AN APPLICATION OF POWER ANALYSIS FOR DETECTION OF TRENDS IN WATER QUALITY

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INTRODUCTION

One of the principle objectives of water quality monitoring is the detection of trends. Monitoring of trends is important for the assessment of environmental pollution changes due to variations in land use practices (Gilbert, 1987). These changes may be the consequence of city growth, industry expansion, erosion from farmlands, or the creation of new hazardous waste storage facilities. Monitoring to detect trends is also an important component of water quality management. Monitoring for trends can be used to evaluate the effectiveness of management programs, and to identify new problems that may lead to changes in those programs.

The ability ("power") of a monitoring program to detect trends can be assessed by approaching the problem in a statistical hypothesis testing framework. Power, for a given confidence level and number of observations, is referred to as the probability of detecting a trend of a certain magnitude when one actually exists. In statistics terminology, power is the probability of rejecting the null hypothesis of no trend when a trend actually exists. For the appropriate statistical trend test, power is a function of the confidence level (probability that the result of the test indicates no trend when the time series does not have a trend), the number of observations, the trend magnitude, and the standard deviation of the water quality parameter time series under consideration.

In general, a power analysis of a monitoring station for a given water quality parameter requires the following steps: Selection of a statistical trend test that best suits the data set being analyzed; determination of the standard deviation of the water quality parameter time series; selection of the confidence level and number of observations; and finally, for the trend magnitude of interest, the power can be obtained using an appropriate power function of the aforementioned parameters. Conversely, for a given power, confidence level and time series standard deviation, the number of observations required to detect a trend of a certain magnitude may be obtained.

The purpose of this report is to present a method for evaluating the trend detection ability of monitoring programs and to apply it, for illustrative purposes, to an existing Potomac River basin monitoring program. In order to accomplish this task, power curves are developed for the nonparametric trend test proposed by Hirsch, et al. (1982), commonly known as the Seasonal Kendall test. Then, the developed power curves are used to estimate the "power" of the Maryland Core monitoring network stations. The powers are estimated for trends defined as changes of 20% and 40% of median annual nutrient concentrations over periods of time from 5 to 20 years. For this report, Nitrogen and phosphorus parameters, the 20% and 40% trend magnitudes levels, and the time periods, are selected as particularly relevant to the Chesapeake Bay Nutrient Reduction Strategy (40% in Nitrogen and Phosphorus loads by the year 2000).

BACKGROUND

In recent years, considerable progress has been made in the development of nonparametric tests for detection of trends in water quality time series. Nonparametric tests, contrary to linear regression techniques, have been found to better represent actual water quality time series which are seldom normally distributed or independent. Furthermore, water quality parameters are often seasonal, and flow dependent (concentrations related to stream flow); and missing records and values below the detection limit are commonly found in the data sets. Nonparametric tests, which account for some of these limitations, have been found to be more powerful than other trend techniques (Hirsch, et al.,1982).

Some of the early nonparametric tests for detection trends in water quality include the Spearman's Rho and Kendall test for linear trends, and the Mann-Whitney test for step trends. These tests have been widely used and new ones have been proposed to account for serial dependence, seasonality, flow dependence, and the missing and below the detention values of the data sets (Lettenmaier, 1976; Hirsch, et al., 1982; Hirsch and Slack, 1984; and Van Belle and Hughes, 1984). A summary of recent papers on nonparametric tests for environmental water quality trend studies is presented by Hipel (1988). For different trend tests, Berryman, et al., (1988) present the power, type of trend tested, time series characteristics, number of stations, and minimum number of observations required for the application of each test. A methodology for selecting the appropriate statistical test to detect linear trends is also presented in their study.

For the Mann-Whitney, Kendall, Spearman's Rho, or Lettenmaier tests for trend, power can be calculated using the power function of the t-test. However, for the Seasonal Kendall test proposed by Hirsch, et al.,(1982) or Hirsch and Slack (1984), the power functions are not known and can only be determined from empirical studies (Berryman, et al.,1988). Using Monte Carlo simulations for different stochastic time series, Hirsch, et al.,(1982) compared the power of the Seasonal Kendall test against other trend techniques. The authors present the results by plotting power as a function of trend slope in units of standard deviation per year. The plots are given for 5,10 and 20 years of monthly observations at a 95% confidence level. For a stochastic time series with seasonality and dependence, simulated by using a LNARS model (log normal autoregressive with seasonal cycle), they conclude that the Seasonal Kendall test is more powerful than other trend techniques.

DEVELOPMENT OF POWER CURVES

Power curves for the Seasonal Kendall test are developed using a Monte Carlo procedure. In this procedure, monthly data series of specified trend slope and length are stochastically generated and tested for trend. Data series are generated using a LNARS model (Hirsch, et. al, 1982) because it considers seasonality and dependence which are commonly found in water quality time series. For each trend slope and confidence level specified, 500 data series are generated. Power is then estimated as the fraction of data series for which the Seasonal Kendall test correctly identified a trend.

Power curves are generated by plotting results of the Monte Carlo simulations as power versus trend slope in units of standard deviation change per year. These units are convenient because they allow one to compare power for data series with different standard deviations, time periods and rates of change.

Figures 1 and 2 show the power curves of the Seasonal Kendall test for 95% and 90% confidence levels respectively, and for 5,10,12,15, and 20 years of monthly observations. Appendix A shows separate plots for each number of years and confidence levels. The plots of Figs. 1 and 2, or Appendix A, can be used to assess the trend detection ability,"power analysis", of any sampling program in the following ways.

- To estimate the power of a monitoring program to detect a trend (using the Seasonal Kendall test) of a given magnitude in a given period of time, a trend slope is calculated and the power is read from the power curve for the appropriate confidence level and number of years.

- Alternatively, given a confidence level, power, and trend slope, the number of sampling years needed to detect a trend can be estimated. The number of years can be interpolated from the plots for cases in which the points lie out of the 5,10,12,15 and 20 years curves.

It is shown in Figs. 1 and 2 that for a given trend slope, the power of the test increases as the number of years of data collection increases. Also, as expected, the power increases as the confidence level decreases. Power and confidence levels must be properly selected for the design of sampling programs to detect trends of specific magnitudes. Berryman, et al.,(1988) argued that if public health is a concern, power should be kept high regardless of some loss in the confidence level, because catastrophic consequences may arise when an existing trend is not detected.

APPLICATION OF POWER ANALYSIS TO MARYLAND DATA

Data Set

Thirty three stations of the Maryland Core monitoring network of nontidal waters within the Potomac River basin are considered (Table 1). The stations and locations within different subregions of the Potomac River basin are depicted in Figure 3 (Rasin and Brooks, 1982). Nitrogen and phosphorus data (Table 2) for these stations were retrieved from the US EPA STORET data base. For this study trends magnitudes equal to 20% and 40% reductions in the 1985 median concentrations are considered. Therefore, application of this analysis to current and future assessments of the Chesapeake Bay Nutrient Reduction Strategy are illustrated.

Procedure

For each station and parameter time series data, the Seasonal Kendall statistics are computed (Fortran programs for computation of the Seasonal Kendall statistics are available from the authors). Then, for each parameter measured at a station, the data set is "detrended" (removal of trend) using the Seasonal Kendall Slope estimator proposed by Hirsch, et al.,(1982). From the "detrended" time series, the residual standard deviation and the trend magnitude to standard deviation ratio are computed. Power is obtained from the curves shown in Figures 1 and 2 or Appendix A.

Results

Tables B.1 and B.2 (Appendix B) contain, for each station and parameter, the 1985 median concentrations, residual (detrended) standard deviation, trend magnitude to standard deviation ratio (for 20% and 40% trend magnitudes), and powers for different confidence levels and number of years of record. These tables show that the standard deviation for a given parameter differs at each station, and as a result, the trend detection ability ("power") varies among stations. Figures 4.a and 4.b show, for all the stations, the average power of each water quality parameter for the 20% and 40% trend magnitudes respectively. For the entire monitoring network, the average powers are computed here for relative comparisons of the trend detection ability of different parameters, trend magnitudes, and time periods.

The powers of detecting a trend magnitude equal to a 40% reduction in 1985 median concentrations are higher than for a 20% reduction (Tables B.1 and B.2 and Figures 4.a and 4.b). Therefore, if a 40% reduction in the 1985 median concentrations is achieved by the year 2000 (15 years of observations), the current monitoring program is able to detect this trend magnitude better than the one due to the 20% reduction. To illustrate this conclusion, Table 3 shows, for the 20% and 40% change at a 95% confidence level, the power ranges and averages of the water quality parameters for all the stations. For instance, it is shown that if a 40% change in the 1985 median concentrations of total nitrogen (TOT-N) occurs by the year 2000, the power of detecting such trend is 0.98 for this parameter (Table 3.b and Fig. 4.b). This means that if such change or a greater one occurs by this year, there is at least a 98% chance that the current monitoring program would detect this trend magnitude. However, if only a 20% change occurs (Table 3.a and Fig. 4.a), the chance of detecting the trend is reduced to 93%. The 95% confidence level means that there is a 5% chance that the trend analysis would conclude that a trend exists for cases in which actually there is none.

Table B.1 shows relatively lower powers for 20% reductions in median concentrations. These lower powers mean that the current monitoring program may not be adequate to detect trends of this magnitude, particularly over short time spans. For instance, as shown in Table 3.a and Fig. 4.a, the powers to detect changes of 20% in median concentrations of total nitrogen in a 5 year period (at a 95% confidence level) ranges from 0.19 to 1.0 with an average of 0.69. However, if only this reduction is achieved by the year 2000 (15 years of observations) the powers range from 0.37 to 1.0 with an average power of 0.93.

For illustrative purposes, and because trend detection of the 20% change is more critical, Fig. 5 shows the average power of all the stations within the different subregions of the Potomac River basin (Fig. 3); Appendix C shows the average powers along stations grouped by the stream name, and Appendix D the powers of each station. Water quality parameters not showing any power on these plots or the tables, are parameters for which not enough data is available for trend analysis (less than 3 years of data).

For the trend magnitude due to a 20% change in the median concentrations, Fig. 4.a shows total nitrogen (TOT-N) to have the highest power. Therefore, evaluation of the progress of the nutrient reduction strategy in 1990 (5 years of observations), shows that there is a 69% chance that, for this parameter, the current sampling program would detect this trend magnitude. However, stations in the Potomac Urban Estuary show an average low power (27%) for this parameter (Fig. 5.d). In general, for this trend magnitude, other parameters show even lower powers (Figs. 4 and 5). Consequently, the ability of detecting this trend decreases for those parameters.

For the different subregions in the Potomac River basin, Fig. 5 generally shows the highest powers for the stations in the Upper Great Valley region, and the lowest powers for the stations in the Potomac Urban Estuary region.

CONCLUSIONS

A methodology to assess the trend detection ability of a monitoring program has been presented. Power curves for the Seasonal Kendall test have been developed, and examples of their applications are illustrated. The technique shows to be very helpful in evaluating the trend detection ability of a monitoring program, and its application to current or future assessments in the progress of the Chesapeake Bay Nutrient Reduction Strategy. However, it should be pointed out that the power curves developed in this study are approximate. Exact power functions of nonparametric tests such as the Seasonal Kendall test are not known (Berryman, et al., 1988). To overcome this difficulty, empirical studies using Monte Carlo simulations have been proposed (Hirsch, et al.,1982) and were adopted in this study. Therefore, the results obtained in this report give an insight into the power of a monitoring program, and provide an approach for relative comparisons of power among water quality parameters and stations within the Potomac River basin.

Powers of a 20% and 40% reduction in the 1985 median concentrations have been presented for 5,10,12,15 and 20 years of observations. The powers obtained are shown to be very useful in the assessment of the Maryland water quality monitoring program. Improvement of the powers obtained in this analysis may be achieved by adopting the following recommendations: Implementation of statistical trend techniques that account for the flow dependence of water quality parameters; better and consistent water quality measurement techniques as well as laboratory procedures; and an increase in the number of observations collected each month. These improvements would contribute to reducing the unexplained (after detrending) variance of each water quality parameter, and consequently, a higher trend detection ability (Power) may be achieved.

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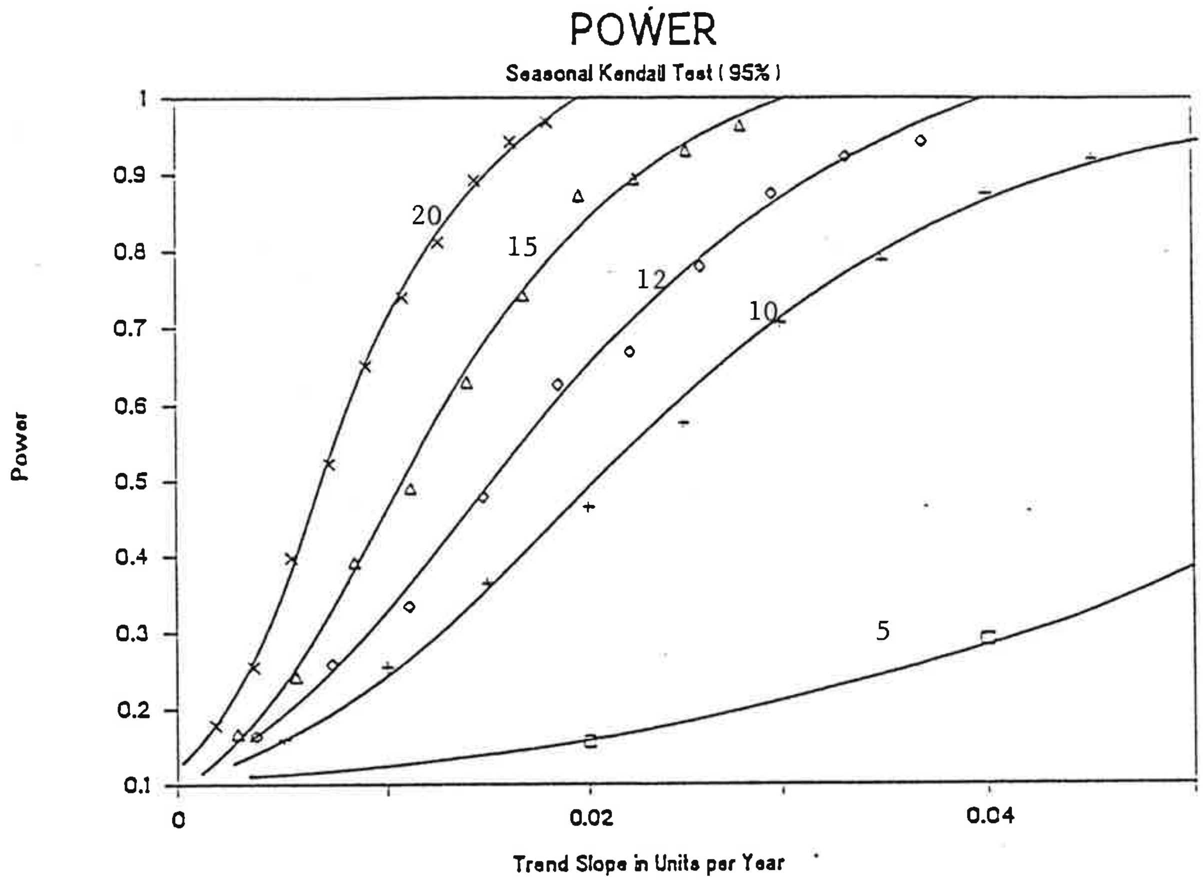


Figure 1. Power, Seasonal Kendall Test
95% confidence level

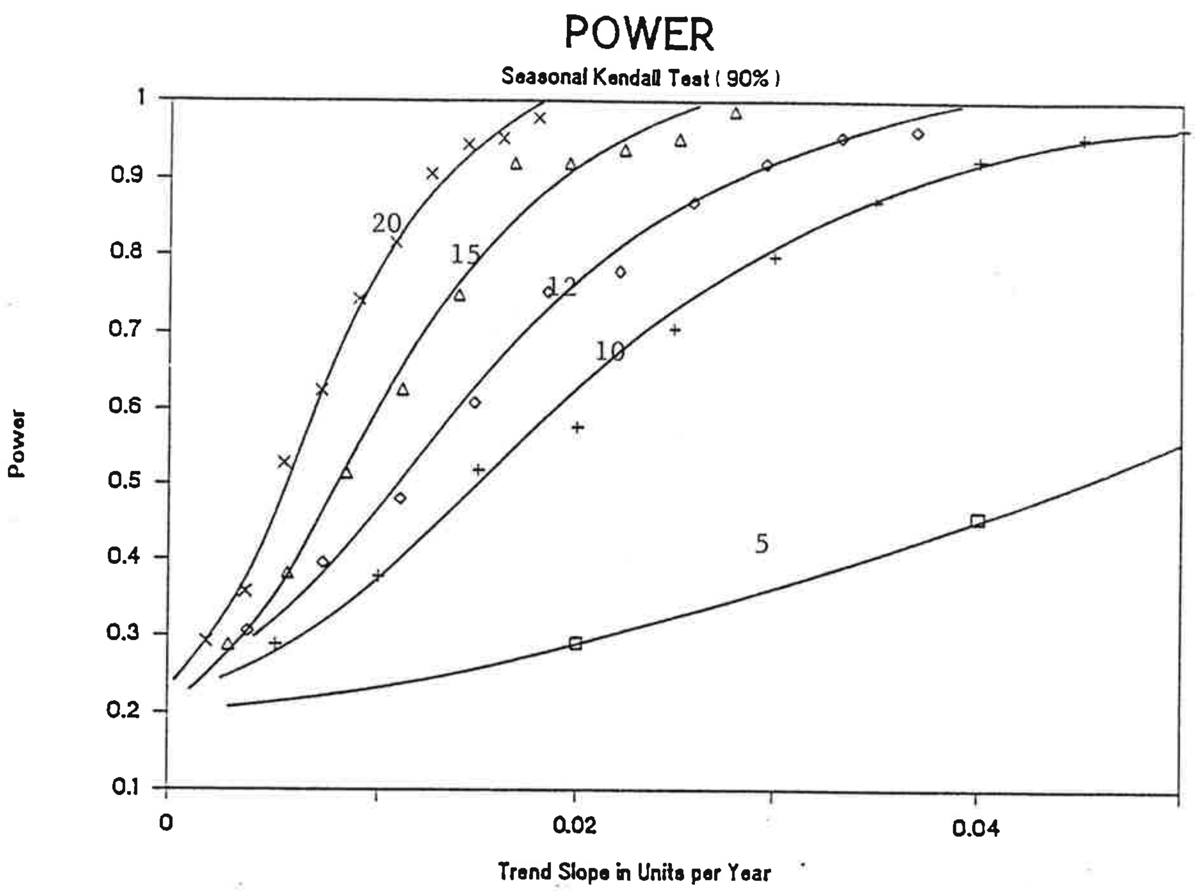


Figure 2 Power, Seasonal Kendall Test
90% confidence level

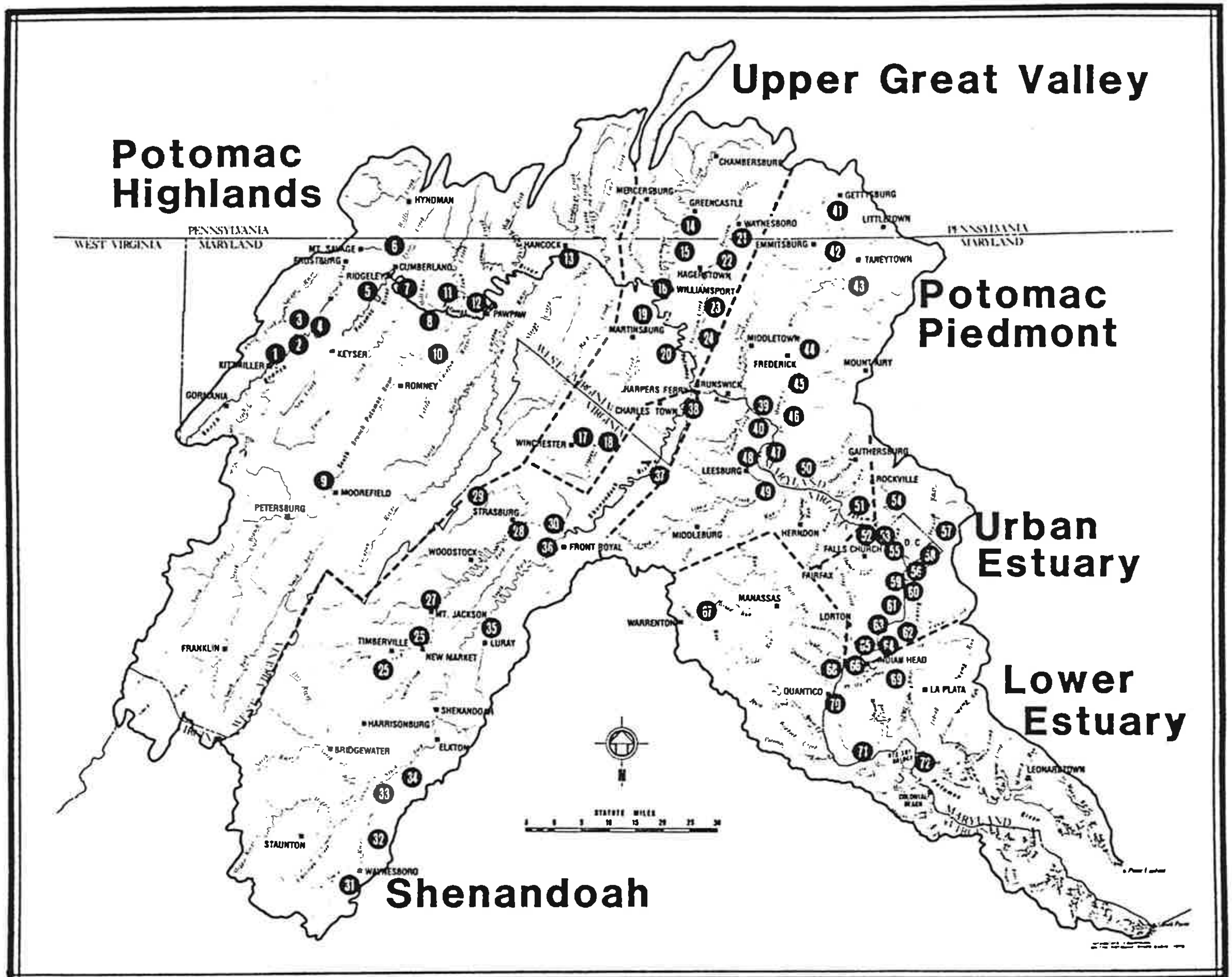
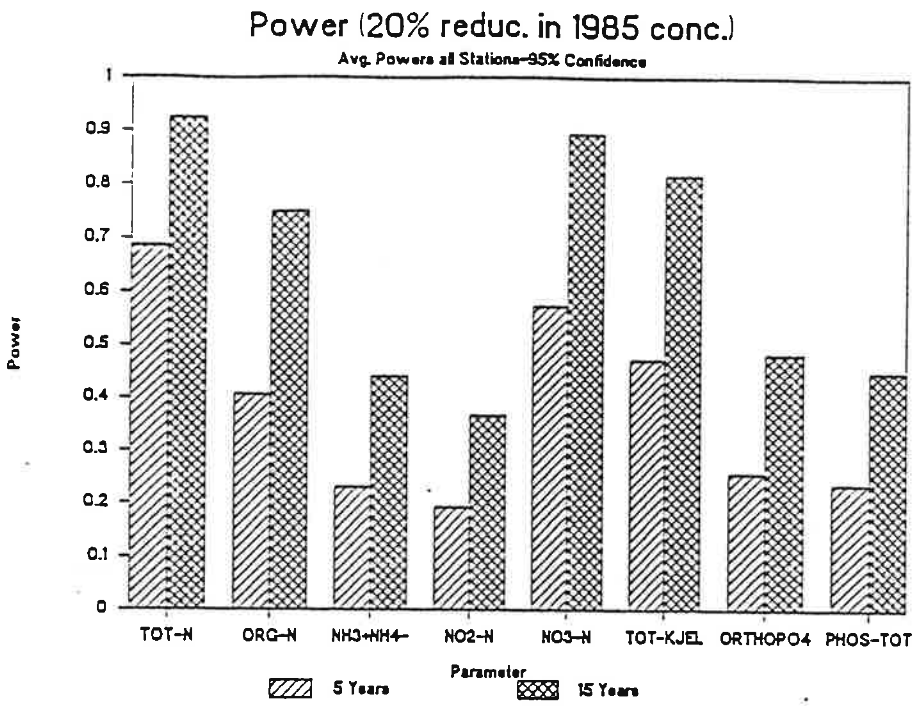
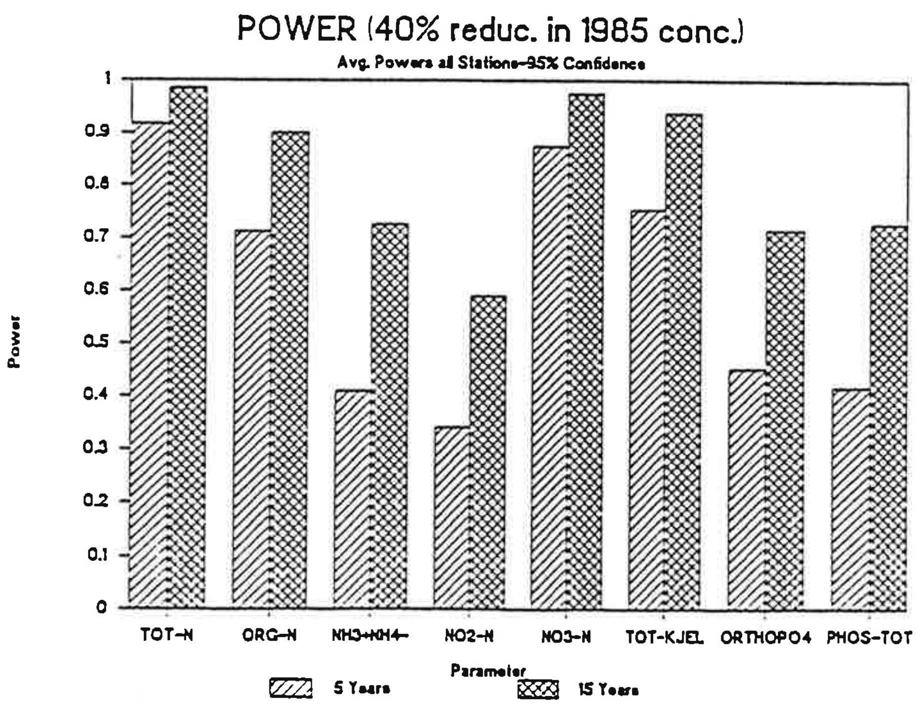


