

A TREND STUDY OF AIR AND WATER
QUALITY IN
BRITISH COLUMBIA

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Over the past few years the Ministry of the Environment has developed a sophisticated computer data storage and retrieval system. Included in the information available in the data files handled by this system are inventories of effluent, air emission and refuse discharges throughout the Province. These include legal conditions pertaining to these discharges through the Pollution Control Act plus relevant government and non-government monitoring data.

The Pollution Control Branch routinely requires holders of pollution control permits to monitor their discharge for quantity and quality on a regular basis. The results of this monitoring are submitted to the Branch for inclusion in the data storage bank. In addition the Regional Office staff of the Pollution Control Branch regularly monitor water and air quality for 7,342 lake, river, marine, groundwater and air sites.

The data base currently holds data for approximately $\frac{1}{2}$ million samples involving over 5 million chemical analyses. Assuming a conservative estimate of \$10.00 per analysis the approximate cost of this monitoring was \$50 million.

The following is an analysis intended to show trends in ambient air and fresh water quality at selected sites throughout the Province. All monitoring information for 167 selected key locations was evaluated and those parameters were chosen which indicated a significant change in air or water quality. Significant trends were found at 24 air sampling sites and 14 fresh water sites.

Data are presented in graphical form for the period 1970 through 1977 although in some cases data are not available for the whole of this period. Interpretation is provided for the data trends for each parameter at each location wherever possible. These interpretations were prepared in close consultation with the Regional Offices of the Pollution Control Branch. In most cases the trends show an improvement in environmental quality and this can often be related directly to the implementation of pollution control works provided in accordance with requirements under the Pollution Control Act.

BRITISH COLUMBIA

TREND STUDY LOCATIONS 1978

Legend

Fresh Water Sites

Air Sites

Scale

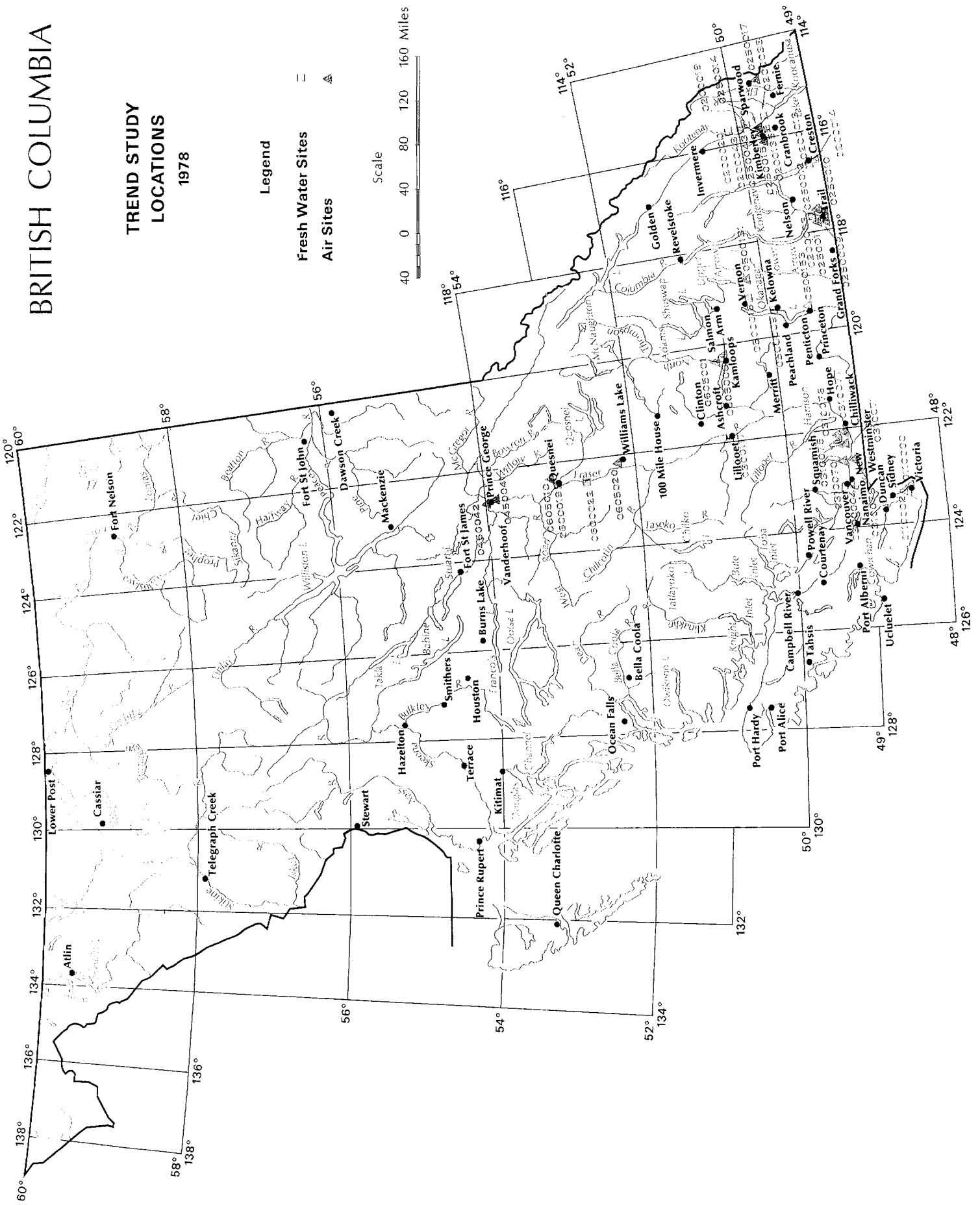


TABLE I: INTERPRETATION OF FRESH WATER DATA

LOCATION	PARAMETERS	INTERPRETATION
1. Brandt's Creek, a tributary to Okanagan Lake		
a. Site 0500009 near creek mouth	carbon - organic copper - dissolved iron - dissolved	Installation of a trade waste treatment plant has resulted in significant lowering of organic carbon and of the dissolved metals copper and iron in Brandt's Creek.
2. Coldstream Creek		
a. Site 0500016 at Kirkland Drive Bridge	colour - true	No explanation currently known for the apparent increase since 1976 for true colour. Note that the higher values are associated with freshet.
3. Columbia River		
a. Site 0200003 at Birchbank	hardness phosphate: ortho phosphate: total (unfiltered) Specific Conductance	Decreasing trends were identified for hardness, ortho-phosphate, total phosphate and specific conductance. Interpretation of the graphs is not straightforward however, since several changes have occurred upstream, on the Columbia or the Kootenay. These changes include major improvements to Cominco, Kimberley discharges, modification of Castlegar's sewage treatment plant, installation of the Nelson and Kinnaird sewage treatment plants, plus impoundment of Hugh Keenleyside and Mica dams on the Columbia and of Libby dam on the Kootenay in Montana.

TABLE I: INTERPRETATION OF FRESH WATER DATA

LOCATION	PARAMETERS	INTERPRETATION
4. Cuisson Creek, a tributary to the Fraser River		
a. Site 0600022 near Alexandria	Nitrate Filterable Residue Total Residue Sulphate	No explanation known for the decrease in nitrate nitrogen circa 1975. PCB South Central Regional Office believes high filterable residue (dissolved solids), total residue (total solids) and sulphate in late 1974 probably related to discharge from Gibraltar Mines. Note the seasonal pattern: all four parameters decreasing with freshet as common for dissolved materials in a river or stream.
5. Fraser River		
a. Site 0600019 at the Quesnel Bridge	Kjeldahl Nitrogen Total Residue	No explanation known for the apparent decrease in both Kjeldahl nitrogen and total residue (or total solids).
b. Site 0300117 at Lillooet	Chromium - total Nitrogen - organic Tannin and Lignin	No explanation known for the apparent increase in all three parameters. The association of chromate maxima with freshet show this metal clearly associated with the suspended matter.
c. Site 0300004 at the Queensborough Bridge, New Westminster	Chromium - total Fecal Coliforms	Increasing trend observed for total chromium and a decreasing trend for fecal coliforms. Note same seasonal pattern for total chromium as at Lillooet, but at lesser dilution, upstream Fraser being diluted by the Thompson. The decrease in fecal coliforms reflects the diversion of upstream sanitary sewers to the Annacis STP.

TABLE I: INTERPRETATION OF FRESH WATER DATA

INTERPRETATION

PARAMETERS

LOCATION

6. Kootenay River

a. Site 0200020 at Canal Flats Potassium - dissolved

No explanation currently known for apparent decrease in dissolved potassium.

b. Site 0200048 at Skookumchuck

Phenolics
Sulfate

Graphs show decrease in low flow maximum for phenolics and dissolved sulphate. These parameters probably are associated with the Crestbrook Forest Industries pulp mill at Skookumchuck, but no changes to works as known, from which these improvements would have been predicted.

c. Site 0200020 at Wasa

Nitrogen - Ammonia

No explanation for the apparent decrease in ammonia nitrogen.

d. Site 0200038 at Picture Valley

Carbon - organic

Fluoride

Nitrogen - Ammonia

Phosphate - Ortho

Phosphate - Total (Filtered)

Phosphate - Total (Unfiltered)

Silica - reactive

Graphs show decreases in organic carbon, fluoride ammonia nitrogen, phosphate (ortho, dissolved total and unfiltered total) and reactive silica, all associated with implementation of Cominco Kimberley's gypsum recycle in 1975.

e. Site 0200014 at Porthill

Fluoride

Lead - dissolved

Nitrogen - ammonia

Phosphate - ortho

Phosphate - total (Unfiltered)

Residue - total

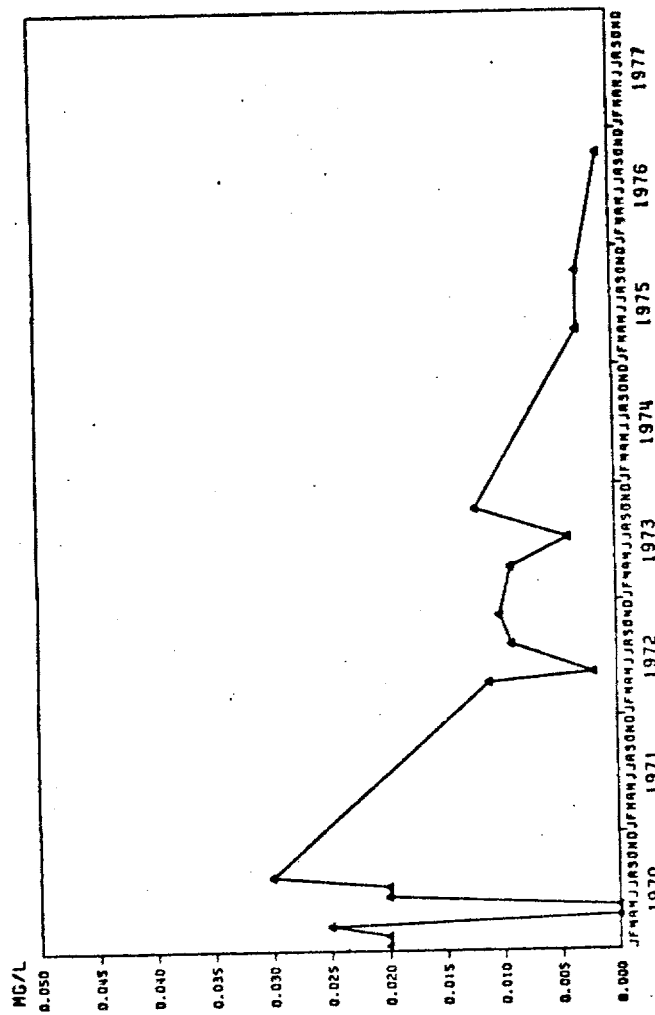
Turbidity

The graphs indicate lower levels of fluoride, lead, ammonia, phosphate (ortho and total), total residue and turbidity associated with the Libby impoundment in 1972 and with the Cominco Kimberley gypsum recycle in 1975.

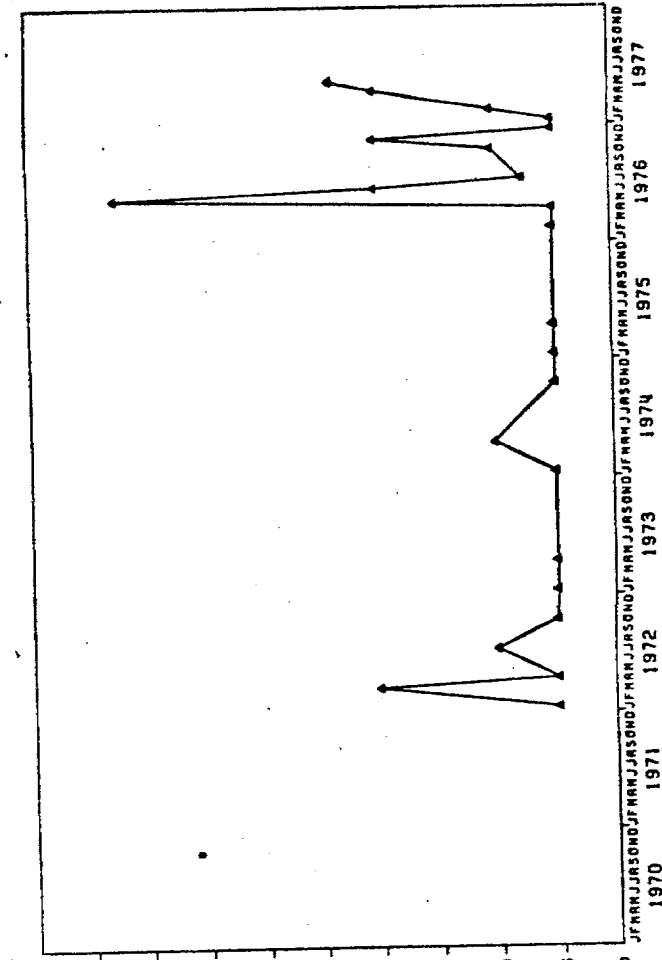
TABLE I: INTERPRETATION OF FRESH WATER DATA

LOCATION	PARAMETERS	INTERPRETATION
f. Site 0200013 at Creston	Chloride Fluoride Nitrogen - Ammonia Nitrogen - Nitrate Phosphate - Ortho Phosphate - Total (Unfiltered) Potassium Sulphate Turbidity	Decreasing trends noted for chloride, fluoride, ammonia nitrogen, nitrate nitrogen, phosphates (ortho and total), potassium, sulphate and turbidity. The graphs reflect the lower peaks due to Libby regulation of flows since impoundment in 1972 (higher low flow flows/greater control of freshet/settling of solids) and also reflect the Cominco Kimberley gypsum recycle Oct. 1975.
7. St. Mary River		
a. Site 0200135 at Wycliffe	Arsenic - dissolved Cadmium - dissolved Fluoride Iron - dissolved Lead - dissolved Nitrogen - organic pH Phosphate - ortho Phosphate - total (Unfiltered) Potassium Residue - Filterable Residue - Total Silica - reactive Specific Conductance Sulphate	Implementation of Cominco Kimberley's gypsum recycle in Oct. 1975 resulted in significant decrease in arsenic (D), cadmium (D), fluoride (D), iron (D), lead (D), organic nitrogen, phosphates (ortho and total), potassium, reactive silica, sulphate, specific conductivity, filterable residue and total residue, plus a significant improvement in the pH. Also improvements to the Kimberley sewage treatment plant (Oct. 1975, activated sludge system) may have contributed to the lower organic nitrogen.

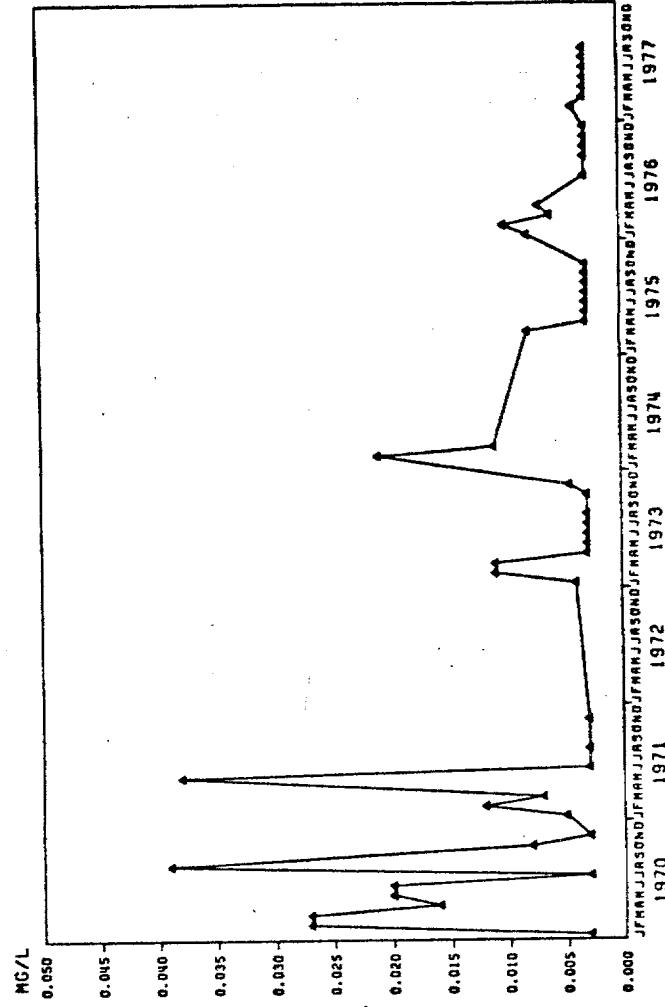
BRANDTS CR. AT MOUTH
MONTHLY MEANS FOR: COPPER



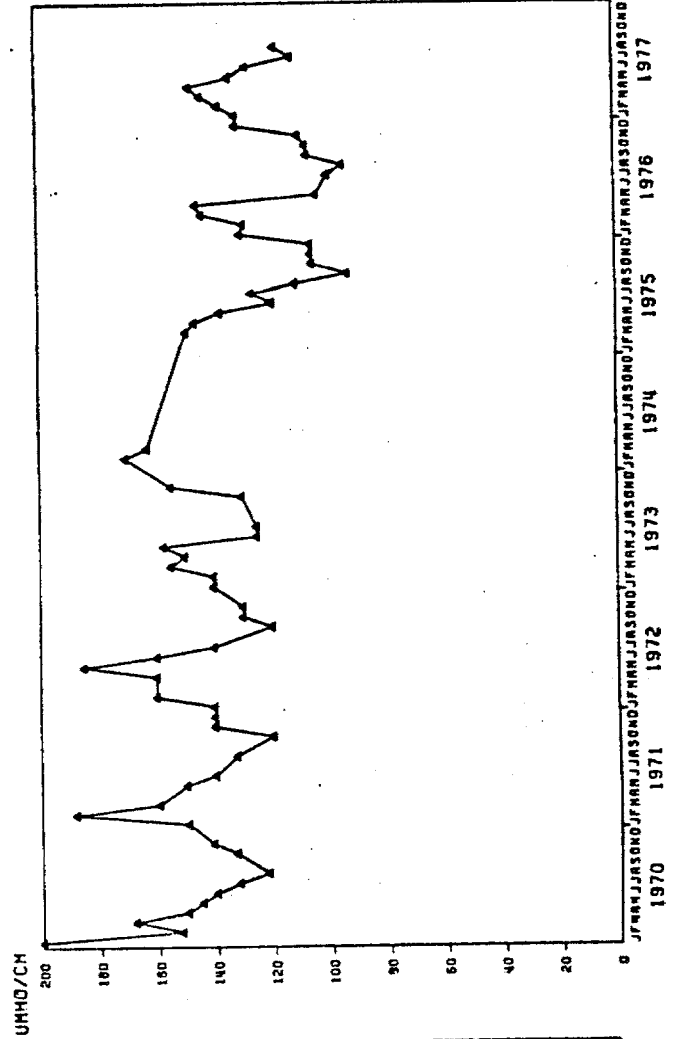
COLDSTREAM CR. AT K/LND.BR
MONTHLY MEANS FOR: COLOUR: TRUE



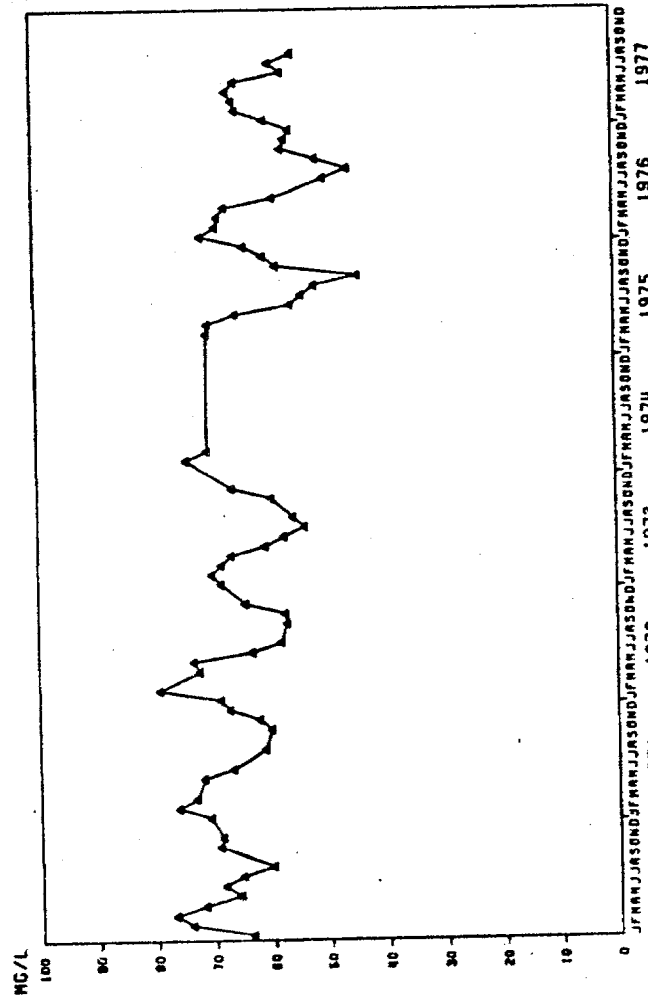
COLUMBIA RIVER; BIRCHBANK
MONTHLY MEANS FOR: PHOSPHORUS:ORT



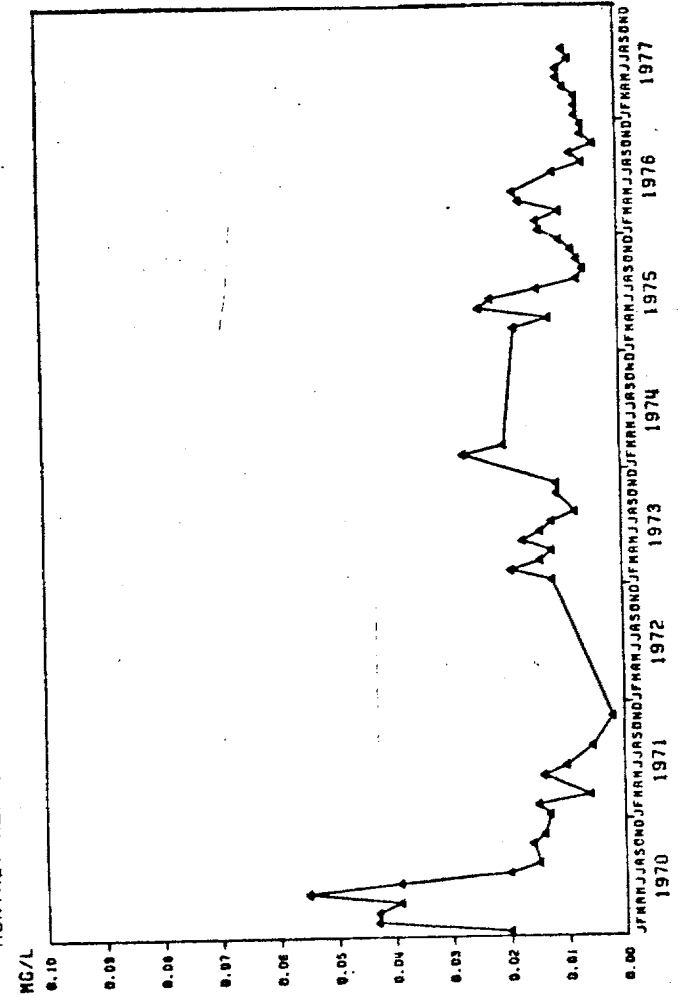
COLUMBIA RIVER; BIRCHBANK
MONTHLY MEANS FOR: SPECIFIC CONDUCT



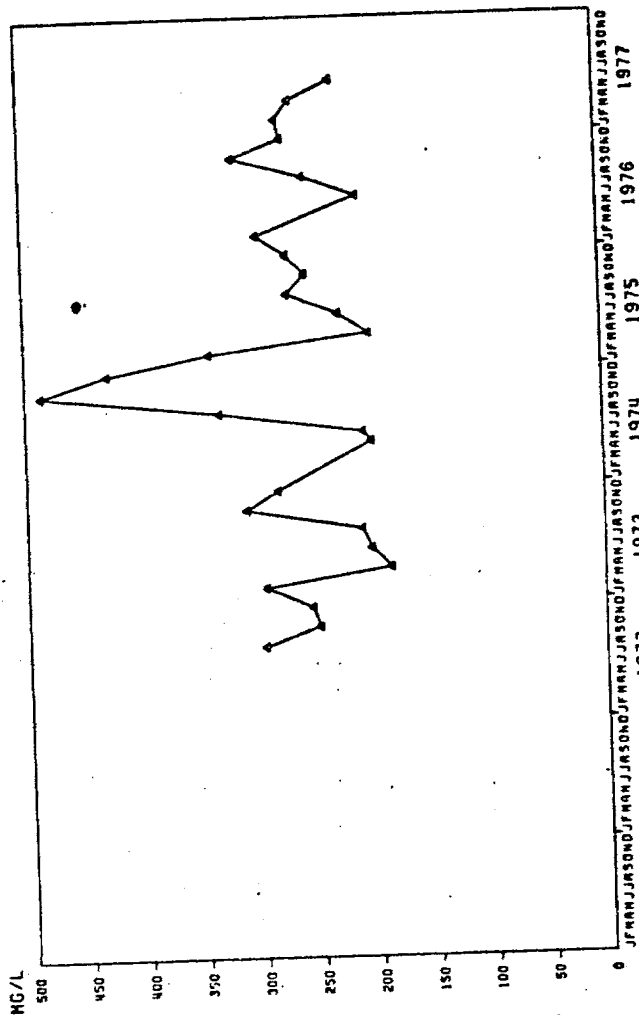
COLUMBIA RIVER; BIRCHBANK
MONTHLY MEANS FOR: HARDNES.T:CA03



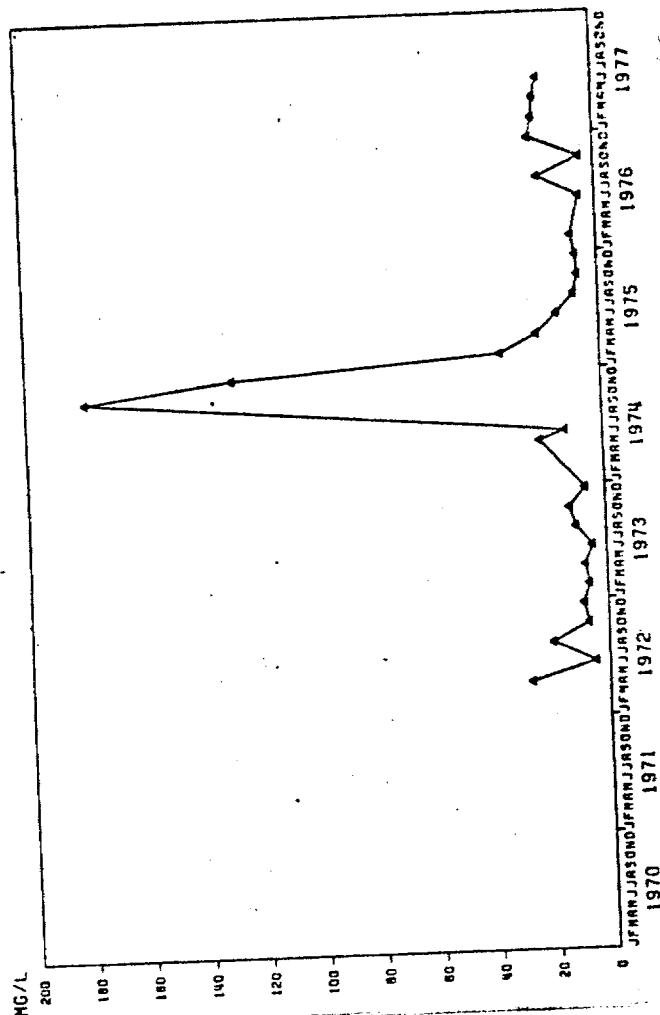
COLUMBIA RIVER; BIRCHBANK
MONTHLY MEANS FOR: PHOSPHORUS :TOT TOTAL



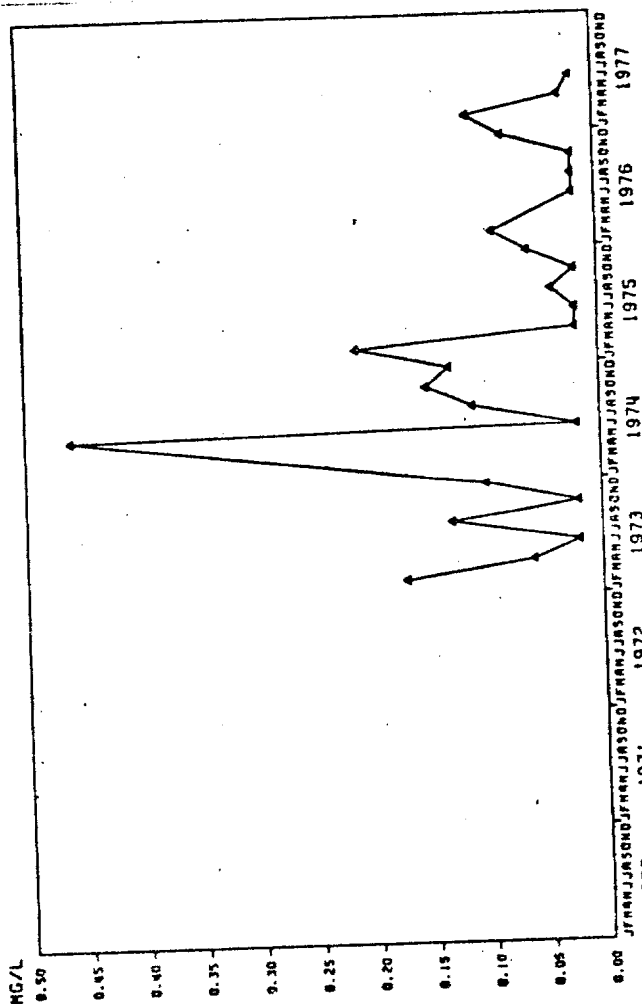
7/GH



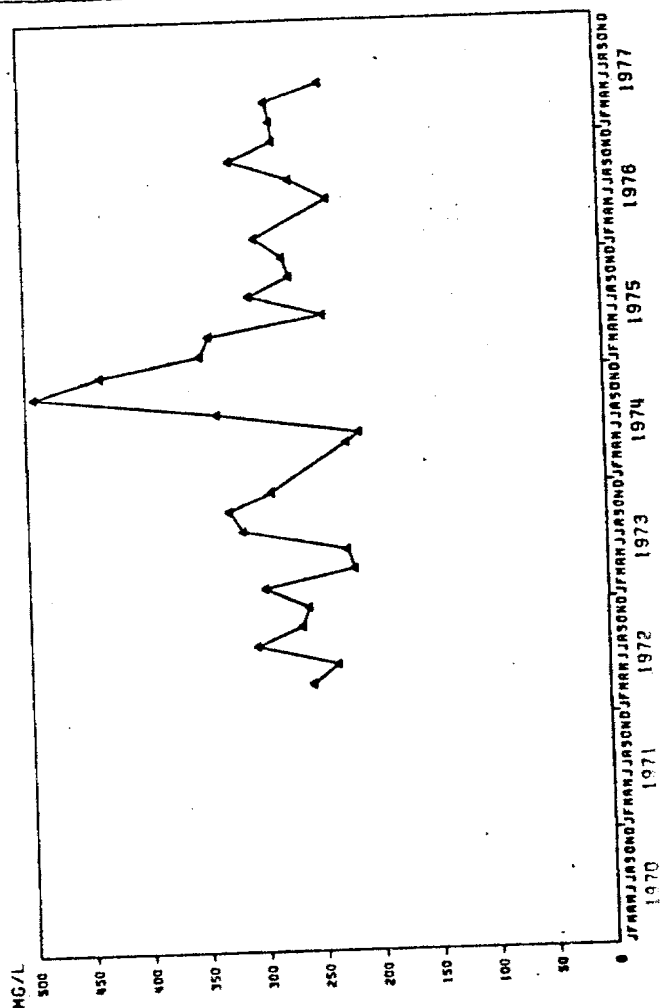
mg/L



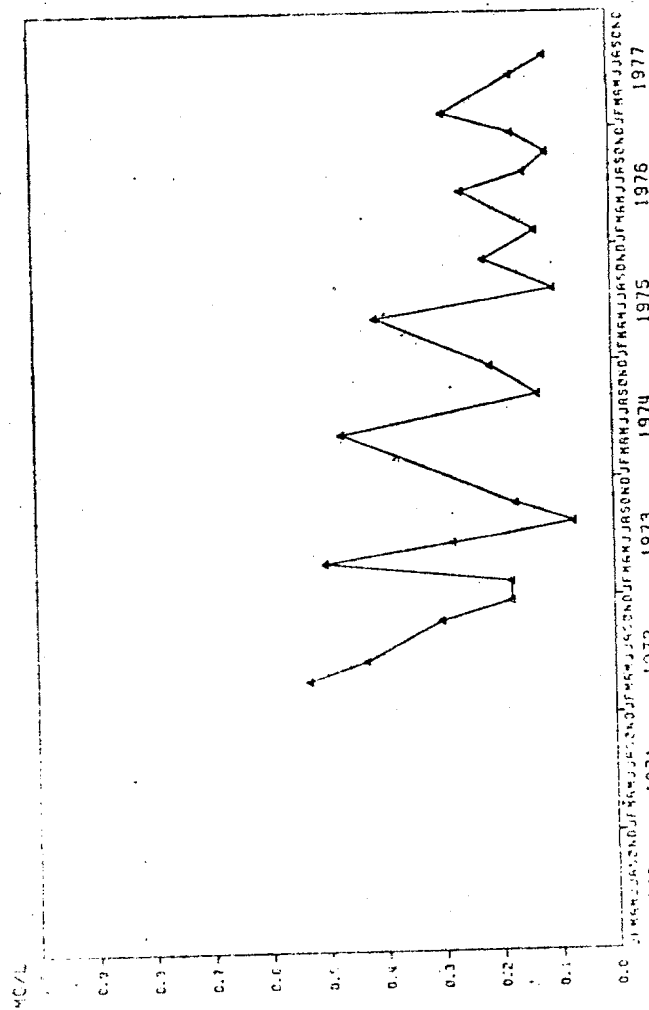
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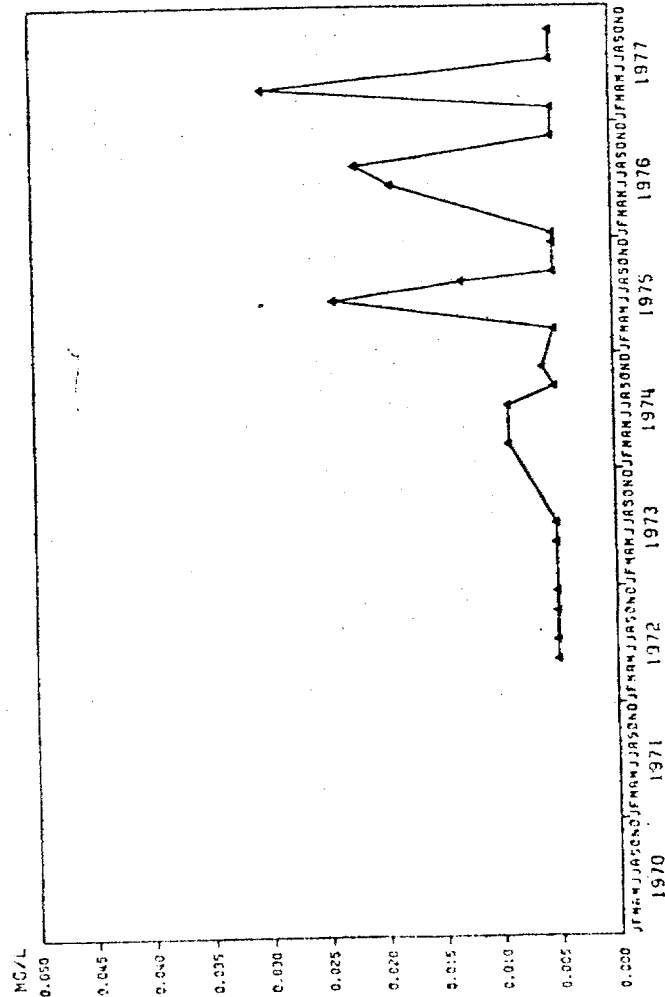
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FRASER R AT QUESNEL BR.
MONTHLY MEANS FOR: NITROGEN: KJELDAH

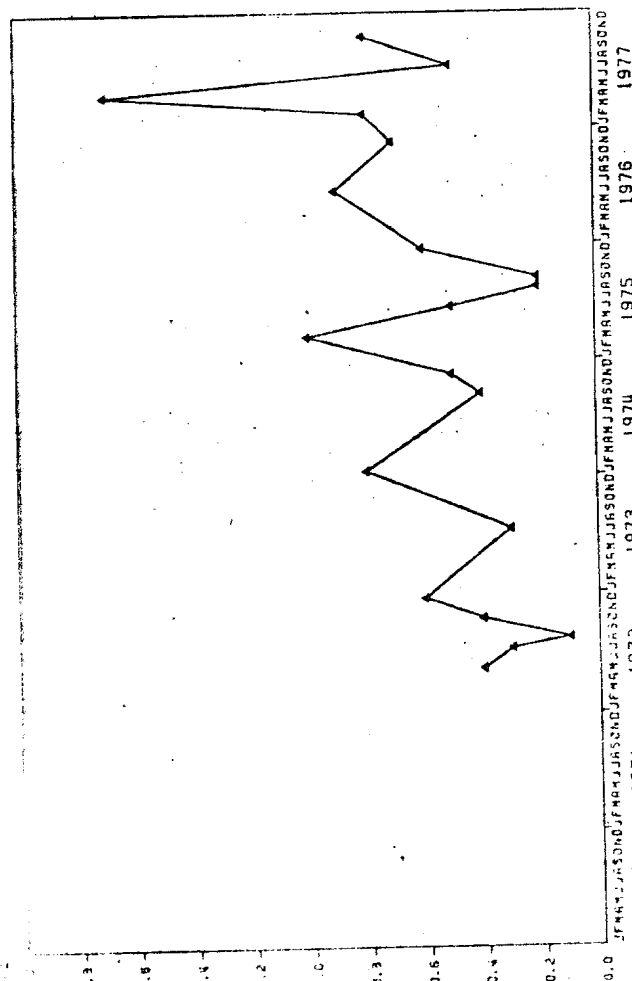


FRASER R. AT LILLOET
MONTHLY MEANS FOR: CHROMIUM
TOTAL



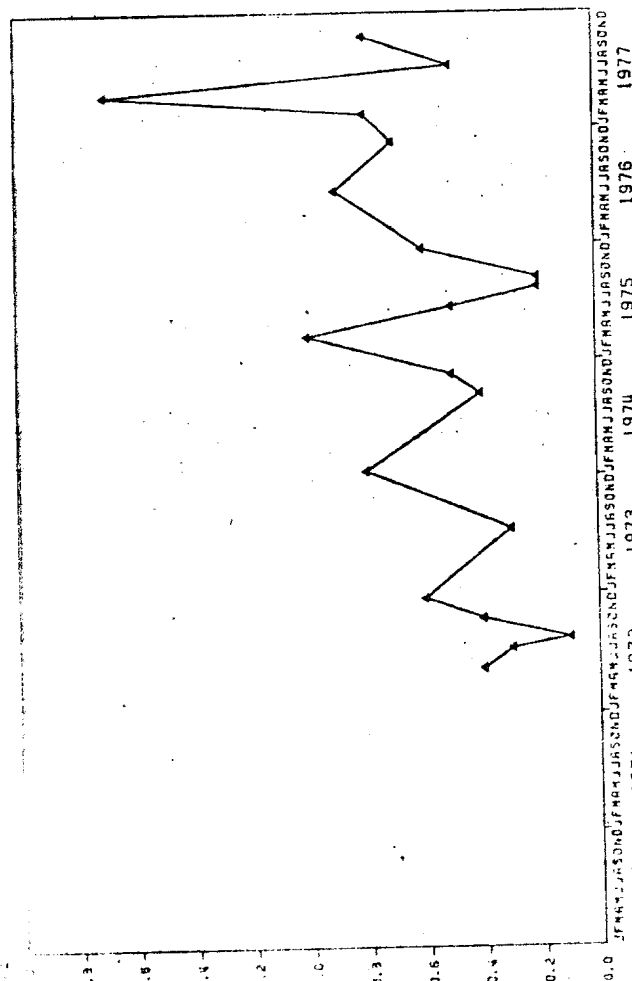
FRASER RIVER QUEENSB BC
MONTHLY MEANS FOR: CHROMIUM TOTAL

MG/L



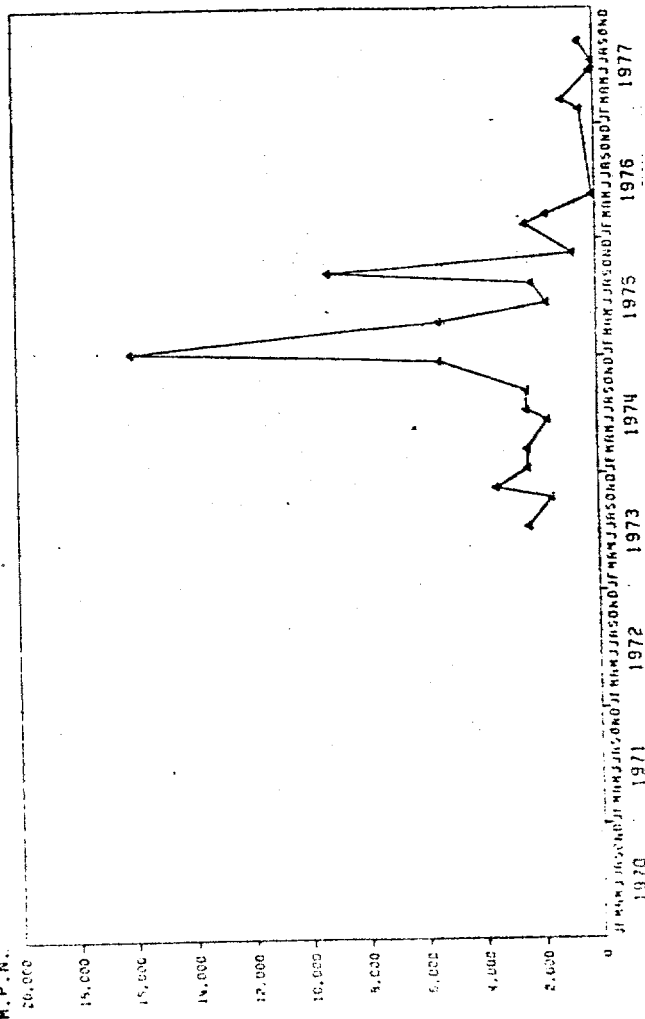
FRASER R. AT LILLOOET
MONTHLY MEANS FOR: TANNIN/LIGNIN

MG/L



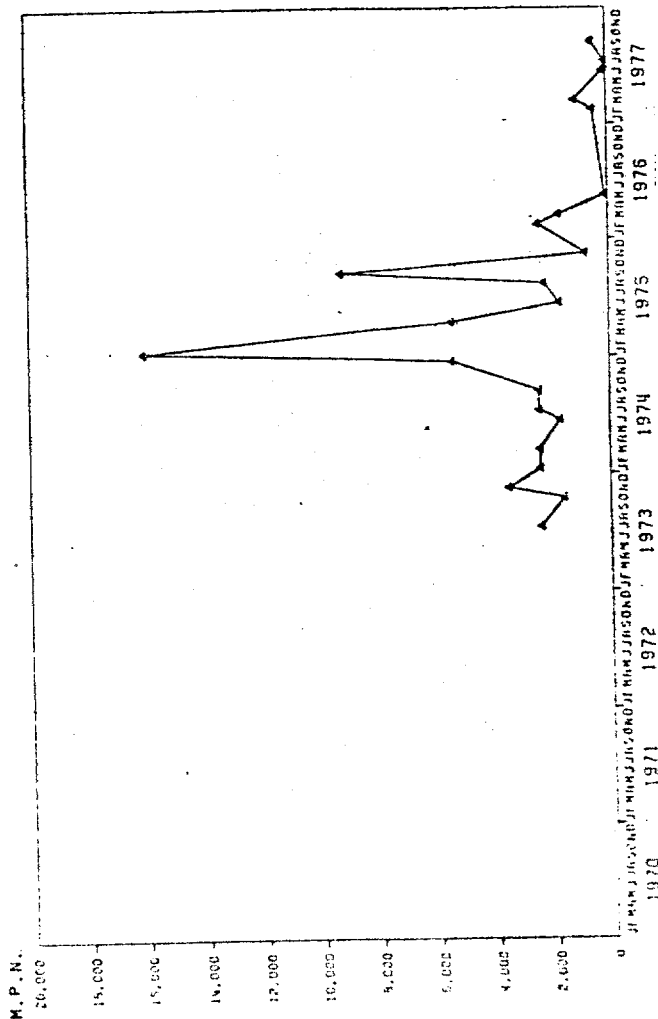
FRASER RIVER QUEENSB BC
MONTHLY MEANS FOR: COLIFORMS: FECAL

M.P.N.



