CHAPTER 10

Vernon Creek

10.1 GENERAL DESCRIPTION

Reference is made to the Key Map, (Figure 10.1), and the Schematic Diagram, (Figure 10.2).

Vernon Creek has a natural watershed of 293 square miles. With the addition of the major diversion of Duteau Creek (65 square miles), the watershed is effectively increased to 358 square miles, although all of the additional area may not be utilized, due to prior licenses and requirements for Fisheries.

In 1970, the area served a population of 24,360 persons and contained 14,075 irrigated acres.

The headwaters of Vernon Creek are located eleven miles southeast of Vernon, at an elevation of 4,900 feet. These waters feed southwesterly through a series of small lakes now joined by a dam on Crooked Lake (CP1) which has a spillway elevation of 4,424.2 feet. Flow continues through Swalwell Lake (CP2) to Ellison Lake and Wood Lake (MP5). A major diversion to the Winfield Okanagan Centre Irrigation District takes place between Swalwell and Ellison (DPI). Rising near Oyama Lake (CP3), elevation 5,000 feet, the major tributary of Oyama Creek supplies the Wood Lake Irrigation District before entering Vernon Creek below Wood Lake. Kalamalka Lake's major tributary is Coldstream Creek (MP10), which has King Edward Lake (CP4) as its only source of stored water. About 10% of the needs of Vernon Irrigation District are served by this tributary. Water is diverted from Kalamalka Lake to meet part of the water requirements of the City of Vernon and South Vernon Irrigation District. The last major tributary to join Vernon Creek before it enters Okanagan Lake is BX Creek (MP16). This creek has its headwaters at Dixon Lake (CP8, elevation 3,000 feet, and supplies part of the City of Vernon and unorganized uses before entering Swan Lake (HP15) and proceeding to its confluence with Vernon Creek.

The major diversion of Duteau Creek rises in Grizzly Swamp, elevation 4,200 feet, and flows through Aberdeen (4,196 feet) and Haddo (4,163 feet) Lakes (CP7). It is then joined by the Flyfish Lakes (4,400 feet) tributary and proceeds to its point of diversion at Headgates (MP12). The diversion

supplies a variety of uses including Vernon Irrigation District and Coldstream Municipality. The Vernon Irrigation District is the largest water user in the area which is assisted by a balancing reservoir at Goose Lake, elevation 1,603 feet.

As shown by the area elevation curves on Figure 14.2, the median elevation of Vernon Creek is 2,900 feet. There are no pronounced plateau areas, and the average ground slope is nearly uniform. The profile of the Creek itself (Fig-ure 14.3) is very flat for the first twenty-six miles having an average gradient of eighteen feet per mile to Ellison Lake. Above Ellison Lake, the gradient steepens markedly to 468 feet per mile to mile 32 where it again flattens out to sixteen feet per mile, including in its last ten miles the Swalwell, Crooked and Dee Lake chain.

There are a number of hydrometric, meteorological and snow course stations within the Vernon Creek system, and these are located on Figure 10.1. Many of the hydrometric records are of short duration and often cover only the summer months.

The most significant hydrometric station is 8NM160, located near the creek mouth. Hydrographs of mean monthly flows passing this station have been plotted on Figure 14.4.

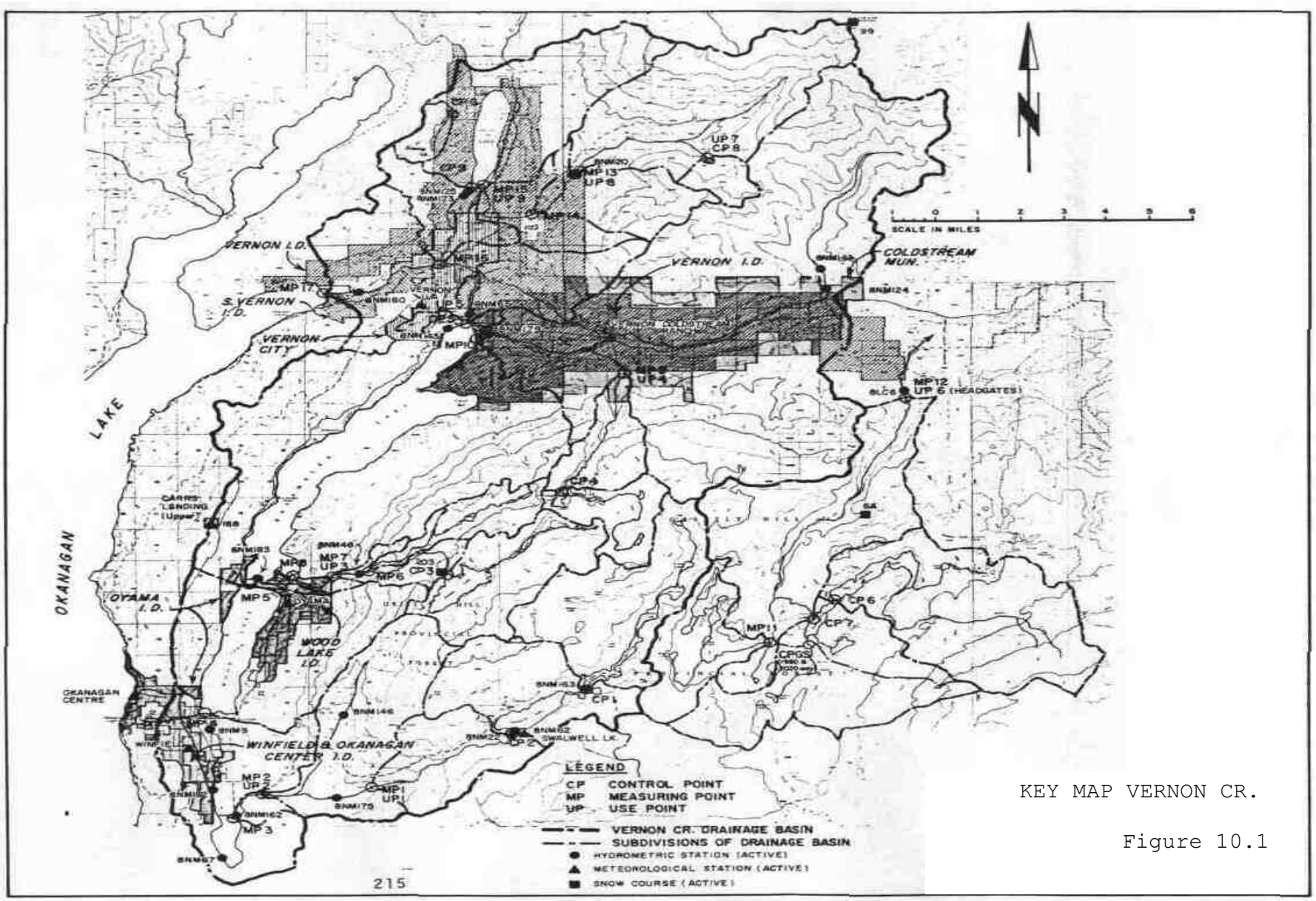
10.2 HISTORICAL BACKGROUND

Historical data on the major organized areas is as follows:

a) Vernon Irrigation District

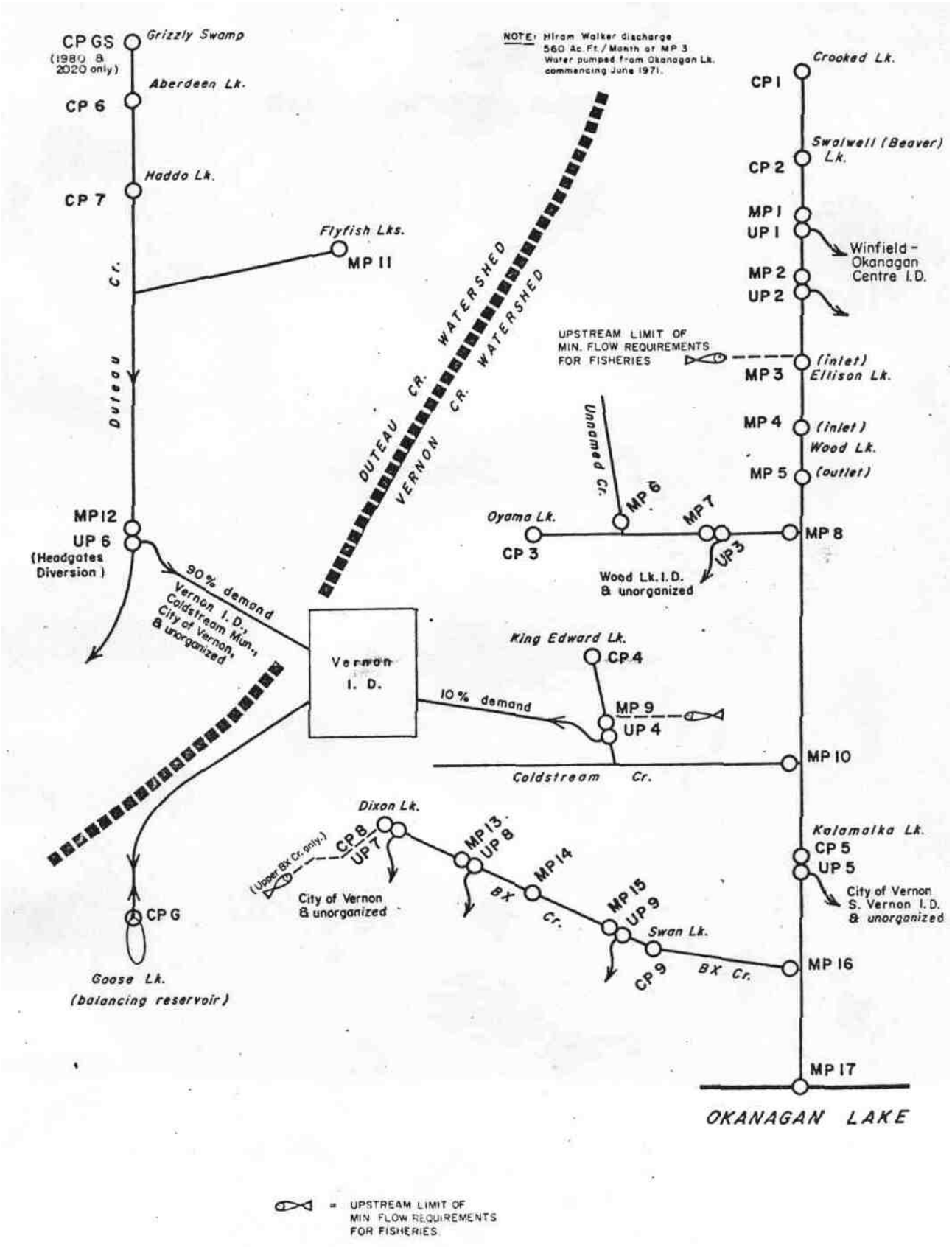
Reference is made to Figure 10.1.

The Vernon Irrigation District is by far the largest single area irrigated In the Okanagan Valley. In 1970, a total of 9,000 acres were under irrigation. Most of this area is situated within the Vernon Creek watershed, along the valley bottom of its tributary, Coldstream Creek. Neither the Coldstream nor its tributaries have the natural capacity to provide more than about 10% of the water needs of Vernon Irrigation District. So, it was necessary to look - at an early stage in development - to Duteau Creek as a supplementary source of water. Although Duteau Creek is by nature part of the Shuswap River system, it is an important upland water source for the Vernon Creek area. By licence, C32119, dated September 1, 1906, Vernon Irrigation District was granted permission to divert 15,000 acre-feet per year, at a point known as "Headgates" (UP6). This license is subordinate to two prior licenses, F05279 (1890) and F03599 (1902), on the Duteau Creek system. To satisfy the prior licenses, two cubic feet per second must be released from Headgates between May 1, and September 15. In addition, a Federal Fisheries Service order, dated February 17, 1971,



KEY MAP VERNON CR.