Figure 3. Potomac River Basin Water Quality Stations

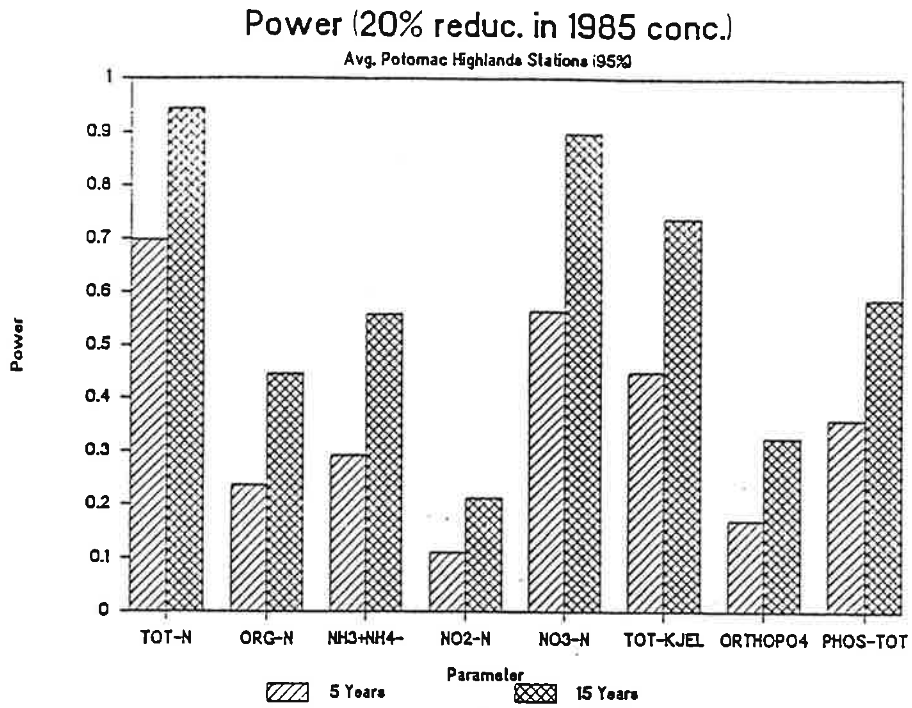


(a)

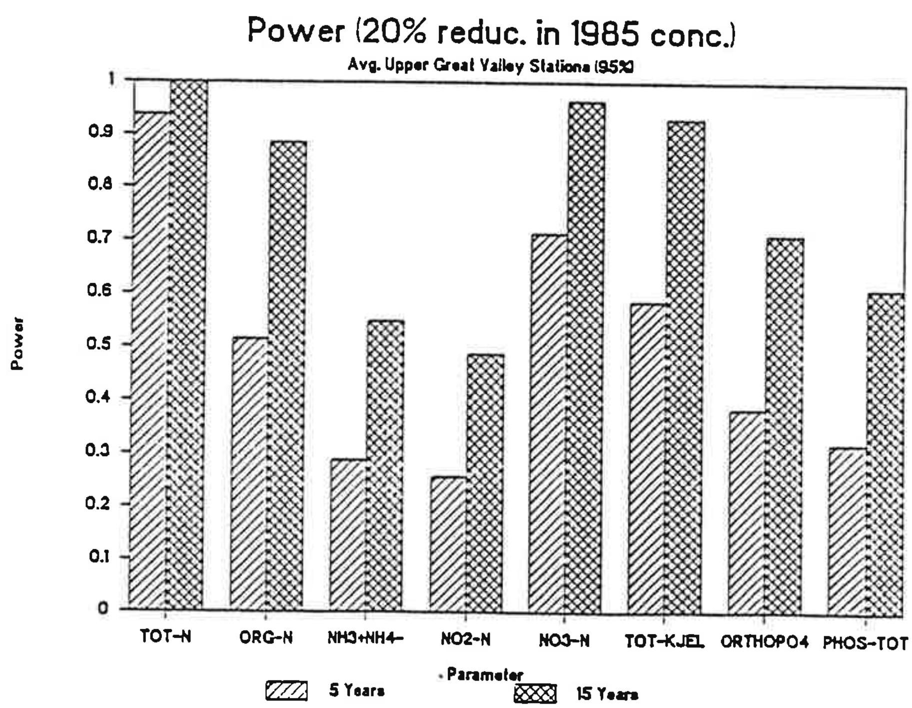


(b)

Figure 4. Average Power of Potomac River Basin Stations

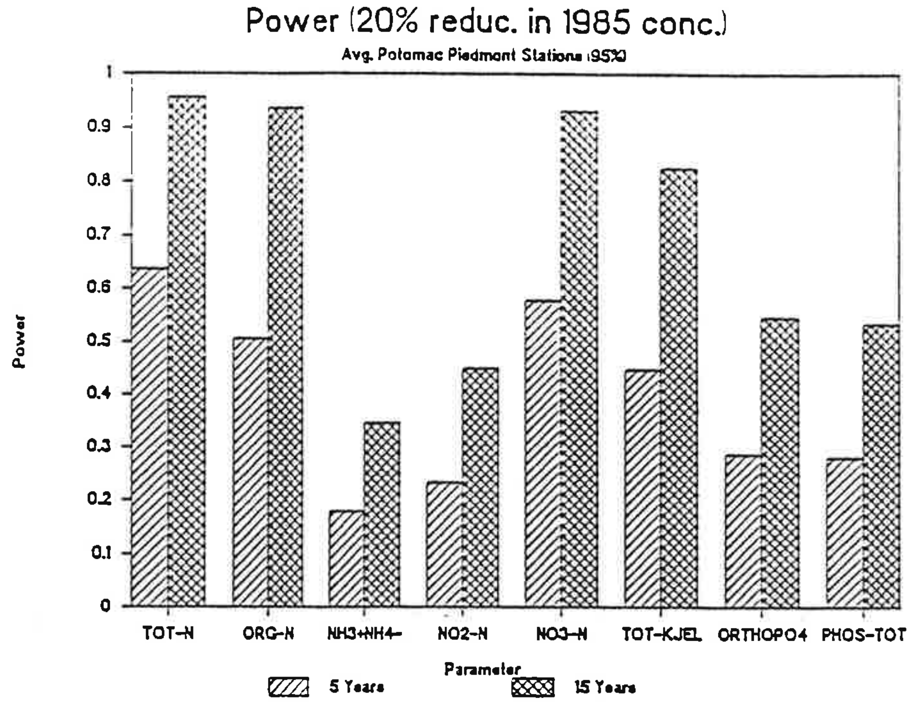


(a)

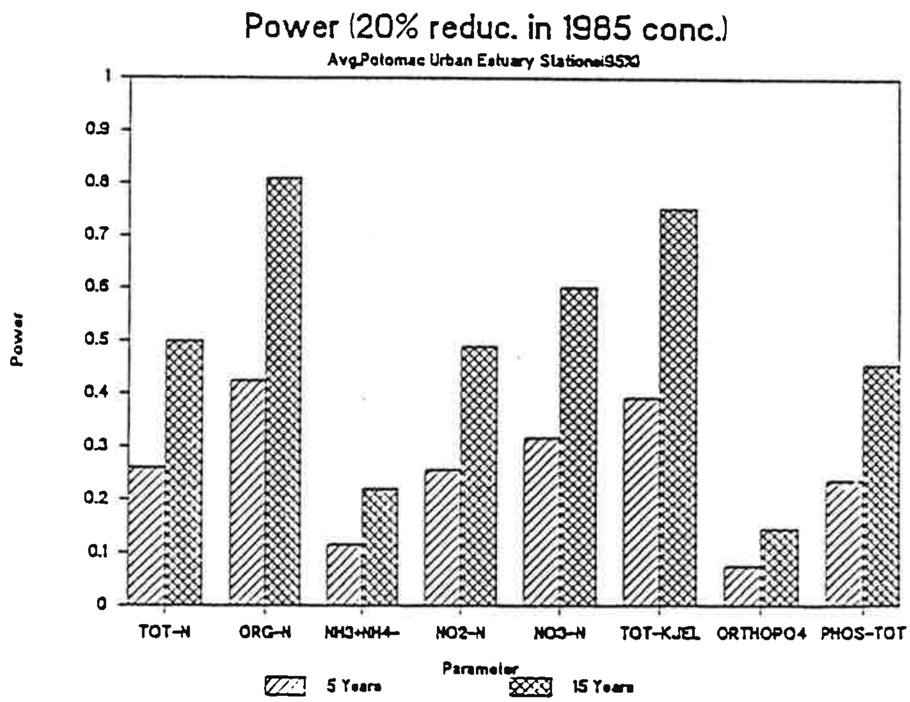


(b)

Figure 5. Average Power of Potomac River Basin Subregions
(a) Potomac Highlands Stations
(b) Upper Great Valley Stations



(c)



(d)

Figure 5. Average Power of Potomac River Basin Subregions (continued)
(c) Potomac Piedmont Stations
(d) Potomac Urban Estuary Stations

Table 1
Water Quality Monitoring Stations

STREAM	LOCATION	STATION	BWQMN
	POTOMAC HIGHLANDS		
North Branch Potomac	Oldtown, MD, Md Rt 51 Toll Bridge	NBP0023	8
	Cumberland, MD, at Md Rt 51	NBP0103	7
	Pinto, MD, West Md RR Bridge	NBP0326	5
	Rt 220 Bridge	NBP0461	
	Bloomington, MD at Md Rt 135 Bridge	NBP0534	2
	Kitzmiller, MD, below Md Rt 38	NBP0689	1
George Creek	Franklin, MD, Md Rt 36 Bridge	GEO0009	4
Savage River	Bloomington, MD, at Md Rt 135	SAV0000	3
Town Creek	Oldtown, MD, Oldtown Rd Bridge	TOW0030	11
Wills Creek	Cumberland, MD, below Braddock Run	WIL0013	6
Mouth of Braddock Run	US 40 and Braddock St Bridge	BDK0000	
Potomac River	Paw Paw, WV, MD Rt 51 Bridge	POT2766	12
	Hancock, MD, below US Rt 522	POT2386	13
	UPPER GREAT VALLEY		
Conococheague Creek	Fairview, MD, Md Rt 58	CON0180	15
	Williansport, MD, Md Rt 68	CON0005	16
Antietan Creek	Rocky Forge, MD, Rt 60 Bridge	ANT0366	22
	Funkstown, MD, Poffenberger	ANT0203	23
	Sharpburg, MD, Rt 34 Bridge	ANT0044	24
Potomac River	Shepherdstown, WV, below Md Rt 24	POT1830	20

BWQMN = Station number in Figure 3

Table 1 (continued)
Water Quality Monitoring Stations

STREAM	LOCATION	STATION	BWQMN
	POTOMAC PIEDMONT		
Potomac River	Point of Rocks, MD, US Rt 15	POT1595	39
Big Pipe Creek	Bruceville, MD	BPC0035	43
Catoctin	Catoctin Creek at Md Rt 464	CAC0031	
	Catoctin Creek at Md Route 17	CAC0148	
Monocacy River	Bridgeport, MD, Rt 97 Bridge	MON0528	42
	At Biggs Ford Road	MON0269	44
	Below Frederick, MD, Reich Ford Br	MON0155	45
	Dickerson, MD, Rt 28 Bridge	MON0020	46
Potomac River	White's Ferry, MD, Rt 107	POT1471	47
Seneca Creek	Bethesda, MD, River Rd Bridge	SEN0008	50
Cabin John Creek	Washington, DC , MacArthur Blvd Br	CJB0005	51
	POTOMAC URBAN ESTUARY		
Potomac River	Bethesda, MD, Little Falls Dam	POT1184	52
Rock Creek	Bethesda, MD, Rt 410 Bridge	RCM0111	
Anacostia River	Bladensburg, MD, US Rt 50 Br.	ANA0082	57

BWQMN = Station number in Figure 3

Table 2
Water Quality Parameters

ABBREVIATION	PARAMETER DESCRIPTION	UNITS
TOT-N	Nitrogen, Total	mg/l
ORG-N	Organic Nitrogen	mg/l
NH3+NH4-	Nitrogen, Ammonia, Total	mg/l
NO2-N	Nitrite Nitrogen, Total	mg/l
NO3-N	Nitrate Nitrogen, Total,	mg/l
TOT-KJEL	Nitrogen, Kjeldahl, Total,	mg/l
ORTHOPO4	Phosphorus, Total, Ortho,	mg/l
PHOS-TOT	Phosphorus, Total,	mg/l

Table 3.a
Power of all Stations
(20% Reduction in Median Concentrations)

PARAMETER	RANGE		AVERAGE	
	5 years	15 Years	5 Years	15 Years
TOT-N	0.19-1.00	0.37-1.00	0.69	0.93
ORG-N	0.07-0.62	0.13-1.00	0.41	0.75
NH3+NH4-	0.08-0.47	0.15-0.90	0.23	0.44
NO2-N	0.03-0.44	0.06-0.85	0.19	0.37
NO3-N	0.18-0.86	0.35-1.00	0.57	0.89
TOT-KJEL	0.10-0.85	0.20-1.00	0.47	0.82
ORTHOPO4	0.00-0.58	0.01-1.00	0.26	0.48
PHOS-TOT	0.03-0.47	0.06-0.90	0.23	0.45

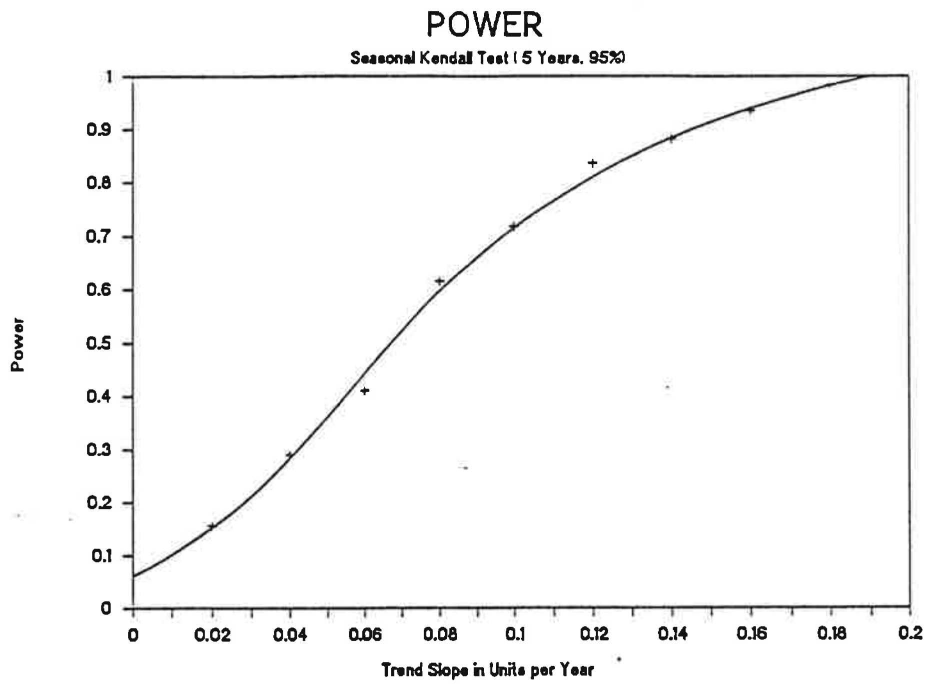
Table 3.b
Power of all Stations
(40% Reduction in Median Concentrations)

PARAMETER	RANGE		AVERAGE	
	5 years	15 Years	5 Years	15 Years
TOT-N	0.35-1.00	0.66-1.00	0.91	0.98
ORG-N	0.12-1.00	0.24-1.00	0.71	0.90
NH3+NH4-	0.14-0.84	0.19-0.28	0.41	0.73
NO2-N	0.06-0.79	0.11-1.00	0.34	0.59
NO3-N	0.32-1.00	0.62-1.00	0.87	0.97
TOT-KJEL	0.18-1.00	0.35-1.00	0.78	0.97
ORTHOPO4	0.00-1.00	0.01-1.00	0.45	0.71
PHOS-TOT	0.05-0.84	0.10-1.00	0.42	0.73

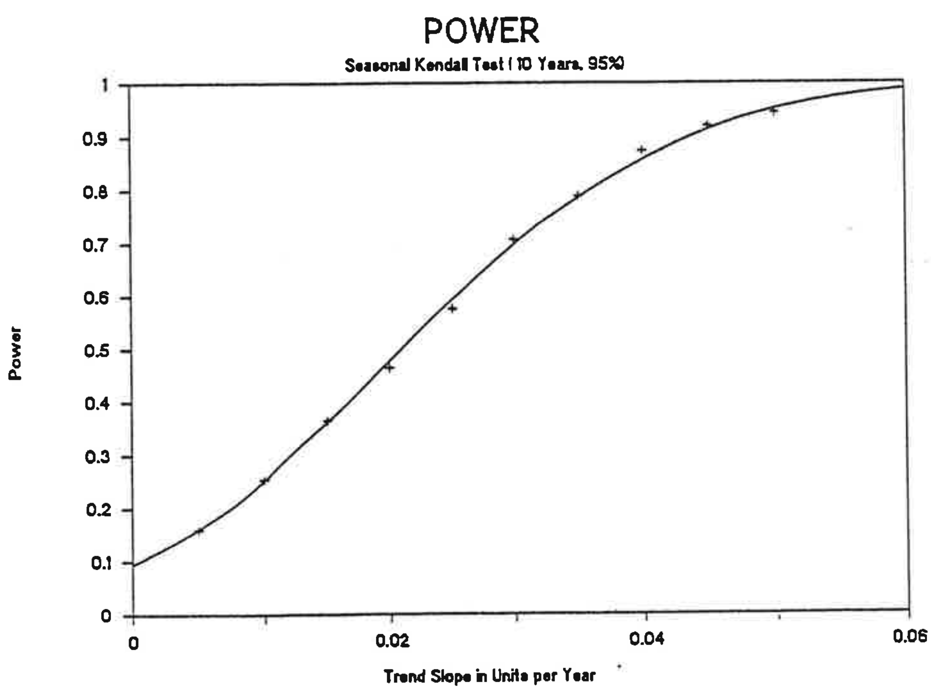
APPENDICES

Appendix A

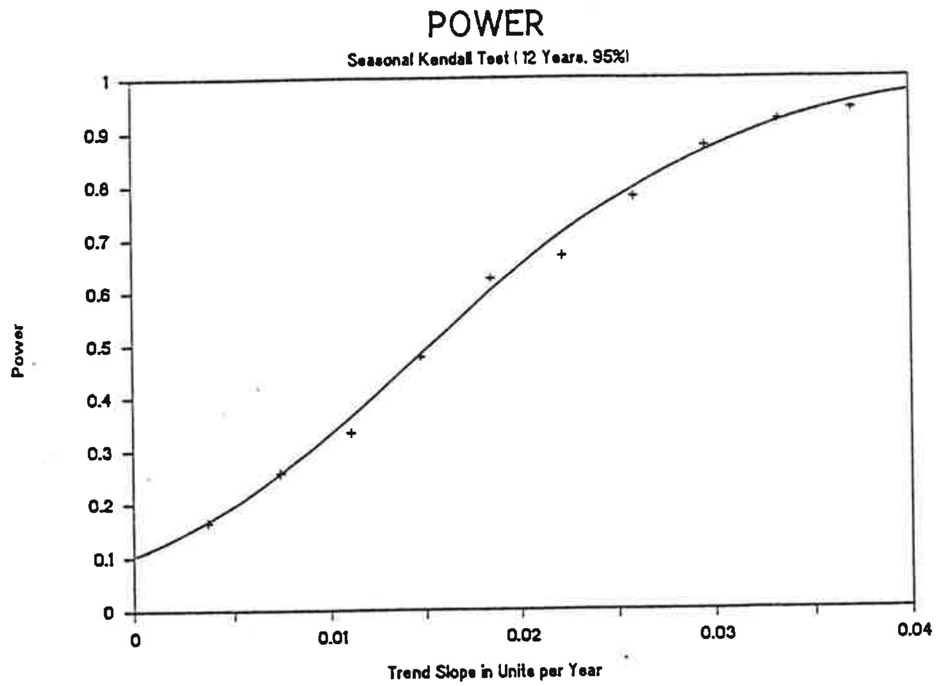
Power Curves

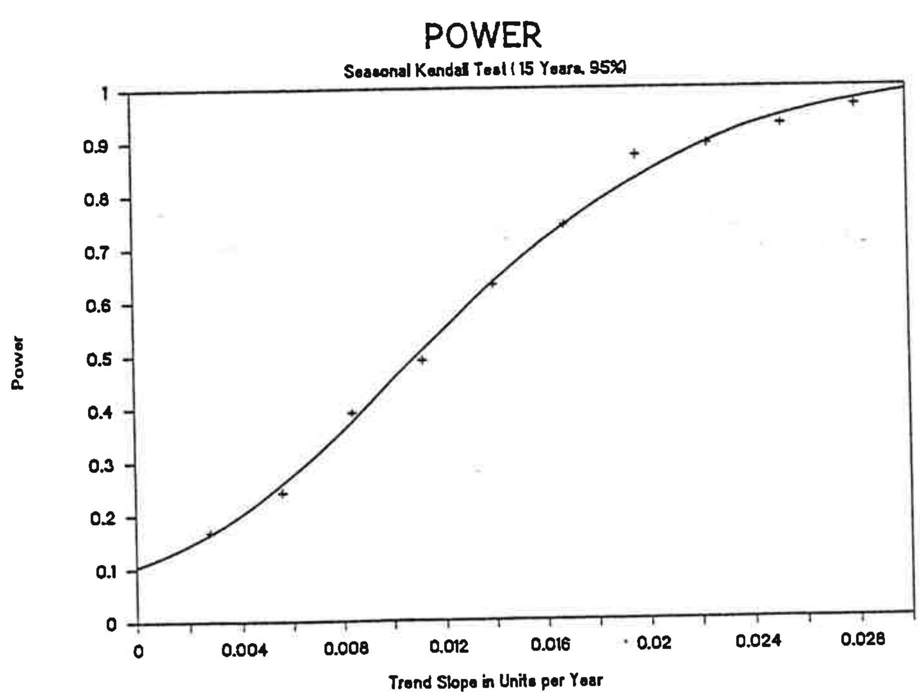


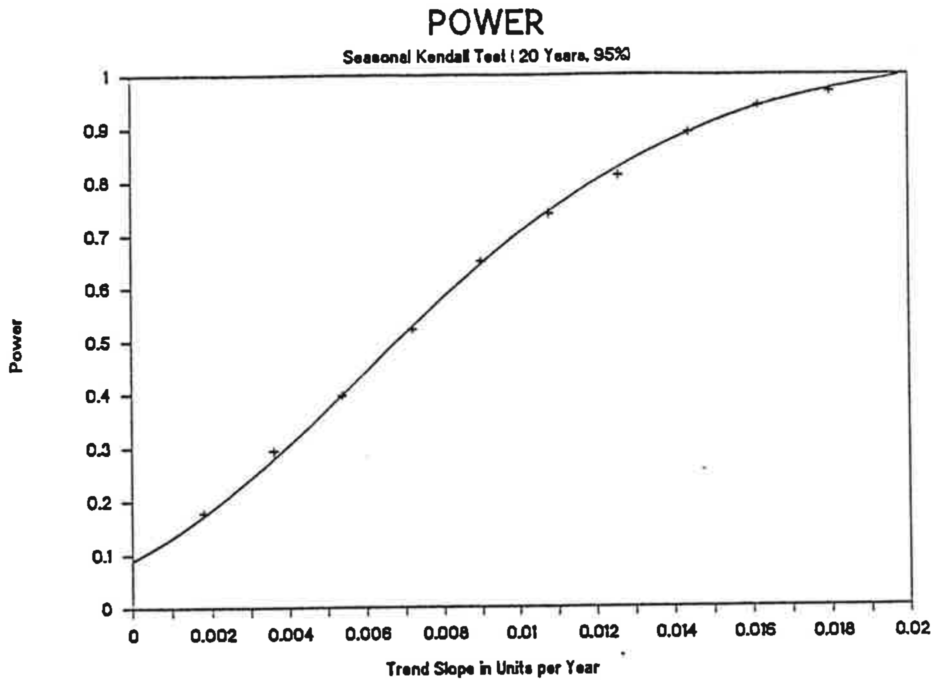
POWER
Seasonal Kendall Test (5 Years, 95%)
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Trend Slope in Units per Year

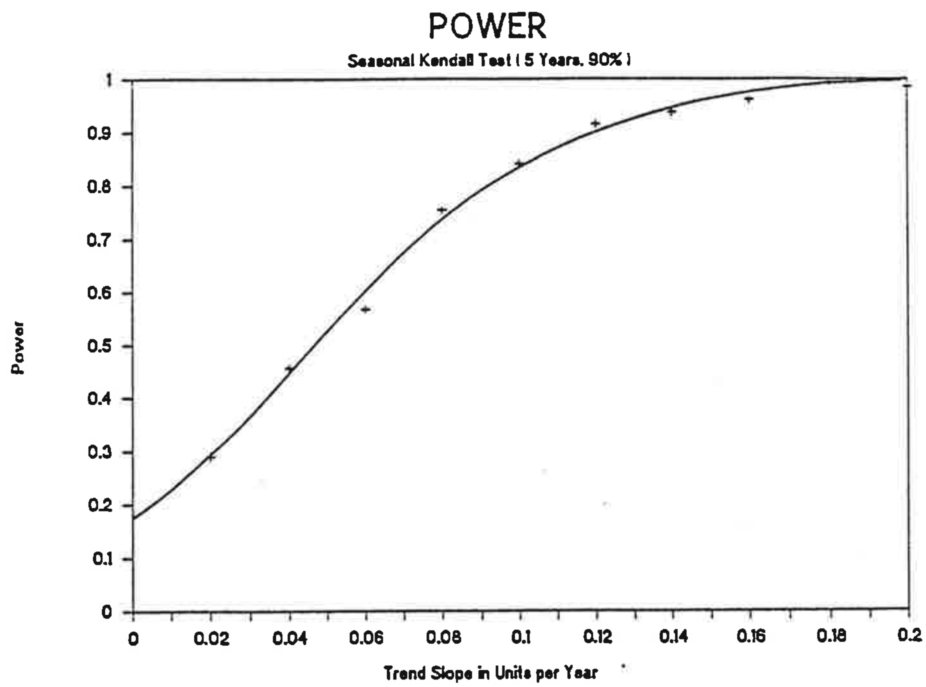


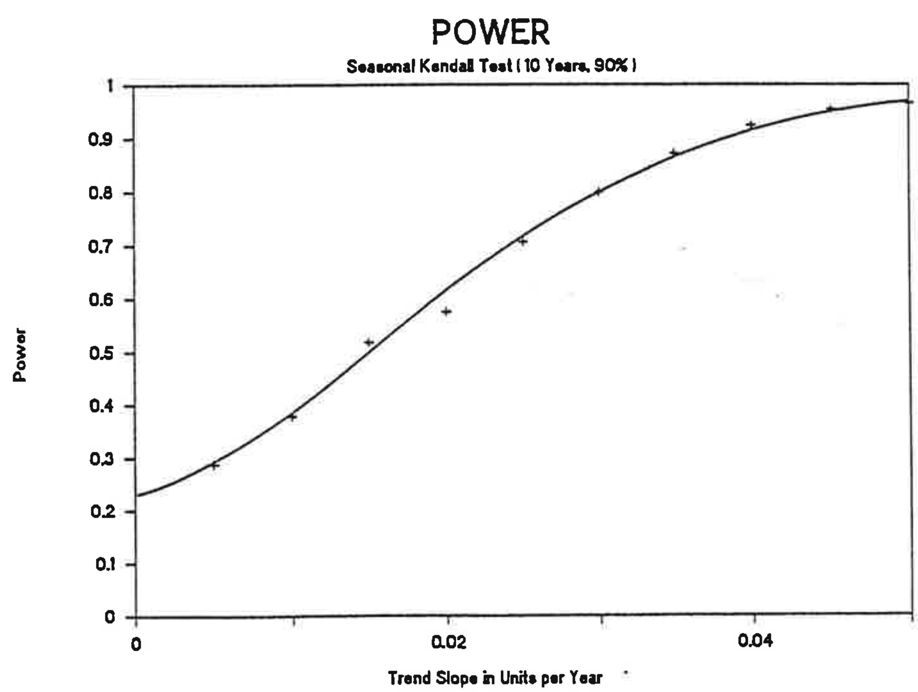
POWER
Seasonal Kendall Test (10 Years, 95%)
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.02
0.04
0.06
Trend Slope in Units per Year