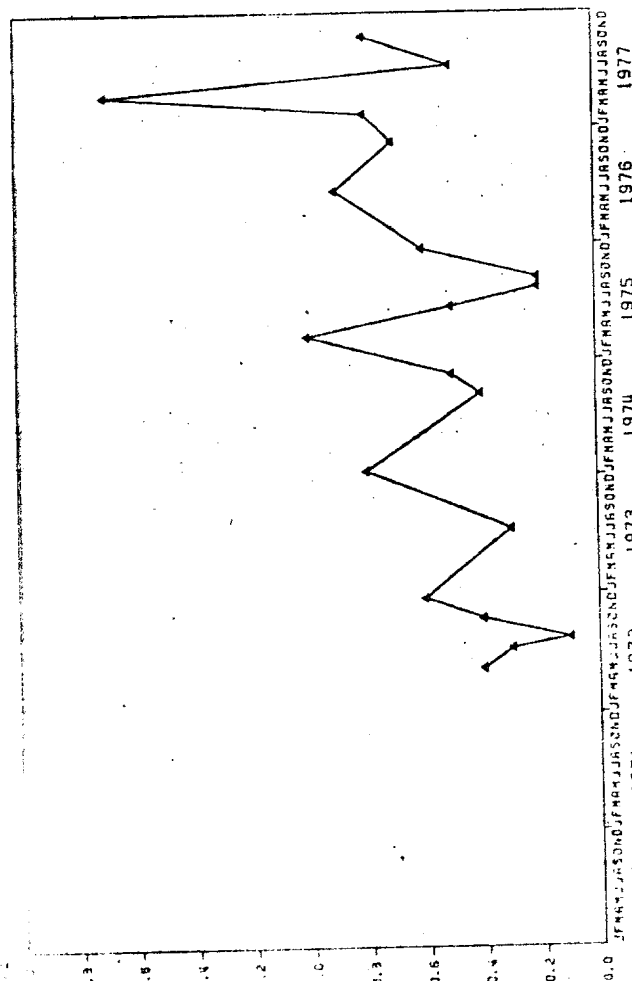
KOOTENAY R; CANAL FLATS
MONTHLY MEANS FOR: POTASSIUM DISSOLVED

MG/L



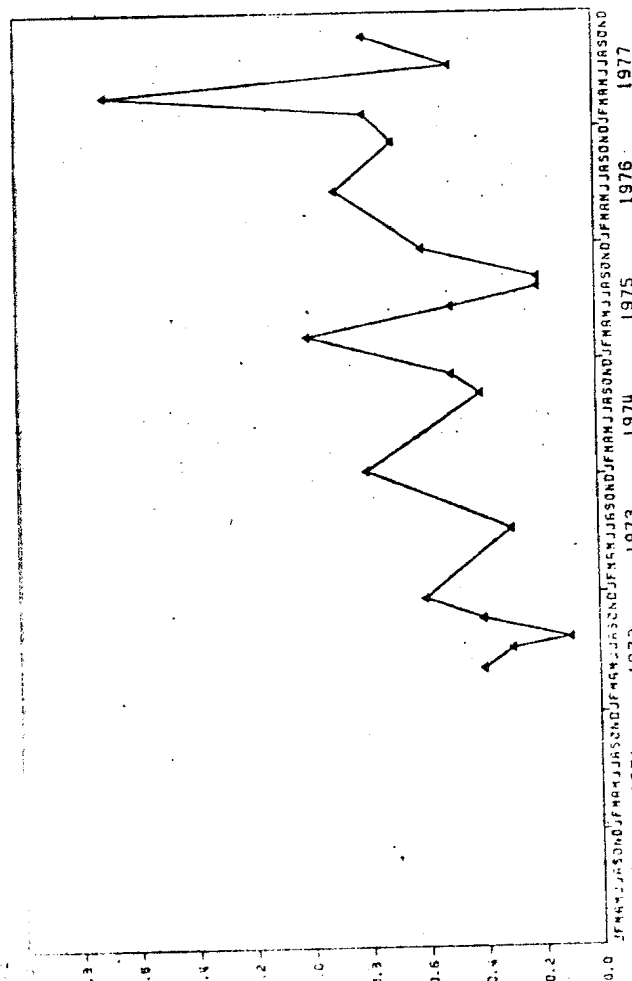
FRASER RIVER QUEENSB BC
MONTHLY MEANS FOR: CHROMIUM TOTAL

MG/L



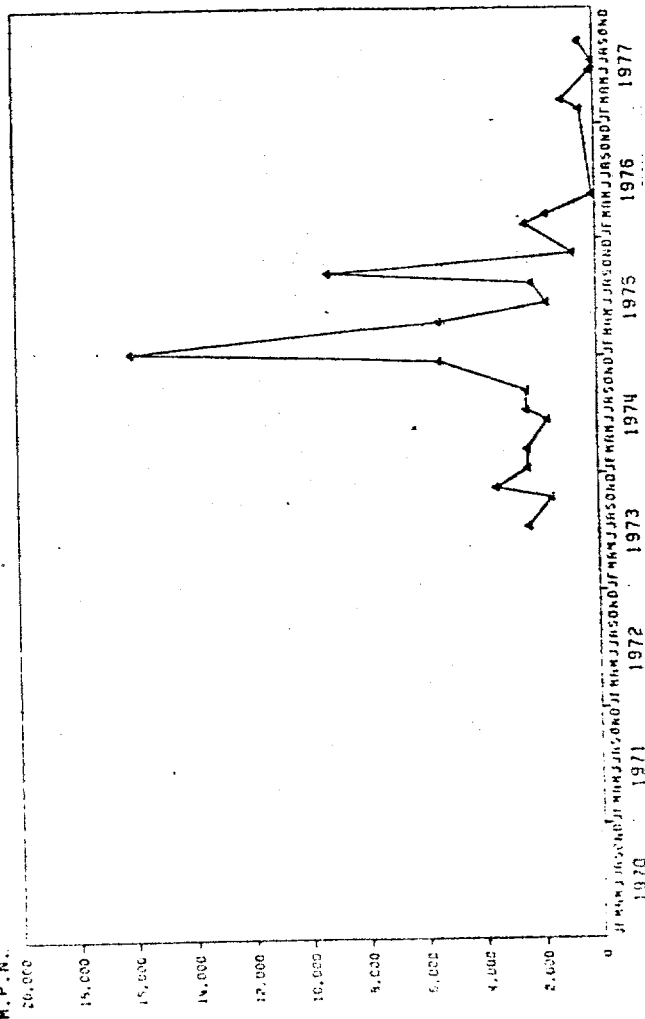
FRASER R. AT LILLOOET
MONTHLY MEANS FOR: TANNIN/LIGNIN

MG/L



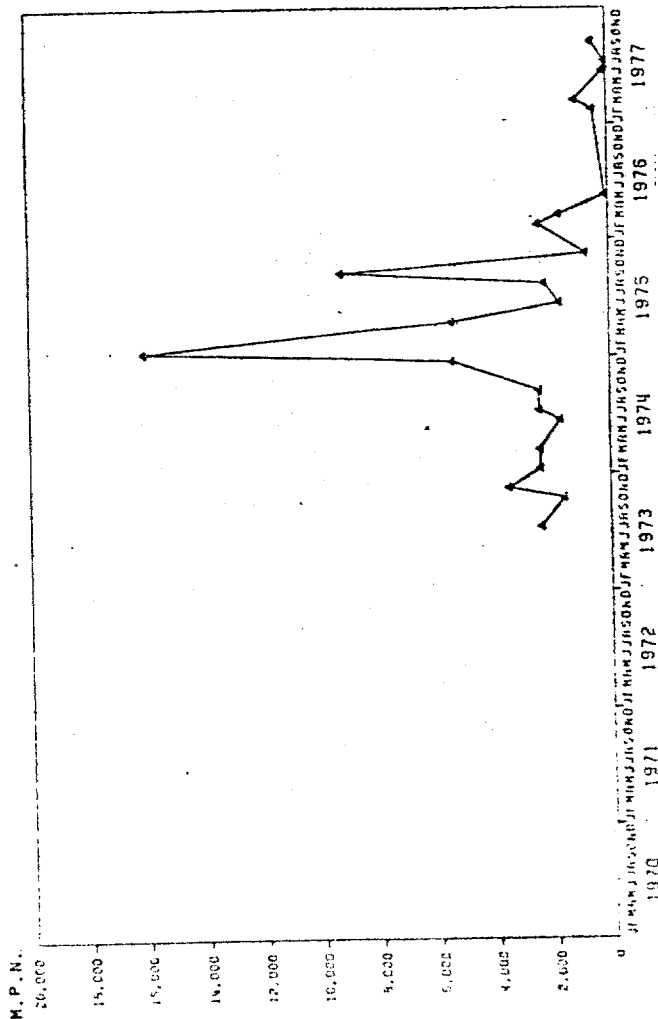
FRASER RIVER QUEENSB BC
MONTHLY MEANS FOR: COLIFORMS: FECAL

M.P.N.

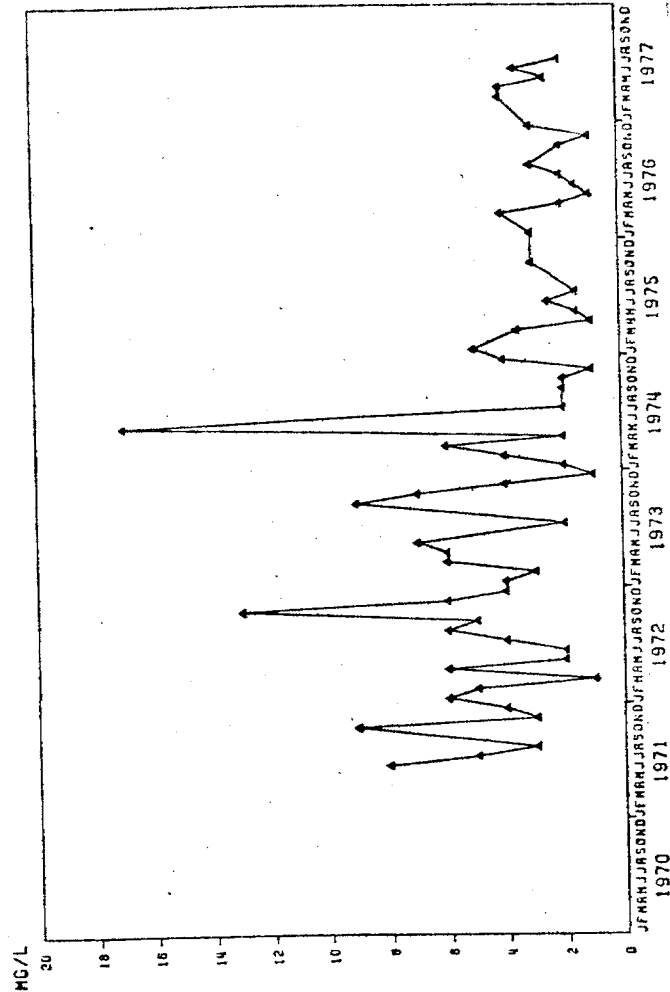
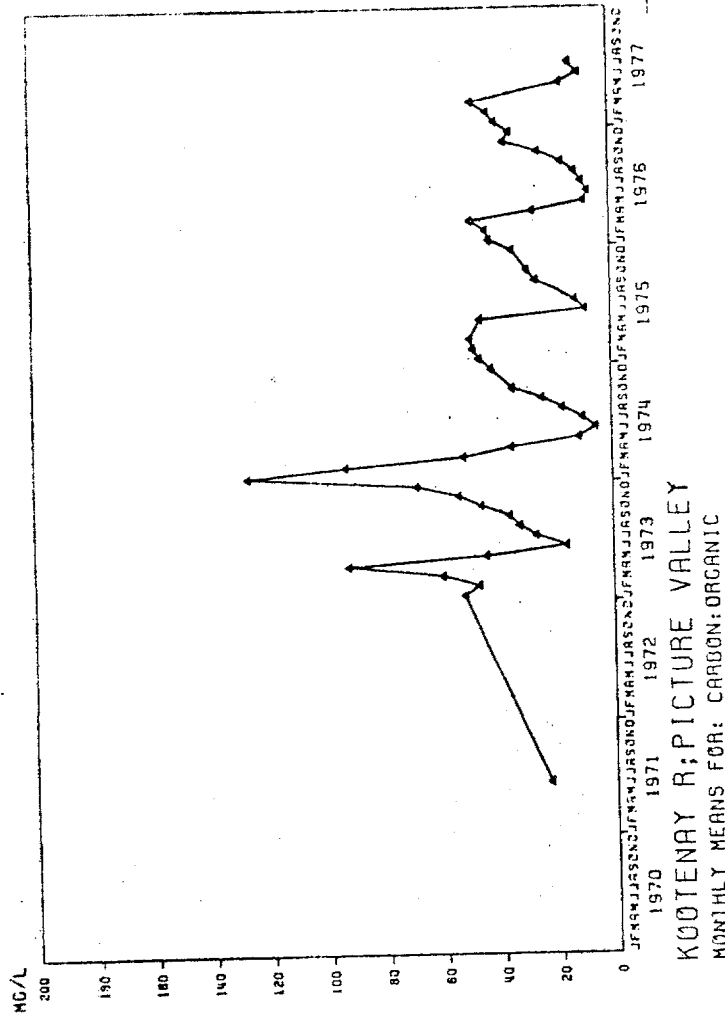


KOOTENAY R; CANAL FLATS
MONTHLY MEANS FOR: POTASSIUM DISSOLVED

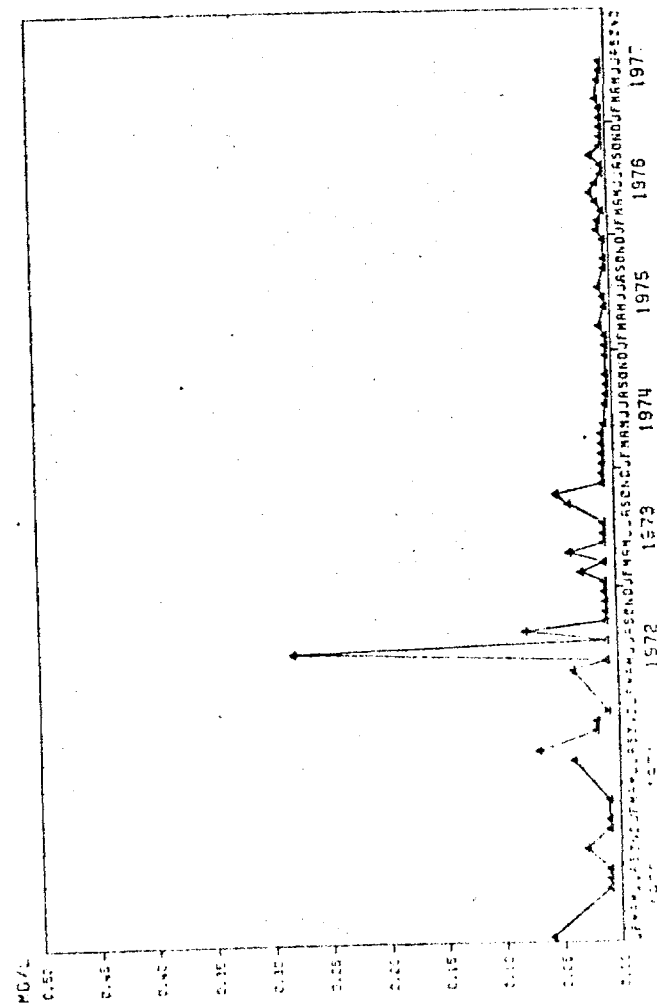
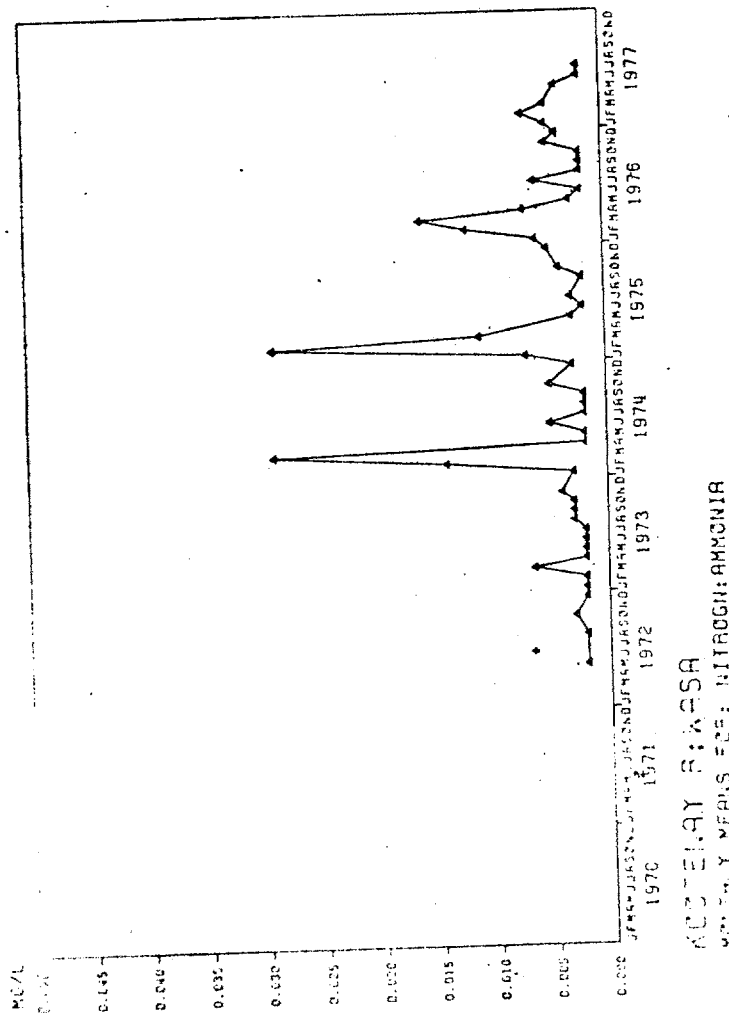
MG/L



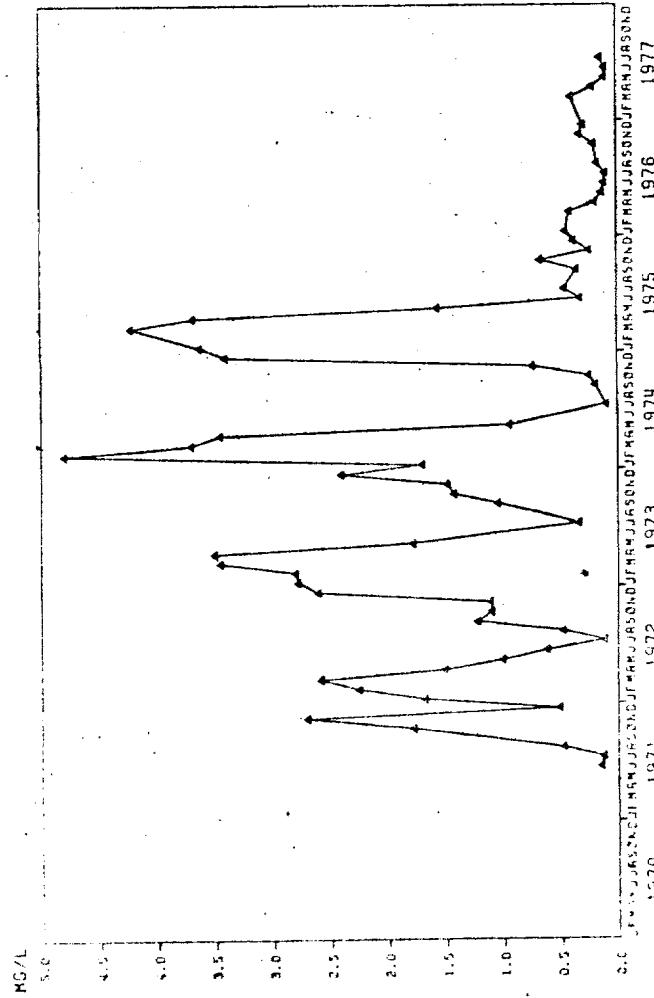
KOOTENAY R; SKOOKUMCHUCK MONTHLY MEANS FOR: SULPHATE DISSOLVED



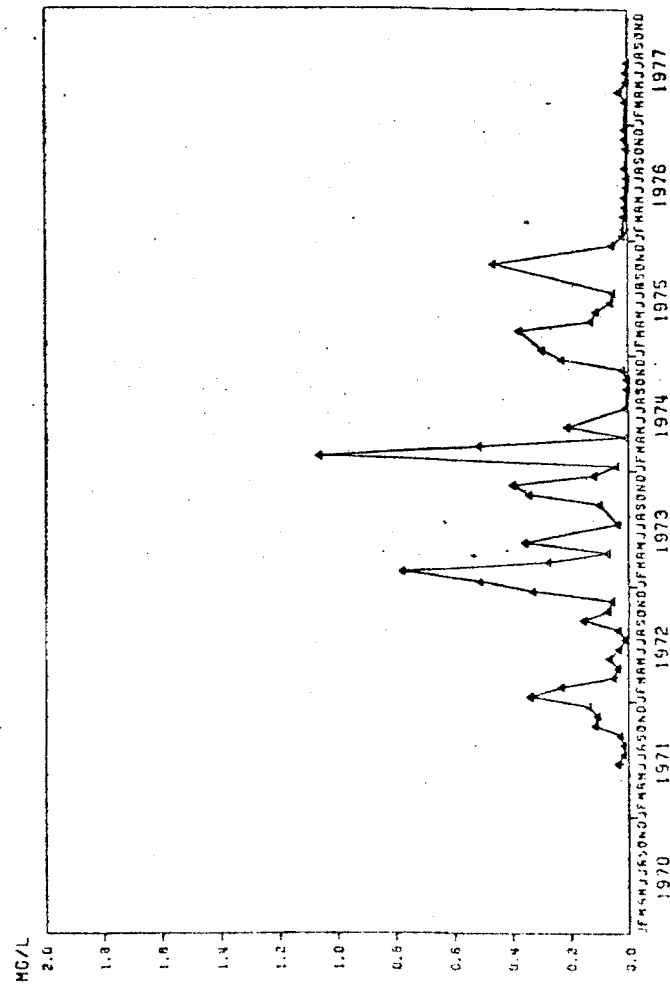
KOOTENAY R; SKOOKUMCHUCK MONTHLY MEANS FOR: PHENOL



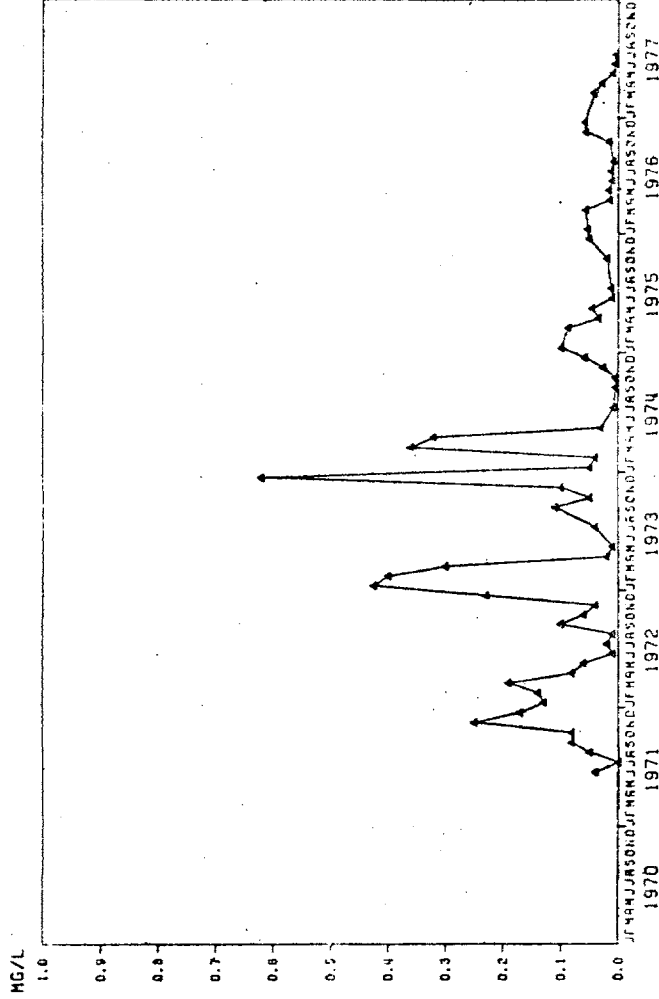
KOOTENAY R: PICTURE VALLEY
MONTHLY MEANS FOR: FLUORIDE: DISSOL



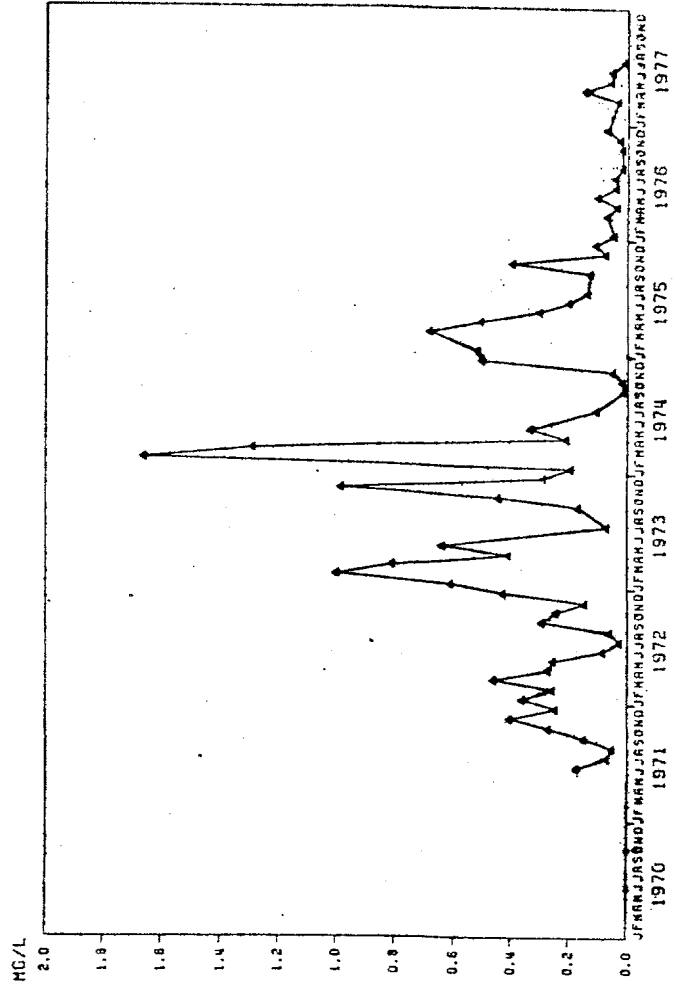
KOOTENAY R: PICTURE VALLEY
MONTHLY MEANS FOR: PHOSPHORUS: ORT



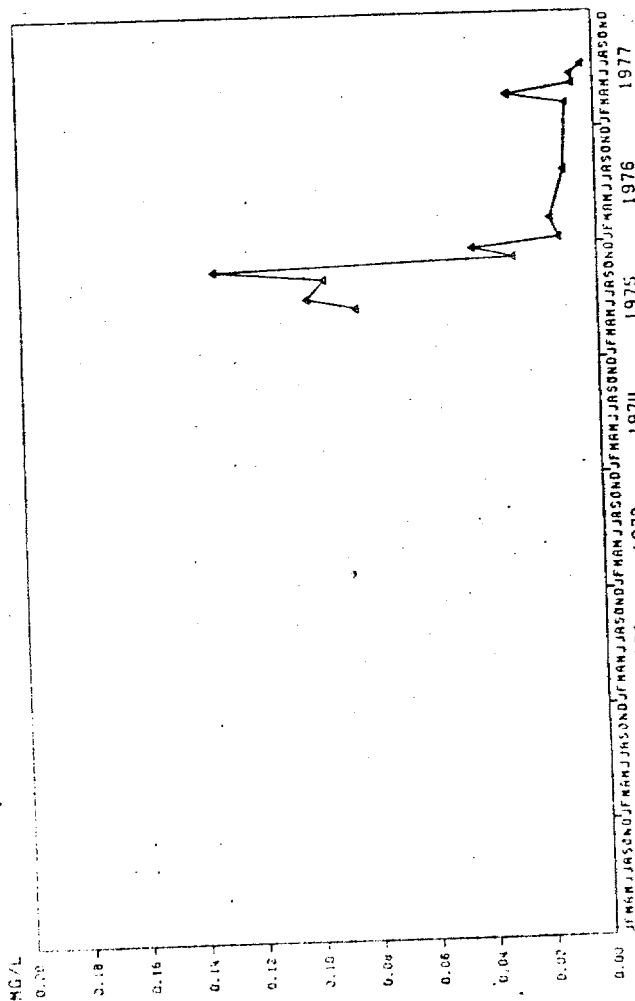
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MONTHLY MEANS FOR: NITROGEN: AMMONIA



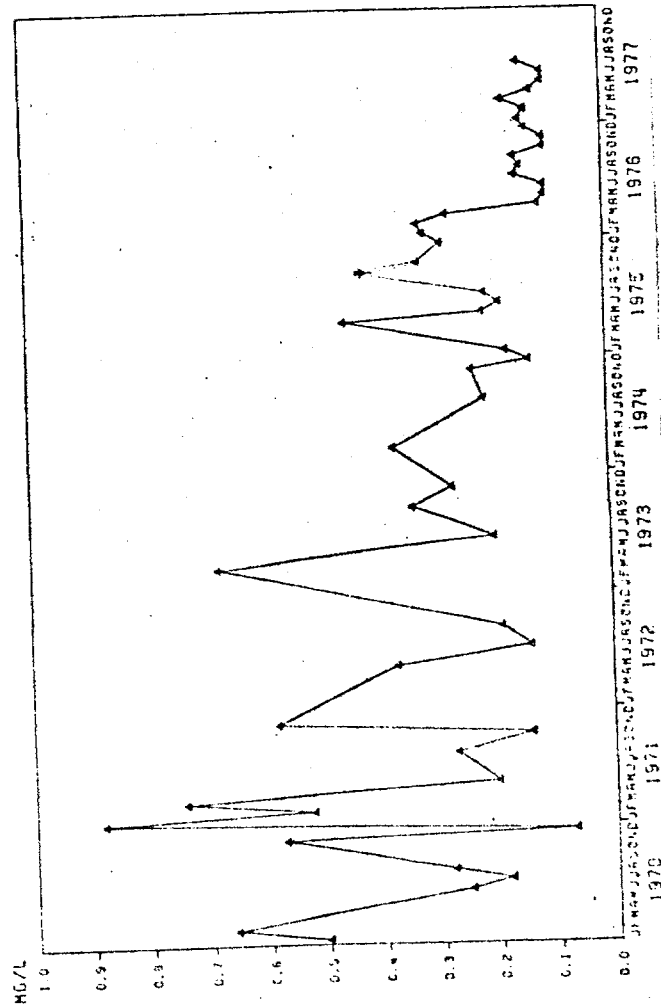
KOOTENAY R: PICTURE VALLEY
MONTHLY MEANS FOR: PHOSPHORUS: TOT TOTAL



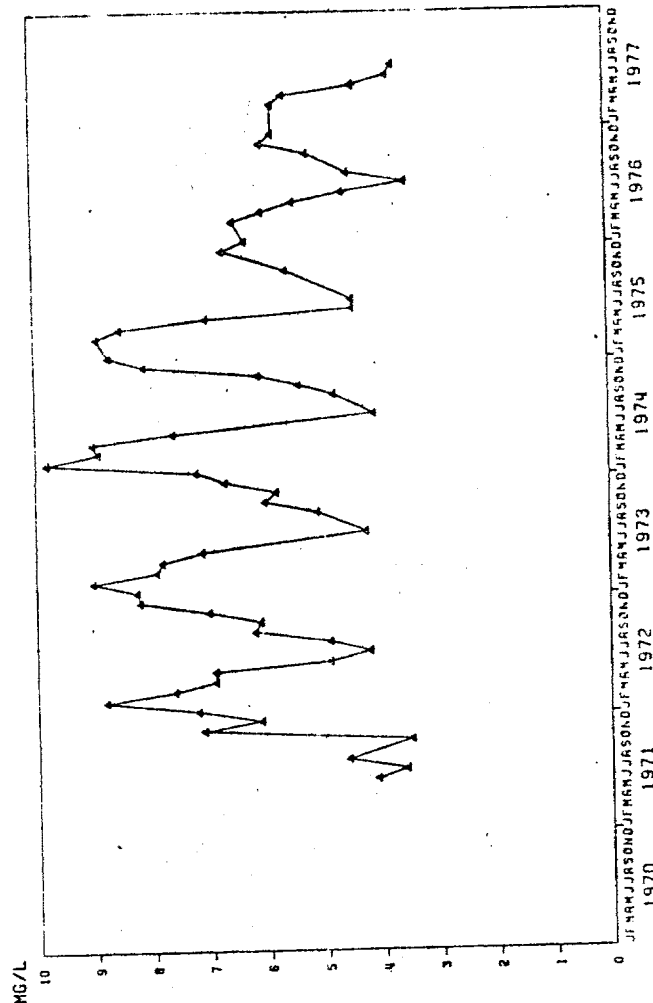
KOOTENAY R: PICTURE VALLEY
MONTHLY MEANS FOR: PHOSPHORUS : TOT DISSOLVED



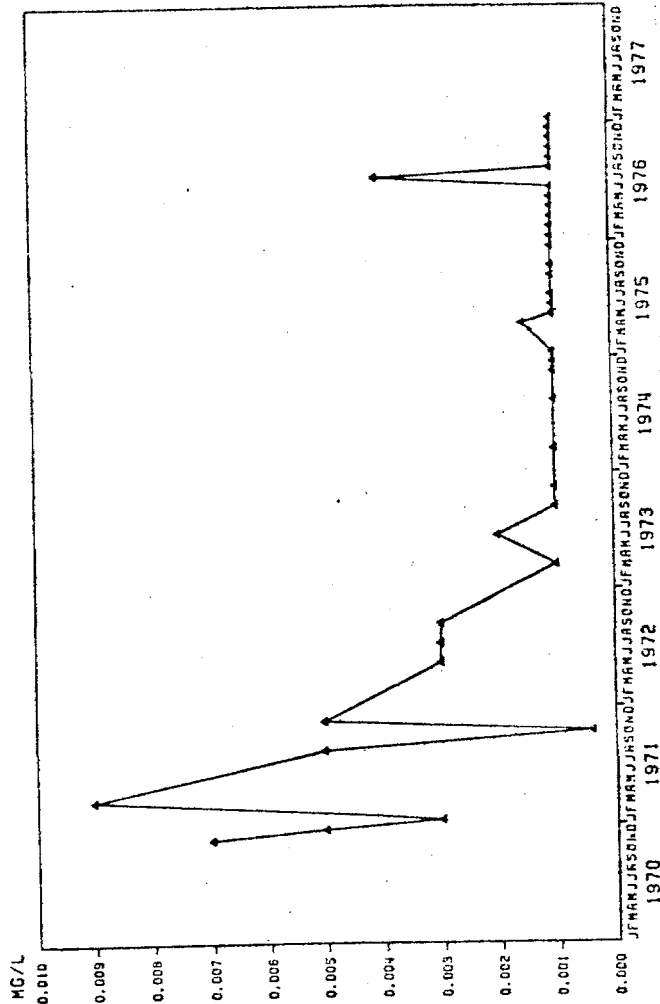
KOOTENAY R: PORTHILL
MONTHLY MEANS FOR: FLUORIDE: DISSOL



