	21.03.91	1968.54	06.01.91
OVERALL MINIMUM IS		5.00	AT	04.08.41	
OVERALL MAXIMUM IS		4839.35	AT	31.05.78	
OVERALL MEAN IS		273.39			

Lake Te Anau
Annual Mean, Minimum and Maximum Daily Mean lake levels
(Units are metres above mean sea level)

Year	Mean	Minimum	Date	Maximum	Date
1926	202.232	201.544	23.07.26	203.494	14.12.26
1927	202.109	201.137	06.09.27	203.569	27.04.27
1928	202.175	201.263	23.03.28	204.781	13.10.28
1929	201.901	201.056	03.06.29	202.791	24.01.29
1930	201.800	201.014	22.08.30	202.670	24.01.30
1931	202.235	201.343	21.05.31	203.527	25.01.31
1932	201.913	201.074	15.08.32	202.922	29.11.32
1933	202.401	201.461	30.07.33	204.134	18.05.33
1934	202.181	201.308	04.03.34	203.311	08.10.34
1935	201.969	201.260	29.09.35	203.601	27.01.35
1936	202.304	201.475	16.01.36	203.951	11.10.36
1937	201.940	201.299	08.07.37	202.798	23.04.37
1938	201.970	201.241	07.08.38	203.204	16.10.38
1939	202.095	201.301	14.04.39	202.930	20.02.39
1940	202.307	201.238	19.08.40	204.027	01.03.40
1941	202.031	201.216	02.09.41	203.463	21.11.41
1942	202.407	201.536	23.02.42	203.738	06.10.42
1943	202.010	201.170	28.08.43	202.973	26.04.43
1944	202.089	201.497	16.01.44	202.884	27.11.44
1945	202.328	201.251	01.08.45	203.707	27.03.45
1946	202.222	201.106	11.07.46	204.027	18.10.46
1947	201.878	201.089	02.05.47	202.885	01.01.47
1948	202.164	201.360	23.05.48	204.210	10.11.48
1949	202.244	201.301	05.07.49	203.524	12.04.49
1950	201.982	201.375	24.05.50	203.464	14.01.50
1951	201.810	201.140	09.03.51	202.999	10.11.51
1952	202.084	201.116	15.09.52	203.738	03.02.52
1953	201.879	200.865	24.02.53	203.113	29.04.53
1954	202.131	201.246	30.05.54	203.174	03.07.54
1955	202.078	201.338	09.08.55	202.884	26.09.55
1956	201.871	201.077	07.03.56	203.090	31.12.56
1957	202.378	201.353	20.09.57	204.210	26.11.57
1958	202.619	201.277	25.09.58	204.134	07.06.58
1959	201.943	201.321	12.04.59	202.854	18.11.59
1960	201.834	201.284	12.05.60	203.090	06.08.60
1961	201.986	201.238	09.02.61	203.003	18.11.61
1962	202.013	201.287	28.04.62	202.746	15.09.62
1963	201.917	201.208	28.07.63	202.795	21.11.63
1964	202.216	201.457	10.03.64	203.402	08.12.64
1965	202.138	201.292	02.09.65	203.264	17.11.65
1966	201.929	201.170	15.09.66	202.868	03.01.66
1967	202.409	201.327	24.07.67	204.359	27.04.67
1968	202.372	201.269	14.07.68	203.732	30.10.68
1969	202.136	201.356	13.06.69	203.906	13.09.69
1970	202.341	201.223	14.06.70	203.978	20.09.70
1971	201.911	201.102	15.03.71	203.344	05.10.71
1972	202.353	201.418	03.03.72	203.749	28.09.72
1973	202.091	201.340	28.08.73	203.166	30.04.73
1974	201.649	200.990	20.06.74	202.732	26.07.74
1975	202.875	201.645	13.07.75	204.784	08.04.75
1976	201.838	200.961	30.09.76	203.483	10.06.76

1977	202.347	200.874	12.09.77	203.644	03.02.77
1978	202.228	201.261	02.08.78	203.984	01.06.78
1979	202.639	201.362	30.08.79	204.008	28.01.79
1980	202.483	201.242	04.08.80	203.537	27.08.80
1981	202.361	201.005	02.09.81	203.421	24.10.81
1982	202.437	201.182	30.07.82	204.243	28.11.82
1983	202.866	201.683	09.03.83	204.656	16.01.83
1984	202.559	201.547	29.07.84	204.112	22.12.84
1985	202.197	201.286	29.03.85	204.118	13.01.85
1986	202.362	201.173	26.09.86	203.471	01.05.86
1987	202.569	201.454	24.05.87	203.589	01.04.87
1988	202.556	201.379	06.06.88	205.103	04.11.88
1989	201.957	201.145	01.10.89	203.015	31.03.89
1990	202.206	201.050	02.10.90	203.715	16.12.90
1991	202.242	200.980	16.07.91	203.875	08.01.91

OVERALL MINIMUM IS	200.865	AT	24.02.53
OVERALL MAXIMUM IS	205.103	AT	04.11.88
OVERALL MEAN IS	202.176		

Lake Te Anau
Annual Mean, Minimum and Maximum Daily Mean Outflows
(Units are cumecs)

Year	Mean	Minimum	Date	Maximum	Date
1926	292.01	164.056	23.07.26	557.121	13.12.26
1927	269.85	97.380	05.09.27	571.313	27.04.27
1928	286.37	118.998	22.03.28	896.680	13.10.28
1929	228.48	84.337	02.06.29	396.207	24.01.29
1930	210.37	77.842	21.08.30	371.975	23.01.30
1931	285.79	130.397	21.05.31	563.917	25.01.31
1932	231.79	86.757	15.08.32	433.460	29.11.32
1933	326.20	150.170	29.07.33	725.494	17.05.33
1934	281.02	124.777	03.03.34	520.025	08.10.34
1935	241.79	116.893	28.09.35	587.005	28.01.35
1936	308.98	150.312	16.01.36	673.069	11.10.36
1937	235.58	123.753	06.07.37	399.732	22.04.37
1938	242.22	113.830	06.08.38	492.023	16.10.38
1939	264.12	122.633	14.04.39	430.879	20.02.39
1940	308.22	113.347	18.08.40	696.158	29.02.40
1941	252.94	108.766	02.09.41	550.040	21.11.41
1942	324.23	161.793	23.02.42	623.316	05.10.42
1943	248.51	101.323	28.08.43	437.533	26.04.43
1944	262.47	156.197	15.01.44	418.379	27.11.44
1945	312.61	113.439	01.08.45	610.244	27.03.45
1946	294.15	91.507	11.07.46	690.474	17.10.46
1947	224.66	89.871	01.05.47	412.879	01.01.47
1948	282.25	134.208	21.05.48	741.643	09.11.48
1949	293.28	123.997	01.07.49	564.156	11.04.49
1950	243.32	135.856	23.05.50	555.712	13.01.50
1951	213.81	96.493	09.03.51	443.717	10.11.51
1952	264.04	93.633	14.09.52	624.739	03.02.52
1953	227.60	54.195	24.02.53	469.125	28.04.53
1954	270.77	113.510	30.05.54	481.468	02.07.54
1955	260.38	129.613	08.08.55	418.379	26.09.55
1956	223.47	87.156	07.03.56	467.607	31.12.56
1957	323.85	131.966	20.09.57	745.188	25.11.57
1958	374.44	119.468	25.09.58	721.906	07.06.58
1959	236.61	127.347	12.04.59	411.679	17.11.59
1960	215.84	120.926	11.05.60	467.607	06.08.60
1961	244.91	113.667	08.02.61	445.168	17.11.61
1962	248.45	124.227	28.04.62	389.194	14.09.62
1963	230.86	109.019	26.07.63	399.366	20.11.63
1964	288.14	150.092	09.03.64	535.398	08.12.64
1965	272.83	122.449	31.08.65	501.107	16.11.65
1966	234.27	102.631	15.09.66	413.594	03.01.66
1967	329.48	128.980	24.07.67	782.375	27.04.67
1968	320.39	119.408	15.07.68	615.462	30.10.68
1969	273.66	133.823	13.06.69	659.897	13.09.69
1970	315.59	111.817	14.06.70	678.589	20.09.70
1971	234.29	92.354	15.03.71	519.830	06.10.71
1972	316.49	143.441	03.03.72	619.258	28.09.72
1973	266.85	130.491	28.08.73	478.874	30.04.73
1974	180.75	83.153	15.06.74	295.682	09.08.74
1975	325.07	103.341	04.03.75	1002.815	08.04.75
1976	189.96	1.500	07.03.76	604.182	11.06.76

1977	259.59	69.928	12.09.77	678.341	03.02.77
1978	279.99	111.506	15.10.78	749.551	02.06.78
1979	300.38	110.933	07.02.79	734.809	29.01.79
1980	324.57	108.631	18.05.80	655.327	27.08.80
1981	247.83	86.951	05.09.81	550.022	25.10.81
1982	339.67	106.613	24.08.82	837.533	28.11.82
1983	350.79	104.301	14.02.83	946.469	16.01.83
1984	324.46	106.803	02.05.84	795.402	22.12.84
1985	248.20	101.964	21.08.85	796.089	13.01.85
1986	273.15	103.787	16.03.86	567.058	01.05.86
1987	320.99	101.740	02.02.87	666.415	01.04.87
1988	375.00	100.633	22.05.88	1081.325	04.11.88
1989	231.09	104.627	25.01.89	484.303	14.11.89
1990	281.03	116.540	19.11.90	694.512	16.12.90
1991	305.41	96.212	16.07.91	741.116	08.01.91

OVERALL MINIMUM IS	1.500	AT	07.03.76
OVERALL MAXIMUM IS	1081.325	AT	04.11.88
OVERALL MEAN IS	273.870		

Lake Manapouri
Annual Mean, Minimum and Maximum Daily Mean Inflows
(Units are cumecs)