Figure 10.1



VERNON CR. SCHEMATIC Figure 10.2

requires that minimum releases to Duteau Creek at Headgates be not less than four cubic feet between January 1 to August 31, and seven cubic feet between September 1 and December 31. The computer analysis carried out under this study have been limited to diversion requirements at UPS made into the Vernon Creek Basin. In a dry year it is evident from Table 5-4 that there would be little or no flow immediately downstream of UPS to meet the above mentioned requirements if full diversion was carried out.

Two large reservoirs, Aberdeen (9,040 acre-feet) (CP6) and Haddo (2,037 acre-feet) (CP7) provide storage and regulation of flow. A third potential reservoir, Grizzly Swamp, is under consideration.

Water diverted at Headgates passes through a chlorination station and enters the Vernon Irrigation District network via a 50-inch diameter steel pipe. This is a complex network with several large variations in elevation and, consequently, line pressure. The mainline or backbone of the system stretches roughly seventeen miles from Headgates to Goose Lake (1,623 acre-feet), which acts as a balancing reservoir in addition to providing end-of-line storage. A contribution (10%) to the water supply of the network is made by King Edward Lake (CP4) (1,253 acre-feet), which Is on a tributary of Coldstream Creek.

Numerous self-contained distribution systems branch off from the mainline. Depending upon mainline pressure at the point of branching, the distribution systems may require either pumping or pressure reducing stations.

In addition to the Vernon Irrigation District, the Duteau Creek diversion supplies water to the City of Vernon and the District of Coldstream.

b) Winfield and Okanagan Centre Irrigation District

The Swalwell (Beaver) Lake Reservoir was originally constructed in 1908 as a homogeneous earth-fill dam with concrete core. The dam was raised in 1944 increasing the storage capacity of the reservoir to 9,585 acre-feet.

Crooked Lake Reservoir upstream of Swalwell Lake impounds 2,445 acre-feet and is a homogeneous earth-fill dam constructed in 1931. Its flooded area includes Crooked, Deer, Island and Dee Lakes. Thus, although there are 10 feet of depth on Crooked Lake, the elevations of the upstream channels connecting the various lakes limit its useful storage to the above-mentioned amount.

Recent Improvements under the ARDA program have included the rehabilitation of Swalwell and Crooked Lake Dams in 1967 as well as the improvement of

4,000 feet of river channel in the upper Vernon Creek between Swalwell Lake and the diversion dam. It will be noted that the latter was located about a mile upstream from the previous intake.

The improvement to the upper Vernon Creek mentioned above was initiated in 1963 in an attempt to reduce the amount of silt carried into the irrigation system. The origin of most of this silt was on the right side of the river in the upper slide area. In this section the canyon is about 300 feet deep and till material exposed along the right bank of the canyon stands on a very steep slope. In the past this slope has been undercut by the creek, but with the channel now on the left side, it is hoped that such erosion will be eliminated.

The Improvement District policy has been to release water from the Swal-well Lake storage reservoir prior to the spring freshet so that a degree of flood control may be realized on Vernon Creek. Normally, storage levels on Crooked Lake are retained near the full supply level.

c) Winfield-Okanagan Centre By-Pass Flume

Many years ago difficulty was experienced in maintaining flow in the section of Vernon Creek between Ellison and Wood Lake due to high seepage lossees in Ellison Lake.

Thus, in order to obtain water directly from Vernon Creek at a point one mile upstream from Ellison Lake, a bypass flume consisting of 6,280 linear feet of 24-inch diameter, semi-circular concrete flume runs from the above-mentioned diversion point to "The Flats" located on the District's eastern boundary. The District is, therefore, able to maintain a flow in that section of Vernon Creek between Ellison and Mood Lake without first having to fill the former.

The diversion licence for the bypass flume dates back to 1908 and amounts to 550 acre-feet equivalent to about 3 cfs assuming operation over a period of three months (100 days). Its capacity would be totally inadequate to carry the total flow of Vernon Creek.

It is interesting to note that the District obtained a conditional water licence for the storage of 507 acre-feet on Ellison Lake. Thus, through the construction of a control structure at its outlet, it was planned to store water on the falling stage of the freshet and prolong the period of runoff on Vernon Creek between Ellison and Mood Lakes, In this way it would be possible to conserve Swalwell Lake storage. However, difficulties regarding access and possible flooding of parts of Ellison Lake prevented further development.

d) Hiram Walker Distillery Diversion

On May 25, 1971, the Hiram Walker plant near Winfield started preliminary operations using water pumped from Okanagan Lake. The quantity which may be diverted under the Water Licence is some 5,000,000 imperial gallons per day for industrial purposes (cooling) plus 300,000 imperial gallons per day for general plant use. A provisional permit under the Pollution Control Act allows the discharge of the 5,000,000 imperial gallons per day (9.23 cfs) to Vernon Creek at a point 3,000 feet upstream from Ellison Lake. To date, the plant has only been under partial operation and average daily discharges have been about one half of the above value. It will be noted that this plant was not in operation and making its contribution to Vernon Creek flows during the year 1970, reported here. Further, that due to a shutdown of the plant in 1973 because of a strike, this additional water did not move through the system during the months of March and April. It is presently (1974) operated only during 5 days of the week.

e) Oyama Improvement District

The construction of new irrigation and domestic water system for the Oyama Improvement District was completed in August, 1966 under ARDA assistance.

The system serves 320 acres on the West side of Wood and Kalamalka Lakes and 80 acres on the east side of the causeway between the two lakes. Water is also served to the Vernon Fruit Union Packing House for fire protection puroses.

The main pumping station of 200 horsepower capacity draws water from a 16 inch diameter well 150 feet deep, located near the north shore of Wood Lake. The capacity of this well is in excess of 2,500 U.S. gpm (5 cfs) and it reported to be one of the highest producing wells of its type in British Columbia.

f) Operation of Wood-Kalamalka Lake

Through the placement of stoplogs on the concrete dam at the outlet of Kalamalka Lake, it is possible to control the water between the sill elevation of 1,282.35 and 1,284.94 providing an active storage depth of 1.59 feet. Since continuous records began in 1954, the maximum elevation of Kalamalka Lake is shown as 1,286.14 occuring on June 5, 1972,

The City of Vernon operates Kalamalka Lake Dam and a basic release is maintained at all times for in-channel flow requirements and the maintenance of groundwater levels for a number of wells located near the stream.

Measurements of the outflow from Kalamalka Lake are made on the highway

bridge immediately downstream of the dam. The results of stage discharge determinations made at this hydrometric station (8NM65) Indicates rather fluctuating conditions and at present three discharge curves have been developed which are applicable to different portions of the historic record.

The City of Vernon withdraws from Kalamalka Lake for domestic and waterworks purposes. Kalamalka Lake provides an important supplementary source of water in addition to that provided from the upper reaches of Vernon Creek and BX Creek.

10.3 LAND USE AND WATER REQUIREMENTS

The Vernon watershed encloses and serves one urban area (Vernon City) and a large agricultural area which is, for the most part, organized for water use 'purposes, into "Irrigation District" under the Water Act.

Water uses in terms of population and areas irrigated are as follows: (Table 10.1).

TABLE 10.1
WATER USERS IN THE VERNON CREEK WATERSHED (1970)

Area Served	Area Irrigated (acres)	Population (approx.) (persons)	Diversion		Total (ac.ft.)
			Irrigation (ac.ft.)	Domestic (ac.ft.)	
Wood Lake I.D.	870	155	2632	33	2665
Winfield and Okanagan Centre I.D.	1982	1566	5996	325	6321
Vernon I.D.	9000	1152	16235	240	16235
S. Vernon I.D.	240	72	432	15	447
Vernon City	0	12920	0	3357	3357
Corp. of the District of Coldstream	0	3118	0	610	610
Other	1939	0	3650	0	3650
TOTAL	14031	18983	28945	4580	33525

Consumptive use diversions as listed above are assumed to result in no return flow within the Vernon Creek basin but rather seep directly to Okanagan Lake. The amount of return flow varies with the type of use and is estimated as follows:

a) For "Irrigation" return flow = 50% of diversion.

b) For "Domestic and Waterworks", return flow = 651 of diversion.

c) For "Industry", return flow = 90% of diversion.

From the above, water utilization in terms of the amounts of consumed water and return flow within the Okanagan Lake Basin may be tabulated as follows:
(Table 10.2).

TABLE 10.2

WATER UTILIZATION IN VERNON CREEK (1970)

Requirements	Diversion for Consumptive Use (acre-feet)	Consumed Water (acre-feet)	Return Flow to Okanagan Lake (acre-feet)
Irrigation	28945	14473	14472
Domestic & Water-works	4580	2977	1603
Industry	0	0	0
TOTALS	33525	17450	16075

A detailed breakdown of the diversion requirements for the various organized areas at the 1970 stage of development is as shown on Table 10.3.

In order to acquire rights over the use of water, most users, acting either individually or collectively in an irrigation district, have maintained water licenses for storage and diversion granted by the Crown, inright of the Province. Licenses provide their holder with rights over the stated amount of water and, in cases of a shortage, the older licence takes precedence over the newer.

Current water licenses in 1970 for both storage and consumptive use are as listed on Table 10.4.

Comparison between the licenses and the computed diversion requirements show that, in total, licensed amounts are about double the estimated water use. A major portion of this difference is due to the allowance for conveyance losses in earth channels and open ditch irrigation which has now been replaced largely by closed pipe systems feeding to sprinklers.

10.4. ESTIMATED NATURAL WATER SUPPLY

Natural water yields for the area are shown on computer print-out sheets, reproduced on Figure 10.3 (Dry Year), Figure 10.4 (Average Year), and Figure 10.5 (Wet Year).

TABLE 10.3

COMPUTED DIVERSION REQUIREMENTS ON VERNON CREEK (1970)

GIVEN IN ACRE-FEET

Month	Type	Vernon I.D.	S.Vernon I.D.	City of Vernon	Winfield and Ok.Center I.D.	Wood Lake I.D.	Coldstream Mun.	Other	Total
J	Agric.	0	0	0	0	0	0	0	0
	Dom.	12	1	168	16	2	30	0	229
	Ind.	0	0	0	0	0	0	0	0
F	Agric.	0	0	0	0	0	0	0	0
	Dom.	10	1	134	13	1	24	0	183
	Ind.	0	0	0	0	0	0	0	0
M	Agric.	0	0	0	0	0	0	0	0
	Dom.	12	1	168	16	2	30	0	229
	Ind.	0	0	0	0	0	0	0	0
A	Agric.	0	0	0	0	0	0	0	0
	Dom.	14	1	201	20	2	37	0	275
	Ind.	0	0	0	0	0	0	0	0
M	Agric.	2775	74	0	611	268	0	611	4339
	Dom.	24	2	335	33	3	61	0	458
	Ind.	0	0	0	0	0	0	0	0
J	Agric.	4633	123	0	1019	447	0	1019	7241
	Dom.	31	2	436	42	4	79	0	594
	Ind.	0	0	0	0	0	0	0	0
J	Agric.	4633	123	0	1019	447	0	1019	7241
	Dom.	38	2	537	52	5	98	0	732
	Ind.	0	0	0	0	0	0	0	0
A	Agric.	4627	123	0	1019	447	0	1019	7235
	Dom.	38	2	537	52	5	98	0	732
	Ind.	0	0	0	0	0	0	0	0
S	Agric.	1850	49	0	407	179	0	407	2892
	Dom.	19	1	268	26	3	49	0	366
	Ind.	0	0	0	0	0	0	0	0
O	Agric.	0	0	0	0	0	0	0	0
	Dom.	17	1	235	23	2	43	0	321
	Ind.	0	0	0	0	0	0	0	0
N	Agric.	0	0	0	0	0	0	0	0
	Dom.	12	1	168	16	2	30	0	229
	Ind.	0	0	0	0	0	0	0	0
D	Agric.	0	0	0	0	0	0	0	0
	Dom.	12	1	168	16	2	30	0	229
	Ind.	0	0	0	0	0	0	0	0
	TOTAL	18757	508	3355	4400	1821	609	4075	33525

Date Of Print-out:
Dec. 7, 1972

FLOWS IN AC. FT.