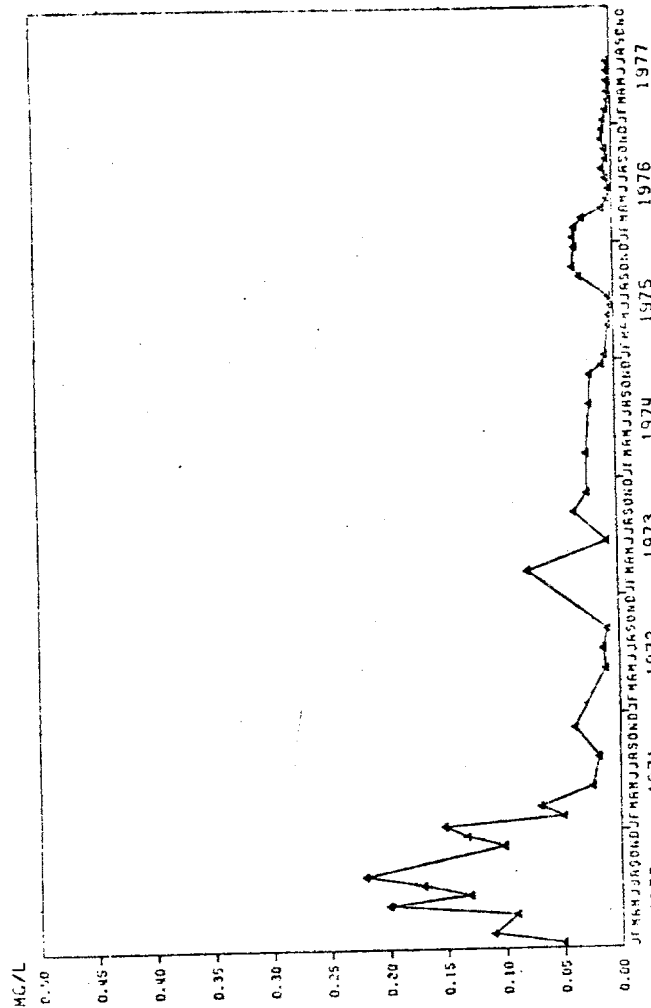
KOOTENAY R: PICTURE VALLEY
MONTHLY MEANS FOR: SILICA: REACTIVE



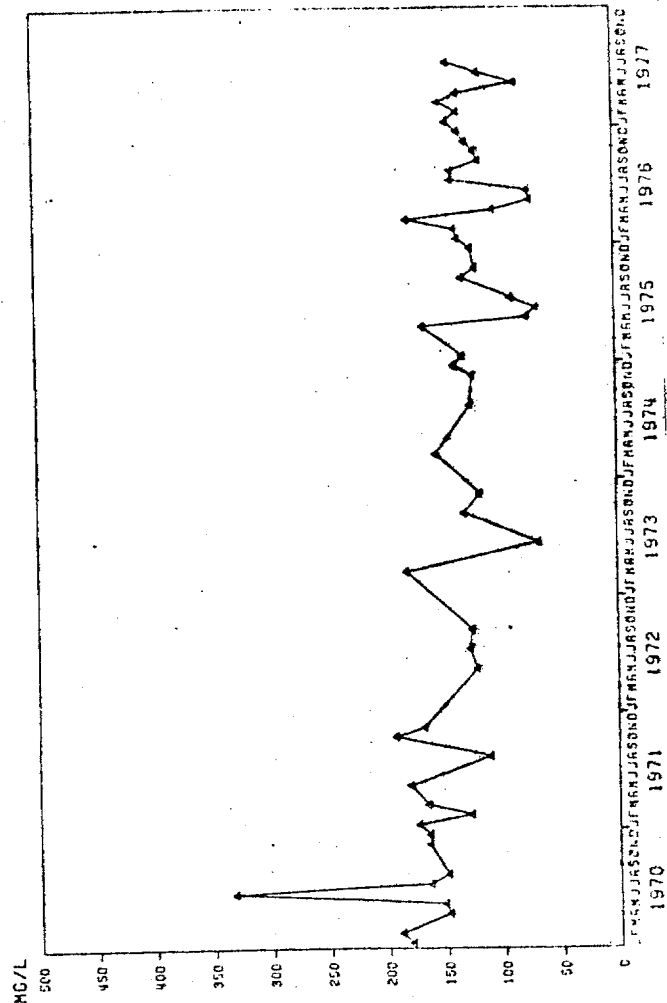
KOOTENAY R: PORTHILL
MONTHLY MEANS FOR: LEAD
DISSOLVED



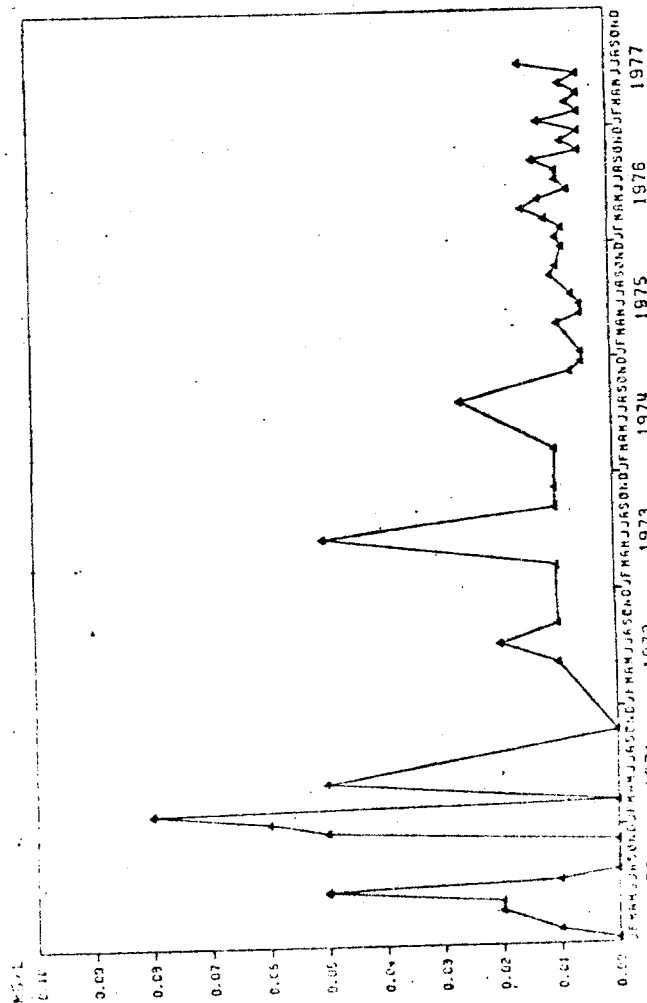
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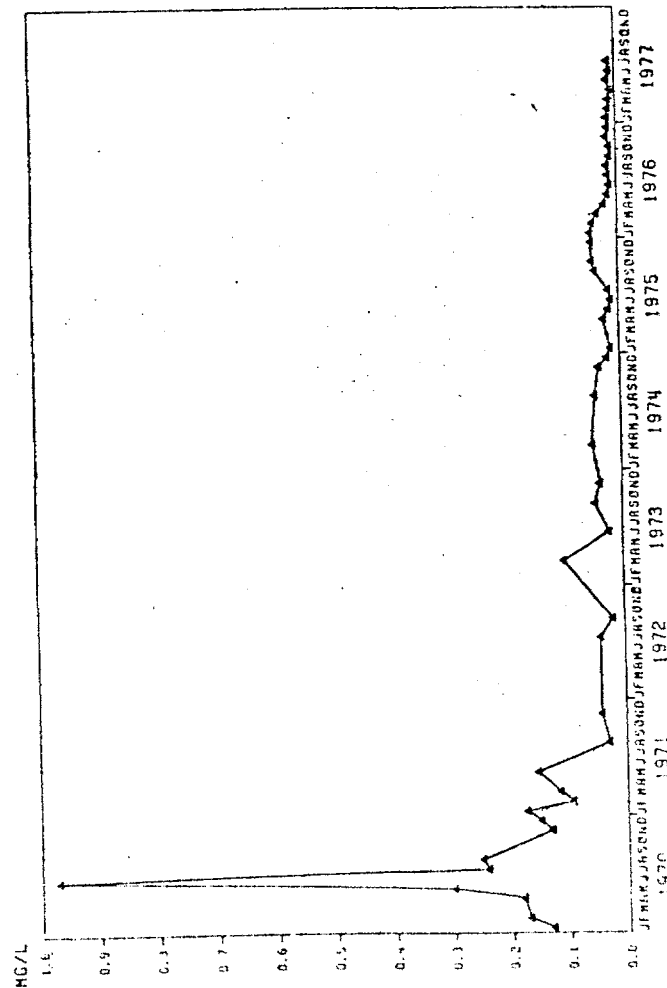
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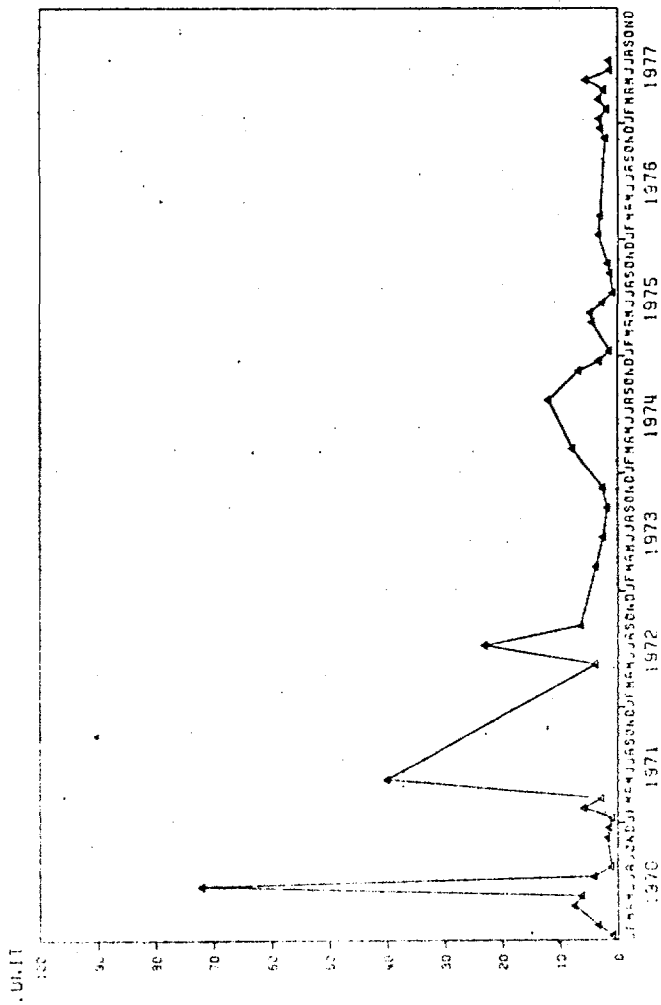
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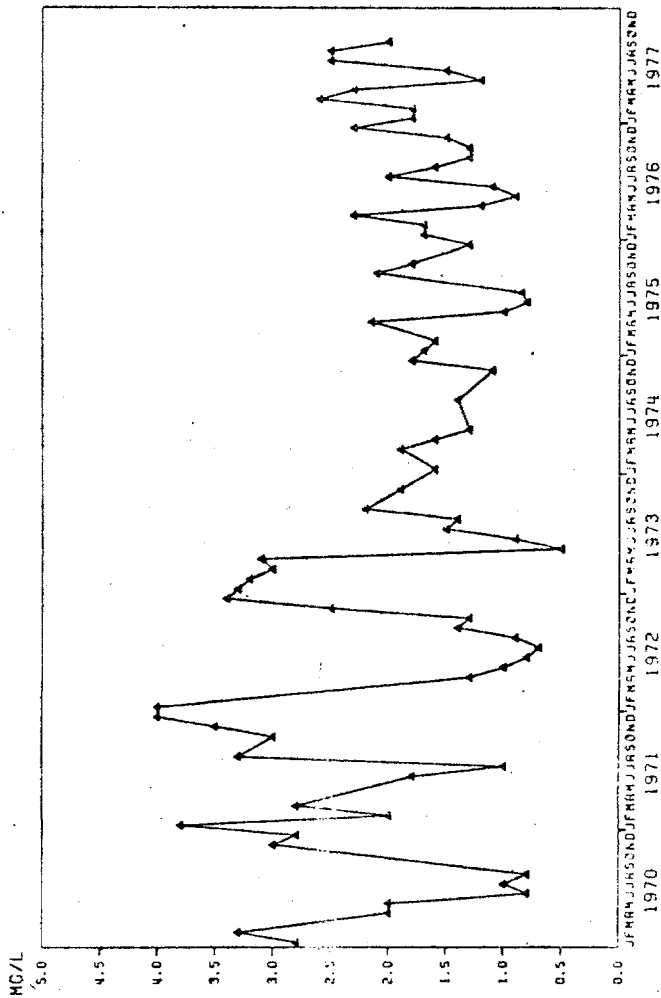
KOOTENAY R: PORTHILL MONTHLY MEANS FOR: PHOSPHORUS: TOT TOTAL



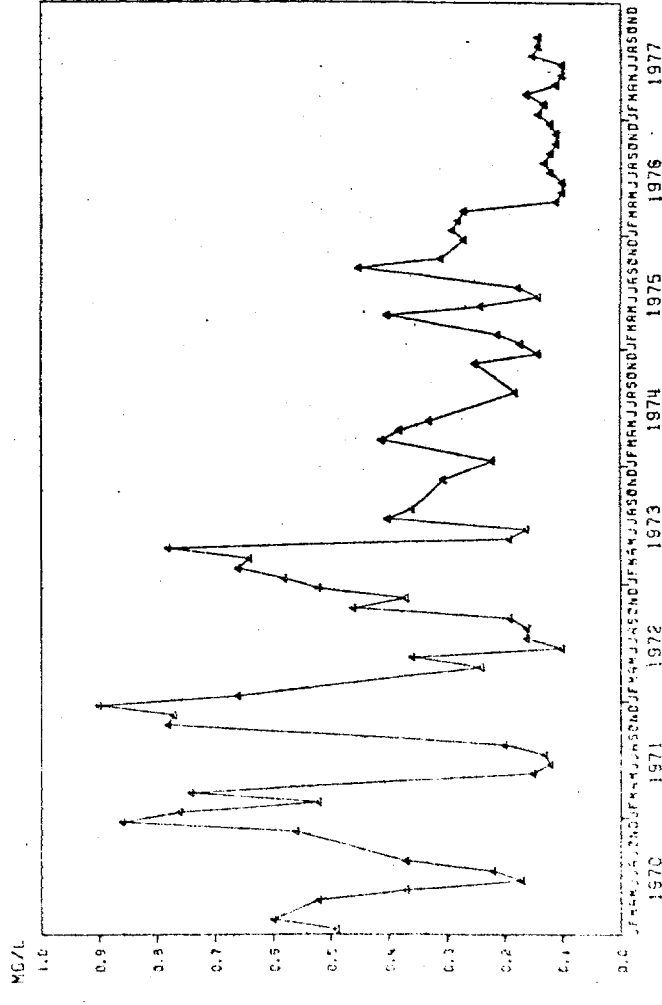
KOOTENAY R; PORTHILL
MONTHLY MEANS FOR: TURBIDITY



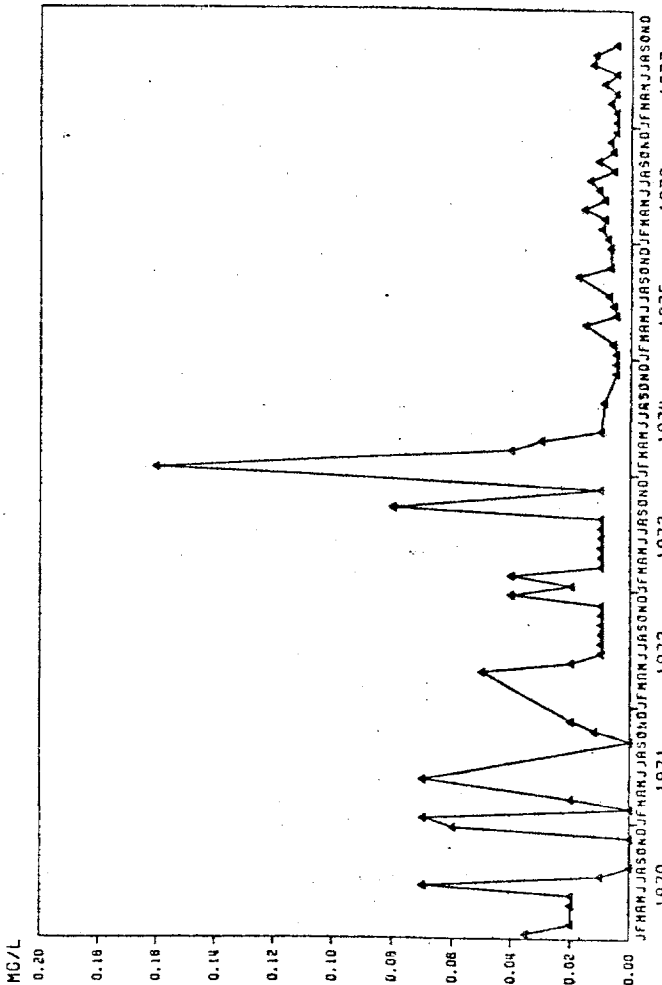
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MONTHLY MEANS FOR: CHLORIDE:DISSOL



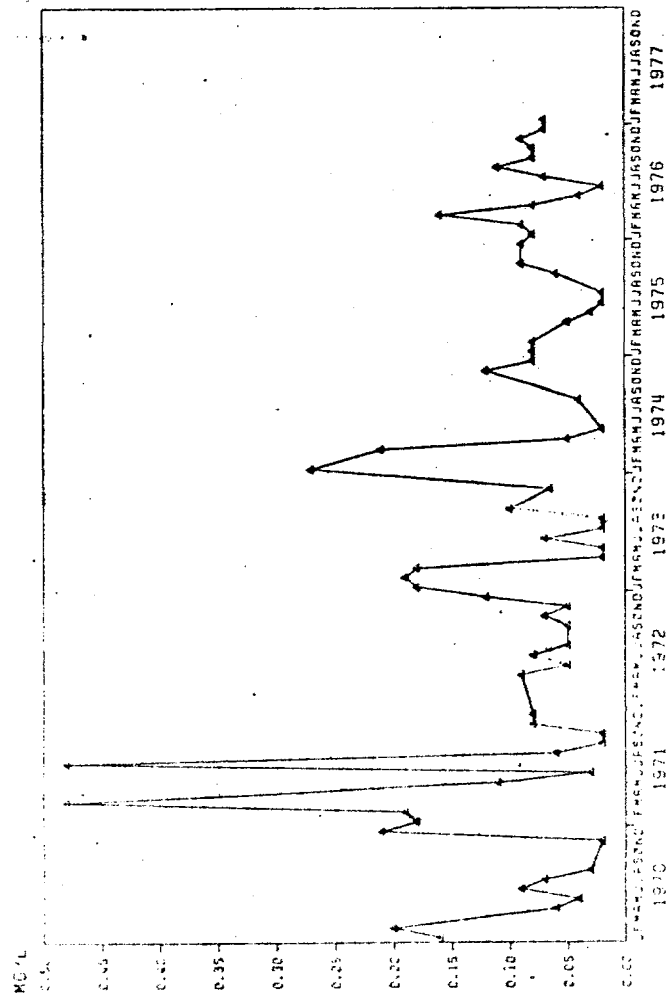
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MONTHLY MEANS FOR: FLUORIDE:DISSOL



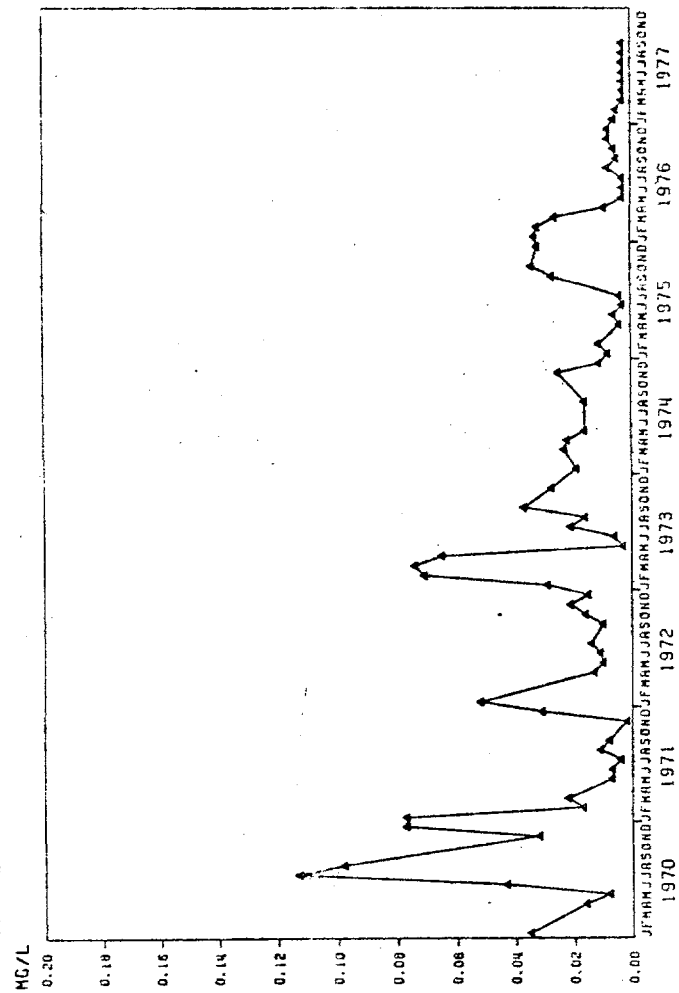
KOOTENAY R; CRESTON
MONTHLY MEANS FOR: NITROGEN:AMMONIA



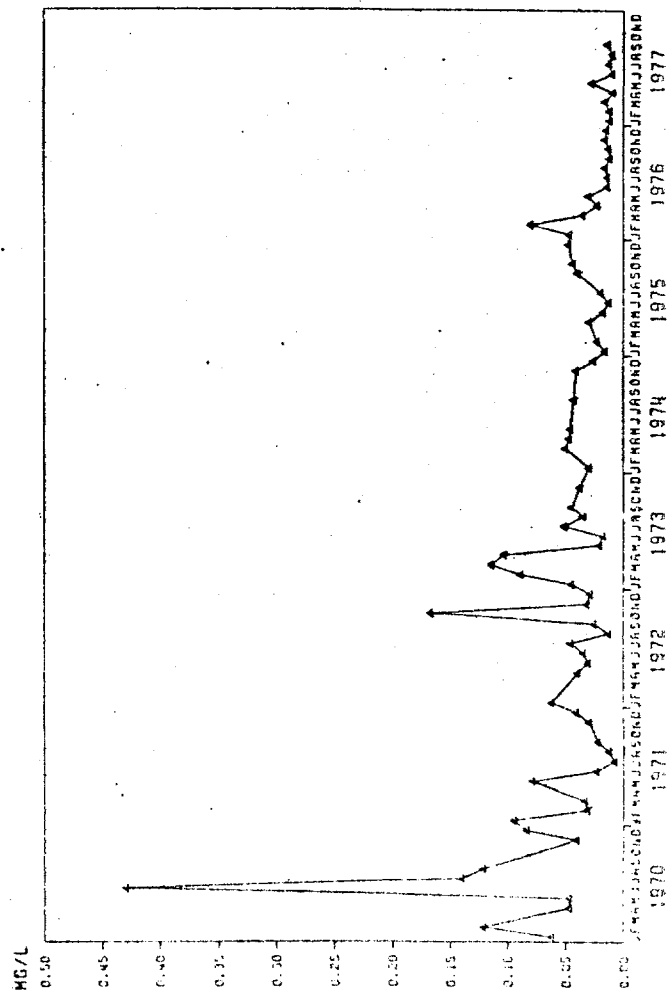
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MONTHLY MEANS FOR: NITROGEN:NO3



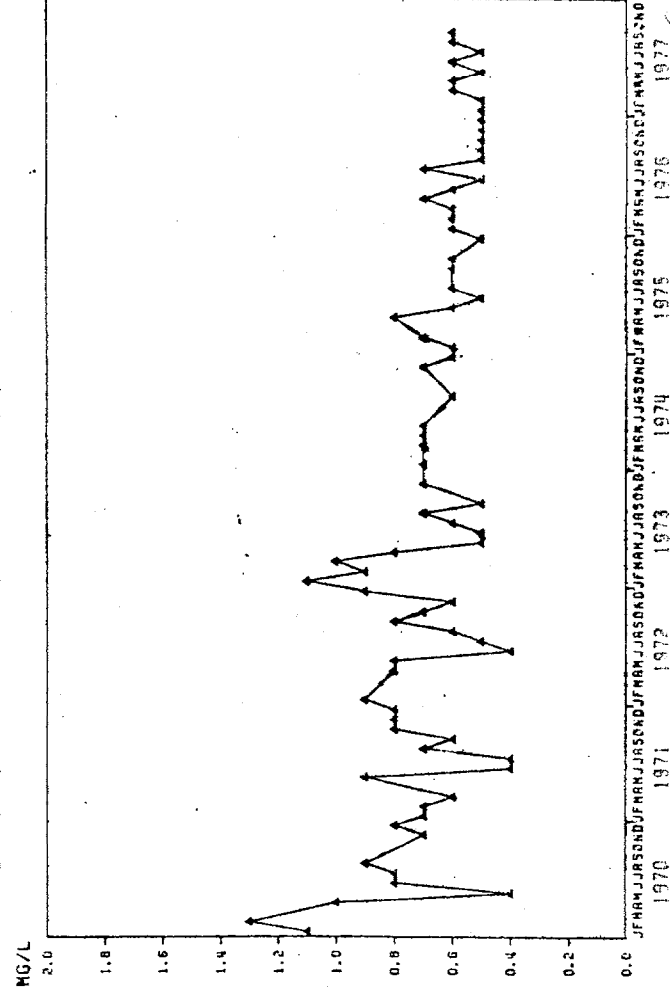
KOOTENAY R;CRESTON
MONTHLY MEANS FOR: PHOSPHORUS:ORT



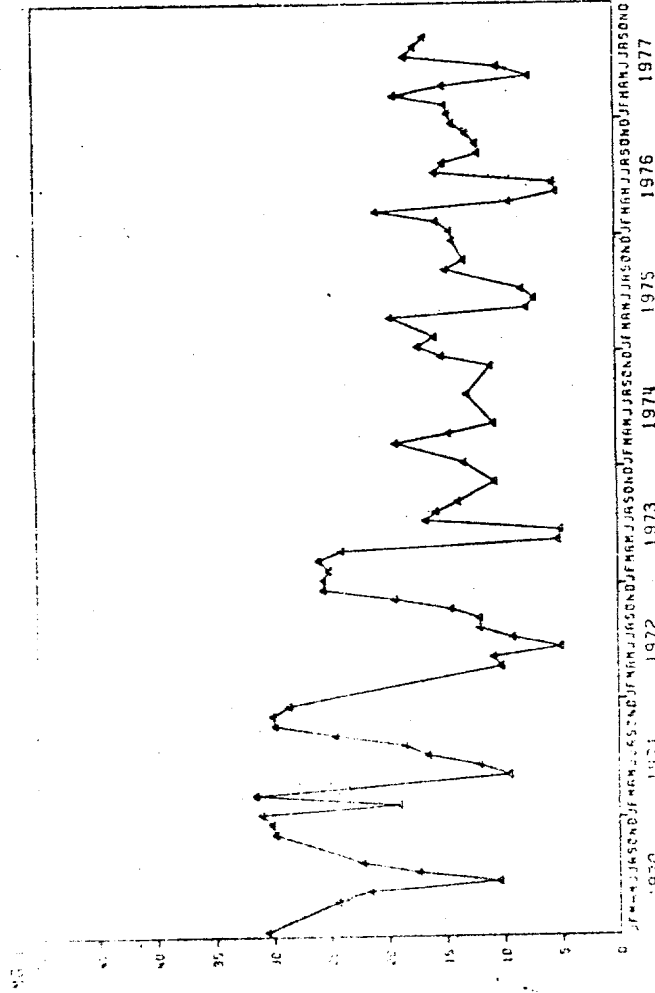
KOOTENAY R;CRESTON
MONTHLY MEANS FOR: PHOSPHORUS :TOT TOTAL



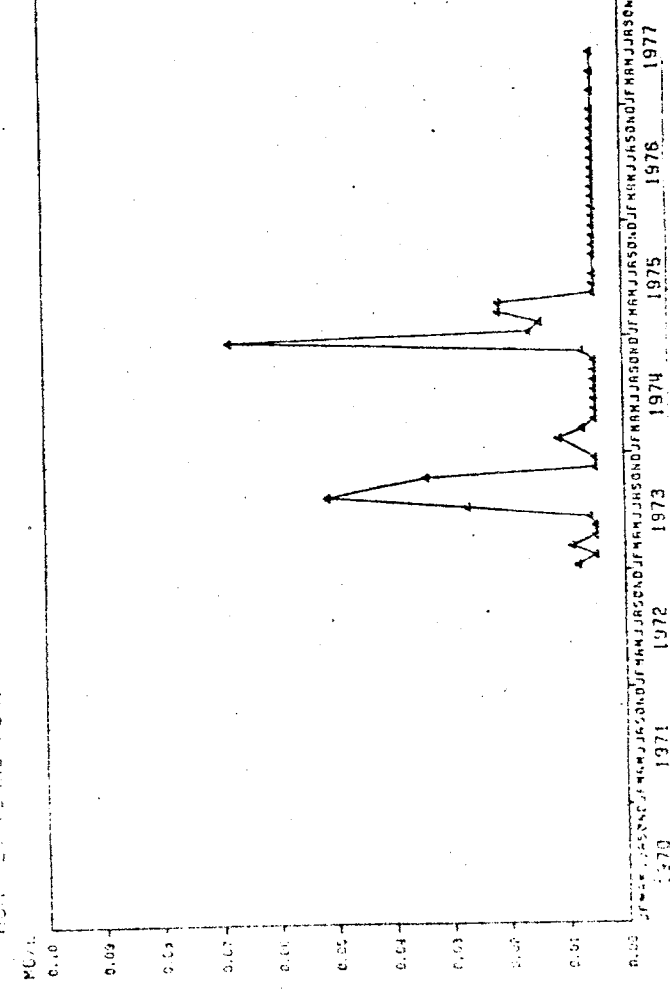
KOOTENAY R;CRESTON
MONTHLY MEANS FOR: POTASSIUM
DISSOLVED



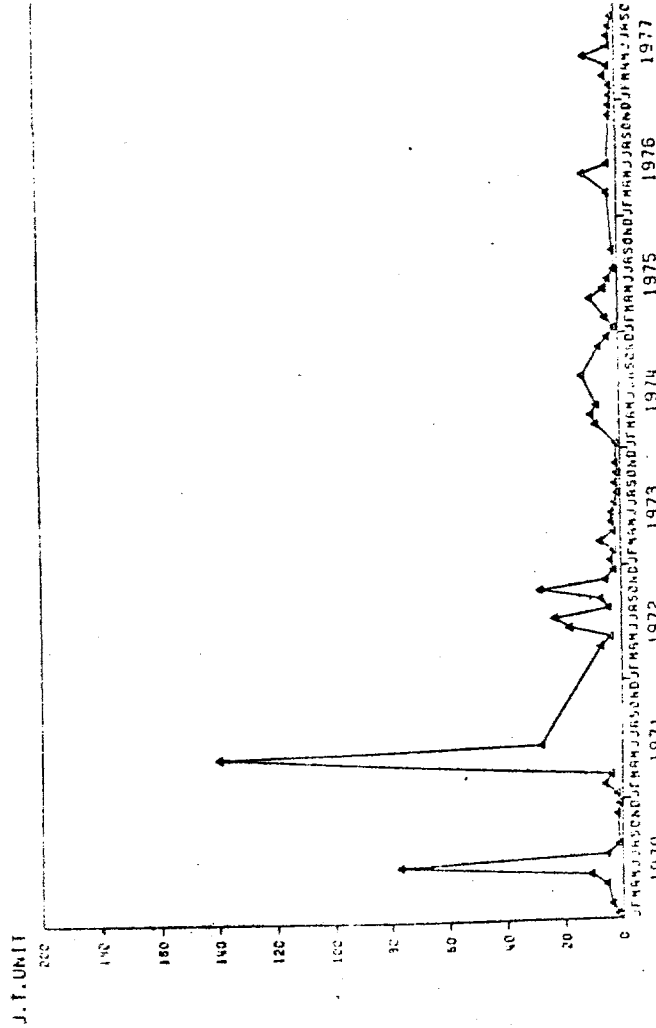
KOOTENAY R:CRESTON
MONTHLY MEANS FOR: DISSOL



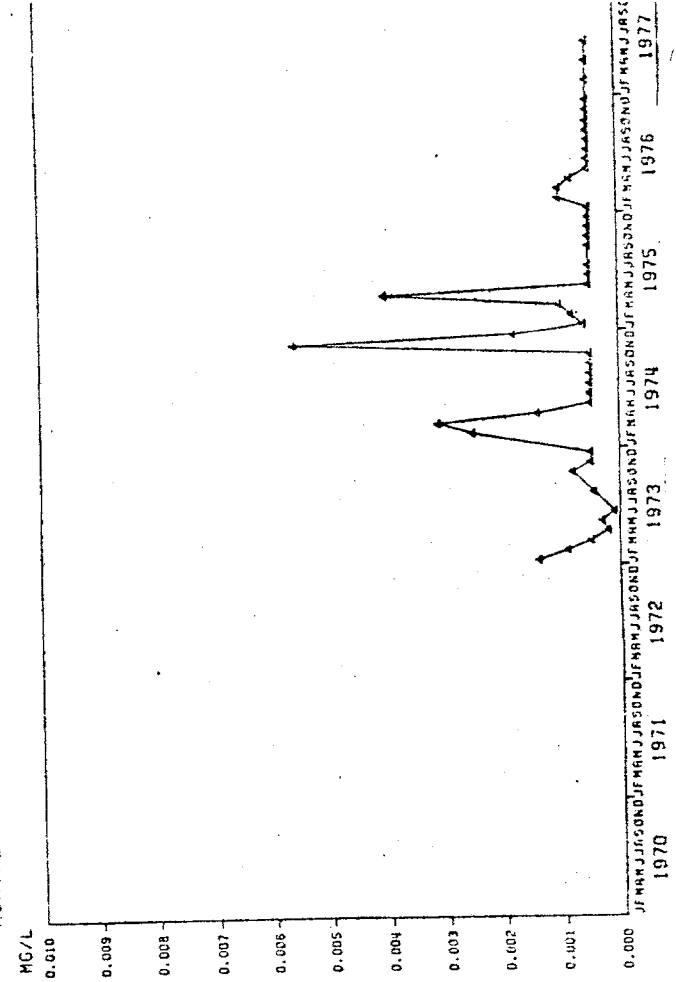
ST. MARY R:WYCLIFFE
MONTHLY MEANS FOR: ARSENIC



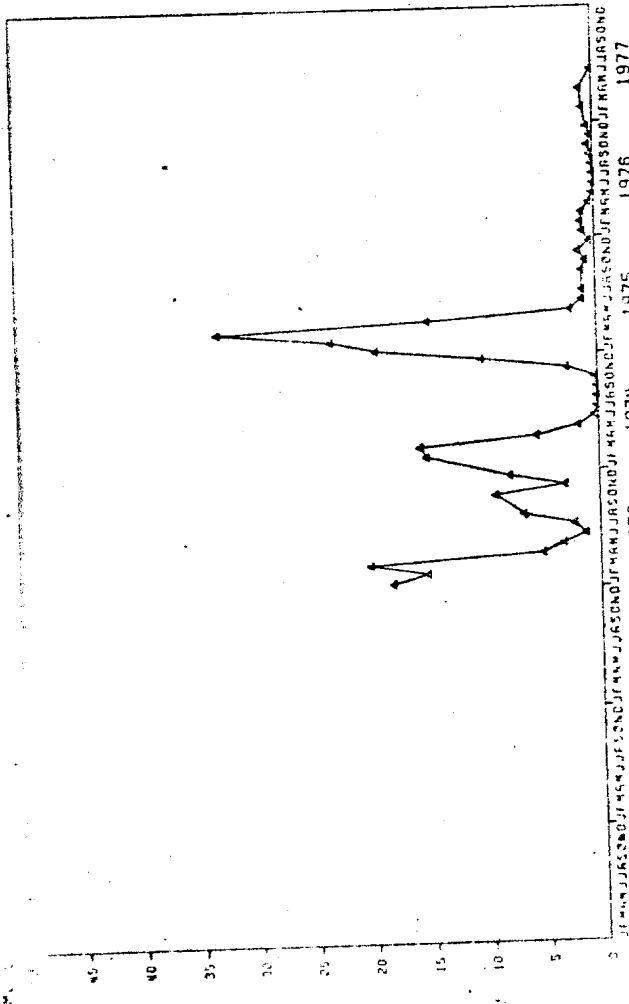
KOOTENAY R:CRESTON
MONTHLY MEANS FOR: TURBIDITY



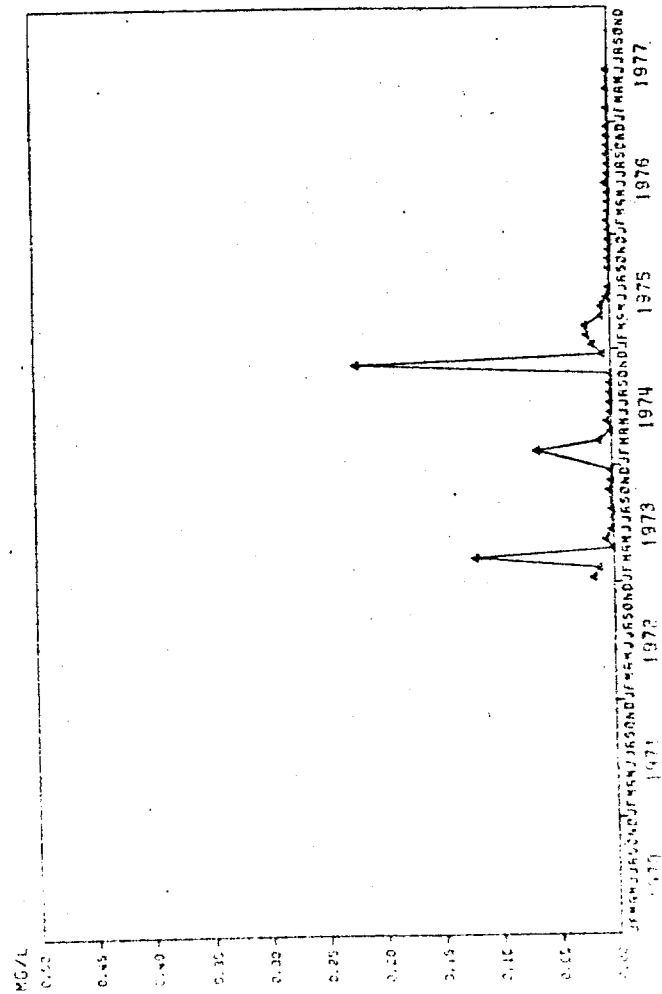
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MONTHLY MEANS FOR: CADMIUM



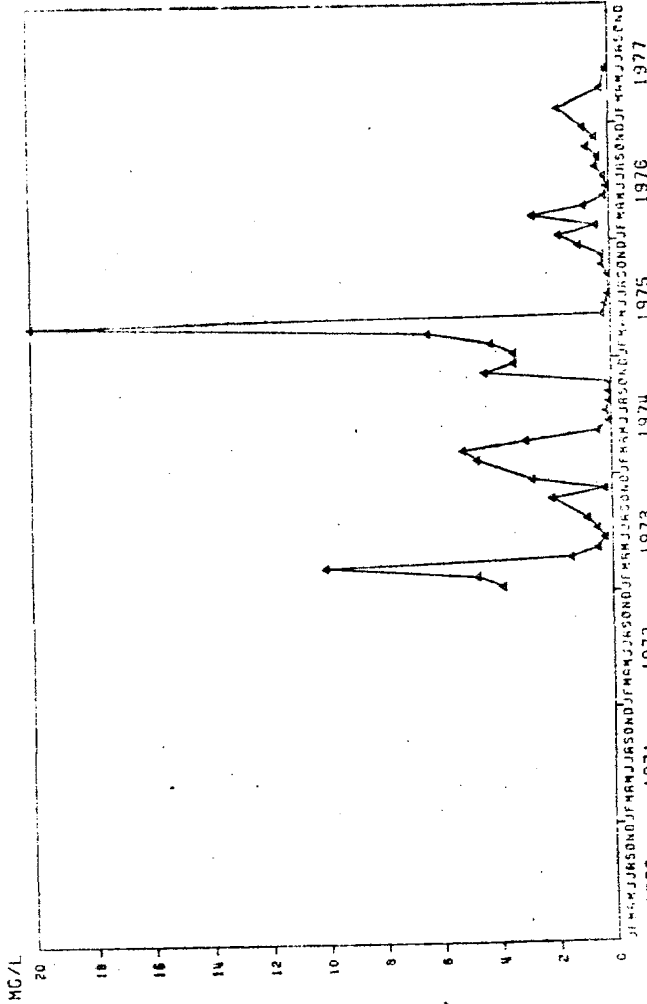
ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: FLUORIDE DISSOL



