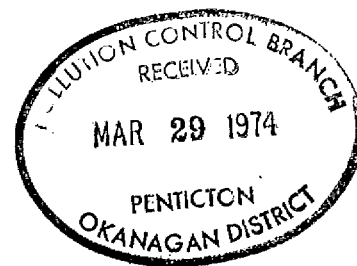


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TASK REPORT
ON
FUTURE LOADINGS OF PHOSPHORUS AND NITROGEN
TO THE OKANAGAN LAKE SYSTEM
TASK 103

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Prepared for the Okanagan Study Committee
in connection with the
Canada-British Columbia Okanagan Basin Agreement

April, 1973

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PREFACE

Task 103 was established in conjunction with the Canada-British Columbia Basin Agreement to provide quantitative estimates of Future Loadings of phosphorus and nitrogen to the Okanagan main valley lake system. The authors have relied on information found in Task 105 (Estimate of Present Loadings for Nutrients and Other Parameters to the Okanagan Lake System), Task 206 (Various Economic Growth Projections) and Task 103 (Preliminary Estimate of Future Loadings to the Okanagan System).

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INTRODUCTION

In conjunction with the Joint Federal-Provincial Okanagan Basin Study, Task 103 "Estimate of Future Loadings of Phosphorus and Nitrogen to the Okanagan Lake System", has been established to provide an estimate of the overall loadings of total nitrogen, total phosphorus and orthophosphorus to the main valley lakes for the years 1980, 2000 and 2020. This report outlines the various methods and procedures used to calculate the projected loadings.

The method used to calculate the future loadings is based on historic trends of various socio-economic parameters, and assumes that the water supply is not a limiting factor. Task 105 (Estimate of Present Loadings for Nutrients and Other Parameters to the Okanagan Lake System) and Task 206 (Various Economic Growth Projections) provide a basis for the projected loadings for nitrogen and phosphorus.

The calculated phosphorus and nitrogen loadings represent a range of population and development patterns as well as several degrees of treatment.

DETERMINATION OF PRESENT LOADING

Data collected under Task 105 was used in the calculation of orthophosphorus, total phosphorus and total nitrogen. Data used in the calculation of orthophosphorus loadings are included at the end of this section in Tables 2 to 7.

To be consistent with previous Tasks, such as 105, the entire study area has been subdivided into eight major lake regions (see Figure 1) namely:

- 1) Wood
- 2) Kalamalka
- 3) Okanagan - North
- 4) Okanagan - Central
- 5) Okanagan - South
- 6) Skaha
- 7) Vaseux
- 8) Osoyoos (Canadian)

The loading sources for both nitrogen and phosphorus have been broken down into a number of categories, as follows:

- 1) Minor tributaries
- 2) Main Valley streams
- 3) Municipal
- 4) Industrial
- 5) Storm sewers
- 6) Dustfall and Precipitation
- 7) Groundwater - Agriculture
- 8) - Septic Tank
- 9) - Other
- 10) - Natural

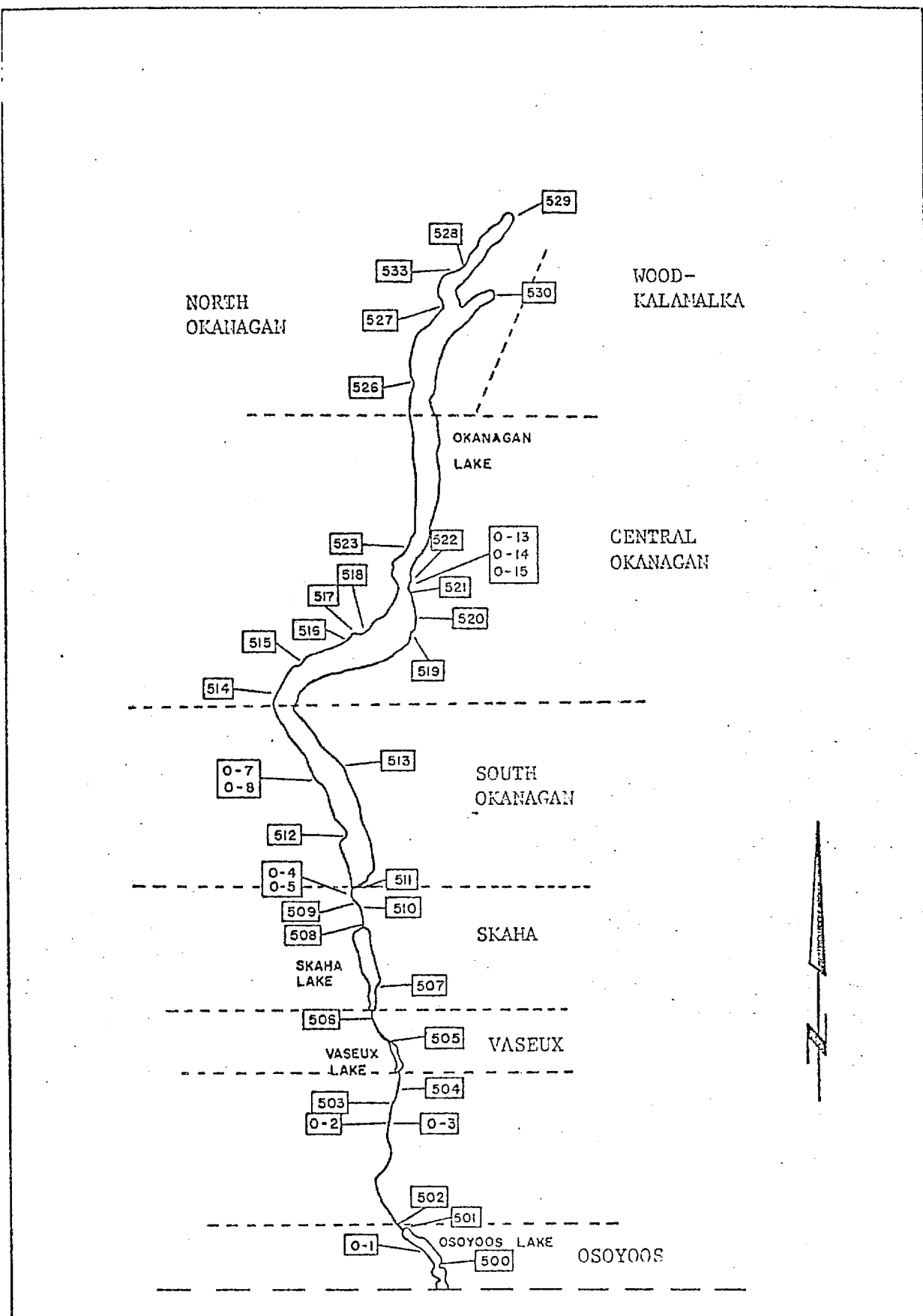


FIGURE 1. ESTABLISHED OKANAGAN BASIN MAJOR LAKE REGIONS

Streams

The stream sampling program under Task 131 included only those streams tributary to the main valley lakes. A comparison of the drainage area of streams sampled and total regional drainage area indicates that the drainage area of streams not considered (Table I) in the survey is considerable. To provide an estimate of the total input of nitrogen and phosphorus into each main valley lake for all streams, an estimate of the input from the unmeasured streams was required. A pro-rating procedure (Tables 2 to 7) based on tons of loading per square mile of drainage area was used to account for the drainage area not monitored.

No attempt has been made to give a range for loadings from streams; however, load variations do occur. For example, the total nutrient input to Wood Lake has been found to vary by an order of magnitude of 10 from a dry year to a wet year. This information will be included in the technical supplement.

Municipal

At this time, there are six municipalities within the Okanagan Basin which discharge treated effluent into surface water. Discharges of phosphorus and nitrogen have been monitored and described in detail in Task 130 (Outfall Discharge Study).

Industrial

Based on data collected on positive industrial discharges (Task 130) the mean N and P concentrations, as well as mean annual discharge, were determined for each industry (see Task 105).

Storm Sewers

A study on the types and amounts of impurities reaching receiving waters from storm sewers at Vernon, Kelowna and Penticton was carried out by the Faculty of Applied Science, the University of British Columbia under Task 133 (Storm Quality Discharge).

