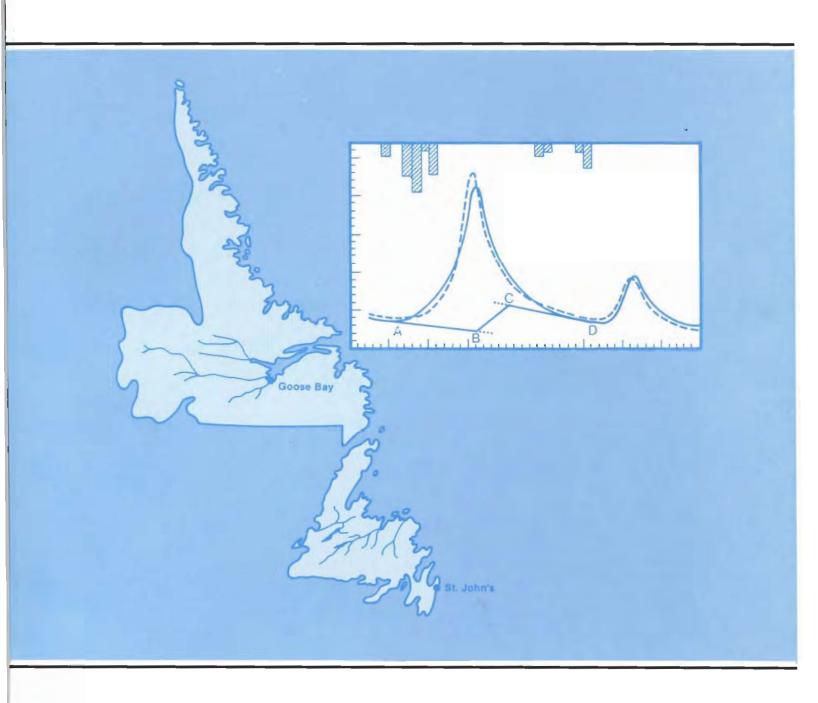
# Estimation of Low Flows for the Island of Newfoundland

# A User's Guide





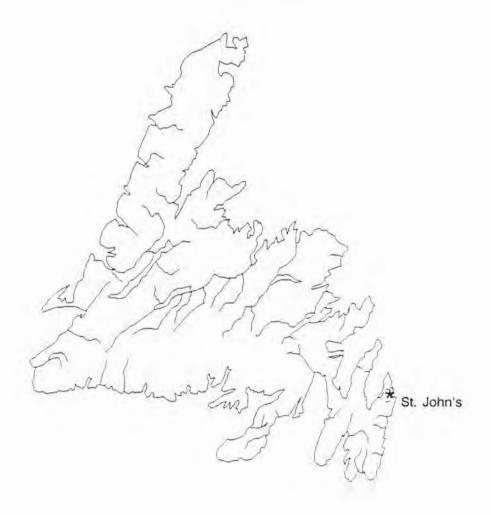
Government of Newfoundland and Labrador Department of Environment and Lands Water Resources Division

WRD-HM-91-IV

June 1991

# ESTIMATION OF LOW FLOWS FOR NEWFOUNDLAND

# A User's Guide





Government of Newfoundland and Labrador Department of Environment and Lands Water Resources Division



#### SUMMARY

The objective of this guide is to provide users with a computer-based method of estimating 1-day, 7-day, 15-day and 30-day low stream flows with return period of 2, 10, 20 and 50 years for the Island of Newfoundland. The significant results of a study on which the estimation technique is based are presented. The computer-based version of the estimation technique is then described followed by an example to illustrate its application.

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#### 1 INTRODUCTION

The characteristics and estimation of low flows are important for several water resources engineering and management applications such as estimating available water supply for municipal and industrial uses, determining the waste-water effluent dilution potential of a receiving stream, predicting the impact of stream diversions on the minimum flow requirements for spawning and migrating fish and, generally, for environmental impact assessment studies.

An annual low flow condition is defined as a period during which the average streamflow is a minimum for the year. The duration of the low flow is usually measured in days and is expressed as an N-day low flow period. The magnitude of the low flow is expressed as the average daily flow (in m³/s or l/s) over the continuous N-day period. For design purposes, low flows are usually expressed in terms of return periods in years. For example, a low flow with duration N-day, magnitude x m³/s and return period T years is the average flow over N continuous days that one expects to be at or below x m³/s, on the average, at least once every T years. The particular combination of duration and return period chosen for characterising a low flow is primarily a function of the intended water management or engineering application.

A report entitled "Characteristics and Estimation of Minimum Streamflows for the Island of Newfoundland" [1], describing the methodology and results of a frequency analysis of low flows at thirty-nine gauging stations on streams in Newfoundland was completed in June 1991. A series of regional regression equations for estimating low flows of several durations and return periods at ungauged sections of streams were derived from the results of the analysis. This guide summarizes the results of the study and presents the regional regression equations. A computer-based approach to using the equations and an example to illustrate their application are then given.

#### 2 DATA ON GAUGED WATERSHEDS

The analysis of low flows was based on unregulated daily stream flows from 39 gauged watersheds in Newfoundland [2]. Figure 1 shows the location of the watersheds and gauging stations. Table 1 lists these watersheds together with the locations of the gauges, the watersheds' drainage areas and the record length available for each station. A partial listing of the physiographic database on the 39 gauged watersheds with natural flows is shown in Table 2 [3].



Figure 1 Locations of Watersheds and Gauging Stations for Low Flow Study

Table 1 List of Gauging Stations Included in Study

NORTHEAST POND RIVER AT NORTHEAST SPOUT COVE RATTLE BROOK NEAR SPOUT COVE RATTLE BROOK NEAR SPOUT COVE RATTLE BROOK NEAR BOAT HARBOUR COME BY CHANCE RIVER NEAR GOBIES NORTHWEST PONS SEAL COVE BROOK NEAR CAPPAHAYDEN NORTHEAST RIVER NEAR LAMALINE TIDES BROOK BELOW FRESHWATER PONG GARNISH RIVER NEAR GARNISH ROCKY RIVER NEAR GARNISH ROCKY RIVER NEAR GOLINET PIPERS HOLE RIVER AT MOTHERS BROOK SOUTHWEST BROOK NEAR BADGER BAY SOUTHERN BAY BROOK NEAR BADGER BAY SOUTHERN BAY BROOK NEAR BOTWOOD MIDDLE BROOK NEAR BOTWOOD RAGED HARBOUR RIVER NEAR MUSGRALLOYDS RIVER BELOW KING GEORGE IV LINDIAN BAY BROOK NEAR BOAD SALMON RIVER AT LONG POND GANDER RIVER AT BIG SALLE SOUTH WEST BROOK NEAR BAIE VERTE NORTHEAST BROOK NEAR BAIE VERTE NORTHEAST BROOK NEAR BAIE VERTE NORTHEAST BROOK NEAR BAIE VERTE	ND N47 38 06 N47 48 43 N47 27 02 N47 55 07 N46 51 08 N46 51 08 N47 16 26 N47 16 26 N47 12 50 N47 13 29 N47 13 29	W52 50 14 W53 09 15 W54 51 18	(km <sup>2</sup> 2)				1		in Record
		W52 50 14 W53 09 15 W54 51 18							
		W53 09 15 W54 51 18	3.9	1953 -	1989				37
		W54 51 18	10.8	1979 -	1989				11
		Wen co co	42.7	1981	1989				0
		W53 50 58	43.3	1970 -	1989				20
		W53 18 11	53.3	1967	1980	1982	- 1989		22
		W52 58 27	53.6	1979 -	1989				11
		W53 50 27	89.6	- 6/61	1989				11
		W55 46 39	115	1980 -	1989				10
		W55 15 54	166	- 1781	1989				13
		W55 19 45	205	1959 -	1989				31
		W53 34 06	285	1950 -	1989				40
		W54 17 08	764	1953 -	1989				37
	JAL PARK N48 36 25	W53 58 50	36.7	1968 -	1989				22
	N49 22 18	W55 48 44	63.8	1982 -	1989				8
	N48 22 44	W53 40 36	67.4	- 9/61	1989				14
	N49 06 21	W55 24 38	1771	1981 -	1989				00
	N48 48 28	W54 13 28	267	1959 -	1989				31
LLOYDS RIVER BELOW KING GEORGE IV LINDIAN BAY BROOK NEAR NORTHWEST AF BAY DU NORD RIVER AT BIG FALLS TERRA NOVA RIVER AT EIGHT MILE BRIDG SALMON RIVER AT LONG POND GANDER RIVER AT BIG SHUTE SOUTH WEST BROOK NEAR BAIE VERTE NORTHEAST BROOK NEAR RODDICKTON BEAVER BROOK NEAR RODDICKTON	HARBOUR N49 23 35	W54 06 25	399	1978 -	1989				12
INDIAN BAY BROOK NEAR NORTHWEST AF BAY DU NORD RIVER AT BIG FALLS TERRA NOVA RIVER AT EIGHT MILE BRIDG SALMON RIVER AT LONG POND GANDER RIVER AT LONG POND GANDER RIVER AT BIG SHUTE SOUTH WEST BROOK NEAR BAIE VERTE NORTHEAST BROOK NEAR RODDICKTON BEAVER BROOK NEAR RODDICKTON	N48 14 32	W57 49 41	469	1981 -	1989				0
BAY DU NORD RIVER AT BIG FALLS TERRA NOVA RIVER AT EIGHT MILE BRIDG SALMON RIVER AT LONG POND GANDER RIVER AT BIG SHUTE SOUTH WEST BROOK NEAR BAIE VERTE NORTHEAST BROOK NEAR RODDICKTON BEAVER BROOK NEAR RODDICKTON	N49 02 24	W53 53 00	554	1981 -	1989				œ
TERRA NOVA RIVER AT EIGHT MILE BRIDG SALMON RIVER AT LONG POND GANDER RIVER AT BIG SHUTE SOUTH WEST BROOK NEAR BAIE VERTE NORTHEAST BROOK NEAR RODDICKTON BEAVER BROOK NEAR RODDICKTON	N47 44 48	W55 26 30	1170	1952 -	1979	1961	1989		37
SALMON RIVER AT LONG POND GANDER RIVER AT BIG SHUTE SOUTH WEST BROOK NEAR BAIE VERTE NORTHEAST BROOK NEAR RODDICKTON BEAVER BROOK NEAR RODDICKTON	N48 26 30	W54 22 21	1290	- 9981	1978	1980	1984		28
GANDER RIVER AT BIG SHUTE SOUTH WEST BROOK NEAR BAIE VERTE NORTHEAST BROOK NEAR RODDICKTON BEAVER BROOK NEAR RODDICKTON	N47 56 40	W55 54 50	2640	1950 -	1964				15
SOUTH WEST BROOK NEAR BAIE VERTE NORTHEAST BROOK NEAR RODDICKTON BEAVER BROOK NEAR RODDICKTON	N49 00 55	W54 51 13	4400	1950 -	1989				40
NORTHEAST BROOK NEAR RODDICKTON BEAVER BROOK NEAR RODDICKTON	N49 53 37	W56 13 22	93.2	1980 -	1989				10
BEAVER BROOK NEAR RODDICKTON	N50 55 44	W56 06 44	200	1980 -	1989				10
一日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日 日	N50 54 51	W56 09 26	237	1960	1978				19
02YK005 SHEFFIELD BROOK NEAR TRANS CANADA HIGHWAY	3HWAY N49 20 11	W56 39 56	391	1973 -	1989				17
02YK002 LEWASEECHJEECH BROOK AT LITTLE GRAND LAKE	LAKE N48 37 20	W57 56 00	470	1956 -	1966	1973	- 1980	, 1982 - 1989	27
02YK004 HINDS BROOK NEAR GRAND LAKE	N49 04 21	W57 10 46	529	1957 -	1986	1969	1877		18
02YF001 CAT ARM RIVER ABOVE GREAT CAT ARM	N50 04 33	W56 55 22	119	1969 -	1981				13
02YC001 TORRENT RIVER AT BRISTOL'S POOL	N50 36 27	W57 09 04	624	1960 -	1989				30
02YL001 UPPER HUMBER RIVER NEAR REIDVILLE	N49 14 26	W57 21 45	2110	1953 -	1989				37
02ZA002 HIGHLANDS RIVER AT TRANS-CANADA HIGHWAY	VAY N48 06 33	W58 47 04	72	1982 -	1989				.00
02ZA003 LITTLE CODROY RIVER NEAR DOYLES	N47 49 19	W59 11 40	139	1982 -	1989				œ
02ZB001 ISLE AUX MORTS RIVER BELOW HIGHWAY BRIDGE	IDGE N47 36 50	W59 00 33	205	1963 -	1989				27
02ZC002 GRANDY BROOK BELOW TOP POND BROOK	N47 51 27	W57 44 00	230	1982 -	1989				œ
	E'S N48 26 44	W58 23 55	343	- 6/61	1989				11
02YJ001 HARRYS RIVER BELOW HIGHWAY BRIDGE	N48 34 31	W58 21 48	640	- 6961	1989				21

Table 2 Physiographic Characteristics of Gauged Watersheds

Number	Area (km <sup>-</sup> 2)	1000	vo rotest % barren	% Lakes and Swamps*	% ACLS	Density (1/km)	Shape	Slope (%)	Channel (km)	Difference (m)
02ZM006	3.9	75.4	3.6	21.0	100.0	1.04	1.24	2.42	2.63	84
02ZL003	10.8	41.8	48.9	9.5	100.0	1.09	1.36	1.25	7.0	16
02ZG004	42.7	35.0	47.0	18.0	95.0	1.62	1.53	1.10	10.01	107
02ZH002	43.3	40.5	49.7	8.6	92.0	1.11	1.66	0.59	17.0	110
02ZN001	53.3	8.0	78.8	12.6	100.0	1.09	2.08	0.61	14.8	83
00ZZW008	53.6	37.0	20.0	13.0	100.0	1.13	1.37	0.62	14.8	133
02ZK002	9.68	47.0	23.0	30.0	81.0	1.11	1.91	0.55	28.9	200
02ZG003	115	15.8	72.0	12.0	92.0	1.55	1.62	0.34	24.5	138
02ZG002	166	38.0	48.6	13.3	92.0	1.35	1.84	1.35	26.7	221
02ZG001	205	28.5	64.0	10.1	96.0	0.55	2.45	09'0	44.7	370
02ZK001	285	8.09	37.1	11.9	55.0	1.01	2.00	0.23	45.2	185
02ZH001	764	10.7	23.4	65.9	91.0	0.71	1.67	0.35	61.0	207
02YS003	36.7	83.6	0.5	15.9	100.0	0.64	1.43	1.11	11.2	143
02YP001	63.8	87.0	0.0	12.8	79.0	0.88	1.62	0.53	20.0	113
02ZJ001	67.4	81.5	3.3	15.0	86.0	1.24	1.43	0.50	16.0	128
02YO006	177	82.5	1.8	16.3	97.0	0.80	1.93	0,45	42.7	190
02YR001	267	74.8	0.8	24.4	98.0	0.26	1.93	0.32	49.3	177
02YR002	399	68.1	0.0	32.0	96.0	0.74	1.68	0.21	45.0	95
02YN002	469	22.0	62.0	16.0	100.0	1.37	2.15	0.22	57.3	166
02YR003	554	0.69	0.0	31.0	87.0	0.68	1.72	0.22	52.4	136
02ZF001	1170	32.2	44.1	23.6	96.0	0.61	2.15	0.29	68.1	282
02YS001	1290	55.4	14.8	29.8	95.0	0.73	2.35	0.12	105.0	207
02ZE001	2640	34.8	49.0	15.7	100.0	0.36	1.75	0.08	100.4	122
02YQ001	4400	78.3	6.9	16.9	91.0	0.45	2.08	0.14	134.0	297
32YM003	93,2	90.06	0.0	10.01	56.0	0.68	1.67	0.57	18.6	107
02YD002	200	82.7	0.1	17.2	0.66	0.93	1.65	0.47	38.3	270
02YD001	237	80.6	11.2	8.2	73.0	0.34	2.23	0.67	40.6	328
02YK005	391	67.6	15.2	17.2	94.0	0.19	1.98	1.07	38.1	378
02YK002	470	54.9	29.0	18.1	100.0	0.63	2.32	0.59	54.9	561
02YK004	529	35.2	28.2	35.5	95.0	0.64	1.78	0.32	49.3	320
02YF001	119	68.8	18.0	13.1	100.0	0.58	1.86	0.73	30.2	250
02YC001	624	33.5	49.8	18.7	0.66	0.78	1.45	1.01	48.3	479
02YL001	2110	74.0	14.5	11.6	75.0	0.79	1,58	0.40	119.0	878
02ZA002	72	81.6	12.9	5.1	43.0	1.15	1.72	2.19	20.4	480
02ZA003	139	68.0	19.0	13.0	73.0	1.46	1.67	1.46	25.2	450
02ZB001	205	0.6	78.2	13.4	80.0	0.72	2.09	0.84	33.3	444
22C002	230	17.0	78.0	4.0	34.0	96.0	1.84	1.06	28.9	360
02ZA001	343	80.2	29.9	10.01	83.0	1.04	2.45	0.68	65.5	463
PACINOS	640	200	0.0	CAL	25.0	* * *	1.01	200	0 00	-

· Notes

<sup>%</sup> Forest; % Barren; % Lakes and Swamps; = Percentage of the Drainage Area Covered by; Forests, Barrens, and Lakes and Swamps. Respectively % ACLS - Percent of Drainage Area Controlled by Lakes and Swamps

#### 3 REGIONAL CHARACTERISTICS OF RUNOFF

The unit mean monthly flows and the mean annual runoff at the 39 gauging stations are shown in Table 3. The mean annual runoff is highest in the southwestern region of the Island where it ranges from 1300 mm to 2100 mm. The lowest mean annual runoff, between 700 mm and 900 mm, occurs in the north-central area of the Island. On the Avalon and Burin Peninsulas, the range of the mean annual runoff is 1000 mm to 1900 mm. On the Northern Peninsula, mean annual runoff is between 1100 mm and 1400 mm.

Unit mean monthly flows show large variations, both temporally and spatially. They range from 0.005 m³/s/km² to 0.158 m³/s/km² depending on month of year and region of Newfoundland. The watersheds on the Avalon Peninsula and on the southwestern corner of the Island yield the higher unit mean monthly flows, while the watersheds in the north-central part of the Island tend to have the lower unit mean monthly flows. On a temporal basis, the higher unit mean monthly flows tend to occur between the months of April and June, which corresponds to the snowmelt season. The lower unit mean monthly flows occur during two periods, one between January and March, i.e., during the winter season prior to snowmelt and the other between July and September, i.e., during the summer season when there are usually higher losses due to increased evapotranspiration rates.

Table 3 Unit Mean Monthly and Annual Flows at Gauging Stations

Station	Drainage						Unit Mean Monthly Flow	fonthly Flow	100					Unit Mean	Mean Annual
Number	Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Flow	Runoff
	(km <sup>-</sup> 2)						(m-3/s/km-2)	'km^2)						(m-3/s/km-2)	(mm)
O2ZM006	3.9	0.036	0.037	0.043	0.065	0.046	0.023	0.011	0.018	0.021	0.034	0 044	0.040	0.034	1080
O2ZL003	10.8	0.043	0.041	0.058	690.0	0.046	0.030	0.026	0.020	0.033	0.039	0.045	0.039	0.041	1280
O2ZG004	42.7	0.059	0.061	0.064	0.082	0.049	0.046	0.035	0.019	0.040	0.043	0.058	0.051	0.051	1600
O2ZH002	43.3	0.041	0.045	0.052	0.077	0.050	0.030	0.022	0.024	0.028	0.047	0.054	0.048	0.043	1360
O2ZN001	53.3	9900	0.065	0 0 0 8	0.087	0.063	0.042	0.034	0.037	0.047	0.060	0.068	0.069	0.059	1860
O2ZM009	53.6	0.068	0.057	0.084	0.091	0.061	0.040	0.033	0.030	0.047	0.053	0.063	0.064	0.058	1820
O2ZK002	89.6	0.059	0.062	0.068	0.075	0.050	0.038	0.034	0.025	0.036	0.051	0.055	0.050	0.050	1590
0226003	115.0	0.043	0.041	0.068	0.077	0.038	0.040	0.030	0.022	0.037	0.038	0.046	0.042	0.043	1370
O2ZG002	166.0	0.063	0.050	990.0	0.092	0.049	0.036	0.028	0.020	0.035	0.048	0.050	0.053	0.049	1580
O2ZG001	205.0	0.046	0.047	0.051	0.071	0.047	0.032	0.023	0.026	0.032	0.042	0.051	0.052	0.043	1360
O2ZK001	285.0	0.052	0.049	0.047	0.055	0.036	0.024	0.018	0.021	0.026	0.040	0.051	0.052	0.039	1240
O2ZH001	764.0	0.036	0.037	0.042	0.064	0.041	0.019	0.013	0.013	0.017	0.029	0.043	0.040	0.033	1030
O2Y S003	36.7	0.022	0.029	0.035	0,061	0.043	0.020	0.012	0.014	0.018	0.029	0.034	0.027	0.029	006
O2YP001	63.8	0.018	0.012	0.030	0.070	0.093	0.029	0.012	0.016	0.015	0.016	0.019	0.014	0,029	006
O2Z3001	67.4	0.035	0.030	0.043	0.068	0.051	0.019	0.013	600'0	0.016	0.026	0.031	0.030	0.031	980
0270006	177.0	0.017	0.019	0.032	0.076	0.046	0.022	0.008	0.015	0.011	0.019	0.018	0.015	0.025	780
O2YR001	267.0	0.024	0.022	0.028	0.051	0.055	0.025	0.012	0.008	600.0	0.015	0.025	0.026	0.025	790
O2Y R002	399.0	0.025	0.022	0.030	0.059	0.041	0.013	0.005	900.0	600.0	0.017	0.022	0.023	0.023	720
O2YN002	469.0	0.040	0.027	0.028	0.092	0.120	0.045	0.019	0.024	0.021	0.032	0.053	0.042	0.045	1430
O2YR003	554.0	0.023	0.022	0.028	0.059	0.046	0.019	0.010	0.007	0.010	0.017	0.017	0.021	0.023	730
O2ZF001	1170.0	0.041	0.038	0.037	0.056	0.050	0.025	0.018	0.017	0.019	0.026	0.040	0.044	0.034	1080
O2Y S001	1290.0	0.032	0.026	0.025	0.051	0.050	0.021	0.013	0.016	0.017	0.025	0.034	0.036	0.028	006
O2ZE001	2640.0	0.037	0.031	0.031	0.047	0.061	0.032	0.019	0.015	0.015	0.022	0.039	0.041	0,033	1020
O2YQ001	4400.0	0.025	0.022	0.024	0.053	0.059	0.023	0.012	0.012	0.013	0.020	0.030	0.030	0.027	850
O2YM003	93.2	0.011	600'0	0.018	0.069	660.0	0.030	0.008	0.015	0.008	0.023	0.029	0.018	0.028	890
O2YD002	200 0	0.010	0.008	0.014	0.045	0.095	0.058	0.011	0.010	0.008	0.017	0.029	0.022	0.027	860
O2YD001	237.0	0.011	600.0	0.010	0.029	0.141	0.103	0.023	0.018	0.018	0.030	0.036	0.023	0.038	1200
O2YK005	391.0	0.016	0.013	0.017	0.047	0.093	0.036	0.016	0.015	0.011	0.022	0.027	0.021	0.028	880
O2YK002	470.0	0.027	0.017	0.019	0.050	0.094	0.045	0.020	0.022	0.024	0.038	0.046	0.034	0.037	1160
O2YK004	529.0	0.021	0.017	0.016	0.031	0.090	0.051	0.018	0.013	0.014	0.027	0.038	0.034	0.031	980
O2YF001	611.0	0.015	0.011	0.014	0.026	0.158	0.119	0.027	0.025	0.026	0.044	0.044	0.028	0.045	1420
O2YC001	624.0	0.016	0.013	0.013	0.032	0.113	660.0	0,035	0.033	0.030	0.039	0.041	0.027	0.041	1290
O2YL001	2110.0	0.020	0.018	0.019	0.049	0.119	0.074	0.023	0.019	0.025	0.040	0.045	0.030	0.039	1240
O2ZA002	72.0	0.033	0.021	0.023	0.090	0.081	0.036	0.013	0.018	0.019	0.024	0.042	0.036	0.036	1140
O2ZA003	139.0	0.052	0.026	0.037	0.134	0.101	0.058	0.027	0.034	0.040	0.044	0.071	0.062	0.057	1810
O2ZB001	205.0	0 037	0.031	0.038	0.102	0.149	0.074	0.037	0.041	0.049	0.073	0.093	0.071	990'0	2090
O22C002	230.0	0.060	0.038	0.045	0.157	0.119	0.068	0.034	0.043	0.042	0.051	0.071	0.050	0,065	2040
O2ZA001	343.0	0.030	0.018	0.029	0.070	0900	0.028	0.013	0.019	0.020	0.027	0.037	0.031	0.032	1010
0273001	640 0	0.027	0.024	0.026	0.059	0.101	0.046	0.021	0.024	0.026	0.039	0.049	0.040	0.041	1280

#### 4 REGIONAL CHARACTERISTICS OF N-DAY LOW FLOWS

For the study on minimum stream flows [1], the N-day low flows were calculated both for the summer season, which was defined as the period between and including July and December and for the winter season, which was defined as the period between and including January and June. Four durations of low flows were investigated: 1-day, 7-day, 15-day and 30-day.