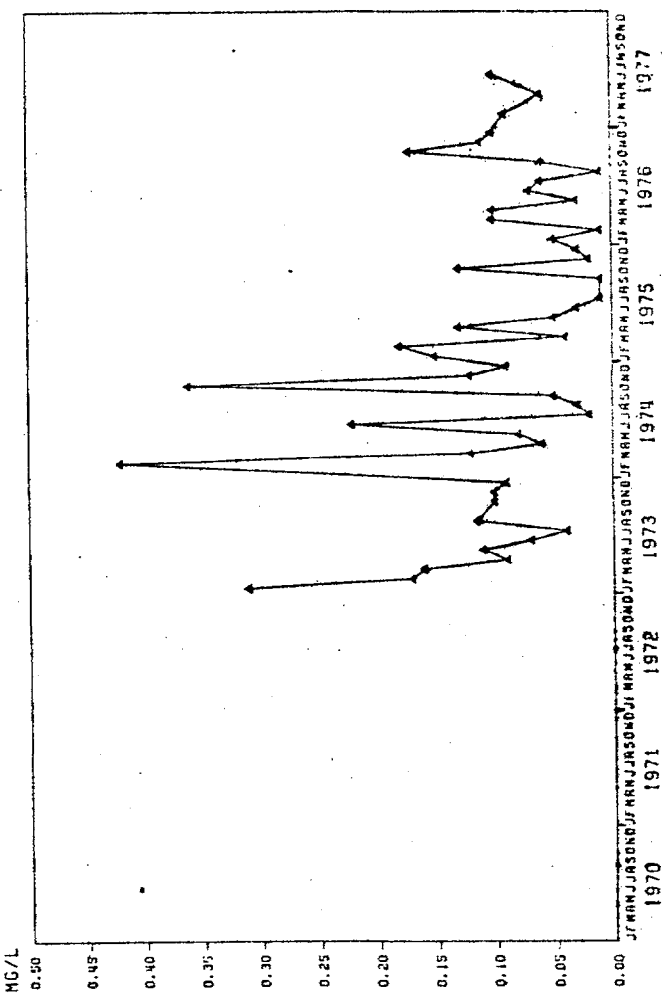
ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: LEAD



ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: IRON

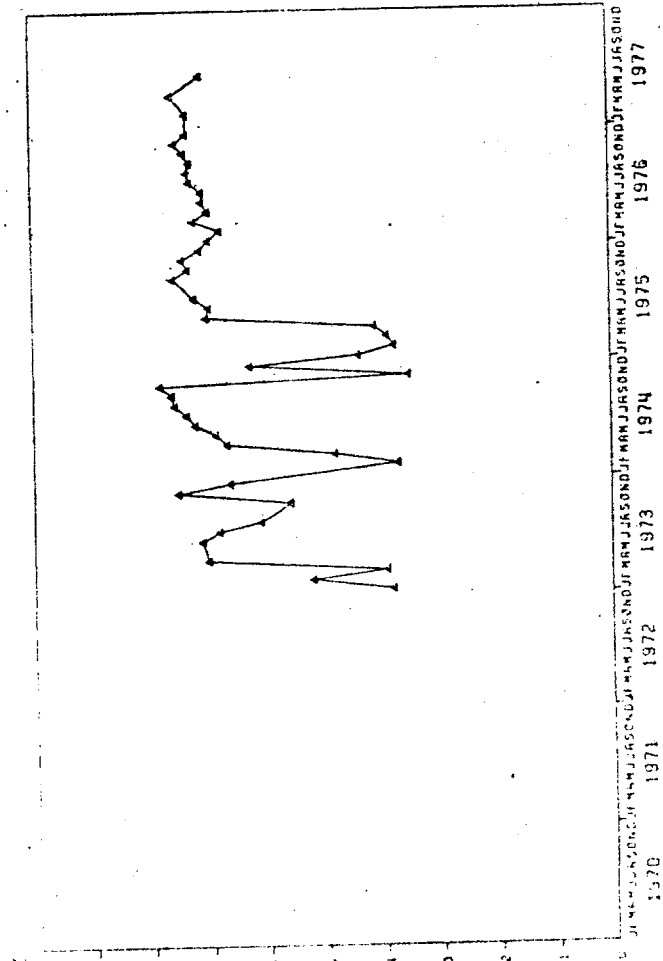


ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: NITROGEN: ORGANIC

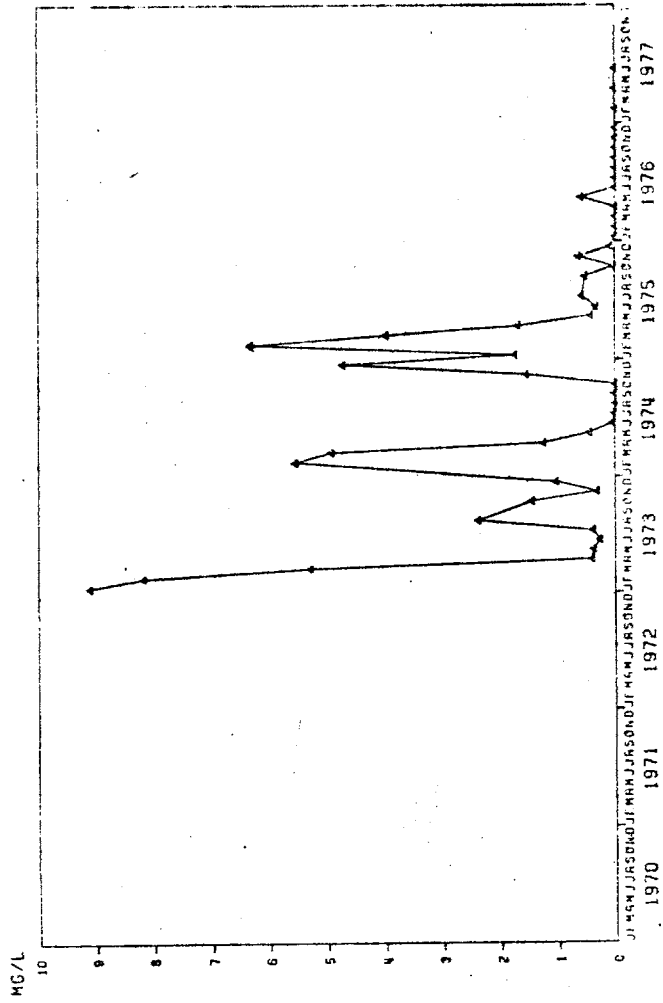


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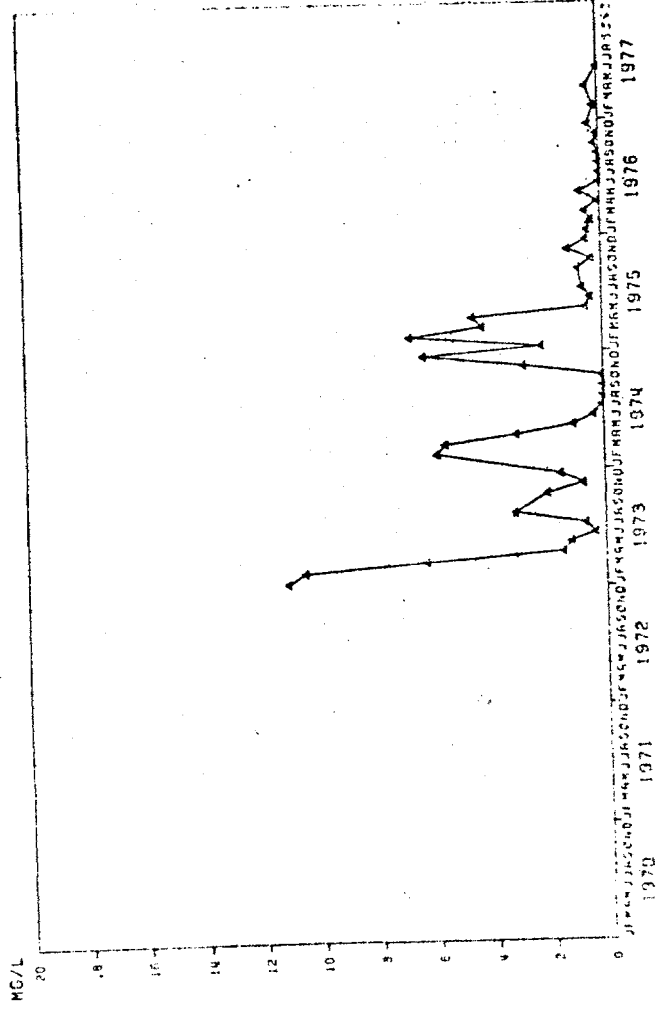
ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: PH



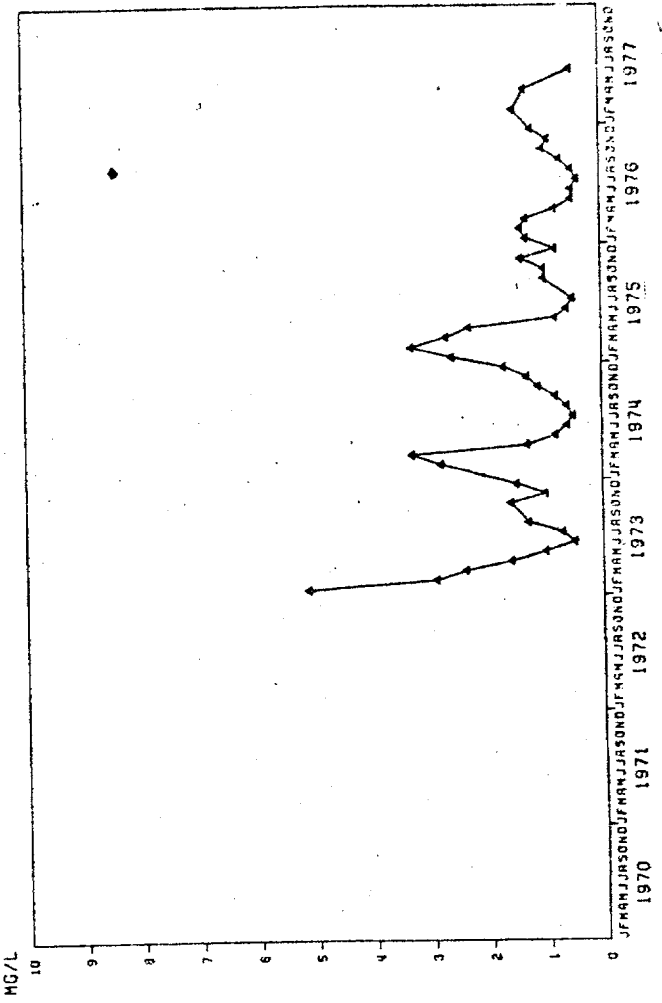
ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: PHOSPHORUS:ORT



ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: PHOSPHORUS :TOT TOTAL



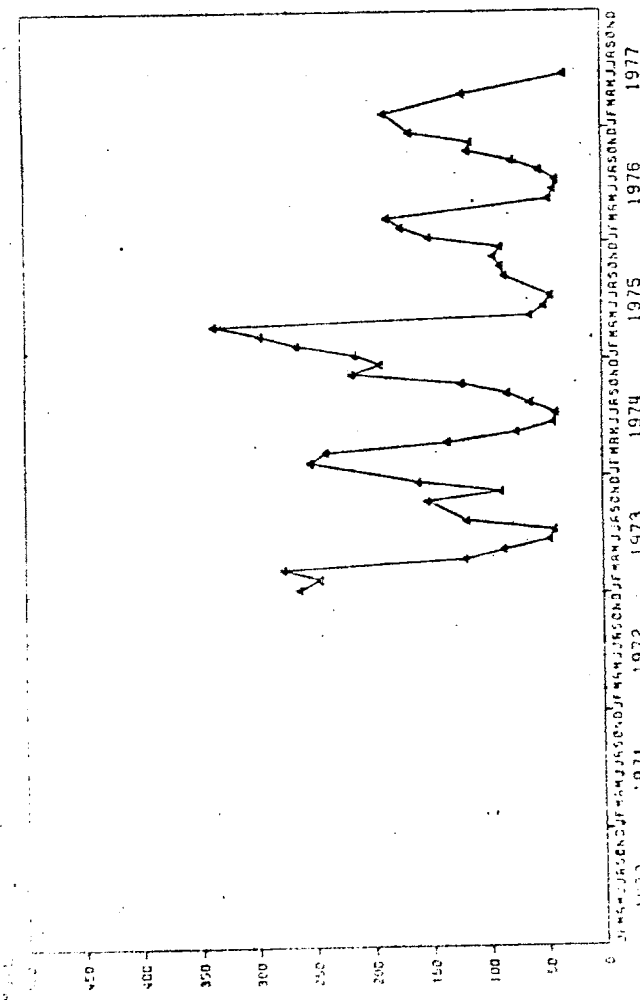
ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: POTASSIUM



DISSOLVED

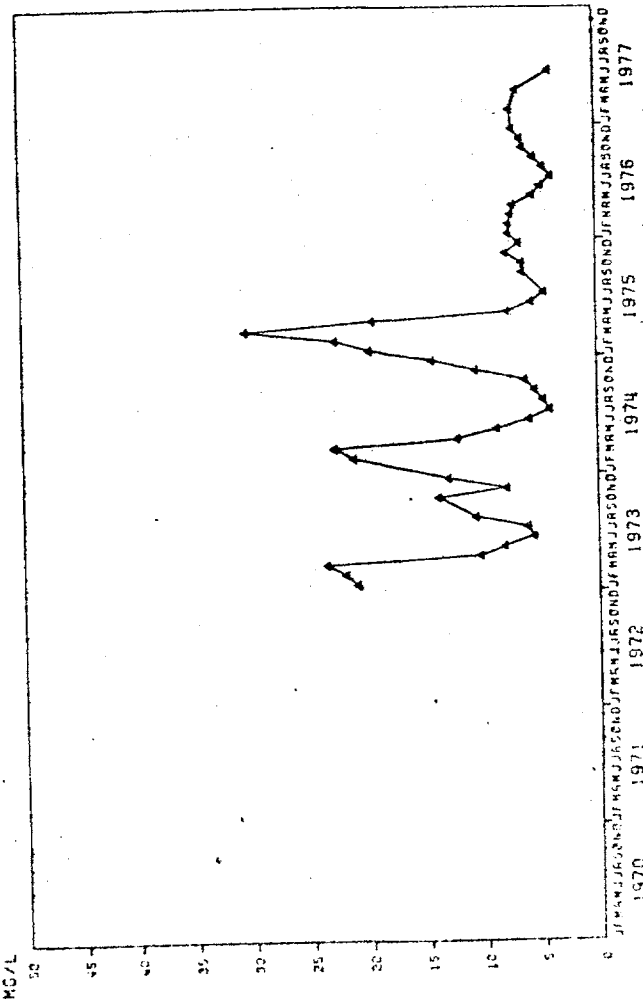
ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: RESIDUE: TL 105C

MC/L



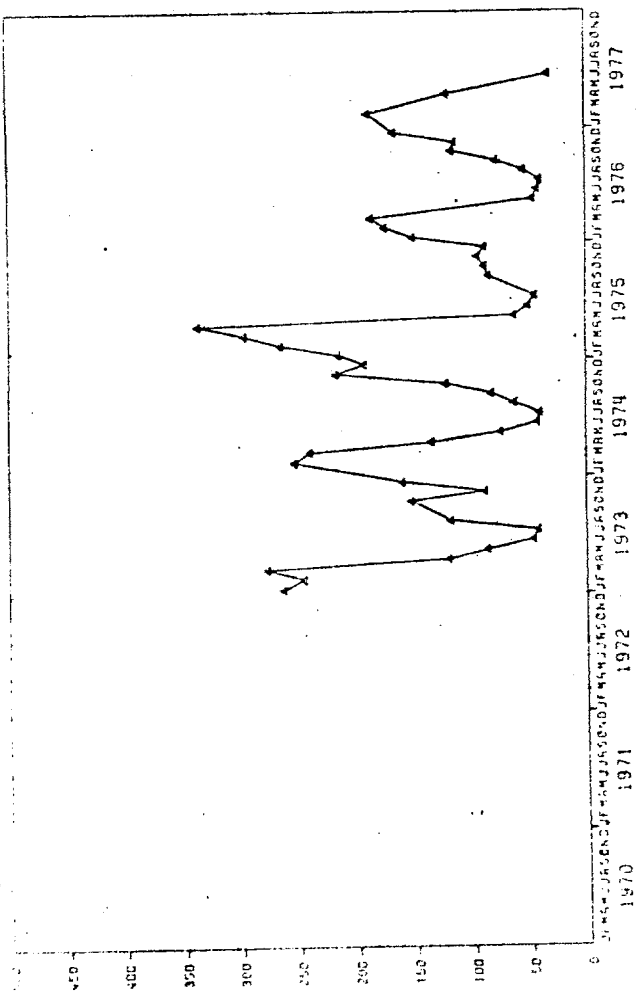
ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: SPECIFIC CONDUCT

UMHO/CM



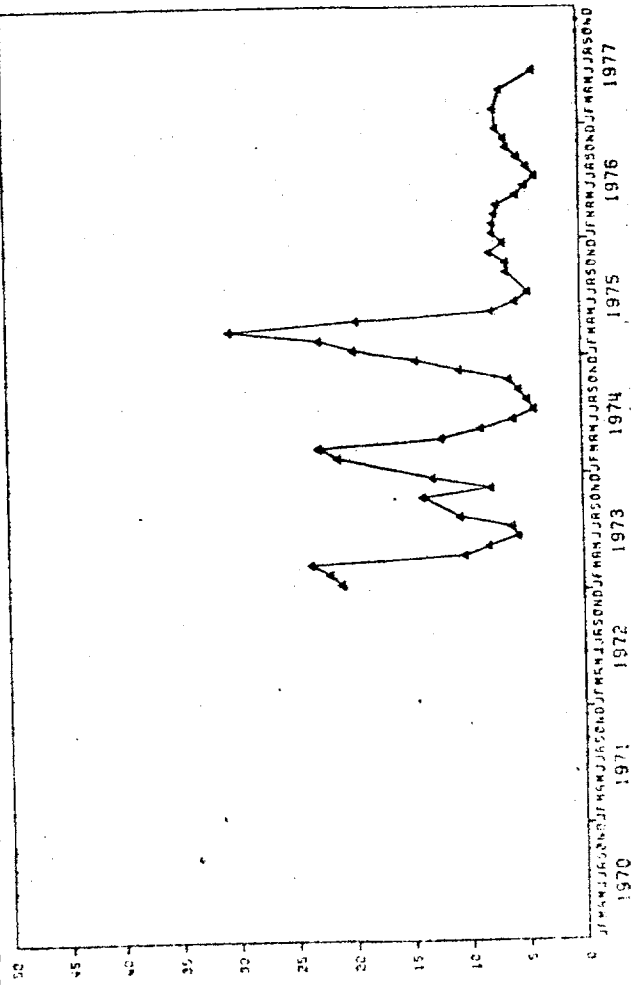
ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: RESIDUE: TL 105C

MC/L



ST. MARY R; WYCLIFFE
MONTHLY MEANS FOR: SILICA: REACTIVE

MC/L



ST. MARY B. NICOLIFPE MONTHLY MEANS 1971: SULPHATE DISSOLVED

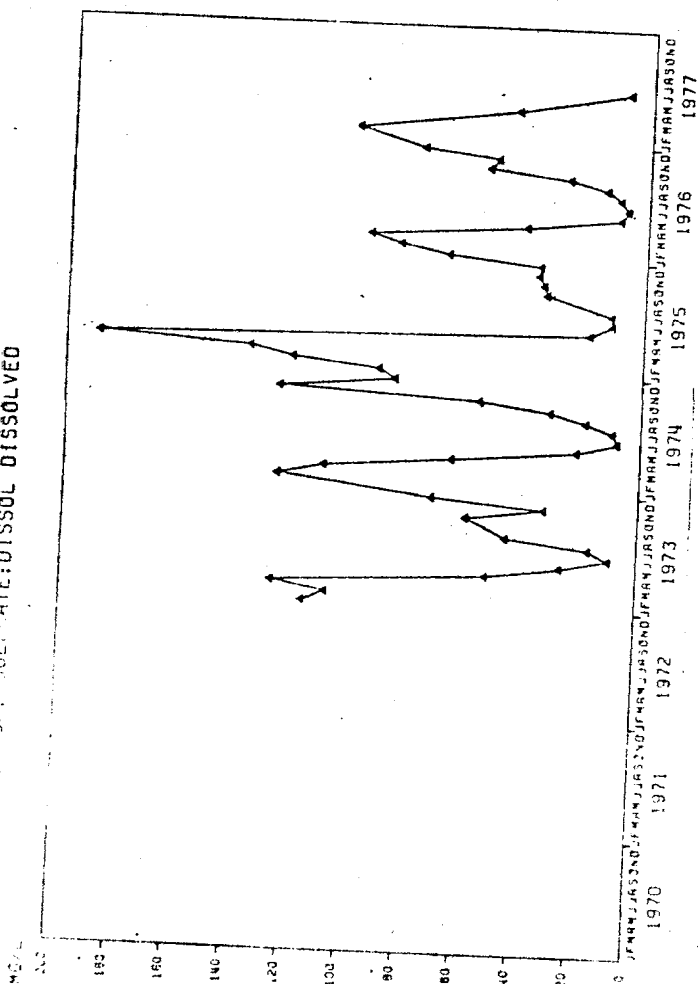


TABLE II: INTERPRETATION OF AMBIENT AIR DATA

LOCATION	PARAMETERS	INTERPRETATION
1. Chilliwack		
a. Site 0310077 at Chilliwack Hospital	Particulate: Total Dustfall Particulate: Soluble Ash Particulate: Soluble Dustfall	All three parameters show a general reduction and stabilization of levels. These generally improving trends reflect a decreasing quantity of contaminants emitted to the atmosphere as a result of implementation of the Pollution Control Branch permits and increased environmental awareness by various industries.
2. Dewdney		
a. Site 0310075 at Dewdney Elementary School	Particulate: Total Dustfall Particulate: Soluble Ash Particulate: Soluble Dustfall	A downwards trend is apparent for all three parameters. There is no readily apparent explanation for somewhat seasonal patterns. Reduction of coal dust emissions from cargo trains (chemical spraying and lower speed) likely has contributed to the improved dustfall.
b. Site 0310076 at the Dewdney Fire Department	Particulate: Total Dustfall Particulate: Soluble Ash Particulate: Soluble Dustfall	See comment for Dewdney Elementary School.
3. Kamloops		
a. Site 0605001 at Kamloops Airport	Particulate: Insoluble Dustfall Particulate: Soluble Dustfall Particulate: Total Dustfall Total suspended particulate	The high results in 1972 and 1973 can be attributed in part to the Weyerhaeuser Canada pulp mill operation in the vicinity and in part to the operation of Froleck Sawmill's woodwaste burner. This burner was closed down October 1973.
b. Site 0605008 at the Kamloops Federal Building	Sulfation Index	The decreasing sulfation index values reflect increased pollution control performance at the Weyerhaeuser pulp mill and the Gulf Oil refinery. It should be

TABLE II: INTERPRETATION OF AMBIENT AIR DATA

LOCATION	PARAMETERS	INTERPRETATION
b. Site 0605008 at the Kamloops Federal Building con't.	Sulfation Index	noted that there was a local source of sulfur emissions since the Federal Building until late 1977 utilized oil (which may contain sulfur compounds) for heating. Finally it is possible that the decrease in sulfation index may be partially the result of wind direction. In 1974 and 1975 the winds prevailed toward the east (i.e. towards the Federal Building from the pulp mill and oil refinery) for 7 months total, but only for 1 month for 1976.
4. Kimberley		
a. Site 0250014, area "K2" in Kimberley area	Soluble Dustfall	The soluble dustfall shows a cyclic pattern with high results occurring in winter and early spring. There is a slight downward trend in the levels, reflecting increased pollution control.
b. Site 0250015 at Chapman Camp	Lead in Insoluble Dustfall Soluble Dustfall Zinc in Insoluble Dustfall Zinc in Total Dustfall	No explanation is known for the higher zinc and lead values observed in 1975 and 1976. See the foregoing note for soluble dustfall.
c. Site 0250043, City Centre	Particulate: Total Dustfall Particulate: Soluble Dustfall Sulfation Index	The graphs from the Kimberley area seem to indicate an improvement of the ambient air quality since late 1976. Peaks generally occur in the late winter and early spring months. To some extent this may be due to reentrainment of material discharged during winter, particularly road sand. Three major events which have an effect on the ambient air quality in the Kimberley area are as follows: (a) The Sullivan Mine fires occurred in a partially uncontrolled state between December 1972 and October 1976. In

TABLE II: INTERPRETATION OF AMBIENT ATR DATA

LOCATION	PARAMETERS	INTERPRETATION
c. Site 0250043, City Centre con't.		October 1976 the company brought mine fires under control. (b) Cominco operations were shut down due to a strike between July and October of 1974. (c) On May 1, 1975, Cominco's concentrate operations at Kimberley came under permit (PA-2443).
5. Langley		
a. Site 0310078 at Langley Liquor Store	Particulate: Soluble Ash Particulate: Soluble Dustfall	Both the soluble ash particulates and the soluble dustfall particulates show decreasing trends, reflecting general increased pollution abatement in the Langley area.
6. Lumby		
a. Site 0500131, at the Lumby Hotel	Particulate: Soluble Ash Particulate: Total Dustfall Particulate: Soluble Dustfall	All three parameters show significant decrease resulting from the modification or closure of six wood waste burners in the Lumby area. Four of these burners were located within 1000 metres of the dustfall station.
7. Maple Ridge		
a. Site 0310070 at the Maple Ridge Elementary School	Particulate: Total Dustfall Particulate: Insoluble Ash Particulate: Insoluble Dustfall Particulate: Soluble Ash	All particulate graphs show a generally decreasing and stabilization of levels, again reflecting upgrading pollution control procedures for air emissions.
8. Mission		
a. Site 0310071 at the Mission Memorial Hospital	Particulate: Total Dustfall Particulate: Soluble Dustfall	Note the unusually sharp seasonal pattern, with maximum particulate in winter. A completely satisfactory explanation of

TABLE II: INTERPRETATION OF AMBIENT AIR DATA

LOCATION	PARAMETERS	INTERPRETATION
a. Site 0310071 at the Mission Memorial Hospital con't.		this pattern is not known. Also note the general reduction in the particulates, resulting from improved pollution control and possibly also from economic slowdown in the Mission area.
9. Pentiction		
a. Site 0500153, Pentiction Air Study Stn. #1	Particulate: Soluble Ash Particulate: Soluble Dustfall	Particulates were substantially improved by closure of the unmodified wood waste burner at Yellow Lake Sawmills Ltd. (June 1972) plus the modification (July 1972) of the wood waste burners at Northwood Properties Ltd. and Greenwood Forest Products Ltd. (March 1973)
10. Prince George		
a. Site 0450042, at the Otway Pulpmill's Heliport	Particulate: Total Dustfall Particulate: Insoluble Ash Particulate: Insoluble Dustfall Particulate: Soluble Ash Particulate: Soluble Dustfall	During the last two years the Otway burner has not been regularly used, except on occasion. For the years prior to 1976 the mill operated spring and summer. Graphs of the various parameters generally show the mill's operating period.
b. Site 0450041 at Highland School	Particulate: Total Dustfall Particulate: Soluble Dustfall	This site also was affected by the Otway burner, though at lesser concentrations of particulates.
11. Quesnel		
a. Carson Pit	Particulate: Soluble Ash Particulate: Soluble Dustfall	The increased values in 1976 and 1977 possibly result from an increase in burning at the Quesnel municipal dump which is in the vicinity of the Carson Pit site. The one very high result in 1976 could be insect contamination as this site has a problem in this regard.

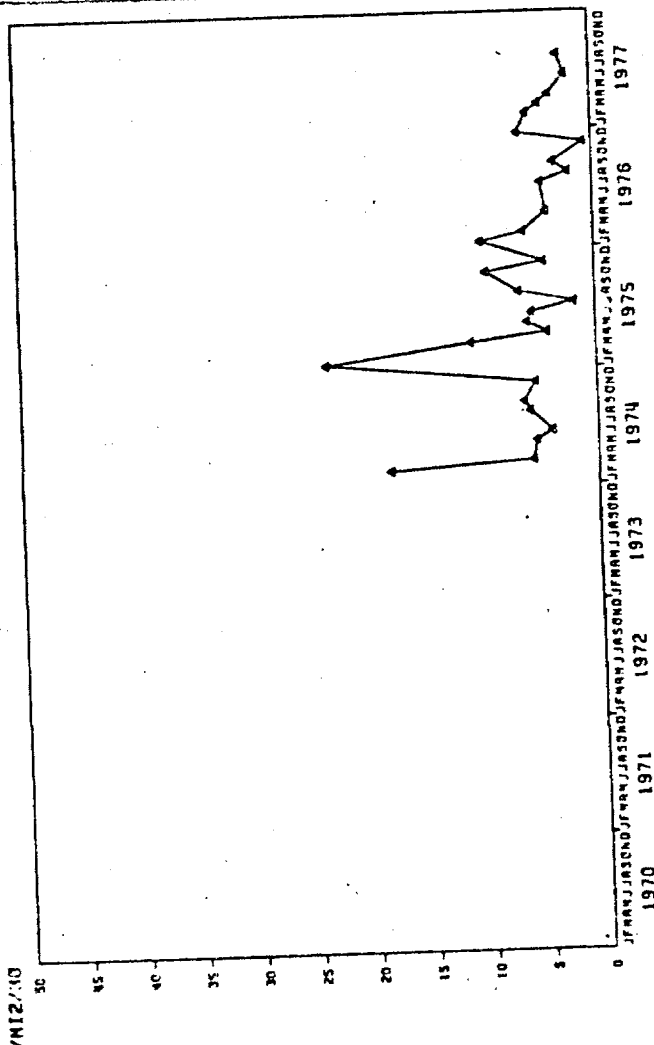
TABLE II: INTERPRETATION OF AMBIENT AIR DATA

LOCATION	PARAMETERS	INTERPRETATION
12. Sparwood		
a. Site 0250017 at the Sparwood Civic Building	Particulate: Total Dustfall Particulate: Total Suspended Particulate: Insoluble Ash Particulate: Insoluble Dustfall Particulate: Soluble Ash Particulate: Soluble Dustfall	The graphs from the Sparwood station result from the activities of the Kaiser Elkview Preparation Plant as well as the development of Sparwood as a community. High dust levels prior to 1974 were partially due to unpaved roads. There seems to be a cyclic pattern with high levels during spring thaw, probably due to resuspension of road sand and particulate from the Kaiser operation. The dustfall generally is non-combustible, however there is a combustible portion, probably coal dust.
13. Trail		
a. Site 0250012 at Annable	Particulate: Total Dustfall Particulate: Soluble Dustfall Zinc: Total Dustfall Arsenic: Low Volume Impinger Cadmium: Soluble Dustfall Cadmium: Total Dustfall Copper: Total Suspended Particulate Lead: Total Dustfall Lead: Total Suspended Particulate Particulate: Soluble Dustfall Particulate: Total Dustfall Zinc: Soluble Dustfall Zinc: Total Suspended Particulate Zinc: Total Dustfall	The graphs from the Trail area indicate a slight improvement in the ambient air quality. Downward trends were evident for many of the parameters, however several showed no general change and some actually increased. There is a generally yearly cycle with decreases in particulate levels during the winter (primarily months with snow) and increases during the spring, summer and fall. Major events which have effected the ambient air quality in the Trail area as follows: i. Cominco operations were shut down due to strike action between July and October 1974. ii. Pollution Control Permits were issued covering the lead, zinc and fertilizer operations in the Trail area on September 9, 1975. iii. Cominco operations in Trail shut down for the month of August each year.
b. Site 0250009 at Butler Park		

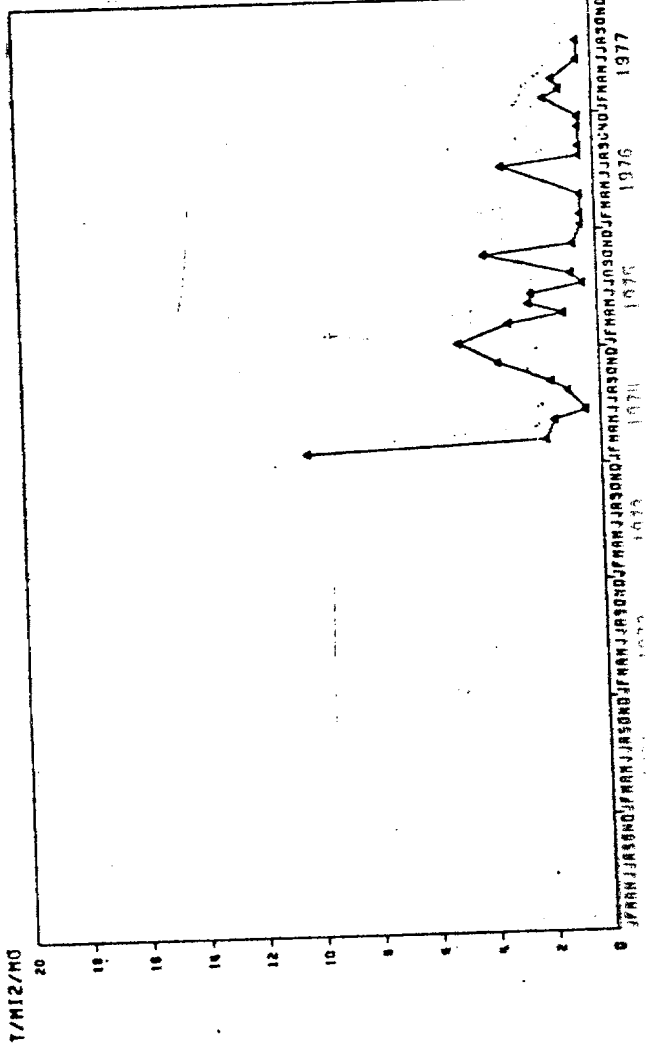
TABLE II: INTERPRETATION OF AMBIENT AIR DATA

LOCATION	PARAMETERS	INTERPRETATION
13. Trail con't.		iv. Major and minor modifications to the operations have been undertaken primarily commencing in 1976 and will continue for several years.
c. Site 0250011 at Glenmerry	Lead: Total Dustfall Particulate: Soluble Dustfall Sodium: Soluble Dustfall Sulfation Index Zinc: Total Dustfall	The graph for lead in total dustfall shows peaks in early winter with the minimums occurring in summer or late spring. These higher lead levels indicate that dustfall in the winter months is primarily influenced by the northwest wind following the river valley. There is a slight downward trend in the lead levels probably due to increased maintenance of pollution control works as well as installation of new ones.
d. Site 0250010 at Rivervale	Particulate: Soluble Dustfall Particulate: Total Dustfall	
14. Victoria		
a. Site 0110002 at Victoria Horsey (in the Woodwards area)	Total Suspended Particulate Particulate: Soluble Ash Particulate: Soluble Dustfall Sulfation Index	The decreasing trends result from increased enforcement, conscientious efforts by permittees and non-permittees, and improved emissions at some half-dozen permits. The winter maximum for sulfation index very likely are due to increased fuel oil usage.
b. Site 0110000 called "Vic 1" at the corner of Fort and Cook Street	Particulate: Soluble Ash Particulate: Total Dustfall Sulfation Index	
15. Williams Lake		
a. Site 0605020 at the Kindergarten Building	Particulate: Total Dustfall Particulate: Insoluble Dustfall Particulate: Soluble Ash Particulate: Soluble Dustfall	For all four parameters the lower values since circa 1974 result from the modification and improved performance of wood waste burners in the Williams Lake area. Very likely paving of gravel roads in the area also influenced these parameters.