TABLE 1
Drainage Areas of Streams Tributary
to Each Respective Main Valley Lake

Lake	Total Drainage Area of Streams Sampled within Region	Total Drainage Area of Region	Monitored Total
	(Mi ²)	(Mi ²)	(percent)
Wood	40.	78.	51
Kalamalka	79.	139.	57
Okanagan N	435.	529.	82
Okanagan C	796.	904.	88
Okanagan S	393.	530.	74
Skaha	204.	280.	73
Vaseux	35.	54.	65
Osoyoos	75.	144.	52

The storm sewer study included the sampling of three storm sewers in each city during periods of snowmelt and rainfall in the spring and summer of 1972. An estimate of the total amount of impurities reaching Okanagan surface waters via storm sewers was made based on measured concentration of contaminants from snowmelt and spring rain, the rates of flow, precipitation, snow removal data, and areas of commercial and residential land use for the three cities.

Dustfall and Precipitation

Quantitative information on the amount of nitrogen and phosphorus reaching the mainstem Okanagan Lakes from dustfall and precipitation was provided from Task 134 (Dustfall and Precipitation Study). In this study, 23 sampling sites were established adjacent to the various main valley lakes. Samples were collected for monthly periods from October, 1971 to November, 1972, and analyzed for soluble Kjeldahl, nitrite and nitrate nitrogen, soluble phosphate and total dustfall.

The areal distribution of nitrogen and phosphorus was calculated from precipitation and dustfall collected at each station and expressed as a flux ($\text{tons/mi}^2 - \text{mon}$).

Groundwater

For the case of nutrient contribution to receiving waters via groundwater, the total estimate was calculated and explained in detail in Task 139. (An Estimate of Nutrient Contribution to Receiving Waters from Agricultural Source Via Groundwater Transport and Estimate of Total Nutrients reaching Receiving Waters in Groundwater) prepared by the Faculty of Applied Science at the University of British Columbia. Although reported as total phosphorus, generally groundwater phosphorus is in the ortho form (W. Stumm).

The estimate of nutrient contribution to receiving waters via groundwater was arrived at by two methods. The first method involves the summation of individual sources of

nutrient contributions in pounds to receiving waters. The nutrient contributions to groundwater were estimated in the "vicinity of the source" and then subjected to multiplying factors in order to arrive at an estimate of the final contribution in pounds to receiving waters. In the second method, the groundwater quantity reaching the receiving water is estimated. This includes an estimate of quantity of flow for agriculture, septic tanks, and "other sources", as well as an estimate of natural or virgin groundwater flow. Calculation of these quantities involves the use of multiplying factors which reflect the action of the transporting pathways between source and receiving waters. This final quantity rate reaching the receiving waters was then multiplied by the final quality of the groundwater adjacent to the receiving waters. Direct and weighted averages were taken of the nutrient contributions from the two methods. The natural groundwater component is the same for both methods.

TABLE 2
ESTIMATED ANNUAL INPUT OF TOTAL NITROGEN, ORTHOPHOSPHORUS AND TOTAL
PHOSPHORUS FROM STREAMS INTO WOOD AND KALAMALKA LAKES

Tributary	Sampling Station Number	Hydrometric Station Number	Drainage Area M ²	Mean Annual Inflow KAcFt.	Mean Concentration mg/l			Estimated Annual Loading Tons/Year		
					Total Nit.	Total Phos.	Ortho Phos.	Total Nit.	Total Phos.	Ortho Phos.
Wood Lake Drainage Basin										
Vernon Cr. (to Wood Lake)	BC4-525	8NM-009	40.0	2.3	1.605	0.070	0.026	5.0	0.2	0.08
Remaining Drainage Area			38.1					5.0	0.2	0.08
Total for Drainage Basin			78.1					10.0	0.4	0.16
Kalamalka Drainage Basin										
Coldstream Creek	BC4-532	8NM-154	79.3	10.0	1.648	0.071	0.026	22.4	1.0	0.35
Remaining Drainage Area			60.4					17.1	0.8	0.28
Total for Drainage Basin								39.5	1.8	0.63

TABLE 3

ESTIMATED ANNUAL INPUT OF TOTAL NITROGEN, ORTHOPHOSPHORUS AND TOTAL PHOSPHORUS FROM STREAMS INTO THE NORTH REGION OF OKANAGAN LAKE

TRIBUTARY	SAMPLING STATION NUMBER	HYDROMETRIC STATION NUMBER	DRAINAGE AREA IN MI ²	MEAN ANNUAL INFLOW Kac Ft.	MEAN CONCENTRATION mg/l			ESTIMATED ANNUAL LOADING--Tons/Year		
					Total Nit.	Total Phos.	Ortho- Phos.	Total Nit.	Total Phos.	Ortho- Phos.
Short Creek	BC4-526	8NM-151	72.0	24.0	0.244	0.082	0.012	8.0	2.7	0.39
Whiteman Creek	BC4-527	8NM-180	76.0	18.5	0.289	0.054	0.029	7.3	1.4	0.73
Equesis Creek	BC4-528	8NM-161	77.0	12.7	0.332	0.054	0.021	5.7	0.9	0.36
Nashwito Creek	BC4-533		31.7	1.3	0.182	0.064	0.064	0.3	0.4	0.11
Deep Creek a)	BC4-529	8NM-153	99.0	9.3	1.505	0.351	0.207	19.0	4.4	2.56
Deep Creek b)								14.8	2.3	0.85
Total Measured Tributary Streams e)			256.2					21.3	8.4	1.59
Remaining Drainage Areas								7.8	2.0	0.38
Vernon Creek c)	BC4-530	8NM-160	297.3	20.7	2.074	0.660	0.535	58.4	18.6	15.0
Vernon Creek d)								20.2	0.8	0.15
Total Tributary Streams f)								43.9	9.7	2.82

- a) Includes effluent from the Armstrong Sewage Treatment Plant.
b) Excludes effluent from the Armstrong Sewage Treatment Plant.
c) Includes effluent from the Vernon Sewage Treatment Plant.
d) Excludes effluent from the Vernon Sewage Treatment Plant.
e) Includes Drainage Area and Loadings from Shorts, Whiteman, Equesis, and Nashwito Creeks.
f) Excludes Vernon Creek.

TABLE 4

**ESTIMATED ANNUAL INPUT OF TOTAL NITROGEN, ORTHOPHOSPHORUS AND TOTAL PHOSPHORUS
FROM STREAMS INTO THE CENTRAL REGION OF OKANAGAN LAKE**

TRIBUTARY	SAMPLING STATION NUMBER	HYDROMETRIC STATION NUMBER	DRAINAGE AREA IN MI ²	MEAN ANNUAL INFLOW Kac Ft.	MEAN CONCENTRATION mg/l			ESTIMATED ANNUAL LOADING--Tons/Year		
					Total Nit.	Total Phos.	Ortho- Phos.	Total Nit.	Total Phos.	Ortho- Phos.
CENTRAL OKANAGAN LAKE DRAINAGE BASINS										
Peachland Creek	BC4-514	8NM-159	58.9	7.2	0.775	0.041	0.015	7.6	0.4	0.15
Trepanier Creek	BC4-515	8NM-155	99.6	23.0	0.160	0.015	0.006	5.0	0.5	0.19
Powers Creek	BC4-516	8NM-157	55.8	14.3	0.879	0.040	0.022	17.1	0.8	0.43
Smith Creek a) Smith Creek b)	BC4-517		4.3	1.1	1.533	0.373	0.254	2.3	0.6	0.38
McDougall Creek	BC4-518		18.6	1.1	0.343	0.092	0.071	0.6	0.0	0.00
Bellvue Creek	BC4-519	8NM-156	34.0	5.9	0.861	0.047	0.021	0.5	0.1	0.11
Mission Creek	BC4-520	8NM-116	336.1	116.7	0.467	0.050	0.013	74.1	7.9	2.53
Kelowna Creek	BC4-521	8NM-53	85.9	8.4	1.202	0.116	0.058	13.7	1.3	0.66
Lambly Creek	BC4-523	8NM-003	103.3	28.7	0.419	0.044	0.017	16.4	1.7	0.66
Total Measured Streams c)			796.5					141.9	13.1	4.90
Remainder			108.3					19.3	1.8	0.67
Total - Drainage Basin			904.8					161.2	14.9	5.57

a) Includes input from Westbank Sewage Lagoons

b) Excludes Input from Westbank Sewage Lagoons

c) Excludes Smith Creek

TABLE 5

ESTIMATED ANNUAL INPUT OF TOTAL NITROGEN, ORTHOPHOSPHORUS AND TOTAL PHOSPHORUS
FROM STREAMS INTO THE SOUTH REGION OF OKANAGAN LAKE