The average unit mean low flows during the winter and summer seasons for four geographical regions of the Island are shown in Table 4.

Table 4 Average Regional Mean N-Day Low Flows Per Unit Area

	Winter	Winter	Summer	Summer
	1-day	30-day	1-day	30-day
	l/s/km <sup>2</sup>	l/s/km <sup>2</sup>	l/s/km <sup>2</sup>	l/s/km <sup>2</sup>
Avalon & Burin	8.4	20.0	5,4	11.0
Central	6.5	11.5	3,1	5
Northern Pen.	4.8	6.8	4.7	7.3
Southwest Region	5.4	12.6	5.1	10.5

It is apparent that in most areas summer unit mean low flows are lower than winter unit mean low flows. Also, the summer unit mean low flows are lowest in the central region of the Island and highest in the eastern part of the Island. For the purposes of this guide only the results pertaining to the summer low flows will be presented, however, the frequency estimates of winter low flows are provided in the main report [1].

#### 5 FREQUENCY ESTIMATES OF N-DAY LOW FLOWS

Calculated summer low flows of four durations (1-day, 7-day, 15-day and 30-day) and for the period of record were used as input data into the Low Flow Frequency Analysis (LFA) computer program [4] to obtain estimates of low flows with various return periods. The LFA program uses the Gumbel Type III probability density function to statistically model low flows. The summer low flow estimates with return periods 2, 5, 10, 20 and 50 years are shown in Table 5 (1-day), Table 6 (7-day), Table 7 (15-day) and Table 8 (30-day).

Table 5 Frequency Estimates of Summer 1-day Low Flows

Station	Drainage Area	Probability	MEAN	.20	.50	.010	020	.090
Number	(km <sup>2</sup> )	Density Function*	(m°3/s)	(m°3/s)	(m <sup>-3/s</sup> )	(m,3/s)	(m <sup>+</sup> 3/s)	(m-3/s)
02ZM006	3.9	≡ છ	0.01	0.007	0.004	0.002	0.001	0.000
02ZL003	10.8	III 9	0.04	0.022	600.0	900 0	9000	0.005
02ZG004	42.7	G III	0.14	0.144	0.089	0.058	0.032	0.002
02ZH002	43.3	≡ 9	0.15	0.103	0.037	0.021	0.013	600.0
02ZN001	53.3	III 9	0.55	0.555	0.395	0.315	0.253	0.190
02ZM009	53.6	G III	0.46	0.450	0.274	0.195	0.139	0.087
02ZK002	89.6	III 5	0.57	0.523	0.310	0.230	0.180	0.141
02ZG003	115	≡ 5	0.38	0.365	0.210	0.141	0.092	0.047
02ZG002	166	CI E	1.17	1.017	0.584	0.441	0.360	0.301
02ZG001	205	⊞ 9	1.38	1.323	0.746	0.491	0.310	0.145
02ZK001	285	III 5	1.23	1.068	0.575	0.410	0.316	0.248
02ZH001	764	III 5	2.67	2.327	1.103	0.670	0.414	0.219
02YS003	36.7	III. S	01.0	080 0	0.041	0.030	0.024	0.020
02YP001	63.8	Ⅲ 9	0.17	0.181	0.095	0.041	0.000	0000
02ZJ001	67.4	III S	0.13	720.0	0.020	600'0	0.004	0.002
02YO006	177	E 5	0.35	0.350	0.235	0.180	0.138	0.098
02YR001	267	≣ 5	1.00	0.866	0.423	0.272	0.184	0.119
02YR002	399	(G III	0.67	0.368	0.092	0,040	0.021	0.012
02YN002	469	E S	2.74	2.373	1.922	1.821	1.778	1,756
02YR003	554	<b>⊞ 5</b>	2.34	2.408	1.257	0.624	0.098	0.000
02ZF001	1170	≣ છ	9.41	9 259	6.011	4.463	3,310	2.186
02YS001	1290	G III	7.12	6,287	3.703	2.824	2.317	1.944
02ZE001	2640	<b>■</b> 9	17.82	16.450	9.239	6.403	4.579	3.065
02YQ001	4400	₩ 5	22.10	20.070	11,050	7.658	5.547	3.858
02YM003	93,2	≣ 9	60'0	0.053	0.011	0.002	0.000	0.000
02YD002	200	<b>■</b> 9	99.0	0.385	0.089	0.029	0.005	0.000
02YD001	237	≡ 9	1.10	1.100	0.789	0.631	0.507	0.379
02YK005	391	€ 5	2.16	2,053	1.285	0.967	0.753	0.568
02YK002	470	≣ 5	3.17	2.988	1.961	1,552	1.286	1.062
02YK004	629	≡ 5	3.87	3.688	2.517	2.038	1.721	1.450
02YF001	611	≡ 5	2.60	2.527	1,604	1.192	0.901	0.632
02YC001	624	III 5	7.11	6.951	5.277	4.543	4.031	3.567
02YL001	2110	E 5	9.27	8,359	4,866	3.618	2.871	2.298
02ZA002	72	E 5	0.26	0.277	0.185	0.128	0.075	0.010
02ZA003	139	≡ 5	1.02	0.888	0.671	0.613	0.586	0.570
02ZB001	205	G III	1.05	0.980	0,635	0.503	0.420	0.352
02ZC002	230	₩ 5	1.17	0.933	0.565	0.471	0.427	0.405
02ZA001	343	E 5	1.52	1.462	1.104	0.961	0.868	0.790
027,3001	640	₩ 9	5.68	5,411	3,541	2.767	2.250	1.803

· Notes

O2, O5, O10, O20, Q50 = Low Flows for Return Periods of 2, 5, 10, 20, 50 Years, Respectively. Probability Density Function = G III. Gumbel Type III