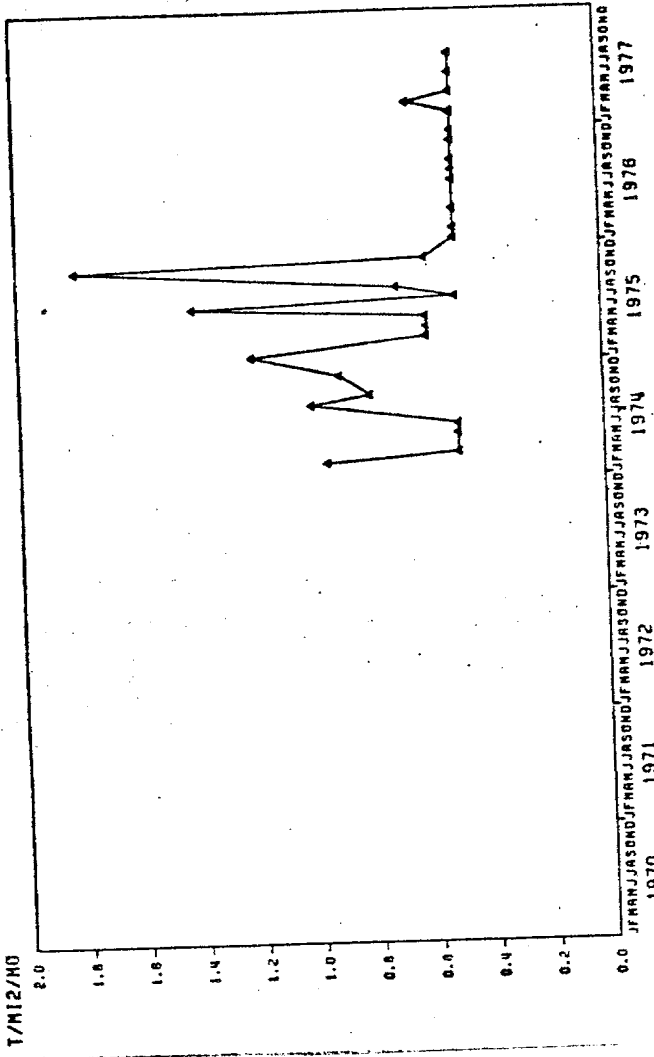
CHILLIWACK HOSPITAL
MONTHLY MEANS FOR: PARTICULATE:TOT DUST.TOT



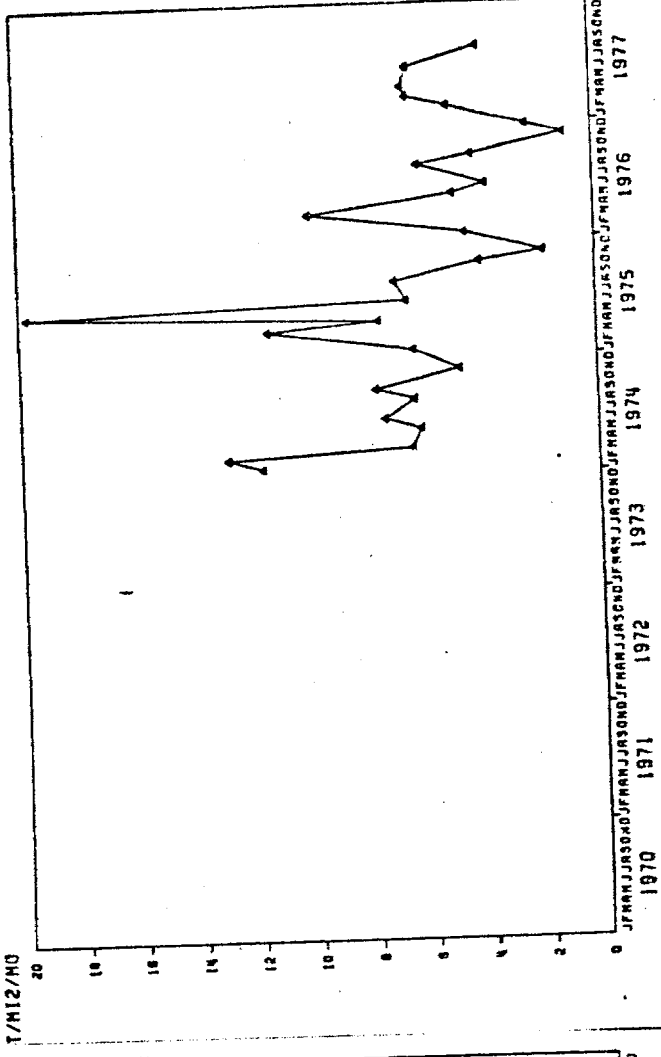
CHILLIWACK HOSPITAL
MONTHLY MEANS FOR: PART: SOLUBLE DUST.SOL



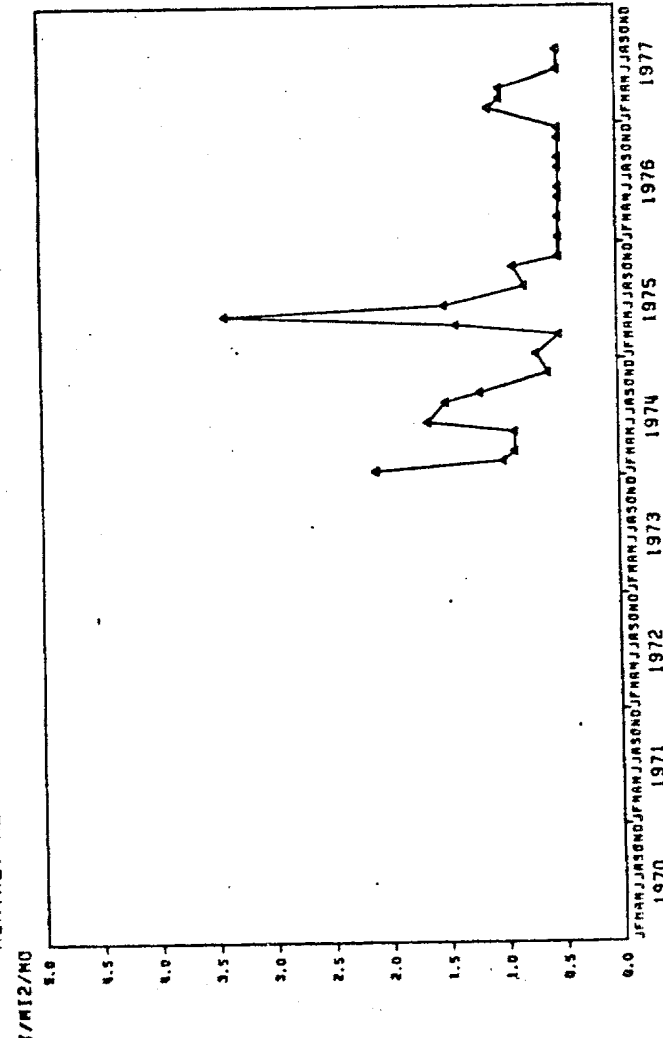
CHILLIWACK HOSPITAL
MONTHLY MEANS FOR: PART: SOLUBLE ASH DUST.SOL



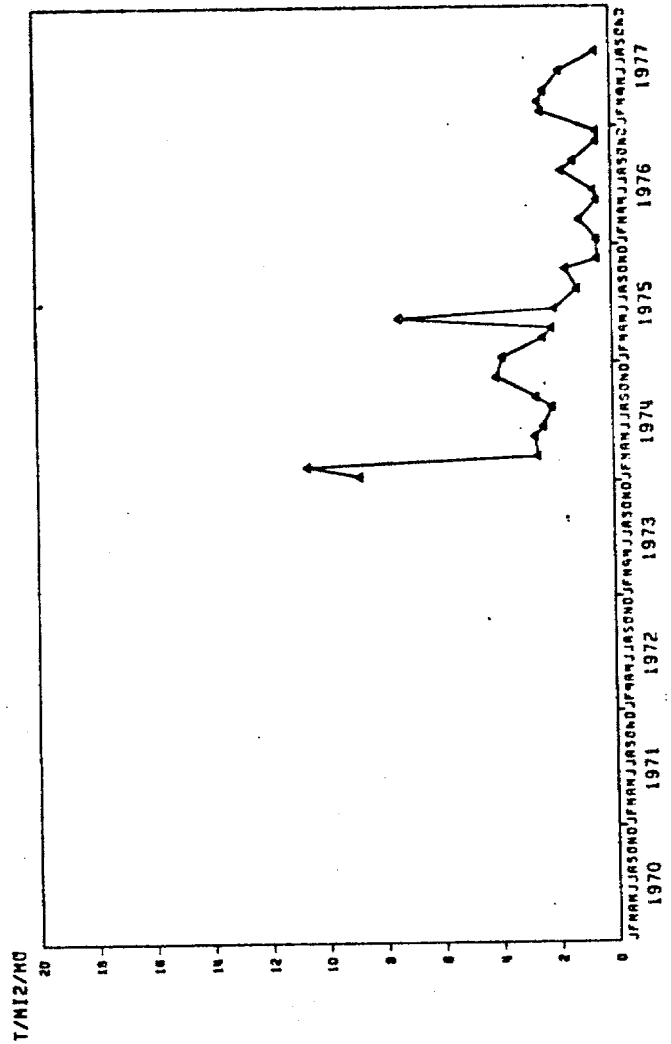
DEWDNEY ELEMENTARY SCHOOL
MONTHLY MEANS FOR: PARTICULATE:TOT DUST.TOT



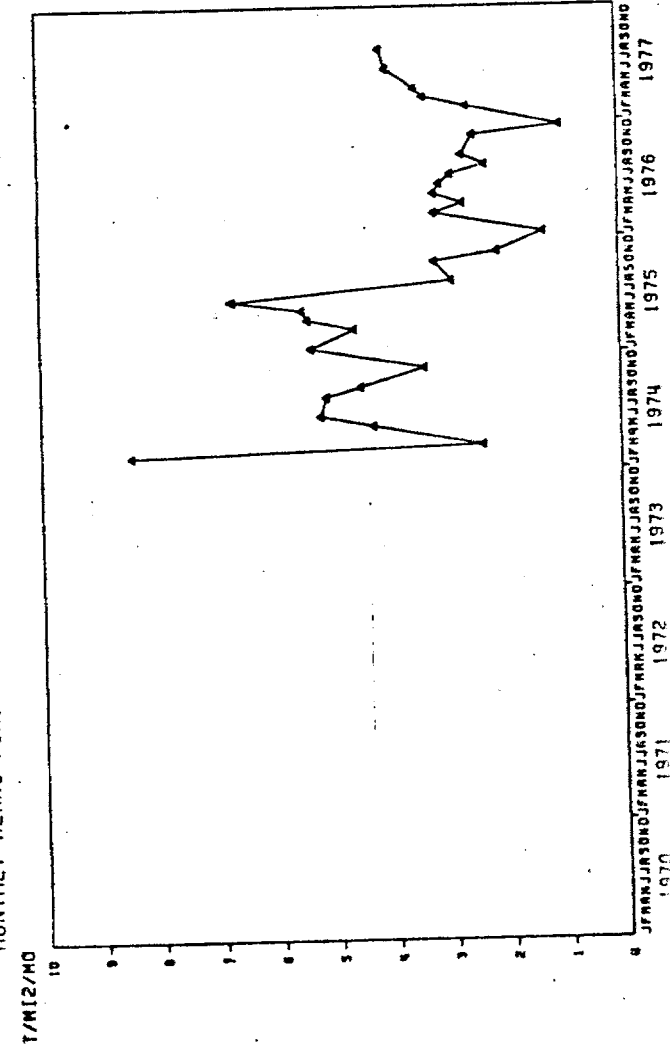
DEWDNEY ELEMENTARY SCHOOL
MONTHLY MEANS FOR: PART: SOLUBL, ASH DUST. SOL



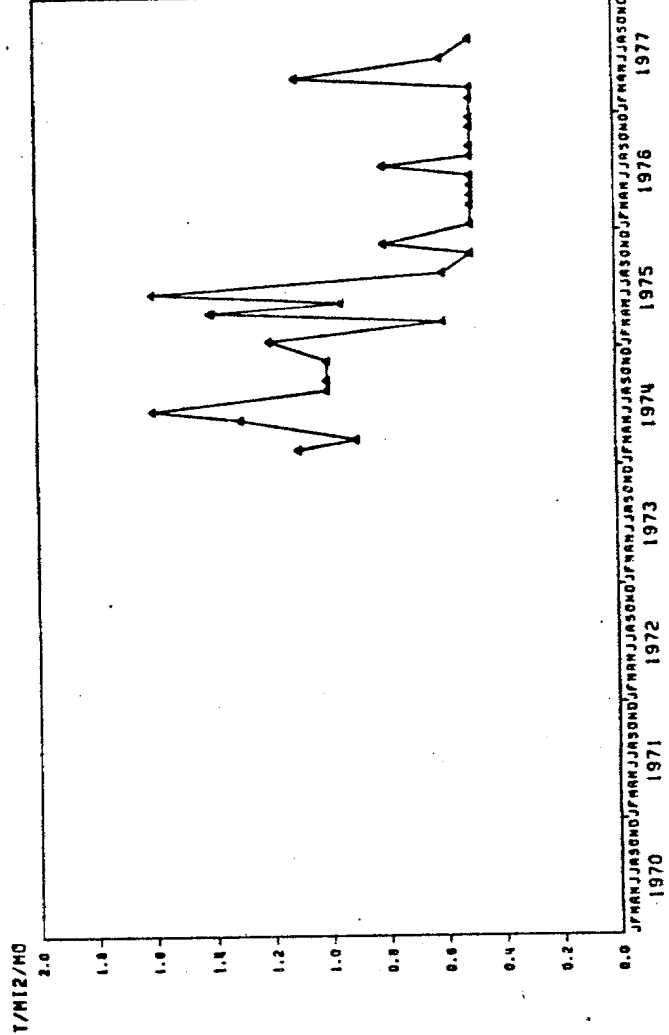
DEWDNEY ELEMENTARY SCHOOL
MONTHLY MEANS FOR: PART: SOLUBLE DUST. SOL



DEWDNEY FIRE DEPARTMENT
MONTHLY MEANS FOR: PARTICULATE, TOT DUST, TOT

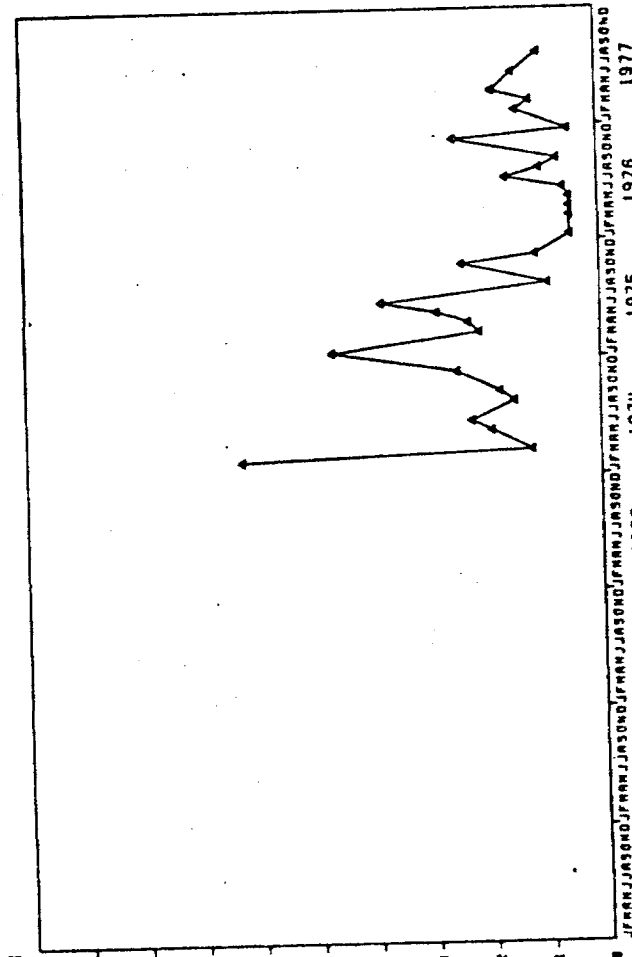


DEWDNEY FIRE DEPARTMENT
MONTHLY MEANS FOR: PART: SOLUBL, ASH DUST. SOL



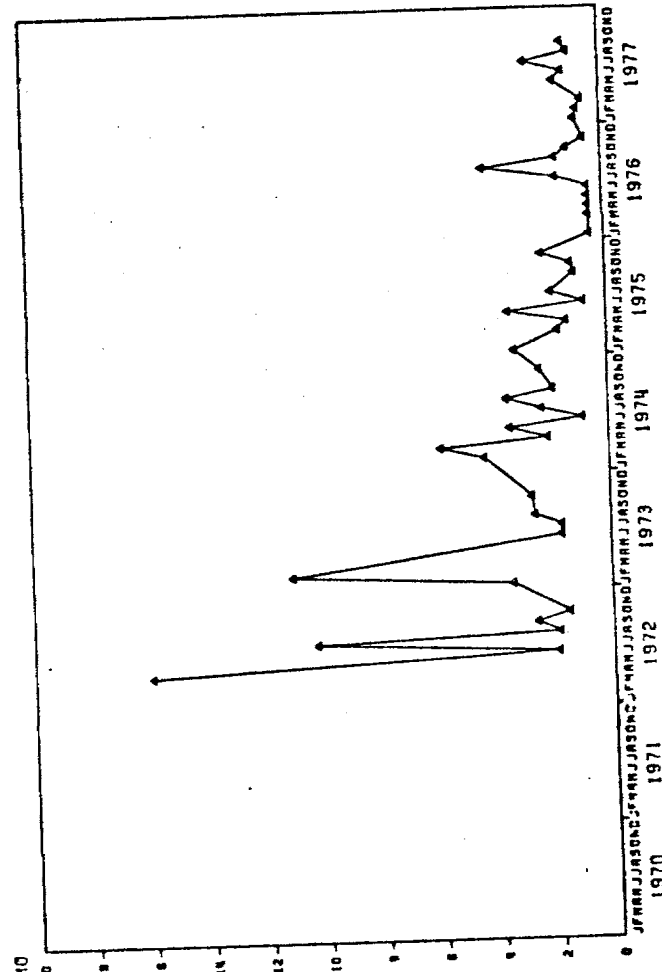
DEWONEY FIRE DEPARTMENT

MONTHLY MEANS FOR: PART: SOLUBLE



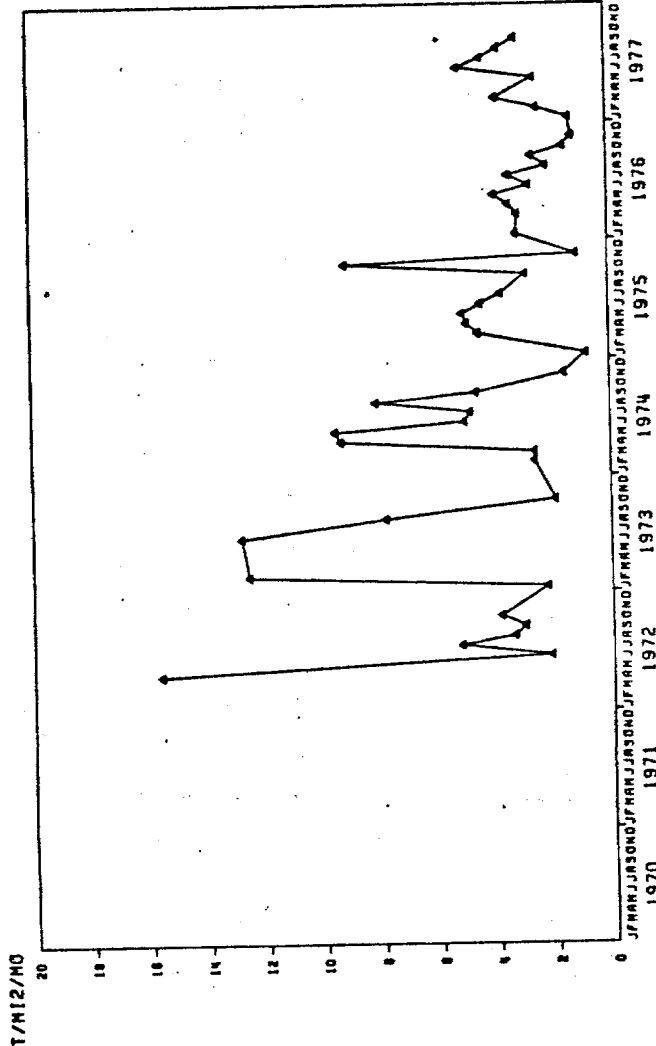
KAMLOOPS AIRPORT

MONTHLY MEANS FOR: PART: SOLUBLE



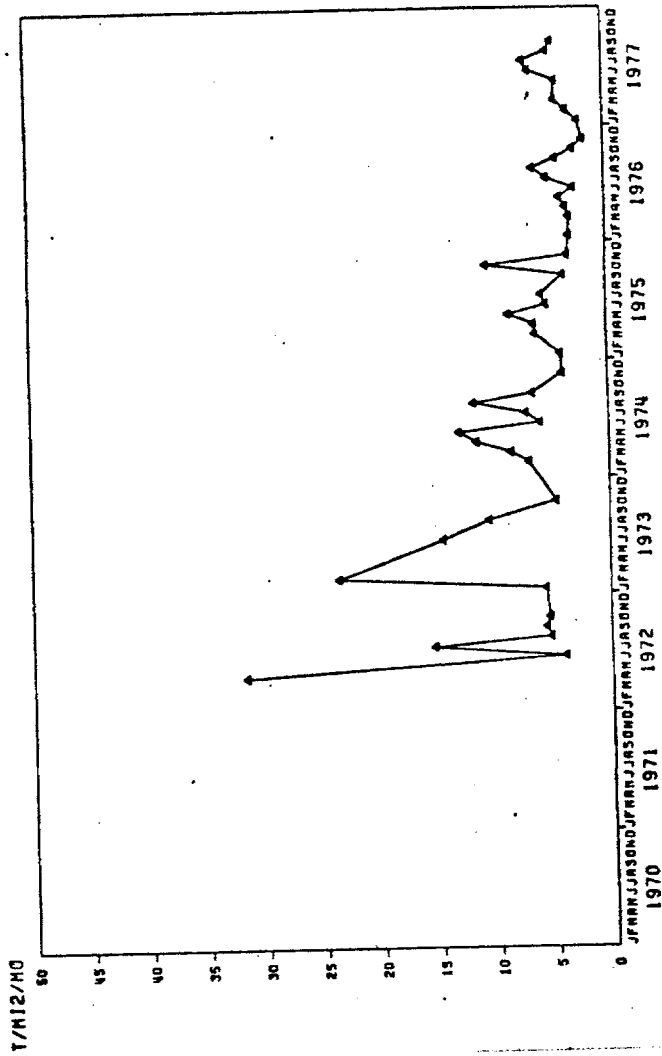
KAMLOOPS AIRPORT

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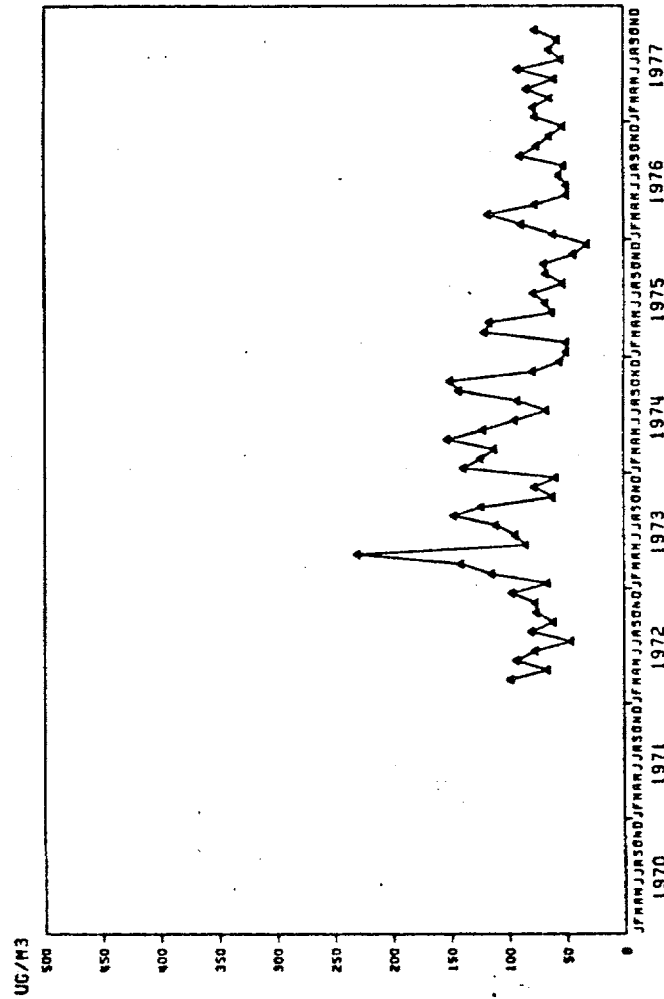


KAMLOOPS AIRPORT

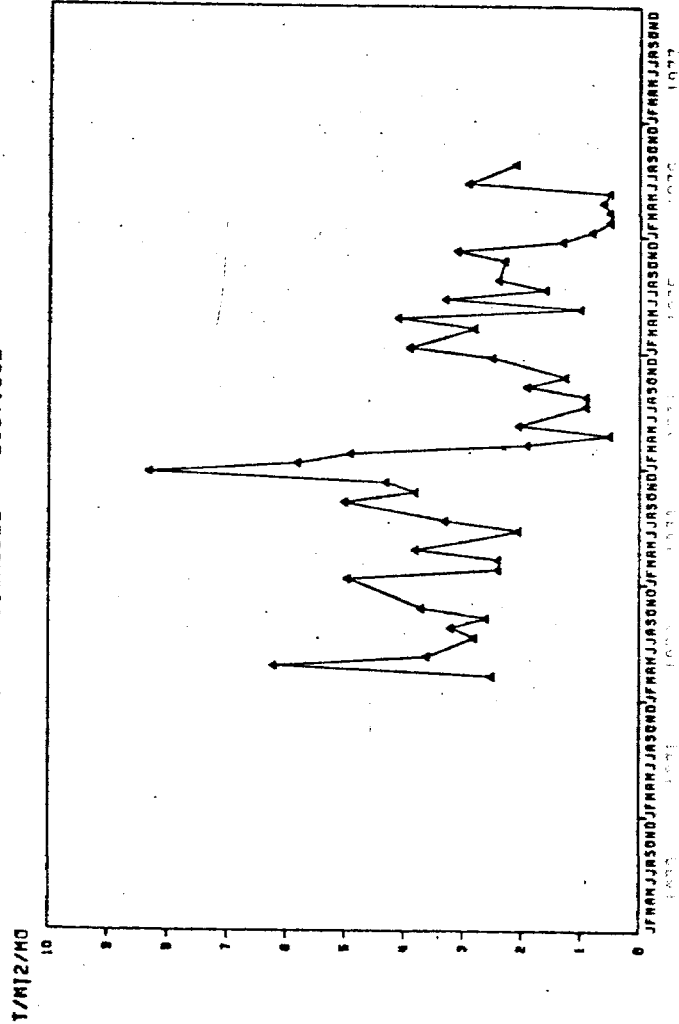
MONTHLY MEANS FOR: PARTICULATE: TOT DUST: TOT



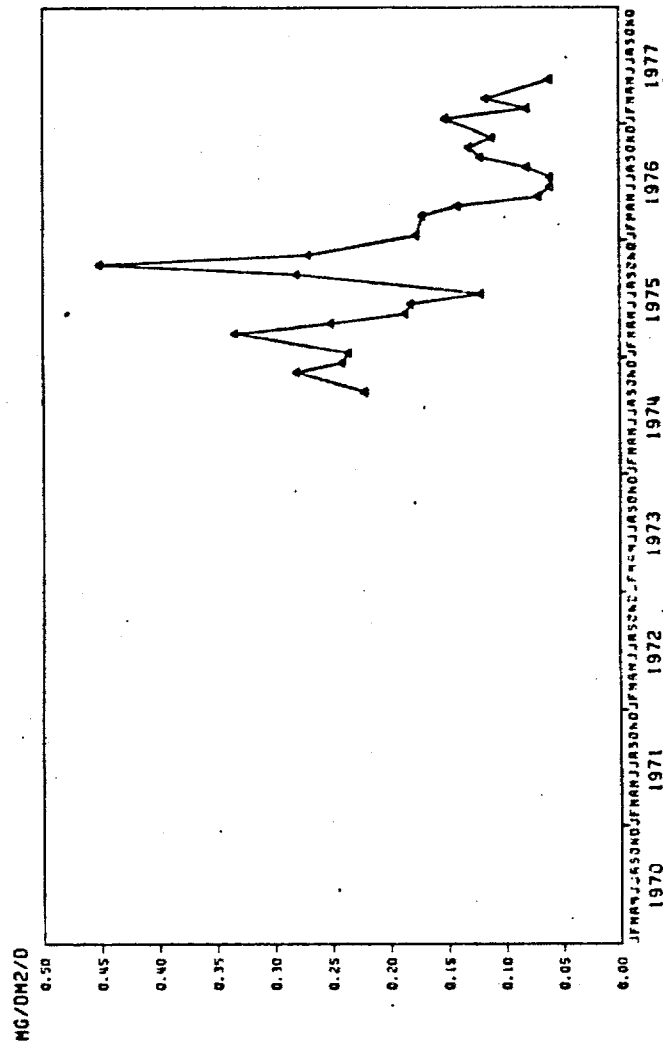
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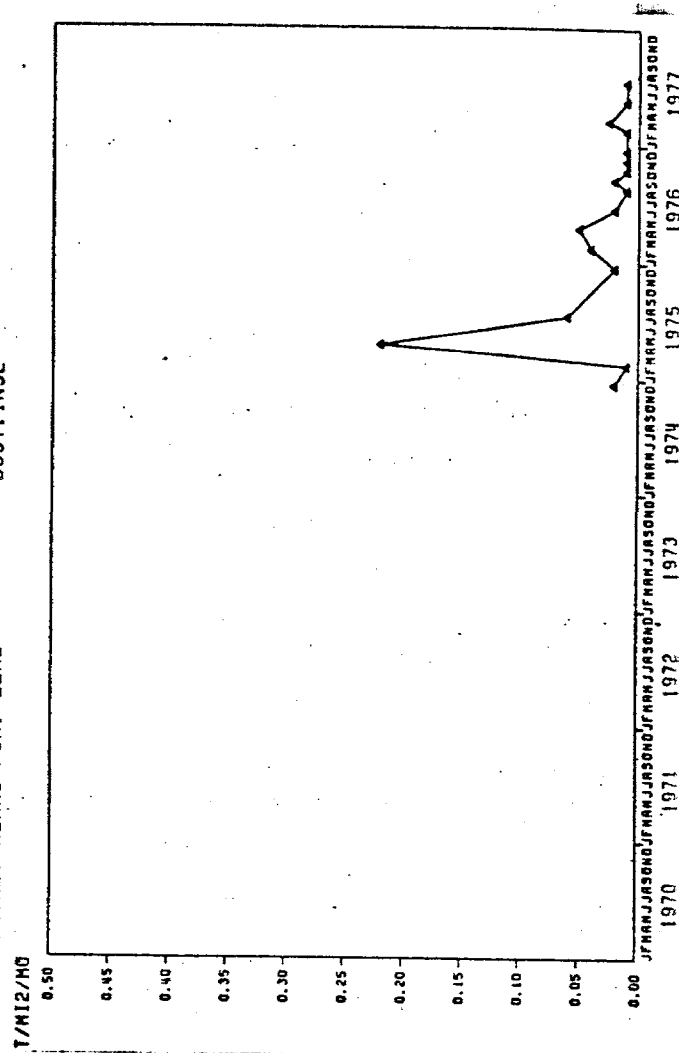
KIMBERLEY ARENA K2 MONTHLY MEANS FOR: PART:SOLUBLE DUST.SOL



KAMLOOPS FEDERAL BUILDING MONTHLY MEANS FOR: SULFATION INDEX

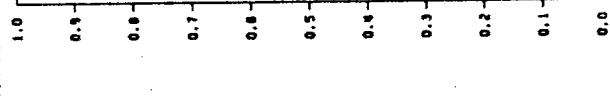


KIMBERLEY CHAPMAN CAMP K3 MONTHLY MEANS FOR: LEAD DUST.INSL



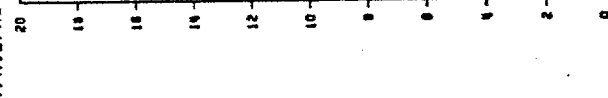
KIMBERLEY CHAPMAN CAMP K3
MONTHLY MEANS FOR: ZINC DUST, INSL

T/M12/HO



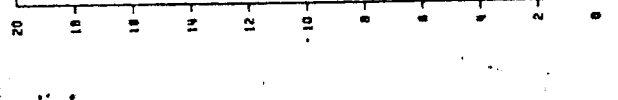
KIMBERLEY CITY CENTRE K5
MONTHLY MEANS FOR: PARTICULATE: TOT DUST, TOT

T/M12/HO



KIMBERLEY CHAPMAN CAMP K3
MONTHLY MEANS FOR: PART: SOLUBLE DUST, SOL

T/M12/HO



KIMBERLEY CHAPMAN CAMP K3
MONTHLY MEANS FOR: ZINC DUST, TOT

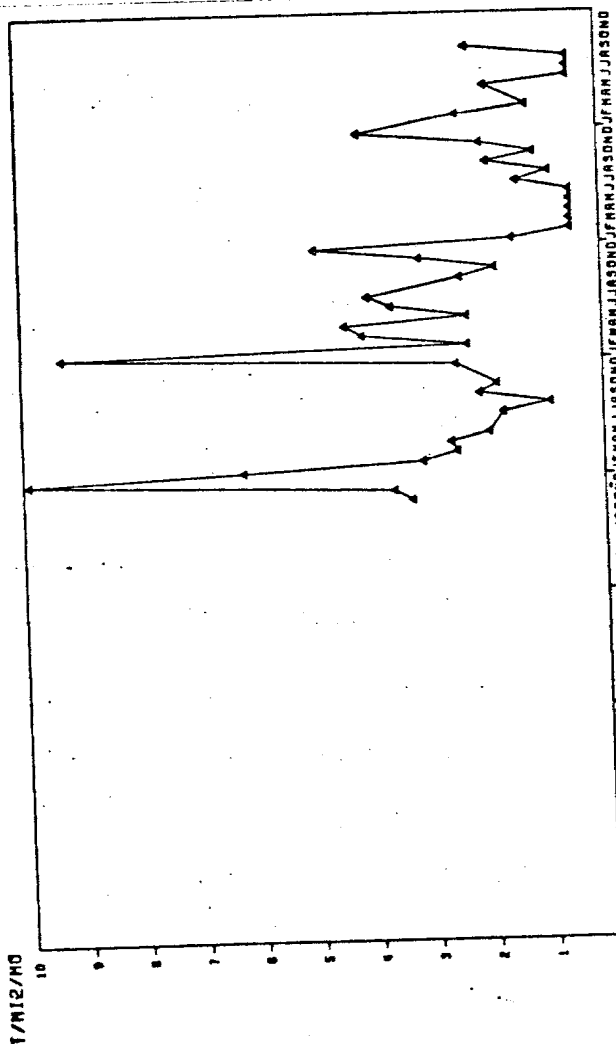
T/M12/HO



KIMBERLEY CITY CENTRE K5

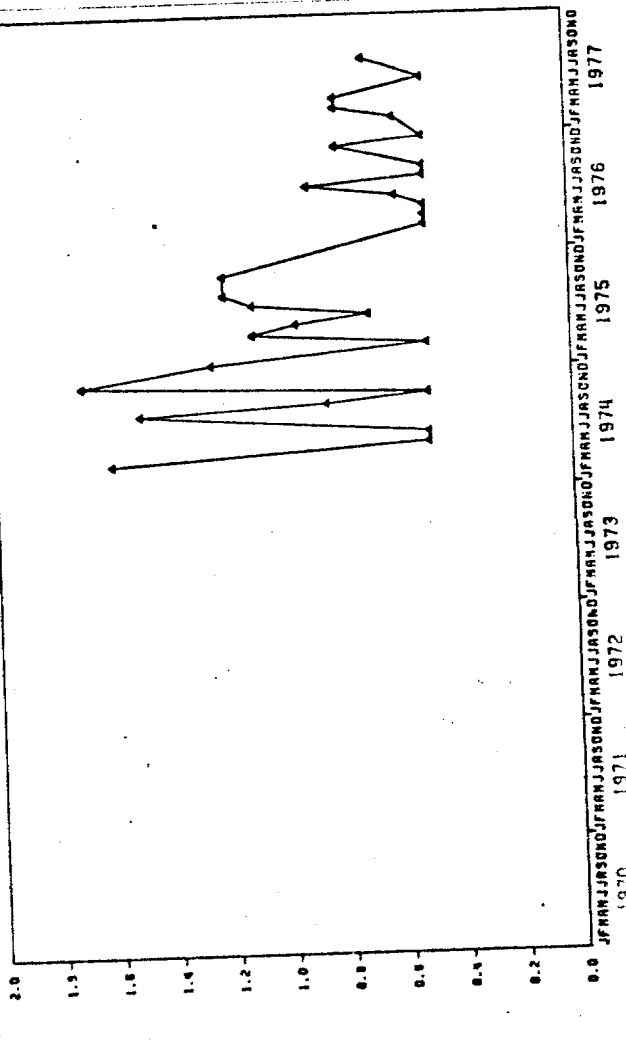
MONTHLY MEANS FOR: PART: SOLUBLE DUST.SOL

MG/DH2/O



MONTHLY MEANS FOR: PART: SOLUBLE DUST.SOL

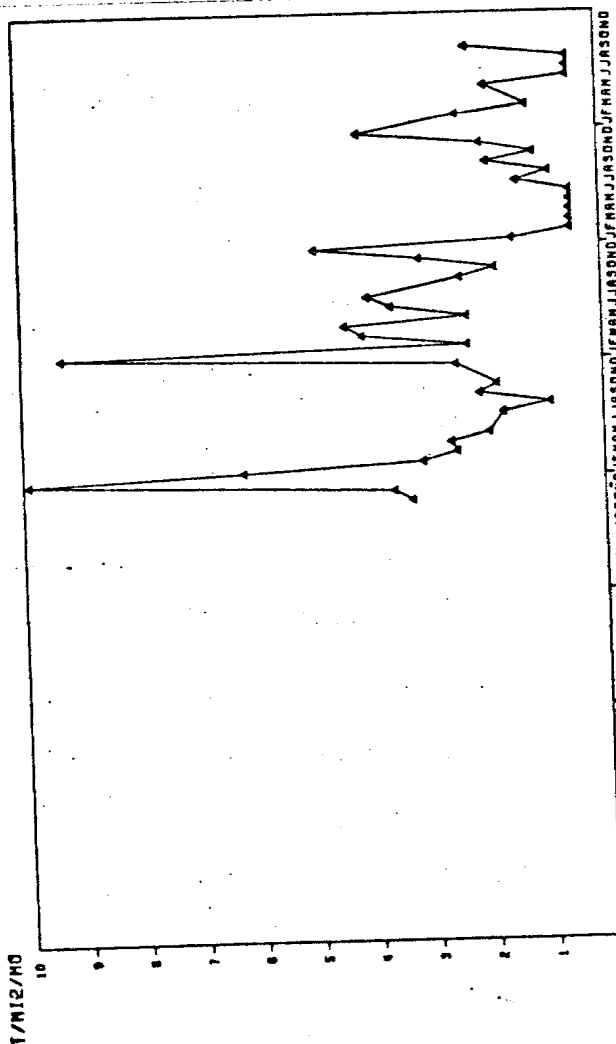
T/MI2/HO



KIMBERLEY CITY CENTRE K5

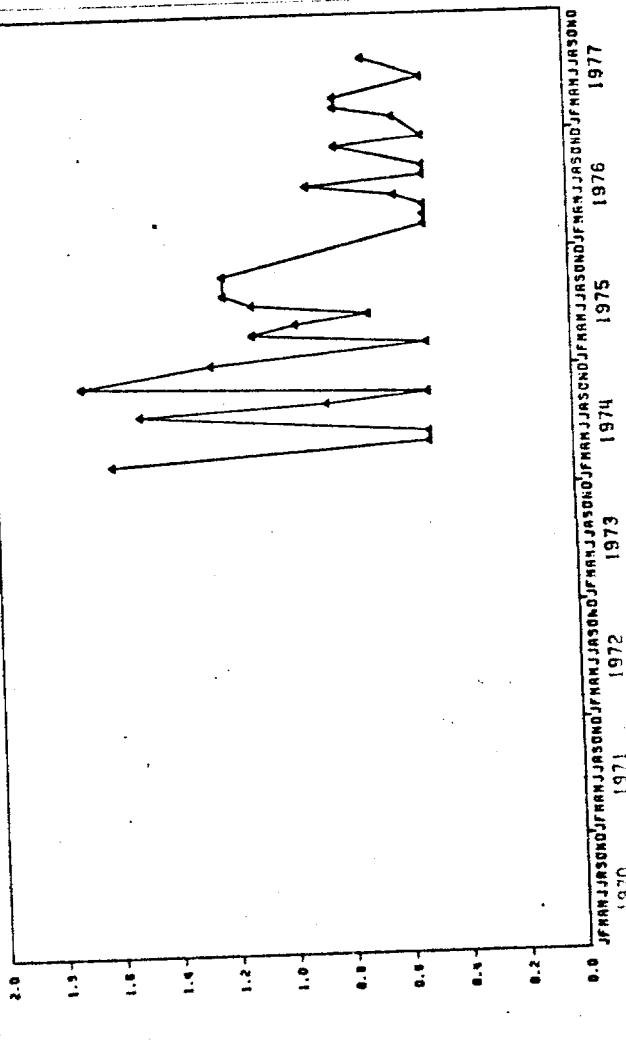
MONTHLY MEANS FOR: Sulfation Index

MG/DH2/O



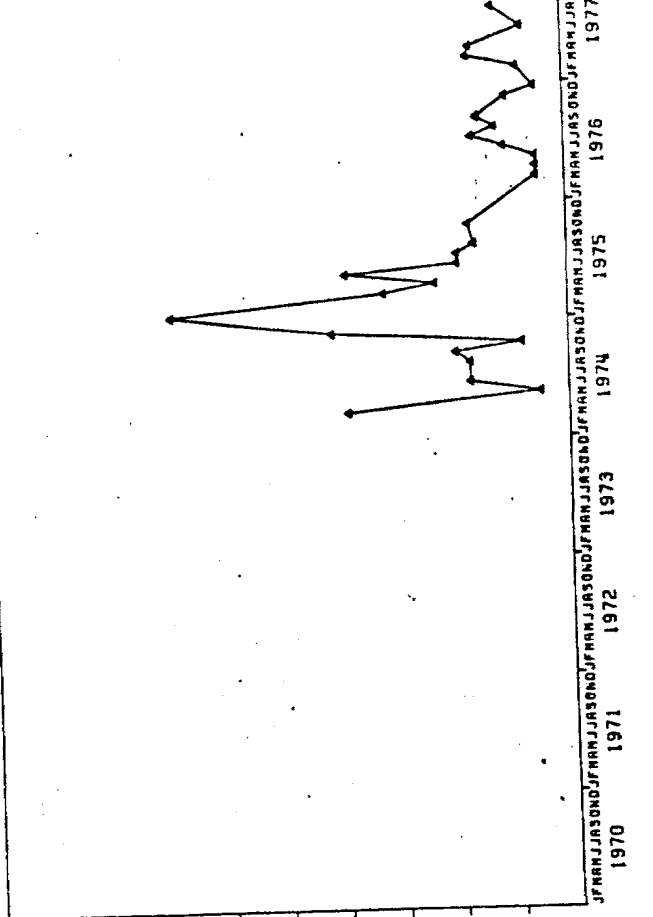
MONTHLY MEANS FOR: PART: SOLUBLE DUST.SOL