Year	Mean	Minimum	Date	Maximum	Date
1932	308.61	97.722	27.07.32	1200.28	24.11.32
1933	469.39	118.246	13.07.33	2107.52	16.05.33
1934	400.34	104.247	05.03.34	1387.44	01.10.34
1935	354.52	9.163	15.12.35	1265.10	26.01.35
1936	459.92	160.318	05.08.36	1704.97	09.10.36
1937	360.32	188.381	09.07.37	1049.06	22.04.37
1938	351.98	104.492	26.07.38	1429.70	15.10.38
1939	394.55	8.147	16.10.39	1082.12	08.12.39
1940	456.01	141.204	30.07.40	1194.23	23.02.40
1941	378.16	49.565	25.07.41	1238.25	22.11.41
1942	479.71	163.657	23.02.42	2275.10	06.10.42
1943	366.14	127.193	27.08.43	1173.47	06.03.43
1944	390.16	173.459	29.01.44	1210.95	04.04.44
1945	468.15	148.684	02.08.45	1630.45	01.05.45
1946	440.92	33.504	04.07.46	2082.17	17.10.46
1947	332.59	102.451	25.04.47	1378.83	22.10.47
1948	426.78	12.078	09.05.48	1995.43	15.12.48
1949	429.47	104.035	05.10.49	1143.73	22.03.49
1950	356.11	140.630	22.05.50	1578.89	07.01.50
1951	336.29	108.064	06.03.51	1187.33	17.07.51
1952	401.15	119.971	18.08.52	1659.23	01.02.52
1953	352.17	57.618	23.02.53	1226.19	25.04.53
1954	412.35	141.459	26.05.54	1312.09	30.06.54
1955	394.45	169.397	20.08.55	1247.24	13.06.55
1956	341.97	51.147	26.02.56	1102.18	25.12.56
1957	506.92	77.600	08.08.57	2278.74	19.11.57
1958	547.54	164.461	19.09.58	1669.18	23.05.58
1959	366.41	8.111	28.12.59	1297.08	16.09.59
1960	333.34	124.939	07.05.60	1702.78	04.08.60
1961	387.09	5.000	26.02.61	982.21	26.11.61
1962	414.21	241.301	28.04.62	973.39	13.09.62
1963	367.73	147.202	20.07.63	1244.49	14.11.63
1964	445.07	189.331	06.03.64	1380.98	21.01.64
1965	398.61	140.910	25.08.65	1566.73	23.05.65
1966	332.77	134.257	15.09.66	1134.93	09.04.66
1967	466.71	97.503	04.07.67	2050.67	25.04.67
1968	463.63	124.716	14.07.68	1474.15	22.10.68
1969	424.20	148.057	23.02.69	1388.71	11.09.69
1970	474.70	143.491	12.06.70	1604.33	10.09.70
1971	329.65	93.388	22.07.71	1155.94	28.10.71
1972	469.86	59.382	14.06.72	1474.79	25.09.72
1973	389.11	135.646	10.04.73	1048.21	15.04.73
1974	260.59	86.311	17.06.74	813.65	08.02.74
1975	477.81	90.226	02.02.75	2120.65	07.04.75
1976	293.08	104.311	25.09.76	1033.31	03.06.76
1977	393.49	84.499	09.09.77	1518.67	02.02.77
1978	409.02	128.036	21.03.78	2193.35	31.05.78
1979	460.96	149.770	18.03.79	1802.32	02.12.79
1980	497.64	137.178	12.05.80	1591.36	27.01.80
1981	384.23	111.904	02.09.81	1430.66	04.10.81

1982	536.27	149.593	10.07.82	1729.52	01.02.82
1983	532.38	178.451	14.02.83	1944.67	11.01.83
1984	504.36	160.606	21.03.84	3251.85	27.01.84
1985	373.38	137.894	15.12.85	1306.13	23.01.85
1986	434.91	147.969	16.12.86	1299.77	03.10.86
1987	497.03	132.147	16.12.87	1221.15	06.10.87
1988	609.83	207.424	01.01.88	2309.80	03.11.88
1989	343.57	128.634	19.02.89	1162.67	15.12.89
1990	432.14	156.999	07.11.90	1363.00	15.12.90
1991		379.353	04.01.91	1230.77	07.01.91

OVERALL MINIMUM IS 5.00 AT 26.02.61
OVERALL MAXIMUM IS 3251.85 AT 27.01.84
OVERALL MEAN IS 414.75

Lake Manapouri
Annual Mean, Minimum and Maximum Daily Mean lake levels
(Units are metres above mean sea level)

Year	Mean	Minimum	Date	Maximum	Date
1926	177.798	177.208	04.04.26	178.902	01.12.26
1927	177.392	177.107	31.07.27	178.138	01.01.27
1928	177.367	177.225	01.01.28	177.507	31.12.28
1929	177.602	177.473	13.11.29	178.171	31.12.29
1930	missing record				
1931	missing record				
1932	177.141	176.053	14.08.32	178.439	29.11.32
1933	177.940	176.674	30.07.33	180.408	19.05.33
1934	177.658	176.370	05.03.34	179.281	08.10.34
1935	177.411	176.497	29.09.35	179.326	27.01.35
1936	177.871	176.789	16.01.36	180.073	11.10.36
1937	177.475	176.655	09.07.37	178.557	24.04.37
1938	177.371	176.385	08.08.38	179.098	16.10.38
1939	177.632	176.446	15.04.39	178.732	09.12.39
1940	177.899	176.316	22.08.40	179.921	01.03.40
1941	177.544	176.430	01.09.41	179.159	23.11.41
1942	178.040	176.855	23.02.42	179.509	07.10.42
1943	177.499	176.324	27.08.43	178.747	16.05.43
1944	177.603	176.796	17.01.44	178.680	28.11.44
1945	177.935	176.412	07.07.45	179.662	27.03.45
1946	177.760	176.129	13.06.46	180.088	18.10.46
1947	177.297	176.047	25.04.47	178.732	01.01.47
1948	177.724	176.598	26.05.48	180.134	11.11.48
1949	177.808	176.469	04.07.49	179.326	14.04.49
1950	177.438	176.369	25.05.50	179.052	12.01.50
1951	177.278	176.103	14.04.51	178.701	12.11.51
1952	177.650	176.149	14.09.52	179.341	04.02.52
1953	177.312	175.671	24.02.53	178.793	29.04.53
1954	177.746	176.487	30.05.54	178.982	03.07.54
1955	177.645	176.586	22.08.55	178.654	18.06.55
1956	177.307	176.086	07.03.56	178.844	31.12.56
1957	178.090	176.650	25.09.57	180.292	25.11.57
1958	178.299	176.505	25.09.58	180.247	08.06.58
1959	177.473	176.467	15.04.59	178.654	18.11.59
1960	177.318	176.406	12.05.60	178.905	06.08.60
1961	177.568	176.388	07.03.61	178.977	18.11.61
1962	177.771	177.130	05.05.62	178.647	15.09.62
1963	177.495	176.472	28.07.63	178.826	20.11.63
1964	177.868	176.802	10.03.64	179.469	08.12.64
1965	177.736	176.474	29.08.65	179.066	18.11.65
1966	177.395	176.269	16.09.66	178.585	03.01.66
1967	178.002	176.540	25.07.67	180.046	15.12.67
1968	178.038	176.514	14.07.68	179.788	30.10.68
1969	177.623	176.570	07.12.69	179.605	14.09.69
1970	177.696	175.973	14.06.70	179.912	20.09.70
1971	176.999	175.805	23.03.71	178.721	02.11.71
1972	177.049	175.067	24.08.72	179.020	26.09.72
1973	177.048	175.670	12.04.73	178.775	09.05.73
1974	176.763	176.054	06.02.74	177.538	22.04.74
1975	177.731	176.745	01.07.75	180.700	11.04.75
1976	177.029	176.079	07.10.76	178.609	13.06.76

1977	177.738	175.832	12.09.77	179.349	04.02.77
1978	177.695	176.633	22.03.78	179.359	03.06.78
1979	178.113	176.330	10.09.79	179.810	18.01.79
1980	178.136	176.742	18.05.80	179.688	05.02.80
1981	177.912	176.930	04.09.81	178.998	05.10.81
1982	178.164	176.515	25.10.82	180.468	28.11.82
1983	178.484	177.746	27.02.83	180.718	22.01.83
1984	178.273	177.603	24.04.84	180.444	28.01.84
1985	177.731	176.201	03.12.85	179.872	25.01.85
1986	177.776	175.870	17.12.86	179.126	05.05.86
1987	178.262	176.840	24.12.87	179.659	10.10.87
1988	178.072	175.890	02.06.88	181.518	04.11.88
1989	177.105	175.810	06.10.89	178.443	28.12.89
1990	177.395	175.958	02.10.90	179.084	24.05.90
1991	177.840	176.047	13.07.91	179.385	09.01.91

OVERALL MINIMUM IS	175.067	AT	24.08.72
OVERALL MAXIMUM IS	181.518	AT	04.11.88
OVERALL MEAN IS	177.655		

Lake Manapouri
Annual Mean, Minimum and Maximum Daily Mean Total Outflow
(Power Station discharge plus Mararoa Weir spill)
(Units are cumecs)

Year	Mean	Minimum	Date	Maximum	Date
1932	306.60	141.783	14.08.32	567.451	29.11.32
1933	467.89	225.080	30.07.33	1159.970	18.05.33
1934	403.84	179.990	05.03.34	797.812	08.10.34
1935	353.56	199.712	29.09.35	802.713	26.01.35
1936	455.99	240.269	16.01.36	1040.014	11.10.36
1937	364.42	220.767	09.07.37	595.314	23.04.37
1938	348.90	182.954	08.08.38	731.841	16.10.38
1939	393.53	190.944	15.04.39	641.366	08.12.39
1940	458.43	174.965	22.08.40	990.494	29.02.40
1941	378.29	190.752	01.09.41	751.072	22.11.41
1942	478.69	248.449	23.02.42	852.645	07.10.42
1943	368.71	175.085	27.08.43	648.322	15.05.43
1944	387.11	243.289	17.01.44	629.571	28.11.44
1945	468.06	186.941	07.07.45	903.009	26.03.45
1946	437.74	151.217	12.06.46	1032.092	18.10.46
1947	336.42	141.062	25.04.47	638.695	01.01.47
1948	422.76	212.109	25.05.48	1045.891	10.11.48
1949	432.27	195.917	04.07.49	799.424	14.04.49
1950	357.84	182.765	25.05.50	722.682	12.01.50
1951	336.67	149.286	14.04.51	633.606	12.11.51
1952	404.62	154.809	15.09.52	806.962	03.02.52
1953	346.11	99.486	20.02.53	654.673	28.04.53
1954	416.32	196.969	30.05.54	706.913	02.07.54
1955	394.32	210.685	22.08.55	622.236	17.06.55
1956	335.02	147.312	07.03.56	666.259	31.12.56
1957	503.62	221.517	25.09.57	1103.717	25.11.57
1958	556.84	199.744	25.09.58	1087.494	07.06.58
1959	366.67	193.848	15.04.59	619.386	17.11.59
1960	333.41	187.571	12.05.60	683.323	06.08.60
1961	384.83	185.158	08.03.61	700.520	18.11.61
1962	416.68	294.983	05.05.62	619.383	14.09.62
1963	366.17	196.595	28.07.63	663.548	19.11.63
1964	442.96	244.177	10.03.64	811.247	08.12.64
1965	398.63	183.444	29.08.65	698.910	18.11.65
1966	335.25	158.100	16.09.66	575.433	03.01.66
1967	462.23	192.593	25.07.67	986.084	15.12.67
1968	465.96	188.595	14.07.68	905.471	30.10.68
1969	423.53	207.576	13.06.69	1137.171	13.09.69
1970	475.55	108.157	01.06.70	1168.863	21.09.70
1971	332.59	80.681	07.06.71	714.687	02.11.71
1972	469.53	141.375	14.03.72	1055.767	28.09.72
1973	393.09	155.127	18.03.73	746.498	11.05.73
1974	258.63	77.291	18.06.74	447.603	24.07.74
1975	474.85	150.398	12.01.75	1324.538	09.04.75
1976	293.58	135.305	05.11.76	703.477	13.06.76
1977	392.11	76.478	13.09.77	976.411	03.02.77
1978	409.08	191.767	20.02.78	1025.753	01.06.78
1979	455.54	77.001	12.01.79	996.868	19.01.79
1980	500.38	138.195	27.07.80	962.385	02.10.80
1981	384.00	129.391	04.02.81	791.673	05.10.81

