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VOLUME 1 OF 1

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MARCH 1998

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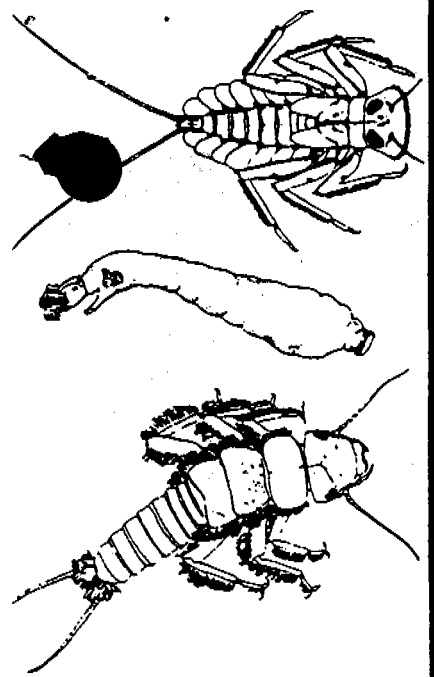
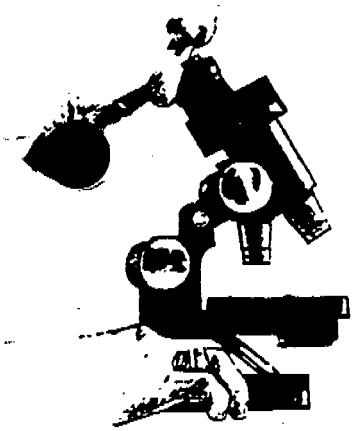


AQUATIC ECOSYSTEM INVENTORY

Macroinvertebrate Analysis



MANTI - LASAL NATIONAL FOREST
EPHRAIM & FERRON RANGER DISTRICTS
1997

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NATIONAL AQUATIC ECOSYSTEM
ANALYSIS LABORATORY

AQUATIC ECOSYSTEM INVENTORY
Macroinvertebrate Analysis

MANTI-LASAL NATIONAL FOREST
EPHRAIM & FERRON RANGER DISTRICTS
1997

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INTRODUCTION

The goal of the Clean Water Act is to preserve and restore the biological integrity of aquatic resources. Monitoring is a tool we use to measure our management successes and failures. Under the Clean Water Act federal agencies have the responsibility for monitoring water quality and associated habitat quality on federally managed lands.

Aquatic macroinvertebrates are an important component of aquatic ecosystems and have long been used to evaluate water and habitat quality. After considering all of the biotic components of an aquatic ecosystem macroinvertebrates are one of the best suited for monitoring and can provide valuable information to assist in making resource decisions. They are relatively easy to collect and identify, are not as mobile as fish, they have sufficiently long life cycles to integrate environmental changes over an annual period, and they provide a vital link in the food chain between primary producers (algae and macrophytes) and fish. They have also been shown to be a cost effective monitoring tool for evaluating the effects of management activities on stream and riparian condition.

This report provides an assessment of the aquatic ecosystems based on the aquatic macroinvertebrate communities. The information provided should be integrated with other data collected in the watershed to gain a more complete understanding of conditions, possible impacts, and trends.

The data for this evaluation are from 42 aquatic macroinvertebrate samples from 7 stations on 7 streams along with water chemistry and physical habitat data provided by your aquatic specialist(s).

SAMPLING METHODS

Samples were taken stratified randomly from the riffle habitat with a Winget-Modified Surber Net, which provides one square foot samples. The 280 micron mesh net collects even the smallest insect instars. These are quantitative, reproducible samples, and the data obtained can be used in ecosystem management to document conditions and trends in relation to management activities in drainages. They provide a basis for spatial and temporal monitoring.

LABORATORY PROCESSING

The aquatic macroinvertebrates were identified in the USFS National Aquatic Ecosystem Analysis Laboratory, BYU-Provo, UT.

1--Subsampler

Samples were subsampled by placing them in a 1000 ml beaker which is positioned over an automated subsampler containing eight pans with fine-meshed screens on the bottom. The pans are rotated on a phonograph-like table and the sample is flushed from the beaker with water delivered through a tube to the bottom of the beaker. The subsampler has been shown to divide the sample into eight equal parts with high efficiency. Large taxa (such as stoneflies) are added to the subsample to be processed. The contents of one to eight pans are processed and standardly 250-300 organisms are picked from the sample.

2--DAT Diversity Index

Data for the DAT Diversity Index--can be obtained while picking the macros from the petri dishes. An accurate DAT is dependent upon taxonomic training of technicians. Technicians should be trained to identify the taxa as they pick them from the sample. Many of the taxa should be identified to the genus or species level. A Veeder Root counter can be used to count taxa picked and to record the diversity.

3--Taxonomy

The macroinvertebrates are classified to species when keys to nymphs/larvae are available (mostly mayflies) to genus for most other orders of insects.

Chironomids are not classified past tribe, some other diptera are taken to family, and miscellaneous invertebrate taxa are sometimes taken to class, order or even phylum. There are so many good indicators of conditions in the EPT orders and dipterans that there has been a great deal of positive feedback about the accuracy of evaluations of ecosystems and thus we feel quite comfortable with these levels of taxonomic identification.

4--Microscopes

Samples are picked with the aid of a dissection-type microscope, and a zoom-magnification feature is desirable. The taxa are separated into small, 35 X 10 mm petri dishes with micro-fine pointed forceps.

A Nikon 0.8 to 4 X lens and 10X eyepiece provides ample magnification for basic Taxonomy. A Leica Stereozoom 0.7 to 3X lens and 10X or 20X eyepiece provides excellent optics for most structures used for identification.

A compound microscope to 90X is helpful for finer detail needed for some invertebrate identifications.

5--Dry Weight Biomass

Following identification and enumerations samples are oven dried in small aluminum 5/8ths inch deep X 2.25 inch pans at 75 degrees Celsius for 8 hours to get dry-weight biomass, which is reported as a mean in grams/m^2/station/date. These data are valuable to help assess fishery potential and benthic community productivity and health.

6--Quality Control

For quality control in the Provo-BYU lab, every sample is checked and the data recorded by our full-time Quality Control Taxonomist who has worked in the lab for over fifteen years. Occasionally final resolution is reached through our joint effort. Our lab was 'certified' by EPA in the early 1980's. Loys Parrish visited the lab and consequently sent a letter of approval.

DATA ANALYSIS

The evaluation of ecosystem integrity and health is based upon aquatic macroinvertebrate data and information along with physical habitat and water quality information provided by your aquatic specialist.

Although the BCI has been the most reliable index used over the years, other indices are being tested and may provide some insight about community structure and health. Numerical values for some of these indices, a discussion of their proposed use and observed weaknesses is included in this report.

Tolerances of individual taxa is indicated by alphabetic and other symbols for each taxon on computer printouts.

INDICES Biotic Condition Index (BCI)

This index has been developed by the USDA Forest Service over the past 18 years, providing a versatile monitoring tool for evaluating conditions in aquatic ecosystems and associated drainages.

This index -

1. measures a stream against its own potential, not that of another stream.

2. is sensitive to most forms of environmental stress.
3. is applicable to various types and sizes of streams.
4. provides a basis for assessment of unstressed to stressed conditions.
5. is independent of sample size, if sample contains a representative assemblage of the species in the community.
6. is based upon data easily acquired.
7. (meshes with and supports stream habitat and water quality data). Integrates biological, physical habitat and water chemistry data.
8. is easily understood, like a score on a test.
9. is particularly useful for monitoring trends.
10. is based mainly upon tolerances (TQ's) of benthic invertebrate taxa (in the sampled community), (84)(88).

Tolerance quotient values used for the BCI have been refined/validated through research on the environment profiles of selected mayfly species (89)(90)(91) using the vast Forest Service database.

Weaknesses:

If a species is present in low numbers, it is treated as if it were present in resident population numbers. The use of CTQd compensates for this in some cases, but it may require further interpretation.

Taxa (species) richness

This index is based upon the fact that a community with good taxonomic diversity generally indicates better conditions than one with low taxonomic diversity (50). This can be a useful metric under certain good conditions.

A good number of families, genera, or species depends upon:

- the level of taxonomic classification,
- elevation,
- topography and parent soil types which affect the water chemistry in the drainage.

Weaknesses:

1. A community may have excellent diversity in an ecosystem with a long history of environmental impacts, and all of the taxa will be those with high tolerance levels.
   - EPT (mayfly, stonefly and caddisfly) species may be present, but would be tolerant species.
2. Organic enrichment can increase biodiversity.
3. This index depends upon sample size (Yapp, 1979).

EPT/Chironomidae

Theoretically, this index compares groups of aquatic insects that have the most clean water (sensitive) species with Chironomidae, a family with a majority of the species tolerant to many forms of pollution (82).

Weaknesses:

1. All or most of the EPT species could be tolerant to the perturbations being evaluated. Thus, one would be comparing tolerant to tolerant species which would not provide the intended contrast. A low

value will often provide a false impression about the environmental quality of an ecosystem.
2. The Chironomid species present could be moderately tolerant to sensitive species.

EPT Index

This index is based upon the fact that most of the cleanwater species are found in the Orders Ephemeroptera, Plecoptera, and Trichoptera. In some cases this will be a valid index.

Percent of the community needed to be in these groups to indicate fair or good or excellent conditions depends upon level of classification.

Weaknesses:

1. Some or all of the EPT species might be tolerant to moderate or severe perturbations.

Percent of Shredder Functional Feeding Group and Total Number of Individuals

Shredders are good indicators of riparian Zone Impacts and may show effects of toxicants adsorbed to the leaves that can affect the microbiological communities that colonize the Coarse Particle Organic Matter (CPOM), (leaves), or can affect shredders directly (82).

Weaknesses:

1. Some shredders are facultative - can utilize in-stream periphyton rather than leaves. Indicators of riparian health must be carefully chosen.
2. Depending upon species present this may or may not be a valid index.

Modified Hilsenhoff Biotic Index (HBI)

Used for EPA RBP-III, this organic enrichment index is based broadly upon family taxonomy. The scale 1-10 is used to estimate the chances that a taxon from a given family would be tolerant to organic enrichment.

This index would work best where an ecosystem has severe organic enrichment impacts. A stream with low organic nutrients would have a low score. Ecosystems with extreme organic enrichment impacts would have a high score (up to 10).

Taxa are assigned TV's (Tolerance Values). The mean value for the community indicates the pollution level. Water with values 0-2 are considered clean, 2-4 slightly enriched, 4-7 enriched and 7-10 polluted (43,44,45).

Weaknesses:

1. Each family of aquatic macroinvertebrates has species which do not compete well where there is organic enrichment. Alignment with tolerances of species in the community could be "right on," completely wrong, or somewhere in between.
2. This index is not designed to detect non-organic effects.

DIVERSITY INDICES

(Variations of Shannon Weaver, 1949)
Shannon's 1949

These indices are based upon the information theory, the more species there are in the community, the more "information." It is a measure of the average degree of "uncertainty" in predicting to what species an individual chosen at random will belong. This increases as the number of species increases and distribution of individuals among species becomes even (83).

Scale:	0 - 1	Poor diversity
	1 - 2	Fair diversity
	2 - 3	Good diversity
	>3	Very good diversity

Weaknesses:

1. If a severely stressed community had a low number of species and each species had close to the same number of organisms, this index would indicate perfect conditions.
2. Diversity, richness and evenness indices often provide a false high. Elimination of a few clean-water species could 'even' the community and show better conditions instead of warning of increased impacts.
3. A dominance among sensitive species could show stress conditions.

Simpson's Index 1949

Values from 0 to 1. Gives probability of two individuals drawn at random from population belonging to the same species. If the probability is high, then the community diversity is low. The higher the number, the higher the diversity (46).

Shannon - Weaver D.I.

Dbar - Dominance Index - values range from 0 - 4.

0 - 1	Poor
1 - 2	Fair
2 - 3	Good
3 - 4	Excellent

RICHNESS INDICES

Menhinick Index (1967) - Margalefs Index (1958)

M.I. = Index of species richness = $\frac{s}{\sqrt{n}}$

(s = number of species in community)
(n = number of organisms)

$s=k\sqrt{n}$ This index presupposes that a functional relationship exists between s and n, or where k is the constant. This must hold true or M.I. will vary with samples containing different values of n. Therefore, communities cannot be compared (83).

s = 30, n = 100, M.I. = 3
s = 15, n = 25, M.I. = 3
s = 10, n = 25, M.I. = 2

Weaknesses:

1. These richness indices vary with sample size.
2. Communities cannot be compared.
3. Must use samples of equal size to work.
4. It is possible to use a rarefaction curve for each habitat sampled to correct for different sample sizes. This is based upon a model dealing with the probabilities that each species will be included in the sample.

Evenness Index

Evenness is a measure of the distribution (numbers of organisms) for taxa in the community. When all species in a community are equally abundant, the index is maximum. It decreases toward zero as abundances of species diverge away from evenness (87).

Percent Contribution of Dominant Taxon

A community dominated by a relatively few species would indicate environmental stress (82). This metric is based upon taxonomic identifications to genus or species level. Values range from 1 to 100%. Lower values indicate a more balanced community and better water quality

Community Similarity Indices

These are used when reference communities exist.

1. Community Loss Index - measures the loss of species between reference and experimental stations. Values = 0 to infinity (83).

$$\text{I (community loss)} = \frac{a-c}{b}$$

(a = # taxa at unimpacted site)
(b = # taxa at study site)
(c = # taxa common to a and b)

2. Jaccard Coefficient of Community - indicates similarity in taxonomic composition. Coefficient increases from 0 to 1.0 as similarity increases between communities (83). This index will show stronger relationships between species with similar tolerances.

3. Index of Similarity Between Two Samples - to detect shifts in community assemblages sites above and below pollution impact (83).

a = # species in Sample 1
b = # species in Sample 2
c = # species common to both samples

$$s = \frac{2c}{a+b}$$

Ratio of Scraper and Filtering Collector Functional Feeding Groups

Theory: Imbalances in community would indicate stress conditions in the ecosystem (83). This is often true but requires interpretation.

A description of the functional feeding group concept is recorded in Cummins (1973). Genus-level functional feeding groups can be found in Merrit & Cummins (1984).

Feeding groups may be specialists for a specific food resource or facultative and thus able to use a broader range of food resources.

The trophic generalists are expected to be better able to tolerate disturbance to aquatic habitats and may become numerically dominant because they are more flexible in foods utilized.

- The numbers of scrapers is highest where there is an abundance of diatoms, lower where filamentous algae or mosses are the dominant vegetation.
- Organic enrichment increases the numbers of filtering collectors by increasing the phytoplankton and zooplankton they feed upon.
- Sedimentation could add another dimension to this formula by covering rocks and diatoms used by scrapers.
- In general 50 to 75% scrapers is considered favorable.

Weaknesses:

1. Toxicants in the water chemistry could be absorbed by any of the forms of phytoplankton or periphyton and could affect this ratio.
2. Numbers of filtering collectors may vary seasonally.
3. Some scrapers are more tolerant than others, but in general represent more sensitive species.

CHICKEN CREEK

Station 1 - July 1, 1997

There were indications of sedimentation at this station. Sediment tolerant indicator taxa present included *Hydropsyche, Optioservus, Tipula, Orthocladiinae, Euparyphus,* and Tubificidae. Cleanwater taxa included just one caddisfly, *Arctopsyche grandis*, that had less than resident population numbers. This indicated limiting conditions in this ecosystem.

The observed low number of shredders in the community is generally found where the riparian habitat is in poor condition or where instream habitat conditions are not suitable for these species. With a stream gradient of 2.0, this stream reach should have good instream substrate maintenance capability. The DAT at this station was 10.2, which indicates fairly good biodiversity.

Compared to summer data from 1984-1990 at Station 1, conditions in July 1997 were better than in 1984, about the same as in 1986 and 1990. BCI values have indicated severe stress conditions (59) in 1984, poor conditions (62-63) in 1986, 1990 and in 1997. The DAT Diversity Index were higher than found in 1984 and 1986 and compared favorably with 1990; see Analysis Data Table.

The potential for a fishery at this station appeared to be fair. The macroinvertebrate biomass of 2.7 g/m^2, could provide nutrients for a good fishery. However, the scarcity of cleanwater species indicated there was probably limited spawning substrate in this stream reach.

The BCI of 63 indicated that poor conditions were present in this stream reach. It appeared that there may be opportunities for management to improve riparian habitat quality, instream habitat quality, and possibly water quality in this aquatic ecosystem.

Station 1 - October 3, 1997

The low diversity and less than resident populations for most of the taxa is often found where there are unstable conditions in an ecosystem. There were indications of sediment at this station. Sediment tolerant indicator taxa present included *Hydropsyche, Optioservus, Cordulegaster, Orthocladiinae,* and Tubificidae. Cleanwater taxa were missing from the community.

The observed lack of shredders in the community is generally found where the riparian habitat is in poor condition or where instream habitat conditions are not suitable for these species. The DAT at this station was 5.7, which indicates fair biodiversity. The number of taxa was almost half the number found in July samples.

Compared to fall data from 1986 and 1990 at Station 1, conditions in October 1997 were not as good. BCI values indicated fair conditions (71-73) in 1986 and 1990, poor conditions (60) in 1997. The biomass and number of taxa were the lowest recorded for this station in 1997. The number of organisms was much lower in 1997. The DAT value was lower than in 1990, about the same as in 1986; see Analysis Data Table.

The potential for a fishery at this station appeared to be poor. The macroinvertebrate biomass of 0.4 g/m^2, would limit the number and size of fish that could be supported in this community and, the lack of cleanwater species indicated a lack of suitable spawning substrate in this stream reach.

The BCI of 60 indicated that poor conditions were present in this stream reach. It appeared that there may be opportunities for management to improve stability, riparian habitat quality, instream habitat quality and possibly water quality in this aquatic ecosystem.

MACROINVERTEBRATE ANALYSIS

Investigator: JILL DUFOUR
Forest/District: MANTI-LASAL NATIONAL FOREST/EPHRAIM R.D.
Stream: CHICKEN CREEK
State/County: UT/JUAB CO.

Station	Location	Date	Diversity Index DAT (mean)	Standing Crop g/m^2 (mean)	Number of Organisms $/m^2$	Number of Taxa	Biotic Condition Index BCI 53
1		07 01 97	10.2	2.7	2,260	21	63
1		10 03 97	5.7	0.4	614	12	60
1		06 19 90	11.7	9.6	29,325	23	63
1		09 19 90	10.2	3.4	41,132	23	71
1		07 06 84	0.9	0.4	6,076	12	59
1		07 24 86	4.1	2.2	24,016	12	62
1		10 06 86	4.7	0.8	24,045	16	73

Scale	DAT	Standing Crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	80 - 90
Fair	6 - 10	0.6 - 1.5	72 - 79
Poor	0 - 5	0.0 - 0.5	below 72

TOTAL SAMPLE STATISTICS

STATION: 1 Chicken Creek, bel. C.G., Juab Co., Manti-Lasal NF, Ephraim R.D. DATE: 7 1 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	21	2260	1497	3024	701.36	17.91	31.03	2.6768	82	84

EPT Index is 37.94%.
EPT/Chironmidae is 0.92.
The Margalef Index of richness is 2.590.
The Menhinick Index of richness is 0.442.
Simpson's Diversity Index is 0.236.
Hill's Evenness Index is 0.663.
Shannon's Index is 1.855.
The Modified Hilsenhoff Tolerance Index is 3.778.
Percent contribution of dominant taxa is 88.73%.
Ratio of Scrapers to Collector-Gatherers is 0.630648.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.003175.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.807937.
Ratio of Filterer functional feeding group to total number of organisms is 0.011111.
Ratio of Scraper functional feeding group to total number of organisms is 0.509524.
Ratio of Predator functional feeding group to total number of organisms is 0.033333.
Ratio of Piercer functional feeding group to total number of organisms is 0.158730.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
Ʊ = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Chicken Creek, bel. C.G., Juab Co., Manti-Lasal NF, Ephraim R.D. DATE: 7 1 97

TAXONOMIC LIST

CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	CINYGMULA		⊥	14	1.157	30	34
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	HEPTAGENIA		⊥ O	11	1.032	54	55
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	EPHEMERELLA	INERMIS	S	29	1.458	92	134
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	79	1.897	72	136
INSECTA	PLECOPTERA	PERLODIDAE	ISOPERLA		⊥ S	57	1.759	48	84
INSECTA	TRICHOPTERA					18	1.254	72	90
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	HYDROPSYCHE		S	7	0.856	108	92
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	ARCTOPSYCHE	GRANDIS		7	0.856	18	15
INSECTA	TRICHOPTERA	PSYCHOMYIDAE	TINODES		S	287	2.458	96	235
INSECTA	TRICHOPTERA	HYDROPTILIDAE	HYDROPTILA		S	348	2.542	108	274
INSECTA	COLEOPTERA	ELMIDAE	OPTIOSERVUS		S	366	2.563	104	266
INSECTA	DIPTERA	TIPULIDAE	ANTOCHA	MONTICOLA	⊥ S	36	1.555	40	62
INSECTA	DIPTERA	TIPULIDAE	TIPULA		□SO	7	0.856	80	68
INSECTA	DIPTERA	SIMULIIDAE			O	11	1.032	108	111
INSECTA	DIPTERA	CHIRONOMIDAE	TANYPODINAE		⊥	7	0.856	72	61
INSECTA	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		SO	926	2.966	108	320
INSECTA	DIPTERA	STRATIOMYIDAE	EUPARYPHUS		S C	11	1.032	108	111
OLIGOCHAETA	TUBIFICIDAE				SO	11	1.032	108	111
OLIGOCHAETA	LUMBRICIDAE				SO	14	1.157	90	104
ARACHNIDA	HYDRACARINA				SO	11	1.032	98	101
NEMATODA					S	4	0.555	108	59

MEAN BIOMASS GM/SQM: 2.7 TOTALS: 2260 3.354

TOTAL SAMPLE STATISTICS

STATION: 1 Chicken Creek, bel. C.G., Juab Co., Manti-Lasal NF, Ephraim R.D. DATE: 10 3 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	12	614	60	1167	508.44	47.84	82.87	2.1065	82	88

EPT Index is 28.65%.
EPT/Chironmidae is 2.88.
The Margalef Index of richness is 1.714.
The Menhinick Index of richness is 0.484.
Simpson's Diversity Index is 0.352.
Hill's Evenness Index is 0.659.
Shannon's Index is 1.460.
The Modified Hilsenhoff Tolerance Index is 4.286.
Percent contribution of dominant taxa is 93.57%.
Ratio of Scrapers to Collector-Gatherers is 0.771084.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.011696.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.970760.
Ratio of Filterer functional feeding group to total number of organisms is 0.070175.
Ratio of Scraper functional feeding group to total number of organisms is 0.748538.
Ratio of Predator functional feeding group to total number of organisms is 0.011696.
Ratio of Piercer functional feeding group to total number of organisms is 0.000000.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
Ʊ = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Chicken Creek, bel. C.G., Juab Co., Manti-Lasal NF, Ephraim R.D. DATE: 10 3 97

TAXONOMIC LIST

CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE			⊥	4	0.555	48	26
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	7	0.856	72	61
INSECTA	PLECOPTERA				⊥□	7	0.856	48	41
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	HYDROPSYCHE		S	43	1.634	108	176
INSECTA	TRICHOPTERA	PSYCHOMYIDAE	TINODES		S	115	2.060	96	197
INSECTA	COLEOPTERA	ELMIDAE	OPTIOSERVUS		S	337	2.528	104	262
INSECTA	ODONATA	CORDULEGASTRIDAE	CORDULEGASTER		S	4	0.555	72	39
INSECTA	DIPTERA	TIPULIDAE	ANTOCHA	MONTICOLA	⊥ S	18	1.254	40	50
INSECTA	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		SO	61	1.785	108	192
INSECTA	DIPTERA	EMPIDIDAE	CHELIFERA		S	4	0.555	95	52
OLIGOCHAETA	TUBIFICIDAE				SO	7	0.856	108	92
OLIGOCHAETA	LUMBRICIDAE				SO	7	0.856	90	77

MEAN BIOMASS GM/SQM: 0.4 TOTALS: 614 2.788

GENTRY HOLLOW

Station 1 - June 12, 1997

There were some indications of sedimentation in this stream reach. Cleanwater taxa indicated fairly good water quality and some good instream substrate and included *Epeorus, Zapada cinctipes,* and *Arctopsyche grandis.*

The observed number of shredders in the community is generally found where the riparian habitat is in fair to poor condition. With a stream gradient of 2.0, this stream reach should have good instream substrate maintenance capability. The DAT at this station was 7.0, which indicates fair biodiversity.

Compared to spring data from 1994 at Station 1, conditions appeared less stable in 1997. The community composition was fairly good but almost all of the analysis element values were lower in 1997; see Analysis Data Table.

The potential for a fishery at this station appeared to be poor. The macroinvertebrate biomass of 0.7 g/m^2 would limit the number and size of fish that could be supported in this community. The clean water taxa present indicated that there could be some suitable spawning substrate.

The BCI of 79 indicated that fair conditions were present in this stream reach. It appeared that there may be opportunities for management to improve stability, riparian habitat quality, and instream habitat quality in this aquatic ecosystem.

Station 1 - September 25, 1997

There was low diversity and none of the taxa had resident population numbers, which generally indicates instability. There were some indications of sedimentation in this stream reach. Cleanwater taxa included just one stonefly, *Zapada cinctipes* which had less than resident population numbers. This indicates limiting conditions in the ecosystem.

The observed number of shredders in the community is generally found where the riparian habitat is in fair to poor condition or where instream habitat conditions are not suitable for these species. The DAT at this station was 4.1, which indicates poor biodiversity.

Compared to fall data from 1994 at Station 1, conditions in September 1997 were more limiting. The BCI of 82 in 1997 indicated a relatively good community composition but the community was limited. Most of the analysis elements were lower in 1997 than found in 1994; see Analysis Data Table.

The potential for a fishery at this station appeared to be poor. The macroinvertebrate biomass of 0.1 g/m^2 would severely limit the number and size of fish that could be supported in this community, and the scarcity of cleanwater species indicated limiting conditions in this stream reach.

The BCI of 82 indicated that this stream reach was in fairly good condition but could be better. It appeared that there may be opportunities for management to improve stability and instream habitat quality in this aquatic ecosystem.

MACROINVERTEBRATE ANALYSIS

Investigator: JILL DUFOUR
Forest/District: MANTI-LASAL NATIONAL FOREST/FERRON R.D.
Stream: GENTRY HOLLOW CREEK
State/County: UT/SANPETE CO.

Station	Location	Date	Diversity Index DAT (mean)	Standing Crop g/m^2 (mean)	Number of Organisms $/m^2$	Number of Taxa	Biotic Condition Index BCI 50
1		6 12 97	7.0	0.7	337	19	79
1		9 25 97	4.1	0.1	269	12	82
1		6 27 94	17.6	7.9	7,944	33	77
1		9 23 94	21.2	2.3	10,188	40	75

Scale	DAT	Standing Crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	80 - 90
Fair	6 - 10	0.6 - 1.5	72 - 79
Poor	0 - 5	0.0 - 0.5	below 72

TOTAL SAMPLE STATISTICS

STATION: 1 Gentry Hollow, ▪ abv. Wild C.H., & culinary diversion, Sampete Co., Manti-Lasal NF, Price-Ferron R.D.
DATE: 6 12 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	19	337	219	455	108.51	18.58	32.17	3.0780	67	63

EPT Index is 76.60%.
EPT/Chironmidae is 10.29.
The Margalef Index of richness is 3.092.
The Menhinick Index of richness is 1.035.
Simpson's Diversity Index is 0.225.
Hill's Evenness Index is 0.526.
Shannon's Index is 2.134.
The Modified Hilsenhoff Tolerance Index is 3.250.
Percent contribution of dominant taxa is 73.40%.
Ratio of Scrapers to Collector-Gatherers is 0.702381.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.085106.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.893617.
Ratio of Filterer functional feeding group to total number of organisms is 0.042553.
Ratio of Scraper functional feeding group to total number of organisms is 0.627659.
Ratio of Predator functional feeding group to total number of organisms is 0.117021.
Ratio of Piercer functional feeding group to total number of organisms is 0.000000.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
U = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Gentry Hollow, - abv. Wild C.H., & culinary diversion, Sampete Co., Manti-Lasal NF, Price-Ferron R.D. DATE: 6 12 97

TAXONOMIC LIST

CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	EPEORUS		-	18	1.254	18	22
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	CINYGMULA		⊥	32	1.509	30	45
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	151	2.178	72	156
INSECTA	PLECOPTERA	NEMOURIDAE	ZAPADA	CINCTIPES	- □	11	1.032	16	16
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	ARCTOPSYCHE	GRANDIS	-	11	1.032	18	18
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	HYALINATA	⊥	4	0.555	24	13
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	ACROPEDES	⊥ C	22	1.333	72	95
INSECTA	TRICHOPTERA	LEPIDOSTOMATIDAE	LEPIDOSTOMA		⊥□	11	1.032	24	24
INSECTA	DIPTERA	TIPULIDAE	ORMOSIA		S	4	0.555	72	39
INSECTA	DIPTERA	TIPULIDAE	HEXATOMA		⊥ S	4	0.555	36	19
INSECTA	DIPTERA	TIPULIDAE	TIPULA		□SO	7	0.856	80	68
INSECTA	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		SO	25	1.400	108	151
INSECTA	DIPTERA	EMPIDIDAE	CHELIFERA		S	4	0.555	95	52
INSECTA	DIPTERA	PTYCHOPTERIDAE			S	4	0.555	100	55
GASTROPODA	PLANORBIDAE				O	4	0.555	108	59
PELECYPODA					S	4	0.555	108	59
OLIGOCHAETA	TUBIFICIDAE				SO	7	0.856	108	92
OLIGOCHAETA	LUMBRICIDAE				SO	11	1.032	90	92
NEMATODA					S	7	0.856	108	92

MEAN BIOMASS GM/SQM: 0.7 TOTALS: 337 2.528

TOTAL SAMPLE STATISTICS

STATION: 1 Gentry Hollow, ▪ abv. Wild C.H., & culinary diversion, Sampete Co., Manti-Lasal NF, Price-Ferron R.D. DATE: 9 25 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	12	269	117	421	139.55	29.94	51.86	2.9258	64	61

EPT Index is 64.00%.
EPT/Chironmidae is 2.40.
The Margalef Index of richness is 1.966.
The Menhinick Index of richness is 0.732.
Simpson's Diversity Index is 0.163.
Hill's Evenness Index is 0.809.
Shannon's Index is 2.028.
The Modified Hilsenhoff Tolerance Index is 3.667.
Percent contribution of dominant taxa is 82.67%.
Ratio of Scrapers to Collector-Gatherers is 0.186047.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.466667.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.573333.
Ratio of Filterer functional feeding group to total number of organisms is 0.000000.
Ratio of Scraper functional feeding group to total number of organisms is 0.106667.
Ratio of Predator functional feeding group to total number of organisms is 0.146667.
Ratio of Piercer functional feeding group to total number of organisms is 0.000000.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
Ʊ = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Gentry Hollow, - abv. Wild C.H., & culinary diversion, Sampete Co., Manti-Lasal NF, Price-Ferron R.D. DATE: 9 25 97

TAXONOMIC LIST

CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	LEPTOPHLEBIIDAE	PARALEPTOPHLEBIA		⊥ S	29	1.458	30	43
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	11	1.032	72	74
INSECTA	PLECOPTERA				⊥□	43	1.634	48	78
INSECTA	PLECOPTERA	NEMOURIDAE	ZAPADA	CINCTIPES	- □	4	0.555	16	8
INSECTA	PLECOPTERA	CAPNIIDAE			⊥□	57	1.759	32	56
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	ACROPEDES	⊥ C	22	1.333	72	95
INSECTA	TRICHOPTERA	LEPIDOSTOMATIDAE	LEPIDOSTOMA		⊥□	7	0.856	24	20
INSECTA	DIPTERA	TIPULIDAE	TIPULA		□SO	14	1.157	80	92
INSECTA	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		SO	72	1.856	108	200
INSECTA	DIPTERA	EMPIDIDAE	CHELIFERA		S	4	0.555	95	52
INSECTA	DIPTERA	PSYCHODIDAE	PERICOMA		S C	4	0.555	86	47
INSECTA	DIPTERA	STRATIOMYIDAE	EUPARYPHUS		S C	4	0.555	108	59

MEAN BIOMASS GM/SQM: 0.1 TOTALS: 269 2.430

MANTI CREEK

Station 1 - July 2, 1997

Diversity in this community was fairly good but there appeared to be a nonselective factor that was limiting to each of the taxa in the community. None of the taxa had resident population numbers. There were some indications of organic enrichment and sedimentation in this stream reach. Organisms tolerant to adverse water chemistry were part of the community. These included *Euparyphus, Pericoma,* Ephydidae, and *Rhyacophila acropedes*. Cleanwater taxa indicated at least fair water quality and some good instream substrate and included *Epeorus, Rhithrogena,* and *Arctopsyche grandis*.

The observed number of shredders in the community is generally found where the riparian habitat is in poor condition. With a stream gradient of 1.5, this stream reach should have fairly good instream substrate maintenance capability. The DAT at this station was 7.3, which indicates fair biodiversity.

Compared to summer data from 1984 and 1990 at Station 1, conditions in July 1997 appeared better than found in 1984, and in some ways better than in 1990. BCI values have indicated severe stress conditions (58) in 1984, fair conditions (75) in 1990 and excellent conditions (100) in 1997. However extremely low numbers of organisms per taxa indicated limiting conditions in 1997.

The potential for a fishery at this station appeared to be poor. The macroinvertebrate biomass of 0.2 g/m^2 would limit the number and size of fish that could be supported in this community. The clean water taxa present indicated at least fair conditions, but that conditions were limiting to aquatic biota.

The BCI of 100 indicated a good assemblage of macroinvertebrate species but was based upon species with less than resident populations. The fact that only 0% of the taxa in the community had resident populations indicated possible instability. It appeared that there may be opportunities for management to improve water quality, riparian habitat quality, and instream habitat quality in this aquatic ecosystem.

Station 1 - October 2, 1997

There were warning numbers of sediment tolerant taxa at this station. Sediment tolerant indicator taxa present included *Hydropsyche, Brachycentrus americanus,* and *Orthocladiinae*. Cleanwater taxa included *Drunella doddsi* and *Arctopsyche grandis*, but both had less than resident population numbers which indicated this ecosystem was limiting to aquatic biota.

The observed number of shredders in the community is generally found where the riparian habitat is in poor condition or where instream habitat conditions are not suitable for these species. The DAT at

this station was 9.2, which indicates fair biodiversity.

Compared to fall data from 1990 at Station 1, conditions in October 1997 appeared similar. The BCI values have indicated good conditions (83 and 88) in both years sampled.

The potential for a fishery at this station appeared to be fair to poor. The macroinvertebrate biomass of 0.8 g/m^2 would limit the number and size of fish that could be supported in this community, and low numbers of cleanwater species indicated limiting conditions in this stream reach.

The BCI of 88 indicated that this stream reach was in good condition but could be better, but only two species had resident population numbers which indicated that this ecosystem was limiting to aquatic biota. It appeared that there may be opportunities for management to improve water quality, riparian habitat quality, and instream habitat quality in this aquatic ecosystem.

MANTI CREEK

Station 1 - July 2, 1997

Diversity in this community was fairly good but there appeared to be a nonselective factor that was limiting to each of the taxa in the community. None of the taxa had resident population numbers. There were some indications of organic enrichment and sedimentation in this stream reach. Organisms tolerant to adverse water chemistry were part of the community. These included *Euparyphus, Pericoma,* Ephydidae, and *Rhyacophila acropedes*. Cleanwater taxa indicated at least fair water quality and some good instream substrate and included *Epeorus, Rhithrogena,* and *Arctopsyche grandis*.

The observed number of shredders in the community is generally found where the riparian habitat is in poor condition. With a stream gradient of 1.5, this stream reach should have fairly good instream substrate maintenance capability. The DAT at this station was 7.3, which indicates fair biodiversity.

Compared to summer data from 1984 and 1990 at Station 1, conditions in July 1997 appeared better than found in 1984, and in some ways better than in 1990. BCI values have indicated severe stress conditions (58) in 1984, fair conditions (75) in 1990 and excellent conditions (100) in 1997. However extremely low numbers of organisms per taxa indicated limiting conditions in 1997.

The potential for a fishery at this station appeared to be poor. The macroinvertebrate biomass of 0.2 g/m^2 would limit the number and size of fish that could be supported in this community. The clean water taxa present indicated at least fair conditions, but that conditions were limiting to aquatic biota.

The BCI of 100 indicated a good assemblage of macroinvertebrate species but was based upon species with less than resident populations. The fact that only 0% of the taxa in the community had resident populations indicated possible instability. It appeared that there may be opportunities for management to improve water quality, riparian habitat quality, and instream habitat quality in this aquatic ecosystem.

Station 1 - October 2, 1997

There were warning numbers of sediment tolerant taxa at this station. Sediment tolerant indicator taxa present included *Hydropsyche, Brachycentrus americanus,* and *Orthocladiinae*. Cleanwater taxa included *Drunella doddsi* and *Arctopsyche grandis*, but both had less than resident population numbers which indicated this ecosystem was limiting to aquatic biota.

The observed number of shredders in the community is generally found where the riparian habitat is in poor condition or where instream habitat conditions are not suitable for these species. The DAT at

this station was 9.2, which indicates fair biodiversity.

Compared to fall data from 1990 at Station 1, conditions in October 1997 appeared similar. The BCI values have indicated good conditions (83 and 88) in both years sampled.

The potential for a fishery at this station appeared to be fair to poor. The macroinvertebrate biomass of 0.8 g/m^2 would limit the number and size of fish that could be supported in this community, and low numbers of cleanwater species indicated limiting conditions in this stream reach.

The BCI of 88 indicated that this stream reach was in good condition but could be better, but only two species had resident population numbers which indicated that this ecosystem was limiting to aquatic biota. It appeared that there may be opportunities for management to improve water quality, riparian habitat quality, and instream habitat quality in this aquatic ecosystem.

MACROINVERTEBRATE ANALYSIS

Investigator: JILL DUFOUR
Forest/District: MANTI-LASAL NATIONAL FOREST/EPHRAIM R.D.
Stream: MANTI CREEK
State/County: UT/SANPETE CO.

Station	Location	Date	Diversity Index DAT (mean)	Standing Crop g/m^2 (mean)	Number of Organisms $/m^2$	Number of Taxa	Biotic Condition Index BCI 53
1		07 02 97	7.3	0.2	309	14	100
1		10 02 97	9.2	0.8	653	18	88
1		06 20 90	2.0	2.2	13,773	15	75
1		09 20 90	11.8	0.3	958	20	83
1		07 24 84	4.5	0.1	165	10	58

Scale	DAT	Standing Crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	80 - 90
Fair	6 - 10	0.6 - 1.5	72 - 79
Poor	0 - 5	0.0 - 0.5	below 72

TOTAL SAMPLE STATISTICS

STATION: 1 Manti Creek, Sampete Co., Manti-Lasal NF, Ephraim R.D. DATE: 7 2 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	14	309	169	448	128.26	24.00	41.57	2.9086	53	49

EPT Index is 87.21%.
EPT/Chironmidae is 9.38.
The Margalef Index of richness is 2.268.
The Menhinick Index of richness is 0.797.
Simpson's Diversity Index is 0.179.
Hill's Evenness Index is 0.745.
Shannon's Index is 2.016.
The Modified Hilsenhoff Tolerance Index is 3.556.
Percent contribution of dominant taxa is 81.40%.
Ratio of Scrapers to Collector-Gatherers is 0.842105.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.011628.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.883721.
Ratio of Filterer functional feeding group to total number of organisms is 0.011628.
Ratio of Scraper functional feeding group to total number of organisms is 0.744186.
Ratio of Predator functional feeding group to total number of organisms is 0.139535.
Ratio of Piercer functional feeding group to total number of organisms is 0.000000.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
Ʊ = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Manti Creek, Sampete Co., Manti-Lasal NF, Ephraim R.D. DATE: 7 2 97

TAXONOMIC LIST

CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	EPEORUS		-	36	1.555	18	27
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	CINYGMULA		⊥	86	1.935	30	58
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	RHITHROGENA		-	18	1.254	21	26
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	83	1.917	72	137
INSECTA	PLECOPTERA	CHLOROPERLIDAE			⊥	18	1.254	24	30
INSECTA	PLECOPTERA	PTERONARCYIDAE	PTERONARCELLA	BADIA	⊥OS	4	0.555	30	16
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	ARCTOPSYCHE	GRANDIS	-	4	0.555	18	9
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA		⊥	4	0.555	30	16
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	HYALINATA	⊥	14	1.157	24	27
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	ACROPEDES	⊥ C	4	0.555	72	39
INSECTA	DIPTERA	CHIRONOMIDAE			SO	29	1.458	108	157
INSECTA	DIPTERA	PSYCHODIDAE	PERICOMA		S C	4	0.555	86	47
INSECTA	DIPTERA	STRATIOMYIDAE	EUPARYPHUS		S C	4	0.555	108	59
INSECTA	DIPTERA	EPHYDRIDAE			S C	4	0.555	108	59

MEAN BIOMASS GM/SQM: 0.2 TOTALS: 309 2.489

TOTAL SAMPLE STATISTICS

STATION: 1 Manti Creek, Sampete Co., Manti-Lasal NF, Ephraim R.D. DATE: 10 2 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	18	653	232	1074	386.50	34.17	59.19	2.7515	54	60

EPT Index is 62.09%.
EPT/Chironmidae is 2.02.
The Margalef Index of richness is 2.623.
The Menhinick Index of richness is 0.704.
Simpson's Diversity Index is 0.222.
Hill's Evenness Index is 0.668.
Shannon's Index is 1.907.
The Modified Hilsenhoff Tolerance Index is 2.700.
Percent contribution of dominant taxa is 85.16%.
Ratio of Scrapers to Collector-Gatherers is 0.304688.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.104396.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.703297.
Ratio of Filterer functional feeding group to total number of organisms is 0.346154.
Ratio of Scraper functional feeding group to total number of organisms is 0.214286.
Ratio of Predator functional feeding group to total number of organisms is 0.307692.
Ratio of Piercer functional feeding group to total number of organisms is 0.000000.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
Ʊ = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Manti Creek, Sampete Co., Manti-Lasal NF, Ephraim R.D. DATE: 10 2 97

TAXONOMIC LIST CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	CINYGMULA		⊥	4	0.555	30	16
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	EPHEMERELLA	INERMIS	S	4	0.555	92	51
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	DRUNELLA	GRANDIS	⊥ S	61	1.785	32	57
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	DRUNELLA	DODDSI	▪	4	0.555	2	1
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	7	0.856	72	61
INSECTA	PLECOPTERA				⊥□	11	1.032	48	49
INSECTA	PLECOPTERA	PERLODIDAE	ISOGENOIDES		⊥ S	22	1.333	30	39
INSECTA	PLECOPTERA	PERLODIDAE	MEGARCYS		⊥ S	4	0.555	30	16
INSECTA	PLECOPTERA	PTERONARCYIDAE	PTERONARCELLA	BADIA	⊥□S	57	1.759	30	52
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	HYDROPSYCHE		S	215	2.333	108	251
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	ARCTOPSYCHE	GRANDIS	▪	7	0.856	18	15
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	ACROPEDES	⊥ C	4	0.555	72	39
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	VAGRITA	⊥	4	0.555	30	16
INSECTA	TRICHOPTERA	BRACHYCENTRIDAE	BRACHYCENTRUS	AMERICANUS	⊥ S	4	0.555	48	26
INSECTA	DIPTERA	TIPULIDAE	HEXATOMA		⊥ S	22	1.333	36	47
INSECTA	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		SO	201	2.303	108	248
INSECTA	DIPTERA	EMPIDIDAE	HEMERODROMIA		S	11	1.032	95	98
INSECTA	DIPTERA	EMPIDIDAE	CHELIFERA		S	14	1.157	95	109

MEAN BIOMASS GM/SQM: 0.8 TOTALS: 653 2.815

OAK CREEK

Station 1 - July 2, 1997

There were some indications of organic enrichment and sedimentation in this stream reach. Organic enrichment and sediment tolerant tubificid worms dominated the community. Cleanwater taxa included *Epeorus* and *Arctopsyche grandis*. Both had extremely low population numbers which indicated that conditions were limiting to these species.

The observed number of shredders in the community is generally found where the riparian habitat is in poor condition or where instream habitat conditions are not suitable for these species. With a stream gradient of 2.0, this stream reach should have good instream substrate maintenance capability. The DAT at this station was 4.0, which indicates poor biodiversity.

Compared to summer data from 1984, 1986 and 1990 at Station 1, conditions in July 1997 were close to the same as found in 1984 and 1986, better than in 1990. BCI values have indicated fair conditions (77-79) in 1984, 1986 and 1997, poor conditions (67) in 1990. For 1997 the number of taxa, number of organisms, DAT and biomass were the lowest recorded at this station.

The potential for a fishery at this station appeared to be poor. The macroinvertebrate biomass of 0.2 g/m^2 would limit the number and size of fish that could be supported in this community and the scarcity of cleanwater species indicated limiting conditions in this stream reach.

The BCI of 77 indicated that fair conditions were present in this stream reach. It appeared that there may be opportunities for management to improve water quality, riparian habitat quality, and instream habitat quality in this aquatic ecosystem.

Station 1 - October 27, 1997

None of the taxa in this community had resident population numbers, which generally indicates instability. There were indications of sedimentation in this stream reach. Cleanwater taxa included *Zapada cinctipes* and *Arctopsyche grandis*. Both had less than resident population numbers which indicated limiting conditions in this ecosystem.

The observed number of shredders in the community is generally found where the riparian habitat is in poor condition or where instream habitat conditions are not suitable for these species. The DAT at this station was 4.4, which indicates poor biodiversity.

Compared to fall data from 1986 and 1990 at Station 1, conditions in October 1997 were not as good. BCI values have indicated good conditions (87) in 1986, fair conditions (78) in 1990 and (77) in 1997. All of the analysis element values were lower than found in prior years; see Analysis Data Table.

The potential for a fishery at this station appeared to be poor. The macroinvertebrate biomass of 0.1 g/m^2 would limit the number and size of fish that could be supported in this community and the scarcity of cleanwater species indicated limited spawning substrate in this stream reach.

The BCI of 77 indicated that fair conditions were present in this stream reach. The macroinvertebrate community indicated that there may be opportunities for management to improve stability, riparian habitat quality, and instream habitat quality in this aquatic ecosystem.

MACROINVERTEBRATE ANALYSIS

Investigator: JILL DUFOUR
Forest/District: MANTI-LASAL NATIONAL FOREST/EPHRAIM R.D.
Stream: OAK CREEK
State/County: UTAH/SANPETE CO.

Station	Location	Date	Diversity Index DAT (mean)	Standing Crop g/m^2 (mean)	Number of Organisms $/m^2$	Number of Taxa	Biotic Condition Index BCI 50
*1		07 02 97	4.0	0.2	631	15	77
1		10 27 97	4.4	0.1	176	12	77
2(1)		06 20 90	6.9	0.8	4,551	24	67
2(1)		09 20 90	8.4	0.3	6,112	22	78
1		07 24 86	17.2	1.3	1,521	26	79
1		10 15 86	15.1	0.6	2,414	36	87
1		07 24 84	7.8	0.9	3,938	19	79

* ABOVE POWER DIVERSION

Scale	DAT	Standing Crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	80 - 90
Fair	6 - 10	0.6 - 1.5	72 - 79
Poor	0 - 5	0.0 - 0.5	below 72

TOTAL SAMPLE STATISTICS

STATION: 1 Oak Creek, ▪ Spring City, abv. pwr diversion, Sanpete Co., Manti-Lasal NF, Ephraim R.D. DATE: 7 2 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	15	631	0	1577	868.05	79.36	137.46	1.8024	60	65

EPT Index is 22.16%.
EPT/Chironmidae is 13.00.
The Margalef Index of richness is 2.171.
The Menhinick Index of richness is 0.597.
Simpson's Diversity Index is 0.510.
Hill's Evenness Index is 0.562.
Shannon's Index is 1.249.
The Modified Hilsenhoff Tolerance Index is 3.250.
Percent contribution of dominant taxa is 89.77%.
Ratio of Scrapers to Collector-Gatherers is 0.185629.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.005682.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.948864.
Ratio of Filterer functional feeding group to total number of organisms is 0.017045.
Ratio of Scraper functional feeding group to total number of organisms is 0.176136.
Ratio of Predator functional feeding group to total number of organisms is 0.062500.
Ratio of Piercer functional feeding group to total number of organisms is 0.017045.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
U = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Oak Creek, - Spring City, abv. pwr diversion, Sanpete Co., Manti-Lasal NF, Ephraim R.D. DATE: 7 2 97

TAXONOMIC LIST

CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	EPEORUS		-	4	0.555	18	9
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	CINYGMULA		⊥	29	1.458	30	43
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	DRUNELLA	COLORADENSIS	⊥ S	14	1.157	28	32
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	65	1.810	72	130
INSECTA	PLECOPTERA	NEMOURIDAE			⊥O	4	0.555	36	19
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	ARCTOPSYCHE	GRANDIS	-	4	0.555	18	9
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	HYALINATA	⊥	11	1.032	24	24
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	ACROPEDES	⊥ C	11	1.032	72	74
INSECTA	DIPTERA	TIPULIDAE	ANTOCHA	MONTICOLA	⊥ S	14	1.157	40	46
INSECTA	DIPTERA	TIPULIDAE	HEXATOMA		⊥ S	4	0.555	36	19
INSECTA	DIPTERA	SIMULIIDAE			O	7	0.856	108	92
INSECTA	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		SO	11	1.032	108	111
HIRUDINEA	HELOBDELLA				SO	7	0.856	108	92
OLIGOCHAETA	TUBIFICIDAE				SO	445	2.648	108	286
ARACHNIDA	HYDRACARINA				SO	4	0.555	98	54

MEAN BIOMASS GM/SQM: 0.2 TOTALS: 631 2.800

TOTAL SAMPLE STATISTICS

STATION: 1 Oak Creek, ▪ Spring City, abv. pwr diversion, Sanpete Co., Manti-Lasal NF, Ephraim R.D. DATE: 10 27 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	12	176	62	290	104.69	34.38	59.55	2.9497	66	65

EPT Index is 36.73%.
EPT/Chironmidae is 1.29.
The Margalef Index of richness is 2.128.
The Menhinick Index of richness is 0.905.
Simpson's Diversity Index is 0.169.
Hill's Evenness Index is 0.766.
Shannon's Index is 2.045.
The Modified Hilsenhoff Tolerance Index is 4.000.
Percent contribution of dominant taxa is 79.59%.
Ratio of Scrapers to Collector-Gatherers is 0.238095.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.020408.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.857143.
Ratio of Filterer functional feeding group to total number of organisms is 0.102041.
Ratio of Scraper functional feeding group to total number of organisms is 0.204082.
Ratio of Predator functional feeding group to total number of organisms is 0.183673.
Ratio of Piercer functional feeding group to total number of organisms is 0.020408.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
Ʊ = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Oak Creek, - Spring City, abv. pwr diversion, Sanpete Co., Manti-Lasal NF, Ephraim R.D. DATE: 10 27 97

TAXONOMIC LIST

CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	DRUNELLA	GRANDIS	⊥ S	14	1.157	32	37
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	22	1.333	72	95
INSECTA	PLECOPTERA	NEMOURIDAE	ZAPADA	CINCTIPES	- D	4	0.555	16	8
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	HYDROPSYCHE		S	7	0.856	108	92
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	ARCTOPSYCHE	GRANDIS	-	11	1.032	18	18
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	VAGRITA	⊥	7	0.856	30	25
INSECTA	DIPTERA	TIPULIDAE	ANTOCHA	MONTICOLA	⊥ S	43	1.634	40	65
INSECTA	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		SO	50	1.701	108	183
INSECTA	DIPTERA	EMPIDIDAE	HEMERODROMIA		S	7	0.856	95	81
INSECTA	DIPTERA	EMPIDIDAE	CHELIFERA		S	4	0.555	95	52
INSECTA	DIPTERA	PSYCHODIDAE	PERICOMA		S C	4	0.555	86	47
ARACHNIDA	HYDRACARINA				SO	4	0.555	98	54

MEAN BIOMASS GM/SQM: 0.1 TOTALS: 176 2.245

PIGEON CREEK

Station 1 - July 1, 1997

There were indications of some sedimentation at this station. Sediment tolerant indicator taxa present per square meter were *Optioservus* (585), *Tipula* (11), Orthocladiinae (617), *Euparyphus* (57), and Tubificidae (25). A dipteran *Euparyphus* that has been observed to be tolerant to adverse water chemistry had a resident population in this community. Cleanwater taxa included just one mayfly *Rhithrogena* with less than resident population numbers.

The observed low number of shredders in the community is generally found where the riparian habitat is in poor condition or where instream habitat conditions are not suitable for these species. With a stream gradient of 2.0, this stream reach should have good instream substrate maintenance capability. The DAT at this station was 10.2, which indicates fairly good biodiversity.

Compared to summer data from 1984, 1986 and 1990 at Station 1, conditions in July 1997 were better than found in 1984 or 1986, not as good as in 1990. BCI values have indicated good conditions (80) in 1990, poor conditions (63) in 1984 and fair conditions (74) in 1986 and (77) in 1997. Other analysis elements compared favorably with those found in prior years; see Analysis Data Table.

The potential for a fishery at this station appeared to be fair to poor. The macroinvertebrate biomass of 1.2 g/m^2 could provide nutrients for a fairly good fishery but the low numbers of cleanwater species indicated there could be limited spawning substrate in this stream reach.

The BCI of 77 indicated that fair conditions were present in this stream reach. The macroinvertebrate community indicated that there may be opportunities for management to improve water quality, riparian habitat quality, and instream habitat quality in this aquatic ecosystem.

Station 1 - October 3, 1997

There were indications of some sedimentation at this station. Sediment tolerant indicator taxa present per square meter included *Optioservus* (3294), *Tipula* (29), Orthocladiinae (850), *Euparyphus* (574), and Tubificidae (18). A dipteran *Euparyphus* which has been observed to be tolerant to adverse water chemistry had a strong resident population. Cleanwater taxa were missing from the community.

The observed low number of shredders in the community is generally found where the riparian habitat is in poor condition or where instream habitat conditions are not suitable for these species. The DAT at this station was 2.6, which indicates poor biodiversity. This value was particularly low because of the

dominances of three taxa in the community.

Compared to fall data from 1984, 1986 and 1990 at Station 1, conditions in October 1997 were not as good as in prior years. BCI values have indicated good conditions (88) in 1986 and (85) in 1990; fair conditions (71) in 1990 and poor conditions (68) in 1997. The DAT was similarly low in 1984.

The potential for a fishery at this station appeared to be fair to poor. The macroinvertebrate biomass of 1.4 g/m^2 could provide nutrients for a fairly good fishery but the lack of cleanwater species indicated that conditions were limiting to aquatic biota in this stream reach.

The BCI of 68 indicated that poor conditions were present in this stream reach. It appeared that there may be opportunities for management to improve water quality, instream habitat quality and possibly riparian habitat quality in this aquatic ecosystem. The macroinvertebrate community indicated that there may be opportunities for management to improve water quality in this aquatic ecosystem.. The macroinvertebrate community indicated that there may be some opportunities for management to improve the instream substrate in this aquatic ecosystem.

MACROINVERTEBRATE ANALYSIS

Investigator: JILL DUFOUR
Forest/District: MANTI-LASAL NATIONAL FOREST/EPHRAIM R.D.
Stream: PIGEON CREEK
State/County: UT/SANPETE CO.

Station	Location	Date	Diversity Index DAT (mean)	Standing Crop g/m^2 (mean)	Number of Organisms $/m^2$	Number of Taxa	Biotic Condition Index BCI 60
1		07 01 97	10.2	1.2	2,425	21	77
1		10 03 97	2.6	1.4	5,034	14	68
1		06 19 90	14.0	22.0	32,796	26	80
1		09 19 90	11.8	7.4	25,853	23	85
1		09 25 84	2.7	1.1	22,252	7	71
1		07 06 84	1.8	0.7	5,663	6	63
1		07 24 86	7.2	4.1	34,461	20	74
1		10 06 86	7.6	1.3	4,290	21	88

Scale	DAT	Standing Crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	80 - 90
Fair	6 - 10	0.6 - 1.5	72 - 79
Poor	0 - 5	0.0 - 0.5	below 72

TOTAL SAMPLE STATISTICS

STATION: 1 Pigeon Creek, Sampete Co., Manti-Lasal NF, Ephraim R.D. DATE: 7 1 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	21	2425	382	4469	1876.65	44.67	77.37	2.6943	71	78

EPT Index is 45.71%.
EPT/Chironmidae is 1.80.
The Margalef Index of richness is 2.566.
The Menhinick Index of richness is 0.426.
Simpson's Diversity Index is 0.209.
Hill's Evenness Index is 0.738.
Shannon's Index is 1.868.
The Modified Hilsenhoff Tolerance Index is 3.091.
Percent contribution of dominant taxa is 88.91%.
Ratio of Scrapers to Collector-Gatherers is 0.921325.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.004438.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.714497.
Ratio of Filterer functional feeding group to total number of organisms is 0.002959.
Ratio of Scraper functional feeding group to total number of organisms is 0.658284.
Ratio of Predator functional feeding group to total number of organisms is 0.025148.
Ratio of Piercer functional feeding group to total number of organisms is 0.278106.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
Ʊ = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Pigeon Creek, Sampete Co., Manti-Lasal NF, Ephraim R.D. DATE: 7 1 97

TAXONOMIC LIST

CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	CINYGMULA		⊥	39	1.596	30	47
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	RHITHROGENA		▪	47	1.669	21	35
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	EPHEMERELLA	INERMIS	S	7	0.856	92	78
INSECTA	EPHEMEROPTERA	LEPTOPHLEBIIDAE	PARALEPTOPHLEBIA		⊥ S	83	1.917	30	57
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	197	2.295	72	165
INSECTA	PLECOPTERA	CHLOROPERLIDAE			⊥	4	0.555	24	13
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA		⊥	4	0.555	30	16
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	COLORADENSIS	⊥	4	0.555	30	16
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	ACROPEDES	⊥ C	29	1.458	72	104
INSECTA	TRICHOPTERA	PSYCHOMYIDAE	TINODES		S	18	1.254	96	120
INSECTA	TRICHOPTERA	HYDROPTILIDAE	HYDROPTILA		S	675	2.829	108	305
INSECTA	TRICHOPTERA	HYDROPTILIDAE	LEUCOTRICHIA		S	4	0.555	108	59
INSECTA	COLEOPTERA	ELMIDAE	OPTIOSERVUS		S	585	2.767	104	287
INSECTA	DIPTERA	TIPULIDAE	ANTOCHA	MONTICOLA	⊥ S	4	0.555	40	22
INSECTA	DIPTERA	TIPULIDAE	DICRANOTA		⊥ S	4	0.555	36	19
INSECTA	DIPTERA	TIPULIDAE	TIPULA		□SO	11	1.032	80	82
INSECTA	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		SO	617	2.790	108	301
INSECTA	DIPTERA	EMPIDIDAE			S	7	0.856	95	81
INSECTA	DIPTERA	STRATIOMYIDAE	EUPARYPHUS		S C	57	1.759	108	189
PELECYPODA					S	7	0.856	108	92
OLIGOCHAETA	TUBIFICIDAE				SO	25	1.400	108	151

MEAN BIOMASS GM/SQM: 1.2 TOTALS: 2425 3.385

TOTAL SAMPLE STATISTICS

STATION: 1 Pigeon Creek, Sampete Co., Manti-Lasal NF, Ephraim R.D. DATE: 10 3 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	14	5034	2043	8025	2746.77	31.50	54.56	1.6211	83	88

EPT Index is 3.35%.
EPT/Chironmidae is 0.20.
The Margalef Index of richness is 1.525.
The Menhinick Index of richness is 0.197.
Simpson's Diversity Index is 0.470.
Hill's Evenness Index is 0.691.
Shannon's Index is 1.124.
The Modified Hilsenhoff Tolerance Index is 3.143.
Percent contribution of dominant taxa is 97.15%.
Ratio of Scrapers to Collector-Gatherers is 0.793755.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.005702.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.981468.
Ratio of Filterer functional feeding group to total number of organisms is 0.014255.
Ratio of Scraper functional feeding group to total number of organisms is 0.779045.
Ratio of Predator functional feeding group to total number of organisms is 0.035638.
Ratio of Piercer functional feeding group to total number of organisms is 0.000000.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
Ʊ = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Pigeon Creek, Sampete Co., Manti-Lasal NF, Ephraim R.D. DATE: 10 3 97

TAXONOMIC LIST CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	EPHEMERELLA	INERMIS	S	22	1.333	92	122
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	4	0.555	72	39
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	ACROPEDES	⊥ C	115	2.060	72	148
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	VAGRITA	⊥	22	1.333	30	39
INSECTA	TRICHOPTERA	HYDROPTILIDAE			S	7	0.856	108	92
INSECTA	COLEOPTERA	ELMIDAE	OPTIOSERVUS		S	3294	3.518	104	365
INSECTA	DIPTERA	TIPULIDAE	ANTOCHA	MONTICOLA	⊥ S	14	1.157	40	46
INSECTA	DIPTERA	TIPULIDAE	HEXATOMA		⊥ S	14	1.157	36	41
INSECTA	DIPTERA	TIPULIDAE	TIPULA		▫SO	29	1.458	80	116
INSECTA	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		SO	850	2.930	108	316
INSECTA	DIPTERA	STRATIOMYIDAE	EUPARYPHUS		S C	574	2.759	108	297
CRUSTACEA	OSTRACODA				S	57	1.759	108	189
PELECYPODA					S	14	1.157	108	124
OLIGOCHAETA	TUBIFICIDAE				SO	18	1.254	108	135

MEAN BIOMASS GM/SQM: 1.4 TOTALS: 5034 3.702

TWELVE MILE CREEK

Station 1 - July 1, 1997

There was low diversity and none of the taxa had resident population number. This generally indicates instability. Cleanwater taxa included just one mayfly, *Epeorus*, with less than resident population numbers.

With a stream gradient of 3.0, this stream reach should have good instream substrate maintenance capability. The DAT at this station was 4.0, which indicates poor biodiversity.

Compared to spring data from 1984, 1986 and 1990 at Station 1, conditions in July 1997 were in some ways better than in prior years. The BCI values have indicated fair conditions (73) in 1990 and (79) in 1997. All of the other analysis elements had lower values in 1997 than in prior years; see Analysis Data Table.

The potential for a fishery at this station appeared to be poor. The macroinvertebrate biomass of 0.1 g/m^2 would limit the number and size of fish that could be supported in this community and the scarcity of cleanwater species indicated limiting conditions in this stream reach.

The BCI of 79 indicated that fair conditions were present in this stream reach. The fact that none of the taxa in the community had resident populations indicated possible instability. This is typical for streams with low alkalinity. Analysis elements (standing crop, BCI, DAT) indicated that overall, this stream reach was at about 0% of its potential. It appeared that there may be opportunities for management to improve stability, riparian habitat quality, and instream habitat quality in this aquatic ecosystem.

Station 1 - October 2, 1997

The extremely low diversity and lack of resident population numbers for taxa present is generally found where there is instability. near dewatering could cause the observed stress. Cleanwater taxa were missing from the community.

The observed lack of shredders in the community is generally found where the riparian habitat is in poor condition or where instream habitat conditions are not suitable for these species. The DAT at this station was 2.0, which indicates poor biodiversity.

Compared to fall data from 1986 and 1990 at Station 1, conditions in October 1997 did not appear to be as stable. The non-selective limiting factor favored a few moderately tolerant taxa and thus the BCI

value in 1997 was not the best indicator of conditions.

The potential for a fishery at this station appeared to be poor. The macroinvertebrate biomass of less than 0.1 g/m^2 would severely limit the number and size of fish that could be supported in this community.

The BCI of 85 indicated there was good potential in this stream, showing that beyond the assumed instability there was at least fair conditions in this aquatic ecosystem. The macroinvertebrate community indicated that there may be some opportunities for management to improve the stability in this aquatic ecosystem.

MACROINVERTEBRATE ANALYSIS

Investigator: JILL DUFOUR
Forest/District: MANTI-LASAL NATIONAL FOREST/ EPHRAIM R.D.
Stream: TWELVE-MILE CREEK
State/County: UT/SANPETE CO.

Station	Location	Date	Diversity Index DAT (mean)	Standing Crop g/m^2 (mean)	Number of Organisms $/m^2$	Number of Taxa	Biotic Condition Index BCI 53
*1		07 01 97	4.0	0.1	93	9	79
1		10 02 97	2.0	0.3	29	4	85
1		06 20 90	13.1	0.8	2,005	26	73
1		09 20 90	14.3	0.5	2,435	28	76
1		07 24 84	8.2	0.1	527	14	66
1		07 24 86	5.1	0.5	1,309	17	66
1		10 06 86	5.4	0.1	1,879	15	69

* AT FOREST BOUNDARY

Scale	DAT	Standing Crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	80 - 90
Fair	6 - 10	0.6 - 1.5	72 - 79
Poor	0 - 5	0.0 - 0.5	below 72

TOTAL SAMPLE STATISTICS

STATION: 1 Twelve Mile Creek, - forest boundary, Sanpete Co., Manti-Lasal NF, Ephraim R.D. DATE: 7 1 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	9	93	57	130	33.54	20.76	35.95	2.6661	63	67

EPT Index is 46.15%.
EPT/Chironmidae is 3.00.
The Margalef Index of richness is 1.764.
The Menhinick Index of richness is 0.932.
Simpson's Diversity Index is 0.193.
Hill's Evenness Index is 0.818.
Shannon's Index is 1.848.
The Modified Hilsenhoff Tolerance Index is 3.667.
Percent contribution of dominant taxa is 84.62%.
Ratio of Scrapers to Collector-Gatherers is 0.523810.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.000000.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.807692.
Ratio of Filterer functional feeding group to total number of organisms is 0.461538.
Ratio of Scraper functional feeding group to total number of organisms is 0.423077.
Ratio of Predator functional feeding group to total number of organisms is 0.000000.
Ratio of Piercer functional feeding group to total number of organisms is 0.000000.

- = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
D = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
Ʊ = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Twelve Mile Creek, - forest boundary, Sanpete Co., Manti-Lasal NF, Ephraim R.D. DATE: 7 1 97

TAXONOMIC LIST

CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	EPEORUS		-	4	0.555	18	9
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	CINYGMULA		⊥	18	1.254	30	37
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	EPHEMERELLA	INERMIS	S	4	0.555	92	51
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	4	0.555	72	39
INSECTA	TRICHOPTERA	BRACHYCENTRIDAE	BRACHYCENTRUS	AMERICANUS	⊥ S	11	1.032	48	49
INSECTA	TRICHOPTERA	BRACHYCENTRIDAE	MICRASEMA		⊥ S	4	0.555	24	13
INSECTA	COLEOPTERA	DYTISCIDAE			S	4	0.555	72	39
INSECTA	DIPTERA	SIMULIIDAE			O	32	1.509	108	162
INSECTA	DIPTERA	CHIRONOMIDAE			SO	14	1.157	108	124

MEAN BIOMASS GM/SQM: 0.1 TOTALS: 93 1.970

TOTAL SAMPLE STATISTICS

STATION: 1 Twelve Mile Creek, ▪ forest boundary, Sanpete Co., Manti-Lasal NF, Ephraim R.D. DATE: 10 2 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	4	29	3	55	23.97	48.21	83.50	1.7500	56	62

EPT Index is 37.50%.
EPT/Chironmidae is 0.75.
The Margalef Index of richness is 0.894.
The Menhinick Index of richness is 0.747.
Simpson's Diversity Index is 0.320.
Hill's Evenness Index is 0.929.
Shannon's Index is 1.213.
The Modified Hilsenhoff Tolerance Index is 2.750.
Percent contribution of dominant taxa is 100.0%.
Ratio of Scrapers to Collector-Gatherers is 0.600000.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.000000.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.625000.
Ratio of Filterer functional feeding group to total number of organisms is 0.125000.
Ratio of Scraper functional feeding group to total number of organisms is 0.375000.
Ratio of Predator functional feeding group to total number of organisms is 0.375000.
Ratio of Piercer functional feeding group to total number of organisms is 0.000000.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
Ʊ = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Twelve Mile Creek, - forest boundary, Sanpete Co., Manti-Lasal NF, Ephraim R.D. DATE: 10 2 97

TAXONOMIC LIST

CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	DRUNELLA	GRANDIS	⊥ S	7	0.856	32	27
INSECTA	TRICHOPTERA	BRACHYCENTRIDAE	BRACHYCENTRUS	AMERICANUS	⊥ S	4	0.555	48	26
INSECTA	DIPTERA	TIPULIDAE	DICRANOTA		⊥ S	4	0.555	36	19
INSECTA	DIPTERA	CHIRONOMIDAE	CHIRONOMINI		SO	14	1.157	108	124

MEAN BIOMASS GM/SQM: less than 0.1 TOTALS: 29 1.458

WILD CATTLE HOLLOW

Station 1 - June 12, 1997

None of the taxa had resident population numbers and there was low diversity. This is generally an indication of instability. There were some indications of sedimentation in this stream reach. Cleanwater taxa indicated fairly good water quality and some good instream substrate and included *Epeorus* and *Arctopsyche grandis*.

With a stream gradient of 2.0, this stream reach should have good instream substrate maintenance capability. The DAT at this station was 4.7, which indicates poor biodiversity.

Compared to early summer data from 1994 at Station 1, conditions in June 1997 were in some ways better and in other ways not as good as in 1994. The BCI values indicated good conditions (83) in 1997, fair conditions (72) in 1994. All of the other analysis elements had lower values in 1997 than found in 1994; see Analysis Data Tables.

The potential for a fishery at this station appeared to be fair. The macroinvertebrate biomass of 0.4 g/m^2 would limit the number and size of fish that could be supported in this community and low numbers of cleanwater species indicated limiting conditions in this stream reach.

The BCI of 83 indicated that this stream reach was in fairly good condition but could be better. The fact that none of the taxa in the community had resident populations indicated possible instability. The macroinvertebrate community indicated that there may be opportunities for management to improve water quality, riparian habitat quality, and instream habitat quality in this aquatic ecosystem.

Station 1 - September 25, 1997

None of the taxa had resident population numbers and there was low diversity in the community. This is often a sign of instability. There were indications of some sedimentation at this station. Cleanwater taxa indicated fairly good water quality and some good instream substrate and included *Zapada cinctipes* and *Arctopsyche grandis*.

The observed number of shredders in the community is generally found where the riparian habitat is in at least fair condition. With a stream gradient of 2.0, this stream reach should have good instream substrate maintenance capability. The DAT at this station was 6.4, which indicates fair biodiversity.

Compared to fall data from 1994 at Station 1, conditions in September 1997 in some ways were better

than in 1994 but most of the analysis elements had considerably lower values in 1997. The DAT, standing crop, number of organisms per species and number of taxa in the community were mere shadows of the rich community found in 1994.

The potential for a fishery at this station appeared to be fair. The macroinvertebrate biomass of 0.4 g/m^2 would limit the number and size of fish that could be supported in this community. The clean water taxa present indicated that there could be some suitable spawning substrate.

The BCI of 100 indicated that this stream reach was close to meeting its potential, but this was based upon a community with low population numbers, an indication of limiting conditions. The fact that none of the taxa in the community had resident populations indicated possible instability. It appeared that there may be opportunities for management to improve stability and instream habitat quality in this aquatic ecosystem. It is recommended that these samples be repeated in 1998 to determine if a negative trend has developed in this ecosystem, and if management activities in this drainage have become limiting.

MACROINVERTEBRATE ANALYSIS

Investigator: JILL DUFOUR
Forest/District: MANTI-LASAL NATIONAL FOREST/FERRON-PRICE R.D.
Stream: WILD CATTLE HOLLOW CREEK
State/County: UT/EMERY CO.

Station	Location	Date	Diversity Index DAT (mean)	Standing Crop g/m^2 (mean)	Number of Organisms $/m^2$	Number of Taxa	Biotic Condition Index BCI 50
1		06 12 97	4.7	0.4	183	13	83
1		09 25 97	6.4	0.4	176	13	100
1	*	06 27 94	17.1	7.8	9,099	31	72
1		09 23 94	18.0	7.9	20,279	33	72

* NEAR CYPRUS PLATEAU MINE, ABOVE GENTRY HOLLOW CREEK

Scale	DAT	Standing Crop	BCI
Excellent	18 - 26	4.0 - 12.0	above 90
Good	11 - 17	1.6 - 4.0	80 - 90
Fair	6 - 10	0.6 - 1.5	72 - 79
Poor	0 - 5	0.0 - 0.5	below 72

TOTAL SAMPLE STATISTICS

STATION: 1 Wild Cattle Hollow, - 15 m. abv. xing, Emery Co., Manti-Lasal NF, Ferron-Price R.D. DATE: 6 12 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	13	183	72	294	101.83	32.13	55.65	3.0646	59	60

EPT Index is 66.67%.
EPT/Chironmidae is 34.00.
The Margalef Index of richness is 2.304.
The Menhinick Index of richness is 0.961.
Simpson's Diversity Index is 0.153.
Hill's Evenness Index is 0.783.
Shannon's Index is 2.124.
The Modified Hilsenhoff Tolerance Index is 3.500.
Percent contribution of dominant taxa is 78.43%.
Ratio of Scrapers to Collector-Gatherers is 1.055556.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.000000.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.705882.
Ratio of Filterer functional feeding group to total number of organisms is 0.019608.
Ratio of Scraper functional feeding group to total number of organisms is 0.745098.
Ratio of Predator functional feeding group to total number of organisms is 0.313726.
Ratio of Piercer functional feeding group to total number of organisms is 0.000000.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
U = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Wild Cattle Hollow, - 15 m. abv. xing, Emery Co., Manti-Lasal NF, Ferron-Price R.D. DATE: 6 12 97

TAXONOMIC LIST CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	EPEORUS		-	7	0.856	18	15
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	CINYGMULA		⊥	18	1.254	30	37
INSECTA	EPHEMEROPTERA	EPHEMERELLIDAE	DRUNELLA	COLORADENSIS	⊥ S	47	1.669	28	46
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	43	1.634	72	117
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	ARCTOPSYCHE	GRANDIS	-	4	0.555	18	9
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	COLORADENSIS	⊥	4	0.555	30	16
INSECTA	COLEOPTERA	ELMIDAE			S	22	1.333	104	138
INSECTA	DIPTERA	TIPULIDAE	ORMOSIA		S	4	0.555	72	39
INSECTA	DIPTERA	TIPULIDAE	HEXATOMA		⊥ S	4	0.555	36	19
INSECTA	DIPTERA	CHIRONOMIDAE	TANYPODINAE		⊥	4	0.555	72	39
INSECTA	DIPTERA	EMPIDIDAE	CHELIFERA		S	4	0.555	95	52
OLIGOCHAETA	TUBIFICIDAE				SO	14	1.157	108	124
OLIGOCHAETA	LUMBRICIDAE				SO	11	1.032	90	92

MEAN BIOMASS GM/SQM: 0.4 TOTALS: 183 2.262

TOTAL SAMPLE STATISTICS

STATION: 1 Wild Cattle Hollow, ▪ 15 m. abv. xing, Emery Co., Manti-Lasal NF, Ferron-Price R.D. DATE: 9 25 97

Repl	Total No. Taxa	Mean /SQM	Confidence Limits (80 Percent) LL	UL	Standard Deviation	Percent SE of Mean	Coeff. of Variation	DBAR	CTQA	CTQD
3	13	176	59	292	106.87	35.09	60.79	3.0998	44	48

EPT Index is 77.55%.
EPT/Chironmidae is 4.22.
The Margalef Index of richness is 2.321.
The Menhinick Index of richness is 0.980.
Simpson's Diversity Index is 0.140.
Hill's Evenness Index is 0.830.
Shannon's Index is 2.149.
The Modified Hilsenhoff Tolerance Index is 2.700.
Percent contribution of dominant taxa is 79.59%.
Ratio of Scrapers to Collector-Gatherers is 0.303030.

Functional feeding groups
Ratio of Shredder functional feeding group to total number of organisms is 0.306123.
Ratio of Coll/Gath functional feeding group to total number of organisms is 0.673469.
Ratio of Filterer functional feeding group to total number of organisms is 0.081633.
Ratio of Scraper functional feeding group to total number of organisms is 0.204082.
Ratio of Predator functional feeding group to total number of organisms is 0.265306.
Ratio of Piercer functional feeding group to total number of organisms is 0.000000.

▪ = Clean Water Taxa
⊥ = Moderately Tolerant Taxa
□ = Shredders
S = Sediment Tolerant Taxa
O = Organic Enrichment Tolerant Taxa
C = Adverse Chemistry Tolerant Taxa
Ʊ = Large Stoneflies

SPECIES ANALYSIS

STATION: 1 Wild Cattle Hollow, - 15 m. abv. xing, Emery Co., Manti-Lasal NF, Ferron-Price R.D. DATE: 9 25 97

TAXONOMIC LIST

CLASS	ORDER	FAMILY	GENUS	SPECIES	TYPE	MEAN N/SQM	LOG10 N/SQM	TQ	LOG10 XTQ
INSECTA	EPHEMEROPTERA	HEPTAGENIIDAE	CINYGMULA		⊥	4	0.555	30	16
INSECTA	EPHEMEROPTERA	BAETIDAE	BAETIS		SO	22	1.333	72	95
INSECTA	PLECOPTERA	NEMOURIDAE	ZAPADA	CINCTIPES	- ◻	36	1.555	16	24
INSECTA	PLECOPTERA	PERLODIDAE	MEGARCYS		⊥ S	4	0.555	30	16
INSECTA	PLECOPTERA	CAPNIIDAE			⊥◻	11	1.032	32	33
INSECTA	TRICHOPTERA	HYDROPSYCHIDAE	ARCTOPSYCHE	GRANDIS	-	14	1.157	18	20
INSECTA	TRICHOPTERA	RHYACOPHILIDAE	RHYACOPHILA	ACROPEDES	⊥ C	36	1.555	72	111
INSECTA	TRICHOPTERA	LIMNEPHILIDAE	OLIGOPHLEBODES		⊥ S	4	0.555	30	16
INSECTA	TRICHOPTERA	LIMNEPHILIDAE	NEOTHREMMA		⊥ S	4	0.555	24	13
INSECTA	TRICHOPTERA	LEPIDOSTOMATIDAE	LEPIDOSTOMA		⊥◻	4	0.555	24	13
INSECTA	DIPTERA	TIPULIDAE	DICRANOTA		⊥ S	4	0.555	36	19
INSECTA	DIPTERA	TIPULIDAE	TIPULA		◻SO	4	0.555	80	44
INSECTA	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		SO	32	1.509	108	162

MEAN BIOMASS GM/SQM: 0.4 TOTALS: 176 2.245

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HANSEN ALLEN & LUCE INC

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March 20, 1998

Mr. Johnny Pappas
Cyprus Plateau Mining Company
Star Point Mine
847 Northwest Highway 191
Helper, Utah 84526

RE: 1997 Annual Water Monitoring Report for the Star Point Mine.

Dear Johnny:

As per your request we have prepared the 1997 Annual Water Monitoring Report for the Star Point Mine following the format prepared for the 1995 annual reports. The Water Monitoring Report includes graphical time plots for flow; pH, TDS; major anions and cations including calcium, magnesium, chloride, bicarbonate and sulfate; and oil and grease for surface stations. The report also includes a station by station summary of data trends. As requested by UDOGM, we have also included the data on a CD disk within the report containing all water quality data and data plots in Quattro Pro for Windows format.

We appreciate the opportunity to assist you with this project. Please call should you have any questions.

Sincerely,

David E. Hansen

David E. Hansen, Ph.D., P.E.
Project Manager

cc: file

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INTRODUCTION

The Star Point Mines, owned and operated by Cyprus Plateau Mining Corporation (CPMC), are located approximately 12 miles southwest of Price, Utah. The entries to underground workings are on the east face of the Wasatch Plateau. The surface facilities occupy 173 acres which drain into sedimentation ponds which in turn drain into Serviceberry Creek, an ephemeral channel. Water from underground workings is generally pumped into old workings, but has historically been discharged at Mudwater Canyon, an NPDES permitted discharge point. The surface over the mine is drained by streams including Tie Fork Canyon, Right Fork Miller Creek, Mud Water Canyon, and Corner Canyon and their tributaries. The locations of all monitoring stations are shown on Map 722.200a located at the end of this report.

Table 1 contains a list of water quality sampling parameters for springs, mine inflows, and surface and ground waters. Data and plots for each station are found in the Appendices.

GROUND WATER MONITORING

SPRINGS

Twenty nine springs were monitored by CPMC during 1997. Monitoring data are arranged according to formation in which the springs originate. The formations of interest, beginning with the lowest, are the Star Point Sandstone, the Blackhawk, the Castlegate Sandstone, the Price River, and the North Horn. The Castlegate is actually a member of the Price River Formation but is sampled separate from the Price River Formation because of its significance. A review of the surficial geology shows that two of the twenty nine springs identified issue from the Star Point Sandstone, three from the Blackhawk Formation, three issue from the Castlegate Sandstone, five from the rest of the Price River Formation, and sixteen from the North Horn Formation.

The stations have been sampled on a quarterly basis when accessible. Graphical time plots have been prepared for flow, pH, TDS, and major cations and anions including calcium, magnesium, chloride, bicarbonate and sulfate. The data have been plotted to show flow and water quality variations as sequential time plots. The plots were used in our analyses of flow and water quality changes over time. Plots were prepared for TDS and flow from all available sampling from 1977 through 1997. Plots were prepared for the other indicated water quality parameters for sampling from 1991 through 1997. Complete data sets of information prior to 1991 can be found in previous annual reports. Water quality data and the plots for each station are located in Appendix A.

Since it is likely that there is correlation between spring flows and precipitation, plots were also prepared which compare recorded flows to annual precipitation records for a local gaging station over the period of record. The National Weather Service rainfall gaging station closest to the Star Point mine area is located in Price which is about 12 miles northeast of the Star Point mine. Average annual precipitation for the Price station is 10.0 inches per year (1980-1997). Precipitation values recorded at the Price weather station have been plotted for comparison with recorded spring flows at each water sampling station. It must be remembered that although data from the Price station provides an overall indication of precipitation patterns, they do not necessarily represent true local conditions.

A station by station summary of the 32 spring stations that were sampled is given below, organized according to the formation in which the springs originate. A discussion of any apparent data trends is included in the summary for each station.

Star Point Sandstone Formation Springs

Two springs issuing from the Star Point Sandstone Formation were sampled during 1997, Birch Spring and Big Bear Spring. These springs were monitored as a part of the Gentry Ridge Impact evaluation involving the Castle Valley Special Service District and the Huntington Cleveland Irrigation Company. These water companies have concerns that mining may impact their water sources in the Huntington Canyon area. Birch and Big Bear springs are two of the larger springs down-gradient from mining and offer an opportunity to monitor ground water that may originate in the mining zone.

Since the early 1980's, the long term trend in flow at Birch Springs has been downward. Plots of historic flow at this station can be found in previous annual reports. The reason for this downward trend could be due to decreased precipitation or mining impacts created by mines in close proximity to the spring. Recent data suggests flows may have stabilized.

Birch Spring

Flow. From 1992 through 1997 the average measured flow was 0.050 cfs; the high was 0.07 cfs and the low was 0.009 cfs. There has been more variation in flow over the past few years and the data plots would tend to indicate that some decrease in flow has been observed. However, as discussed during the CHIA review during the fall of 1997, it is not believed that the decrease in flows is the result of CPMC mining activities. The data indicates there is some correlation between precipitation and flow when the delaying effects of snowmelt and recharge are considered.

pH. From 1992 through 1997 the average measured pH was 7.0 the high was 7.9 and the low was 6.1. Measurements taken since 1994 have been relatively consistent but are higher than measurements taken in 1992 and 1993.

TDS. The average TDS concentration for the period of record is 462 mg/l with maximum and minimum recorded values of 580 and 418 mg/l respectively. The 580 mg/l sample taken in October of 1997 was uncharacteristically high and may be an outlier. The overall TDS of Birch Spring appears to be increasing, however, the values shown are still within the limits of one standard deviation above and below average.

Major Cations and Anions. Levels of major cations and anions have varied during the period of record. however no general trends in the data are apparent.

Big Bear

Flow. From 1992 through 1997 the average measured flow was 0.23 cfs; and most values were between 0.35 and 0.15 cfs, although a flow of 0.0 was measured in October 1993. The data indicates there is some correlation between precipitation and flow when the delaying effects of snowmelt and recharge are considered. This is apparent during the most recently recorded precipitation and runoff events shown on the graph.

pH. From 1992 through 1997 the average measured pH was 7.3; the high was 8.5 and the low was 6.5. Measurements since 1994 have been consistently higher than measurements taken in 1992 and 1993. Measurements taken since 1994 have been relatively constant with two values being recorded higher than one standard deviation above average.

TDS. The average TDS concentration for the period of record is 343 mg/l with most values lying between 290 and 370 mg/l. One sample taken in October of 1995 was higher than usual at 426 mg/l. The potential increasing trend in TDS between 1994 and 1995 has showed a potential slight decrease in 1996 and 1997.

Major Cations and Anions. Calcium, magnesium, chloride and sulphate levels all showed slight increases in concentrations in 1994 and 1995, however, since that time have either stabilized or seen a slight decrease.

A summary of the general trend for major water quality parameters for springs found within the Star Point Sandstone Formation is provided in the following table. Note that the table shows whether the general trend (as evidenced by the graphs provided in the Appendices) is "Down", "Stable", or "Up". For major cations and anions, there may be more than one category marked, indicating that there was variation found between parameters evaluated. The reader is referred to either the text or the graphs for further details when two or more categories are marked.

Summary for Star Point Sandstone Formation Springs

Station	Flow			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
Birch	X				X	X		X	X		X	X
Big Bear		X	X		X			X		X	X	

Blackhawk Formation Springs

Five stations at springs issuing from the Blackhawk formation were sampled in 1997. These stations are: 530, CVS6, CVS7, CVS9 and CVS10. Two of the stations, CVS9 and CVS10, are new as of 1995.

530

Flow. From 1986 through 1997 the average measured flow was 0.0095 cfs with a high of 0.033 and a low of 0.0. "Dry" measurements were recorded in August of 1990 and September of 1991. No increasing or decreasing trends in the data are apparent, although a flow increase was noted in 1997 which is believed attributable to increased local precipitation. Flows measured prior to 1992 were likely estimated as almost all measurements are consistently at 0.01 cfs. Other than what can be observed in 1997, a correlation between precipitation and flow is not apparent.

pH. From 1991 through 1995, pH measurements have varied between a high of 8.8 and a low of 6.4. The average measured pH for the period of record is 7.8. No increasing or decreasing trends in the data are apparent.

TDS. From 1986 to 1995 most TDS measurements have generally been between 270 mg/l and 344 mg/l, with the average TDS concentration being 308 mg/l. No increasing or decreasing trends are readily apparent.

Major Cations and Anions. Levels of major cations and anions have varied during the period of record, with calcium, magnesium and chloride levels following a possible slight increasing trend. Bicarbonate data shows a possible decrease in concentrations while sulfate remains relatively constant.

CVS6

Flow. Data at station CVS6 has only been recorded since 1993. All measured flows from 1993 to 1995 have been 0.0 with the exception of June 1993 when a flow of 0.002 cfs was recorded.

pH. The only pH measurement, taken in June 1993, was 6.2.

TDS. The only TDS measurement, taken in June 1993, was 240 mg/l.

Major Cations and Anions. The only measurement of major cations and anions, taken in June 1993, indicated normal concentrations of all measured parameters.

CVS7

Flow. From 1993 through 1997 the average measured flow was 0.0013 cfs with a high of 0.01 and a low of 0.0. Most measurements are at 0.001 cfs. "Dry" measurements were recorded in August and September of 1994, and in September of 1997. No increasing or decreasing trends in the data are apparent. A correlation between precipitation and flow is not apparent from the data.

pH. From 1993 through 1997, pH measurements have varied between a high of 8.6 and a low of 6.3. The average measured pH for the period of record is 7.4. A slight increase in pH may be occurring at this site as can be observed from the data set..

TDS. From 1993 to 1997 the average measured TDS concentration was 263 mg/l with a high of 310 and a low of 236 mg/l. No long term variations in TDS concentrations appear to be occurring.

Major Cations and Anions. The five years of data that are available appear to be indicate that no apparent long term changes are noted with the possible exception of bicarbonate which may be experiencing a decline.

CVS9

Flow. Only three years of data are available for this station. Flow measurements varied between 0.0 and 0.004 cfs. Although no trend is apparent, insufficient data is available to identify any long term trends.

pH. pH measurements varied between 7.6 and 8.5. Not enough data is available to identify long term trends.

TDS. TDS measurements for this station varied between 320 and 371 mg/l. Not enough data is available to identify long term trends.