T/MI2/HO

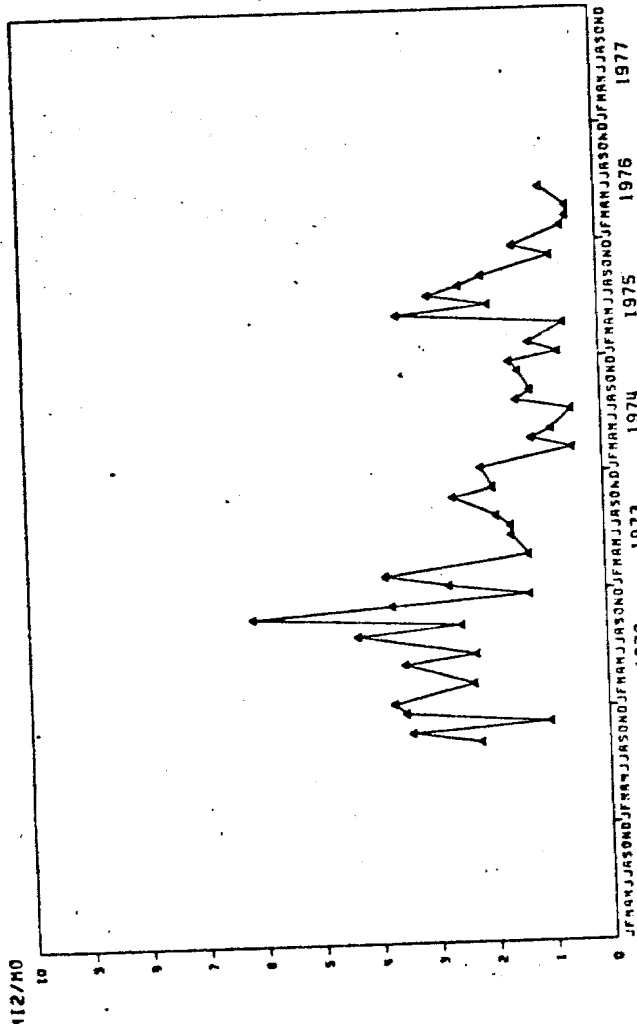


MONTHLY MEANS FOR: PART: SOLUBLE DUST.SOL

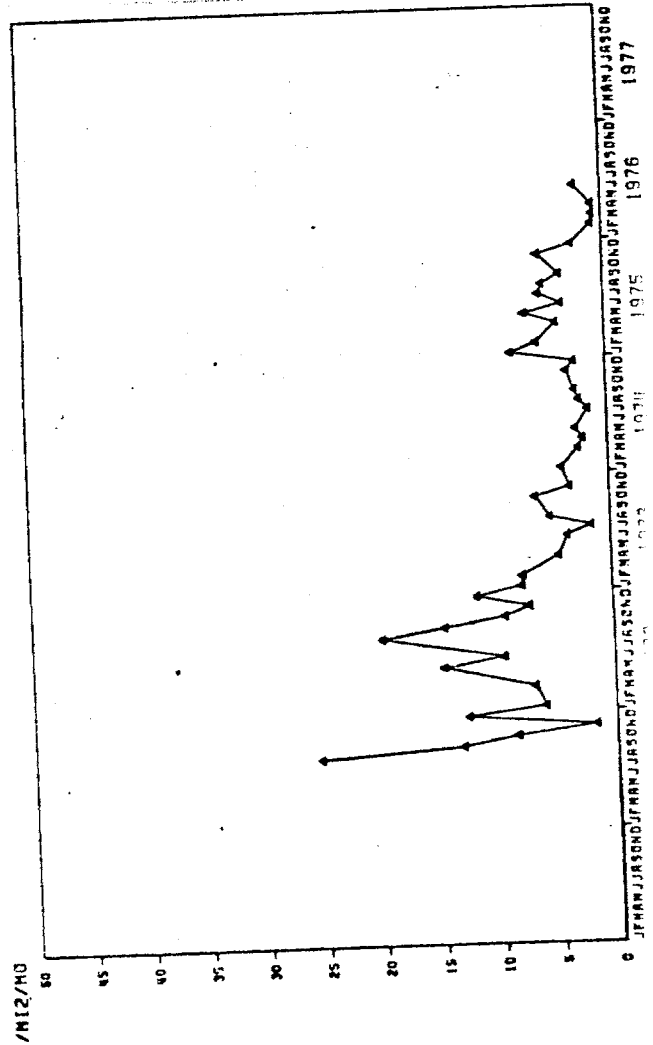
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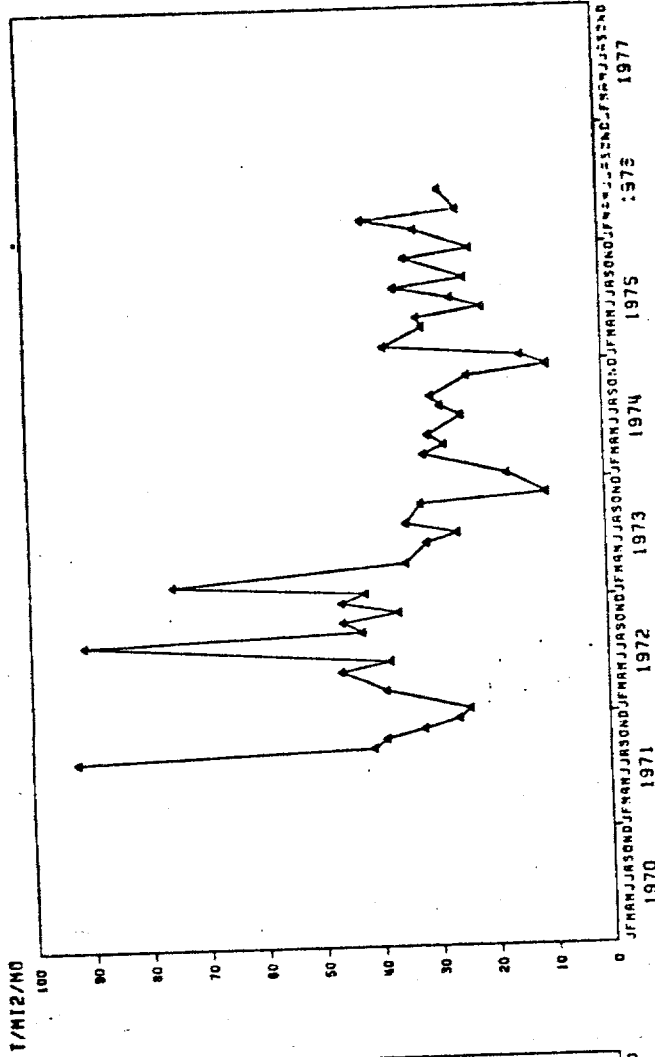
LUMBY AIR-LUMBY HOTEL
MONTHLY MEANS FOR: PART: SOLUBLE, ASH DUST. SOL



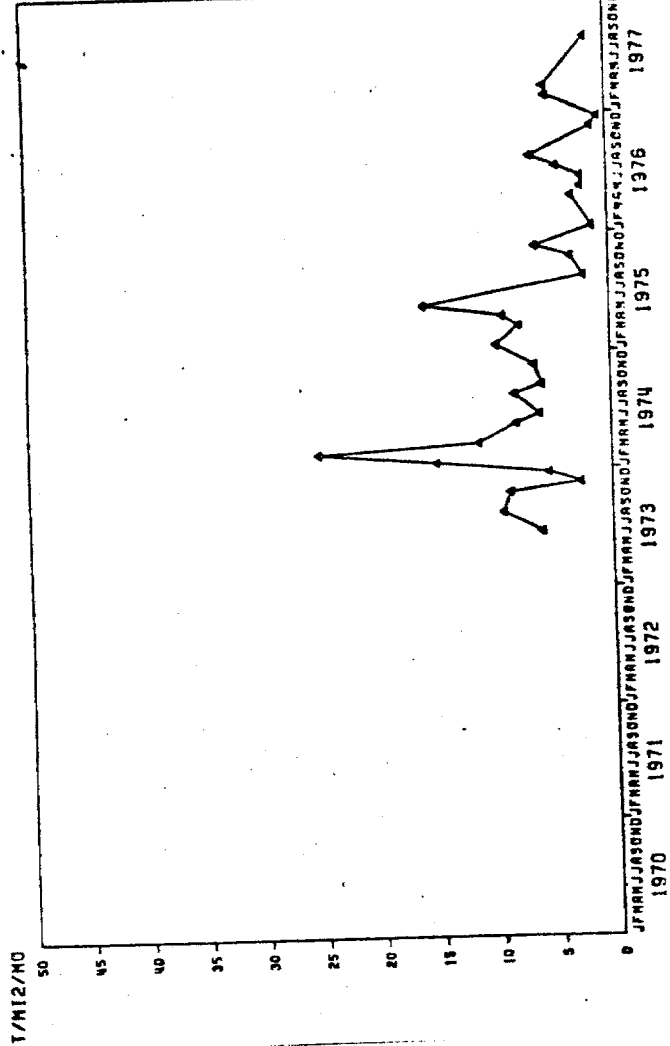
LUMBY AIR-LUMBY HOTEL
MONTHLY MEANS FOR: PART: SOLUBLE DUST. SOL



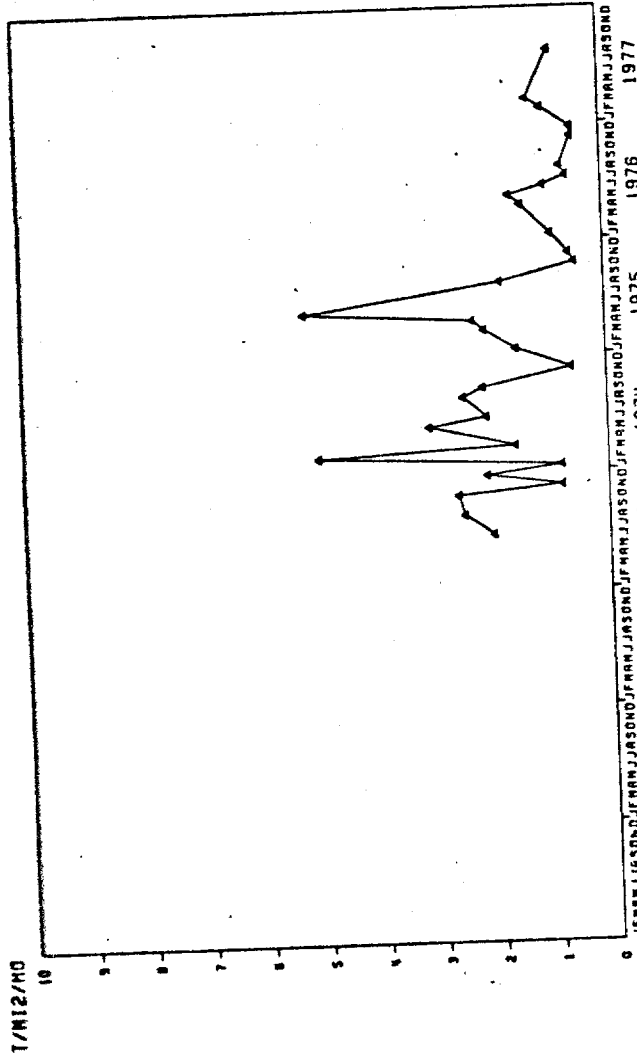
LUMBY AIR-LUMBY HOTEL
MONTHLY MEANS FOR: PARTICULATE, TOT DUST. TOT



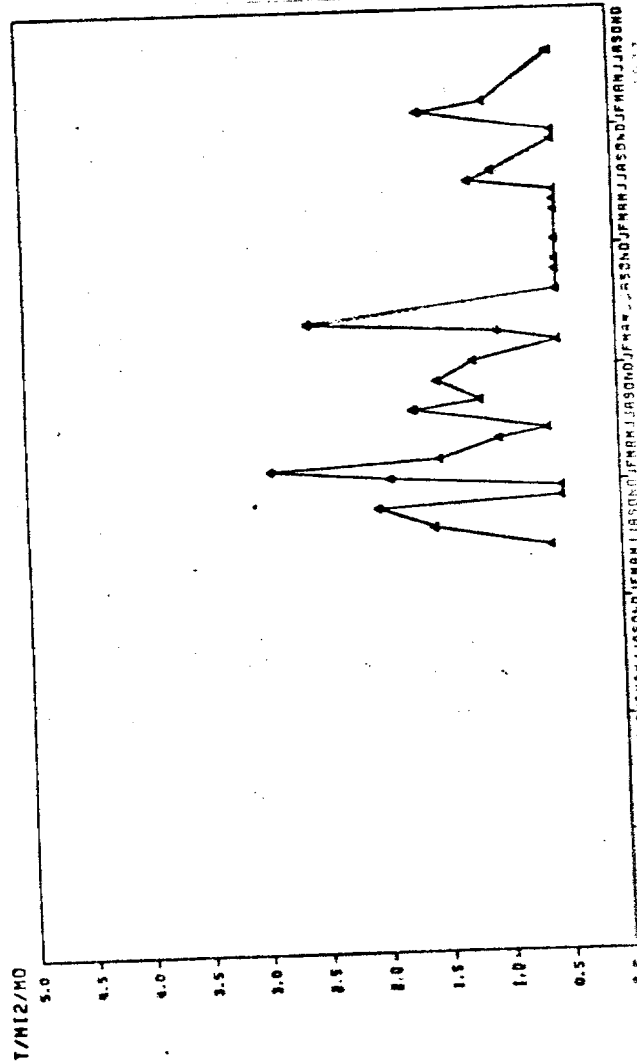
MAPLE RIDGE ELEM. SCHOOL
MONTHLY MEANS FOR: PARTICULATE, TOT DUST. TOT



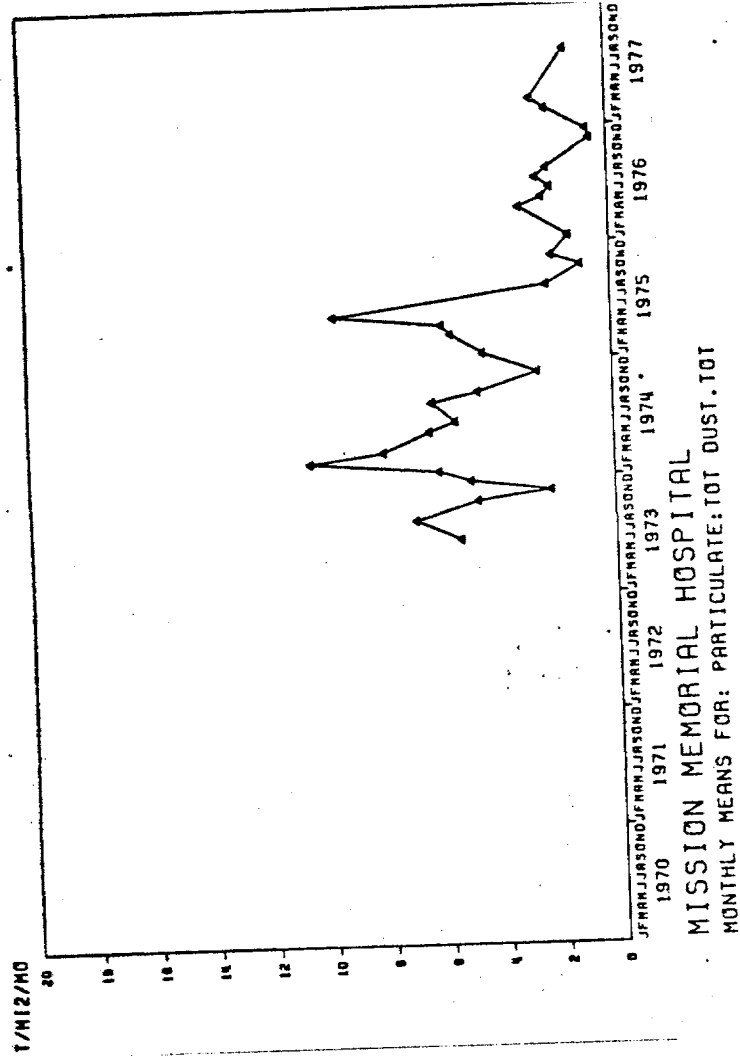
MAPLE RIDGE ELEM. SCHOOL
MONTHLY MEANS FOR: PART:INSOL,ASH DUST,INSL



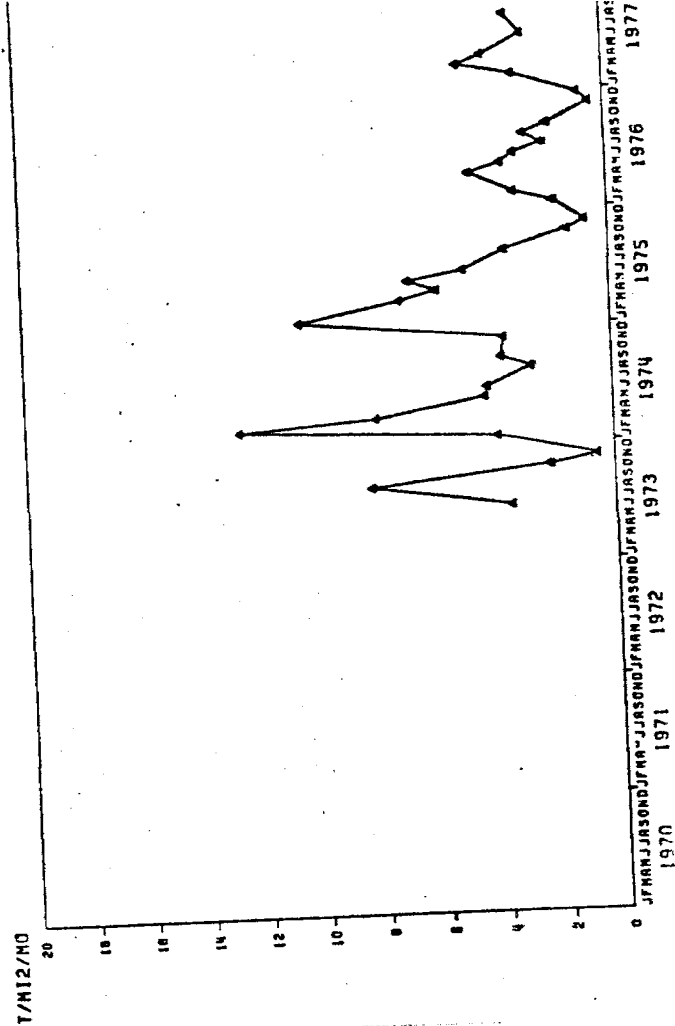
MAPLE RIDGE ELEM. SCHOOL
MONTHLY MEANS FOR: PART:SOLUBL,ASH DUST,SOL



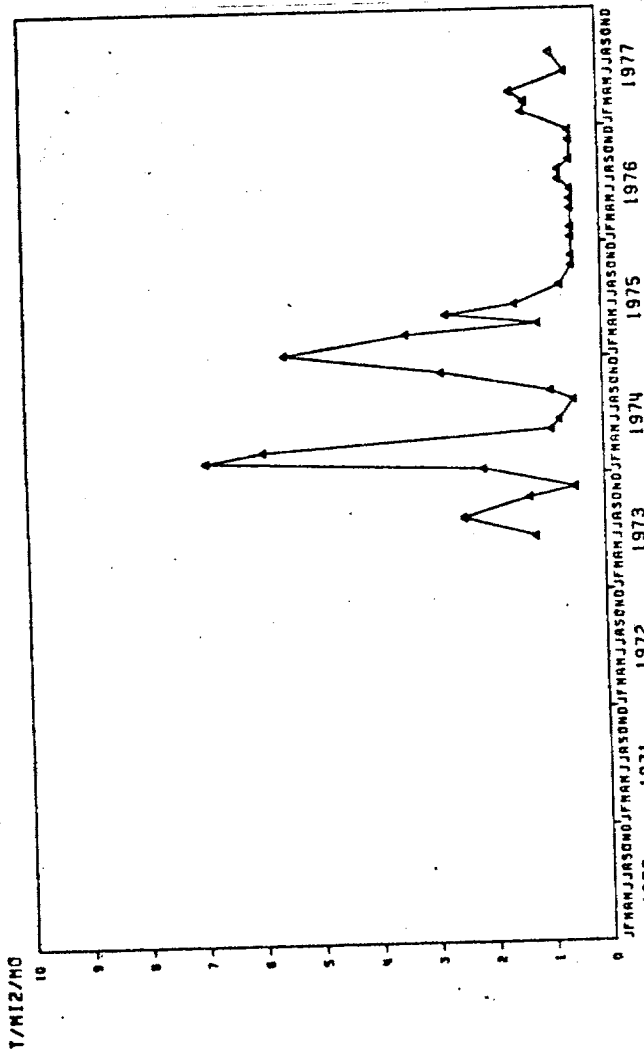
MAPLE RIDGE ELEM. SCHOOL
MONTHLY MEANS FOR: PART:INSOLUBLE DUST,INSL



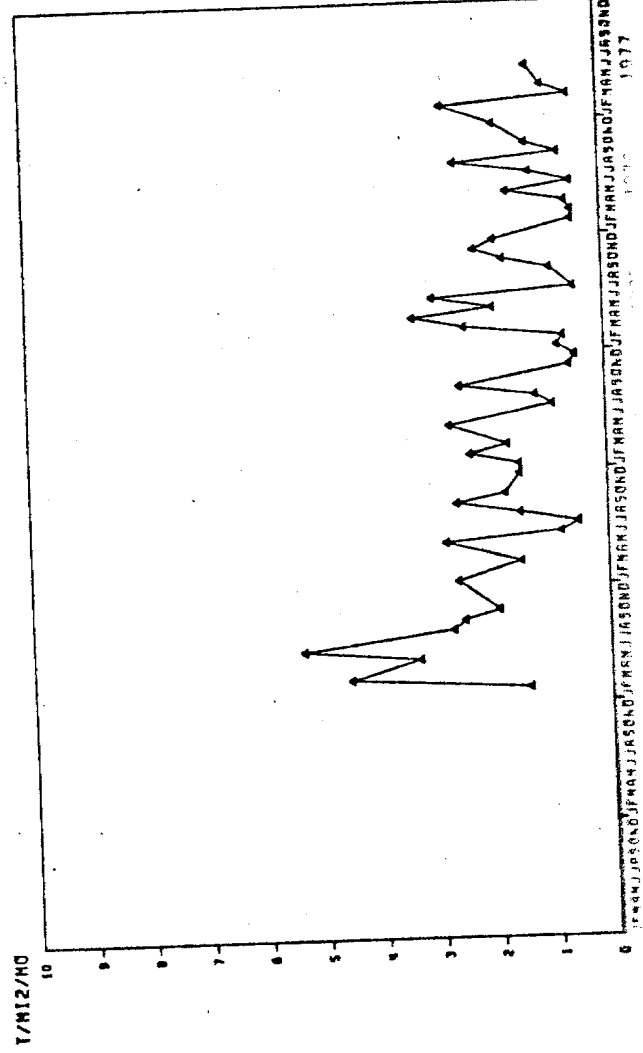
MISSION MEMORIAL HOSPITAL
MONTHLY MEANS FOR: PARTICULATE:TOT DUST,TOT



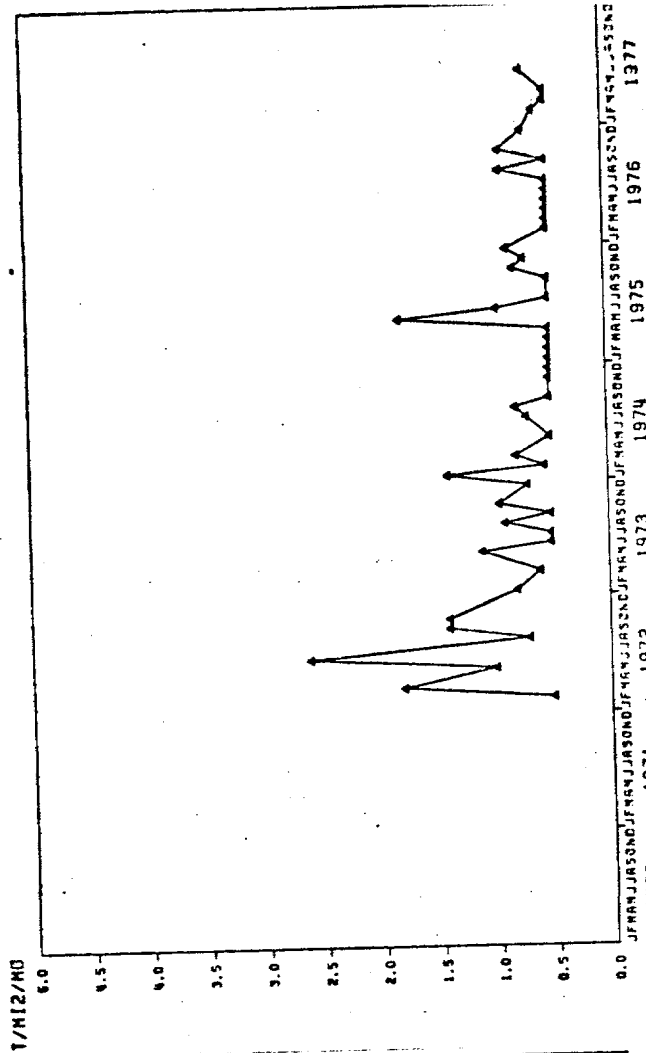
MISSION MEMORIAL HOSPITAL
MONTHLY MEANS FOR: PART: SOLUBLE DUST.SOL



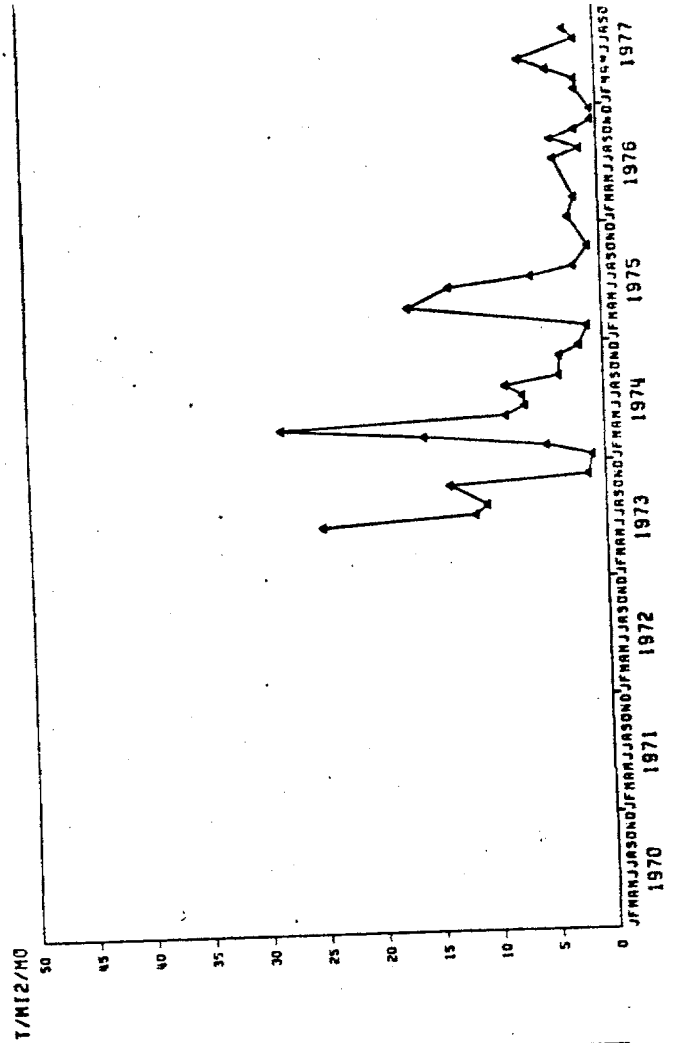
PENTICTON AIR STUDY STN 1
MONTHLY MEANS FOR: PART: SOLUBLE DUST.SOL



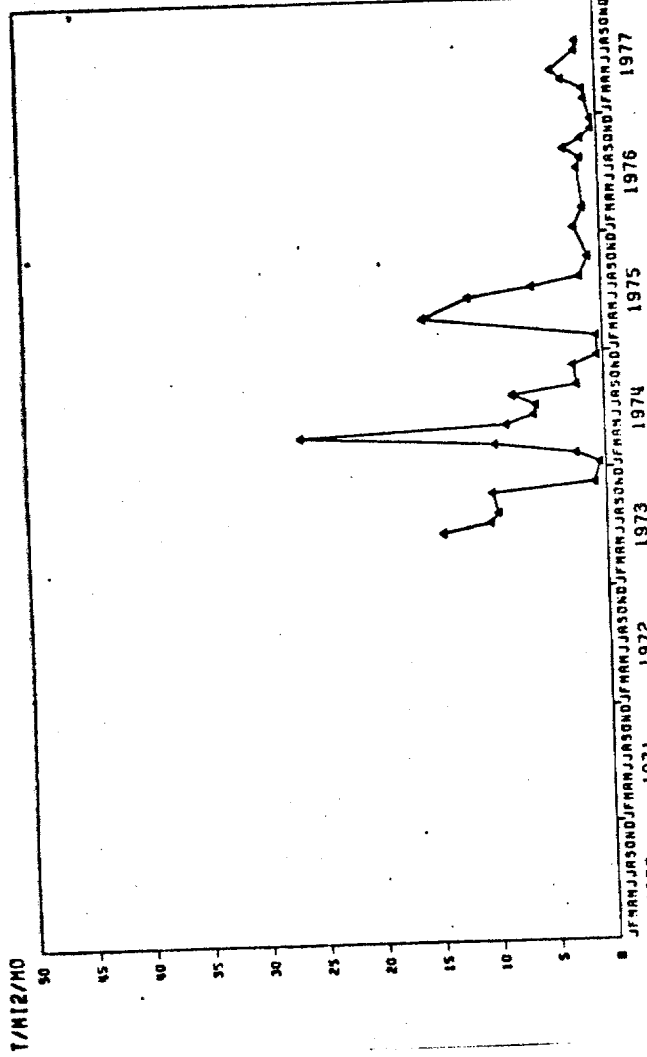
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MONTHLY MEANS FOR: PART: SOLUBLE ASH DUST.SOL



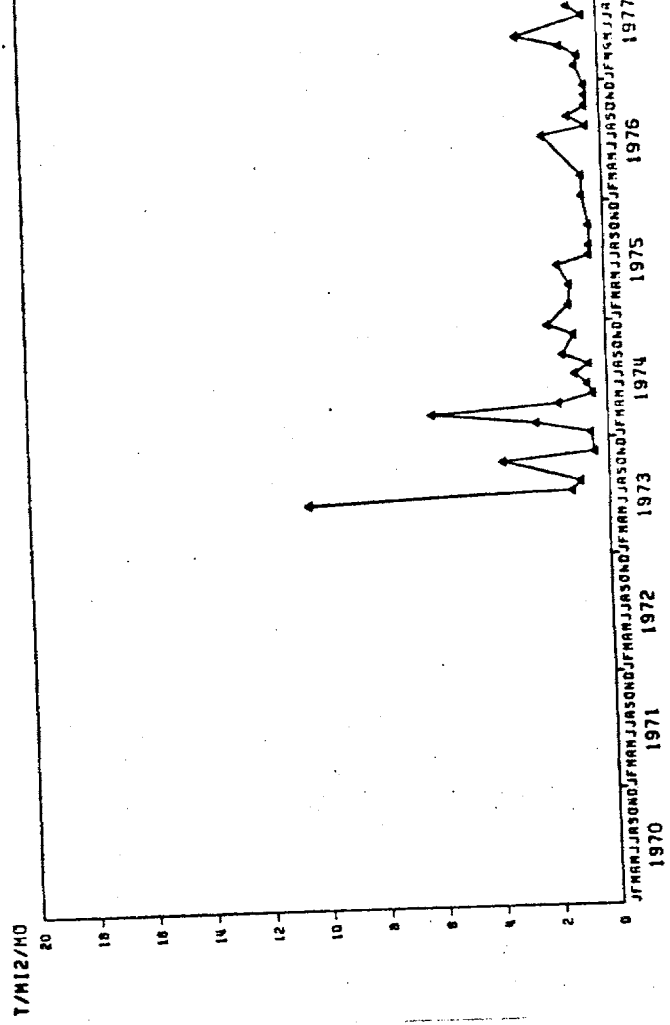
OTWAY P MILL HELIPORT PRINCE GEORGE
MONTHLY MEANS FOR: PARTICULATE: TOT DUST.TOT



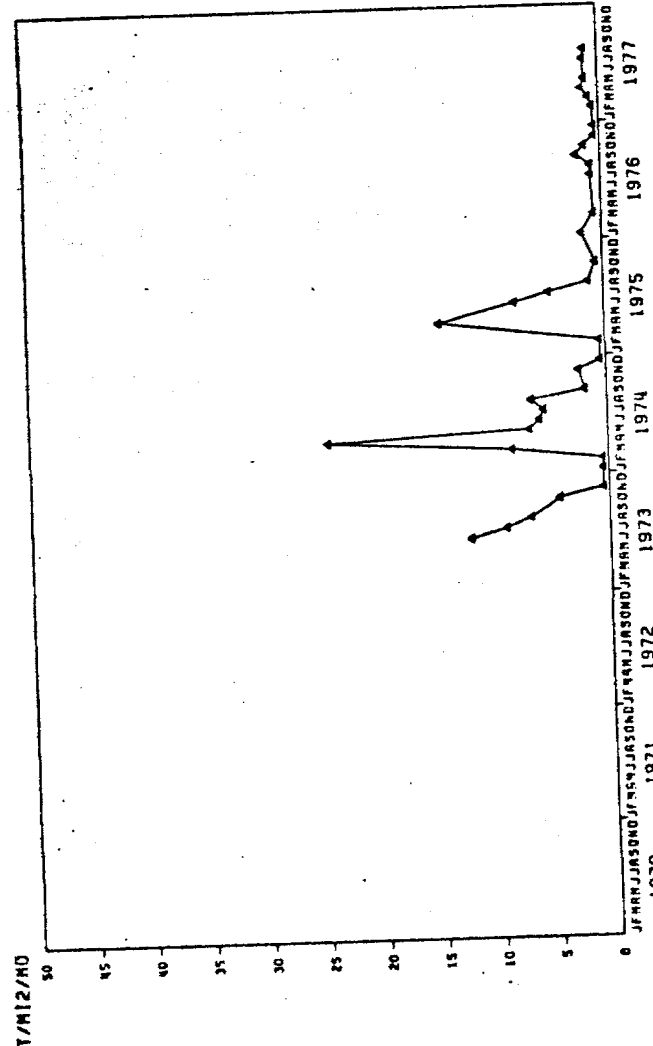
OTWAY P MILL HELIPORT PRINCE GEORGE
MONTHLY MEANS FOR: PART: INSOLUBLE DUST. INSL



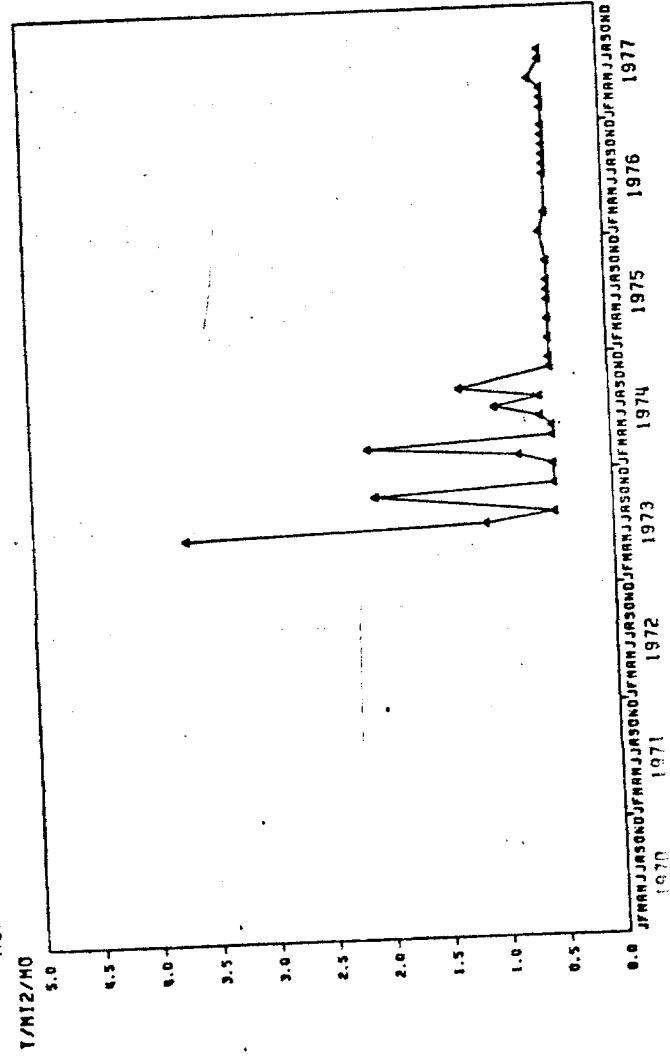
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MONTHLY MEANS FOR: PART: SOLUBLE DUST. SOL



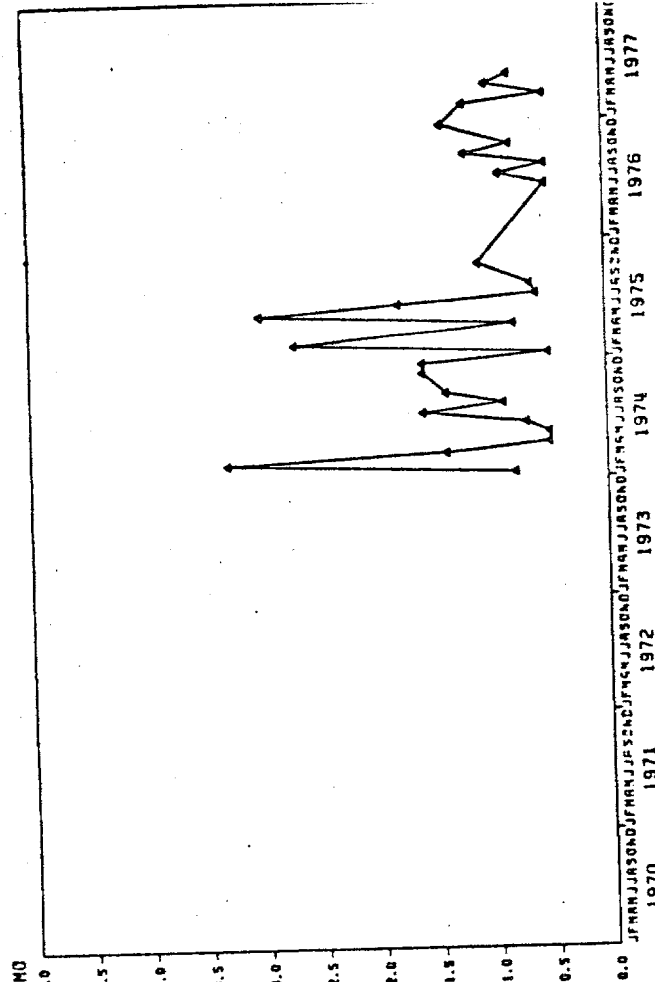
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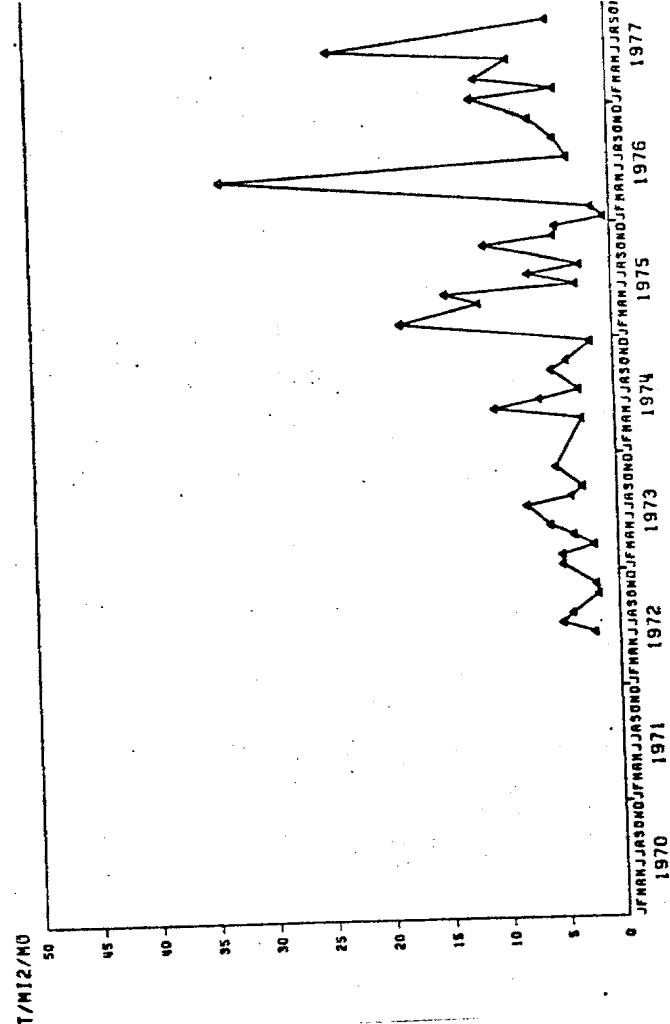
OTWAY P MILL HELIPORT PRINCE GEORGE
MONTHLY MEANS FOR: PART: SOLUBL. ASH DUST. SOL



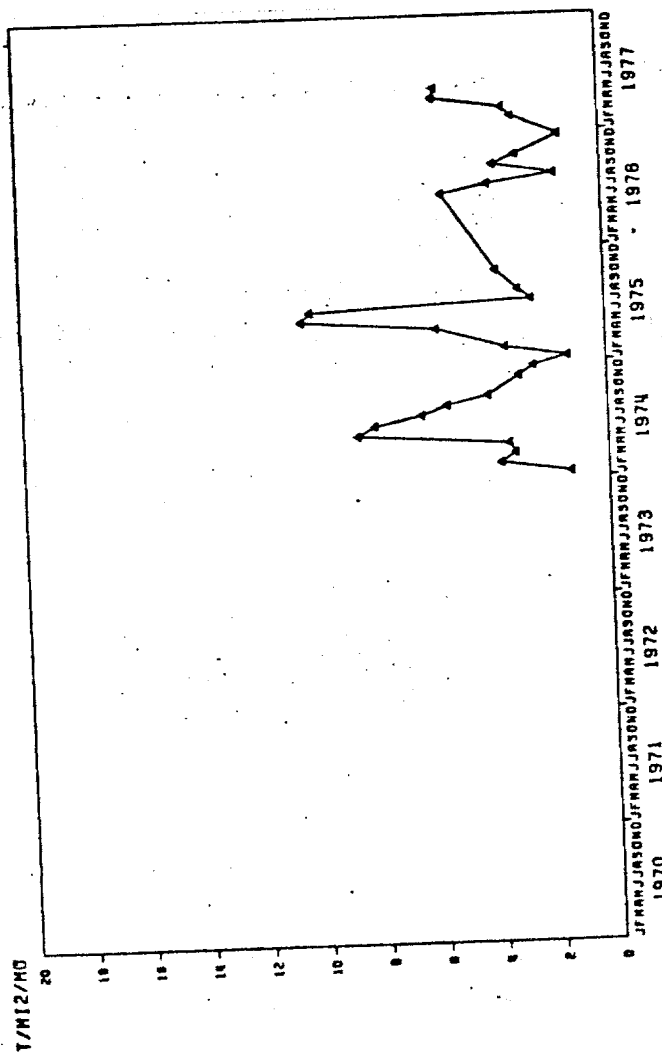
OTWAY P MILL HIGHLAND SCH PRINCE GEORGE
MONTHLY MEANS FOR: PART: SOLUBLE DUST. SOL