1982	531.72	131.506	01.08.82	1264.662	28.11.82
1983	536.87	215.043	17.07.83	1370.939	17.01.83
1984	500.96	109.912	21.07.84	1300.688	28.01.84
1985	381.91	.161	09.12.85	1049.995	24.01.85
1986	432.66	157.463	15.12.86	834.632	05.05.86
1987	498.50	135.518	18.12.87	1034.249	09.10.87
1988	605.50	201.571	24.06.88	1928.244	04.11.88
1989	343.05	43.223	06.08.89	603.290	01.01.89
1990	429.48	100.841	10.11.90	866.599	24.05.90
1991	472.58	123.765	13.07.91	952.867	09.01.91

OVERALL MINIMUM IS	161.875	AT	09.12.85
OVERALL MAXIMUM IS	1928.244	AT	04.11.88
OVERALL MEAN IS	414.671		

Manapouri Power Station
Annual Mean, Minimum and Maximum Daily Mean Flows
(Units are cumecs)

Year	Mean	Minimum	Date	Maximum	Date
1969	67.41	.000	08.09.69	133.341	20.11.69
1970	85.89	.000	01.01.70	203.730	15.05.70
1971	183.35	.000	01.01.71	322.842	24.09.71
1972	296.02	122.112	06.01.72	395.430	10.11.72
1973	327.59	151.748	18.03.73	474.963	22.12.73
1974	258.51	76.862	18.06.74	447.253	24.07.74
1975	369.28	150.334	12.01.75	461.735	09.04.75
1976	285.19	133.977	05.11.76	486.127	18.06.76
1977	368.06	75.793	12.09.77	508.691	01.02.77
1978	389.30	180.985	11.08.78	482.852	26.05.78
1979	384.98	.000	13.01.79	471.933	06.05.79
1980	374.09	137.941	27.07.80	467.689	01.10.80
1981	366.76	129.100	04.02.81	470.094	10.12.81
1982	411.42	.000	09.03.82	472.228	05.02.82
1983	438.44	203.447	13.03.83	472.490	11.08.83
1984	419.51	109.094	21.07.84	471.863	01.06.84
1985	329.92	.000	04.12.85	469.964	23.01.85
1986	400.18	157.249	15.12.86	471.281	15.06.86
1987	411.76	135.312	18.12.87	471.367	19.04.87
1988	422.38	184.576	09.06.88	473.637	05.11.88
1989	330.61	43.171	06.08.89	472.535	29.11.89
1990	388.69	100.836	10.11.90	473.595	18.12.90
1991		311.813	03.02.91	474.009	12.01.91

OVERALL MINIMUM IS 0.000 AT 08.09.69
OVERALL MAXIMUM IS 508.691 AT 01.02.77
OVERALL MEAN IS 341.479

Manapouri Lake Control (Mararoa Weir)
Annual Mean, Minimum and Maximum Instantaneous Outflows
(Units are cumecs)

Year	Mean	Minimum	Date	Maximum	Date
1965	504.32	210.334	29.08.65	842.971	17.11.65
1966	357.13	197.514	11.09.66	674.025	02.01.66
1967	missing record				
1968	missing record				
1969	519.20	215.735	20.12.69	1157.526	13.09.69
1970	389.66	83.702	14.06.70	1139.359	19.09.70
1971	149.25	.413	30.07.71	490.939	02.11.71
1972	173.51	.132	23.08.72	670.483	28.09.72
1973	65.50	.001	05.04.73	305.583	10.05.73
1974	.12	.001	21.01.74	3.167	25.07.74
1975	105.57	.000	15.03.75	893.930	07.04.75
1976	8.40	.001	08.01.76	249.279	13.06.76
1977	24.05	.001	07.01.77	545.906	06.11.77
1978	19.77	.001	30.03.78	654.662	31.05.78
1979	70.56	.001	22.03.79	568.318	18.01.79
1980	126.29	.108	18.05.80	635.673	26.08.80
1981	17.24	.001	22.04.81	399.294	04.10.81
1982	120.31	.180	19.05.82	830.521	28.11.82
1983	98.43	.001	21.03.83	1081.817	13.01.83
1984	81.44	.001	27.02.84	1146.379	27.01.84
1985	51.99	.001	02.01.85	585.260	25.01.85
1986	32.47	.001	16.01.86	373.775	04.05.86
1987	86.79	.060	10.07.87	1052.794	02.07.87
1988	183.12	.034	12.05.88	1470.339	04.11.88
1989	12.44	.001	28.06.89	306.765	29.03.89
1990	40.80	.002	27.09.90	402.004	24.05.90
1991		.014	25.01.91	486.683	08.01.91

OVERALL MINIMUM IS 0.000 AT 15.03.75
OVERALL MAXIMUM IS 1470.339 AT 04.11.88
OVERALL MEAN IS 120.660

Mararoa River at Cliffs
Annual Mean, Minimum and Maximum Instantaneous Flows
(Units are cumecs)

Year	Mean	Minimum	Date	Maximum	Date
1976	29.9	4.203	26.04.76	176.846	03.06.76
1977	26.1	6.959	27.08.77	500.941	30.10.77
1978	30.7	4.203	17.03.78	906.009	31.05.78
1979	36.7	9.960	11.04.79	476.722	27.01.79
1980	41.9	10.668	17.05.80	983.282	26.08.80
1981	25.0	5.472	30.11.81	258.254	26.04.81
1982	41.7	7.557	07.05.82	611.782	22.05.82
1983	44.8	5.514	08.03.83	740.618	13.01.83
1984	37.1	11.072	29.02.84	826.179	27.01.84
1985	24.7	6.257	17.04.85	227.513	23.01.85
1986	30.1	8.821	19.02.86	304.424	13.06.86
1987	43.4	9.614	18.12.87	712.260	13.06.87
1988	40.2	7.639	11.02.88	440.184	13.09.88
1989	23.3	7.393	19.02.89	290.978	29.03.89
1990	33.6	5.108	06.03.90	199.839	19.05.90
1991	30.4	6.375	27.03.91	130.119	18.02.91

OVERALL MINIMUM IS 4.203 AT 26.04.76
OVERALL MAXIMUM IS 983.282 AT 26.08.80
OVERALL MEAN IS 33.839

Waiau River at Sunnyside
Annual Mean, Minimum and Maximum Flows
(Units are cumecs)

Year	Mean	Minimum	Date	Maximum	Date
1972	234.02	7.559	26.02.72	875.24	26.09.72
1973	94.92	5.327	03.03.73	467.43	23.11.73
1974	23.38	5.661	10.03.74	239.33	08.02.74
1975	151.47	5.661	21.03.75	1167.44	07.04.75
1976	36.75	5.619	12.01.76	455.44	09.06.76
1977	57.86	12.780	21.03.77	756.63	02.02.77
1978	53.17	9.807	14.03.78	771.58	01.06.78
1979	103.67	14.884	08.11.79	750.68	16.05.79
1980	175.55	11.121	13.05.80	1116.30	26.08.80
1981	48.18	9.967	28.02.81	524.36	04.10.81
1982	157.00	13.626	23.04.82	1039.99	27.11.82
1983	136.07	11.954	27.02.83	1312.37	13.01.83
1984	104.75	5.903	29.02.84	2020.96	27.01.84
1985	74.69	5.788	15.04.85	921.02	22.01.85
1986	62.97	6.619	10.02.86	481.91	02.01.86
1987	147.25	8.802	16.05.87	879.61	27.02.87
1988	257.70	8.513	12.03.88	1465.20	03.11.88
1989	42.17	7.899	10.03.89	520.25	29.03.89
1990	77.02	7.231	11.04.90	546.50	23.05.90
1991	106.08	11.844	30.01.91	788.62	18.02.91
OVERALL MINIMUM IS		5.33	AT 03.03.73		
OVERALL MAXIMUM IS		2020.96	AT 27.01.84		
OVERALL MEAN IS		104.25			

Waiau River at Tuatapere
Annual Mean, Minimum and Maximum Flows
(Units are cumecs)

Year	Mean	Minimum	Date	Maximum	Date
1964	617.59	324.935	30.07.64	1344.76	07.12.64
1965	567.36	262.671	30.08.65	1246.58	23.05.65
1966	446.07	232.814	08.09.66	1117.24	09.04.66
1967	640.39	247.414	26.07.67	1867.77	14.12.67
1968	638.70	259.314	15.07.68	1515.94	30.11.68
1969	551.97	241.717	07.12.69	1352.12	11.09.69
1970	466.90	115.660	14.06.70	1565.86	11.09.70
1971	248.11	25.849	04.05.71	1012.86	01.11.71
1972	289.93	8.408	02.03.72	1181.04	25.09.72
1973	134.08	11.897	12.04.73	534.18	09.05.73
1974	52.34	12.735	17.12.74	389.68	09.02.74
1975	194.96	13.314	21.02.75	1427.80	07.04.75
1976	72.69	12.689	27.04.76	792.91	03.06.76
1977	85.75	11.282	31.03.77	1136.64	03.05.77
1978	83.47	13.078	15.03.78	1194.01	31.05.78
1979	146.32	22.889	14.02.79	1817.25	16.05.79
1980	228.84	24.108	19.05.80	1896.31	26.08.80
1981	73.08	12.021	01.03.81	635.52	04.10.81
1982	190.66	17.983	24.04.82	1339.30	22.05.82
1983	201.63	19.202	27.02.83	1994.48	13.01.83
1984	168.19	21.236	29.02.84	3319.91	27.01.84
1985	111.72	15.723	14.04.85	1195.42	23.01.85
1986	109.18	15.723	11.02.86	807.00	12.06.86
1987	189.32	22.957	13.01.87	1430.59	10.03.87
1988	247.94	21.031	13.03.88	1585.84	28.10.88
1989	79.06	15.664	11.12.89	890.07	08.06.89
1990	98.63	8.581	13.04.90	664.94	19.05.90
1991	210.18	14.018	30.01.91	1772.67	18.02.91
OVERALL MINIMUM IS		8.40	AT 02.03.72		
OVERALL MAXIMUM IS		3319.91	AT 27.01.84		
OVERALL MEAN IS		244.89			