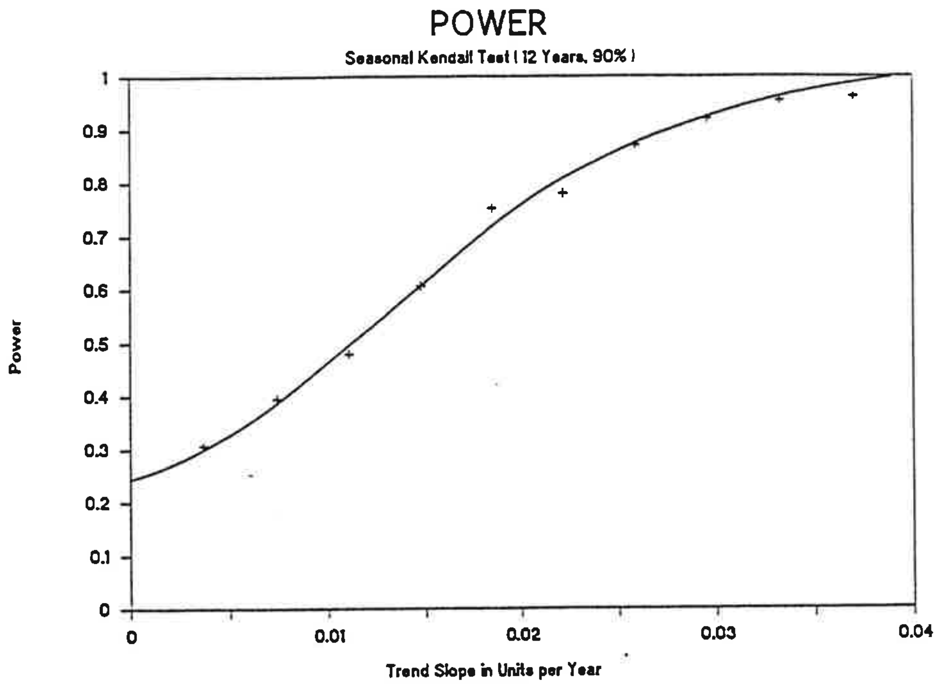

POWER
Seasonal Kendall Test (12 Years, 95%)
Power
Trend Slope in Units per Year
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.01
0.02
0.03
0.04

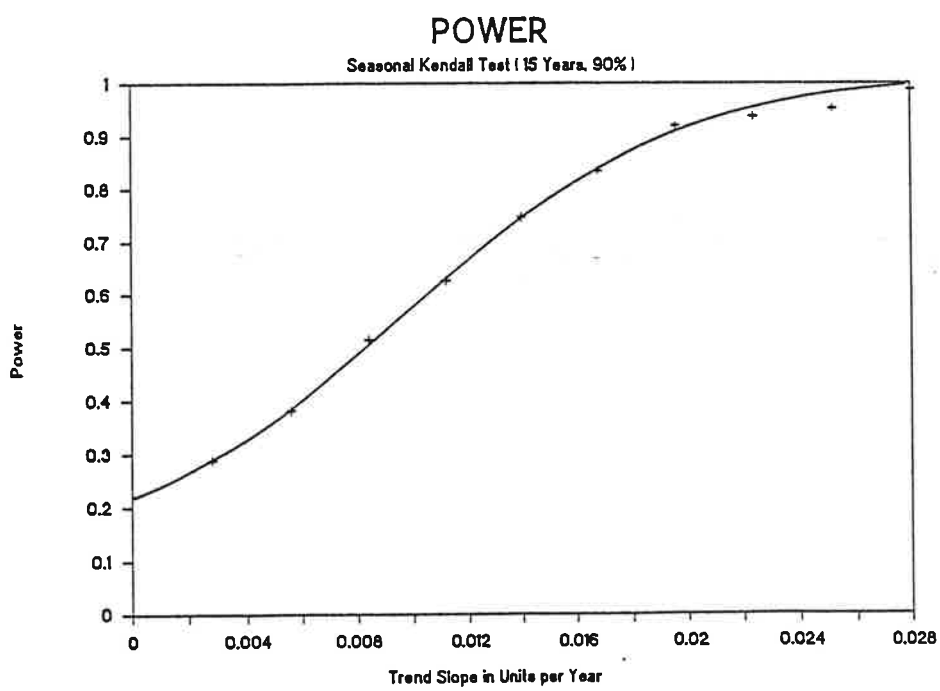

POWER
Seasonal Kendall Test (15 Years, 95%)
Power
Trend Slope in Units per Year
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.004
0.008
0.012
0.016
0.02
0.024
0.028

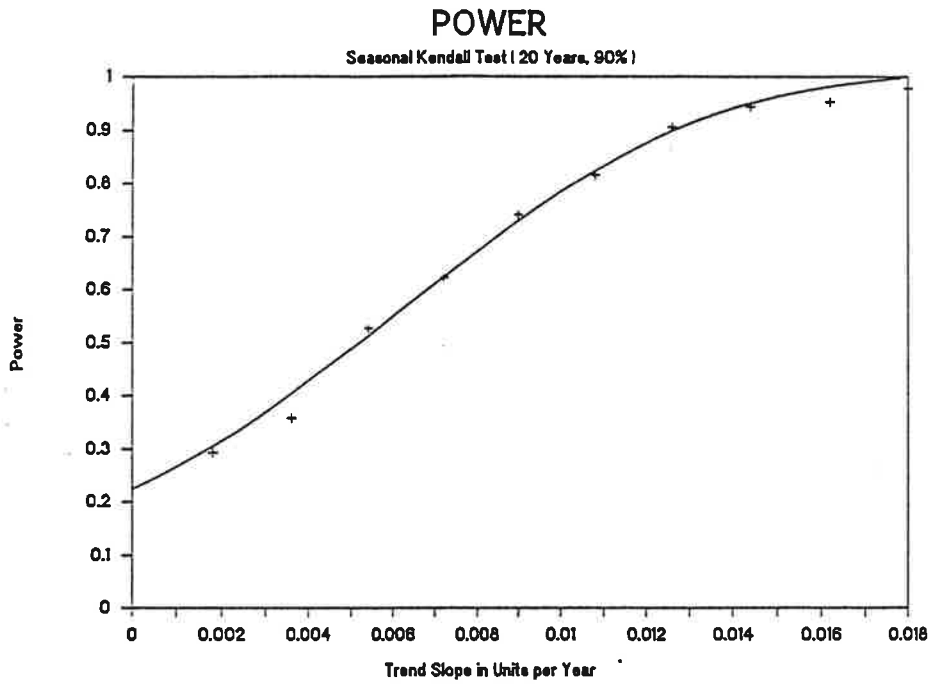

POWER
Seasonal Kendall Test (20 Years, 95%)
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.002
0.004
0.006
0.008
0.01
0.012
0.014
0.016
0.018
0.02
Trend Slope in Units per Year


POWER
Seasonal Kendall Test (5 Years, 90%)
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Trend Slope in Units per Year


POWER
Seasonal Kendall Test (10 Years, 90%)
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.02
0.04
Trend Slope in Units per Year


POWER
Seasonal Kendall Test (12 Years, 90%)
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.01
0.02
0.03
0.04
Trend Slope in Units per Year


POWER
Seasonal Kendall Test (15 Years, 90%)
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.004
0.008
0.012
0.016
0.02
0.024
0.028
Trend Slope in Units per Year


POWER
Seasonal Kendall Test (20 Years, 90%)
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.002
0.004
0.006
0.008
0.01
0.012
0.014
0.016
0.018
Trend Slope in Units per Year

Appendix B

Power Tables

Table B.1 Power, 20% Reduction in 1985 Median Concentrations

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
ANA0082	TOTAL N	.880	1.500	.118	.19	.31	.34	.37	.44	.34	.45	.49	.51	.55
	ORG N	.640	.483	.265	.38	.60	.66	.72	.82	.54	.71	.77	.81	.88
	NH3+NH4-	.100	.473	.042	.08	.13	.15	.16	.20	.19	.25	.28	.28	.30
	NO2-N	.018	.039	.092	.16	.25	.28	.30	.37	.30	.39	.43	.44	.48
	NO3-N	.700	1.231	.114	.19	.30	.33	.36	.43	.34	.44	.48	.50	.54
	TOT KJEL	.670	.540	.248	.36	.57	.63	.69	.78	.52	.69	.74	.78	.85
	ORTHOPO4	.020	.087	.046	.09	.14	.16	.17	.21	.20	.26	.29	.29	.32
	PHOS-TOT	.070	.101	.139	.22	.35	.39	.42	.50	.38	.49	.54	.56	.60
ANT0044	TOTAL N	5.040	.917	1.099	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.060	.060	.200	.30	.48	.53	.57	.66	.46	.61	.66	.69	.75
	NO2-N	.032	.050	.128	.21	.33	.37	.40	.47	.36	.47	.51	.53	.58
	NO3-N	3.280	.927	.708	.86	1.00	1.00	1.00	1.00	.92	1.00	1.00	1.00	1.00
	TOT KJEL	.560	.315	.356	.48	.76	.84	.92	1.00	.63	.84	.90	.96	1.00
	ORTHOPO4	.200	.135	.296	.42	.66	.72	.79	.90	.57	.76	.81	.86	.94
ANT0203	TOTAL N	4.702	1.269	.741	.89	1.00	1.00	1.00	1.00	.95	1.00	1.00	1.00	1.00
	ORG N	.620	.431	.288	.41	.64	.71	.77	.88	.56	.75	.80	.85	.92
	NO2-N	.060	.072	.167	.26	.41	.45	.49	.58	.42	.55	.59	.62	.67
	NO3-N	3.730	1.139	.655	.81	1.00	1.00	1.00	1.00	.89	1.00	1.00	1.00	1.00
	TOT KJEL	.850	.643	.264	.38	.60	.66	.72	.82	.54	.71	.76	.81	.88
	ORTHOPO4	.275	.336	.164	.25	.40	.45	.49	.57	.41	.54	.59	.61	.67
	PHOS-TOT	.340	.383	.178	.27	.43	.48	.52	.61	.43	.57	.61	.64	.70
ANT0366	TOTAL N	4.540	1.229	.739	.89	1.00	1.00	1.00	1.00	.95	1.00	1.00	1.00	1.00
	NH3+NH4-	.300	.174	.345	.47	.74	.82	.90	1.00	.62	.83	.88	.94	1.00
	NO2-N	.042	.073	.115	.19	.30	.34	.36	.43	.34	.44	.49	.50	.54
	NO3-N	2.410	.957	.504	.65	1.00	1.00	1.00	1.00	.77	1.00	1.00	1.00	1.00
	TOT KJEL	.805	.232	.694	.85	1.00	1.00	1.00	1.00	.91	1.00	1.00	1.00	1.00
	ORTHOPO4	.195	.089	.438	.58	.91	.99	1.00	1.00	.71	.95	1.00	1.00	1.00
	PHOS-TOT	.205	.119	.345	.47	.74	.82	.90	1.00	.62	.83	.88	.94	1.00

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.1 Power, 20% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	.595	.622	.191	.29	.46	.51	.55	.64	.45	.59	.64	.67	.73
	NH3+NH4-	.030	.074	.081	.14	.23	.25	.27	.33	.28	.36	.40	.41	.44
BDK0000	NO2-N	.006	.010	.120	.20	.31	.35	.38	.45	.35	.45	.50	.51	.56
	NO3-N	.380	.384	.198	.30	.47	.52	.57	.66	.46	.60	.65	.68	.74
	TOT KJEL	.300	.294	.204	.31	.48	.53	.58	.67	.47	.61	.66	.70	.76
	TOTAL N	3.180	.979	.650	.80	1.00	1.00	1.00	1.00	.88	1.00	1.00	1.00	1.00
	NH3+NH4-	.030	.075	.080	.14	.22	.25	.27	.33	.28	.36	.40	.40	.44
BPC0035	TOT KJEL	.500	.404	.248	.36	.57	.62	.68	.78	.52	.68	.74	.78	.85
	ORTHOPO4	.025	.054	.093	.16	.25	.28	.30	.37	.30	.39	.43	.44	.48
	PHOS-TOT	.070	.097	.144	.23	.36	.40	.44	.52	.38	.50	.55	.57	.62
	TOTAL N	1.730	1.028	.337	.46	.73	.80	.88	.99	.61	.82	.87	.93	1.00
	NH3+NH4-	.045	.050	.180	.27	.44	.48	.53	.61	.43	.57	.62	.65	.70
	NO2-N	.010	.113	.018	.04	.07	.07	.08	.10	.12	.15	.17	.17	.18
CAC0031	NO3-N	1.030	.712	.289	.41	.65	.71	.78	.88	.56	.75	.80	.85	.93
	TOT KJEL	.405	.248	.327	.45	.71	.78	.86	.97	.60	.80	.86	.92	.99
	ORTHOPO4	.060	.036	.333	.46	.72	.80	.88	.98	.61	.81	.87	.93	1.00
	PHOS-TOT	.090	.087	.207	.31	.49	.54	.59	.68	.47	.62	.67	.70	.76
	TOTAL N	1.452	.665	.437	.58	.90	.99	1.00	1.00	.71	.95	1.00	1.00	1.00
	NH3+NH4-	.070	.056	.250	.36	.57	.63	.69	.79	.52	.69	.74	.78	.85
	NO2-N	.013	.024	.108	.18	.29	.32	.35	.41	.33	.43	.47	.48	.52
CAC0148	NO3-N	.840	.517	.325	.45	.71	.78	.86	.96	.60	.80	.86	.91	.99
	TOT KJEL	.485	.274	.354	.48	.76	.84	.92	1.00	.63	.84	.90	.96	1.00
	ORTHOPO4	.050	.098	.102	.17	.27	.30	.33	.40	.32	.41	.45	.47	.51
	PHOS-TOT	.115	.112	.205	.31	.49	.54	.59	.68	.47	.62	.67	.70	.76

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.1 Power, 20% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	1.382	.531	.521	.67	1.00	1.00	1.00	1.00	.78	1.00	1.00	1.00	1.00
	NH3+NH4-	.020	.027	.148	.23	.37	.41	.45	.53	.39	.51	.56	.58	.63
	NO2-N	.006	.011	.109	.18	.29	.32	.35	.42	.33	.43	.47	.48	.53
CJB0005	NO3-N	.760	.344	.442	.58	.91	1.00	1.00	1.00	.71	.95	1.00	1.00	1.00
	TOT KJEL	.350	.207	.338	.46	.73	.81	.89	.99	.61	.82	.87	.93	1.00
	ORTHOPO4	.010	.014	.143	.23	.36	.40	.43	.51	.38	.50	.55	.57	.61
	PHOS-TOT	.040	.061	.131	.21	.34	.37	.40	.48	.36	.48	.52	.54	.58
	TOTAL N	3.900	1.033	.755	.91	1.00	1.00	1.00	1.00	.96	1.00	1.00	1.00	1.00
	ORG N	.485	.203	.478	.62	.97	1.00	1.00	1.00	.74	1.00	1.00	1.00	1.00
	NH3+NH4-	.040	.138	.058	.11	.17	.19	.21	.26	.23	.30	.33	.34	.36
CON0005	NO2-N	.017	.012	.283	.40	.63	.70	.77	.87	.56	.74	.79	.84	.91
	NO3-N	3.200	1.008	.635	.79	1.00	1.00	1.00	1.00	.87	1.00	1.00	1.00	1.00
	TOT KJEL	.550	.225	.489	.63	.99	1.00	1.00	1.00	.75	1.00	1.00	1.00	1.00
	ORTHOPO4	.130	.083	.313	.44	.69	.76	.83	.94	.59	.78	.84	.89	.97
	PHOS-TOT	.160	.163	.196	.30	.47	.52	.57	.65	.46	.60	.65	.68	.74
	TOTAL N	4.521	.880	1.028	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.030	.034	.176	.27	.43	.47	.52	.60	.43	.56	.61	.64	.69
	NO2-N	.021	.016	.262	.38	.60	.66	.72	.82	.53	.71	.76	.81	.87
CON0180	NO3-N	2.505	.826	.607	.76	1.00	1.00	1.00	1.00	.85	1.00	1.00	1.00	1.00
	TOT KJEL	.500	.187	.535	.68	1.00	1.00	1.00	1.00	.79	1.00	1.00	1.00	1.00
	ORTHOPO4	.100	.136	.147	.23	.37	.41	.45	.52	.39	.51	.55	.58	.63
	PHOS-TOT	.160	.128	.250	.36	.57	.63	.69	.79	.52	.69	.74	.78	.85

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.1 Power, 20% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	1.048	.357	.587	.74	1.00	1.00	1.00	1.00	.83	1.00	1.00	1.00	1.00
	ORG N	.300	.599	.100	.17	.27	.30	.32	.39	.31	.41	.45	.46	.50
	NH3+NH4-	.265	.246	.215	.32	.51	.56	.61	.70	.48	.63	.68	.72	.78
GE00009	NO2-N	.010	.012	.167	.26	.41	.45	.49	.58	.42	.55	.59	.62	.67
	NO3-N	.855	.305	.561	.71	1.00	1.00	1.00	1.00	.81	1.00	1.00	1.00	1.00
	TOT KJEL	.600	.583	.206	.31	.49	.54	.59	.68	.47	.62	.67	.70	.76
	ORTHOPO4	.020	.088	.045	.09	.14	.16	.17	.21	.20	.26	.29	.29	.32
	PHOS-TOT	.085	.405	.042	.08	.13	.15	.16	.20	.19	.25	.28	.28	.30
	TOTAL N	2.526	.820	.616	.77	1.00	1.00	1.00	1.00	.86	1.00	1.00	1.00	1.00
	ORG N	.675	.372	.363	.49	.78	.85	.94	1.00	.64	.85	.91	.97	1.00
	NH3+NH4-	.105	.258	.081	.14	.23	.25	.27	.33	.28	.36	.40	.41	.44
MON0020	NO2-N	.031	.026	.238	.35	.55	.61	.66	.76	.51	.67	.72	.76	.83
	NO3-N	2.080	.712	.584	.73	1.00	1.00	1.00	1.00	.83	1.00	1.00	1.00	1.00
	TOT KJEL	.720	.467	.308	.43	.68	.75	.82	.93	.58	.78	.83	.89	.96
	ORTHOPO4	.130	.108	.241	.35	.55	.61	.67	.77	.51	.67	.73	.77	.83
	PHOS-TOT	.180	.156	.231	.34	.54	.59	.65	.74	.50	.66	.71	.75	.81
	TOTAL N	2.402	.904	.531	.68	1.00	1.00	1.00	1.00	.79	1.00	1.00	1.00	1.00
	ORG N	.700	.361	.388	.52	.82	.90	.99	1.00	.66	.88	.94	1.00	1.00
	NH3+NH4-	.200	.451	.089	.15	.24	.27	.29	.36	.29	.38	.42	.43	.47
MON0155	NO2-N	.037	.045	.164	.25	.41	.45	.49	.57	.41	.54	.59	.61	.67
	NO3-N	2.130	.789	.540	.69	1.00	1.00	1.00	1.00	.80	1.00	1.00	1.00	1.00
	TOT KJEL	.920	.533	.345	.47	.75	.82	.90	1.00	.62	.83	.88	.95	1.00
	ORTHOPO4	.170	.121	.281	.40	.63	.69	.76	.86	.55	.74	.79	.84	.91
	PHOS-TOT	.220	.164	.268	.38	.61	.67	.73	.83	.54	.72	.77	.82	.89
	TOTAL N	2.190	.943	.464	.61	.95	1.00	1.00	1.00	.73	.98	1.00	1.00	1.00
	ORG N	.600	.343	.350	.48	.75	.83	.91	1.00	.63	.83	.89	.95	1.00
	NH3+NH4-	.060	.221	.054	.10	.16	.18	.20	.24	.22	.29	.32	.32	.35
MON0269	NO2-N	.017	.023	.148	.23	.37	.41	.45	.53	.39	.51	.56	.58	.63
	NO3-N	1.930	.812	.475	.62	.97	1.00	1.00	1.00	.74	.99	1.00	1.00	1.00
	TOT KJEL	.700	.451	.310	.43	.68	.75	.83	.93	.59	.78	.83	.89	.96
	ORTHOPO4	.095	.099	.192	.29	.46	.51	.55	.64	.45	.59	.64	.67	.73

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.1 Power, 20% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	1.551	1.248	.249	.36	.57	.63	.69	.78	.52	.69	.74	.78	.85
	ORG N	.680	.295	.461	.60	.94	1.00	1.00	1.00	.73	.98	1.00	1.00	1.00
	NH3+NH4-	.080	.400	.040	.08	.13	.14	.15	.19	.19	.24	.27	.27	.29
MON0528	NO2-N	.017	.021	.162	.25	.40	.44	.48	.56	.41	.54	.58	.61	.66
	NO3-N	1.120	1.057	.212	.31	.50	.55	.60	.69	.47	.63	.68	.71	.77
	TOT KJEL	.700	.537	.261	.37	.59	.65	.71	.81	.53	.71	.76	.80	.87
	ORTHOPO4	.150	.147	.204	.31	.48	.53	.58	.67	.47	.61	.66	.70	.76
	PHOS-TOT	.200	.190	.211	.31	.50	.55	.60	.69	.47	.62	.67	.71	.77
	TOTAL N	1.220	.301	.811	.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.070	.052	.269	.38	.61	.67	.73	.83	.54	.72	.77	.82	.89
	NO2-N	.008	.012	.133	.21	.34	.38	.41	.49	.37	.48	.53	.54	.59
NBP0023	NO3-N	.777	.261	.595	.74	1.00	1.00	1.00	1.00	.84	1.00	1.00	1.00	1.00
	TOT KJEL	.500	.181	.552	.70	1.00	1.00	1.00	1.00	.81	1.00	1.00	1.00	1.00
	ORTHOPO4	.027	.020	.270	.39	.61	.67	.74	.84	.54	.72	.77	.82	.89
	PHOS-TOT	.087	.158	.110	.18	.29	.32	.35	.42	.33	.43	.47	.49	.53
	TOTAL N	.927	.317	.585	.73	1.00	1.00	1.00	1.00	.83	1.00	1.00	1.00	1.00
	ORG N	.400	.618	.129	.21	.33	.37	.40	.48	.36	.47	.52	.54	.58
	NH3+NH4-	.120	.123	.195	.29	.47	.51	.56	.65	.45	.60	.65	.68	.74
NBP0103	NO2-N	.009	.063	.029	.06	.10	.11	.11	.15	.16	.20	.23	.22	.24
	NO3-N	.790	.255	.620	.77	1.00	1.00	1.00	1.00	.86	1.00	1.00	1.00	1.00
	TOT KJEL	.500	.547	.183	.28	.44	.49	.53	.62	.44	.58	.62	.65	.71
	ORTHOPO4	.040	.065	.123	.20	.32	.35	.38	.46	.35	.46	.50	.52	.56
	PHOS-TOT	.120	.125	.192	.29	.46	.51	.55	.64	.45	.59	.64	.67	.73
	TOTAL N	.685	.272	.504	.65	1.00	1.00	1.00	1.00	.77	1.00	1.00	1.00	1.00
	ORG N	.435	2.559	.034	.07	.11	.12	.13	.17	.17	.22	.25	.25	.27
	NH3+NH4-	.170	.174	.195	.29	.47	.52	.56	.65	.45	.60	.65	.68	.74
NBP0326	NO2-N	.009	.057	.032	.06	.10	.12	.12	.16	.17	.21	.24	.24	.26
	NO3-N	.575	.297	.387	.52	.82	.90	.99	1.00	.66	.88	.94	1.00	1.00
	TOT KJEL	.600	2.184	.055	.10	.17	.18	.20	.25	.23	.29	.32	.33	.35
	ORTHOPO4	.020	.085	.047	.09	.15	.16	.17	.22	.21	.27	.30	.30	.32
	PHOS-TOT	.095	.101	.188	.29	.45	.50	.55	.63	.44	.59	.63	.66	.72

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.1 Power, 20% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	1.230	.310	.794	.95	1.00	1.00	1.00	1.00	.98	1.00	1.00	1.00	1.00
	NH3+NH4-	.100	.102	.196	.30	.47	.52	.56	.65	.45	.60	.65	.68	.74
	NO2-N	.008	.018	.089	.15	.25	.27	.29	.36	.29	.38	.42	.43	.47
NBP0461	NO3-N	.535	.232	.461	.60	.95	1.00	1.00	1.00	.73	.98	1.00	1.00	1.00
	TOT KJEL	.600	.228	.526	.67	1.00	1.00	1.00	1.00	.78	1.00	1.00	1.00	1.00
	ORTHOPO4	.020	.019	.211	.31	.50	.55	.60	.69	.47	.62	.67	.71	.77
	PHOS-TOT	.090	.100	.180	.27	.44	.48	.53	.61	.43	.57	.62	.65	.70
	TOTAL N	.656	.254	.517	.66	1.00	1.00	1.00	1.00	.78	1.00	1.00	1.00	1.00
	ORG N	.200	.165	.242	.35	.56	.61	.67	.77	.51	.68	.73	.77	.84
	NH3+NH4-	.200	.178	.225	.33	.52	.58	.63	.73	.49	.65	.70	.74	.80
NBP0534	NO2-N	.003	.008	.075	.13	.21	.24	.26	.31	.27	.35	.38	.39	.42
	NO3-N	.570	.272	.419	.56	.87	.96	1.00	1.00	.69	.92	.98	1.00	1.00
	TOT KJEL	.400	.175	.457	.60	.94	1.00	1.00	1.00	.73	.97	1.00	1.00	1.00
	ORTHOPO4	.020	.069	.058	.11	.17	.19	.21	.26	.23	.30	.33	.34	.36
	PHOS-TOT	.035	.590	.012	.03	.05	.05	.06	.08	.10	.12	.14	.13	.15
	TOTAL N	.618	.267	.463	.60	.95	1.00	1.00	1.00	.73	.98	1.00	1.00	1.00
	ORG N	.235	.178	.264	.38	.60	.66	.72	.82	.54	.71	.76	.81	.88
	NH3+NH4-	.200	.207	.193	.29	.46	.51	.56	.65	.45	.59	.64	.68	.73
NBP0689	NO2-N	.003	.013	.046	.09	.14	.16	.17	.21	.20	.26	.29	.29	.32
	NO3-N	.530	.201	.527	.67	1.00	1.00	1.00	1.00	.79	1.00	1.00	1.00	1.00
	TOT KJEL	.450	.180	.500	.64	1.00	1.00	1.00	1.00	.76	1.00	1.00	1.00	1.00
	ORTHOPO4	.020	5.615	.001	.00	.00	.01	.01	.01	.02	.02	.03	.03	.03
	PHOS-TOT	.040	.093	.086	.15	.24	.26	.29	.35	.29	.38	.41	.42	.46
	TOTAL N	1.220	1.082	.226	.33	.53	.58	.63	.73	.49	.65	.70	.74	.80
	ORG N	.630	.367	.343	.47	.74	.82	.90	1.00	.62	.82	.88	.94	1.00
	NH3+NH4-	.040	.095	.084	.15	.23	.26	.28	.34	.29	.37	.41	.42	.45
POT1184	NO2-N	.012	.009	.267	.38	.60	.66	.73	.83	.54	.71	.77	.81	.88
	NO3-N	.900	1.010	.178	.27	.43	.48	.52	.61	.43	.57	.62	.64	.70
	TOT KJEL	.640	.361	.355	.48	.76	.84	.92	1.00	.63	.84	.90	.96	1.00
	ORTHOPO4	.040	.259	.031	.06	.10	.11	.12	.16	.16	.21	.24	.23	.25
	PHOS-TOT	.087	.228	.076	.13	.22	.24	.26	.32	.27	.35	.39	.39	.43