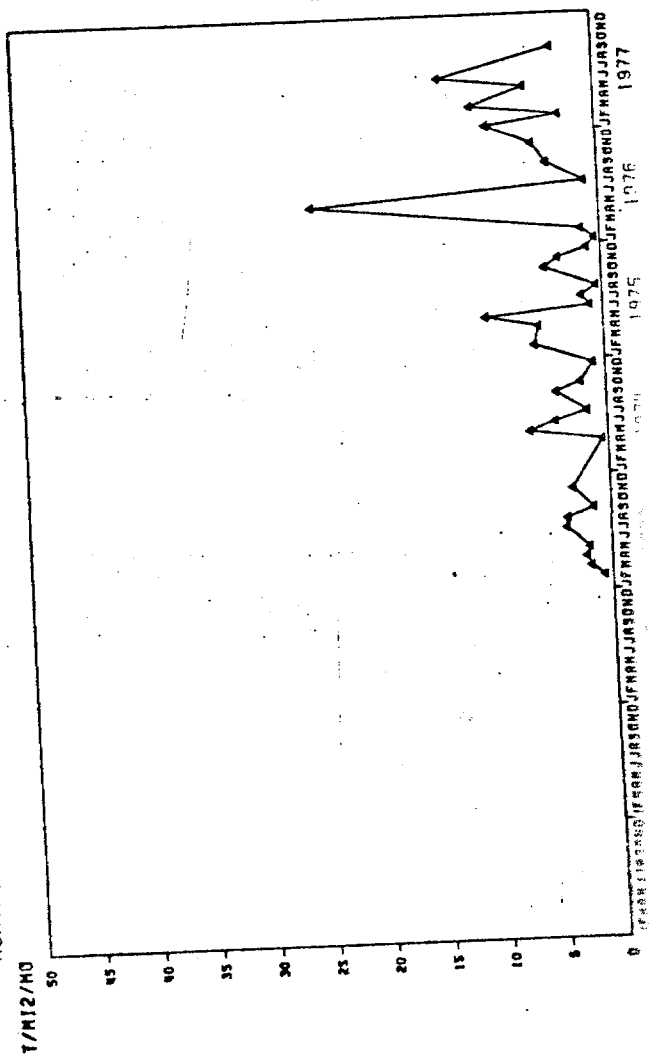
QUES-CARSON PIT
MONTHLY MEANS FOR: PART: SOLUBLE DUST. SOL



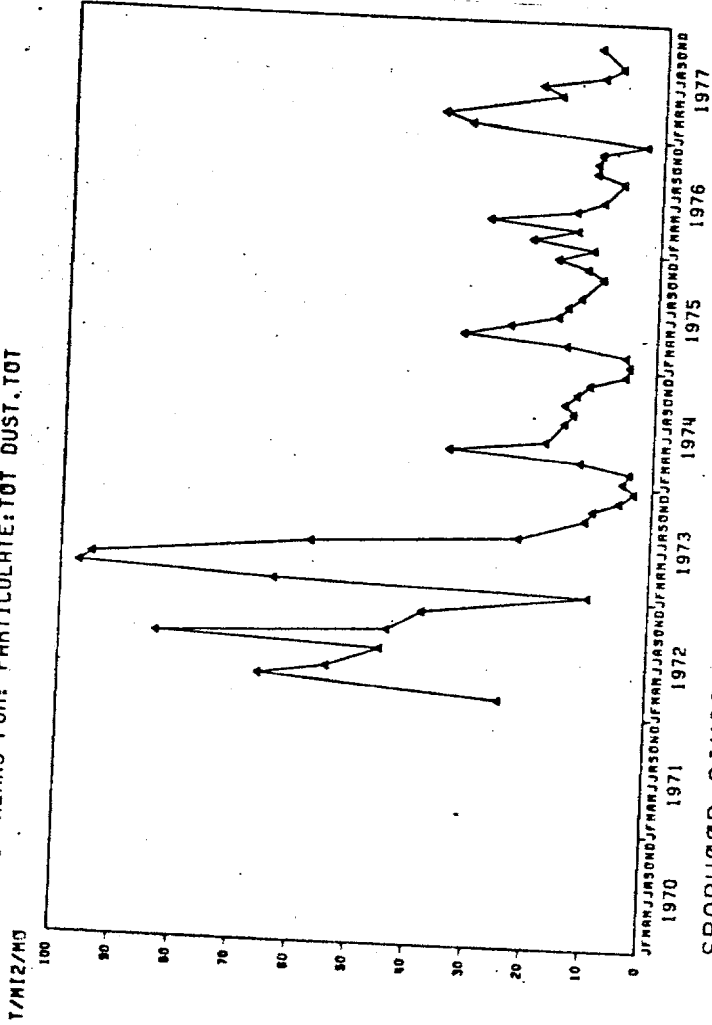
OTWAY P MILL HIGHLAND SCH PRINCE GEORGE
MONTHLY MEANS FOR: PARTICULATE: TOT DUST. TOT



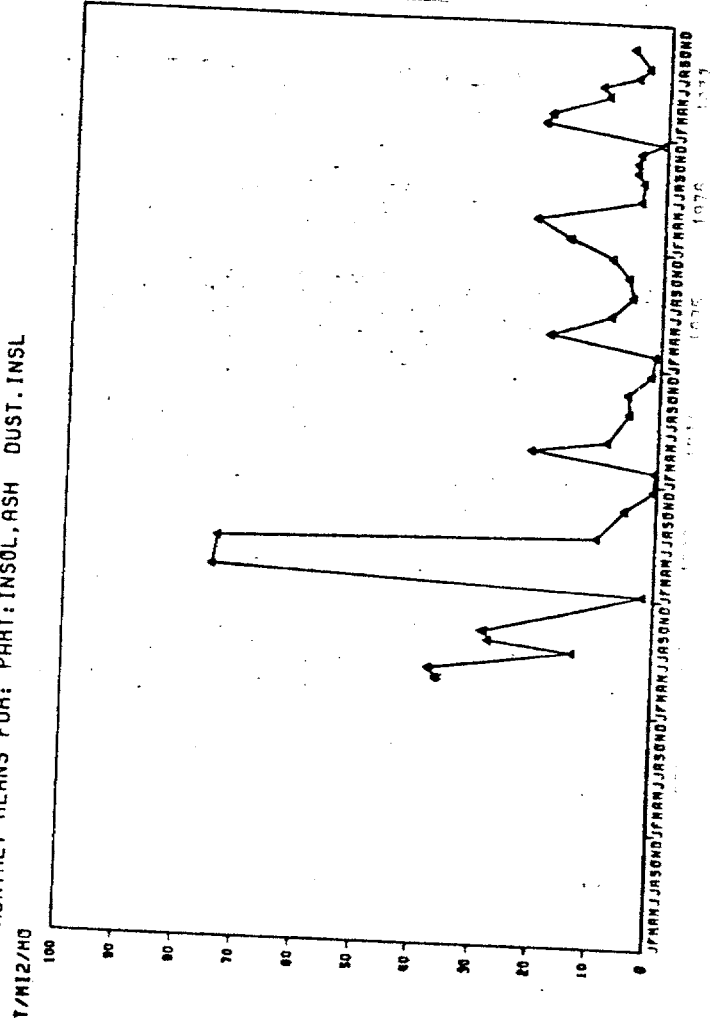
QUES-CARSON PIT
MONTHLY MEANS FOR: PART: SOLUBL, ASH DUST. SOL



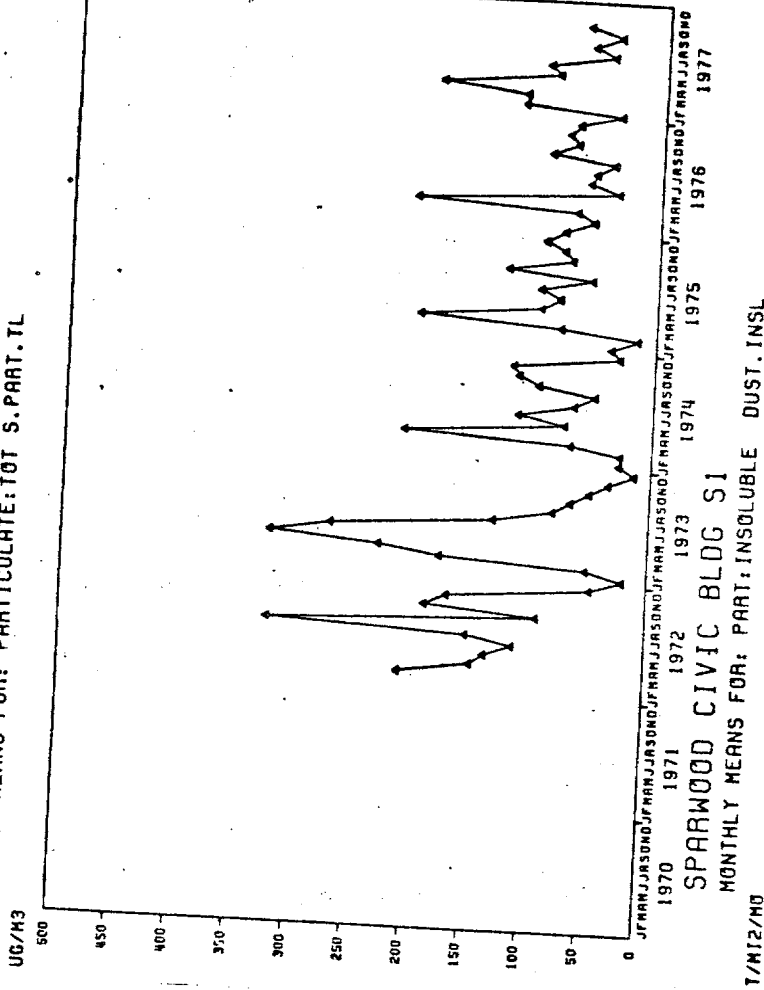
SPARWOOD CIVIC BLDG S1
MONTHLY MEANS FOR: PARTICULATE:TOT DUST,TOT



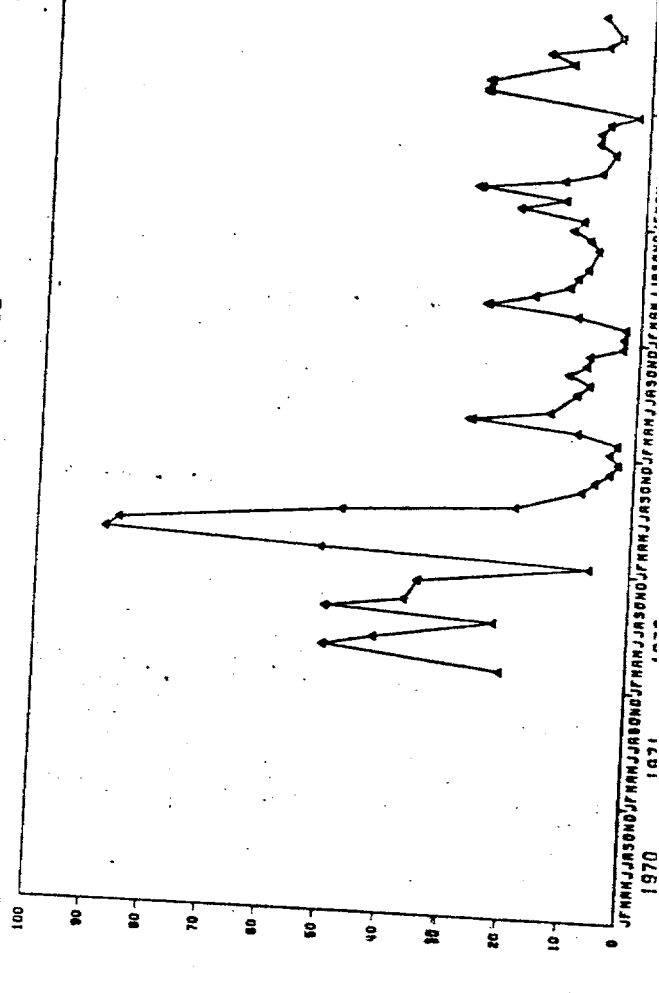
SPARWOOD CIVIC BLDG S1
MONTHLY MEANS FOR: PART:INSOL,ASH DUST,INSL



SPARWOOD CIVIC BLDG S1
MONTHLY MEANS FOR: PARTICULATE:TOT S.PART,TL

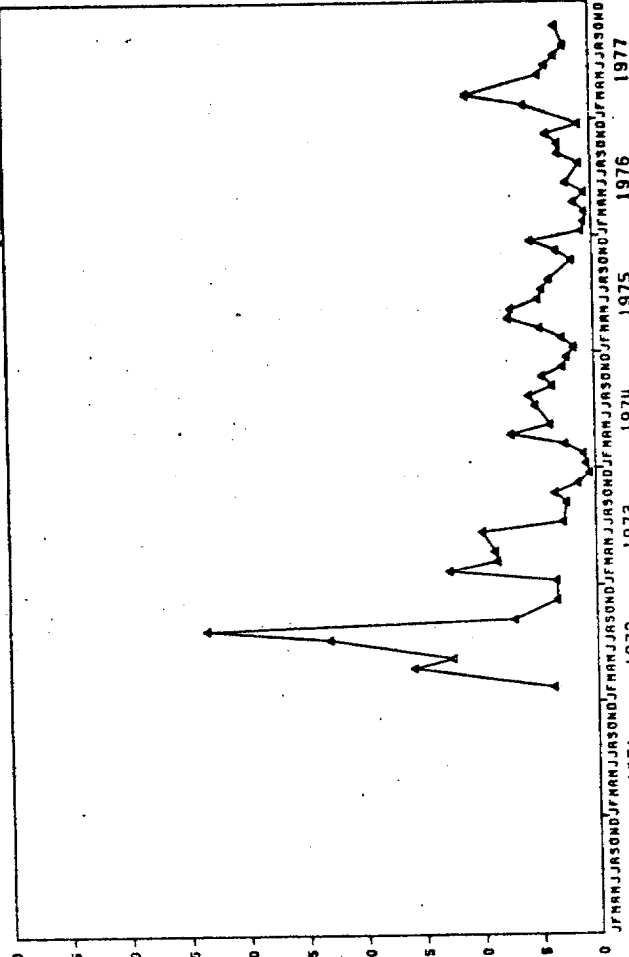


SPARWOOD CIVIC BLDG S1
MONTHLY MEANS FOR: PART:INSOLUBLE DUST,INSL



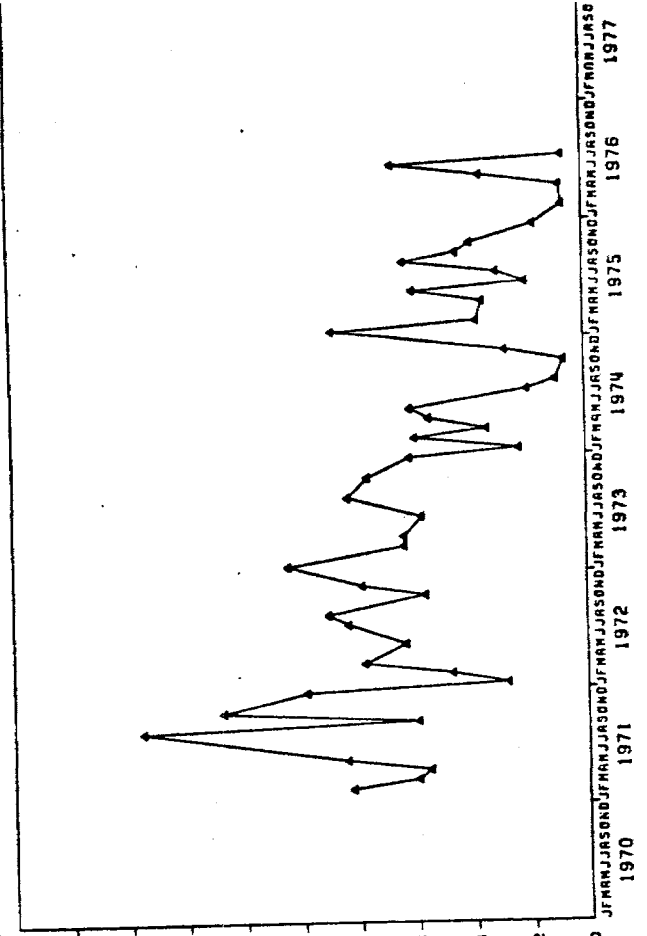
SPARWOOD CIVIC BLDG S1
MONTHLY MEANS FOR: PART: SOLUBLE DUST.SOL

T/M12/MO



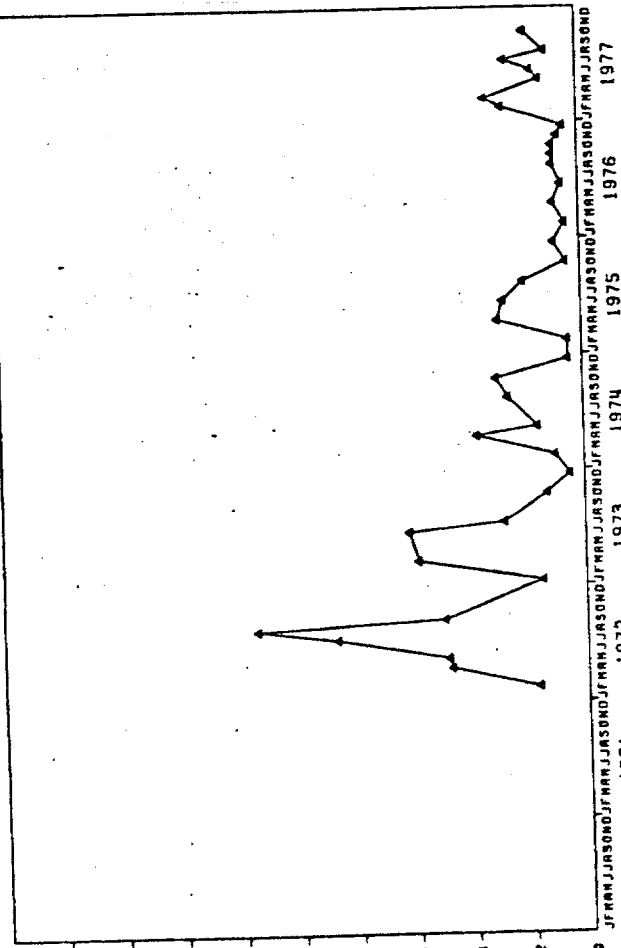
TRAIL ANNABLE T5
MONTHLY MEANS FOR: PART: SOLUBLE DUST.SOL

T/M12/MO



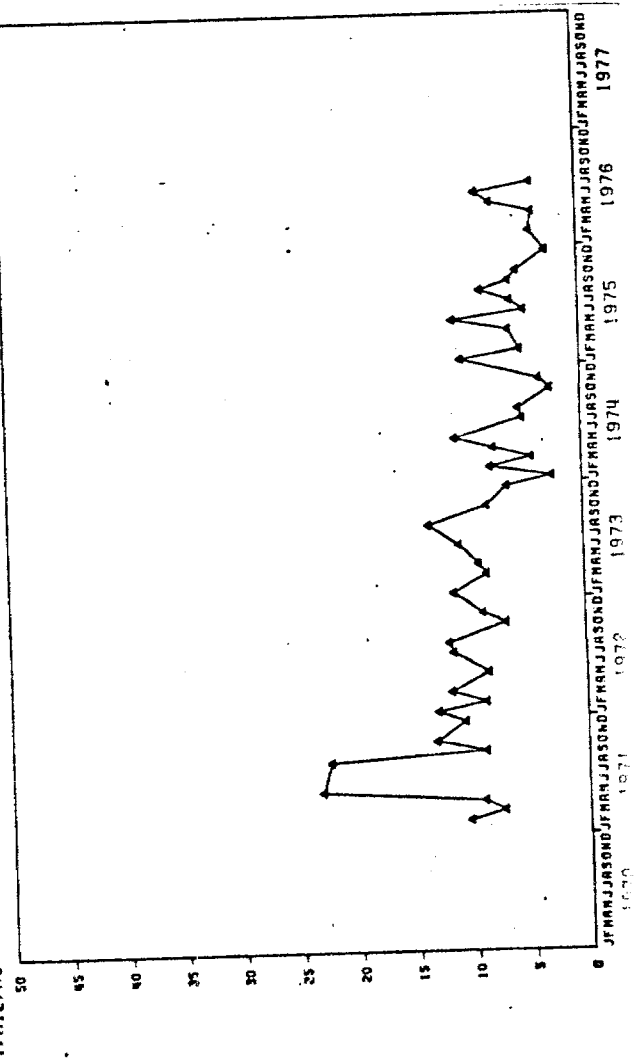
SPARWOOD CIVIC BLDG S1
MONTHLY MEANS FOR: PART: SOLUBLE, ASH DUST.SOL

T/M12/MO

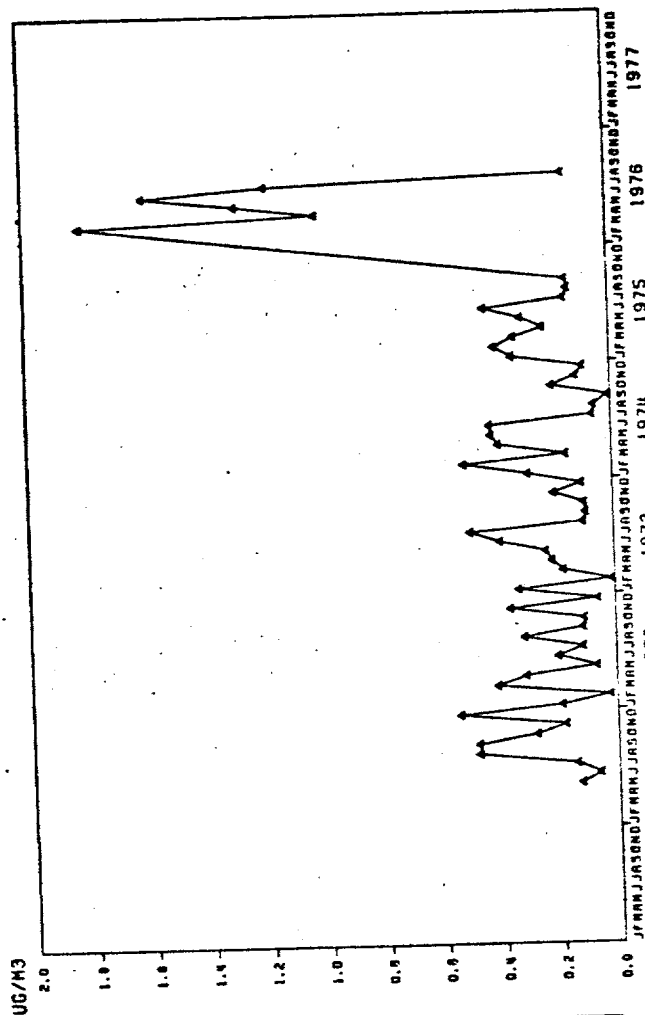


TRAIL ANNABLE T5
MONTHLY MEANS FOR: PARTICULATE: TOT DUST.TOT

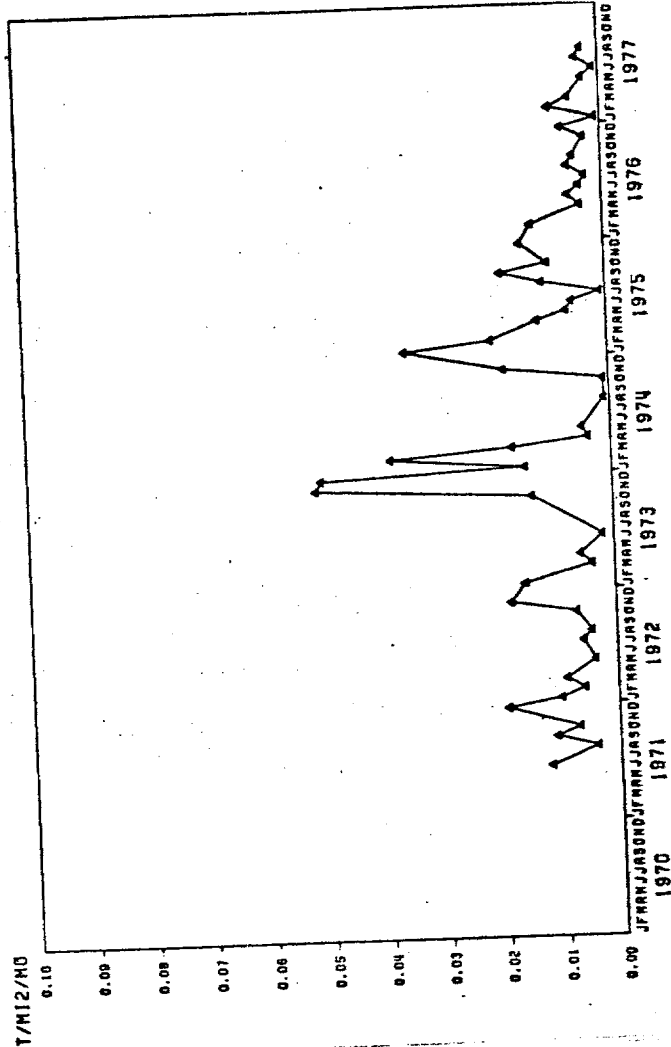
T/M12/MO



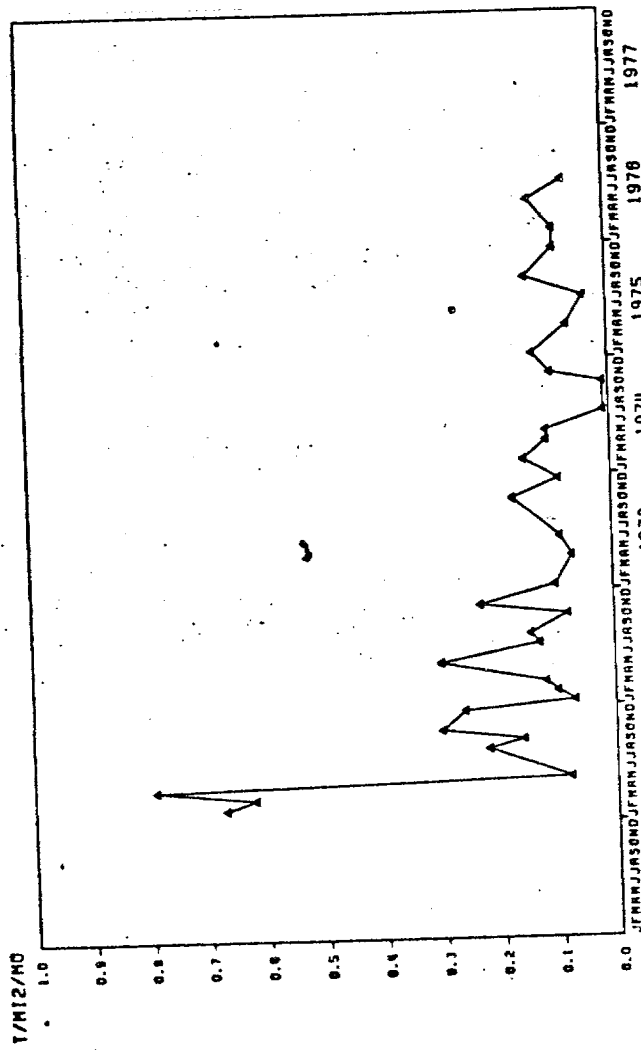
TRAIL BUTLER PARK T2 MONTHLY MEANS FOR: ARSENIC



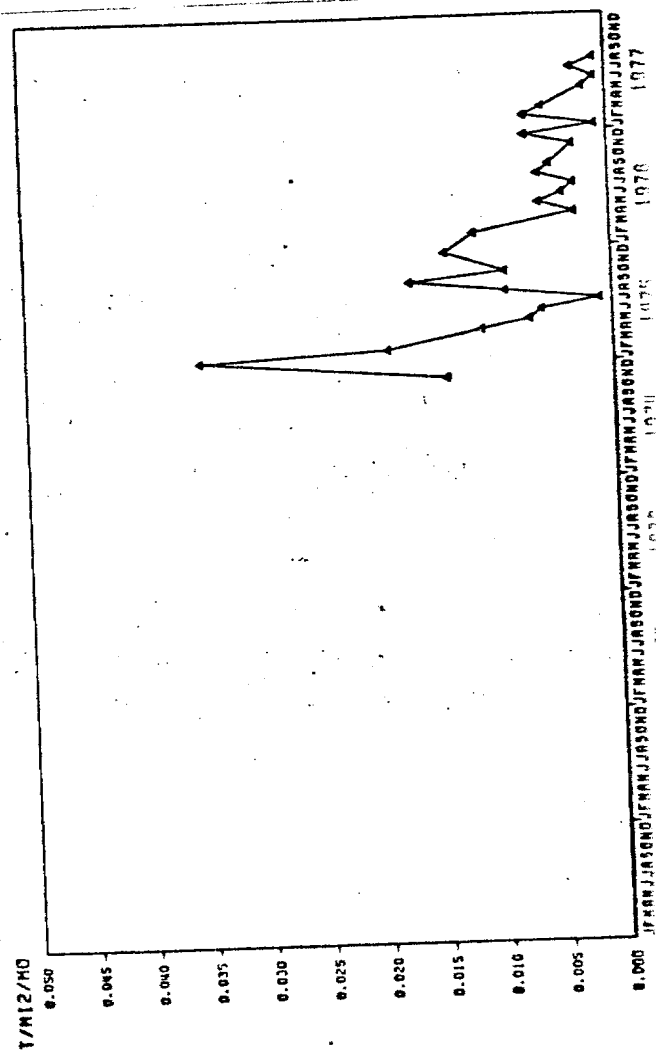
TRAIL BUTLER PARK T2 MONTHLY MEANS FOR: CADMIUM



TRAIL ANNABLE T5 MONTHLY MEANS FOR: ZINC

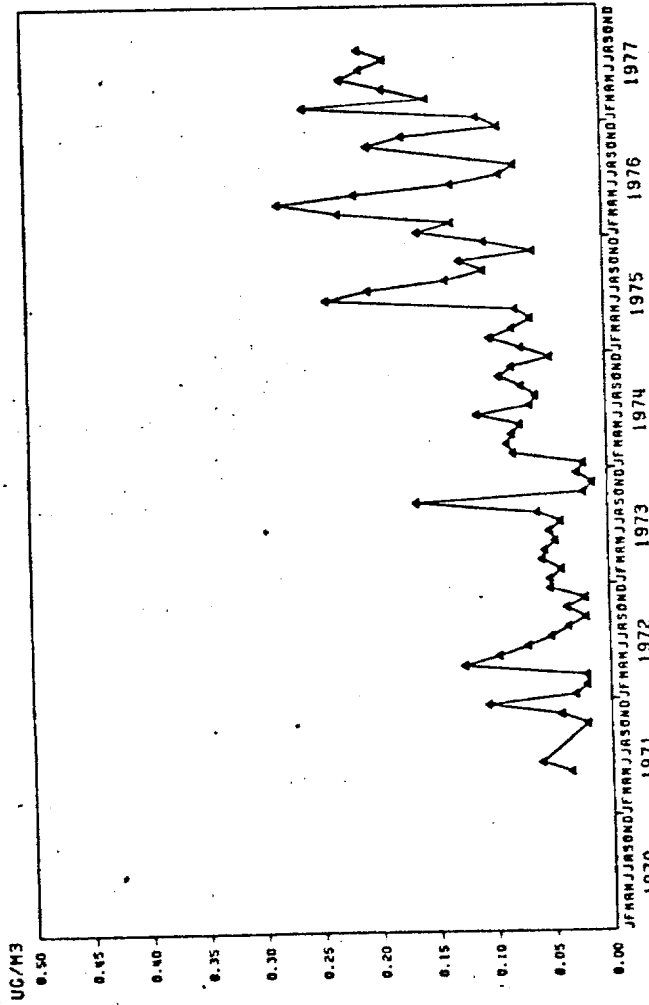


TRAIL BUTLER PARK T2 MONTHLY MEANS FOR: CHROMIUM



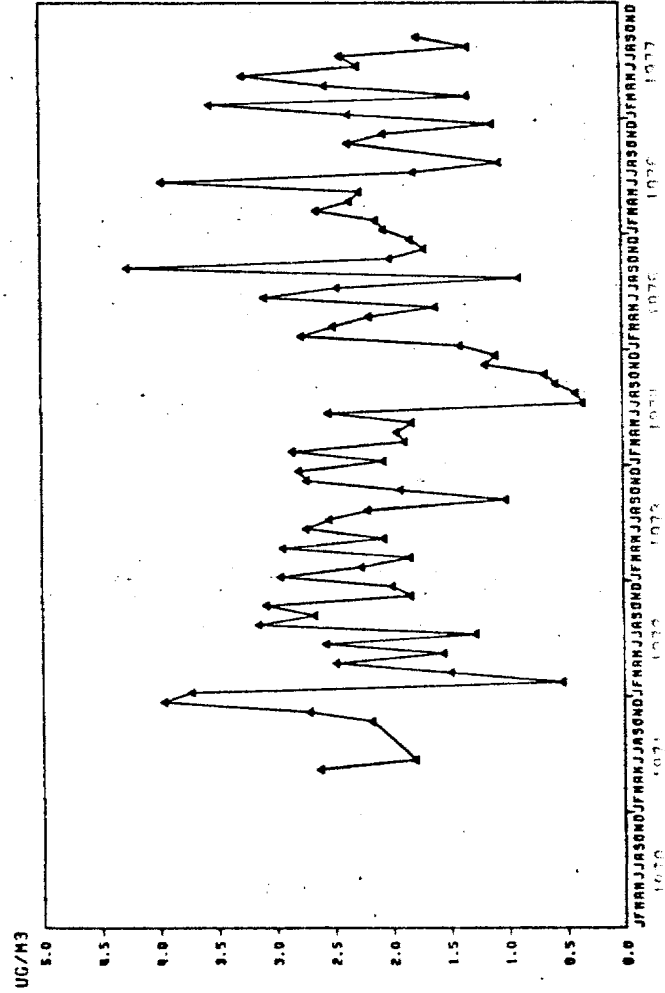
TRAIL BUTLER PARK T2
MONTHLY MEANS FOR: COPPER

S. PAAT. TL



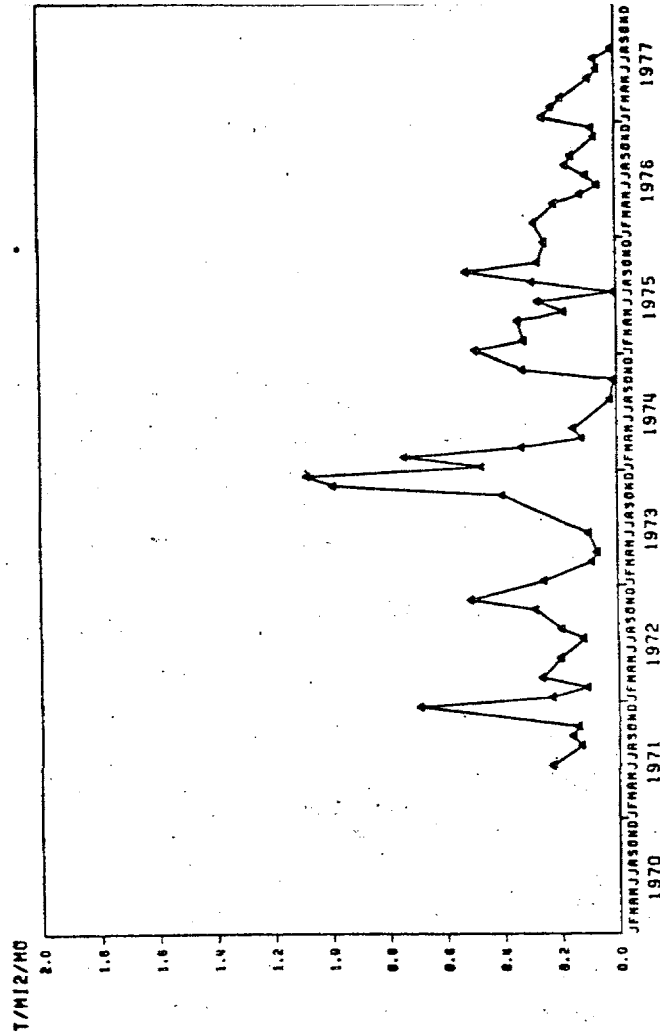
TRAIL BUTLER PARK T2
MONTHLY MEANS FOR: LEAD

S. PAAT.TL



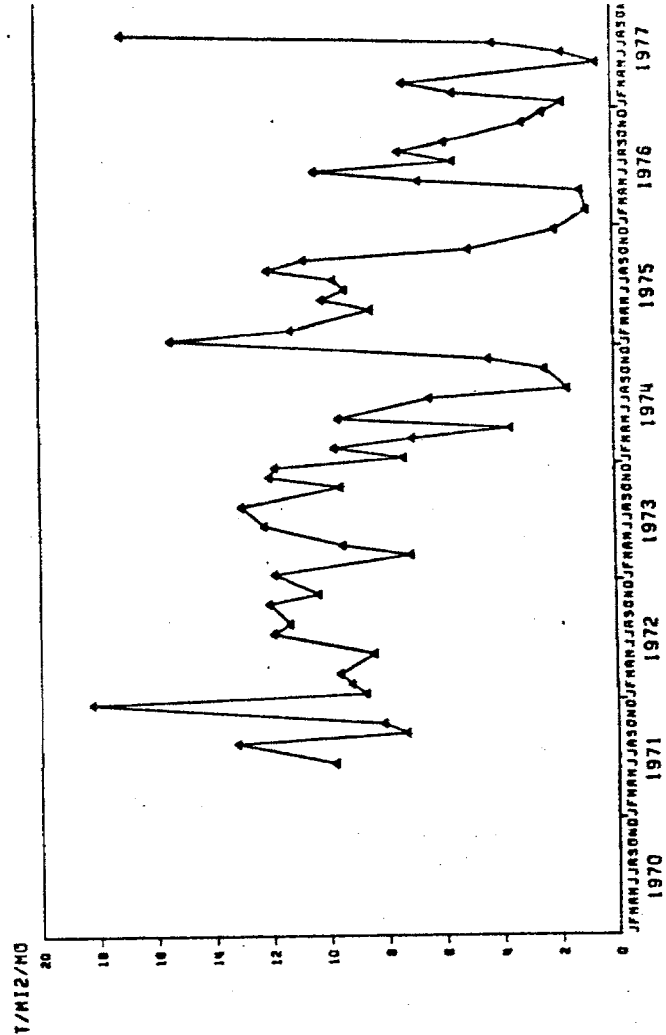
TRAIL BUTLER PARK T2
MONTHLY MEANS FOR: LEAD