Monowai River
Annual Mean, Minimum and Maximum Flows
(Units are cumecs)

Year	Mean	Minimum	Date	Maximum	Date
1976	9.884	0.905	23.09.76	18.7370	18.11.76
1977	14.316	0.035	22.08.77	36.5270	30.10.77
1978	11.613	0.061	14.03.78	26.8720	15.10.78
1979	13.850	0.167	08.11.79	41.9440	17.05.79
1980	16.528	0.194	05.03.80	37.2800	03.10.80
1981	11.366	0.078	28.02.81	19.6240	04.10.81
1982	14.894	0.167	15.10.82	47.0640	27.11.82
1983	16.152	0.494	23.02.83	43.6390	22.01.83
1984	13.297	0.388	25.02.84	21.4870	20.06.84
1985	11.590	0.167	05.04.85	22.0060	14.01.85
1986	14.814	0.332	08.02.86	22.3330	11.05.86
1987	16.836	0.111	02.04.87	68.8110	11.03.87
1988	17.021	0.005	15.02.88	56.1250	04.11.88
1989	10.197	0.000	10.10.89	38.2920	03.04.89
1990	11.781	.001	04.04.90	24.4940	30.09.90
1991	15.485	0.249	31.01.91	54.1590	19.02.91
OVERALL MINIMUM IS		0.00	AT 10.10.89		
OVERALL MAXIMUM IS		68.81	AT 11.03.87		
OVERALL MEAN IS		13.73			

Lake Monowai
Annual Mean, Minimum and Maximum Daily Mean lake levels
(Units are metres above local datum)

Year	Mean	Minimum	Date	Maximum	Date
1977	3.539	2.923	16.08.77	4.52584	31.10.77
1978	2.968	1.832	22.03.78	4.30825	15.10.78
1979	3.327	2.528	06.09.79	4.19649	16.05.79
1980	3.365	2.332	19.05.80	4.23900	02.10.80
1981	2.415	1.656	25.07.81	3.20026	11.10.81
1982	3.160	2.580	30.03.82	4.44798	28.11.82
1983	3.545	2.436	07.12.83	4.41192	22.01.83
1984	3.012	2.271	27.09.84	3.51977	13.06.84
1985	2.645	1.522	26.10.85	3.74516	13.01.85
1986	2.896	1.932	20.12.86	3.53214	13.06.86
1987	3.074	2.349	31.12.87	4.09985	04.03.87
1988	3.066	2.227	11.02.88	4.33470	04.11.88
1989	2.693	1.595	02.10.89	3.95850	22.04.89
1990	2.700	1.633	29.03.90	3.58595	30.05.90
1991	3.256	2.940	28.01.91	3.93242	19.02.91
OVERALL MINIMUM IS		1.522	AT 26.10.85		
OVERALL MAXIMUM IS		4.525	AT 31.10.77		
OVERALL MEAN IS		3.019			

6

FLOOD FREQUENCIES

Table of flows for various return periods

Table of the return period of the 3 largest floods recorded at each site

Graphs (frequency plots) of annual maximum floods [from which the values in the tables were derived]

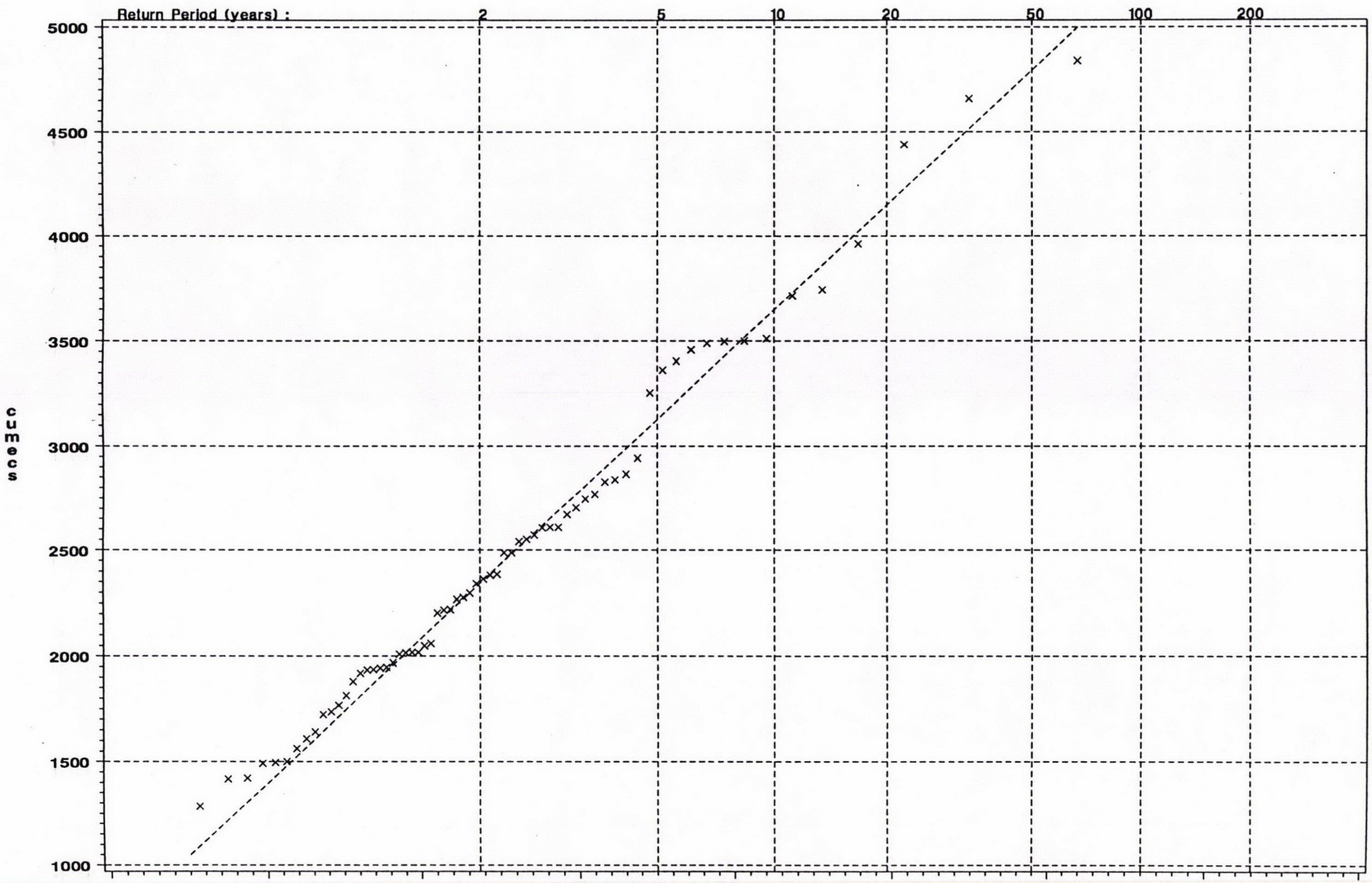
Section 6 - Flood Frequencies

Annual maximum floods have been analysed using the Gumbel extreme value type 1 method and plotted using Weibul plotting positions. Data is graphed for individual sites and tabulated for all sites (NB Data in the table is derived from the individual graphs).

First part of the table summarises flows to be expected for return periods from 2 to 100 years.

Second part of the table lists the calculated return period of the three largest flood events recorded at each site.

By and large most floods have been of return period 50 years or less. The exceptions were the January 1984 flood, in which there was exceptional rainfall in the catchments of Lake Manapouri and the lower Waiau, and the November 1988 outflow from Lake Manapouri following 2 months of sustained rainfall in the lake catchments.