Table 6 Frequency Estimates of Summer 7-day Low Flows

Mumbber         (m² 4)         (m² 34)         (m² 34) <th< th=""><th>Station</th><th>Drainage Area</th><th>Probability</th><th>MEAN</th><th>.20</th><th>.50</th><th>010</th><th>020</th><th>050</th></th<>	Station	Drainage Area	Probability	MEAN	.20	.50	010	020	050
39         GIII         0.01         0.009         0.004         0.002         0.001           427         GIII         0.05         0.028         0.013         0.010         0.008           427         GIII         0.18         0.136         0.024         0.001         0.008           433         GIII         0.18         0.136         0.024         0.028         0.028           536         GIII         0.63         0.634         0.349         0.034         0.028           536         GIII         0.63         0.634         0.349         0.034         0.028           116         GIII         0.74         0.644         0.349         0.028         0.028           206         GIII         0.74         0.644         0.70         0.043         0.028           206         GIII         0.74         0.71         0.70         0.208         0.028         0.028           206         GIII         1.32         1.274         0.769         0.647         0.769         0.708         0.708           210         GIII         1.52         1.474         0.769         0.648         0.748         0.748 <td< th=""><th>Number</th><th>(km<sup>2</sup>)</th><th>Density Function*</th><th>(m,3/s)</th><th>(m-3/s)</th><th>(m-3/s)</th><th>(m°3/s)</th><th>(m-3/s)</th><th>(m-3/s)</th></td<>	Number	(km <sup>2</sup> )	Density Function*	(m,3/s)	(m-3/s)	(m-3/s)	(m°3/s)	(m-3/s)	(m-3/s)
10.8         GIII         0.05         0.028         0.013         0.010         0.008           4.2.7         GIII         0.19         0.196         0.013         0.014         0.008           4.2.7         GIII         0.19         0.196         0.054         0.037         0.026           5.3.6         GIII         0.63         0.625         0.441         0.246         0.026           5.3.6         GIII         0.70         0.641         0.236         0.027         0.026           1.15         GIII         0.70         0.441         0.296         0.226         0.126           2.05         GIII         0.70         0.447         0.296         0.226         0.126           2.05         GIII         1.50         1.274         0.796         0.202         0.126           2.06         GIII         1.50         1.274         0.766         0.245         0.436           2.06         GIII         1.50         1.274         0.766         0.436         0.446         0.286         0.478           2.07         GIII         0.12         0.744         0.764         0.764         0.764         0.764         0.764 <td< td=""><td>02ZM006</td><td>3.9</td><td>= 5</td><td>0.01</td><td>600.0</td><td>0.004</td><td>0.005</td><td>0.001</td><td>0000</td></td<>	02ZM006	3.9	= 5	0.01	600.0	0.004	0.005	0.001	0000
427         GIII         0.18         0.124         0.081         0.043         0.043           5.3.3         GIII         0.18         0.136         0.058         0.027         0.026           5.3.3         GIII         0.63         0.624         0.441         0.049         0.028           5.3.5         GIII         0.63         0.641         0.370         0.286         0.027           1.16         GIII         0.47         0.47         0.47         0.296         0.202         0.128           2.65         GIII         1.53         1.210         0.711         0.296         0.202         0.128           2.65         GIII         1.53         1.210         0.714         0.645         0.202         0.128           2.65         GIII         1.56         1.274         0.646         0.267         0.402         0.202           2.64         GIII         0.16         0.084         0.024         0.734         0.739           3.67         GIII         0.16         0.084         0.024         0.724         0.739           4.65         GIII         0.10         0.024         0.724         0.741         0.744         0.7	02ZL003	10.8	III 9	90.0	0.028	0.013	0.010	600.0	0.009
43.3         GIII         0.18         0.185         0.058         0.037         0.026           53.3         GIII         0.63         0.625         0.41         0.349         0.278           53.6         GIII         0.63         0.634         0.238         0.248         0.18           115         GIII         0.70         0.641         0.370         0.268         0.128           116         GIII         1.33         1.210         0.711         0.268         0.028           205         GIII         1.33         1.210         0.711         0.268         0.028           205         GIII         1.33         1.210         0.711         0.268         0.012           205         GIII         1.33         1.210         0.711         0.268         0.517         0.128           206         GIII         1.22         2.627         1.243         0.761         0.738           574         GIII         0.16         0.042         0.028         0.028         0.028           674         GIII         0.16         0.042         0.721         0.028         0.028           674         GIII         0.16 <t< td=""><td>)2ZG004</td><td>42.7</td><td>G III</td><td>0.19</td><td>0.196</td><td>0.124</td><td>0.081</td><td>0.043</td><td>0000</td></t<>	)2ZG004	42.7	G III	0.19	0.196	0.124	0.081	0.043	0000
53.3         GIII         0.63         0.625         0.441         0.349         0.278           83.6         GIII         0.53         0.634         0.336         0.236         0.164           83.6         GIII         0.77         0.641         0.370         0.643         0.236         0.164           115         GIII         0.47         0.477         0.711         0.526         0.128           205         GIII         1.58         1.474         0.796         0.525         0.403           226         GIII         1.58         1.274         0.766         0.527         0.403           226         GIII         0.12         0.771         0.765         0.439         0.783         0.783           286         GIII         0.12         0.147         0.764         0.783         0.478           574         GIII         0.20         0.201         0.466         0.202         0.478           674         GIII         0.10         0.402         0.204         0.026         0.203           674         GIII         0.10         0.402         0.204         0.028         0.204           674         GIII	22H002	43,3	G III	0.18	0.136	0.058	0.037	0.026	0.020
53.6         G III         0.63         0.634         0.338         0.236         0.164           115         G III         0.77         0.417         0.370         0.268         0.205           116         G III         0.77         0.477         0.370         0.208         0.205           226         G III         1.33         1.210         0.711         0.525         0.408           286         G III         1.58         1.210         0.711         0.525         0.408           286         G III         1.58         1.210         0.711         0.525         0.408           286         G III         1.58         1.214         0.786         0.517         0.408           387         G III         0.12         0.764         0.478         0.478         0.478           464         G III         0.12         0.104         0.056         0.020         0.026           574         G III         0.12         0.447         0.448         0.486         0.438           574         G III         0.12         0.462         0.274         0.296         0.026           574         G III         0.142         0.477 <td>02ZN001</td> <td>53.3</td> <td>111.5</td> <td>0.63</td> <td>0.625</td> <td>0.441</td> <td>0.349</td> <td>0.278</td> <td>0.205</td>	02ZN001	53.3	111.5	0.63	0.625	0.441	0.349	0.278	0.205
38 6         G III         0.70         0.641         0.370         0.268         0.205           115         G III         0.47         0.268         0.202         0.128           226         G III         1.58         1.210         0.711         0.625         0.408           226         G III         1.58         1.474         0.796         0.517         0.309           226         G III         1.50         1.274         0.796         0.517         0.408           744         G III         1.50         1.274         0.796         0.517         0.408           554         G III         0.12         0.104         0.054         0.039         0.026           674         G III         0.20         0.024         0.026         0.026         0.026           674         G III         0.40         0.402         0.274         0.226         0.068           674         G III         0.40         0.402         0.274         0.212         0.108           177         G III         0.40         0.402         0.274         0.212         0.108           1789         G III         0.40         0.402         0.274 <td>92ZM009</td> <td>53.6</td> <td>II 5</td> <td>0.53</td> <td>0.534</td> <td>0.338</td> <td>0.236</td> <td>0.154</td> <td>0.067</td>	92ZM009	53.6	II 5	0.53	0.534	0.338	0.236	0.154	0.067
115         G III         0.47         0.206         0.202         0.128           206         G III         1.33         1.210         0.711         0.525         0.408           206         G III         1.50         1.210         0.711         0.525         0.408           205         G III         1.50         1.274         0.676         0.517         0.339           285         G III         0.12         2.667         1.243         0.761         0.339           958         G III         0.12         2.667         1.243         0.761         0.339           674         G III         0.16         0.004         0.054         0.058         0.078           674         G III         0.16         0.094         0.056         0.013         0.008           674         G III         0.10         0.094         0.026         0.012         0.013           674         G III         0.10         0.034         0.026         0.013         0.013           1170         G III         1.042         0.046         0.024         0.026         0.014           1170         G III         1.026         0.046         0.024<	32ZK002	89.6	111 5	0.70	0.641	0.370	0.268	0.205	0.154
166         G III         133         1210         0711         0.525         0.408           205         G III         1.58         1.474         0.796         0.517         0.330           205         G III         1.58         1.474         0.796         0.517         0.330           764         G III         3.02         2.677         1.243         0.761         0.435           87.4         G III         0.12         0.104         0.654         0.036         0.026           177         G III         0.16         0.924         0.026         0.013         0.006           177         G III         0.16         0.026         0.274         0.026         0.026           267         G III         0.402         0.274         0.212         0.066           177         G III         0.402         0.274         0.212         0.066           267         G III         0.402         0.274         0.212         0.106           177         G III         0.402         0.274         0.212         0.106           177         G III         0.733         0.456         0.274         0.126           171	5ZG003	115	III 5	0.47	0.477	0.296	0.202	0.128	0.051
205         G III         1.58         1474         0.796         0.517         0.330           285         G III         1.50         1274         0.676         0.485         0.379           784         G III         3.02         2.627         1.243         0.745         0.478           387         G III         0.12         0.104         0.054         0.059         0.008           654         G III         0.12         0.104         0.056         0.009         0.008           177         G III         0.10         0.059         0.020         0.013         0.008           287         G III         0.10         0.046         0.020         0.013         0.008           489         G III         0.03         0.046         0.020         0.008         0.008           1170         G III         0.73         0.466         0.026         0.008         0.008           1170         G III         1.02         0.466         0.026         0.008         0.008           1170         G III         1.012         9.40         6.488         0.482         0.614           1170         G III         1.022         2.641 </td <td>12ZG002</td> <td>166</td> <td>III 5</td> <td>1,33</td> <td>1.210</td> <td>0.711</td> <td>0.525</td> <td>0.408</td> <td>0.317</td>	12ZG002	166	III 5	1,33	1.210	0.711	0.525	0.408	0.317
285         G III         1.50         1.274         0.676         0.485         0.379           367         G III         0.12         2.647         1.243         0.761         0.478           367         G III         0.12         0.104         0.056         0.028         0.028           67.4         G III         0.16         0.094         0.026         0.013         0.008           67.4         G III         0.16         0.094         0.026         0.013         0.008           67.4         G III         0.10         0.026         0.013         0.008           267         G III         0.10         0.026         0.013         0.008           469         G III         0.73         0.417         0.13         0.024         0.026           1170         G III         0.73         0.448         0.246         0.246         0.024         0.024           1170         G III         1.012         9.440         0.488         0.024         0.024         0.024           1170         G III         1.012         9.44         1.488         0.727         0.186           264         G III         1.220         0.1	12ZG001	205	G III	1,58	1.474	0.796	0.517	0.330	0.169
764         G III         302         2.627         1.243         0.761         0.478           5367         G III         0.12         0.104         0.054         0.038         0.029           673         G III         0.12         0.104         0.056         0.038         0.008           673         G III         0.16         0.094         0.026         0.012         0.006           177         G III         0.16         0.042         0.274         0.212         0.006           267         G III         0.10         0.042         0.274         0.226         0.006           267         G III         0.73         0.447         0.113         0.026         0.026           469         G III         1.012         0.447         0.113         0.024         0.026           1170         G III         1.012         0.447         0.113         0.024         0.026         0.026           1170         G III         1.012         0.447         0.113         0.024         0.024         0.026         0.026           1290         G III         1.012         0.447         0.113         0.024         0.024         0.024	12ZK001	285	III 5	1.50	1.274	9290	0.485	0.379	0.305
36.7         G III         0.12         0.104         0.054         0.038         0.029           67.4         G III         0.20         0.201         0.050         0.006           67.4         G III         0.20         0.201         0.050         0.006           67.4         G III         0.40         0.402         0.274         0.013         0.006           2.67         G III         0.40         0.402         0.274         0.013         0.008           2.67         G III         0.40         0.402         0.274         0.212         0.008           2.67         G III         0.40         0.456         0.296         0.008           4.69         G III         0.73         0.417         0.113         0.024         0.026           1.70         G III         1.012         9.40         6.468         4.826         2.813           1.20         G III         1.012         9.40         6.468         4.826         2.813           1.20         G III         1.012         9.40         6.468         4.826         2.813           1.20         G III         1.012         9.40         6.468         4.826 <t< td=""><td>12ZH001</td><td>764</td><td>111.9</td><td>3.02</td><td>2.627</td><td>1.243</td><td>0.761</td><td>0.478</td><td>0.265</td></t<>	12ZH001	764	111.9	3.02	2.627	1.243	0.761	0.478	0.265
63.8         G III         0.20         0.201         0.103         0.060         0.006           177         G III         0.16         0.094         0.026         0.013         0.008           267         G III         0.16         0.094         0.026         0.013         0.008           267         G III         0.73         0.417         0.113         0.026         0.206           399         G III         0.73         0.417         0.113         0.054         0.031           469         G III         0.73         0.417         0.113         0.054         0.031           1170         G III         1.282         2.568         2.077         1.964         1.916           1170         G III         1.252         2.641         1.429         0.024         0.031           1280         G III         1.884         17.140         9.651         6.827         6.067           250         G III         1.884         17.140         9.651         6.024         0.024           4400         G III         1.24         1.220         0.849         0.644         0.024           250         G III         0.742 <t< td=""><td>2YS003</td><td>36.7</td><td>III 9</td><td>0.12</td><td>0.104</td><td>0.054</td><td>0.038</td><td>0.029</td><td>0.023</td></t<>	2YS003	36.7	III 9	0.12	0.104	0.054	0.038	0.029	0.023
67.4         GIIII         0.16         0.094         0.026         0.013         0.008           177         GIII         0.40         0.402         0.274         0.012         0.166           394         GIII         0.43         0.456         0.296         0.205           399         GIII         0.73         0.417         0.13         0.034           469         GIII         2.92         2.568         2.077         1.964         1.916           554         GIII         2.92         2.641         1.429         0.727         0.031           170         GIII         10.12         2.940         6.468         4.826         3.613           1290         GIII         10.12         2.940         6.468         4.826         2.571           2640         GIII         10.12         9.940         6.468         4.826         2.571           2640         GIII         1.884         17.140         9.651         6.027         0.120           2640         GIII         1.884         17.140         9.651         6.027         0.020           270         GIII         1.220         0.144         0.044         0.044 <td>12YP001</td> <td>63.8</td> <td></td> <td>0.20</td> <td>0.201</td> <td>0.103</td> <td>0.050</td> <td>900.0</td> <td>0000</td>	12YP001	63.8		0.20	0.201	0.103	0.050	900.0	0000
177         G III         0.40         0.402         0.274         0.212         0.166           267         G III         1.10         0.935         0.456         0.296         0.205           498         G III         2.52         2.548         2.077         1.964         1.916           554         G III         2.52         2.641         1.429         0.727         0.031           1290         G III         10.12         9.940         6.468         4.826         2.571           2640         G III         10.12         9.940         6.468         4.826         2.571           2640         G III         10.12         9.940         6.468         4.826         2.571           2640         G III         10.12         9.940         6.468         4.826         2.571           4400         G III         1.84         17.140         9.651         6.827         5.067           4400         G III         0.74         0.453         0.124         0.054         0.024           200         G III         0.74         0.453         0.124         0.054         0.024           470         G III         4.161 <t< td=""><td>12ZJ001</td><td>67.4</td><td>= B</td><td>0.16</td><td>0.094</td><td>0.026</td><td>0.013</td><td>0.008</td><td>0.005</td></t<>	12ZJ001	67.4	= B	0.16	0.094	0.026	0.013	0.008	0.005
267         G III         1.10         0.935         0.466         0.296         0.205           399         G III         0.73         0.417         0.113         0.054         0.031           469         G III         2.92         2.568         2.077         1.964         1.916           1750         G III         10.12         9.940         6.468         4.826         3.613           1290         G III         10.12         9.940         6.468         4.826         3.613           1290         G III         10.12         9.940         6.468         4.826         2.571           1290         G III         10.12         9.940         6.468         4.826         2.571           4400         G III         18.84         17.140         9.651         6.827         5.067           4400         G III         0.11         0.083         0.014         0.004         0.000           200         G III         0.74         0.483         0.014         0.004         0.000           301         G III         1.24         1.240         1.746         0.054         0.024           470         G III         1.24 <t< td=""><td>12YO006</td><td>171</td><td>E 5</td><td>0.40</td><td>0,402</td><td>0.274</td><td>0.212</td><td>0.166</td><td>0.120</td></t<>	12YO006	171	E 5	0.40	0,402	0.274	0.212	0.166	0.120
399         G III         0,73         0,417         0,113         0,054         0,031           469         G III         2,82         2,58         2,077         1,964         1,916           554         G III         10,12         9,940         6,468         4,826         3,613           1170         G III         10,12         9,940         6,468         4,826         2,571           290         G III         10,12         9,940         6,468         4,826         3,613           290         G III         10,12         9,940         6,468         4,826         2,571           2940         G III         1,844         17,140         9,651         6,277         5,067           4400         G III         0,11         0,063         0,014         0,004         0,000           200         G III         0,74         0,453         0,124         0,054         0,000           201         G III         0,74         0,453         0,124         0,054         0,000           470         G III         1,220         0,849         0,674         0,624         0,639           470         G III         4,14         3	12YR001	267	111 5	1.10	0.935	0.456	0.296	0.205	0.139
469         G III         2 92         2 558         2 077         1.964         1.916           554         G III         2 52         2 641         1.429         0.727         0.120           170         G III         10.12         9 940         6 468         4 826         3 613           1290         G III         18 84         17.140         9 651         6 827         5.067           2640         G III         18 84         17.140         9 651         6 827         5.067           4400         G III         0.11         0.01         0.004         0.004         0.004           200         G III         0.74         0.453         0.124         0.054         0.024           200         G III         0.74         0.453         0.124         0.054         0.004           200         G III         0.74         0.453         0.124         0.054         0.004           201         G III         1.24         1.220         0.849         0.672         0.819           470         G III         1.24         1.246         1.246         1.246         1.246           529         G III         1.24         2.2	27 H002	399	G III	0.73	0.417	0.113	0.054	0.031	0.021
554         G III         2.52         2.641         1.429         0.727         0.120           1170         G III         10.12         9.940         6.468         4.826         3.613           1290         G III         18.84         17.140         9.651         6.827         5.067           2640         G III         18.84         17.140         9.651         6.827         5.067           4400         G III         23.53         21.240         11.700         8.179         6.020           200         G III         0.74         0.463         0.014         0.064         0.000           200         G III         0.74         0.453         0.124         0.674         0.024           237         G III         0.74         0.453         0.124         0.054         0.000           391         G III         1.24         1.220         0.849         0.672         0.819           470         G III         3.54         3.23         2.154         1.035         0.819           529         G III         4.14         3.977         2.194         1.213         0.837           611         G III         1.056 <t< td=""><td>27 N002</td><td>469</td><td>III 9</td><td>2.92</td><td>2.558</td><td>2,077</td><td>1.964</td><td>1.916</td><td>1.889</td></t<>	27 N002	469	III 9	2.92	2.558	2,077	1.964	1.916	1.889
1170         G III         10 12         9 940         6.468         4.826         3.613           1290         G III         8.03         7.333         4.363         3.266         2.571           2640         G III         18.84         17.140         9.651         6.827         5.067           4400         G III         23.53         21.240         11.700         8.179         6.020           93.2         G III         0.74         0.063         0.014         0.004         0.004           200         G III         0.74         0.053         0.014         0.004         0.024           230         G III         0.74         0.054         0.024         0.024           237         G III         0.74         0.054         0.024         0.024           470         G III         1.24         1.220         0.049         0.672         0.539           529         G III         4.14         3.977         2.194         1.394         1.399           529         G III         7.50         7.280         5.538         4.801         4.302           2110         G III         10.51         9.340         5.709         <	12YR003	554	<b>⊞</b> 9	2.52	2.641	1.429	0.727	0.120	0000
1290         G III         8 03         7,333         4,363         3.256         2,571           2640         G III         18 84         17,140         9 651         6 827         5.067           4400         G III         23.53         21,240         11,700         8.179         6.020           93.2         G III         0.043         0.014         0.004         0.000           200         G III         0.74         0.453         0.014         0.004         0.000           237         G III         1.24         1.220         0.849         0.672         0.639           391         G III         1.24         1.220         0.849         0.672         0.639           470         G III         4.14         3.977         2.194         1.394         1.399           529         G III         4.14         3.977         2.192         1.894         1.399           611         G III         10.51         9.340         5.739         4.487         3.788           72         G III         10.51         9.340         5.799         4.487         3.788           72         G III         1.18         1.018	12ZF001	1170	III 9	10.12	9.940	6.468	4.826	3.613	2.437
2640         GIII         18 84         17,140         9.651         6.827         5.067           4400         GIII         23.53         21.240         11.700         8.179         6.020           93.2         GIII         0.11         0.063         0.014         0.004         0.000           200         GIII         0.74         0.453         0.014         0.004         0.000           200         GIII         0.74         0.453         0.014         0.004         0.000           200         GIII         1.24         1.220         0.849         0.672         0.639           470         GIII         2.36         2.212         1.369         1.035         0.819           470         GIII         4.14         3.977         2.146         1.694         1.399           529         GIII         4.14         3.977         2.192         1.837           611         GIII         1.051         9.340         5.739         4.487         3.788           72         GIII         1.051         9.340         5.709         4.487         3.78           139         GIII         1.18         1.018         0.749	12YS001	1290	III 9	8.03	7.333	4.363	3.256	2.571	2.028
4400         G III         23.53         21.240         11.700         8.179         6.020           93.2         G III         0.11         0.063         0.014         0.004         0.000           200         G III         0.74         0.453         0.124         0.054         0.004           200         G III         1.24         1.220         0.849         0.672         0.639           391         G III         2.36         2.212         1.369         0.672         0.539           470         G III         2.36         2.212         1.369         0.672         0.819           529         G III         4.14         3.977         2.719         2.192         1.399           529         G III         4.14         3.977         2.719         2.192         1.837           611         G III         7.50         7.280         5.538         4.801         4.302           72         G III         10.51         9.340         5.709         4.487         3.788           72         G III         1.18         1.018         0.597         0.596           72         G III         1.35         1.216         0.777 </td <td>2ZE001</td> <td>2640</td> <td>III 5</td> <td>18.84</td> <td>17.140</td> <td>9.651</td> <td>6.827</td> <td>5.067</td> <td>3.656</td>	2ZE001	2640	III 5	18.84	17.140	9.651	6.827	5.067	3.656
93.2         G III         0.11         0.063         0.014         0.004         0.000           200         G III         0.74         0.453         0.124         0.054         0.024           237         G III         1.24         1.220         0.849         0.672         0.539           391         G III         2.36         2.212         1.369         1.035         0.819           470         G III         3.54         3.323         2.154         1.694         1.399           529         G III         4.14         3.977         2.719         2.192         1.837           611         G III         4.14         3.977         2.719         2.192         1.837           624         G III         7.50         7.280         5.538         4.801         4.302           72         G III         10.51         9.340         5.709         4.487         3.788           72         G III         10.51         9.340         5.709         4.487         3.788           72         G III         1.18         1.018         0.211         0.155         0.105           230         G III         1.45         1.215	12YQ001	4400	≡ 5	23.53	21.240	11.700	8.179	6.020	4.319
200         G III         0.74         0.453         0.124         0.054         0.024           237         G III         1.24         1.220         0.849         0.672         0.539           391         G III         2.36         2.212         1.369         1.035         0.819           470         G III         3.54         3.323         2.164         1.694         1.399           529         G III         4.14         3.977         2.719         2.192         1.837           611         G III         4.14         3.977         2.719         2.192         1.837           624         G III         7.50         7.280         5.538         4.801         4.302           72         G III         10.51         9.340         5.709         4.487         3.788           72         G III         10.51         9.340         5.709         4.487         3.788           72         G III         1.18         1.018         0.211         0.155         0.105           139         G III         1.18         1.216         0.777         0.656         0.597         0.510           230         G III         1.45	2YM003	93.2	III 5	0.11	0.063	0.014	0.004	0.000	0.000
237         G III         1.24         1.220         0.849         0.672         0.539           391         G III         2.36         2.212         1.369         1.035         0.819           470         G III         3.54         3.323         2.164         1.694         1.399           529         G III         4.14         3.977         2.719         2.192         1.837           611         G III         4.14         3.977         2.719         2.192         1.837           624         G III         7.50         7.280         5.538         4.801         4.302           72         G III         10.51         9.340         5.709         4.487         3.788           72         G III         10.51         9.340         5.709         4.487         3.788           72         G III         1.18         1.018         0.211         0.155         0.105           139         G III         1.18         1.219         0.749         0.597         0.510           230         G III         1.45         1.215         0.777         0.656         0.596           343         G III         6.43         5.901	2YD002	200	≡ 5	0.74	0.453	0.124	0.054	0.024	0.010
391         G III         2.36         2.212         1.369         1.035         0.819           470         G III         3.54         3.323         2.164         1.694         1.399           529         G III         4.14         3.977         2.719         2.192         1.837           611         G III         7.50         7.280         5.538         4.801         4.302           2110         G III         10.51         9.340         5.709         4.487         3.788           72         G III         10.51         9.340         5.709         4.487         3.788           72         G III         10.51         9.340         5.709         4.487         3.788           72         G III         1.18         1.018         0.211         0.155         0.105           139         G III         1.35         1.200         0.749         0.597         0.510           230         G III         1.45         1.215         0.777         0.656         0.596           343         G III         6.43         5.901         4.161         3.563         3.215	2YD001	237	≡5	1.24	1.220	0.849	0.672	0.539	0.410
470         G    1         3.54         3.323         2.154         1.694         1.399           529         G    1         4.14         3.977         2.719         2.192         1.837           611         G    3.05         2.943         1.746         1.213         0.637           624         G    3.05         2.943         1.746         1.213         0.637           210         G    1         7.50         7.280         5.538         4.801         4.302           2210         G    1         10.51         9.340         5.709         4.487         3.788           72         G    1         0.29         0.304         0.211         0.155         0.105           139         G    1.18         1.018         0.830         0.789         0.772           205         G    1.35         1.200         0.749         0.597         0.510           230         G    1.45         1.215         0.777         0.656         0.596           343         G    1.69         1.69         1.69         1.042         0.950           640         G    1         6.43         5.901         4.161         3.563         3.215	2YK005	391	II 5	2.36	2.212	1.369	1.035	0.819	0.639
529         G III         4.14         3.977         2.719         2.192         1.837           611         G III         3.05         2.943         1.746         1.213         0.837           624         G III         7.50         7.280         5.638         4.801         4.302           2110         G III         10.51         9.340         5.709         4.487         3.788           72         G III         10.51         9.340         0.211         0.156         0.105           139         G III         1.18         1.018         0.830         0.789         0.772           205         G III         1.35         1.200         0.749         0.597         0.510           230         G III         1.45         1.215         0.777         0.656         0.596           343         G III         6.43         5.901         4.161         3.563         3.215	27K002	470	E 9	3.54	3.323	2.154	1.694	1.399	1,153
611         G III         3.05         2.943         1.746         1.213         0.837           624         G III         7.50         7.280         5.538         4.801         4.302           2110         G III         10.51         9.340         5.709         4.487         3.788           72         G III         10.51         9.340         5.709         4.487         3.788           205         G III         1.18         1.018         0.830         0.789         0.705           206         G III         1.35         1.200         0.749         0.597         0.510           230         G III         1.45         1.215         0.777         0.656         0.596           343         G III         6.43         5.901         4.161         3.563         3.215	2YK004	529	≡ 5	4.14	3.977	2.719	2.192	1.837	1.525
624         G III         7.50         7.280         5.538         4.801         4.302           2110         G III         10.51         9.340         5.709         4.487         3.788           72         G III         0.29         0.304         0.211         0.155         0.105           139         G III         1.18         1.018         0.830         0.789         0.772           205         G III         1.35         1,200         0.749         0.597         0.510           230         G III         1.45         1,215         0.777         0.656         0.596           343         G III         6.43         5.901         4.161         3.563         3.215	2YF001	611	≡5	3.05	2.943	1.746	1.213	0.837	0.490
2110         G III         10.51         9.340         5.709         4.487         3.788           72         G III         0.29         0.304         0.211         0.155         0.105           139         G III         1.18         1.018         0.830         0.789         0.772           205         G III         1.35         1.200         0.749         0.597         0.510           230         G III         1.45         1.215         0.777         0.656         0.596           343         G III         1.66         1.569         1.189         1.042         0.950           640         G III         6.43         5.901         4.161         3.563         3.215	2YC001	624	≡ છ	7.50	7.280	5.538	4.801	4.302	3.861
72 G III 0.29 0.304 0.211 0.155 0.105 139 G III 1.18 1.018 0.830 0.789 0.772 205 G III 1.35 1.200 0.749 0.597 0.510 230 G III 1.45 1.215 0.777 0.656 0.596 343 G III 1.65 1.569 1.189 1.042 0.950 640 G III 6.43 5.901 4.161 3.563 3.215	2YL001	2110	<b>⊞</b> 5	10.51	9.340	5.709	4.487	3.788	3.278
139         G III         1.18         1.018         0.830         0.789         0.772           205         G III         1.35         1.200         0.749         0.597         0.510           230         G III         1.45         1.215         0.777         0.656         0.596           343         G III         1.65         1.569         1.189         1.042         0.950           640         G III         6.43         5.901         4.161         3.563         3.215	2ZA002	72	≡ 5	0.29	0.304	0.211	0.155	0.105	0.045
205     G III     1.35     1,200     0.749     0.597     0.510       230     G III     1,45     1,215     0.777     0.656     0.596       343     G III     1.65     1,189     1,042     0.950       640     G III     6.43     5,901     4,161     3,563     3,215	2ZA003	139	≣ 9	1.18	1.018	0.830	0.789	0.772	0.763
230 G III 1,45 1,215 0,777 0,656 0,596 343 G III 1,65 1,569 1,189 1,042 0,950 640 G III 6,43 5,901 4,161 3,563 3,215	12ZB001	205	III 9	1.35	1,200	0.749	0.597	0.510	0.446
343 G III 1.65 1.569 1.189 1.042 0.950 640 G III 6.43 5.901 4.161 3.563 3.215	2ZC002	230	III 9	1,45	1,215	0.777	0.656	0.596	0.559
640 GIII 6.43 5.901 4.161 3.563 3.215	12ZA001	343	≣ 9	1.65	1.569	1.189	1.042	0.950	0.874
	2YJ001	640	II 9	6.43	5.901	4.161	3.563	3.215	2.958

\* Notes

Q2, Q5, Q10, Q20, Q50 = Low Flows for Return Periods of 2, 5, 10, 20, 50 Years, Respectively. Probability Density Function = G III : Gumbel Type III