LOCATION	AREA IN K. AC.	J	F	M	A	M	J	J	A	S	O	N	D	YEAR	
CPDA 1	8.8	52.	65.	83.	145.	1607.	876.	157.	67.	65.	65.	65.	65.	3374.	
CPDA 2	15.3	91.	115.	146.	252.	2963.	1586.	276.	120.	115.	115.	115.	115.	5990.	
MPDA 1	20.3	113.	143.	182.	324.	3613.	1891.	347.	147.	142.	142.	142.	142.	7327.	
MPDA 2	28.1	135.	170.	216.	398.	4220.	2192.	418.	172.	167.	167.	167.	167.	8589.	
MPDA 3	28.7	135.	170.	216.	398.	4220.	2192.	418.	172.	167.	167.	167.	167.	8589.	
MPDA 4	37.3	135.	170.	217.	400.	4225.	2195.	419.	172.	167.	167.	167.	167.	8601.	
MPDA 5	49.6	143.	179.	228.	430.	4415.	2283.	445.	180.	175.	175.	175.	175.	9005.	
CPDA 3	6.6	36.	48.	59.	99.	1260.	679.	112.	51.	48.	48.	48.	48.	2536.	
MPDA 6	6.0	30.	30.	45.	97.	731.	345.	98.	30.	30.	30.	30.	30.	1521.	
MPDA 7	13.6	73.	86.	114.	218.	2160.	1105.	223.	88.	85.	85.	85.	85.	4408.	
MPDA 8	14.0	74.	87.	116.	223.	2183.	1115.	227.	89.	86.	86.	86.	86.	4456.	VERNON
CPDA 4	2.9	18.	24.	30.	48.	593.	313.	54.	24.	24.	24.	24.	24.	1197.	CREEK
MPDA 9	6.0	32.	41.	52.	91.	997.	515.	97.	41.	40.	40.	40.	40.	2026.	
MPDA 10	49.2	110.	134.	171.	390.	2956.	1442.	360.	124.	123.	123.	123.	123.	6179.	
CPDA 5	142.7	344.	419.	541.	1110.	9974.	5036.	1090.	411.	403.	403.	403.	403.	20537.	
CPDA 8	1.2	3.	4.	4.	13.	68.	31.	11.	3.	3.	3.	3.	3.	148.	
MPDA 13	13.2	40.	51.	60.	133.	1491.	846.	138.	57.	50.	50.	48.	48.	3010.	
MPDA 14	17.4	48.	58.	69.	158.	1634.	912.	156.	64.	57.	57.	54.	54.	3317.	
MPDA 15	20.2	47.	59.	71.	162.	1656.	923.	160.	65.	58.	58.	55.	55.	3367.	
CPDA 9	29.7	53.	67.	81.	185.	1824.	1003.	181.	72.	65.	65.	62.	62.	3720.	
MPDA 16	32.8	53.	67.	81.	185.	1824.	1003.	181.	72.	65.	65.	62.	62.	3720.	
MPDA 17	187.3	399.	488.	625.	1303.	11842.	6059.	1278.	484.	469.	469.	466.	466.	24349.	MP17 = TOTAL OF NATURAL FLOWS YIELDED BY VERNON CR. & EXCLUDING DUTEAU CR. DIVERSION
CPDA 6	13.0	69.	83.	103.	203.	3264.	2016.	227.	111.	95.	95.	83.	83.	6434.	
CPDA 7	23.5	124.	145.	188.	371.	5158.	3077.	396.	179.	161.	161.	145.	145.	10251.	DUTEAU
MPDA 11	4.5	24.	28.	38.	74.	678.	336.	73.	28.	28.	28.	28.	28.	1192.	CREEK
MPDA 12	41.7	208.	237.	316.	642.	7316.	4117.	652.	269.	251.	251.	235.	235.	14727.	MP12 = TOTAL OF NATURAL FLOWS YIELDED BY DUTEAU CR. AT POINT OF DIVERSION (HEADGATES)
	229.0	807.	725.	941.	1945.	19158.	10176.	1930.	753.	720.	720.	701.	701.	39077.	MP17 + MP12 = SUM OF NATURAL FLOWS YIELDED BY VERNON CR. & DUTEAU CR. AT HEADGATES (EQUIVALENT TO THEORETICAL TOTAL NATURAL YIELD OF DOUBLE BASIN)

VERNON CR. DRY YEAR (NATURAL FLOW)

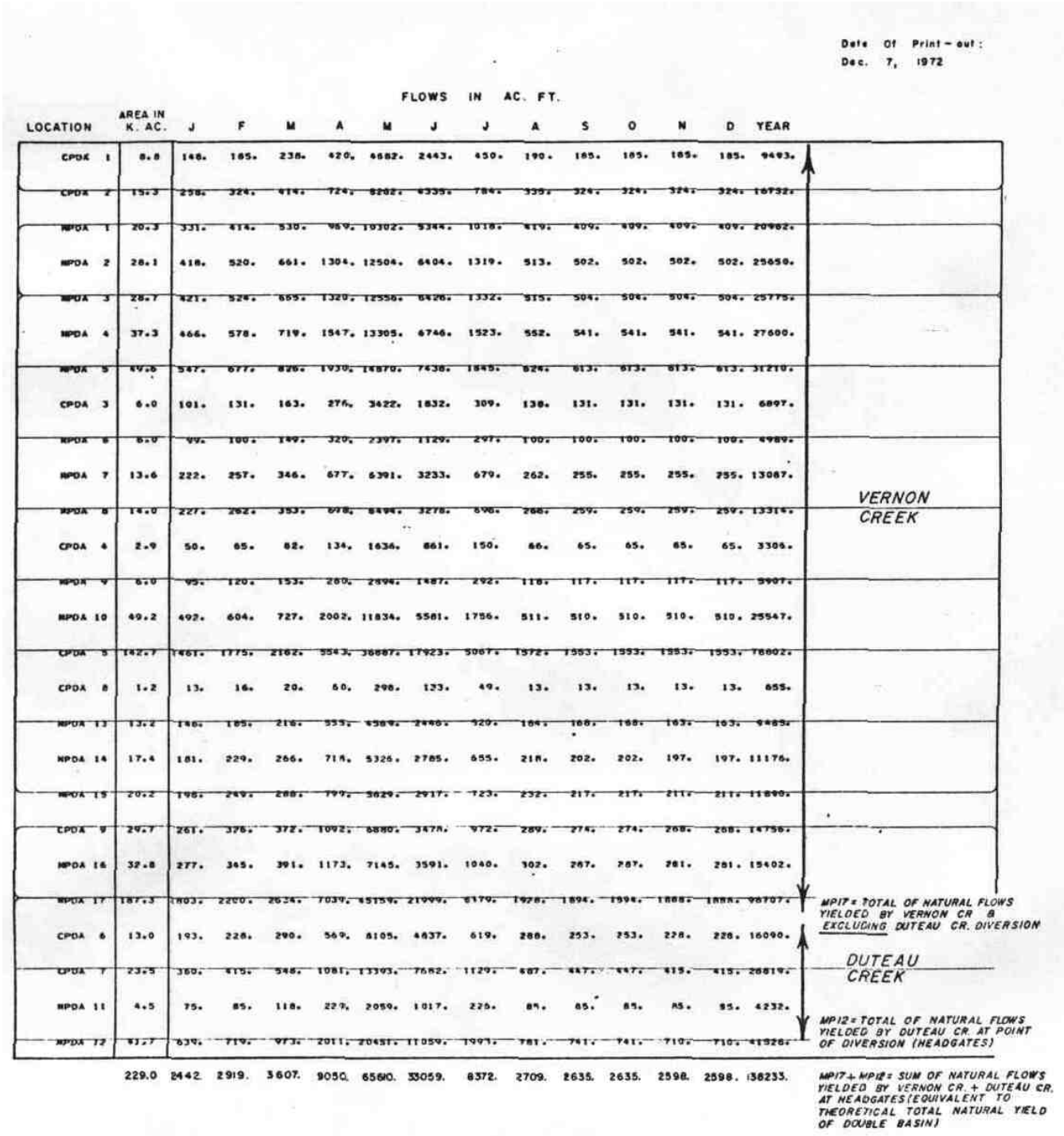
Figure 10.3

Date of Print-out:
Dec. 7, 1972

FLOWS IN AC. FT.

LOCATION	AREA IN K.AC.	J	F	M	A	M	J	J	A	S	O	N	D	YEAR	
CPDA 1	8.8	83.	104.	134.	235.	2657.	1392.	253.	108.	104.	104.	104.	104.	5384.	
CPDA 2	15.3	143.	184.	234.	407.	4707.	2478.	443.	190.	184.	184.	184.	184.	9524.	
MPDA 1	20.3	184.	231.	295.	533.	5805.	3025.	565.	236.	229.	229.	229.	229.	11792.	
MPDA 2	28.1	225.	281.	358.	679.	6887.	3554.	709.	281.	274.	274.	274.	274.	14062.	
MPDA 3	26.7	225.	281.	358.	682.	6895.	3558.	702.	282.	275.	275.	275.	275.	14082.	
MPDA 4	37.3	233.	290.	368.	720.	7021.	3612.	734.	288.	281.	281.	281.	281.	14388.	
MPDA 5	49.6	255.	318.	400.	821.	7513.	3835.	820.	310.	303.	303.	303.	303.	15481.	
CPDA 3	6.8	58.	75.	93.	157.	1975.	1062.	177.	80.	75.	75.	75.	75.	3980.	
MPDA 6	6.0	52.	53.	78.	168.	1263.	595.	156.	53.	53.	53.	53.	53.	2629.	
MPDA 7	13.6	121.	141.	189.	366.	3537.	1799.	370.	145.	140.	140.	140.	140.	7230.	
MPDA 8	14.0	124.	144.	193.	377.	3587.	1821.	379.	147.	143.	143.	143.	143.	7340.	VERNON CREEK
CPDA 4	2.9	28.	37.	47.	76.	937.	494.	86.	38.	37.	37.	37.	37.	1892.	
MPDA 9	6.0	52.	66.	84.	151.	1613.	833.	159.	66.	65.	65.	65.	65.	3265.	
MPDA 10	49.2	215.	262.	328.	814.	5514.	2648.	732.	234.	233.	233.	233.	233.	11680.	
CPDA 5	142.7	647.	786.	994.	2243.	17732.	8809.	2128.	740.	728.	728.	728.	728.	36991.	
CPDA 8	1.2	6.	7.	9.	27.	140.	62.	22.	6.	6.	6.	6.	6.	305.	
MPDA 13	13.2	71.	90.	107.	252.	2447.	1351.	246.	96.	86.	86.	83.	83.	4999.	
MPDA 14	17.4	84.	107.	127.	311.	2755.	1492.	296.	110.	100.	100.	98.	98.	5673.	
MPDA 15	20.2	88.	112.	132.	330.	2833.	1526.	311.	113.	103.	103.	100.	100.	5851.	
CPDA 9	29.7	107.	134.	158.	407.	3240.	1714.	378.	131.	121.	121.	117.	117.	6748.	
MPDA 16	32.8	105.	137.	161.	420.	3282.	1732.	389.	133.	123.	123.	120.	120.	6849.	
MPDA 17	187.3	769.	939.	1172.	2725.	21250.	10644.	2568.	884.	862.	862.	859.	859.	44392.	MP17 = TOTAL OF NATURAL FLOWS YIELDED BY VERNON CR. @ EXCLUDING DUTEAU CR DIVERSION
CPDA 6	13.0	110.	131.	184.	323.	4871.	2956.	356.	170.	147.	147.	131.	131.	9637.	
CPDA 7	23.5	201.	234.	305.	601.	7867.	4597.	635.	280.	254.	254.	234.	234.	15697.	DUTEAU CREEK
MPDA 11	4.5	41.	46.	64.	124.	1125.	557.	123.	46.	46.	46.	46.	46.	2310.	
MPDA 12	41.7	347.	392.	528.	1080.	11590.	6385.	1083.	435.	409.	409.	388.	388.	23437.	MP12 = TOTAL OF NATURAL FLOWS YIELDED BY DUTEAU CR. AT POINT OF DIVERSION (HEADGATES)
	229.0	1116.	1331.	1700.	3805.	32840.	17029.	3652.	1319.	1272.	1272.	1247.	1247.	67828.	MP17 + MP12 = SUM OF NATURAL FLOWS YIELDED BY VERNON CR. + DUTEAU CR. AT HEADGATES (EQUIVALENT TO THEORETICAL TOTAL NATURAL YIELD OF DOUBLE BASIN)

VERNON CR. AVERAGE YEAR (NATURAL FLOW) Figure 10.4



Date Of Print - out :
Dec. 7, 1972

FLOWS IN AC. FT.