TRIBUTARY	SAMPLING STATION NUMBER	HYDROMETRIC STATION NUMBER	DRAINAGE AREA MI.	MEAN ANNUAL INFLOW KacFt.	MEAN CONCENTRATION mg/l			ESTIMATED ANNUAL LOADING--Tons/Year		
					Total Nit.	Total Phos.	Ortho- Phos.	Total Nit.	Total Phos.	Ortho- Phos.
SOUTH OKANAGAN LAKE DRAINAGE BASINS										
	Penticton Creek BC4-511	8NM-118	69.5	16.7	0.462	0.37	0.005	10.5	0.8	0.13
	Trout Creek BC4-512	8NM-158	289.4	30.5	0.508	0.147	0.006	21.1	6.1	2.49
	Chute Creek BC4-513		34.1	0.5	0.355	0.014	0.005	0.2	0.0	0.00
Total Measured Streams			393.0					31.8	6.9	2.62
Remainder			137.9					11.2	2.4	0.92
Total Drainage Area			530.9					43.0	9.3	3.54

TABLE 6
ESTIMATED ANNUAL INPUT OF TOTAL NITROGEN, ORTHOPHOSPHORUS AND TOTAL
PHOSPHORUS FROM STREAMS INTO SKAHA LAKE

Tributary	Sampling Station Number	Hydrometric Station Number	Drainage Area Mi ²	Mean Annual Inflow KAcFt.	Mean Concentration mg/l			Estimated Annual Loading Tons/Year		
					Total Nit.	Total Phos.	Ortho Phos.	Total Nit.	Total Phos.	Ortho Phos.
Okanagan River										
Okanagan L. Outlet)	-	8NM-050	-	270.6	-	-	-	-	-	-
(Inflow to Skaha L.) a)	BC4-508			289.1	0.394	0.054	0.026	154.9	21.2	10.20
(Inflow to Skaha L.) b)								98.8	6.8	0.00*
Skaha Lake Drainage Basin										
Shingle Creek	BC4-509	8NM-150	117.1	8.8	0.253	0.027	0.005	3.0	0.3	0.06
Ellis Creek	BC4-510	8NM-135	64.6	8.0	0.460	0.108	0.028	5.0	1.2	0.30
McLean Ck.	BC4-507		23.0	0.2	0.366	0.035	0.019	0.1	0.0	0.00
Measured Trib.Total			204.7					8.1	1.5	0.36
Remaining Drainage Area			75.8					3.0	0.6	0.13
Total - c)			280.5					3.1	0.6	0.13

a) Includes input from Okanagan Lake, Shingle, Ellis Creeks and the Pentiction Sewage Treatment Plant

b) Excludes input from the Pentiction Sewage Treatment Plant

c) Excludes Shingle Creek and McLean Creek

* Orthophosphorus uptake rate is high therefore a larger error is inherent in these calculations.

TABLE 7

ESTIMATED ANNUAL INPUT OF TOTAL NITROGEN, ORTHOPHOSPHORUS AND TOTAL PHOSPHORUS FROM STREAMS INTO VASEUX AND OSOYOOS LAKES

TRIBUTARY	SAMPLING STATION NUMBER	HYDROMETRIC STATION NUMBER	DRAINAGE AREA IN MI ²	MEAN ANNUAL INFLOW KAC Ft.	MEAN CONCENTRATION mg/l			ESTIMATED ANNUAL LOADING - Tons/Yr.		
					Total Nit.	Total Phos.	Ortho- Phos.	Total Nit.	Total Phos.	Ortho- Nit.
<u>Okanagan River</u>										
At Okanagan Falls		8NM-002		287.8						
Upstream of Vaseux Lake	BC4-505	-		301.2	0.328	0.023	0.007	134.4	9.4	2.88
Upstream of Osoyoos a) Lake	BC4-502	8NM-85	-	320.2	0.365	0.030	0.006	158.9	13.1	2.61
Upstream of Osoyoos b) Lake								154.8	11.1	0.78
<u>Vaseux Lake Drainage Basin</u>										
Shuttleworth Creek	BC4-506	8NM-149	35.0	3.4	0.671	0.030	0.006	3.1	0.1	0.03
Remaining Drainage Area			18.7					1.7	0.1	0.02
Total								4.8	0.2	0.05
<u>Osoyoos Lake Drainage Basin</u>										
Inkaneep Creek	BC9-501		75.3	1.4	0.259	0.081	0.032	0.5	0.2	0.06
Remaining Drainage Areas			68.5					0.5	0.2	0.05
Total								1.0	0.4	0.11

a) Includes Village of Oliver Sewage Treatment Plant Discharge

b) Excludes Village of Oliver Sewage Treatment Plant Discharge

ESTIMATE OF FUTURE LOADINGS

For the purpose of this report, loading sources were considered to be either controllable or uncontrollable. It is recognized that some sources classified as uncontrollable may in fact be indirectly controllable. Only municipal sources are considered controllable and as a result directly treatable.

It is not known at this time to what extent land-use activities add to natural background nutrient levels in the surface waters. Consequently, the degree of possible control has not been determined, but will be discussed further in Task 102B (Future Water Quality Under Selected Water Management Alternatives). Furthermore, the amount of water which will be diverted from the streams is not known. Therefore, although the concentrations of solids in the streams may increase, the loading has been assumed not to.

Similarly, it is not known at this time to what extent the forestry industry, for example, contributes to dustfall loadings within the study area. The literature indicates that the variation of dustfall loading for the Okanagan will not increase significantly considering the expected socio-economic growth.

The projected nitrogen and phosphorus loadings and the base loadings for each scenario are summarized in the appendix. In each projection the loadings are estimated for the degree of municipal waste treatment for each sub-region of the Okanagan Basin.

METHOD OF CALCULATING PROJECTIONS

Nitrogen and phosphorus loading projections (in Appendix) for 1980, 2000 and 2020, Scenarios I, II and III are derived from preliminary projections to 2020 of population, irrigated acreage and manufacturing output by sub-regions for the Okanagan Basin. The estimated inputs (in tons) of total phosphorus and nitrogen for 1969-71 were used as the base case.

Constant Loadings

The following inputs were assumed constant, the predictable variation of these sources being relatively insignificant with the exception of major streams.

- 1) Streams
- 2) Groundwater - Natural
- 3) Dustfall and Precipitation

Municipal

Municipal projection of phosphorus loadings to 2020 are based on the degree of treatment and a per capita loading of phosphorus influent of 0.008 lb/capita-day (A.E. Zaroni).

Municipal nitrogen loadings per capita for the three scenarios are estimated to remain the same as presently calculated from population growth rate and output of the existing plants.

The projected loadings for the present degree of treatment are calculated from population ratios (Table 8). Phosphorus removal varies from plant to plant presently. Therefore, ratios based on population effectively take into account the degree of removal. Tertiary treatment loading projections are based on an estimated influent loading calculated from population contributions (Table 9).

Carryover

Phosphorus and nitrogen carryover from Skaha Lake, to Vaseux Lake and Osoyoos Lake has been calculated based on the following assumptions:

- 1) Depletion of phosphorus occurs with time below the major source.
- 2) The variables, stream flow, time, and distance are interchangeable.
- 3) Under present conditions the river has assimilated total phosphorus and nitrogen to a minimal level. Any loading higher than present (1969-71) conditions is represented by a parallel curve (see Figures 2 and 3).
- 4) Any loading less than present (1969-71) is estimated by interpolation between the present and natural state curve.
- 5) The minimal loading possible increases to a maximum ten percent under zero municipal input.
- 6) The input from Okanagan Lake is relatively constant.

The model (Figures 2 and 3) developed is not complex and deviation from present conditions does give errors; however, for the purposes of this report, the model is assumed to be adequate.

Industrial

The loadings from industry were projected on the basis of dollar value and pounds or tons of product. Unfortunately, the socio-economic information does not consider the effects of inflation and other complicating factors.