Major Cations and Anions. Levels of major cations and anions have only been recorded since 1995. Insufficient data exist to identify long term trends.

CVS10

Flow. Only three years of data are available for this station with flow being recorded only during the last 2 years. Insufficient data is available to identify any long term trends.

pH. Although it would appear that no long term pH trends are evident, insufficient data exist to make an accurate analysis at this station.

TDS. Although it would appear that no long term TDS trends are evident, insufficient data exist to make an accurate analysis at this station.

Major Cations and Anions. Although it would appear that no long term data trends for major cations and anions are evident, insufficient data exist to make an accurate analysis at this station.

A summary of the general trend for major water quality parameters for springs found within the Blackhawk Formation is provided in the following table. For major cations and anions, there may be more than one category marked, indicating that there was variation found between parameters evaluated. The reader is referred to either the text or the graphs for further details when two or more categories are marked. Additional data collected over time will help define a possible trend. N/A in the table indicates insufficient data exists to make a determination of a potential trend.

Summary for Blackhawk Formation Springs

Station	Flow			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
530		X	X		X			X		X	X	X
CVS6		N/A			N/A				N/A		N/A	
CVS7		X				X		X		X	X	

Station	Flow			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
CVS9		X			X			X			X	
CVS10		X			X			X			X	

Castlegate Formation Springs

238

Flow. From 1987 through 1997 the average measured flow was 0.02 cfs with a high of 0.13 and a low of 0.008. The data indicate increasing flows and a correlation between precipitation and flow when the delaying effects of snowmelt and recharge are considered.

pH. From 1991 through 1997, pH measurements have varied between a high of 8.1 and a low of 6.1. The average measured pH for the period of record is 7.3. Levels of pH are currently on the same order of magnitude that they were in the early 1990's after experiencing a dip in the 1992 and 1993 period.. Levels appear to have remained relatively consistent since 1994.

TDS. From 1987 to 1997 most TDS measurements have generally been between 200 and 240 mg/l, with the average TDS concentration being 220 mg/l. No increasing or decreasing trends are apparent.

Major Cations and Anions. Levels of some major cations and anions have varied during the period of record, however no general long term trends in the data are apparent. Although calcium values during the last two years are on the higher end of historic data, they are still not uncharacteristic of historic data. The reverse might be said of bicarbonate where data over the last three years is on the low end of recorded data. Additional data taken over the next few years will help clarify variations noted.

492

Flow. This spring issues from the north face of the drainage north of the mining zone. From 1986 through 1997 the average measured flow was 1.54 gpm; the high was 4.0 gpm and the low was 0.90 gpm. Mining was conducted in the area south of the spring from 1988 through about the fourth quarter of 1991. The general flow does not appear to have been impacted by mining. There does not appear to any long term correlation with direct precipitation, however, the spring is near the top of the ridge and the recharge zone for the spring is limited. This may be indicated by the fluctuation in the flow. The data does indicate an annual correlation between snowmelt and spring flow runoff.

pH. From 1991 through 1997, pH measurements have varied between a high of 8.28 and a low of 5.3. The average measured pH for the period of record is 7.4. Although a slight increase in

pH is observed since 1994, the data is still well within the limits of recorded data. Trends in the data, if any, will become apparent over time.

TDS. From 1989 to 1997 most TDS measurements have generally been between 190 and 230 mg/l, with the average TDS concentration being 209 mg/l. At present, the data do not indicate any long term trend in TDS concentration.

Major Cations and Anions. Levels of major cations and anions have varied during the period of record, however no general trends in the data are apparent, except for bicarbonate which may be showing a slight decline since 1994.

494

Flow. This spring issues from the south face of the drainage in the northern area of the mining zone. From 1986 through 1997 the average measured flow was 1.25 gpm; the high was 3.0 gpm and the low was 0 gpm. Mining was conducted in the area of the spring from 1988 through about the fourth quarter of 1991. The flow appears to have been lower during 1991 through 1994 after mining, however, it is up again to premining levels. The flow during mining and prior to mining may show some correlation to precipitation. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 6 exhibited this trend, and had increasing flows. If mining caused the decreased flows during 1991 through 1994, the recharge area may be recovering as indicated by the flows in 1995 through 1997.

pH. From 1991 through 1997, pH measurements have generally varied between 6.4 and 8.4 with the average being 8.2. A very high value of 12.7 was recorded in July 1993. No increasing or decreasing trends are apparent in the data.

TDS. Only 5 TDS measurements have been recorded from 1987 through 1995; one in 1987, three in 1988 and one in 1995. The average recorded TDS concentration is 243 mg/l with the high at 270 mg/l and the low at 190 mg/l. The data is insufficient to indicate any increasing or decreasing trends.

Major Cations and Anions. Major cations and anions have only been sampled once during the period of record and are within expected ranges.

A summary of the general trend for major water quality parameters for springs found within the Castlegate Formation is provided in the following table. N/A in the table indicates insufficient data exists to make a determination of a potential trend.

Summary for Castlegate Formation Springs

Station	Flow			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
238		X			X	X		X		X	X	
492		X			X	X		X		X	X	
494		X	X		X			N/A			N/A	

Price River Formation Springs

S149

Flow. From 1985 through 1997 the average measured flow was 0.054 cfs with most values between 0.0 and 0.15. A much higher than typical flow value of 0.57 cfs was recorded in June of 1995. Measurements indicate higher flows in the springtime and lower flows in the summer and fall. The data do not indicate an increasing or decreasing trend in flows but seasonal variations indicate flows increase during spring thaws.

pH. From 1991 through 1997, pH measurements have varied from a high of 8.51 to a low of 6.0, the average being 7.4. Values of pH during 1996 and 1997 are on the high end of recorded historic data. The observance of a trend will be verified with additional data collected over the next couple of years.

TDS. TDS measurements have been recorded from 1985 through 1997 with the exception of the years 1989 and 1990. Before 1989, TDS concentrations typically ranged between 250 and 300 mg/l. Between 1991 and 1997, however, TDS concentrations varied between 300 and 400 mg/l. Although there has obviously been an increasing trend in the past, recent data indicates that this trend now may have ceased.

Major Cations and Anions. Levels of major cations and anions have had some variation during the period of record, and increasing trends have potentially been observed prior to 1994 in calcium, magnesium, and bicarbonate. Since that time however, all parameters appear to have stabilized except for bicarbonate which showed a significant drop and re-stabilization in 1995 from an approximate value of 320 to 270 mg/l.

S182

Flow. Most of the flow measurements from 1979 through 1997 indicated no flow at the spring during the summer and autumn months and flows of 0.01 cfs during the springtime. No flow has been recorded at this site since the early summer of 1995. A higher than typical flow value of 0.054 cfs was recorded in June of 1995. Measurements indicate higher flows in the springtime and lower flows (of no flow) in the summer and fall. The data do show an overall lack of early spring flow at this site since 1990 (with the exception of 1995). The absence of early summer

flows may indicate a loss of flow, however, additional time and verification is needed to ensure that the loss of flow is not a result of decreased precipitation noted in the late 1980's and early 1990's (as compared to the late 1970's, early 1980's and mid to late 1990's).

pH. Only two pH measurements have been taken at this spring. In June 1986 the pH was 6.9 and one in June 1995 the pH was 6.4.

TDS. TDS measurements have varied considerably between 1979 and 1995 between a low of 130 mg/l and a high of 260 mg/l. TDS measurements were not taken from 1991 through 1994. The data shows no significant long term trends.

Major Cations and Anions. Measurements of major cations and anions were not taken from 1991 through 1994. Data plotted for the prior period of record shows no significant trends over time.

229

Flow. Most of the flow measurements from 1979 through 1997 indicated no flow during the summer and autumn months and flows between 0.05 and 0.1 cfs during the springtime. A higher than typical flow value of 0.184 cfs was recorded in June of 1995. Measurements indicate higher flows in the springtime and lower flows in the summer and fall. The data do not indicate an increasing or decreasing trend in flows but seasonal variations indicate flows increase during spring thaws.

pH. Only six pH measurements have been taken at this spring since 1991. The high recorded value was 8.18 and the low was 6.2 with an average of 7.3. Although data since 1996 show the highest pH values, there is insufficient data to determine the existence of any long term trend. The data should be reviewed over time to see if the most recent data reflects a trend or reflects normal variations.

TDS. From 1986 through 1997 TDS measurements have varied between a low of 174 mg/l and a high of 220 mg/l. No long term trends are apparent in the data.

Major Cations and Anions. Although measurements of major cations and anions have varied over time, there is insufficient data to confirm the presence of long term trends. A cursory review of the plots show increases in calcium, magnesium, and sulfate, and a decline in bicarbonate, however, the variations noted may be normal fluctuations. Additional data is needed to confirm or deny the existence of any trend.

458

Flow. Data from 1992 through 1997 indicate springtime flows between 0.02 and 0.1 cfs and summer and autumn flows between 0.0 and 0.01 cfs. The annual report prepared for 1995 indicated that "it is possible that mining may have had an impact upon this spring" since flows dropped off after 1994. However, mining impacts can be now dismissed since flows returned to "apparent normal" conditions in 1997..

pH. From 1992 through 1997 pH has varied between 8.14 and 6.2, the average being 7.2. No long term trends can at this time be verified by the data set.

TDS. From 1986 through 1997 TDS measurements have varied between a low of 284 mg/l and a high of 340 mg/l. Although the 1997 data shows an increase over historic levels, no trend can be verified without additional data.

Major Cations and Anions. Levels of major cations and anions have varied during the period of record, however no general trends in the data are apparent. The variations appear to be random.

500

Flow. From 1987 through 1997, only three measurements have indicated any flow at this spring. Flows of 0.1 cfs were recorded both in May 1987 and July 1989, and a flow of 0.002 was recorded in June of 1997. The data do not indicate an increasing or decreasing trend in flows and there is no indication that a correlation between precipitation and flow exists.

pH. Measurements of pH were recorded from 1987 through 1989, and again in 1997. The data shows that pH has ranged between 6.6 and 8.4 with the average being 7.8. No long term trend is apparent from the data.

TDS. Data on TDS concentration only exists for the years 1987, 1988, 1989 and 1997. The high recorded value was 268, the low was 198, and the average was 242. No long term trend is apparent from the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record, however no general long term trends in the data are apparent.

A summary of the general trend for major water quality parameters for springs found within the Price River Formation is provided in the following table. For major cations and anions there may be more than one category marked, indicating that there was variation found between parameters evaluated. The reader is referred to either the text or the graphs for further details when two or more categories are marked N/A in the table indicates insufficient data exists to make a determination of a potential trend. A question mark indicates increased levels, but insufficient data exists to make a determination of a potential trend.

Summary for Price River Formation Springs

Station	Flow			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
S149		X			X	X		X		X	X	
S182	X	X			N/A			X			X	
229		X			X	X		X		X	X	X

Station	Flow			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
458		X			X	?		X	?		X	
500		X			X			X			X	

North Horn Formation Springs

S111

Flow. From 1980 through 1991 only two measurements have indicated any flow at this spring. Since 1992 flows have ranged from 0.0006 cfs to 0.01 cfs. The data indicate increased flows since 1992, but no correlation between precipitation and flow has been made.

pH. From 1991 through 1997 pH has varied between a high of 8.6 and a low of 5.9, with the average being 7.0. A visual review of the data plot shows that pH declined from 1991 to 1993, then began a period of increase through 1997. Additional data will demonstrate whether the noted variations are naturally occurring, or demonstrate a change in conditions.

TDS. From 1980 through 1997 most TDS measurements varied between 130 and 230 mg/l. An unusually high value of 688 mg/l was recorded in October 1984. No long term trends are indicated by the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record but no general long term trends in the data are apparent except for possible declines in bicarbonate levels. Bicarbonate levels appear to be lower since 1994 than those recorded prior to 1994.

232

Flow. From 1988 through 1991 springtime flows were recorded at 0.01 or 0.02 cfs and summer and autumn flows were always 0.0. From 1991 through 1997 the data shows more sustained late summer and fall flows. An unusually high flow of 0.05 was recorded in June 1995. The data do not indicate any increasing or decreasing trends in flows but do indicate a correlation between precipitation and flow.

pH. From 1991 through 1995 pH has varied between a high of 8.25 and a low of 6.0, with the average being 7.1. Data collected since 1993 shows pH levels on the high end of that collected previously. Additional data will verify whether this variation is due to natural causes, or whether a long term trend is evidenced.

TDS. From 1988 through 1997 most TDS measurements generally varied between 170 and 210 mg/l. No long term trends are apparent from the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record. A preliminary review of magnesium may be indicating a slight increasing trend, and sulfate may have experienced a slight decreasing trend since 1992. No general and obvious trends in the other data are apparent.

424

Flow. From 1991 through 1997 flow measurements typically varied between 0.0 and 0.45 cfs. A high flow of 0.45 was recorded in May 1992 but no other measurements have been taken in the month of May in other years to compare it to. The data do not indicate any increasing or decreasing trends in flows but do indicate a correlation between precipitation, snowmelt and flow.

pH. From 1991 through 1997 pH has varied between a high of 8.5 and a low of 6.3, with the average being 7.5. The most recent pH data shows that current levels of pH are in the 7.5 to 8.0 range. No trend in pH is believed to exist in the data, although more data will be required to verify this conclusion.

TDS. From 1991 through 1997 most TDS measurements generally varied between 250 and 325 mg/l. No long term trends are apparent from the data.

Major Cations and Anions. Levels of other major cations and anions varied during the period of record but no general trends in the data are apparent.

429

Flow. From 1987 through 1997 springtime flows recorded at this station have generally varied between 0.01 an 0.05 cfs. Summer and fall flows are typically at or near 0.0. The data do not indicate any increasing or decreasing trends in flows but seasonal variations indicate increased flows during spring thaws.

pH. From 1991 through 1997 pH has varied between a high of 9.15 and a low of 6.8, with the average being 8.1. No long term trends are apparent from the data.

TDS. From 1991 through 1997 TDS measurements varied between a high of 280 and a low of 196 mg/l, with the average being 237 mg/l. No long term trends are apparent from the data.

Major Cations and Anions. Levels of major cations and anions have varied but no general trends are apparent from the data, with the possible exception of bicarbonate which shows decreased levels since 1994. Additional data collected over time will verify any trend.

444

Flow. Flows recorded at this station from 1987 through 1997 have typically ranged between 0.01 and 0.05 cfs, although springtime flows have been as high as 0.17 cfs. The data do not indicate any increasing or decreasing trends in flows but seasonal variations indicate flows increase during spring thaws.

pH. From 1991 through 1997 pH has varied between a high of 8.6 and a low of 6.1, with the average being 7.5. Data since 1993 have been on the high end of the range and may indicate an increasing trend. Any trend will be verified over time.

TDS. From 1991 through 1997 most TDS measurements generally ranged from 250 to 280 mg/l, with the average being 264 mg/l. No long term trends are apparent from the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record but no general long term trends in the data are apparent, except for bicarbonate where values have been reported to be on the low side since 1994. Any trend will be verified with additional data collection.

450

Flow. Springtime flows recorded at this station have been as high as 0.07 cfs but flows recorded during the summer or fall months are usually less than 0.01 cfs and are often 0.0. The data do not indicate any increasing or decreasing trends in flows but seasonal variations indicate flows increase during spring thaws.

pH. From 1991 through 1997 pH has varied between a high of 8.4 and a low of 6.2, with the average being 7.3. No obvious trends are apparent from the data.

TDS. Seven TDS measurements have been recorded from 1991 through 1997. The high was 300 mg/l, the low 238 mg/l, and the average 275 mg/l. No long term trends are apparent from the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record but no general long term trends in the data are apparent.

452

Flow. Springtime flows recorded at this station have been as high as 0.14 cfs but flows recorded during the summer or fall months are usually between 0.01 and 0.04 cfs. The data do not indicate any increasing or decreasing trends in flows but seasonal variations indicate flows increase during spring thaws.

pH. From 1991 through 1997 pH has varied between a high of 8.6 and a low of 6.3, with the average being 7.6. No long term trends are apparent from the data.

TDS. TDS levels recorded from 1986 through 1997 have varied from a high of 270 mg/l to a low of 208 mg/l with the average at 239 mg/l. No long term trends are visible in the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record but no general trends in the data are apparent.

518

Flow. Flows recorded at this station have been as high as 0.17 cfs in the springtime but are usually between 0.01 and 0.05 cfs in the summer and fall and have often been 0.0. The data do not indicate any increasing or decreasing trends in flows but seasonal variations indicate flows increase during spring thaws.

pH. From 1991 through 1997 pH has varied between a high of 8.3 and a low of 6.1, with the average being 7.4. Although pH levels since 1995 have been on the high end of that reported historically, insufficient data exists to document a trend, and none is believed to exist.

TDS. TDS levels recorded from 1986 through 1997 have varied from a high of 320 mg/l to a low of 200 mg/l with the average at 259 mg/l. No long term trends are apparent from the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record but no general long term trends in the data are apparent.

748

Flow. From 1979 through 1991, flows recorded during the months of May and June have typically been 0.01 cfs, with occasional higher values of 0.04 cfs. From 1992 through 1995 the data shows more variability but is still usually less than 0.01 cfs except in the springtime. No long term trend in flow is believed to exist for this station.

pH. From 1991 through 1997 pH has varied between a high of 8.3 and a low of 6.3, with the average being 7.3. No long term trends are apparent from the data.

TDS. Most TDS levels recorded from 1979 through 1997 have been between 200 and 240 mg/l with the average at 217 mg/l. No long term trends are apparent from the data.

Major Cations and Anions. The data indicates magnesium levels may be following a slightly increasing trend, and bicarbonate may have experienced a drop since 1994. Levels of other major cations and anions varied during the period of record but no general trends in the data are apparent.

749

Flow. Springtime flows recorded from 1985 through 1997 have usually been between 0.01 and 0.02 cfs. Summer and autumn flows are usually less than 0.005 cfs and are often 0.0. Although no long term trends appear to be evidenced, there is short term variation due to spring thaws.

pH. From 1991 through 1997 pH has varied between a high of 8.3 and a low of 6.2, with the average being 7.4. No long term trends are apparent from the data.

TDS. Most TDS levels recorded from 1979 through 1997 have generally been between 240 and 280 mg/l with the average at 262 mg/l. No long term trends are apparent from the data.

Major Cations and Anions. The data indicates calcium and magnesium levels may be following a slightly increasing trend while bicarbonate is showing decreased values since 1994. Levels of other major cations and anions varied during the period of record but no general trends in the data are apparent.

751

Flow. Springtime flows recorded from 1980 through 1997 have usually been about 0.01 cfs but have gotten as high as 0.03 cfs. Summer and autumn flows are usually less than 0.005 cfs and are often 0.0. The data possibly indicate an increasing trend in low flows from 1992 through present, and seasonal variations indicate flows increase during spring thaws.

pH. From 1991 through 1997 pH has varied between a high of 8.4 and a low of 6.2, with the average being 7.2. Slight increases in pH since 1994 may indicate the beginning of an upward trend. Additional data collected over the next couple of years will confirm any long term trend.

TDS. Most TDS levels recorded from 1980 through 1997 have generally been between 190 and 240 mg/l with the average at 219 mg/l. No long term trends are apparent from the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record but no general long term trends in the data are apparent.

753

Flow. From 1992 through 1997 recorded flows have generally been less than 0.005. Springtime flows have been recorded as high as 0.045 cfs. The data possibly indicate an increasing trend in base flows since 1992 and seasonal variations indicate flows respond to spring thaws.

pH. From 1991 through 1997 pH has varied between a high of 8.3 and a low of 6.4, with the average being 7.6. pH values have been on the high end of historic data over the last two years. The continuance of these high values over time may indicate a long term increase in pH levels.

TDS. Most TDS levels recorded from 1979 through 1997 have generally been between 190 and 280 mg/l with an average of 246 mg/l. No long term trends are apparent from the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record but no general trends in the data are apparent.

971

Flow. From 1989 through 1997, all measurements have shown no flow at this station except at two times in 1990 and 1991 when there was enough seepage to take limited samples. Insufficient data is available to determine any trend.

pH. Only two pH measurements have been recorded at this station. In May 1990 the pH was 7.2 and in July 1991 the pH was 7. Insufficient data is available to determine any trend.

TDS. Only two TDS measurements have been recorded at this station. In May 1990 the TDS concentration was 124 mg/l and in July 1991 the TDS concentration was 242 mg/l. Insufficient data is available to determine any trend.

Major Cations and Anions. Insufficient data exists to identify possible trends in the data.

978

Flow. From 1984 through 1997 most flow measurements have been between 0.0 and 0.05 cfs, although springtime flows have been as high as 0.45 cfs. No long term trends in the data are apparent but seasonal variations indicate flows increase during spring thaws.

pH. From 1991 through 1997 pH values have varied between a high of 8.3 and a low of 6.2, with the average being 7.3. Although some variation has occurred, no obvious trends are apparent in the data.

TDS. From 1984 through 1997 TDS values have generally varied between 220 and 260 mg/l, with the average being 238 mg/l. No long term trends are apparent in the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record but no general trends in the data are apparent.

85261

Flow. From 1985 through 1997 flow measurements have generally varied between 0.01 and 0.06 cfs, with the average being 0.042 cfs. A high value of 0.19 cfs was recorded in June 1995. No long term trends in the data are apparent but seasonal variations do indicate flows increase during spring thaws.

pH. From 1991 through 1997 pH values have varied between a high of 8.2 and a low of 6.2, with the average being 7.3. No long term trends are apparent in the data.

TDS. From 1984 through 1997 TDS values have varied between a high of 314 and a low of 232 mg/l, with the average being 262 mg/l. No long term trends are apparent in the data.

Major Cations and Anions. Overall calcium and magnesium levels show higher, and bicarbonate shows lower since 1994. Although these variations are occurring, it is believed that they may be natural. Additional data will help verify this natural variation. Levels of other major cations and anions varied during the period of record but no general trends in the data are apparent.

438

Flow. From 1993 through 1997 summer and autumn flow measurements have generally varied between 0.01 and 0.002 cfs, but springtime flows have been as high as 0.04 cfs. No long term trends in the data are apparent but seasonal variations indicate flows increase during spring thaws.

pH. From 1993 through 1997 pH values have varied between a high of 8.0 and a low of 6.3, with the average being 7.5. No long term trends are apparent in the data.

TDS. From 1984 through 1997 TDS values have varied between a high of 350 and a low of 190 mg/l, with the average being 272 mg/l. No long term trends are apparent in the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record but no general trends in the data are apparent except for a possible decrease in bicarbonate since 1994.

486

Flow. Data has been available for this site since 1995. Over the period of record flows have varied between 0.001 and 0.15 cfs. The available 3 years of records show at this time that flows appear to be relatively stable with no long term trends. Seasonal variations indicate flows increase during spring thaws.

pH. pH measurements varied between 7.7 and 6.83, and have an average of 7.3. At this time there are no observable long term trends which have been identified.

TDS. TDS measurements varied between 300 and 370 mg/l since 1995 and have an average of 324 mg/l. No long term trends can be identified in the data set at this time.

Major Cations and Anions. No long term trends have at this time been clearly identified in the available data set.

A summary of the general trend for major water quality parameters for springs found within the North Horn Formation is provided in the following table. For major cations and anions there may be more than one category marked, indicating that there was variation found between parameters evaluated. The reader is referred to either the text or the graphs for further details when two or more categories are marked N/A in the table indicates insufficient data exists to make a determination of a potential trend.

Summary for North Horn Formation Springs

Station	Flow			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
S111		X			X	X		X		X	X	
232		X			X	X		X		X	X	X
424		X			X			X			X	
429		X			X			X		X	X	
444		X				?		X		X	X	
450		X			X			X			X	

Station	Flow			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
452		X			X			X			X	
518		X			X			X			X	
748		X			X			X		X	X	X
749		X			X			X		X	X	X
751			X		X	X		X			X	
753		X	X			?		X			X	
971		N/A			N/A			N/A			N/A	
978		X			X			X			X	
85261		X			X			X		X	X	X
438		X			X			X		X	X	
486		X			X			X			X	

CONCLUSIONS

Flows from springs are often high in the early part of the year, suggesting that flows increase due to the spring thaws. A number of the springs have shown increased flows in recent years which correlates with increased precipitation. Few clearly identifiable trends in pH or TDS levels could be identified. Some trends in levels of major cations and anions were noted but no area-wide and uniform trend is immediately evident.

MONITORING WELLS

The well monitoring program consisted of monitoring twelve wells; eight within the mine (P86-01-TD, P86-02-HD & P86-03-WD, P92-01-WD, P92- 02-WD, P92-03-WD, P92-04-WD, and P93-01-WD) and four located on the surface (86-26-6, 86-35-2-3, 92-10-1, & 85351). Well P-92-01-WD is a triple nested well with pipes labeled A, B and C, from shallowest to deepest respectively. Well P92-OlC-WD was monitored for quality and water depth, P92-OlA-WD and P92-OlB-WD were monitored for water depth only. The eight in-mine wells were completed below the coal seams, and are intended to identify and monitor the ground water level below the mining zone. The surface wells are located south of current mining operations on Gentry Ridge, in Tie Fork Canyon, and northwest of current mining. The locations of all of these wells can be found on Map 722.200a. Wells 86-35-2-3 are located in Tie Fork Canyon and consist of two artesian wells approximately 200 feet apart. Prior to 1988, the wells were sampled separately; however, due to accessibility problems, composite samples have been taken since 1988. Data and plots of the individual wells (86-35-2 and 86- 35-3) can be found in prior annual hydrology reports. Since mining started in the Gentry Ridge area in 1992, the composite data presented in this report is adequate to monitor mining impacts. There could have been no mining impacts to

86-35-2-3 prior to 1992 since mining was not initiated within its hydrologic zone until that time. Data prior to 1988 represent additional background data for historic flows and quality.

These stations have been sampled on a quarterly basis when accessible. Graphical time plots have been prepared for water surface elevation, pH, TDS, major cations and anions including calcium, magnesium, chloride, bicarbonate and sulfate. The data have been plotted to show flow and water quality variations as sequential time plots. The plots were used in our analyses of water surface elevation and water quality changes over time. Plots were prepared for TDS and flow from all available sampling from 1977 through 1997. Plots were prepared for the other indicated water quality parameters for sampling from 1991 through 1997. Complete data sets of information prior to 1991 can be found in previous annual reports. Water sampling data and the plots for each station are located in Appendix B.

Since it is likely that there is correlation between water surface elevation in the well and precipitation, plots were also prepared which compare recorded elevations to annual precipitation records for the local gaging station over the period of record. The National Weather Service rainfall gaging station closest to the Star Point mine area is located in Price which is about 12 miles north of the Star Point mine. Average annual precipitation for the Price station is 10.0 inches per year (1980 - 1997). Precipitation values recorded at the Price weather station have been plotted for comparison with recorded spring flows at each water sampling station. It must be remembered that although data from the Price station provides an overall indication of precipitation patterns they do not necessarily represent true local conditions.

A station by station summary of the 15 well stations that were sampled is given below. A discussion of any apparent data trends is included in the summary for each station.

In-Mine Wells

P8601TD

Elevation. From 1986 through 1991 the elevation of the water surface in the well was constant at approximately 8350 feet. From 1991 through 1997 an increasing trend has raised the water level to a high of 8394.7 feet as measured in October of 1997. There appears to be no correlation between precipitation and the elevation of the water surface in the well.

pH. Only one pH measurement, taken in September 1987, is recorded for this well. The pH was 7.6.

TDS. Only one TDS measurement, taken in September 1987, is recorded for this well. The TDS was 672 m~/l.

Major Cations and Anions. Only one sampling of major cations and anions is recorded for this well. The data is insufficient to identify any trends.

P8602HD

Elevation. From May 1986 through August 1987 the elevation of the water surface in the well varied between 8411 and 8413 feet. From October 1987 through April 1994 the water surface

ranged between 8402 and 8404 feet. Measurements taken since 1995 show a slight rebound in levels to approximately 8405 feet. Water levels have remained relatively constant since 1995.

Water Quality. This station monitors water level only.

P8603WD

Elevation. The water surface elevation in this well dropped steadily from 1986 through 1992 from a high of almost 8320 feet to a low of 8302 feet. In 1993 and 1994 the elevation rose to a high of 8308 feet and thereafter dropped to an approximate low of 8302 feet. Since the early 1990's the water level rose slightly, then continued on a downward trend until appearing to stabilize in 1997.

Water Quality. This station monitors water level only.

P9201AWD

Elevation. The water surface elevation in this well dropped from a high of 8324.3 feet in 1992 to a low of 8292.9 feet in October 1994, and has stabilized near 8295 feet through 1997. This well is part of a nested piezometer system together with station P9201BWD and P9201CWD. Only water level data has been collected on this station and station P9201BWD. Refer to station P9201CWD for water quality data at this site.

Water Quality. This station monitors water level only.

P9201BWD

Elevation. The water surface elevation in this well dropped from a high of 8325.4 feet in 1992 to around 8280 feet in 1994, and has stabilized near 8280 feet through 1997. Samples taken in October 1993 and October 1994 were lower at around 8250 feet. This well is part of a nested piezometer system together with station P9201AWD and P9201CWD. Only water level data has been collected on this station and station P9201AWD. Refer to station P9201CWD for water quality data at this site.

Water Quality. This station monitors water level only.

P9201CWD

Elevation. The water surface elevation in this well dropped from a high of 8306.3 feet in 1992 to 8197.5 feet in 1995. Since then water levels have rebounded to 8235 feet in 1997. The well appears to have rebounded following the termination of long wall mining in south Gentry Ridge. This well is part of a nested piezometer system together with station P9201AWD and P9201BWD. Only water level data has been collected on station P9201AWD and station P9201BWD. Refer to this station for water quality data at this site.

pH. From 1992 through 1995 pH has generally varied between 6.5 and 7.5, with the average being 7.2. No long term trends are apparent from the data.

TDS. From 1992 through 1997 TDS has varied between a high of 445 mg/l and a low of 398 mg/l with the average being 416 mg/l. The recorded data may indicate an increasing trend in TDS concentration, although a low TDS reading was taken in 1997 which rivals those two data points collected in 1994 and 1995.

Major Cations and Anions. Levels of major cations and anions varied during the period of record but no general trends can be distinctly identified in the data.

P9202WD

Elevation. The water surface elevation in this well dropped from a high of 8350.9 feet in 1992 to around 8225 feet in August 1995. Since then this well has experienced a slight rebound to the point that water levels at the end of 1997 were approximately 8270 feet. This well has experienced a slight rebound subsequent to termination of long wall mining in Gentry Ridge.

pH. From 1992 through 1995 pH has varied between 6.1 and 7.8, with the average being 7.0. The data indicates an increasing trend in pH.

TDS. From 1992 through 1997 TDS has varied between a low of 378 mg/l and a high of 430 mg/l with the average being 396 mg/l. Overall data indicate no long term trends in TDS concentration .

Major Cations and Anions. Concentrations of bicarbonate and sulphate may have experienced a slight decline since 1993 and 1994. Other major cations and anions varied during the period of record but no general trends can be distinctly identified in the data.

P9203WD

Elevation. The water surface elevation in this well has dropped steadily from 1992 through 1995 from a high of 8323.1 feet to a low of 8252.9 feet in May of 1996 when the well was abandoned.

Water Quality. This station monitors water level only.

P9204WD

Elevation. The water surface elevation in this well dropped steadily from 1992 through 1995 from a high of 8359.4 feet to a low of 8207 feet, but thereafter began a rebound to a level of 8241.7 feet in the fall of 1997.

Water Quality. This station monitors water level only.

P9301WD

Elevation. The water surface elevation in this well remained at 8338.7 feet from 1993 through 1994 and dropped to, and has remained at 8337.1 feet since 1995.

Water Quality. This station monitors water level only.

Surface Wells

86266

Elevation. The water surface elevation in this well dropped in 1994 from a high of 8128.5 feet to a low of 8093.8 feet. The water surface remained at this elevation until September 1995 when it rose to 8113.5 feet. Since then the water appears to have stabilized at 8202.4 feet.

Water Quality. This station monitors water level only.

863523

Flow. From 1988 through 1997 the average measured flow from this well was 0.17 cfs; the low was 0.023 cfs and the high 0.3 cfs. This well is actually a developed spring. A definite decreasing trend in flow from 1989 through June 1995 is evident from the data, with the exception of three measurements in the winter of 1993 and spring of 1994. The meter for these wells was moved during October 1993 by the Castle Valley Special Service District (CVSSD). It has come to our attention that the meter was improperly installed allowing a vacuum to build up inside the meter causing erroneous meter readings. According to Darrel Leamaster of the CVSSD, the meter was reworked and the flow in late May was 69 GPM or 0.154 cfs. This seems to indicate that the well flow continued to decline. Flow measurements reached a low in June 1995 but steadily increased since that time to a fall 1997 flow rate of 0.24 cfs. The data indicates little if any correlation between precipitation and flow, but does show the impact of mining within Gentry Ridge. Flows have completely recovered since termination of mine dewatering within the Gentry Ridge section of the mine.

pH. From 1991 through 1997 pH measurements have generally varied between 6 and 13. The four measurements taken in the first part of 1993 (recorded to be at or near 13 units) are believed to be anomalous readings and in error. No long term trends are apparent in the data.

TDS. From 1988 through 1997 TDS values have generally varied between 300 and 380 mg/l. However, four measurements taken in the first part of 1993 were much higher; between 580 and 680. As with pH, no long term trends are apparent in the data.

Major Cations and Anions. Bicarbonate levels dropped in 1995 below previous levels but no long term trend is expected. Levels of other major cations and anions varied during the period of record but no general trends in the data are apparent.

92101

Elevation. The water surface elevation in this well has remained constant at 8571.5 from 1994 through 1997.

Water Quality. This station monitors water level only.

Flow. Only data since 1995 is available for this station. Flow measurements varied from a high of 0.86 cfs in June to a low of 0.007 cfs in August of 1995. Although limited data is available at this time, no long term trends appear to be present in the data set.

pH. pH measurements varied from a low of 6.86 to a high of 7.85 through 1997. pH may have increased since 1995 but additional data is needed to confirm any long term trend.

TDS. TDS measurements varied from a high of 450 mg/l to a low of 330 mg/l through 1997. Although there is not enough data available to verify a long term trend, the three years of available data seem to indicate an increasing trend my exist.

Major Cations and Anions. Some parameters showed possible increases while others showed stability or a slight decline. However, there is not enough data available to identify long term trends.

A summary of the general trend for major water quality parameters for wells is provided in the following table. For major cations and anions there may be more than one category marked, indicating that there was variation found between parameters evaluated. The reader is referred to either the text or the graphs for further details when two or more categories are marked. N/A in the table indicates insufficient data exists to make a determination of a potential trend. The majority of the wells monitor water level only, and therefore no water quality data is available.

Summary for Wells

Station	Level			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
P8601TD			X		N/A			N/A			N/A	
P8602HD		X		Level Only								
P8603WD	X	X		Level Only								
P9201AWD		X		Level Only								
P9201BWD		X		Level Only								
P9201CWD		X		Level Only								
P9202WD			X		X			X		X	X	
P9203WD	X			Level Only								
P9204WD			X	Level Only								
P9301WD		X		Level Only								

Station	Level			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
86266		X	X	Level Only								
863523			X*		X			X			X	
92101		X		Level Only								
85351		X			X			X			X	

* Water Level for this well indicates "Flow

CONCLUSIONS

A large increase in flow in 1988 at station 863523 was previously recorded and documented in prior annual reports. As indicated in those reports, the change in flow followed closely after a series of earthquakes in August. These earthquakes were recorded by the University of Utah Seismology Department as follows: August 14, 1 :07 PM, magnitude 3.8; August 14, 2:03 PM, magnitude 5.3; August 15, 8:50 AM, magnitude 3.0; and August 18, 6:57 AM, magnitude 4.4. The epicenters of all of these earthquakes were in approximately the same location, approximately 15 miles east of Ferron, Utah, approximately 29 miles southeast of wells 86-35-2-3. The 5.3 and 4.4 magnitude quakes were felt by residents in northern Emery county north of well 86-35-2-3. In addition, there were many smaller magnitude earthquakes during this same time period. It appears that the quakes may have loosened up or opened up the fractures and faults that are documented to be the source of water for these wells. As a result, the large increase in flow noted historically may have been caused by the loosening or opening up of the fractures or faults allowing more water to be discharged.

Until mining ceased in 1995, water was pumped to a location near well P86-01-TD. Data plots show increasing levels at P86-01-TD and P86-02-HD since mid 1993. It is possible that this discharged water has been charging the system in the general area and causing the water level in these wells to rise. These wells are located in the older mining areas. The water level in well P86-03-WD has gone up and down over the past few years. Since the area of well P86-03-WD is at the south end of longwall panels 1 through 7, it is possible that mining has impacted the water level in this location, however, there are extensive mine workings immediately south of this location in the US Fuel mining area. The impacts of mining by US Fuel for many years in the area makes it difficult to firmly estimate any impact by CPMC. It is also a possibility that the water level in this well could have reacted to the prolonged drought.

Monitoring wells P92-OlA-WD, P92-OlB-WD, P92-OlC-WD, P92-02-WD, P92-03-WD, and P92-04-WD were placed in early 1992 in the current longwall mining area. The water levels in wells P92-OlA-WD, P92-OlB-WD, and P92-03-WD have exhibited a marked drop in elevation since their placement through mid 1995. Wells P92-OlC-WD, P92-02-WD, and P92-04-WD experienced a short term decline followed by a rebound. All wells completed in the Blackhawk Formation below the seam being mined, (P92-OlA-WD, P92- 01B-WD, and P92-03-WD), have dropped a net average of 45 feet through 1997, while the wells completed in the Spring Canyon Sandstone (P92-OlC-WD, P92-02- WD, and P92-04-WD) have dropped a net average of 80 feet.

As indicated, mining operations within the Gentry Ridge have now been completed and ground water is no longer being pumped out of the area. Water surface elevation graphs for some wells in the vicinity show a decrease in water elevation and/or flows during the mining and pumping operations, followed by a stabilization of the water level and or flow data. With the cessation of mining, natural recharge has been re-established wherein the water has returned to its natural southerly drainage course. Well data indicate that water levels and flow rates are beginning to rise again since longwall mining has ceased in the south Gentry Ridge area.

SURFACE WATER MONITORING

There are twelve surface water monitoring locations. Mine surface facilities are located in Sage Brush Canyon, a tributary to Serviceberry Canyon, both of which are ephemeral drainages. Monitoring station 101 is located directly downstream from the facilities. Station 51 is located in Mud Water Creek below the mine discharge point. No water has been discharged from the mine at this location since 1987. The remaining surface water monitoring stations are located on streams which drain areas over and around mine workings. The locations of these monitoring stations are found on Map 722.200a.

These stations have been sampled on a quarterly basis when accessible. Graphical time plots have been prepared for flow, pH, TDS, oil and grease, major cations and anions including calcium, magnesium, chloride, bicarbonate and sulfate. The data have been plotted to show flow and water quality variations as sequential time plots. The plots were used in our analyses of flow and water quality changes over time. Plots were prepared for TDS and flow from all available sampling from 1977 through 1997. Plots were prepared for the other indicated water quality parameters for sampling from 1991 through 1997. Complete data sets of information prior to 1991 can be found in previous annual reports. Water sampling data and the plots for each station are located in Appendix C

Since it is likely that there is correlation between stream flows and precipitation, plots were also prepared which compare recorded flows to annual precipitation records for a local gaging station over the period of record. The National Weather Service rainfall gaging station closest to the Star Point mine area is located in Price which is about 12 miles northeast of the Star Point mine. Average annual precipitation for the Price station is 10.0 inches per year (1980-1997). Precipitation values recorded at the Price weather station have been plotted for comparison with recorded spring flows at each water sampling station. It must be remembered that although data from the Price station provides an overall indication of precipitation patterns they do not necessarily represent true local conditions.

A station by station summary of the 12 surface water stations that were sampled is given below. A discussion of any apparent data trends is included in the summary for each station.

SAGE BRUSH CANYON

101

Flow. From 1980 through 1995 the measured flow at this station has varied from 0.0 to a maximum of 0.3 cfs. The data indicates some correlation with precipitation data in that, during the wetter years of 1980 through 1987, and again after 1993, measured flows were higher. The

drier years between 1988 and 1992 showed lower overall flow values. No long term trends are apparent in the data.

pH. From 1991 through 1997, the measured pH varied from 8.4 to 9.2, with the exception of one measurement taken in June 1993 when the pH was 15.6. The 15.6 value is believed to be in error. No long term trends are apparent in the data.

TDS. TDS levels have generally varied from approximately 700 to 3,500 mg/l, with the average being 2,228 mg/l. One very high value was recorded at 5,824 mg/l in June 1993. No long term trends are apparent in the data.

Oil and Grease. Data on oil and grease exists for five samples since 1995. No long term trends are apparent in the data.

Major Cations and Anions. Levels of major cations and anions varied during the period of record but no general trends in the data are apparent, except for a possible decline in bicarbonate.

MUD WATER CREEK

There are two sampling locations in Mud Water Canyon, one is at the Mud Water discharge from the underground workings. Mud Water discharge is also designated as Station 001, NPDES Permit UT-0023736. There has been no flow from the discharge point since 1987. The other location is Mud Water Creek which was sampled in 1992 at station 51.

51

Flow. From 1981 through 1997 the measured flow at this station has generally varied between 0.0 and 0.2 cfs. Springtime flows however are recorded as high as 0.89 cfs. A careful review of the data seems to indicate a correlation between flow and precipitation as well as annual snowmelt runoff. No long term trends are apparent in the data.

pH. From 1991 through 1997, the measured pH varied from 7.8 to 9.0, with the exception of one measurement taken in June 1993 when the pH was 15.6 (believed to be in error). No long term trends are apparent in the data.

TDS. TDS levels have generally varied from approximately 500 to 2,000 mg/l, with the average being 1,481 mg/l. One very high value was recorded at 4,531 mg/l in April 1993. No long term trends are apparent in the data.

Oil and Grease. Data on oil and grease exists for six samples taken since 1995. None of the samples show any detectable quantities of oil and grease.

Major Cations and Anions. Levels of major cations and anions have been fairly constant during the period of record and no general trends in the data are apparent.

CORNER CANYON

361

Flow. From 1980 through 1997 the measured flow at this station has generally varied between 0.0 and 0.5 cfs. Springtime flows however are recorded as high as 3 cfs. Higher flows during the wet years from 1980 through 1987 and lower flows during the dry years of 1988 through 1991 indicate a correlation between flow and precipitation, although flows have remained low since 1988 even though precipitation increased from 1992 through 1994. This station has observed relatively constant flows since 1988. It is noted however that the decline in flow noted subsequent to 1987 may be the result of mining activities.

pH. From 1991 through 1997, the measured pH varied from a low of 6.3 to a high of 13.2, the average being 8.6. No long term trends are apparent in the data.

TDS. TDS levels have generally varied from approximately 400 to 800 mg/l, with the average being 591 mg/l. One high value was recorded at 1,400 mg/l in July 1981. TDS levels appear to have remained fairly constant throughout the period of record.

Oil and Grease. Data on oil and grease exists for limited samples taken since 1995. No long term trend is apparent in the data sets collected.

Major Cations and Anions. From 1991 through 1997 a slightly increasing trend in major cations and anions is evident except in bicarbonate levels. Future measurements will help clarify whether there is a significant trend for these parameters.

TIE FORK CANYON

341

Flow. From 1980 through 1997 the measured flow at this station has generally varied between 0.0 and 2 cfs. Springtime flows however are recorded as high as 8.4 cfs. Seasonal variations indicate flows increase during spring thaws.

pH. From 1991 through 1997, the measured pH has generally varied between 7 and 10, with the exception of one measurement taken in June 1993 when the pH was 14. The average level using all available data is 8.5. No long term trends are apparent in the data.

TDS. TDS levels have generally varied from approximately 200 to 320 mg/l, with the average being 273 mg/l. One very high value was recorded at 540 mg/l in June 1981. No long term trends are apparent in the data.

Oil and Grease. Data on oil and grease exists in selected samples taken since 1995. No long term trends are apparent in the data.

Major Cations and Anions. Levels of major cations and anions have varied during the period of record but no general trends in the data are apparent.

Flow. From 1980 through 1997 the measured flow at this station has generally varied between 0.0 and 2 cfs. Springtime flows however are recorded as high as 12.7 cfs. Seasonal variations indicate flows increase during spring thaws. No long term trends are apparent in the data.

pH. From 1991 through 1997, the measured pH has generally varied between 7 and 10, with the exception of one measurement taken in June 1993 when the pH was 14.1. The average was 8.5. No long term trends are apparent in the data.

TDS. TDS levels have generally varied from approximately 200 to 400 mg/l, with the average being 301 mg/l. High values were recorded at 760 mg/l and 586 mg/l in December 1980 and June 1981 respectively. No long term trends are apparent in the data.

Oil and Grease. Data on oil and grease exists for samples taken since 1995. No long term trends are apparent in the data.

Major Cations and Anions. Levels of major cations and anions have varied during the period of record but no general trends in the data are clearly apparent.

NORTH FORK RIGHT FORK MILLER CREEK

The North Fork Right Fork Miller Creek (NFRF) is a perennial stream above mining in Section 18, Township 12 South, Range 8 East, Salt Lake Base and Meridian. Mining has been conducted in two coal seams beneath the stream area, the Wattis Seam and the Third Seam. Monitoring of the NFRF has been conducted since before mining began according to the approved permit. Longwall mining began in the area in 1988 in the Wattis Seam and continued into the second quarter of 1990. In 1991 mining in the Third Seam was conducted, and lasted until approximately the fourth quarter.

This analysis presents data and reaches conclusions regarding flow, pH, and conductivity of waters in the NFRF drainage in the mining and possibly affected zone. Monitoring stations were established starting above the mining zone and extending down the stream channel to the confluence of the NFRF, and the South Fork Right Fork Miller Creek, which is below the mining zone. Monitoring station ST-1 was established by U.S. Fuels Co. many years ago prior to CPMC mining, and has been used by CPMC during NFRF monitoring. Station ST-1 is the same as station M15 in the CPMC monitoring program; both designations have been used in past reports.

Monitoring station M8 was established to provide data at the eastern edge of the mining zone. A permanent V-notch weir was established at this location. Station ST-1 (M15) is a rectangular weir; flows at all other monitoring locations have been measured with a portable V-notch weir or a bucket and stopwatch. Field measurements include flow, pH, temperature, and conductivity. Water quality samples were taken at the regular approved permit schedule at the stations listed in the Star Point Mine Mining and Reclamation permit.

Graphical plots have been prepared for flow, and precipitation; data have been plotted to show flow variations over time. Total annual precipitation has been plotted on the flow plots since it is possible that precipitation correlates with ground water flows. Total yearly precipitation has been used since the plots used in the past were not made on scaled time basis. The National Weather Service rainfall gaging station closest to the Star Point Mine area is located in Price which is about 12 miles northeast of the mine. Average annual precipitation for the Price station is 10.0 inches per year (1980-1997). Precipitation values recorded at the Price station have been plotted for comparison with recorded NFRF flows at each station. It must be remembered that although data from the Price station provide an overall indication of precipitation patterns, they do not necessarily represent true local conditions.

The analysis presented here only considered flow, pH, and conductivity as has been done in the past. The main monitoring stations will be included in this analysis. Each monitoring station will be addressed starting at spring 491 which is the beginning of the NFRF, and continuing down the drainage to stations, 492, M1, 493, 494, M2, M4, M3, Below M3, M8, M7, M10, M9, M12, M11, M14, M13, 495, M15 (ST1) and ST2. The channel is ephemeral above spring 491.

491

Flow. Spring 491 is in the NFRF drainage bottom north of the mining zone, and is the beginning of the perennial stream. From 1986 through 1997 the average measured flow was 3.48 gpm; the high was 8.0 gpm and the low was 1.0 gpm. Mining was conducted in the area south of the spring from 1988 through about the fourth quarter of 1991. The data seem to indicate there may be more variation over the 1991 through 1997 period, however, the record does not include many years of data prior to 1988 to make a strong conclusion regarding possible mining impacts. The general flow does not appear to have been impacted by mining. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 6 exhibited this trend, and 3 had increasing flows.

pH. From 1986 through 1997 the average measured pH was 7.62; the high was 8.4 and the low was 6.33. Other than two relatively low pH levels in 1993, the pH level appears to be stable.

Conductivity. The average conductivity concentration for the period of record is 339 μMHOS/CM with a high of 460 and a low of 151. Most values lie between 200 and 400 μMHOS/CM; one value in 1995 was lower than expected at 151. No increasing trend is evident in the data.

492

Data and discussion related to this station are provided the section entitled " Castlegate Formation Springs".

M1

Flow. This station is located in the channel just below spring 491 where the perennial flow begins. From 1986 through 1997 the average measured flow was 8.64 gpm; the high was 15.0 gpm and the low was 2.20 gpm. Mining was conducted in the area of the spring from 1988 through about the fourth quarter of 1991. There may be a correlation with precipitation, however, a long term flow record is not available to make any strong conclusions. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 6 exhibited this trend, and 2 had increasing flows, and 1 had nearly even flows. The flow during the mining time period was slightly higher than is has been since mining, and it appears there is a slight downward trend.

pH. From 1986 through 1997 the average measured pH was 7.96; the high was 8.6 and the low was 6.5. Other than one relatively low pH levels in 1993 at 6.5, the pH level does not exhibit a strong trend up or down.

Conductivity. The average conductivity concentration for the period of record is 367 μMHOS/CM with a high of 444 and a low of 235. Conductivity levels are somewhat higher than prior to mining in the area, however, there is a limited data record prior to mining, and strong conclusions about a long term trend is not possible.

493

Flow. This spring issues from the north face of the drainage at the northern edge of the mining zone. From 1986 through 1997 the average measured flow was 0.26 gpm; the high was 2.0 gpm and the low was 0 gpm. Mining was conducted in the area of the spring from 1988 through about the fourth quarter of 1991. The flow has been 0 since mining ended in the area and may have been impacted by mining. It is unusual for the flow to naturally disappear as has been the case here.

pH. From 1986 through 1990 the average measured pH was 7.97; the high was 8.7 and the low was 6.6. Limited data are available to reach conclusions about pH levels.

Conductivity. The average conductivity concentration for the period of record is 337 μMHOS/CM with a high of 450 and a low of 205. Limited data are available to reach conclusions about conductivity levels.

494

Data and discussion related to this station are provided the section entitled " Castlegate Formation Springs".

M2

Flow. This station is in the drainage in the northern area of the mining zone. From 1986 through 1997 the average measured flow was 11.86 gpm; the high was 30.5 gpm and the low was 3.7 gpm. Mining was conducted in the area of the spring from 1988 through about the fourth quarter of 1991. The flow appears to have been lower during 1991 through 1994 after mining but, is near the levels prior to and during mining. The flow may show some correlation to precipitation. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 7 exhibited this trend, and 2 had increasing flows. If mining caused the decreased flows during 1991 through 1994, the recharge area may be recovering as indicated by the flows in 1995 through 1997.

pH. From 1986 through 1997 the average measured pH was 8.09; the high was 8.8 and the low was 6.9. There does not appear to be a trend in pH levels.

Conductivity. The average conductivity concentration for the period of record is 377 μMHOS/CM with a high of 495 and a low of 250. There is no apparent trend in conductivity levels.

M4

Flow. This station is in the drainage near the center of the mining zone. From 1986 through 1997 the average measured flow was 4.24 gpm; the high was 21.0 gpm and the low was 0 gpm. Mining was conducted beneath this monitoring station from 1988 through about the fourth quarter of 1991. The flow has been very low since mining ended in the area and may have been impacted by mining. There has been flow measured two times since 1990, once each in July of 1995 and July of 1996.

pH. From 1986 through 1997 the average measured pH was 8.36; the high was 9.2 and the low was 7.4. The pH levels have been consistent over the period of record.

Conductivity. The average conductivity concentration for the period of record is 361 μMHOS/CM with a high of 440 and a low of 262. Conductivity levels have fluctuated somewhat, however, the level does not appear to be increasing.

M3

Flow. This station is in a small side canyon draining into the NFRF from the southwest. The drainage is near the center of the mining zone. From 1986 through 1997 the average measured flow was 7.87 gpm; the high was 77.0 gpm and the low was 0 gpm. Mining was conducted beneath this monitoring station from 1988 through about the fourth quarter of 1991. The flow has been low since mining ended in the area but seems to be increasing. Flows in 1997 were as high or higher than prior to mining.

pH. From 1986 through 1990 the average measured pH was 7.83; the high was 9.1 and the low was 6.2. Two low levels were experienced in 1993 just above 6, however, the level has returned back to above 7.5.

Conductivity. The average conductivity concentration from between 1987 and 1990, prior to and during mining was 612. Since mining ended, the concentration has risen to an average of 1131 μMHOS/CM. The long term average was 823 μMHOS/CM with a high of 1340, and a low of 265. Mining impacts to conductivity are possible if ground water is intercepted in newly fractured strata where it can pick up additional dissolved constituents, and then return to the channel at lower elevations.

Below M3

Flow. This station is in the NFRF draining approximately 50 feet below M3 and approximately 80 feet below station M4. Flow was measured at this station in July 1993 but had not been present in 1992. The plot for this station shows flow in 1986 through September 1991, however, since this station was added in 1993 the flows at stations M4 and M3 were added together to obtain an estimate of flow prior to 1993 to use for comparison purposes. Since stations M3 and M4 are very close, it is felt that these data give a reasonable approximation of flows for comparison. The station is near the center of the mining zone. From 1986 through 1992 the average estimated flow was 14.8 gpm; the high was 37.0 gpm and the low was 0 gpm. Since 1993 the average measured flow was 22.19 gpm; the high was 40 gpm and the low was 8 gpm. Mining was conducted beneath this monitoring station from 1988 through about the fourth quarter of 1991. The average flow has been higher since mining ended than prior to and during mining. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 4 exhibited this trend, and 1 had increasing flows, and 1 had nearly even flows.

pH. From 1986 through 1992 the average estimated pH was 8.4; the high was 9.2 and the low was 7.45. Since 1993 the average measured pH was 7.28; the high was 8.37 and the low was 6.01. The pH level appears to be relatively stable.

Conductivity. The average estimated conductivity concentration from between 1986 and 1992, prior to and during mining was 38; with a high of 810 and a low of 264.5. Since 1992, after mining ended, the concentration has risen to an average of 2103 μMHOS/CM with a high of 2350, and a low of 1355. Mining impacts to conductivity are possible if ground water is intercepted in newly fractured strata where it can pick up additional dissolved constituents, and then return to the channel at lower elevations.

M8

Flow. This station is in the NFRF below the mining zone. From 1986 through July 1991 the flow was higher than it has been since mining was conducted in the area. As indicated by the plot the average flow from 1986 through July 1991 was 25.4 gpm; with a high of 62 gpm and a low of 3.7. Since July 1991 the average flow was 12.9 gpm; with a high of 71.4 and a low of 0.9 gpm.

For the period between July 1991 and July 1994 the flow was very low but, has been higher since. The flow during this period appears to be lower than expected when compared to the annual precipitation. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 6 exhibited this trend, and 2 had increasing flows, and 1 had nearly even flows.

pH. From 1991 through 1997, the measured pH has generally varied between 7 and 10, with the exception of one measurement taken in June 1993 when the pH was 13.9. The average was 8.4. No long term trends are apparent in the data.

TDS. TDS levels followed an increasing trend from 1988 through 1990, after which they appear to have stabilized. The maximum TDS concentration measured in 1993 was 2,972 mg/l, but this value is thought to be anomalous. TDS values are typically less than, 1700 mg/l. The increase in TDS levels is noted to have begun following initiation of local mining and is believed to possibly be mining related.

Oil and Grease. Data on oil and grease exists for samples taken since 1995. No long term trends are apparent in the data.

Major Cations and Anions. Calcium levels have been increasing since 1993. Other cations and anions appear to have remained relatively constant. Other than a possible increase in calcium, no general long term trends are at this time apparent in the data.

M7

Flow. This station is a large side canyon draining into the NFRF from the north at the eastern edge of the mining zone. From 1986 through July 1991, before and during mining the flow was higher than it has been since mining ended. The average measured flow was 4.4 gpm; with a high of 8.6 gpm and a low of 0.5 gpm. Since July 1991 the average measured flow was 2.62 gpm; with a high of 4.48 gpm and a low of 1 gpm. The flow during this period appears to be lower than expected when compared to the annual precipitation. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 6 exhibited this trend, and 1 had increasing flows, and 2 had nearly even flows.

pH. From 1986 through 1997 the average measured pH was 8.24; the high was 9.30 and the low was 7.18. The pH levels appears to be relatively stable with no increasing or decreasing trend, and are similar to the levels before mining.

Conductivity. The average measured conductivity concentration from between 1986 and September 1988, prior to mining was 606; with a high of 695 and a low of 530. Since 1988, and after mining started, the concentration has risen to an average of 1327 μMHOS/CM with a high of 1922, and a low of 1030. The higher conductivity levels started when mining was being conducted immediately to the west of the drainage which flows to station M7.

M10

Flow. This station is in the NFRF below the mining zone approximately 450 below station M8. The flow has shown a very similar trend as exhibited by station M8, and since it lies immediately down canyon from M8 this is to be expected. The flow is a combination of the flow at stations M8 and M7 so the flow is higher. The flow during the period after about 1992 appears to be lower than expected when compared to the annual precipitation. For the period between July 1991 and July 1994 the flow was very low but, has been higher since. Like station M8, during the period between July 1991 and July 1994 the flow was very low but, has been higher since. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 5 exhibited this trend, and 1 had increasing flows, and 3 had nearly even flows.

pH. From 1986 through 1997 the average measured pH was 8.19; the high was 9.4 and the low was 6.98. The pH level appears to be relatively stable with no increasing or decreasing trend, and is similar to the levels before mining.

Conductivity. The average measured conductivity concentration from between 1986 and 1988, prior to mining was 504; with a high of 600 and a low of 398. Since 1988, and after mining started, the concentration has risen to an average of 1596 μMHOS/CM with a high of 1970, and a low of 1025. The higher conductivity levels upstream appear to be impacting the level at station M10.

M9

Flow. This spring issues from the north face of the drainage below the mining zone. From 1986 through 1997 the average measured flow was 1.94 gpm; the high was 6.0 gpm and the low was 0 gpm. Mining was conducted in the area up canyon from the spring from 1988 through about the fourth quarter of 1991. The flow appears to have been higher during the period 1986 through about 1993 during and after mining. Since 1993 the flow has been considerably lower and lower than expected when compared to the annual precipitation levels. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 4 exhibited this trend, and 1 had increasing flows, and 2 had nearly even flows. It is interesting to note that during, prior to, and after mining until 1994 the flows during each year exhibited lower flows later in the summers, however, after 1994 when there was no recorded flow 2 years exhibited even flows and 1 year exhibited and increase in flow later in the summer.

pH. From 1986 through 1997 the average measured pH was 7.97; the high was 8.8 and the low was 6.8. There does not appear to be a trend in pH levels.

Conductivity. Conductivity levels from this site have always been high. There is a very large deposit of minerals at the ground surface where the spring issues forth indicating a high concentration dissolved minerals. The average conductivity concentration for the period of record

was 1953 μMHOS/CM with a high of 2280 and a low of 1250. There is no apparent trend in conductivity levels.

M12

Flow. This station is in the NFRF below the mining zone approximately 1600 feet below station M8. The flow has been very consistent over the period of record. The average measured flow has been 28.97 gpm; with a high of 130.2 gpm and a low of 4.93 gpm. The flow fluctuations up canyon appear to be masked by the time the flow reaches this station. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 7 exhibited this trend, and 1 had increasing flows, and 2 had nearly even flows.

pH. From 1986 through 1997 the average measured pH was 8.34; the high was 9.1 and the low was 7.28. The pH level appears to be relatively stable with no increasing or decreasing trend, and is similar to the levels before mining.

Conductivity. The average measured conductivity concentration from between 1986 and 1988, prior to mining was 614; with a high of 680 and a low of 550. Since 1988, and after mining started, the concentration has risen to an average of 1711 μMHOS/CM with a high of 2090, and a low of 1135. The higher conductivity levels upstream appear to be impacting the levels at station M12.

M11

Flow. This station is a small canyon draining into the NFRF from the west, below the mining zone. From 1986 through September 1993, before, during, and after mining there was only one measured flow from this drainage. The average measured flow for the period of record was 9.75 gpm; with a high of 70 gpm and a low of 0 gpm. Since July 1994 the drainage has flowed, but is exhibiting a steady downward trend in flow. The flow may have come from water discharged into the old works during the period of time mining was conducted on the west side of the graben. During this time period, CPMC pumped water from the west side of the graben and discharged it into the old mine works up canyon from station M11. Since the dip of the strata is to the south and slightly to the east, the low end of the system is in the area south of the NFRF. The lowering flow indicated by the data at this station may be indicative of the fact that discharges into the old works ceased in about 1995, and the system is returning to equilibrium.

pH. From 1986 through 1997 the average measured pH was 8.17; the high was 8.23 and the low was 8.0 The pH level appears to be relatively stable with no increasing or decreasing trend.

Conductivity. The average measured conductivity concentration from between 1986 and 1997 was 2764; with a high of 3370 and a low of 1600 which occurred prior to mining in 1986. Since 1994 when the flow increased dramatically the concentration has been consistently above 2400 μMHOS/CM.

M14

Flow. This station is in the NFRF below the mining zone approximately 2800 feet below station M8. The flow was consistent during mining but decreased in 1992 and 1993. Since 1993 the flows have been as high as during mining. The average measured flow has been 31.87 gpm; with a high of 145.9 gpm and a low of 3 gpm. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 5 exhibited this trend, and3 had increasing flows. The flow fluctuations up canyon appear to be masked by the time the flow reaches this station.

pH. From 1986 through 1997 the average measured pH was 8.20; the high was 8.8 and the low was 6.99. The pH level appears to be relatively stable with no increasing or decreasing trend, and is similar to the levels before mining.

Conductivity. The average measured conductivity concentration from between 1986 and 1987, prior to mining was 606; with a high of 620 and a low of 592. Since 1987, and after mining started, the concentration has risen to an average of 1817 μMHOS/CM with a high of 2430, and a low of 1435. The higher conductivity levels upstream appear to be impacting the level at station M14.

M13

Flow. This station is a side canyon draining into the NFRF from the northeast below the mining zone approximately 2900 feet below station M8. There have been only three flows recorded over the period of record, and they have been very low. The average measured flow has been 0.33 gpm; with a high of 2.0 gpm and a low of 0 gpm. This drainage appears to only flow in response to higher precipitation events. It is highly unlikely that mining could have impacted the flow from this drainage.

pH. From 1986 through 1997 the average measured pH was 8.34; the high was 8.5 and the low was 8.0. There are only three data points and thus no trend can be observed. It is highly unlikely that mining could have impacted the water quality from this drainage.

Conductivity. The average measured conductivity concentration for the period of record was 1180; with a high of 1473 and a low of 920. There are only three data points and thus no trend can be observed. It is highly unlikely that mining could have impacted the water quality from this drainage.

495

Flow. This spring issues from the north face of the drainage near the confluence of the NFRF and the South Fork Right Fork of Miller Creek approximately 1.4 miles below the mining zone. From 1986 through 1997 the average measured flow was 0.45 gpm; the high was 2.0 gpm and the low was 0 gpm. It is highly unlikely that mining has impacted the flow from this spring, and it is included in the monitoring to give a comparison with springs issuing higher in the NFRF. There

appears to be a long term decline in flow, even though precipitation has increased over the past five years. The flow seems generally to react to snow melt; the flow was higher at the July monitoring session, and decreased later in the summer. Where there were two monitoring sessions during a given year, 5 exhibited this trend, and 1 had increasing flows, and 1 had nearly even flows.

pH. From 1986 through 1997 the average measured pH was 7.73; the high was 8.4 and the low was 6.67. There does not appear to be a trend in pH levels. It is highly unlikely that mining could have impacted the water quality from this spring.

Conductivity. The average conductivity concentration for the period of record is 2183 μMHOS/CM with a high of 2730 and a low of 1397. There is no apparent trend in conductivity levels. It is highly unlikely that mining could have impacted the water quality from this spring.

M15 (ST-1)

Flow. From 1980 through 1997 the measured flow at this station has generally varied between 0.0 and 0.5 cfs and an average of 0.15 cfs. Springtime flows however are recorded as high as 2 cfs. A visual review of the precipitation versus flow plot indicates that there may be a direct correlation between precipitation and runoff. As can be seen in the plot, flows decreased, then again increased following a response to the drought noted during the late 1980's and early 1990's, or possibly from mining beneath Miller Creek. Regardless of the cause, flows appear to have stabilized in the recent past to approximate pre-mining conditions. Seasonal variations indicate flows also increase in response to spring thaws. No current general long term trends resulting from mining are evident in the available data.

pH. From 1991 through 1997, the measured pH has generally varied between 6.5 and 8.5, with the exception of one measurement taken in June 1993 when the pH was 13.7. The average pH is recorded to be 8.1. No long term trends are apparent in the data.

TDS. TDS levels have varied considerably from a pre-mining low of 240 mg/l in 1988 to a high of 2,884 mg/l in 1993. TDS levels appear to have followed an increasing trend from 1988 through 1994, followed by a decrease and stabilization to levels characteristic of the 1980's. The TDS level may be somewhat higher due to subsidence increasing the ground water contact with freshly broken rock.

Oil and Grease. Data on oil and grease exists for samples taken since 1995. No long term trends are apparent in the data.

Major Cations and Anions. No long term trends are apparent in the data.

ST2

Flow. From 1981 through 1997 the measured flow at this station has generally varied between 0.0 and 0.5 cfs. Springtime flows however are recorded as high as 3.5 cfs. Seasonal variations indicate flows increase during spring thaws. No long term trends are apparent in the data.

pH. From 1991 through 1997, the measured pH has generally varied between 6.5 and 10, with the exception of one measurement taken in June 1993 when the pH was 14.7. The average was 8.3. No long term trends are apparent in the data.

TDS. TDS levels have varied considerably from a low of 241 mg/l to a high of 1,320 mg/l. Sporadic higher levels were reported since 1993, however many of the data points still plot in the range of historic data. No long term trends are apparent in the data.

Oil and Grease. Data on oil and grease exists for samples taken since 1995. No long term trends are apparent in the data.

Major Cations and Anions. No long term trends are apparent in the data.

87101CV

Flow. From 1993 through 1997 the measured flow at this station has generally varied between 0.0 and 0.05 cfs. Springtime flows however are recorded as high as 0.2 cfs. Although one sample was taken in 1987, no data exists for the years 1988 through 1992. Flows recorded since 1995 show that flows have begun a slight upward trend. Seasonal variations indicate flows increase during spring thaws.

pH. Typical pH values at this station are between 8.5 and 9. However, a value of 14.8 was recorded in June 1993. No long term trends are apparent in the data.

TDS. TDS levels have varied between 190 and 432 mg/l, the average being 306 mg/l. No long term trends are apparent in the data.

Oil and Grease. Data on oil and grease exists for samples taken since 1995. No long term trends are apparent in the data.

Major Cations and Anions. Levels of Major cations and anions have varied over the period of record but no general trends are apparent.

87102CV

Flow. From 1993 through 1997 the measured flow at this station has generally varied between 0.0 and 3 cfs. Springtime flows however are recorded as high as 8.7 cfs. No long term trends are apparent in the data. Seasonal variations indicate flows increase during spring thaws.

pH. From 1993 through 1997 pH measurements have varied between 6.9 and 9.3, the average being 8.3. Although 1993 levels were lower than post 1994 levels, data since 1994 show a leveling of data. No long term trends since 1993 are apparent in the data.

TDS. TDS levels have varied between 90 and 220 mg/l, the average being 148 mg/l. No long term trends are apparent in the data.

Oil and Grease. Data on oil and grease exists for samples taken since 1995. No long term trends are apparent in the data.

Major Cations and Anions. Levels of Major cations and anions have varied over the period of record but no long term trends are apparent in the data.

87103CV

Flow. From 1993 through 1997 the measured flow at this station has generally varied between 0.0 and 3 cfs. Springtime flows however are recorded as high as 8.9 cfs. Base flows were been reported an increasing trend since 1995. Seasonal variations indicate flows increase during spring thaws.

pH. From 1993 through 1997 pH measurements have varied between 6.9 and 9.3, the average being 8.3. Although 1993 levels were lower than post 1994 levels, the post 1994 values show a leveling of data. No long term trends are apparent in the data since 1993.

TDS. TDS levels have varied between 93 and 230 mg/l, the average being 159 mg/l. No long term trends are apparent in the data.

Oil and Grease. Data on oil and grease exists for samples taken since 1995. No long term trends are apparent in the data.

Major Cations and Anions. Levels of Major cations and anions have varied over the period of record but no long term trends are apparent in the data.

93341CV

Flow. From 1993 through 1997 the measured flow at this station has generally varied between 0.0 and 2 cfs. Springtime flows however are recorded as high as 4 cfs. Seasonal variations indicate flows increase during spring thaws. No long term trends are apparent in the data.

pH. From 1993 through 1997 pH measurements have varied between 6.9 and 9.0, the average being 8.2. Although 1993 levels were lower than post 1994 levels, the post 1994 values show a leveling of data. No long term trends are apparent in the data.

TDS. TDS levels have varied between 75 and 190 mg/l, the average being 135 mg/l. No long term trends are apparent in the data.

Oil and Grease. Data on oil and grease exists for samples taken since 1995. No long term trends are apparent in the data.

Major Cations and Anions. Levels of Major cations and anions have varied over the period of record but no long term trends are apparent in the data.

A summary of the general trend for Major water quality parameters for surface water is provided in the following table. For major cations and anions there may be more than one category marked, indicating that there was variation found between parameters evaluated.

Summary for Surface Water in Routine Monitoring Plan

Station	Flow			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
101		X			X			X		X	X	
51		X			X			X			X	
361	X	X			X			X			X	X
341		X			X			X			X	
342		X			X			X			X	
ST1		X			X		X	X			X	
ST2		X			X			X			X	
M8		X			X			X	X		X	X
87101CV			X		X			X			X	
87102CV		X			X			X			X	
87103CV			X		X			X			X	
93341CV		X			X			X			X	

Summary for Surface Water in NFRF Miller Creek Monitoring Plan

Station	Flow			pH			TDS		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
491		X			X			X	
M1		X			X			N/A	
493	X	X			N/A			N/A	
M2			X		X			X	
M4	X	X			X			X	
M3		X	X		X				X
Below M3		X	X		X				X

Station	Flow			pH			TDS		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
M7	X	X	X		X				X
M10	X	X	X		X				X
M9	X				X			X	
M12		X			X				X
M11	X				X			X	
M14		X			X				X
M13		X			N/A				X
495	X				X				X

CONCLUSIONS

Flow measurements for surface waters generally show seasonal variations and increased flows during spring thaws. The data also indicates flows are higher during times of higher precipitation and lower during dry spells, indicating a correlation between flow and precipitation. Some of the surface stations monitored showed an upward trend in flow for 1997.

Mining may be impacting the flow and quality of water in the NFRF of Miller Creek. However, by the time water issuing from springs and base flow in the drainage reaches the confluence of the NFRF and the South Fork Right Fork the flow is at similar levels as with flows before mining began. This may be indicating that flows being diverted underground through mining and subsidence are reappearing downstream thereby providing an overall stream balance at Station ST1. There is no apparent adverse trend in pH levels. Although conductivity levels are higher than they were prior to mining, they are relatively steady at around 2,000 μMHOS/CM. There does not appear to be a significant total combined impact on the NFRF from mining.

CPMC had an agreement with U.S. Fuels Company for mining coal in the NFRF drainage area. The agreement allowed CPMC to mine the privately owned coal reserves independent of impacts to the land surface and water rights controlled by U.S. Fuels Company.

UNDERGROUND MINE FLOW MONITORING & MUDWATER DISCHARGE

There are five locations in the mine where underground waters are monitored. These locations are First West 4 (lW4), First West North 6 (lWN6), Ninth Left 12 (9L12), Gentry Ridge, and Mudwater Canyon discharge. Mud Water discharge is also designated as Station 001, NPDES Permit UT- 0023736. Station First West North 6 was abandoned during 1994 because the location in the mine was sealed up preventing access. This station had not had a flow since 1988. The Gentry Ridge monitoring station measures waters intercepted in the Federal Coal Lease U-13097 beneath Gentry Ridge, the current

longwall mining area. Most of the water intercepted in this lease is collected and discharged into an old area of the mine in Section 18, Township 15 South, Range 8 East.

The in-mine stations have been sampled on a quarterly basis when accessible. The locations of these stations is shown on Map 722.200a. Graphical time plots have been prepared for flow, pH, TDS, and Major cations and anions including calcium, magnesium, chloride, bicarbonate and sulfate. The data have been plotted to show flow and water quality variations as sequential time plots. The plots were used in our analyses of flow and water quality changes over time as discussed herein. Plots were prepared for TDS and flow from all available sampling from 1977 through 1997. Plots were prepared for the other indicated water quality parameters for sampling from 1991 through 1997. Complete data sets of information prior to 1991 can be found in previous annual reports.

Since it is likely that there is correlation between in-mine flows and precipitation, plots were also prepared which compare recorded flows to annual precipitation records for a local gaging station over the period of record. The National Weather Service rainfall gaging station closest to the Star Point mine area is located in Price which is about 12 miles northeast of the Star Point mine. Average annual precipitation for the Price station is 10.0 inches per year (1980-1997). Precipitation values recorded at the Price weather station have been plotted for comparison with recorded spring flows at each water sampling station. It must be remembered that although data from the Price station provides an overall indication of precipitation patterns they do not necessarily represent true local conditions.

A station by station summary of the 5 in-mine stations that were sampled is given below. Water quality data for samples obtained at each station are given in Appendix D. A discussion of any apparent data trends is included in the summary for each station.

IW4

Flow. From 1992 through 1997 measured flows from this station have ranged from 0.0 to 0.03 cfs. No natural increasing or decreasing trends are apparent. The data indicates there is little if any correlation between flow and precipitation.

pH. From 1992 through 1997 the average measured pH was 7.4; the high was 8.1 and the low was 6.4. The data indicates that pH may be somewhat inversely related to flow. No data is available since 1994.

TDS. TDS levels have risen steadily from 1987 through 1994. The maximum TDS concentration for the period of record is 1,118 mg/l; the minimum is 769 mg/l.

Major Cations and Anions. Sulphate and manganese levels have followed an increasing trend from 1990 through 1994, while chloride levels have followed a decreasing trend. Other Major cations and anions have varied during the period of record, however no general trends are apparent.

IWN6

Flow. From 1985 through 1997 measured flows from this station have ranged from 0.0 to 0.08 cfs. Recorded flows were 0.0 between 1988 and 1995. Some flow has again been recorded at this station starting in 1996.

pH. From 1985 through 1997 the average measured pH was 7.8; the high was 8.5 and the low as 7.2. pH was not recorded between 1989 and 1995. No clearly evident trends are apparent in the data.

TDS. The maximum TDS concentration for the period of record was 1,590 mg/l; the minimum is 160 mg/l. TDS levels followed a potentially increasing trend from 1985 through 1989, and were recorded high in 1996 and 1997. Data shows that TDS levels may be decreasing again. Additional data will help clarify the long term trend.

Major Cations and Anions. Calcium, magnesium and sulphate followed an increasing trend from 1985 through 1989, and may now be showing a decreasing trend starting in 1996. Bicarbonate may be following an inverse relationship.

9L12

Flow. Measured flows have steadily dropped from 1985 through 1994, then stabilized subsequent to that time. Flow measurements have ranged from a high of 0.4 cfs to a low of 0.0 cfs. The data indicates there is little if any correlation between flow and precipitation. The decreasing flows are believed to be the result of dewatering localized perched aquifers.

pH. The maximum pH for the period of record is 8.1 and the minimum is 6.1 while the average is 7.3. No long term trends are apparent in the data.

TDS. From 1985 through 1997 TDS levels have fluctuated from a low of 717 mg/l to a high of 1,492 mg/l. TDS increased after 1984 and stabilized to its current level in about 1990. No additional long term trends are apparent in the data since 1990..

Major Cations and Anions. Calcium levels started dropping in 1991, reached a low in 1993, then started a rebound to present 1997 levels. Magnesium levels may have started an increasing trend beginning in 1995. Chloride and bicarbonate levels have remained relatively constant. Sulphate levels may be showing an overall decline beginning in the early 1990's.

Gentry Ridge

Flow. From 1992 through 1997 measured flows from this station have ranged from 0.05 to 3.6 cfs. The data indicate flows took a substantial decline subsequent to 1995. The data indicates there is little if any correlation between flow and precipitation.

pH. From 1992 through 1997 the average measured pH was 7.5; the high was 9.1 and the low was 6.3. pH levels were increasing in 1992 and 1993 and have stabilized since 1994.

TDS. From 1992 through 1997 the average measured TDS concentration was 506 mg/l, the high was 756 mg/l and the low was 366 mg/l. TDS levels showed an increasing trend since 1994.

Major Cations and Anions. Calcium and magnesium may be indicating an increase in levels beginning in about 1994. Additional data is needed however to confirm this. Levels of other major cations and anions have varied during the period of record however no general long term trends in the data are apparent.

Mudwater Discharge

Flow. Flow measurements from 1983 through 1987 were all at 0.45 cfs except for one measurement of 1.11 cfs in August 1986. No discharges have been made since 1987. Because this is a pumped discharge, no correlation with precipitation would exist.

pH. From 1983 through 1987 the average measured pH was 7.5; the high was 8.2 and the low was 7. No long term trends are apparent in the data.

TDS. From 1983 through 1987 TDS concentration steadily increased. The data ranged from a low of 366 to a high of 1,330 mg/l.

Major Cations and Anions. Insufficient data exists to identify trends in levels of major cations and anions.

A summary of the general trend for major water quality parameters for underground mine flows and for the Mudwater Discharge is provided in the following table. For major cations and anions there may be more than one category marked, indicating that there was variation found between parameters evaluated. The reader is referred to either the text or the graphs for further details when two or more categories are marked.

Summary for Underground Mine Flows and Mudwater Discharge Water

Station	Flow			pH			TDS			Major Cations/Anions		
	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up	Down	Stable	Up
1W4		X			X			X		X	X	X
1WN6	SITE ABANDONED IN 1994											
9L12	X				X			X		X	X	
Gentry Ridge			X		X				X		X	
Mudwater	NO DISCHARGE SINCE 1987											

CONCLUSIONS

Flow measurements from in-mine stations generally do not show much correlation with precipitation data. Noticeable trends in flows are at station 1WN6 were flows have been increasing, the Gentry Ridge station where flows have been decreasing, and at station 9L12 where flows decreased then stabilized. pH levels have fluctuated but have not been extreme. Noticeable trends in TDS levels are apparent at station lW4, where TDS has risen steadily, at station 1NW6 where TDS has been noted to both rise and fall, and at the Gentry Ridge station where TDS levels have been noted to rise lately. Some minor trends have been noted at selected stations regarding levels of major cations and anions, however, nothing was found which was believed to be of major concern at the present time.

It appears that the TDS level increased at station 9L12 due to freshly broken rock in the subsided coal seam zone contributing dissolved minerals to a peak in 1991 and then started to decline. Mining was conducted in the drainage area for monitoring station 9L12 from 1984 to 1989. It appears that two years after mining ceased, the TDS levels started to decline. The initial high flow at the Gentry Ridge monitoring station was a result of dewatering ponded water in the longwall area. After the ponded water was pumped down, the flow leveled off at an average of 0.693 cfs for the remainder of 1992. The flow increased dramatically in 1993 and rose throughout the year and continued to increase through December 1994 at which time it started to decrease. Since 1995 flows have been allowed to return to their natural southerly flow direction.

Mitigation agreements were signed during 1993 with the Castle Valley Special Service District and the Huntington Cleveland Irrigation Company to resolve their concerns about possible mining impacts to their sources. Under these agreements, Cyprus Plateau has monitored the quantity and quality of the water from applicable water sources for a determination of mining impact.

PRECIPITATION AND CLIMATOLOGICAL DATA

Precipitation data for the Price weather station is shown on the surface and ground water data plots.

TABLE 1
Water Quality Analytical Schedule

Field Parameters	Surface Water		Ground Water	
	Baseline	Operational	Baseline	Operational
FIELD MEASUREMENTS				
Water Level or Flow				
pH				
Specific Conductivity				
Water Temperature °C				
LABORATORY MEASUREMENTS				
Anion - Cation Balance				
Bicarbonate				
Calcium Diss				
Carbonate				
Chloride Diss				
Iron Dissolved				
Iron Total				
Lead, Total++				
Magnesium, Diss				
Manganese, Total				
Nitrate, Diss+				
Nitrite, Diss+				
Oil & Grease				
Potassium, Diss				
Sodium, Diss				
Sulfate, Diss				
Sulfide, Diss++				
Total Dissolved Solids				
Total Suspended Solids				
Total Hardness				

\+ Stations 51MW and ST-1 only.
\+ + One year.