LOCATION	AREA IN K. AC.	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
CPDA 1	8.8	148.	185.	238.	420.	4682.	2443.	450.	190.	185.	185.	185.	185.	9493.
CPDA 2	15.3	258.	324.	414.	724.	8202.	4339.	784.	339.	324.	324.	324.	324.	16732.
MPDA 1	20.3	331.	414.	530.	969.	10302.	5344.	1018.	419.	409.	409.	409.	409.	20962.
MPDA 2	28.1	418.	520.	661.	1304.	12504.	6404.	1319.	513.	502.	502.	502.	502.	25650.
MPDA 3	28.7	421.	524.	665.	1320.	12556.	6426.	1332.	515.	504.	504.	504.	504.	25775.
MPDA 4	37.3	466.	578.	719.	1547.	13305.	6746.	1523.	552.	541.	541.	541.	541.	27600.
MPDA 5	49.8	547.	677.	826.	1930.	14870.	7438.	1845.	624.	613.	613.	613.	613.	31210.
CPDA 3	6.0	101.	131.	163.	276.	3422.	1832.	309.	138.	131.	131.	131.	131.	6897.
MPDA 6	6.0	99.	100.	149.	320.	2397.	1129.	297.	100.	100.	100.	100.	100.	4989.
MPDA 7	13.6	222.	257.	346.	677.	6391.	3233.	679.	262.	255.	255.	255.	255.	13087.
MPDA 8	14.0	227.	262.	353.	678.	6494.	3278.	696.	268.	259.	259.	259.	259.	13314.
CPDA 4	2.9	50.	65.	82.	134.	1634.	861.	150.	66.	65.	65.	65.	65.	3306.
MPDA 9	6.0	95.	120.	153.	280.	2694.	1487.	292.	118.	117.	117.	117.	117.	5907.
MPDA 10	49.2	492.	604.	727.	2002.	11834.	5581.	1756.	511.	510.	510.	510.	510.	25547.
CPDA 5	142.7	1461.	1775.	2162.	5543.	36887.	17923.	5067.	1572.	1553.	1553.	1553.	1553.	78602.
CPDA 8	1.2	13.	16.	20.	60.	298.	133.	49.	13.	13.	13.	13.	13.	655.
MPDA 13	13.2	146.	185.	216.	555.	6589.	2940.	529.	184.	168.	168.	163.	163.	9485.
MPDA 14	17.4	181.	229.	266.	716.	5326.	2785.	655.	218.	202.	202.	197.	197.	11176.
MPDA 15	20.2	198.	249.	288.	799.	5629.	2917.	723.	232.	217.	217.	211.	211.	11890.
CPDA 9	29.7	261.	328.	372.	1092.	6880.	3478.	972.	289.	274.	274.	268.	268.	14756.
MPDA 16	32.8	277.	345.	391.	1173.	7145.	3591.	1040.	302.	287.	287.	281.	281.	15402.
MPDA 17	187.3	1803.	2200.	2634.	7039.	45159.	21999.	6179.	1928.	1894.	1894.	1888.	1888.	98707.
CPDA 6	13.0	193.	228.	290.	569.	8105.	4637.	619.	288.	253.	253.	228.	228.	16090.
CPDA 7	23.5	360.	415.	548.	1081.	13393.	7682.	1129.	687.	447.	447.	415.	415.	26819.
MPDA 11	4.5	75.	85.	118.	229.	2059.	1017.	225.	89.	85.	85.	85.	85.	4232.
MPDA 12	41.7	639.	719.	973.	2011.	20451.	11059.	1997.	781.	741.	741.	710.	710.	41926.
	229.0	2442.	2919.	3607.	9050.	65660.	33059.	8372.	2709.	2635.	2635.	2598.	2598.	136233.

VERNON CREEK

MP17 = TOTAL OF NATURAL FLOWS YIELDED BY VERNON CR @ EXCLUDING DUTEAU CR. DIVERSION

DUTEAU CREEK

MP12 = TOTAL OF NATURAL FLOWS YIELDED BY DUTEAU CR. AT POINT OF DIVERSION (HEADGATES)

MP17 + MP12 = SUM OF NATURAL FLOWS YIELDED BY VERNON CR. + DUTEAU CR. AT HEADGATES (EQUIVALENT TO THEORETICAL TOTAL NATURAL YIELD OF DOUBLE BASIN)

VERNON CR. WET YEAR (NATURAL FLOW) Figure 10.5

In summary, the annual precipitation and natural runoff of the Vernon Creek Basin under the three types of year is as shown in Table 10.5.

TABLE 10.4

WATER LICENSED ON VERNON CREEK (1970)

Area Served	Total Licensed Storage (ac.ft.)	Agriculture (ac. ft.)	Licensed Diversion			Computed Diversion Requirement (ac.ft.)
			Domestic (ac.ft.)	Industry (ac.ft.)	Total (ac.ft.)	
Wood Lake I.D.	3000	2127	0	0	5127	2665
Winfield and Okanagan Center I.D.	14179	5779	469	0	6248	6321
Vernon I.D.	27750	43032	336	0	43368	16235
S. Vernon I.D.	740	0	0	0	0	447
Vernon City	1974	0	8554	471	9025	3357
Corp. of District of Coldstream	0	0	336	0	336	610
Other	70	2086	286	180	2552	3650
TOTAL	47713	53024	9981	651	66656	33525

TABLE 10.5

ESTIMATED NATURAL WATER YIELDS FOR VERNON CREEK SUB-BASIN

Type of Year	Kilo Acre-Feet	Inches Over Basin	Average Precipitation (inches)	Remarks
Dry	24.3	1.6	-	Area = 293 Square Miles Abstracted from Computer Print-Out Data
Average	44.4	2.9	22.0	
Wet	96.7	6.2	-	

10.5 STORAGE (Reference Figure 10.2)

In a climate of spring floods and summer droughts, it is necessary to store a high proportion of total available water so that it may be used when needed. To this end, the Vernon Creek water users have developed a system of ten reservoirs with a total live storage of 46,719 acre-feet. Each is operated largely independently and as required by their owner.

a) Crooked Lake (CP1), at the head of the Vernon Creek system is owned and operated by the Winfield-Okanagan Centre Irrigation District. The dam was built of earth fill in 1931. In 1965, the spillway was raised to elevation 4424.2 feet. Outlet control works consist of a 20-inch diameter culvert with an invert elevation of 4413.4 feet.

b) Swalwell Lake (CP2) reservoir is also operated by Winfield-Okanagan Center Irrigation District. Its dam is of earth fill and was constructed in 1964. The control works consist of a 32-inch arch culvert at an invert elevation of 4396.3 feet. The spillway elevation is 4414.0 feet.

c) Oyama Lake (CP3) reservoir is operated by Wood Lake Irrigation District. It was constructed in 1951 of earth fill with a concrete core well. Spillway and outlet invert elevations are estimated at 4479.0 feet and 4470.0 feet, respectively.

d) Kalamalka Lake (CP5) is the largest in the area and is operated by City of Vernon. It has a concrete dam with stoplog control for a storage depth of 1.6 feet. The outlet elevation is at 1283.3 feet.

e) King Edward Lake (CP4) reservoir is of earth fill and concrete core with a 27-inch concrete outlet culvert. Elevations are imprecise but are estimated at 4460 feet and 4480 feet for outlet and spillway, respectively. The storage is operated by Vernon Irrigation District. Construction was completed in 1947.

f) Aberdeen Lake (CP6) at the head of Duteau Creek, Is operated by Vernon Irrigation District. Its spillway is at 4196.1 feet and its outlet is at 417.3.9 foot elevation. The dam is of earth fill and was completed in 1960.

g) Haddo lake (CP7) is also controlled by Vernon Irrigation District. Its outlet invert is at elevation 4149.3, and its spillway at 4163.8 feet. The dam is of earth tilt and was completed in 1960.

h) Dixon Lake (CP8) Is a small (208 acre-feet), but strategically placed storage, with a spillway at roughly 3000 foot elevation.

i) Swan Lake (CP9) is at a low elevation and is controlled jointly by Vernon Irrigation District and South Vernon Irrigation District. Its spillway is at elevation 1276.5, and control is by a 24-inch culvert at elevation 1274.0 feet.

j) Goose Lake (CPG) is owned and operated by Vernon Irrigation District, and is

an integral part of their distribution system. Although it has virtually no watershed of its own, water from other sources is piped into its reservoir of 1623 acre-foot capacity during the freshet period. Situated at an elevation of 1619.0 feet at the spillway, and 1603 feet at its outlet pipe, the lake serves as a balancing reservoir and, in addition, provides storage at a point in the system remote from other water sources.

Hydrologic information on the ten reservoirs is given by Table 10.6.

TABLE 10.6
1970 STORAGES IN THE VERNON CREEK SYSTEM

Reservoir	Drainage Area (acres)	Live Storage (acre-feet)	Surface Area (acres)	Annual Natural Runoff (acre-feet)		
				Dry Year	Average Year	Wet Year
Crooked	8800	2445	481	3374	5384	9493
Swalwell (Beaver)	15300	9585	755	5990	9524	16732
Oyama	6000	4988	650	2536	3980	6897
King Edward	2900	1253	83	1197	1892	3306
Kalamalka-Wood	142700	13080	6294	20537	36991	78602
Aberdeen	13000	9040	628	6434	8637	16090
Haddo	23500	2037	198	10251	15697	26819
Dixon	1200	208	28	148	305	655
Swan	29700	2460	1030	3720	6746	14756
Goose	1000	1623	85	0	0	0
TOTAL	244100	46719	10232	50187	90156	173350

* Exclusive of Hiram Walker pumped diversion from Okanagan Lake and return discharge to Vernon Creek above Ellison Lake (MP3).

An examination of the above table would indicate that with the possible exceptions of Kalamatka-Wood and Haddo, there is little opportunity for increased storage, assuming all active storage is to be filled in a dry year. Moreover, Crooked and Swalwell Dams with spillway elevations of 4413.4 and 4414.0 have a combined active storage capacity of 12000 acre-feet compared to the dry year inflow of 9364. Hence there is no opportunity for the development of additional firm storage in this portion of the basin.