Table 7 Frequency Estimates of Summer 15-day Low Flows

r. (km.2)         Danisity Function*         (m.34s)         (m.34s) <th>r         (im. 34)         (i</th> <th>Station</th> <th>Drainage Area</th> <th>Probability</th> <th>MEAN</th> <th>02.</th> <th>.50</th> <th>010</th> <th>020</th> <th>.050</th>	r         (im. 34)         (i	Station	Drainage Area	Probability	MEAN	02.	.50	010	020	.050
3.9         GIIII         0.01         0.011         0.005         0.007         0.007         0.001         0.013           10.8         GIII         0.26         0.037         0.017         0.014         0.013           4.3.3         GIII         0.25         0.260         0.076         0.045         0.014         0.059           5.3.6         GIII         0.23         0.178         0.076         0.080         0.006         0.017         0.014         0.014         0.059           1.15         GIII         0.84         0.640         0.448         0.288         0.210         0.014	3.9         GIIII         0.01         0.011         0.005         0.007         0.005           10.8         GIII         0.06         0.037         0.017         0.014         0.013           43.7         GIII         0.25         0.260         0.078         0.046         0.035           53.3         GIII         0.23         0.778         0.076         0.046         0.036           53.6         GIII         0.64         0.629         0.405         0.289         0.314           115         GIII         0.62         0.629         0.401         0.286         0.206           115         GIII         1.62         1.431         0.888         0.627         0.737           205         GIII         1.67         1.745         0.884         0.276         0.737           206         GIII         1.67         1.745         0.824         0.586         0.737           206         GIII         1.87         1.745         0.834         0.734         0.734           207         GIII         0.15         0.72         0.72         0.740         0.73         0.747           206         GIII         0.13         <	Number	(km <sup>-</sup> 2)	Density Function*	(m-3/s)	(m-3/s)	(m°3/s)	(m,3/s)	(m°3/s)	(m°3/s)
10.8         G III         0.06         0.037         0.017         0.014         0.013           4.2.7         G III         0.25         0.280         0.163         0.017         0.058           4.3.7         G III         0.23         0.178         0.078         0.048         0.048           5.3.6         G III         0.04         0.040         0.049         0.049         0.049         0.049           5.3.6         G III         0.04         0.040         0.049         0.049         0.049         0.049           1.15         G III         0.04         0.040         0.049         0.04	10.8         G1II         0.06         0.037         0.017         0.014         0.013           4.3.7         GIII         0.25         0.784         0.018         0.049         0.054           4.3.3         GIII         0.25         0.786         0.078         0.049         0.034           5.3.6         GIII         0.24         0.728         0.078         0.036         0.034           5.3.6         GIII         0.90         0.800         0.448         0.236         0.210         0.034           1.15         GIII         1.62         0.448         0.445         0.286         0.210         0.034           2.66         GIII         1.62         0.449         0.448         0.289         0.017         0.017           2.66         GIII         1.62         1.449         0.824         0.824         0.584         0.565         0.477           2.67         GIII         1.87         1.745         0.834         0.584         0.477         0.778         0.478         0.729         0.729         0.729         0.729         0.729         0.729         0.729         0.729         0.729         0.729         0.729         0.729         0.729 <td>02ZM006</td> <td>3.9</td> <td>E E</td> <td>0.01</td> <td>0.011</td> <td>0.005</td> <td>0.003</td> <td>0.001</td> <td>0.000</td>	02ZM006	3.9	E E	0.01	0.011	0.005	0.003	0.001	0.000
427         G III         0.25         0.260         0.163         0.107         0.059           53.3         G III         0.23         0.178         0.076         0.048         0.034           53.3         G III         0.74         0.728         0.078         0.039         0.034           53.5         G III         0.74         0.640         0.405         0.289         0.037           116         G III         0.62         0.629         0.401         0.228         0.207           205         G III         1.53         1.431         0.858         0.627         0.473           206         G III         1.63         1.431         0.858         0.627         0.473           206         G III         1.67         1.431         0.858         0.627         0.473           206         G III         1.67         1.431         0.858         0.647         0.874         0.874         0.874         0.875         0.447         0.875         0.447         0.875         0.447         0.875         0.447         0.875         0.447         0.875         0.447         0.875         0.447         0.447         0.447         0.447         0.447 <td>427         G III         0.25         0.260         0.163         0.107         0.059           53.3         G III         0.23         0.178         0.076         0.048         0.034           53.3         G III         0.74         0.728         0.076         0.036         0.034           53.6         G III         0.64         0.640         0.405         0.289         0.017           116         G III         0.62         0.629         0.401         0.286         0.526           205         G III         1.53         1.431         0.858         0.627         0.473           205         G III         1.87         1.431         0.858         0.627         0.473           206         G III         1.87         1.431         0.859         0.647         0.473           206         G III         1.87         1.431         0.859         0.627         0.473           206         G III         1.87         1.441         0.859         0.644         0.811         0.473           207         G III         0.22         0.293         0.464         0.134         0.143           208         G III         1.17<!--</td--><td>02ZL003</td><td>10.8</td><td>III 5</td><td>90.0</td><td>0.037</td><td>710.0</td><td>0.014</td><td>0.013</td><td>0.012</td></td>	427         G III         0.25         0.260         0.163         0.107         0.059           53.3         G III         0.23         0.178         0.076         0.048         0.034           53.3         G III         0.74         0.728         0.076         0.036         0.034           53.6         G III         0.64         0.640         0.405         0.289         0.017           116         G III         0.62         0.629         0.401         0.286         0.526           205         G III         1.53         1.431         0.858         0.627         0.473           205         G III         1.87         1.431         0.858         0.627         0.473           206         G III         1.87         1.431         0.859         0.647         0.473           206         G III         1.87         1.431         0.859         0.627         0.473           206         G III         1.87         1.441         0.859         0.644         0.811         0.473           207         G III         0.22         0.293         0.464         0.134         0.143           208         G III         1.17 </td <td>02ZL003</td> <td>10.8</td> <td>III 5</td> <td>90.0</td> <td>0.037</td> <td>710.0</td> <td>0.014</td> <td>0.013</td> <td>0.012</td>	02ZL003	10.8	III 5	90.0	0.037	710.0	0.014	0.013	0.012
443         G III         0 23         0178         0 076         0 048         0 034           55.3         G III         0 644         0 728         0 562         0 395         0 317           55.6         G III         0 644         0 640         0 640         0 629         0 289         0 200           115         G III         0 640         0 600         0 446         0 236         0 276         0 173           116         G III         1 55         1 431         0 868         0 627         0 477         0 677           206         G III         1 55         1 431         0 868         0 627         0 477           206         G III         1 55         1 431         0 868         0 627         0 477           206         G III         1 57         1 59         0 892         0 686         0 447           526         G III         0 15         0 113         0 132         0 146         0 146         0 146           574         G III         0 19         0 132         0 280         0 447         0 146         0 146         0 146           674         G III         0 19         0 146         0 137	43.3         G       0.23         0.178         0.076         0.048         0.034           53.3         G       0.24         0.728         0.602         0.395         0.317           55.6         G     0.44         0.728         0.602         0.289         0.200           115         G     0.44         0.629         0.449         0.276         0.173           116         G     1.67         1.431         0.869         0.670         0.477           205         G     1.67         1.431         0.869         0.670         0.477           205         G     1.67         1.745         0.829         0.664         0.173           206         G     1.67         1.745         0.829         0.670         0.477           206         G     1.67         1.745         0.829         0.647         0.477           206         G     1.67         0.126         0.700         0.662         0.477           207         G     1.67         0.113         0.113         0.113         0.113         0.113         0.113         0.113         0.113         0.114         0.114           56         G       0.126         0.126         0.126         0.126 <t< td=""><td>12ZG004</td><td>42.7</td><td>≣ 5</td><td>0.25</td><td>0.260</td><td>0.163</td><td>0.107</td><td>0.059</td><td>0.003</td></t<>	12ZG004	42.7	≣ 5	0.25	0.260	0.163	0.107	0.059	0.003
53.3         GIII         0.74         0.728         0.365         0.345         0.317           8.3 6         GIII         0.64         0.640         0.690         0.600 <td>53.3         GIII         0.74         0.728         0.365         0.345         0.317           8.3 6         GIII         0.64         0.640         0.645         0.289         0.200           8.9 8         GIII         0.02         0.600         0.441         0.276         0.173           1.15         GIII         0.02         0.629         0.401         0.276         0.175           2.05         GIII         1.63         1.431         0.858         0.627         0.477           2.05         GIII         1.67         1.697         0.834         0.666         0.477           2.05         GIII         0.12         0.690         0.600         0.600         0.447           2.06         GIII         0.12         0.72         0.666         0.047         0.666         0.047           2.07         GIII         0.12         0.070         0.062         0.047         0.072         0.046         0.013           2.07         GIII         0.12         0.070         0.062         0.046         0.014         0.014         0.014           2.08         GIII         0.12         0.070         0.062         0.047         0.</td> <td>22H002</td> <td>43.3</td> <td>E 5</td> <td>0.23</td> <td>0.178</td> <td>9200</td> <td>0.048</td> <td>0.034</td> <td>0.026</td>	53.3         GIII         0.74         0.728         0.365         0.345         0.317           8.3 6         GIII         0.64         0.640         0.645         0.289         0.200           8.9 8         GIII         0.02         0.600         0.441         0.276         0.173           1.15         GIII         0.02         0.629         0.401         0.276         0.175           2.05         GIII         1.63         1.431         0.858         0.627         0.477           2.05         GIII         1.67         1.697         0.834         0.666         0.477           2.05         GIII         0.12         0.690         0.600         0.600         0.447           2.06         GIII         0.12         0.72         0.666         0.047         0.666         0.047           2.07         GIII         0.12         0.070         0.062         0.047         0.072         0.046         0.013           2.07         GIII         0.12         0.070         0.062         0.046         0.014         0.014         0.014           2.08         GIII         0.12         0.070         0.062         0.047         0.	22H002	43.3	E 5	0.23	0.178	9200	0.048	0.034	0.026
5.3.6         GIII         0.64         0.640         0.045         0.286         0.200           115         GIII         0.89         0.600         0.448         0.256         0.205           115         GIII         0.82         0.629         0.441         0.276         0.173           166         GIII         1.63         1.431         0.856         0.627         0.477           286         GIII         1.67         1.697         0.832         0.686         0.477           286         GIII         0.15         0.126         0.670         0.689         0.477           564         GIII         0.15         0.126         0.070         0.682         0.447           654         GIII         0.15         0.126         0.070         0.682         0.447           657         GIII         0.15         0.126         0.070         0.682         0.447           654         GIII         0.15         0.123         0.046         0.013         0.014           674         GIII         0.18         0.479         0.227         0.049         0.016           1770         GIII         0.19         0.132	5.3.6         GIII         0.64         0.640         0.405         0.286         0.280           115         GIII         0.82         0.629         0.448         0.256         0.205           115         GIII         0.62         0.629         0.441         0.256         0.477           205         GIII         1.53         1.431         0.668         0.627         0.477           205         GIII         1.67         1.745         0.832         0.686         0.477           285         GIII         1.67         1.687         0.684         0.662         0.477           367         GIII         0.15         0.130         0.682         0.696         0.477           368         GIII         0.15         0.136         0.132         0.682         0.643           63         GIII         0.15         0.126         0.70         0.682         0.447           56         GIII         0.15         0.132         0.642         0.696         0.447           57         GIII         0.16         0.113         0.070         0.862         0.043           57         GIII         0.16         0.113         0.	12ZN001	53.3	≣ 5	0.74	0.728	0,502	0,395	0.317	0.242
89 6         GIII         0.90         0.800         0.448         0.325         0.222           115         GIII         1.62         0.629         0.401         0.276         0.173           166         GIII         1.63         1.474         0.888         0.627         0.477           205         GIII         1.87         1.745         0.884         0.627         0.477           205         GIII         1.87         1.597         0.834         0.687         0.477           36.7         GIII         0.15         0.126         0.70         0.696         0.447           36.8         GIII         0.15         0.126         0.70         0.696         0.447           56.8         GIII         0.12         0.120         0.690         0.447         0.013         0.644           177         GIII         0.12         0.123         0.064         0.014         0.016           177         GIII         0.18         0.479         0.327         0.696         0.016           178         GIII         0.479         0.327         0.260         0.016         0.016           178         GIII         0.479	89 6         GIII         0.80         0.848         0.325         0.252           115         GIII         0.62         0.641         0.276         0.173           166         GIII         1.63         1.745         0.689         0.677         0.477           205         GIII         1.87         1.745         0.684         0.666         0.372           205         GIII         1.87         1.745         0.684         0.666         0.477           206         GIII         0.15         0.126         0.727         0.677         0.611           36.7         GIII         0.15         0.123         0.064         0.013           67.4         GIII         0.12         0.070         0.022         0.047           177         GIII         0.12         0.077         0.084         0.017         0.017           267         GIII         0.14         0.123         0.044         0.017         0.018           267         GIII         0.14         0.022         0.022         0.017         0.018         0.014           170         GIII         0.18         0.479         0.227         0.025         0.014 <td>52M009</td> <td>53.6</td> <td>E 5</td> <td>0.64</td> <td>0.640</td> <td>0.405</td> <td>0.289</td> <td>0.200</td> <td>0.111</td>	52M009	53.6	E 5	0.64	0.640	0.405	0.289	0.200	0.111
115         GHII         0.62         0.629         0.401         0.276         0.173           205         GIII         1.53         1.431         0.884         0.687         0.477           205         GIII         1.63         1.431         0.884         0.687         0.477           205         GIII         1.697         0.824         0.687         0.372           367         GIII         0.15         0.126         0.686         0.372           638         GIII         0.15         0.126         0.692         0.647         0.647           638         GIII         0.19         0.126         0.070         0.062         0.043           674         GIII         0.19         0.113         0.032         0.044         0.043           867         GIII         0.19         0.113         0.032         0.044         0.014           867         GIII         0.79         0.480         0.480         0.044         0.014           177         GIII         1.099         0.480         0.480         0.044         0.014           1780         GIII         1.099         0.044         0.034         0.044	115         GHII         0.62         0.629         0.401         0.276         0.173           205         GIII         1.63         1.431         0.888         0.627         0.477           205         GIII         1.63         1.431         0.828         0.627         0.477           205         GIII         1.67         1.697         0.824         0.566         0.372           285         GIII         0.15         0.126         0.700         0.622         0.447           36.7         GIII         0.19         0.123         0.062         0.043           63.8         GIII         0.19         0.123         0.062         0.043           177         GIII         0.19         0.13         0.062         0.016           267         GIII         0.19         0.123         0.064         0.016           267         GIII         1.17         0.990         0.480         0.017         0.016           267         GIII         1.084         1.033         0.064         0.016         0.016           268         GIII         1.084         0.133         0.062         0.016         0.016	2ZK002	89.6	≡ 5	06.0	0.800	0.448	0.325	0.252	0.198
166         G III         153         1431         0.858         0.627         0.477           205         G III         187         1745         0.858         0.6596         0.372           205         G III         187         1546         0.834         0.6596         0.477           764         G III         3.56         2.985         1.346         0.811         0.517           858         G III         0.15         0.126         0.070         0.662         0.447           858         G III         0.15         0.126         0.070         0.062         0.043           177         G III         0.18         0.479         0.327         0.064         0.106           287         G III         0.48         0.449         0.327         0.066         0.106           499         G III         1.17         0.980         0.480         0.344         0.046           1170         G III         1.098         0.484         0.134         0.260         0.146           1170         G III         1.098         0.484         0.042         0.040         0.146           1170         G III         1.098         1.020 <td>166         GIIII         153         1431         0.888         0.627         0.477           285         GIII         187         1.745         0.922         0.696         0.372           286         GIII         187         1.745         0.834         0.685         0.477           764         GIII         0.15         0.126         0.070         0.685         0.477           638         GIII         0.15         0.126         0.070         0.662         0.043           638         GIII         0.18         0.123         0.064         0.016         0.016           67.4         GIII         0.18         0.123         0.052         0.043         0.017         0.013           177         GIII         0.18         0.479         0.227         0.064         0.016           554         GIII         0.48         0.479         0.257         0.250         0.106           469         GIII         1.17         0.480         0.479         0.257         0.260         0.106           469         GIII         1.098         0.479         0.273         0.260         0.016           460         GIII         <td< td=""><td>12ZG003</td><td>115</td><td>III 5</td><td>0.62</td><td>0.629</td><td>0.401</td><td>0.276</td><td>0.173</td><td>0,061</td></td<></td>	166         GIIII         153         1431         0.888         0.627         0.477           285         GIII         187         1.745         0.922         0.696         0.372           286         GIII         187         1.745         0.834         0.685         0.477           764         GIII         0.15         0.126         0.070         0.685         0.477           638         GIII         0.15         0.126         0.070         0.662         0.043           638         GIII         0.18         0.123         0.064         0.016         0.016           67.4         GIII         0.18         0.123         0.052         0.043         0.017         0.013           177         GIII         0.18         0.479         0.227         0.064         0.016           554         GIII         0.48         0.479         0.257         0.250         0.106           469         GIII         1.17         0.480         0.479         0.257         0.260         0.106           469         GIII         1.098         0.479         0.273         0.260         0.016           460         GIII <td< td=""><td>12ZG003</td><td>115</td><td>III 5</td><td>0.62</td><td>0.629</td><td>0.401</td><td>0.276</td><td>0.173</td><td>0,061</td></td<>	12ZG003	115	III 5	0.62	0.629	0.401	0.276	0.173	0,061
205         G III         187         1745         0.832         0.596         0.372           286         G III         1.87         1.597         0.834         0.586         0.477           744         746         2.64         2.944         0.641         0.641           36.7         G III         0.15         0.126         0.070         0.062         0.043           63.8         G III         0.12         0.123         0.071         0.016         0.016           177         G III         0.12         0.073         0.074         0.016         0.016           267         G III         0.13         0.073         0.074         0.016         0.016           267         G III         0.17         0.990         0.480         0.314         0.220           267         G III         1.17         0.990         0.480         0.314         0.222           1470         G III         1.17         0.990         0.480         0.314         0.222           1470         G III         1.099         1.089         0.480         0.314         0.316           1480         G III         1.090         1.270         0.220 </td <td>205         G III         187         1745         0.832         0.596         0.372           286         G III         1,87         1,597         0.834         0.586         0.477           764         G III         0.15         2.965         1,597         0.834         0.586         0.447           36.7         G III         0.15         0.126         0.070         0.062         0.043           57.4         G III         0.12         0.123         0.074         0.016           57.4         G III         0.13         0.073         0.064         0.016           267         G III         0.14         0.990         0.480         0.017         0.016           267         G III         0.79         0.464         0.133         0.066         0.010           468         G III         0.79         0.464         0.133         0.066         0.040           469         G III         1.096         1.080         0.044         0.013         0.066         0.040           460         G III         1.096         1.080         0.464         0.133         0.260         0.040           264         G III         1.096&lt;</td> <td>2ZG002</td> <td>166</td> <td>≣ 5</td> <td>1,53</td> <td>1,431</td> <td>0.858</td> <td>0.627</td> <td>0.477</td> <td>0.349</td>	205         G III         187         1745         0.832         0.596         0.372           286         G III         1,87         1,597         0.834         0.586         0.477           764         G III         0.15         2.965         1,597         0.834         0.586         0.447           36.7         G III         0.15         0.126         0.070         0.062         0.043           57.4         G III         0.12         0.123         0.074         0.016           57.4         G III         0.13         0.073         0.064         0.016           267         G III         0.14         0.990         0.480         0.017         0.016           267         G III         0.79         0.464         0.133         0.066         0.010           468         G III         0.79         0.464         0.133         0.066         0.040           469         G III         1.096         1.080         0.044         0.013         0.066         0.040           460         G III         1.096         1.080         0.464         0.133         0.260         0.040           264         G III         1.096<	2ZG002	166	≣ 5	1,53	1,431	0.858	0.627	0.477	0.349
286         G III         1.87         1.587         0.834         0.585         0.447           364         G III         3.55         2.985         1.346         0.811         0.511           387         G III         0.126         0.023         0.064         0.043           638         G III         0.12         0.033         0.017         0.016           638         G III         0.13         0.033         0.017         0.010           267         G III         0.13         0.033         0.017         0.010           267         G III         0.149         0.489         0.827         0.046         0.010           267         G III         0.79         0.464         0.134         0.026         0.040           177         G III         1.08         1.084         0.134         0.026         0.040           178         G III         1.084         1.084         0.134         0.048         0.044           179         G III         1.084         1.084         0.048         0.048         0.048           179         G III         1.084         1.084         0.048         0.048         0.048 <tr< td=""><td>286         G III         1,87         1,597         0,834         0,585         0,447           364         G III         0,15         0,196         0,196         0,611         0,611           368         G III         0,15         0,126         0,700         0,622         0,643           874         G III         0,19         0,113         0,033         0,017         0,019           167         G III         0,19         0,113         0,033         0,017         0,019           267         G III         0,19         0,479         0,327         0,250         0,190           287         G III         1,17         0,990         0,480         0,047         0,019           489         G III         1,17         0,990         0,480         0,014         0,022           489         G III         1,079         0,464         0,133         0,066         0,040           489         G III         1,087         2,833         1,589         0,046         0,046           489         G III         1,084         1,080         0,047         0,046         0,046           480         G III         1,086         1,080&lt;</td><td>12ZG001</td><td>205</td><td><b>≡</b> 5</td><td>1.87</td><td>1,745</td><td>0.932</td><td>969'0</td><td>0.372</td><td>0.179</td></tr<>	286         G III         1,87         1,597         0,834         0,585         0,447           364         G III         0,15         0,196         0,196         0,611         0,611           368         G III         0,15         0,126         0,700         0,622         0,643           874         G III         0,19         0,113         0,033         0,017         0,019           167         G III         0,19         0,113         0,033         0,017         0,019           267         G III         0,19         0,479         0,327         0,250         0,190           287         G III         1,17         0,990         0,480         0,047         0,019           489         G III         1,17         0,990         0,480         0,014         0,022           489         G III         1,079         0,464         0,133         0,066         0,040           489         G III         1,087         2,833         1,589         0,046         0,046           489         G III         1,084         1,080         0,047         0,046         0,046           480         G III         1,086         1,080<	12ZG001	205	<b>≡</b> 5	1.87	1,745	0.932	969'0	0.372	0.179
764         G III         3 55         2.985         1,346         0.811         0.511           36.7         G III         0.15         0.126         0.070         0.062         0.043           63.8         G III         0.12         0.023         0.017         0.062         0.043           67.8         G III         0.13         0.033         0.017         0.016         0.016           267         G III         0.13         0.032         0.014         0.016         0.016           267         G III         0.13         0.037         0.066         0.106         0.106           267         G III         0.79         0.449         0.133         0.016         0.016           469         G III         1.17         0.980         0.480         0.018         0.043           1170         G III         1.089         10.089         0.089         0.016         0.040           1170         G III         1.086         10.089         0.089         0.049         0.066           2640         G III         1.089         1.069         0.089         0.049         0.069           2640         G III         1.089         <	764         G III         3 55         2 985         1 346         0 811         0 511           367         G III         0 15         0 126         0 070         0 062         0 043           638         G III         0 12         0 136         0 070         0 062         0 016           67.4         G III         0 19         0 133         0 017         0 010           1 77         G III         0 19         0 137         0 032         0 017         0 010           267         G III         0 146         0 489         0 489         0 240         0 140         0 190           267         G III         0 77         0 484         0 689         0 140         0 140           1170         G III         1 0 89         1 6 89         0 6 83         0 146         0 140           1290         G III         1 0 89         1 6 80         1 0 090         2 100         0 146           1290         G III         1 0 89         1 8 0 0         1 0 0         0 0 0         0 0 0         0 0 0         0 0 0         0 0 0         0 0 0         0 0 0         0 0 0         0 0 0         0 0 0         0 0 0         0 0 0         0 0 0	2ZK001	285	III 59	1.87	1.597	0.834	0.585	0.447	0.349
36.7         G III         0.15         0.126         0.070         0.062         0.043           63.8         G III         0.22         0.230         0.123         0.064         0.016           67.4         G III         0.22         0.230         0.017         0.016         0.016           177         G III         0.48         0.479         0.327         0.017         0.016           267         G III         0.48         0.479         0.337         0.017         0.010           267         G III         0.79         0.464         0.133         0.046         0.010           469         G III         0.79         0.464         0.133         0.066         0.040           554         G III         1.099         1.084         0.133         0.066         0.040           1170         G III         1.099         1.080         0.040         0.146         0.146           1170         G III         1.099         1.080         0.019         0.040         0.146           2640         G III         1.099         1.080         0.019         0.010         0.010           270         G III         1.099 <td< td=""><td>36.7         G III         0.15         0.126         0.070         0.062         0.043           63.8         G III         0.22         0.230         0.123         0.016         0.016           67.4         G III         0.13         0.013         0.017         0.016           177         G III         0.14         0.48         0.479         0.527         0.016           267         G III         1.17         0.990         0.480         0.314         0.016           267         G III         1.17         0.990         0.480         0.314         0.220           459         G III         1.07         0.990         0.480         0.314         0.222           554         G III         1.084         10.840         7.026         0.309         0.406           1170         G III         1.089         10.840         7.026         5.202         3.840           1170         G III         1.086         1.080         1.089         0.014         0.018         0.016           2640         G III         1.086         1.080         1.080         0.018         0.010           2641         G III         1.080         &lt;</td><td>2ZH001</td><td>764</td><td><b>≡</b> 5</td><td>3.55</td><td>2,985</td><td>1,346</td><td>0.811</td><td>0.511</td><td>0.298</td></td<>	36.7         G III         0.15         0.126         0.070         0.062         0.043           63.8         G III         0.22         0.230         0.123         0.016         0.016           67.4         G III         0.13         0.013         0.017         0.016           177         G III         0.14         0.48         0.479         0.527         0.016           267         G III         1.17         0.990         0.480         0.314         0.016           267         G III         1.17         0.990         0.480         0.314         0.220           459         G III         1.07         0.990         0.480         0.314         0.222           554         G III         1.084         10.840         7.026         0.309         0.406           1170         G III         1.089         10.840         7.026         5.202         3.840           1170         G III         1.086         1.080         1.089         0.014         0.018         0.016           2640         G III         1.086         1.080         1.080         0.018         0.010           2641         G III         1.080         <	2ZH001	764	<b>≡</b> 5	3.55	2,985	1,346	0.811	0.511	0.298
63.8         G III         0.22         0.230         0.123         0.064         0.016           67.4         G III         0.19         0.113         0.033         0.017         0.010           177         G III         0.19         0.113         0.033         0.017         0.010           267         G III         1.17         0.990         0.484         0.133         0.026         0.190           469         G III         1.17         0.990         0.484         0.133         0.026         0.040           469         G III         1.09         1.689         0.489         0.489         0.046         0.040           1170         G III         1.996         10.080         7.026         5.010         0.046           2540         G III         1.996         10.080         7.103         6.265         2.010           2640         G III         1.996         10.080         7.103         6.265         3.040           2640         G III         1.996         1.080         7.036         6.265         3.040           2640         G III         1.996         1.090         7.102         6.202         3.01	63.8         G III         0.22         0.230         0.123         0.064         0.016           67.4         G III         0.19         0.113         0.033         0.017         0.010           177         G III         0.19         0.479         0.250         0.040         0.010           267         G III         1.17         0.990         0.464         0.133         0.066         0.040           469         G III         1.17         0.990         0.464         0.133         0.066         0.040           469         G III         1.07         0.464         0.133         0.066         0.040           1400         G III         1.089         10.840         7.227         2.099         2.010           1500         G III         1.089         16.840         7.026         5.202         3.840           1290         G III         1.986         18.080         10.090         7.103         5.265           2640         G III         1.996         18.080         7.103         5.265         3.04           4400         G III         1.40         1.374         0.149         0.03         0.04           230	2YS003	36.7	III 5	0.15	0.126	0.070	0.052	0.043	0.036
67.4         G III         0.19         0.113         0.033         0.017         0.010           177         G III         0.48         0.479         0.327         0.260         0.190           267         G III         0.79         0.464         0.133         0.066         0.040           399         G III         0.79         0.464         0.133         0.066         0.040           469         G III         0.79         0.464         0.133         0.066         0.040           554         G III         10.89         0.044         0.133         0.066         0.040           1290         G III         10.89         18.080         1.080         0.146         0.146           2640         G III         19.86         18.080         1.090         7.103         2.620         0.146           4400         G III         19.86         18.080         1.090         7.103         6.360         0.068           93.2         G III         1.986         18.080         1.090         7.103         6.360         0.068           93.2         G III         1.996         1.375         0.044         0.043         0.044         0.044	67.4         G III         0.19         0.113         0.033         0.017         0.010           177         G III         0.48         0.479         0.327         0.260         0.190           267         G III         0.79         0.460         0.434         0.222         0.990         0.480         0.194         0.190           399         G III         0.79         0.460         0.134         0.222         0.006         0.010           554         G III         10.89         0.684         0.133         0.066         0.040         0.146           1170         G III         10.89         10.840         7.026         5.202         3.840           2540         G III         10.89         10.840         7.026         5.202         3.840           4400         G III         19.86         18.080         10.090         7.036         5.256         3.96           2540         G III         1.996         18.080         1.040         3.86         5.262         3.840           2640         G III         1.40         1.840         0.043         0.044         0.044         0.044         0.044         0.044         0.044         0.044	2YP001	63.8	<b>≡</b> 9	0.22	0.230	0.123	0.084	0.016	0.000