Revised: 6/1/92

APPENDIX A
SPRINGS

Cyprus Plateau Mining Company - Water Quality Data

Station: BIRCHSP | Property: Star Point | Location: 1400' S 600' E of NW com. Sec 26, T16S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Star Point Sandstone | Print Date: February 25, 1998 | Elevation:

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92																						
Jun-92																						
Jul-92																						
Aug-92																						
Sep-92																						
Oct-92	10/30/92	0.06	6.2	840	11.6				416	270	16	10	140	91	46	2	6	<	0			
Nov-92																						
Dec-92	12/21/92	0.06	6.3	777	10.6				465	310	0	6	134	104	50	2	7	<	0			
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/23/93	0.065	6.2	680	11.1	418			430	395	0	6	107	95	47	3	7	<	0.02 <	0.02 <	0.01	
Jul-93	07/22/93	0.065	6.1	704	11.8	454			415	327	12	5	109	92	45	3	7	<	0.02 <	0.02 <	0.01	
Aug-93																						
Sep-93																						
Oct-93	10/19/93	0.054	6.1	743	11	426			424	439	0	5	111	94	46	3	7	<	0.02	0.03	0.01	
Nov-93																						
Dec-93																						
Jan-94	01/25/94	0.066				454			446	403	0	6	95	98	49	2	7	<	0.02 <	0.02	0.01	PH, COND, TEMP: METE
Feb-94																						
Mar-94																						
Apr-94	04/25/94	0.051	7	884	9.7	446			394	415	0	5	101	87	43	2	6	<	0.02	0.03 <	0.01	
May-94																						
Jun-94																						
Jul-94	07/21/94	0.067	7.5	607	15.2	448			405	381	5	5	103	90	44	2	6	<	0.02 <	0.02 <	0.01	
Aug-94																						
Sep-94																						
Oct-94	10/25/94	0.07	7.8	731	11	442			387	198	0	5	93	86	42	2	6	<	0.02	0.03 <	0.01	
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95	02/20/95	0.011	7.2	791	11	430			412	331 <	2	5	100	90.6	45.4	2.3	6.3	-1.6 <	0.01	0.31	0.029	
Mar-95																						
Apr-95	04/26/95	0.0668	7.2	673	52.7	460			412	323 <	2	5	110	89.9	45.5	2.4	6.5	-1.9 <	0.01	0.06	0.01	
May-95																						
Jun-95																						
Jul-95	07/31/95	0.046	7.2	795	55.2	490			426	317 <	2	5	100	93.6	46.8	2.2	6.3	1.6 <	0.01	0.12	0.022	
Aug-95																						
Sep-95																						
Oct-95	10/19/95	0.07	7.21	769	53	490			471	337 <	2	6	126	99.9	53.8	2.7	7.6	1.3 <	0.01	0.11	0.011	
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96	03/12/96	0.035	7	836	12	458			437	330												
Apr-96											2 <	7	100	96.9	47.4	2.3	6.6	1	0.01 <	0.21	0.029	
May-96																						
Jun-96	06/23/96		7.3	681	11	483			480	333	2 <	5	110	109	50.6	2.4	6.7	4.4	0.01 <	0.09	0.014	
Jul-96																						
Aug-96	08/28/96	0.035	6.79	698	11	429			421	293	2 <	6	100	91.8	46.7	2.4	6.5	3.8	0.01 <	0.1	0.017	
Sep-96																						
Oct-96																						
Nov-96	11/06/96	0.035	7.5	629	11	471			442	334	2 <	6	110	97.9	48	2.5	6.7	0.2	0.01 <	0.09	0.02	
Dec-96																						
Jan-97																						
Feb-97																						
Mar-97	03/17/97	0.009	7.9	768	11	461			450	328	2 <	7	100	100	48.6	2.5	6.6	2.7	0.01 <	0.02 <	0.005	
Apr-97																						
May-97																						
Jun-97	06/26/97	0.04	7.1	729	11	481			480	328	2 <	6	110	106	52.2	2	7.7	4.9	0.01 <	0.01 <	0.016	
Jul-97	07/31/97	0.038	7.68	813	11.5	470			440	320	10 <	1.9	110	97	49	2.8	6.7	2.7	0.01 <	0.05	0.005	
Aug-97																						
Sep-97																						
Oct-97	10/06/97	0.047	7.35	796	11.5	580			480	330	10 <	5.7	120	110	50	3.3	7.6	3.9	0.01 <	0.07	0.014	
Nov-97																						
Dec-97																						

Cyprus Plateau Mining Company - Water Quality Data

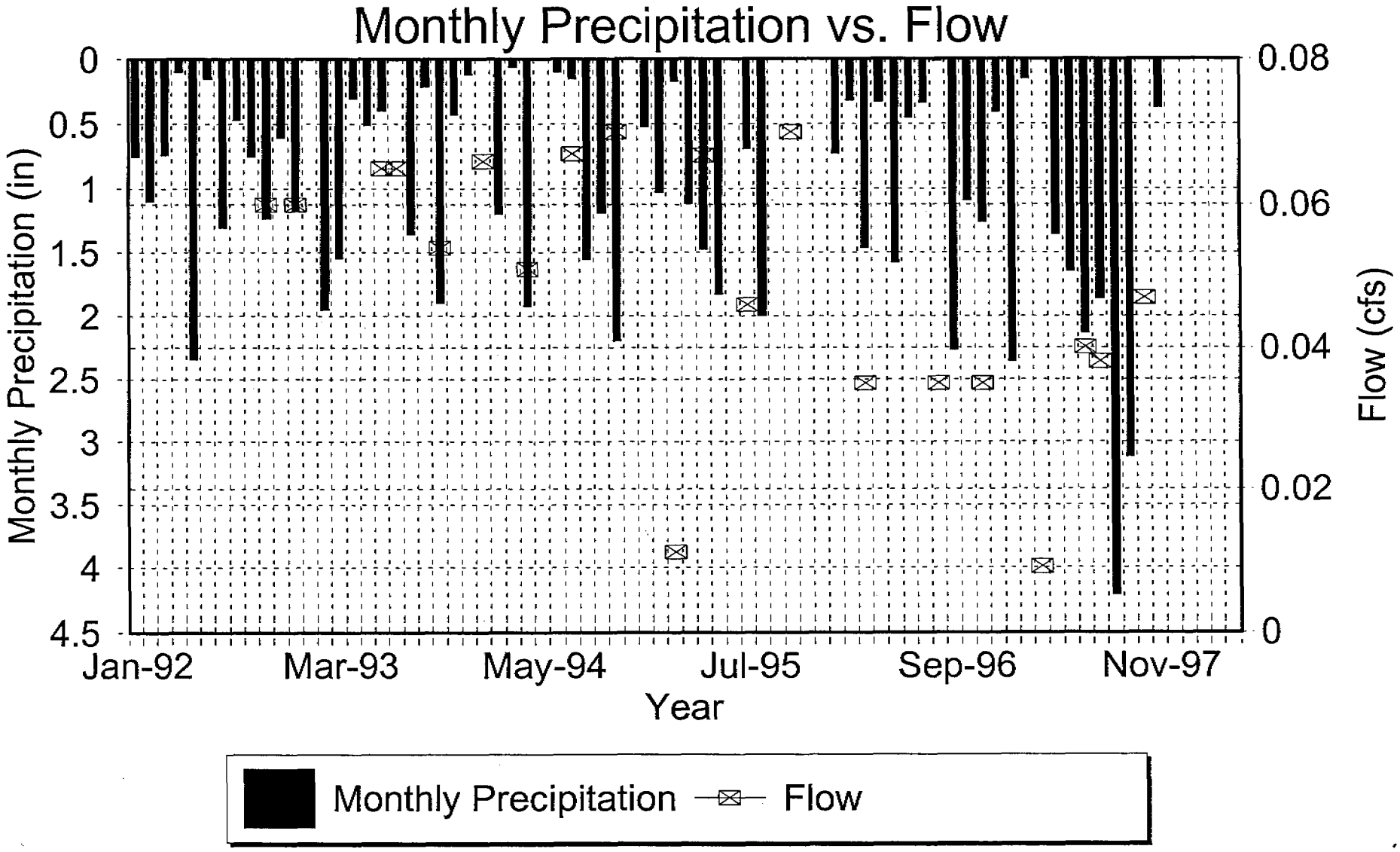
Station: BIRCHSP | Property: Star Point | Location: 1400' S 600' E of NW corn. Sec 26, T16S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Star Point Sandstone | Print Date: February 25, 1998 | Elevation:

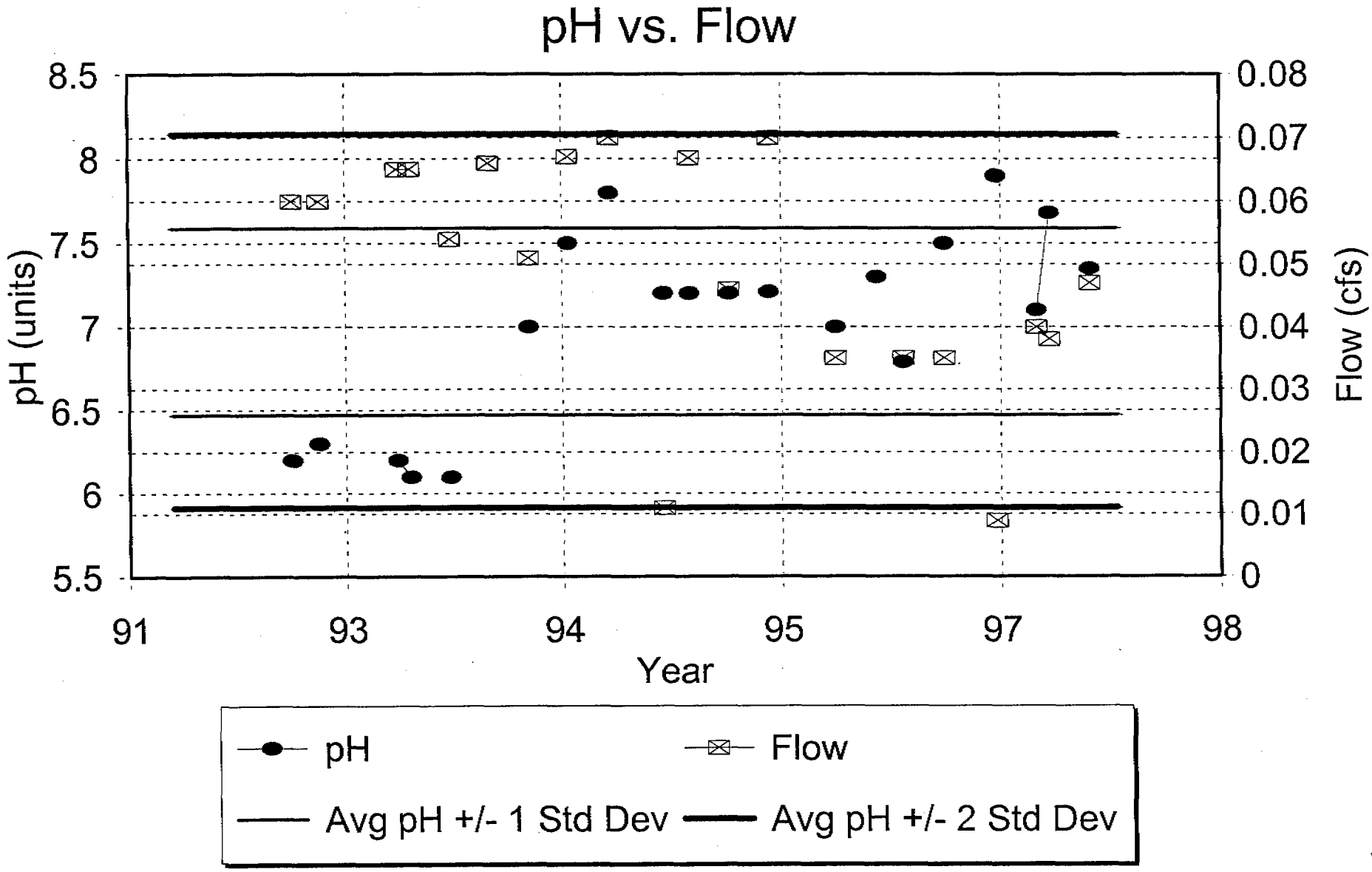
Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
END DATA																						
Count		20	20	20	20	19	0	0	21	21	21	21	21	21	21	21	21	12	21	19	19	
Minimum		0.009	6.1	607	9.7	418	ERR	ERR	387	198 <	0 <	1.9	93	86	42	2	6	-1.9 <	0 <	0.01 <	0.005	
Maximum		0.07	7.9	884	55.2	580	ERR	ERR	460	439 <	16 <	10	140	110	53.8	3.3	7.7	4.9 <	0.02 <	0.31 <	0.029	
Average		0.0495	7.0315	747.2	17.695	462.68	ERR	ERR	434.9	335.33 <	3.4762 <	5.6476	109	96.171	47.429	2.419	6.7048	1.9167 <	0.0124 <	0.0742 <	0.0138	
Standard Deviation		0.0179	0.5574	71.011	15.136	34.623	ERR	ERR	27.448	50.647 <	4.4252 <	1.4022	11.884	6.6253	2.8706	0.3984	0.5094	2.1404 <	0.0061 <	0.074 <	0.0067	
Avg. -1 Std. Dev.		0.0316	6.4741	676.19	2.5588	428.06	ERR	ERR	407.46	284.69 <	-0.949 <	4.2454	97.116	89.546	44.558	2.0207	6.1953	-0.224 <	0.0063 <	0.0002 <	0.0071	
Avg. +1 Std. Dev.		0.0675	7.5889	818.21	32.831	497.31	ERR	ERR	462.35	385.98 <	7.9014 <	7.0499	120.88	102.8	50.299	2.8174	7.2142	4.0571 <	0.0185 <	0.1482 <	0.0205	
Avg. -2 Std. Dev.		0.0137	5.9168	605.18	-12.58	393.44	ERR	ERR	380.01	234.04 <	-5.374 <	2.8431	85.231	82.921	41.687	1.6223	5.6859	-2.364 <	0.0002 <	-0.074 <	0.0003	
Avg. +2 Std. Dev.		0.0854	8.1462	889.22	47.967	531.93	ERR	ERR	489.8	436.63 <	12.327 <	8.4521	132.77	109.42	53.17	3.2158	7.7236	6.1975 <	0.0246 <	0.2222 <	0.0273	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

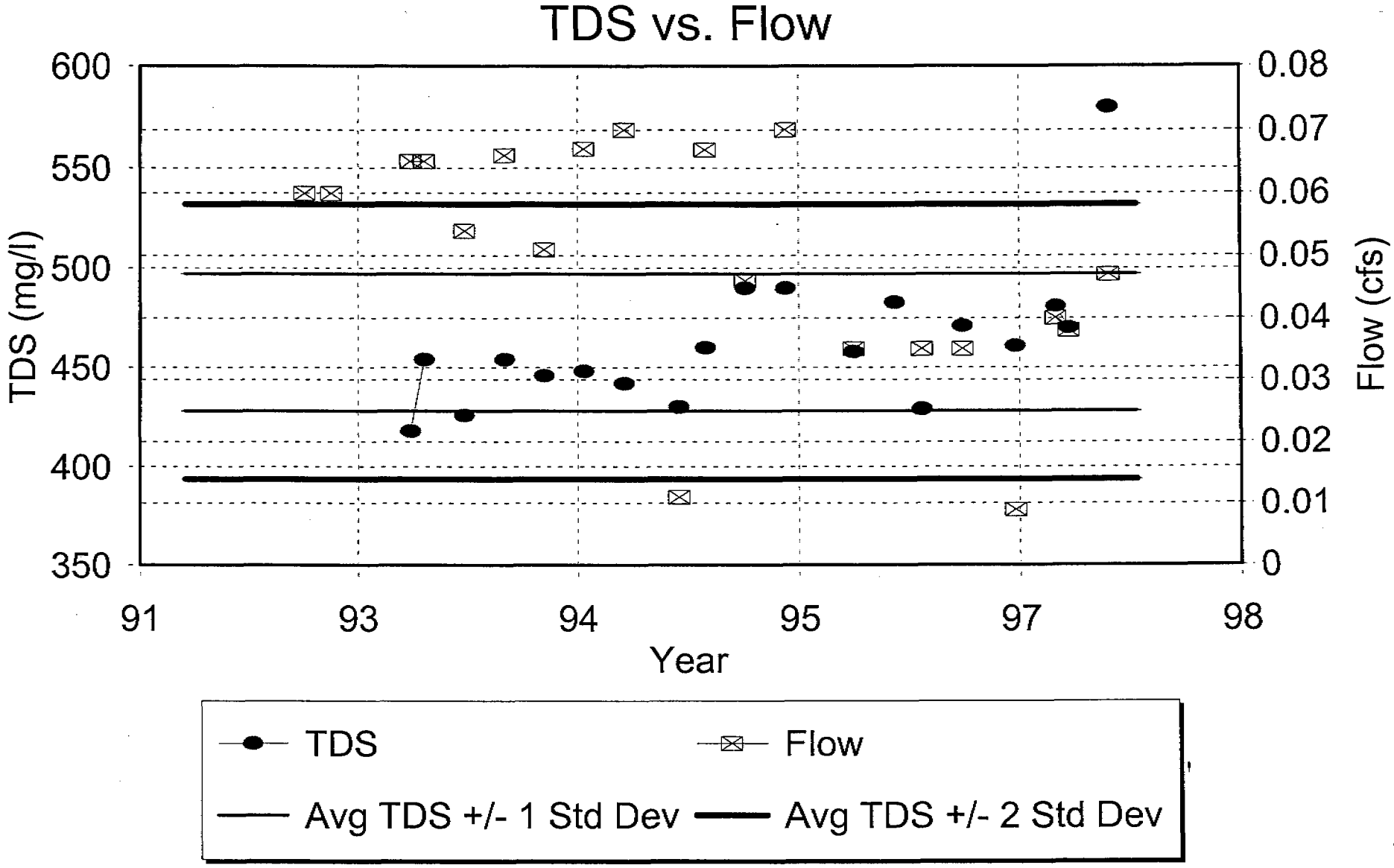
* Measurements taken for this month are extremely anomalous and judged to be in error and were not included in this table. See previous reports for actual data.

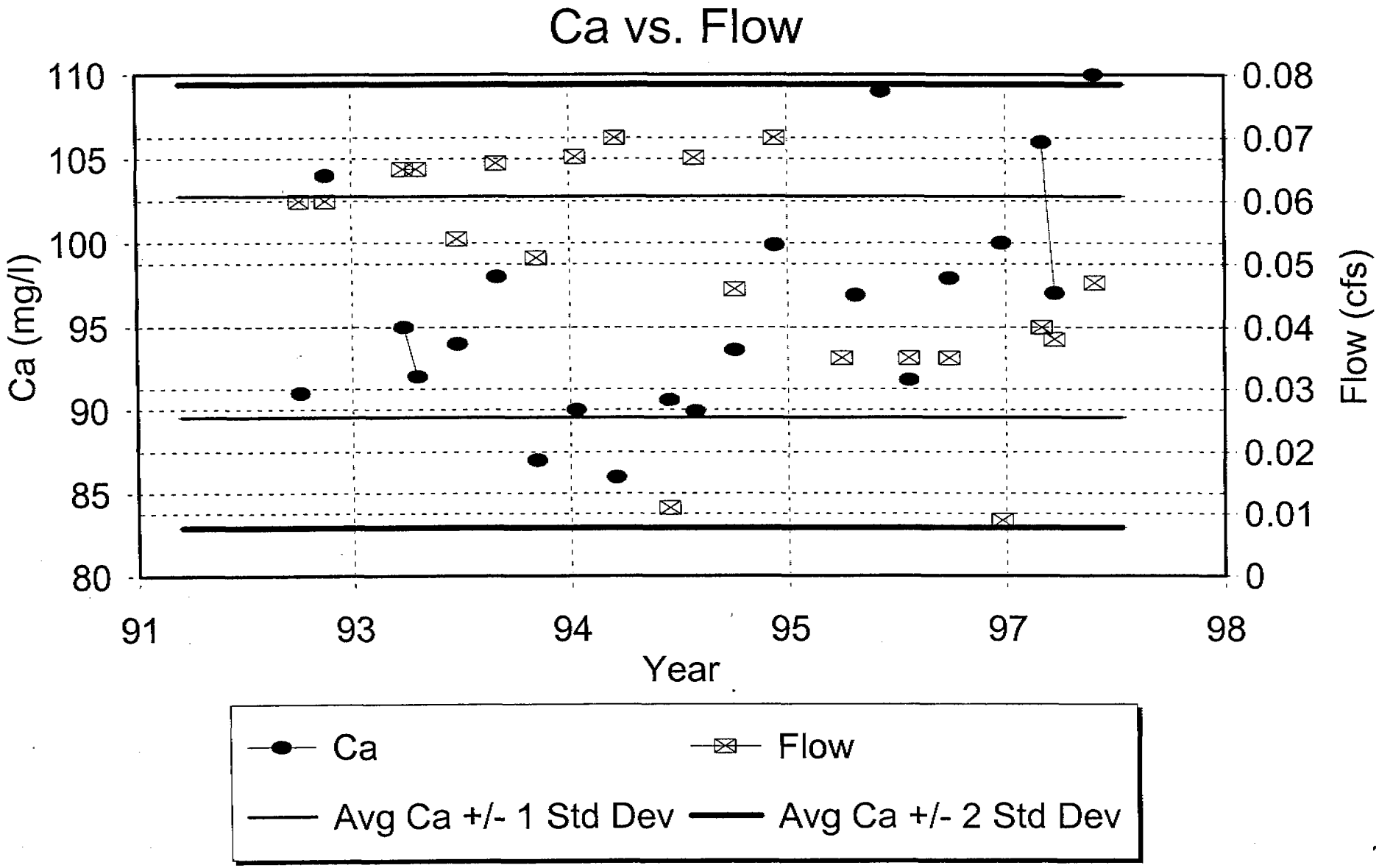
Station Birch Springs



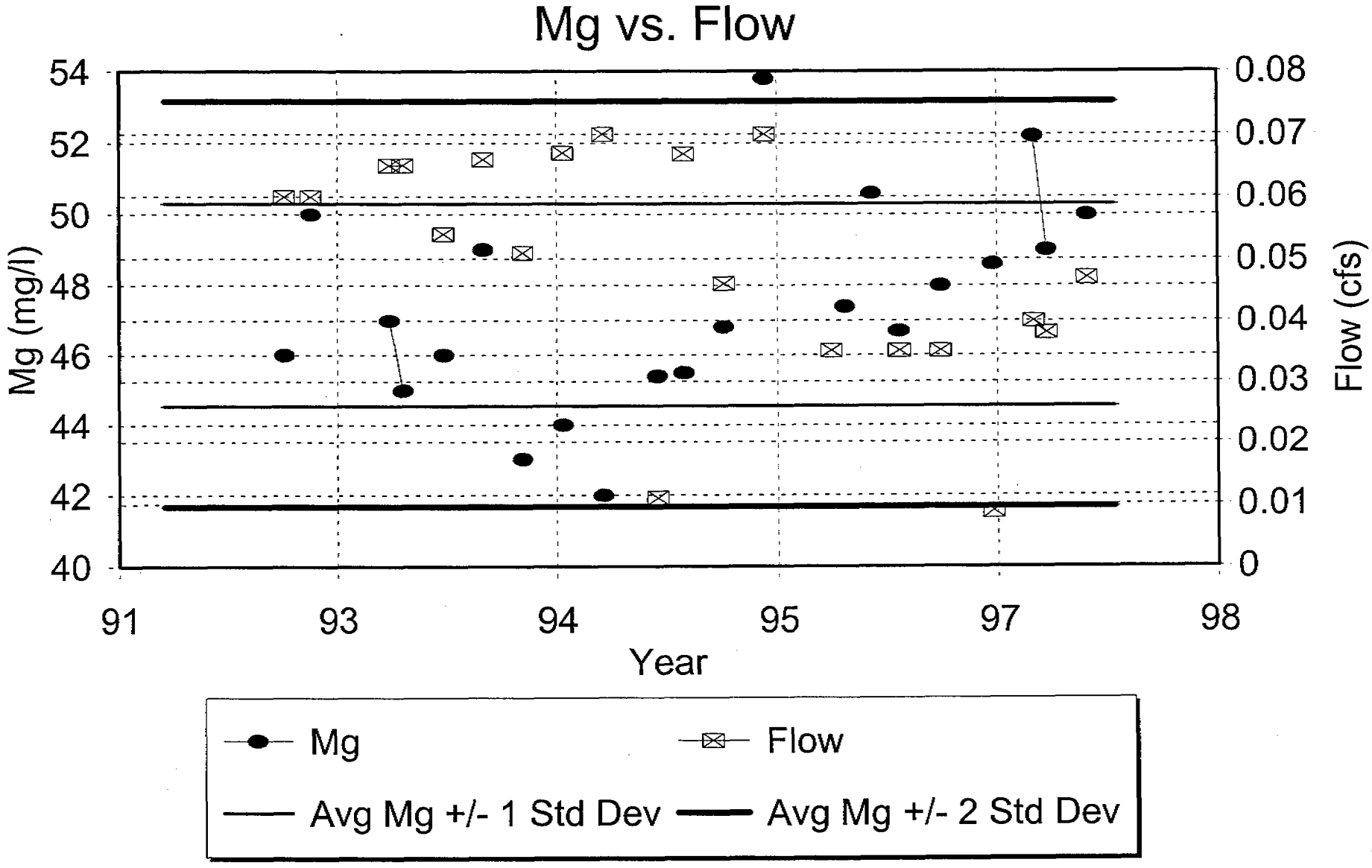

Station Birch Spring
pH vs. Flow
8.5
8
7.5
7
6.5
6
5.5
pH (units)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Flow (cfs)
91
93
94
95
97
98
Year
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev

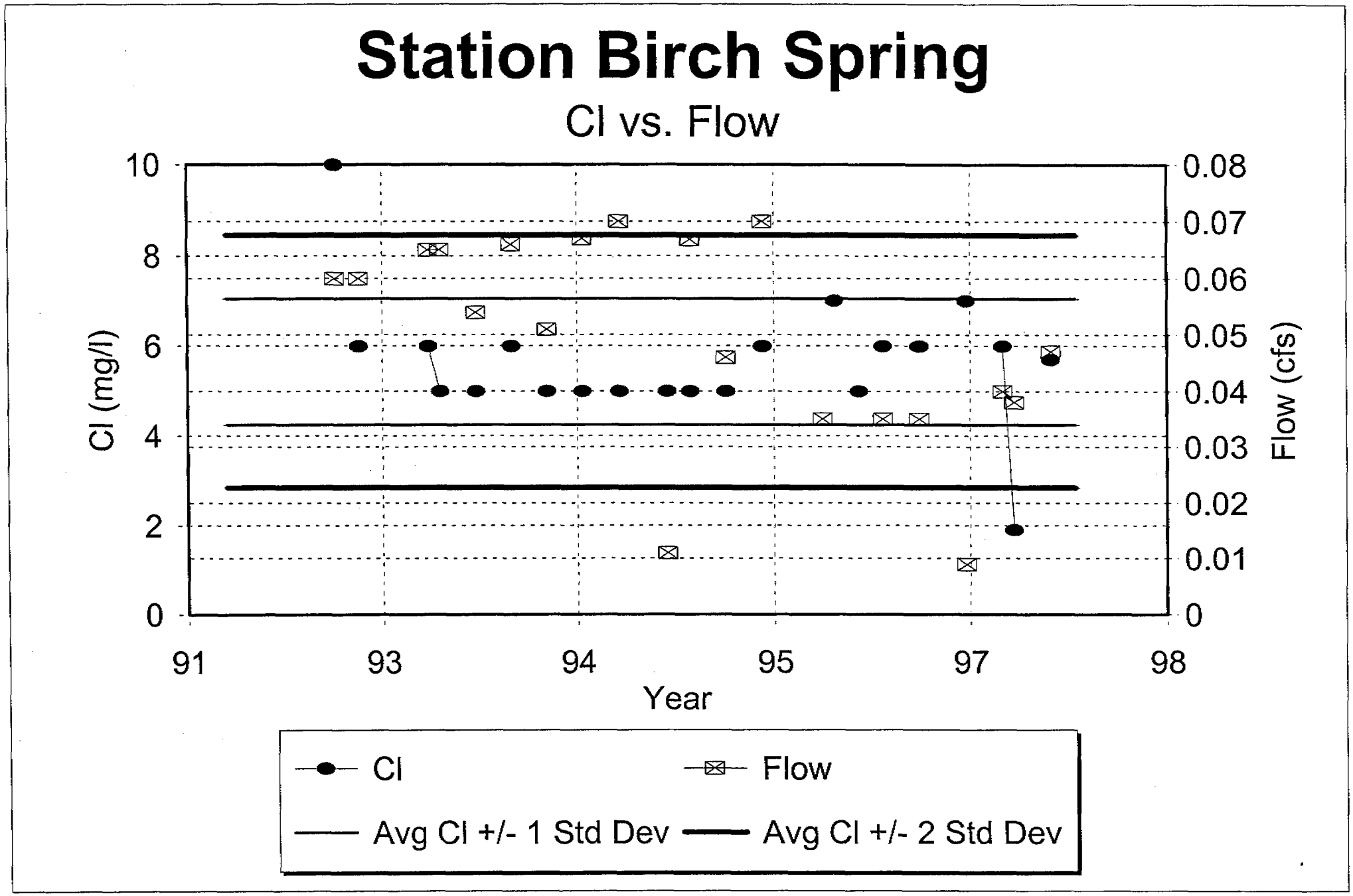
Station Birch Spring



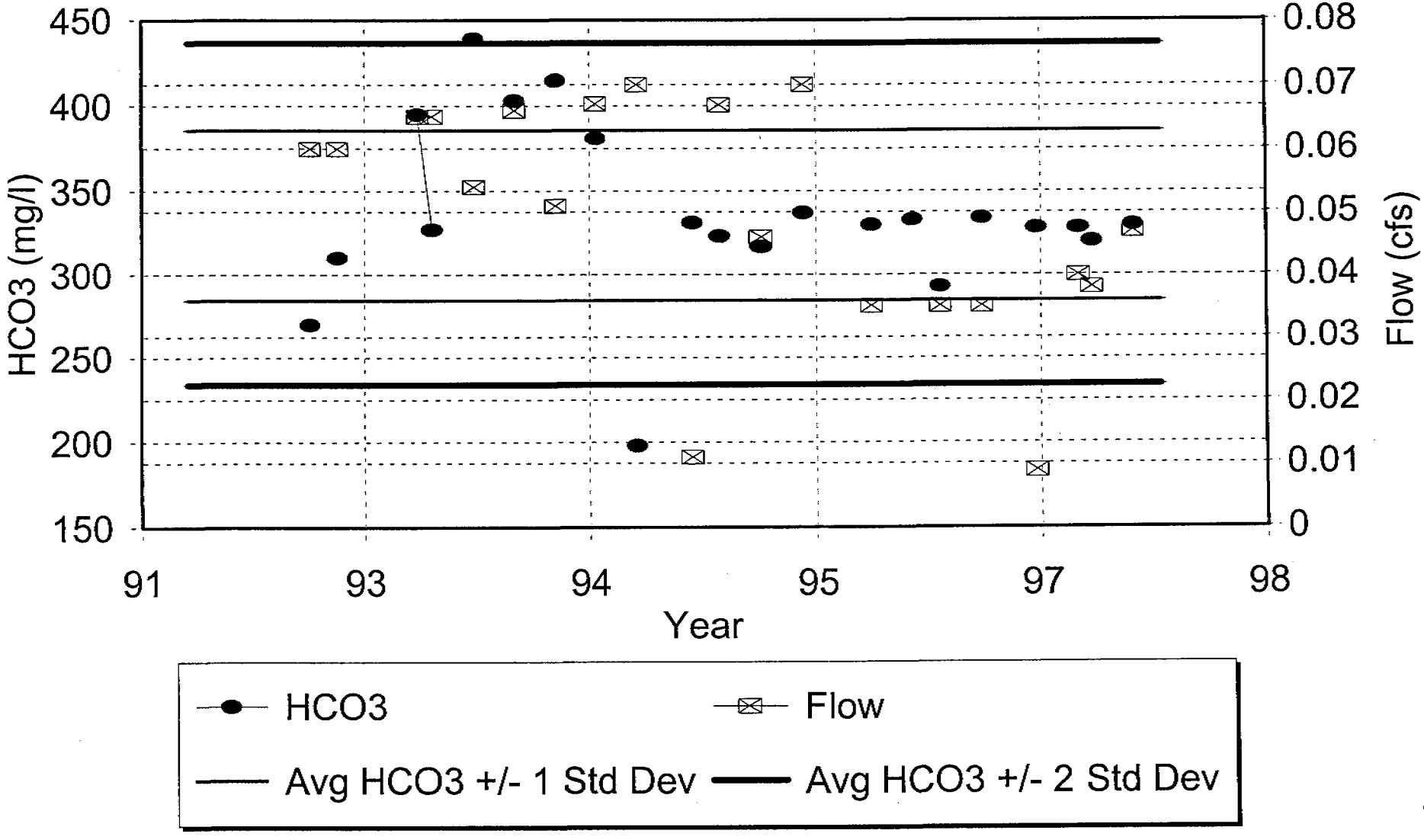

Station Birch Spring
Ca vs. Flow
Ca (mg/l)
110
105
100
95
90
85
80
Flow (cfs)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
91
93
94
95
97
98
Year
Ca
Flow
Avg Ca +/- 1 Std Dev
Avg Ca +/- 2 Std Dev

Station Birch Spring



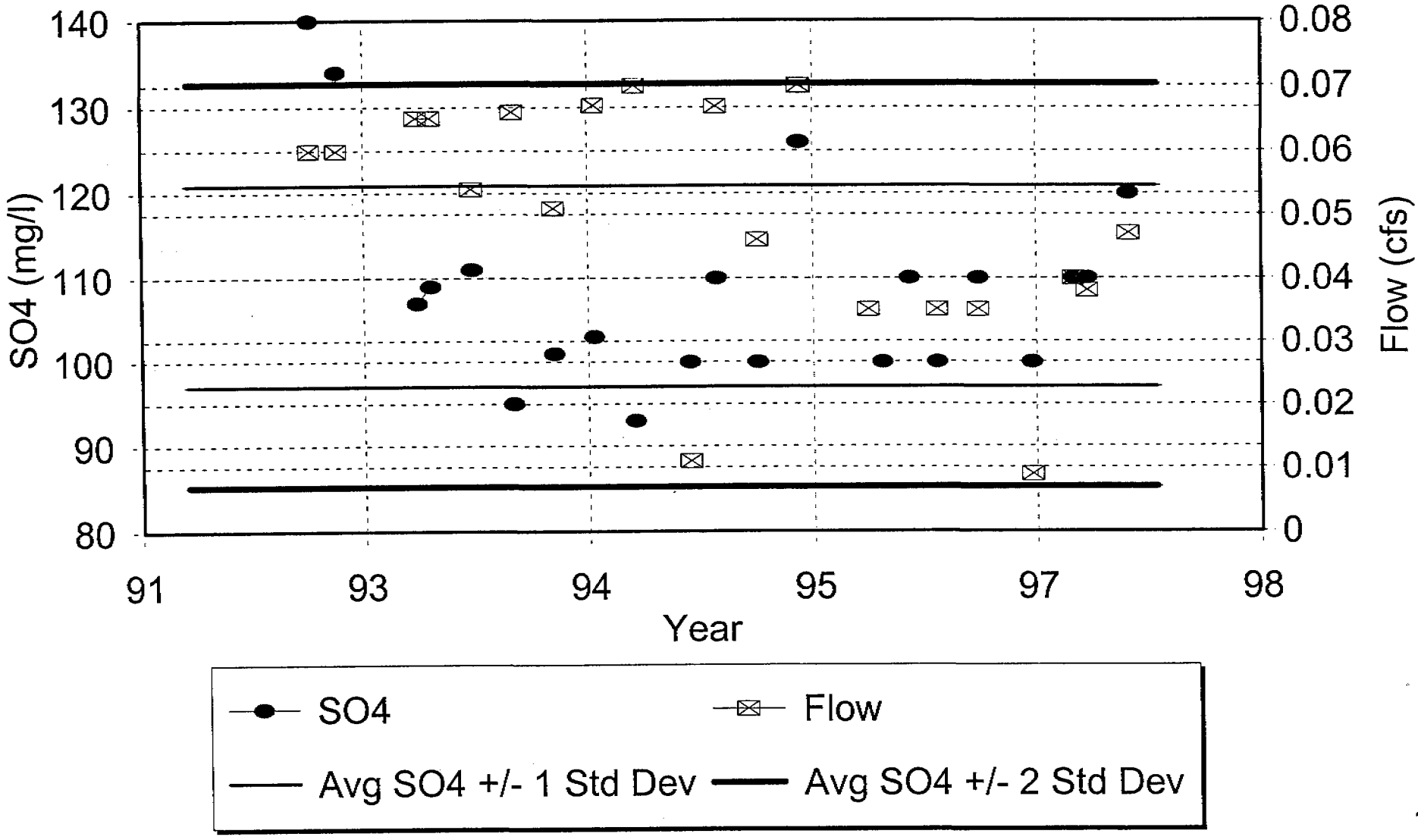

Station Birch Spring
Cl vs. Flow
Cl (mg/l)
Flow (cfs)
Year
10
8
6
4
2
0
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
91
93
94
95
97
98
Cl
Flow
Avg Cl +/- 1 Std Dev
Avg Cl +/- 2 Std Dev

Station Birch Spring



Station Birch Spring

SO4 vs. Flow



Cyprus Plateau Mining Company - Water Quality Data

Station: BIGBEAR | Property: Star Point | Location: Huntington Canyon | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Star Point Sandstone | Print Date: February 25, 1996 | Elevation:

Date Mo-Yr	Sample Date	Field Measurements Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	Laboratory Measurements TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92																						
Jun-92																						
Jul-92																						
Aug-92																						
Sep-92																						
Oct-92	10/30/92	0.238	6.5	614	9.9				415	238	24	4	58	75	31	1	4	<	0	<	0	
Nov-92																						
Dec-92	12/21/92	0.223	6.5	600	9.5				340	272	0	3	72	82	33	1	4	<	0	<	0	
Jan-93	*																					
Feb-93																						
Mar-93																						
Apr-93	*																					
May-93																						
Jun-93	06/23/93	0.247	6.5	525	9.7	302			329	344	0	4	35	79	32	1	4	<	0.02 <	0.02 <	0.01	
Jul-93	07/22/93	0.258	6.5	532	9.9	320			278	298	12	3	37	67	27	1	4	<	0.02 <	0.02 <	0.01	
Aug-93																						
Sep-93																						
Oct-93	10/19/93	0	6.5	552	9.6	288			308	366	0	3	39	74	30	1	4	<	0.02 <	0.02 <	0.01	
Nov-93																						
Dec-93																						
Jan-94	01/25/94	0.296				310			317	329	0	4	35	76	31 <	1	4	<	0.02 <	0.02 <	0.01	PH, COND, TEMP: METE
Feb-94																						
Mar-94																						
Apr-94	04/25/94	0.27	7.3	627	8.8	294			294	356	0	3	29	70	29 <	1	4	<	0.02 <	0.2 <	0.1	
May-94																						
Jun-94																						
Jul-94	07/21/94	0.26	7.7	501	16.8	296			273	320	7	3	27	65	27	1	4	<	0.02 <	0.02 <	0.01	
Aug-94																						
Sep-94																						
Oct-94	10/25/94	0.263	8.2	559	10	328			339	388	0	4	42	80	34	1	14	<	0.02 <	0.02 <	0.01	
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95	02/20/95	0.236	7.17	621	10	310			312	286 <	2	4	40	74.2	31.4	1.2	4.3	-1.6 <	0.01	0.13 <	0.005	
Mar-95																						
Apr-95	04/26/95	0.1716	7.6	538	52.9	350			340	277 <	2	4	60	79.7	34.3	1.4	4.7	0.9 <	0.01	0.02 <	0.005	
May-95																						
Jun-95																						
Jul-95	07/31/95	0.22	7.7	652	13	370			341	281 <	2	4	60	79.4	34.7	1.3	4.6	0.4	0.01	0.13	0.021	
Aug-95																						
Sep-95																						
Oct-95	10/19/95	0.31	7.46	671	53	440			406	282 <	2	5	109	91.6	43.1	1.7	6.1	2.2 <	0.01	0.06	0.012	
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96	03/12/96	0.31	7.3	697	12	383			364	283	2 <	4	80	85.6	36.5	1.9	5.3	0.7	0.01 <	0.03 g	0.005	
Apr-96																						
May-96																						
Jun-96	06/23/96	0.178	7.3	489	10	382			388	286	2 <	3	70	92.8	37.9	1.7	5.2	4.9	0.01 <	0.02	0.005	
Jul-96																						
Aug-96	08/19/96	0.174	6.82	484	11	346			334	273	2 <	4	60	77.7	34.1	1.6	4.7	0.7	0.01 <	0.01 <	0.005	
Sep-96																						
Oct-96																						
Nov-96	11/06/96	0.168	7.8	569	10	362			352	286	2 <	4	10 <	82.6	35.5	1.9	6.2	1.9	0.01 <	0.01 <	0.005	
Dec-96																						
Jan-97																						
Feb-97																						
Mar-97	03/17/97	0.157	8.5	665	11	362			359	285	2 <	4	60	84.1	36.1	1.7	4.8	2.4	0.01 <	0.01 <	0.005	
Apr-97																						
May-97																						
Jun-97	06/26/97	0.29	7.6	529	11	354			349	297	2 <	3	50	82.6	34.7	1.3	4.5	0.9	0.01 <	0.01 <	0.005	
Jul-97	07/31/97	0.31	7.61	585	10	330			330	280	10 <	2	48	77	33	1.8	4.6	1.1	0.02	0.11	0.005	
Aug-97																						
Sep-97																						
Oct-97	10/06/97	0.33	7.84	604	11	390			350	290	10 <	1.7	54	86	34	1.8	5.1	2.7	0.01 <	0.02	0.005	
Nov-97																						
Dec-97																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 25, 1998

Station: BIGBEAR | Property: Star Point | Location: Huntington Canyon | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Star Point Sandstone | Elevation:

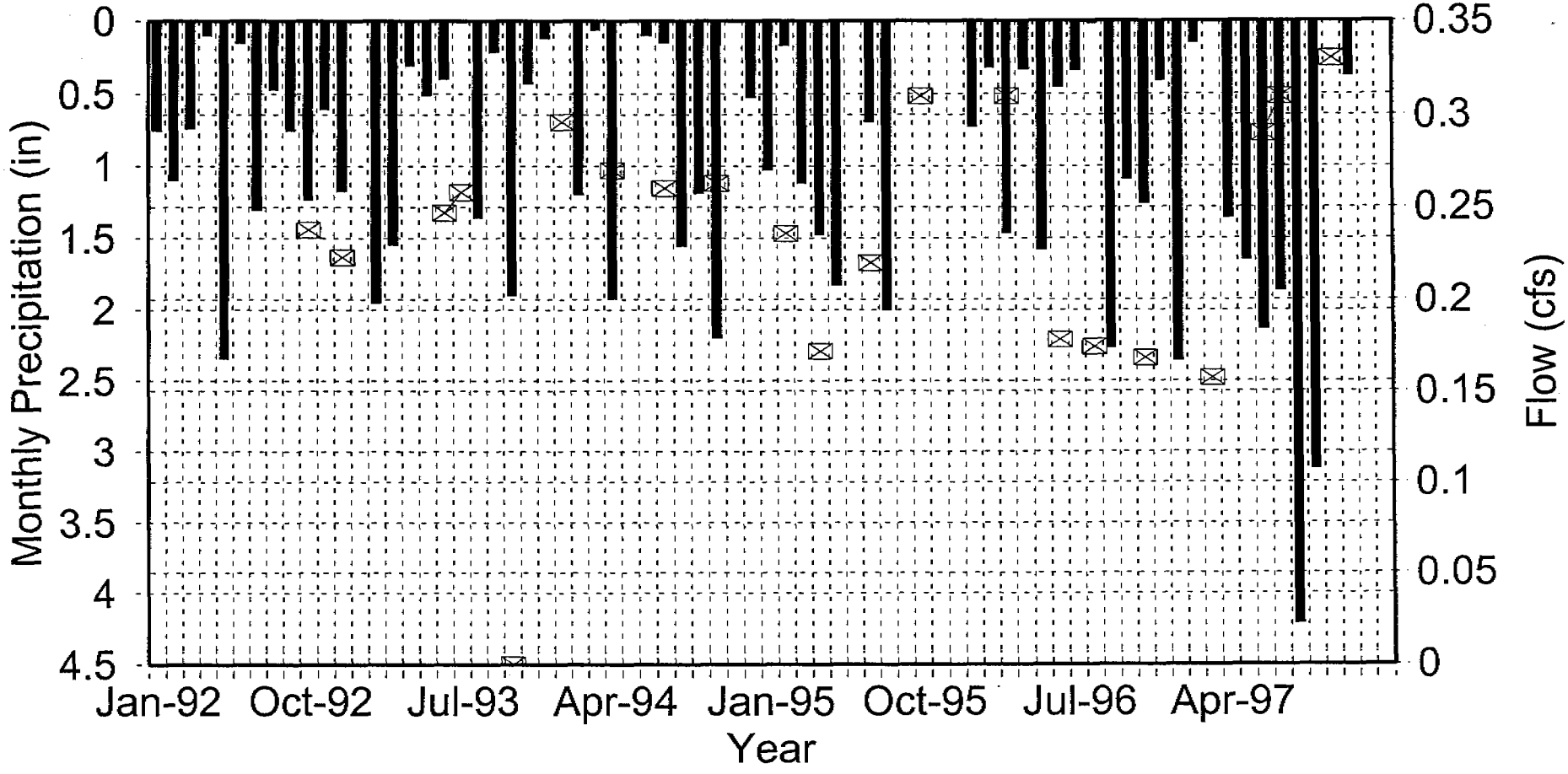
Date Mo-Yr	Sample Date	Field Measurements Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	Laboratory Measurements TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
END DATA																						
Count		21	20	20	20	19	0	0	21	21	21	21	21	21	21	21	21	12	21	19	21	
Minimum		0	6.5	484	8.8	288	ERR	ERR	273	238 <	0 <	1.7	10 <	65	27 <	1	4	-1.6 <	0 <	0.01 <	0	
Maximum		0.33	8.5	697	53	440	ERR	ERR	415	388 <	24 <	5	109 <	92.8	43.1 <	1.9	14	4.9 <	0.02 <	0.2 <	0.1	
Average		0.2336	7.32	580.7	14.955	343	ERR	ERR	338.95	300.81 <	3.9524 <	3.5095	51.19 <	79.11	33.3 <	1.3476	5.0524	1.4333 <	0.0129 <	0.0463 <	0.0116	
Standard Deviation		0.0734	0.5853	61.316	12.774	38.924	ERR	ERR	35.569	35.58 <	5.6944 <	0.7634	20.923 <	6.9138	3.5955 <	0.35	2.1046	1.5107 <	0.0063 <	0.0531 <	0.0203	
Avg. -1 Std. Dev.		0.1604	6.7347	519.36	2.1809	304.08	ERR	ERR	303.38	265.23 <	-1.742 <	2.7461	30.267 <	72.196	29.705 <	0.9976	2.9478	-0.077 <	0.0066 <	-0.007 <	-0.009	
Avg. +1 Std. Dev.		0.3072	7.9053	642.02	27.729	381.92	ERR	ERR	374.52	336.39 <	9.6468 <	4.2729	72.114 <	86.023	36.895 <	1.6976	7.1569	2.944 <	0.0191 <	0.0995 <	0.0318	
Avg. -2 Std. Dev.		0.087	6.1493	458.07	-10.59	265.15	ERR	ERR	267.81	229.65 <	-7.436 <	1.9827	9.3444 <	65.282	26.109 <	0.6476	0.8433	-1.588 <	0.0003 <	-0.06 <	-0.029	
Avg. +2 Std. Dev.		0.3806	8.4907	703.33	40.503	420.85	ERR	ERR	410.09	371.97 <	15.341 <	5.0363	93.037 <	92.937	40.491 <	2.0476	9.2615	4.4547 <	0.0254 <	0.1526 <	0.0521	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

* Measurements taken for this month are extremely anomalous and judged to be in error and were not included in this table. See previous reports for actual data.

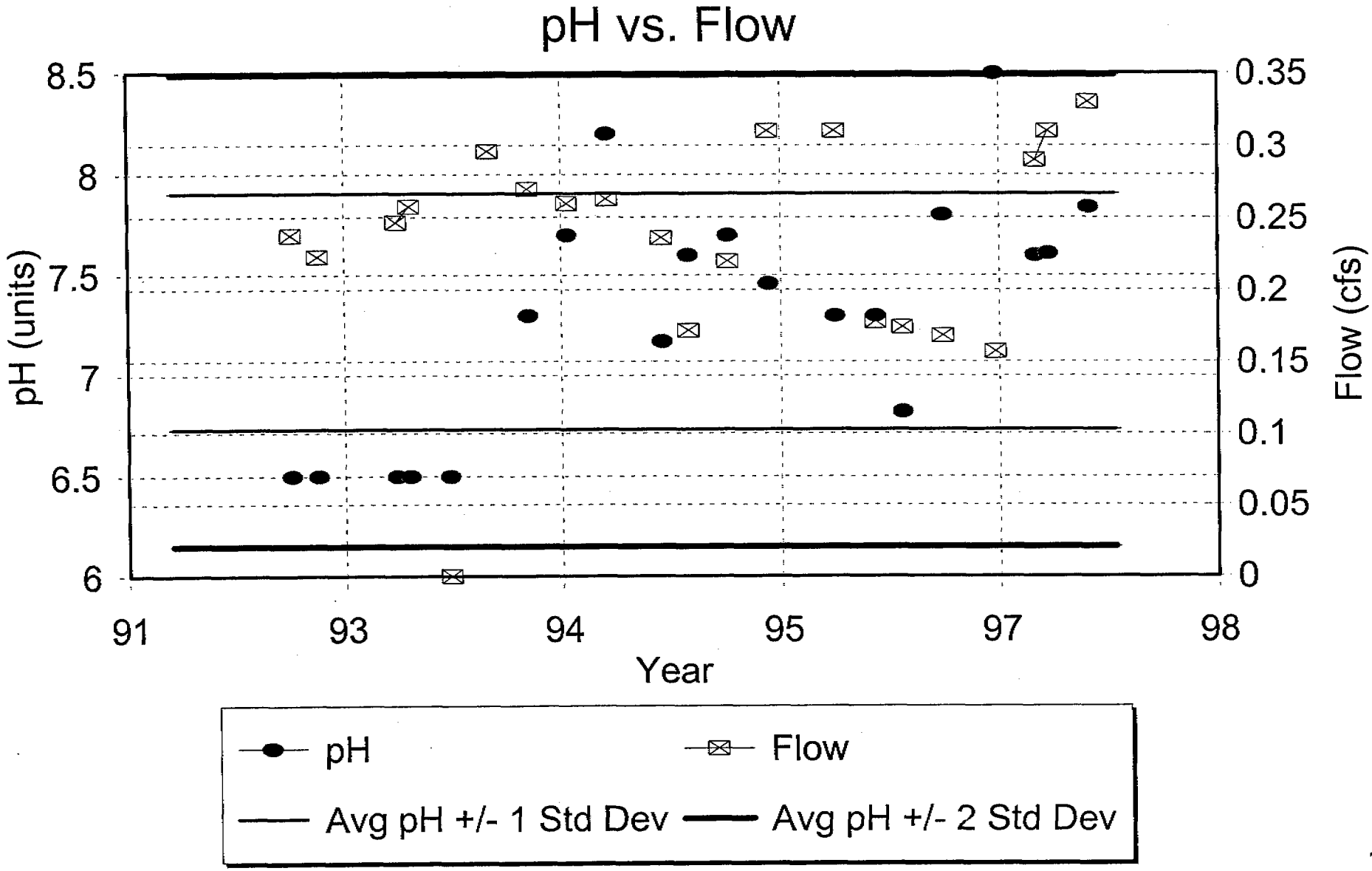
Station Big Bear Spring

Monthly Precipitation vs. Flow

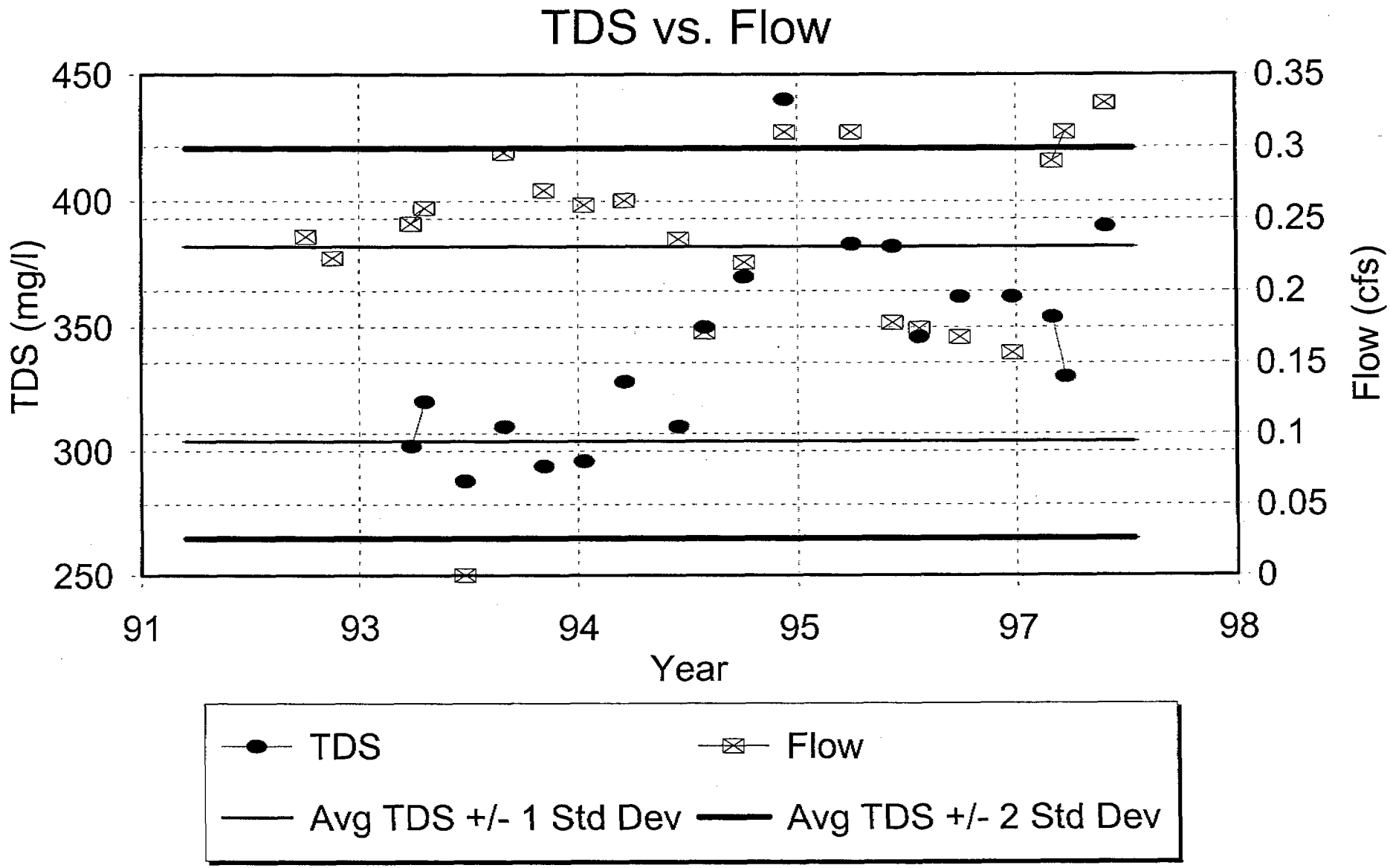


Monthly Precipitation — Flow

Station Big Bear Spring

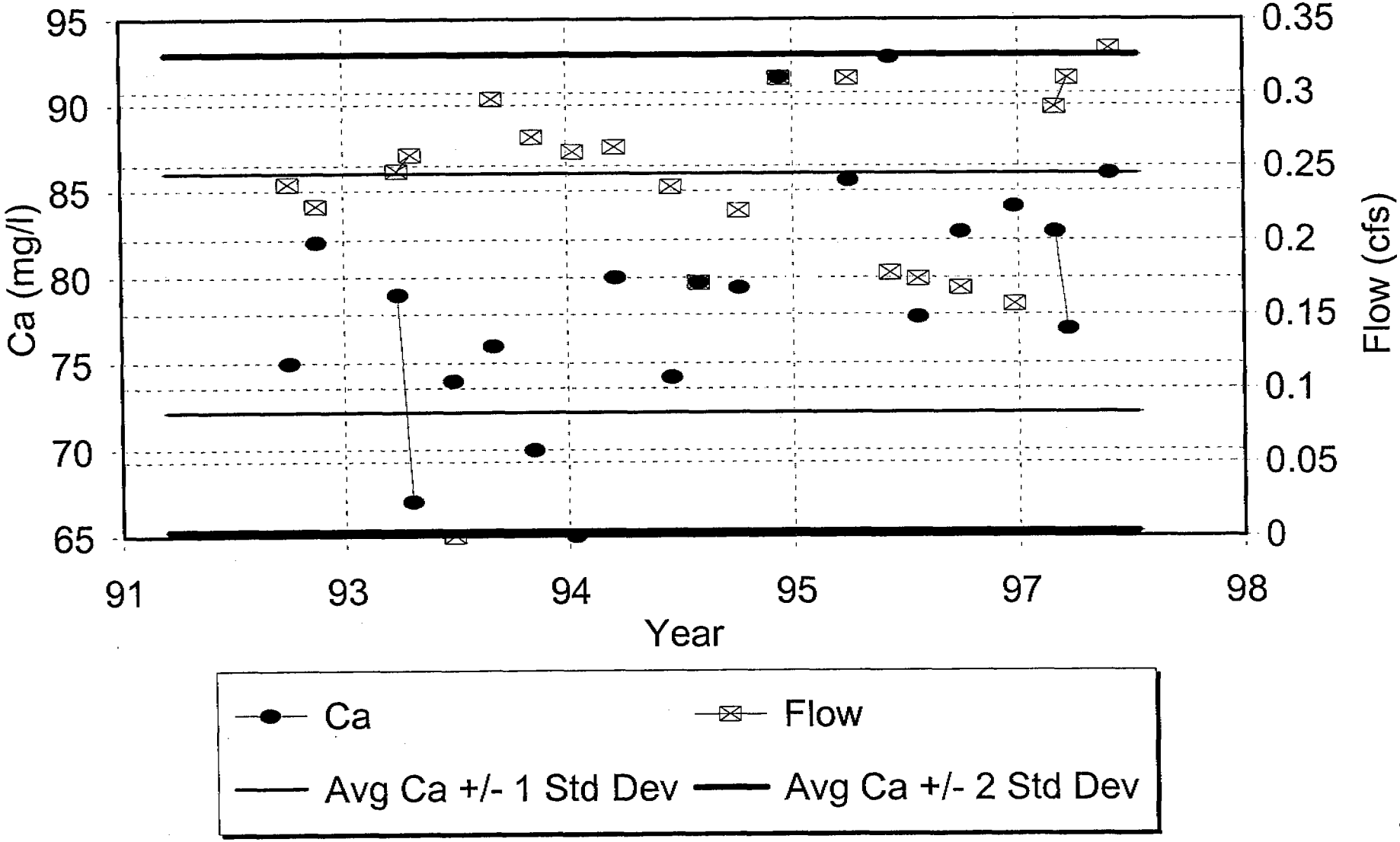


Station Big Bear Spring



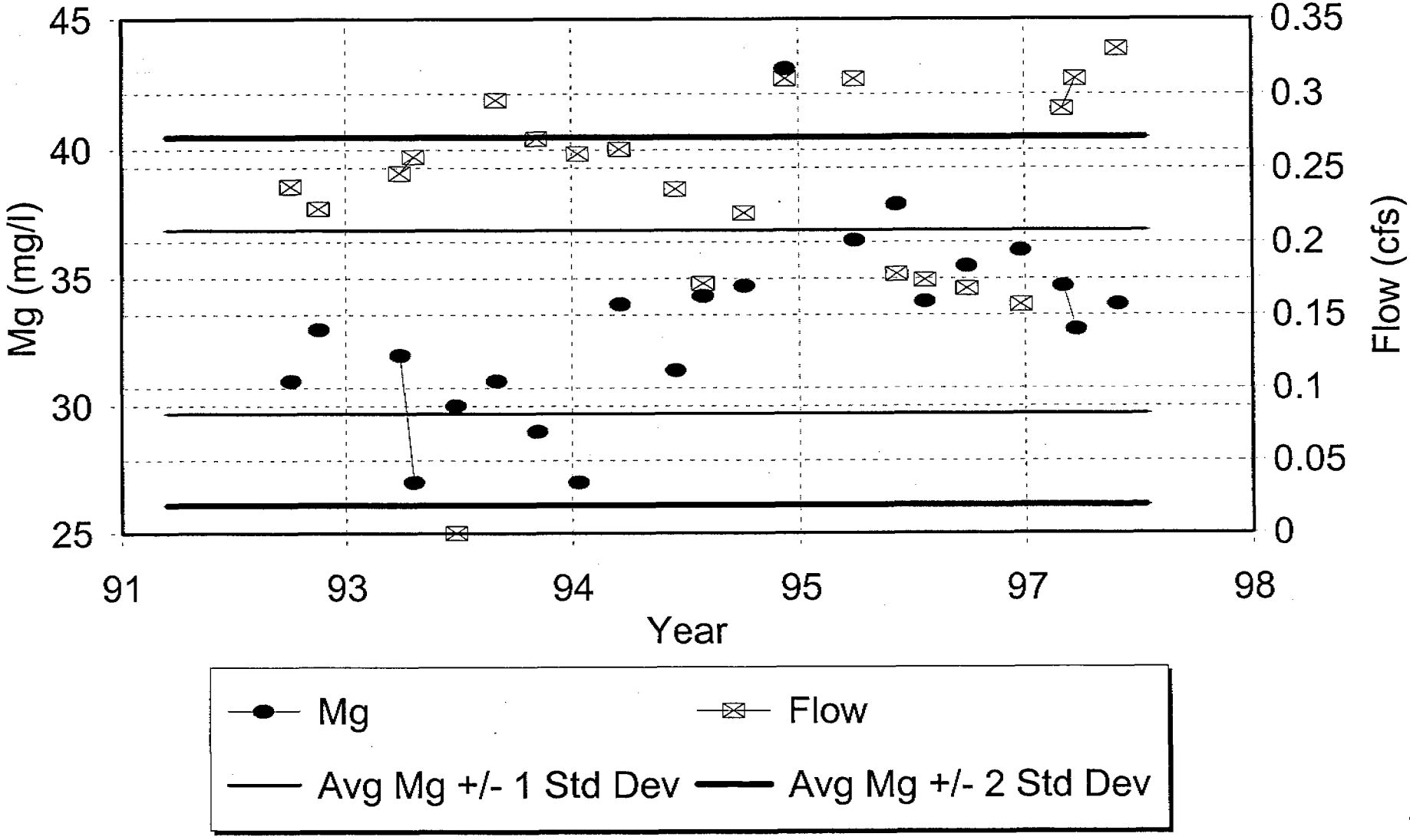
Station Big Bear Spring

Ca vs. Flow



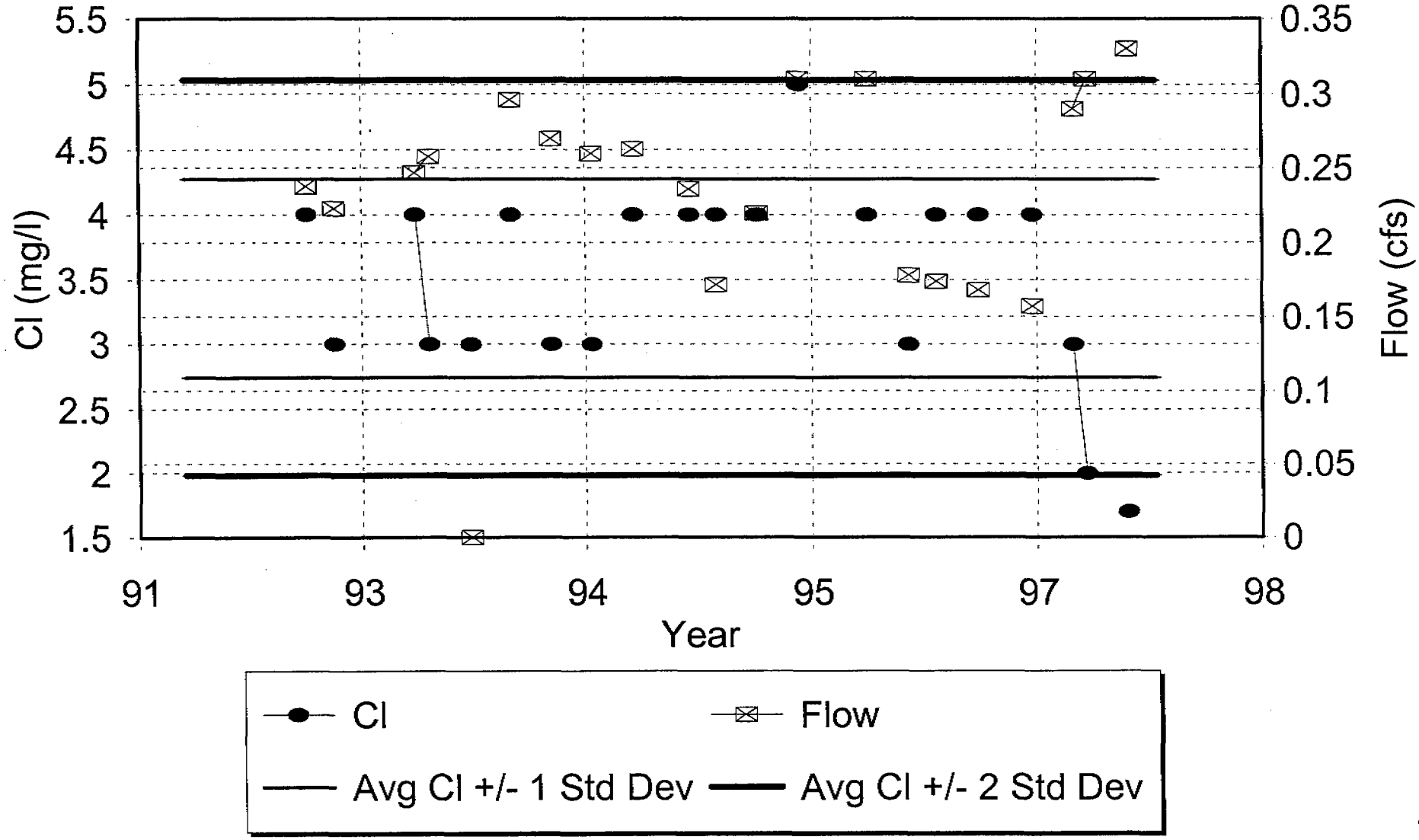
Station Big Bear Spring

Mg vs. Flow

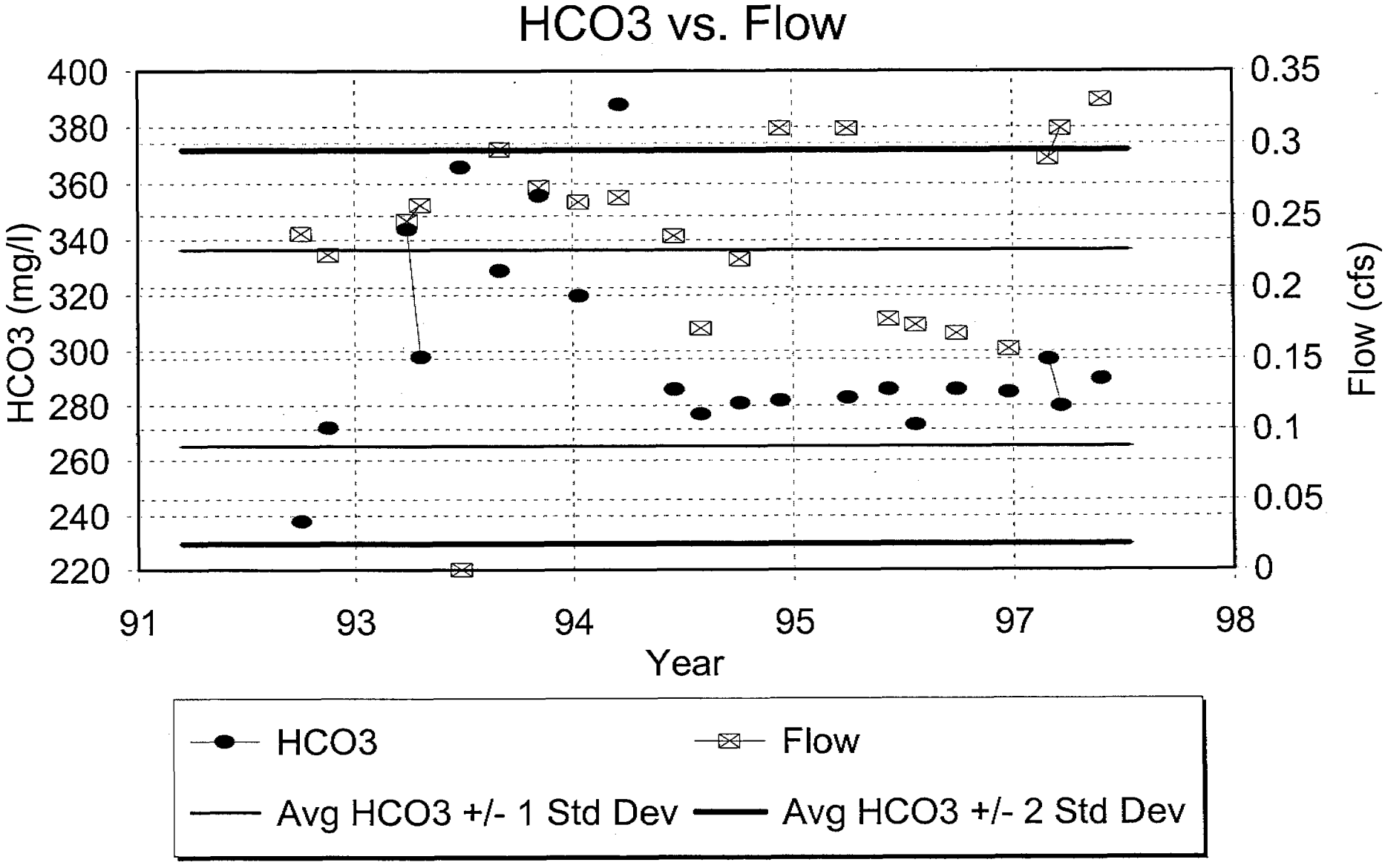


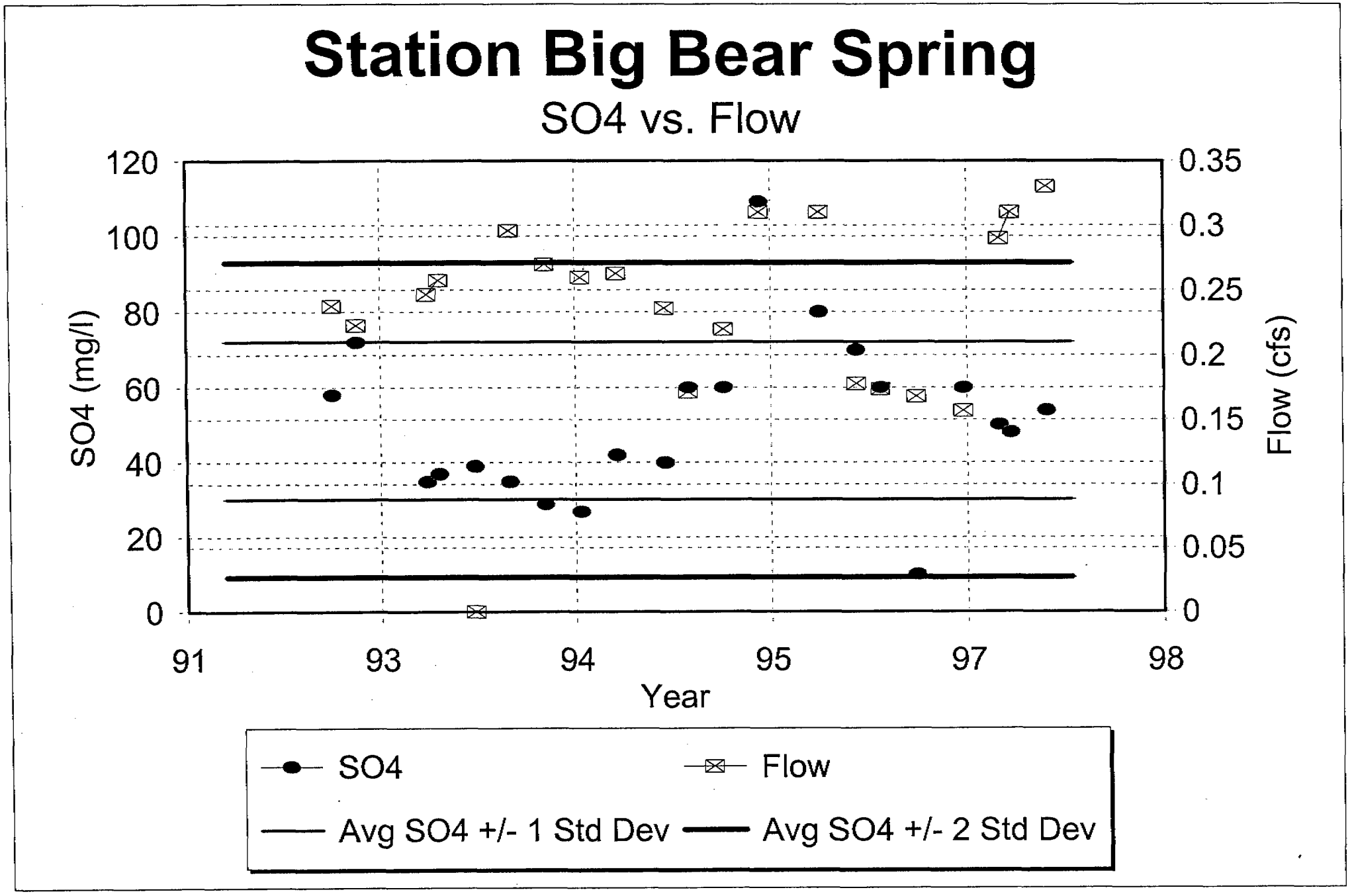
Station Big Bear Spring

Cl vs. Flow



Station Big Bear Spring




Station Big Bear Spring
SO4 vs. Flow
SO4 (mg/l)
120
100
80
60
40
20
0
Flow (cfs)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
91
93
94
95
97
98
Year
SO4
Flow
Avg SO4 +/- 1 Std Dev
Avg SO4 +/- 2 Std Dev

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 25, 1998

Station: 530 | Property: Star Point | Location: 2375' S 800' E of NW com. Sec 11, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Blackhawk | Elevation: 9160

Date		Field Measurements				Laboratory Measurements																Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	
Jan-86																						
Feb-86																						
Mar-86																						
Apr-86																						
May-86																						
Jun-86																						
Jul-86																						
Aug-86																						
Sep-86																						
Oct-86	10/10/86	0.02				300																
Nov-86																						
Dec-86																						
Jan-87																						
Feb-87																						
Mar-87																						
Apr-87																						
May-87	05/23/87	0.01																				
Jun-87																						
Jul-87	07/19/87	0.02																				
Aug-87	08/12/87	0.02				304																
Sep-87	09/22/87	0.02				294																
Oct-87																						
Nov-87																						
Dec-87																						
Jan-88																						
Feb-88																						
Mar-88																						
Apr-88																						
May-88																						
Jun-88	06/01/88	0.01																				
Jul-88	07/09/88	0.01				276																
Aug-88	08/13/88	0.01																				
Sep-88	09/03/88	0.01				308																
Oct-88																						
Nov-88																						
Dec-88																						
Jan-89																						
Feb-89																						
Mar-89																						
Apr-89																						
May-89																						
Jun-89	06/06/89	0.01				298																
Jul-89	07/11/89	0.01				328																
Aug-89	08/22/89	0.01																				
Sep-89	09/14/89	0.01				294																
Oct-89																						
Nov-89																						
Dec-89																						
Jan-90																						
Feb-90																						
Mar-90																						
Apr-90																						
May-90																						
Jun-90	06/02/90	0.01				344																
Jul-90																						
Aug-90	08/22/90	0																				
Sep-90																						
Oct-90	10/03/90	0.01				318																
Nov-90																						
Dec-90																						
Jan-91																						
Feb-91																						
Mar-91																						
Apr-91																						
May-91																						
Jun-91	06/11/91	0.01	7.2	540	6	320			267	271	12	3	43	64	26	1	4		< 0.02	0.06 <	0.01	
Jul-91	07/16/91	0.01	6.8	510	12	308			288	322	0	5	23	71	27	1	6		< 0.02	0.12 <	0.01	
Aug-91																						
Sep-91	09/17/91	0	8.2	530	10	300			267	325	0	3	21	69	29	1	4		0.03	0.13 <	0.01	
Oct-91																						
Nov-91																						
Dec-91																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 25, 1998

Station: 530 | Property: Star Point | Location: 2375' S 800' E of NW com. Sec 11, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Blackhawk | Elevation: 9160

Date Mo-Yr	Sample Date	Field Measurements Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	Laboratory Measurements TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92																						
Jun-92	06/17/92	0.007	8.1	568	8.3	304			268	256	0	4	56	63	27	1	5	<	0.02	0.03		
Jul-92	07/15/92	0.001	8.2	345	9.1	320			312	334	0	4	45	87	23 <	1	4	<	0.02	0.13		
Aug-92	08/26/92	0.001	7.2	354	9.2																	
Sep-92	09/22/92	0.001	6.4	529	9.9	298			310	273	0	4	80	70	33	3	6		0.02	0.95		
Oct-92																						
Nov-92																						
Dec-92																						
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/21/93	0.008	6.6	539	8.5	282			285	342	0	4	31	68	31 <	1	5	<	0.02	0.03 <	0.01	
Jul-93	07/26/93	0.006	6.9	521	10.2	302			271	305	10	4	2	64	30 <	1	5	<	0.02	0.03 <	0.01	
Aug-93	08/17/93	0.005	6.7	528	7.2																	
Sep-93	09/27/93	0.009	6.9	506	6.5	308			298	356	0	5	25	70	30 <	1	5	<	0.02	0.05 <	0.01	
Oct-93																						
Nov-93																						
Dec-93																						
Jan-94																						
Feb-94																						
Mar-94																						
Apr-94																						
May-94																						
Jun-94	06/08/94	0.003	8.3	607	9.9	278			282	342	0	4	25	67	28 <	1	5	<	0.02 <	0.02 <	0.01	
Jul-94	07/19/94	0.01	8.1	588	11.4	288			293	348	0	4	31	68	30	1	5	<	0.02	0.07 <	0.01	
Aug-94	08/31/94	0.003	7.8	471	10																	
Sep-94	09/21/94	0.01	8.1	565	9.5	318			321	329	0	4	25	76	32	1	5		0.04	0.22 <	0.01	
Oct-94																						
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95																						
Mar-95																						
Apr-95																						
May-95																						
Jun-95	06/22/95	0.0055	7.9	541	5	320			321	291 <	2	5	20	75.4	32.3	1	5.5	2.3 <	0.01	0.02 <	0.005	
Jul-95	07/27/95	0.009	7.9	582	7	330			315	265 <	2	5	30	73.2	32.1	0.7	5.4	0.6	0.02 <	0.01 <	0.005	
Aug-95	08/23/95	0.008	8	515	11																	
Sep-95	09/27/95	0.006	8.1	614	7	340			322	273 <	2	5	318	76	32.1	1.1	5.3	2.8 <	0.01	0.4	0.074	
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/12/96	0.007	7.65	745	6	325			333	287	2 <	5	30	77.6	33.7	0.8	5.8	3.1	0.01 <	0.03	0.005	
Jul-96	07/24/96	0.007	8.5	623	8	321			328	284	2 <	5	30	76.5	33.2	0.8	5.5	2.7	0.01 <	0.02	0.005	
Aug-96	08/19/96	0.008	8.8	478	8																	
Sep-96	09/30/96	0.005	7.9	588	6	317			312	285	2 <	5	30	74.2	30.9	0.8	5	0.1	0.06	0.11	0.005	
Oct-96																						
Nov-96																						
Dec-96																						
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/18/97	0.033	8.21	675	6.5	334			328	318	2 <	6	20	78.1	32.4	0.7	5.9	-0.8	0.01 <	0.08	0.005	
Jul-97	07/30/97	0.02	7.72	528	9	300			130	270	10 <	2.9	23	74	31	1.2	5.4	4.4	0.01 <	0.01 <	0.005	
Aug-97	08/13/97	0.013	8.12	560	10																	
Sep-97	09/17/97	[illegible].011	8.18	668	8	270			340	270	10 [illegible]	7.1	22	75	36	1.3	6.9	7.5	0.05	0.18	0.005	
Oct-97																						
Nov-97																						
Dec-97																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 25, 1998

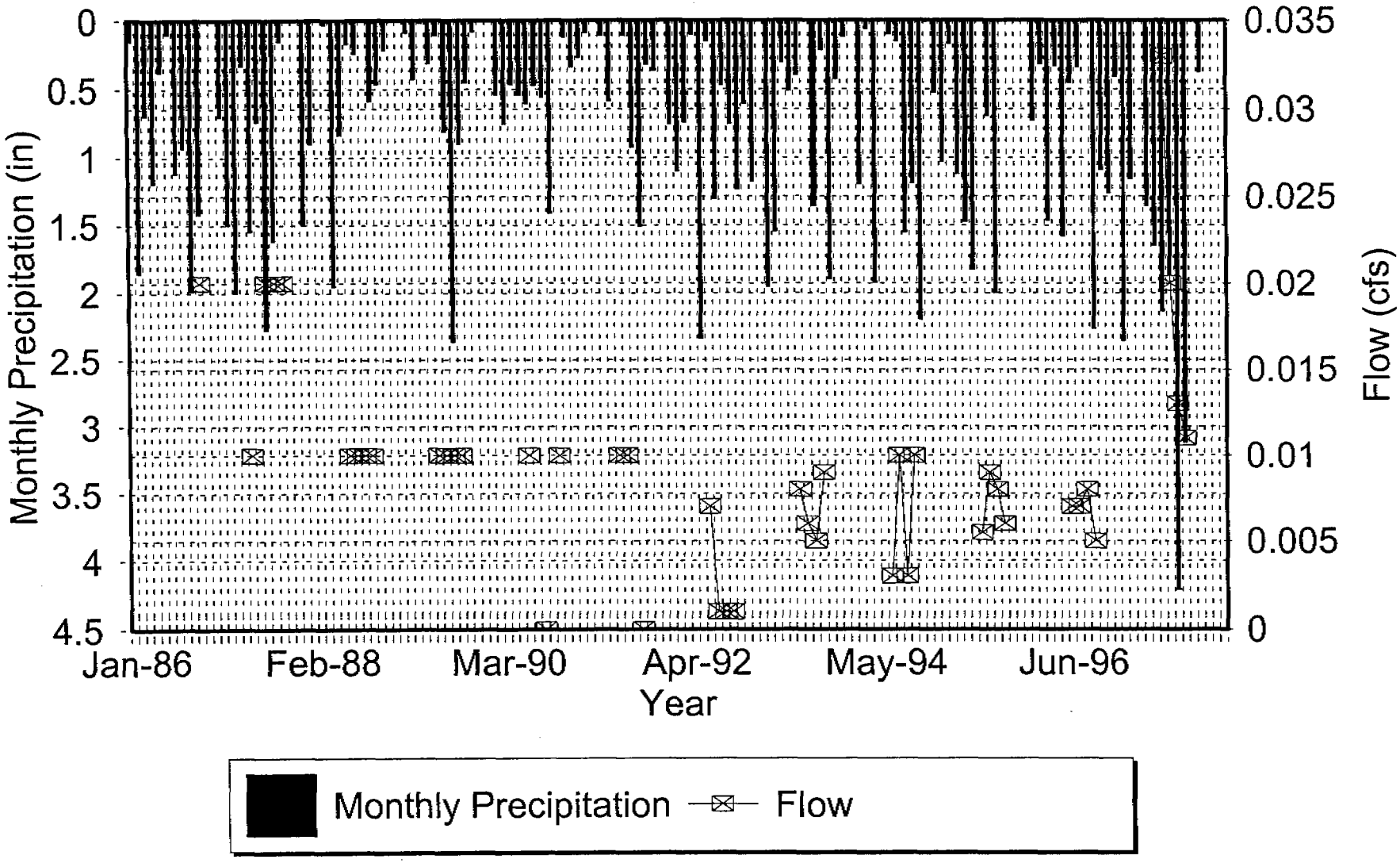
Station: 530 | Property: Star Point | Location: 2375' S 800' E of NW corn. Sec 11, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Blackhawk | Elevation: 9160

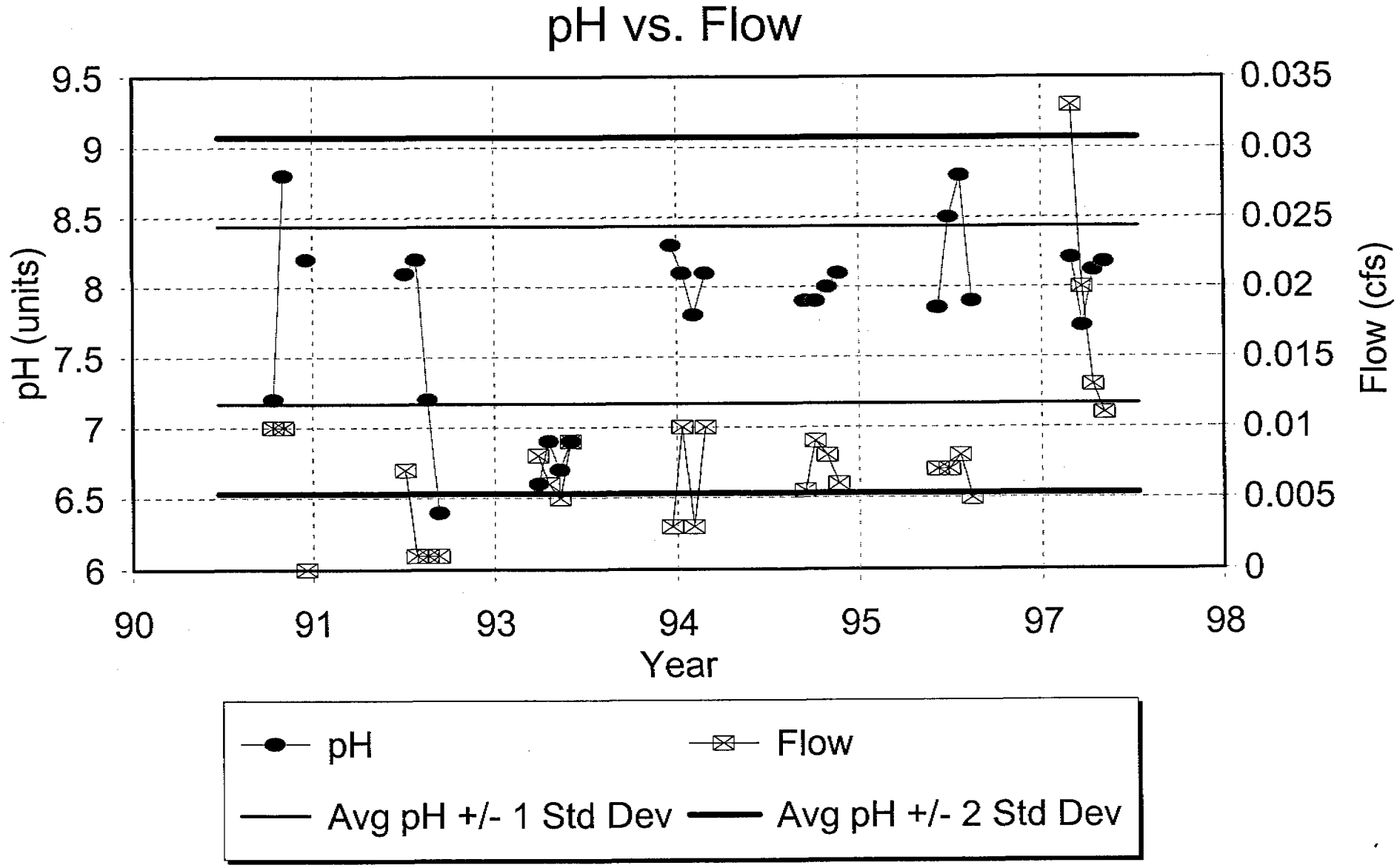
Date		Field Measurements				Laboratory Measurements																Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	
END DATA																						
	Count	43	27	27	27	31	0	0	21	21	21	21	21	21	21	21	21	9	21	21	18	
	Minimum	0	6.4	345	5	270	ERR	ERR	130	256 <	0 <	2.9	2	63	23 <	0.7	4	-0.8 <	0.01 <	0.01 <	0.005	
	Maximum	0.033	8.6	745	12	344	ERR	ERR	340	356 <	12 <	7.1	318	87	36 <	3	6.9	7.5 <	0.06 <	0.95 <	0.074	
	Average	0.0095	7.803	548.89	8.4889	307.97	ERR	ERR	295.76	303.14 <	2.6667 <	4.4762	44.286	72.238	30.462 <	1.0667	5.2238	2.5222 <	0.0219 <	0.1295 <	0.0113	
	Standard Deviation	0.0063	0.6343	82.593	1.8109	18.269	ERR	ERR	42.888	30.242 <	3.9198 <	0.9773	63.069	5.6039	2.9206 <	0.455	0.6872	2.3427 <	0.013 <	0.2043 <	0.0154	
	Avg. -1 Std. Dev.	0.0031	7.1686	466.3	6.6779	289.7	ERR	ERR	252.87	272.9 <	-1.253 <	3.4989	-18.78	66.634	27.541 <	0.6117	4.5366	0.1795 <	0.009 <	-0.075 <	-0.004	
	Avg. +1 Std. Dev.	0.0158	8.4373	631.48	10.3	326.24	ERR	ERR	338.65	333.39 <	6.5865 <	5.4535	107.35	77.842	33.383 <	1.5216	5.911	4.865 <	0.0349 <	0.3338 <	0.0267	
	Avg. -2 Std. Dev.	-0.003	6.5343	383.7	4.867	271.43	ERR	ERR	209.98	242.66 <	-5.173 <	2.5216	-81.85	61.03	24.621 <	0.1568	3.6493	-2.163 <	-0.004 <	-0.279 <	-0.019	
	Avg. +2 Std. Dev.	0.0221	9.0716	714.07	12.111	344.51	ERR	ERR	381.54	363.63 <	10.506 <	6.4308	170.42	83.446	36.303 <	1.9766	6.5983	7.2077 <	0.0478 <	0.5381 <	0.0421	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

Station 530

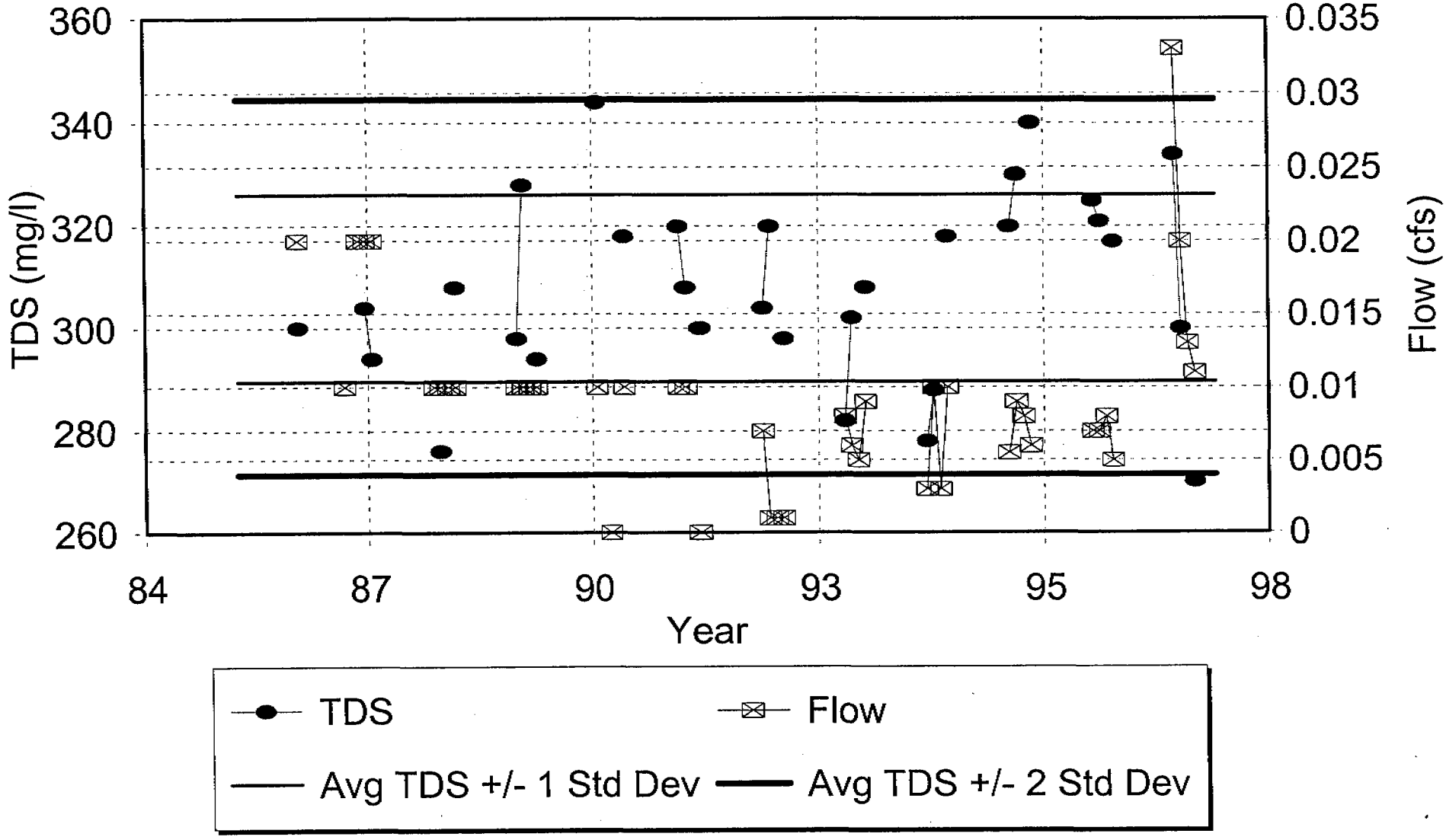
Monthly Precipitation vs. Flow




Station 530
pH vs. Flow
9.5
9
8.5
8
7.5
7
6.5
6
pH (units)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Flow (cfs)
90
91
93
94
95
97
98
Year
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev

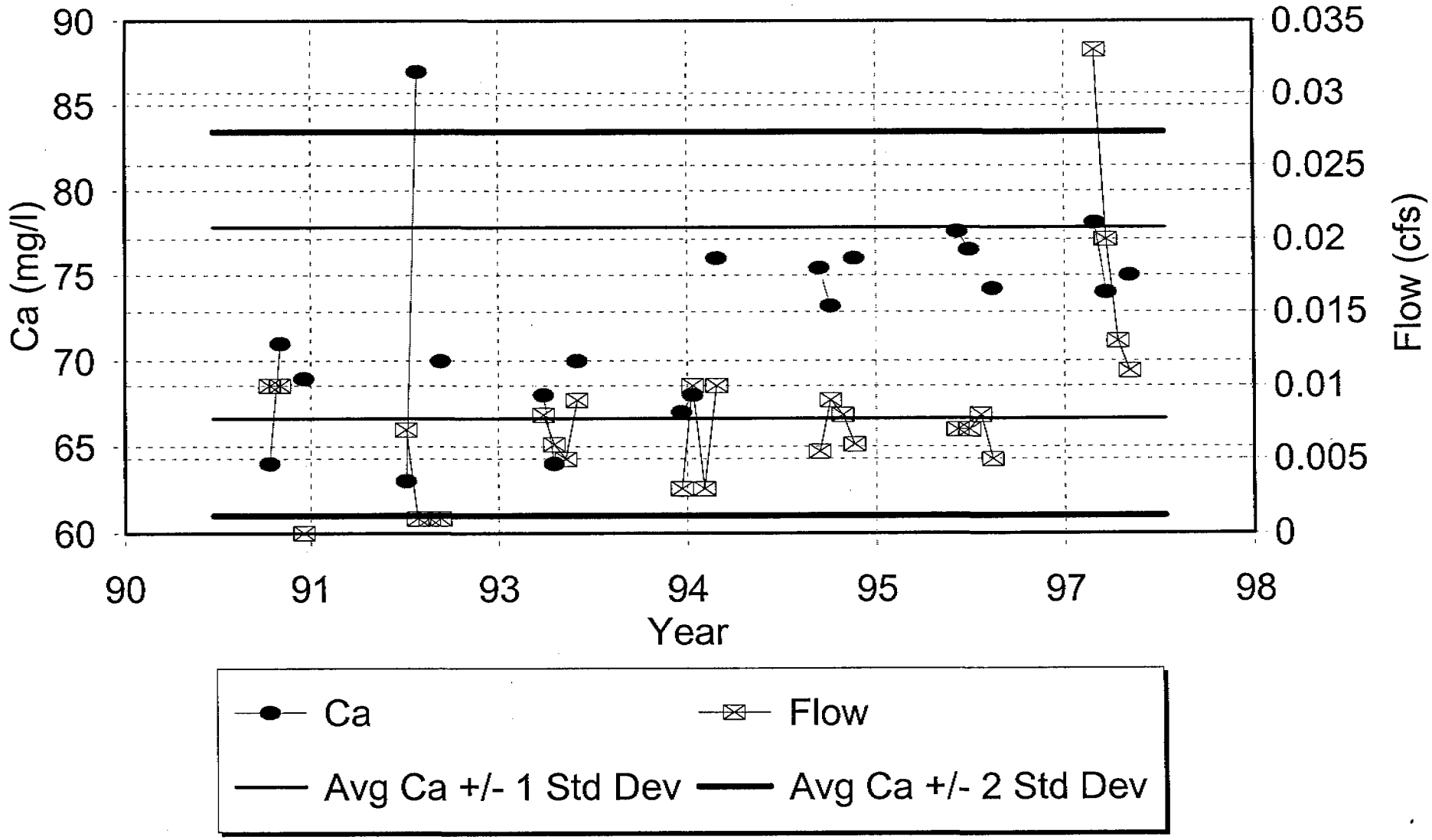
Station 530

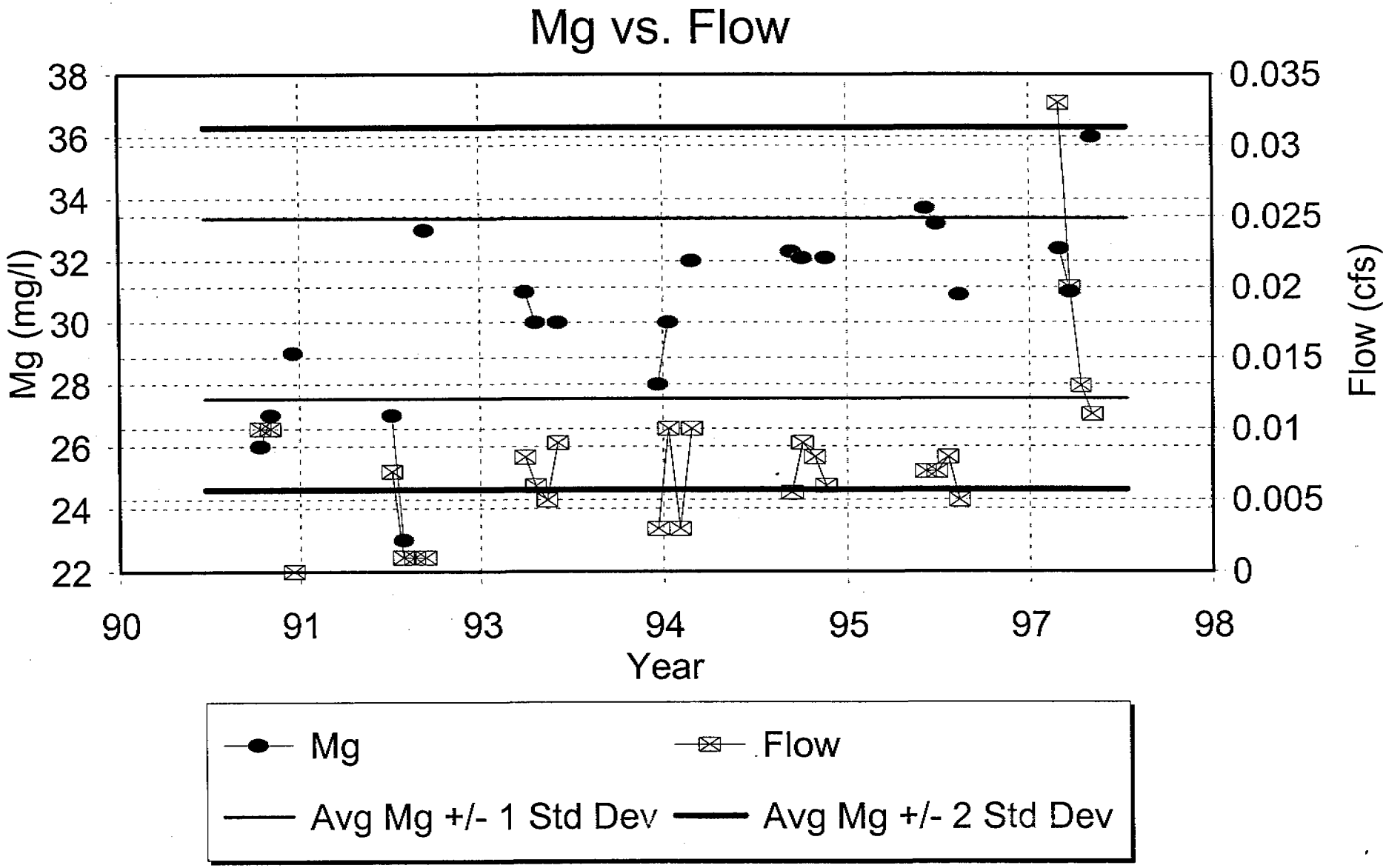
TDS vs. Flow



Station 530

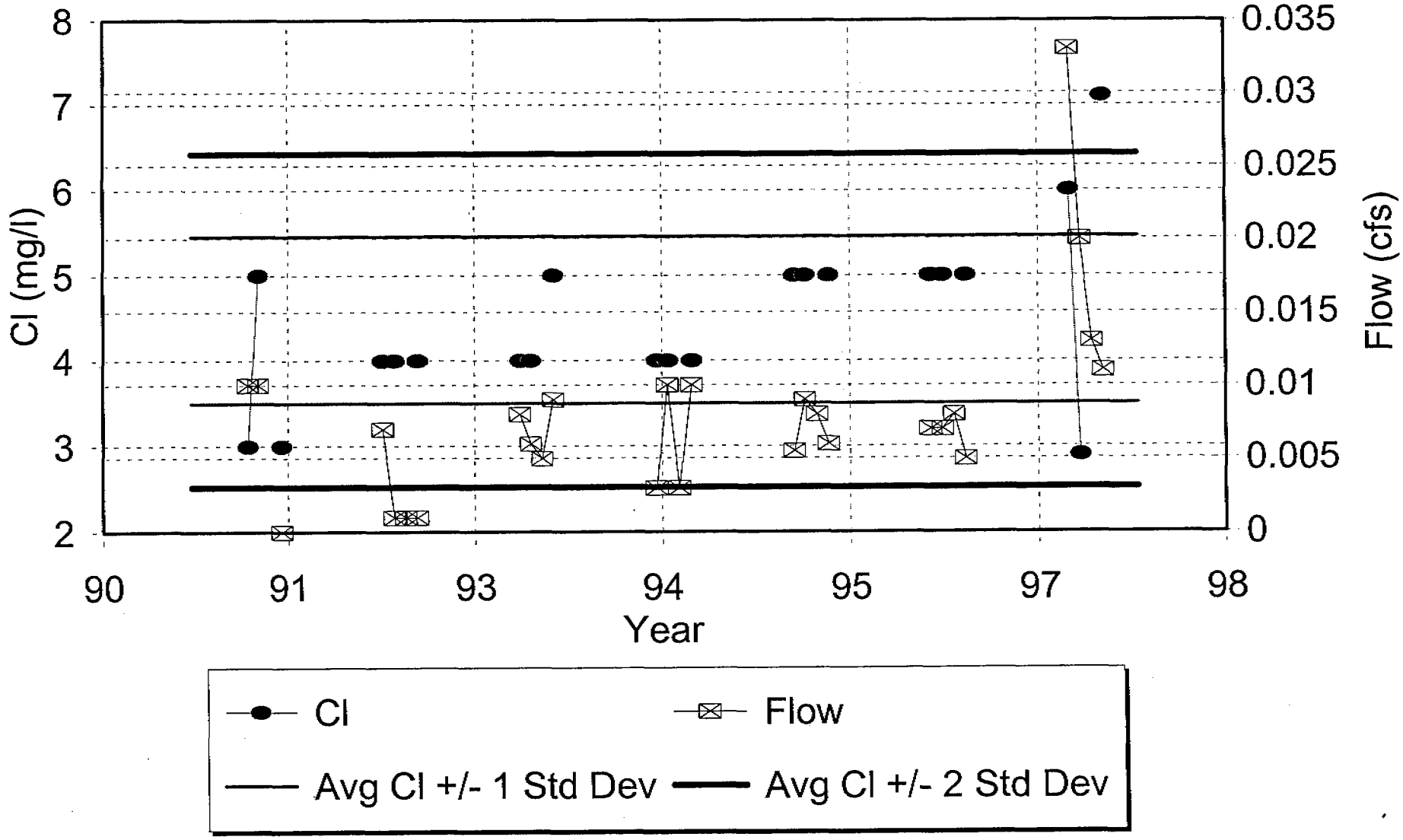
Ca vs. Flow

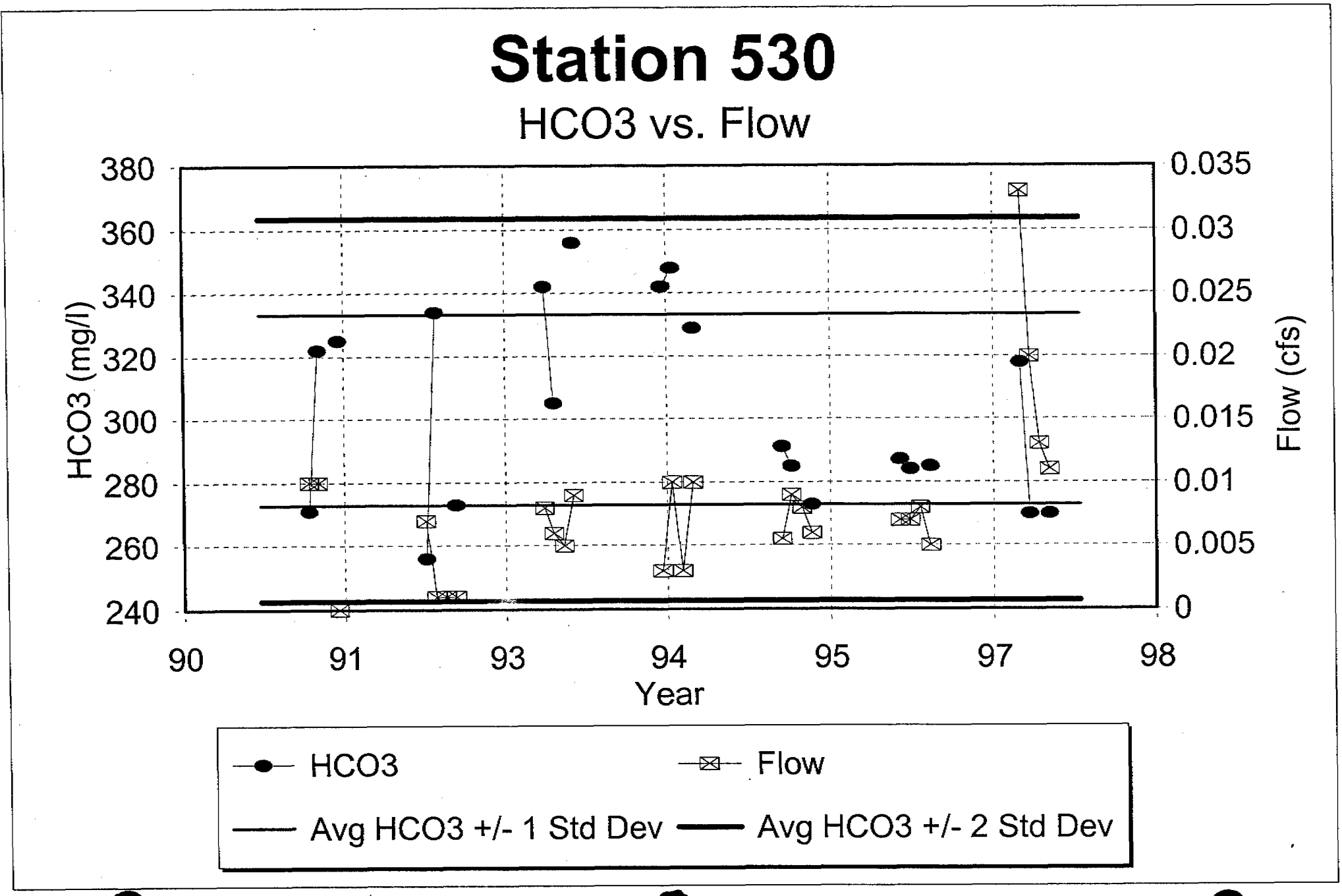



Station 530
Mg vs. Flow
Mg (mg/l)
38
36
34
32
30
28
26
24
22
Flow (cfs)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
90
91
93
94
95
97
98
Year
Mg
Flow
Avg Mg +/- 1 Std Dev
Avg Mg +/- 2 Std Dev

Station 530

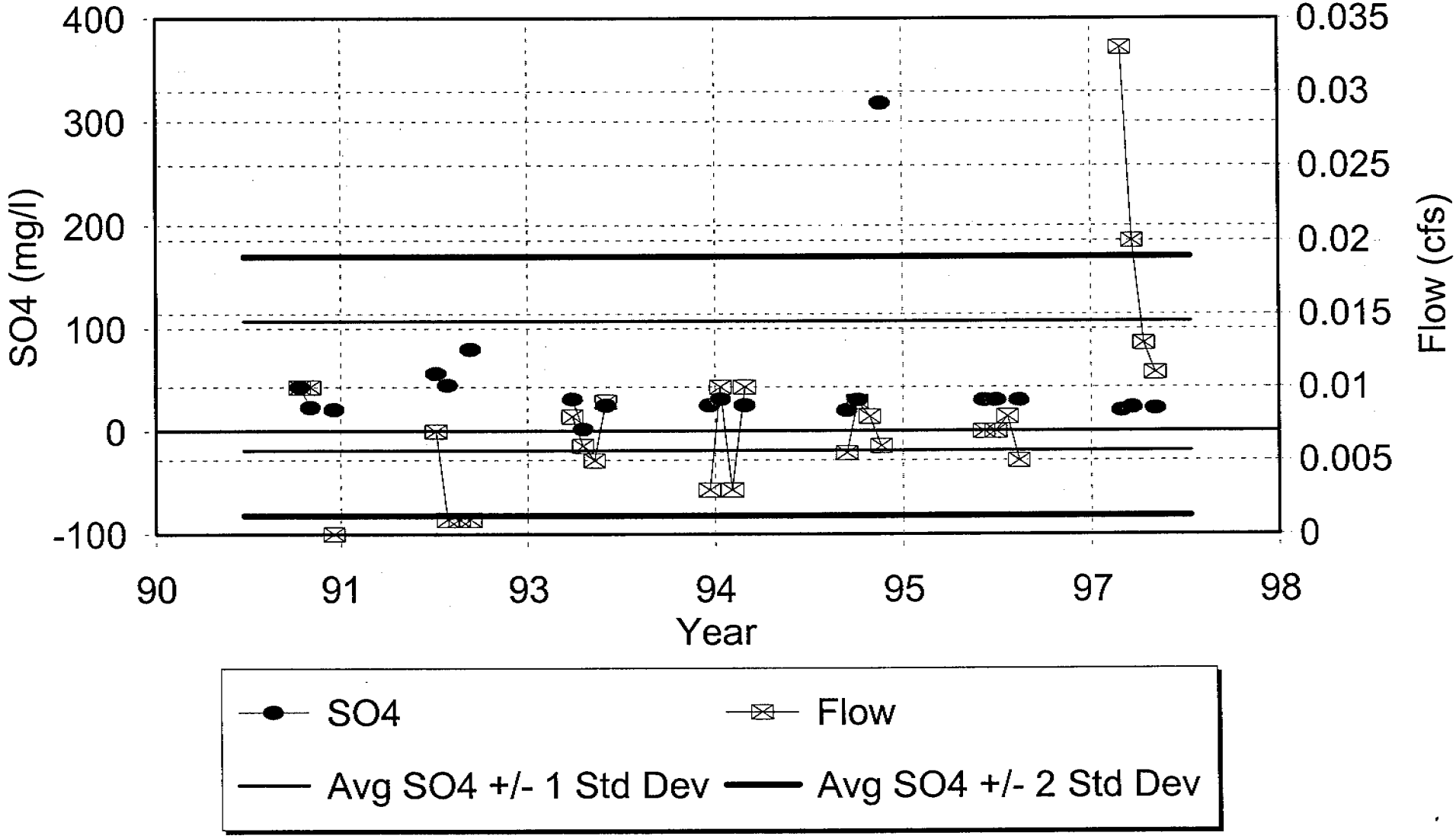
Cl vs. Flow




Station 530
HCO3 vs. Flow
HCO3 (mg/l)
380
360
340
320
300
280
260
240
Flow (cfs)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
90
91
93
94
95
97
98
Year
HCO3
Flow
Avg HCO3 +/- 1 Std Dev
Avg HCO3 +/- 2 Std Dev

Station 530

SO4 vs. Flow



Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 25, 1998

Station: CVS6 | Property: Star Point | Location: 875' N 2300' E of SW com. Sec 2, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Blackhawk | Elevation: 9350

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/23/93	0.002	6.2	478	9.2	240			268	290	0	3	25	63	27 <	1	3	<	0.02	0.08 <	0.01	
Jul-93	07/26/93	0																				NO FLOW
Aug-93	08/17/93	0																				NO FLOW
Sep-93	09/27/93	0																				NO FLOW
Oct-93																						
Nov-93																						
Dec-93																						
Jan-94																						
Feb-94																						
Mar-94																						
Apr-94																						
May-94																						
Jun-94	06/08/94	0																				NO FLOW
Jul-94	07/19/94	0																				NO FLOW
Aug-94	08/31/94	0																				NO FLOW
Sep-94	09/21/94	0																				NO FLOW
Oct-94																						
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95																						
Mar-95																						
Apr-95																						
May-95																						
Jun-95																						
Jul-95	07/26/95	0																				damp - No sample possibl
Aug-95	08/23/95	0																				
Sep-95	09/27/95	0																				
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/11/96	0																				Dry
Jul-96	07/23/96	0																				Dry
Aug-96	08/19/96	0																				Dry
Sep-96	09/30/96	0																				Dry
Oct-96																						
Nov-96																						
Dec-96																						
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/12/97	0																				Dry
Jul-97	07/30/97	0																				Dry
Aug-97	08/13/97	0																				Dry
Sep-97	09/16/97	0																				Dry
Oct-97																						
Nov-97																						
Dec-97																						
END DATA																						
Count		19	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	1	1	1	
Minimum		0	6.2	478	9.2	240	ERR	ERR	268	290	0	3	25	63	27 <	1	3	ERR <	0.02	0.08 <	0.01	
Maximum		0.002	6.2	478	9.2	240	ERR	ERR	268	290	0	3	25	63	27 <	1	3	ERR <	0.02	0.08 <	0.01	
Average		0.0001	6.2	478	9.2	240	ERR	ERR	268	290	0	3	25	63	27 <	1	3	ERR <	0.02	0.08 <	0.01	
Standard Deviation		0.0004	0	0	0	0	ERR	ERR	0	0	0	0	0	0	0 <	0	0	ERR <	0	0 <	0	
Avg. -1 Std. Dev.		-0.000	6.2	478	9.2	240	ERR	ERR	268	290	0	3	25	63	27 <	1	3	ERR <	0.02	0.08 <	0.01	
Avg. +1 Std. Dev.		0.0006	6.2	478	9.2	240	ERR	ERR	268	290	0	3	25	63	27 <	1	3	ERR <	0.02	0.08 <	0.01	
Avg. -2 Std. Dev.		-0.001	6.2	478	9.2	240	ERR	ERR	268	290	0	3	25	63	27 <	1	3	ERR <	0.02	0.08 <	0.01	
Avg. +2 Std. Dev.		0.001	6.2	478	9.2	240	ERR	ERR	268	290	0	3	25	63	27 <	1	3	ERR <	0.02	0.08 <	0.01	

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 25, 1998

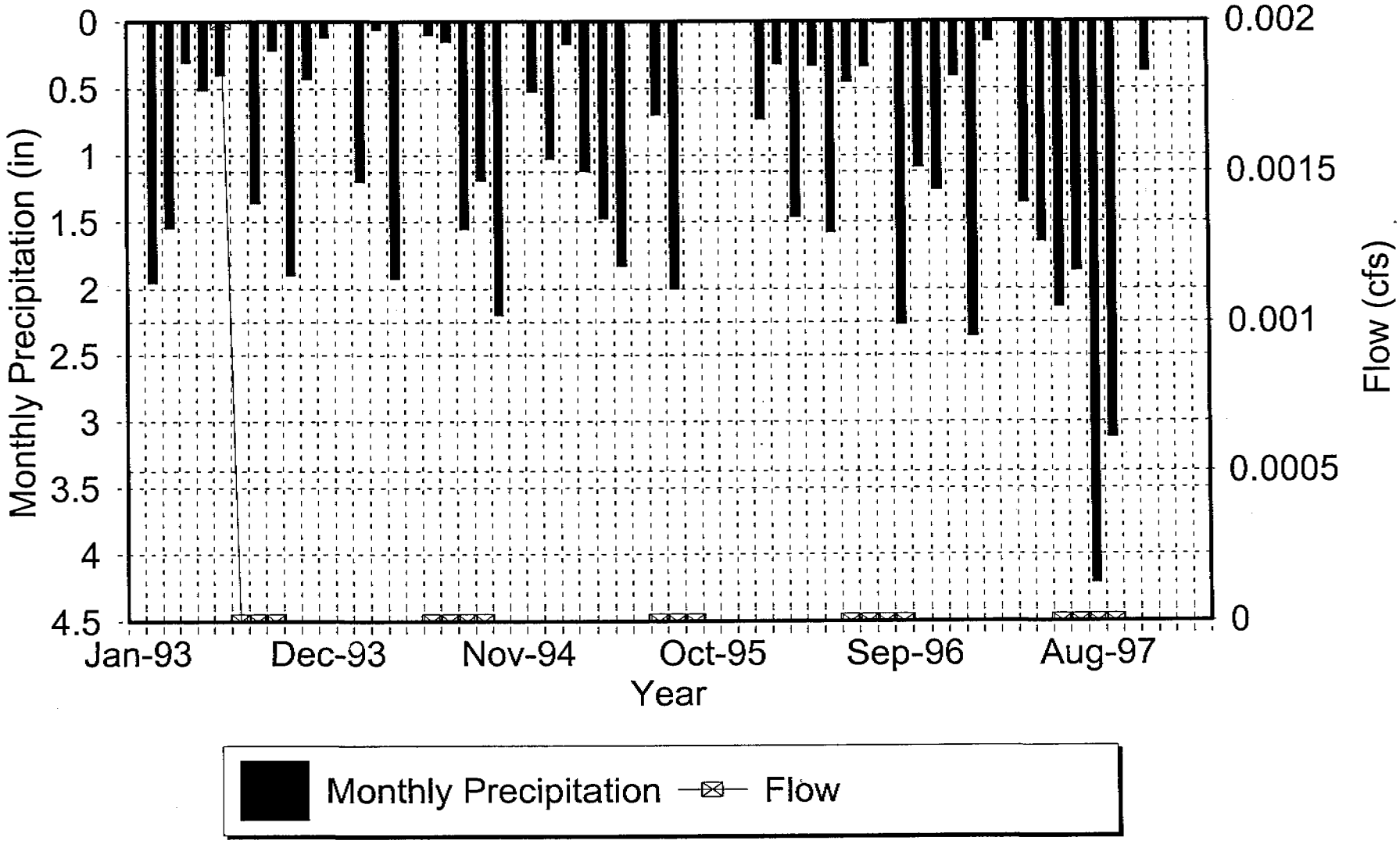
Station: CVS6 | Property: Star Point | Location: 875' N 2300' E of SW com. Sec 2, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Blackhawk | Elevation: 9350

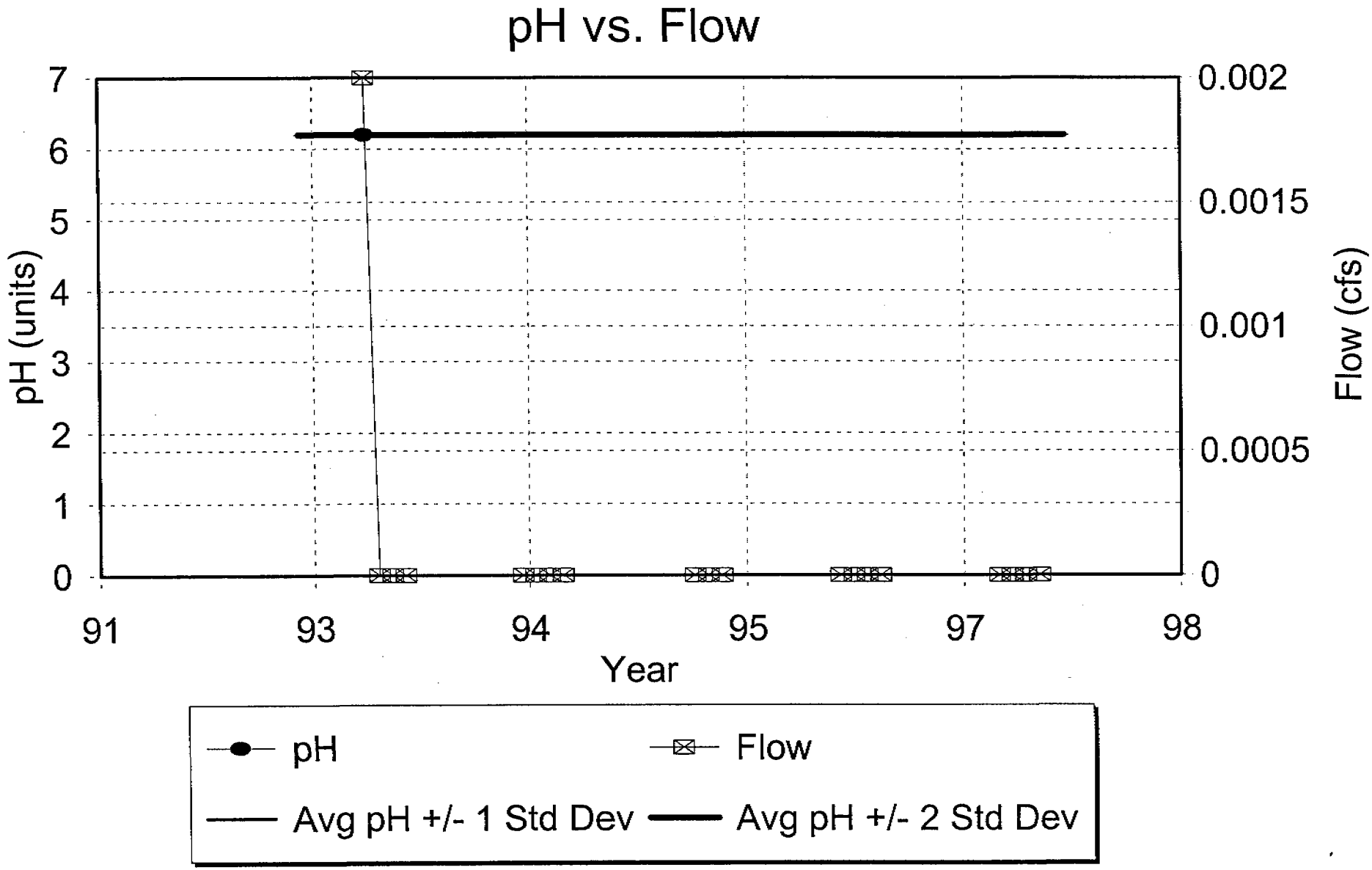
Date		Field Measurements				Laboratory Measurements																Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

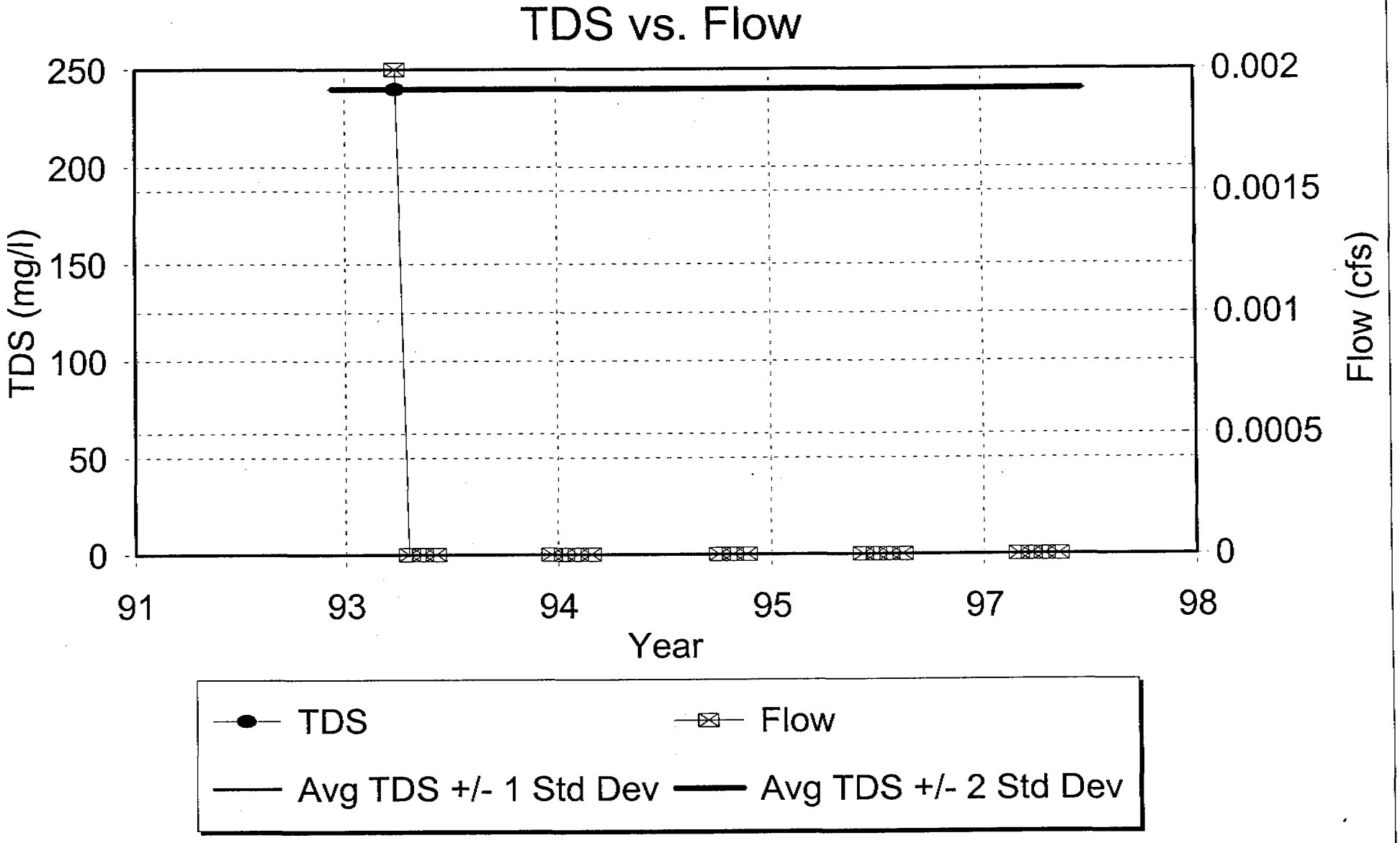
Station CVS6

Monthly Precipitation vs. Flow



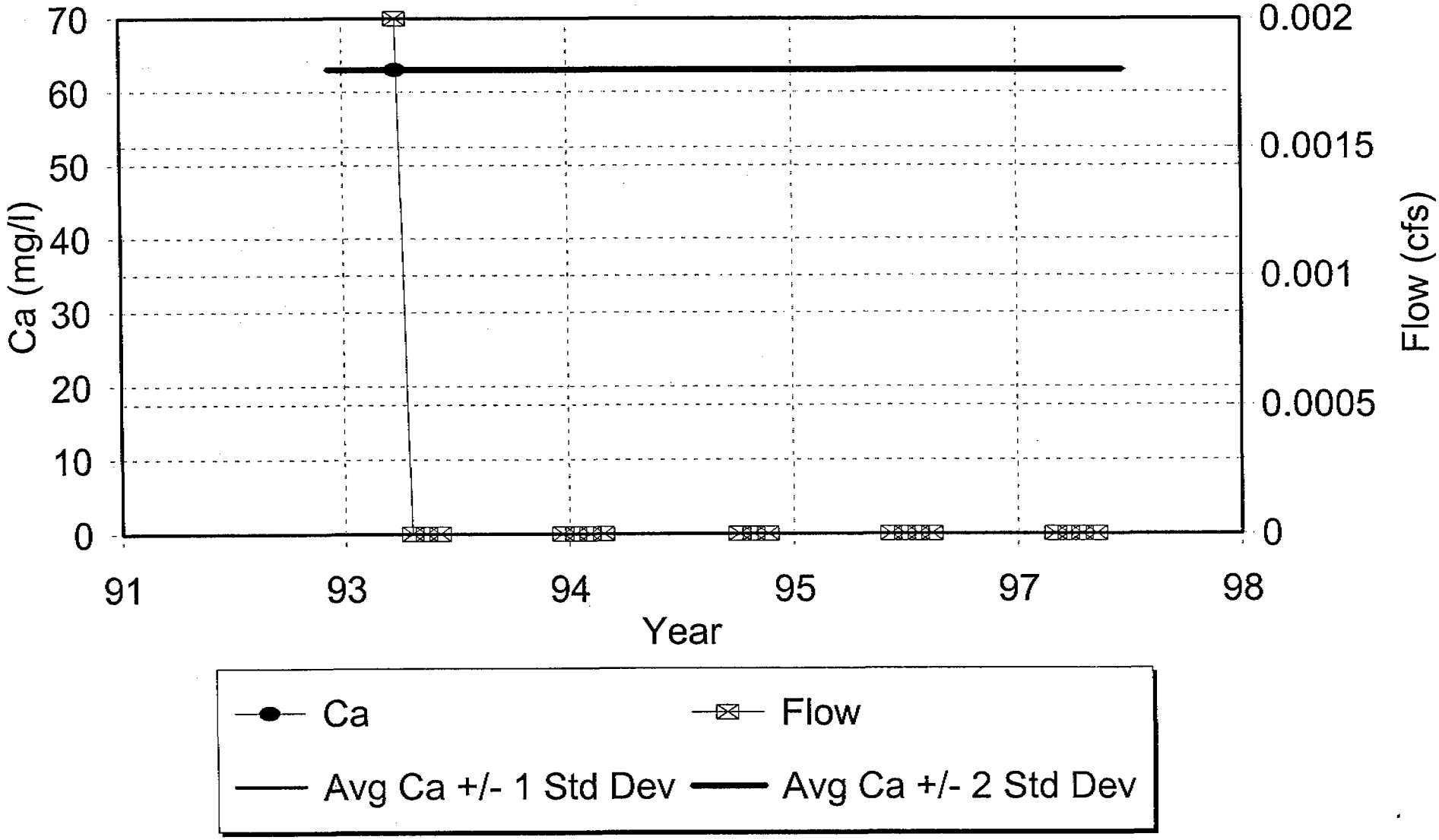

Station CVS6
pH vs. Flow
pH (units)
7
6
5
4
3
2
1
0
0.002
0.0015
0.001
0.0005
0
Flow (cfs)
91
93
94
95
97
98
Year
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev

Station CVS6

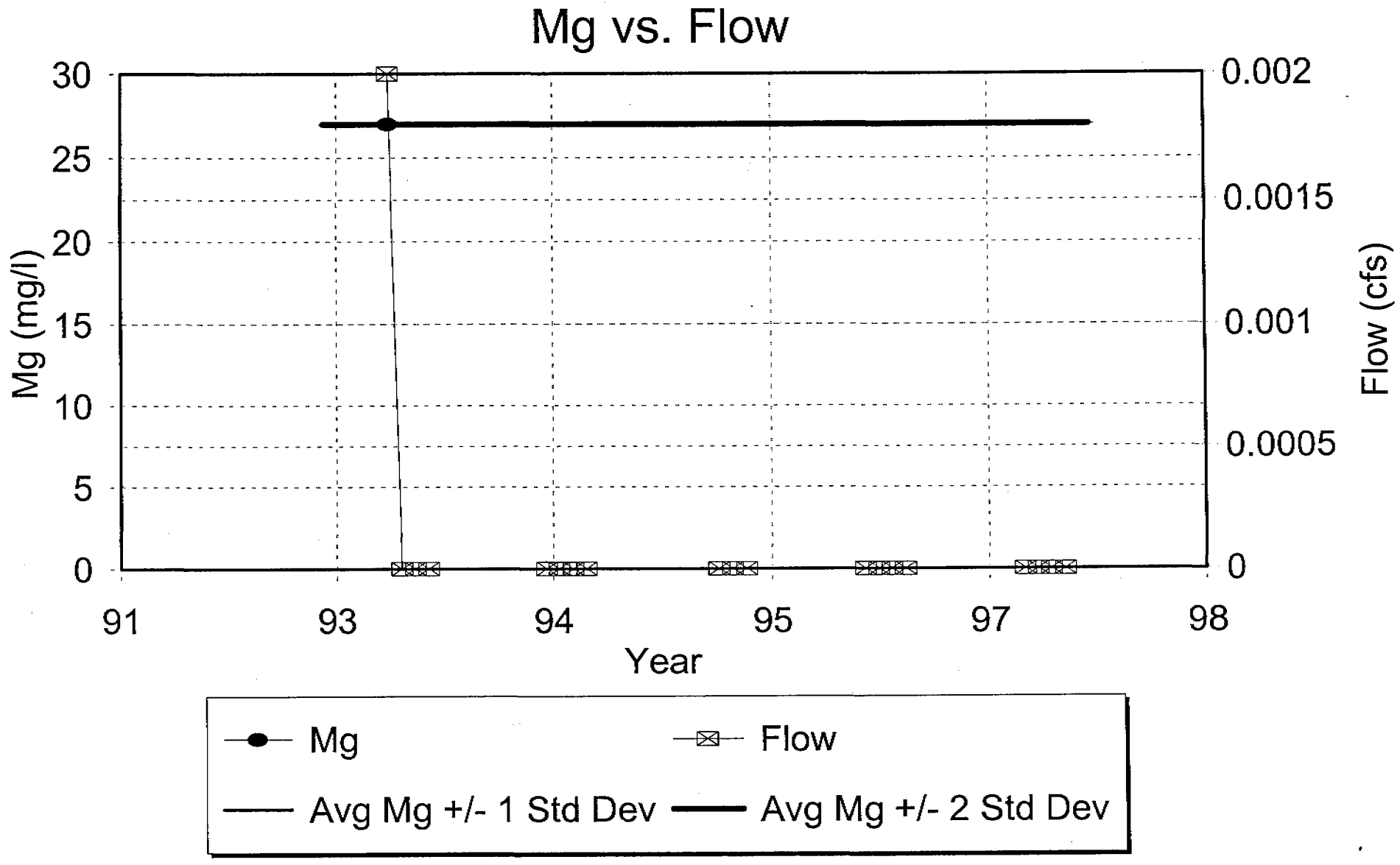


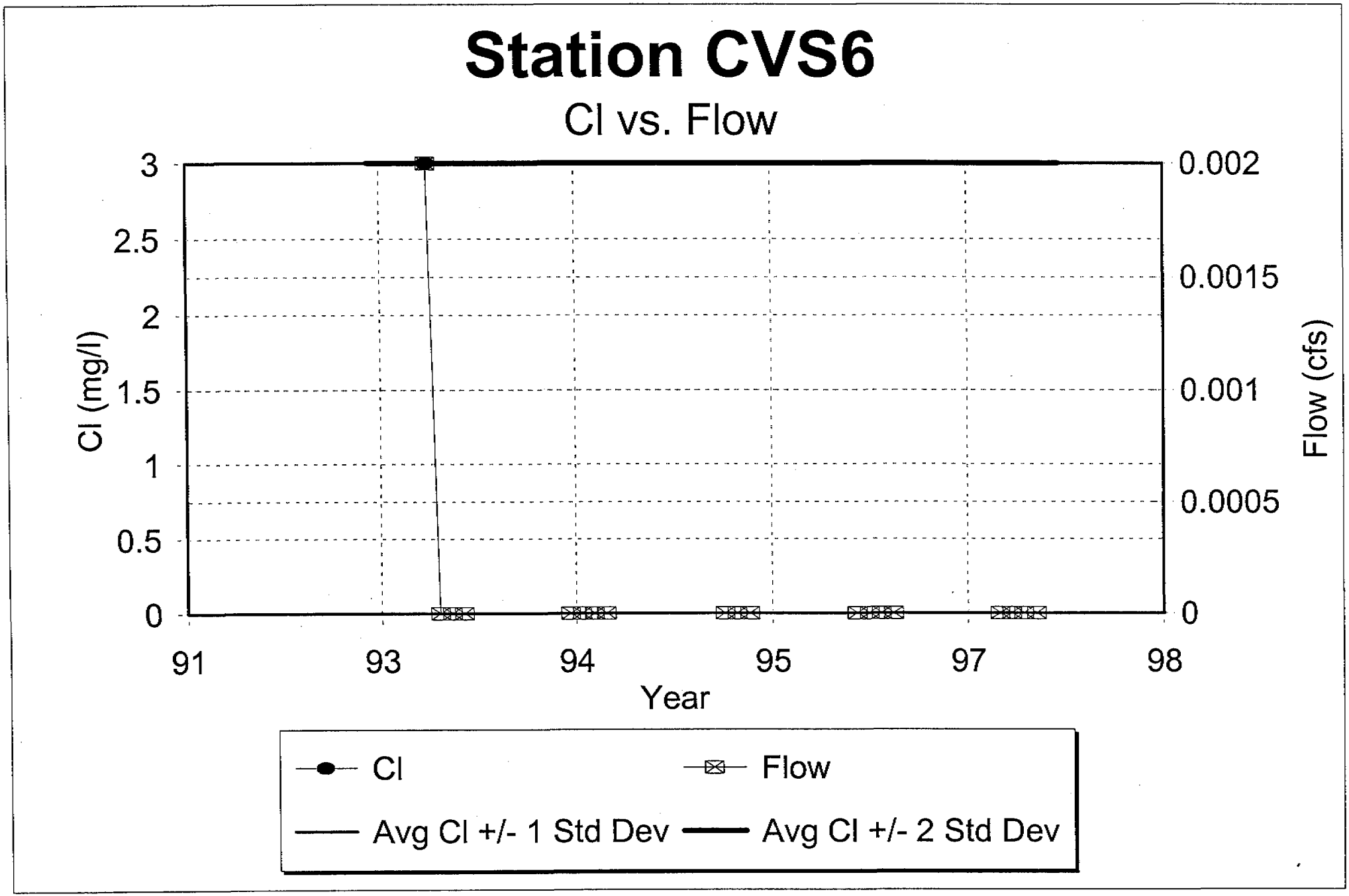
Station CVS6

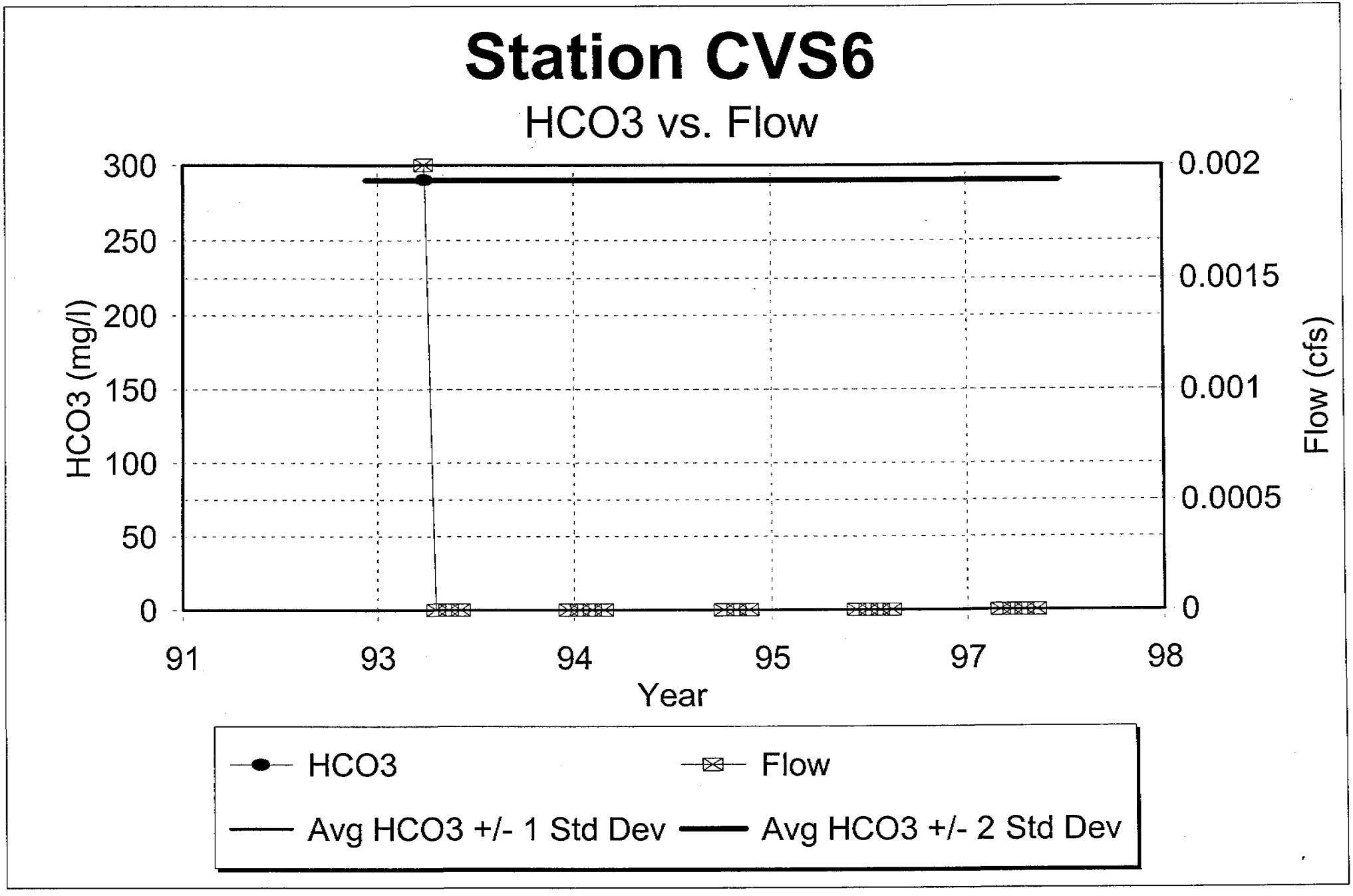
Ca vs. Flow



Station CVS6

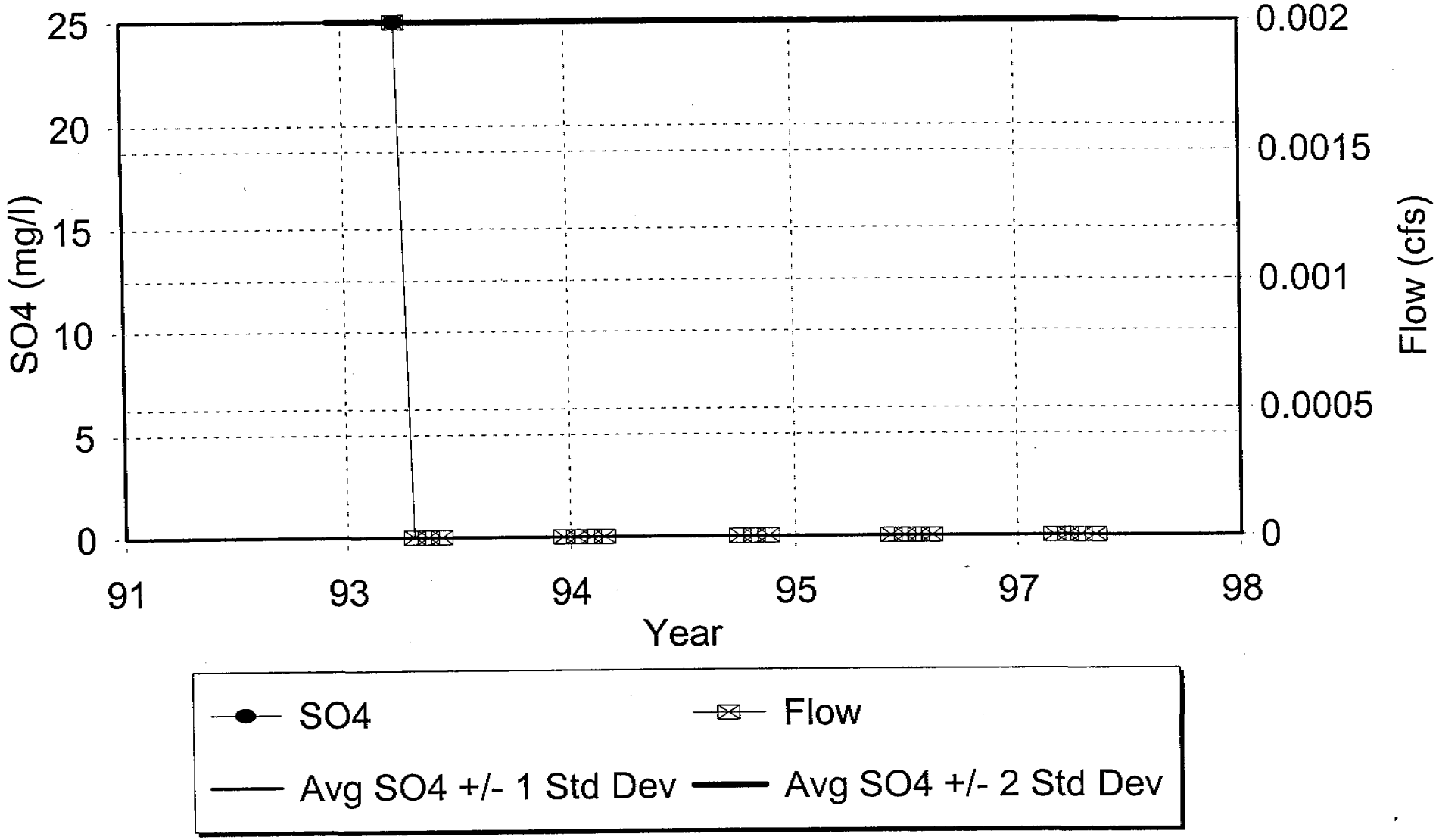



Station CVS6
Cl vs. Flow
Cl (mg/l)
3
2.5
2
1.5
1
0.5
0
0.002
0.0015
0.001
0.0005
0
Flow (cfs)
91
93
94
95
97
98
Year
Cl
Flow
Avg Cl +/- 1 Std Dev
Avg Cl +/- 2 Std Dev


Station CVS6
HCO3 vs. Flow
300
250
200
150
100
50
0
HCO3 (mg/l)
0.002
0.0015
0.001
0.0005
0
Flow (cfs)
91
93
94
95
97
98
Year
HCO3
Flow
Avg HCO3 +/- 1 Std Dev
Avg HCO3 +/- 2 Std Dev

Station CVS6

SO4 vs. Flow



Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 25, 1998

Station: CVS7 | Property: Star Point | Location: 1300' N 1900' E of SW corn. Sec 2, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Blackhawk | Elevation: 9540

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/21/93	0.001	6.3	453	8.5	236			253	290	0	3	10	62	24 <	1	3	<	0.02	0.27 <	0.01	
Jul-93	07/26/93	0.001	6.6	452	12.3	244			244	273	7	3	10	60	23 <	1	4	<	0.02 <	0.02 <	0.01	
Aug-93	08/17/93	0.001	6.4	462	8.4																	
Sep-93	09/27/93	0.001	6.5	470	5.2	250			219	283	0	4	2	53	21 <	1	4	<	0.02 <	0.02 <	0.01	
Oct-93																						
Nov-93																						
Dec-93																						
Jan-94																						
Feb-94																						
Mar-94																						
Apr-94																						
May-94																						
Jun-94	06/08/94	0.001	8.1	520	14.7	252			249	311	0	3	12	65	21 <	1	3	<	0.02 <	0.02 <	0.01	
Jul-94	07/19/94	< 0.01	7.8	475	17.2	258			272	323	0	4	14	66	26	1	5	<	0.02 <	0.02	0.03	
Aug-94	08/31/94	0																				NO FLOW
Sep-94	09/21/94	0																				NO FLOW
Oct-94																						
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95																						
Mar-95																						
Apr-95																						
May-95																						
Jun-95	06/21/95	0.001	7.1	523	44.5	310			290	230 <	2	6	50	68	29.1	0.5	5.3	1.8 <	0.01	0.03 <	0.005	
Jul-95	07/26/95	0.001	7.5	539	11	280			306	255 <	2	6	20	73.4	29.9	0.7	4.8	5.5 <	0.01 <	0.01 <	0.005	
Aug-95	08/23/95	0.001	7.36	504	13																	
Sep-95	09/27/95	0.0006	7.45	583	8	260			279	239 <	2	6	17	67.9	26.5	0.6	4.6	4.4	0.06 <	0.01	0.006	
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/11/96	0.001	7.3	447	4	277			280	254	2 <	5	20	67.3	27.3	0.6	4.7	1.6	0.01 <	0.03	0.005	
Jul-96	07/23/96	0.0004	8.04	440	13	284			290	256	2 <	6	20	69.7	28.2	0.8	5.3	2.9	0.01 <	0.04	0.009	
Aug-96	08/19/96	0.0006	7.75	429	13																	
Sep-96	09/30/96	0.0001	7.4	507	8.5	264			261	240	2 <	6	20	63.3	24.9	0.8	5	0.6	0.01 <	0.02	0.005	
Oct-96																						
Nov-96																						
Dec-96																						
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/17/97	0.003	8.6	588	4.5	256			278	234	2 <	6	10 <	69.4	25.5	0.8	4.2	6.6	0.01 <	0.04	0.005	
Jul-97	07/30/97	0.0009	7.66	519	10	250			260	230	10 <	3.6	14	63	24	1.1	4.8	3.5	0.01 <	0.03	0.005	
Aug-97	08/13/97	0.0007	7.73	440	15																	
Sep-97	09/16/97	0																				Dry
Oct-97																						
Nov-97																						
Dec-97																						
END DATA																						
Count		20	17	17	17	13	0	0	13	13	13	13	13	13	13	13	13	8	13	13	13	
Minimum		< 0	6.3	429	4	236	ERR	ERR	219	230 <	0 <	3	2 <	53	21 <	0.5	3	0.6 <	0.01 <	0.01 <	0.005	
Maximum		< 0.01	8.6	588	44.5	310	ERR	ERR	306	323 <	10 <	6	50 <	73.4	29.9 <	1.1	5.3	6.6 <	0.06 <	0.27 <	0.03	
Average		< 0.0013	7.3876	491.24	12.4	263.15	ERR	ERR	267.77	262.92 <	2.3846 <	4.7385	16.846 <	65.231	25.415 <	0.8385	4.4385	3.3625 <	0.0177 <	0.0431 <	0.0068	
Standard Deviation		< 0.0021	0.6217	47.734	8.8281	19.151	ERR	ERR	22.306	29.679 <	2.8158 <	1.2731	10.883 <	4.9607	2.712 <	0.1862	0.7365	1.9215 <	0.0131 <	0.0661 <	0.0065	
Avg. -1 Std. Dev.		< -0.001	6.766	443.5	3.5719	244	ERR	ERR	245.46	233.24 <	-0.431 <	3.4653	5.9632 <	60.27	22.703 <	0.6523	3.702	1.441 <	0.0046 <	-0.023 <	0.0023	
Avg. +1 Std. Dev.		< 0.0034	8.0093	538.97	21.228	282.3	ERR	ERR	290.08	292.6 <	5.2005 <	6.0116	27.729 <	70.191	28.127 <	1.0247	5.1749	5.284 <	0.0308 <	0.1092 <	0.0153	
Avg. -2 Std. Dev.		< -0.003	6.1443	395.77	-5.256	224.85	ERR	ERR	223.16	203.57 <	-3.247 <	2.1922	-4.92 <	55.309	19.991 <	0.466	2.9656	-0.481 <	-0.009 <	-0.089 <	-0.004	

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 25, 1998

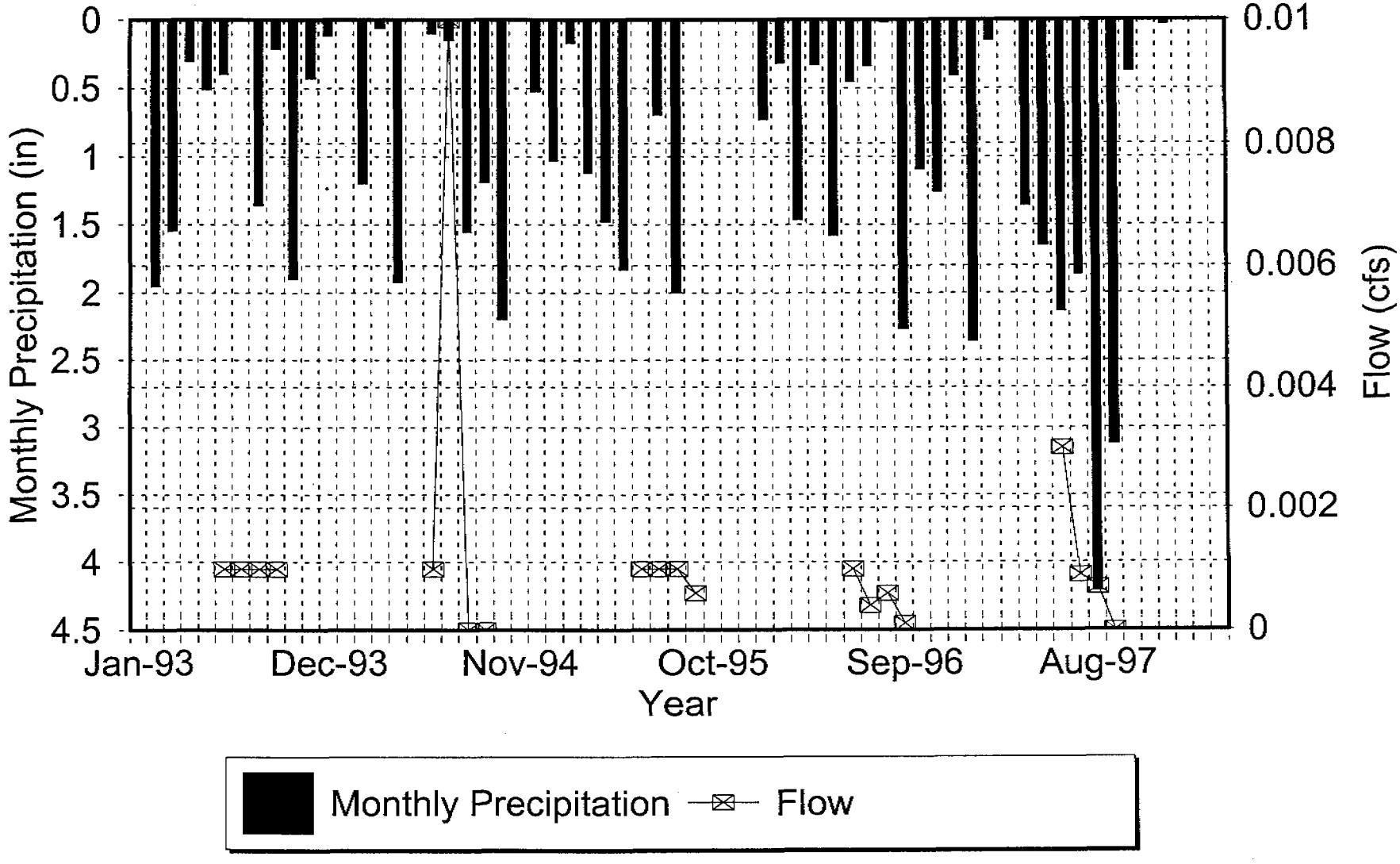
Station: CVS7 | Property: Star Point | Location: 1300' N 1900' E of SW corn. Sec 2, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Blackhawk | Elevation: 9540

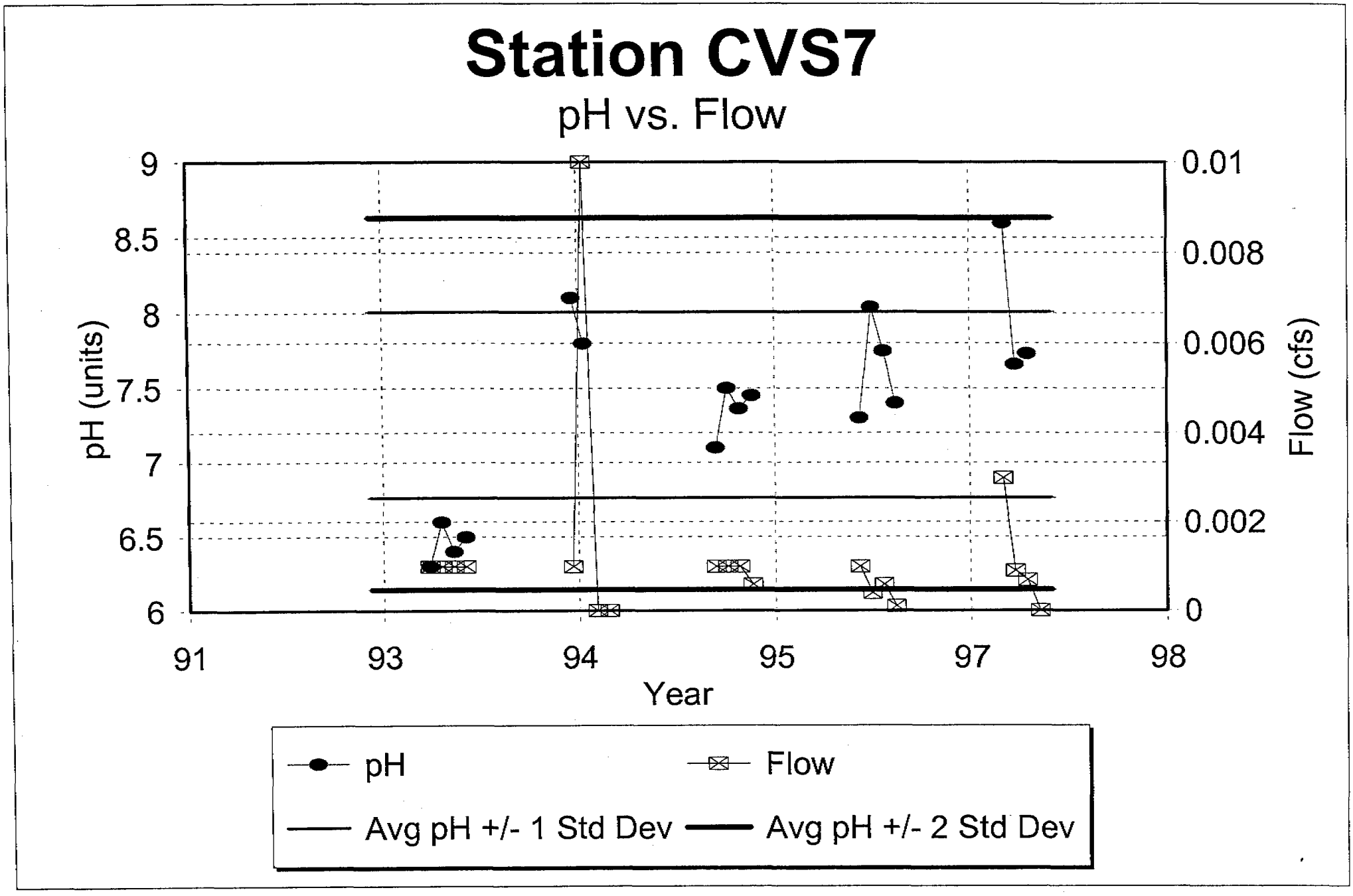
Date		Field Measurements				Laboratory Measurements																	Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)		
Avg. +2 Std. Dev.		< 0.0055	8.631	586.7	30.056	301.46	ERR	ERR	312.38	322.26	< 6.0163	< 7.2847	38.612	< 75.152	30.839	< 1.2109	5.9114	7.2056	< 0.0439	< 0.1754	< 0.0219		

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

Station CVS7

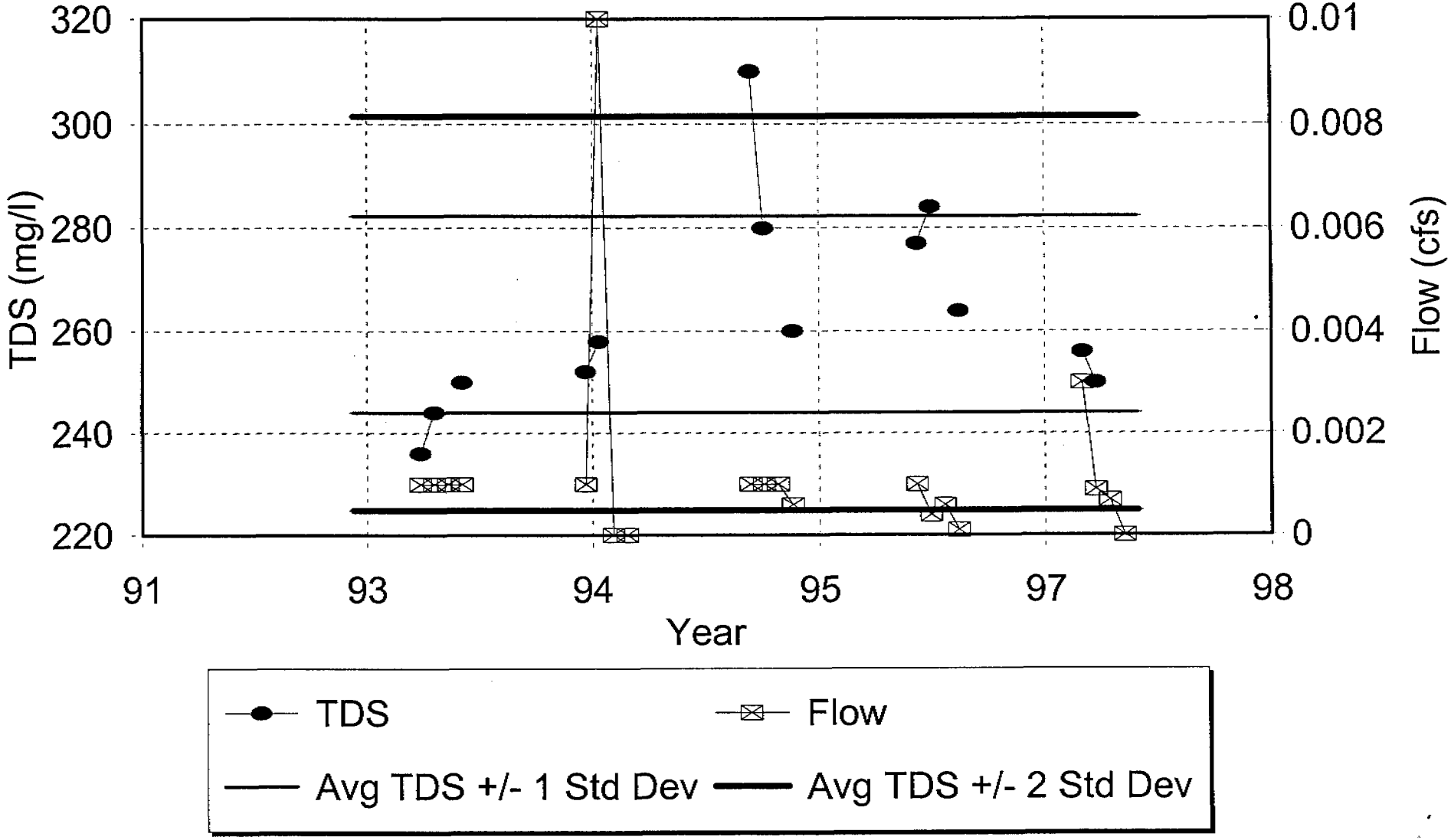
Monthly Precipitation vs. Flow

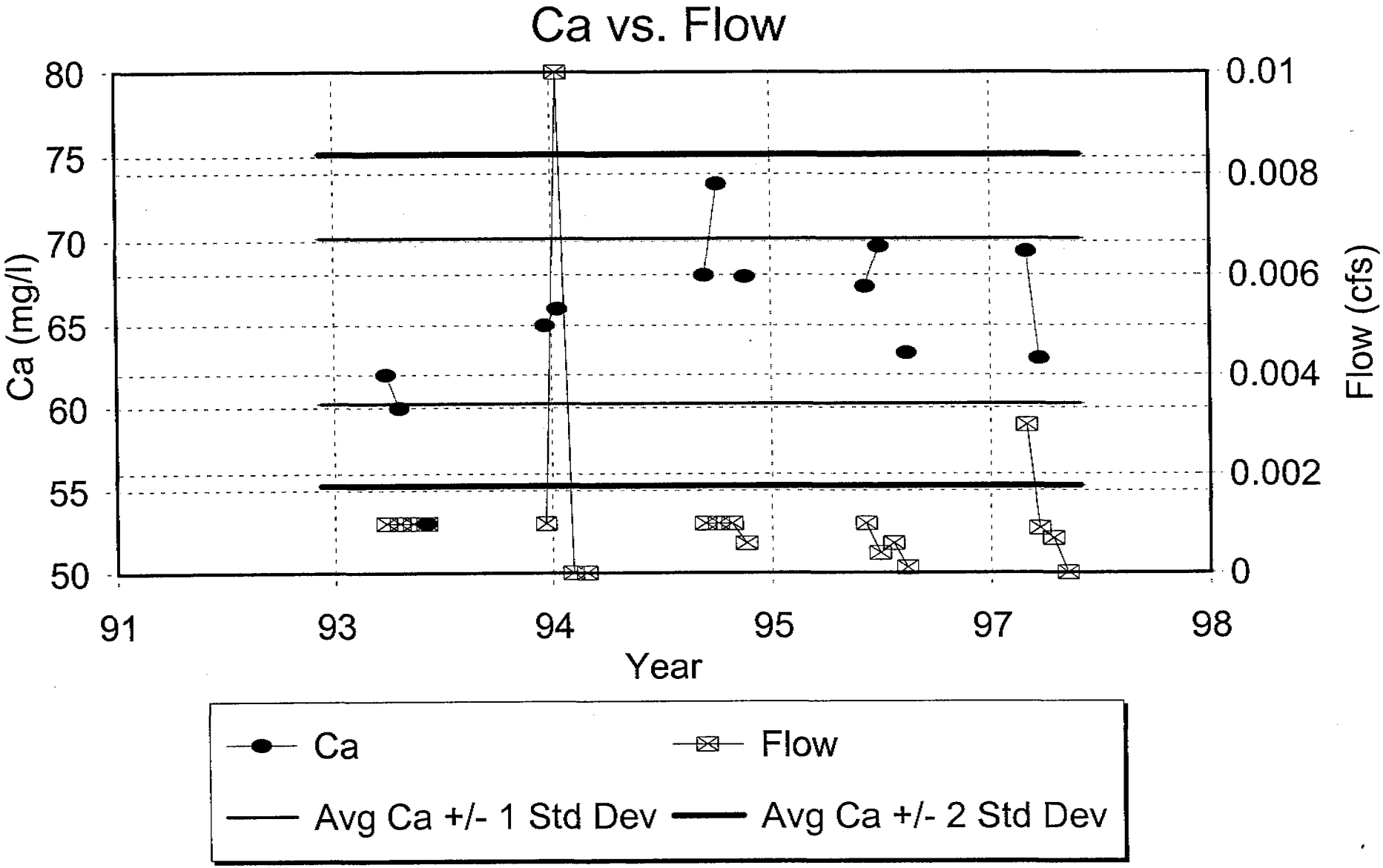



Station CVS7
pH vs. Flow
pH (units)
9
8.5
8
7.5
7
6.5
6
Flow (cfs)
0.01
0.008
0.006
0.004
0.002
0
91
93
94
95
97
98
Year
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev

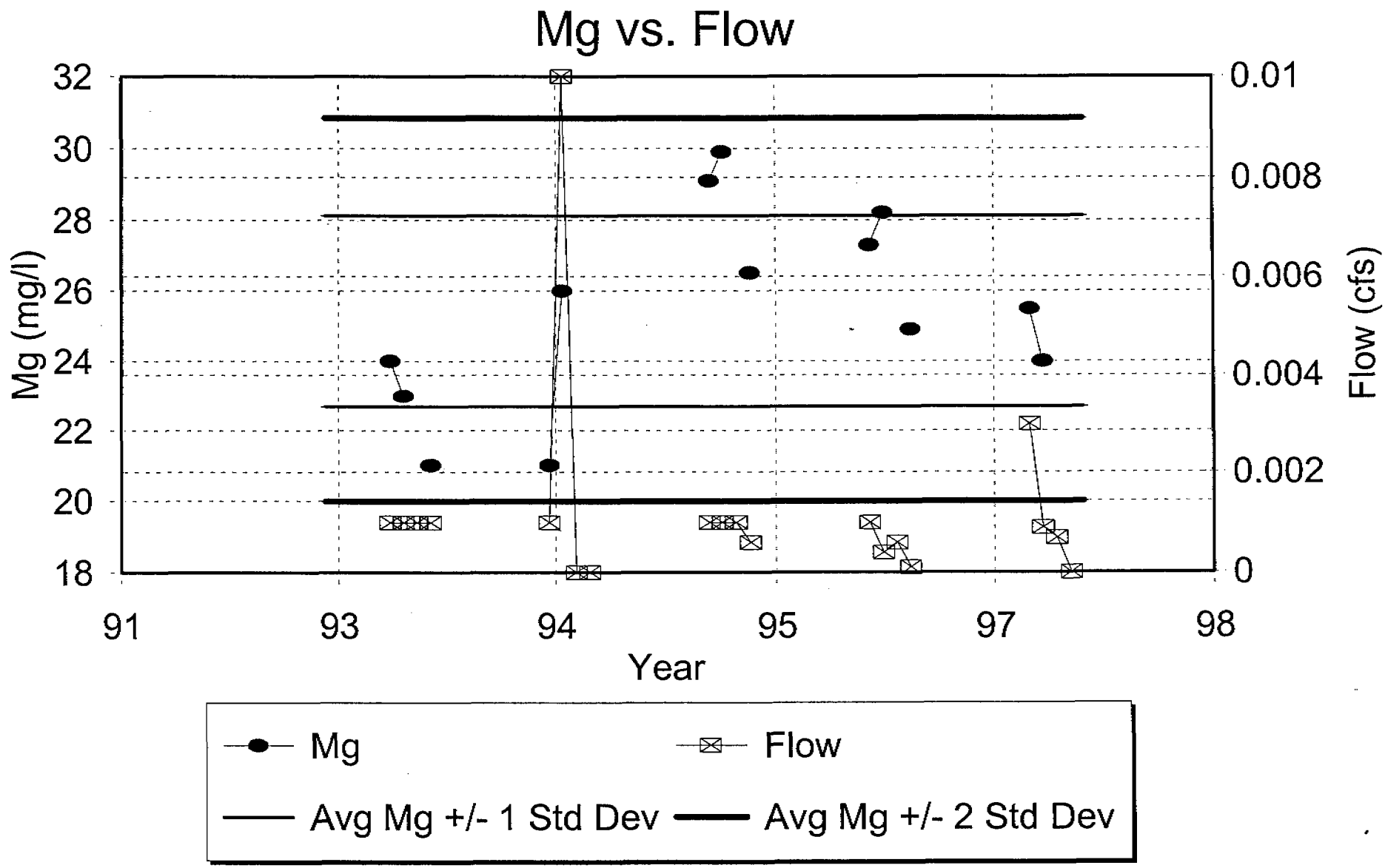
Station CVS7

TDS vs. Flow



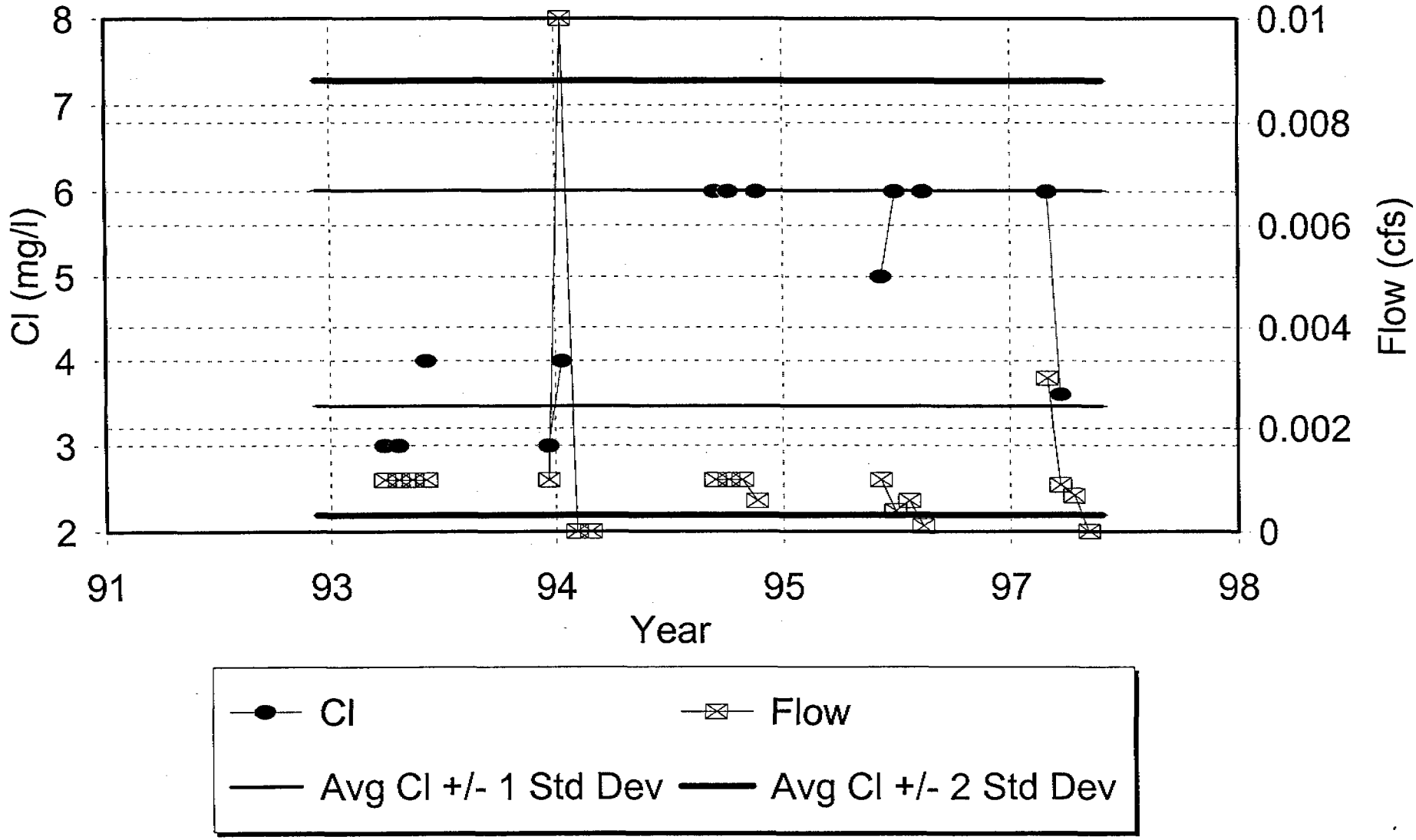

Station CVS7
Ca vs. Flow
Ca (mg/l)
80
75
70
65
60
55
50
Flow (cfs)
0.01
0.008
0.006
0.004
0.002
0
91
93
94
95
97
98
Year
Ca
Flow
Avg Ca +/- 1 Std Dev
Avg Ca +/- 2 Std Dev

Station CVS7



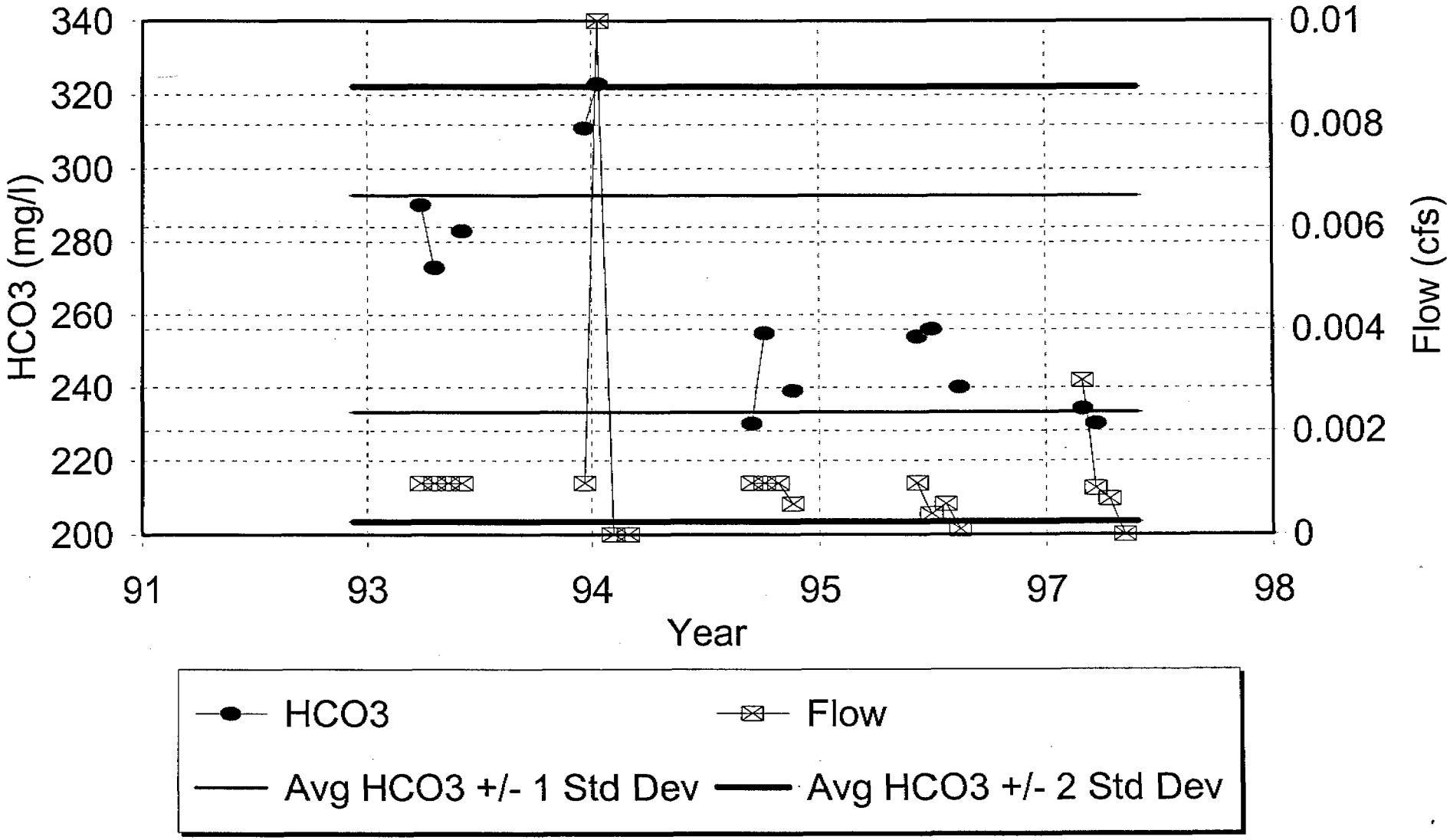
Station CVS7

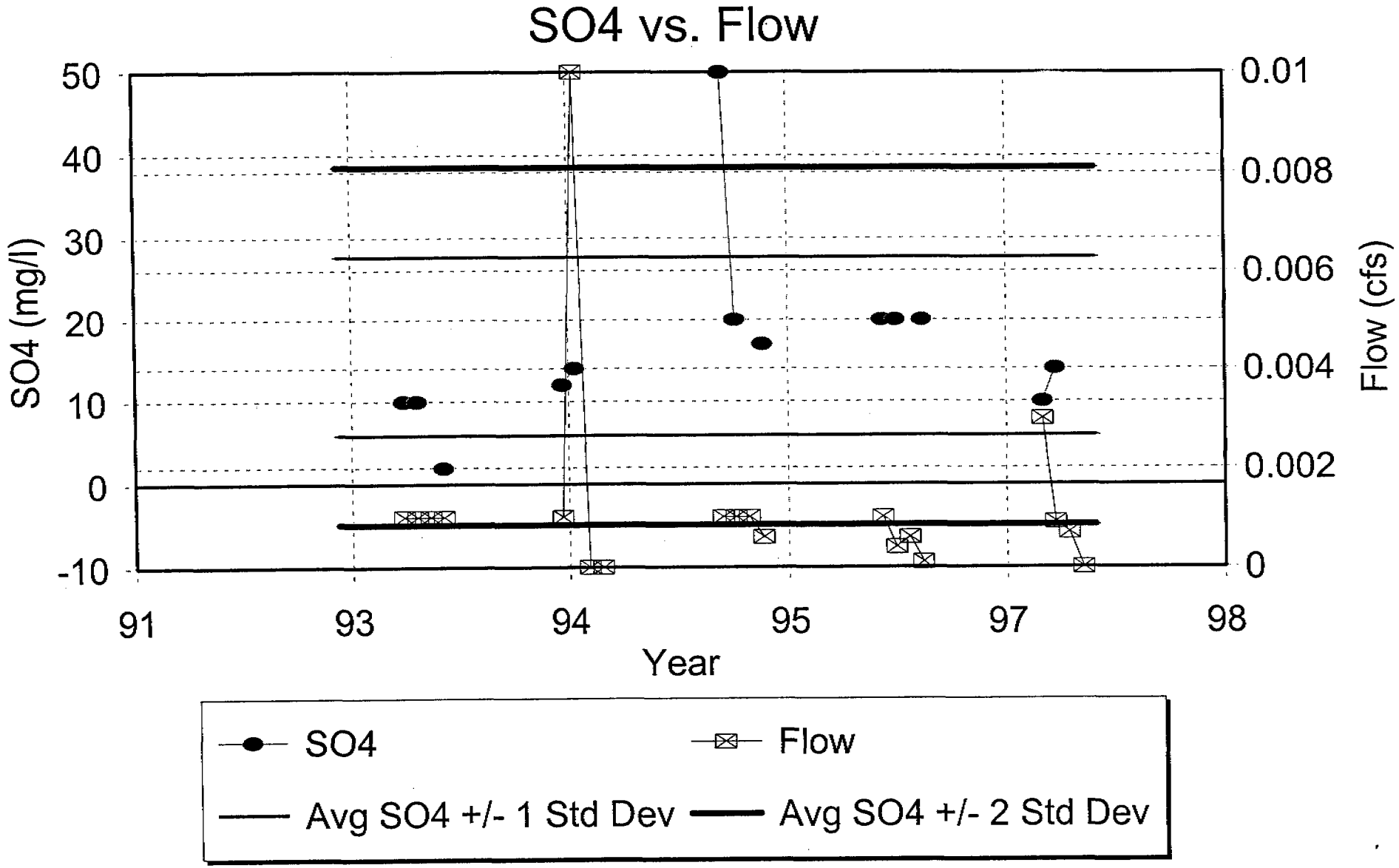
Cl vs. Flow



Station CVS7

HCO3 vs. Flow




Station CVS7
SO4 vs. Flow
SO4 (mg/l)
50
40
30
20
10
0
-10
0.01
0.008
0.006
0.004
0.002
0
Flow (cfs)
91
93
94
95
97
98
Year
SO4
Flow
Avg SO4 +/- 1 Std Dev
Avg SO4 +/- 2 Std Dev

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 27, 1998

Station: CVS9 | Property: Star Point | Location: 2500' N 25o' E of SE corn. Sec 3, T15S, R7E | Station Type: | Sampling Frequency: Quarterly | Formation: | Elevation: 8960