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.1 Power, 20% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	1.950	.758	.515	.66	1.00	1.00	1.00	1.00	.78	1.00	1.00	1.00	1.00
	ORG N	.580	.284	.408	.54	.86	.94	1.00	1.00	.68	.91	.97	1.00	1.00
	NH3+NH4-	.085	.289	.059	.11	.17	.19	.21	.26	.23	.30	.34	.34	.37
POT1471	NO2-N	.018	.012	.300	.42	.66	.73	.80	.91	.58	.76	.82	.87	.95
	NO3-N	1.670	.665	.502	.65	1.00	1.00	1.00	1.00	.76	1.00	1.00	1.00	1.00
	TOT KJEL	.585	.336	.348	.48	.75	.82	.91	1.00	.62	.83	.89	.95	1.00
	ORTHOPO4	.080	.062	.258	.37	.59	.65	.71	.81	.53	.70	.75	.80	.87
	PHOS-TOT	.130	.161	.161	.25	.40	.44	.48	.56	.41	.54	.58	.61	.66
	NO2-N	.008	.005	.320	.44	.70	.77	.85	.95	.60	.79	.85	.90	.98
POT1595	NO3-N	.920	.432	.426	.56	.89	.97	1.00	1.00	.70	.93	.99	1.00	1.00
	TOT KJEL	.470	.164	.573	.72	1.00	1.00	1.00	1.00	.82	1.00	1.00	1.00	1.00
	PHOS-TOT	.080	.052	.308	.43	.68	.75	.82	.92	.58	.77	.83	.88	.96
	NO2-N	.010	.038	.053	.10	.16	.18	.19	.24	.22	.28	.32	.32	.34
POT1830	NO3-N	.950	.650	.292	.41	.65	.72	.79	.89	.57	.75	.81	.86	.93
	TOT KJEL	.425	.231	.368	.50	.79	.86	.95	1.00	.64	.86	.92	.98	1.00
	PHOS-TOT	.050	.085	.118	.19	.31	.34	.37	.44	.34	.45	.49	.51	.55
	NO2-N	.006	.045	.027	.06	.09	.10	.11	.14	.15	.19	.22	.21	.23
POT2386	NO3-N	.525	.959	.109	.18	.29	.32	.35	.42	.33	.43	.47	.49	.53
	PHOS-TOT	.050	.272	.037	.07	.12	.13	.14	.18	.18	.23	.26	.26	.28
	NO2-N	.005	.075	.013	.03	.05	.06	.06	.08	.10	.13	.15	.14	.16
POT2766	NO3-N	.570	.334	.341	.47	.74	.81	.89	1.00	.62	.82	.88	.94	1.00
	PHOS-TOT	.050	.140	.071	.13	.20	.23	.25	.30	.26	.34	.37	.38	.41

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.1 Power, 20% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	NO2-N	.019	.026	.146	.23	.37	.41	.44	.52	.39	.51	.55	.57	.62
RCM0111	NO3-N	1.010	.566	.357	.49	.77	.84	.93	1.00	.63	.84	.90	.96	1.00
	TOT KJEL	.430	.372	.231	.34	.54	.59	.65	.74	.50	.66	.71	.75	.81
	PHOS-TOT	.080	.064	.250	.36	.57	.63	.69	.79	.52	.69	.74	.78	.85
	NO2-N	.003	.036	.017	.04	.06	.07	.07	.10	.12	.15	.17	.16	.18
SAV0000	NO3-N	.630	.179	.704	.86	1.00	1.00	1.00	1.00	.92	1.00	1.00	1.00	1.00
	PHOS-TOT	.020	.043	.093	.16	.25	.28	.30	.37	.30	.39	.43	.44	.48
	NO2-N	.009	.016	.112	.19	.30	.33	.36	.43	.33	.44	.48	.49	.54
SEN0008	NO3-N	1.935	.620	.624	.77	1.00	1.00	1.00	1.00	.86	1.00	1.00	1.00	1.00
	TOT KJEL	.395	.468	.169	.26	.41	.46	.50	.58	.42	.55	.60	.62	.68
	PHOS-TOT	.080	.131	.122	.20	.32	.35	.38	.45	.35	.46	.50	.52	.56
	NO2-N	.002	.030	.013	.03	.05	.06	.06	.08	.10	.13	.15	.14	.16
TOW0030	NO3-N	.320	.187	.342	.47	.74	.81	.89	1.00	.62	.82	.88	.94	1.00
	PHOS-TOT	.020	.086	.047	.09	.14	.16	.17	.22	.21	.26	.30	.30	.32
	NO2-N	.004	.012	.067	.12	.19	.21	.23	.29	.25	.32	.36	.36	.39
WIL0013	NO3-N	.660	.351	.376	.51	.80	.88	.97	1.00	.65	.87	.93	.99	1.00
	PHOS-TOT	.043	.117	.074	.13	.21	.23	.25	.31	.26	.34	.38	.39	.42

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.2 Power, 40% Reduction in 1985 Median Concentrations

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	.880	1.500	.237	.35	.55	.60	.66	.76	.50	.67	.72	.76	.82
	ORG N	.640	.483	.530	.68	1.00	1.00	1.00	1.00	.79	1.00	1.00	1.00	1.00
	NH3+NH4-	.100	.473	.085	.15	.24	.26	.28	.34	.29	.37	.41	.42	.45
ANA0082	NO2-N	.018	.039	.185	.28	.45	.49	.54	.62	.44	.58	.63	.66	.71
	NO3-N	.700	1.231	.227	.33	.53	.58	.64	.73	.49	.65	.70	.74	.81
	TOT KJEL	.670	.540	.496	.64	1.00	1.00	1.00	1.00	.76	1.00	1.00	1.00	1.00
	ORTHOPO4	.020	.087	.092	.16	.25	.28	.30	.37	.30	.39	.43	.44	.48
	PHOS-TOT	.070	.101	.277	.39	.62	.69	.75	.85	.55	.73	.78	.83	.90
	TOTAL N	5.040	.917	2.198	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.060	.060	.400	.53	.84	.92	1.00	1.00	.67	.90	.96	1.00	1.00
ANT0044	NO2-N	.032	.050	.256	.37	.58	.64	.70	.80	.53	.70	.75	.79	.86
	NO3-N	3.280	.927	1.415	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.560	.315	.711	.86	1.00	1.00	1.00	1.00	.93	1.00	1.00	1.00	1.00
	ORTHOPO4	.200	.135	.593	.74	1.00	1.00	1.00	1.00	.84	1.00	1.00	1.00	1.00
	TOTAL N	4.702	1.269	1.482	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORG N	.620	.431	.575	.72	1.00	1.00	1.00	1.00	.82	1.00	1.00	1.00	1.00
	NO2-N	.060	.072	.333	.46	.72	.80	.88	.98	.61	.81	.87	.93	1.00
ANT0203	NO3-N	3.730	1.139	1.310	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.850	.643	.529	.67	1.00	1.00	1.00	1.00	.79	1.00	1.00	1.00	1.00
	ORTHOPO4	.275	.336	.327	.45	.71	.78	.86	.97	.60	.80	.86	.92	.99
	PHOS-TOT	.340	.383	.355	.48	.76	.84	.92	1.00	.63	.84	.90	.96	1.00
	TOTAL N	4.540	1.229	1.478	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.300	.174	.690	.84	1.00	1.00	1.00	1.00	.91	1.00	1.00	1.00	1.00
	NO2-N	.042	.073	.230	.34	.53	.59	.64	.74	.50	.66	.71	.75	.81
ANT0366	NO3-N	2.410	.957	1.007	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.805	.232	1.388	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORTHOPO4	.195	.089	.876	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	PHOS-TOT	.205	.119	.689	.84	1.00	1.00	1.00	1.00	.91	1.00	1.00	1.00	1.00

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.2 Power, 40% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	.595	.622	.383	.52	.81	.89	.98	1.00	.66	.88	.94	1.00	1.00
	NH3+NH4-	.030	.074	.162	.25	.40	.44	.48	.56	.41	.54	.59	.61	.66
BDK0000	NO2-N	.006	.010	.240	.35	.55	.61	.67	.76	.51	.67	.72	.77	.83
	NO3-N	.380	.384	.396	.53	.83	.92	1.00	1.00	.67	.89	.95	1.00	1.00
	TOT KJEL	.300	.294	.408	.54	.86	.94	1.00	1.00	.68	.91	.97	1.00	1.00
	TOTAL N	3.180	.979	1.299	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.030	.075	.160	.25	.40	.44	.48	.56	.41	.53	.58	.61	.66
BPC0035	TOT KJEL	.500	.404	.495	.64	1.00	1.00	1.00	1.00	.76	1.00	1.00	1.00	1.00
	ORTHOPO4	.025	.054	.185	.28	.45	.49	.54	.63	.44	.58	.63	.66	.71
	PHOS-TOT	.070	.097	.289	.41	.64	.71	.78	.88	.56	.75	.80	.85	.92
	TOTAL N	1.730	1.028	.673	.83	1.00	1.00	1.00	1.00	.90	1.00	1.00	1.00	1.00
	NH3+NH4-	.045	.050	.360	.49	.77	.85	.93	1.00	.64	.85	.90	.97	1.00
CAC0031	NO2-N	.010	.113	.035	.07	.12	.13	.14	.18	.18	.23	.25	.25	.27
	NO3-N	1.030	.712	.579	.73	1.00	1.00	1.00	1.00	.83	1.00	1.00	1.00	1.00
	TOT KJEL	.405	.248	.653	.80	1.00	1.00	1.00	1.00	.88	1.00	1.00	1.00	1.00
	ORTHOPO4	.060	.036	.667	.82	1.00	1.00	1.00	1.00	.89	1.00	1.00	1.00	1.00
	PHOS-TOT	.090	.087	.414	.55	.86	.95	1.00	1.00	.69	.92	.98	1.00	1.00
	TOTAL N	1.452	.665	.873	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.070	.056	.500	.64	1.00	1.00	1.00	1.00	.76	1.00	1.00	1.00	1.00
	NO2-N	.013	.024	.217	.32	.51	.56	.61	.71	.48	.63	.69	.72	.78
CAC0148	NO3-N	.840	.517	.650	.80	1.00	1.00	1.00	1.00	.88	1.00	1.00	1.00	1.00
	TOT KJEL	.485	.274	.708	.86	1.00	1.00	1.00	1.00	.92	1.00	1.00	1.00	1.00
	ORTHOPO4	.050	.098	.204	.31	.48	.53	.58	.67	.47	.61	.66	.70	.76
	PHOS-TOT	.115	.112	.411	.55	.86	.94	1.00	1.00	.68	.91	.97	1.00	1.00

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.2 Power, 40% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	1.382	.531	1.041	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.020	.027	.296	.42	.66	.72	.79	.90	.57	.76	.81	.86	.94
	NO2-N	.006	.011	.218	.32	.51	.56	.62	.71	.48	.64	.69	.72	.79
CJB0005	NO3-N	.760	.344	.884	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.350	.207	.676	.83	1.00	1.00	1.00	1.00	.90	1.00	1.00	1.00	1.00
	ORTHOPO4	.010	.014	.286	.40	.64	.70	.77	.87	.56	.74	.80	.85	.92
	PHOS-TOT	.040	.061	.262	.38	.60	.65	.72	.82	.53	.71	.76	.81	.87
	TOTAL N	3.900	1.033	1.510	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORG N	.485	.203	.956	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.040	.138	.116	.19	.30	.34	.37	.44	.34	.44	.49	.50	.54
CON0005	NO2-N	.017	.012	.567	.71	1.00	1.00	1.00	1.00	.82	1.00	1.00	1.00	1.00
	NO3-N	3.200	1.008	1.270	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.550	.225	.978	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORTHOPO4	.130	.083	.627	.78	1.00	1.00	1.00	1.00	.86	1.00	1.00	1.00	1.00
	PHOS-TOT	.160	.163	.393	.53	.83	.91	1.00	1.00	.67	.89	.95	1.00	1.00
	TOTAL N	4.521	.880	2.055	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.030	.034	.353	.48	.76	.83	.92	1.00	.63	.84	.89	.96	1.00
	NO2-N	.021	.016	.525	.67	1.00	1.00	1.00	1.00	.78	1.00	1.00	1.00	1.00
CON0180	NO3-N	2.505	.826	1.213	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.500	.187	1.070	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORTHOPO4	.100	.136	.294	.41	.65	.72	.79	.89	.57	.76	.81	.86	.93
	PHOS-TOT	.160	.128	.500	.64	1.00	1.00	1.00	1.00	.76	1.00	1.00	1.00	1.00

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.2 Power, 40% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	1.048	.357	1.174	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORG N	.300	.599	.200	.30	.48	.53	.57	.66	.46	.61	.66	.69	.75
	NH3+NH4-	.265	.246	.431	.57	.89	.98	1.00	1.00	.70	.94	1.00	1.00	1.00
GEO0009	NO2-N	.010	.012	.333	.46	.72	.80	.88	.98	.61	.81	.87	.93	1.00
	NO3-N	.855	.305	1.121	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.600	.583	.412	.55	.86	.94	1.00	1.00	.69	.91	.97	1.00	1.00
	ORTHOPO4	.020	.088	.091	.16	.25	.28	.30	.36	.30	.39	.43	.44	.47
	PHOS-TOT	.085	.405	.084	.15	.23	.26	.28	.34	.28	.37	.41	.42	.45
	TOTAL N	2.526	.820	1.232	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORG N	.675	.372	.726	.88	1.00	1.00	1.00	1.00	.94	1.00	1.00	1.00	1.00
	NH3+NH4-	.105	.258	.163	.25	.40	.44	.48	.57	.41	.54	.59	.61	.66
MON0020	NO2-N	.031	.026	.477	.62	.97	1.00	1.00	1.00	.74	.99	1.00	1.00	1.00
	NO3-N	2.080	.712	1.169	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.720	.467	.617	.77	1.00	1.00	1.00	1.00	.86	1.00	1.00	1.00	1.00
	ORTHOPO4	.130	.108	.481	.62	.98	1.00	1.00	1.00	.75	1.00	1.00	1.00	1.00
	PHOS-TOT	.180	.156	.462	.60	.95	1.00	1.00	1.00	.73	.98	1.00	1.00	1.00
	TOTAL N	2.402	.904	1.063	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORG N	.700	.361	.776	.93	1.00	1.00	1.00	1.00	.97	1.00	1.00	1.00	1.00
	NH3+NH4-	.200	.451	.177	.27	.43	.48	.52	.61	.43	.57	.61	.64	.70
MON0155	NO2-N	.037	.045	.329	.45	.72	.79	.87	.97	.61	.80	.86	.92	1.00
	NO3-N	2.130	.789	1.080	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.920	.533	.690	.84	1.00	1.00	1.00	1.00	.91	1.00	1.00	1.00	1.00
	ORTHOPO4	.170	.121	.562	.71	1.00	1.00	1.00	1.00	.81	1.00	1.00	1.00	1.00
	PHOS-TOT	.220	.164	.537	.68	1.00	1.00	1.00	1.00	.79	1.00	1.00	1.00	1.00
	TOTAL N	2.190	.943	.929	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORG N	.600	.343	.700	.85	1.00	1.00	1.00	1.00	.92	1.00	1.00	1.00	1.00
	NH3+NH4-	.060	.221	.109	.18	.29	.32	.35	.42	.33	.43	.47	.48	.52
MON0269	NO2-N	.017	.023	.296	.42	.66	.72	.79	.90	.57	.76	.81	.86	.94
	NO3-N	1.930	.812	.951	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.700	.451	.621	.77	1.00	1.00	1.00	1.00	.86	1.00	1.00	1.00	1.00
	ORTHOPO4	.095	.099	.384	.52	.81	.89	.98	1.00	.66	.88	.94	1.00	1.00

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.2 Power, 40% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
MON0528	TOTAL N	1.551	1.248	.497	.64	1.00	1.00	1.00	1.00	.76	1.00	1.00	1.00	1.00
	ORG N	.680	.295	.922	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.080	.400	.080	.14	.22	.25	.27	.33	.28	.36	.40	.40	.44
	NO2-N	.017	.021	.324	.45	.71	.78	.85	.96	.60	.80	.85	.91	.99
	NO3-N	1.120	1.057	.424	.56	.88	.97	1.00	1.00	.70	.93	.99	1.00	1.00
	TOT KJEL	.700	.537	.521	.67	1.00	1.00	1.00	1.00	.78	1.00	1.00	1.00	1.00
	ORTHOPO4	.150	.147	.408	.54	.86	.94	1.00	1.00	.68	.91	.97	1.00	1.00
	PHOS-TOT	.200	.190	.421	.56	.88	.96	1.00	1.00	.69	.93	.99	1.00	1.00
NBP0023	TOTAL N	1.220	.301	1.621	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.070	.052	.538	.68	1.00	1.00	1.00	1.00	.79	1.00	1.00	1.00	1.00
	NO2-N	.008	.012	.267	.38	.60	.66	.73	.83	.54	.71	.77	.81	.88
	NO3-N	.777	.261	1.191	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.500	.181	1.105	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORTHOPO4	.027	.020	.540	.69	1.00	1.00	1.00	1.00	.80	1.00	1.00	1.00	1.00
	PHOS-TOT	.087	.158	.220	.33	.52	.57	.62	.71	.49	.64	.69	.73	.79
NBP0103	TOTAL N	.927	.317	1.170	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORG N	.400	.618	.259	.37	.59	.65	.71	.81	.53	.70	.76	.80	.87
	NH3+NH4-	.120	.123	.390	.52	.82	.90	1.00	1.00	.67	.89	.95	1.00	1.00
	NO2-N	.009	.063	.057	.11	.17	.19	.20	.25	.23	.30	.33	.33	.36
	NO3-N	.790	.255	1.239	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.500	.547	.366	.50	.78	.86	.94	1.00	.64	.85	.91	.98	1.00
	ORTHOPO4	.040	.065	.246	.36	.56	.62	.68	.78	.52	.68	.74	.78	.84
	PHOS-TOT	.120	.125	.384	.52	.81	.89	.98	1.00	.66	.88	.94	1.00	1.00
NBP0326	TOTAL N	.685	.272	1.007	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORG N	.435	2.559	.068	.12	.20	.22	.24	.29	.25	.33	.36	.37	.40
	NH3+NH4-	.170	.174	.391	.52	.83	.91	1.00	1.00	.67	.89	.95	1.00	1.00
	NO2-N	.009	.057	.063	.11	.19	.21	.22	.27	.24	.31	.35	.35	.38
	NO3-N	.575	.297	.774	.93	1.00	1.00	1.00	1.00	.97	1.00	1.00	1.00	1.00
	TOT KJEL	.600	2.184	.110	.18	.29	.32	.35	.42	.33	.43	.47	.49	.53
	ORTHOPO4	.020	.085	.094	.16	.26	.28	.31	.37	.30	.39	.43	.44	.48
	PHOS-TOT	.095	.101	.376	.51	.80	.88	.97	1.00	.65	.87	.93	.99	1.00

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.2 Power, 40% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	1.230	.310	1.587	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.100	.102	.392	.53	.83	.91	1.00	1.00	.67	.89	.95	1.00	1.00
NBP0461	NO2-N	.008	.018	.178	.27	.43	.48	.52	.61	.43	.57	.62	.64	.70
	NO3-N	.535	.232	.922	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.600	.228	1.053	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORTHOPO4	.020	.019	.421	.56	.88	.96	1.00	1.00	.69	.93	.99	1.00	1.00
	PHOS-TOT	.090	.100	.360	.49	.77	.85	.93	1.00	.64	.85	.90	.97	1.00
	TOTAL N	.656	.254	1.033	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORG N	.200	.165	.485	.63	.98	1.00	1.00	1.00	.75	1.00	1.00	1.00	1.00
	NH3+NH4-	.200	.178	.449	.59	.93	1.00	1.00	1.00	.72	.96	1.00	1.00	1.00
NBP0534	NO2-N	.003	.008	.150	.24	.38	.42	.45	.53	.39	.51	.56	.58	.63
	NO3-N	.570	.272	.838	.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.400	.175	.914	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORTHOPO4	.020	.069	.116	.19	.30	.34	.37	.44	.34	.44	.49	.50	.54
	PHOS-TOT	.035	.590	.024	.05	.08	.09	.10	.13	.14	.18	.20	.20	.22
	TOTAL N	.618	.267	.926	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORG N	.235	.178	.528	.67	1.00	1.00	1.00	1.00	.79	1.00	1.00	1.00	1.00
	NH3+NH4-	.200	.207	.386	.52	.82	.90	.99	1.00	.66	.88	.94	1.00	1.00
NBP0689	NO2-N	.003	.013	.092	.16	.25	.28	.30	.37	.30	.39	.43	.44	.48
	NO3-N	.530	.201	1.055	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.450	.180	1.000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORTHOPO4	.020	5.615	.001	.00	.01	.01	.01	.01	.03	.04	.04	.04	.04
	PHOS-TOT	.040	.093	.172	.26	.42	.46	.51	.59	.42	.56	.60	.63	.68
	TOTAL N	1.220	1.082	.451	.59	.93	1.00	1.00	1.00	.72	.96	1.00	1.00	1.00
	ORG N	.630	.367	.687	.84	1.00	1.00	1.00	1.00	.91	1.00	1.00	1.00	1.00
	NH3+NH4-	.040	.095	.168	.26	.41	.46	.50	.58	.42	.55	.60	.62	.68
POT1184	NO2-N	.012	.009	.533	.68	1.00	1.00	1.00	1.00	.79	1.00	1.00	1.00	1.00
	NO3-N	.900	1.010	.356	.49	.77	.84	.93	1.00	.63	.84	.90	.96	1.00
	TOT KJEL	.640	.361	.709	.86	1.00	1.00	1.00	1.00	.93	1.00	1.00	1.00	1.00
	ORTHOPO4	.040	.259	.062	.11	.18	.20	.22	.27	.24	.31	.35	.35	.38
	PHOS-TOT	.087	.228	.153	.24	.38	.42	.46	.54	.40	.52	.57	.59	.64

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

Table B.2 Power, 40% Reduction in 1985 Median Concentrations (Continued)

Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
	TOTAL N	1.950	.758	1.029	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ORG N	.580	.284	.817	.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	NH3+NH4-	.085	.289	.118	.19	.31	.34	.37	.44	.34	.45	.49	.51	.55
POT1471	NO2-N	.018	.012	.600	.75	1.00	1.00	1.00	1.00	.84	1.00	1.00	1.00	1.00
	NO3-N	1.670	.665	1.005	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.585	.336	.696	.85	1.00	1.00	1.00	1.00	.92	1.00	1.00	1.00	1.00
	ORTHOPO4	.080	.062	.516	.66	1.00	1.00	1.00	1.00	.78	1.00	1.00	1.00	1.00
	PHOS-TOT	.130	.161	.323	.45	.71	.78	.85	.96	.60	.80	.85	.91	.99
	NO2-N	.008	.005	.640	.79	1.00	1.00	1.00	1.00	.87	1.00	1.00	1.00	1.00
POT1595	NO3-N	.920	.432	.852	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.470	.164	1.146	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	PHOS-TOT	.080	.052	.615	.77	1.00	1.00	1.00	1.00	.86	1.00	1.00	1.00	1.00
	NO2-N	.010	.038	.105	.18	.28	.31	.34	.41	.32	.42	.46	.47	.51
POT1830	NO3-N	.950	.650	.585	.73	1.00	1.00	1.00	1.00	.83	1.00	1.00	1.00	1.00
	TOT KJEL	.425	.231	.736	.89	1.00	1.00	1.00	1.00	.94	1.00	1.00	1.00	1.00
	PHOS-TOT	.050	.085	.235	.34	.54	.60	.66	.75	.50	.67	.72	.76	.82
	NO2-N	.006	.045	.053	.10	.16	.18	.19	.24	.22	.29	.32	.32	.35
POT2386	NO3-N	.525	.959	.219	.32	.51	.57	.62	.71	.48	.64	.69	.73	.79
	PHOS-TOT	.050	.272	.074	.13	.21	.23	.25	.31	.26	.34	.38	.39	.42
	NO2-N	.005	.075	.027	.06	.09	.10	.11	.14	.15	.19	.22	.21	.23
POT2766	NO3-N	.570	.334	.683	.83	1.00	1.00	1.00	1.00	.91	1.00	1.00	1.00	1.00
	PHOS-TOT	.050	.140	.143	.23	.36	.40	.43	.51	.38	.50	.55	.57	.61

Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

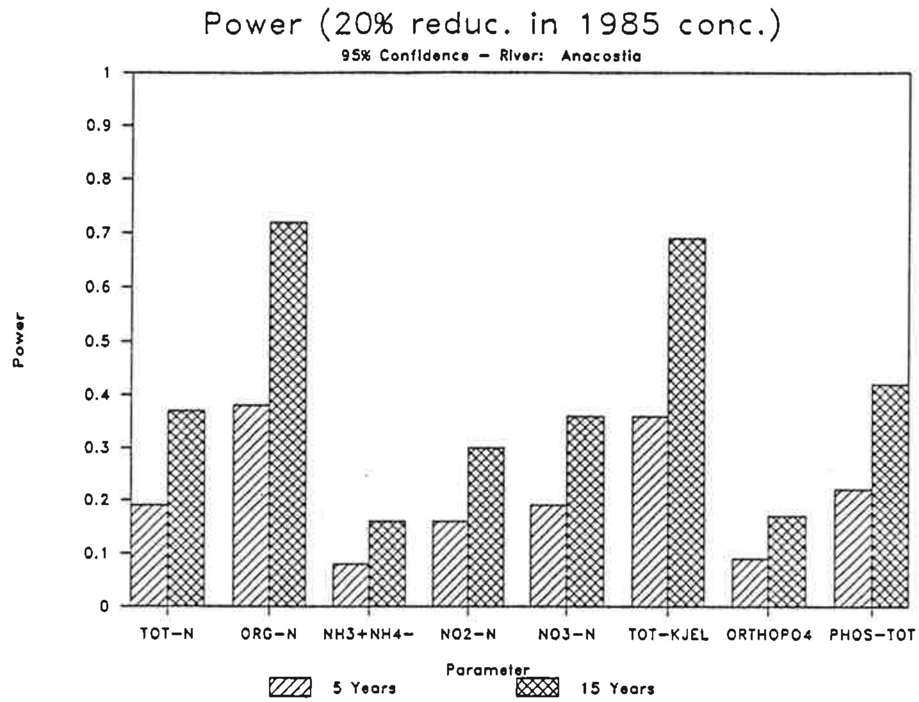
Table B.2 Power, 40% Reduction in 1985 Median Concentrations (Continued)