177         G III         0.48         0.479         0.327         0.250         0.190           267         G III         1.17         0.990         0.480         0.314         0.222           469         G III         1.77         0.990         0.480         0.314         0.222           469         G III         3.24         2.913         2.277         2.099         2.010           554         G III         10.99         10.840         7.026         5.202         3.840           1260         G III         10.99         10.840         7.026         5.202         3.840           1260         G III         10.99         10.840         7.026         5.202         3.840           1260         G III         19.96         12.00         7.103         5.255         3.840           2540         G III         0.83         0.514         0.163         0.03         0.588           270         G III         1.40         1.377         0.944         0.739         0.588           287         G III         4.40         1.377         0.944         0.739         0.588           529         G III         4.50	177         G    II         0.448         0.479         0.327         0.260         0.190           267         G    II         1.17         0.990         0.480         0.314         0.222           469         G    II         1.17         0.990         0.480         0.314         0.222           469         G    II         3.24         2.913         2.777         2.099         2.010           554         G    II         2.67         2.833         1.589         0.830         0.146           1170         G    II         10.99         10.840         7.026         5.202         3.840           1280         G    II         10.99         10.840         7.026         5.202         3.840           1280         G    II         10.99         10.840         7.026         5.202         3.840           1280         G    II         25.36         22.710         12.400         8.657         8.396           400         G    II         0.17         0.087         0.019         0.058         0.058           30         G    II         0.83         0.514         0.183         0.058         0.058           40         G    II	2Z3001	67.4	III 5	0.19	0.113	0.033	0.017	0.010	0.007
267         G III         1,17         0,990         0,480         0,314         0,222           399         G III         0,79         0,464         0,133         0,066         0,040           469         G III         0,79         0,464         0,133         0,066         0,040           554         G III         10,89         1,589         0,830         0,146           1170         G III         10,96         1,589         0,830         0,146           1260         G III         19,96         18,080         1,090         7,103         5,262           2640         G III         19,96         18,080         10,090         7,103         5,262           2640         G III         19,96         18,080         1,090         7,103         5,262           2640         G III         1,996         18,080         1,103         6,262         2,260           2640         G III         1,40         1,377         0,944         0,034         0,683           267         G III         1,40         1,374         1,40         1,564         0,683           470         G III         4,50         4,296         2,845	267         G III         1,17         0.990         0.480         0.314         0.222           399         G III         0.79         0.464         0.133         0.066         0.040           469         G III         2,74         2.913         0.277         2.099         0.040           1750         G III         10,99         10,840         7.026         5.002         0.146           1750         G III         10,99         10,840         7.026         5.202         3.840           1290         G III         19,96         18,080         10,090         7,103         5.265           2640         G III         19,96         18,080         10,090         7,103         5.265           4400         G III         1,996         18,080         1,090         7,103         5.265           200         G III         1,400         8.657         8.396         1,090         0,098         0,005           201         G III         1,400         1,374         0,144         0,198         0,005         0,008         0,008         0,008         0,008         0,008         0,008         0,008         0,008         0,008         0,008	2YO006	177	≡ 5	0.48	0.479	0.327	0.250	0.190	0.127
399         G III         0 79         0 464         0 133         0 066         0 040           469         G III         3.24         2.913         2.277         2.099         2.010           554         G III         10.99         1.589         0.830         0.146           1170         G III         10.99         18.080         7.026         5.202         3.840           2840         G III         19.96         18.080         10.090         7.103         2.820           2840         G III         19.96         18.080         17.03         2.220         2.20           2840         G III         0.17         0.087         0.019         0.007         0.003           2840         G III         0.17         0.087         0.019         0.007         0.003           2841         G III         1.40         1.377         0.944         0.739         0.588           2842         G III         4.50         4.236         2.348         1.000         1.556           529         G III         4.50         4.236         2.348         0.038         0.038           611         G III         4.50         4.236	399         G III         0 79         0 464         0 133         0 066         0 040           469         G III         3.24         2.913         2.277         2.099         2.010           554         G III         10.99         10.89         7.026         5.202         3.840           17290         G III         10.99         18.080         7.026         5.202         3.840           2640         G III         19.96         18.080         10.090         7.103         2.650           2640         G III         19.96         18.080         10.090         7.103         2.650           2640         G III         25.36         22.710         12.400         8.657         2.650           2640         G III         0.17         0.087         0.019         0.007         0.003           237         G III         1.40         1.374         0.143         0.058           247         G III         2.59         2.386         1.444         1.118         0.058           470         G III         4.50         4.236         2.300         1.961         0.968           529         G III         4.50         2.342	2YR001	267	= 5	1.17	0.990	0.480	0.314	0.222	0.157
469         G III         3.24         2.913         2.277         2.099         2.010           554         G III         2.67         2.833         1.589         0.830         0.146           1170         G III         10.89         10.840         7.026         5.202         3.840           1290         G III         19.96         18.080         7.103         5.250         3.840           2540         G III         19.96         18.080         7.103         5.255         3.840           93.2         G III         0.17         0.049         7.103         5.256         6.386           93.2         G III         0.17         0.049         0.049         0.058         6.366           200         G III         0.83         0.514         0.163         0.058         0.588           237         G III         1.40         1.377         0.944         0.739         0.588           391         G III         2.59         2.388         1.474         1.118         0.892           470         G III         4.50         3.382         1.845         1.284         0.934           529         G III         8.24 <td< td=""><td>469         G III         3.24         2.913         2.277         2.099         2.010           1170         G III         10.99         10.840         7.026         5.202         3.840           1170         G III         10.99         10.840         7.026         5.202         3.840           2640         G III         19.96         18.027         4.502         3.307         2.620           2640         G III         19.96         18.027         4.502         3.307         2.620           2640         G III         19.96         18.027         4.502         3.307         2.620           2640         G III         0.17         0.087         0.019         0.007         0.008           200         G III         0.17         0.087         0.019         0.007         0.058           237         G III         1.40         1.377         0.944         0.739         0.588           240         G III         1.40         1.377         0.944         0.739         0.588           259         G III         4.50         4.526         2.428         1.940         0.882           210         G III         3.346</td><td>2YR002</td><td>399</td><td>≡ 5</td><td>0.79</td><td>0.464</td><td>0.133</td><td>0.066</td><td>0.040</td><td>0.027</td></td<>	469         G III         3.24         2.913         2.277         2.099         2.010           1170         G III         10.99         10.840         7.026         5.202         3.840           1170         G III         10.99         10.840         7.026         5.202         3.840           2640         G III         19.96         18.027         4.502         3.307         2.620           2640         G III         19.96         18.027         4.502         3.307         2.620           2640         G III         19.96         18.027         4.502         3.307         2.620           2640         G III         0.17         0.087         0.019         0.007         0.008           200         G III         0.17         0.087         0.019         0.007         0.058           237         G III         1.40         1.377         0.944         0.739         0.588           240         G III         1.40         1.377         0.944         0.739         0.588           259         G III         4.50         4.526         2.428         1.940         0.882           210         G III         3.346	2YR002	399	≡ 5	0.79	0.464	0.133	0.066	0.040	0.027
554         G III         2 67         2.833         1.589         0.830         0.146           1170         G III         10.99         10.840         7 026         5.202         3.840           1290         G III         19.96         18.080         10.090         7,103         5.265           2640         G III         25.36         22.710         12.400         8.657         6.396           93.2         G III         0.83         0.514         0.019         0.008         0.058           200         G III         0.83         0.514         0.163         0.088         0.058           237         G III         1.40         1.377         0.944         0.739         0.588           391         G III         2.59         2.388         1.474         1.118         0.892           470         G III         4.50         4.236         2.428         1.590         1.556           529         G III         4.50         4.236         2.345         1.284         0.934           611         G III         4.50         4.236         2.428         1.284         0.934           621         G III         1.268         <	554         G III         2,67         2,833         1,589         0,840         7,026         5,202         3,840           1170         G III         10,89         10,840         7,026         5,202         3,840           1290         G III         19,96         18,080         10,090         7,103         5,255           2400         G III         25,36         22,710         12,400         8,657         6,396           230         G III         0,83         0,514         0,097         0,007         0,003           200         G III         0,83         0,514         0,183         0,068         0,058           237         G III         1,40         1,374         0,118         0,097         0,003           331         G III         1,40         1,344         0,739         0,588         0,588           331         G III         2,59         2,388         1,474         1,118         0,882           470         G III         4,50         4,236         2,428         1,900         1,951           611         G III         4,50         4,236         2,428         1,284         0,934           72 <td< td=""><td>2YN002</td><td>469</td><td>III 5</td><td>3.24</td><td>2.913</td><td>2.277</td><td>2.099</td><td>2.010</td><td>1,955</td></td<>	2YN002	469	III 5	3.24	2.913	2.277	2.099	2.010	1,955
1170         G III         10.89         10.840         7 026         5.202         3.840           1290         G III         9.16         8.027         4.502         3.307         2.620           2640         G III         19.96         18.080         10.090         7.103         5.255           4400         G III         25.36         22.710         12.400         8.657         6.396           93.2         G III         0.17         0.087         0.019         0.007         0.003           200         G III         1.40         1.377         0.944         0.739         0.588           237         G III         2.59         2.386         1.474         1.118         0.882           470         G III         4.50         4.286         2.428         1.900         1.566           529         G III         4.50         4.286         2.845         2.300         1.951           614         G III         4.50         4.286         2.845         5.300         1.951           624         G III         8.24         7.899         6.048         5.330         4.830           610         G III         1.36         <	1170         G III         10.840         7.026         5.202         3.840           1280         G III         9.16         8.027         4.502         3.307         2.620           2640         G III         19.96         18.080         10.090         7.103         5.255           4400         G III         25.36         22.710         12.400         8.657         6.396           93.2         G III         0.17         0.087         0.019         0.007         0.003           237         G III         0.83         0.514         0.163         0.067         0.068           391         G III         1.40         1.377         0.844         0.739         0.588           470         G III         2.59         2.386         1.474         1.118         0.892           470         G III         4.50         4.236         2.428         1.900         1.556           529         G III         4.50         4.236         2.345         2.300         1.951           611         G III         3.74         3.382         1.852         1.284         0.934           72         G III         1.268         10.920	2YR003	554	₩9	2.67	2.833	1.589	0.830	0.146	0.000
1290         G III         9 16         8 027         4 502         3 307         2 620           2640         G III         19 96         18 080         10 090         7 103         5 256           4400         G III         25 36         22.710         12 400         8 657         6 396           93.2         G III         0.17         0.087         0.019         0.007         0.003           200         G III         1.40         1.377         0.944         0.739         0.588           237         G III         2.59         2.398         1.474         1.118         0.892           470         G III         4.50         4.236         2.346         1.900         1.556           529         G III         3.346         2.428         1.900         1.556           613         3.74         3.382         1.845         1.344         0.934           624         G III         1.264         7.889         6.048         5.300         1.951           72         G III         1.268         10.920         6.422         5.002         4.230           205         G III         1.35         1.168         0.915         <	1290         G III         9 16         8 027         4.502         3.307         2.620           2640         G III         19 36         18 080         10 090         7,103         5.255           4400         G III         25 36         22 710         12 400         8 657         6 396           200         G III         0.17         0.087         0.019         0.007         0.003           200         G III         0.17         0.087         0.019         0.007         0.003           237         G III         1.40         1.377         0.163         0.088         0.058           237         G III         2.59         2.388         1.474         1.118         0.058           470         G III         3.98         3.746         2.428         1.900         1.951           611         G III         4.50         4.236         2.345         1.284         0.934           624         G III         3.74         3.382         1.862         2.300         1.951           611         G III         1.268         10.920         6.422         5.002         4.236           270         G III         1.36 <td< td=""><td>2ZF001</td><td>1170</td><td>II 5</td><td>10.99</td><td>10.840</td><td>7.026</td><td>5.202</td><td>3.840</td><td>2.507</td></td<>	2ZF001	1170	II 5	10.99	10.840	7.026	5.202	3.840	2.507
2640         G III         19 96         18 080         10 090         7,103         5.255           4400         G III         25.36         22,710         12 400         8.657         6.396           93.2         G III         0.17         0.087         0.019         0.007         0.003           200         G III         0.17         0.087         0.019         0.007         0.003           200         G III         1.40         1.377         0.944         0.739         0.588           237         G III         2.59         2.398         1.474         1.118         0.892           470         G III         4.50         4.236         2.428         1.900         1.556           529         G III         4.50         4.236         2.845         2.300         1.951           611         G III         4.50         4.236         2.845         2.300         1.951           624         G III         8.24         7.889         6.048         5.330         4.872           2110         G III         8.24         7.889         6.048         6.085         0.828           256         G III         1.268 <td< td=""><td>2640         G III         19.96         18.080         10.090         7,103         5.256           4400         G III         25.36         22.710         12.400         8.657         6.396           93.2         G III         0.17         0.087         0.019         0.007         0.003           200         G III         0.17         0.084         0.068         0.058           237         G III         1.40         1.377         0.944         0.739         0.583           391         G III         2.59         2.398         1.474         1.118         0.892           470         G III         4.50         4.236         2.428         1.900         1.556           529         G III         4.50         4.236         2.345         2.300         1.951           611         G III         8.24         7.889         6.048         5.300         1.951           624         G III         12.68         10.920         6.422         5.002         4.230           210         G III         1.264         0.350         0.242         0.183         0.135           226         G III         1.70         1.485         <t< td=""><td>2YS001</td><td>1290</td><td>≡ 5</td><td>9.16</td><td>8.027</td><td>4.502</td><td>3.307</td><td>2.620</td><td>2.115</td></t<></td></td<>	2640         G III         19.96         18.080         10.090         7,103         5.256           4400         G III         25.36         22.710         12.400         8.657         6.396           93.2         G III         0.17         0.087         0.019         0.007         0.003           200         G III         0.17         0.084         0.068         0.058           237         G III         1.40         1.377         0.944         0.739         0.583           391         G III         2.59         2.398         1.474         1.118         0.892           470         G III         4.50         4.236         2.428         1.900         1.556           529         G III         4.50         4.236         2.345         2.300         1.951           611         G III         8.24         7.889         6.048         5.300         1.951           624         G III         12.68         10.920         6.422         5.002         4.230           210         G III         1.264         0.350         0.242         0.183         0.135           226         G III         1.70         1.485 <t< td=""><td>2YS001</td><td>1290</td><td>≡ 5</td><td>9.16</td><td>8.027</td><td>4.502</td><td>3.307</td><td>2.620</td><td>2.115</td></t<>	2YS001	1290	≡ 5	9.16	8.027	4.502	3.307	2.620	2.115
4400         G III         25.36         22.710         12.400         8 657         6.396           93.2         G III         0.17         0.087         0.019         0.007         0.003           200         G III         0.17         0.087         0.019         0.007         0.003           200         G III         1.40         1.377         0.944         0.739         0.588           391         G III         2.59         2.398         1.474         1.118         0.892           470         G III         4.50         4.236         2.428         1.900         1.556           529         G III         4.50         4.236         2.845         2.300         1.951           611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         8.24         7.889         6.048         5.330         4.872           72         G III         1.268         10.920         6.422         5.002         4.230           72         G III         1.35         1.168         0.915         0.985         0.925           230         G III         1.70         1.485	4400         G III         25.36         22.710         12.400         8.657         6.396           93.2         G III         0.17         0.087         0.019         0.007         0.003           200         G III         0.17         0.087         0.019         0.007         0.003           200         G III         1.40         1.377         0.944         0.739         0.588           391         G III         2.59         2.398         1.474         1.118         0.892           470         G III         4.50         4.236         2.428         1.900         1.566           529         G III         4.50         4.236         2.3845         2.300         1.951           611         G III         3.74         3.382         1.862         1.284         0.934           624         G III         1.268         10.920         6.422         5.300         4.872           2110         G III         1.268         10.920         6.422         5.002         4.230           72         G III         1.26         1.082         0.915         0.183         0.185           230         G III         1.70	2ZE001	2640	III 59	19.96	18.080	10.090	7,103	5.255	3.785
93.2         GIII         0.17         0.087         0.019         0.007         0.003           200         GIII         0.83         0.514         0.163         0.088         0.058           237         GIII         1.40         1.377         0.944         0.739         0.588           391         GIII         2.59         2.398         1.474         1.118         0.892           470         GIII         4.50         4.236         2.428         1.900         1.556           529         GIII         4.50         4.236         2.845         2.300         1.951           611         GIII         3.74         3.382         1.852         1.284         0.934           624         GIII         8.24         7.889         6.048         5.330         4.872           2110         GIII         12.68         10.920         6.422         5.002         4.230           72         GIII         0.34         0.350         0.242         0.183         0.135           139         GIII         1.70         1.485         0.907         0.722         0.620           230         GIII         1.90         1.779	93.2         GIII         0.17         0.087         0.019         0.007         0.003           200         GIII         0.83         0.514         0.163         0.088         0.058           237         GIII         1.40         1.377         0.944         0.739         0.588           391         GIII         2.59         2.398         1.474         1.118         0.892           470         GIII         4.50         4.236         2.428         1.900         1.566           529         GIII         4.50         4.236         2.845         2.300         1.951           611         GIII         3.74         3.382         1.852         1.284         0.934           624         GIII         12.68         10.920         6.422         5.300         1.951           72         GIII         12.68         10.920         6.422         5.002         4.230           72         GIII         1.35         1.168         0.915         0.962         0.928           230         GIII         1.70         1.485         0.907         0.722         0.620           230         GIII         1.90         1.777	2YQ001	4400	≡ 5	25,36	22.710	12.400	8.657	6.396	4.641
200         G III         0.83         0.514         0.163         0.088         0.058           237         G III         1.40         1.377         0.944         0.739         0.588           391         G III         2.59         2.398         1.474         1.118         0.892           470         G III         4.50         4.236         2.428         1.900         1.556           529         G III         4.50         4.236         2.845         2.300         1.951           611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         8.24         7.889         6.048         5.330         4.872           2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.183         0.135           139         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.264         1.096         0.994           40         G III         1.85         1.727 <td>200         G III         0.83         0.514         0.163         0.088         0.058           237         G III         1.40         1.377         0.944         0.739         0.588           391         G III         2.59         2.398         1.474         1.118         0.892           470         G III         4.50         4.236         2.428         1.900         1.566           529         G III         4.50         4.236         2.845         2.300         1.951           611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         12.68         10.920         6.422         5.300         1.951           72         G III         12.68         10.920         6.422         5.002         4.230           72         G III         1.35         1.168         0.915         0.965         0.928           230         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.264         1.096         0.994           44         G III         1.85         1.727<td>2YM003</td><td>93.2</td><td><b>≡</b> 5</td><td>0.17</td><td>0.087</td><td>0.019</td><td>200.0</td><td>0.003</td><td>100.0</td></td>	200         G III         0.83         0.514         0.163         0.088         0.058           237         G III         1.40         1.377         0.944         0.739         0.588           391         G III         2.59         2.398         1.474         1.118         0.892           470         G III         4.50         4.236         2.428         1.900         1.566           529         G III         4.50         4.236         2.845         2.300         1.951           611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         12.68         10.920         6.422         5.300         1.951           72         G III         12.68         10.920         6.422         5.002         4.230           72         G III         1.35         1.168         0.915         0.965         0.928           230         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.264         1.096         0.994           44         G III         1.85         1.727 <td>2YM003</td> <td>93.2</td> <td><b>≡</b> 5</td> <td>0.17</td> <td>0.087</td> <td>0.019</td> <td>200.0</td> <td>0.003</td> <td>100.0</td>	2YM003	93.2	<b>≡</b> 5	0.17	0.087	0.019	200.0	0.003	100.0
237         G III         140         1,377         0,944         0,739         0,588           391         G III         2,59         2,398         1,474         1,118         0,892           470         G III         3,98         3,746         2,428         1,900         1,566           529         G III         4,50         4,236         2,845         2,300         1,951           611         G III         3,74         3,382         1,852         1,284         0,934           624         G III         8,24         7,889         6,048         5,330         4,872           2110         G III         12,68         10,920         6,422         5,002         4,230           72         G III         0,34         0,350         0,242         0,183         0,135           139         G III         1,76         1,485         0,907         0,782         0,620           230         G III         1,70         1,485         0,907         0,722         0,620           230         G III         1,90         1,779         1,264         1,096         0,994           40         G III         7,21         6,325	237         G III         1.40         1.377         0.944         0.739         0.588           391         G III         2.59         2.398         1.474         1.118         0.892           470         G III         4.50         4.236         2.428         1.900         1.566           529         G III         4.50         4.236         2.845         2.300         1.951           611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         8.24         7.889         6.048         5.330         4.872           2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.183         0.135           139         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         7.21         6.325         4.513         3.988         3.719	2VD002	200	E 5	0.83	0.514	0.163	0.088	0.058	0.042
391         G III         2.59         2.398         1.474         1.118         0.892           470         G III         3.98         3.746         2.428         1.900         1.566           529         G III         4.50         4.236         2.845         2.300         1.951           611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         8.24         7.889         6.048         5.330         4.872           2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.183         0.135           139         G III         1.35         1.168         0.915         0.655         0.620           205         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         7.21         6.325         4.513         3.988         3.719	391         G III         2.59         2.398         1.474         1.118         0.892           470         G III         3.98         3.746         2.428         1.900         1.566           529         G III         4.50         4.236         2.845         2.300         1.951           611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         8.24         7.889         6.048         5.330         4.872           2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.183         0.135           139         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         1.85         1.727         1.264         1.096         0.994           640         G III         7.21         6.325         4.513         3.988         3.719	2YD001	237	II 5	1.40	1,377	0.944	0.739	0.588	0.440
470         G III         3.98         3.746         2.428         1.900         1.566           529         G III         4.50         4.236         2.845         2.300         1.951           611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         8.24         7.889         6.048         5.330         4.872           2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.185         0.135           138         G III         1.35         1.168         0.915         0.655         0.620           205         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         7.21         6.325         4.513         3.988         3.719	470         G III         3.98         3.746         2.428         1.900         1.566           529         G III         4.50         4.236         2.845         2.300         1.951           611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         12.68         10.920         6.422         5.300         1.951           72         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.183         0.135           139         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         7.21         6.325         4.513         3.988         3.719	2YK005	391	11 5	2.59	2.398	1.474	1,118	0.892	0.708
529         G III         4.50         4.236         2.845         2.300         1.951           611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         8.24         7.889         6.048         5.330         4.872           2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.185         0.135           139         G III         1.35         1.168         0.915         0.855         0.828           205         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         7.21         6.325         4.513         3.988         3.719	529         G III         4,50         4,236         2,845         2,300         1,951           611         G III         3.74         3.382         1,852         1,284         0,934           624         G III         8.24         7,889         6,048         5,330         4,872           2110         G III         12,68         10,920         6,422         5,002         4,230           72         G III         0,34         0,350         0,242         0,183         0,135           205         G III         1,35         1,168         0,915         0,855         0,828           205         G III         1,70         1,485         0,907         0,722         0,620           230         G III         1,90         1,779         1,151         0,908         0,753           343         G III         7,21         6,325         4,513         3,988         3,719	2YK002	470	111.5	3.98	3.746	2.428	1.900	1.556	1.266
611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         8.24         7.889         6.048         5.330         4.872           2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.185         0.135           205         G III         1.35         1.168         0.915         0.855         0.828           205         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         7.21         6.325         4.513         3.988         3.719	611         G III         3.74         3.382         1.852         1.284         0.934           624         G III         8.24         7.889         6.048         5.330         4.872           2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.183         0.135           205         G III         1.35         1.168         0.915         0.855         0.828           205         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         7.21         6.325         4.513         3.988         3.719	2YK004	529	E €	4.50	4,236	2.845	2,300	1.951	1.662
624         G III         8.24         7.889         6.048         5.330         4.872           2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.183         0.135           139         G III         1.35         1.168         0.915         0.855         0.828           205         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         7.21         6.325         4.513         3.988         3.719	624         G III         8.24         7.889         6.048         5.330         4.872           2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.183         0.135           205         G III         1.35         1.168         0.915         0.855         0.828           230         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         7.21         6.325         4.513         3.988         3.719	2YF001	611	III D	3.74	3.382	1,852	1,284	0.934	0.658
2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.183         0.135           139         G III         1.35         1.168         0.915         0.855         0.628           205         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         7.21         6.325         4.513         3.988         3.719	2110         G III         12.68         10.920         6.422         5.002         4.230           72         G III         0.34         0.350         0.242         0.183         0.135           205         G III         1.35         1.168         0.915         0.855         0.828           205         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         1.85         1.727         1.264         1.096         0.994           640         G III         7.21         6.325         4.513         3.988         3.719	2YC001	624	⊞ 5	8.24	7.889	6.048	5.330	4.872	4.494
72         G III         0.34         0.350         0.242         0.183         0.135           139         G III         1.35         1.168         0.915         0.855         0.828           205         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         1.85         1.727         1.264         1.096         0.994           640         G III         7.21         6.325         4.513         3.988         3.719	72         G III         0.34         0.350         0.242         0.185         0.135           139         G III         1,35         1,168         0.915         0.855         0.628           205         G III         1,70         1,485         0.907         0.722         0.620           230         G III         1,90         1,779         1,151         0.908         0.753           343         G III         1,85         1,727         1,264         1,096         0.994           640         G III         7,21         6,325         4,513         3,988         3,719	2YL001	2110	≡ 5	12.68	10.920	6,422	5.002	4.230	3.696
139         G III         1,35         1,168         0,915         0,855         0,828           205         G III         1,70         1,485         0,907         0,722         0,620           230         G III         1,90         1,779         1,151         0,908         0,753           343         G III         1,85         1,727         1,264         1,096         0,994           640         G III         7,21         6,325         4,513         3,988         3,719	139         G III         1,35         1,168         0,915         0,855         0,828           205         G III         1,70         1,485         0,907         0,722         0,620           230         G III         1,90         1,779         1,151         0,908         0,753           343         G III         1,85         1,727         1,264         1,096         0,994           640         G III         7,21         6,325         4,513         3,988         3,719	2ZA002	72	III 9	0.34	0.350	0.242	0.183	0.135	0.083
205         G III         1.70         1.485         0.907         0.722         0.620           230         G III         1.90         1.779         1.151         0.908         0.753           343         G III         1.85         1.727         1.264         1.096         0.994           640         G III         7.21         6.325         4.513         3.988         3.719	205 G III 1,70 1,485 0,907 0,722 0,620 230 G III 1,90 1,779 1,151 0,908 0,753 343 G III 1,85 1,727 1,264 1,096 0,994 640 G III 7,21 6,325 4,513 3,988 3,719	2ZA003	139	III 59	1,35	1,168	0.915	0.855	0.828	0.813
230 G III 1.90 1.779 1.151 0.908 0.753 343 G III 1.85 1.727 1.264 1.096 0.994 640 G III 7.21 6.325 4.513 3.988 3.719	230 G III 1.90 1.779 1.151 0.908 0.753 343 G III 1.85 1.727 1.264 1.096 0.994 640 G III 7.21 6.325 4.513 3.988 3.719	2ZB001	205	III 5	1.70	1.485	206.0	0.722	0.620	0.548
343 G III 185 1,727 1,264 1,096 0,994 640 G III 7,21 6,325 4,513 3,988 3,719	343 G III 185 1,727 1,264 1,096 0,994 640 G III 7,21 6,325 4,513 3,988 3,719	2ZC002	230	⊞ 5	1.90	1.779	1.151	0.908	0.753	0.627
640 G III 7.21 6,325 4,513 3,988 3,719	640 G III 7.21 6,325 4,513 3,988 3,719	2ZA001	343	≣ 5	1,85	1.727	1.264	1,096	0.994	0.915
		2YJ001	640	≣ 5	7.21	6,325	4.513	3.988	3.719	3.546