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-91																							
Feb-91																							
Mar-91																							
Apr-91																							
May-91																							
Jun-91																							
Jul-91																							
Aug-91																							
Sep-91																							
Oct-91																							
Nov-91																							
Dec-91																							
Jan-92																							
Feb-92																							
Mar-92																							
Apr-92																							
May-92																							
Jun-92																							
Jul-92																							
Aug-92																							
Sep-92																							
Oct-92																							
Nov-92																							
Dec-92																							
Jan-93																							
Feb-93																							
Mar-93																							
Apr-93																							
May-93																							
Jun-93																							
Jul-93																							
Aug-93																							
Sep-93																							
Oct-93																							
Nov-93																							
Dec-93																							
Jan-94																							
Feb-94																							
Mar-94																							
Apr-94																							
May-94																							
Jun-94																							
Jul-94																							
Aug-94																							
Sep-94																							
Oct-94																							
Nov-94																							
Dec-94																							
Jan-95																							
Feb-95																							
Mar-95																							
Apr-95																							
May-95																							
Jun-95	06/21/95	0.001	7.6	646	8.61	370			350	301 <	2	2	60	77.4	38	1.1	5.3	-0.6 <	0.01	0.37	0.011		
Jul-95	07/27/95	0.003	7.8	648	7	370			353	314 <	2	4	37	77.8	38.6	1	5.5	1.1	0.06	0.1 <	0.005		
Aug-95	08/23/95	0.003	7.75	507	11																		
Sep-95	09/27/95	0																					
Oct-95																							
Nov-95																							
Dec-95																							
Jan-96																							
Feb-96																							
Mar-96																							
Apr-96																							
May-96																							
Jun-96	06/12/96	0.007	7.63	775	5	356			372	323	2 <	3	30	82	40.6	0.8	5.6	3.5	0.01 <	0.02	0.005		
Jul-96	07/23/96	0.004	8.52	537	10	364			380	331	2 <	3	30	84.6	41.1	1.1	5.8	3.6	0.01 <	0.57	0.021		
Aug-96	08/19/96	0.002	8.21	608	8																		
Sep-96	09/30/96	0.0003																				Seep-heavily impacted by	
Oct-96																							
Nov-96																							
Dec-96																							

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 27, 1998

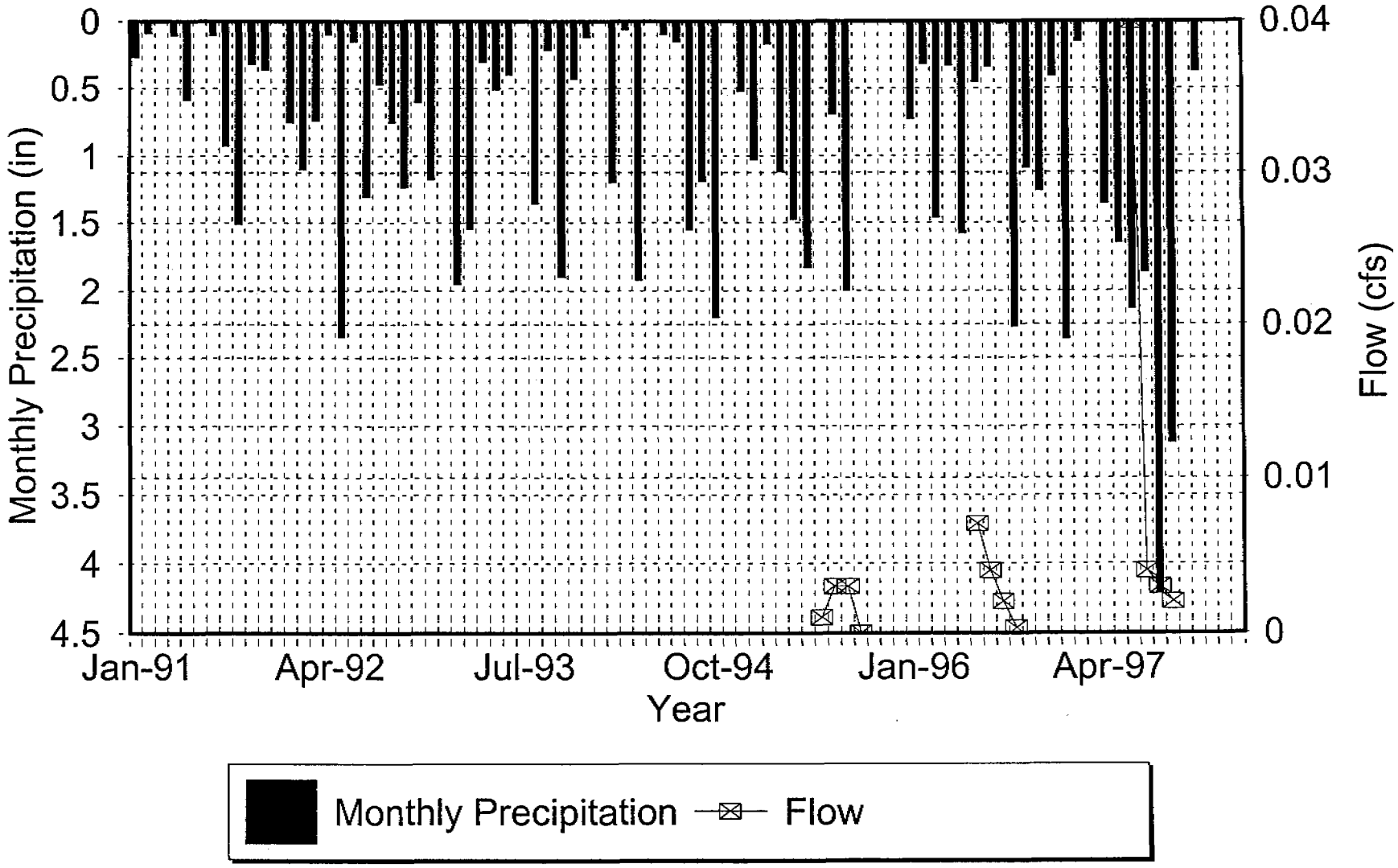
Station: CVS9 | Property: Star Point | Location: 2500' N 25o' E of SE corn. Sec 3, T15S, R7E | Station Type: | Sampling Frequency: Quarterly | Formation: | Elevation: 8960

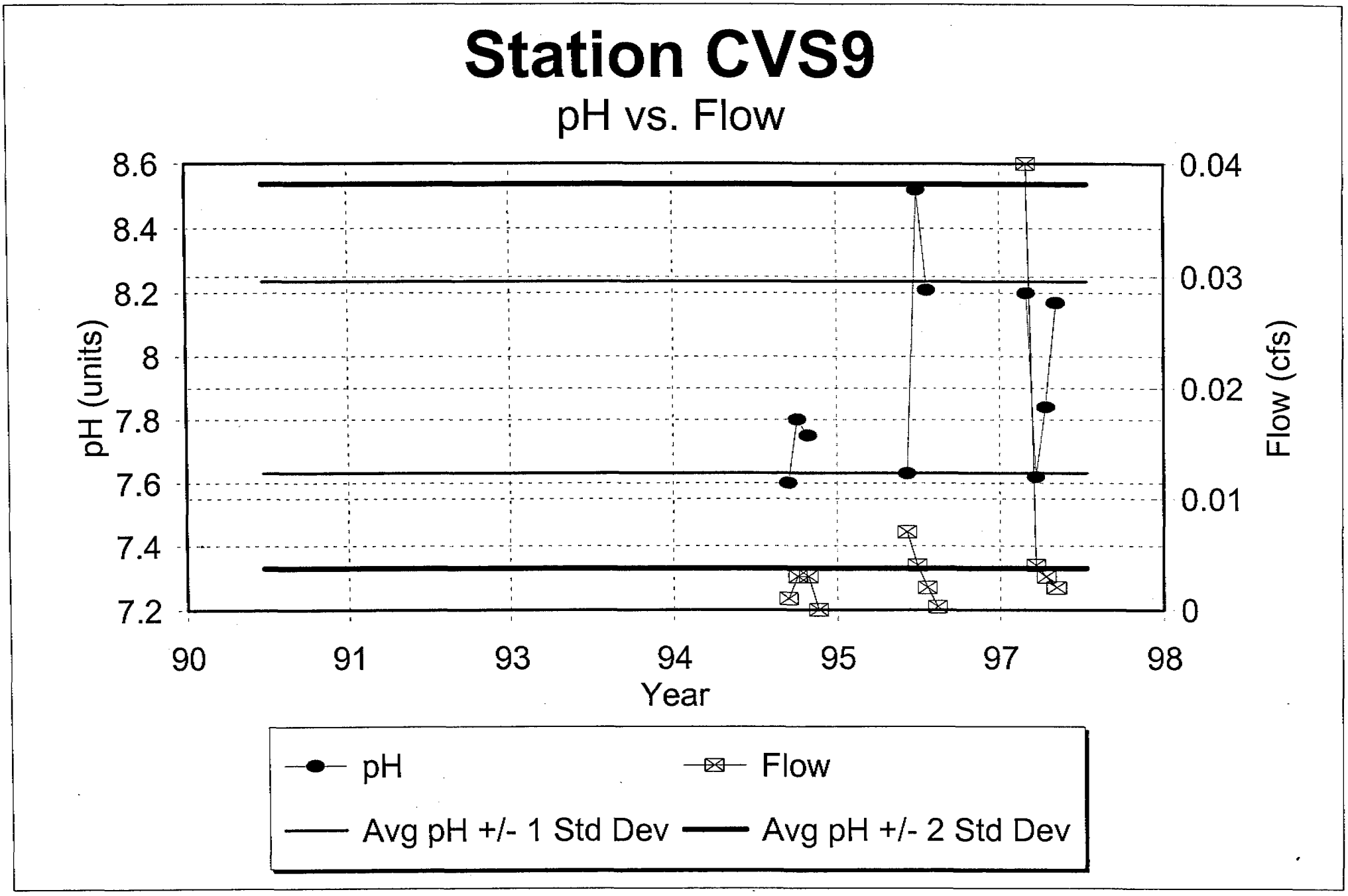
Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/17/97	0.04	8.2	645	5.5	371			379	340	2 <	4	30	87.7	38.9	1.1	5.6	1.9	0.01 <	0.01 <	0.005	
Jul-97	07/30/97	0.004	7.62	660	7	340			350	320	10 <	0.5 <	24	79	36	1.3	5.2	1.9	0.01 <	0.51	0.005	
Aug-97	08/13/97	0.003	7.84	628	8																	
Sep-97	09/17/97	0.002	8.17	630	6	320			380	310	10 <	7.2	23	81	42	1.6	5.9	6.2	0.01 <	0.16	0.008	
Oct-97																						
Nov-97																						
Dec-97																						
END DATA																						
Count		12	10	10	10	7	0	0	7	7	7	7	7	7	7	7	7	7	7	7	7	
Minimum		0	7.6	507	5	320	ERR	ERR	350	301 <	2 <	0.5 <	23	77.4	36	0.8	5.2	-0.6 <	0.01 <	0.01 <	0.005	
Maximum		0.04	8.52	775	11	371	ERR	ERR	380	340 <	10 <	7.2 <	60	87.7	42	1.6	5.9	6.2 <	0.06 <	0.57 <	0.021	
Average		0.0058	7.934	630.4	7.611	355.86	ERR	ERR	366.29	319.86 <	4.2857 <	3.3657 <	33.429	81.357	39.314	1.1429	5.5571	2.5143 <	0.0171 <	0.2486 <	0.0086	
Standard Deviation		0.0105	0.3015	69.71	1.8196	17.86	ERR	ERR	13.509	12.112 <	3.614 <	1.9216 <	11.66	3.4879	1.9067	0.2321	0.2321	2.0067 <	0.0175 <	0.2156 <	0.0055	
Avg. -1 Std. Dev.		-0.005	7.6325	560.69	5.7914	338	ERR	ERR	352.78	307.75 <	0.6717 <	1.4641 <	21.768	77.869	37.408	0.9107	5.325	0.5076 <	-0.000 <	0.0329 <	0.0031	
Avg. +1 Std. Dev.		0.0163	8.2355	700.11	9.4306	373.72	ERR	ERR	379.79	331.97 <	7.8997 <	5.3073 <	45.089	84.845	41.221	1.375	5.7893	4.521 <	0.0346 <	0.4642 <	0.0141	
Avg. -2 Std. Dev.		-0.015	7.3309	490.98	3.9718	320.14	ERR	ERR	339.27	295.63 <	-2.942 <	-0.458 <	10.108	74.381	35.501	0.6786	5.0929	-1.499 <	-0.018 <	-0.183 <	-0.002	
Avg. +2 Std. Dev.		0.0267	8.5371	769.82	11.25	391.58	ERR	ERR	393.3	344.08 <	11.514 <	7.229 <	56.749	86.333	43.128	1.6071	6.0214	6.5277 <	0.0521 <	0.6798 <	0.0196	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

Station CVS9

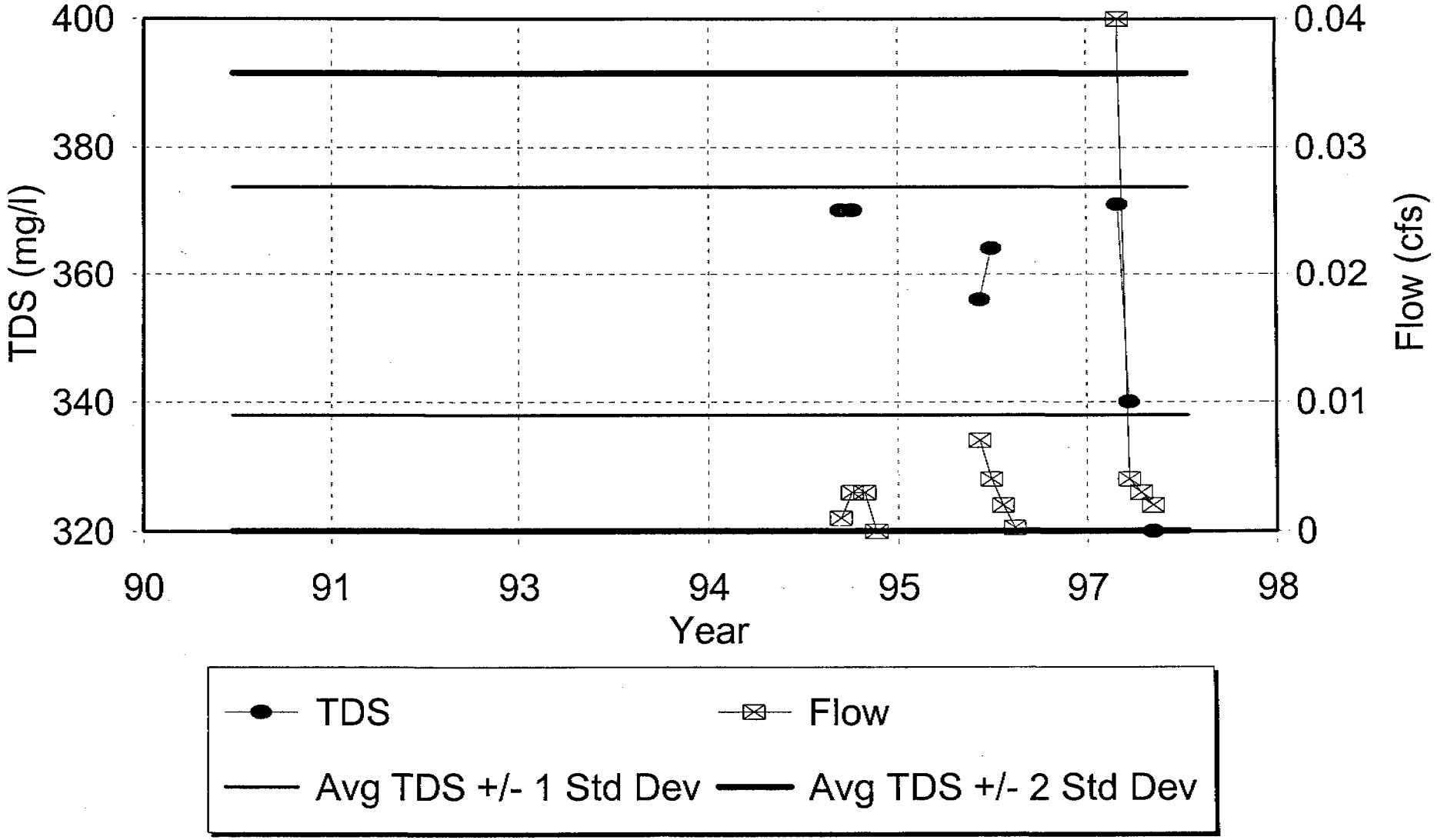
Monthly Precipitation vs. Flow




Station CVS9
pH vs. Flow
8.6
8.4
8.2
8
7.8
7.6
7.4
7.2
pH (units)
0.04
0.03
0.02
0.01
0
Flow (cfs)
90
91
93
94
95
97
98
Year
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev

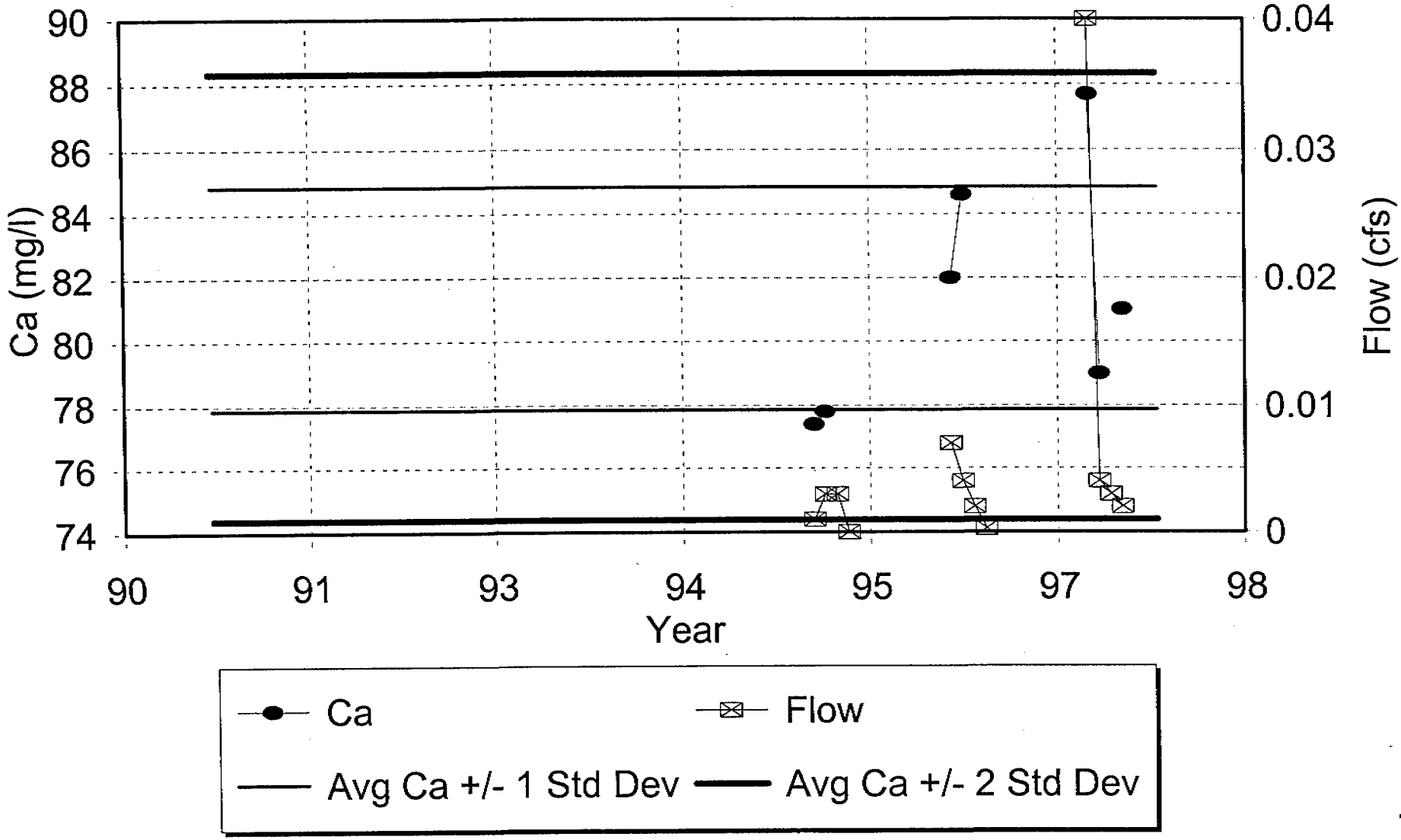
Station CVS9

TDS vs. Flow



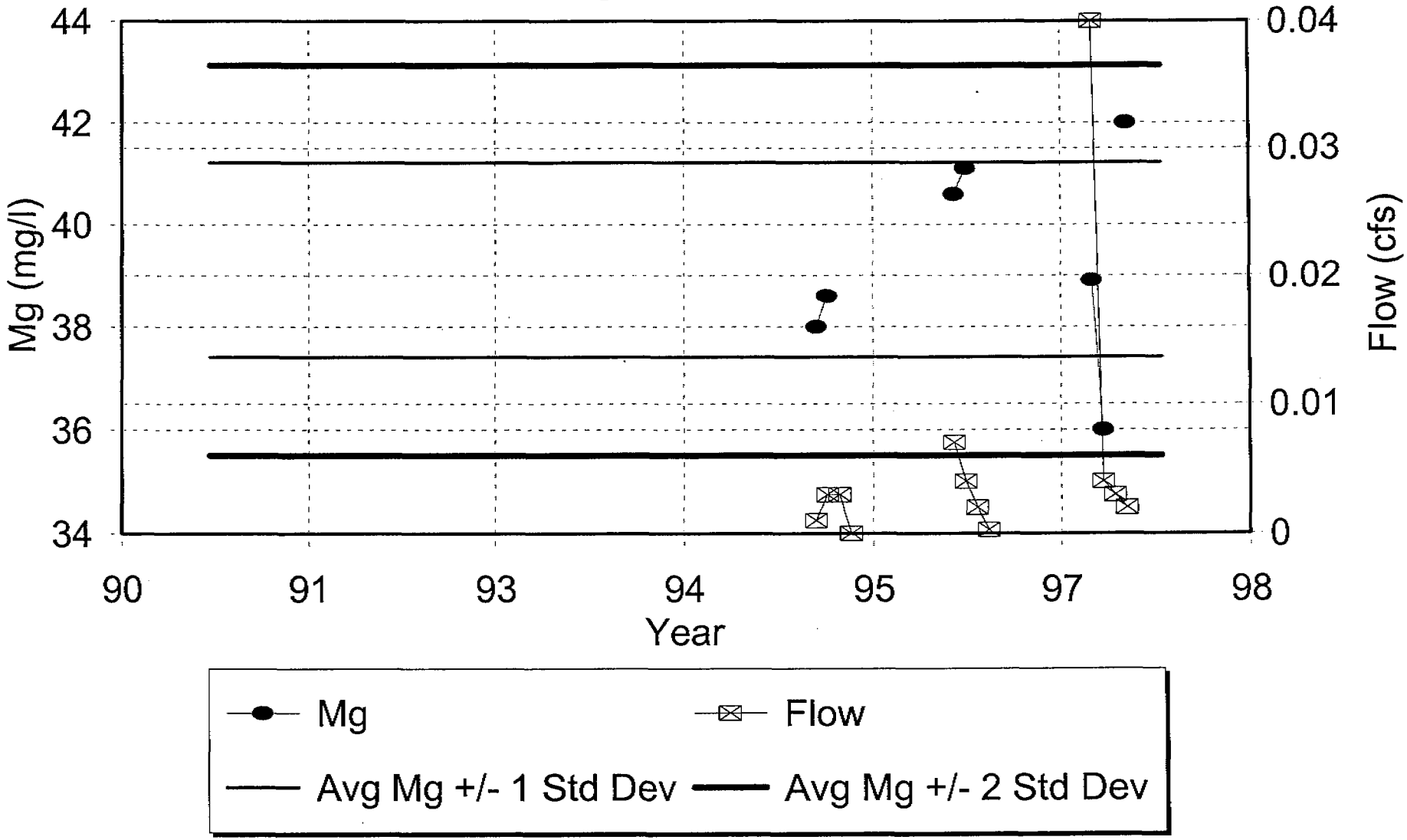
Station CVS9

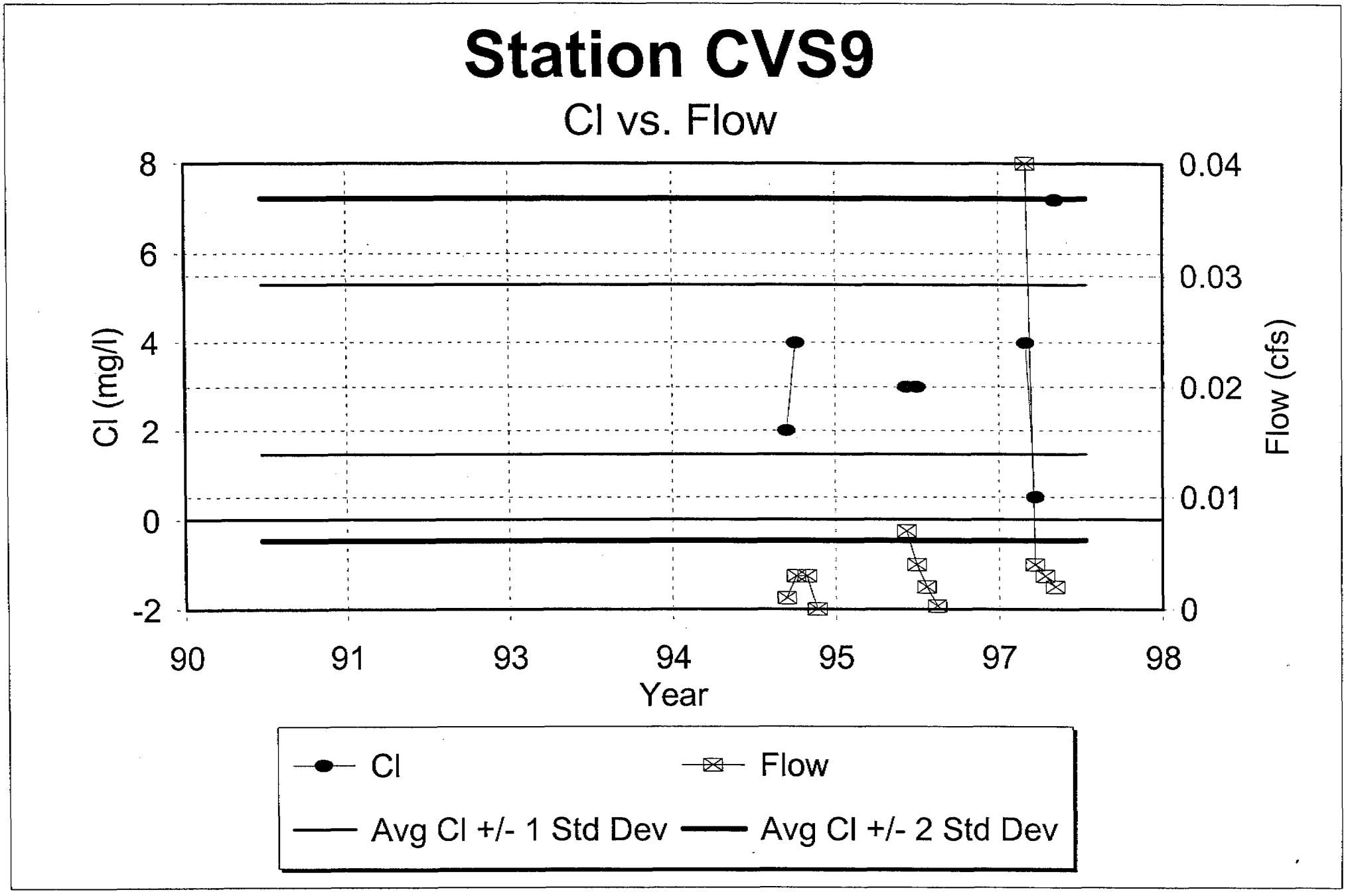
Ca vs. Flow

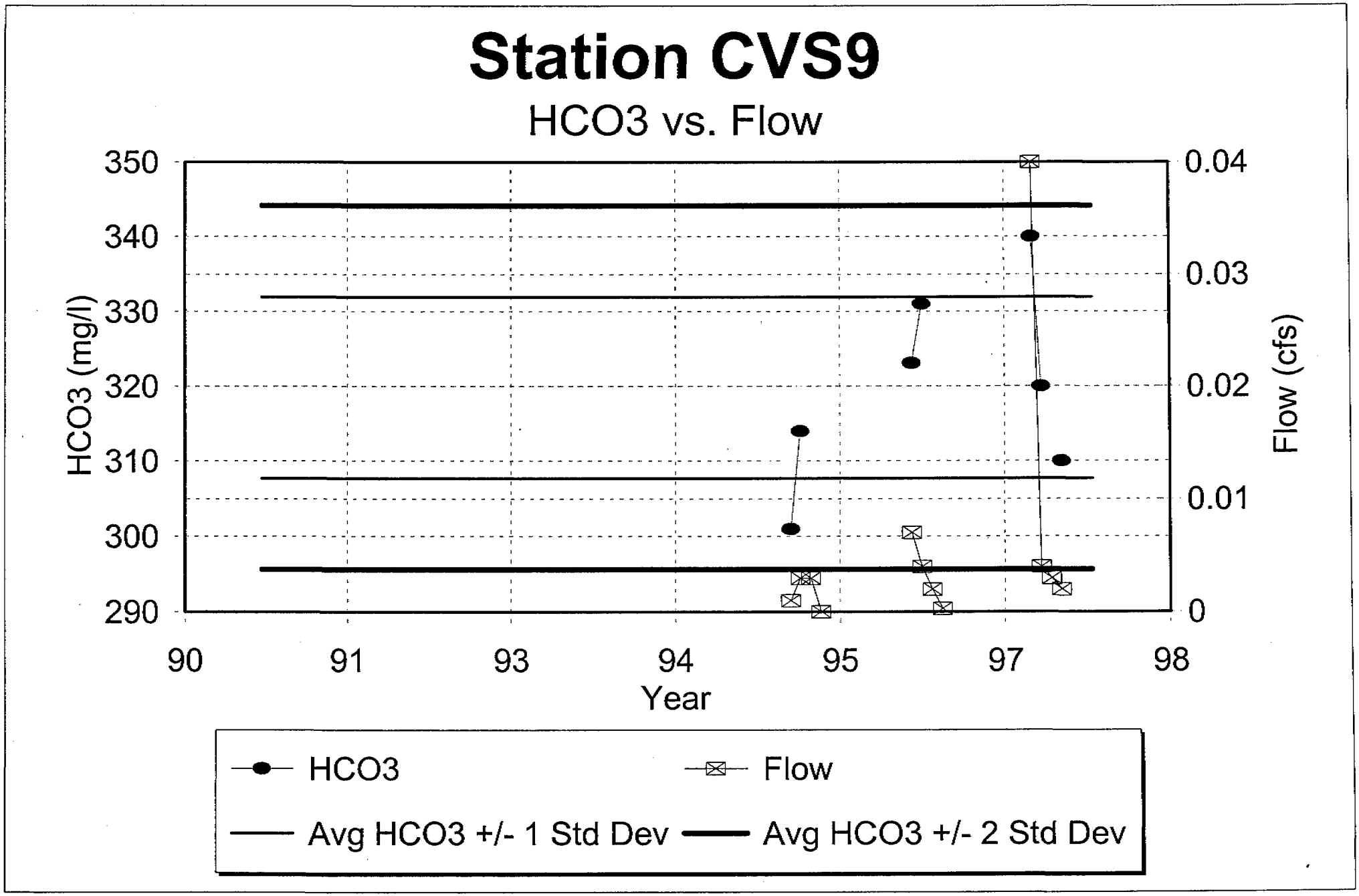


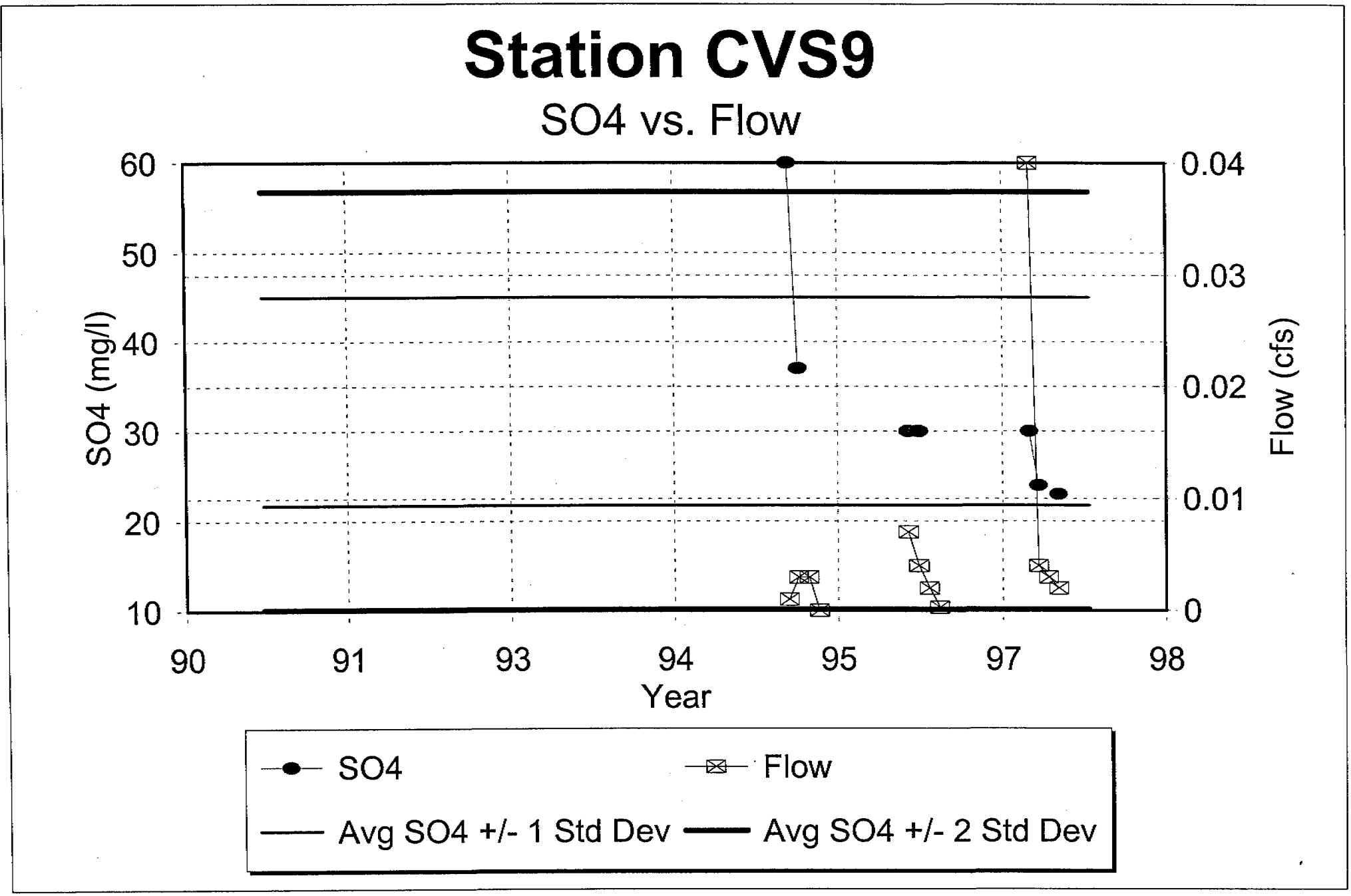
Station CVS9

Mg vs. Flow




Station CVS9
Cl vs. Flow
Cl (mg/l)
8
6
4
2
0
-2
0.04
0.03
0.02
0.01
0
Flow (cfs)
90
91
93
94
95
97
98
Year
Cl
Flow
Avg Cl +/- 1 Std Dev
Avg Cl +/- 2 Std Dev


Station CVS9
HCO3 vs. Flow
350
340
330
320
310
300
290
HCO3 (mg/l)
0.04
0.03
0.02
0.01
0
Flow (cfs)
90
91
93
94
95
97
98
Year
HCO3
Flow
Avg HCO3 +/- 1 Std Dev
Avg HCO3 +/- 2 Std Dev


Station CVS9
SO4 vs. Flow
SO4 (mg/l)
60
50
40
30
20
10
Flow (cfs)
0.04
0.03
0.02
0.01
0
90
91
93
94
95
97
98
Year
SO4
Flow
Avg SO4 +/- 1 Std Dev
Avg SO4 +/- 2 Std Dev

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 27, 1998

Station: CVS10 | Property: Star Point | Location: 2250' N 1875' E of SE com. Sec 3, T15S, R7E | Station Type: | Sampling Frequency: Quarterly | Formation: | Elevation: 8710

Date		Field Measurements				Laboratory Measurements																	Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)		
Jan-91																							
Feb-91																							
Mar-91																							
Apr-91																							
May-91																							
Jun-91																							
Jul-91																							
Aug-91																							
Sep-91																							
Oct-91																							
Nov-91																							
Dec-91																							
Jan-92																							
Feb-92																							
Mar-92																							
Apr-92																							
May-92																							
Jun-92																							
Jul-92																							
Aug-92																							
Sep-92																							
Oct-92																							
Nov-92																							
Dec-92																							
Jan-93																							
Feb-93																							
Mar-93																							
Apr-93																							
May-93																							
Jun-93																							
Jul-93																							
Aug-93																							
Sep-93																							
Oct-93																							
Nov-93																							
Dec-93																							
Jan-94																							
Feb-94																							
Mar-94																							
Apr-94																							
May-94																							
Jun-94																							
Jul-94																							
Aug-94																							
Sep-94																							
Oct-94																							
Nov-94																							
Dec-94																							
Jan-95																							
Feb-95																							
Mar-95																							
Apr-95																							
May-95																							
Jun-95	06/21/95																						Snow drift covered
Jul-95	07/27/95	0																					
Aug-95	08/23/95	0																					
Sep-95	09/27/95	0																					
Oct-95																							
Nov-95																							
Dec-95																							
Jan-96																							
Feb-96																							
Mar-96																							
Apr-96																							
May-96																							
Jun-96	06/12/96	0.002	8.12	745	6	336			366	282	2 <	10	30	72	45.2	1.2	8.4	8.1	0.05	0.42	0.017		
Jul-96	07/23/96	0.002	8.81	520	6	338			360	290	2 <	9	30	70.2	45	1.1	8.4	6.4	0.01 <	0.72	0.019		
Aug-96	08/19/96	0.004	8.53	513	7																		Unable to sample-impacte
Sep-96	09/30/96	0.0005	8.46	627	6.5																		
Oct-96																							
Nov-96																							
Dec-96																							

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 27, 1998

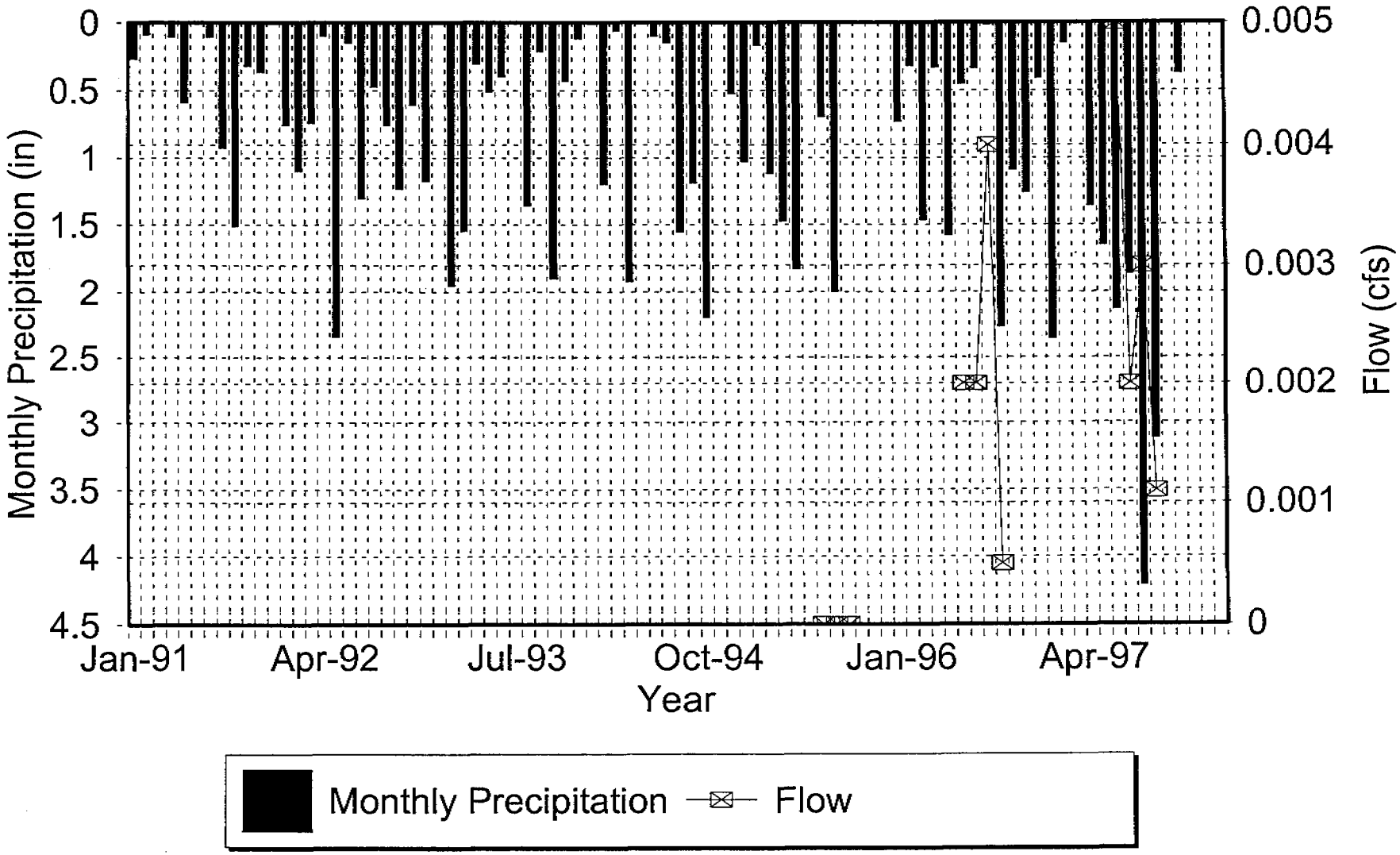
Station: CVS10 | Property: Star Point | Location: 2250' N 1875' E of SE corn. Sec 3, T15S, R7E | Station Type: | Sampling Frequency: Quarterly | Formation: | Elevation: 8710

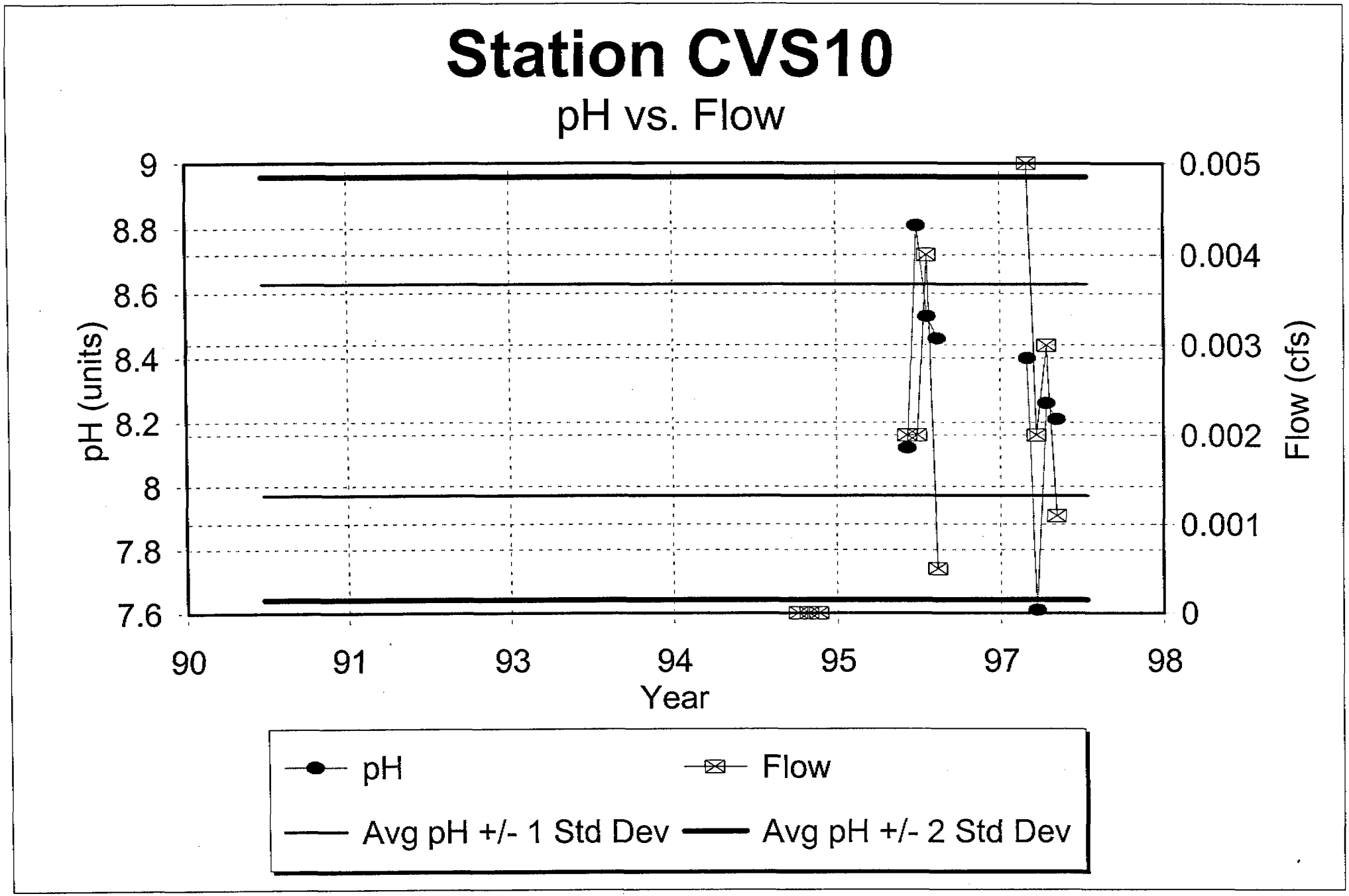
Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/17/97	0.005	8.4	616	9	358			374	314	2 <	9	30	77.4	43.8	1.2	7.9	4.5	0.01 <	0.06	0.005	
Jul-97	07/30/97	0.002	7.61	636	10	370			170	300	10 <	4.7	20	67	42	1.5	7.9	4.6	0.01 <	0.03	0.005	
Aug-97	08/13/97	0.003	8.26	647	8																	
Sep-97	09/17/97	0.0011	8.21	670	6	310			370	290	10 <	14	24	70	48	3.6	8.7	8.3	0.01 <	3.5	0.066	
Oct-97																						
Nov-97																						
Dec-97																						
END DATA																						
Count		11	8	8	6	5	0	0	5	5	5	5	5	5	5	5	5	5	5	5	5	
Minimum		0	7.61	513	6	310	ERR	ERR	170	282	2 <	4.7	20	67	42	1.1	7.9	4.5	0.01 <	0.03	0.005	
Maximum		0.005	8.81	745	10	370	ERR	ERR	374	314	10 <	14	30	77.4	48	3.6	8.7	8.3	0.05 <	3.5	0.066	
Average		0.0018	8.3	621.75	7.5625	342.4	ERR	ERR	328	295.2	5.2 <	9.34	26.8	71.32	44.8	1.72	8.26	6.38	0.018 <	0.946	0.0224	
Standard Deviation		0.0018	0.3292	71.239	1.3564	20.568	ERR	ERR	79.135	10.998	3.9192 <	2.9635	4.1183	3.4377	1.9637	0.9495	0.3137	1.6339	0.016 <	1.3019	0.0226	
Avg. -1 Std. Dev.		0.0002	7.9708	550.51	6.2061	321.83	ERR	ERR	248.86	284.2	1.2808 <	6.3765	22.682	67.882	42.836	0.7705	7.9463	4.7461	0.002 <	-0.356	-0.000	
Avg. +1 Std. Dev.		0.0034	8.6292	692.99	8.9189	362.97	ERR	ERR	407.14	306.2	9.1192 <	12.304	30.918	74.758	46.764	2.6695	8.5737	8.0139	0.034 <	2.2479	0.045	
Avg. -2 Std. Dev.		-0.001	7.6417	479.27	4.8497	301.26	ERR	ERR	169.73	273.2	-2.636 <	3.413	18.563	64.445	40.873	-0.179	7.6326	3.1122	-0.014 <	-1.658	-0.023	
Avg. +2 Std. Dev.		0.005	8.9583	764.23	10.275	383.54	ERR	ERR	486.27	317.2	13.038 <	15.267	35.037	78.195	48.727	3.6191	8.8874	9.6478	0.05 <	3.5498	0.0675	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

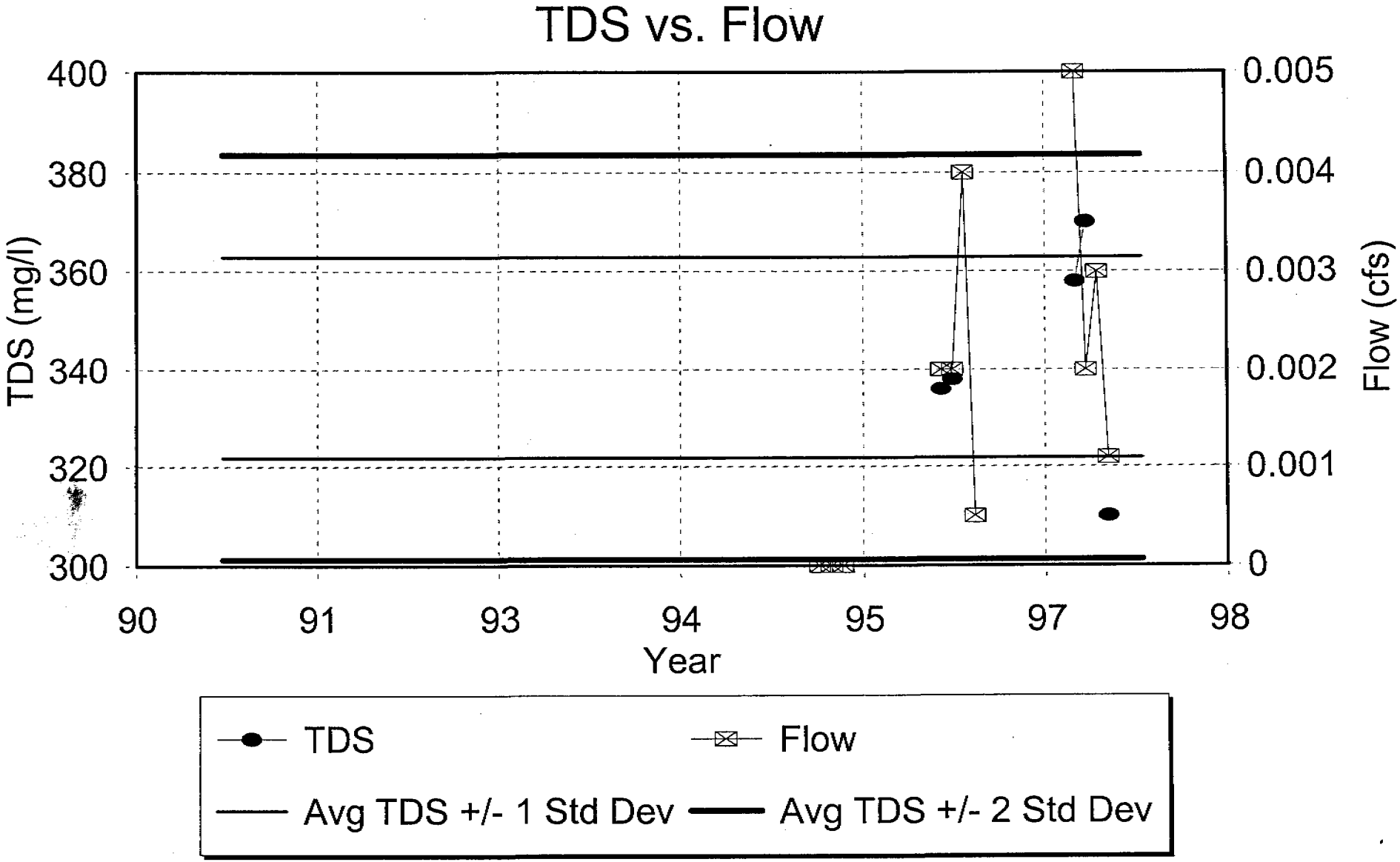
Station CVS10

Monthly Precipitation vs. Flow



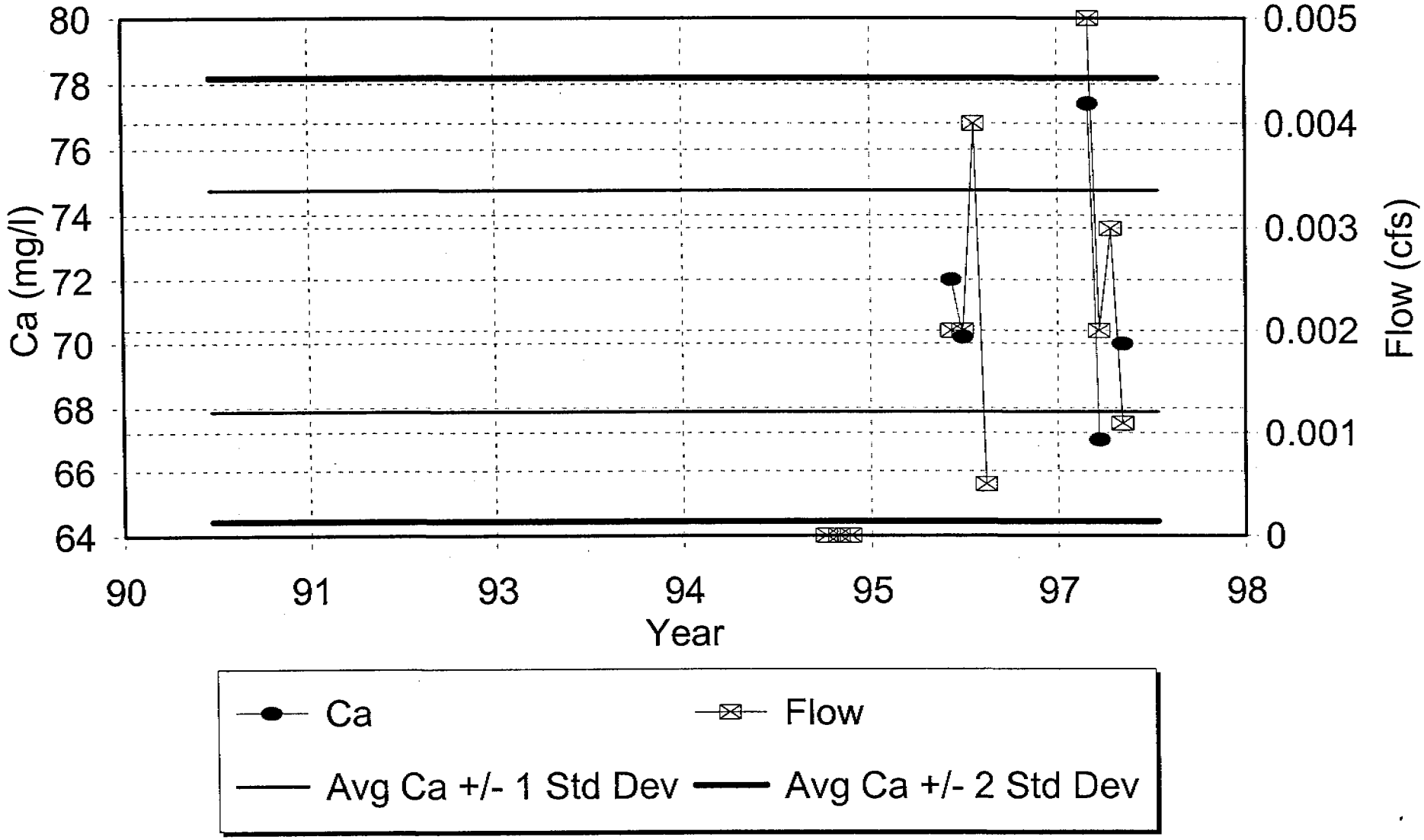

Station CVS10
pH vs. Flow
pH (units)
9
8.8
8.6
8.4
8.2
8
7.8
7.6
Flow (cfs)
0.005
0.004
0.003
0.002
0.001
0
90
91
93
94
95
97
98
Year
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev

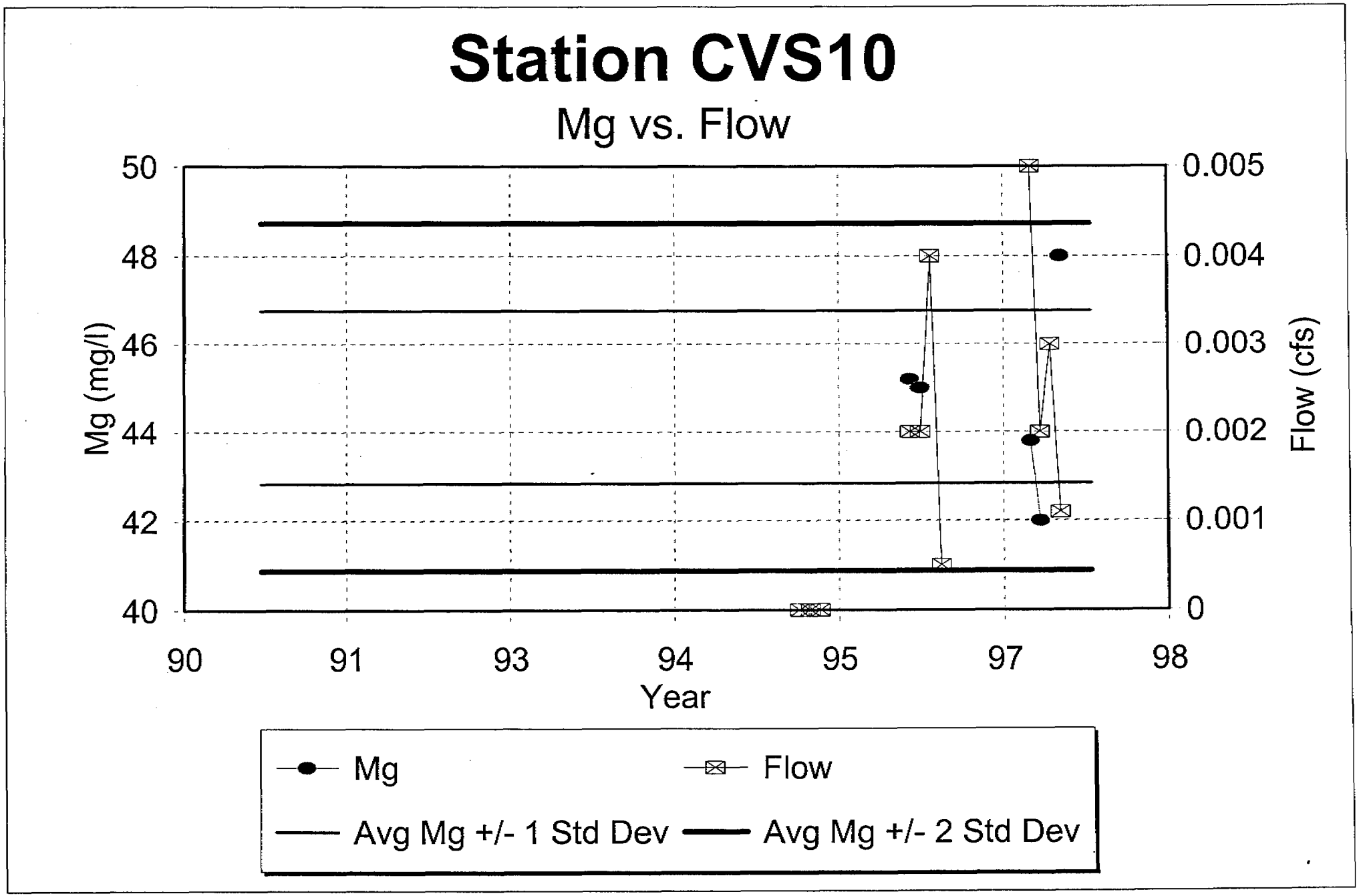
Station CVS10



Station CVS10

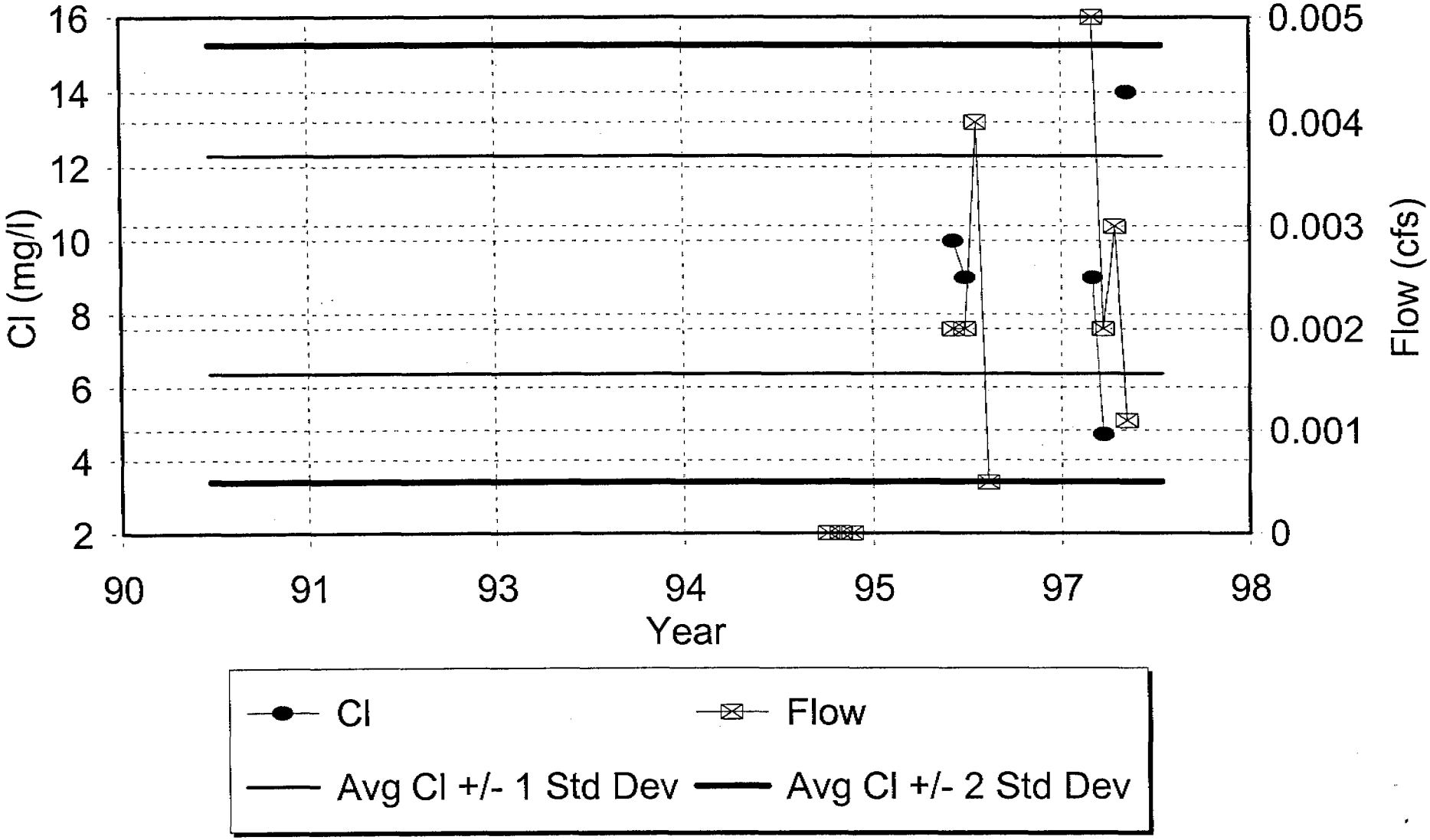
Ca vs. Flow

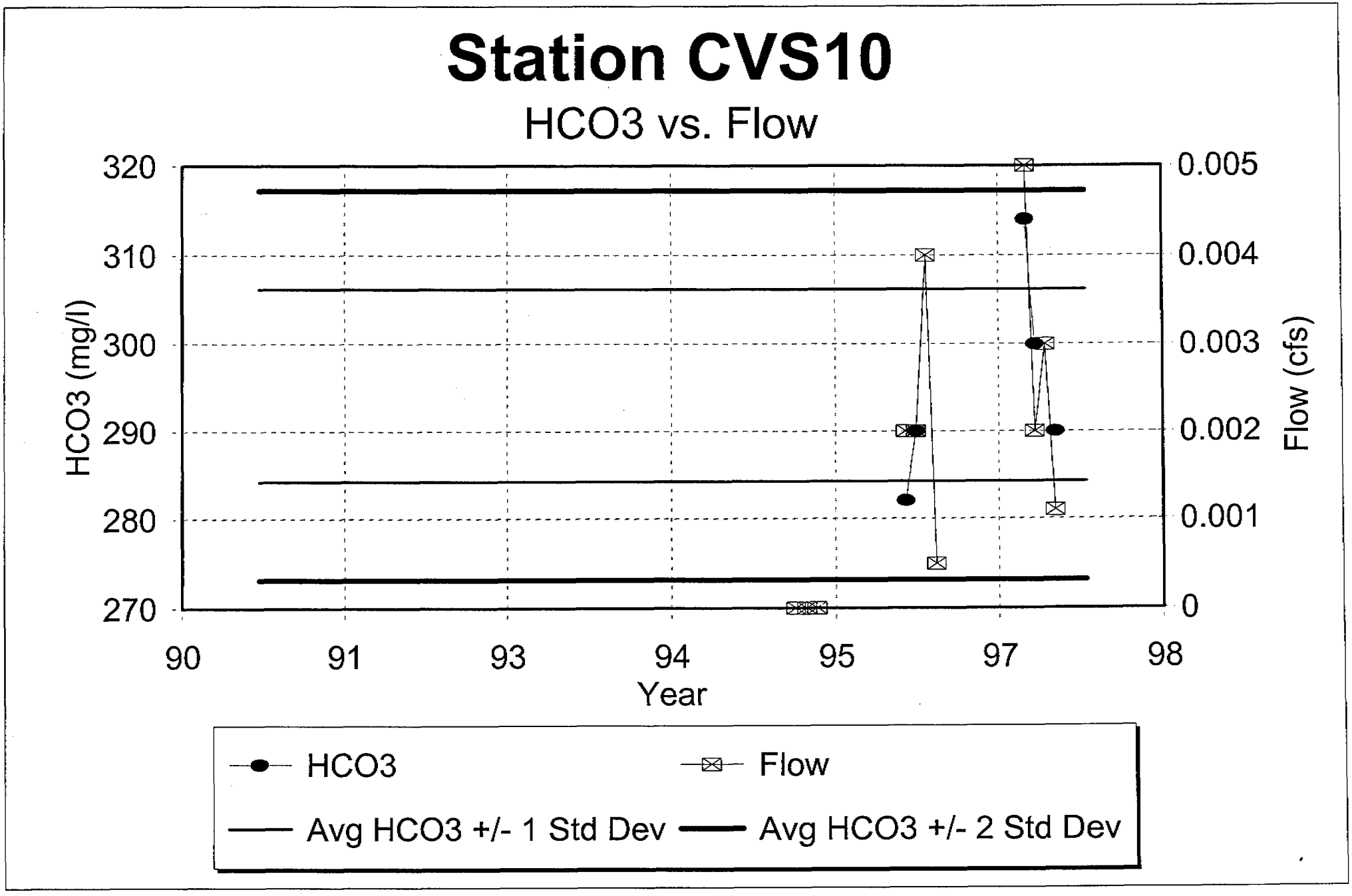


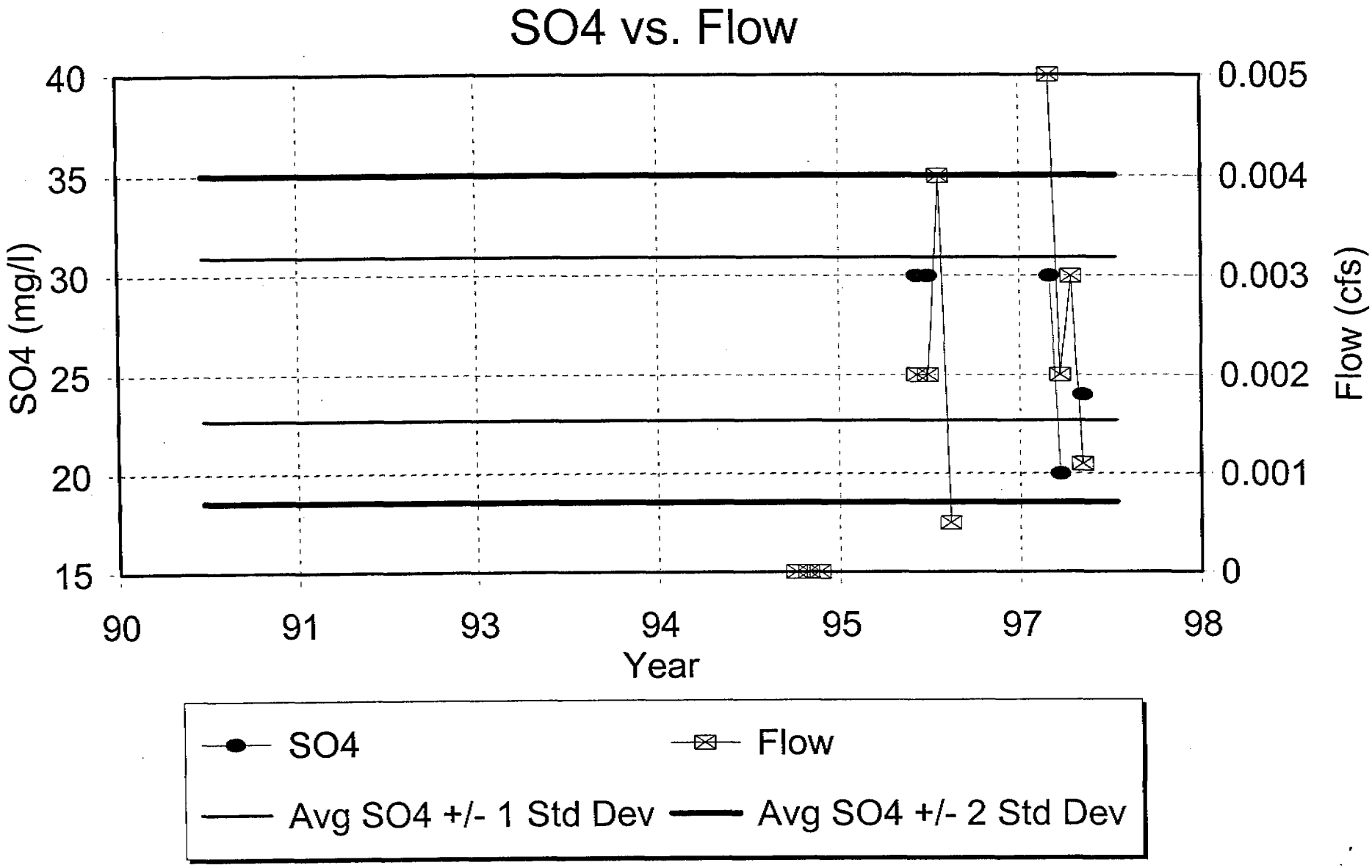

Station CVS10
Mg vs. Flow
Mg (mg/l)
50
48
46
44
42
40
0.005
0.004
0.003
0.002
0.001
0
Flow (cfs)
90
91
93
94
95
97
98
Year
Mg
Flow
Avg Mg +/- 1 Std Dev
Avg Mg +/- 2 Std Dev

Station CVS10

Cl vs. Flow




Station CVS10
HCO3 vs. Flow
320
310
300
290
280
270
HCO3 (mg/l)
0.005
0.004
0.003
0.002
0.001
0
Flow (cfs)
90
91
93
94
95
97
98
Year
HCO3
Flow
Avg HCO3 +/- 1 Std Dev
Avg HCO3 +/- 2 Std Dev


Station CVS10
SO4 vs. Flow
40
35
30
25
20
15
SO4 (mg/l)
0.005
0.004
0.003
0.002
0.001
0
Flow (cfs)
90
91
93
94
95
97
98
Year
SO4
Flow
Avg SO4 +/- 1 Std Dev
Avg SO4 +/- 2 Std Dev

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 25, 1998

Station: 238 | Property: Star Point | Location: 1875' S 1750' E of NW corn. Sec 18, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Castlegate | Elevation: 9150

Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-87																						
Feb-87																						
Mar-87																						
Apr-87																						
May-87																						
Jun-87																						
Jul-87																						
Aug-87																						
Sep-87																						
Oct-87	10/09/87	0.01				246																
Nov-87																						
Dec-87																						
Jan-88																						
Feb-88																						
Mar-88																						
Apr-88																						
May-88																						
Jun-88	06/14/88	0.02				220																
Jul-88	07/16/88	0.01				208																
Aug-88	08/19/88	0.01																				
Sep-88	09/05/88	0.01				200																
Oct-88																						
Nov-88																						
Dec-88																						
Jan-89																						
Feb-89																						
Mar-89																						
Apr-89																						
May-89																						
Jun-89	06/05/89	0.02				202																
Jul-89	07/11/89	0.01				202																
Aug-89	08/22/89	0.01																				
Sep-89	09/15/89	0.01				208																
Oct-89																						
Nov-89																						
Dec-89																						
Jan-90																						
Feb-90																						
Mar-90																						
Apr-90																						
May-90	05/30/90	0.03				226																
Jun-90																						
Jul-90	07/06/90	0.01				222																
Aug-90	08/22/90	0.01																				
Sep-90	09/24/90	0.01				236																
Oct-90																						
Nov-90																						
Dec-90																						
Jan-91																						
Feb-91																						
Mar-91																						
Apr-91																						
May-91																						
Jun-91	06/11/91	0.04	7.2	370	5	176			186	215	7	2	10	58	10	1	1		< 0.02	0.05	< 0.01	
Jul-91	07/15/91	0.03	7.8	370	6	204			237	215	2	31	6	72	14	1	2		< 0.02	0.16	< 0.01	
Aug-91																						
Sep-91	09/18/91	0.01	7.9	420	5	224			202	222	0	1	25	61	12	1	2		0.07	0.71	0.03	
Oct-91																						
Nov-91																						
Dec-91																						
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92																						
Jun-92	06/17/92	0.008	7.4	407	5	218			219	220	0	1	45	73	9	1	1		< 0.02	< 0.02		
Jul-92	07/15/92	0.012	7.4	383	5	212			212	266	0	1	2	65	12	1	1		< 0.02	0.29		
Aug-92	08/21/92	0.012	6.8	389	5.7																	
Sep-92	09/03/92	0.011	6.2	400	5.1	222			213	193	7	1	39	64	13	1	2		< 0.02	0.39		
Oct-92																						
Nov-92																						
Dec-92																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 25, 1998

Station: 238 | Property: Star Point | Location: 1875' S 1750' E of NW corn. Sec 18, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Castlegate | Elevation: 9150

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/23/93	0.05	6.2	339	5.4	178			176	239	0	1	2	54	10 <	1	2	<	0.02	0.14 <	0.01	
Jul-93	07/22/93	0.024	6.3	373	4.8	210			209	227	0	1	10	64	12	1	2	<	0.02 <	0.02 <	0.01	
Aug-93	08/18/93	0.021	6.1	397	4.6																	
Sep-93	09/13/93	0.011	6.3	389	5.1	230			194	239	0	2	20	58	12	1	2	<	0.02 <	0.02 <	0.01	
Oct-93																						
Nov-93																						
Dec-93																						
Jan-94																						
Feb-94																						
Mar-94																						
Apr-94																						
May-94																						
Jun-94	06/28/94	0.032	7.1	438	3.1	238			214	220	0	2	17	66	12	1	1	<	0.02 <	0.02 <	0.01	LAB FILTRATION REQUI
Jul-94	07/21/94	0.013	7.9	373	11.8	206			199	234	0	1	21	60	12	1	2	<	0.02 <	0.02 <	0.01	
Aug-94	08/31/94	0.008	8.1	325	11.5																	1.5472597946965E-137
Sep-94	09/21/94	0.01	7.6	353	9.2	216			232	261	0	1	19	70	14	1	2		0.02	0.1 <	0.01	
Oct-94																						
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95																						
Mar-95																						
Apr-95																						
May-95																						
Jun-95	06/22/95	0.11	7.6	410	6.2	210			213	199 <	2	1	10	66.3	11.6	0.9	1.5	1.6 <	0.01	0.06 <	0.005	
Jul-95	07/27/95	0.033	7.6	465	5	230			221	185 <	2	1	20	66.7	13.2	1.2	1.7	4.3 <	0.01	0.03 <	0.005	
Aug-95	08/23/95	0.018	6.4	357	6																	
Sep-95	09/28/95	0.022	7.6	252	5.167	230			224	190 <	2	1	22	67.1	13.7	1.2	1.8	3.4 <	0.01	0.06 <	0.005	
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/12/96	0.038	7.92	495	5	226			229	198	2 <	1	20	70.7	12.6	0.9	1.7	2.8	0.01 <	0.03	0.005	
Jul-96	07/23/96	0.018	7.83	366	5	237			237	196	2 <	1	30	71	14.4	1.3	1.8	2.8	0.01 <	0.06	0.005	
Aug-96	08/19/96	0.023	7.75	341	5																	
Sep-96																						
Oct-96	10/01/96	0.01	7.8	530	5	233			232	191	2 <	1	30	69.6	14.2	1.4	1.8	3.1	0.09	0.29	0.008	
Nov-96																						
Dec-96																						
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/18/97	0.13	8.2	438	5.5	215			229	198	2 <	1 <	10 <	70.6	12.8	1.1	1.7	5.8	0.01 <	0.01 <	0.005	
Jul-97	07/30/97	0.03	7.65	459	5	320			180	150	10 <	0.5 <	22	52	11	1.2	1.5	2	0.01 <	0.4	0.005	
Aug-97	08/13/97	0.02	7.62	403	6																	
Sep-97	09/16/97	0.013	7.95	478	5	230			240	190	10 <	1.5	20	68	16	1.8	2.1	6.5	0.01 <	0.05	0.005	
Oct-97																						
Nov-97																						
Dec-97																						
END DATA																						
	Count	40	27	27	27	31	0	0	21	21	21	21	21	21	21	21	21	9	21	21	18	
	Minimum	0.008	6.1	252	3.1	176	ERR	ERR	176	150 <	0 <	0.5 <	2 <	52	9 <	0.9	1	1.6 <	0.01 <	0.01 <	0.005	
	Maximum	0.13	8.2	530	11.8	320	ERR	ERR	240	266 <	10 <	31 <	45 <	73	16 <	1.8	2.1	6.5 <	0.09 <	0.71 <	0.03	
	Average	0.0232	7.3415	397.78	5.764	220.48	ERR	ERR	214.19	211.81 <	2.381 <	2.5714 <	19.143 <	65.095	12.452 <	1.0952	1.6952	3.5689 <	0.0219 <	0.1395 <	0.0088	
	Standard Deviation	0.0245	0.6523	56.375	1.9123	24.096	ERR	ERR	18.503	26.627 <	3.1694 <	[illegible] <	10.705 <	5.8097	1.6153 <	0.2011	0.3748	1.5588 <	0.0197 <	0.176 <	0.0057	
	Avg. -1 Std. Dev.	-0.001	6.6892	341.4	3.8717	196.39	ERR	ERR	195.69	185.18 <	-0.788 <	[illegible] <	8.4378 <	59.286	10.837 <	0.8941	1.3205	2.0301 <	0.0022 <	-0.036 <	0.0031	
	Avg. +1 Std. Dev.	0.0477	7.9938	454.15	7.6962	244.58	ERR	ERR	232.69	238.44 <	5.5504 <	8.9397 <	29.848 <	70.905	14.068 <	1.2964	2.07	5.1477 <	0.0416 <	0.3155 <	0.0144	
	Avg. -2 Std. Dev.	0.026	6.0369	285.03	1.9594	172.29	ERR	ERR	177.19	158.55 <	-3.958 <	-10.17 <	-2.267 <	53.476	9.2218 <	0.693	0.9457	0.4713 <	-0.017 <	-0.212 <	-0.003	
	Avg. +2 Std. Dev.	[illegible]0722	8.6461	510.53	9.6085	268.68	ERR	ERR	251.2	265.06 <	8.7199 <	15.308 <	40.553 <	76.715	15.683 <	1.4975	2.4448	6.7065 <	0.0612 <	0.4915 <	0.020	

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 25, 1998

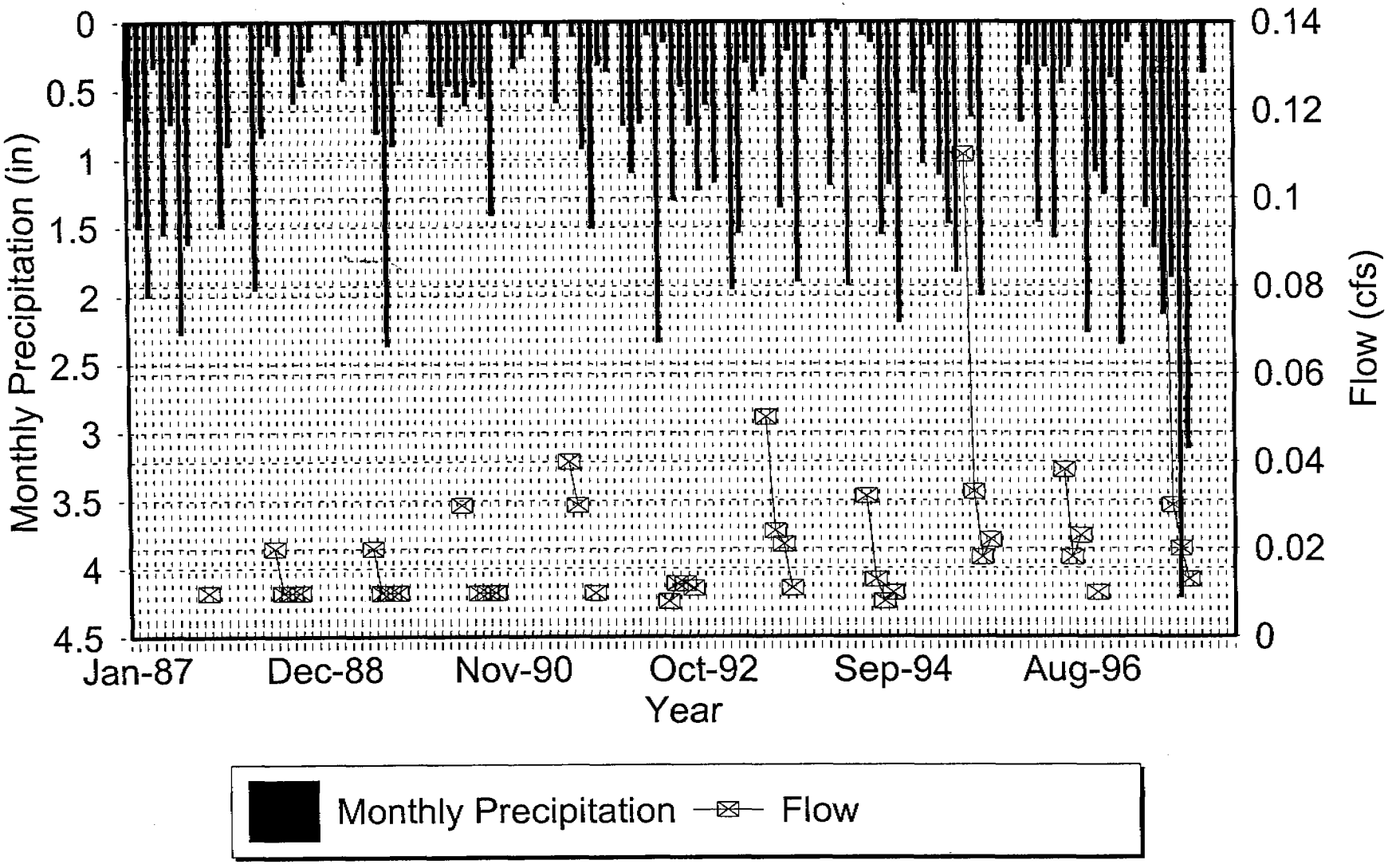
Station: 236 Property: Star Point Location: 1875' S 1750' E of NW corn. Sec 18, T15S, R7E Station Type: Spring Sampling Frequency: Quarterly Formation: Castlegate Elevation: 9150

Date		Field Measurements				Laboratory Measurements																Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