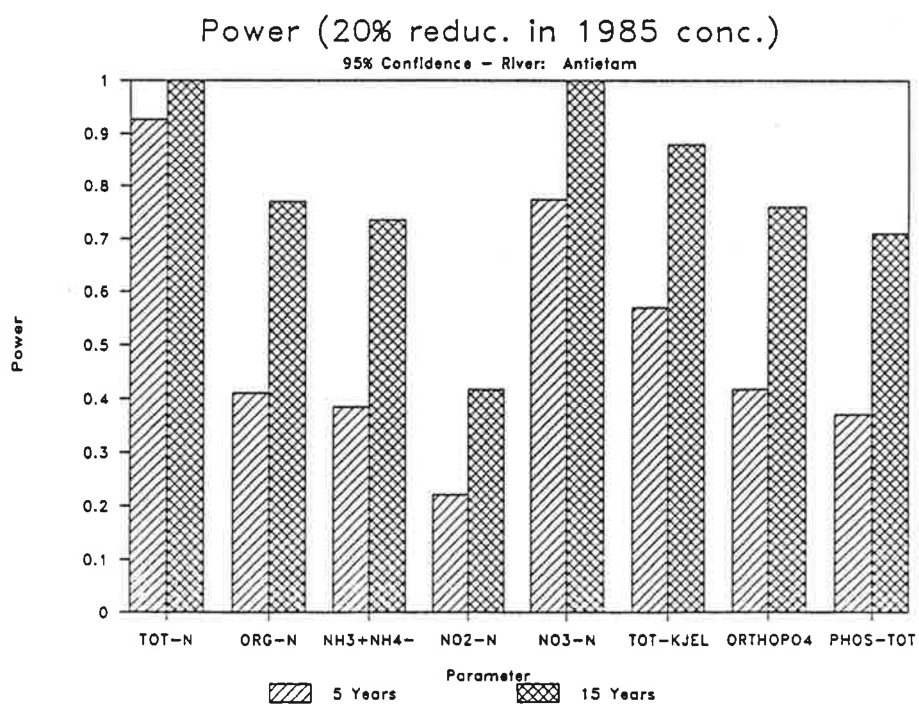
Station	Parameter	Median Conc.	Stdev	T/Stdev	Years (95% Confidence) 5	10	12	15	20	Years (90% Confidence) 5	10	12	15	20
RCM0111	NO2-N	.019	.026	.292	.41	.65	.72	.79	.89	.57	.75	.81	.86	.93
	NO3-N	1.010	.566	.714	.87	1.00	1.00	1.00	1.00	.93	1.00	1.00	1.00	1.00
	TOT KJEL	.430	.372	.462	.60	.95	1.00	1.00	1.00	.73	.98	1.00	1.00	1.00
	PHOS-TOT	.080	.064	.500	.64	1.00	1.00	1.00	1.00	.76	1.00	1.00	1.00	1.00
SAV0000	NO2-N	.003	.036	.033	.07	.11	.12	.13	.17	.17	.22	.25	.24	.26
	NO3-N	.630	.179	1.408	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	PHOS-TOT	.020	.043	.186	.28	.45	.50	.54	.63	.44	.58	.63	.66	.72
SEN0008	NO2-N	.009	.016	.225	.33	.52	.58	.63	.73	.49	.65	.70	.74	.80
	NO3-N	1.935	.620	1.248	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	TOT KJEL	.395	.468	.338	.46	.73	.80	.88	.99	.61	.82	.87	.93	1.00
	PHOS-TOT	.080	.131	.244	.35	.56	.62	.68	.77	.51	.68	.73	.77	.84
TOW0030	NO2-N	.002	.030	.027	.06	.09	.10	.11	.14	.15	.19	.22	.21	.23
	NO3-N	.320	.187	.684	.84	1.00	1.00	1.00	1.00	.91	1.00	1.00	1.00	1.00
	PHOS-TOT	.020	.086	.093	.16	.25	.28	.30	.37	.30	.39	.43	.44	.48
WIL0013	NO2-N	.004	.012	.133	.21	.34	.38	.41	.49	.37	.48	.53	.54	.59
	NO3-N	.660	.351	.752	.91	1.00	1.00	1.00	1.00	.96	1.00	1.00	1.00	1.00
	PHOS-TOT	.043	.117	.147	.23	.37	.41	.44	.52	.39	.51	.55	.58	.62

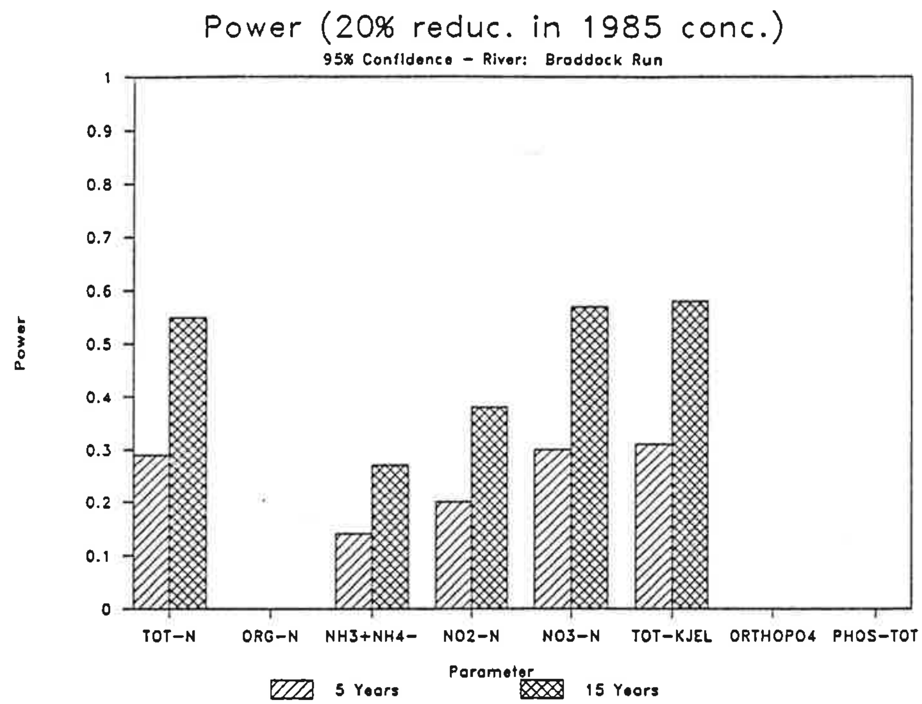
Stdev= residual standard deviation
T/Stdev=Trend magnitude to standard deviation ratio

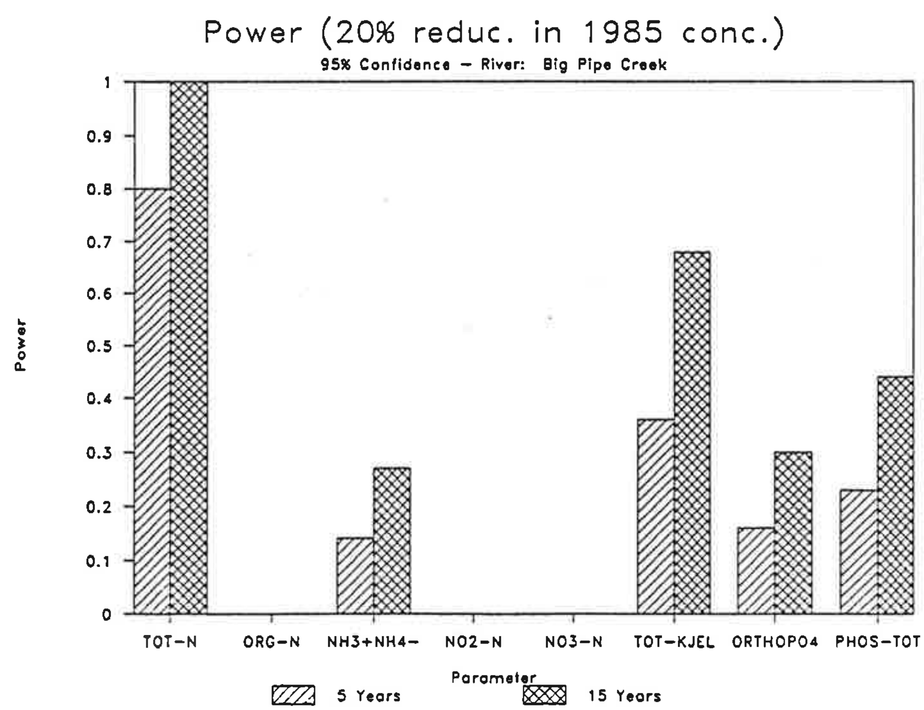
Appendix C

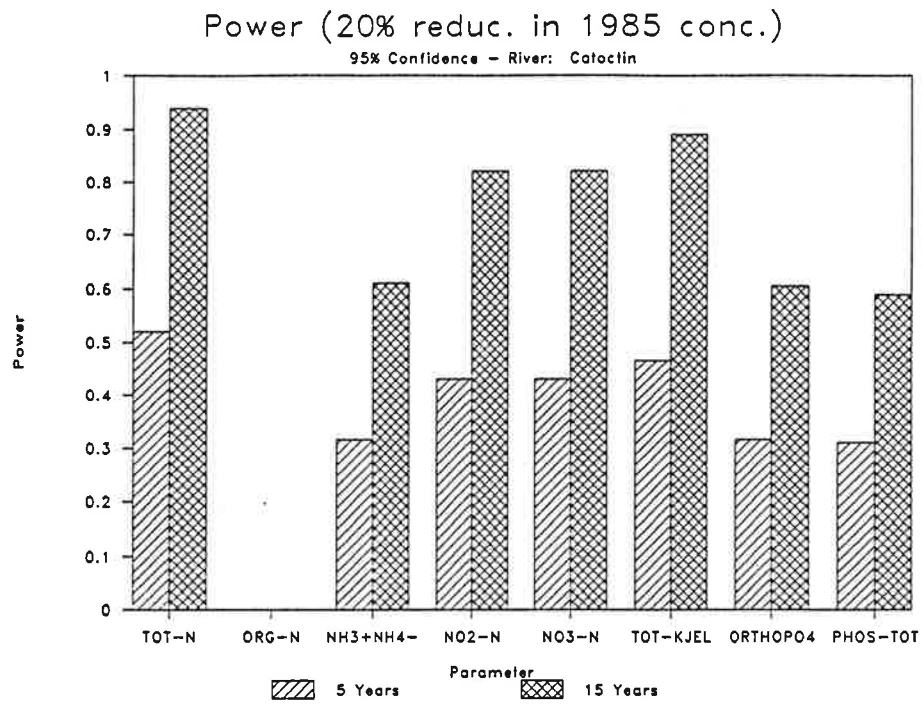
Average Power Along Streams

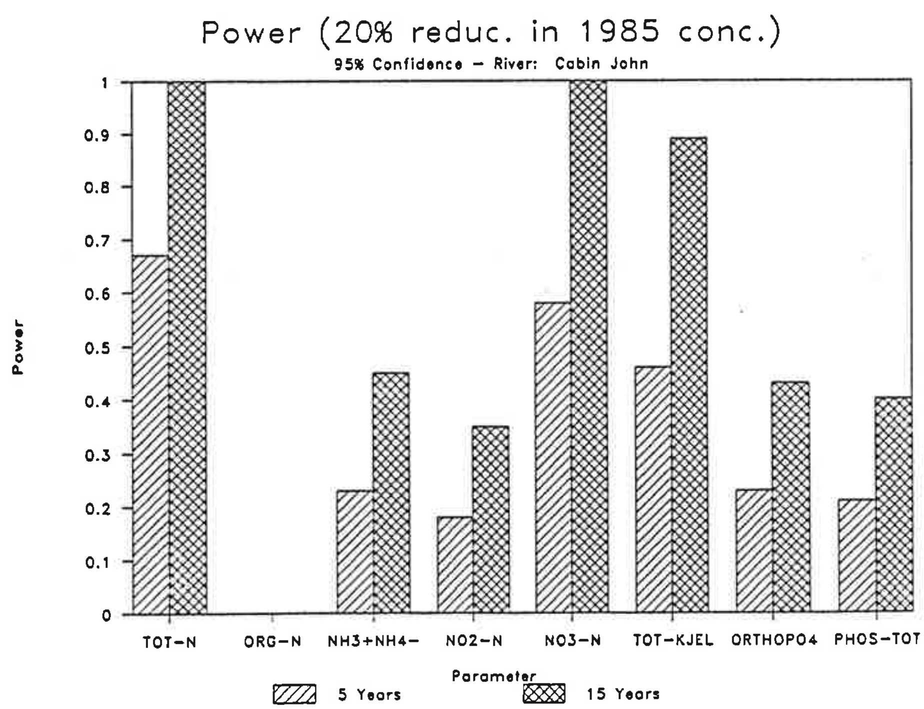

Power (20% reduc. in 1985 conc.)
95% Confidence - River: Anacostia
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

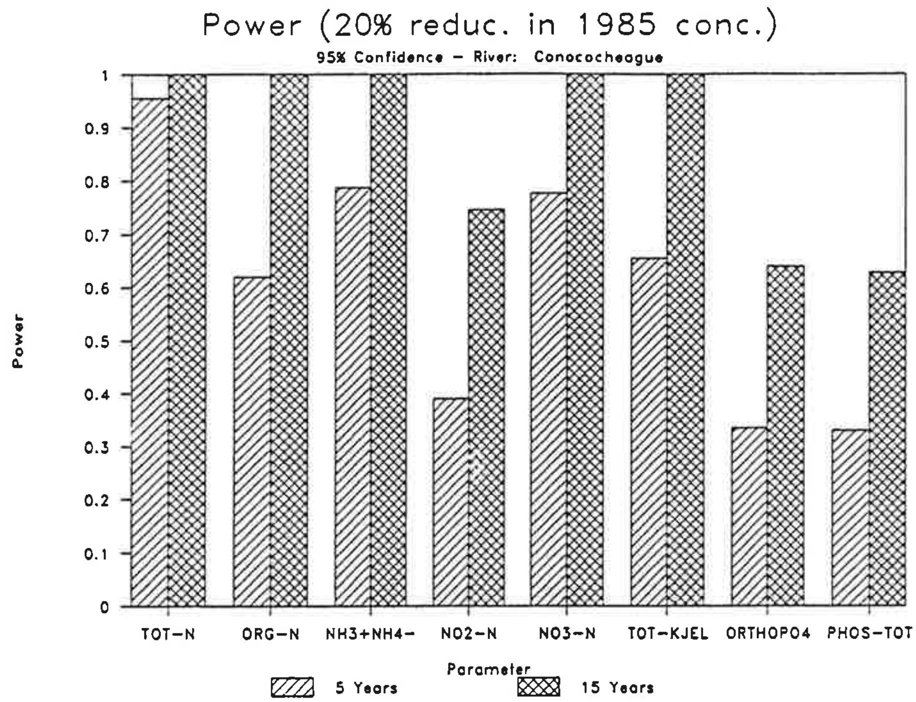

Power (20% reduc. in 1985 conc.)
95% Confidence - River: Antietam
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years


Power (20% reduc. in 1985 conc.)
95% Confidence - River: Braddock Run
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

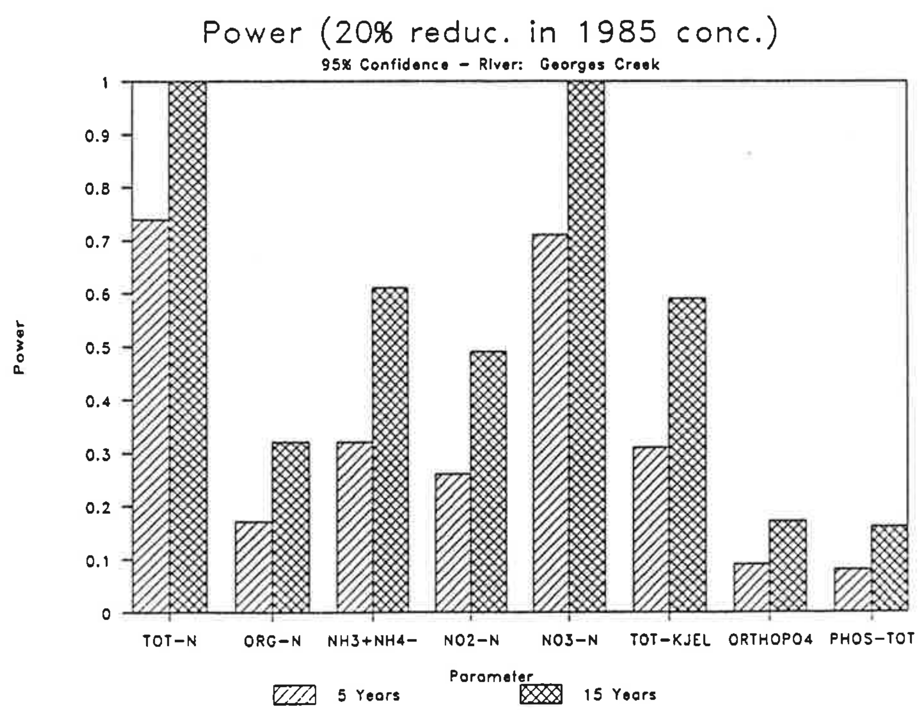

Power (20% reduc. in 1985 conc.)
95% Confidence - River: Big Pipe Creek
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years


Power (20% reduc. in 1985 conc.)
95% Confidence – River: Catoctin
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT–N
ORG–N
NH3+NH4–
NO2–N
NO3–N
TOT–KJEL
ORTHOPO4
PHOS–TOT
Parameter
5 Years
15 Years

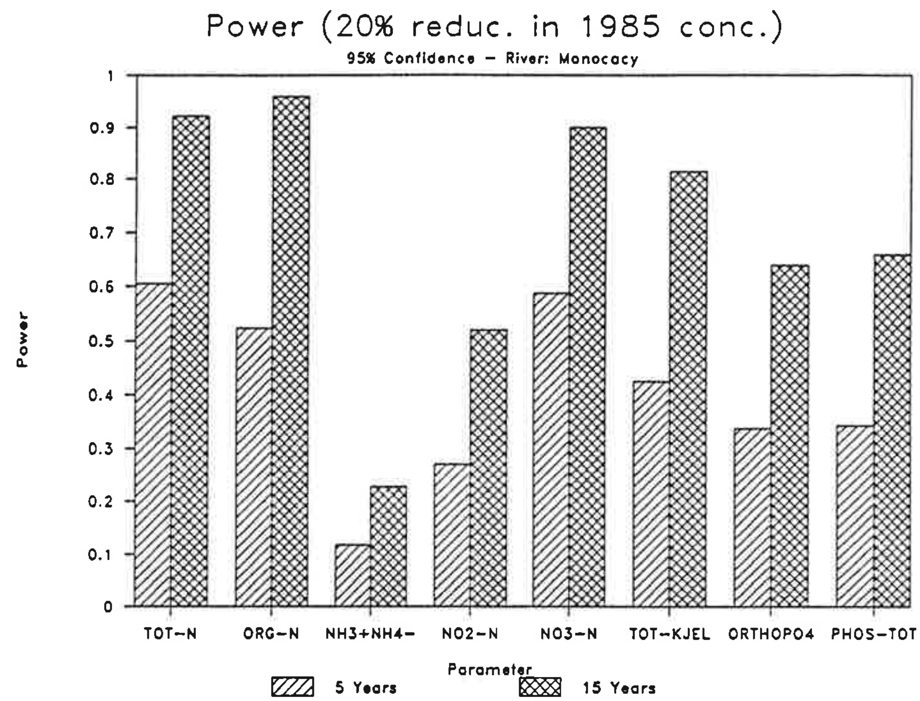

Power (20% reduc. in 1985 conc.)
95% Confidence – River: Cabin John
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT–N
ORG–N
NH3+NH4–
NO2–N
NO3–N
TOT–KJEL
ORTHOPO4
PHOS–TOT
Parameter
5 Years
15 Years

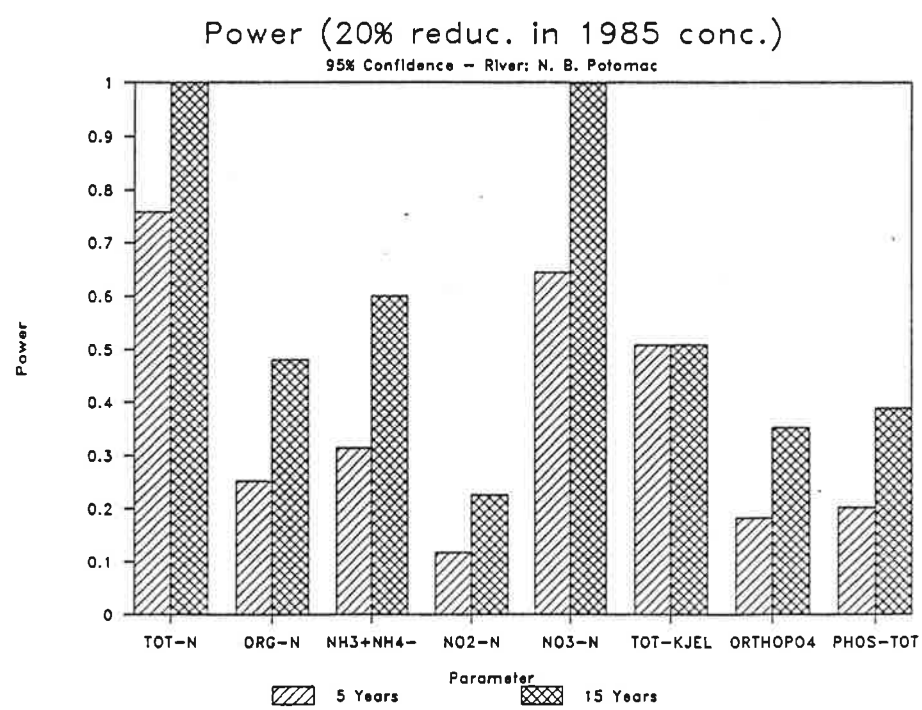


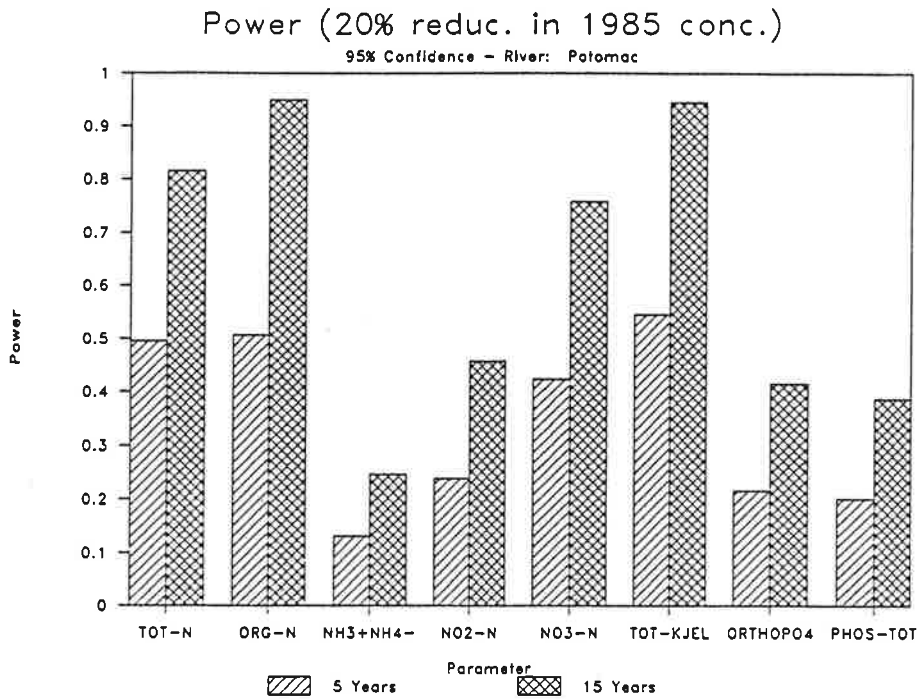
Power (20% reduc. in 1985 conc.)
95% Confidence - River: Conococheague
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