In the calculation of industrial loadings, the industries in each of the regions have been broken down into the following categories:

- a) Fruit and Vegetable Cannerys
- b) Wineries, Distillers and Soft Drinks
- c) Sawmills and Plywood Mills
- d) Fruit Packers
- e) Pulpmill (Scenario II)
- f) Rink and Fish Hatcheries

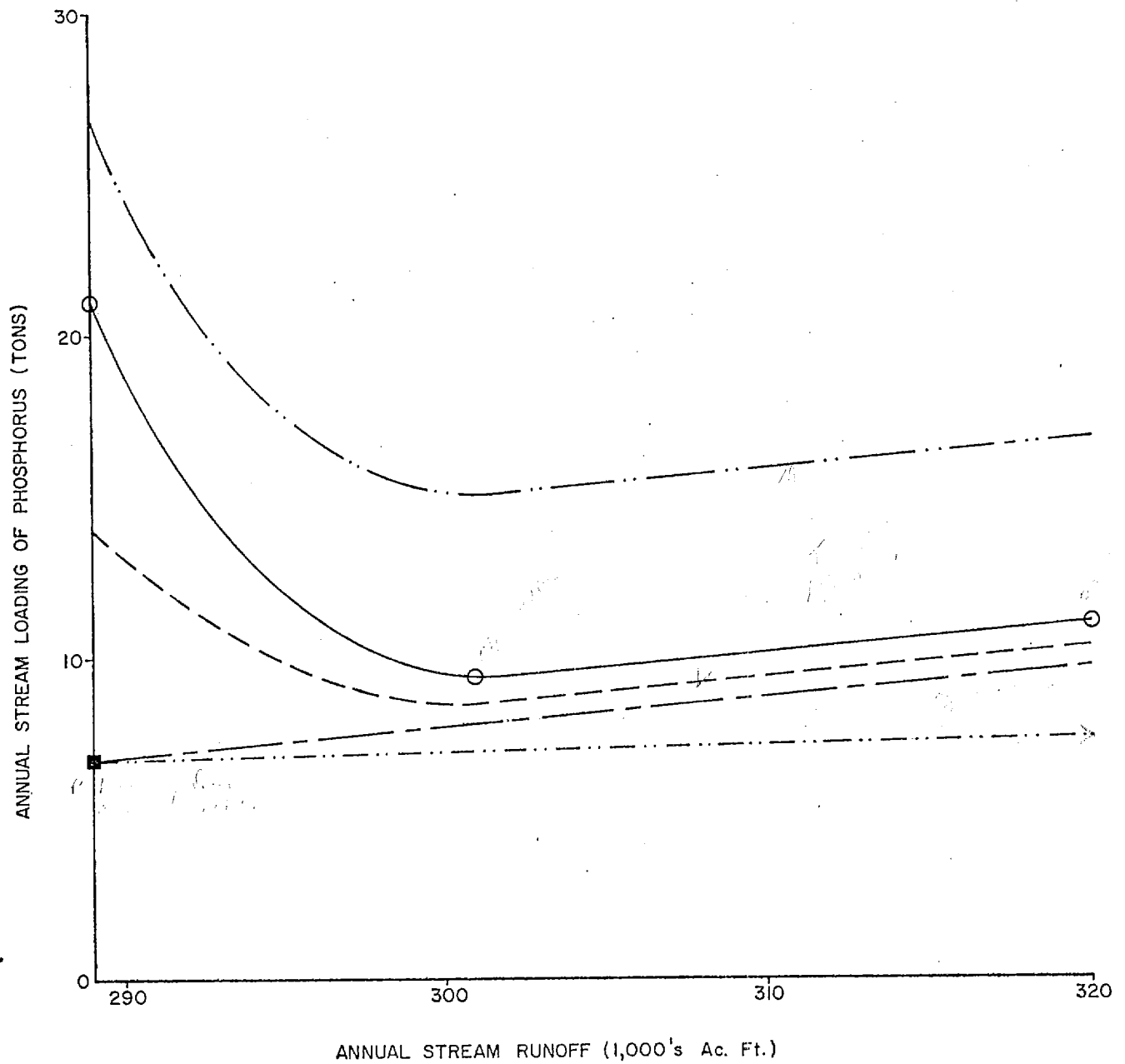
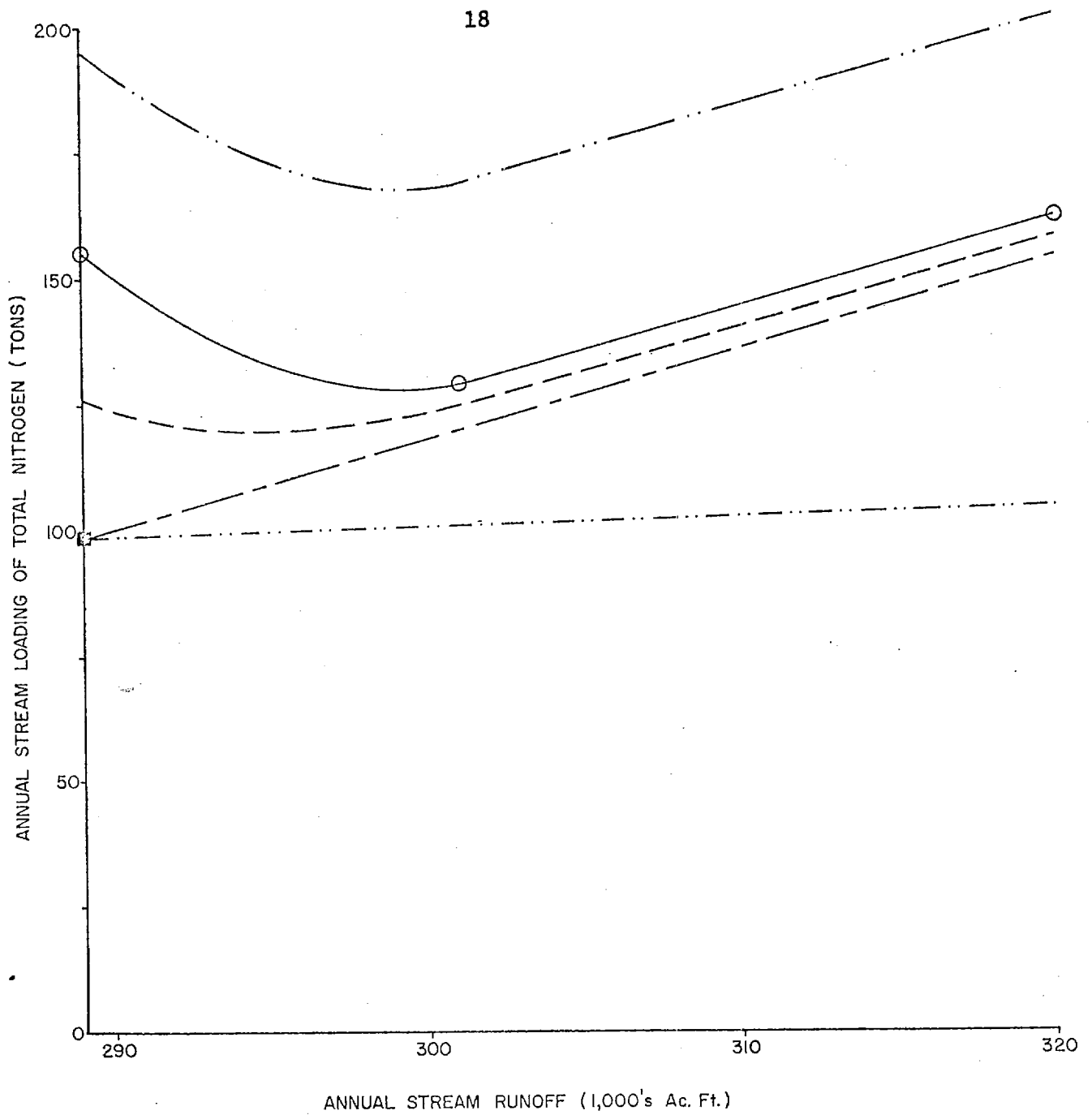


Fig. 2 PHOSPHORUS CARRYOVER IN THE OKANAGAN RIVER SYSTEM



- MEASURED NITROGEN LOADING (56.09 TONS MUNICIPAL SOURCE)
- CUMULATIVE NATURAL INPUT
- LOADING WITH 96.1 TONS MUNICIPAL SOURCE
- ASSUMED NATURAL STATE LOADING (NO MUNICIPAL SOURCE)
- LOADING WITH 28.05 TONS MUNICIPAL SOURCE

Fig. 3 NITROGEN CARRYOVER IN THE OKANAGAN RIVER SYSTEM

The projection of both total nitrogen and total phosphorus for a), b) and c) are on the basis of dollar values, the projection for d) is based on the tons of product; the projection for e) is based on tons of product assuming typical values of nitrogen and phosphorus from a second-treatment plant; and for f) the loadings are assumed constant.

Storm Sewers

The projection of loadings from storm sewers is based on the population of the major centers of Vernon, Kelowna and Penticton.

Groundwater

The projected contribution of phosphorus and nitrogen from agriculture by way of groundwater is based on land expansion. Tables of projected land available are found in the preliminary projections from Bjorback, Task 206.

The projected septic tank contribution of nitrogen and phosphorus to the mainstem lakes is based on projected rural population expansion.

Similarly the projected increase from other groundwater sources is based on the total population expansion in the sub regions of the Okanagan.