Lake Te Anau Annual Maximum Daily Mean Inflows

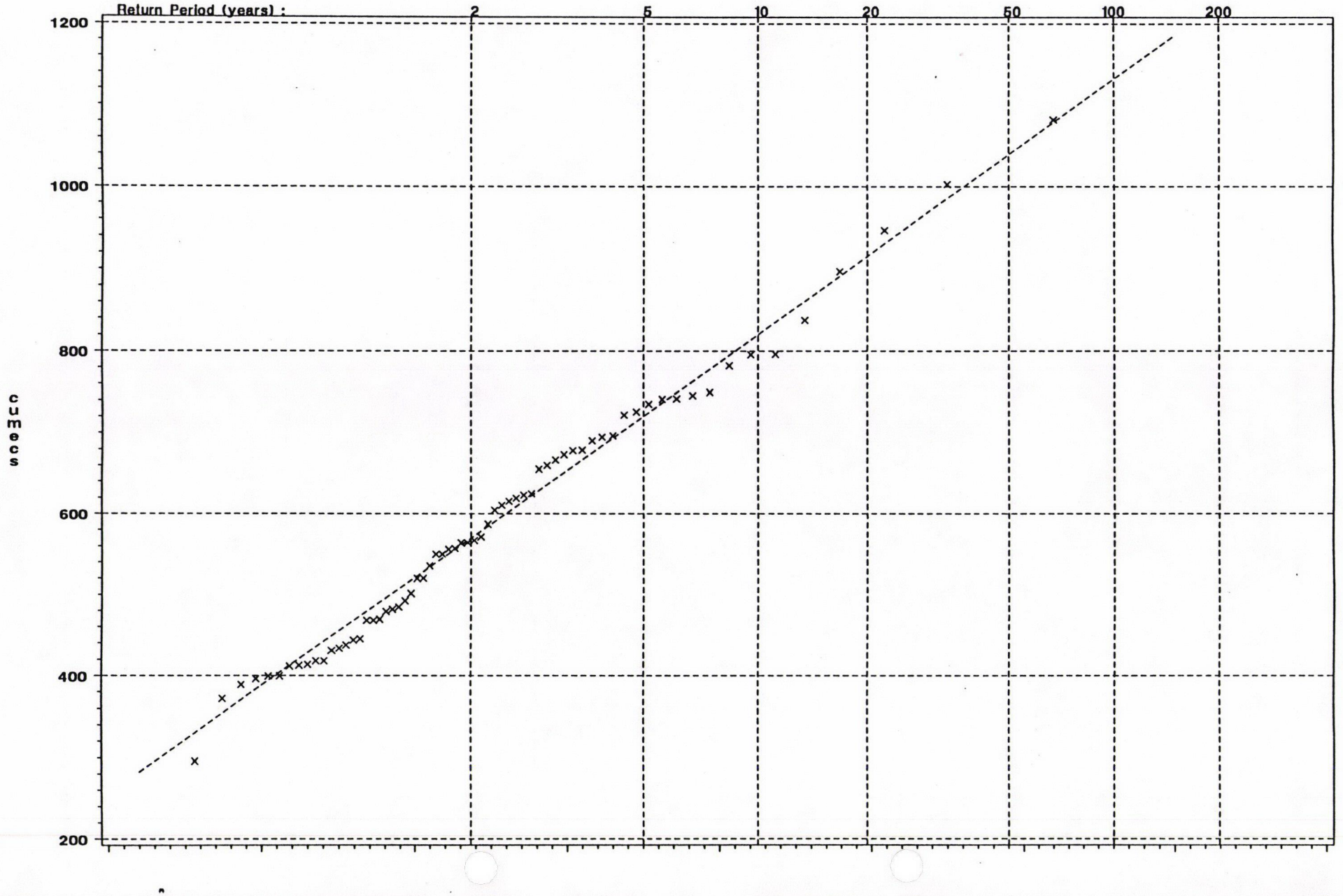
RETURN PERIODS

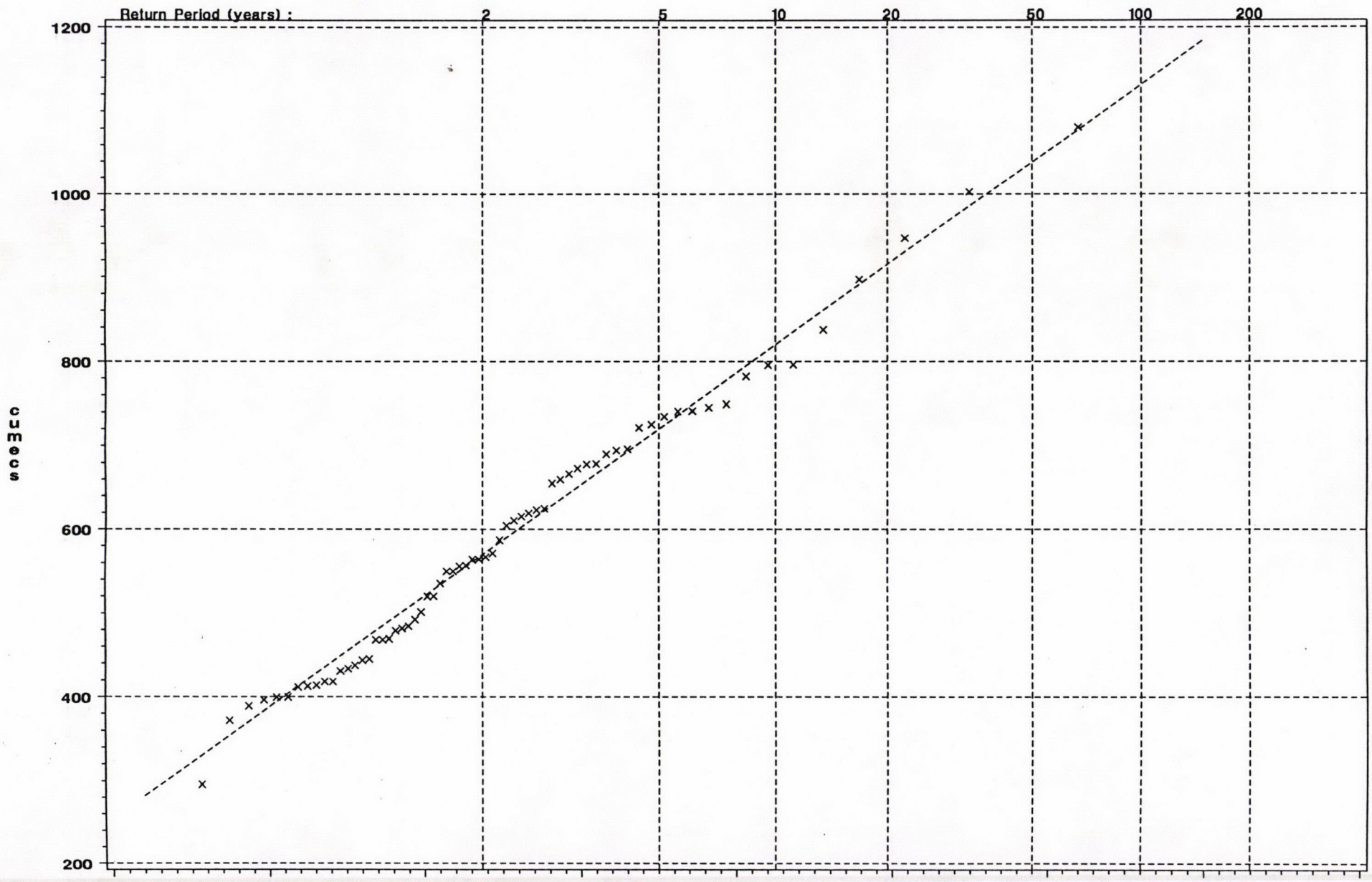
Flows in cumecs for various return periods

Site	Return Period (years) 2	5	10	50	100
L Te Anau inflow	2350	3130	3650	4800	5300
L Te Anau outflow	560	710	820	1040	1130
L Manapouri inflow	1400	1800	2100	2700	2900
L Manapouri outflow	830	1050	1200	1520	1670
MLC outflow	640	1000	1240	1760	1980
Mararoa at Cliffs	480	760	970	1400	1600
Waiau at Sunnyside	780	1180	1450	2030	2270
Waiau at Tuatapere	1250	1700	2000	2650	2900

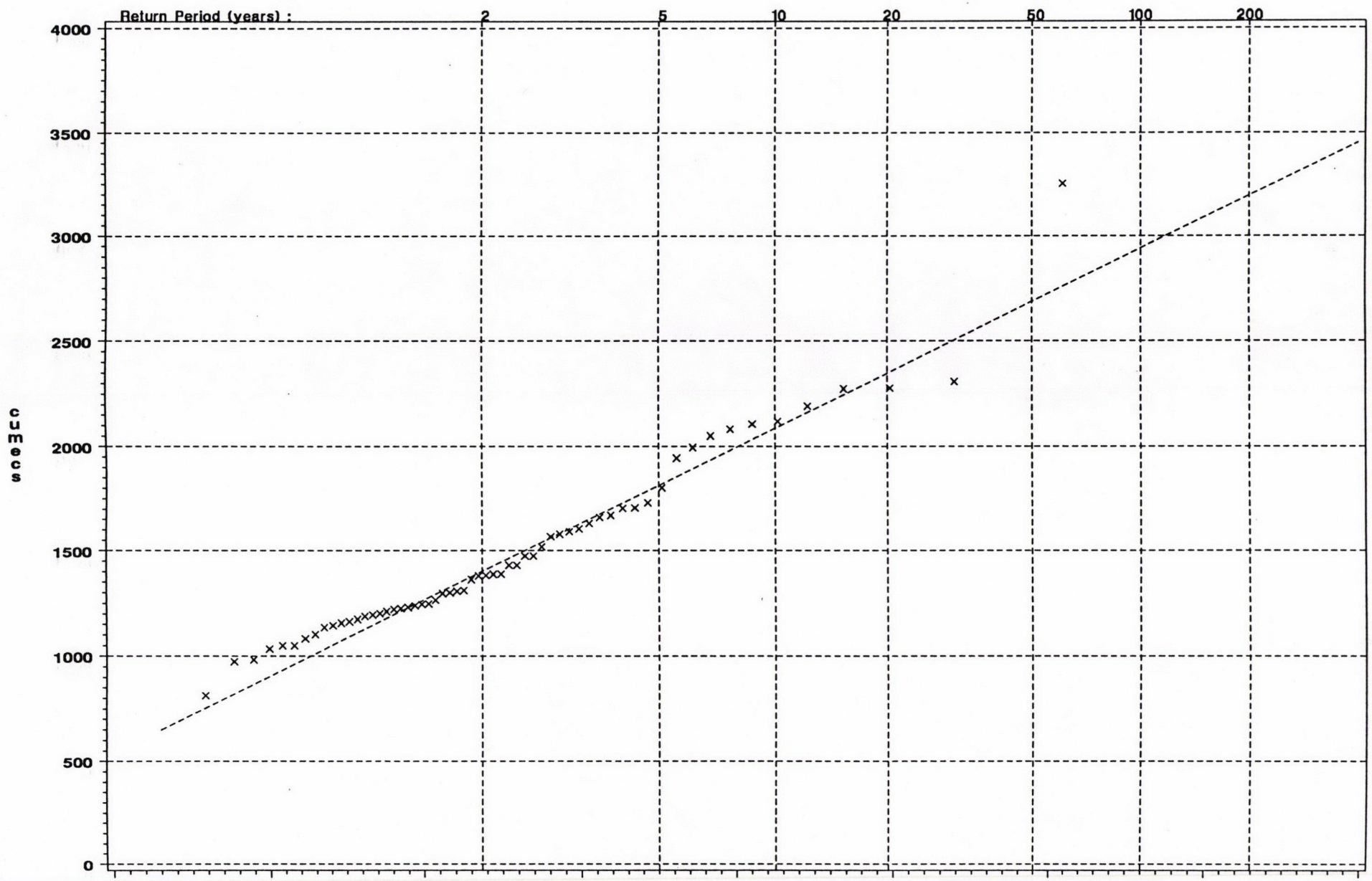
Return period (RP) of the largest floods recorded at each site

Site	Flow	Date	RP
L Te Anau inflow	4,839m^3/s	May 1978	50yrs
	4,658m^3/s	Jan 1984	40yrs
	4,437m^3/s	Dec 1979	35yrs
L Te Anau outflow	1,081m^3/s	Nov 1988	65yrs
	1,003m^3/s	Apr 1975	40yrs
	946m^3/s	Jan 1983	30yrs
L Manapouri inflow	3,252m^3/s	Jan 1984	+200yrs
	2,310m^3/s	Nov 1988	20yrs
	2,278m^3/s	Nov 1957	18yrs
L Manapouri outflow	1,928m^3/s	Nov 1988	+200yrs
	1,371m^3/s	Jan 1983	30yrs
	1,325m^3/s	Apr 1975	20yrs
MLC outflow	1,470m^3/s	Nov 1988	20yrs
	1,158m^3/s	Sep 1969	8yrs
	1,146m^3/s	Jan 1984	8yrs
Mararoa at Cliffs	983m^3/s	Aug 1980	11yrs
	906m^3/s	May 1978	8yrs
	826m^3/s	Jan 1984	6yrs
Waiau at Sunnyside	2,021m^3/s	Jan 1984	50yrs
	1,465m^3/s	Nov 1988	10yrs
	1,312m^3/s	Jan 1983	7yrs
Waiau at Tuatapere	3,320m^3/s	Jan 1984	+200yrs
	1,994m^3/s	Jan 1983	10yrs
	1,896m^3/s	Aug 1980	8yrs