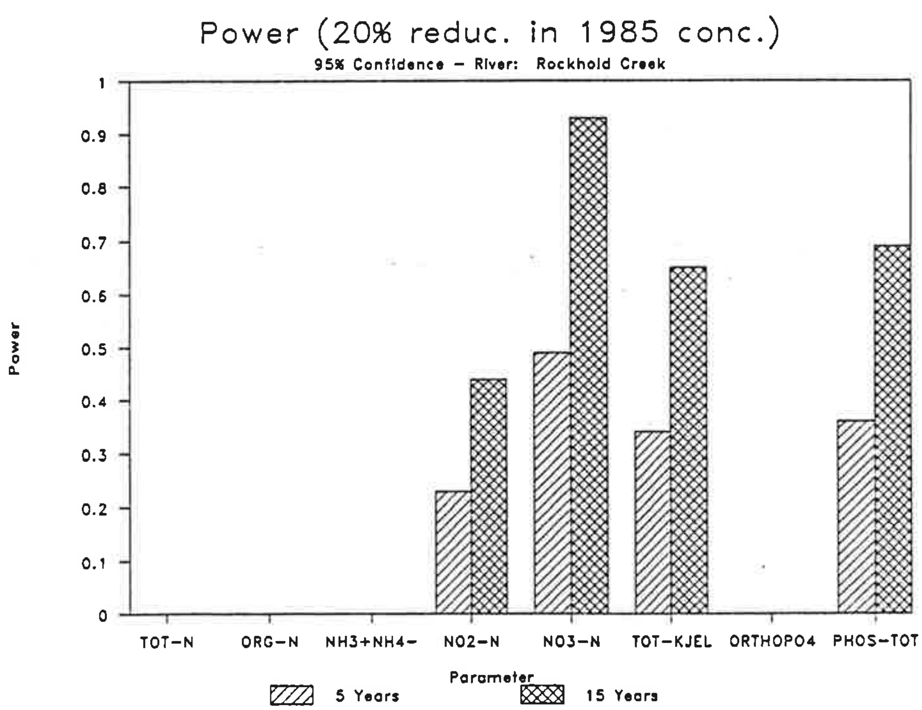


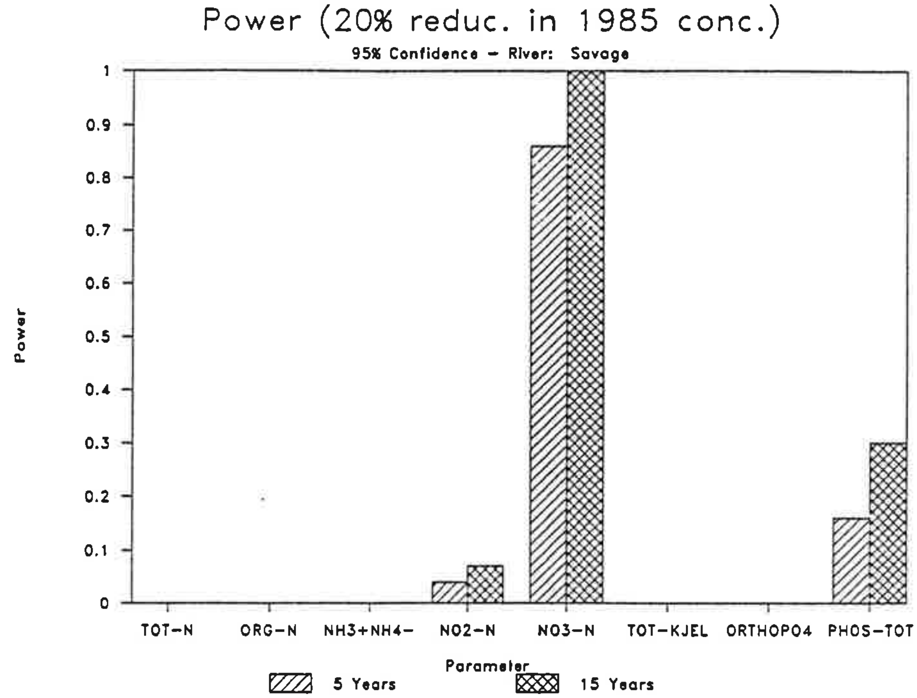
Power (20% reduc. in 1985 conc.)
95% Confidence - River: Georges Creek
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

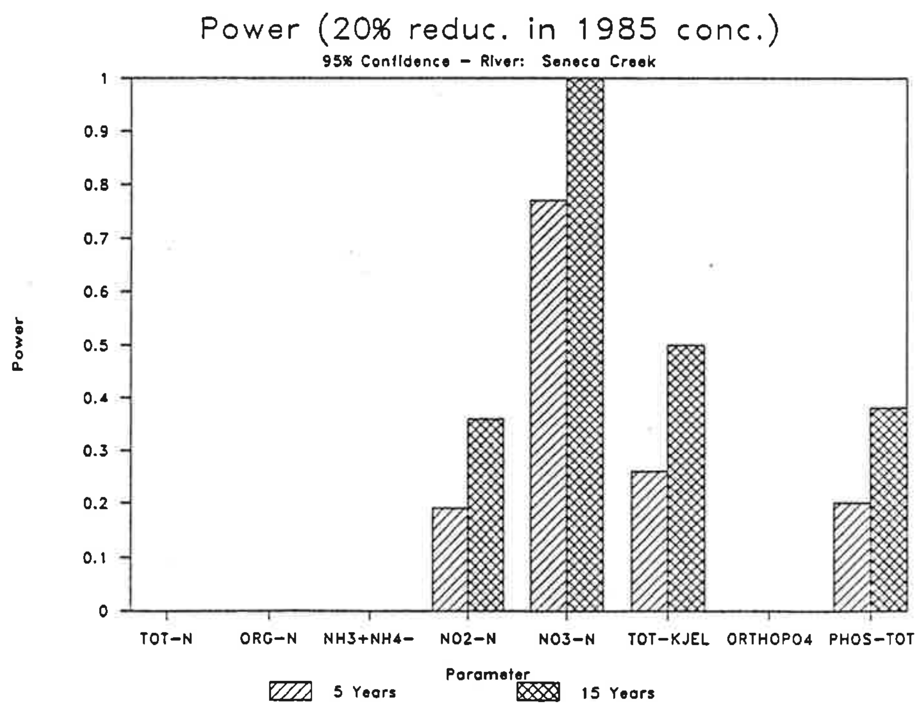

Power (20% reduc. in 1985 conc.)
95% Confidence – River: Monocacy
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT–N
ORG–N
NH3+NH4–
NO2–N
NO3–N
TOT–KJEL
ORTHOPO4
PHOS–TOT
Parameter
5 Years
15 Years

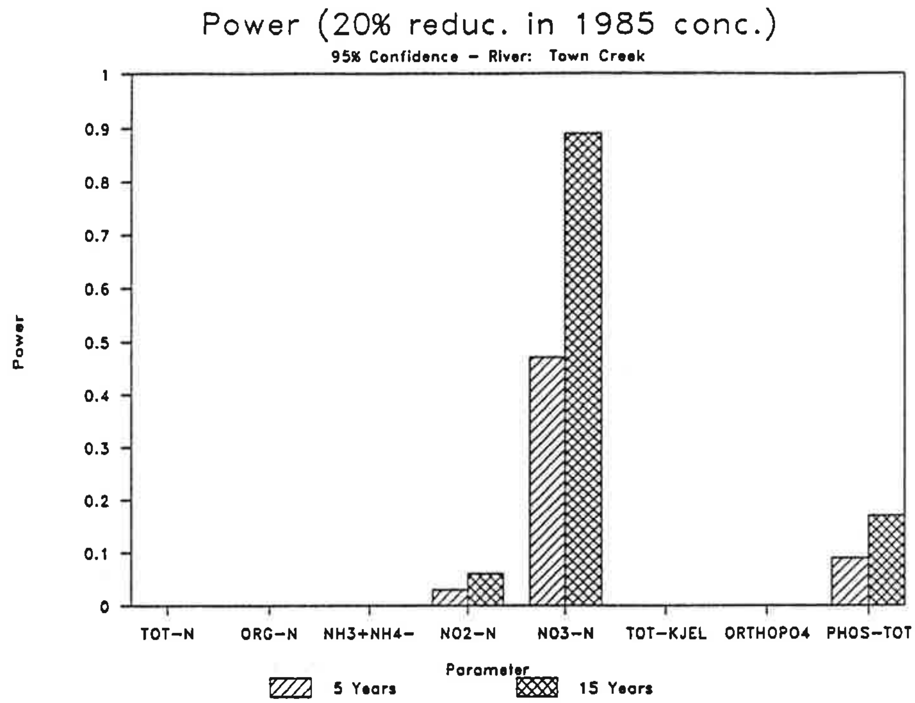

Power (20% reduc. in 1985 conc.)
95% Confidence – River: N. B. Potomac
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT–N
ORG–N
NH3+NH4–
NO2–N
NO3–N
TOT–KJEL
ORTHOPO4
PHOS–TOT
Parameter
5 Years
15 Years

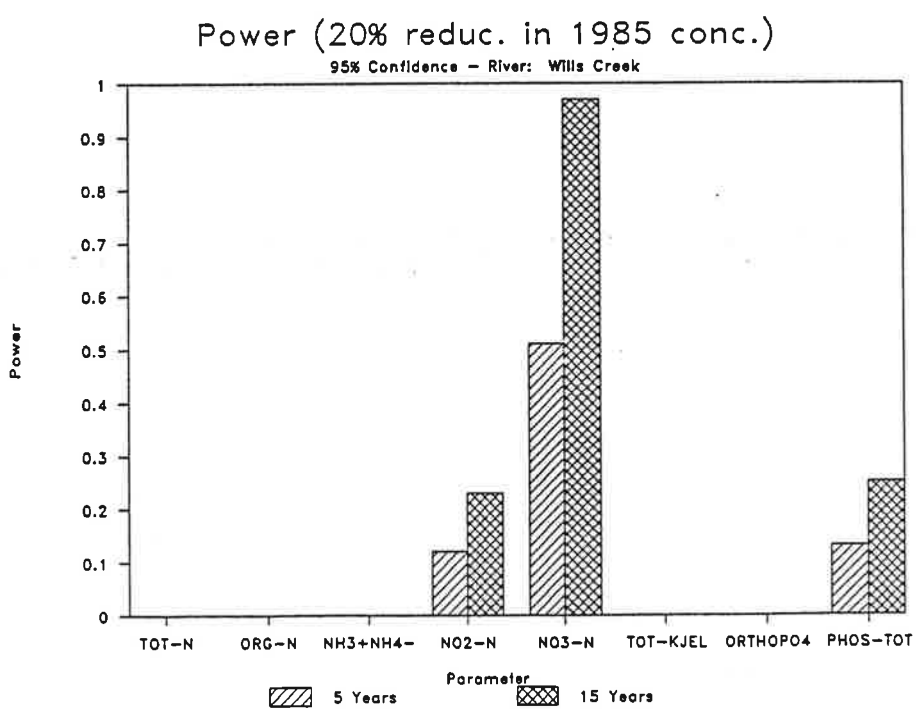

Power (20% reduc. in 1985 conc.)
95% Confidence - River: Potomac
Power
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years


Power (20% reduc. in 1985 conc.)
95% Confidence - River: Rockhold Creek
Power
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years


Power (20% reduc. in 1985 conc.)
95% Confidence - River: Savage
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

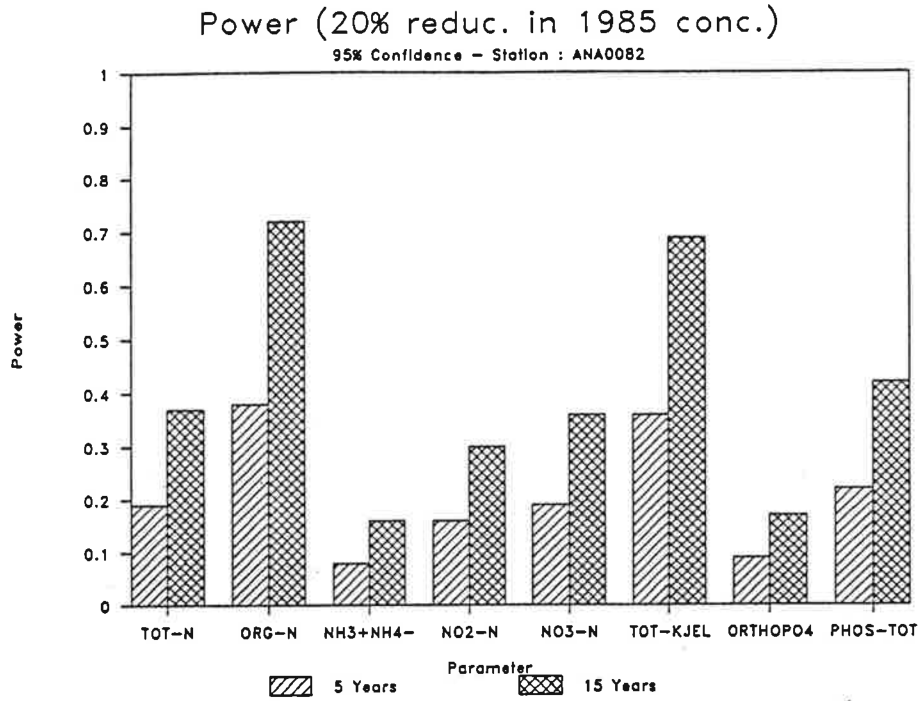

Power (20% reduc. in 1985 conc.)
95% Confidence - River: Seneca Creek
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

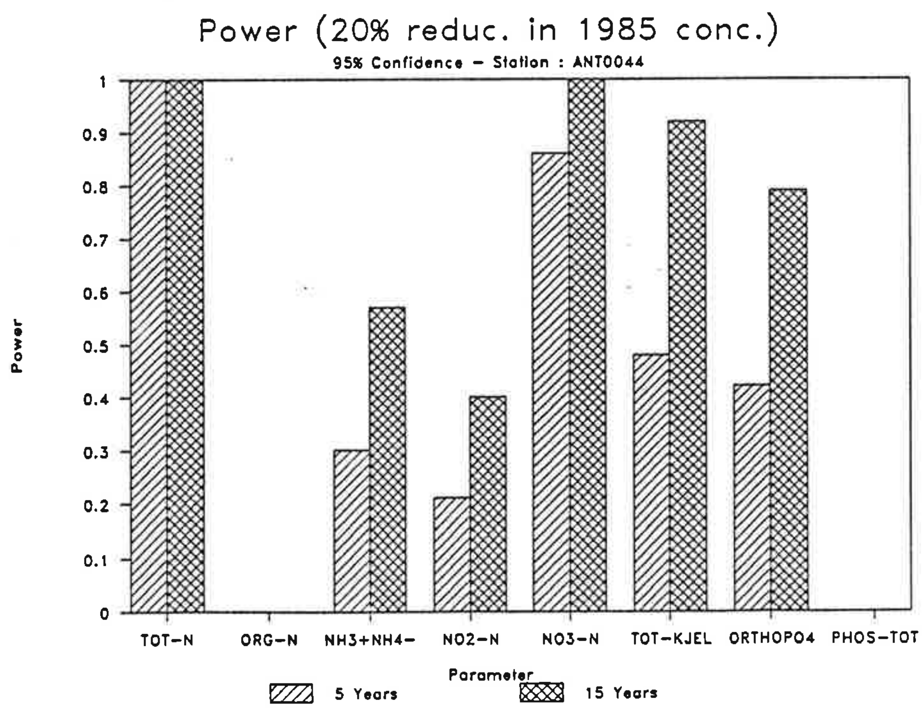

Power (20% reduc. in 1985 conc.)
95% Confidence - River: Town Creek
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

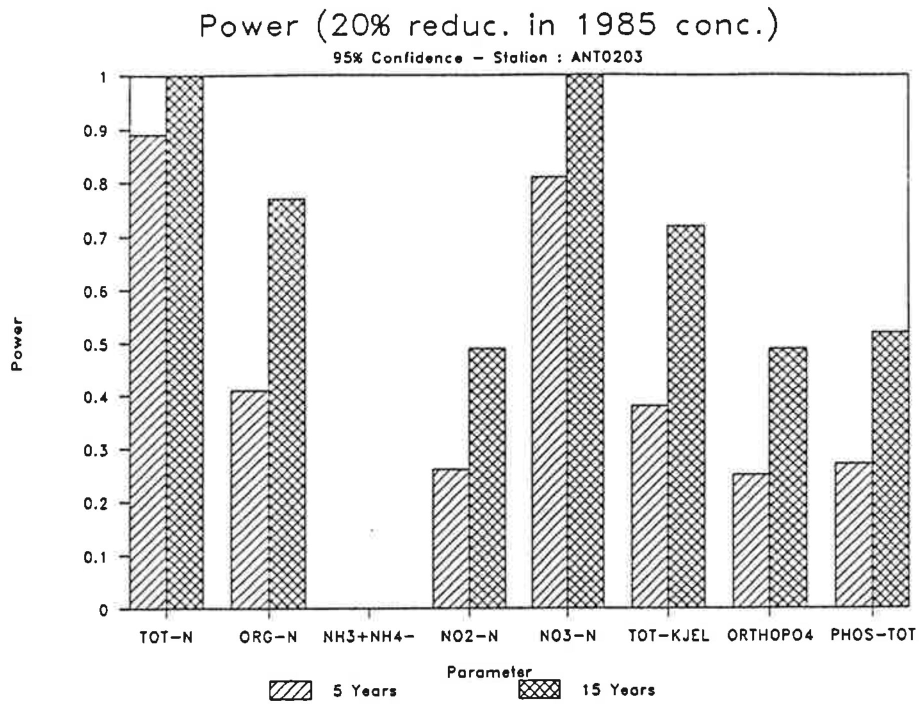

Power (20% reduc. in 1985 conc.)
95% Confidence - River: Wills Creek
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

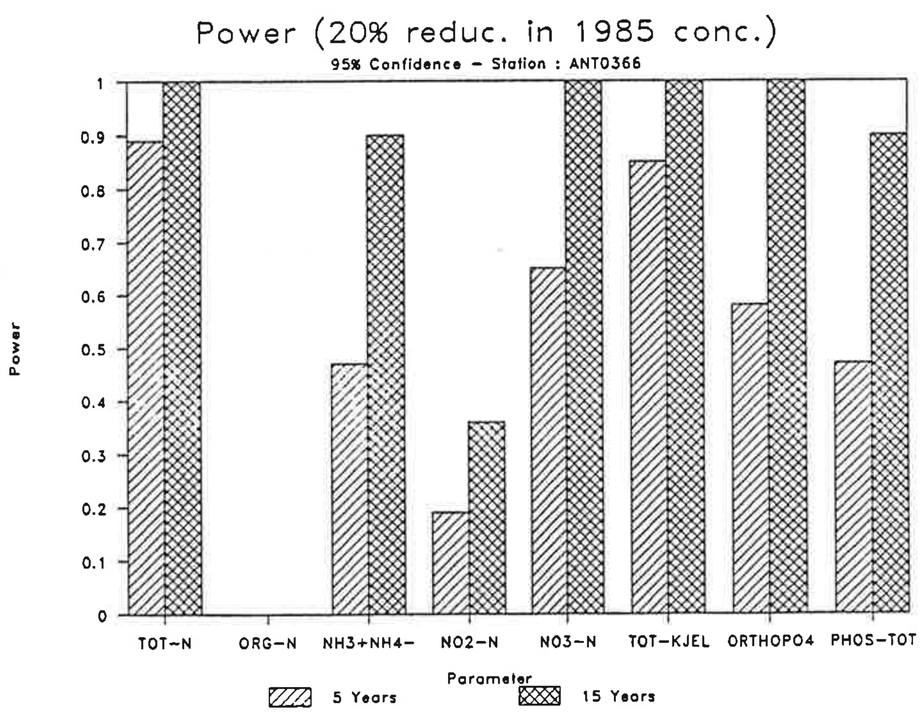
Appendix D

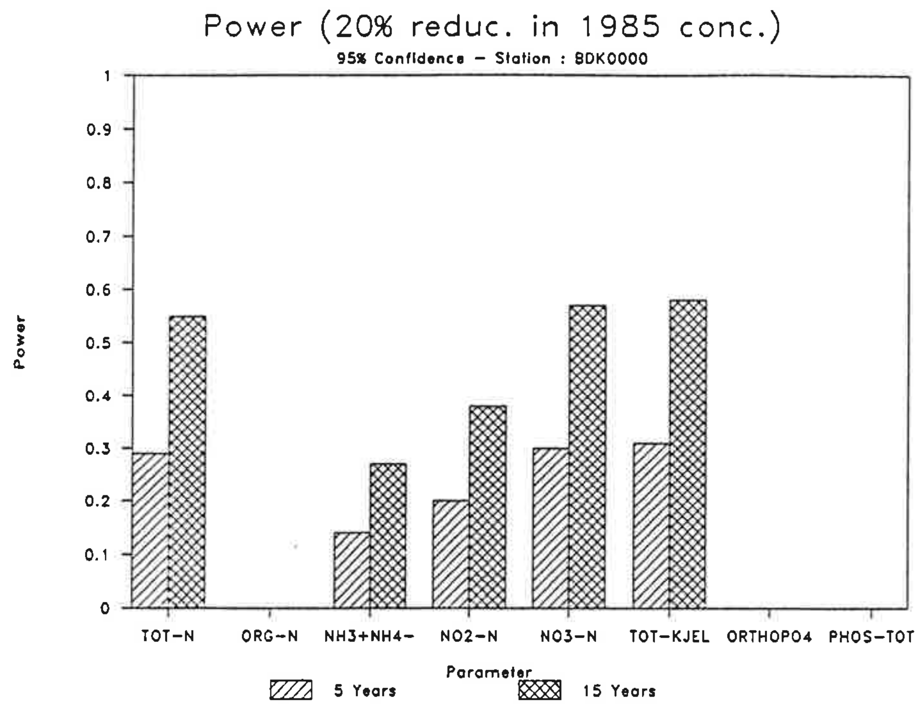
Powers at stations

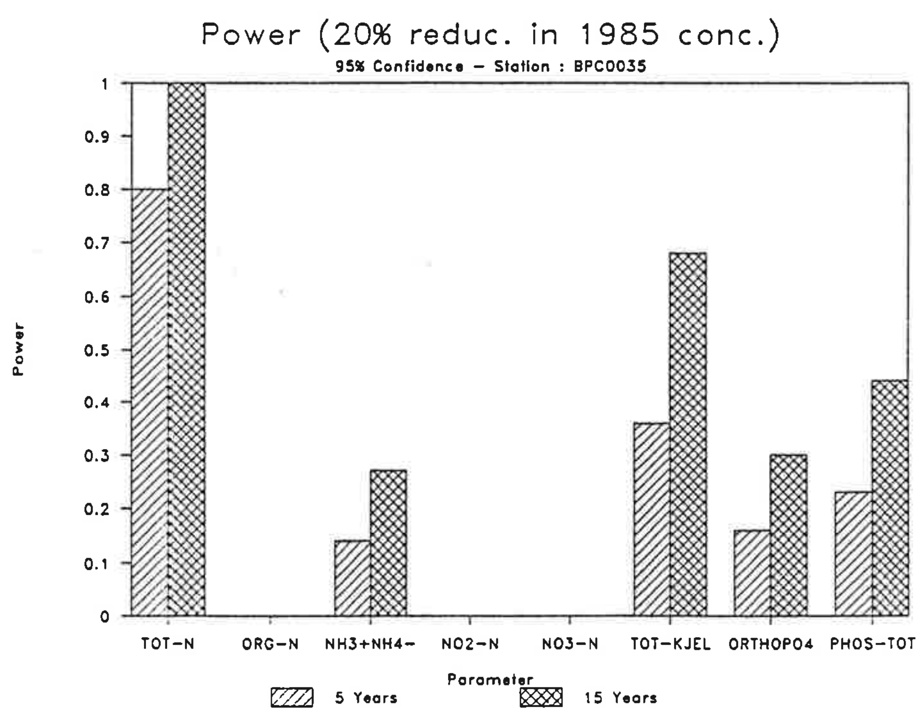

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : ANA0082
Power
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

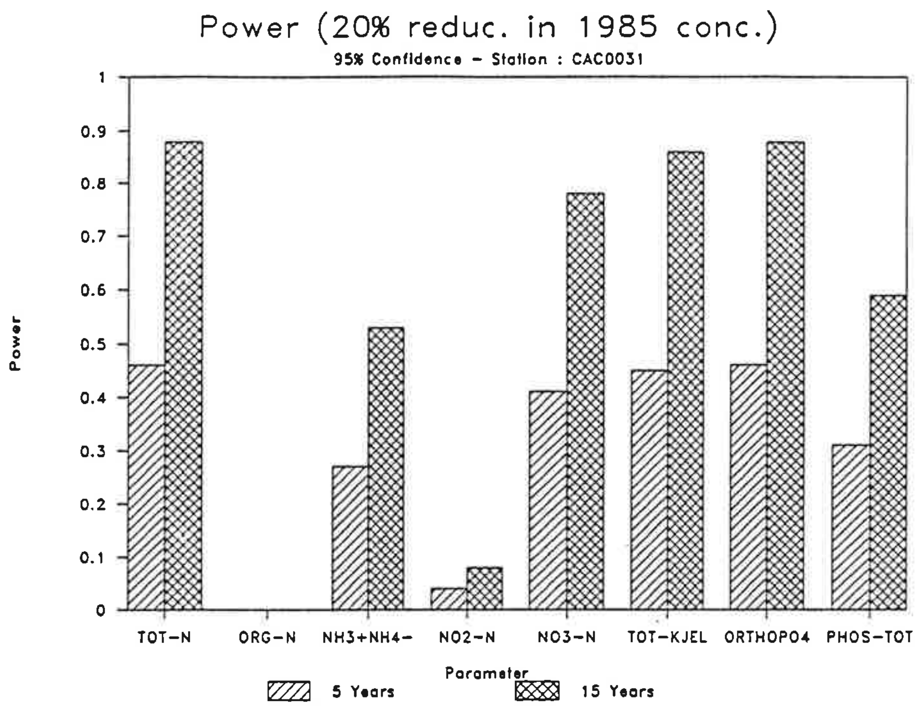

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : ANT0044
Power
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

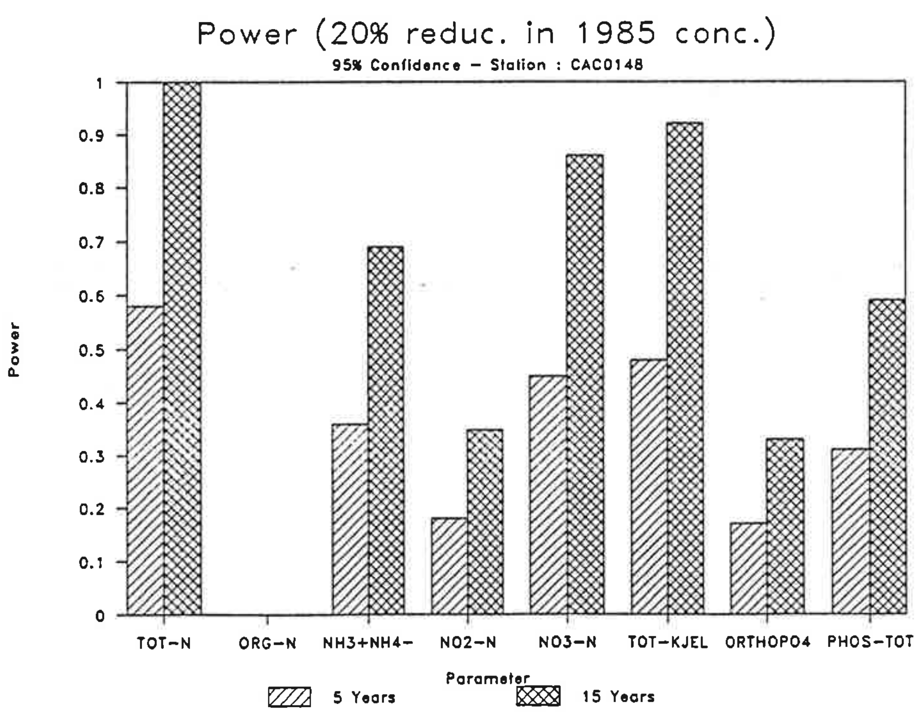

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : ANT0203
Power
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