Total Phosphorus Influent (in tons),
Population and Population factors for
Six Municipalities in the Okanagan Valley
(Scenario I - Present Economic Growth)

Municipality	Present Eff. Total - P	Present Treatment	1971 Pop. Total P	1980 Pop. Total P	2000 Pop. Total P	2020 Pop. Total P
Armstrong	P 2.07 N 5.20	Aerated lagoon to Deep Creek	1,631 (1)	2,050 3.08 (1.26)	2,750 4.12 (1.68)	3,850 5.77 (2.36)
Vernon	P 17.77 N 38.16	Trickling Filter to Vernon Creek 11% Removal of P	13,283 (1)	16,900 25.40 (1.27)	22,700 34.20 (1.71)	32,400 48.60 (2.44)
Kelowna	P 20.42 N 57.77	Activated Sludge to Okanagan Lake 30% Removal of P	19,412 (1)	26,600 39.80 (1.37)	37,900 56.90 (1.95)	56,400 84.50 (2.90)
Westbank	P 0.82 N 1.73	Lagoon to Smith Creek 9% Removal of P	1,620 (1)	2,750 4.12 (1.69)	4,850 7.28 (2.98)	8,950 13.80 (5.5)
Penticton	P 14.45 N 56.09	Activated Sludge & Lime Prec. to Okanagan R. 47% Removal of P.	18,146 (1)	23,400 35.10 (1.29)	32,100 48.10 (1.76)	46,200 69.30 (2.54)
Oliver	P 2.03 N 4.05	Activated Sludge to Okanagan R. 15% Removal of P	1,598 (1)	1,800 2.70 (1.13)	2,150 3.22 (1.34)	2,750 4.12 (1.72)

Table 9 - Projected Total Phosphorus Loading from Municipal Sources

	Armstrong	Vernon	Kelowna	Westbank	Penticton	Oliver
1969-71						
Influent P	2.45	19.90	29.10	0.90	27.20	2.40
Effluent P	2.07	17.77	20.42	0.82	14.45	2.03
Percent Removal	16%	11%	30%	9%	47%	15%
Effluent N	5.20	38.16	57.77	1.73	56.09	4.05
SCENARIO I						
1980						
Influent P	3.08	25.40	39.80	4.12	35.10	2.70
Present Removal	2.69	22.60	27.90	3.75	18.60	2.30
80% Removal	0.62	5.08	7.96	0.82	7.05	0.54
95% Removal	0.45	3.81	7.45	0.62	5.28	0.41
Effluent N	6.54	48.5	79.00	2.93	72.50	4.58
2000						
Influent P	4.12	34.20	56.90	7.28	48.10	3.22
Present Removal	3.46	30.40	39.80	6.64	25.50	2.74
80% Removal	0.83	6.35	11.30	1.46	9.65	0.64
95% Removal	0.62	5.15	8.54	1.09	7.24	0.48
Effluent N	8.76	65.2	112.5	5.17	98.70	5.44
2020						
Influent P	5.77	48.60	84.50	13.80	69.30	4.12
Present Removal	4.86	43/20	59.20	12.60	36.70	3.50
80% Removal	0.97	9.74	16.90	2.76	13.90	0.82
95% Removal	0.87	7.30	12.69	2.08	10.40	0.62
Effluent N	12.2	93.5	167.3	9.55	142.50	6.98

Table 9
Continued

	Armstrong	Vernon	Kelowna	Westbank	Penticton	Oliver
SCENARIO II						
2000						
Influent P	4.43	37.40	61.90	7.97	53.00	3.46
Present Removal	3.71	33.30	43.25	7.25	28.05	2.94
80% Removal	0.85	7.49	12.39	1.59	16.00	0.69
95% Removal	0.65	5.62	9.29	1.19	7.95	0.52
Effluent N	9.40	71.40	122.10	5.64	108.80	5.84
2020						
Influent P	6.23	53.60	93.50	14.88	77.00	4.35
Present Removal	5.23	47.70	65.40	13.50	40.80	3.70
80% Removal	1.25	10.70	18.70	2.98	15.40	0.87
95% Removal	0.93	8.05	14.04	2.23	11.55	0.66
Effluent N	13.20	102.00	184.50	10.55	158.00	7.39
	Arm- strong	Vernon	Kelowna	West- bank	Pen- ticton	Oliver
SCENARIO III						
2000						
Influent P	3.98	32.90	55.60	7.13	46.20	3.23
Present Removal	3.34	29.30	38.90	6.49	24.40	2.74
80% Removal	0.80	6.59	11.12	1.43	9.24	0.65
95% Removal	0.60	4.94	8.50	1.07	6.94	0.48
Effluent N	8.40	63.00	110.00	5.05	94.90	5.48
2020						
Influent P	4.13	35.80	63.50	10.05	51.40	3.45
Present Removal	3.46	31.90	44.40	9.14	27.20	2.93
80% Removal	0.83	7.17	12.71	2.01	10.29	0.69
95% Removal	0.62	5.37	9.53	1.50	7.71	0.52
Effluent N	8.62	68.30	125.00	7.12	105.20	5.84

DISCUSSION OF LIMITATION OF PROJECTED LOADINGS

Several shortcomings relative to providing projections with our limited knowledge have been noted in this report. These shortcomings have resulted in the use of several assumptions, which provide a first order approximation of loadings for the future.

In the absence of industrial intake water quality data, it is impossible to determine exactly how an industrial process alters intake water quality, and hence contaminant and nutrient loading levels. In most cases the original nutrient content is insignificant relative to the change in concentration.

For the purposes of these projections it has been assumed that there would be no increased treatment of industrial effluents. Realistically, this cannot be assumed in view of present developments and possible Provincial requirements. For example, an industrial waste treatment plant is being built at Kelowna. The outfalls from Okanagan Beverage Ltd., Kelowna Wines., Kelowna Growers Exchange, and Sun-Rype No. 2 in 1969-1971 discharged large waste loadings to Brandt's Creek. The total phosphorus loadings from these industries is 335 pounds per year, which is relatively insignificant. These wastes will be directed to the new Brandt's Creek activated sludge treatment plant scheduled for completion in 1973. The new treatment plant will add approximately 550 pounds of "P" per year over and above the present "P" loading. Similarly Dutch Dairies Ltd., in Armstrong, will be serviced with an activated sludge plant by 1973. Presently 5.5 million gallons of milk wastes are discharged annually to Deep Creek, which flows into the north arm of Okanagan Lake.

LIST OF REFERENCES

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APPENDIX 1

TOTAL PHOSPHORUS, ORTHOPHOSPHORUS AND
NITROGEN LOADINGS (1969-1971)

ESTIMATED INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN VALLEY
OKANAGAN LAKES FROM KNOWN SOURCES, 1969 - 1971

Mainstem Lake Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Municipal	-	-	19.84	21.24	-	14.45	-	2.05
Industrial	-	-	-	0.50	0.30	0.01	-	0.10
Storm Sewers	-	-	0.19	0.09	0.02	0.05	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
<u>Groundwater</u>								
- Agriculture	0.09	0.01	0.09	0.29	0.14	0.07	0.05	0.72
- Septic Tanks	0.20	0.11	0.25	0.63	0.58	0.32	0.04	1.23
- Other	0.07	0.00	0.00	0.02	0.04	0.01	0.00	0.02
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	0.85	2.23	34.08	40.37	14.99	23.22	9.65	16.16

* includes major streams

ESTIMATED INPUT (IN TONS) OF ORTHOPHOSPHORUS TO THE MAIN VALLEY
OKANAGAN LAKES FROM KNOWN SOURCES, 1969 - 71

Mainstem Lake Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.08	0.63 [*]	2.82	5.57	3.54	0.13	0.05	0.11
Main Valley Stream	0.08	-	0.15	-	-	0.00	2.88	0.78
Municipal	-	-	16.56	18.03	-	11.52 ^{**}	-	1.83
Industrial	0.0	-	-	0.12	0.13	0.0	-	0.05
Storm Sewers	-	-	0.03	0.01	0.01	0.01	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
Agriculture	0.09	0.01	0.09	0.29	0.14	0.07	0.05	0.72
Septic Tanks	0.20	0.11	0.25	0.63	0.58	0.32	0.04	1.23
Other	0.07	0.00	0.00	0.02	0.04	0.01	0.00	0.02
Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	0.61	1.06	23.09	27.37	9.03	12.97	3.08	5.33

* includes major streams

** input from sewage treatment plant exceeds stream load of 10.20 tons
assume maximum error is in the stream load calculation