Storages are currently operated in a manner which seems best to the own-

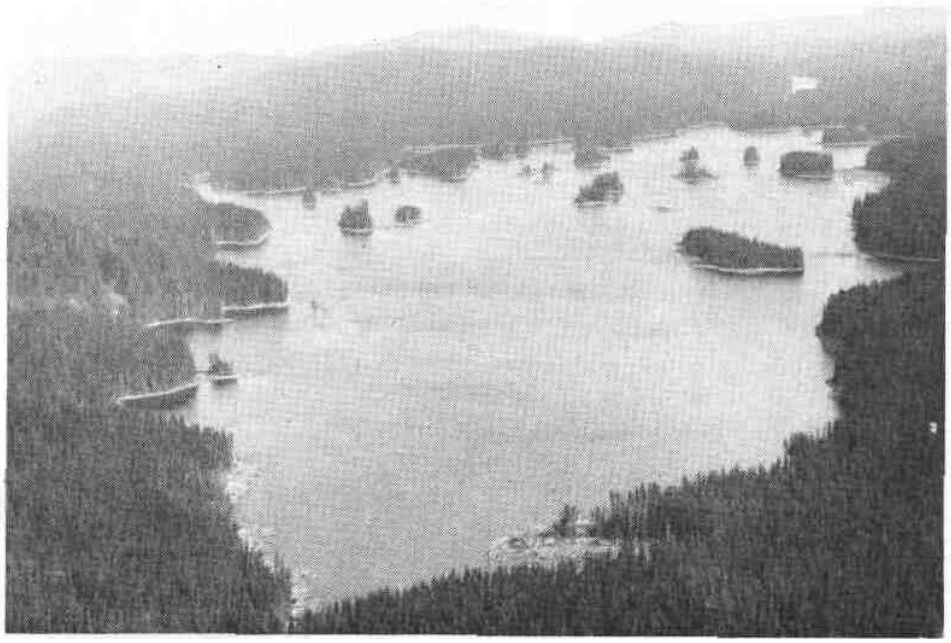


Photo 39 OYAMA LAKE - Looking Northeast (Sept. 12, 1973)
Vernon Creek System

Photo 40 CROOKED LAKE - Looking Northeast (Sept. 12, 1973)
Vernon Creek System

Photo 41 HADDO LAKE - Looking North (Sept. 12, 1973)
Vernon Creek System

Photo 42 ABERDEEN LAKE - Looking North (Sept. 12, 1973)
Vernon Creek System

ers for the purposes of irrigation or other consumptive use. Methods of operation are by no means rigid but generally follow the pattern outlined in Table 10.7.

TABLE 10.7
RULE CURVE VALUES FOR VERNON CREEK RESERVOIRS

Reservoir Name	Reservoir Capacity	Rule Curve Values Expressed as a Percentage of Reservoir Capacity											
		J	F	M	A	M	J	J	A	S	O	N	D
Crooked	2445	90	90	90	100	100	97	93	90	90	90	90	90
Swalwell	9585	60	60	60	70	100	100	87	73	60	60	60	60
Oyama	4988	60	60	60	70	100	100	87	73	60	60	60	60
King Edward	1253	50	50	50	65	100	100	83	67	50	50	50	50
Kalamalka	13080	80	80	80	90	100	100	93	87	80	80	80	80
Aberdeen	9040	40	40	40	60	100	100	80	60	40	40	40	40
Haddo	2037	10	10	10	40	100	100	70	40	10	10	10	10
Dixon	208	40	40	40	60	100	100	80	60	40	40	40	40
Swan	2460	60	60	60	70	100	100	87	73	60	60	60	60
Goose	1623	30	50	70	100	100	90	70	50	30	30	30	30
TOTAL	46719												

EXPLANATION: For any given month -

a) Percentages shown refer to active storage occupied by water at end of month. e.g. 30% storage occupied by water at end of March.
b) When rule curve value is exceeded, all excess water is released.
c) When rule curve value is not achieved, only stated water requirements are released.
d) Information based on local records of water users, over a period 1964-1971.

The above rule curve values have been used in computer programming for the production of print-outs showing regulated flows.

At the 1970 stage of development, little or no consideration is given to the operation of storage for Fisheries or other non-consumptive use.

10.5.1 Regulated Flows

When natural flow is affected by storage changes, diversions to or from

the area and withdrawals for irrigation, domestic or industrial purposes, the resulting discharges are called "residual flows". These residual flows, for various selected points and three types of weather year at 1970 development, are shown on computer print-outs. They are reproduced as Figure 10.6 (Dry Year), Figure 10.7 (Average Year), and Figure 10.8 (Wet Year).

10.5.2 BX Creek (Reference figure 10.9)

Reference to these figures will show that residual flows immediately upstream and immediately downstream from the selected point are given. The difference is the amount diverted at the point for consumptive use. It will be noted that a consumptive "demand deficiency" is recorded for almost the whole year at UP 7, on BX Creek during "dry", "average", and "wet" years. This is because of estimated diversion rates for City of Vernon from a very small catchment. What happens, in fact, is that Vernon supplements its water supply by pumping from Kalamalka Lake (UP5), and hence, does not outwardly experience any shortage. Similarly, a small "demand deficiency" will be noted in July and August at UP 9. Both of these deficiencies are experienced on the BX Creek system and point up the fact that this area is very weak in its ability to meet water demands placed upon it.

Reference to the computer print-outs, Figures 10.6 etc., indicate that Fisheries deficiencies are quite pronounced in the upper reaches of Coldstream and BX Creeks. In most cases, it would appear that the natural supply of water is simply not enough to meet the stated requirements.

10.6 MAINSTEM VERNON CREEK

Non-consumptive use deficiencies are minor where shown (e.g. Figure 4.52) at creek mouth and may be relieved by modifying storage releases. It is worth noting here that the relatively large active storage in Kalamalka Lake provides the opportunity to maintain reasonable flows downstream with small modifications to the control pattern of Kalamalka Lake.

In a dry year, as defined, at the 1970 stage of development, water requirements exceed water supply. This is illustrated by the Deficiency Diagram on Figure 10.10. Under the present or historic method of operation of storage, deficiencies are felt by both consumptive and non-consumptive (Fisheries) users. Under the influence of the rudimentary model for modified operation of storage, it becomes possible to approach elimination of non-consumptive deficiencies This suggests that refinements to the historic method of operating storage would result in a more advantageous use of the water resource.

STORAGES GIVEN ARE FOR THE END OF THE MONTH
UNITS FOR DEMANDS, STORAGES, FLOWS, AND DEFICIENCIES ARE ACRE FEET

		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL
CONTROL POINT	1													
STORAGE		2200.	2200.	2200.	2345.	2445.	2445.	2372.	2276.	2200.	2200.	2200.	2200.	
CONTROL POINT	2													
STORAGE		5751.	5751.	5751.	5858.	7154.	7379.	5892.	4184.	3628.	3678.	3728.	3778.	
CONTROL POINT	3													
STORAGE		2993.	2993.	2993.	3092.	4352.	4750.	4265.	3461.	2993.	2993.	2993.	2993.	
CONTROL POINT	4													
STORAGE		626.	626.	626.	674.	1253.	1253.	1040.	840.	626.	674.	626.	626.	
CONTROL POINT	5													
STORAGE		10464.	10484.	10464.	11061.	13080.	13080.	12164.	11330.	10464.	10464.	10464.	10464.	
CONTROL POINT	6													
STORAGE		3616.	3616.	3616.	3819.	7083.	9040.	5755.	1966.	575.	670.	753.	836.	
CONTROL POINT	7													
STORAGE		204.	204.	204.	371.	1384.	127.	0.	0.	0.	66.	128.	190.	
CONTROL POINT	8													
STORAGE		12.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CONTROL POINT	9													
STORAGE		1476.	1476.	1476.	1649.	2460.	2460.	2140.	1796.	1476.	1476.	1476.	1476.	
CONTROL POINT	G													
STORAGE		487.	673.	927.	1123.	1123.	1123.	1123.	811.	487.	487.	487.	487.	
MEASURING POINT	3													
FLOW		120.	157.	200.	126.	1639.	0.	0.	0.	0.	94.	101.	101.	2537.
DEFICIENCY (FISH)		360.	323.	280.	354.	0.	480.	480.	480.	480.	506.	379.	379.	4501.
MEASURING POINT	4													
FLOW		120.	157.	200.	127.	1561.	2.	1.	0.	0.	94.	101.	101.	2546.
DEFICIENCY (FISH)		360.	323.	280.	353.	0.	478.	479.	480.	480.	506.	379.	379.	4479
MEASURING POINT	5													
FLOW		128.	166.	212.	157.	1834.	91.	27.	8.	8.	102.	109.	109.	2950.
DEFICIENCY (FISH)		352.	314.	268.	323.	0.	389.	453.	472.	472.	498.	371.	371.	4283
MEASURING POINT	8													
FLOW		72.	85.	113.	172.	498.	10.	4.	5.	450.	84.	84.	84.	1611.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
MEASURING POINT	10													
FLOW		110.	134.	171.	341.	2244.	1218.	348.	90.	247.	124.	124.	124.	5283.
DEFICIENCY (FISH)		250.	226.	189.	19.	0.	0.	12.	261.	113.	356.	236.	236.	1898
MEASURING POINT	14													
FLOW		43.	54.	65.	145.	1533.	828.	92.	6.	32.	54.	51.	51.	2954.
DEFICIENCY (FISH)		107.	96.	85.	5.	0.	0.	58.	144.	118.	186.	99.	99.	997.
MEASURING POINT	16													
FLOW		50.	63.	76.	0.	650.	814.	341.	351.	327.	62.	59.	59.	3052.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
MEASURING POINT	17													
FLOW		303.	410.	526.	8.	3527.	1830.	1137.	706.	1720.	287.	321.	321.	11097.
DEFICIENCY (FISH)		177.	70.	0.	472.	0.	0.	0.	0.	0.	313.	159.	159.	1350.
USE POINT	1													
DEMAND, IRRIGATION		0.	0.	0.	0.	890.	1499.	1499.	1499.	600.	0.	0.	0.	5996.
DEMAND, DOMESTIC		16.	13.	16.	20.	33.	42.	52.	52.	26.	23.	16.	15.	325.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		16.	13.	16.	20.	932.	1541.	1551.	1551.	626.	23.	16.	15.	6321.
FLOW, UPSTREAM		114.	143.	182.	71.	2218.	1666.	1906.	1957.	771.	92.	92.	92.	9295.
FLOW, DOWNSTREAM		98.	130.	166.	51.	1286.	125.	355.	401.	145.	69.	76.	76.	2977.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	2													
DEMAND, IRRIGATION		0.	0.	0.	0.	255.	426.	426.	426.	170.	0.	0.	0.	1703.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	255.	426.	426.	426.	170.	0.	0.	0.	1703.
FLOW, UPSTREAM		120.	157.	200.	126.	1894.	426.	426.	426.	170.	94.	101.	101.	4240.
FLOW, DOWNSTREAM		120.	157.	200.	126.	1639.	0.	0.	0.	0.	94.	101.	101.	2537.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	3													
DEMAND, IRRIGATION		0.	0.	0.	0.	422.	703.	703.	703.	281.	0.	0.	0.	2812.
DEMAND, DOMESTIC		2.	1.	2.	2.	3.	4.	5.	5.	3.	2.	2.	2.	33.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		2.	1.	2.	2.	425.	707.	708.	708.	284.	2.	2.	2.	2845.
FLOW, UPSTREAM		73.	85.	114.	119.	900.	707.	708.	712.	733.	85.	85.	85.	4406.
FLOW, DOWNSTREAM		71.	84.	112.	117.	475.	0.	0.	4.	449.	83.	83.	83.	1561.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	4													
DEMAND, IRRIGATION		0.	0.	0.	0.	135.	225.	225.	225.	90.	0.	0.	0.	900.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	135.	225.	225.	225.	90.	0.	0.	0.	900.
FLOW, UPSTREAM		32.	41.	52.	42.	419.	517.	310.	241.	256.	41.	41.	41.	2031.
FLOW, DOWNSTREAM		32.	41.	52.	42.	284.	292.	85.	16.	166.	41.	41.	41.	1131.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY (FISH)		328.	319.	308.	318.	196.	68.	275.	344.	196.	439.	319.	319.	3429.
USE POINT	5													
DEMAND, IRRIGATION		0.	0.	0.	0.	192.	321.	321.	321.	128.	0.	0.	0.	1283.
DEMAND, DOMESTIC		75.	60.	75.	90.	151.	196.	241.	241.	120.	105.	75.	75.	1504.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		75.	60.	75.	90.	343.	517.	562.	562.	248.	105.	75.	75.	2787.
FLOW, UPSTREAM		326.	405.	522.	90.	2977.	1514.	1353.	915.	1639.	328.	335.	335.	10739.
FLOW, DOWNSTREAM		251.	345.	447.	0.	2634.	997.	791.	353.	1391.	223.	260.	263.	7952.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY (FISH)		229.	135.	33.	0.	0.	0.	0.	127.	0.	377.	220.	220.	1341.
USE POINT	6													
DEMAND, IRRIGATION		0.	0.	0.	0.	2315.	3859.	3859.	3859.	1543.	0.	0.	0.	15435.
DEMAND, DOMESTIC		62.	50.	62.	75.	124.	162.	199.	199.	99.	87.	62.	62.	1243.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		62.	50.	62.	75.	2439.	4021.	4058.	4058.	1642.	87.	62.	62.	16678.
FLOW, UPSTREAM		353.	236.	316.	271.	2439.	4021.	4058.	4150.	1967.	93.	118.	115.	18359.
FLOW, DOWNSTREAM		291.	186.	254.	196.	0.	0.	0.	311.	325.	6.	56.	55.	3681.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	7													
DEMAND, IRRIGATION		0.	0.	0.	0.	27.	45.	45.	45.	18.	0.	0.	0.	180.
DEMAND, DOMESTIC		74.	59.	74.	88.	147.	192.	236.	236.	118.	103.	74.	74.	1475.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		74.	59.	74.	88.	174.	237.	281.	281.	136.	103.	74.	74.	1655.
FLOW, UPSTREAM		74.	16.	4.	13.	68.	31.	11.	3.	3.	3.	3.	3.	232.
FLOW, DOWNSTREAM		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, DEFICIENCY		0.	43.	70.	75.	106.	206.	270.	278.	133.	100.	71.	71.	1423.
DEFICIENCY (FISH)		150.	150.	150.	150.	240.	150.	150.	150.	150.	240.	150.	150.	1980.
USE POINT	8													
DEMAND, IRRIGATION		0.	0.	0.	0.	32.	54.	54.	54.	22.	0.	0.	0.	216.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	32.	54.	54.	54.	22.	0.	0.	0.	216.
FLOW, UPSTREAM		37.	47.	56.	120.	1422.	816.	125.	54.	48.	48.	45.	45.	2863.
FLOW, DOWNSTREAM		37.	47.	56.	120.	1390.	762.	71.	0.	26.	45.	45.	45.	2647.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY (FISH)		113.	103.	94.	30.	0.	0.	79.	150.	124.	192.	105.	105.	1095.
USE POINT	9													
DEMAND, IRRIGATION		0.	0.	0.	0.	63.	105.	105.	105.	42.	0.	0.	0.	420.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	63.	105.	105.	105.	42.	0.	0.	0.	420.
FLOW, UPSTREAM		44.	55.	66.	149.	1556.	838.	95.	7.	33.	55.	52.	52.	3032.
FLOW, DOWNSTREAM		44.	55.	66.	149.	1491.	733.	0.	3.	0.	55.	52.	52.	2699.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	10.	98.	9.	0.	0.	0.	117.
DEFICIENCY (FISH)		106.	95.	84.	1.	0.	0.	150.	150.	150.	185.	98.	98.	1117.
GRAND TOTALS FOR ALL THE USE POINTS:														
DEMAND, IRRIGATION		0.	0.	0.	0.	4140.	7237.	7237.	7237.	2894.	0.	0.	0.	28945.
DEMAND, DOMESTIC		229.	183.	229.	275.	458.	596.	733.	733.	366.	320.	229.	229.	4580.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		229.	183.	229.	275.	4598.	7833.	7970.	7970.	3260.	320.	229.	229.	33525.
DEMAND, DEFICIENCY		0.	43.	70.	75.	106.	206.	240.	376.	142.	100.	71.	71.	1540.