101.1500



TRAIL BUTLER PARK T2
MONTHLY MEANS FOR: PART: SOLUBLE

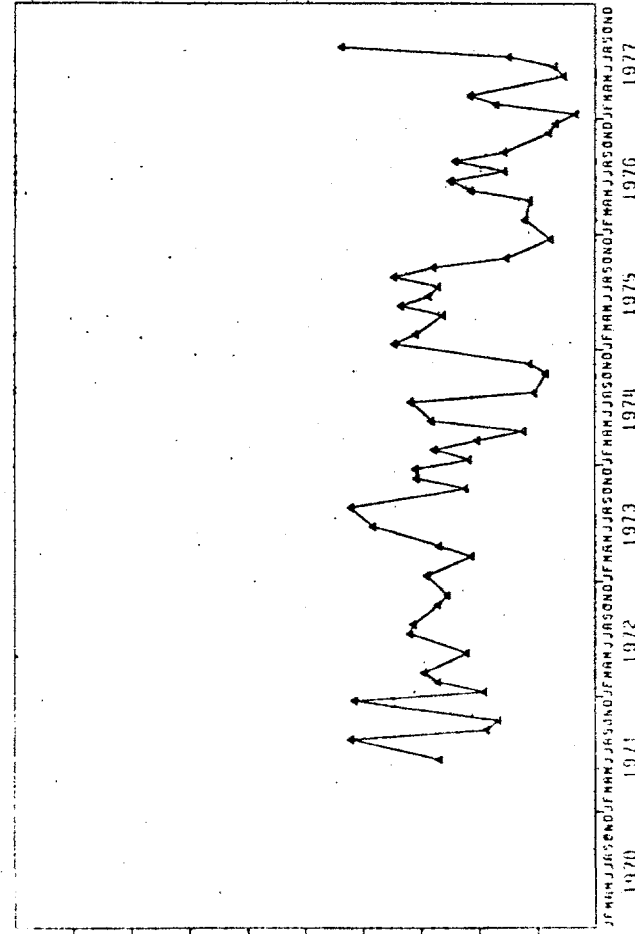
DUST.SOL



TRAIL BUTLER PARK T2

MONTHLY MEANS FOR: PARTICULATE:TOT DUST.TOT

T/M12/HQ

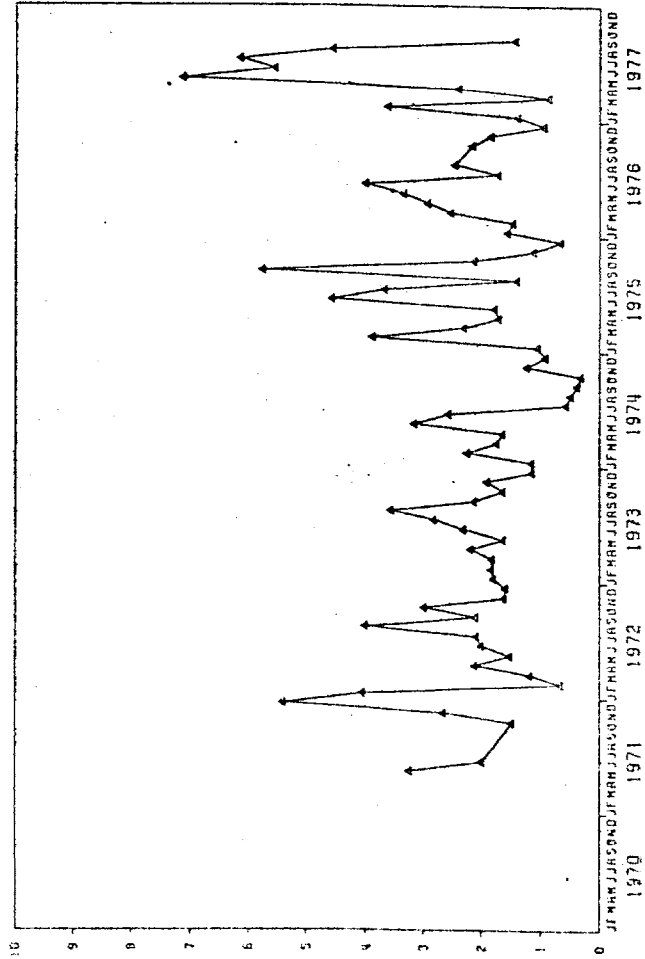


TRAIL BUTLER PARK T2

MONTHLY MEANS FOR: ZINC

UC/M3

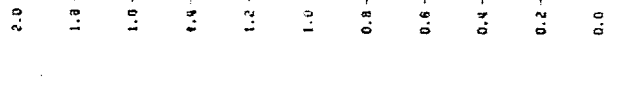
S.PART.IL



TRAIL BUTLER PARK T2

MONTHLY MEANS FOR: ZINC

T/M12/HQ

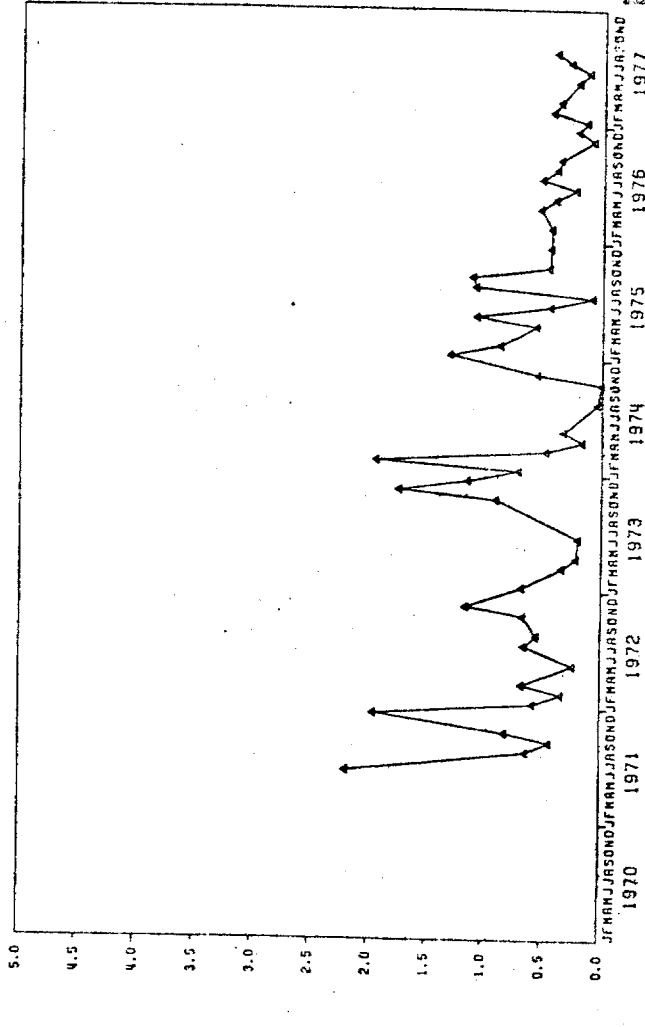


TRAIL BUTLER PARK T2

MONTHLY MEANS FOR: ZINC

T/M12/HQ

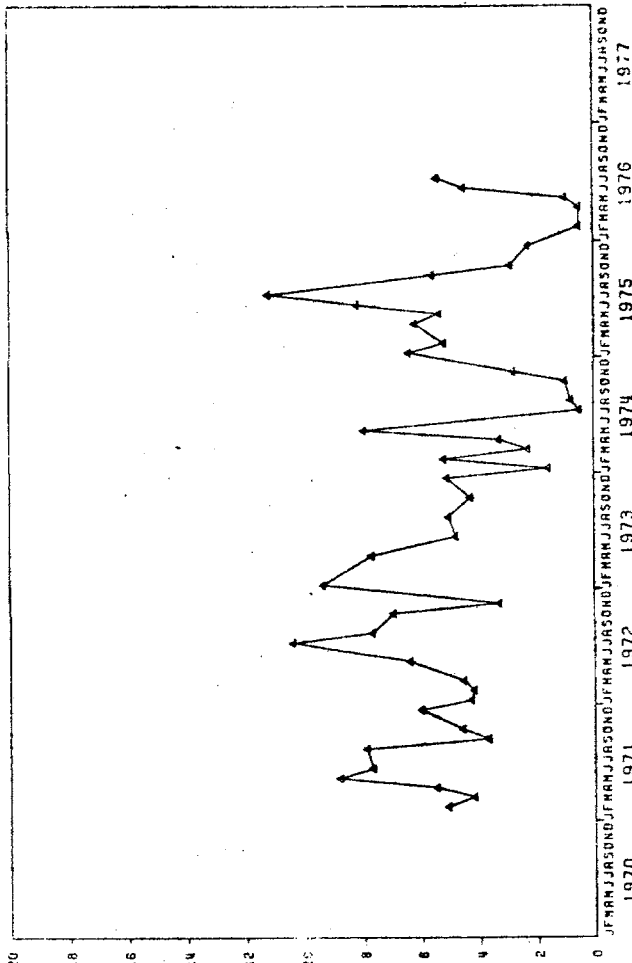
DUST.TOT



DUST.SOL

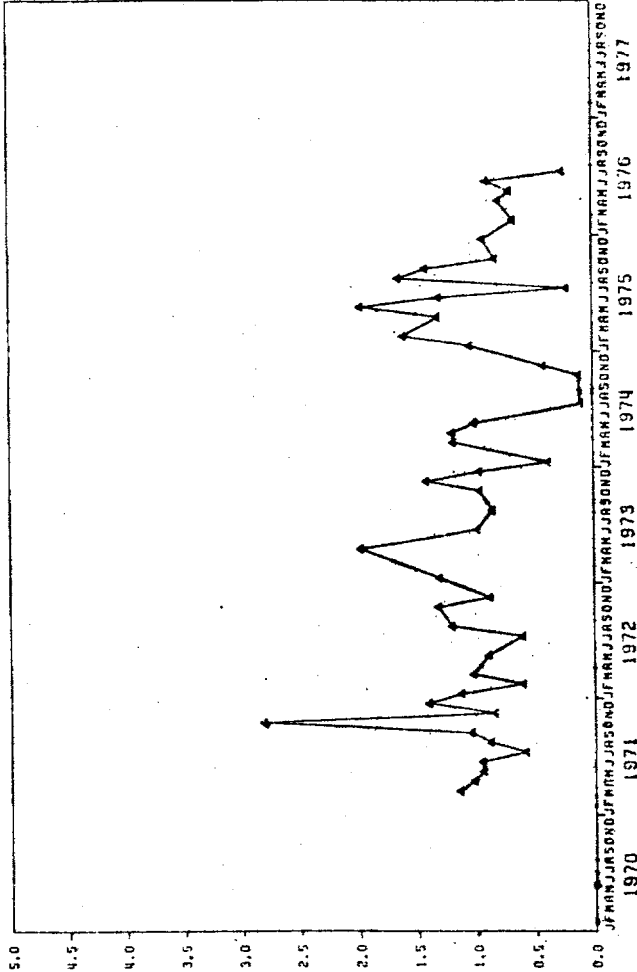
TRAIL GLENMERRY T4
MONTHLY MEANS FOR: PART: SOLUBLE DUST.SOL

T/M12/MO



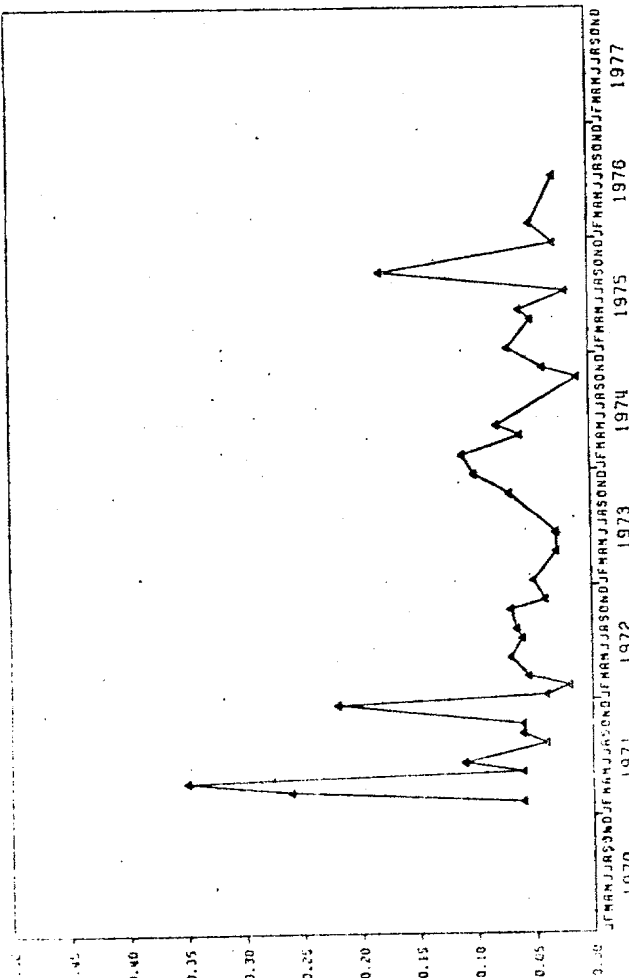
TRAIL GLENMERRY T4
MONTHLY MEANS FOR: SULFATION INDEX

MG/DM2/D



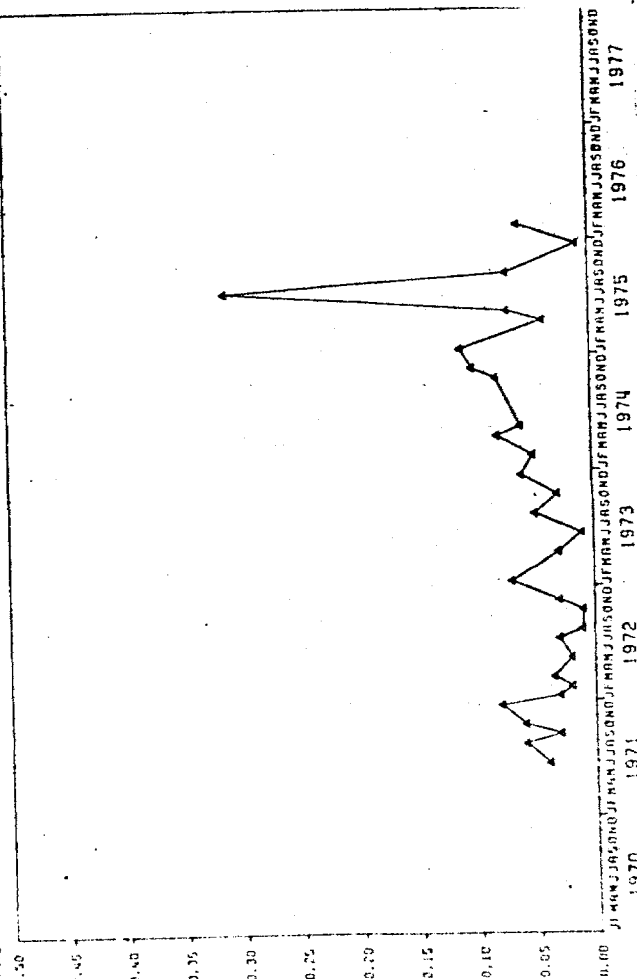
TRAIL GLENMERRY T4
MONTHLY MEANS FOR: LEAD

T/M12/MO



TRAIL GLENMERRY T4
MONTHLY MEANS FOR: SODIUM

T/M12/MO

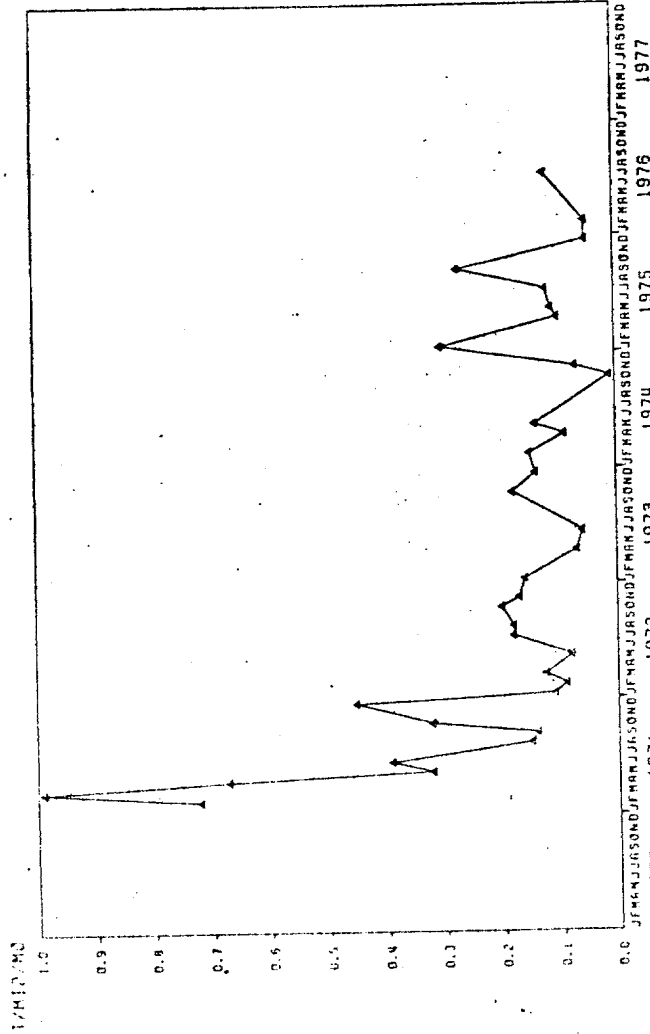


TRAIL GLENMERRY T4

DUST.TOT

DUST.SOL

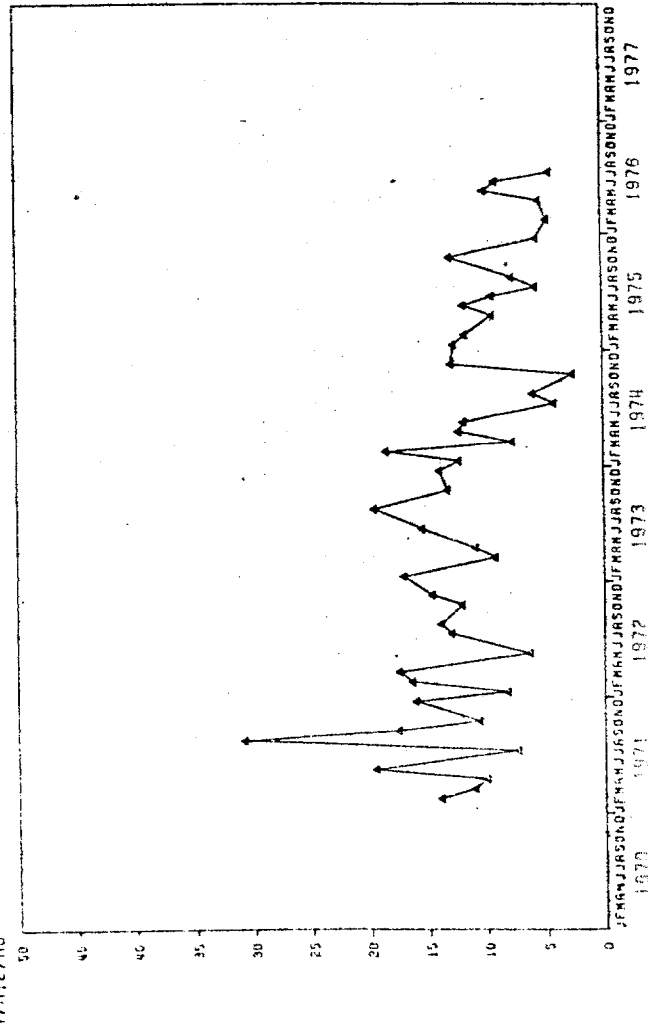
T/M12/MO



TRAIL RIVERVALE T3

MONTHLY MEANS FOR: PARTICULATE:TOT DUST.TOT

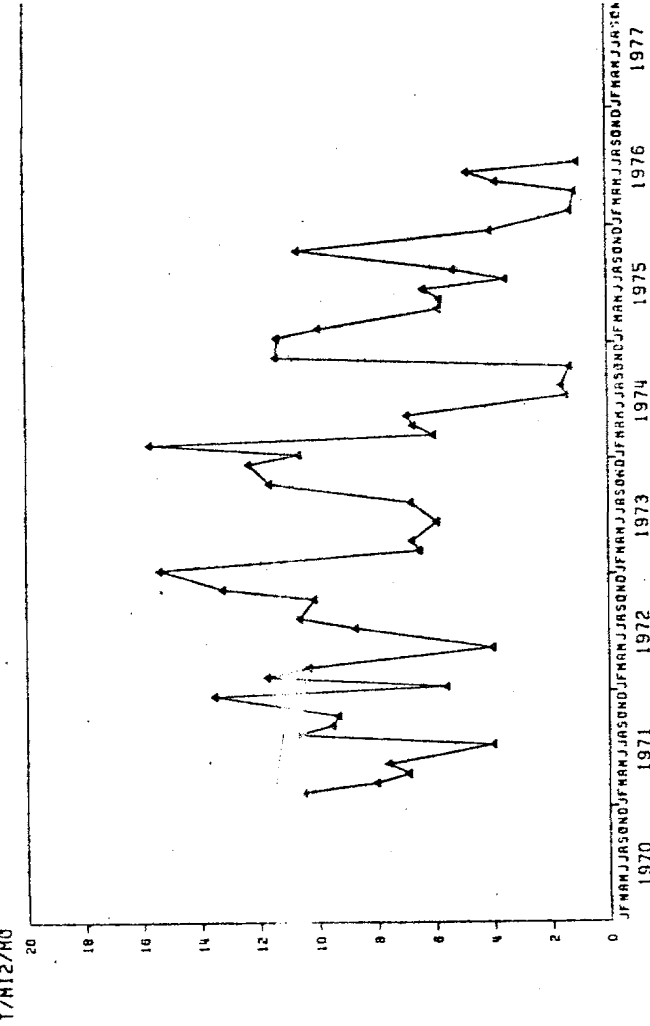
T/M12/MO



TRAIL RIVERVALE T3

MONTHLY MEANS FOR: PART: SOLUBLE

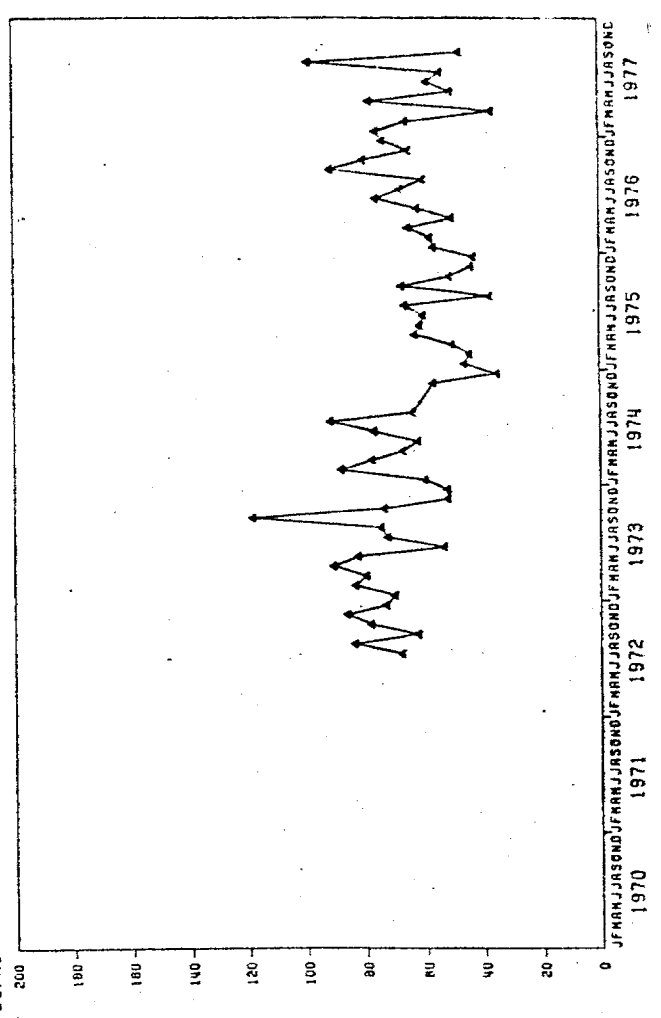
T/M12/MO



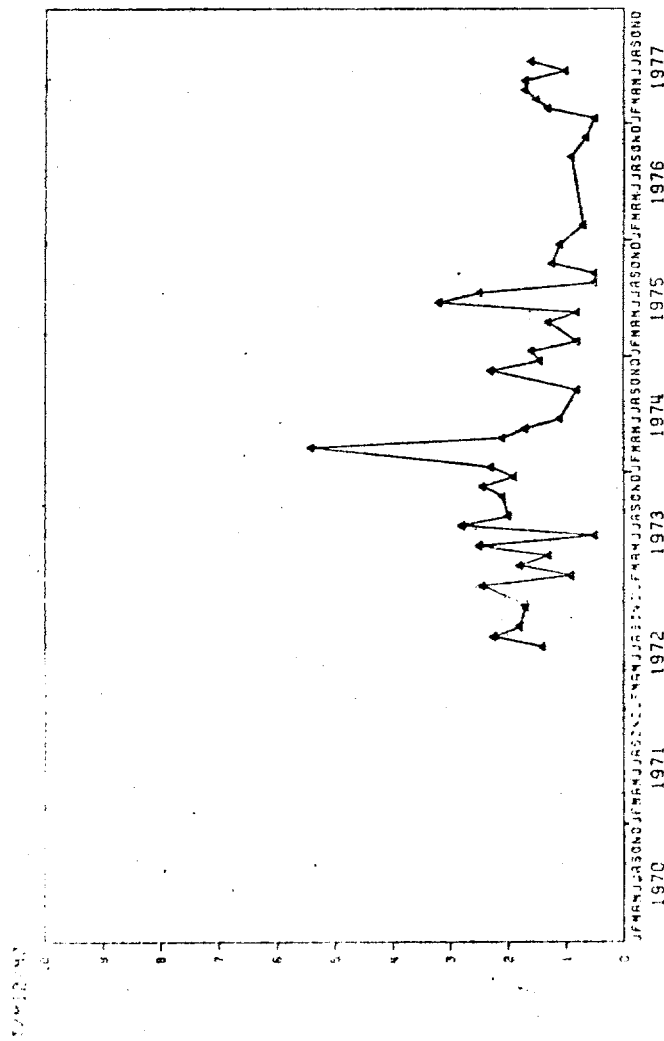
VICTORIA HORSEY

MONTHLY MEANS FOR: PARTICULATE:TOT S.PART.TL

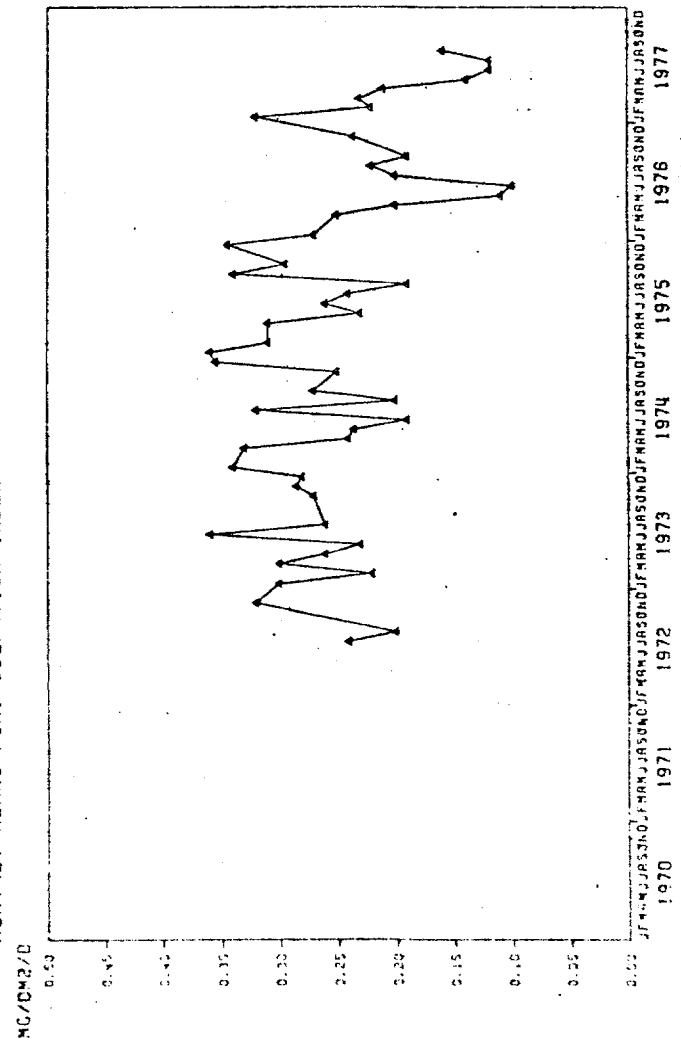
UG/M3



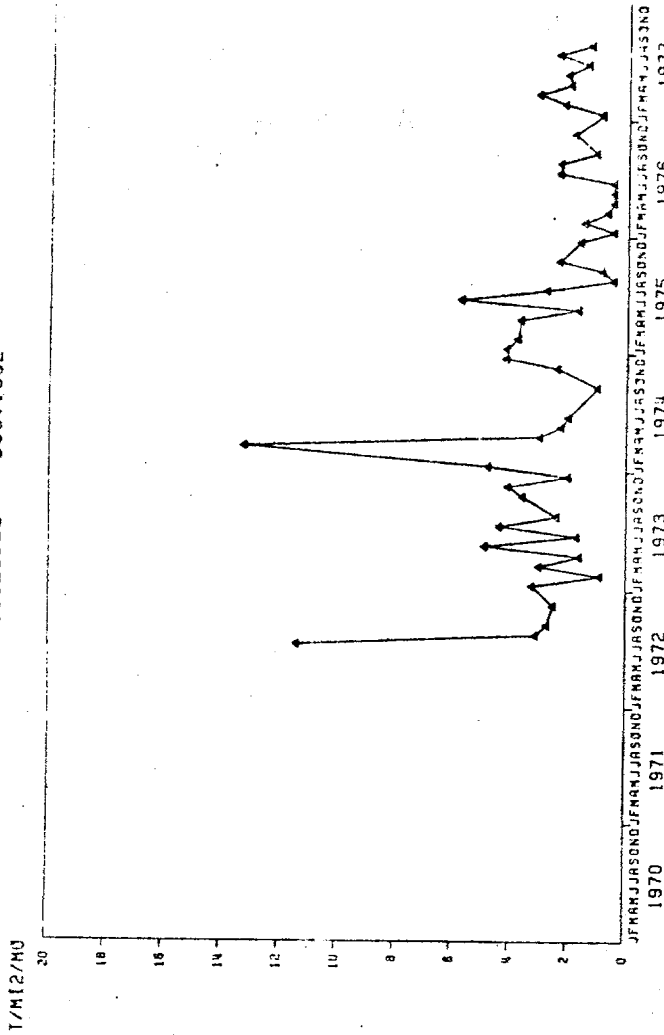
VICTORIA HORSEY
MONTHLY MEANS FOR: PART: SOLUBL. ASH DUST. SOL



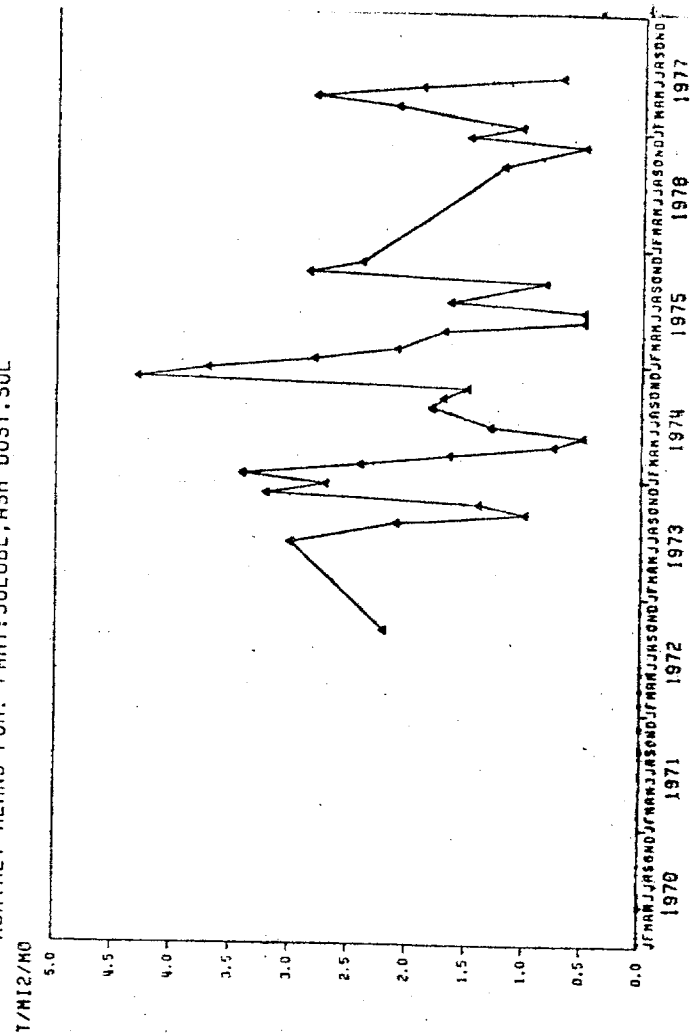
VICTORIA HORSEY
MONTHLY MEANS FOR: SULFATION INDEX



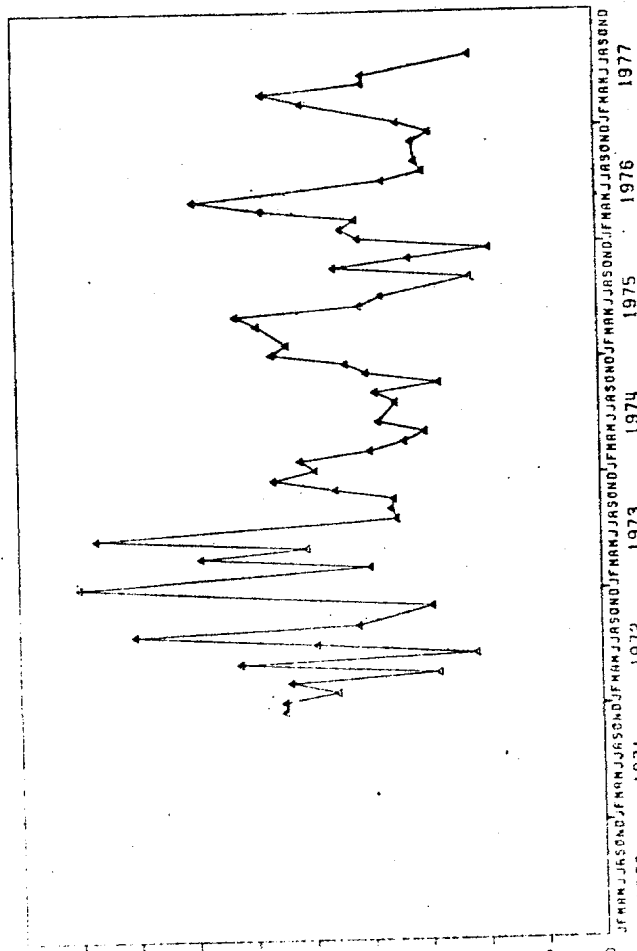
VICTORIA HORSEY
MONTHLY MEANS FOR: PART: SOLUBLE DUST. SOL



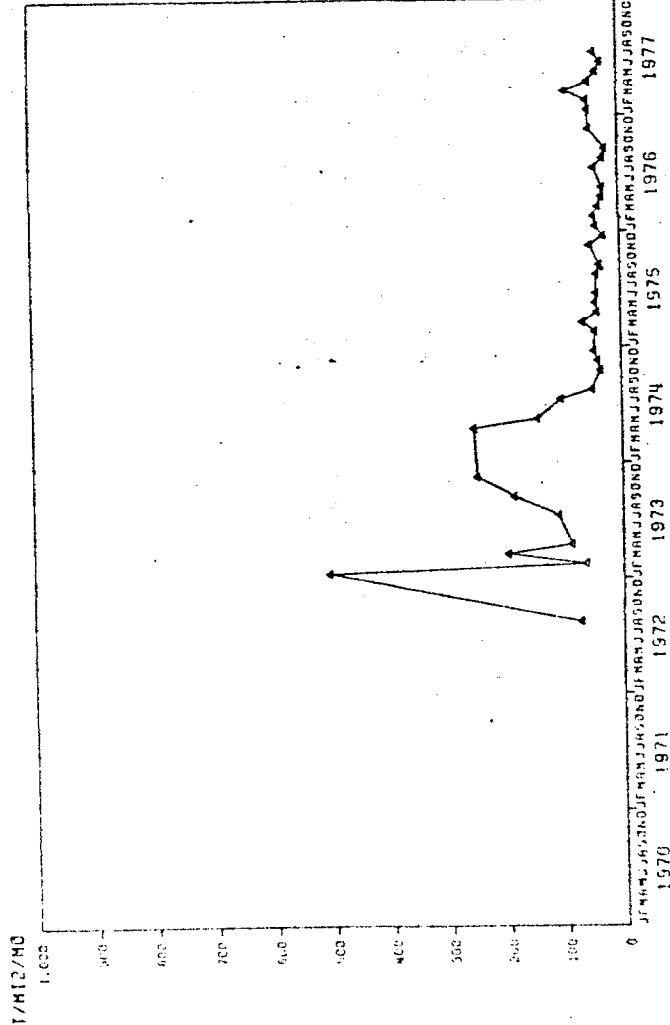
VICTORIA VIC 1
MONTHLY MEANS FOR: PART: SOLUBL. ASH DUST. SOL



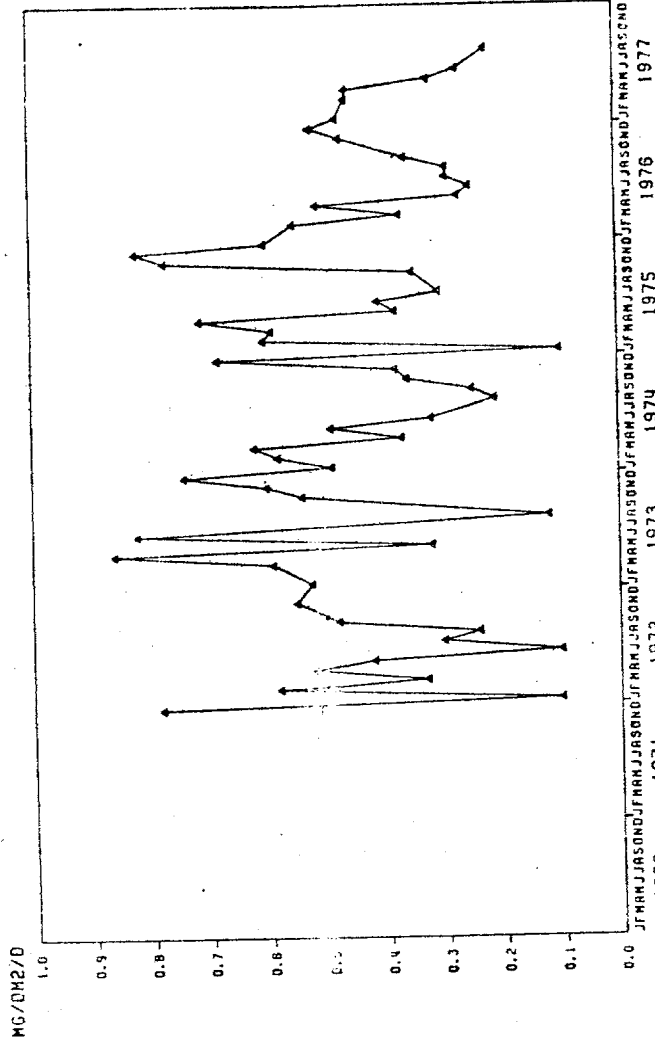
VICTORIA VIC 1
MONTHLY MEANS FOR: PARTICULATE:TOT DUST.TOT



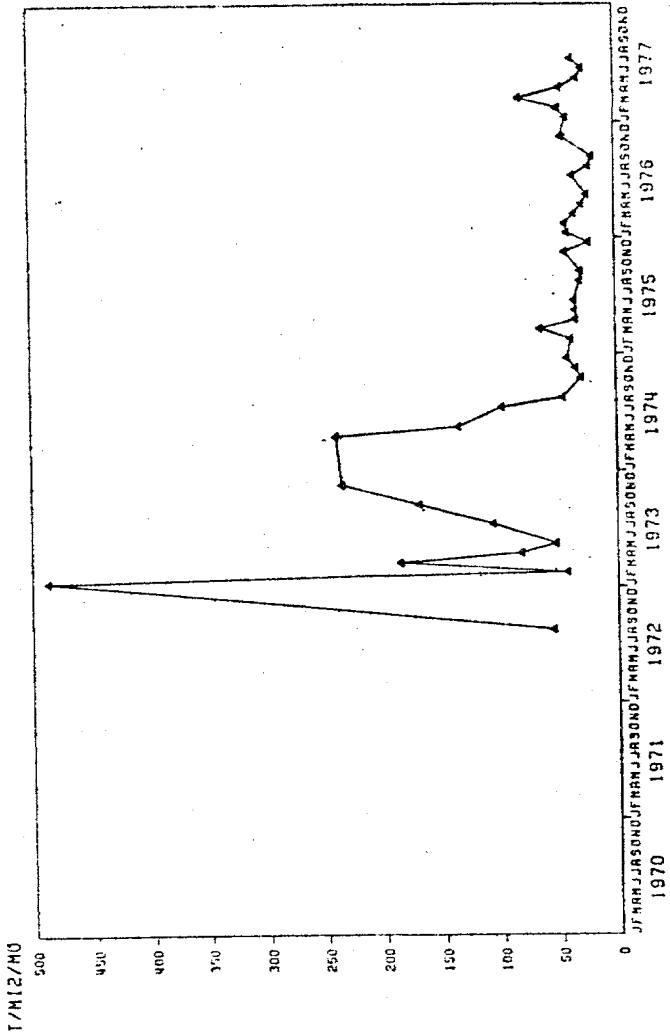
WLMs LK-KINDGTN-HWY 20
MONTHLY MEANS FOR: PARTICULATE:TOT DUST.TOT



VICTORIA VIC 1
MONTHLY MEANS FOR: SULFATION INDEX



WLMs LK-KINDGTN-HWY 20
MONTHLY MEANS FOR: PART: INSOLUBLE DUST. INSL



WLN5 LK--KING IN-HWY 20
MONTHLY MEANS FOR: PART: SOLUBL.ASH DUST.SOL