*** assumed to be orthophosphorus "STUM, W., Morgan, J., Aquatic Chem. p 544"

ESTIMATED INPUT (IN TONS) OF TOTAL NITROGEN TO THE MAIN VALLEY
OKANAGAN LAKES FROM KNOWN SOURCES, 1969 - 1971

Mainstem Lake Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	5.00	39.50 [*]	43.90	161.20	43.00	3.10	4.80	1.00
Main Valley Stream	5.00	-	20.20	-	-	98.80	134.40	158.90
Municipal	-	-	43.36	59.50	-	56.09	-	4.05
Industrial	0.00	-	-	1.60	7.60	0.10	-	5.20
Storm Sewers	-	-	1.30	0.48	0.13	0.25	-	-
Dustfall & Precipitation	1.90	4.60	24.30	28.40	32.70	11.30	1.80	3.00
Groundwater								
- Agriculture	5.07	0.67	5.71	22.08	17.75	7.73	3.99	26.90
- Septic Tanks	1.45	0.81	1.86	5.94	5.17	2.17	0.42	7.14
- Other	0.86	0.13	0.41	1.77	2.66	1.13	0.15	0.71
- Netural	1.32	1.07	7.70	27.04	13.58	5.04	2.18	1.41
Total	20.60	46.78	148.74	308.01	122.59	185.71	148.74	208.11

* includes major streams

APPENDIX 2

SCENARIO I - ESTIMATED TOTAL NITROGEN LOADINGS
TO MAIN VALLEY LAKES

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL NITROGEN TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I, PRESENT ECONOMIC GROWTH

1980

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	5.00	39.50 *	43.90	161.20	43.00	3.10	4.80	1.00
Main Valley Stream	5.00	--	20.20	--	--	98.80	134.40	158.90
Carryover	--	--	--	--	--	--	16.41	16.41
Municipal	--	--	55.04	81.93	--	72.50	--	4.58
Industrial	--	--	--	--	--	--	--	--
Storm Sewers	--	--	1.65	0.66	0.17	0.32	--	--
Dustfall & Precipitation	1.90	4.60	24.30	28.40	32.70	11.30	1.80	3.00
Groundwater								
- Agriculture	4.74	0.63	7.71	17.69	16.29	7.98	4.12	27.75
- Septic Tanks	2.69	1.26	2.50	9.73	6.69	2.93	0.63	9.13
- Other	1.60	0.20	0.53	2.70	3.44	2.05	0.23	0.91
- Natural	1.32	1.07	7.70	27.04	13.58	5.04	2.18	1.41
Total	22.25	47.26	163.53	329.35	115.87	204.02	164.57	223.09

-- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL NITROGEN TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I, PRESENT ECONOMIC GROWTH

2000

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	5.00	39.50 *	43.90	161.20	43.00	3.10	4.80	1.00
Main Valley Stream	5.00	--	20.20	--	--	98.80	134.40	158.90
Carryover	--	--	--	--	--	--	42.61	42.61
Municipal	--	--	73.96	117.67	--	98.70	--	5.44
Industrial	--	--	--	--	--	--	--	--
Storm Sewers	--	--	2.22	0.94	0.23	0.44	--	--
Dustfall & Precipitation	1.90	4.60	24.30	28.40	32.70	11.30	1.80	3.00
Groundwater								
- Agriculture	3.74	0.49	11.28	10.80	11.35	7.30	3.77	25.40
- Septic Tanks	5.23	2.05	3.55	16.57	9.24	4.19	1.05	12.45
- Other	3.10	0.33	0.74	4.33	4.75	2.01	0.38	1.24
- Natural	1.32	1.07	7.70	27.04	13.58	5.04	2.18	1.41
Total	25.29	48.04	187.85	366.95	114.85	230.88	190.99	251.45

-- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL NITROGEN TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I, PRESENT ECONOMIC GROWTH

2020

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	5.00	39.50 *	43.90	161.20	43.00	3.10	4.80	1.00
Main Valley Stream	5.00	--	20.20	--	--	98.80	134.40	158.90
Carryover	--	--	--	--	--	--	86.41	86.41
Municipal	--	--	105.70	176.85	--	142.50	--	6.98
Industrial	--	--	--	--	--	--	--	--
Storm Sewers	--	--	3.17	1.40	0.33	0.63	--	--
Dustfall & Precipitation	1.90	4.60	24.30	28.40	32.70	11.30	1.80	3.00
Groundwater								
- Agriculture	2.97	0.39	14.99	6.65	7.69	7.48	3.86	26.05
- Septic Tanks	10.67	3.52	5.40	29.48	13.44	6.28	1.81	18.27
- Other	6.33	0.57	1.09	7.28	6.92	2.90	0.65	1.82
- Natural	1.32	1.07	7.70	27.04	13.58	5.04	2.18	1.41
Total	33.19	49.65	226.45	438.30	117.66	278.03	235.91	303.84

-- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

APPENDIX 3

SCENARIO I - ESTIMATED TOTAL PHOSPHORUS

LOADINGS TO MAIN VALLEY LAKES

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I - PRESENT ECONOMIC GROWTH
1980, PRESENT PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	4.15	4.15
Municipal	-	-	25.29	31.65	-	18.60	-	2.30
Industrial	-	-	-	0.95	0.41	0.01	-	-
Storm Sewers	-	-	0.24	0.12	0.03	0.06	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.18	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.08	0.01	0.12	0.23	0.13	0.07	0.05	0.74
- Septic Tanks	0.37	0.17	0.34	1.03	0.75	0.43	0.06	1.57
- Other	0.13	0.00	0.00	0.03	0.05	0.02	0.00	0.03
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.07	2.29	39.70	51.30	15.26	27.50	13.82	20.85

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I - PRESENT ECONOMIC GROWTH
1980, 80% PHOSPHORUS REMOVAL

Mainstem Sources . . . Lake	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	0.77	0.77
Municipal	-	-	5.70	8.78	-	7.05	-	0.54
Industrial	-	-	-	0.95	0.41	0.01	-	-
Storm Sewers	-	-	0.24	0.12	0.03	0.06	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.18	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.08	0.01	0.12	0.23	0.13	0.07	0.05	0.74
- Septic Tanks	0.37	0.17	0.34	1.03	0.75	0.43	0.06	1.57
- Other	0.13	0.00	0.00	0.03	0.05	0.02	0.00	0.03
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.07	2.29	20.11	28.44	15.26	15.95	8.90	14.17

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I - PRESENT ECONOMIC GROWTH
1980, 95% PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	0.95	0.95
Municipal	-	-	4.27	8.07	-	5.28	-	0.41
Industrial	-	-	-	0.95	0.41	0.01	-	-
Storm Sewers	-	-	0.24	0.12	0.03	0.06	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.18	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.08	0.01	0.12	0.23	0.13	0.07	0.05	0.74
- Septic Tanks	0.37	0.17	0.34	1.03	0.75	0.43	0.06	1.57
- Other	0.13	0.00	0.00	0.03	0.05	0.02	0.00	0.03
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.07	2.29	18.68	27.73	15.26	14.18	8.71	13.86

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I - PRESENT ECONOMIC GROWTH
2000, PRESENT PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.60	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	11.05	11.05
Municipal	-	-	33.86	46.44	-	25.50	-	2.74
Industrial	-	-	-	1.17	0.63	0.02	-	-
Storm Sewers	-	-	0.32	0.18	0.04	0.09	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.18	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.07	0.01	0.18	0.14	0.09	0.07	0.05	0.68
- Septic Tanks	0.72	0.28	0.48	1.76	1.04	0.62	0.10	2.15
- Other	0.25	0.00	0.00	0.05	0.07	0.02	0.00	0.03
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.53	2.40	48.51	67.04	15.76	34.63	20.76	28.71

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I - PRESENT ECONOMIC GROWTH
2000, 80% PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	0.50	0.50
Municipal	-	-	7.18	12.76	-	9.65	-	0.64
Industrial	-	-	-	1.17	0.63	0.02	-	-
Storm Sewers	-	-	0.32	0.18	0.04	0.09	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.18	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.07	0.01	0.18	0.14	0.09	0.07	0.05	0.68
- Septic Tanks	0.72	0.28	0.48	1.76	1.04	0.62	0.10	2.15
- Other	0.25	0.00	0.00	0.05	0.07	0.02	0.00	0.03
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.53	2.40	21.87	33.36	15.76	18.78	9.21	15.06