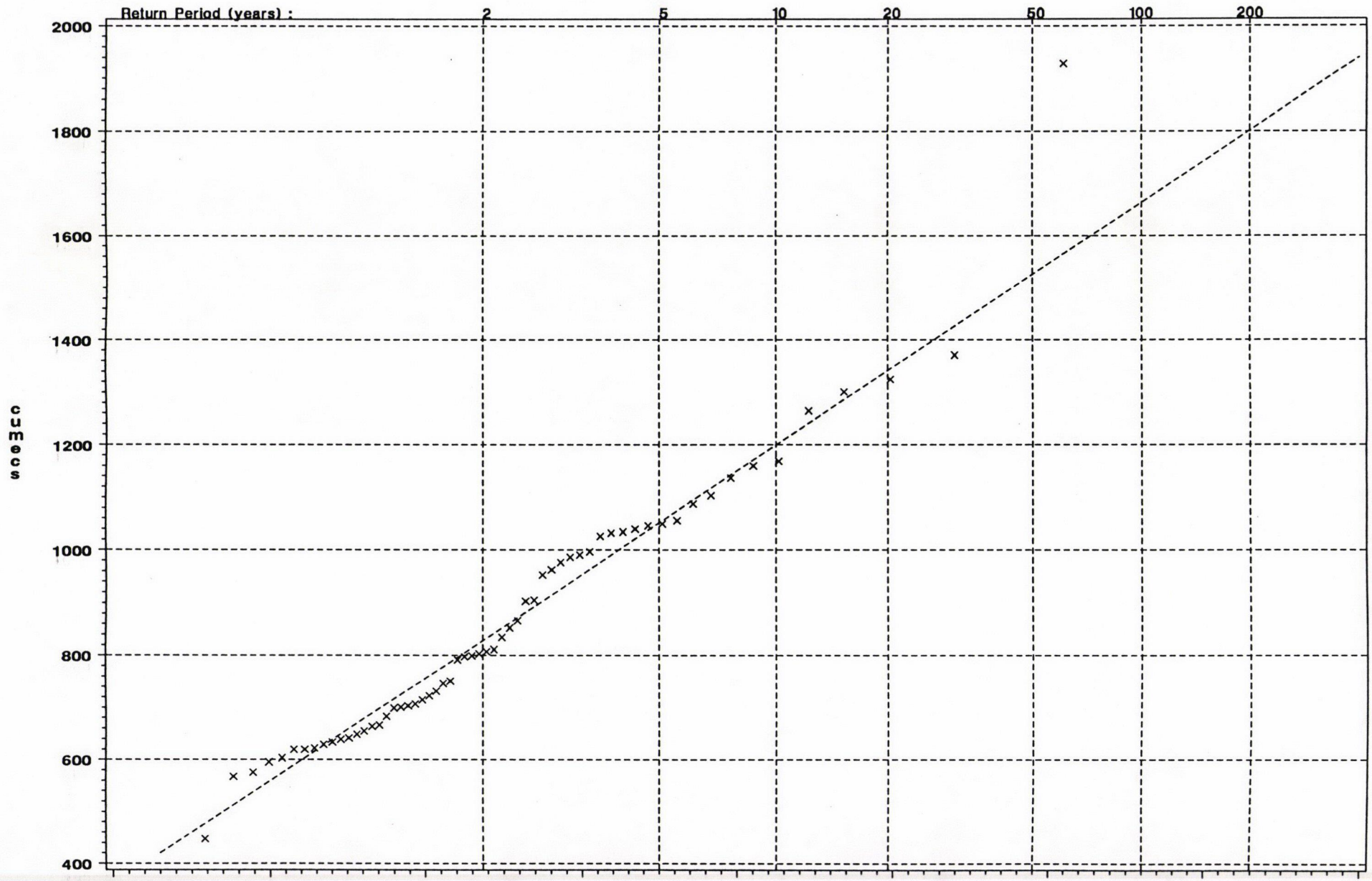

Return Period (years) :
2
5
10
20
50
100
200
1200
1000
800
600
400
200
cumecs



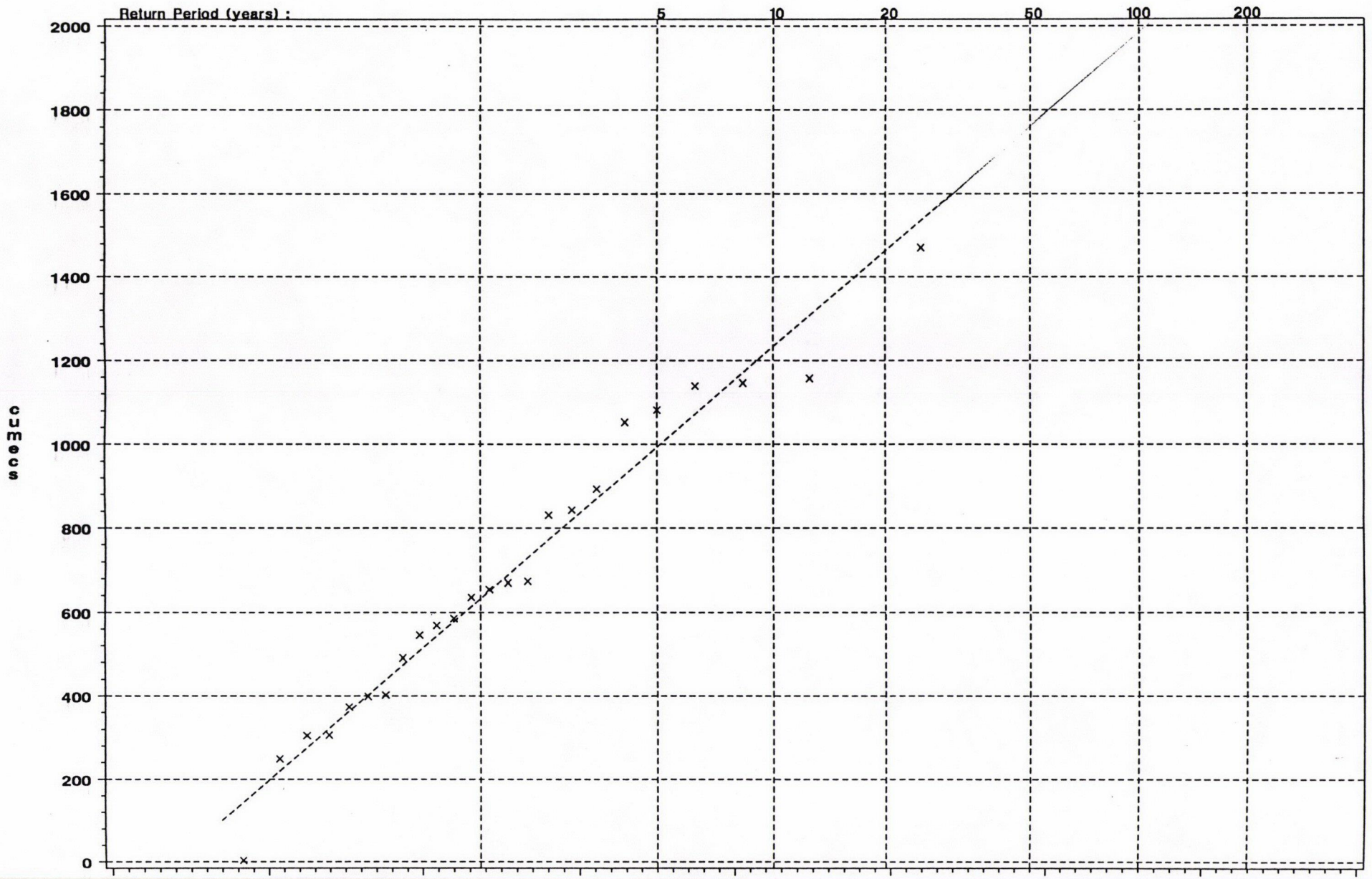
Lake Te Anau Annual Maximum Daily Mean Outflows



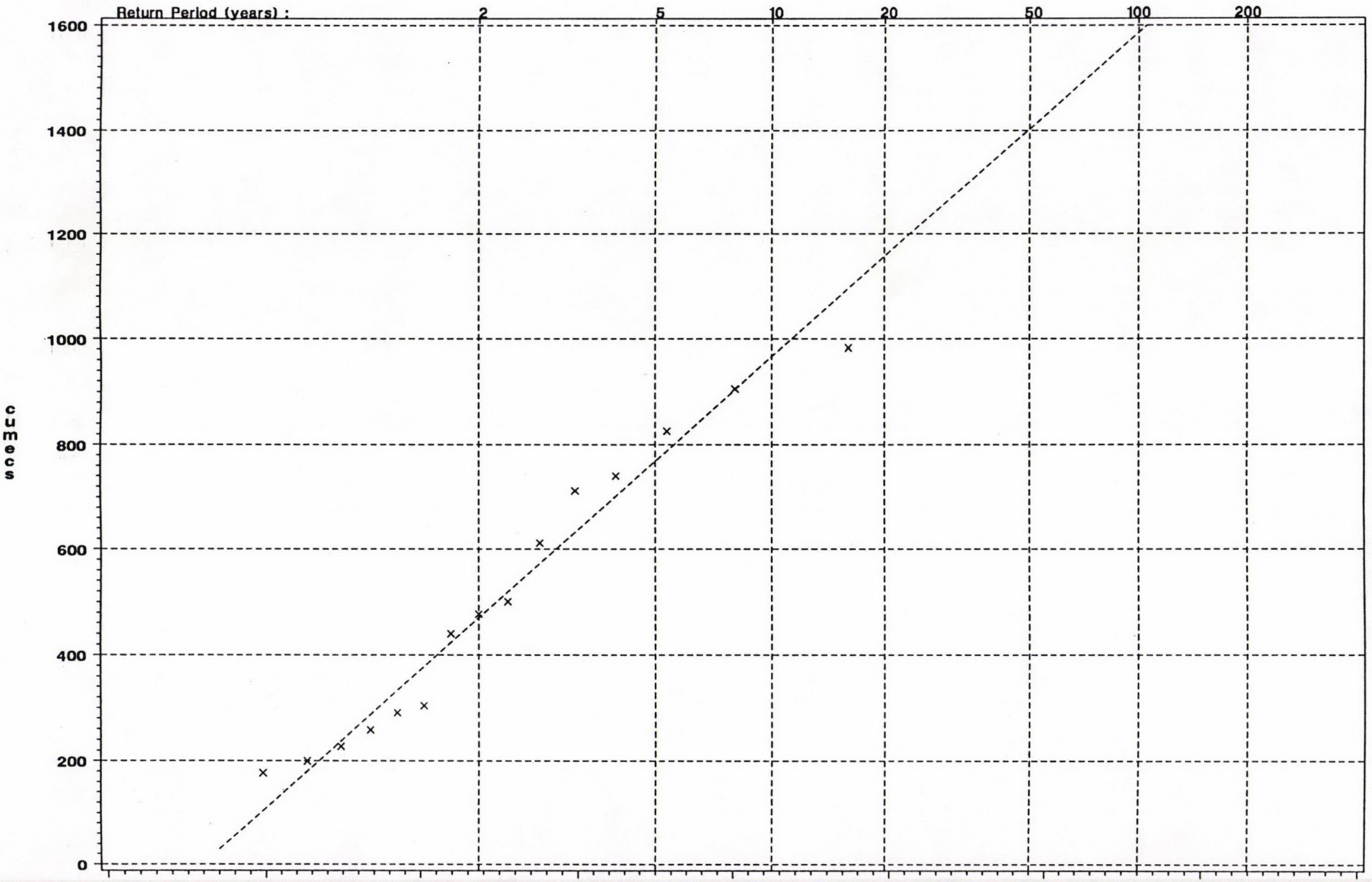
Lake Manapouri Annual Maximum Daily Mean Inflows