. Notes

O2, O5, O10, O20, O50 = Low Flows for Return Periods of 2, 5, 10, 20, 50 Years, Respectively, Probability Density Function = G III: Gumbel Type III

Table 8 Frequency Estimates of Summer 30-day Low Flows

(m.74)         Dentely Function*         (m.74e)         (m.74e)         (m.74e)         (m.73e)	Station	Drainage Area	Probability	MEAN	.20	.90	010	020	.050
3.9         G             0.02         0.015         0.006         0.003         0.001           4.2         G             0.09         0.053         0.030         0.029           4.3         G             0.04         0.053         0.030         0.029           4.3         G             0.04         0.059         0.021         0.073         0.049           5.3         G             0.34         0.299         0.659         0.073         0.028           5.3         G             0.34         0.86         0.659         0.073         0.048           5.3         G             1.2         0.86         0.659         0.043         0.078           1.15         G             1.2         1.047         0.611         0.043         0.288           2.2         G             1.2         2.2         1.577         0.86         0.863           2.0         G             4.64         3.685         1.577         0.864         0.874           2.2         G             4.64         3.685         1.577         0.864         0.864           2.0         G             4.64         3.685         1.577         0.827	Number	(km-2)	Density Function*	(m-3/s)	(m^3/s)	(m°3/s)	(m~3/s)	(m <sup>-3/8</sup> )	(m <sup>-3/s</sup> )
108         GIII         0.09         0.053         0.033         0.030           42.7         GIII         0.44         0.436         0.0271         0.056         0.064           43.3         GIII         0.44         0.897         0.665         0.073         0.084           55.46         GIII         0.24         0.897         0.665         0.472         0.084           85.6         GIII         1,20         1.047         0.611         0.472         0.084           115         GIII         1,20         1.047         0.611         0.402         0.029           266         GIII         1,20         1.047         0.611         0.402         0.028           266         GIII         1,20         1.104         0.642         0.402         0.289           266         GIII         1,20         1.104         0.611         0.402         0.289           266         GIII         1,20         1.104         0.642         0.472         0.589           267         GIII         1,22         1.152         0.642         0.472         0.589           268         GIII         0.222         0.175         0.082	02ZM006	3.9		0.05	0.015	900.0	0.003	0.001	0000
427         GIII         0.44         0.429         0.271         0.166         0.064           55.3         GIII         0.34         0.299         0.122         0.073         0.049           55.3         GIII         0.84         0.879         0.122         0.073         0.049           55.4         GIII         1.13         1.104         0.659         0.402         0.280           115         GIII         1.13         1.104         0.642         0.403         0.288           205         GIII         1.13         1.104         0.642         0.403         0.288           205         GIII         1.13         1.104         0.642         0.403         0.588           206         GIII         1.13         1.104         0.642         0.429         0.589           205         GIII         2.244         1.153         0.896         0.589         0.589           206         GIII         0.22         0.175         0.895         0.074         0.589           207         GIII         0.22         0.129         0.024         0.029         0.044         0.029           208         GIII         0.22	2ZL003	10.8		60'0	0.053	0.033	0.030	0.029	0.029
43.3         GIII         0.38         0.289         0.122         0.073         0.049           53.4         GIII         0.84         0.907         0.605         0.472         0.378           53.6         GIII         1.20         1.047         0.645         0.643         0.284           115         GIII         1.20         1.047         0.648         0.589         0.648         0.288           166         GIII         1.20         1.047         0.648         0.589         0.688         0.289         0.289         0.289         0.289         0.289         0.289         0.289         0.588 <td>2ZG004</td> <td>42.7</td> <td></td> <td>0.41</td> <td>0.436</td> <td>0.271</td> <td>0.165</td> <td>0.064</td> <td>0.000</td>	2ZG004	42.7		0.41	0.436	0.271	0.165	0.064	0.000
53.3         GIII         0.84         0.897         0.666         0.472         0.378           83.6         GIII         1.08         0.659         0.659         0.613         0.280           89.6         GIII         1.104         0.651         0.643         0.280         0.280           116         GIII         1.13         1.104         0.642         0.428         0.280           205         GIII         2.234         1.163         0.484         0.568           205         GIII         2.24         1.163         0.864         0.564           285         GIII         0.29         0.324         0.864         0.564           63.8         GIII         0.29         0.355         0.164         0.074         0.083           63.8         GIII         0.29         0.355         0.164         0.074         0.083           63.8         GIII         0.29         0.355         0.164         0.074         0.083           63.8         GIII         0.29         0.325         0.164         0.074         0.083           63.8         GIII         1.37         1.128         0.043         0.074         0.083	2ZH002	43.3		0.39	0.299	0.122	0.073	0.049	0.034
5.3.6         GIII         0.85         0.659         0.403         0.200           115         GIII         1.20         1.047         0.611         0.408         0.280           116         GIII         1.12         1.104         0.641         0.408         0.284           116         GIII         1.24         1.821         1.071         0.768         0.264           205         GIII         2.33         2.234         1.153         0.864         0.554           286         GIII         4.64         2.234         1.157         0.864         0.564           65.4         GIII         0.22         0.175         0.895         0.074         0.663           67.4         GIII         0.22         0.175         0.085         0.074         0.603           67.4         GIII         0.22         0.175         0.085         0.074         0.063           67.4         GIII         0.22         0.175         0.034         0.070         0.063           67.4         GIII         0.22         0.129         0.044         0.073         0.064           67.4         GIII         0.137         0.159         0.074	ZN001	53.3		0.94	0.907	0.605	0.472	0.378	0.292
89 6         GIIII         120         1047         0611         0.468         0.338           116         GIII         113         1108         0.642         0.420         0.284           166         GIII         1.93         1.108         0.642         0.420         0.584           205         GIII         1.93         2.278         1.314         0.864         0.586           286         GIII         4.64         3.683         1.577         0.877         0.613           36.7         GIII         0.22         0.175         0.086         0.074         0.683           67.4         GIII         0.22         0.175         0.084         0.578         0.578           67.4         GIII         0.22         0.175         0.084         0.078         0.078           67.4         GIII         0.22         0.176         0.034         0.078         0.078           177         GIII         0.24         0.034         0.044         0.078         0.078           177         GIII         1.37         1.128         0.034         0.078         0.071           178         GIII         1.071         2.276         <	600MZ	53.6		0.85	0.859	0.559	0.403	0,280	0.151
115         G             113         1,108         0,642         0,420         0,254           205         G             1,94         1,821         1,071         0,788         0,568           205         G             2,94         2,234         1,153         0,864         0,534           285         G             2,64         2,234         1,153         0,865         0,613           3,64         G             0,22         0,075         0,985         0,674         0,683           63,8         G             0,22         0,075         0,095         0,075         0,683           63,8         G             0,28         0,129         0,034         0,074         0,683           67,4         G             0,28         0,129         0,034         0,034         0,034           28,7         G             1,170         0,944         0,550         0,144         0,034           28,6         G             1,260         12,490         8,187         8,098         0,016           1,70         G             1,27         1,2490         8,187         8,098         0,132           2640         G             1,249 <t< td=""><td>ZK002</td><td>89.6</td><td></td><td>1.20</td><td>1.047</td><td>0.611</td><td>0.468</td><td>0.388</td><td>0.330</td></t<>	ZK002	89.6		1.20	1.047	0.611	0.468	0.388	0.330
166         G III         1.94         1.821         1.071         0.768         0.569           265         G III         2.33         2.278         1.314         0.864         0.554           265         G III         2.64         2.278         1.314         0.864         0.554           764         G III         4.54         3.685         1.577         0.807         0.653           63.4         G III         0.22         0.176         0.096         0.074         0.063           63.4         G III         0.29         0.305         0.046         0.078         0.000           67.4         G III         0.29         0.305         0.046         0.078         0.000           177         G III         0.29         0.305         0.046         0.078         0.000           287         G III         0.66         0.683         0.464         0.378         0.242           499         G III         4.16         3.688         1.841         1.082         0.242           499         G III         4.16         3.942         2.976         0.046         0.234           1170         G III         1.071         0.242	ZG003	115		1.13	1.108	0.642	0.420	0.254	0.093
265         G III         2.33         2.278         1.314         0.864         0.534           764         611         4.54         3.685         1.753         0.805         0.613           764         61II         4.54         3.685         1.757         0.805         0.613           38.7         G III         0.22         0.175         0.036         0.078         0.067           63.8         G III         0.29         0.305         0.164         0.078         0.000           63.8         G III         0.68         0.883         0.464         0.078         0.000           267         G III         1.37         1.128         0.530         0.016         0.000           4.69         G III         1.37         1.128         0.530         0.046         0.016           5.64         G III         1.37         1.128         0.530         0.077         0.046           5.64         G III         1.24         0.948         0.156         0.077         0.046           5.64         G III         1.071         0.029         0.046         0.047         0.046           5.64         G III         1.071         0.0	ZG002	166		1.94	1.821	1.071	0.768	0.569	0.401
285         G III         2 64         2 234         1 153         0 805         0 613           364         G III         4 54         3 685         1 577         0 805         0 678           58,6         G III         0 22         0 175         0 074         0 063           63,8         G III         0 22         0 175         0 074         0 066           67,4         G III         0 22         0 129         0 034         0 006         0 015           177         G III         0 22         0 129         0 034         0 020         0 015           267         G III         1 37         1 128         0 034         0 020         0 015           399         G III         1 37         1 128         0 546         0 034         0 20           460         G III         1 128         0 546         0 046         0 046         0 046           1170         G III         1 1 2 1         2 342         2 376         0 046         0 046         0 046           1170         G III         1 1 2 2         2 342         2 376         2 34         1 34         0 046         0 34           2640         G III	ZG001	205		2.33	2.278	1.314	0.864	0.534	0.219
764         G III         4 54         3.685         1.577         0.927         0.578           63.8         G III         0.22         0.175         0.085         0.074         0.063           63.8         G III         0.22         0.156         0.085         0.077         0.000           67.4         G III         0.28         0.129         0.036         0.079         0.000           67.4         G III         0.28         0.129         0.044         0.020         0.015           287         G III         0.86         0.683         0.464         0.039         0.200           287         G III         1.37         1.128         0.530         0.042         0.005           469         G III         4.16         3.842         2.836         0.243         0.046           469         G III         1.250         12.490         8.167         6.088         4.343           1170         G III         1.071         9.261         1.648         8.167         0.046           2640         G III         1.071         2.048         3.482         2.848         1.341         1.343           2640         G III <t< td=""><td>ZK001</td><td>285</td><td>ĺ</td><td>2.64</td><td>2.234</td><td>1.153</td><td>0.805</td><td>0.613</td><td>0.478</td></t<>	ZK001	285	ĺ	2.64	2.234	1.153	0.805	0.613	0.478
36.7         GIII         0.22         0.175         0.086         0.074         0.063           63.8         GIII         0.29         0.305         0.164         0.078         0.000           67.4         GIII         0.28         0.129         0.034         0.020         0.015           177         GIII         0.66         0.683         0.444         0.520         0.015         0.015           267         GIII         1.37         1.128         0.530         0.343         0.230           468         GIII         1.37         1.128         0.550         0.077         0.046           564         GIII         2.91         3.084         1.481         1.062         0.23           1170         GIII         12.50         12.490         8.167         6.08         0.348           1170         GIII         12.50         12.490         8.167         6.08         4.343           1170         GIII         2.245         2.0060         11.000         7.132           264         GIII         2.245         2.0060         11.000         7.132           270         GIII         2.245         2.0060         11.000<	ZH001	764	<b>■ 0</b>	4.54	3.685	1.577	0.927	0.578	0.342
63.8         GIII         0.29         0.305         0.164         0.078         0.000           67.4         GIII         0.28         0.129         0.034         0.020         0.015           177         GIII         0.28         0.129         0.034         0.020         0.015           267         GIII         1.37         1.128         0.530         0.343         0.242           469         GIII         4.16         3.942         2.976         2.614         2.391           469         GIII         12.50         12.90         0.077         0.046           1170         GIII         1.67         2.976         2.614         2.391           2640         GIII         1.67         1.841         1.062         0.348           1170         GIII         1.071         9.261         5.486         3.660         2.381           2640         GIII         2.245         20.060         11.000         7.726         5.750           4400         GIII         2.945         2.0760         11.000         7.726         5.750           270         GIII         1.94         1.54         1.040         7.132         7.132 <td>Y S003</td> <td>36.7</td> <td><b>⊞ Ø</b></td> <td>0.22</td> <td>0.175</td> <td>0.095</td> <td>0.074</td> <td>0.063</td> <td>0.057</td>	Y S003	36.7	<b>⊞ Ø</b>	0.22	0.175	0.095	0.074	0.063	0.057
67.4         G III         0.28         0.129         0.034         0.020         0.015           177         G III         0.66         0.683         0.464         0.338         0.230           267         G III         1.72         0.156         0.077         0.046           399         G III         4.16         3.942         2.976         2.614         2.301           564         G III         1.291         3.088         1.841         1.062         0.348           1290         G III         1.250         12.490         8.167         6.088         0.348           1290         G III         22.45         20.060         11.002         2.348         3.348           2640         G III         22.45         20.060         11.002         2.348         3.348           2640         G III         22.45         20.060         11.002         2.859         2.750           2640         G III         22.45         20.060         11.002         2.853         2.738           2740         G III         1.754         1.057         0.010         0.01         0.01           2840         G III         1.754         1.057	Y P001	63.8	≡ 5	0.29	0.305	0.164	0.078	0000	0000
177         G III         0.66         0.683         0.464         0.338         0.230           287         G III         1.37         1.128         0.530         0.343         0.242           469         G III         0.94         0.550         0.155         0.077         0.046           469         G III         4.16         3.942         2.976         0.077         0.046           564         G III         12.50         12.490         8.167         6.008         4.343           1170         G III         10.71         9.261         5.048         3.650         2.869           2640         G III         10.71         9.261         5.048         3.650         2.869           2640         G III         1.91         1.754         1.067         0.010         0.001           200         G III         0.99         0.717         0.239         0.113         0.024           201         G III         1.91         1.754         1.067         0.796         0.713           202         G III         0.99         0.717         0.239         0.116         0.710           21         G III         1.91         1.05	100FZ	67.4	<b>■</b> 8	0.28	0.129	0.034	0.020	0.015	0.014
267         G III         1.37         1.128         0.630         0.343         0.242           399         G III         0.94         0.650         0.155         0.077         0.046           469         G III         4.16         3.942         2.976         2.614         2.991           564         G III         1.260         12.991         3.088         1.841         1.062         0.348           1170         G III         1.2.60         12.990         8.167         6.008         4.343           1290         G III         10.71         9.261         5.048         3.650         2.869           2640         G III         10.71         9.261         5.760         2.869         2.770         13.840         9.625         7.132           4400         G III         1.94         1.754         1.067         0.713         0.001         0.001           200         G III         1.94         1.754         1.067         0.796         0.001         0.001           201         G III         1.94         2.674         1.621         1.309           470         G III         5.06         4.619         3.104         2.549	1YO006	1771	III 9	99.0	0.683	0.464	0.338	0.230	0.107
399         G III         0.94         0.550         0.155         0.077         0.046           469         G III         4.16         3.942         2.976         2.614         2.391           554         G III         1.291         3.942         2.976         2.614         2.391           1170         G III         12.50         12.990         8.167         6.082         4.343           1290         G III         10.71         9.261         5.048         3.660         2.865           2640         G III         10.71         9.261         5.760         4.343           4400         G III         22.45         20.060         11.000         7.726         5.750           2640         G III         0.27         0.156         0.035         0.010         0.001           260         G III         0.27         0.156         0.035         0.010         0.001           270         G III         1.94         1.754         1.057         0.796         0.052           281         G III         1.94         2.54         1.621         1.309           470         G III         1.044         9.756         0.326         <	Y R001	267	⊞ 9	1.37	1,128	0.530	0.343	0.242	0.173
469         G III         416         3.942         2.976         2.614         2.391           1554         G III         2.91         3.088         1.841         1.062         0.348           1170         G III         12.50         12.490         8.167         6.008         4.343           1290         G III         10.71         9.261         5.048         3.650         2.869           2640         G III         22.45         20.060         11,000         7.726         5.750           4400         G III         0.27         0.156         0.035         0.011         0.001           200         G III         0.29         0.717         0.239         0.113         0.052           200         G III         0.99         0.717         0.239         0.113         0.062           201         G III         1.91         1.754         1.067         0.796         0.634           470         G III         2.96         2.728         1.670         1.263         1.794           629         G III         5.12         4.619         3.104         2.549         0.718           611         G III         10.44 <td< td=""><td>Y R002</td><td>399</td><td>III 9</td><td>0.94</td><td>0.550</td><td>0,155</td><td>0.077</td><td>0.046</td><td>0.031</td></td<>	Y R002	399	III 9	0.94	0.550	0,155	0.077	0.046	0.031
564         G III         2.91         3.088         1.841         1.062         0.348           1170         G III         12.50         12.490         8.167         6.008         4.343           1290         G III         10.71         9.261         5.048         3.660         2.859           2640         G III         29.13         25.770         13.840         9.625         7.132           4400         G III         0.27         0.156         0.035         0.010         0.001           200         G III         0.89         0.717         0.239         0.113         0.052           237         G III         1.91         1.754         1.067         0.796         0.634           391         G III         2.95         2.728         1.670         0.796         0.634           470         G III         1.91         1.754         1.670         0.796         0.634           470         G III         5.12         4.640         2.836         2.186         1.794           529         G III         10.44         9.750         7.455         0.652         1.309           610         G III         10.44 <t< td=""><td>YN002</td><td>469</td><td>III 9</td><td>4.16</td><td>3.942</td><td>2.976</td><td>2.614</td><td>2.391</td><td>2.213</td></t<>	YN002	469	III 9	4.16	3.942	2.976	2.614	2.391	2.213
1170         G III         12.50         12.490         8.167         6.008         4.343           1290         G III         10.71         9.261         5.048         3.660         2.859           2640         G III         22.45         20.060         11.000         7.726         5.750           4400         G III         29.13         25.770         13.840         9.625         7.132           93.2         G III         0.99         0.717         0.239         0.010         0.001           200         G III         1.91         1.754         1.057         0.796         0.052           391         G III         1.91         1.754         1.057         0.796         0.001           470         G III         1.91         1.754         1.057         0.796         0.052           470         G III         5.12         4.640         2.836         2.186         1.794           529         G III         10.44         9.760         7.455         6.658         0.196           611         G III         1.773         15.620         9.344         7.258         6.058           210         G III         1.773	Y H003	554	@ B	2.91	3.088	1.841	1.062	0.348	0.000
1290         G III         1071         9.261         5.048         3.650         2.859           2640         G III         22.45         20.060         11.000         7.726         5.750           4400         G III         29.13         25.770         13.840         9.625         7.132           93.2         G III         0.27         0.156         0.035         0.010         0.001           200         G III         0.27         0.156         0.035         0.013         0.001           200         G III         1.91         1.754         1.057         0.796         0.052           237         G III         1.91         1.754         1.057         0.796         0.054           470         G III         5.12         4.619         3.104         2.549         2.12           611         G III         10.44         9.750         7.455         6.58         6.182           611         G III         10.44         9.750         7.455         6.58         6.182           710         G III         10.73         1.5620         9.344         7.28         6.182           72         G III         1.73         1	ZF001	1170	E S	12.50	12.490	8.167	8.008	4.343	2,653
2640         G III         22,45         20.060         11,000         7,726         5,750           4400         G III         29,13         25,770         13,840         9,625         7,132           93.2         G III         0,27         0,156         0,035         0,010         0,001           200         G III         0,89         0,717         0,239         0,113         0,052           237         G III         0,89         0,717         0,239         0,010         0,001           237         G III         1,91         1,754         1,067         0,796         0,634           391         G III         2,96         2,728         1,670         1,263         1,006           470         G III         5,12         4,640         2,836         2,186         1,734           529         G III         5,00         4,619         3,104         2,549         1,734           611         G III         10,44         9,750         7,455         6,658         6,192           72         G III         1,73         1,562         9,344         7,258         6,075           72         G III         1,73         1,	YS001	1290	■ 5	10.71	9.261	5.048	3.650	2.859	2.288
4400         G III         29.13         25.770         13.840         9.625         7.132           83.2         G III         0.27         0.156         0.035         0.010         0.001           200         G III         0.99         0.717         0.239         0.113         0.062           237         G III         1.91         1.754         1.067         0.796         0.001           470         G III         2.96         2.728         1.670         1.263         1.006           470         G III         5.12         4.640         2.836         2.186         1.794           529         G III         5.00         4.619         3.104         2.549         1.794           624         G III         10.44         9.750         7.455         6.658         6.192           2110         G III         10.44         9.750         7.455         6.658         6.056           210         G III         1.773         1.562         9.344         7.258         6.075           72         G III         0.44         0.452         0.332         0.265         0.987           230         G III         1.73         1.	ZE001	2640	III 9	22.45	20.060	11.000	7.726	5.750	4.219
83.2         G III         0.27         0.156         0.035         0.010         0.001           200         G III         0.99         0.717         0.239         0.113         0.062           237         G III         1.91         1.754         1.067         0.796         0.062           470         G III         2.95         2.728         1.670         1.263         1.006           470         G III         5.12         4.640         2.836         2.186         1.794           529         G III         5.00         4.619         3.104         2.549         1.794           624         G III         10.44         9.750         7.455         6.658         6.192           2110         G III         10.44         9.750         7.455         6.658         6.056           72         G III         0.44         0.452         0.332         0.265         0.208           139         G III         1.73         1.562         9.344         7.258         6.056           139         G III         0.44         0.452         0.332         0.265         0.908           205         G III         1.73         1.556 </td <td>YQ001</td> <td>4400</td> <td>■ 5</td> <td>29.13</td> <td>25.770</td> <td>13.840</td> <td>9.625</td> <td>7.132</td> <td>5.242</td>	YQ001	4400	■ 5	29.13	25.770	13.840	9.625	7.132	5.242
200         G III         0.99         0.717         0.239         0.113         0.062           237         G III         1.91         1.754         1.067         0.796         0.634           391         G III         2.96         2.728         1.067         0.796         0.634           470         G III         5.12         4.640         2.836         2.186         1.794           529         G III         5.00         4.619         3.104         2.549         1.794           611         G III         10.44         9.750         7.455         6.658         6.192           2110         G III         10.44         9.750         7.455         6.658         6.075           72         G III         1.773         1.5620         9.344         7.258         6.075           72         G III         0.44         0.452         0.332         0.265         0.208           139         G III         1.73         1.562         1.134         0.999         0.925           205         G III         2.89         2.507         1.753         1.432         0.987           30         G III         2.29         2.071 <td>YM003</td> <td>93.2</td> <td>≡ 9</td> <td>0.27</td> <td>0.156</td> <td>0.035</td> <td>0.010</td> <td>0.001</td> <td>0.000</td>	YM003	93.2	≡ 9	0.27	0.156	0.035	0.010	0.001	0.000
237         G III         1.91         1.754         1.067         0.796         0.634           391         G III         2.96         2.728         1.670         1.263         1.006           470         G III         5.12         4.640         2.836         2.186         1.794           529         G III         5.00         4.619         3.104         2.549         2.212           611         G III         10.44         9.750         7.455         6.658         6.192           2110         G III         10.44         9.750         7.455         6.658         6.075           72         G III         1.773         1.5620         9.344         7.258         6.075           139         G III         0.44         0.452         0.332         0.265         0.208           139         G III         1.73         1.562         1.134         0.999         0.925           205         G III         1.73         1.562         1.134         0.999         0.925           205         G III         2.89         2.507         1.763         1.432         0.987           300         G III         2.29         2.071<	YD002	200	III 9	66.0	0.717	0.239	0.113	0.052	0.016
391         GIII         2.96         2.728         1.670         1.263         1.006           470         GIII         5.12         4.640         2.836         2.186         1.794           529         GIII         5.00         4.619         3.104         2.549         2.212           611         GIII         10.44         9.750         7.455         6.658         6.192           2110         GIII         17.73         15.620         9.344         7.258         6.075           72         GIII         0.44         0.452         0.332         0.265         0.208           139         GIII         1.73         1.562         1.134         0.999         0.925           205         GIII         1.73         1.562         0.332         0.265         0.208           139         GIII         1.73         1.562         1.134         0.999         0.925           205         GIII         2.89         2.507         1.763         1.432         0.987           30         GIII         2.29         2.071         1.357         1.112         0.969           640         GIII         8.74         7.849         <	YD001	237	= 5	1.91	1.754	1,057	0.796	0.634	0.504
470         G III         5.12         4.640         2.836         2.186         1.794           529         G III         5.00         4,619         3.104         2.549         2.212           611         G III         10.44         9.760         7.455         6.658         6.192           2110         G III         10.44         9.760         7.455         6.658         6.075           72         G III         0.44         0.452         0.332         0.265         0.208           139         G III         1.73         1.562         1.134         0.999         0.925           205         G III         2.89         2.507         1.763         1.539         1.432           343         G III         2.29         2.071         1.357         1.112         0.969           640         G III         8.74         7.849         5.632         4.946         4.577	YK005	391	⊞ 5	2.95	2.728	1.670	1.263	1,006	0.796
529         G III         5 00         4,619         3.104         2.549         2.212           611         G III         10,44         9.763         2.264         1,621         1,309           624         G III         10,44         9.760         7,455         6.658         6.192           2110         G III         17,73         15,620         9.344         7,258         6.075           72         G III         0,44         0,452         0,332         0,265         0,208           139         G III         1,73         1,562         1,134         0,999         0,925           205         G III         3,02         2,848         1,565         1,192         0,987           230         G III         2,89         2,507         1,763         1,539         1,432           343         G III         2,29         2,071         1,357         1,112         0,969           640         G III         8,74         7,849         5,632         4,946         4,577	YK002	470	<b>■</b> 9	5,12	4.640	2.836	2.186	1,794	1.492
611 G III G III 6 78 4.553 2.254 1.621 1.309 624 G III 10.44 9.750 7.455 6.658 6.192 2110 G III 17.73 15.620 9.344 7.258 6.075 72 G III 0.44 0.452 0.332 0.265 0.208 139 G III 1.73 1.562 1.134 0.999 0.925 205 G III 2.89 2.507 1.753 1.539 1.432 343 G III 2.29 2.071 1.357 1.112 0.969 640 G III 8.74 7.849 5.632 4.946 4.577	YK004	529	8 €	2,00	4,619	3.104	2.549	2.212	1.949
624         G III         10.44         9.750         7.455         6.658         6.192           2110         G III         17.73         15.620         9.344         7.258         6.075           72         G III         0.44         0.452         0.332         0.265         0.208           139         G III         1.73         1.562         1.134         0.999         0.925           205         G III         3.02         2.648         1.556         1.192         0.987           230         G III         2.89         2.507         1.753         1.539         1.432           343         G III         2.29         2.071         1.357         1.112         0.969           640         G III         8.74         7.849         5.632         4.946         4.577	YF001	119	⊞ 5	5.78	4,553	2.254	1.621	1.309	1,116
2110     G III     17.73     15.620     9.344     7.258     6.075       72     G III     0.44     0.452     0.332     0.265     0.208       139     G III     1.73     1.562     1.134     0.899     0.925       205     G III     3.02     2.648     1,555     1,192     0.987       230     G III     2.89     2.507     1.753     1.539     1.432       343     G III     2.29     2.071     1.357     1.112     0.969       640     G III     8.74     7.849     5.632     4.946     4.577	YC001	624	<b>■</b> 5	10.44	9.750	7.455	6.658	6.192	5.843
72 G III 0.44 0.452 0.332 0.265 0.208 139 G III 1.73 1.562 1.134 0.899 0.925 205 G III 3.02 2.648 1.555 1.192 0.987 230 G III 2.89 2.507 1.753 1.539 1.432 343 G III 2.29 2.071 1.357 1.112 0.969 640 G III 8.74 7.849 5.632 4.946 4.577	YL001	2110		17.73	15,620	9.344	7.258	6.075	5.221
139         G III         173         1.562         1.134         0.999         0.925           205         G III         3.02         2.648         1,555         1.192         0.987           230         G III         2.89         2.507         1.753         1.539         1.432           343         G III         2.29         2.071         1.357         1.112         0.969           640         G III         8.74         7.849         5.632         4.946         4.577	ZA002	72	III 5	0.44	0.452	0.332	0.265	0.208	0,145
205         G III         3 02         2 648         1,655         1,192         0.987           230         G III         2.89         2.507         1.753         1.539         1.432           343         G III         2.29         2.071         1.357         1.112         0.969           640         G III         8.74         7.849         5.632         4.946         4.577	ZA003	139	III 9	1.73	1.562	1.134	0.999	0.925	0.874
230 G III 2.89 2.507 1.753 1.539 1.432 343 G III 2.29 2.071 1.357 1.112 0.969 640 G III 8.74 7.849 5.632 4.946 4.577	ZB001	205	8 €	3.02	2.648	1,555	1.192	0.987	0.839
343 G III 2.29 2.071 1.357 1.112 0.969 640 G III 8.74 7.849 5.632 4.946 4.577	ZC002	230	(B)	2.89	2.507	1.753	1.539	1.432	1,363
640 G III 8.74 7.849 5.632 4.946 4.577	ZA001	343	III 9	2.29	2.071	1.357	1.112	696.0	0.863
	Y3001	640	III 5	8.74	7.849	5.632	4.946	4.577	4.326