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I - PRESENT ECONOMIC GROWTH
2000, 95% PHOSPHORUS REMOVAL

Mainstem Sources / Lake	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	0.75	0.75
Municipal	-	-	5.77	9.63	-	7.24	-	0.48
Industrial	-	-	-	1.17	0.63	0.02	-	-
Storm Sewers	-	-	0.32	0.18	0.04	0.09	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.18	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.07	0.01	0.18	0.14	0.09	0.07	0.05	0.68
- Septic Tanks	0.72	0.28	0.48	1.76	1.04	0.62	0.10	2.15
- Other	0.25	0.00	0.00	0.05	0.07	0.02	0.00	0.03
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.53	2.40	20.46	30.23	15.76	16.37	8.96	14.65

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I - PRESENT ECONOMIC GROWTH
2020, PRESENT PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	22.25	22.25
Municipal	-	-	48.06	71.80	-	36.70	-	3.50
Industrial	-	-	-	1.67	0.85	0.02	-	-
Storm Sewers	-	-	0.46	0.26	0.05	0.13	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.18	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.05	0.01	0.24	0.09	0.06	0.07	0.05	0.70
- Septic Tanks	1.47	0.48	0.73	3.13	1.51	0.93	0.17	3.15
- Other	0.51	0.00	0.00	0.08	0.10	0.03	0.00	0.05
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	2.52	2.60	63.20	94.33	16.46	46.19	32.03	41.71

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I - PRESENT ECONOMIC GROWTH
2020, 80% PHOSPHORUS REMOVAL

Mainstem Sources Lake	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	0.06	0.06
Municipal	-	-	10.71	19.66	-	13.90	-	0.82
Industrial	-	-	-	1.67	0.85	0.02	-	-
Storm Sewers	-	-	0.46	0.26	0.05	0.13	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.05	0.01	0.24	0.09	0.06	0.07	0.05	0.70
- Septic Tanks	1.47	0.48	0.73	3.13	1.51	0.93	0.17	3.15
- Other	0.51	0.00	0.00	0.08	0.10	0.03	0.00	0.05
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	2.52	2.60	25.85	42.19	16.46	23.39	9.72	16.72

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO I - PRESENT ECONOMIC GROWTH
2020, 95% PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	0.42	0.42
Municipal	-	-	8.17	14.77	-	10.40	-	0.62
Industrial	-	-	-	1.67	0.85	0.02	-	-
Storm Sewers	-	-	0.46	0.26	0.05	0.13	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.05	0.01	0.24	0.09	0.06	0.07	0.05	0.70
- Septic Tanks	1.47	0.48	0.73	3.13	1.51	0.93	0.17	3.15
- Other	0.51	0.00	0.00	0.08	0.10	0.03	0.00	0.05
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	2.52	2.60	23.31	37.60	16.46	19.89	9.36	16.16

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

APPENDIX 4

SCENARIO II - ESTIMATED TOTAL NITROGEN

LOADINGS TO MAIN VALLEY LAKES

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL NITROGEN TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO II, HIGH ECONOMIC GROWTH

2000

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	5.00	39.50 *	43.90	161.20	43.00	3.10	4.80	1.00
Main Valley Stream	5.00	--	20.20	--	--	98.80	134.40	158.90
Carryover	--	--	--	--	--	--	52.71	52.71
Municipal	--	--	80.80	127.74	--	108.80	--	5.84
Industrial	--	--	--	--	--	--	--	--
Storm Sewers	--	--	2.43	1.02	0.25	0.48	--	--
Dustfall & Precipitation	1.90	4.60	24.30	28.40	32.70	11.30	1.80	3.00
Groundwater								
- Agriculture	3.57	0.47	11.28	9.62	10.43	7.24	3.74	25.19
- Septic Tanks	5.70	2.23	3.87	18.04	10.20	4.61	1.14	13.28
- Other	3.38	0.36	0.81	4.71	5.25	2.21	0.41	1.32
- Natural	1.32	1.07	7.70	27.04	13.58	5.04	2.18	1.41
Total	25.87	48.23	195.29	377.77	115.41	241.58	200.38	262.65

-- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL NITROGEN TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO II, HIGH ECONOMIC GROWTH

2020

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	5.00	39.50 *	43.90	161.20	43.00	3.10	4.80	1.00
Main Valley Stream	5.00	--	20.20	--	--	98.80	134.40	158.90
Carryover	--	--	--	--	--	--	101.91	101.91
Municipal	--	--	102.00	195.05	--	158.00	--	7.39
Industrial	--	--	--	--	--	--	--	--
Storm Sewers	--	--	3.49	1.54	0.37	0.70	--	--
Dustfall & Precipitation	1.90	4.60	24.30	28.40	32.70	11.30	1.80	3.00
Groundwater								
- Agriculture	2.67	0.35	14.99	4.27	6.40	7.36	3.80	25.62
- Septic Tanks	11.76	3.87	5.90	32.54	14.96	6.91	1.98	19.10
- Other	6.97	0.62	1.19	8.03	7.70	3.21	0.71	1.90
- Natural	1.32	1.07	7.70	27.04	13.58	5.04	2.18	1.41
Total	34.62	50.01	223.67	458.07	118.71	294.42	251.58	320.23

-- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

APPENDIX 5

SCENARIO II - ESTIMATED TOTAL PHOSPHORUS

LOADINGS TO MAIN VALLEY LAKES

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO II - HIGH ECONOMIC GROWTH

2000, PRESENT PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20		0.80	-	-	6.80	9.40	11.07
Carryover	-	-	37.01	50.50	-	28.05	-	13.60
Municipal	-	-	7.5	1.42	0.63	0.02	-	3.46
Industrial	-	-	0.36	0.19	0.04	0.10	-	-
Storm Sewers	-	-						
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.06	0.01	0.18	0.13	0.08	0.07	0.05	0.67
- Septic Tanks	0.79	0.30	0.52	1.91	1.14	0.68	0.11	2.29
- Other	0.27	0.00	0.00	0.05	0.08	0.02	0.00	0.04
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.61	2.42	59.28	71.80	15.86	27.25	23.32	32.12

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO II - HIGH ECONOMIC GROWTH

2000, 80% PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.79	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20		0.80	-	-	6.80	9.40	11.07
Carryover							1.55	1.55
Municipal	-	-	8.34	13.98	-	16.00	-	0.69
Industrial		-	7.5	1.42	0.63	0.02	-	
Storm Sewers	-	-	0.36	0.19	0.04	0.10	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.06	0.01	0.18	0.13	0.08	0.07	0.05	0.67
- Septic Tanks	0.79	0.30	0.52	1.91	1.14	0.68	0.11	2.29
- Other	0.27	0.00	0.00	0.05	0.08	0.02	0.00	0.04
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.61	2.42	20.61	35.28	15.86	25.20	11.27	17.30

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO II - HIGH ECONOMIC GROWTH

2000, 95% PHOSPHORUS REMOVAL

Mainstem Sources Lake	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20		0.80	-	-	6.80	9.40	11.07
Carryover							0.67	0.67
Municipal	-	-	6.27	10.48	-	7.95	-	0.52
Industrial		-	7.5	1.42	0.63	0.02	-	
Storm Sewers	-	-	0.36	0.19	0.04	0.10	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.06	0.01	0.18	0.13	0.08	0.07	0.05	0.67
- Septic Tanks	0.79	0.30	0.52	1.91	1.14	0.68	0.11	2.29
- Other	0.27	0.00	0.00	0.05	0.08	0.02	0.00	0.04
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.61	2.42	28.54	31.78	15.86	17.15	9.05	14.91

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO II - HIGH ECONOMIC GROWTH

2020, PRESENT PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20		0.80	-	-	6.80	9.40	11.07
Carryover	-	-	52.93	78.90	-	40.00	25.55	25.55
Municipal	-	-	17.5	1.68	0.85	0.02	-	3.70
Industrial	-	-	0.51	0.29	0.06	0.14	-	-
Storm Sewers	-	-						
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.05	0.01	0.24	0.06	0.05	0.07	0.05	0.69
- Septic Tanks	1.62	0.53	0.79	3.45	1.68	1.02	0.19	3.29
- Other	0.57	0.00	0.00	0.09	0.12	0.03	0.00	0.05
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	2.73	2.65	85.68	102.07	16.65	49.59	33.35	45.34

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO II - HIGH ECONOMIC GROWTH

2020, 80% PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20		0.80	-	-	6.80	9.40	11.07
Carryover							0.95	0.95
Municipal	-	-	11.95	21.68	-	15.40	-	0.87
Industrial	-	-	17.5	1.68	0.85	0.02	-	-
Storm Sewers	-	-	0.51	0.29	0.06	0.14	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.05	0.01	0.24	0.06	0.05	0.07	0.05	0.69
- Septic Tanks	1.62	0.53	0.79	3.45	1.68	1.02	0.19	3.29
- Other	0.57	0.00	0.00	0.09	0.12	0.03	0.00	0.05
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	2.73	2.65	44.70	44.85	16.65	24.99	10.75	17.91