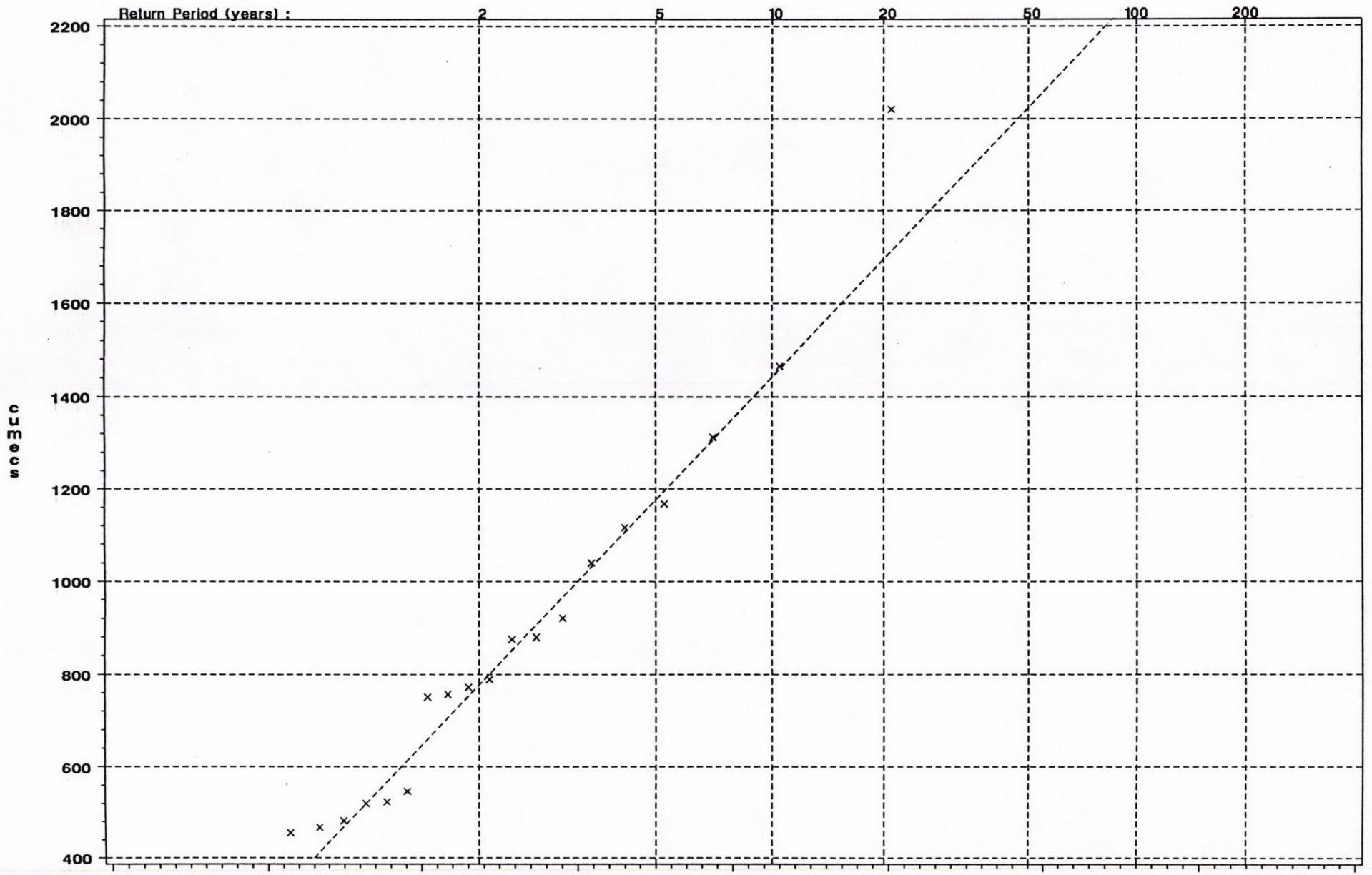
Lake Manapouri Annual Maximum Daily Mean Outflows (Power Sta tion plus MLC)



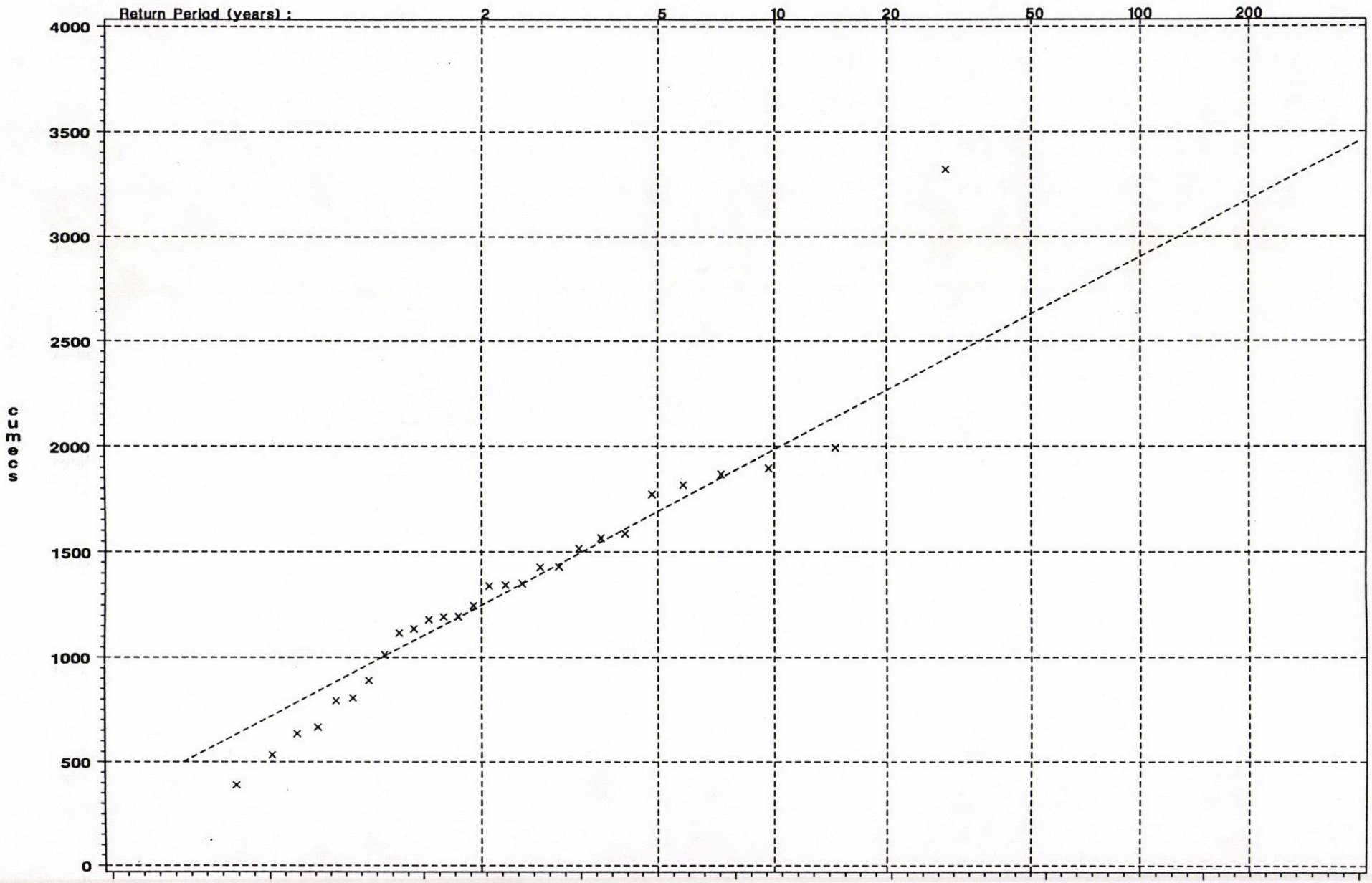
Lake Manapouri Control (MLC) Annual Maximum Outflows



Mararoa R at Cliffs Annual Maximum Flows



Waiau R at Sunnyside Annual Maximum Flows



Waiau R at Tuatapere Annual Maximum Flows

7

MISCELLANEOUS

GRAPHS

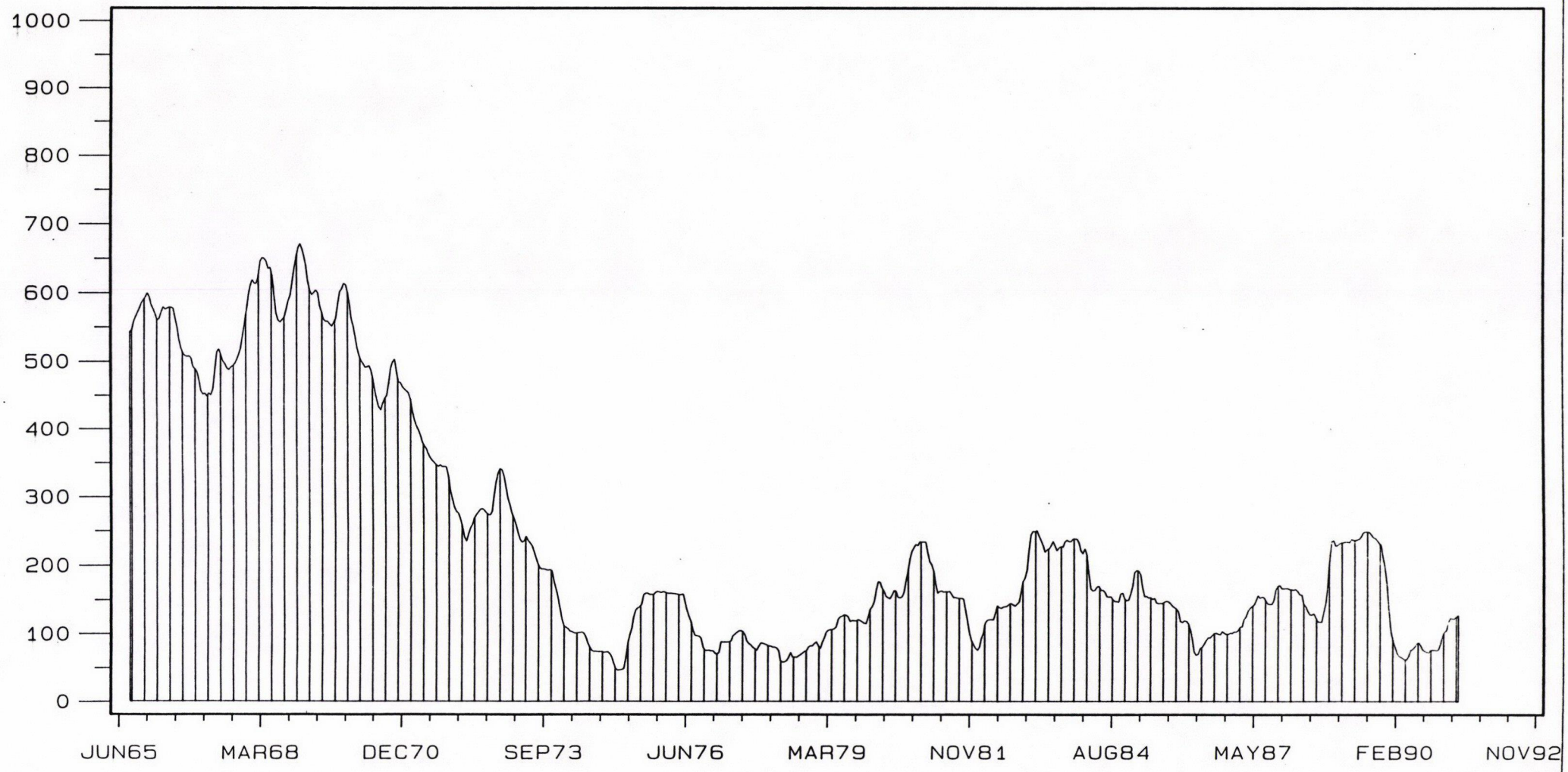
Average flow recorded at Tuatapere
[smoothed via taking a moving average]