<sup>\*</sup> Notes Q2, Q5, Q10, Q20, Q50 = Low Flows for Return Periods of 2, 5, 10, 20, 50 Years, Respectively. Probability Density Function = G III : Gumbel Type III

#### 6 REGRESSION EQUATIONS FOR ESTIMATING N-DAY LOW FLOWS

Regression analysis is a multi-variate analysis in which the low flow frequency estimates from gauged watersheds are related quantitatively to independent physiographic characteristics of the watersheds. The resulting equations can be used to estimate low flow characteristics at sites with inadequate hydrologic information.

The "best" regression equations were obtained when the Island was divided into three (3) regions and the regression analysis performed in each region separately. The regions are shown in Figure 2. The division of the Island was the outcome of an iterative process of identifying regions with distinct hydrological, climatic and physiographic characteristics, performing regression analyses for each identified region, evaluating the resulting regression equations and re-defining the regions' boundaries if necessary. The three regions are:

- A: Avalon and Burin Peninsulas and the Southwest Newfoundland. The main characteristics of this region are high precipitation, high runoff potential and significant barren areas.
- B: North-Central Newfoundland. The main characteristics of this region are low precipitation, low runoff potential and significant forest areas (insignificant barren areas).
- C: Humber Valley and Northern Peninsula. The main characteristics of this region are moderate precipitation, moderate runoff potential and moderate forest and barren areas.

The south coast of the Island was not identified as a region in Figure 2 because of insufficient hydrologic data in the area.

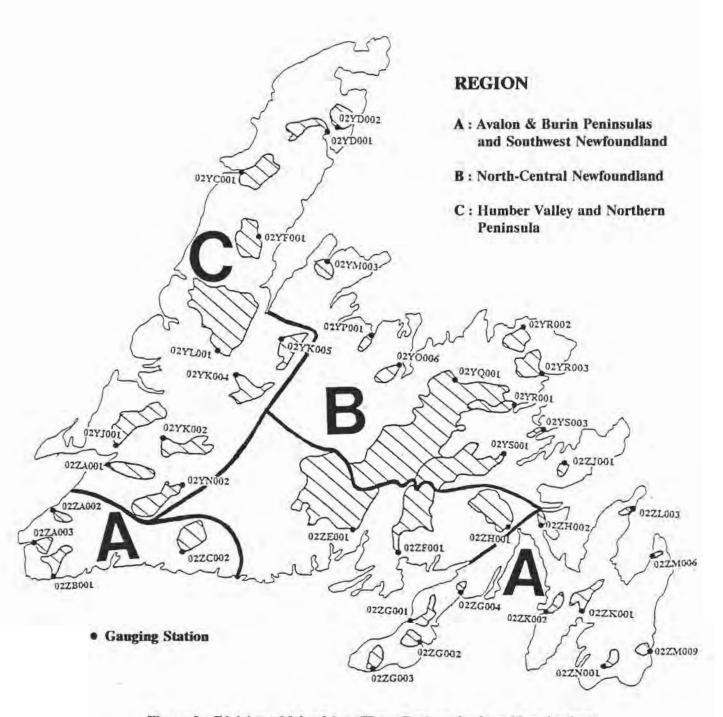


Figure 2 Division of Island into Three Regions for Low Flow Analysis

The regression analysis for each region consisted of the following steps:

- (1) Regression analysis between the Beta@30 and watershed characteristics. Beta@30 were the beta parameters of the 30-day low flow series as calculated by LFA [4]. One regression equation was derived for each region.
- (2) Regression analysis between Beta@30 and Beta@N, where N = 1, 7 and 15. Beta@N were the beta parameters of the N-day low flow series as calculated by LFA. Three regression equations (N = 1,7,15) were obtained for each region.
- (3) Regression analysis between Beta@N and Q2@N, Q2@N and Q5@N, Q5@N and Q10@N, Q10@N and Q20@N, and Q20@N and Q50@N. QT@N was the T-year, N-day low flow estimate, as calculated by LFA. The analysis was done for each region and low flow duration.

The equations resulting from regression analyses are given in Tables 9, 10 and 11 for regions A, B and C, respectively. The equations for Beta@30 for the three regions show that Beta@30 is primarily dependent on drainage area; in region A, Beta@30 depends slightly on the percentage of forested area. The equation for region A when percentage of forested area is excluded from the analysis is also shown in Table 9. This equation can be used for estimating low flows in region A when only the drainage area is available as the predictive parameter.

A comparison of the low flow frequency estimates with the estimates obtained from applying the regression equations on the gauged watersheds indicates that the percentage difference between the frequency and regression estimates in most cases ranged from +50% to -50%, although some were much higher. The high values occurred most often for low flows with high return periods, that is, when the frequency estimates were close to zero. The high percentage differences were due to the fact that for very low flow estimates the differences between the regression and frequency estimates became very close to the frequency estimates themselves.

Table 9 Regression Equations for Region A

Equation			$\underline{R^2}$	S.E.E
BETA@30	=	14.8594*DA <sup>1.140</sup> *FAR <sup>-0.251</sup>	0.97	0.113
BETA@30	=	4.9774*DA <sup>1.192</sup>	0.96	0.133 ***
Q2@30	-	0.832*BETA@30	0.99	0.049
Q5@30	=	0.610*Q2@30	0.96	0.104
Q10@30	=	0.773*Q5@30	0.97	0.081
Q20@30	=	0.829*Q10@30	0.96	0.081
Q50@30	=	0.853*Q20@30	0.94	0.099
BETA@15	=	0.6699*BETA@301.006	0.99	0.059
Q2@15	=	0.833*BETA@15	0.99	0.036
Q5@15	=	0.605*Q2@15	0.96	0.080
Q10@15	=	0.764*Q5@15	0.97	0.057
Q20@15	=	0.829*Q10@15	0.96	0.052
Q50@15	=	0.853*Q20@15	0.94	0.062
BETA@7	=	0.5236*BETA@301.010	0.99	0.077
Q2@7	=	0.831*BETA@7	0.99	0.029
Q5@7	=	0.610*Q2@7	0.95	0.072
Q10@7	=	0.781*Q5@7	0.96	0.053
Q20@7	=	0.840*Q10@7	0.96	0.048
Q50@7	=	0.866*Q20@7	0.94	0.057
BETA@1	=	0.4198*BETA301.015	0.98	0.100
Q2@1	=	0.831*BETA@1	0.99	0.024
Q5@1	=	0.606*Q2@1	0.97	0.049
Q10@1	=	0.769*Q5@1	0.97	0.038
Q20@1	=	0.822*Q10@1	0.96	0.038
Q50@1	=	0.676*Q20@1	0.80	0.078

#### Notes:

BETA@N: Beta parameter of Gumbel Type III PDF for N-day low flow series

QT@N: T-year Low Flow Regression Estimate of duration N days

R<sup>2</sup>: Correlation coefficient

S.E.E.: Standard error of estimate [QT@N, log<sub>10</sub>(BETA@N)]

DA: Drainage Area (km²)

FAR: Percentage of drainage area covered by forests

\*\*\* Regression equation with only DA as the predictive parameter

Table 10 Regression Equations for Region B

Equation			$\underline{\mathbf{R}^2}$	<u>S.E.E</u>
BETA@30	=	5.0466*DA <sup>0.966</sup>	0.83	0.184
Q2@30	=	0.844*BETA@30	0.99	0.101
Q5@30	=	0.566*Q2@30	0.97	0.102
Q10@30	=	0.588*Q5@30	0.99	0.032
Q20@30	=	0.393*Q10@30	0.77	0.062
Q50@30	=	0.602*Q20@30	0.88	0.022
BETA@15	=	0.4046*BETA@301.099	0.99	0.047
Q2@15	=	0.841*BETA@15	0.99	0.081
Q5@15	=	0.543*Q2@15	0.98	0.070
Q10@15	=	0.542*Q5@15	0.98	0.034
Q20@15	=	0.287*Q10@15	0.24	0.073
Q50@15	=	0.695*Q20@15	0.99	0.004
BETA@7	=	0.2280*BETA@30 <sup>1.166</sup>	0.98	0.075
Q2@7	=	0.834*BETA@7	0.99	0.072
Q5@7	=	0.526*Q2@7	0.98	0.063
Q10@7	=	0.529*Q5@7	0.98	0.033
Q20@7	=	0.280*Q10@7	0.21	. 0.070
Q50@7	=	0.694*Q20@7	0.99	0.004
BETA@1	=	0.1449*BETA301.214	0.98	0.077
Q2@1	=	0.826*BETA@1	0.99	0.064
Q5@1	=	0.509*Q2@1	0.98	0.057
Q10@1	=	0.518*Q5@1	0.98	0.031
Q20@1	=	0.275*Q10@1	0.19	0.065
Q50@1	=	0.670*Q20@1	0.99	0.004

#### Notes:

BETA@N: Beta parameter of Gumbel Type III PDF for N-day low flow series

QT@N: T-year Low Flow Regression Estimate of duration N days

R<sup>2</sup>: Correlation coefficient

S.E.E.: Standard error of estimate [QT@N, log<sub>10</sub>(BETA@N)]

DA: Drainage Area (km²)

FAR: Percentage of drainage area covered by forests

Table 11 Regression Equations for Region C

		$\underline{\mathbf{R}^2}$	S.E.E
=	DA <sup>1,383</sup>	0.85	0.093
=	0.859*BETA@30	0.99	0.247
=	0.701*Q2@30	0.95	0.449
=	0.862*Q5@30	0.99	0.193
=	0.910*Q10@30	0.99	0.128
=	0.929*Q20@30	0.99	0.108
=	0.7362*BETA@301.009	0.98	0.039
=	0.870*BETA@15	0.99	0.133
=	0.712*Q2@15	0.97	0.291
=	0.858*Q5@15	0.99	0.169
=	0.902*Q10@15	0.99	0.134
=	0.917*Q20@15	0.99	0.130
=	0.5848*BETA@301.023	0.96	0.053
=	0.879*BETA@7	0.99	0.094
=	0.715*Q2@7	0.98	0.229
=	0.847*Q5@7	0.99	0.148
=	0.886*Q10@7	0.99	0.127
=	0.894*Q20@7	0.99	0.134
=	0.4864*BETA301.034	0.94	0.065
=	0.880*BETA@1	0.99	0.086
=	0.708*Q2@1	0.98	0.215
=	0.831*Q5@1	0.99	0.136
=	0.866*Q10@1	0.99	0.114
=	0.867*020@1	0.99	0.118
		= 0.859*BETA@30 = 0.701*Q2@30 = 0.862*Q5@30 = 0.910*Q10@30 = 0.929*Q20@30 = 0.7362*BETA@30 <sup>1.009</sup> = 0.870*BETA@15 = 0.712*Q2@15 = 0.858*Q5@15 = 0.902*Q10@15 = 0.917*Q20@15 = 0.5848*BETA@30 <sup>1.023</sup> = 0.879*BETA@7 = 0.715*Q2@7 = 0.847*Q5@7 = 0.847*Q5@7 = 0.894*Q20@7 = 0.4864*BETA30 <sup>1.034</sup> = 0.894*Q20@7 = 0.4864*BETA@1 = 0.708*Q2@1 = 0.831*Q5@1 = 0.866*Q10@1	= DA <sup>1.383</sup> 0.85 = 0.859*BETA@30 0.99 = 0.701*Q2@30 0.95 = 0.862*Q5@30 0.99 = 0.910*Q10@30 0.99 = 0.929*Q20@30 0.99 = 0.7362*BETA@30 <sup>1.009</sup> 0.98 = 0.870*BETA@15 0.99 = 0.712*Q2@15 0.97 = 0.858*Q5@15 0.99 = 0.902*Q10@15 0.99 = 0.917*Q20@15 0.99 = 0.917*Q20@15 0.99 = 0.879*BETA@7 0.99 = 0.847*Q5@7 0.99 = 0.847*Q5@7 0.99 = 0.886*Q10@7 0.99 = 0.4864*BETA30 <sup>1.034</sup> 0.94 = 0.880*BETA@1 0.99 = 0.4864*BETA30 <sup>1.034</sup> 0.94 = 0.880*BETA@1 0.99 = 0.831*Q5@1 0.99 = 0.866*Q10@1 0.99

#### Notes:

BETA@N: Beta parameter of Gumbel Type III PDF for N-day low flow series

QT@N: T-year Low Flow Regression Estimate of duration N days

R<sup>2</sup>: Correlation coefficient

S.E.E.: Standard error of estimate [QT@N, log<sub>10</sub>(BETA@N)]

DA: Drainage Area (km²)

FAR: Percentage of drainage area covered by forests

It is recommended that the regression equations given in Tables 9, 10 and 11 be applied under the following conditions:

#### Equations for Region A:

- The drainage area of the watershed must be less than 200 km<sup>2</sup>.
- The percentage of barren area in the watershed must be between 25% and 75%. (The percentage of forested area must be between 10% and 70%. The percentage of watershed area occupied by lakes and swamps must between 10% and 20%.)