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO II - HIGH ECONOMIC GROWTH

2020, 95% PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20		0.80	-	-	6.80	9.40	11.07
Carryover	-	-	8.98	16.27	-	11.55	0.30	0.30
Municipal	-	--	17.5	1.68	0.85	0.02	-	0.66
Industrial	-	-	0.51	0.29	0.06	0.14	-	-
Storm Sewers								
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.05	0.01	0.24	0.06	0.05	0.07	0.05	0.69
- Septic Tanks	1.62	0.53	0.79	3.45	1.68	1.02	0.19	3.29
- Other	0.57	0.00	0.00	0.09	0.12	0.03	0.00	0.05
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	2.73	2.65	41.73	39.44	16.65	21.14	9.50	16.45

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

APPENDIX 6

SCENARIO III - ESTIMATED TOTAL NITROGEN
LOADINGS TO MAIN VALLEY LAKES

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL NITROGEN TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO III, LOW ECONOMIC GROWTH

2000

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	5.00	39.50 *	43.90	161.20	43.00	3.10	4.80	1.00
Main Valley Stream	5.00	--	20.20	--	--	98.80	134.40	158.90
Carryover	--	--	--	--	--	--	38.81	38.81
Municipal	--	--	71.40	115.05	--	94.90	--	5.48
Industrial	--	--	--	--	--	--	--	--
Storm Sewers	--	--	2.14	0.92	0.22	0.42	--	--
Dustfall & Precipitation	1.90	4.60	24.30	28.40	32.70	11.30	1.80	3.00
Groundwater								
- Agriculture	4.40	0.58	11.28	16.14	15.01	7.30	3.77	25.41
- Septic Tanks	5.13	1.96	3.42	16.16	8.89	3.98	1.01	12.45
- Other	3.04	0.32	0.71	4.22	4.58	1.92	0.36	1.24
- Natural	1.32	1.07	7.70	27.04	13.58	5.04	2.18	1.41
Total	25.79	48.03	185.05	369.20	117.98	226.76	187.13	247.70

-- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL NITROGEN TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO III, LOW ECONOMIC GROWTH

2020

Mainstem Sources Lake	Wood	Kalamalka	Okanagan			Skeha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Major Tributaries	5.00	39.50 *	43.90	161.20	43.00	3.10	4.80	1.00
Main Valley Stream	5.00	--	20.20	--	--	98.80	134.40	158.90
Carryover	--	--	--	--	--	--	49.11	49.11
Municipal	--	--	76.92	132.12	--	105.20	--	5.84
Industrial	--	--	--	--	--	--	--	--
Storm Sewers	--	--	2.33	1.04	0.24	0.47	--	--
Dustfall & Precipitation	1.90	4.60	24.30	28.40	32.70	11.30	1.80	3.00
Groundwater								
- Agriculture	4.07	0.54	14.99	13.41	11.89	7.85	4.05	27.33
- Septic Tanks	7.98	2.57	3.94	22.04	9.93	4.61	1.35	13.28
- Other	4.73	0.41	0.79	5.45	5.11	2.14	0.48	1.32
- Natural	1.32	1.07	7.70	27.04	13.58	5.04	2.18	1.41
Total	30.00	48.69	195.07	390.70	116.45	238.51	198.17	261.19

-- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

APPENDIX 7

SCENARIO III - ESTIMATED TOTAL PHOSPHORUS

LOADINGS TO MAIN VALLEY LAKES

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO III - LOW ECONOMIC GROWTH
2000, PRESENT PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	9.95	9.95
Municipal	-	-	32.64	45.39	-	24.40	-	2.74
Industrial	-	-	-	2.91	0.63	0.02	-	-
Storm Sewers	-	-	0.31	0.17	0.03	0.08	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.08	0.01	0.18	0.21	0.12	0.07	0.05	0.68
- Septic Tanks	0.71	0.27	0.46	1.71	1.00	0.59	0.10	2.15
- Other	0.25	0.00	0.00	0.05	0.07	0.02	0.00	0.03
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.53	2.39	47.30	68.04	15.74	33.49	19.66	27.61

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO III - LOW ECONOMIC GROWTH
2000, 80% PHOSPHORUS REMOVAL

Mainstem Sources Lake	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	-0.54	-0.54
Municipal	-	-	7.39	12.55	-	9.24	-	0.65
Industrial	-	-	-	2.91	0.63	0.02	-	-
Storm Sewers	-	-	0.31	0.17	0.03	0.08	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.08	0.01	0.18	0.21	0.12	0.07	0.05	0.68
- Septic Tanks	0.71	0.27	0.46	1.71	1.00	0.59	0.10	2.15
- Other	0.25	0.00	0.00	0.05	0.07	0.02	0.00	0.03
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.53	2.39	22.05	35.20	15.74	18.33	9.17	15.03

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO III - LOW ECONOMIC GROWTH
2000, 95% PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	-0.78	-0.78
Municipal	-	-	5.55	9.57	-	6.94	-	0.48
Industrial	-	-	-	2.91	0.63	0.02	-	-
Storm Sewers	-	-	0.31	0.17	0.03	0.08	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.08	0.01	0.18	0.21	0.12	0.07	0.05	0.68
- Septic Tanks	0.71	0.27	0.46	1.71	1.00	0.59	0.10	2.15
- Other	0.25	0.00	0.00	0.05	0.07	0.02	0.00	0.03
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	1.53	2.39	20.21	32.32	15.74	16.03	8.93	14.62

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO III - LOW ECONOMIC GROWTH
2020, PRESENT PHOSPHORUS REMOVAL

Mainstem Sources / Lake	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	12.75	12.75
Municipal	-	-	35.36	53.54	-	27.20	-	3.23
Industrial	-	-	-	3.93	0.84	0.02	-	-
Storm Sewers	-	-	0.34	0.20	0.04	0.09	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.07	0.01	0.24	0.18	0.09	0.07	0.05	0.73
- Septic Tanks	1.10	0.35	0.53	2.34	1.11	0.68	0.13	2.29
- Other	0.39	0.00	0.00	0.06	0.08	0.02	0.00	0.04
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	2.05	2.47	50.18	77.85	16.05	36.39	22.49	31.10

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO III - LOW ECONOMIC GROWTH
2020, 80% PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	-0.43	-0.43
Municipal	-	-	8.00	24.72	-	10.29	-	0.69
Industrial	-	-	-	3.93	0.84	0.02	-	-
Storm Sewers	-	-	0.34	0.20	0.04	0.09	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.07	0.01	0.24	0.18	0.09	0.07	0.05	0.73
- Septic Tanks	1.10	0.35	0.53	2.34	1.11	0.68	0.13	2.29
- Other	0.39	0.00	0.00	0.06	0.08	0.02	0.00	0.04
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	2.05	2.47	22.82	49.03	16.05	19.48	9.31	15.38

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams

ESTIMATED ANNUAL INPUT (IN TONS) OF TOTAL PHOSPHORUS TO THE MAIN OKANAGAN LAKES FROM KNOWN SOURCES

SCENARIO III - LOW ECONOMIC GROWTH
2020, 95% PHOSPHORUS REMOVAL

Mainstem Sources	Wood	Kalamalka	Okanagan			Skaha	Vaseux	Osoyoos (Canadian)
			North	Central	South			
Minor Tributaries	0.20	1.80*	9.74	14.90	9.30	0.6	0.10	0.40
Main Valley Stream	0.20	-	0.80	-	-	6.80	9.40	11.07
Carryover	-	-	-	-	-	-	-0.70	-0.70
Municipal	-	-	5.99	11.03	-	7.71	-	0.52
Industrial	-	-	-	3.93	0.84	0.02	-	-
Storm Sewers	-	-	0.34	0.20	0.04	0.09	-	-
Dustfall & Precipitation	0.07	0.30	2.95	2.48	4.37	0.83	0.02	0.49
Groundwater								
- Agriculture	0.07	0.01	0.24	0.18	0.09	0.07	0.05	0.73
- Septic Tanks	1.10	0.35	0.53	2.34	1.11	0.68	0.13	2.29
- Other	0.39	0.00	0.00	0.06	0.08	0.02	0.00	0.04
- Natural	0.02	0.01	0.22	0.22	0.22	0.08	0.04	0.10
Total	2.05	2.47	20.81	35.34	16.05	16.90	9.04	14.94

- indicates no known discharges

* No breakdown between minor tributaries and main valley streams