VERNON CR. DRY YEAR (1970) Figure 10.6

STORAGES GIVEN ARE FOR THE END OF THE MONTH
UNITS FOR DEMANDS, STORAGES, FLOWS, AND DEFICIENCIES ARE ACRE FEET

		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL
CONTROL POINT	1													
STORAGE		2200.	2200.	2200.	2415.	2445.	2445.	2372.	2274.	2200.	2200.	2200.	2200.	
CONTROL POINT	2													
STORAGE		5751.	5751.	5751.	5923.	7972.	9059.	7855.	6757.	5751.	5751.	5751.	5751.	
CONTROL POINT	3													
STORAGE		2993.	2993.	2993.	3150.	4988.	4988.	4340.	3641.	2993.	2993.	2993.	2993.	
CONTROL POINT	4													
STORAGE		626.	626.	629.	732.	1253.	1253.	1040.	843.	626.	626.	626.	626.	
CONTROL POINT	5													
STORAGE		10464.	10464.	10464.	11772.	13080.	13080.	12104.	11340.	10464.	10464.	10464.	10464.	
CONTROL POINT	6													
STORAGE		3616.	3616.	3616.	3939.	8810.	9040.	7232.	4480.	3247.	3394.	3525.	3616.	
CONTROL POINT	7													
STORAGE		204.	204.	204.	462.	2037.	2037.	871.	0.	0.	187.	204.	204.	
CONTROL POINT	8													
STORAGE		15.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CONTROL POINT	9													
STORAGE		1476.	1476.	1476.	1722.	2460.	2460.	2140.	1796.	1476.	1476.	1476.	1476.	
CONTROL POINT	6													
STORAGE		487.	611.	1130.	1340.	1623.	1461.	1136.	811.	487.	487.	487.	487.	
MEASURING POINT	3													
FLOW		208.	268.	342.	254.	3048.	904.	2.	0.	57.	251.	258.	258.	6050.
DEFICIENCY (FISH)		272.	212.	138.	226.	0.	0.	478.	480.	423.	349.	222.	222.	3022.
MEASURING POINT	4													
FLOW		216.	277.	351.	202.	3774.	558.	34.	6.	63.	257.	264.	264.	6356.
DEFICIENCY (FISH)		264.	203.	129.	188.	0.	0.	446.	474.	417.	343.	216.	216.	2896.
MEASURING POINT	5													
FLOW		239.	305.	383.	393.	4265.	781.	120.	26.	85.	279.	286.	286.	7650.
DEFICIENCY (FISH)		241.	175.	97.	87.	0.	0.	360.	452.	395.	321.	194.	194.	2516.
MEASURING POINT	8													
FLOW		122.	143.	190.	216.	1353.	1114.	318.	137.	506.	140.	140.	140.	4520.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
MEASURING POINT	10													
FLOW		215.	262.	328.	734.	4679.	2424.	721.	209.	356.	233.	233.	233.	10776.
DEFICIENCY (FISH)		145.	98.	32.	0.	0.	0.	0.	151.	4.	247.	127.	127.	931.
MEASURING POINT	14													
FLOW		78.	99.	118.	284.	2583.	1375.	219.	49.	71.	93.	89.	89.	5147.
DEFICIENCY (FISH)		72.	51.	32.	0.	0.	0.	0.	101.	79.	147.	61.	61.	604
MEASURING POINT	16													
FLOW		103.	129.	152.	146.	2309.	1511.	527.	344.	373.	117.	113.	113.	5857.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
MEASURING POINT	17													
FLOW		640.	856.	1069.	384.	12459.	5921.	2289.	1023.	2049.	725.	758.	758.	28960.
DEFICIENCY (FISH)		0.	0.	0.	96.	0.	0.	0.	0.	0.	0.	0.	0.	96.
USE POINT	1													
DEMAND, IRRIGATION		0.	0.	0.	0.	899.	1499.	1499.	1499.	600.	0.	0.	0.	5996.
DEMAND, DOMESTIC		16.	13.	16.	20.	33.	42.	52.	52.	26.	23.	16.	16.	325.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		16.	13.	16.	20.	932.	1541.	1551.	1551.	626.	23.	16.	16.	6321.
FLOW, UPSTREAM		184.	231.	295.	126.	3745.	1939.	1842.	1932.	808.	278.	229.	229.	11789.
FLOW, DOWNSTREAM		168.	218.	279.	306.	2813.	398.	291.	381.	182.	206.	213.	213.	5468.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	2													
DEMAND, IRRIGATION		0.	0.	0.	0.	255.	426.	426.	426.	170.	0.	0.	0.	1703.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	255.	426.	426.	426.	170.	0.	0.	0.	1703.
FLOW, UPSTREAM		208.	267.	341.	252.	3895.	927.	426.	426.	227.	251.	258.	258.	7738.
FLOW, DOWNSTREAM		208.	267.	341.	252.	3640.	501.	0.	0.	57.	251.	258.	258.	6037.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	3													
DEMAND, IRRIGATION		0.	0.	0.	0.	422.	703.	703.	703.	281.	0.	0.	0.	2812.
DEMAND, DOMESTIC		2.	1.	2.	2.	3.	4.	5.	5.	3.	2.	2.	2.	33.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		2.	1.	2.	2.	425.	707.	708.	708.	284.	2.	2.	2.	2845.
FLOW, UPSTREAM		122.	141.	159.	208.	1728.	1799.	1018.	843.	788.	140.	140.	140.	7257.
FLOW, DOWNSTREAM		120.	140.	157.	206.	1303.	1092.	310.	135.	504.	138.	138.	138.	4412.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	4													
DEMAND, IRRIGATION		0.	0.	0.	0.	135.	225.	225.	225.	90.	0.	0.	0.	900.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	135.	225.	225.	225.	90.	0.	0.	0.	900.
FLOW, UPSTREAM		52.	66.	84.	70.	1063.	833.	373.	258.	278.	65.	65.	65.	3280.
FLOW, DOWNSTREAM		52.	66.	84.	70.	928.	608.	148.	41.	188.	65.	65.	65.	2380.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY (FISH)		308.	294.	274.	290.	0.	0.	212.	319.	172.	415.	295.	295.	2876.
USE POINT	5													
DEMAND, IRRIGATION		0.	0.	0.	0.	192.	321.	321.	321.	128.	0.	0.	0.	1283.
DEMAND, DOMESTIC		75.	60.	75.	90.	151.	196.	241.	241.	120.	105.	75.	75.	1504.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		75.	60.	75.	90.	343.	517.	562.	562.	248.	105.	75.	75.	2787.
FLOW, UPSTREAM		628.	772.	975.	266.	10257.	4824.	2272.	1213.	1914.	702.	709.	709.	25237.
FLOW, DOWNSTREAM		553.	712.	900.	176.	9914.	4307.	1710.	645.	1666.	597.	634.	634.	22450.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY (FISH)		0.	0.	0.	304	0.	0.	0.	0.	0.	3.	0.	0.	307.
USE POINT	6													
DEMAND, IRRIGATION		0.	0.	0.	0.	2315.	3859.	3859.	3859.	1543.	0.	0.	0.	15435.
DEMAND, DOMESTIC		62.	50.	62.	75.	124.	162.	199.	199.	99.	87.	62.	62.	1243.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		62.	50.	62.	75.	2439.	4021.	4058.	4058.	1642.	87.	62.	62.	16678.
FLOW, UPSTREAM		633.	439.	663.	479.	7507.	8451.	4383.	4383.	3987.	223.	259.	542.	30215.
FLOW, DOWNSTREAM		571.	359.	607.	404.	5368.	4430.	325.	325.	325.	136.	207.	480.	23537.
DEMAND, DEFICIENCY		0.	0.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	7													
DEMAND, IRRIGATION		0.	0.	0.	0.	27.	45.	45.	45.	18.	0.	0.	0.	180.
DEMAND, DOMESTIC		74.	57.	74.	88.	147.	192.	236.	236.	118.	103.	74.	74.	1475.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		74.	57.	74.	88.	174.	237.	281.	281.	136.	103.	74.	74.	1855.
FLOW, UPSTREAM		74.	22.	9.	27.	143.	62.	22.	6.	6.	6.	6.	6.	388.
FLOW, DOWNSTREAM		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.	0.
DEMAND, DEFICIENCY		0.	37.	65.	61.	31.	175.	259.	275.	130.	97.	68.	68.	1269.
DEFICIENCY (FISH)		150.	150.	150.	150.	240.	150.	150.	150.	150.	240.	150.	150.	1980.
USE POINT	8													
DEMAND, IRRIGATION		0.	0.	0.	0.	32.	54.	54.	54.	22.	0.	0.	0.	216.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	32.	54.	54.	54.	22.	0.	0.	0.	216.
FLOW, UPSTREAM		65.	63.	95.	225.	2307.	1289.	224.	90.	80.	80.	76.	76.	4683.
FLOW, DOWNSTREAM		65.	63.	98.	225.	2275.	1235.	173.	35.	58.	80.	76.	76.	4477.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY (FISH)		85.	67.	52.	0.	0.	0.	0.	114.	92.	160.	74.	74.	718.
USE POINT	9													
DEMAND, IRRIGATION		0.	0.	0.	0.	63.	105.	105.	105.	42.	0.	0.	0.	420.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	63.	105.	105.	105.	42.	0.	0.	0.	420.
FLOW, UPSTREAM		42.	136.	173.	332.	2661.	1409.	234.	53.	75.	97.	93.	93.	5328.
FLOW, DOWNSTREAM		82.	136.	173.	332.	2598.	1304.	179.	3.	31.	97.	93.	93.	4959.
DEMAND, DEFICIENCY		0.	0.	0.	0.	5.	0.	2.	52.	0.	0.	0.	0.	52.
DEFICIENCY (FISH)		68.	46.	27.	0.	0.	0.	0.	150.	117.	143.	57.	67.	665.
GRAND TOTALS FOR ALL THE USE POINTS:														
DEMAND, IRRIGATION		0.	0.	0.	0.	4365.	7237.	7237.	7237.	2894.	0.	0.	0.	28945.
DEMAND, DOMESTIC		220.	143.	229.	275.	458.	596.	713.	731.	366.	320.	229.	229.	4580.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		220.	143.	229.	275.	4796.	7833.	7870.	7973.	3260.	320.	229.	229.	33525.
DEMAND, DEFICIENCY		0.	37.	65.	41.	34.	175.	259.	327.	130.	97.	68.	66.	1321.