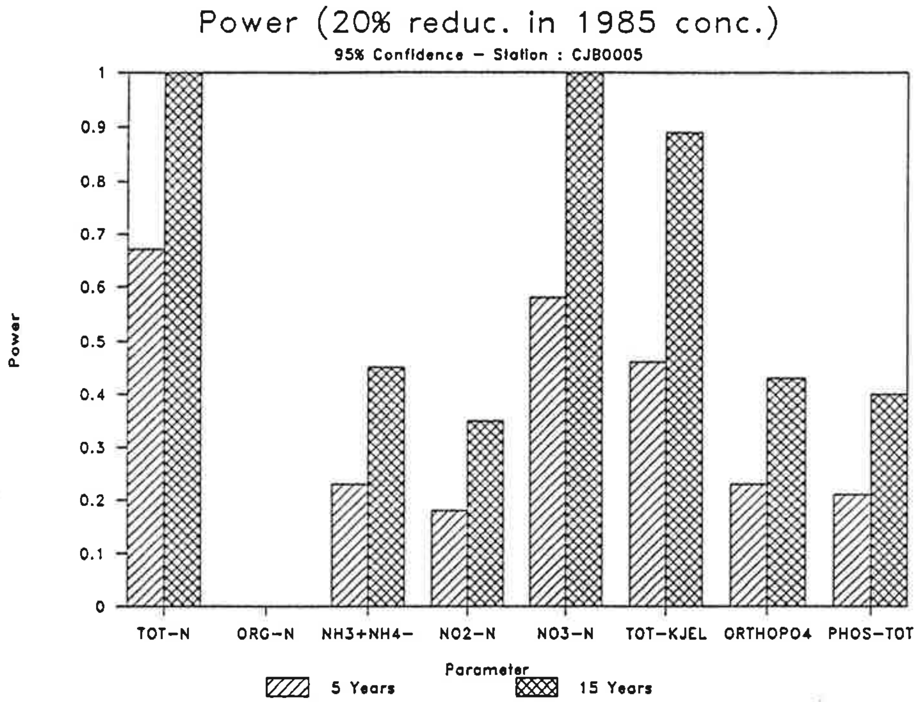

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : ANT0366
Power
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

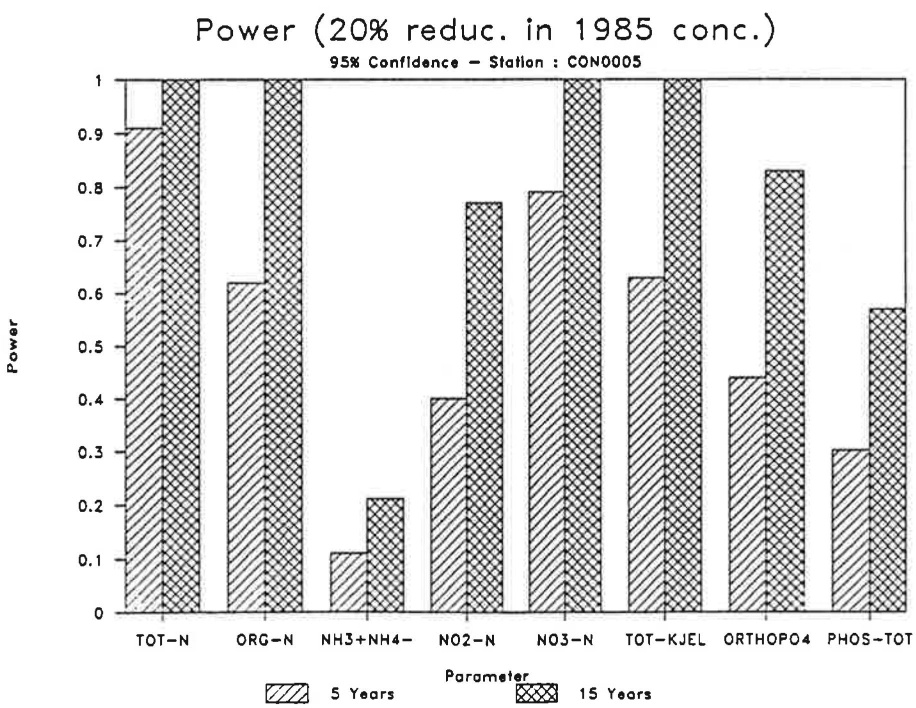

Power (20% reduc. in 1985 conc.)
95% Confidence – Station : BDK0000
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

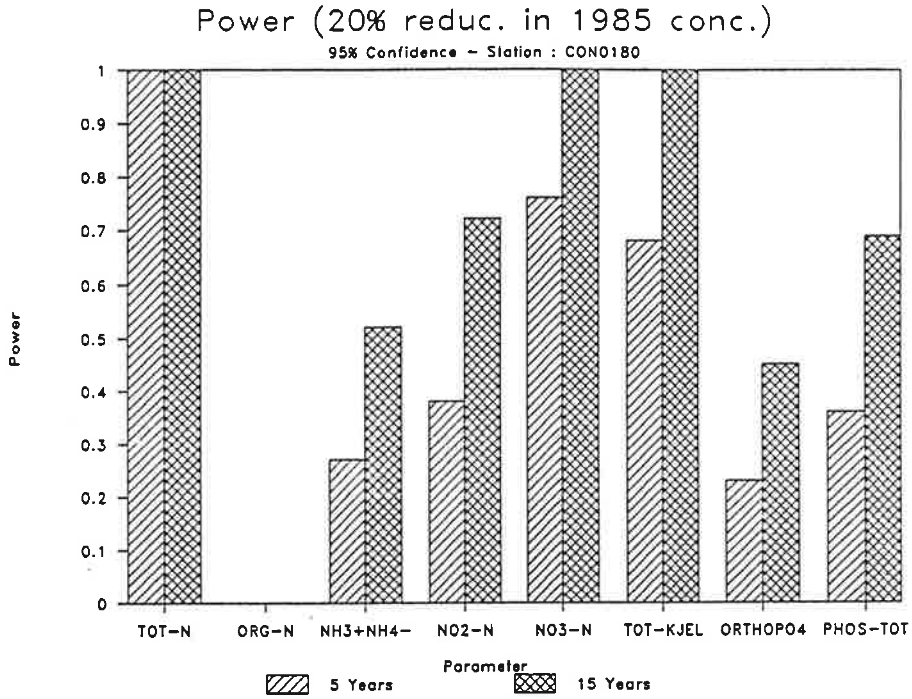

Power (20% reduc. in 1985 conc.)
95% Confidence – Station : BPC0035
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years


Power (20% reduc. in 1985 conc.)
95% Confidence - Station : CAC0031
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

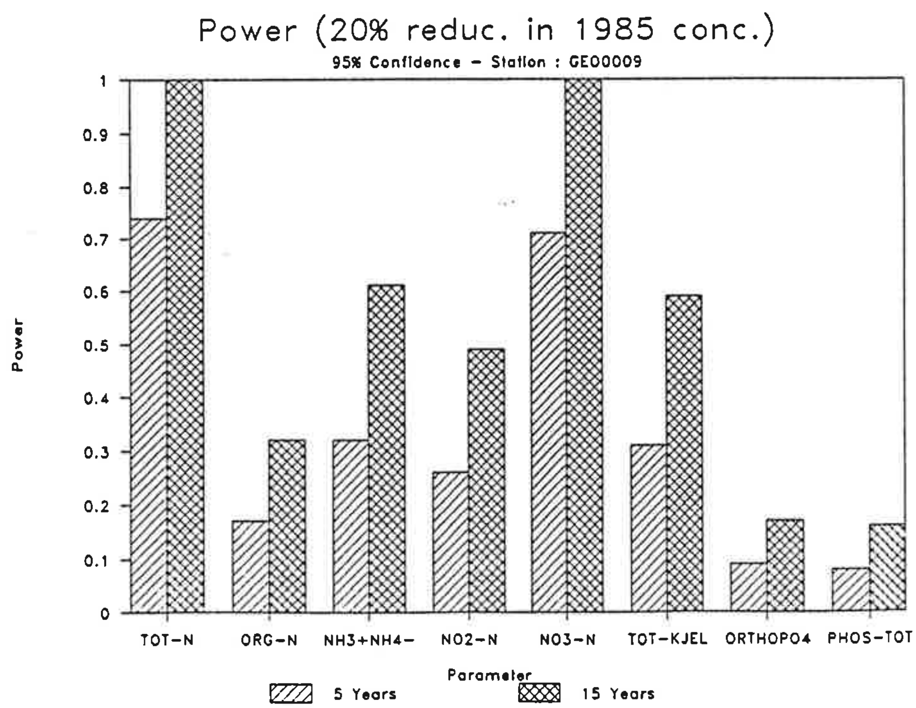

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : CAC0148
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years


Power (20% reduc. in 1985 conc.)
95% Confidence - Station : CJB0005
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

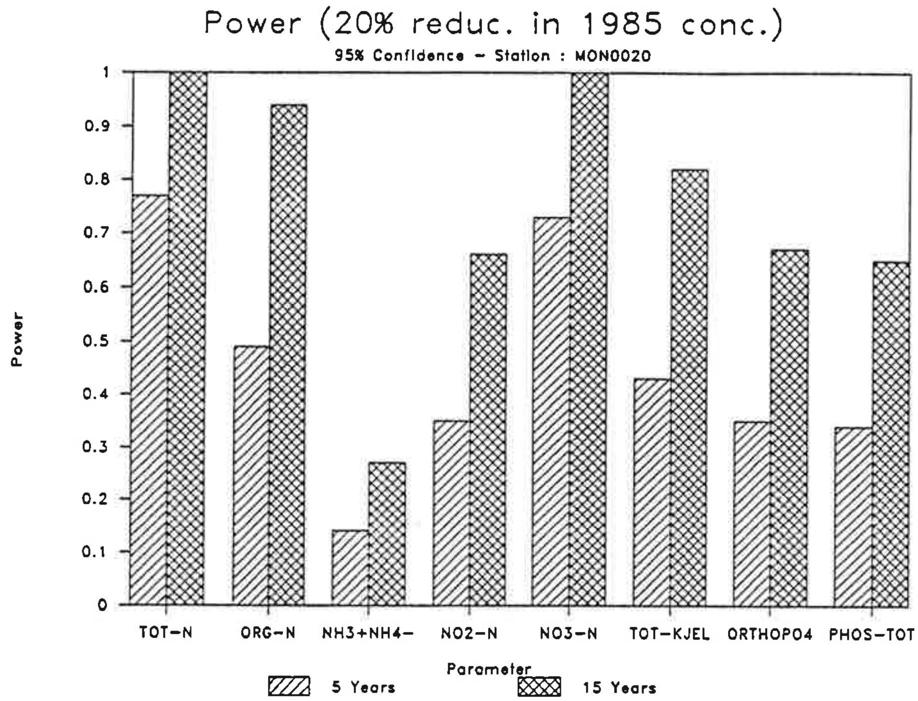

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : CON0005
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

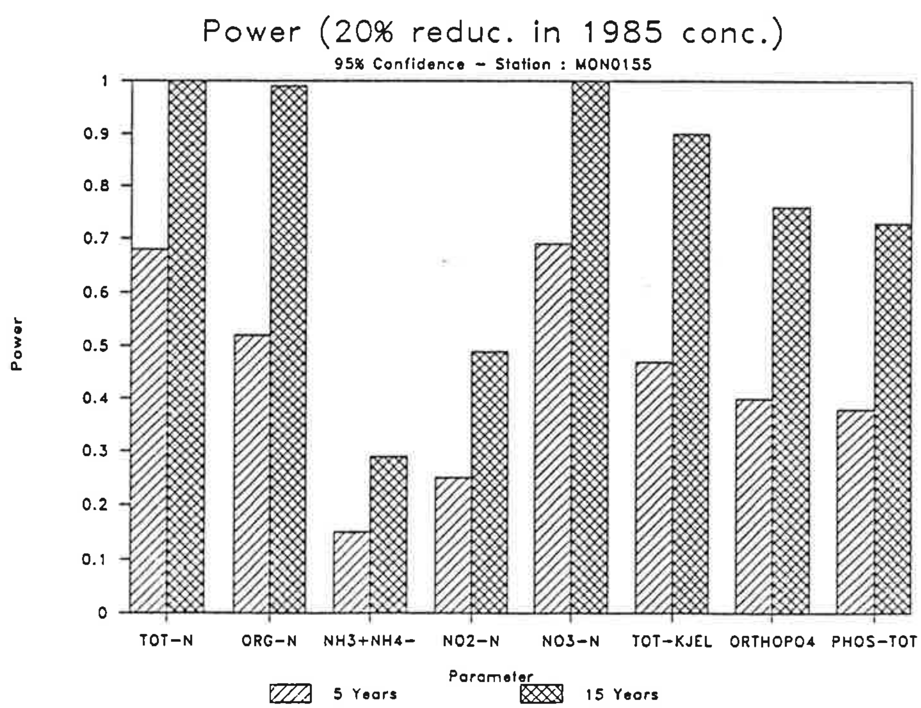


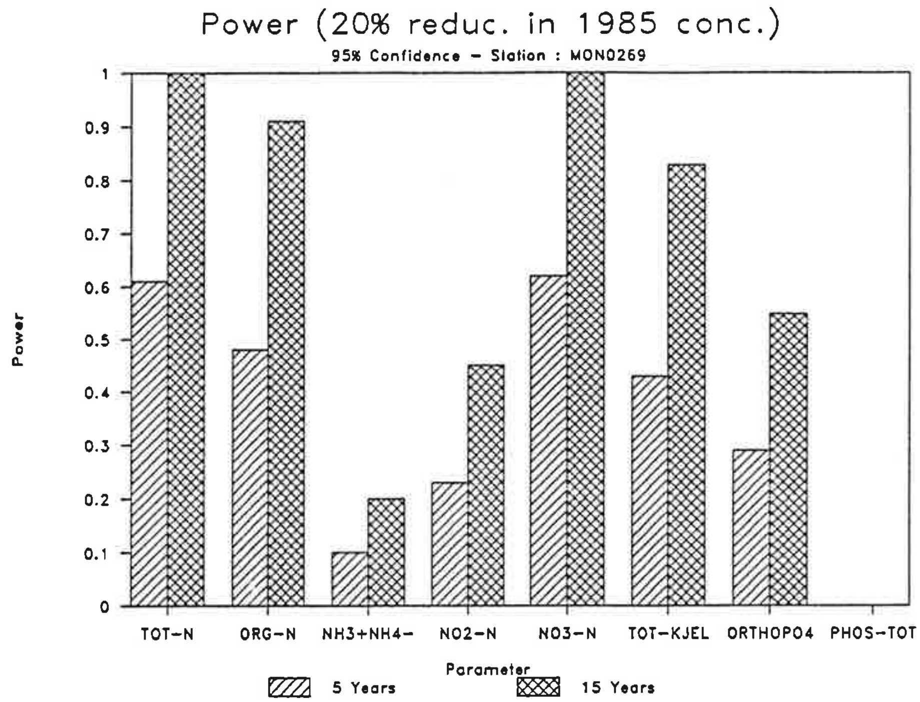
Power (20% reduc. in 1985 conc.)
95% Confidence - Station : CON0180
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

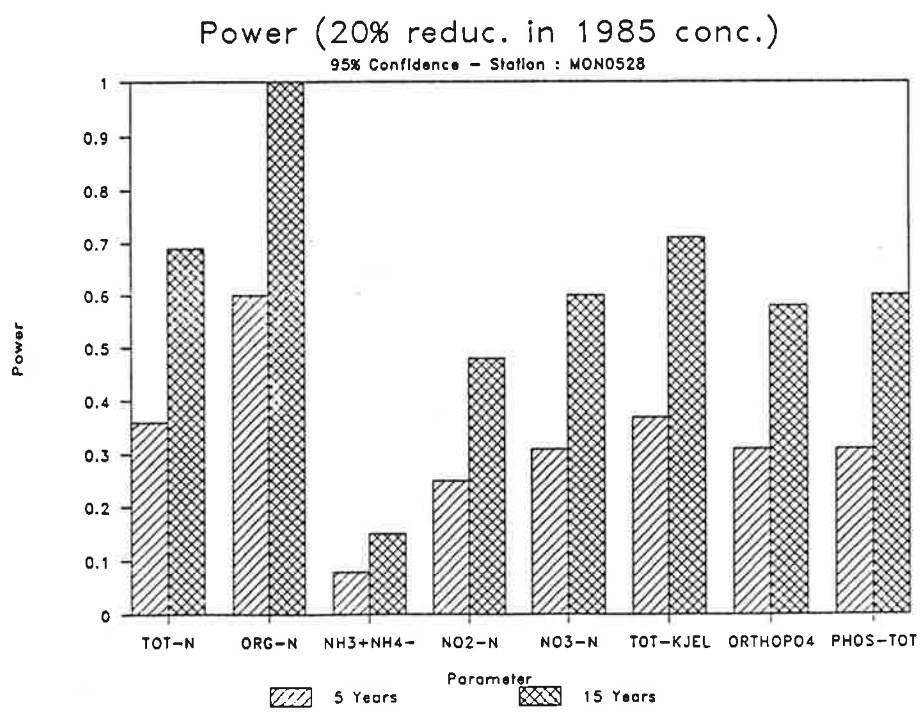


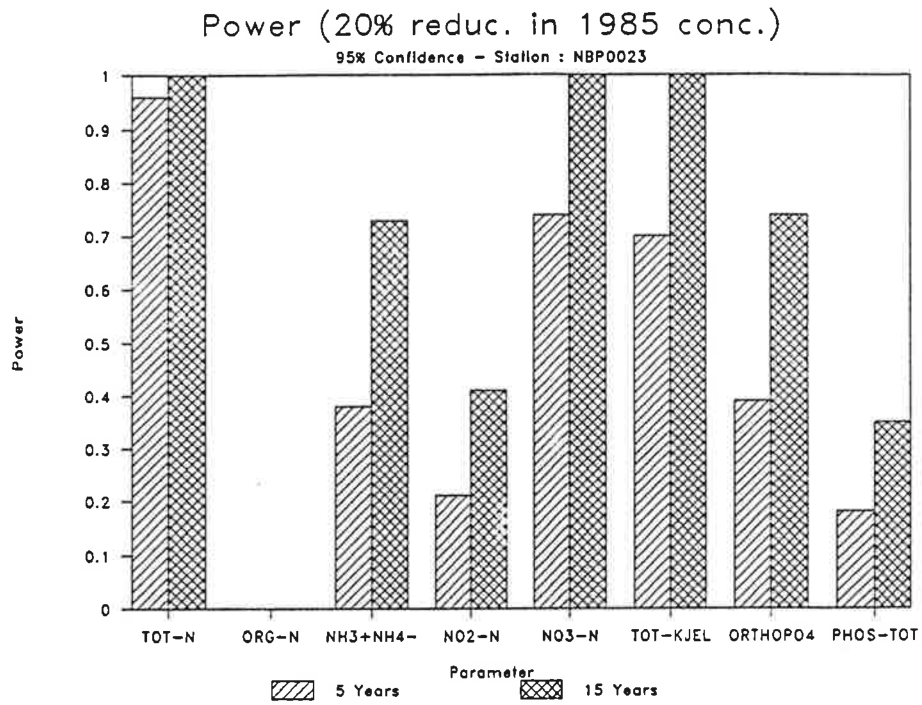
Power (20% reduc. in 1985 conc.)
95% Confidence - Station : GE00009
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

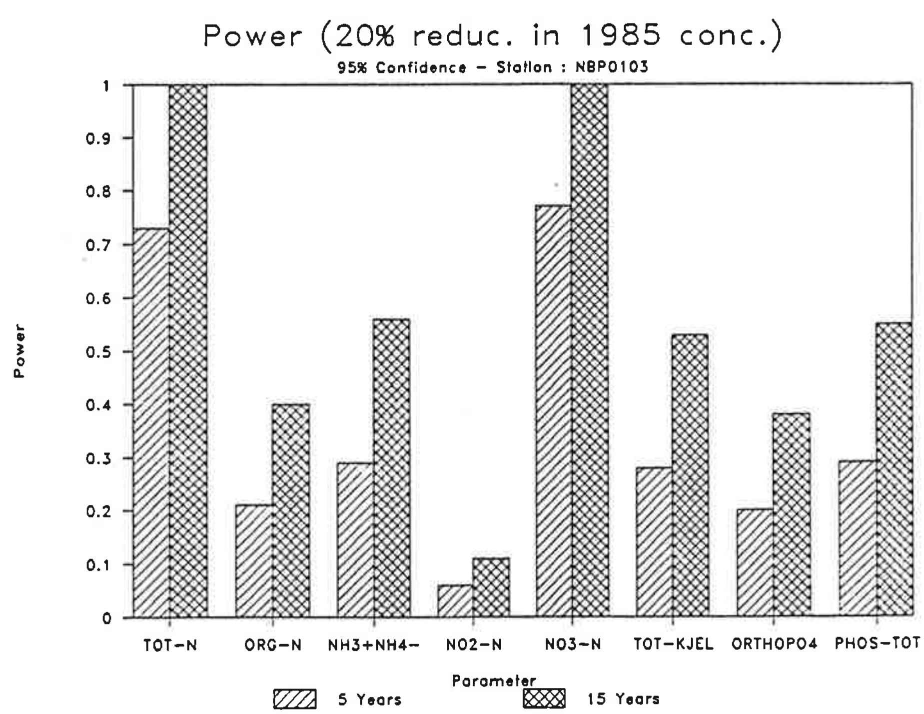

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : MON0020
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

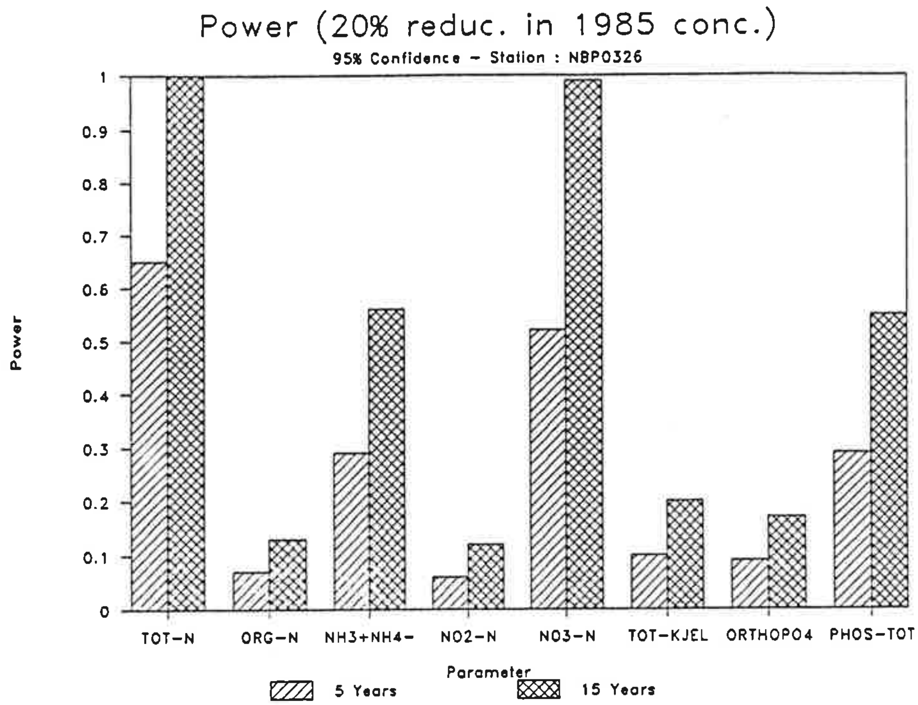

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : MON0155
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

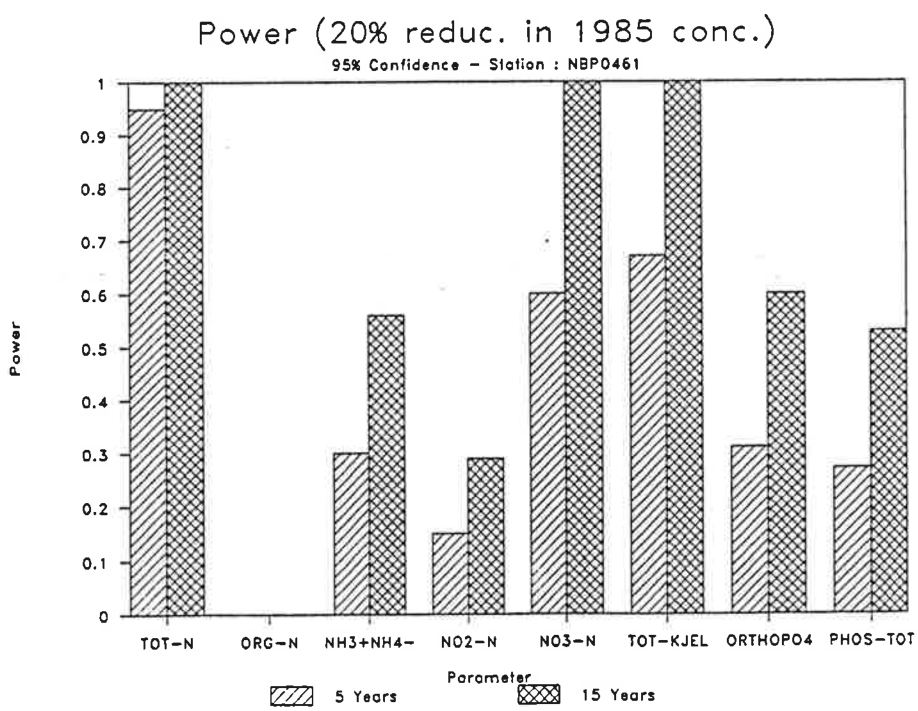

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : MON0269
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

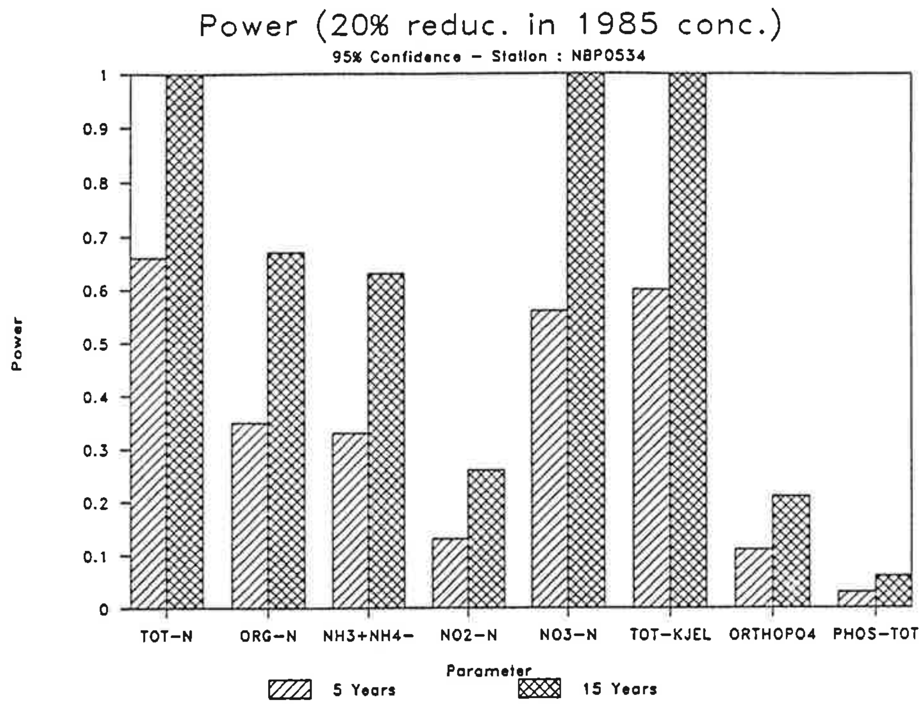

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : MON0528
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