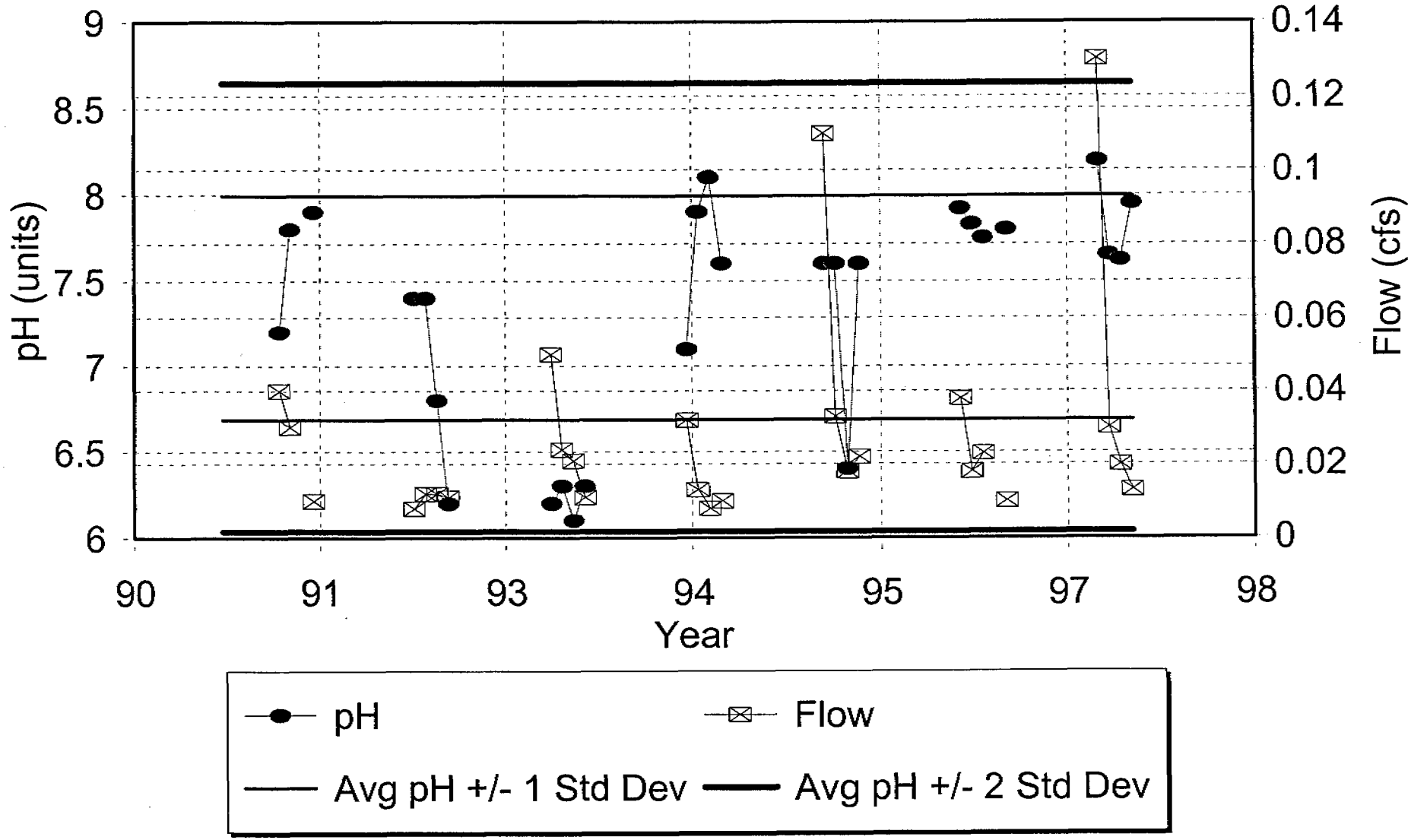
Station 238

Monthly Precipitation vs. Flow



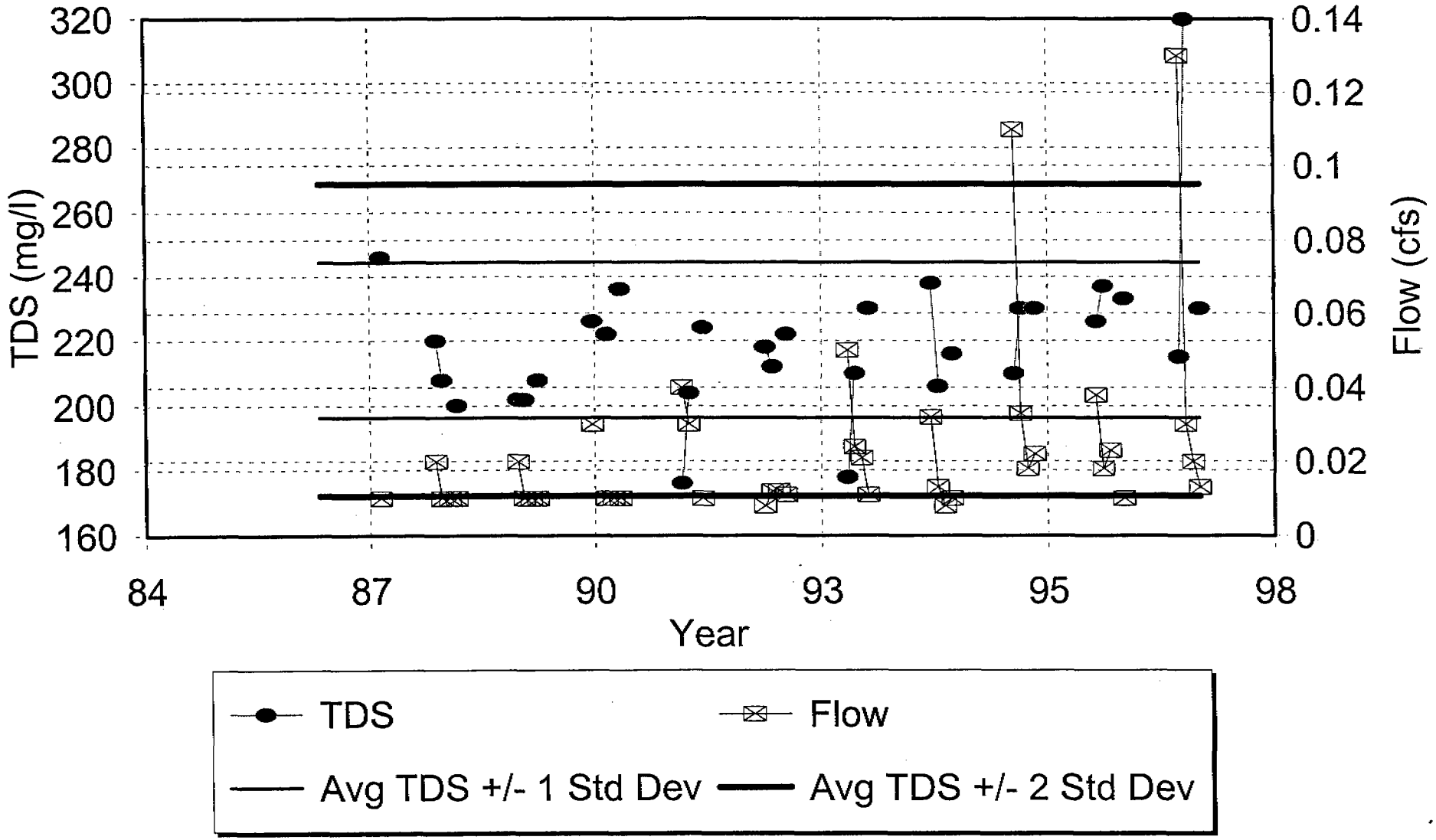
Station 238

pH vs. Flow



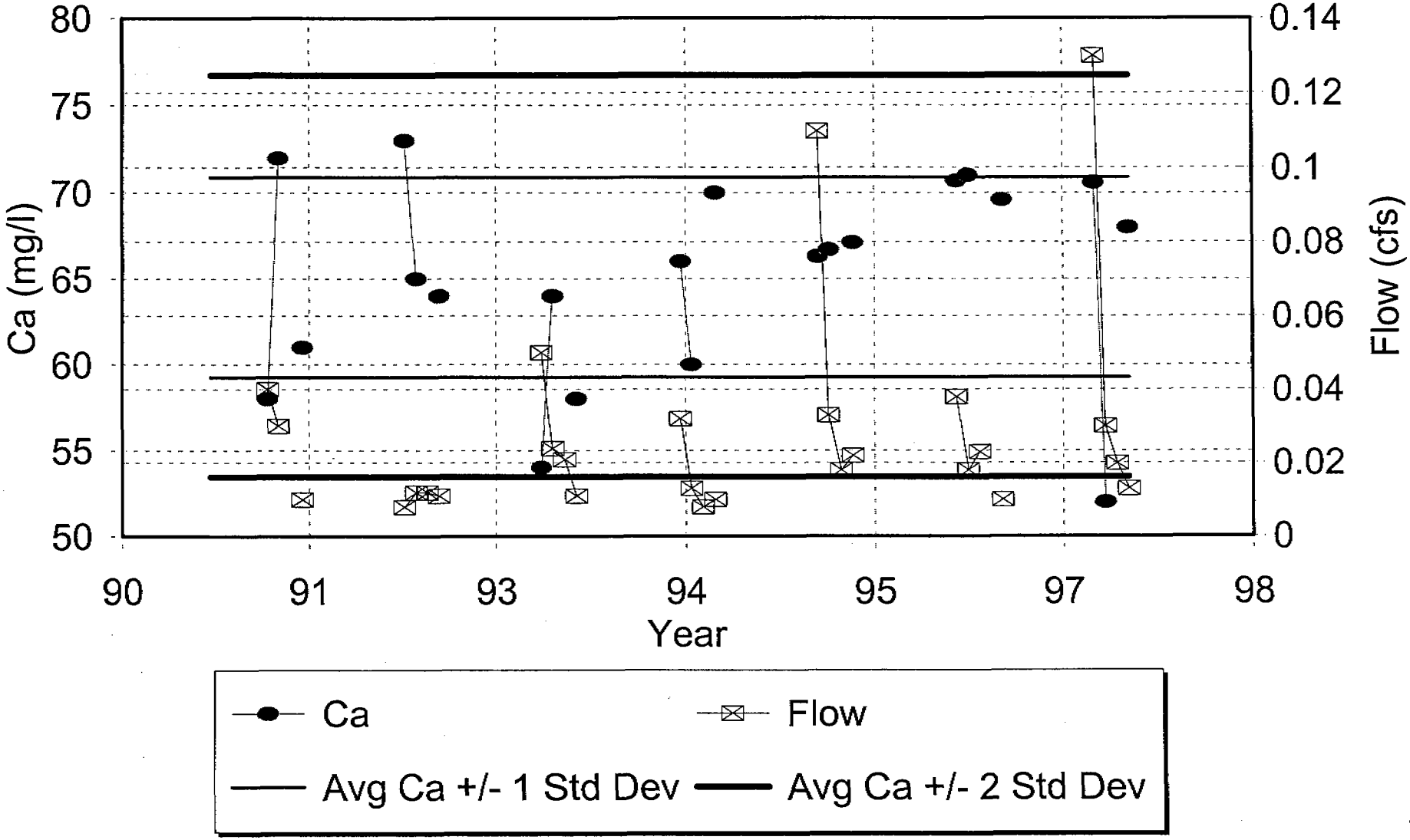
Station 238

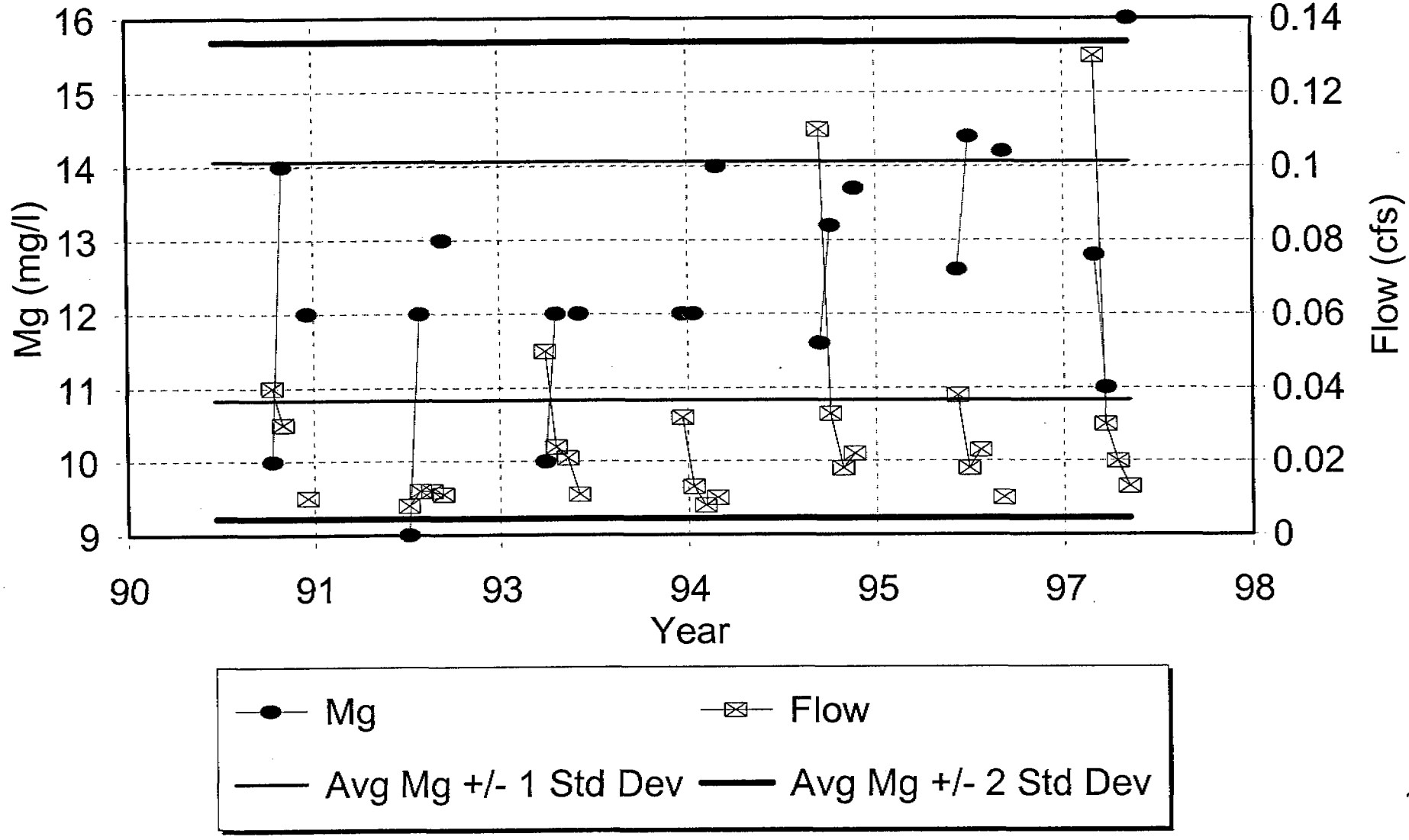
TDS vs. Flow



Station 238

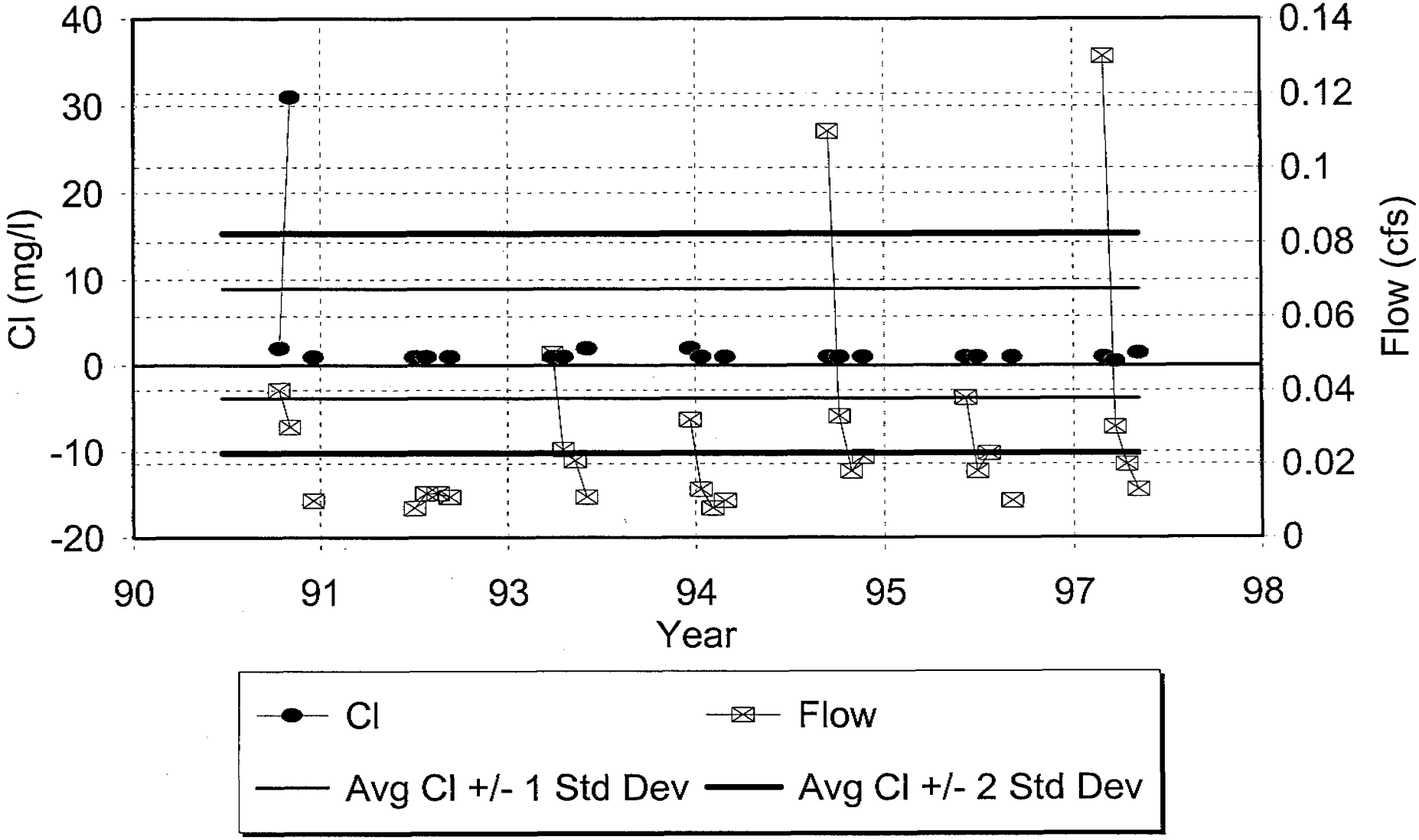
Ca vs. Flow

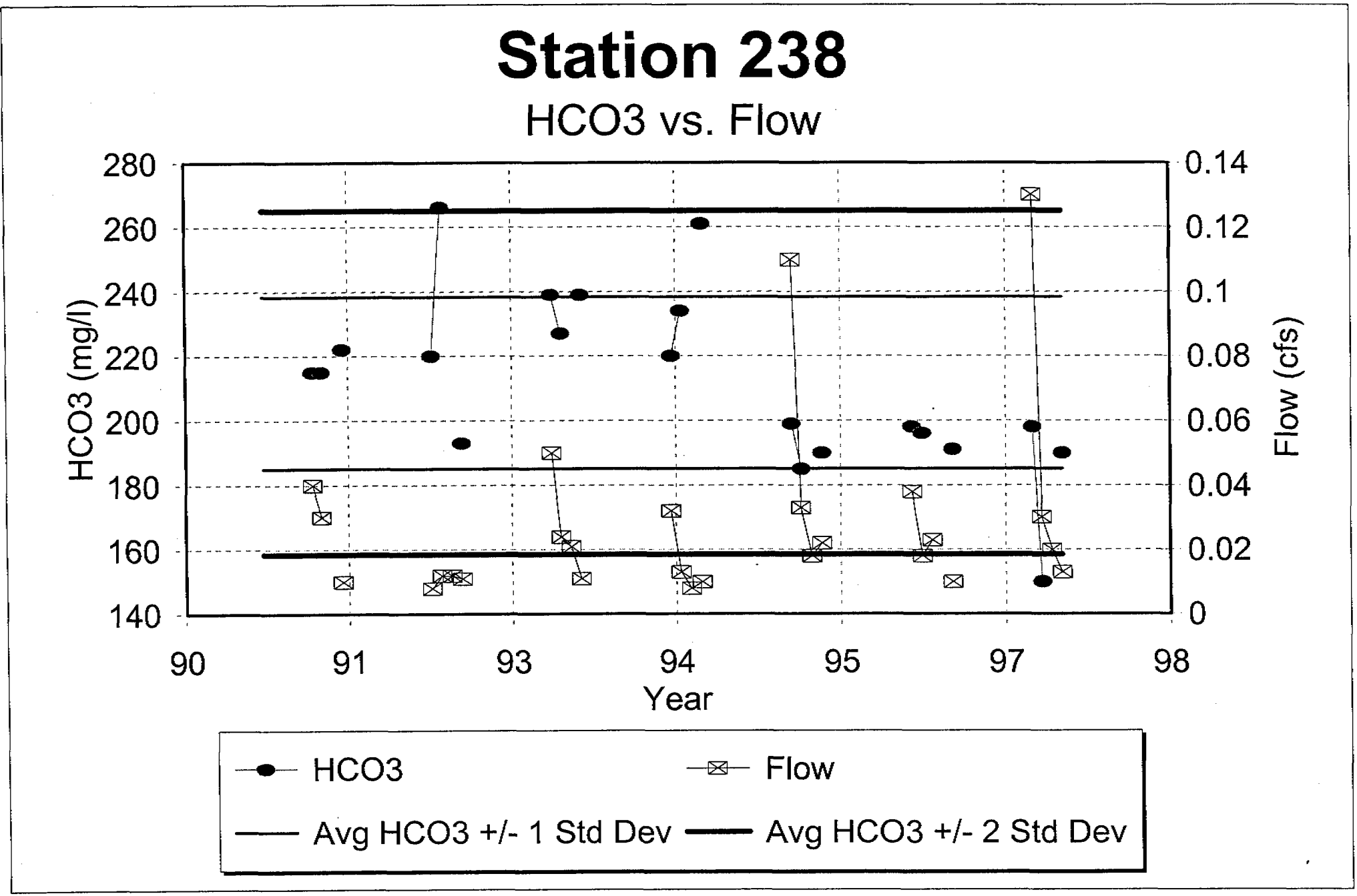



Station 238
Mg vs. Flow
Mg (mg/l)
16
15
14
13
12
11
10
9
Flow (cfs)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
90
91
93
94
95
97
98
Year
Mg
Flow
Avg Mg +/- 1 Std Dev
Avg Mg +/- 2 Std Dev

Station 238

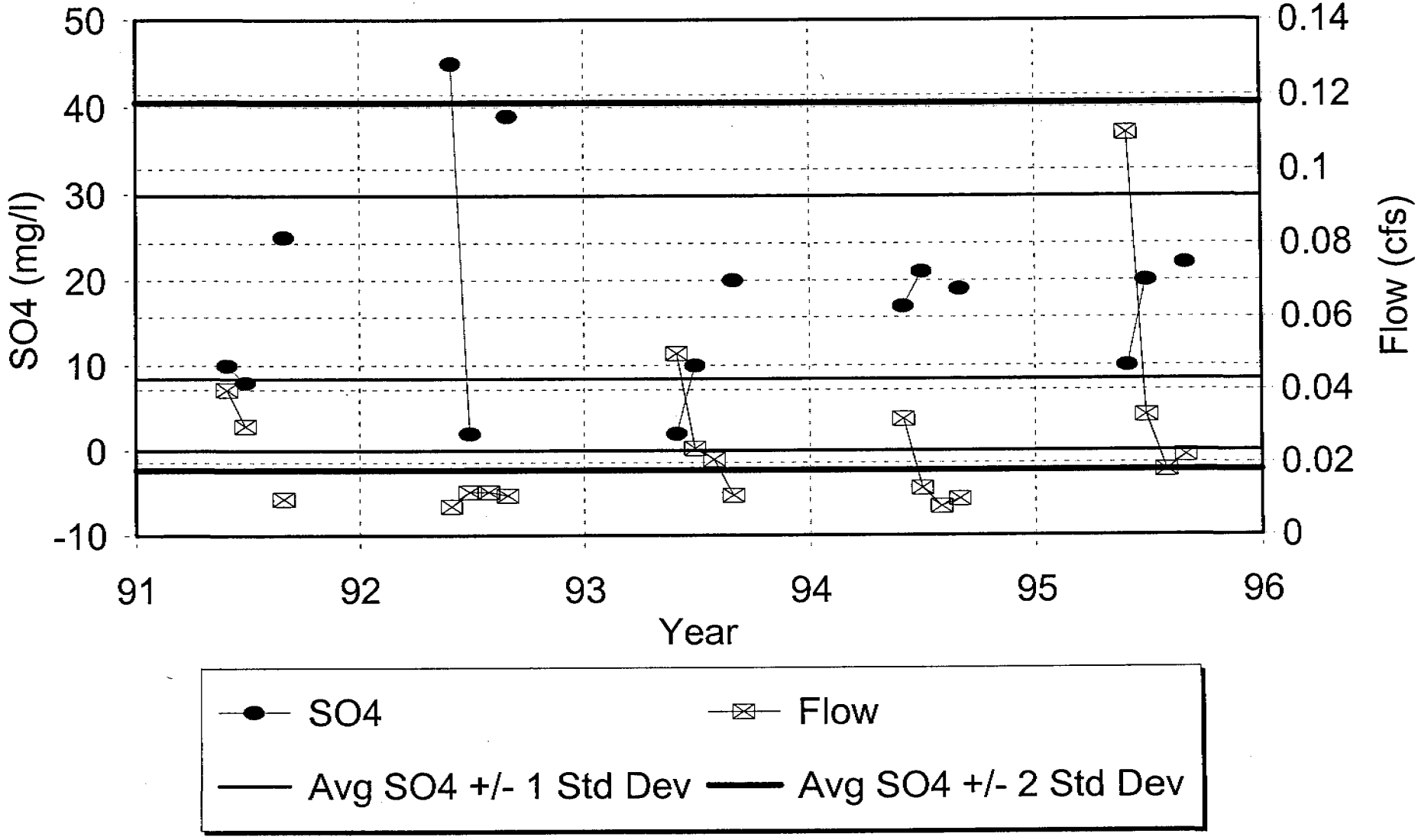
Cl vs. Flow




Station 238
HCO3 vs. Flow
280
260
240
220
200
180
160
140
HCO3 (mg/l)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Flow (cfs)
90
91
93
94
95
97
98
Year
HCO3
Flow
Avg HCO3 +/- 1 Std Dev
Avg HCO3 +/- 2 Std Dev

Station 238

SO4 vs. Flow



Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 492 | Property: Star Point | Location: 100' N 1625' E OF SW com. Sec 7, T15S, R8E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Castlegate | Elevation: 9445

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-89																							
Feb-89																							
Mar-89																							
Apr-89																							
May-89																							
Jun-89	06/05/89	0.01				220																	
Jul-89	07/11/89	0				232																	
Aug-89	08/22/89	0																					
Sep-89	09/15/89	0.01				204																	
Oct-89																							
Nov-89																							
Dec-89																							
Jan-90																							
Feb-90																							
Mar-90																							
Apr-90																							
May-90																							
Jun-90	06/04/90	0				200																	
Jul-90	07/07/90	0				226																	
Aug-90	08/30/90	0																					
Sep-90	09/18/90	0				208																	
Oct-90																							
Nov-90																							
Dec-90																							
Jan-91																							
Feb-91																							
Mar-91																							
Apr-91																							
May-91																							
Jun-91	06/13/91	0.01	7.3	390	4	250			207	217	10	1	27	50	20 <	1	7	<	0.02 <	0.02 <	0.01		
Jul-91	07/16/91	0	7.8	420	6	212			201	227	2	3	6	51	18	1	3		0.02	0.24 <	0.01		
Aug-91																							
Sep-91	09/18/91	0	8	420	7	224			199	227	0	2	12	50	18 <	1	2		0.18	0.46	0.02		
Oct-91																							
Nov-91																							
Dec-91																							
Jan-92																							
Feb-92																							
Mar-92																							
Apr-92																							
May-92																							
Jun-92	06/17/92	0.002	7.6	389	5.3	200			203	217	0	2	33	50	19	1	3	<	0.02	0.08			
Jul-92	07/16/92	0.002	7.6	391	5.5	220			212	229	0	2	23	62	14 <	1	2	<	0.02	0.09			
Aug-92	08/25/92	0.005	7	380	6																		
Sep-92	09/21/92	0.005	6.2	338	5.9	212			208	251	5	2	2	52	19	1	3	<	0.02	0.1			
Oct-92																							
Nov-92																							
Dec-92																							
Jan-93																							
Feb-93																							
Mar-93																							
Apr-93																							
May-93																							
Jun-93	06/25/93	0.007	6.3	852	5.9	146			145	159	0	3	2	40	11 <	1	2		0.06	0.15 <	0.01		
Jul-93	07/07/93	0.003	6.5	366	6	202			217	239	0	2	9	54	20 <	1	3	<	0.02 <	0.02 <	0.01		
Aug-93	08/18/93	0.002	6.4	365	6																		
Sep-93	09/27/93	0.002	5.3	394	5.3	214			194	239	0	3	6	48	18 <	1	2	<	0.02	0.31 <	0.01		
Oct-93																							
Nov-93																							
Dec-93																							
Jan-94																							
Feb-94																							
Mar-94																							
Apr-94																							
May-94																							
Jun-94	06/20/94	0.005	8	430	4.3	198			222	261	0	2	6	56	20 <	1	4		0.08	0.08 <	0.01		
Jul-94	06/20/94	0.003	6.1	368	13	218			194	242	0	2	2	48	18 <	1	2	<	0.02	0.1 <	0.01		
Aug-94	08/31/94	0.005	7.7	330	10.2																		LOTS OF COW ACTIVITY
Sep-94	09/26/94	0.003	8	303	11.1	188			182	214	0	2	4	45	17 <	1	2	<	0.02	0.03 <	0.01		
Oct-94																							
Nov-94																							
Dec-94																							

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

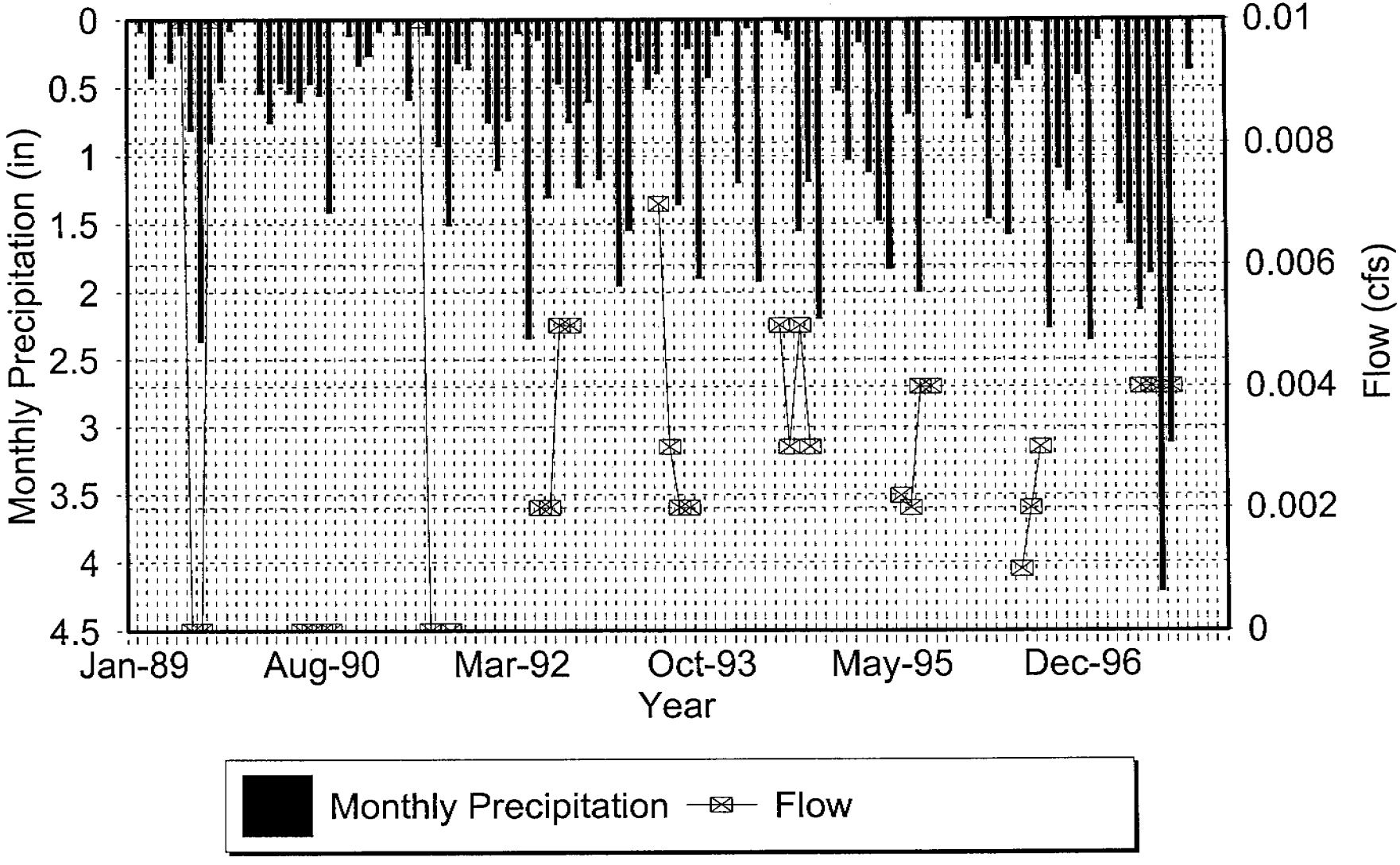
Station: 492 | Property: Star Point | Location: 100' N 1625' E OF SW com. Sec 7, T15S, R6E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Castlegate | Elevation: 9445

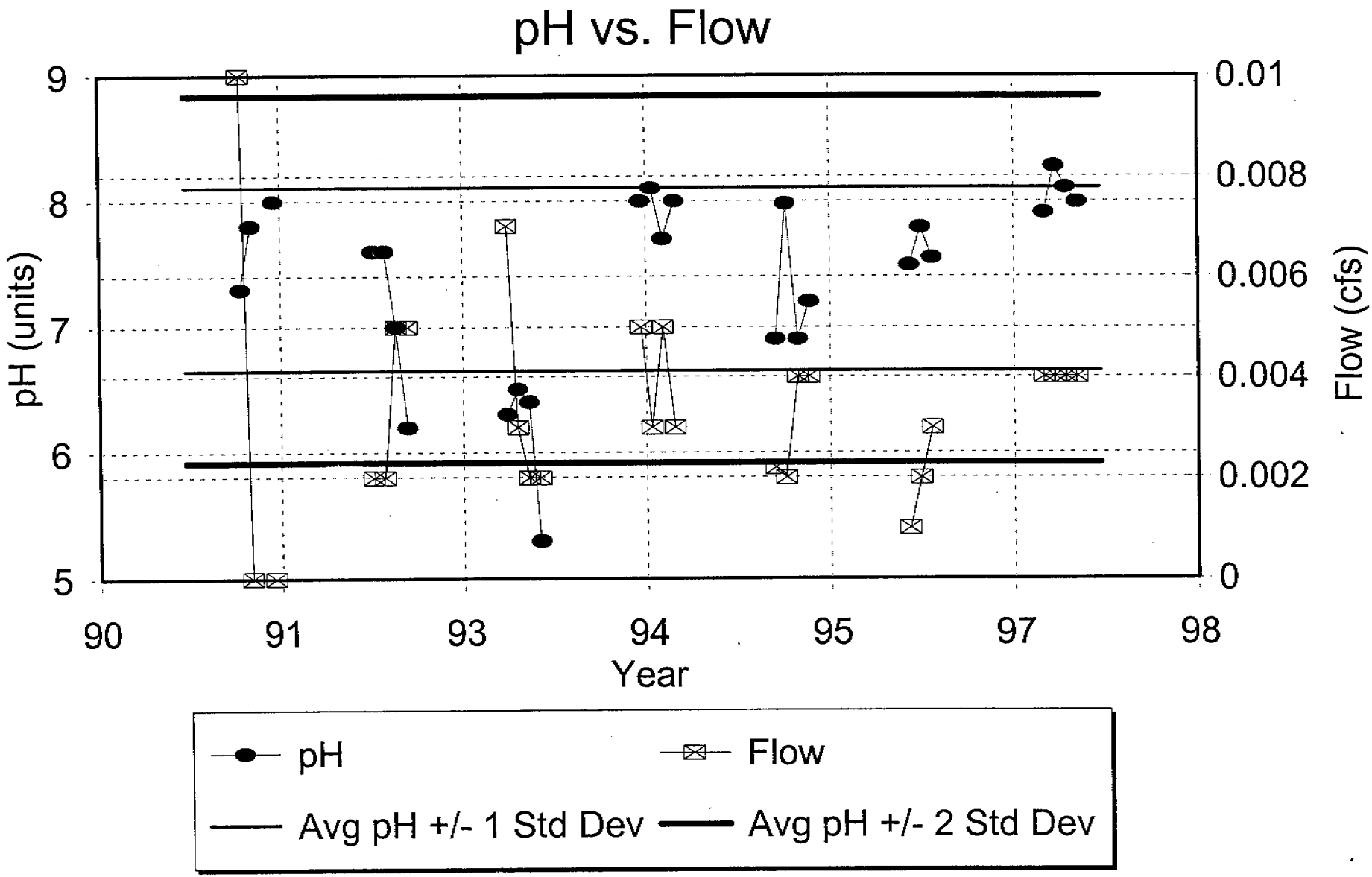
Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-95																							
Feb-95																							
Mar-95																							
Apr-95																							
May-95																							
Jun-95	06/22/95	0.0022	6.9	377	3.8	190			212	204 <	2	3 <	10	52	20	0.6	2.8	2.5 <	0.01 <	0.01 <	0.005	
Jul-95	07/27/95	0.002	7.98	327	7	220			215	195 <	2	2	10	52.9	20.2	0.7	2.8	3.2 <	0.01 <	0.01 <	0.005	
Aug-95	08/23/95	0.004	6.9	546	6																	
Sep-95	09/26/95	0.004	7.2	2560	6.67	210			225	193 <	2	3	11	55.5	21	0.6	2.8	5.2 <	0.01 <	0.01 <	0.005	
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/12/96	0.001	7.49	454	5	207			219	195	2 <	2	10 <	54	20.5	0.5	2.8	4.2	0.2	0.09	0.005	
Jul-96	07/23/96	0.002	7.79	345	6	202			222	202	2 <	2	10 <	55.1	20.4	0.7	2.8	5.5	0.01 <	0.02	0.005	
Aug-96	08/19/96	0.003	7.55	412	6																	
Sep-96																						
Oct-96																						
Nov-96																						
Dec-96																						
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/18/97	0.004	7.91	380	5	235			234	249	2 <	2	10 <	58.2	21.5	0.8	2.8	-2.2	0.01 <	0.01 <	0.005	
Jul-97	07/30/97	0.004	8.28	430	7	210			210	190	10 <	0.5 <	5 <	53	19	0.7	2.8	6.7	0.01 <	0.09	0.005	
Aug-97	08/13/97	0.004	8.11	420	7																	
Sep-97	09/17/97	0.004	7.99	394	6	180			200	180	10 <	2.2	5 <	49	18	1.1	3.2	5.6	0.01 <	0.36	0.007	
Oct-97																						
Nov-97																						
Dec-97																						
END DATA																						
Count		34	26	26	26	26	0	0	20	20	20	20	20	20	20	20	20	6	20	20	17	
Minimum		0	5.3	303	3.8	148	ERR	ERR	145	159 <	0 <	0.5 <	2 <	40	11 <	0.5	2	-2.2 <	0.01 <	0.01 <	0.005	
Maximum		0.01	8.28	2560	13	250	ERR	ERR	234	261 <	10 <	3 <	33 <	62	21.5 <	1.1	7	6.7 <	0.2 <	0.46 <	0.02	
Average		0.0032	7.3808	491.58	6.4219	208.85	ERR	ERR	206.05	216.5 <	2.45 <	2.135 <	10.15 <	51.785	18.63 <	0.885	2.89	3.8375 <	0.0385 <	0.114 <	0.0084	
Standard Deviation		0.0028	0.7305	425.66	2.0329	19.279	ERR	ERR	18.473	25.939 <	3.4128 <	0.6295 <	8.1196 <	4.6486	2.3996 <	0.1768	1.0742	2.6148 <	0.0534 <	0.1259 <	0.0037	
Avg. -1 Std. Dev.		0.0004	6.6502	65.917	4.389	189.57	ERR	ERR	187.58	190.56 <	-0.963 <	1.5055 <	2.0304 <	47.136	16.23 <	0.7082	1.8156	1.2227 <	-0.015 <	-0.012 <	0.0046	
Avg. +1 Std. Dev.		0.006	8.1113	917.24	8.4548	228.12	ERR	ERR	224.52	242.44 <	5.8628 <	2.7645 <	18.27 <	56.434	21.03 <	1.0618	3.9642	6.4523 <	0.0919 <	0.2399 <	0.0121	
Avg. -2 Std. Dev.		-0.002	5.9197	-359.7	2.3561	170.29	ERR	ERR	169.1	164.62 <	-4.376 <	0.876 <	-6.069 <	42.488	13.831 <	0.5313	0.7416	-1.392 <	-0.068 <	-0.138 <	0.0009	
Avg. +2 Std. Dev.		0.0068	8.8419	1342.9	10.488	247.4	ERR	ERR	243	268.38 <	9.2757 <	3.394 <	26.389 <	61.082	23.429 <	1.2387	5.0384	9.0672 <	0.1453 <	0.3658 <	0.0158	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

Station 492

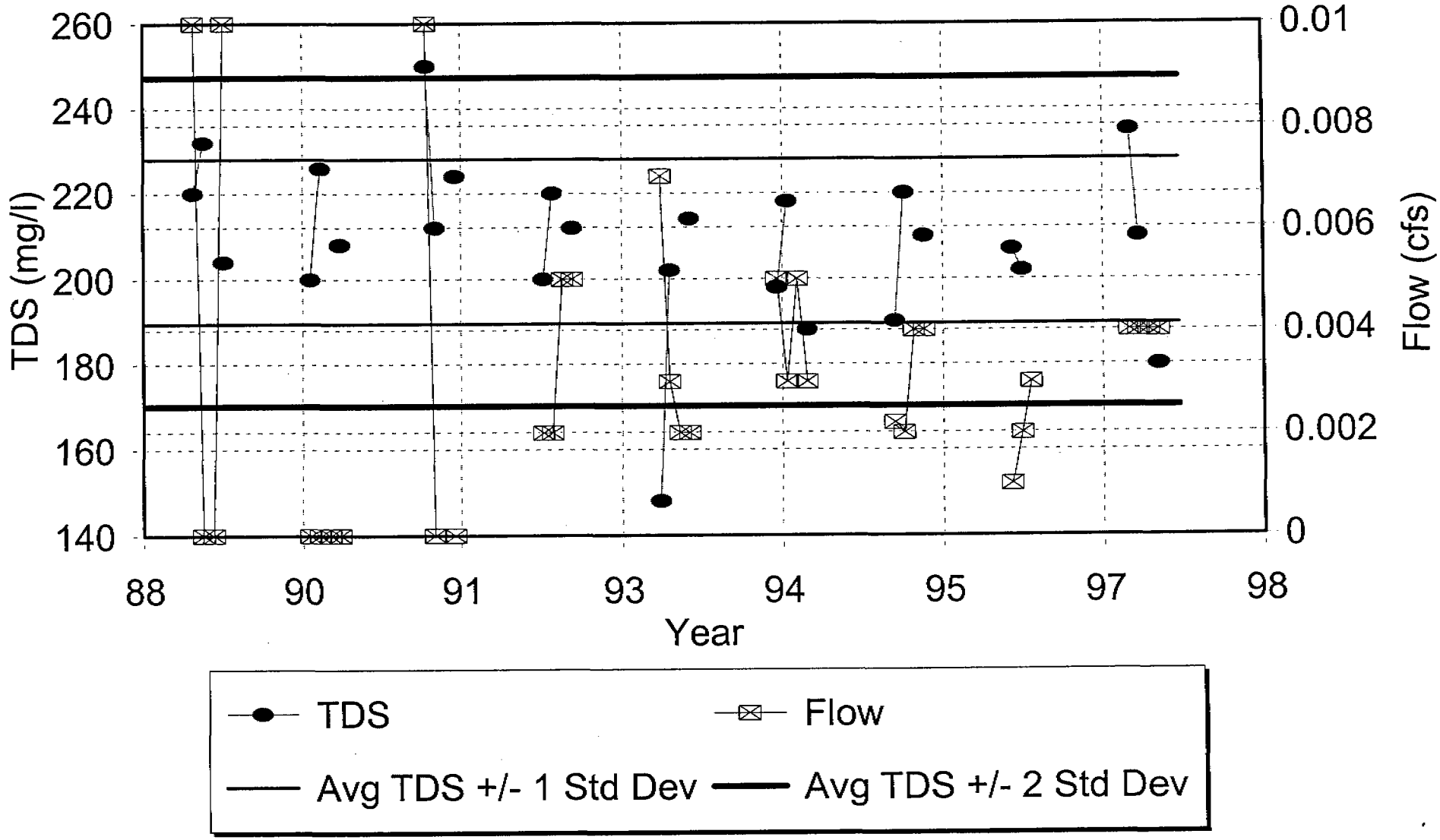
Monthly Precipitation vs. Flow

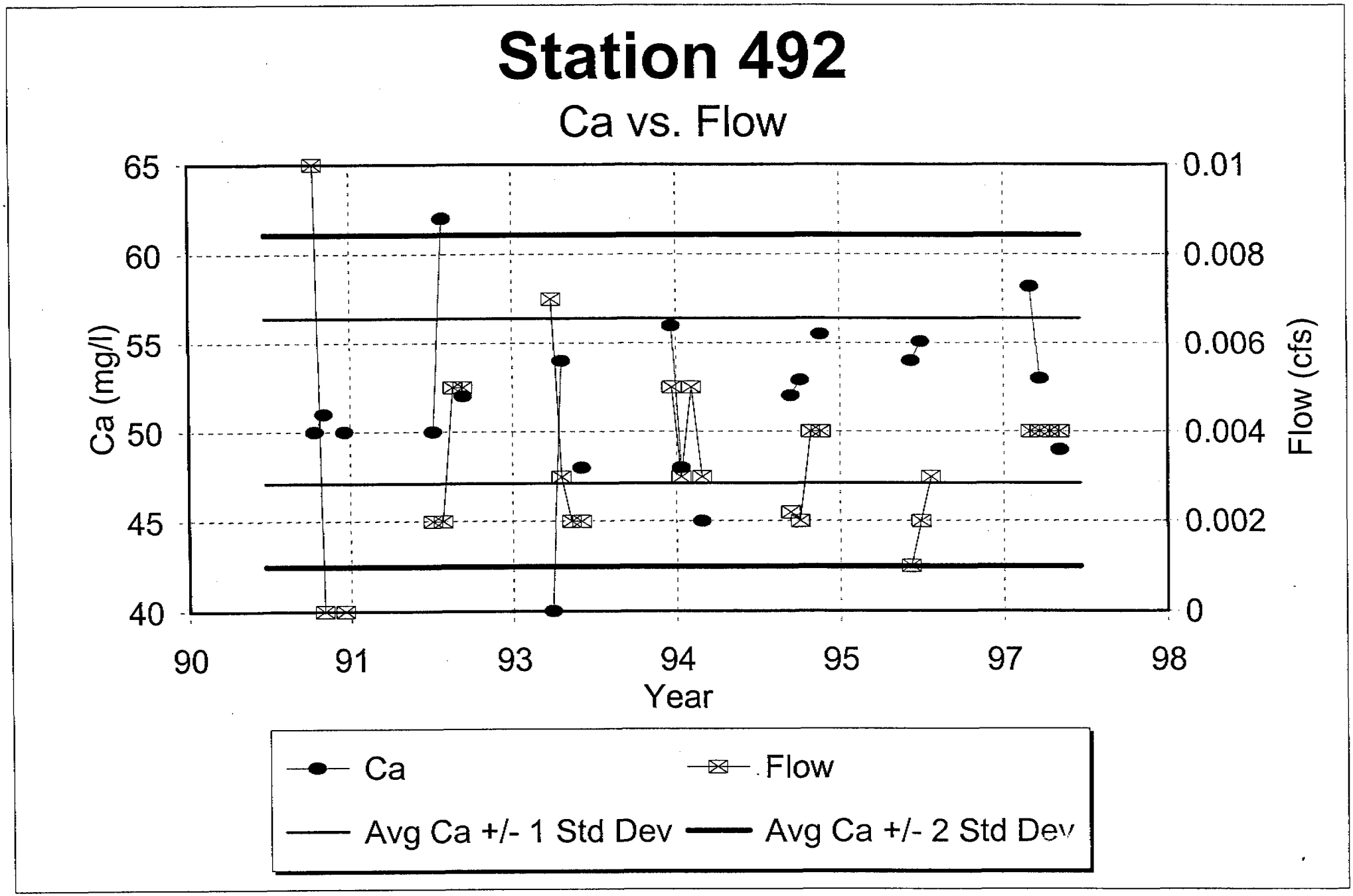



Station 492
pH vs. Flow
pH (units)
9
8
7
6
5
Flow (cfs)
0.01
0.008
0.006
0.004
0.002
0
90
91
93
94
95
97
98
Year
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev

Station 492

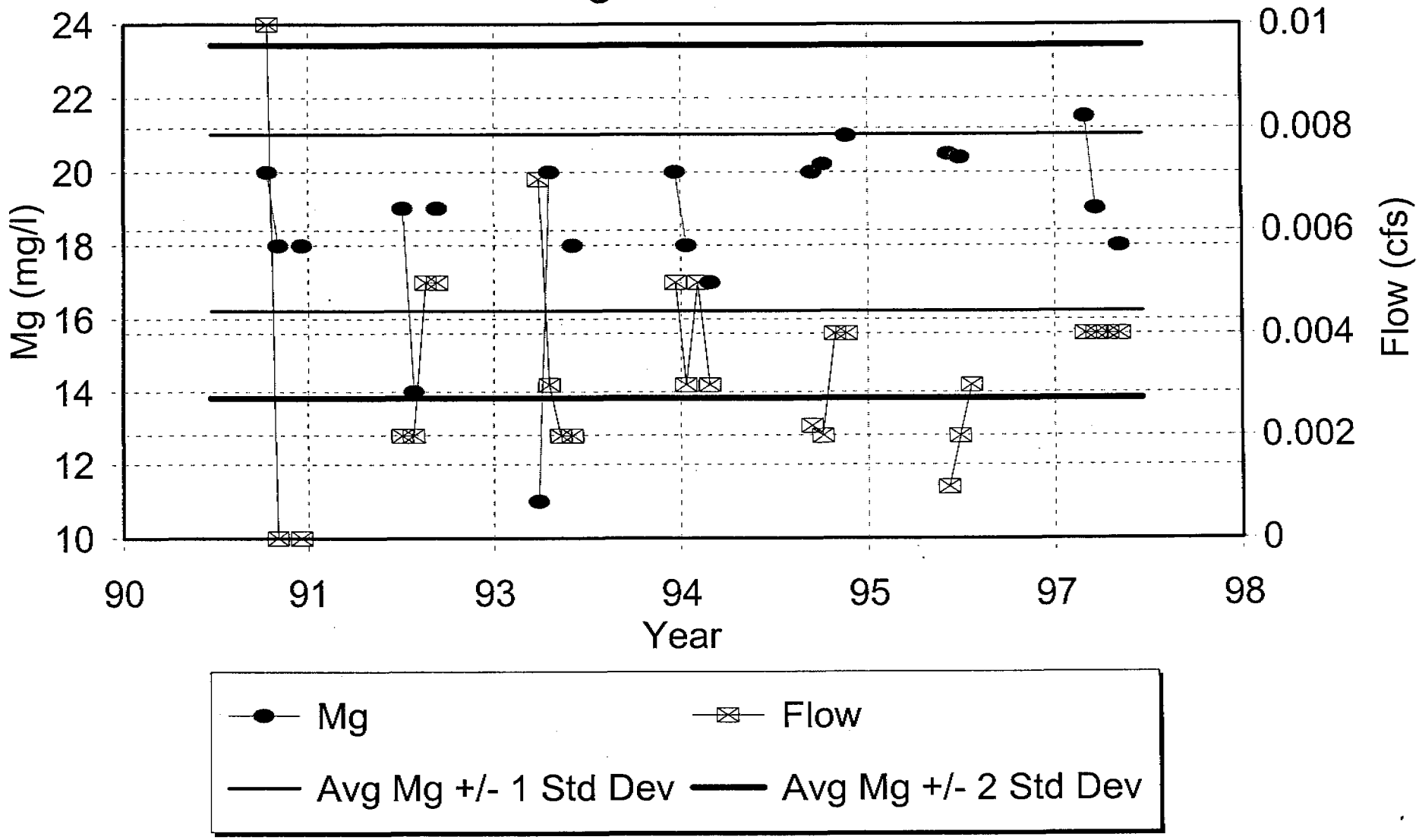
TDS vs. Flow




Station 492
Ca vs. Flow
Ca (mg/l)
65
60
55
50
45
40
Flow (cfs)
0.01
0.008
0.006
0.004
0.002
0
90
91
93
94
95
97
98
Year
Ca
Flow
Avg Ca +/- 1 Std Dev
Avg Ca +/- 2 Std Dev

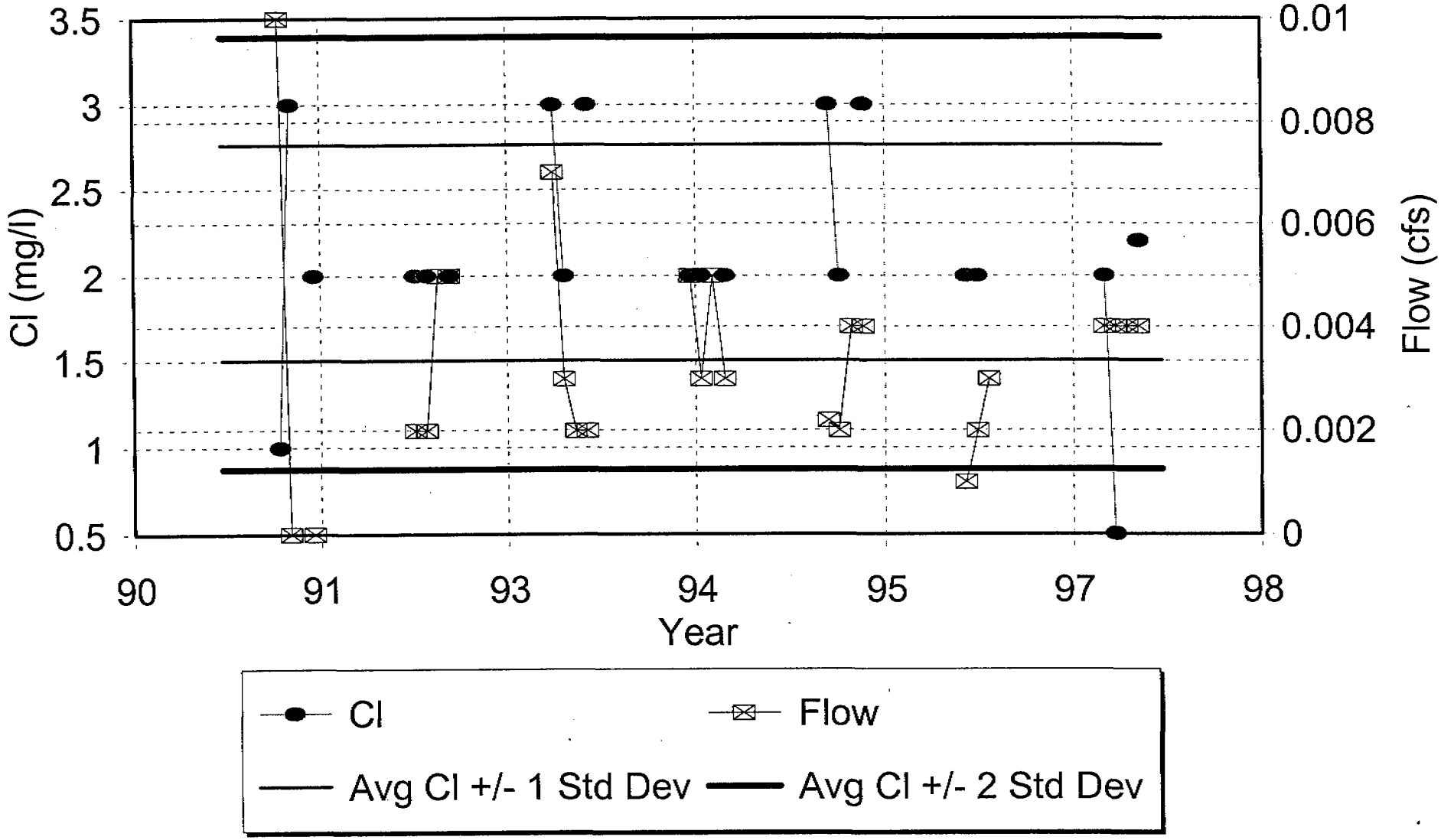
Station 492

Mg vs. Flow



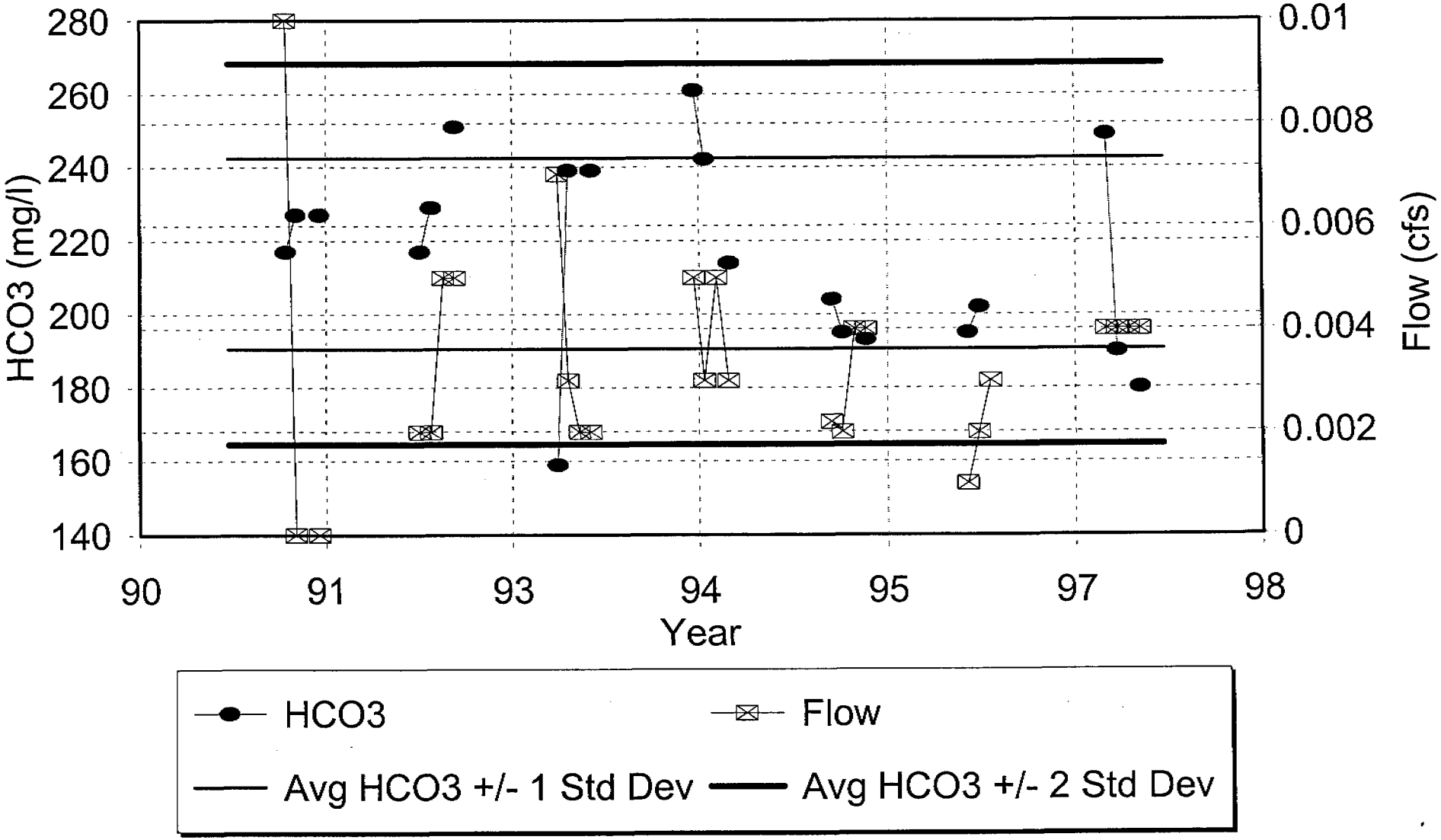
Station 492

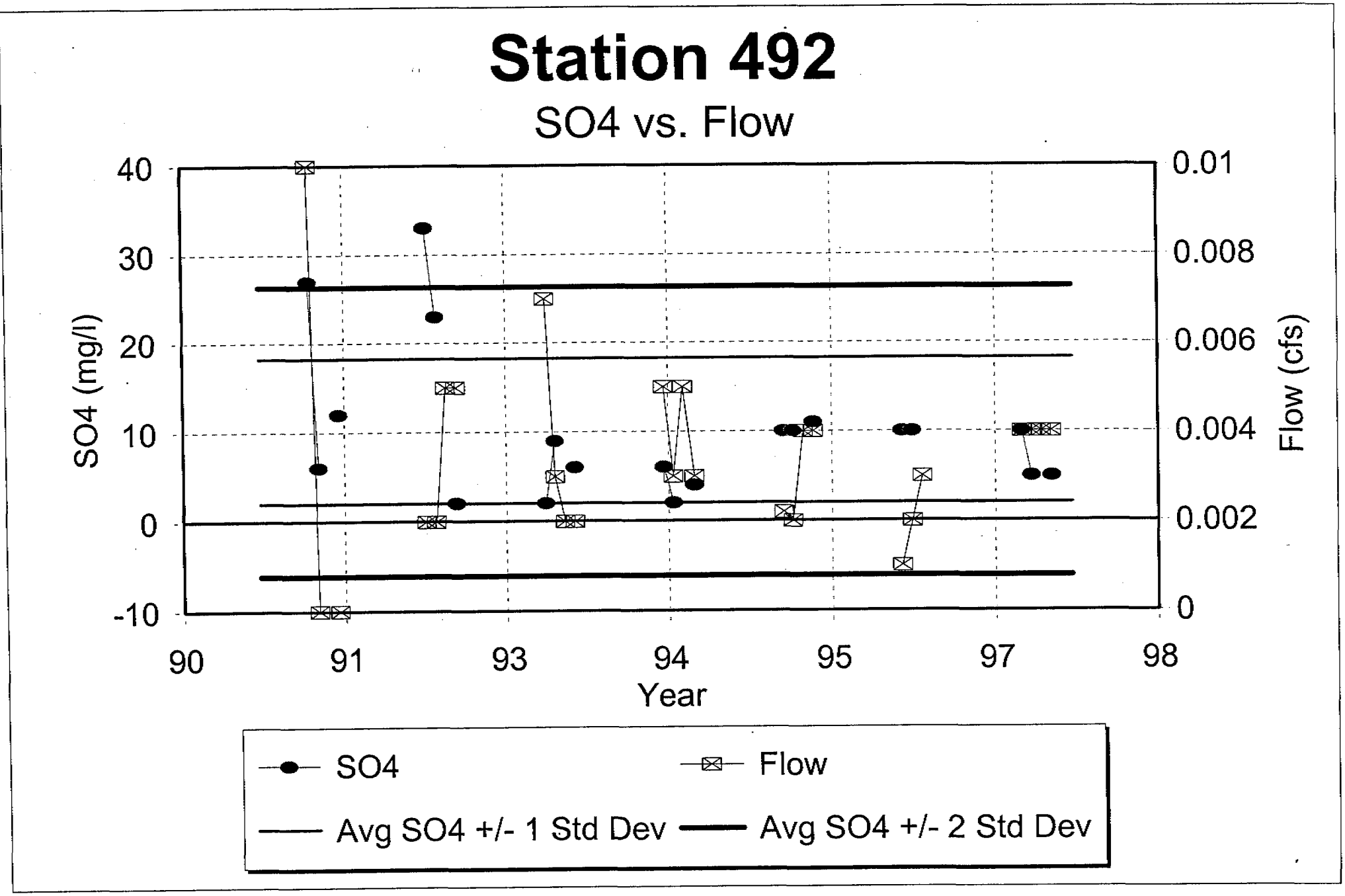
Cl vs. Flow



Station 492

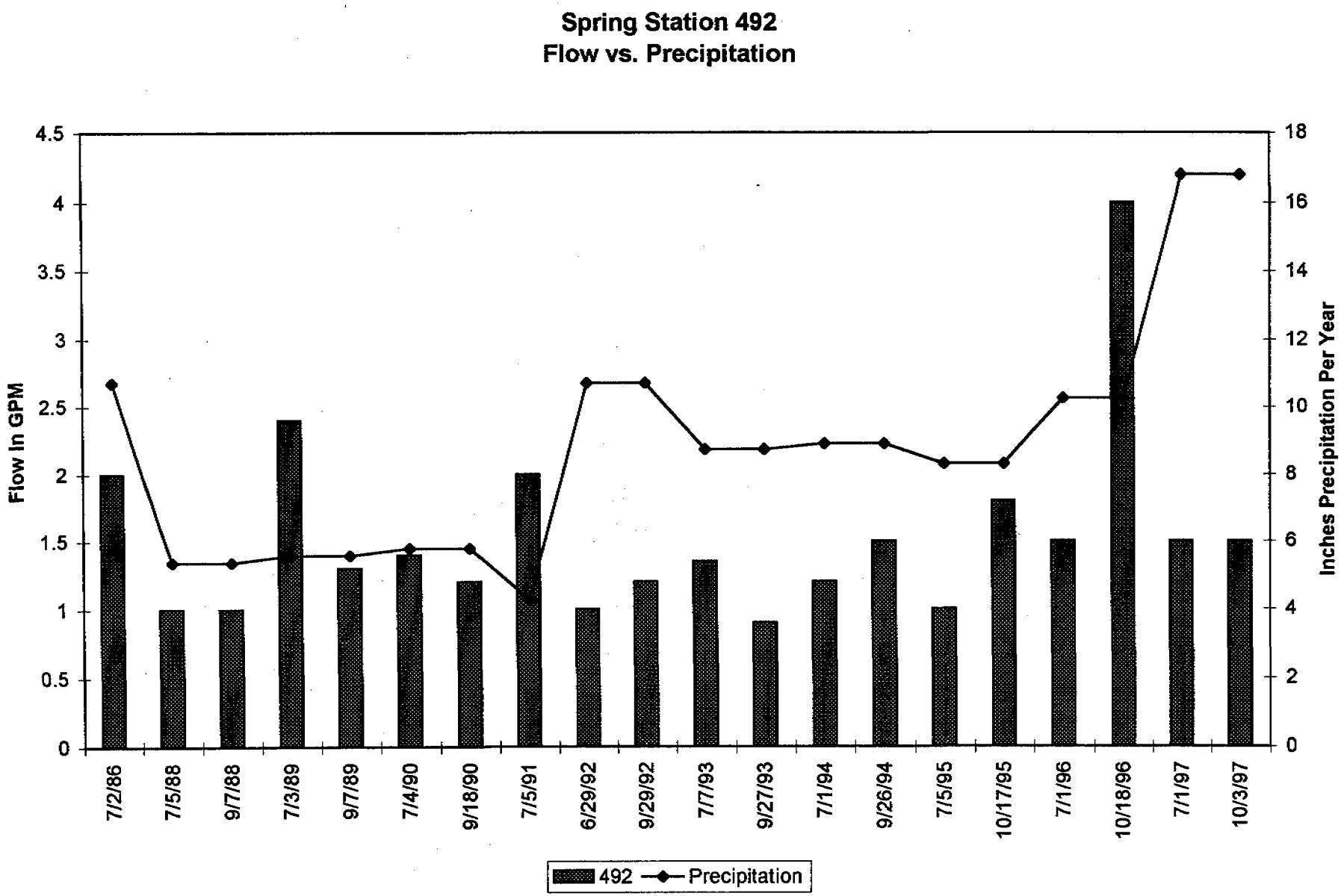
HCO3 vs. Flow




Station 492
SO4 vs. Flow
SO4 (mg/l)
40
30
20
10
0
-10
Flow (cfs)
0.01
0.008
0.006
0.004
0.002
0
90
91
93
94
95
97
98
Year
SO4
Flow
Avg SO4 +/- 1 Std Dev
Avg SO4 +/- 2 Std Dev

SPRING STATION 492

DATE	FIELD MEASUREMENTS				
	TIME	FLOW IN GPM	TEMP	pH	CONDUCTIVITY UHMOS/CM
07/02/86		2.0		7.3	325
07/05/88	8:35 AM	1.0	7.3	6.9	275
09/07/88	9:15 AM	1.0	7.5	8.6	270
07/03/89	8:15 AM	2.4	4.0	8.1	390
09/07/89	10:30 AM	1.3	6.0	7.9	420
07/04/90	8:25 AM	1.4	5.0	8.5	410
09/18/90	9:15 AM	1.2	5.0	8.3	370
07/05/91	11 :35 PM	2.0	6.0	8.6	390
06/29/92	10:35 AM	1	5.2	7	390
09/29/92	10:20 AM	1.2	5.4	6.3	375
07/07/93	10:20 AM	1.35	4.9	6.4	338
09/27/93	9:10 AM	0.9	4.8	6.2	336
07/01/94	9:25 AM	1.2	6.1	7.22	385
09/26/94	11:30 AM	1.5	8.7	8.06	405
07/05/95	10:05 AM	1	6	8.16	310
10/17/95	11:05 AM	1.8	5	8.2	370
07/01/96	9:55 AM	1.5	5	7.92	436
10/18/96	10:40 AM	4	1	7.99	411
07/01/97	10:16 AM	1.5	5.5	8.21	455
10/03/97	11:00 AM	1.5	5	8.11	375
AVG		1.54	5.4	7.70	372
MAX		4.00	8.7	8.60	455
MIN		0.90	1.0	6.20	270
STD DEV		0.70	1.6	0.77	50


Spring Station 492
Flow vs. Precipitation
Flow In GPM
Inches Precipitation Per Year
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
18
16
14
12
10
8
6
4
2
0
7/2/86
7/5/88
9/7/88
7/3/89
9/7/89
7/4/90
9/18/90
7/5/91
6/29/92
9/29/92
7/7/93
9/27/93
7/1/94
9/26/94
7/5/95
10/17/95
7/1/96
10/18/96
7/1/97
10/3/97
492
Precipitation

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 494 | Property: Star Point | Location: 375' S 2000' E of NW com. Sec 18, T15S, R8E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Castlegate | Elevation: 9395

Date		Field Measurements				Laboratory Measurements																	Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)		
Jan-87																							
Feb-87																							
Mar-87																							
Apr-87																							
May-87																							
Jun-87																							
Jul-87																							
Aug-87																							
Sep-87																							
Oct-87	10/09/87	0.01				262																	
Nov-87																							
Dec-87																							
Jan-88																							
Feb-88																							
Mar-88																							
Apr-88																							
May-88																							
Jun-88	06/14/88	0.02				190																	
Jul-88	07/16/88	0				270																	
Aug-88	08/19/88	0																					
Sep-88	09/05/88	0				264																	
Oct-88																							
Nov-88																							
Dec-88																							
Jan-89																							
Feb-89																							
Mar-89																							
Apr-89																							
May-89																							
Jun-89	06/05/89	0																					
Jul-89																							
Aug-89																							
Sep-89	09/15/89	0																					
Oct-89																							
Nov-89																							
Dec-89																							
Jan-90																							
Feb-90																							
Mar-90																							
Apr-90																							
May-90																							
Jun-90	06/04/90	0																					
Jul-90																							
Aug-90																							
Sep-90	09/18/90	0																					
Oct-90																							
Nov-90																							
Dec-90																							
Jan-91																							
Feb-91																							
Mar-91																							
Apr-91																							
May-91																							
Jun-91	06/13/91	0	8.3	450	4																		
Jul-91	07/18/91	0	8.4	500	8																		
Aug-91																							
Sep-91	09/17/91	0	7.9	420	7																		
Oct-91																							
Nov-91																							
Dec-91																							
Jan-92																							
Feb-92																							
Mar-92																							
Apr-92																							
May-92																							
Jun-92	06/29/92	0.002																					
Jul-92																							
Aug-92																							
Sep-92	09/29/92	0.001	6.9	503	6.2																		
Oct-92																							
Nov-92																							
Dec-92																							

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 494 | Property: Star Point | Location: 375' S 2000' E of NW corn. Sec 18, T15S, R8E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Castlegate | Elevation: 9395

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cal/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-93																							
Feb-93																							
Mar-93																							
Apr-93																							
May-93																							
Jun-93	06/25/93	0.003	6.4	360	5.4																		
Jul-93	07/07/93	0.002	12.7	410	7.2																		
Aug-93																							
Sep-93	09/27/93	0.001	7.1	418	10.2																		
Oct-93																							
Nov-93																							
Dec-93																							
Jan-94																							
Feb-94																							
Mar-94																							
Apr-94																							
May-94																							
Jun-94	06/20/94	0.005	8.3	507	7.3																		LOTS OF COW ACTIVITY
Jul-94																							
Aug-94																							
Sep-94	09/26/94	0																					NO FLOW
Oct-94																							
Nov-94																							
Dec-94																							
Jan-95																							
Feb-95																							
Mar-95																							
Apr-95																							
May-95																							
Jun-95	06/22/95	0.0045	7.5	408	9	230			248	189 <	2	2	80	61.8	22.8 <	0.3	3.3	-3.9	0.02	0.1 <	0.005	
Jul-95																							
Aug-95																							
Sep-95	09/28/95	0.0022	7.96	420	7																		No Sample
Oct-95																							
Nov-95																							
Dec-95																							
Jan-96																							
Feb-96																							
Mar-96																							
Apr-96																							
May-96																							
Jun-96	06/12/96	0.0012	8.24	475	13																		
Jul-96																							
Aug-96																							
Sep-96																							
Oct-96																							
Nov-96																							
Dec-96																							
Jan-97																							
Feb-97																							
Mar-97																							
Apr-97																							
May-97																							
Jun-97	06/17/97	0.004	8.47	504	16																		
Jul-97																							
Aug-97																							
Sep-97	09/16/97	0.004	8.62	458	8																		
Oct-97																							
Nov-97																							
Dec-97																							
Jan-98																							
END DATA																							
Count		24	13	13	13	5	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1		
Minimum		0	6.4	360	4	190	ERR	ERR	248	189 <	2	2	80	61.8	22.8 <	0.3	3.3	-3.9	0.02	0.1 <	0.005		
Maximum		0.02	12.7	507	16	270	ERR	ERR	248	189 <	2	2	80	61.8	22.8 <	0.3	3.3	-3.9	0.02	0.1 <	0.005		
Average		0.0025	8.2146	448.69	8.3308	243.2	ERR	ERR	248	189 <	2	2	80	61.8	22.8 <	0.3	3.3	-3.9	0.02	0.1 <	0.005		
Standard Deviation		0.0043	1.4501	45.069	3.0703	30.029	ERR	ERR	0	0 <	0	0	0	0	0 <	0	0	0	0	0 <	0		
Avg. -1 Std. Dev.		-0.002	6.7545	403.6	5.2605	213.17	ERR	ERR	248	189 <	2	2	80	61.8	22.8 <	0.3	3.3	-3.9	0.02	0.1 <	0.005		
Avg. +1 Std. Dev.		[illegible].0068	9.6647	493.78	11.401	273.23	ERR	ERR	248	189 <	2	2	80	61.8	22.8 <	0.3	3.3	-3.9	0.02	0.1 <	0.005		
Avg. -2 Std. Dev.		[illegible].006	5.3144	358.52	2.1902	183.14	ERR	ERR	248	189 <	2	2	80	61.8	22.8 <	0.3	3.3	-3.9	0.02	0.1 <	0.005		

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

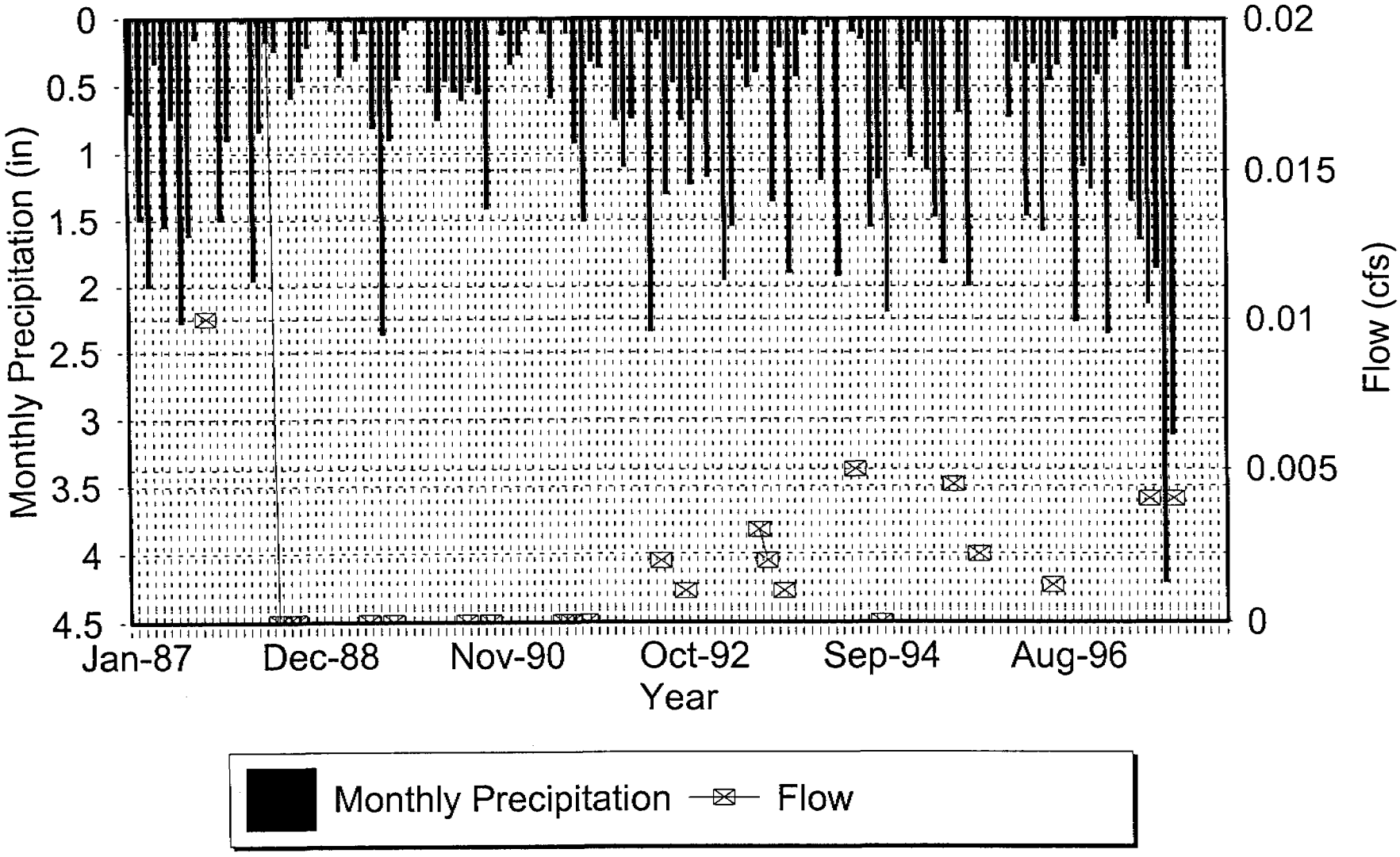
Station: 494 | Property: Star Point | Location: 375' S 2000' E of NW corn. Sec 18, T15S, R6E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Castlegate | Elevation: 9395

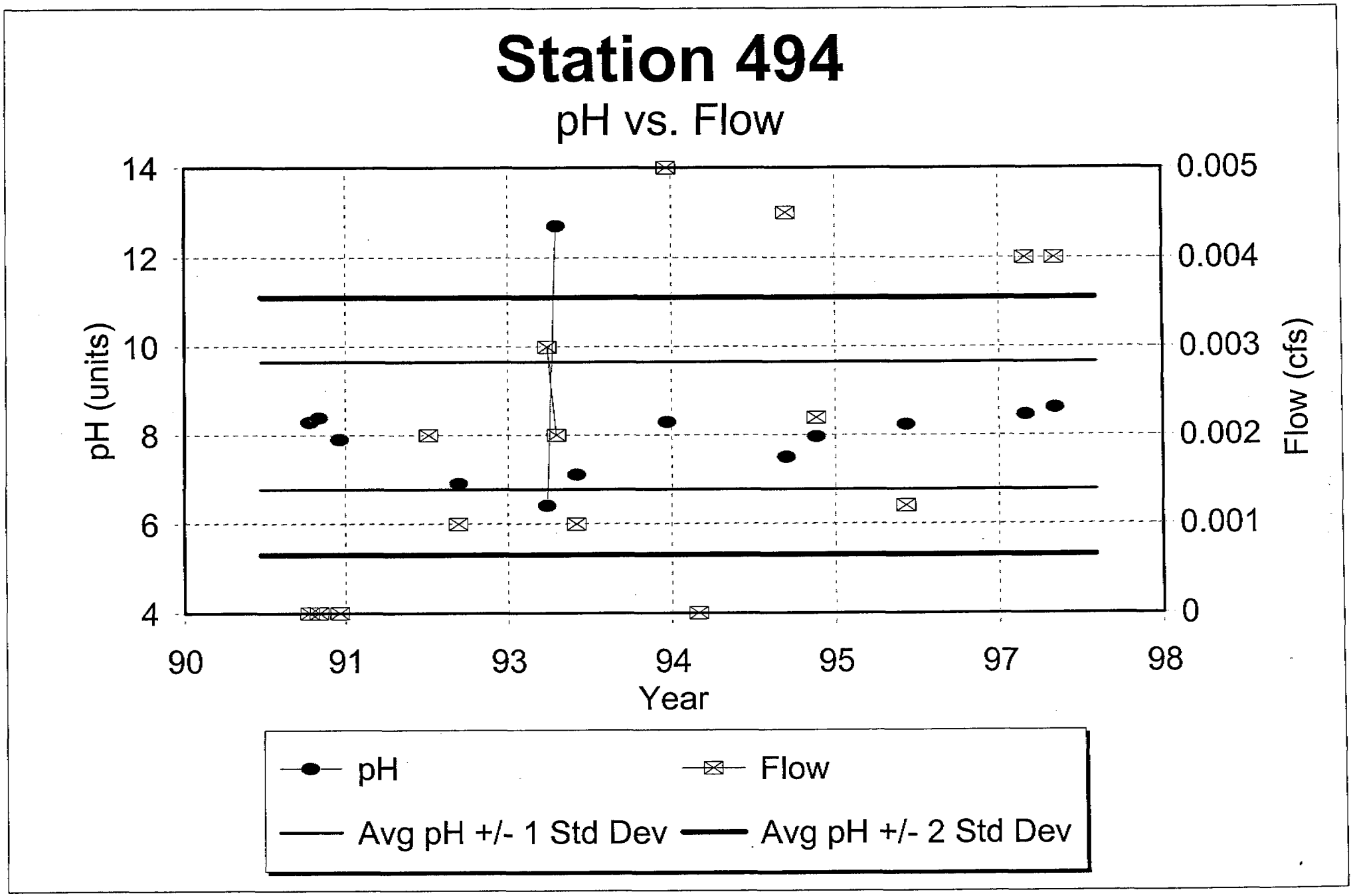
Date		Field Measurements				Laboratory Measurements																Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	
Avg. +2 Std. Dev.		0.0112	11.115	538.87	14.471	303.26	ERR	ERR	248	189 <	2	2	80	61.8	22.8 <	0.3	3.3	-3.9	0.02	0.1 <	0.005	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

Station 494

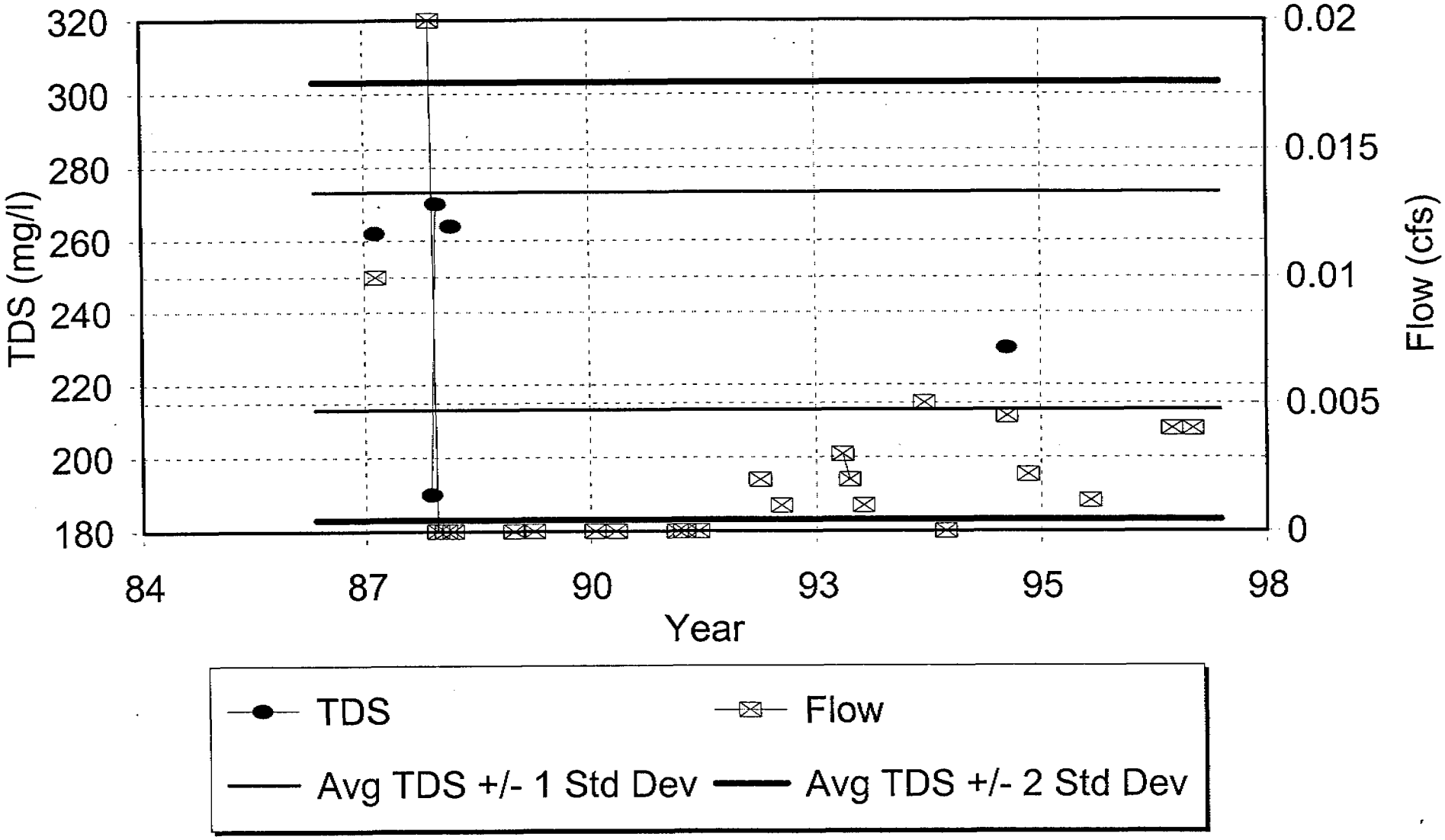
Monthly Precipitation vs. Flow

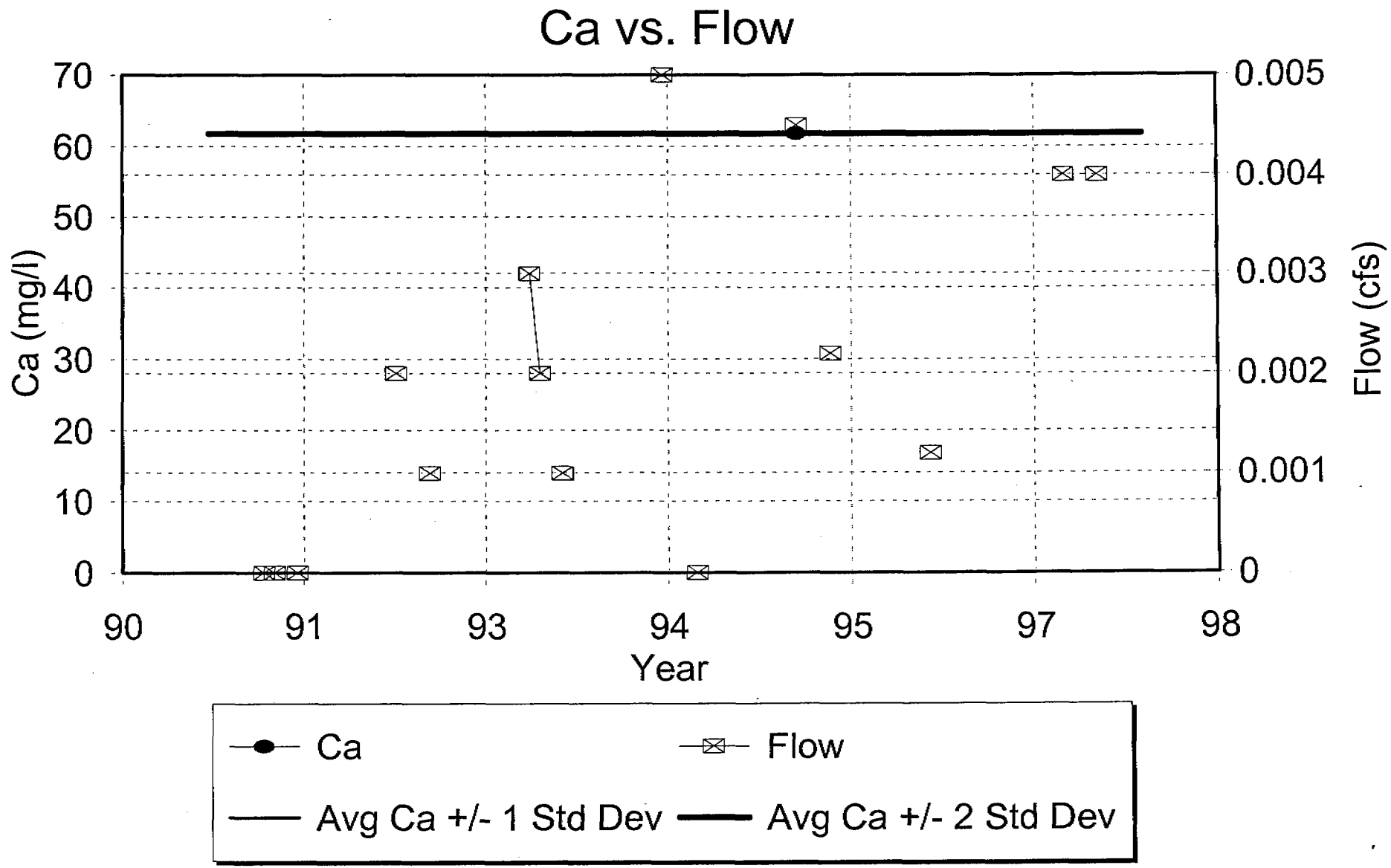


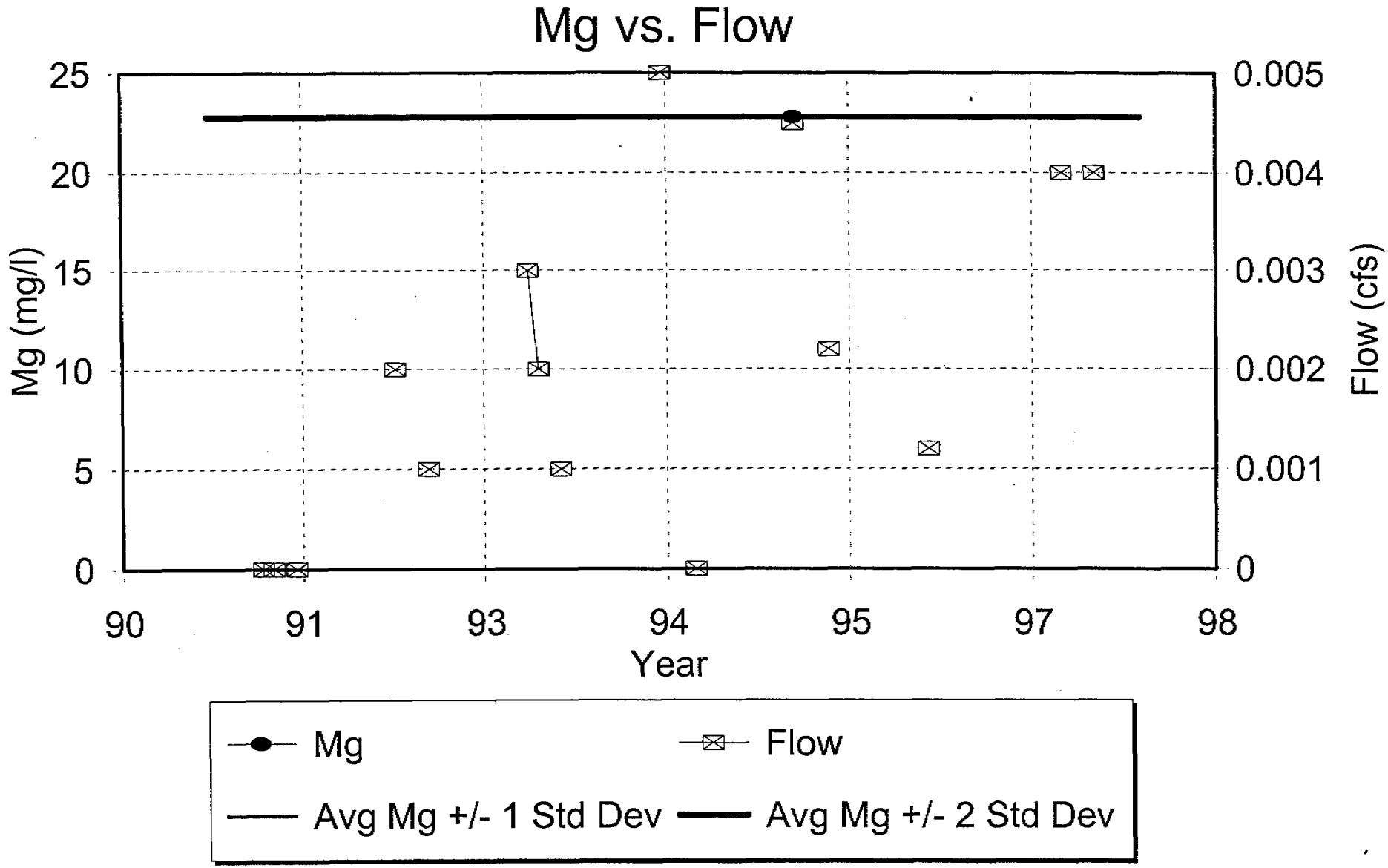

Station 494
pH vs. Flow
14
12
10
8
6
4
pH (units)
0.005
0.004
0.003
0.002
0.001
0
Flow (cfs)
90
91
93
94
95
97
98
Year
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev

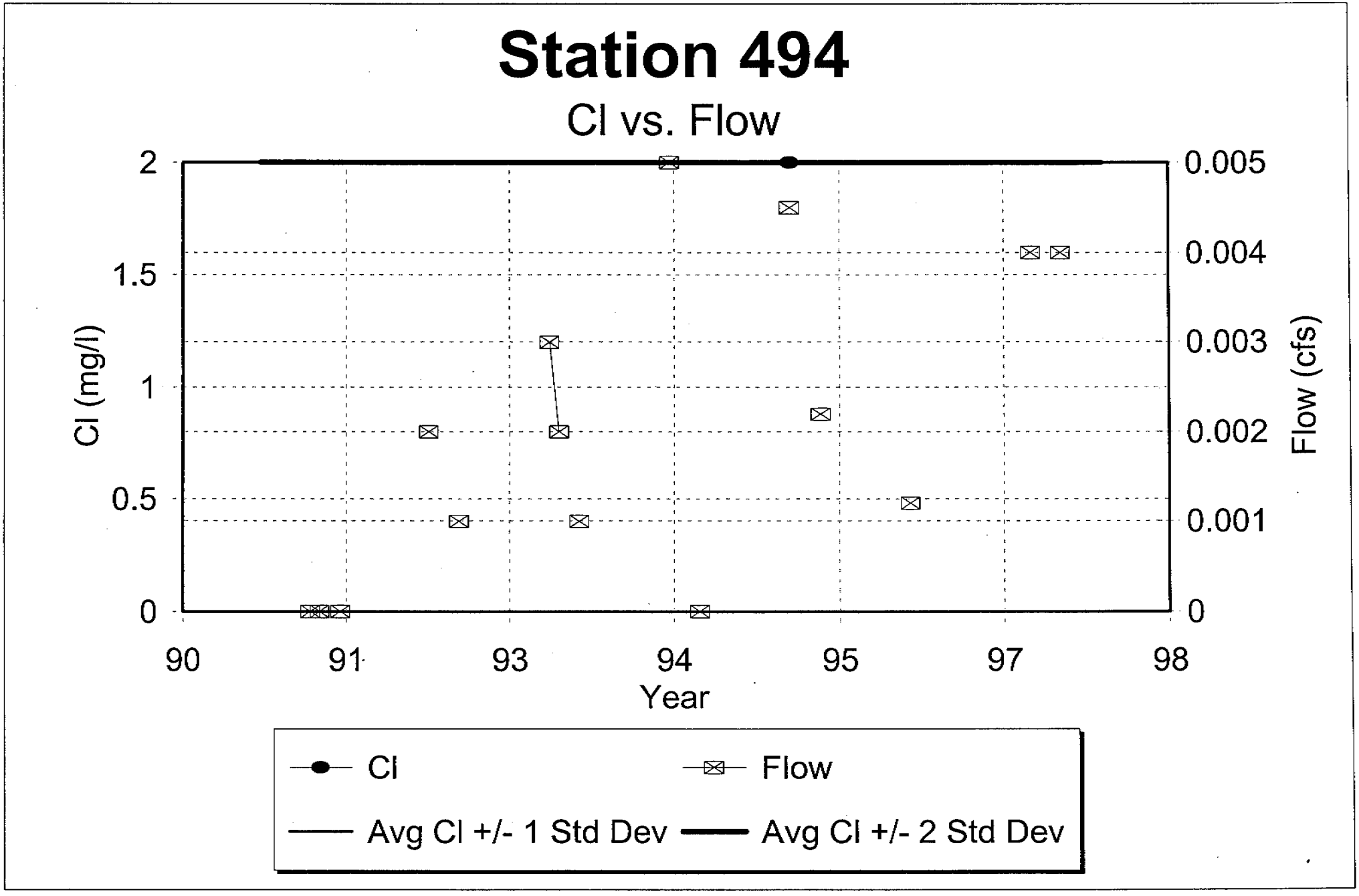
Station 494

TDS vs. Flow



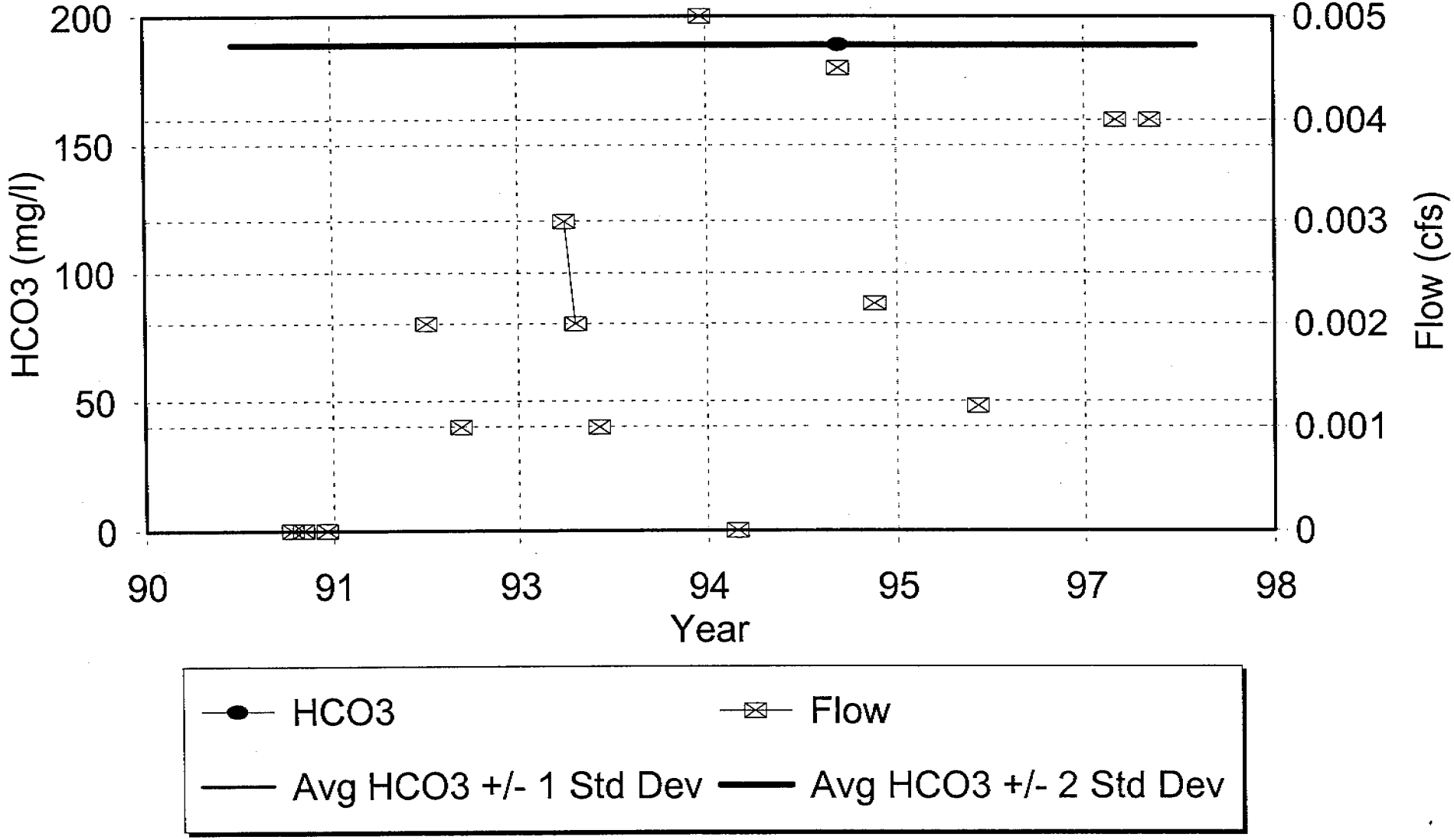

Station 494
Ca vs. Flow
Ca (mg/l)
70
60
50
40
30
20
10
0
0.005
0.004
0.003
0.002
0.001
0
Flow (cfs)
90
91
93
94
95
97
98
Year
Ca
Flow
Avg Ca +/- 1 Std Dev
Avg Ca +/- 2 Std Dev

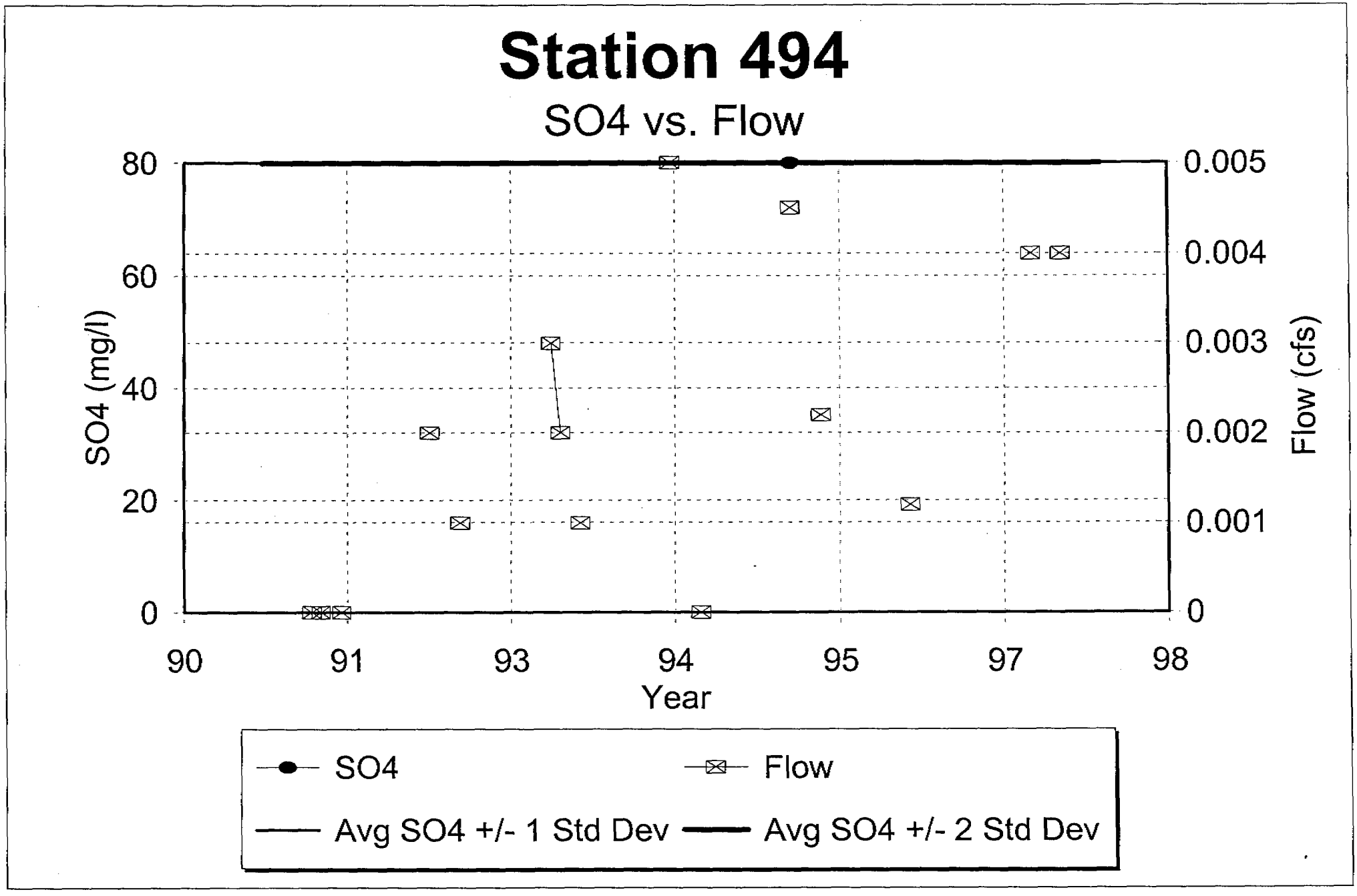

Station 494
Mg vs. Flow
Mg (mg/l)
25
20
15
10
5
0
0.005
0.004
0.003
0.002
0.001
0
Flow (cfs)
90
91
93
94
95
97
98
Year
Mg
Flow
Avg Mg +/- 1 Std Dev
Avg Mg +/- 2 Std Dev


Station 494
Cl vs. Flow
Cl (mg/l)
2
1.5
1
0.5
0
0.005
0.004
0.003
0.002
0.001
0
Flow (cfs)
90
91
93
94
95
97
98
Year
Cl
Flow
Avg Cl +/- 1 Std Dev
Avg Cl +/- 2 Std Dev

Station 494

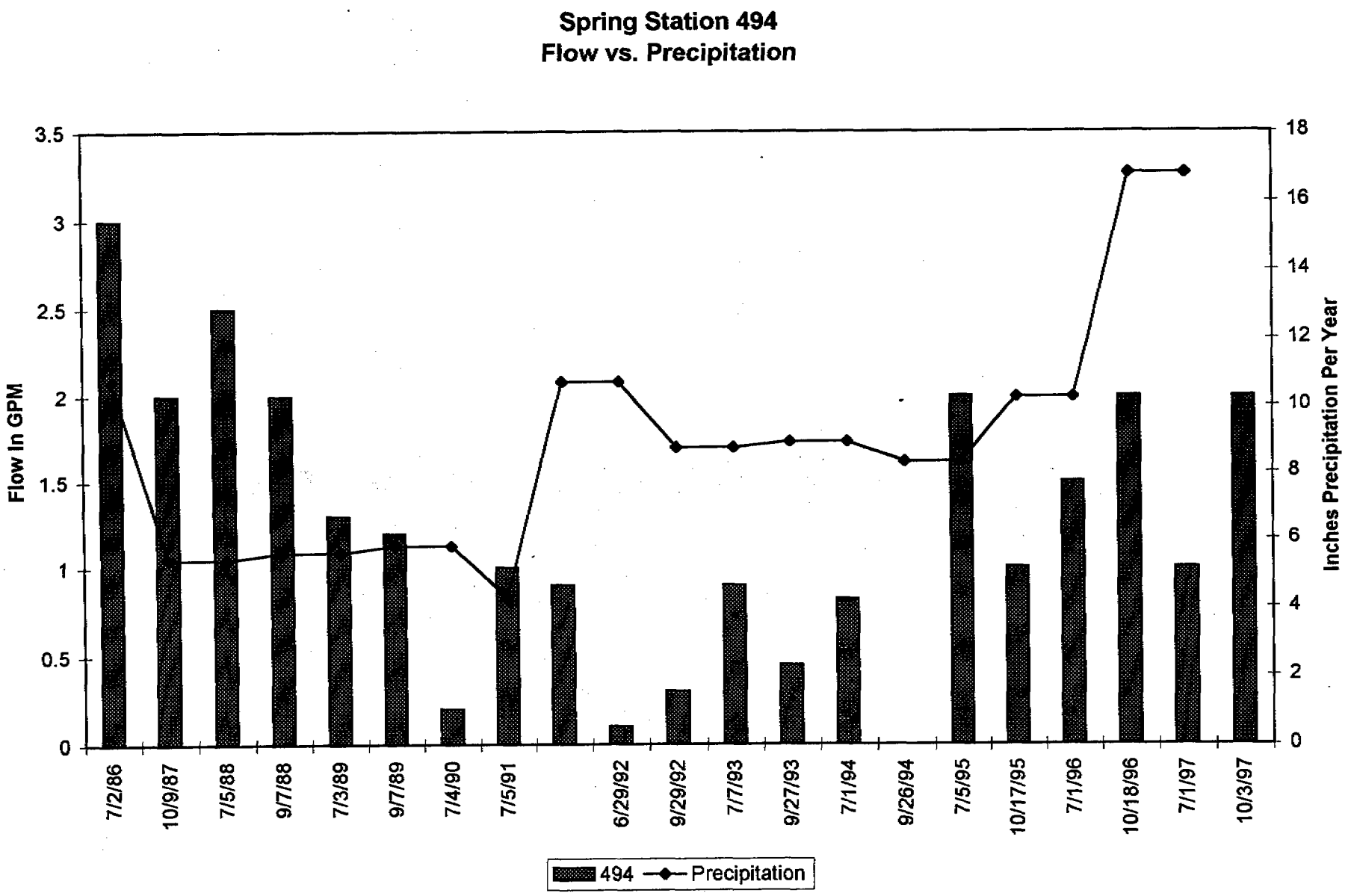
HCO3 vs. Flow




Station 494
SO4 vs. Flow
SO4 (mg/l)
80
60
40
20
0
0.005
0.004
0.003
0.002
0.001
0
Flow (cfs)
90
91
93
94
95
97
98
Year
SO4
Flow
Avg SO4 +/- 1 Std Dev
Avg SO4 +/- 2 Std Dev

SPRING STATION 494

DATE	FIELD MEASUREMENTS				
	TIME	FLOW IN GPM	TEMP	pH	CONDUCTIVITY UHMOS/CM
07/02/86		3.0		7.2	445
10/09/87	9:30 AM	2.0	5.9	8.4	525
07/05/88	8:85 AM	2.5	8.2	8.1	288
09/07/88	9:30 AM	2.0	8.0	8.9	310
07/03/89	8:40 AM	1.3	5.0	8.5	440
09/07/89	10:45 AM	1.2	7.0	8.2	460
07/04/90	8:40 AM	0.2	8.0	8.6	460
07/05/91	11:45 AM	1.0	8.0	8.3	450
		0.9	8.0	8.4	500
06/29/92	10:45 AM	0.1	8.4	7.92	474
09/29/92	10:30 AM	0.3	6.2	8.87	503
07/07/93	11:10 AM	0.90	12.6	7.1	410
09/27/93	10:10 AM	0.45	10.2	7.1	418
07/01/94	9:45 AM	0.82	9.3	7.3	425
09/26/94	11:35 AM	0			
07/05/95	10:20 AM	2	11	8.12	378
10/17/95	11:15 AM	1	7	8.01	446
07/01/96	10:20 AM	1.5	12	8.43	568
10/18/96	11:00 AM	2.0	0	8.53	465
07/01/97	10:42 AM	1	8	7.77	515
10/03/97	11:25 AM	2	6	8.34	436
AVG		1.25	7.8	8.10	446
MAX		3.00	12.6	8.90	568
MIN		0.00	0.0	7.10	288
STD DEV		0.83	2.8	0.55	67


Spring Station 494
Flow vs. Precipitation
Flow In GPM
Inches Precipitation Per Year
3.5
3
2.5
2
1.5
1
0.5
0
18
16
14
12
10
8
6
4
2
0
7/2/86
10/9/87
7/5/88
9/7/88
7/3/89
9/7/89
7/4/90
7/5/91
6/29/92
9/29/92
7/7/93
9/27/93
7/1/94
9/26/94
7/5/95
10/17/95
7/1/96
10/18/96
7/1/97
10/3/97
494
Precipitation

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: S149 | Property: Star Point | Location: 1000' N 100' W of SE com. Sec 15, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9390

Date		Field Measurements				Laboratory Measurements																Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	
Jan-85																						
Feb-85																						
Mar-85																						
Apr-85																						
May-85																						
Jun-85	06/12/85	0.02				264																
Jul-85																						
Aug-85																						
Sep-85																						
Oct-85																						
Nov-85																						
Dec-85																						
Jan-86																						
Feb-86																						
Mar-86																						
Apr-86																						
May-86																						
Jun-86	06/12/86	0.06				262																
Jul-86																						
Aug-86																						
Sep-86	09/30/86	0.01				289																
Oct-86																						
Nov-86																						
Dec-86																						
Jan-87																						
Feb-87																						
Mar-87																						
Apr-87																						
May-87	05/22/87	0.13				274																
Jun-87																						
Jul-87	07/16/87	0.09				256																
Aug-87	08/14/87	0.02				276																
Sep-87	09/23/87	0.01				288																
Oct-87																						
Nov-87																						
Dec-87																						
Jan-88																						
Feb-88																						
Mar-88																						
Apr-88																						
May-88																						
Jun-88	06/03/88	0.14																				
Jul-88	07/16/88	0.01				286																
Aug-88	08/20/88	0.01																				
Sep-88	09/10/88	0.01				294																
Oct-88																						
Nov-88																						
Dec-88																						
Jan-89																						
Feb-89																						
Mar-89																						
Apr-89																						
May-89																						
Jun-89	06/05/89	0.03																				
Jul-89	07/11/89	0.01																				
Aug-89	07/22/89	0.01																				
Sep-89	09/14/89	0																				
Oct-89																						
Nov-89																						
Dec-89																						
Jan-90																						
Feb-90																						
Mar-90																						
Apr-90																						
May-90	05/30/90	0.06																				
Jun-90																						
Jul-90	07/07/90	0.01																				
Aug-90	08/22/90	0																				
Sep-90	09/24/90	0.01																				
Oct-90																						
Nov-90																						
Dec-90																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: S149 | Property: Star Point | Location: 1000' N 100' W of SE com. Sec 15, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9390

Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-91																						
Feb-91																						
Mar-91																						
Apr-91																						
May-91																						
Jun-91	06/12/91	0.24	7.2	500	4	324			228	268	12	3	14	70	13	1	2	<	0.02 <	0.02 <	0.01	
Jul-91	07/15/91	0.05	7.5	430	6																	
Aug-91																						
Sep-91	09/17/91	0.01	8.2	490	7	298			263	300	0	1	19	79	16 <	1	3		0.06	0.31	0.01	
Oct-91																						
Nov-91																						
Dec-91																						
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92	05/19/92	0.0847	7.6	552	5.1	322			303	310	0	1	54	90	19	1	3	<	0.02 <	0.02		
Jun-92																						
Jul-92	07/16/92	0.019	7.2	583	5.9																	
Aug-92	08/26/92	0.015	6.7	620	6.2																	
Sep-92	09/21/92	0.011	6.1	649	6.5	396			300	305	0	2	70	79	25	1	10		0.04	1.28		
Oct-92																						
Nov-92																						
Dec-92																						
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/21/93	0.125	6	533	5.4	302			310	317	0	2	70	88	22	1	3	<	0.02 <	0.02 <	0.01	
Jul-93	07/27/93	0.029	6.2	550	6	350			334	322	0	2	47	91	26	1	3	<	0.02	0.56 <	0.01	
Aug-93	08/17/93	0.021	6.1	557	6.8																	
Sep-93	09/27/93	0.012	6.2	610	6.3	382			320	332	0	2	77	87	25	1	3	<	0.02	1.72	0.02	
Oct-93																						
Nov-93																						
Dec-93																						
Jan-94																						
Feb-94																						
Mar-94																						
Apr-94																						
May-94																						
Jun-94	06/09/94	0.067	7.4	629	4.2	348			293	320	0	2	45	81	22	1	3	<	0.02 <	0.02 <	0.01	
Jul-94	07/19/94	0.02	7.8	604	12.8	328			327	361	14	2	8	88	26	2	4	<	0.02	0.13 <	0.01	
Aug-94	08/31/94	0.006																				RAIN IN A.M. = ~.10". LO
Sep-94	09/21/94	0.01	7.8	643	8.6	382			373	323	0	2	77	100	30	2	4		0.09	0.1 <	0.01	
Oct-94																						
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95																						
Mar-95																						
Apr-95																						
May-95																						
Jun-95	06/21/95	0.57	7.3	572	6	300			288	235 <	2 <	1	40	81.9	20.3	1.5	3.2	3.5 <	0.01 <	0.01 <	0.005	
Jul-95	07/26/95	0.033	7.3	554	7	320			322	255 <	2	2	50	86.2	24.6	1.4	3.5	3.2 <	0.01	0.19 <	0.005	
Aug-95	08/23/95	0.033	7.14	548	8																	
Sep-95	09/27/95	0.03	7.3	561	7	360			343	274 <	2	3	65	92.2	27.4	1.6	3.5	0.9	0.02	0.01 <	0.005	
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/12/96	0.141	8.15	688	5	325			317	261	2 <	2	50	87.1	24.2	1.3	3.5	1.6	0.01 <	0.01 <	0.005	
Jul-96	07/24/96	0.018	8.1	628	7	352			350	271	2 <	2	60	94.8	27.6	1.5	3.5	3.3	0.01 <	0.05	0.005	
Aug-96	08/19/96	0.022	8.51	571	8																	
Sep-96	09/30/96	0.011	7.8	668	6.5	353			333	266	2 <	2	70	90.2	26.2	1.5	3.4	0	0.01 <	0.01 <	0.005	
Oct-96																						
Nov-96																						
Dec-96																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

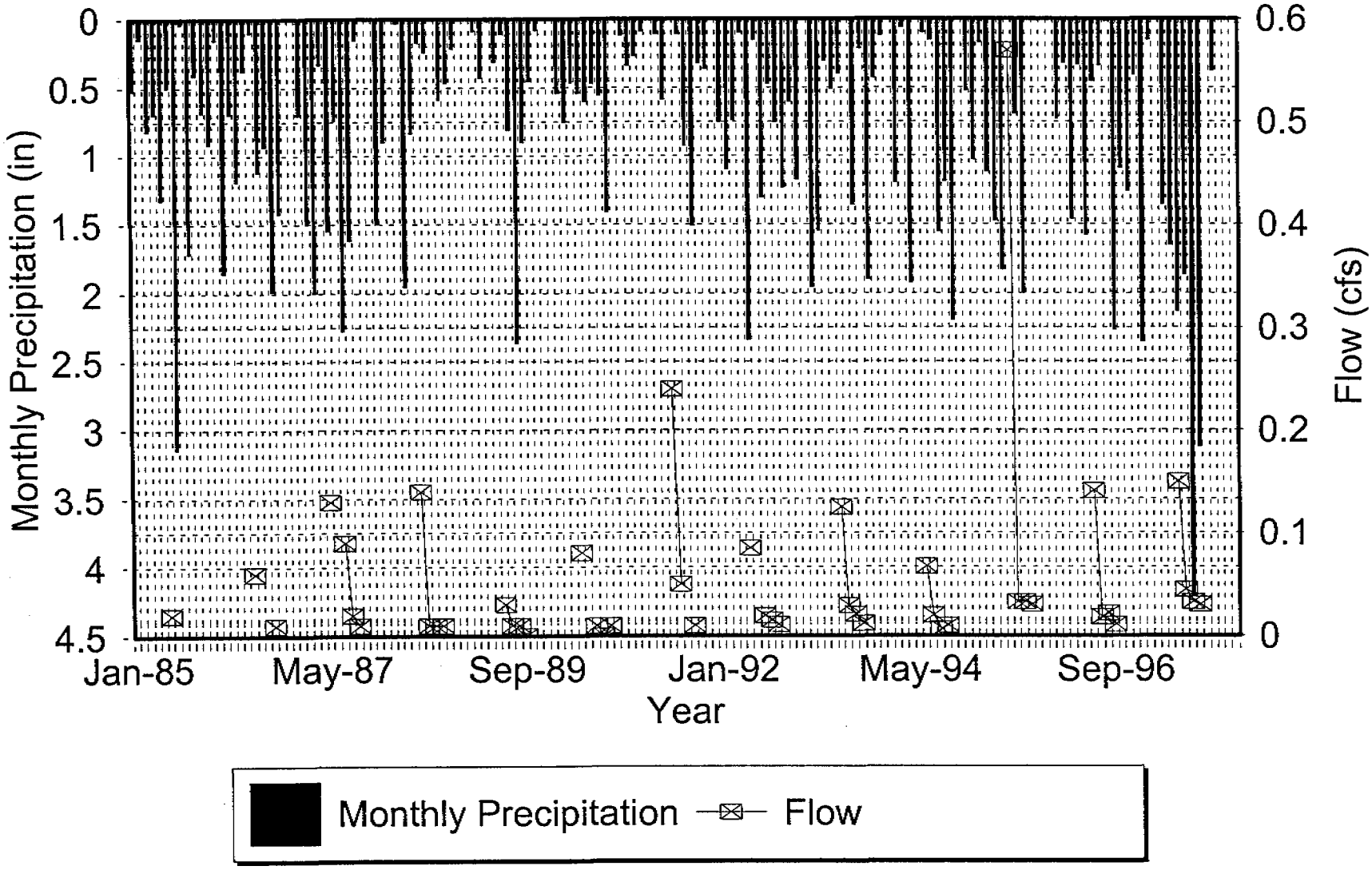
Station: S149 | Property: Star Point | Location: 1000' N 100' W of SE corn. Sec 15, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9390

Date		Field Measurements				Laboratory Measurements																Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/17/97	0.15	7.9	590	6	320			311	274	2 <	2	40	85.9	23.5	1.3	3.3	0.2	0.01 <	0.01 <	0.005	
Jul-97	07/30/97	0.045	7.55	645	6.5	340			320	250	10 <	0.5 <	59	88	25	1.9	3.6	3.3	0.01 <	0.02	0.005	
Aug-97	08/13/97	0.033	8.16	602	7																	
Sep-97	09/16/97	0.03	8.34	682	8	280			330	250	10 <	2.1	71	85	29	2.1	3.8	2.3	0.01 <	0.01 <	0.005	
Oct-97																						
Nov-97																						
Dec-97																						
END DATA																						
Count		46	26	26	26	28	0	0	19	19	19	19	19	19	19	19	19	9	19	19	17	
Minimum		0	6	430	4	256	ERR	ERR	228	235 <	0 <	0.5 <	8	70	13 <	1	2	0 <	0.01 <	0.01 <	0.005	
Maximum		0.57	8.51	688	12.8	396	ERR	ERR	373	361 <	14 <	3 <	77	100	30 <	2.1	10	3.5 <	0.09 <	1.72 <	0.02	
Average		0.0543	7.3673	586.88	6.6462	316.82	ERR	ERR	313.95	289.16 <	3.1579 <	1.8737 <	51.895	86.647	23.779 <	1.3737	3.6474	2.0333 <	0.0226 <	0.2368 <	0.0079	
Standard Deviation		0.0918	0.7351	59.98	1.6416	37.966	ERR	ERR	31.124	33.625 <	4.4635 <	0.6051 <	20.141	6.4008	4.185 <	0.385	1.5615	1.3233 <	0.02 <	0.4593 <	0.0039	
Avg. -1 Std. Dev.		-0.037	6.6322	526.9	5.0043	278.86	ERR	ERR	282.82	255.53 <	-1.306 <	1.2686 <	31.753	80.247	19.594 <	0.9886	2.0859	0.71 <	0.0027 <	-0.222 <	0.0041	
Avg. +1 Std. Dev.		0.146	8.1024	646.86	8.288	354.79	ERR	ERR	345.07	322.78 <	7.6214 <	2.4788 <	72.036	93.048	27.964 <	1.7587	5.2089	3.3566 <	0.0426 <	0.6962 <	0.0118	
Avg. -2 Std. Dev.		-0.129	5.8972	466.93	3.3625	240.89	ERR	ERR	251.7	221.91 <	-5.769 <	0.6635 <	11.612	73.846	15.409 <	0.6036	0.5244	-0.613 <	-0.017 <	-0.682 <	0.0002	
Avg. +2 Std. Dev.		0.2378	8.8374	706.84	9.9298	392.75	ERR	ERR	376.19	356.41 <	12.085 <	3.0839 <	92.177	99.449	32.149 <	2.1438	6.7704	4.6799 <	0.0625 <	1.1555 <	0.0157	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

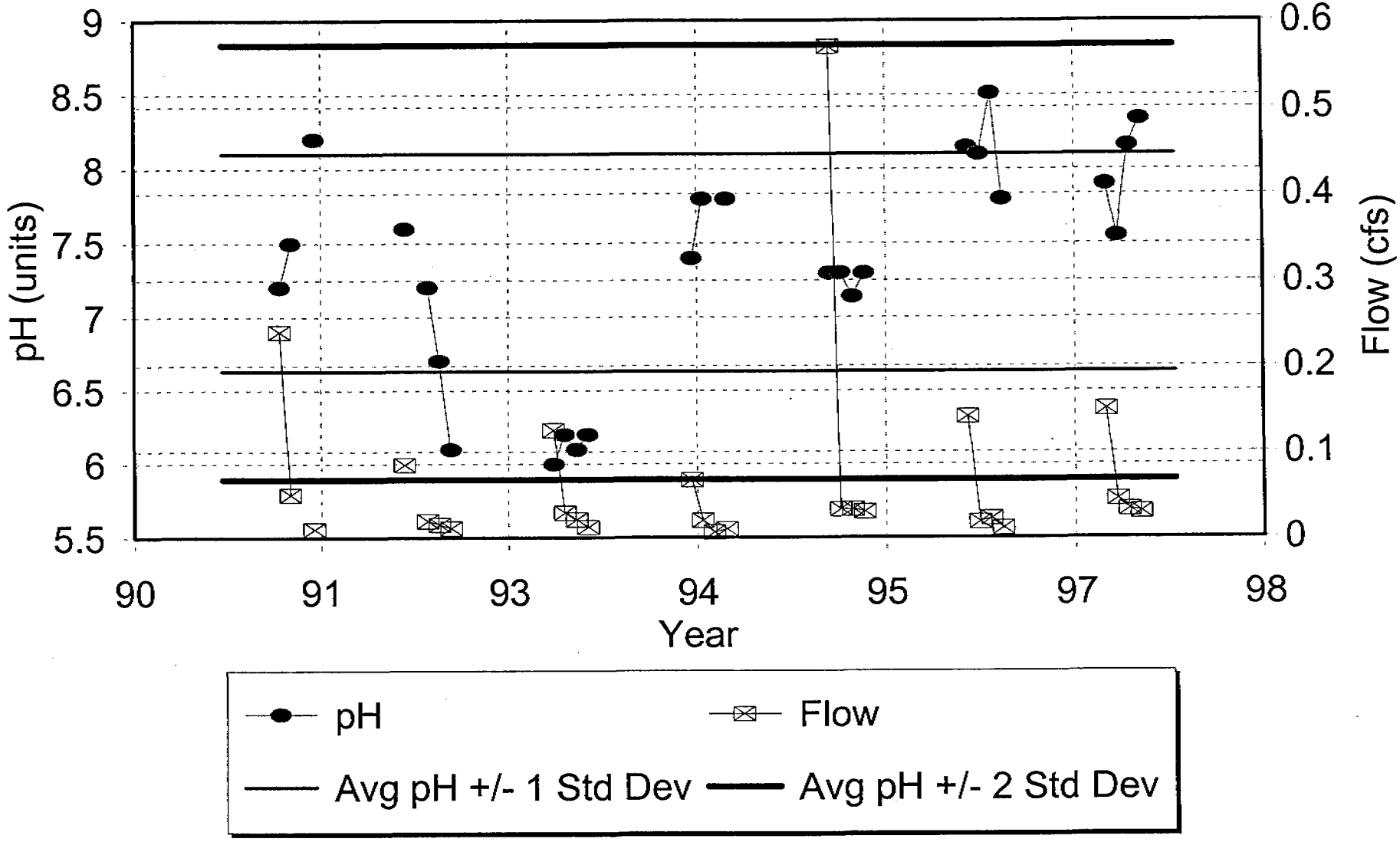
Station S149

Monthly Precipitation vs. Flow



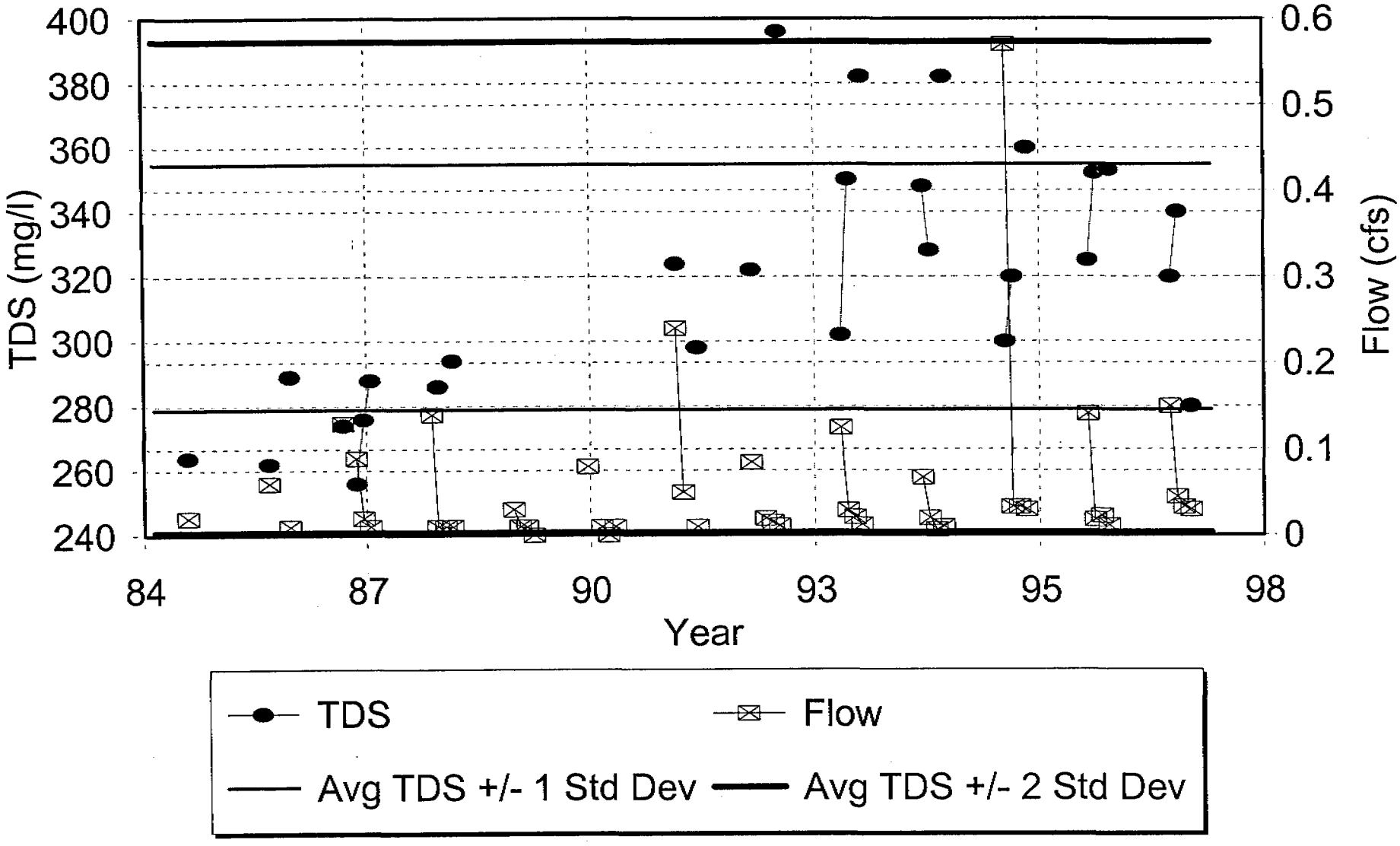
Station S149

pH vs. Flow



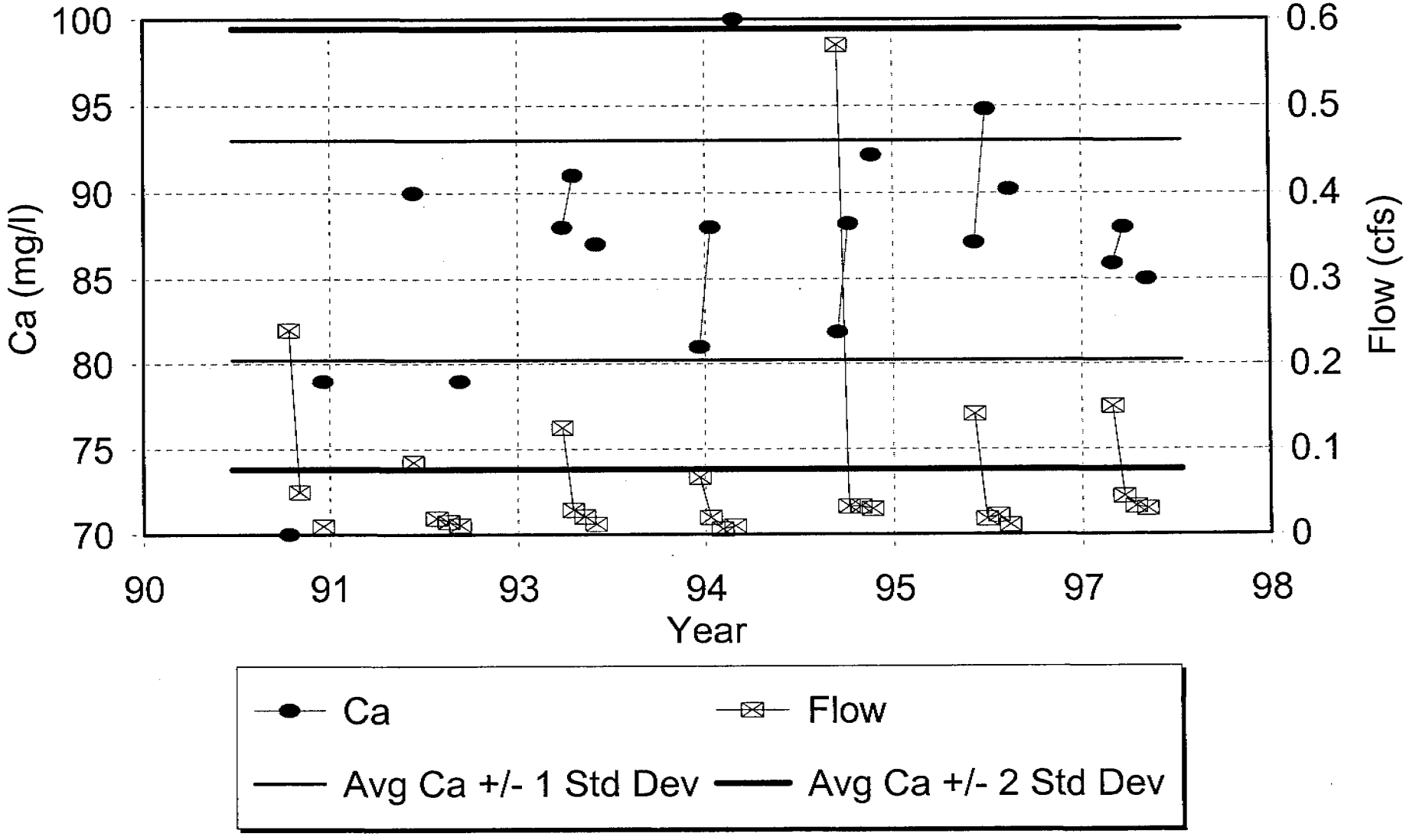
Station S149

TDS vs. Flow



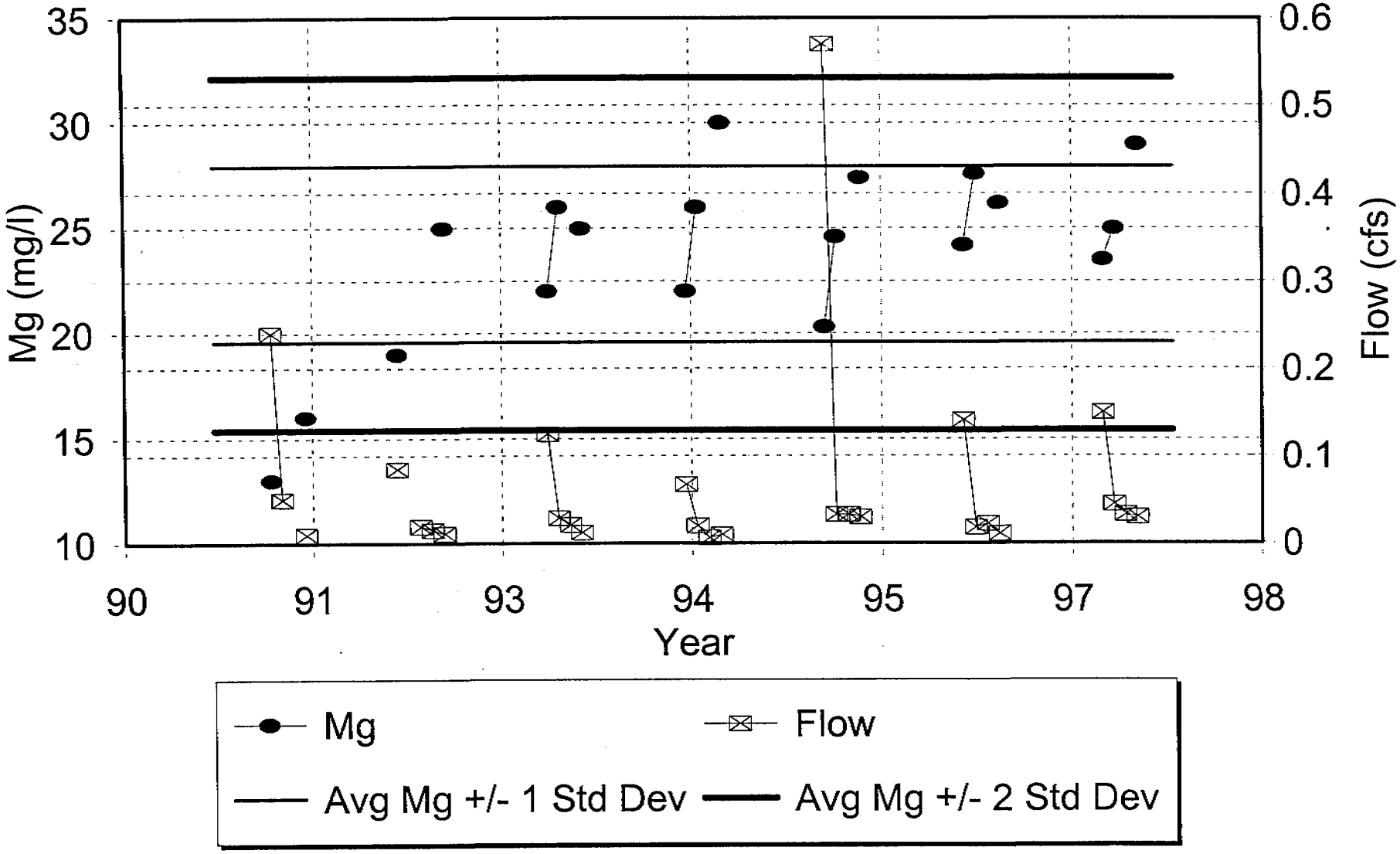
Station S149

Ca vs. Flow

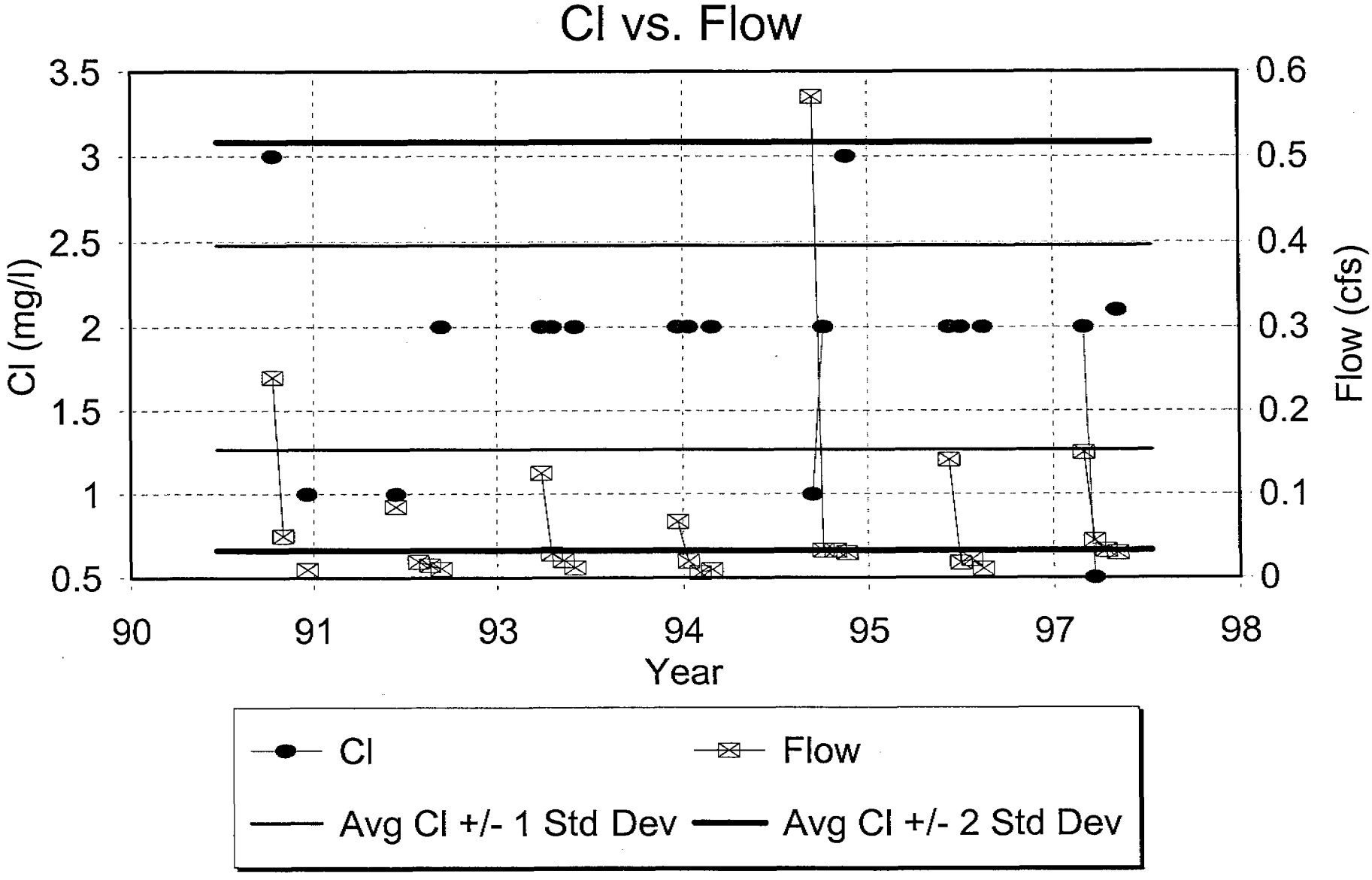


Station S149

Mg vs. Flow

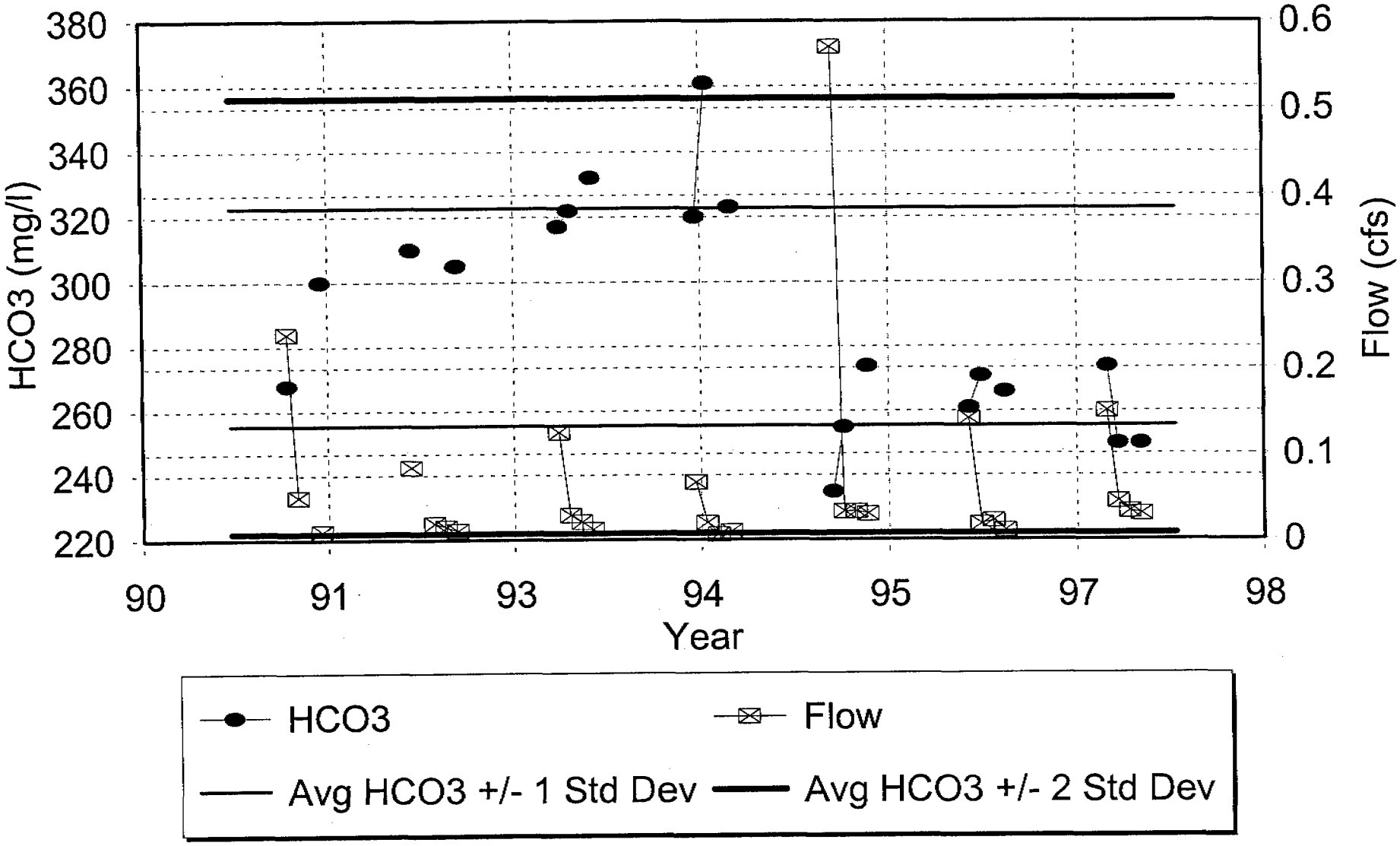


Station S149



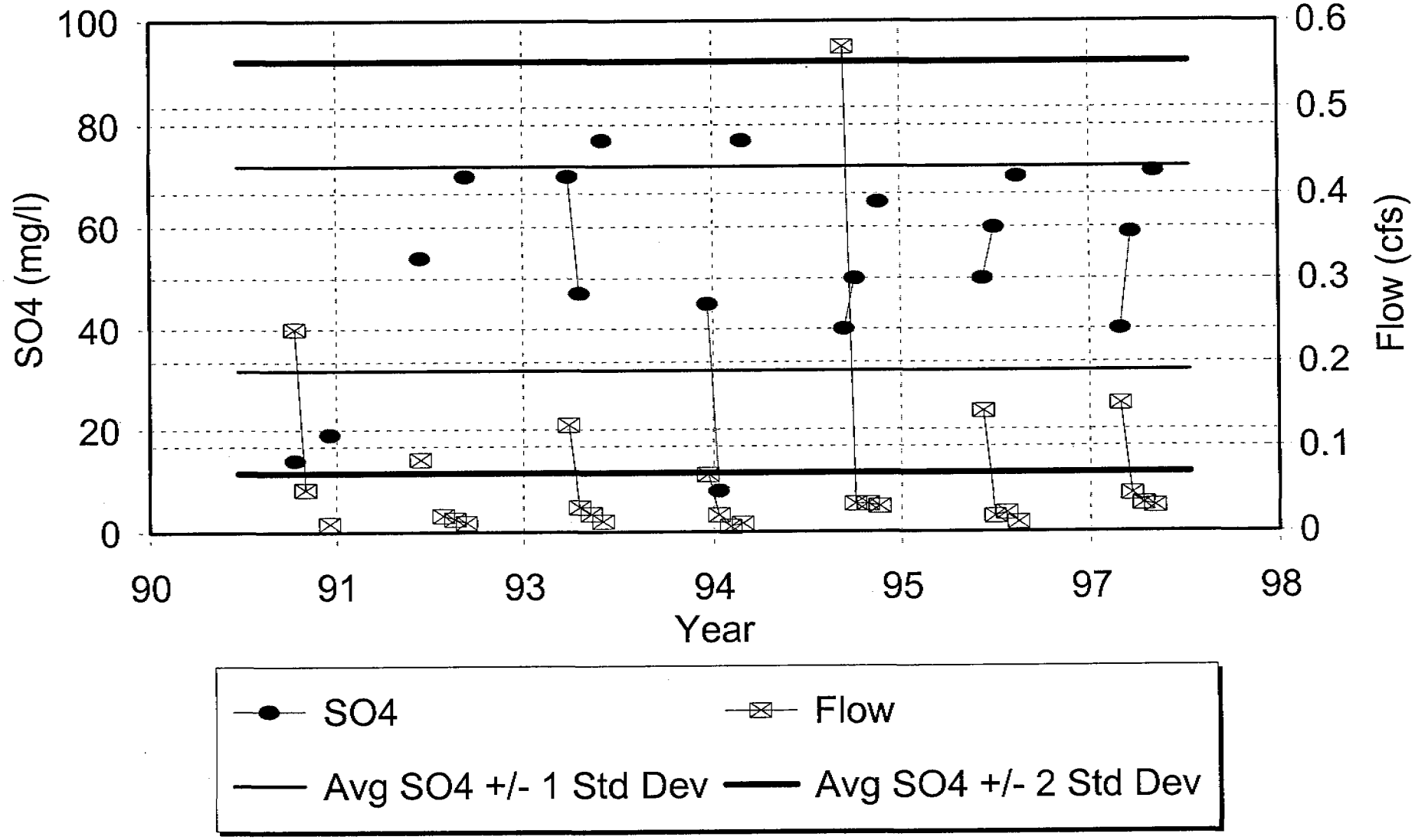
Station S149

HCO3 vs. Flow



Station S149

SO4 vs. Flow



Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: S182 | Property: Star Point | Location: 300' S 2125' W of NE com. Sec 18, T15S, R8E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9630

Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-79																						
Feb-79																						
Mar-79																						
Apr-79																						
May-79																						
Jun-79																						
Jul-79																						
Aug-79																						
Sep-79	09/12/79	0																				
Oct-79																						
Nov-79																						
Dec-79																						
Jan-80																						
Feb-80																						
Mar-80																						
Apr-80																						
May-80																						
Jun-80																						
Jul-80																						
Aug-80																						
Sep-80	09/30/80	0				205																
Oct-80	10/22/80	0				248																
Nov-80	11/10/80	0				220																
Dec-80	12/30/80	0				260																
Jan-81	01/06/81																					IN-ACCESSIBLE - SNOW
Feb-81	02/04/81																					IN-ACCESSIBLE - SNOW
Mar-81	03/25/81																					IN-ACCESSIBLE - SNOW
Apr-81	04/28/81																					IN-ACCESSIBLE - SNOW
May-81	05/28/81																					IN-ACCESSIBLE - RAIN &
Jun-81	06/16/81	0				150																
Jul-81	07/31/81					185																
Aug-81	08/29/81	0				210																
Sep-81	09/24/81					226																
Oct-81	10/07/81	0.01				233																
Nov-81	11/24/81																					IN-ACCESSIBLE
Dec-81	12/29/81																					IN-ACCESSIBLE
Jan-82																						
Feb-82																						
Mar-82																						
Apr-82																						
May-82																						
Jun-82																						
Jul-82																						
Aug-82																						
Sep-82																						
Oct-82																						
Nov-82																						
Dec-82																						
Jan-83																						
Feb-83																						
Mar-83	03/24/83																					IN-ACCESSIBLE
Apr-83																						
May-83	05/12/83																					IN-ACCESSIBLE
Jun-83	06/29/83	0.01				147																
Jul-83																						
Aug-83																						
Sep-83																						
Oct-83	10/05/83	0				183																
Nov-83																						
Dec-83																						
Jan-84	01/06/84																					COVERED W/SNOW NO
Feb-84																						
Mar-84	03/30/84																					COVERED W/SNOW NO
Apr-84																						
May-84																						
Jun-84	06/21/84	0.01				166																
Jul-84																						
Aug-84																						
Sep-84																						
Oct-84	10/25/84					255																
Nov-84																						
Dec-84	12/11/84																					IN-ACCESSIBLE - SNOW

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: S182 | Property: Star Point | Location: 300' S 2125' W of NE com. Sec 18, T15S, R8E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9630

Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-85																						
Feb-85	02/21/85																					IN-ACCESSIBLE - SNOW
Mar-85																						
Apr-85																						
May-85																						
Jun-85	06/13/85	0				163																
Jul-85																						
Aug-85																						
Sep-85	09/24/85	0				235																
Oct-85																						
Nov-85																						
Dec-85																						
Jan-86																						
Feb-86																						
Mar-86																						
Apr-86																						
May-86																						
Jun-86	07/11/86	0.03	6.9	263	7	170				159		3	25						0.14	0.14 <	0.01	
Jul-86																						
Aug-86																						
Sep-86																			0.13	0.7	0.02	
Oct-86	10/10/86	0				204				189		7	30									
Nov-86																						
Dec-86																						
Jan-87																						
Feb-87																						
Mar-87																						
Apr-87																						
May-87	05/22/87	0.06																				
Jun-87																						
Jul-87	07/19/87	0.01																				
Aug-87	08/12/87	0.01																				
Sep-87	09/22/87	0				206				206		3	16	64	13	1	5		0.08 <	0.02 <	0.01	
Oct-87																						
Nov-87																						
Dec-87																						
Jan-88																						
Feb-88																						
Mar-88																						
Apr-88																						
May-88																						
Jun-88	06/14/88	0.01				184				167		2	12	47	9	1	2	<	0.02	0.06 <	0.01	
Jul-88	07/15/88	0.01				206				195		4	19	53	11 <	1	6		0.02 <	0.02 <	0.01	
Aug-88	08/19/88	0																				
Sep-88	09/05/88	0				208				206		4	23	57	13	1	3		0.03	0.03 <	0.01	
Oct-88																						
Nov-88																						
Dec-88																						
Jan-89																						
Feb-89																						
Mar-89																						
Apr-89																						
May-89																						
Jun-89	06/05/89	0				202				144		4	10	36	9 <	1	3		0.03	0.05 <	0.01	
Jul-89	07/11/89	0				222				190		3	21	57	12	2	4	<	0.02	0.03 <	0.01	
Aug-89	08/22/89	0																				
Sep-89	09/15/89	0				206				200		2	21	56	13 <	1	4	<	0.02	0.04 <	0.01	
Oct-89																						
Nov-89																						
Dec-89																						
Jan-90																						
Feb-90																						
Mar-90																						
Apr-90																						
May-90																						
Jun-90	06/04/90	0.01				226				177		3	14	50	10 <	1	4		0.03	0.13 <	0.01	
Jul-90	07/02/90	0				192				201		4	25	55	12	1	4	<	0.02	0.05 <	0.01	
Aug-90	08/30/90	0																				
Sep-90																						
Oct-90	10/03/90	0				214				193		3	39	61	12 <	1	4	<	0.02	0.05 <	0.01	
Nov-90																						
Dec-90																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: S182 | Property: Star Point | Location: 300' S 2125' W of NE corn. Sec 18, T15S, R8E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9630

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-91																						
Feb-91																						
Mar-91																						
Apr-91																						
May-91																						
Jun-91	06/11/91	0																				NO FLOW
Jul-91	07/15/91	0																				
Aug-91																						
Sep-91																						
Oct-91																						
Nov-91																						
Dec-91																						
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92																						
Jun-92																						
Jul-92																						
Aug-92																						
Sep-92																						
Oct-92																						
Nov-92																						
Dec-92																						
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/25/93	0																				NO FLOW
Jul-93	07/26/93	0																				NO FLOW
Aug-93	08/18/93	0																				NO FLOW
Sep-93	09/28/93	0																				NO FLOW
Oct-93																						
Nov-93																						
Dec-93																						
Jan-94																						
Feb-94																						
Mar-94																						
Apr-94																						
May-94																						
Jun-94	06/20/94	0																				NO FLOW
Jul-94	07/20/94	0																				NO FLOW
Aug-94	08/31/94	0																				NO FLOW
Sep-94	09/21/94	0																				NO FLOW
Oct-94																						
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95																						
Mar-95																						
Apr-95																						
May-95																						
Jun-95	06/22/95	0.054	6.4	247	5	130			131	122 <	2	3	10	40.1	7.5	0.9	3.2	0.9	0.03	0.08 <	0.005	
Jul-95	07/27/95	0																				
Aug-95	08/23/95	0																				
Sep-95	09/28/95	0																				
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/11/96	0																				Dry
Jul-96	07/23/96	0																				Dry
Aug-96	08/19/96	0																				Dry
Sep-96																						
Oct-96	10/01/96	0																				Damp-no sample taken
Nov-96																						
Dec-96																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

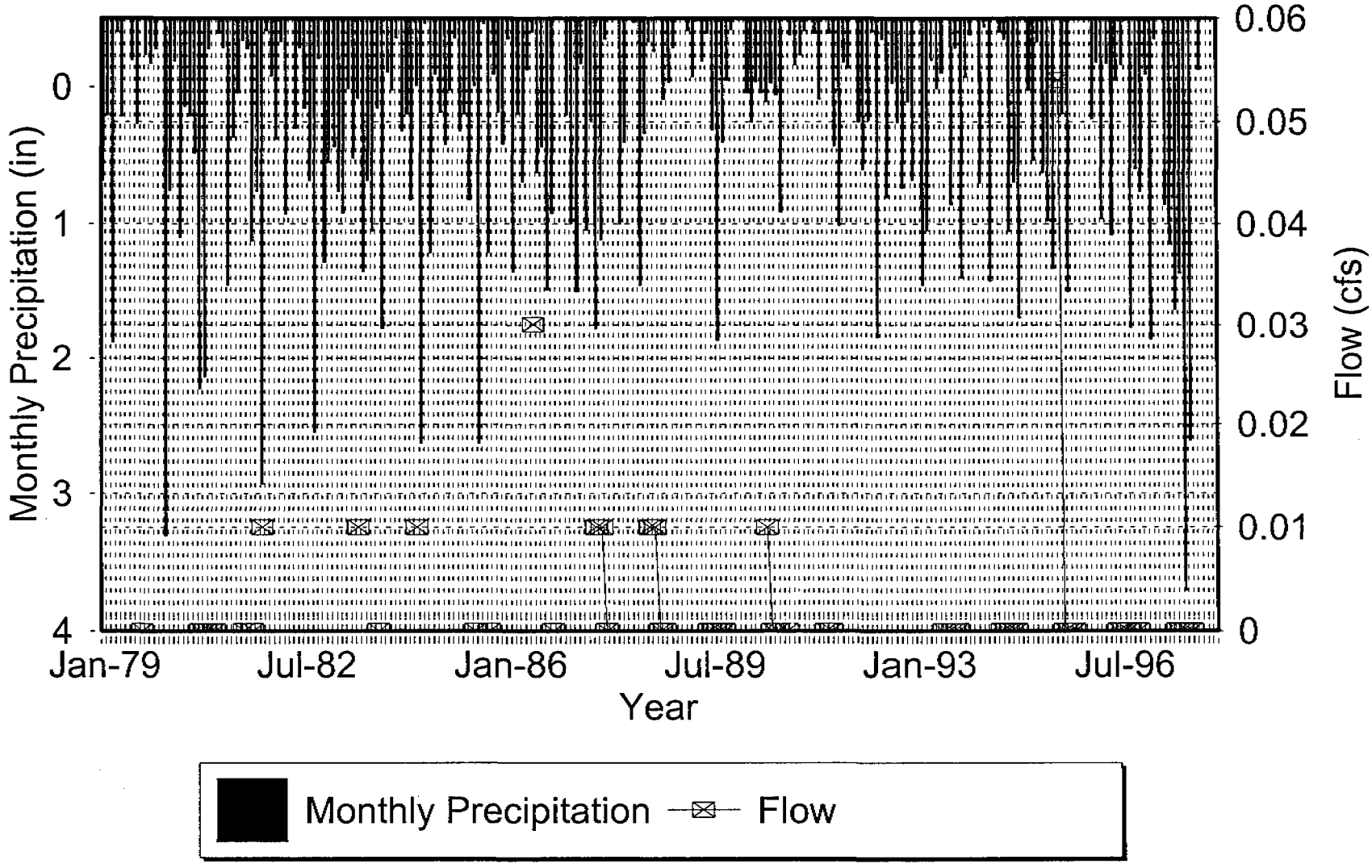
Station: S182 | Property: Star Point | Location: 300' S 2125' W of NE com. Sec 18, T15S, R8E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9630

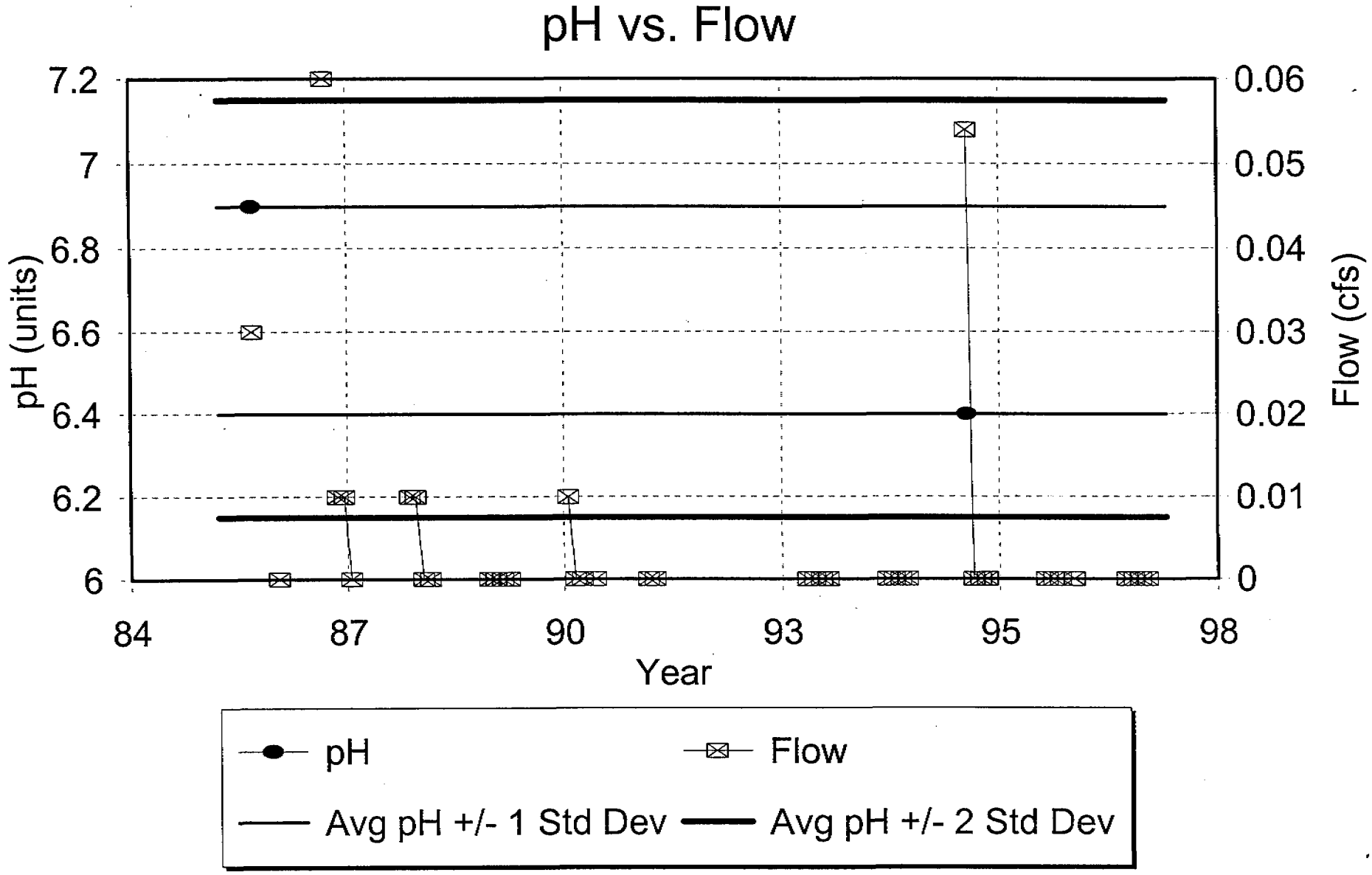
Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/12/97	0																				Damp-no sample taken
Jul-97	07/30/97	0																				Dry
Aug-97	08/13/97	0																				Dry
Sep-97	09/16/97	0																				Dry
Oct-97																						
Nov-97																						
Dec-97																						
END DATA																						
Count		53	2	2	2	28	0	0	1	13	1	13	13	11	11	11	11	1	13	13	13	
Minimum		0	6.4	247	5	130	ERR	ERR	131	122 <	2	2	10	38	7.5 <	0.9	2	0.9 <	0.02 <	0.02 <	0.005	
Maximum		0.06	6.9	263	7	260	ERR	ERR	131	206 <	2	7	39	64	13 <	2	6	0.9 <	0.14 <	0.7 <	0.02	
Average		0.0042	6.65	255	6	202.07	ERR	ERR	131	180.69 <	2	3.4615	20.385	52.555	11.045 <	1.0818	3.8364	0.9 <	0.0454 <	0.1077 <	0.0104	
Standard Deviation		0.0117	0.25	8	1	31.875	ERR	ERR	0	24.87 <	0	1.2163	8.0244	7.7707	1.8148 <	0.2918	1.0156	0 <	0.0413 <	0.1748 <	0.0031	
Avg. -1 Std. Dev.		-0.007	6.4	247	5	170.2	ERR	ERR	131	155.82 <	2	2.2453	12.36	44.784	9.2307 <	0.7901	2.8208	0.9 <	0.0041 <	-0.067 <	0.0073	
Avg. +1 Std. Dev.		0.0159	6.9	263	7	233.95	ERR	ERR	131	205.56 <	2	4.6778	28.409	60.325	12.86 <	1.3736	4.8519	0.9 <	0.0866 <	0.2825 <	0.0135	
Avg. -2 Std. Dev.		-0.019	6.15	239	4	138.32	ERR	ERR	131	130.95 <	2	1.029	4.3359	37.013	7.4159 <	0.4983	1.8052	0.9 <	-0.037 <	-0.242 <	0.0042	
Avg. +2 Std. Dev.		0.0276	7.15	271	8	265.82	ERR	ERR	131	230.43 <	2	5.8941	36.433	68.096	14.675 <	1.6653	5.8675	0.9 <	0.1279 <	0.4574 <	0.0165	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

Station S182

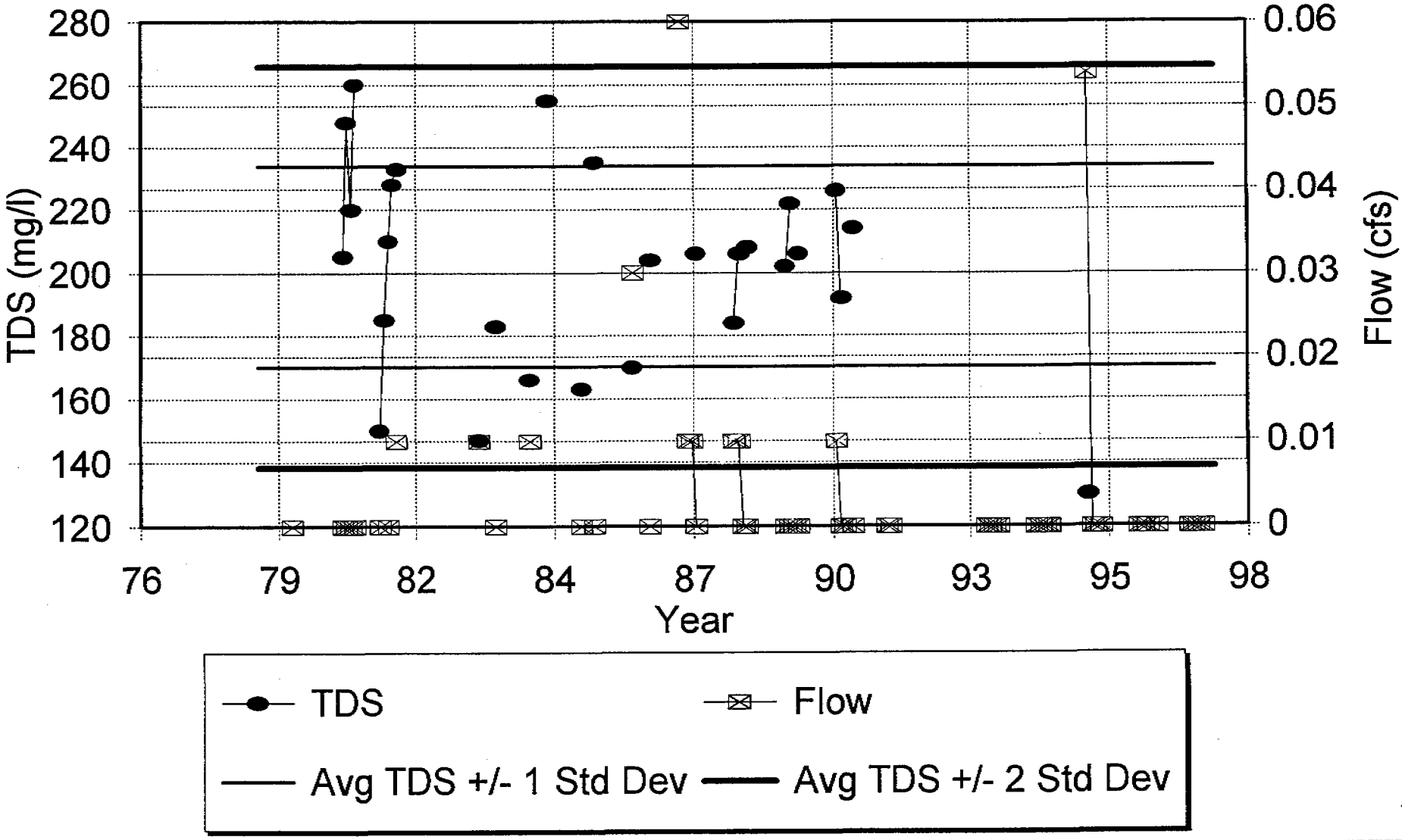
Monthly Precipitation vs. Flow




Station S182
pH vs. Flow
7.2
7
6.8
6.6
6.4
6.2
6
pH (units)
0.06
0.05
0.04
0.03
0.02
0.01
0
Flow (cfs)
84
87
90
93
95
98
Year
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev