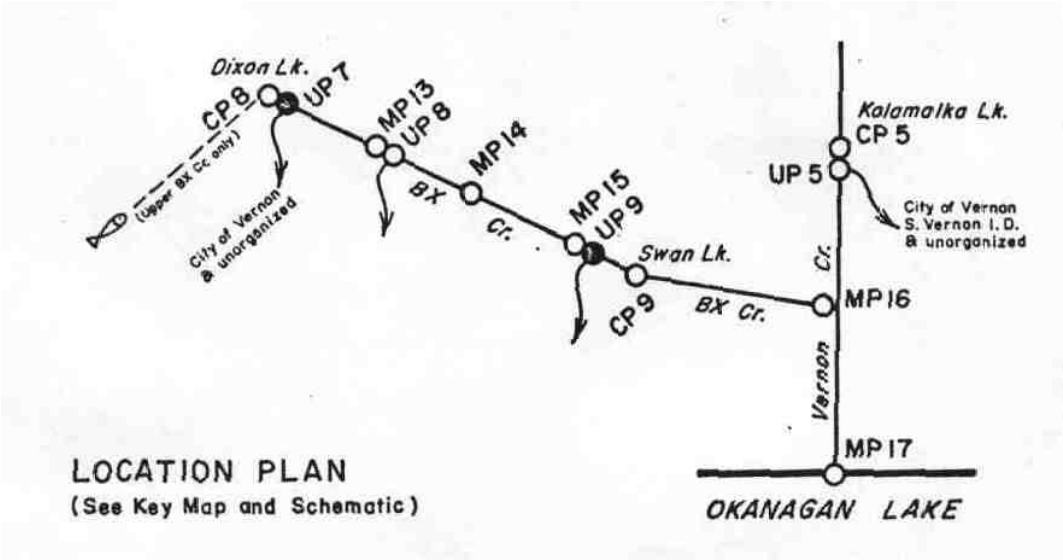
VERNON CR. AVERAGE YEAR (1970) Figure 10.7