Monthly mean flows at Tuatapere pre- and post-control

Comparison of flood peaks at the
Mararoa weir, Sunnyside and Tuatapere

Waiau River at Tuatapere

Average flows from 1965 to 1991



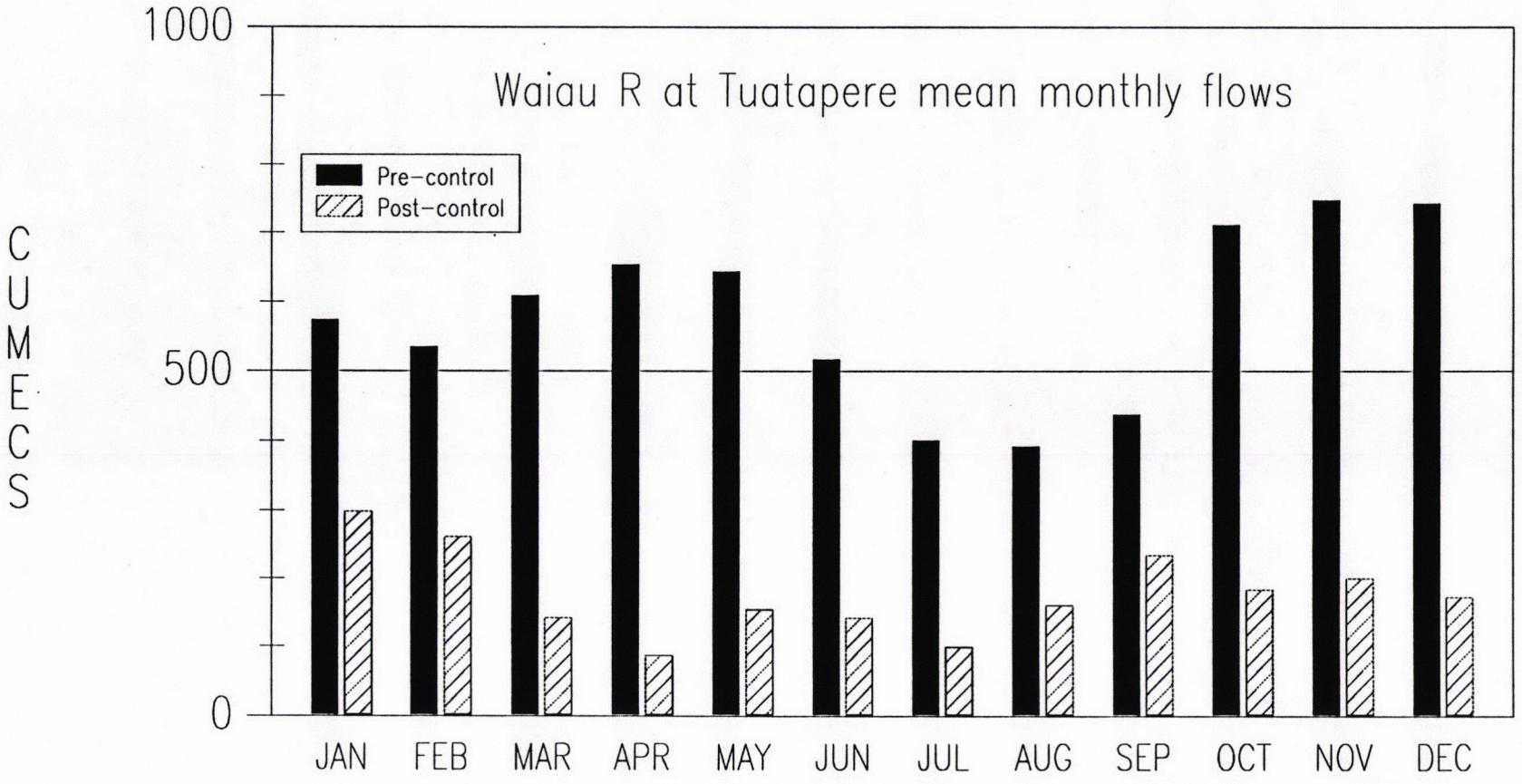
Section 7 - Miscellaneous Graphs

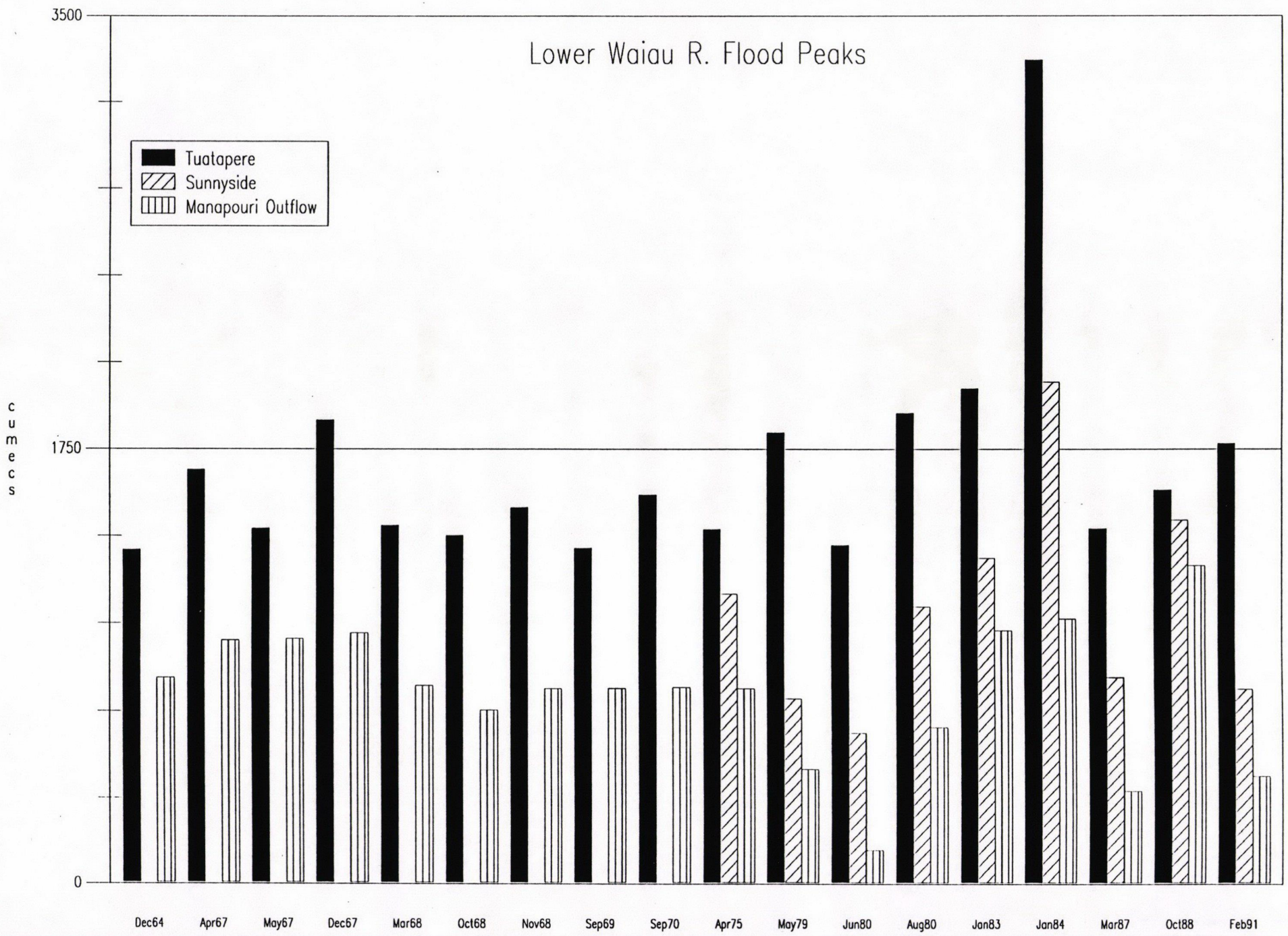
Graph 1 depicts the smoothed average flow at Tuatapere from mid 1965 until 1991. It shows clearly the generally reduced flows since commencement of power scheme operation.

Graph 2 depicts average monthly flows at Tuatapere pre- and post-control. This graph shows the seasonal variation of the flow regime.

Graph 3 depicts for 18 largest floods since 1964 the magnitude of peaks at 3 points on the lower Waiau River. These points are at the "head" of the river (below Manapouri Lake Control), at Sunnyside and at Tuatapere.

Points to note from this latter graph are the relative size of each flood and the variation in size from location to location. The January 1984 flood is by far the largest to have occurred at Tuatapere since 1964 although the outflow from Lake Manapouri was no greater than has occurred in other flood events.


Waiau R at Tuatapere mean monthly flows
Pre-control
Post-control
CUMECS
1000
500
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC


Lower Waiau R. Flood Peaks
Tuatapere
Sunnyside
Manapouri Outflow
cumecs
3500
1750
0
Dec64
Apr67
May67
Dec67
Mar68
Oct68
Nov68
Sep69
Sep70
Apr75
May79
Jun80
Aug80
Jan83
Jan84
Mar87
Oct88
Feb91