#### Equations for Region B:

- 1. The drainage area of the watershed must be between 40 km<sup>2</sup> and 400 km<sup>2</sup>.
- The percentage of barren area in the watershed must be less than 5%. (The
  percentage of forested area must be greater than 80%, with the rest of the
  watershed occupied by lakes and swamps.)

#### Equations for Region C:

- The drainage area of the watershed must be between 240 km<sup>2</sup> and 600 km<sup>2</sup>.
- The percentage of barren area in the watershed must be between 10% and 40%. (The percentage of forested area must be between 40% and 65%. The percentage of the watershed occupied by lakes and swamps should be between 10% and 20%.)

#### 7 COMPUTER-BASED USE OF REGRESSION EQUATIONS

Manual calculations of low flow estimates using the regression equations in Tables 9, 10 and 11 require tedious substitutions of watershed characteristics and regression coefficients. This increases the chances of errors. To eliminate this source of errors, a Lotus 1-2-3<sup>1</sup> worksheet, LFFE-91.WK1 [5], has been developed to perform the calculations automatically once the watershed's name, geographical location and physiographic parameters are input. The results are displayed instantly on the screen. A copy of the package is available from: Director, Water Resources Division, Department of Environment and Lands, P.O. Box 8700, St. John's, Newfoundland, A1B 4J6.

A typical spreadsheet as displayed when the Lotus worksheet LFFE-91.WK1 is loaded is illustrated in Table 12. The entry cells are unprotected cells and are differentiated on the screen. Any attempt to enter characters in protected cells will result in a "beep" indicating an illegal entry. Pressing the "Esc" key will abort the attempted change in a protected cell. Messages will appear on the screen whenever the user is to be made aware of certain information. For example, whenever watershed parameters are outside their applicable range or area of watershed is less than other entered areas or an unacceptable input for watershed location has been entered, a message will appear in the lower left-hand corner of the screen indicating the error.

Whenever the message "(Not Used)" appears by an entry cell, it means that this particular parameter is not used in calculating the low flow estimates and entering numbers for this parameter will not change the results. However, it is recommended that such parameters be evaluated and input so that the program can indicate whether they are within the applicable range. This will give the user more information on which to assess the validity of the results.

<sup>&</sup>lt;sup>1</sup>Lotus 1-2-3 is a U.S. registered trademark of Lotus Development Corporation.

Table 12 Example of Spreadsheet as Displayed on Computer Screen

ACTOR OF CONTRACTOR	VV				
Name of watershed	Northe	ast River @			02
Location of watershed	1	Eastern 8	& Southwes	stern	
(Eastern-Southwestern=1, North-Centre	al=2, Hum	ber & North	nern Penin	sula=3)	
Range of Mean Annual Runoff for Reg	gion 1 = 11	00 mm to 2	2100 mm		
Physiographic Parameters			Paramet	er Range	
DA Area of watershed	89.6	km²	4.0	200.0	
FAR Forested Area (X if Unavail.)	42.1	km²	9.0	62.7	÷
BAR Barren Area (Not Used)	20.6	km2 **	22.4	67.2	
ALS Lakes+Swamps Area (Not Used)	26.9	km² **	9.0	17.9	
WARNINGS & ERROR DIAGNOSIS	ъ Т		Low Flows	s (I/s)	
	(year)	1-day	7-day	15-day	30-day
	2	368	443	553	791
** Use results with caution:	10	171	211	255	373
These parameters are outside	20	141	177	212	309
the range for reliable results.	50	95	154	181	264

#### Data Input into LFFE-91.WK1

#### [1] Name of Watershed

Enter the name of the watershed for which low flows are being estimated.

#### [2] Location of Watershed

Three (3) hydrological regions have been identified during the low flow study and are shown in Figure 2. Refer to this figure to determine the region within which the watershed lies. Note that Regions A, B and C in Figure 2 must be input as 1, 2 and 3 in LFFE-91.WK1.

#### [3] DA Area of Watershed

This is the drainage area (in km<sup>2</sup>) of the watershed at the section where low flows need to be estimated. It is recommended that the drainage area be determined using a planimeter or digitizer from 1:50,000 topographic maps.

#### [4] FAR Forested Area

This is the area (in km<sup>2</sup>) of the watershed covered by forests. It is recommended that the forested area be determined using a planimeter or digitizer from 1:50,000 topographic maps.

The forested area is used as a predictive parameter in the regression equations for calculating low flows for watersheds in region A only. If, however, the forested area is not available, then an "x" can be entered. The alternate regression equation will be used to calculate low flows for region A and a message will appear at the bottom of the screen indicating this case. For watersheds in regions B and C, the forested area is not used in the regression equations and a message "(Not Used)" will appear by the entry cell. Nevertheless, it is preferable that the forested area be calculated and entered. The program will indicate whether this calculated area is

within the range used in deriving the equations. Hence, the user will be able to evaluate the results.

#### [5] BAR Barren Area and [6] ALS Lakes+Swamps Area

The area (in km²) covered by barrens and the area (in km²) covered by lakes and swamps are <u>not required</u> for calculating low flow estimates. However, it is recommended that these areas be extracted and entered so that it can be determined whether they are within the applicable range. This is especially important for watersheds located in region B. In this region, all but one of the watersheds used in the analysis were less than 3% barren. Hence, if the ungauged watershed has a much higher proportion of barren area, the low flow estimates could be seriously in error.

#### **OUTPUT OF PROGRAM**

The program outputs the 2-, 10-, 20- and 50-year expected low flows of durations 1-, 7-, 15- and 30-day in litres per sec (1/s).

The program also outputs the range of the **mean annual runoff** (in mm) expected for the particular region within which the watershed is located.

A copy of the worksheet as illustrated in Table 12 can be obtained by pressing the "Print Screen" or by using Lotus 1-2-3 print commands.

#### 8 ESTIMATION PROCEDURE

The procedural steps given below for estimating low flows using the regression equations should be treated as guidelines. Specific situations warrant that professional engineering judgement, as appropriate to site/watershed conditions, be exercised in the application of the procedure. For example, large-scale logging, groundwater contribution from outside the watershed's topographic divide, and artificial regulations and diversions can severely affect the applicability of the procedure.

A detailed description on the application of the regional regression equations using LFFE-91.WK1 to estimate low flows at ungauged sections of streams is given below as Case A.

Occasionally, a hydrometric station will be located on the subject stream. If the watershed area at the ungauged site is less than 15% smaller or larger than the watershed area at the gauged site and the number of years of daily flow data at the gauged section is equal to or greater than 8, then a method to estimate low flows at the ungauged site using the information at the gauged section is given as <u>Case B</u>.

An example to illustrate the procedural steps is given.

#### CASE A .. Estimating Low Flows at an Ungauged Site

- [A.1] Plot site on a topographic map and delineate the drainage divide.
  - It is recommended that 1:50,000 National Topographic Series maps be used for delineating the watershed boundary.
- [A.2] Refer to Figure 2 and determine the hydrologic region within which the subject basin is located.

[A.3] Estimate Physiographic Parameters .. DA, FAR, BAR, ALS

Determine watershed area (DA), forest area (FAR), barren area (BAR) and area of lakes and swamps (ALS), all in km<sup>2</sup>, using a planimeter or a digitizer and 1:50,000 topographic maps.

- [A.4] Input Name of Watershed (Step A.1), Location of Watershed (Step A.2) and physiographic parameters (Step A.3) into worksheet.
- [A.5] Check whether or not the parameters fall within the specified ranges for which the equations are considered to be applicable.

These ranges are automatically displayed on the computer screen besides the entry cells. If any parameter value <u>used</u> in the regression equation falls well outside the specified range, it is suggested that other methods of obtaining low flows be investigated. If the parameter value is only slightly outside the specified range or if it is not a parameter used in estimating low flows, the equations can be used to obtain first estimates of the low flows. It may still be necessary to investigate other methods of obtaining the low flows.

[A.6] Select the appropriate constants and coefficients from Tables 9, 10 and 11 to calculate low flows of the desired return period and region.

This step is performed automatically by LFFE-91.WK1 and the low flow estimates with return periods of 2, 10, 20 and 50 years and durations 1, 7, 15 and 30 days are displayed on the computer screen.

#### CASE B .. Estimating Low Flows at an Ungauged Site Located on a Gauged Stream

[B.1] Plot ungauged site on a topographic map, delineate the drainage divide and determine drainage area.

Let area =  $DA[u] km^2$ .

[B.2] Plot gauged site on a topographic map, delineate the drainage divide and determine drainage area.

Let area =  $DA[g] km^2$ .

Obtain the number of years of daily flow data available at gauged site.

Let n = n[g].

- [B.3] If (0.85\*DA[g] < DA[u] < 1.15\*DA[g]) and n[g] > 7 then goto Step B.4, otherwise goto Step A.1 (case A).
- [B.4] Perform Steps A.1 to A.6 for ungauged site.

Extract low flow estimates of required return period and duration from computer results.

[B.5] Perform Steps A.1 to A.6 for gauged site.

If the gauged site is included in Table 2, then, the physiographic parameters DA, FAR, BAR and ALS listed therein can used. Note that FAR, BAR and ALS are given as percentages in Table 2, but must be entered as <a href="km²">km²</a> in LFFE-91.WK1. Extract low flow estimates of required return period and duration from computer results.

[B.6] Conduct a single station flood frequency analysis on data at gauged site.

A method for conducting single station frequency analyses is given in the report [1]. If the gauged site has been included in Tables 5, 6, 7 and 8 then

use the results given in the Tables. Abstract the low flows for the required return periods and durations.

# [B.7] Adjust low flow estimates at ungauged site (results of Step B.4) with low flow estimates at gauged site (results of Steps B.5 and B.6).

The adjustment includes the effects arising due to differences in drainage areas (DA) and, if the watershed is in region A, forested area (FAR). The equation used to adjust the low flow estimates is as follows:

$$QT@N[Site,Adjusted] = \frac{QT@N[Site,Regression]}{QT@N[Gauge,Regression]} \times QT@N[Gauge,Frequency]$$

where,

QT@N(Site,Adjusted) is the adjusted T-year and N-day low flow estimate at the site,

QT@N(Site,Regression) is the T-year and N-day low flow estimate at the site obtained by using the regression equations (Step B.4),

QT@N(Gauge,Regression) is the T-year and N-day low flow estimate at the gauging station obtained from the regression equations (Step B.5),

QT@N(Gauge,Frequency) is the T-year and N-day low flow estimate at the gauging station obtained from a frequency analysis of recorded flows or from Tables 5, 6, 7, and 8 if the gauging station was included in the study.

#### 9 ILLUSTRATIVE EXAMPLE

The illustrative example has been designed in such a way that <u>Case A</u> of an ungauged site on an ungauged stream and <u>Case B</u> of an ungauged site on a gauged stream can be described for the same ungauged site.

#### **Problem Definition**

Low flow estimates of return periods 2, 10, 20 and 50 years and durations 1, 7, 15 and 30 days are required at an ungauged site on the Northeast River near Placentia. This site is about 3 km above an existing gauging station (02ZK002). In the first instance, in Case A, it will be assumed that the gauging station does not exist on the stream and only the regression equations will be used to determine the low flow estimates. Then, in Case B, using the known frequency estimates of low flows at the gauging station, the low flows at the site will be re-estimated to illustrate the adjustment process.

#### Case A .. ASSUME GAUGING STATION DOES NOT EXIST ON STREAM

- [A.1] The topographic divide of the watershed to the ungauged site was delineated on a 1:50,000 topographic map. The forest, barren, lakes and swamps areas were identified and marked.
- [A.2] Referring to Figure 2, it was determined that the watershed is located in the Burin Peninsula, i.e, Region A. In LFFE-91,WK1 this information is entered as Region 1.
- [A.3] All the required areas were determined using a digitizer. The drainage area, DA, was determined to be 82.6 km².

The forested area, FAR, was determined to be 37.5 km<sup>2</sup>.

The barren area, BAR, was determined to be 19.5 km<sup>2</sup>.

The area of lakes + swamps, ALS, was determined to be 25.6 km<sup>2</sup>.

- [A.4] The values from Steps A.2 and A.3 were input into LFFE-91.WK1.
- [A.5] The parameters BAR and ALS were outside their applicable ranges. ALS was significantly higher than its upper limit. Since neither parameter is used in estimating low flows, the regression equations can still be used, but some caution is necessary in using the results.
- [A.6] The required low flow estimates at the ungauged site together with the input parameters are shown in Table 13, which is a copy of the worksheet as displayed on the computer screen.

# Table 13 Low Flow Estimates at Ungauged Site

Name of watershed	Northe	ast River @	<b>Ungauge</b>	d Site	
Location of watershed	1	Eastern 8	Southwes	stern	
(Eastern-Southwestern=1, North-Central	=2, Hum	ber & North	nern Penin	sula=3)	
Range of Mean Annual Runoff for Region	on 1 = 11	00 mm to 2	100 mm		
Physiographic Parameters			Paramet	er Range	
DA Area of watershed	82.6	km²	4.0	200.0	
FAR Forested Area (X if Unavail.)	37.5	km²	8.3	57.8	
BAR Barren Area (Not Used)	19.5	km2 **	20.7	61.9	
ALS Lakes+Swamps Area (Not Used)	25.6	km² **	8.3	16.5	
WARNINGS & ERROR DIAGNOSIS .	т		Low Flows	s (I/s)	
	(year)	1-day	7-day	15-day	30-day
	2	337	407	508	727
** Use results with caution:	10	157	194	235	343
These parameters are outside	20	129	163	195	284
the range for reliable results.	50	87	141	166	242

#### Case B .. GAUGING STATION EXISTS ON STREAM

- [B.1] The drainage area at the ungauged site,  $DA[u] = 82.6 \text{ km}^2$ .
- [B.2] The gauged site on Northeast River is 02ZK002 and is included in Table 2. From Table 2, the drainage area at the gauged site, DA[g], is 89.6 km<sup>2</sup>. From Table 1, the number of years of daily flow data, n[g], is 11.
- [B.3] 0.85\*DA[g] (=76.2) < DA[u] (=82.6) < 1.15\*DA[g] (=103) and n[g] (=11) > 7, therefore, proceed to Step B.4.
- [B.4] Go through Steps A.1 to A.6 for ungauged site. These have already been done for Case A above and the regression low flow estimates are given in Table 13.
- [B.5] Go through Steps A.1 to A.6 for the gauged site, 02ZK002. Since this site is included in Table 2, the physiographic parameters are read as  $DA = 89.6 \text{ km}^2$ ,  $FAR = 42.1 \text{ km}^2$ ,  $BAR = 20.6 \text{ km}^2$  and  $ALS = 26.9 \text{ km}^2$ . The regression low flow estimates are shown in Table 14.
- [B.6] The gauged site is included in Tables 5, 6, 7 and 8. The low flow frequency estimates, obtained therein, are shown in Table 15.
- [B.7] The adjusted low flow estimates at the ungauged site, together with the estimates obtained in Steps B.4, B.5 and B.6, are shown in Table 15.

Table 14 Low Flow Estimates at Gauged Site 02ZK002

Name of watershed	Northe	ast River @	Gaunad S	Sito 027KD	102
Location of watershed	1		Southwes		02
(Eastern-Southwestern=1, North-Centra					
[1] ([1] [1] [1] [1] [1] [1] [1] [1] [1] [1]				suia=3)	
Range of Mean Annual Runoff for Region	on 1 = 11	00 mm to 2	2100 mm		
Physiographic Parameters			Paramet	er Range	
DA Area of watershed	89.6	km <sup>2</sup>	4.0	200.0	
FAR Forested Area (X if Unavail.)	42.1	km²	9.0	62.7	
BAR Barren Area (Not Used)	20.6	km2 **	22.4	67.2	
ALS Lakes+Swamps Area (Not Used)	26.9	km² **	9.0	17.9	
WARNINGS & ERROR DIAGNOSIS	. Т		Low Flows	s (I/s)	
	(year)	1-day	7-day	15-day	30-day
	2	368	443	553	79
** Use results with caution:	10	171	211	255	373
These parameters are outside	20	141	177	212	309
the range for reliable results.	50	95	154	181	264

Table 15 Adjusted Low Flow Estimates at Ungauged Site

A:	Low Flow Estimate	es at Ungauged Site us	sing Regression Equation	ns (I/s)
T (Year)	1-day	7-day	15-day	30-day
2	337	407	508	727
10	157	194	235	343
20	129	163	195	284
50	87	141	166	242
B:	Low Flow Estimate	es at Gauged Site using	g Regression Equations	(l/s)
T (Year)	1-day	7-day	15-day	30-day
2	368	443	553	791
10	171	211	255	373
20	141	177	212	309
50	95	154	181	264
C:	Low Flow Estimate	es at Gauged Site from	Frequency Analysis (I/s	1
				1
C:	Low Flow Estimate	es at Gauged Site from	Frequency Analysis (I/s	) 30-day
C:	Low Flow Estimate	es at Gauged Site from 7-day	Frequency Analysis (I/s	) 30-day 1047
C: T (Year)	Low Flow Estimate 1-day 523	es at Gauged Site from 7-day 641	Frequency Analysis (I/s 15-day 800	30-day 1047 468
C: T (Year)	Low Flow Estimate  1-day  523 230	es at Gauged Site from 7-day 641 268	Frequency Analysis (I/s 15-day 800 325	30-day 1047 468 388
C: T (Year) 2 10 20	1-day 523 230 180 141	7-day 641 268 205	Frequency Analysis (I/s 15-day 800 325 252 198	30-day 1047 468 388 330
C: T (Year) 2 10 20	1-day 523 230 180 141	7-day 641 268 205 154	Frequency Analysis (I/s 15-day 800 325 252 198	30-day 1047 468 388 330
C: T (Year) 2 10 20 50	Low Flow Estimate  1-day  523 230 180 141  Adjusted Low Flow	7-day 641 268 205 154 Estimates at Ungauge	Frequency Analysis (I/s  15-day  800 325 252 198  ed Site (I/s) = [A/B	30-day 1047 468 388 330
C: T (Year) 20 50	Low Flow Estimate  1-day  523 230 180 141  Adjusted Low Flow  1-day	7-day  641 268 205 154  Estimates at Ungauge	Frequency Analysis (I/s  15-day  800 325 252 198  ed Site (I/s) = [A/B	30-day 1047 468 388 330 ]*C
C: T (Year) 2 10 20 50 T (Year)	Low Flow Estimate  1-day  523 230 180 141  Adjusted Low Flow  1-day  479	7-day 641 268 205 154 Estimates at Ungauge 7-day 589	Frequency Analysis (I/s  15-day  800 325 252 198  ed Site (I/s) = [A/B  15-day  735	30-day 1047 468 388 330 ]*C

Neither the illustration of the procedure in the above example nor the suggested procedural steps given for estimation of low flows are intended to be exhaustive. Rather, the intent has been to merely demonstrate the application of the procedure through worked examples. Therefore, it is recommended that professional engineering judgement should be exercised in specific applications.

#### 10 REFERENCES

- Characteristics and Estimation of Minimum Streamflows for the Island of Newfoundland, Newfoundland Department of Environment and Lands, Water Resources Division, 1991.
- [2] HYDAT, Surface Water Data, Volume 2.0, 1988, Environment Canada, Water Resources Branch, 1990.
- [3] Compilation of Physiographic Data for Flood Frequency Analysis, 1982; Hydrometeorologic and Physiographic Data Abstraction for the Island of Newfoundland: An Update, 1989, Newfoundland Department of Environment and Lands, Water Resources Division.
- [4] Low Flow Frequency Analysis, Program LFA, Condie, R. and Cheng, L.C., Environment Canada, Water Resources Branch, 1977.
- [5] LFFE-91.WK1, Regional Frequency Estimates of Low Flows for the Island of Newfoundland using Lotus 1-2-3, Newfoundland Department of Environment and Lands, Water Resources Division, 1991.