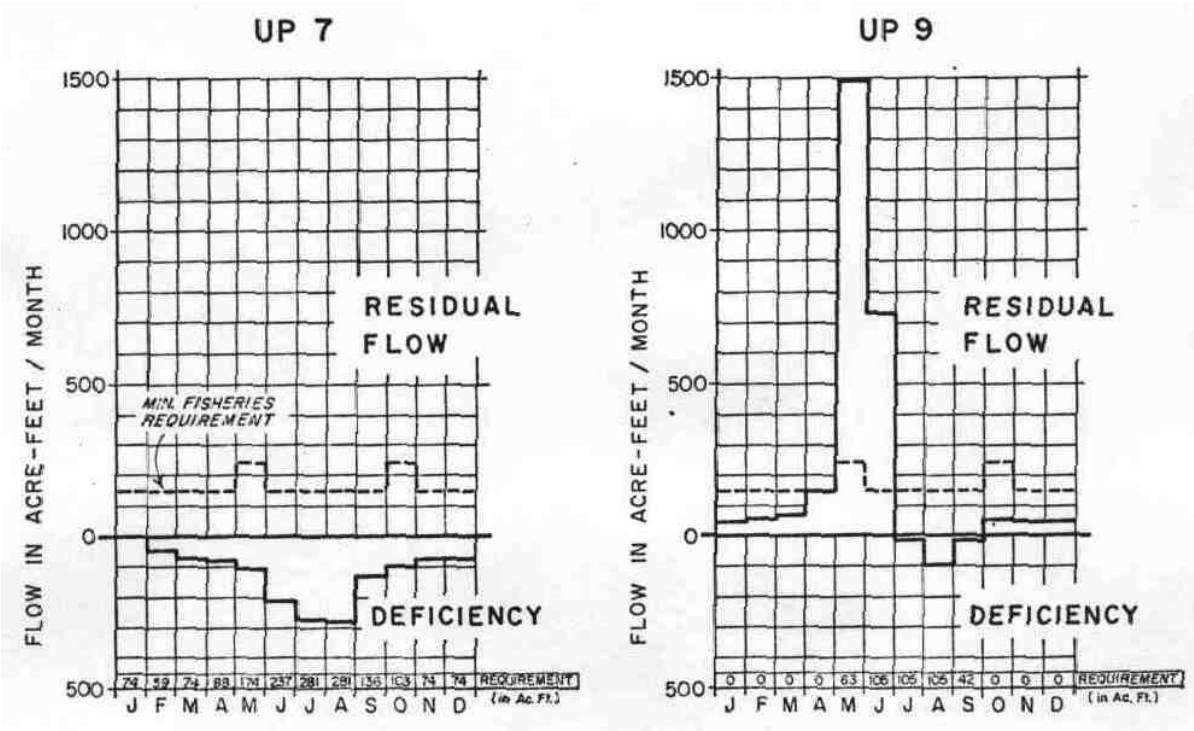
Date of Print-out: Dec. 5, 1972

STORAGES GIVEN ARE FOR THE END OF THE MONTH
UNITS FOR DEMANDS, STORAGES, FLOWS, AND DEFICIENCIES ARE ACRE FEET

		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL
CONTROL POINT	1													
STORAGE		2200.	2200.	2200.	2445.	2445.	2445.	2372.	2274.	2200.	2200.	2200.	2200.	
CONTROL POINT	2													
STORAGE		5751.	5751.	5751.	6056.	9585.	9585.	8339.	6974.	5751.	5751.	5751.	5751.	
CONTROL POINT	3													
STORAGE		2993.	2993.	2993.	3269.	4180.	4980.	4340.	3841.	2993.	2993.	2993.	2993.	
CONTROL POINT	4													
STORAGE		626.	626.	626.	760.	1253.	1253.	1040.	860.	626.	626.	626.	625.	
CONTROL POINT	5													
STORAGE		10464.	10464.	10464.	11772.	13080.	13080.	12164.	11380.	10464.	10464.	10464.	10464.	
CONTROL POINT	6													
STORAGE		3616.	3616.	3616.	4185.	9040.	9040.	7232.	5381.	3616.	3616.	3616.	3616.	
CONTROL POINT	7													
STORAGE		204.	204.	204.	716.	2037.	2037.	1426.	0.	194.	204.	204.	204.	
CONTROL POINT	8													
STORAGE		22.	0.	0.	0.	124.	20.	0.	0.	0.	0.	0.	0.	
CONTROL POINT	9													
STORAGE		1476.	1476.	1476.	1722.	2460.	2460.	2140.	1796.	1476.	1476.	1476.	1476.	
CONTROL POINT	6													
STORAGE		487.	811.	1136.	1623.	1623.	1461.	1136.	811.	487.	487.	487.	487.	
MEASURING POINT	3													
FLOW		404.	511.	849.	752.	7960.	4459.	674.	2.	1004.	481.	488.	488.	17751.
DEFICIENCY (FISH)		76.	0.	0.	0.	0.	0.	0.	478.	0.	119.	0.	0.	673.
MEASURING POINT	4													
FLOW		449.	566.	704.	979.	8590.	4779.	866.	38.	1040.	517.	524.	524.	19573.
DEFICIENCY (FISH)		31.	0.	0.	0.	0.	0.	0.	442.	0.	83.	0.	0.	556.
MEASURING POINT	5													
FLOW		530.	604.	811.	1302.	10195.	5472.	1100.	110.	1112.	509.	590.	590.	23102.
DEFICIENCY (FISH)		0.	0.	0.	0.	0.	0.	0.	370.	0.	0.	0.	0.	370.
MEASURING POINT	8													
FLOW		226.	261.	352.	421.	4350.	2570.	638.	257.	824.	256.	258.	258.	10472.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
MEASURING POINT	10													
FLOW		492.	604.	728.	1868.	11206.	5355.	1745.	486.	633.	510.	510.	512.	24646.
DEFICIENCY (FISH)		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MEASURING POINT	14													
FLOW		187.	212.	247.	657.	4996.	2599.	552.	151.	167.	189.	184.	184.	10305.
DEFICIENCY (FISH)		0.	0.	0.	0.	0.	0.	0.	0.	0.	51.	0.	0.	51.
MEASURING POINT	16													
FLOW		263.	328.	371.	867.	6014.	3299.	1152.	474.	529.	273.	268.	268.	14106.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
MEASURING POINT	17													
FLOW		1696.	2108.	2523.	4355.	34988.	18290.	6113.	1776.	3791.	1750.	1782.	1782.	80856.
DEFICIENCY (FISH)		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
USE POINT	1													
DEMAND, IRRIGATION		0.	0.	0.	0.	899.	1499.	1499.	1499.	600.	0.	0.	0.	5996.
DEMAND, DOMESTIC		16.	13.	16.	20.	33.	42.	52.	52.	26.	23.	16.	16.	325.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		16.	13.	16.	20.	932.	1541.	1551.	1551.	626.	23.	16.	16.	6321.
FLOW, UPSTREAM		330.	414.	530.	421.	6773.	5344.	2337.	1883.	1705.	409.	409.	407.	20963.
FLOW, DOWNSTREAM		314.	401.	514.	401.	5841.	3803.	780.	132.	1079.	386.	393.	393.	14642.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	2													
DEMAND, IRRIGATION		0.	0.	0.	0.	255.	426.	426.	426.	170.	0.	0.	0.	1703.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	255.	426.	426.	426.	170.	0.	0.	0.	1703.
FLOW, UPSTREAM		401.	557.	645.	736.	8044.	4863.	1087.	425.	1172.	479.	486.	486.	19331.
FLOW, DOWNSTREAM		401.	507.	645.	736.	7789.	4437.	661.	0.	1002.	479.	486.	486.	17629.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	3													
DEMAND, IRRIGATION		0.	0.	0.	0.	422.	703.	703.	703.	281.	0.	0.	0.	2812.
DEMAND, DOMESTIC		2.	1.	2.	2.	3.	4.	5.	5.	3.	2.	2.	2.	33.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		2.	1.	2.	2.	425.	707.	708.	708.	284.	2.	2.	2.	2845.
FLOW, UPSTREAM		223.	256.	347.	401.	4672.	3232.	1327.	960.	903.	255.	255.	255.	13087.
FLOW, DOWNSTREAM		221.	255.	345.	399.	4247.	2525.	619.	252.	619.	253.	253.	253.	10242.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	4													
DEMAND, IRRIGATION		0.	0.	0.	0.	135.	225.	225.	225.	90.	0.	0.	0.	900.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	135.	225.	225.	225.	90.	0.	0.	0.	900.
FLOW, UPSTREAM		95.	120.	153.	146.	2401.	1487.	505.	318.	330.	117.	117.	117.	5905.
FLOW, DOWNSTREAM		95.	120.	153.	146.	2266.	1262.	280.	93.	240.	117.	117.	117.	5005.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY (FISH)		265.	240.	207.	214.	0.	0.	80.	267.	120.	365.	243.	243.	2242.
USE POINT	5													
DEMAND, IRRIGATION		0.	0.	0.	0.	192.	321.	321.	321.	128.	0.	0.	0.	1283.
DEMAND, DOMESTIC		75.	60.	75.	90.	151.	196.	241.	241.	120.	105.	75.	75.	1504.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		75.	60.	75.	90.	343.	517.	562.	562.	248.	105.	75.	75.	2787.
FLOW, UPSTREAM		1442.	1701.	2146.	3255.	28090.	15023.	5752.	1810.	3456.	1528.	1535.	1535.	68833.
FLOW, DOWNSTREAM		1387.	1701.	2071.	3165.	27747.	14506.	4690.	1248.	3208.	1423.	1460.	1460.	64046.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY (FISH)		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
USE POINT	6													
DEMAND, IRRIGATION		0.	0.	0.	0.	2315.	3859.	3859.	3859.	1543.	0.	0.	0.	15435.
DEMAND, DOMESTIC		62.	50.	62.	75.	124.	162.	199.	199.	99.	87.	62.	62.	1243.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		62.	50.	62.	75.	2439.	4021.	4058.	4058.	1642.	87.	62.	62.	16678.
FLOW, UPSTREAM		1215.	1063.	1559.	1296.	26108.	18261.	5091.	4183.	3300.	1376.	1356.	1355.	56371.
FLOW, DOWNSTREAM		1153.	1013.	1497.	1221.	23669.	14240.	1033.	325.	1666.	1289.	1294.	1294.	49693.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
USE POINT	7													
DEMAND, IRRIGATION		0.	0.	0.	0.	27.	45.	45.	45.	18.	0.	0.	0.	180.
DEMAND, DOMESTIC		74.	59.	74.	88.	147.	192.	236.	236.	118.	103.	74.	74.	1475.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		74.	59.	74.	88.	174.	237.	281.	281.	136.	103.	74.	74.	1655.
FLOW, UPSTREAM		74.	38.	20.	60.	174.	237.	69.	13.	13.	13.	13.	13.	737.
FLOW, DOWNSTREAM		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, DEFICIENCY		0.	21.	54.	28.	0.	0.	212.	268.	123.	90.	61.	61.	918.
DEFICIENCY (FISH)		150.	150.	150.	150.	240.	150	150.	150.	150.	240.	160.	150.	1980.
USE POINT	8													
DEMAND, IRRIGATION		0.	0.	0.	0.	32.	54.	54.	54.	22.	0.	0.	0.	216.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	32.	54.	54.	54.	22.	0.	0.	0.	216.
FLOW, UPSTREAM		132.	169.	197.	495.	4271.	2314.	471.	171.	155.	155.	150.	150.	8833.
FLOW, DOWNSTREAM		132.	169.	197.	495.	4230.	2260.	417.	117.	133.	155.	150.	150.	8614.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY (FISH)		18.	0.	0.	0.	0.	0.	0.	33.	17.	85.	0.	0.	153.
USE POINT	9													
DEMAND, IRRIGATION		0.	0.	0.	0.	63.	105.	105.	105.	42.	0.	0.	0.	420.
DEMAND, DOMESTIC		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		0.	0.	0.	0.	63.	105.	105.	105.	42.	0.	0.	0.	420.
FLOW, UPSTREAM		184.	232.	268.	739.	5299.	2730.	620.	165.	181.	203.	198.	198.	11017.
FLOW, DOWNSTREAM		184.	232.	268.	739.	5236.	2625.	515.	60.	139.	203.	198.	198.	10597.
DEMAND, DEFICIENCY		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEFICIENCY (FISH)		0.	0.	0.	0.	0.	0.	0.	90.	11.	37.	0.	0.	138.
GRAND TOTALS FOR ALL THE USE POINTS:														
DEMAND, IRRIGATION		0.	0.	0.	0.	4340.	7237.	7237.	7237.	2894.	0.	0.	0.	28945.
DEMAND, DOMESTIC		229.	183.	229.	275.	458.	596.	733.	733.	366.	320.	229.	229.	4580.
DEMAND, INDUSTRIAL		0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DEMAND, TOTAL		229.	183.	229.	275.	4798.	7833.	7970.	7970.	3260.	320.	229.	229.	33525.
DEMAND, DEFICIENCY		0.	21.	54.	28.	0.	0.	212.	268.	123.	90.	61.	61.	918.

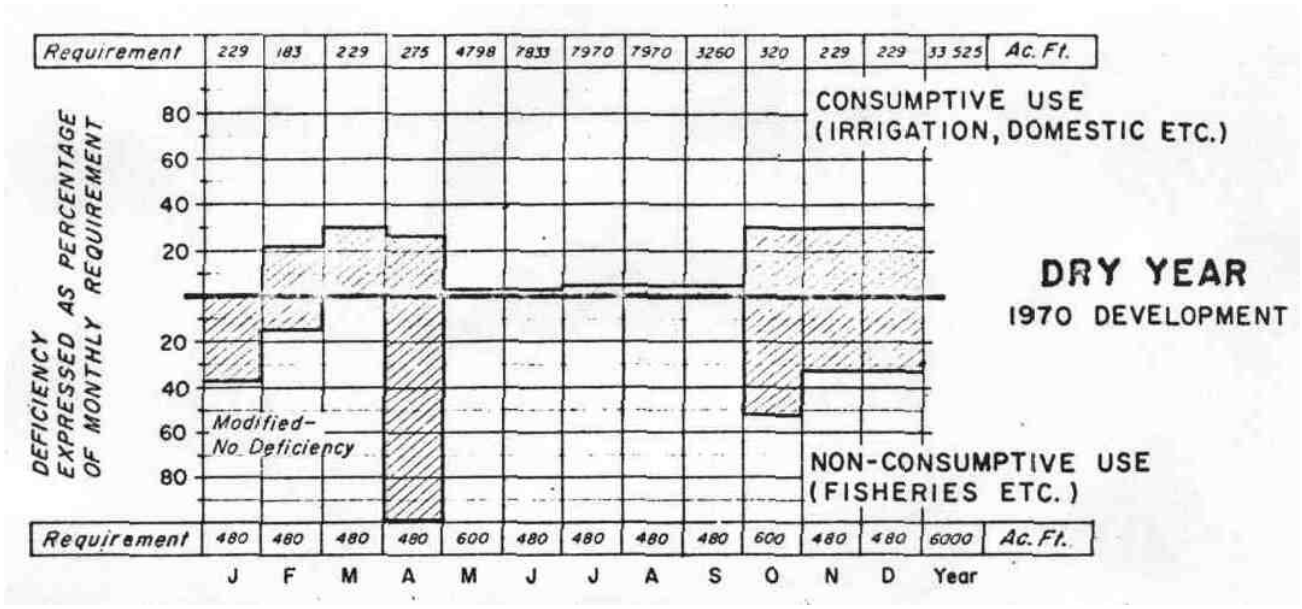
VERNON CR. WET YEAR (1970) Figure 10.8

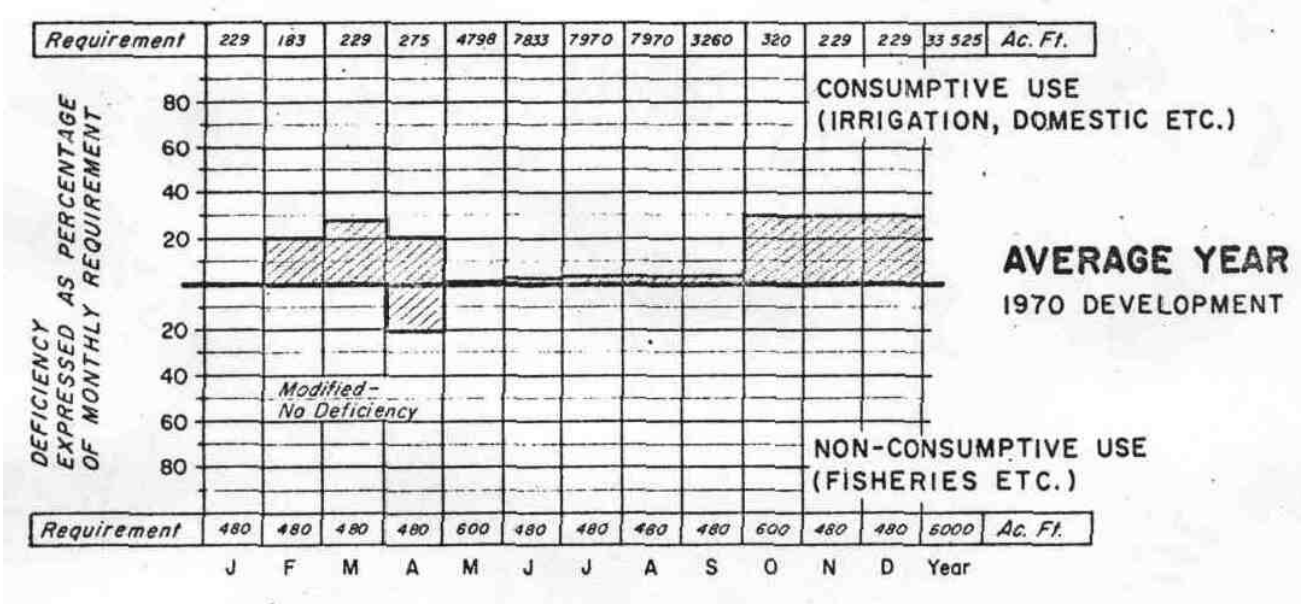




CONSUMPTIVE USE DEFICIENCY IN DRY YEAR
(1970)

DEFICIENCY HYDROGRAPHS VERNON CREEK Figure 10.9





LEGEND
Historic (Simulated) Operation
Modified (Simulated) Operation

NOTES: 1. Consumptive Use deficiencies are totals for whole basin.
2. Non-Consumptive deficiencies are those extant at creek mouth.
3. In a Wet Year, a fisheries deficiency of 0 ac. ft. exists at mouth.

VERNON CR. (1970) DEFICIENCY DIAGRAM Figure 10.10

The present Hiram Walker Distillery pumped diversion from Okanagan Lake with discharge to Vernon Creek at MP3 (Not included in the printout) would, if operated continuously add some 6000 to 7000 acre-feet per year to this portion of the basin. This would eliminate all water deficiencies in this portion of the Main Stem (MP3 to mouth).

This would release some 3000 acre-feet of residual flow upstream at MP2 which if stored could serve some 2000 acres of land along the Main Stem. (Figure 5M)

In conclusion, the contribution which Vernon Creek makes to the gross inflow to Okanagan Lake may be evaluated for various types of year as shown on Table 10.8.

TABLE 10.8

COMPARISON BETWEEN ESTIMATED INFLOWS

to

VERNON CREEK AND OKANAGAN LAKE

Type of Year	Inflow to Okanagan Lake from Vernon Creek* (acre-feet)	Total Tributary Inflow to Okanagan Lake from All Sources* (acre-feet)	Percentage Contribution by Vernon Creek to Okanagan Lake Inflow
Dry	11,100	279,200	4.0
Average	29,000	516,000	5.6

* Regulated Flows at 1970 Development