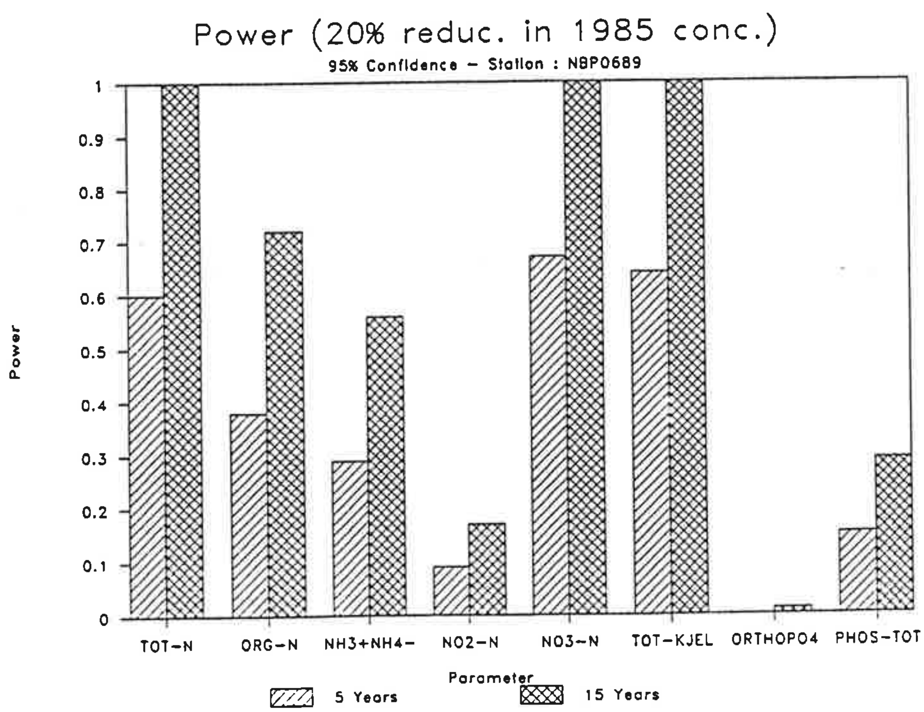

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : NBP0023
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

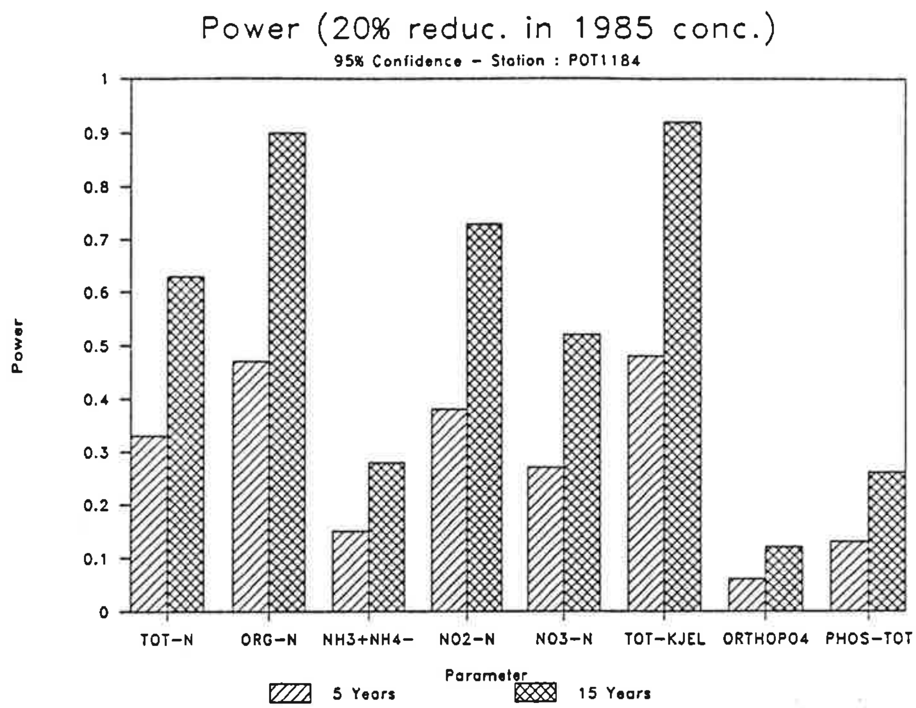

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : NBP0103
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

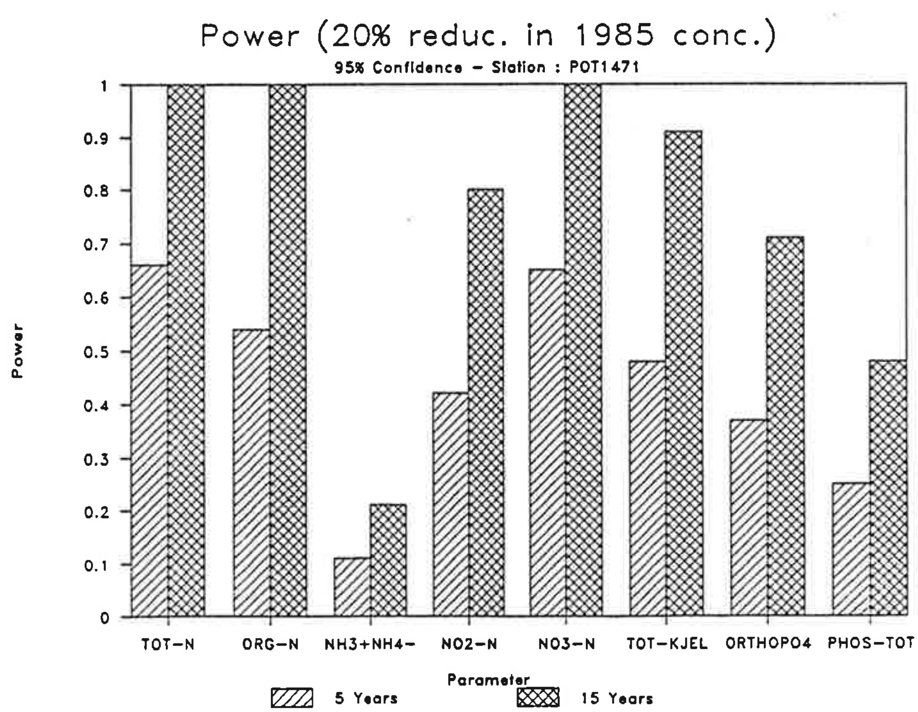

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : NBP0326
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

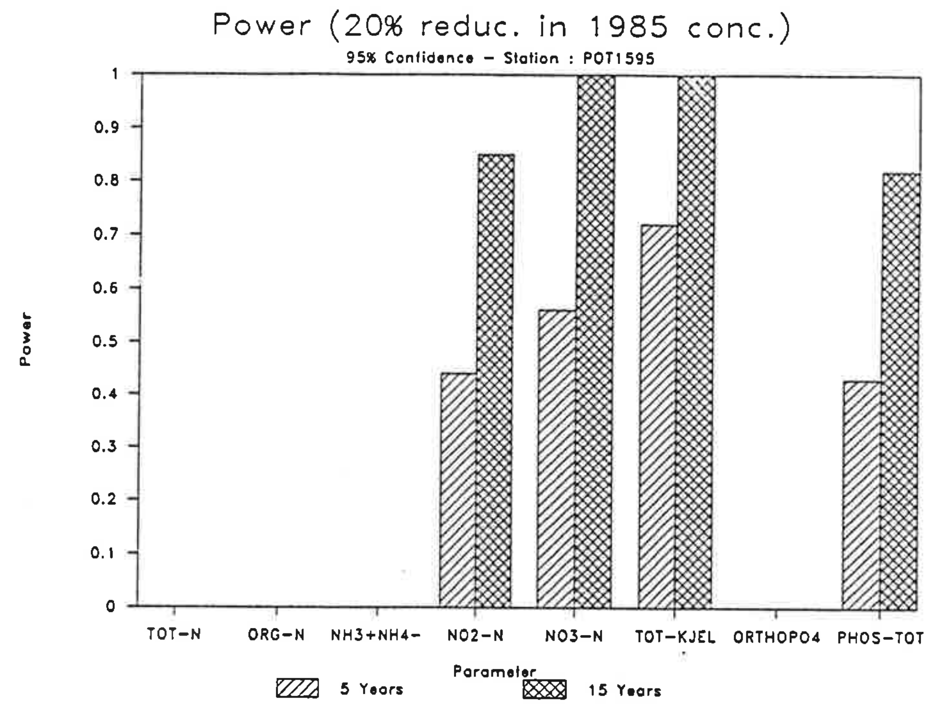

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : NBP0461
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

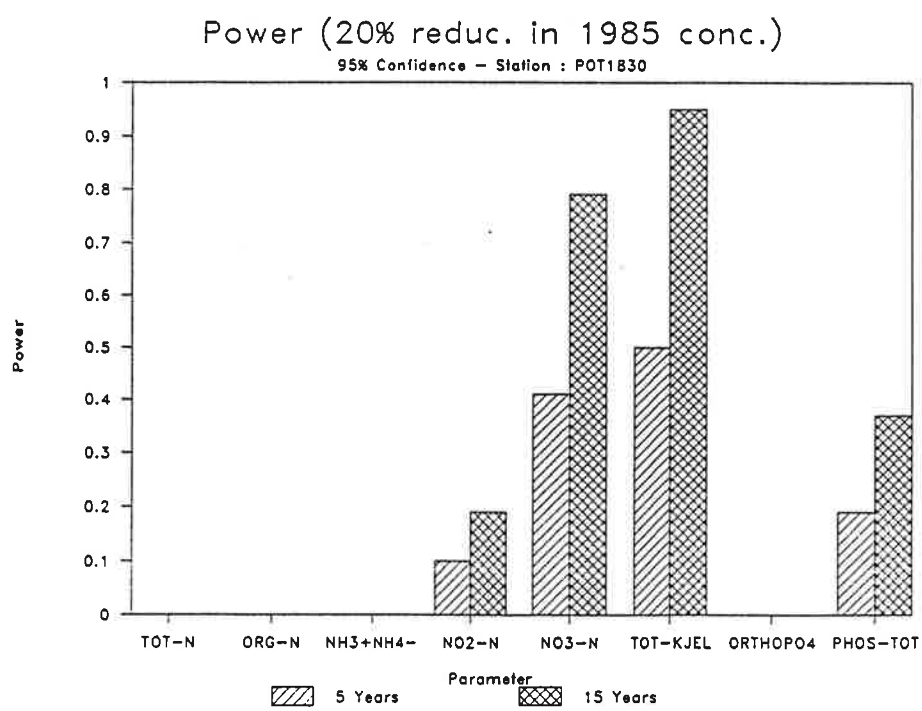

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : NBP0534
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

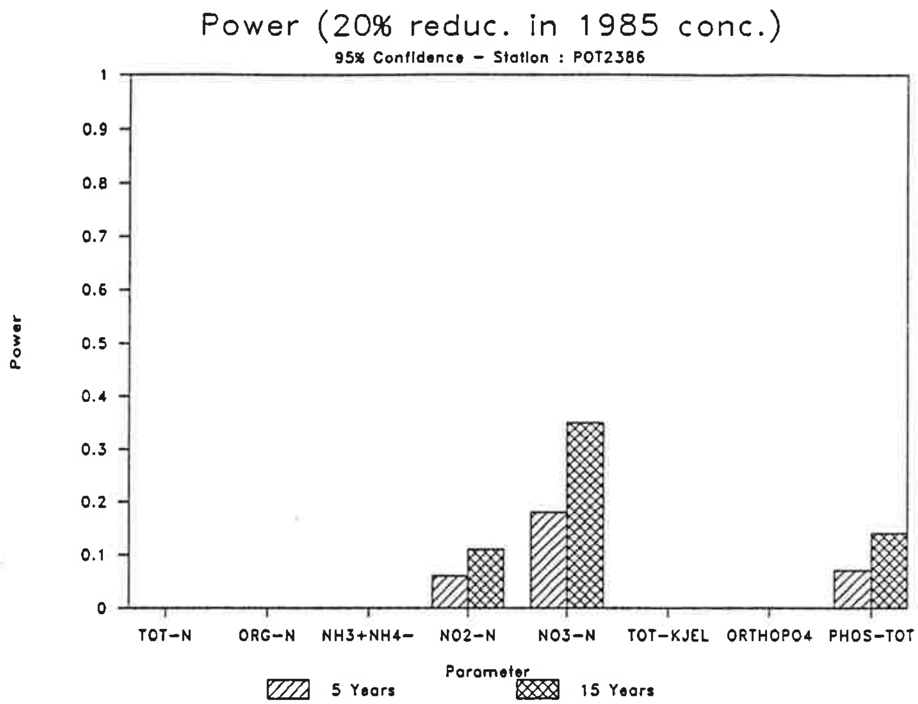

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : NBP0689
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

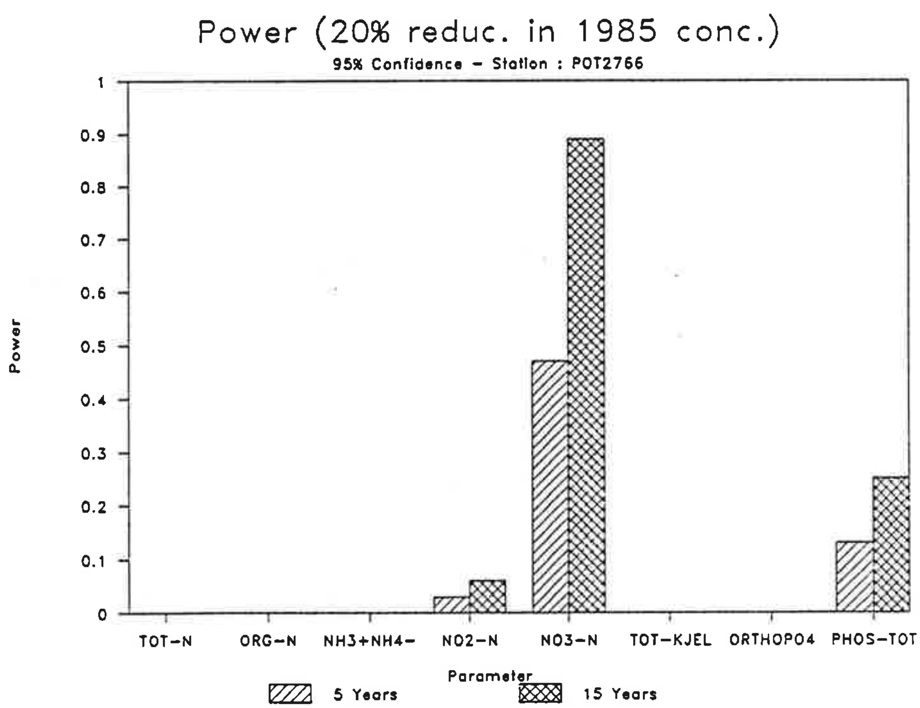

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : POT1184
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

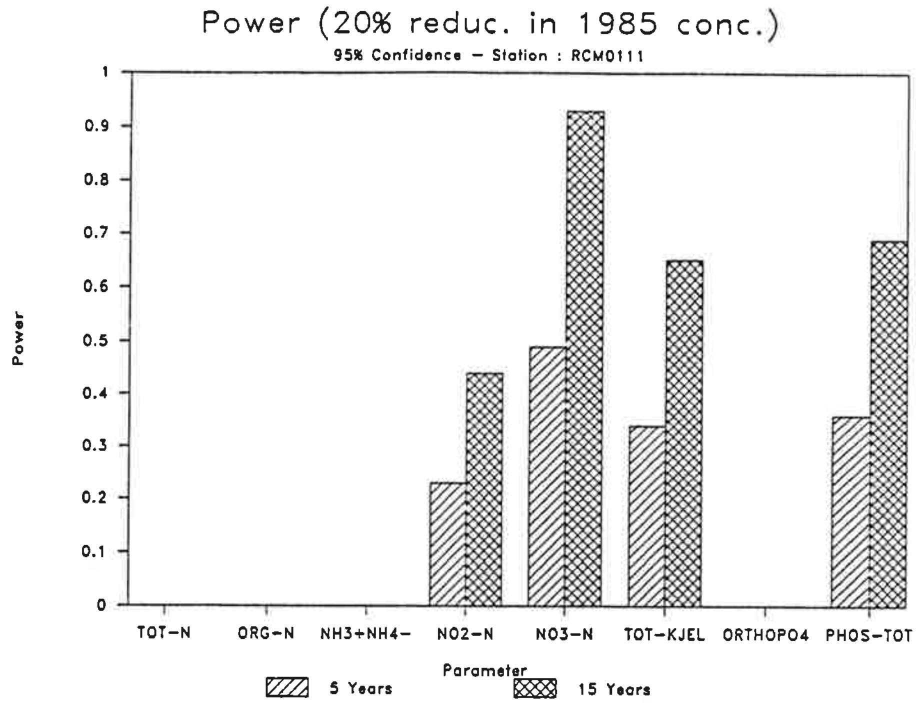

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : POT1471
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

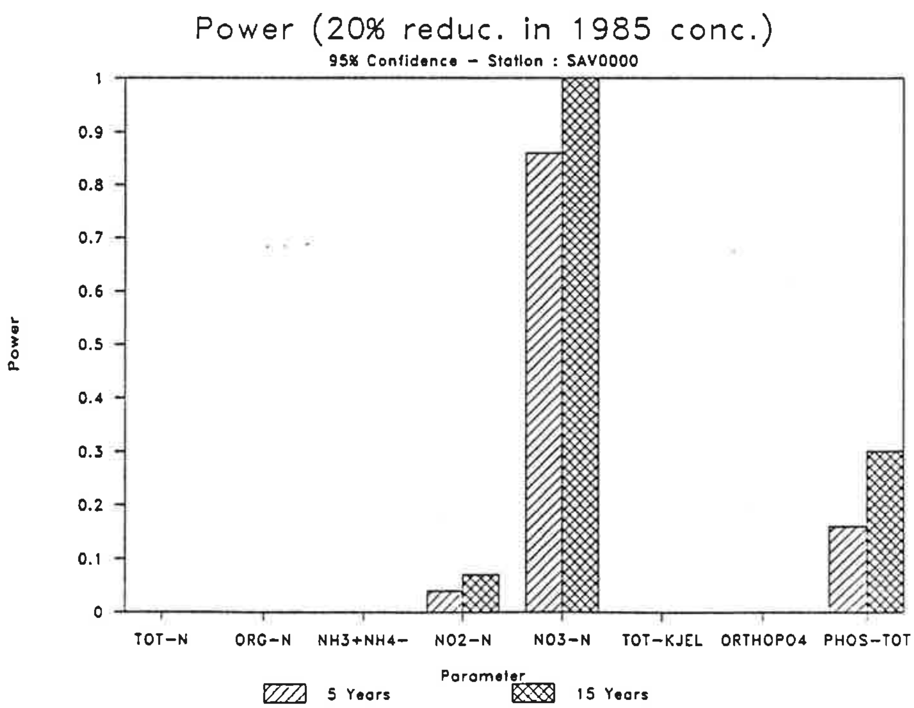

Power (20% reduc. in 1985 conc.)
95% Confidence – Station : POT1595
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT–N
ORG–N
NH3+NH4–
NO2–N
NO3–N
TOT–KJEL
ORTHOPO4
PHOS–TOT
Parameter
5 Years
15 Years

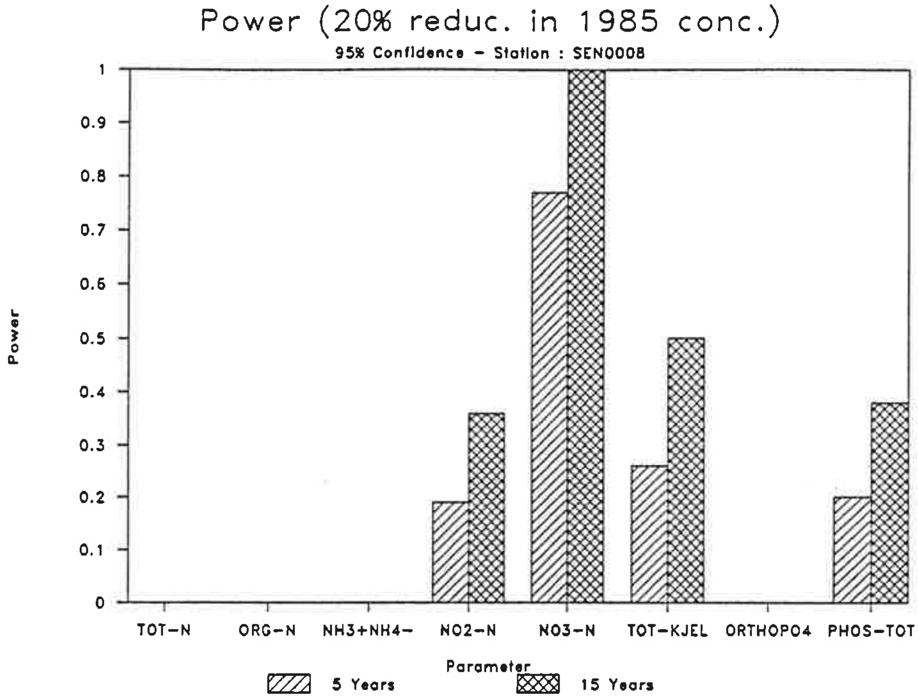

Power (20% reduc. in 1985 conc.)
95% Confidence – Station : POT1830
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT–N
ORG–N
NH3+NH4–
NO2–N
NO3–N
TOT–KJEL
ORTHOPO4
PHOS–TOT
Parameter
5 Years
15 Years


Power (20% reduc. in 1985 conc.)
95% Confidence - Station : POT2386
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years

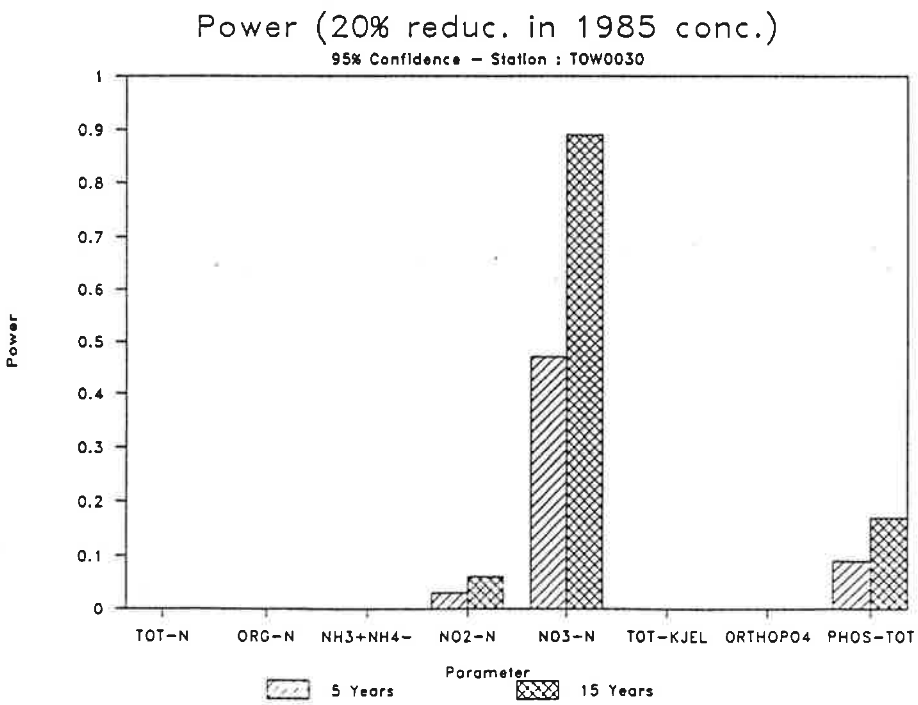

Power (20% reduc. in 1985 conc.)
95% Confidence - Station : POT2766
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years


Power (20% reduc. in 1985 conc.)
95% Confidence – Station : RCM0111
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT–N
ORG–N
NH3+NH4–
NO2–N
NO3–N
TOT–KJEL
ORTHOPO4
PHOS–TOT
Parameter
5 Years
15 Years

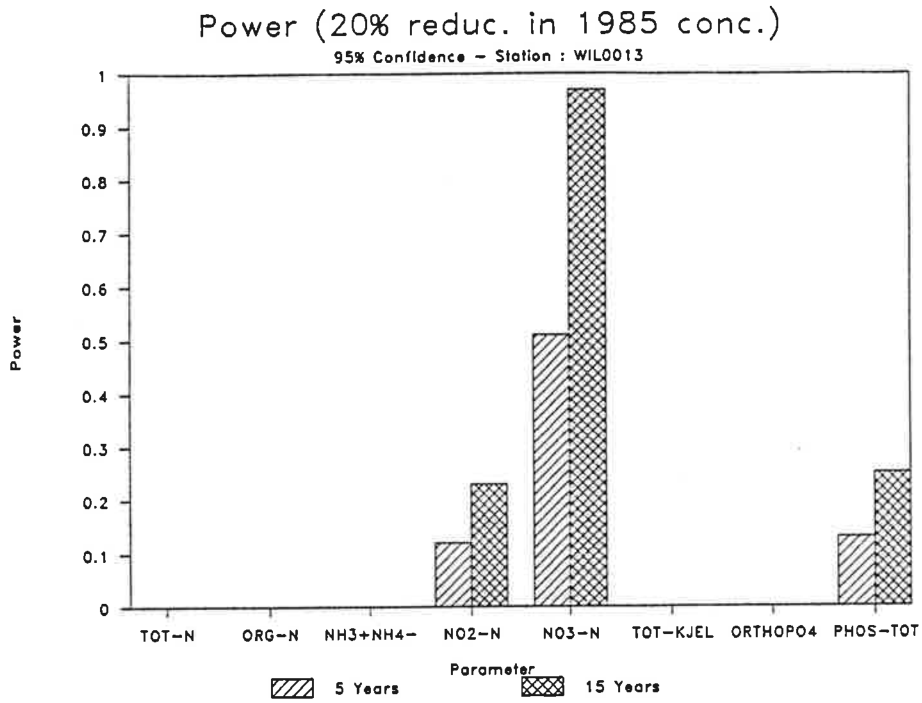

Power (20% reduc. in 1985 conc.)
95% Confidence – Station : SAV0000
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT–N
ORG–N
NH3+NH4–
NO2–N
NO3–N
TOT–KJEL
ORTHOPO4
PHOS–TOT
Parameter
5 Years
15 Years



Power (20% reduc. in 1985 conc.)
95% Confidence - Station : SEN0008
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years



Power (20% reduc. in 1985 conc.)
95% Confidence - Station : TOW0030
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT-N
ORG-N
NH3+NH4-
NO2-N
NO3-N
TOT-KJEL
ORTHOPO4
PHOS-TOT
Parameter
5 Years
15 Years



Power (20% reduc. in 1985 conc.)
95% Confidence – Station : WIL0013
Power
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TOT–N
ORG–N
NH3+NH4–
NO2–N
NO3–N
TOT–KJEL
ORTHOPO4
PHOS–TOT
Parameter
5 Years
15 Years