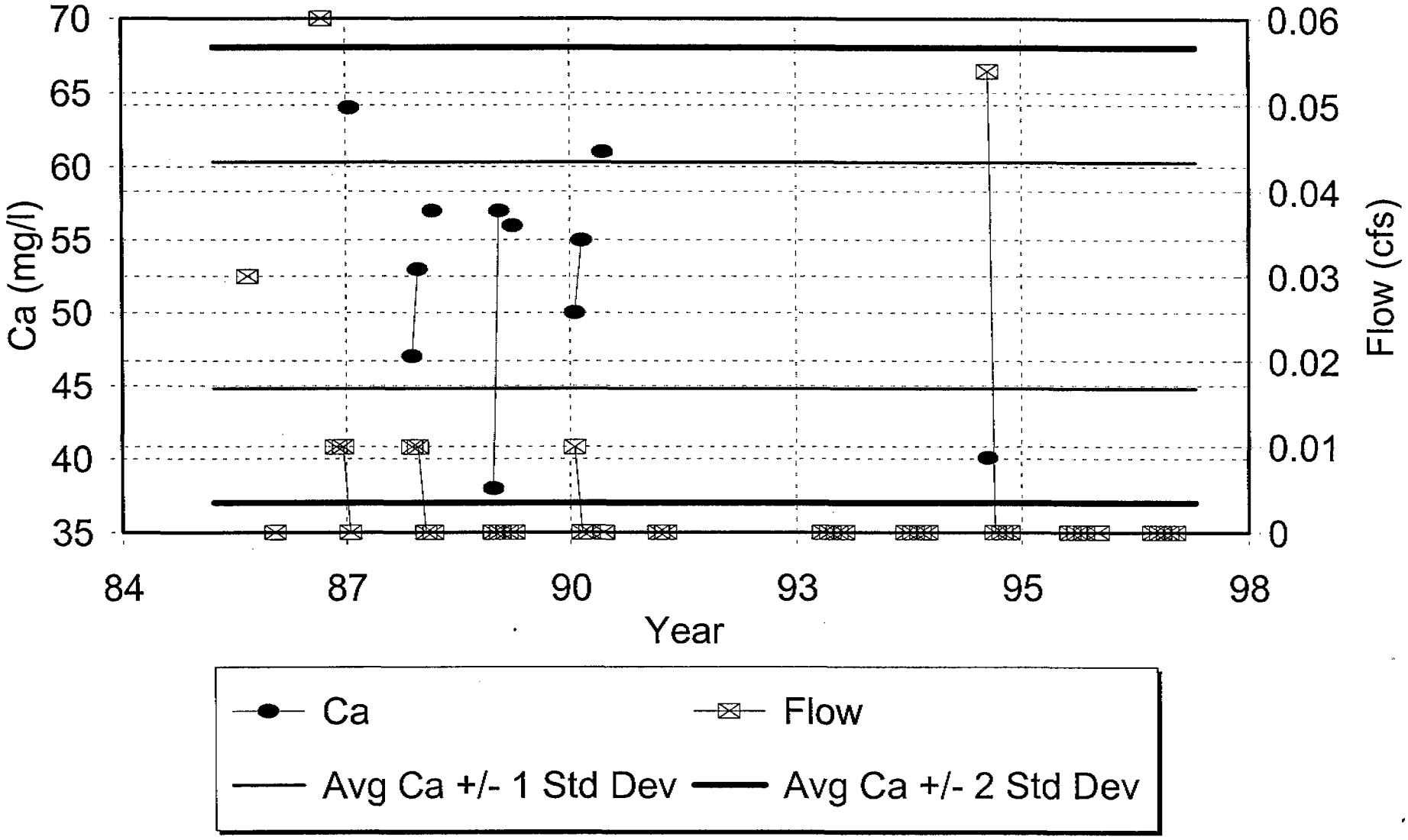
Station S182

TDS vs. Flow



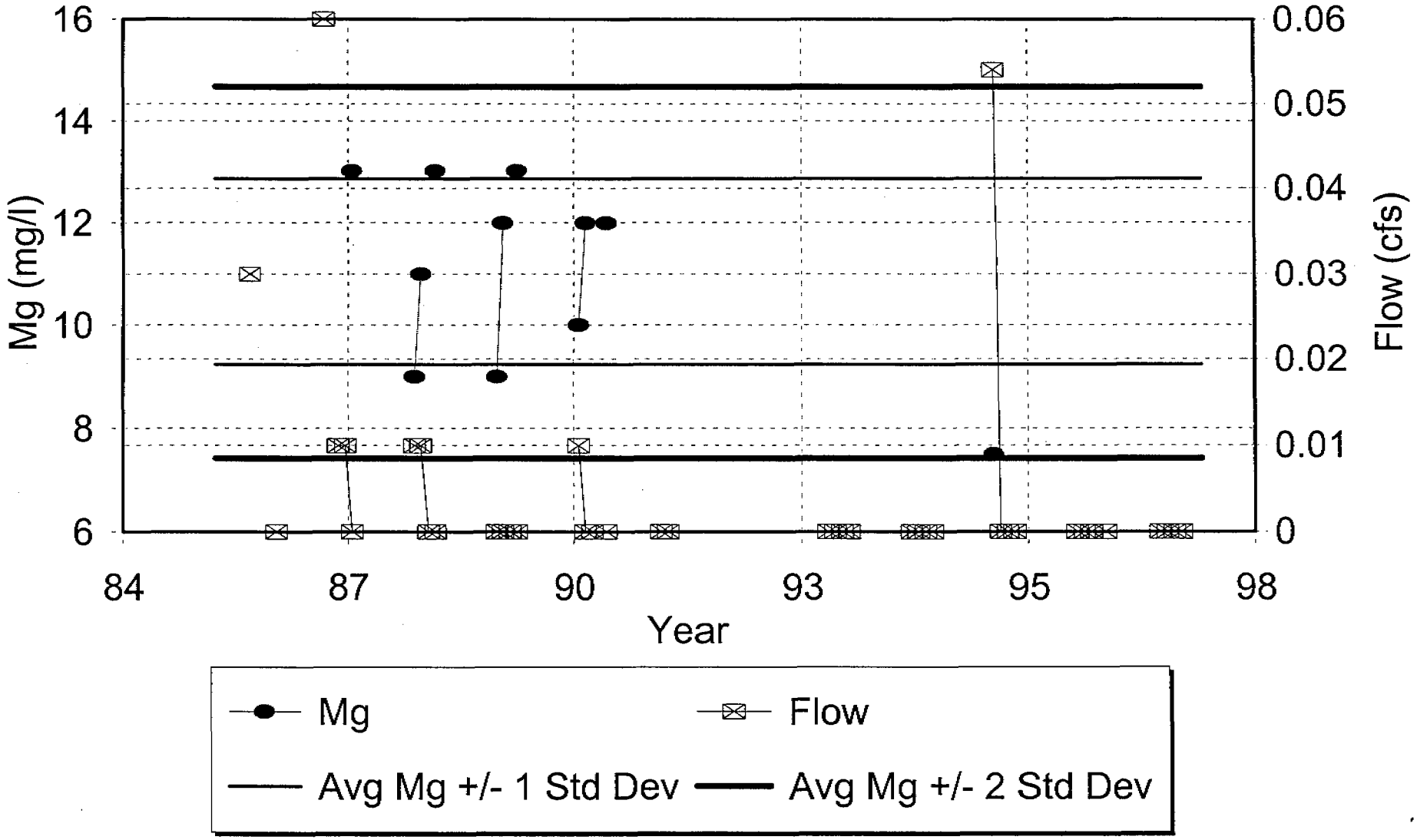
Station S182

Ca vs. Flow

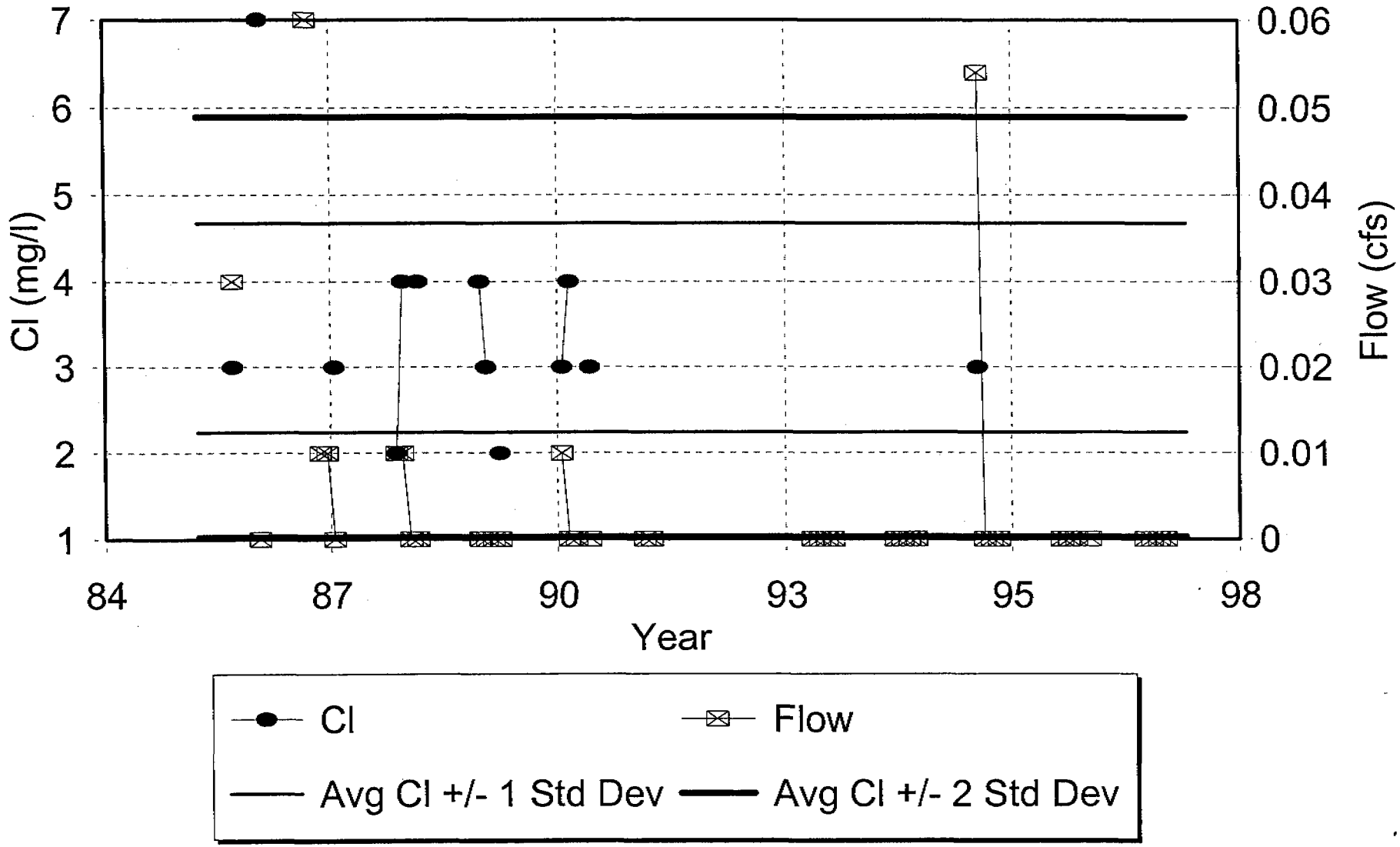


Station S182

Mg vs. Flow

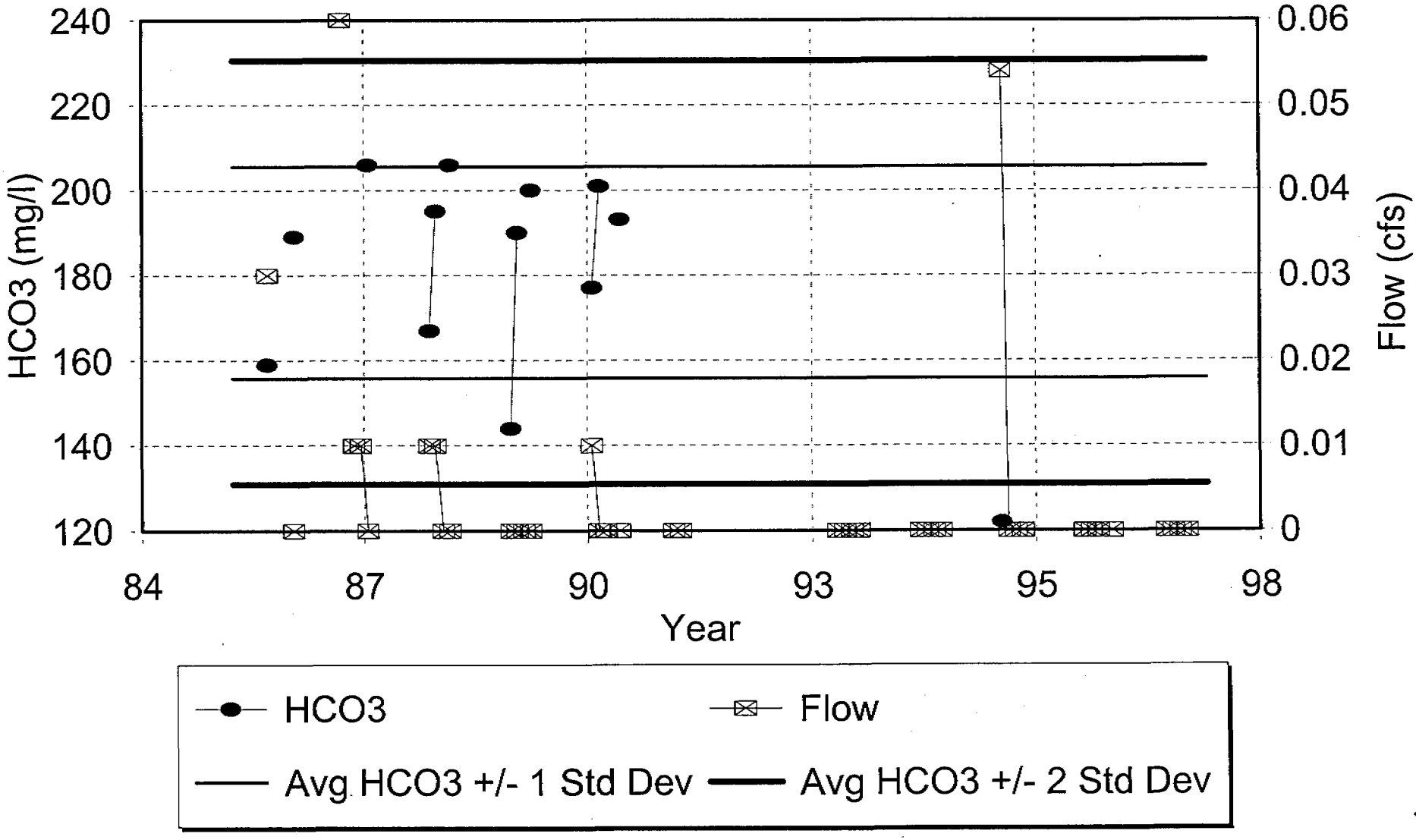


Station S182



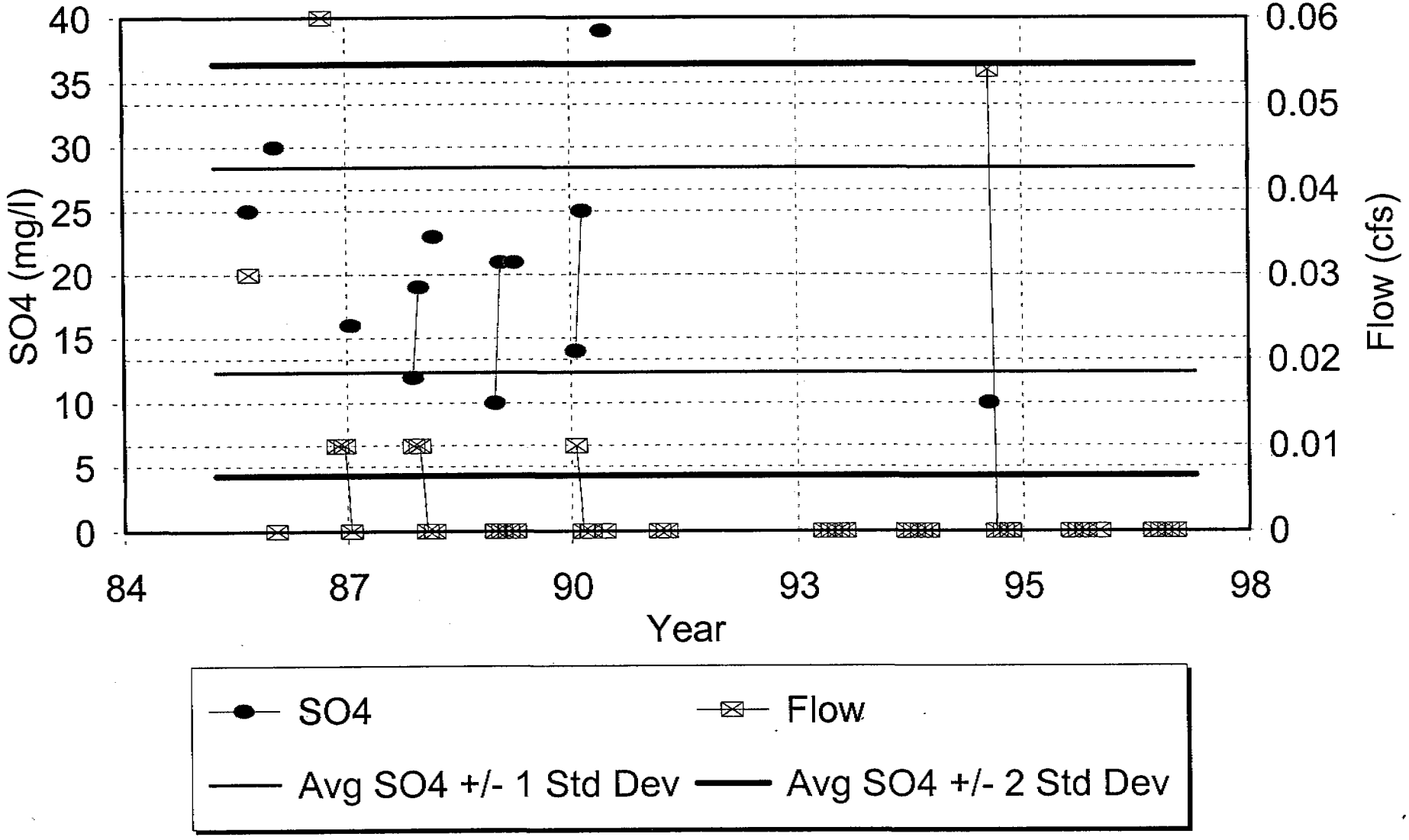
Station S182

HCO3 vs. Flow



Station S182

SO4 vs. Flow



Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 229 | Property: Star Point | Location: 2250' S 625' E of NW corn. Sec 18, T15S, R8E | Station Type: | Sampling Frequency: Quarterly | Formation: | Elevation:

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-86																						
Feb-86																						
Mar-86																						
Apr-86																						
May-86																						
Jun-86																						
Jul-86																						
Aug-86																						
Sep-86																						
Oct-86	10/10	0				204																
Nov-86																						
Dec-86																						
Jan-87																						
Feb-87																						
Mar-87																						
Apr-87																						
May-87	05/19	0.05				192																
Jun-87																						
Jul-87	07/20	0.02				176																
Aug-87	08/12	0.01				182																
Sep-87																						
Oct-87																						
Nov-87																						
Dec-87																						
Jan-88																						
Feb-88																						
Mar-88																						
Apr-88																						
May-88																						
Jun-88	06/01	0.08																				
Jul-88	07/16	0																				NO FLOW
Aug-88	08/20	0																				NO FLOW
Sep-88	09/05	0																				NO FLOW
Oct-88																						
Nov-88																						
Dec-88																						
Jan-89																						
Feb-89																						
Mar-89																						
Apr-89																						
May-89																						
Jun-89	06/05	0.01				214																
Jul-89	07/11	0																				NO FLOW
Aug-89	08/22	0																				NO FLOW
Sep-89	09/15	0																				NO FLOW
Oct-89																						
Nov-89																						
Dec-89																						
Jan-90																						
Feb-90																						
Mar-90																						
Apr-90																						
May-90	05/30	0																				NO FLOW
Jun-90																						
Jul-90	07/06	0																				NO FLOW
Aug-90	08/22	0																				NO FLOW
Sep-90	09/24	0																				NO FLOW
Oct-90																						
Nov-90																						
Dec-90																						
Jan-91																						
Feb-91																						
Mar-91																						
Apr-91																						
May-91																						
Jun-91	06/11	0.05	7.2	340	3	202			170	207	5	2	8	55	8	1	1		< 0.02		< 0.01	
Jul-91	07/15	0																				
Aug-91																						
Sep-91	09/18	0																				NO FLOW
Oct-91																						
Nov-91																						
Dec-91																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 229 | Property: Star Point | Location: 2250' S 625' E of NW com. Sec 18, T15S, R8E | Station Type: | Sampling Frequency: Quarterly | Formation: | Elevation:

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92																						
Jun-92																						
Jul-92																						
Aug-92																						
Sep-92																						
Oct-92																						
Nov-92																						
Dec-92																						
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/22	0.07	6.2	312	3.9	174			173	222	0	1	6	56	8 <	1	1	<	0.02	0.02 <	0.01	
Jul-93	07/26	0																				NO FLOW
Aug-93	08/18	0																				NO FLOW
Sep-93	09/28	0																				NO FLOW
Oct-93																						
Nov-93																						
Dec-93																						
Jan-94																						
Feb-94																						
Mar-94																						
Apr-94																						
May-94																						
Jun-94	06/09	0																				NO FLOW
Jul-94	07/20	0																				NO FLOW
Aug-94	08/31	0																				NO FLOW
Sep-94	09/21	0																				NO FLOW
Oct-94																						
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95																						
Mar-95																						
Apr-95																						
May-95																						
Jun-95	06/22	0.184	7.2	395	6	190			210	184		1 <	10	67.9	9.9	0.8	1.3	7.2 <	0.01 <	0.01 <	0.005	
Jul-95	07/27	0.0016	7.4	478	7	220			207	185		2	10	66.1	10.1	0.7	1.4	3	0.04 <	0.01 <	0.005	
Aug-95	08/23	0																				
Sep-95	09/28	0																				
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/12/96	0.059	7.8	458	4	200			210	183	2 <	1	10	67.3	10.1	0.6	1.4	4.6	0.04	0.01	0.005	
Jul-96	07/23/96	0																				Dry
Aug-96	08/19/96	0																				Dry
Sep-96																						
Oct-96	10/01/96	0																				Dry
Nov-96																						
Dec-96																						
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/18/97	0.1	8.16	457	4.5	193			206	190	2 <	1 <	10 <	66.4	9.8	0.8	1.5	5.1	0.01 <	0.01 <	0.005	
Jul-97	07/30/97	0																				Dry
Aug-97	08/13/97	0																				Dry
Sep-97	09/16/97	0																				Dry
Oct-97																						
Nov-97																						
Dec-97																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

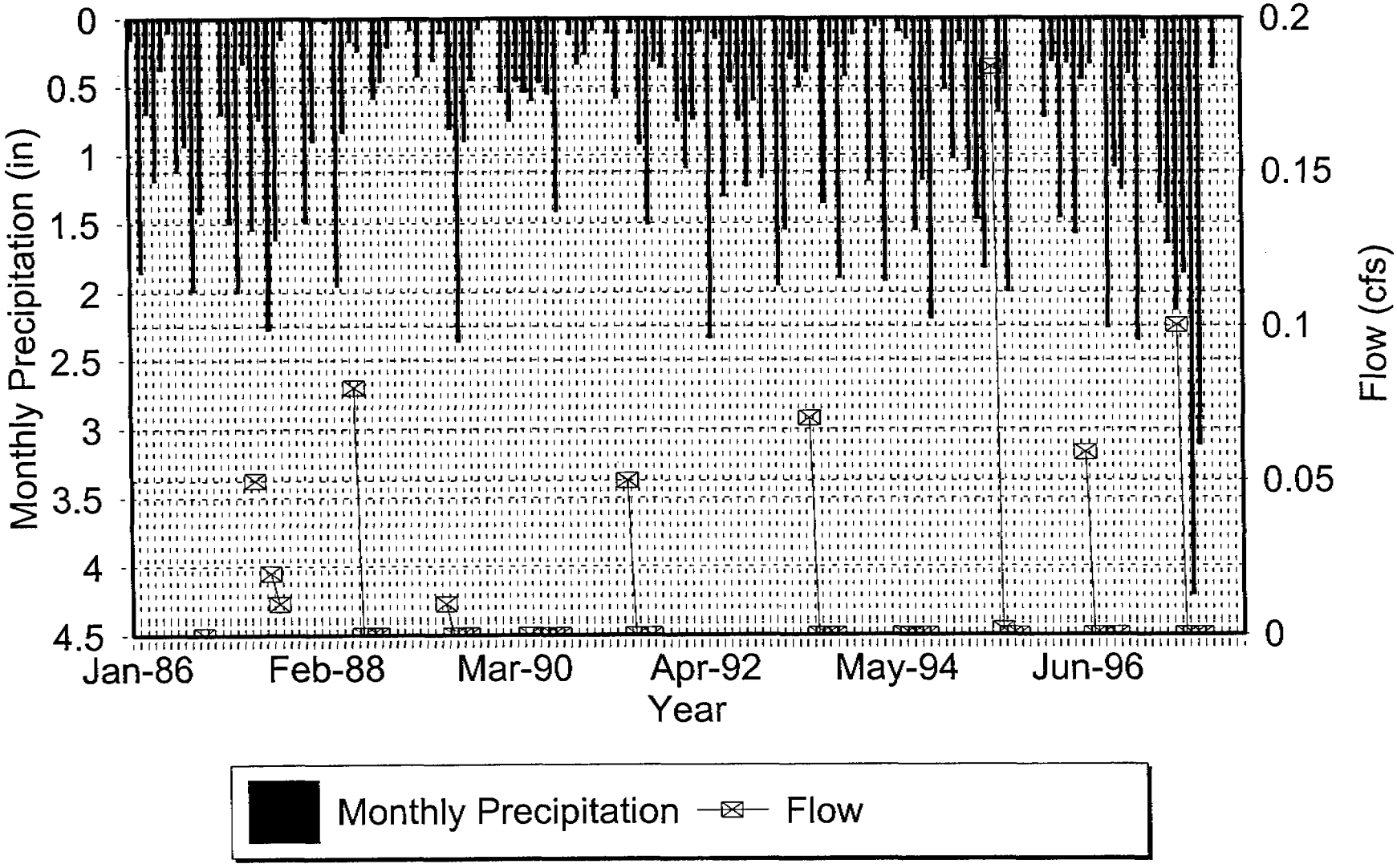
Station: 229 | Property: Star Point | Location: 2250' S 625' E of NW corn. Sec 18, T15S, R8E | Station Type: | Sampling Frequency: Quarterly | Formation: | Elevation:

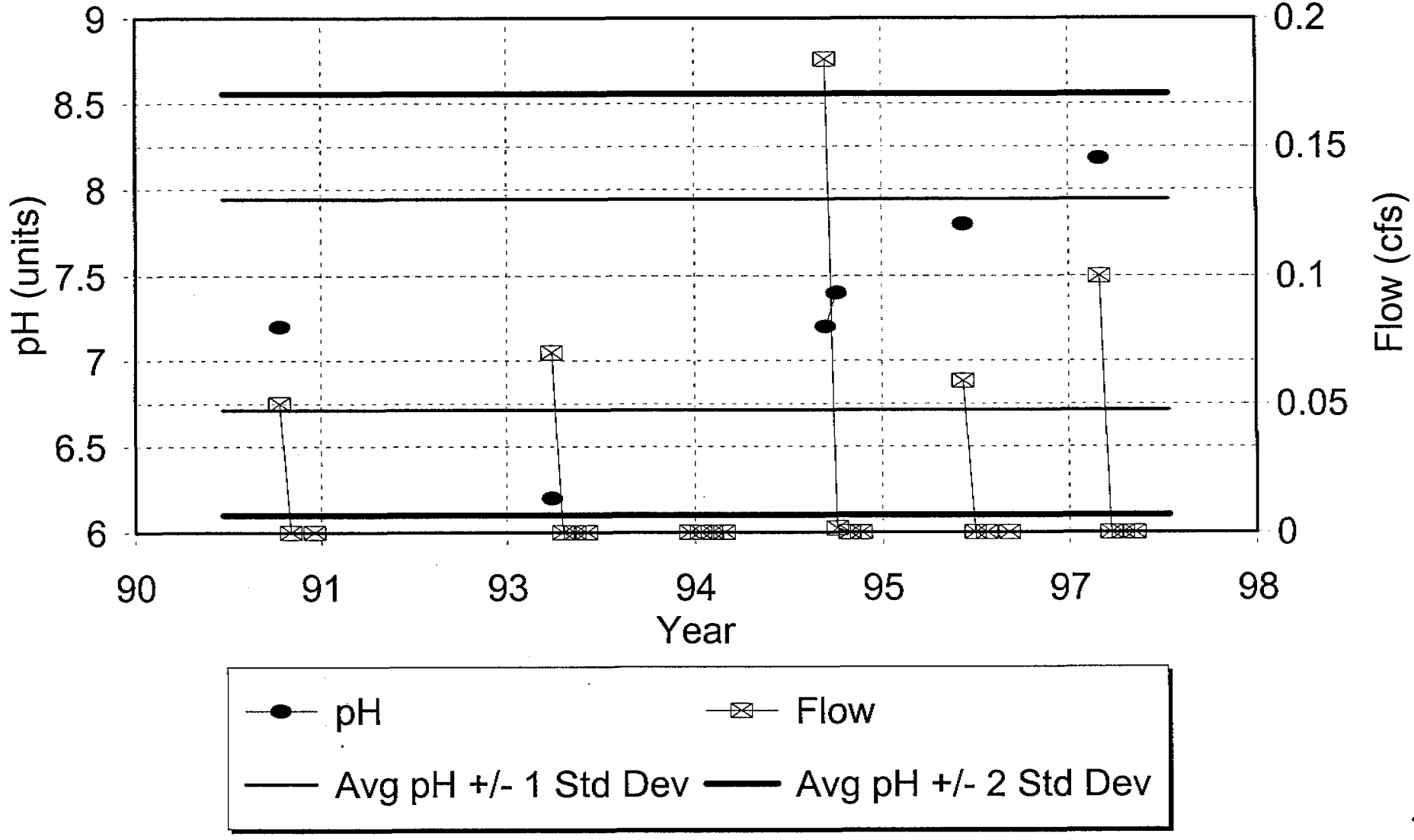
Date		Field Measurements				Laboratory Measurements																Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cal/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	
END DATA																						
Count		39	6	6	6	11	0	0	6	6	4	6	6	6	6	6	6	4	6	5	6	
Minimum		0	6.2	312	3	174	ERR	ERR	170	183	0 <	1 <	6 <	55	8 <	0.6	1	3 <	0.01 <	0.01 <	0.005	
Maximum		0.184	8.18	478	7	220	ERR	ERR	210	222	5 <	2 <	10 <	67.9	10.1 <	1	1.5	7.2 <	0.04 <	0.02 <	0.01	
Average		0.0163	7.33	406.67	4.7333	195.18	ERR	ERR	196	195.17	2.25 <	1.3333 <	9 <	63.117	9.3167 <	0.8167	1.2667	4.975 <	0.0233 <	0.012 <	0.0067	
Standard Deviation		0.0372	0.6136	62.981	1.3561	13.979	ERR	ERR	17.407	14.508	1.7854 <	0.4714 <	1.5275 <	5.4251	0.937 <	0.1462	0.1972	1.5006 <	0.0125 <	0.004 <	0.0024	
Avg. -1 Std. Dev.		-0.021	6.7164	343.69	3.3773	181.2	ERR	ERR	178.59	180.66	0.4646 <	0.8619 <	7.4725 <	57.692	8.3796 <	0.6704	1.0695	3.4744 <	0.0109 <	0.008 <	0.0043	
Avg. +1 Std. Dev.		0.0535	7.9436	469.65	6.0694	209.16	ERR	ERR	213.41	209.67	4.0354 <	1.8047 <	10.528 <	68.542	10.254 <	0.9629	1.4639	6.4756 <	0.0358 <	0.016 <	0.009	
Avg. -2 Std. Dev.		-0.058	6.1028	280.71	2.0212	167.22	ERR	ERR	161.19	166.15	-1.321 <	0.3905 <	5.9449 <	52.267	7.4426 <	0.5242	0.8723	1.9738 <	-0.002 <	0.004 <	0.002	
Avg. +2 Std. Dev.		0.0906	8.5572	532.63	7.4454	223.14	ERR	ERR	230.81	224.18	5.6207 <	2.2761 <	12.055 <	73.967	11.191 <	1.1092	1.6611	7.9762 <	0.0483 <	0.02 <	0.0114	

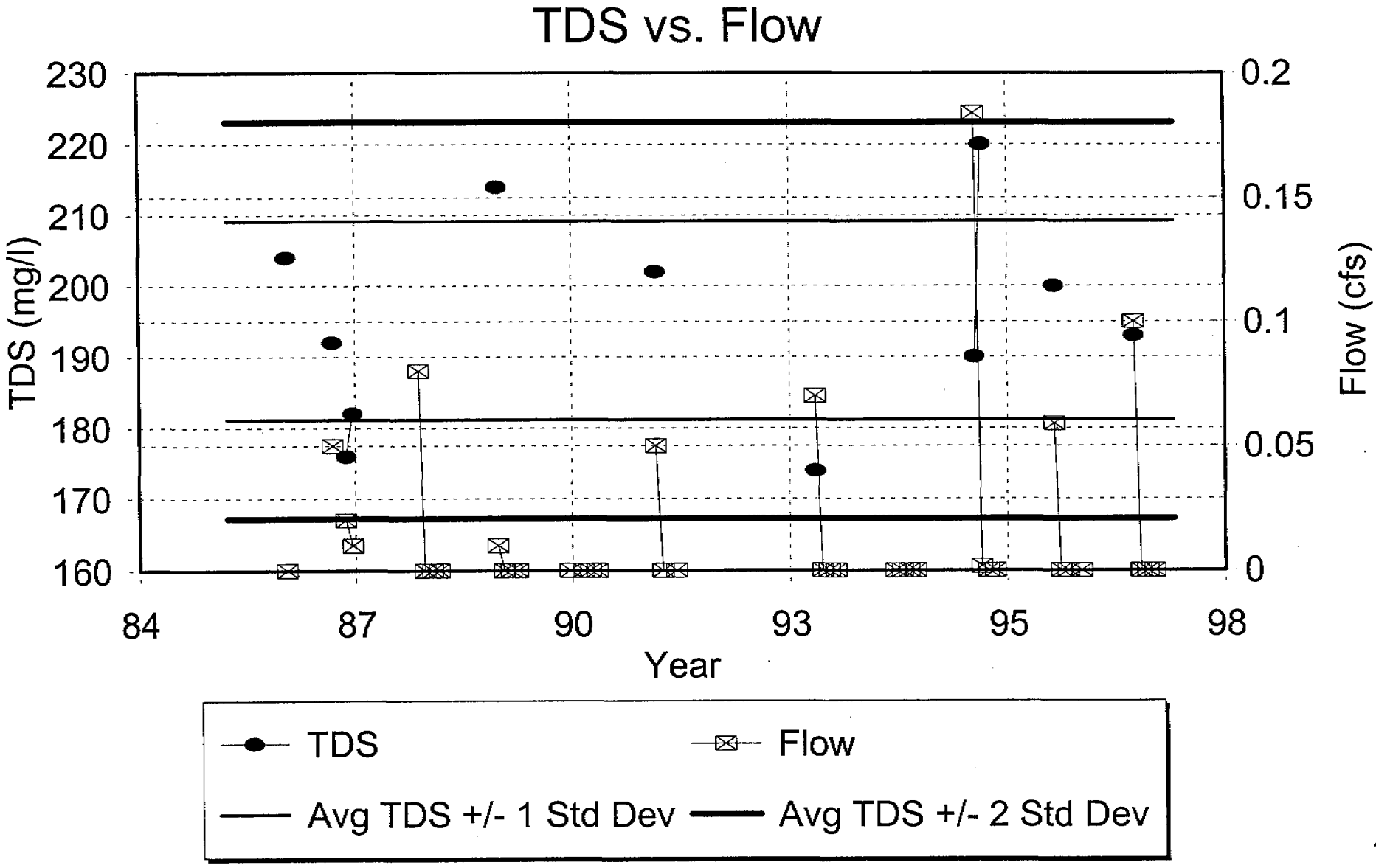
NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

Station 229

Monthly Precipitation vs. Flow

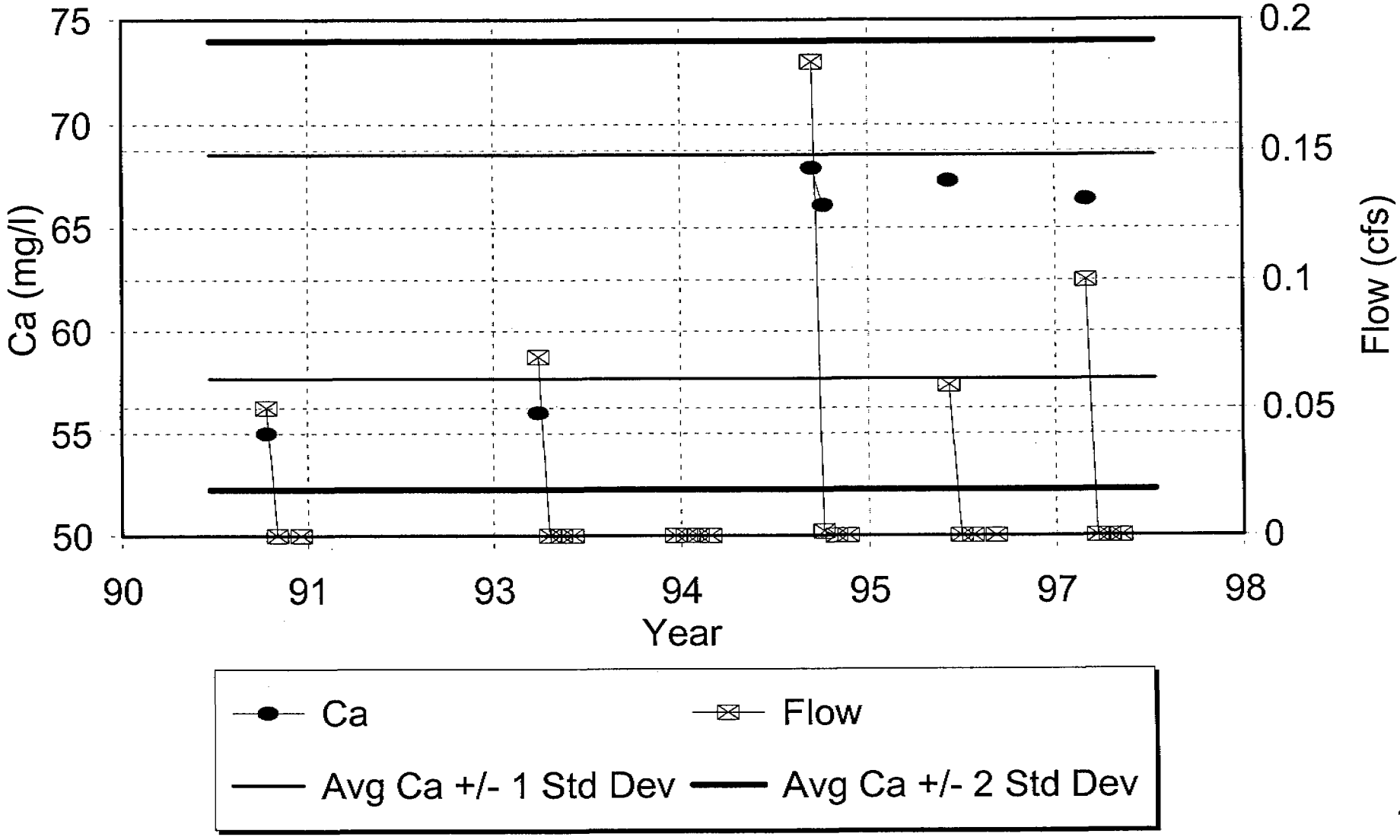



Station 229
pH vs. Flow
pH (units)
9
8.5
8
7.5
7
6.5
6
Flow (cfs)
0.2
0.15
0.1
0.05
0
90
91
93
94
95
97
98
Year
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev


Station 229
TDS vs. Flow
TDS (mg/l)
230
220
210
200
190
180
170
160
Flow (cfs)
0.2
0.15
0.1
0.05
0
84
87
90
93
95
98
Year
TDS
Flow
Avg TDS +/- 1 Std Dev
Avg TDS +/- 2 Std Dev

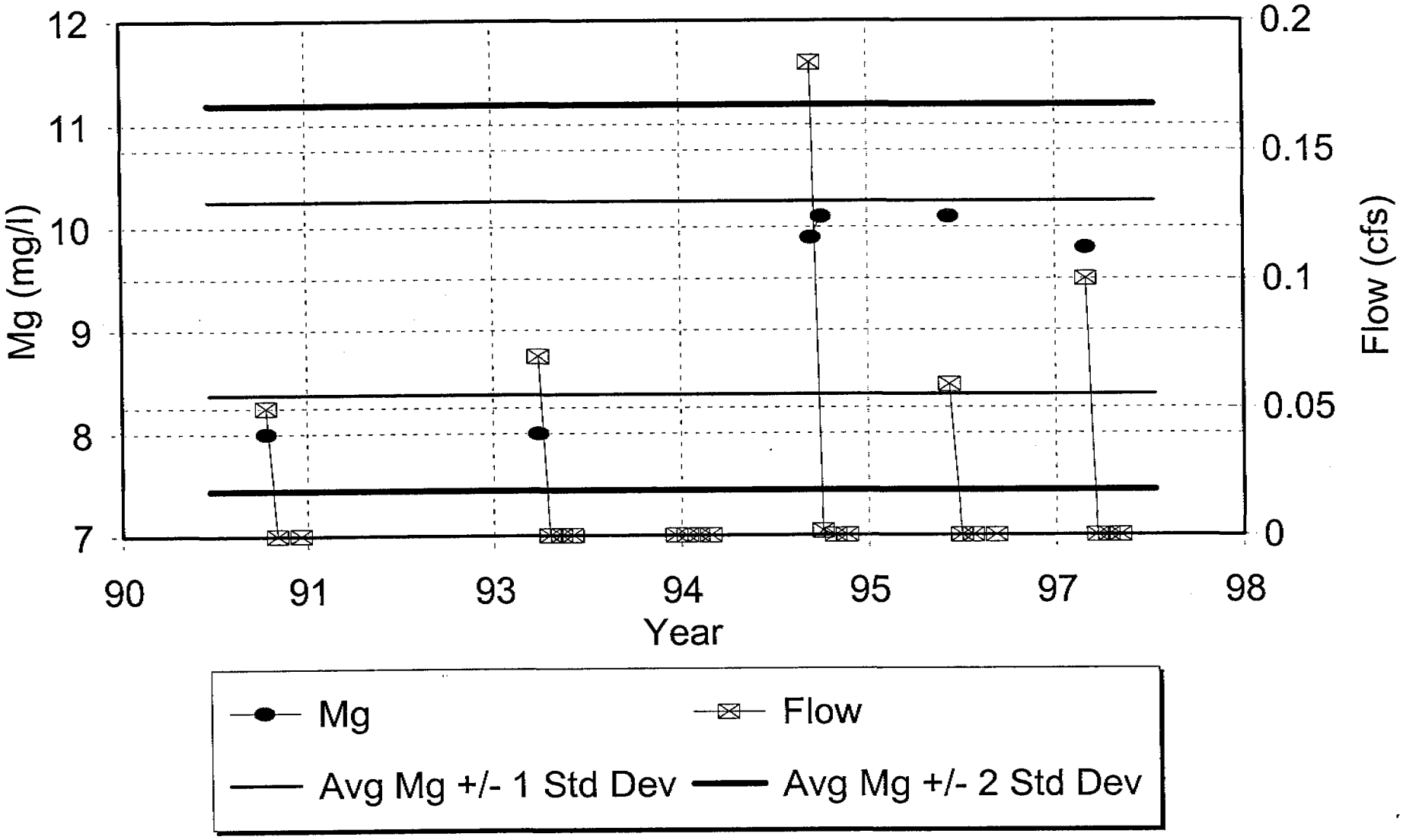
Station 229

Ca vs. Flow



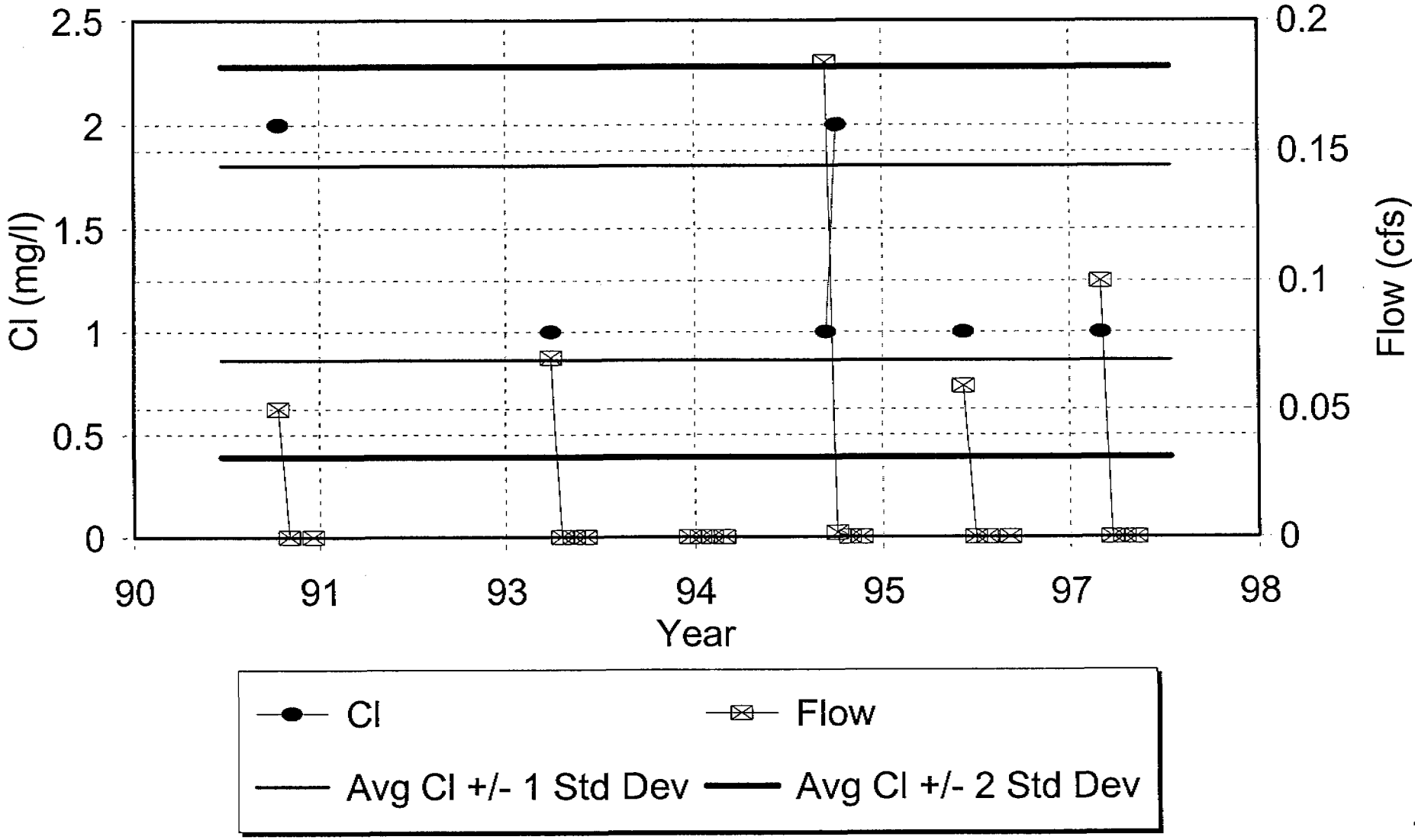
Station 229

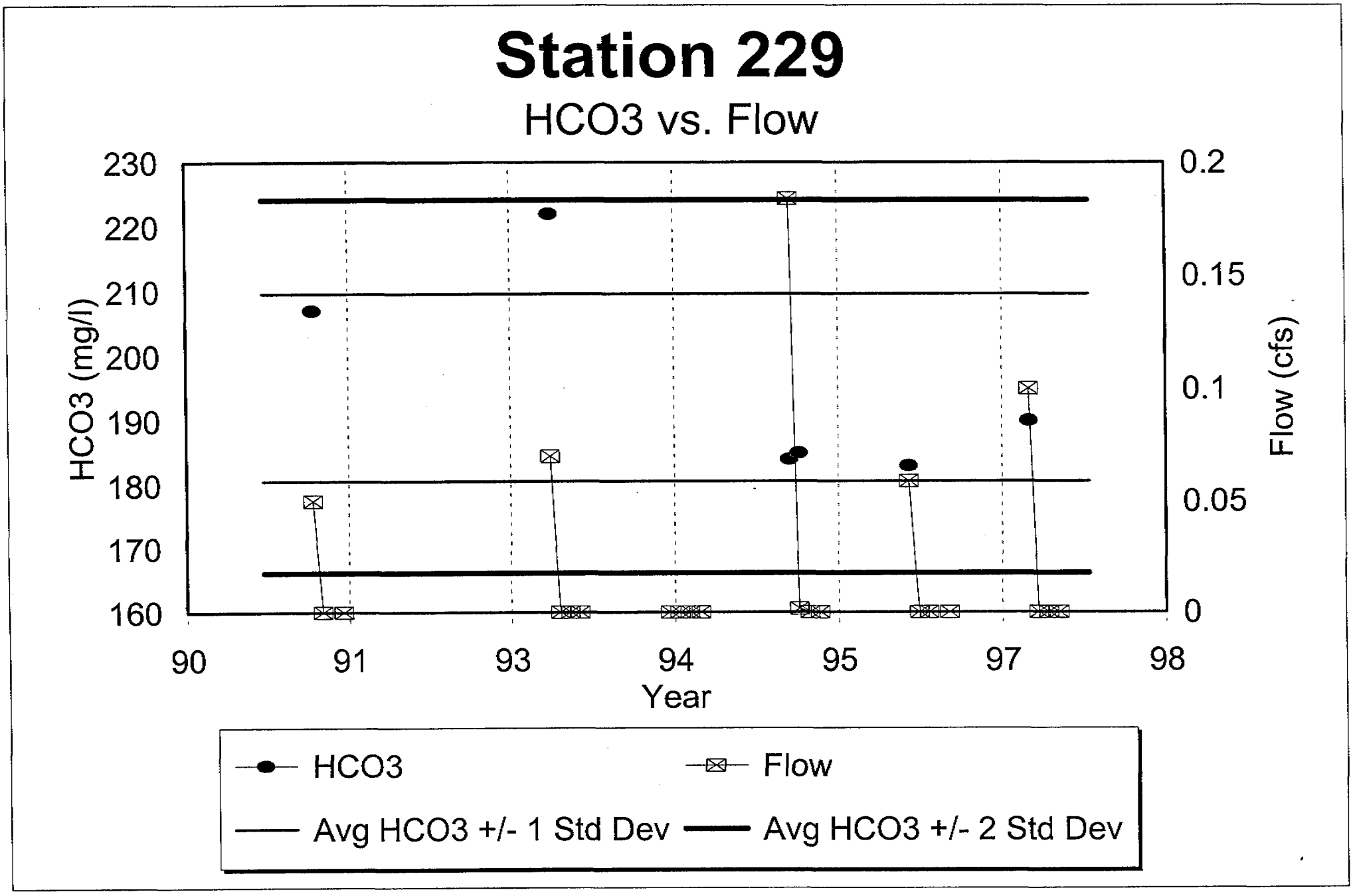
Mg vs. Flow



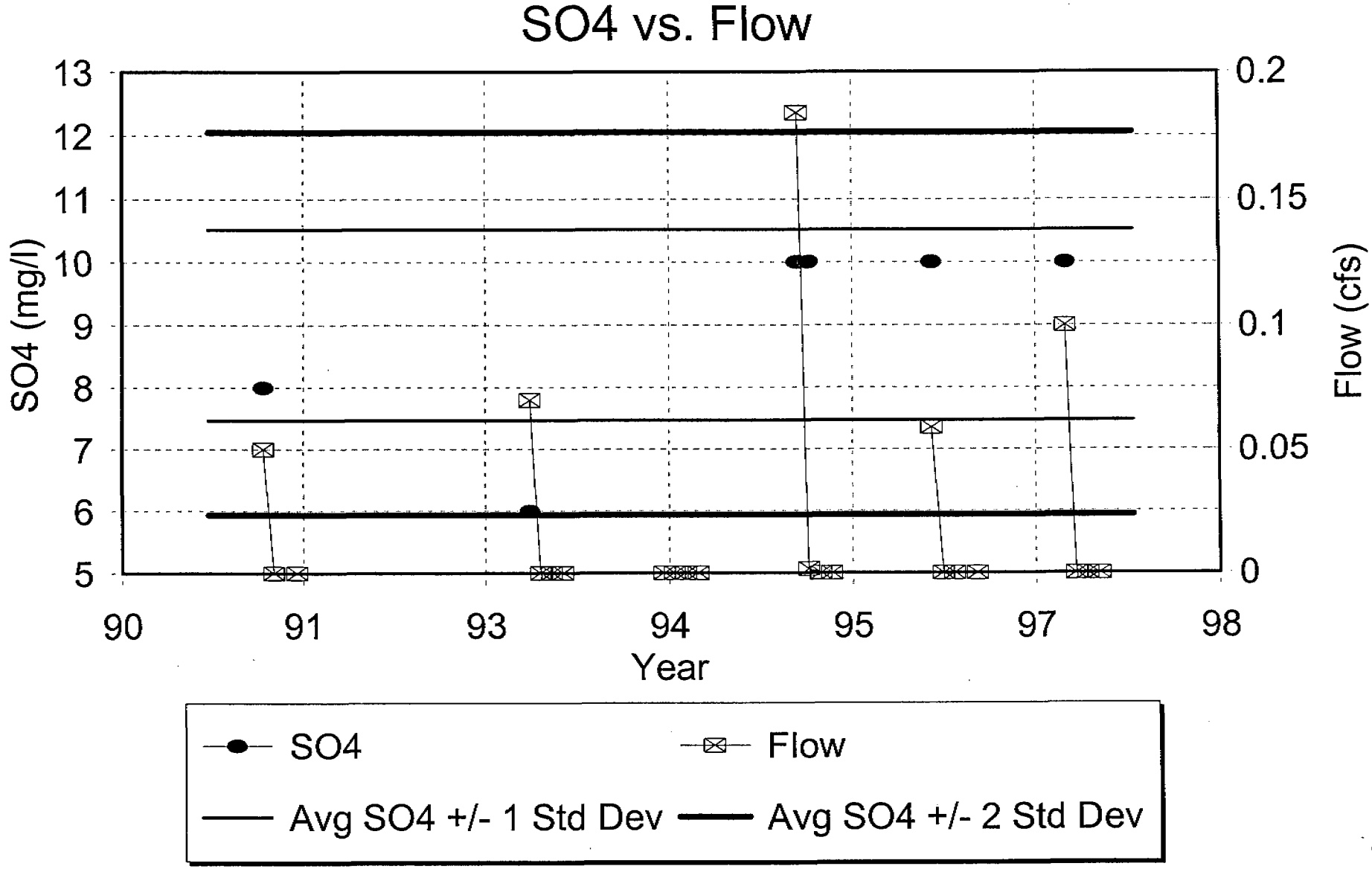
Station 229

Cl vs. Flow




Station 229
HCO3 vs. Flow
HCO3 (mg/l)
230
220
210
200
190
180
170
160
0.2
0.15
0.1
0.05
0
Flow (cfs)
90
91
93
94
95
97
98
Year
HCO3
Flow
Avg HCO3 +/- 1 Std Dev
Avg HCO3 +/- 2 Std Dev

Station 229


SO4 vs. Flow
SO4 (mg/l)
13
12
11
10
9
8
7
6
5
Flow (cfs)
0.2
0.15
0.1
0.05
0
90
91
93
94
95
97
98
Year
SO4
Flow
Avg SO4 +/- 1 Std Dev
Avg SO4 +/- 2 Std Dev

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 458 | Property: Star Point | Location: 2250' S 750' E of NW com. Sec 23, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9400

Date		Field Measurements				Laboratory Measurements																	Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)		
Jan-92																							
Feb-92																							
Mar-92																							
Apr-92																							
May-92	05/20	0.0067	7.6	916	5.8	284			281	188	0	2	99	83	18	1	3	<	0				
Jun-92	06/17	0.033	7.4	538	6.2	296			299	270	0	2	37	85	21	1	3	<	0				
Jul-92	07/16	0.011	7	541	6.4																		
Aug-92	08/26	0.009	7.4	530	6.9																		
Sep-92	09/21	0.005	6.2	534	7				299	262	16	2	21	85	21	1	3	<	0				
Oct-92																							
Nov-92																							
Dec-92																							
Jan-93																							
Feb-93																							
Mar-93																							
Apr-93																							
May-93																							
Jun-93	06/22	0.096	6.4	485	6	284			285	342	0	2	4	81	20	1	3	<	0.02	0.02 <	0.01		
Jul-93	07/27	0.011	6.2	514	6.5	300			301	334	0	2	37	86	21	1	3	<	0.02 <	0.02 <	0.01		
Aug-93	08/17	0.01	6.3	518	5.4																		
Sep-93	09/27	0.005	6.2	513	6.6	302			268	303	0	2	27	76	19	1	3	<	0.02 <	0.02 <	0.01		
Oct-93																							
Nov-93																							
Dec-93																							
Jan-94																							
Feb-94																							
Mar-94																							
Apr-94																							
May-94																							
Jun-94	06/08	0.023	7.5	611	4.9	288			268	342	0	2	25	76	19	1	4	<	0.02 <	0.02 <	0.01	CATIONS & ANIONS REA	
Jul-94	07/19	0.01	7.9	548	15.8	298			275	300	10	2	39	77	20	1	3	<	0.02	0.9 <	0.01		
Aug-94	08/31	0																				NO FLOW	
Sep-94	09/21	0																				NO FLOW	
Oct-94																							
Nov-94																							
Dec-94																							
Jan-95																							
Feb-95																							
Mar-95																							
Apr-95																							
May-95																							
Jun-95	06/22	0																					
Jul-95	07/27	0																					
Aug-95	08/23	0																					
Sep-95	09/27	0																					
Oct-95																							
Nov-95																							
Dec-95																							
Jan-96																							
Feb-96																							
Mar-96																							
Apr-96																							
May-96																							
Jun-96	06/11/96	0																				Dry	
Jul-96	07/23/96	0																				Dry	
Aug-96	08/19/96	0																				Dry	
Sep-96	09/30/96	0																				Dry	
Oct-96																							
Nov-96																							
Dec-96																							
Jan-97																							
Feb-97																							
Mar-97																							
Apr-97																							
May-97																							
Jun-97	06/18/97	0.03	7.87	650	5.5	309			314	284	2 <	2	20	90.6	21.4	1.4	3.1	2.4	0.01 <	0.04	0.005		
Jul-97	07/30/97	0.004	7.63	495	8																		
Aug-97	08/13/97	0.004	8.14	462	8																		
Sep-97	09/16/97	0.004	7.97	550	9	340			290	250	10 <	1.5	26	80	22	2.1	3.7	3.7	0.01 <	0.56	0.007		
Oct-97																							
Nov-97																							
Dec-97																							

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

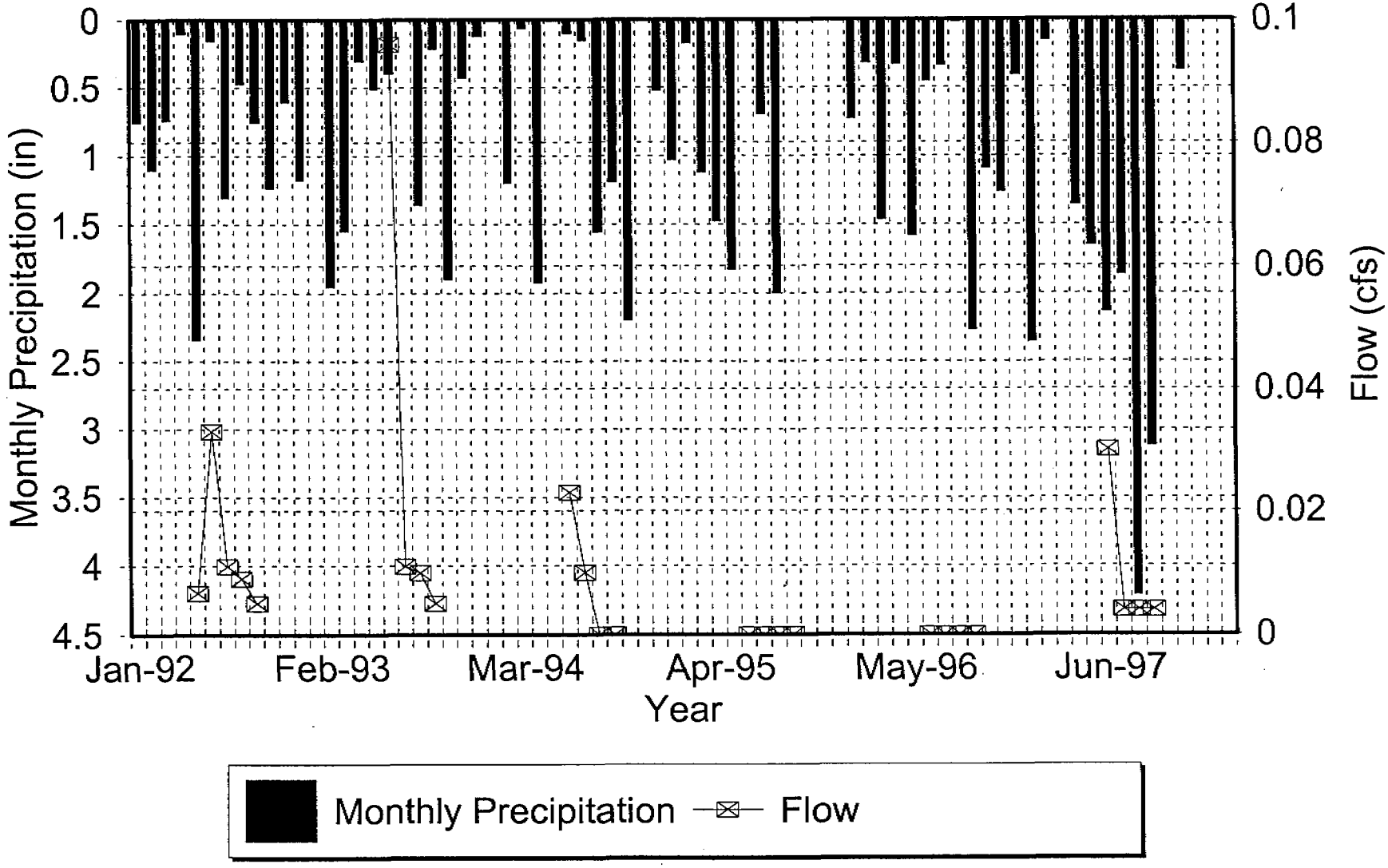
Station: 458 | Property: Star Point | Location: 2250' S 750' E of NW com. Sec 23, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9400

Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
END DATA																						
Count		25	15	15	15	9	0	0	10	10	10	10	10	10	10	10	10	2	10	7	7	
Minimum		0	6.2	462	4.9	284	ERR	ERR	268	188	0 <	1.5	4	76	18	1	3	2.4 <	0 <	0.02 <	0.005	
Maximum		0.096	8.14	916	15.6	340	ERR	ERR	314	342	16 <	2	99	90.6	22	2.1	4	3.7 <	0.02 <	0.9 <	0.01	
Average		0.0105	7.1607	560.33	7.2667	300.11	ERR	ERR	288	267.5	3.8 <	1.95	33.5	81.96	20.24	1.15	3.18	3.05 <	0.012 <	0.2257 <	0.0089	
Standard Deviation		0.0197	0.7031	105.09	2.4663	16.196	ERR	ERR	14.553	45.579	5.6178 <	0.15	23.926	4.5929	1.1993	0.3384	0.3429	0.65 <	0.0067 <	0.3317 <	0.0019	
Avg. -1 Std. Dev.		-0.009	6.4776	455.25	4.7983	283.91	ERR	ERR	273.45	241.92	-1.818 <	1.8	9.5741	77.367	19.041	0.8116	2.8371	2.4 <	0.0033 <	-0.106 <	0.007	
Avg. +1 Std. Dev.		0.0301	7.8837	665.42	9.775	316.31	ERR	ERR	302.55	333.08	9.4176 <	2.1	57.426	86.553	21.439	1.4884	3.5229	3.7 <	0.0207 <	0.5574 <	0.0107	
Avg. -2 Std. Dev.		-0.029	5.7745	350.16	2.31	267.72	ERR	ERR	258.89	196.34	-7.436 <	1.65	-14.35	72.774	17.641	0.4732	2.4941	1.75 <	-0.005 <	-0.438 <	0.0051	
Avg. +2 Std. Dev.		0.0498	8.5868	770.5	12.263	332.5	ERR	ERR	317.11	378.66	15.036 <	2.25	81.352	91.146	22.639	1.8268	3.8659	4.35 <	0.0294 <	0.8891 <	0.0126	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

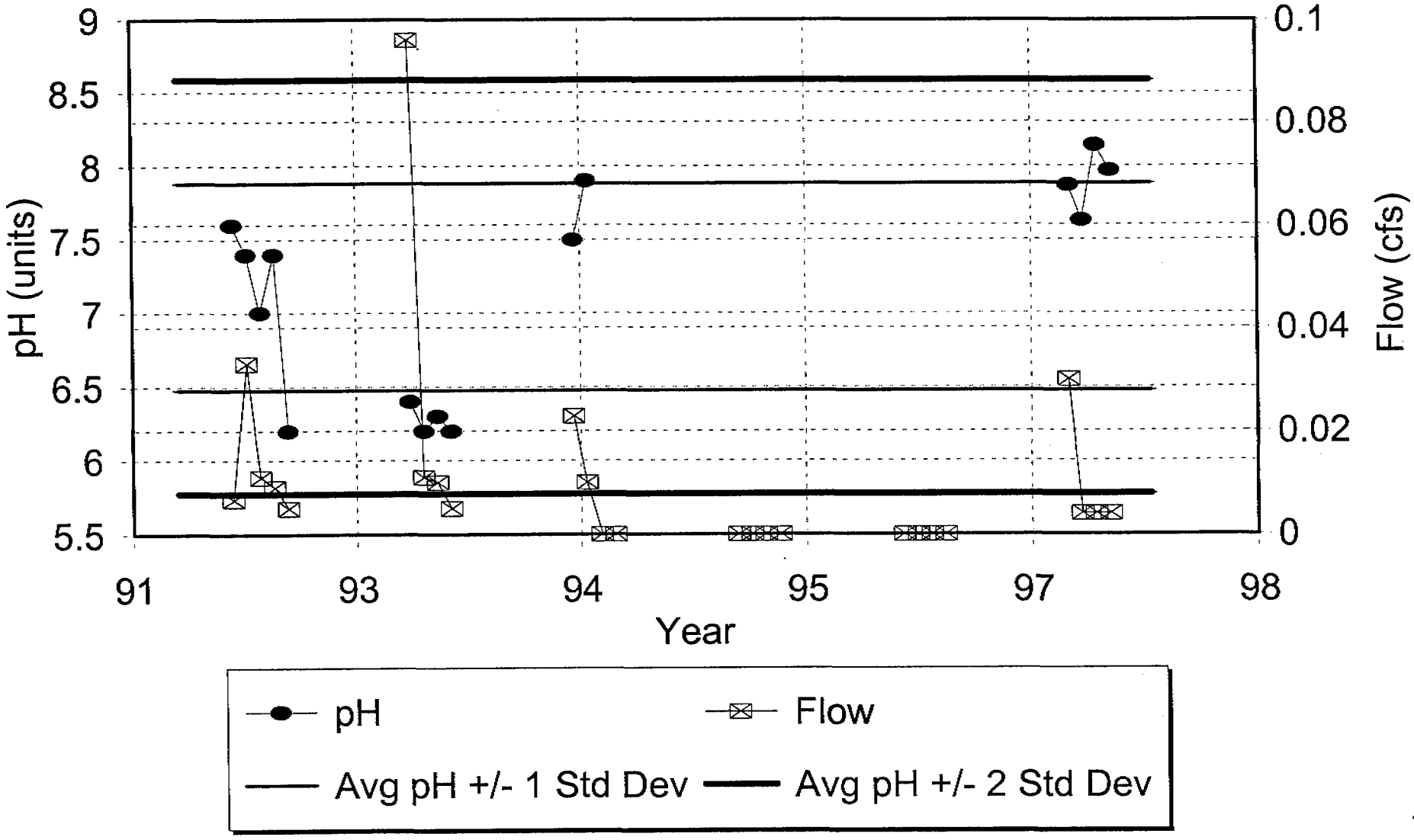
Station 458

Monthly Precipitation vs. Flow



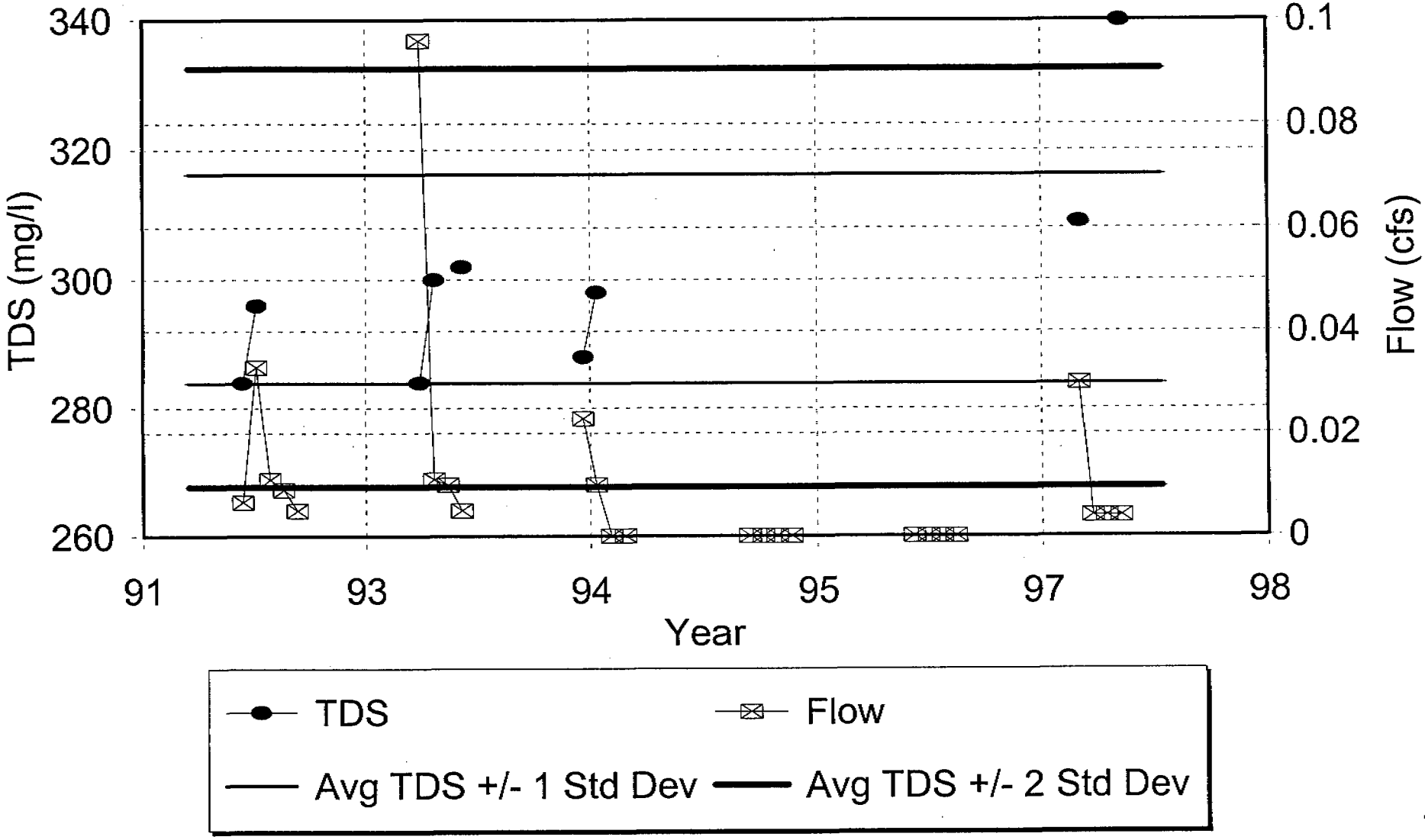
Station 458

pH vs. Flow



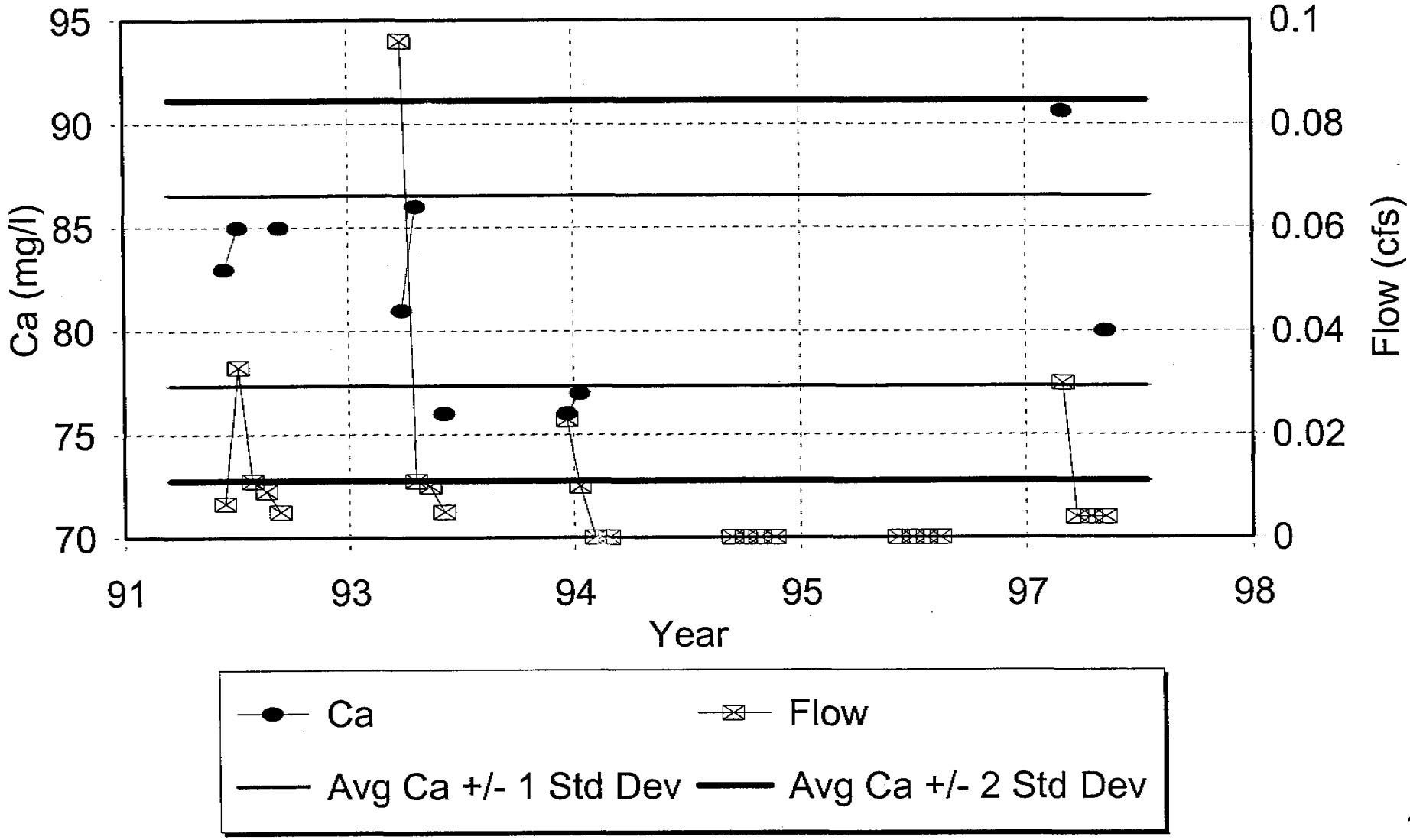
Station 458

TDS vs. Flow



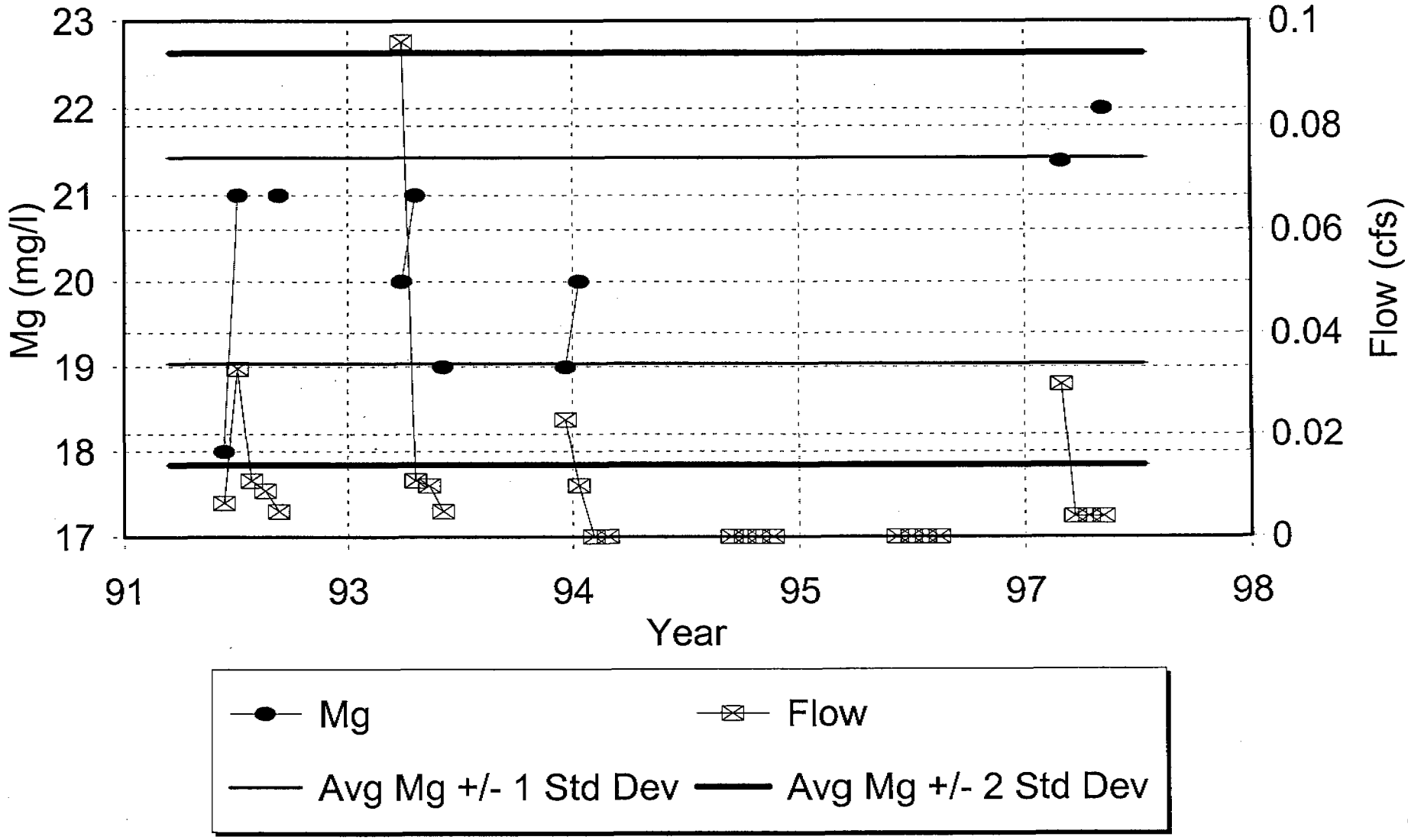
Station 458

Ca vs. Flow



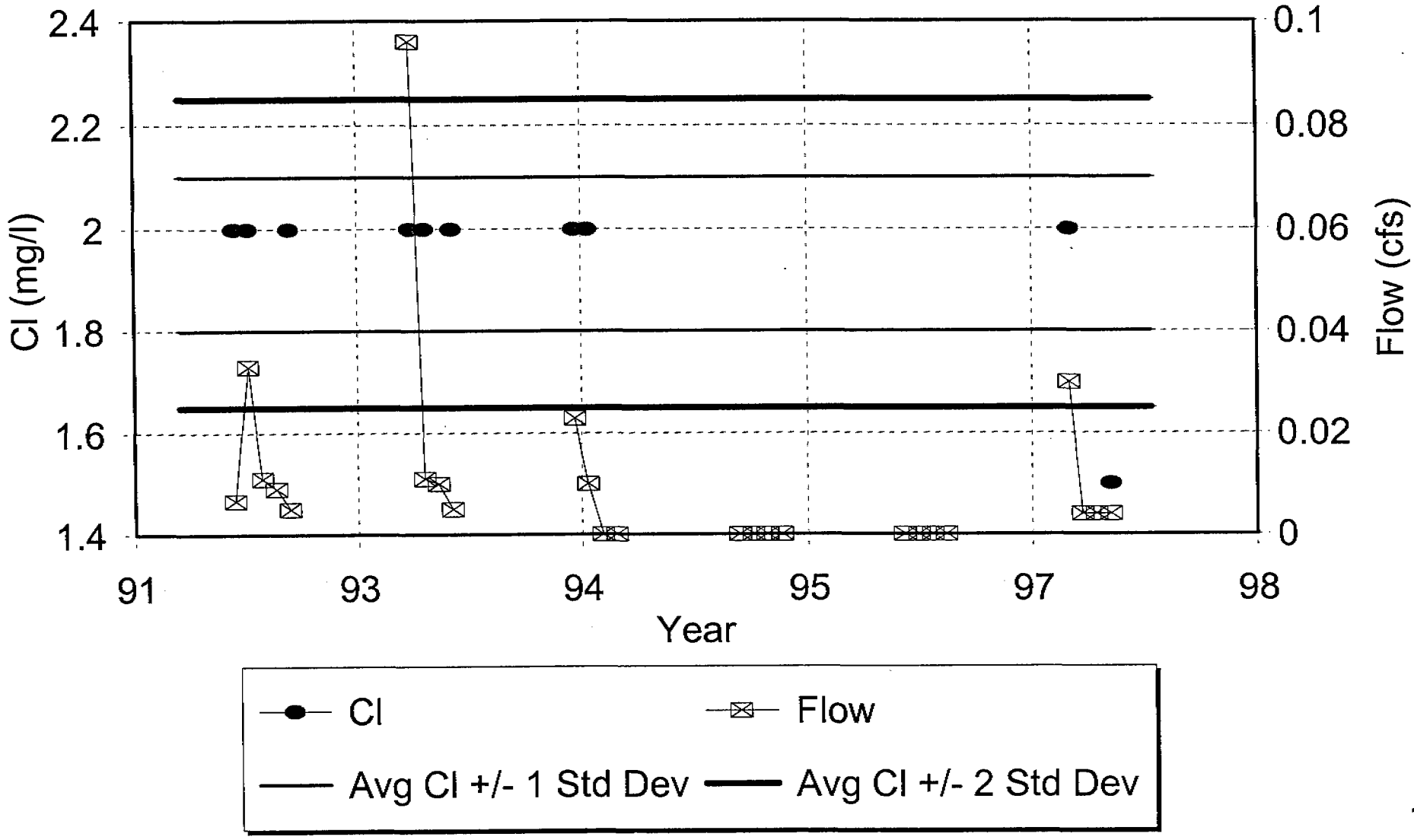
Station 458

Mg vs. Flow

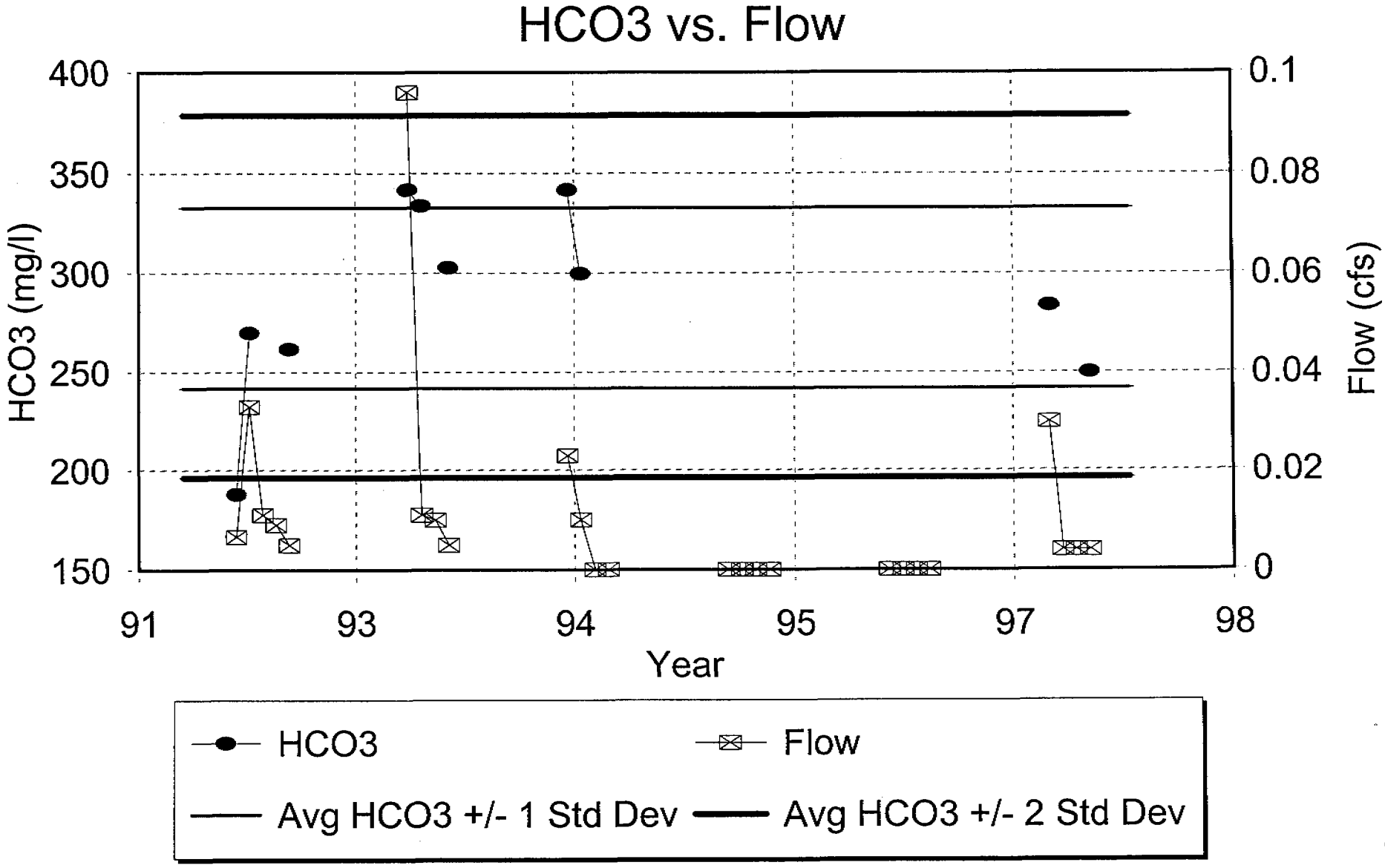


Station 458

Cl vs. Flow

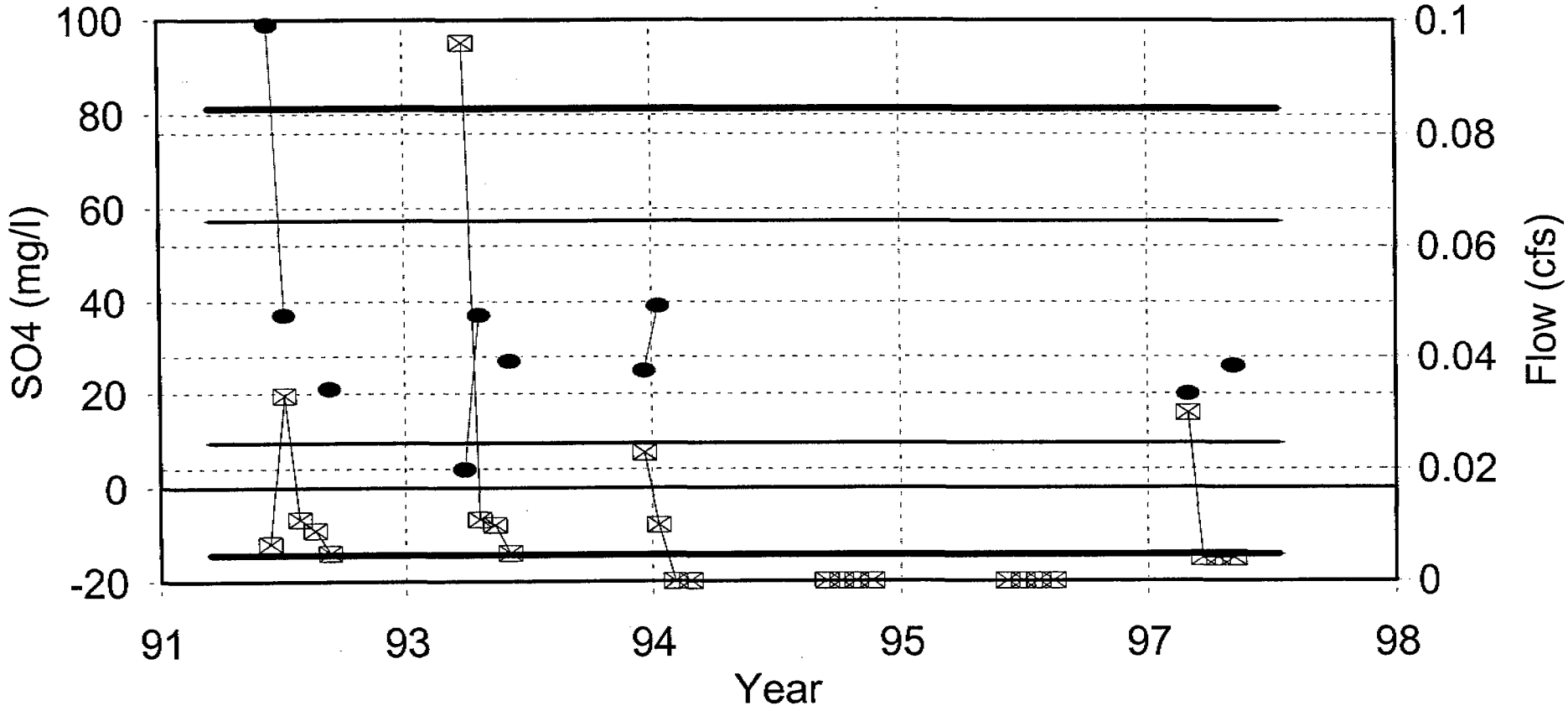


Station 458


HCO3 vs. Flow
400
350
300
250
200
150
HCO3 (mg/l)
0.1
0.08
0.06
0.04
0.02
0
Flow (cfs)
91
93
94
95
97
98
Year
HCO3
Flow
Avg HCO3 +/- 1 Std Dev
Avg HCO3 +/- 2 Std Dev

Station 458

SO4 vs. Flow



SO4 — Flow

Avg SO4 +/- 1 Std Dev — Avg SO4 +/- 2 Std Dev

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 500 | Property: Star Point | Location: 100' S 1300' W of NE corn. Sec 18, T15S, R6E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9460

Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-87																						
Feb-87																						
Mar-87																						
Apr-87																						
May-87	05/23	0.01	8	400	5.4	242				249		2	2	34	23 <	1	3	<	0.02	0.03 <	0.01	
Jun-87																						
Jul-87	07/20	0	8	380	5.6	256			228	268		3	2	55	22	1	2	<	0.02	0.23 <	0.01	
Aug-87	08/12	0	8	320	8	198			238	266		3	2	64	19	1	3	<	0.02 <	0.02 <	0.01	
Sep-87	09/22	0	6.6	500	5.5	236			266	271		3	6	72	21	1	2	<	0.02	1.44	0.06	
Oct-87																						
Nov-87																						
Dec-87																						
Jan-88																						
Feb-88																						
Mar-88																						
Apr-88																						
May-88																						
Jun-88	06/14	0	8.3	287	9.5	262				264		2	12	75		1	2	<	0.02 <	0.02 <	0.01	
Jul-88	07/15	0	8.1	292	9.5	258			218	262		3	14	56	19 <	1	3	<	0.02	0.02 <	0.01	
Aug-88	08/19	0	7.6	280	9																	
Sep-88	09/05	0	8.4	290	7.5	236			234	260		2	2	59	21	1	2	<	0.02	0.05 <	0.01	
Oct-88																						
Nov-88																						
Dec-88																						
Jan-89																						
Feb-89																						
Mar-89																						
Apr-89																						
May-89																						
Jun-89	06/06	0	7.7	690	6	234			218	232		3	8	56	19	1	2	<	0.02	0.03 <	0.01	
Jul-89	07/11	0.01	7.6	540	7	268			273	264		2	16	73	22	1	2	<	0.02	0.25	0.01	
Aug-89	08/22	0	7.5	490	6																	
Sep-89	09/15	0																				NO FLOW
Oct-89																						
Nov-89																						
Dec-89																						
Jan-90																						
Feb-90																						
Mar-90																						
Apr-90																						
May-90																						
Jun-90	06/04	0																				NO FLOW
Jul-90	07/06	0																				NO FLOW
Aug-90	08/30	0																				NO FLOW
Sep-90	09/24	0																				NO FLOW
Oct-90																						
Nov-90																						
Dec-90																						
Jan-91																						
Feb-91																						
Mar-91																						
Apr-91																						
May-91																						
Jun-91	06/11	0																				NO FLOW
Jul-91	07/16	0																				
Aug-91																						
Sep-91	09/17	0																				NO FLOW
Oct-91																						
Nov-91																						
Dec-91																						
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92																						
Jun-92																						
Jul-92																						
Aug-92																						
Sep-92																						
Oct-92																						
Nov-92																						
Dec-92																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 500 | Property: Star Point | Location: 100' S 1300' W of NE corn. Sec 18, T15S, R8E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9460

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/25	0																				NO FLOW
Jul-93	07/27	0																				NO FLOW
Aug-93	08/18	0																				NO FLOW
Sep-93	09/28	0																				NO FLOW
Oct-93																						
Nov-93																						
Dec-93																						
Jan-94																						
Feb-94																						
Mar-94																						
Apr-94																						
May-94	06/20	0																				NO FLOW
Jun-94	07/20	0																				NO FLOW
Jul-94	08/31	0																				NO FLOW
Aug-94																						
Sep-94	09/21	0																				NO FLOW
Oct-94																						
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95																						
Mar-95	06/22	0																				
Apr-95	07/27	0																				
May-95	08/23	0																				
Jun-95	09/28	0																				
Jul-95																						
Aug-95																						
Sep-95																						
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/11/96	0																				Dry
Jul-96	07/23/96	0																				Dry
Aug-96	08/19/96	0																				Dry
Sep-96																						
Oct-96	10/01/96	0																				Dry
Nov-96																						
Dec-96																						
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/18/97	0.002	8.19	533	14	232			233	228	2 <	2	10<	59	20.8	0.7	2.7	-0.3	0.01 <	0.27	0.005	Damp-no sample taken.
Jul-97	07/30/97	0																				Dry
Aug-97	08/13/97	0																				Dry
Sep-97	09/16/97	0																				Dry
Oct-97																						
Nov-97																						
Dec-97																						
END DATA																						
Count		39	12	12	12	10	0	0	8	10	1	10	10	10	9	10	10	1	10	10	10	
Minimum		0	6.6	280	5.4	198	ERR	ERR	218	228	2 <	2	0	34	19 <	0.7	2	-0.3 <	0.01 <	0.02 <	0.005	
Maximum		0.01	8.4	690	14	268	ERR	ERR	273	271	2 <	3	16	75	23 <	1	3	-0.3 <	0.02 <	1.44 <	0.06	
Average		0.0006	7.8325	416.83	7.75	242.2	ERR	ERR	238.5	256.4	2 <	2.5	6.4	60.3	20.756 <	0.97	2.37	-0.3 <	0.019 <	0.236 <	0.0145	
Standard Deviation		0.0022	0.4636	127.09	2.3939	19.234	ERR	ERR	19.196	14.34	0 <	0.5	5.4991	11.349	1.3945 <	0.09	0.4605	0 <	0.003 <	0.4136 <	0.0152	
Avg. -1 Std. Dev.		-0.002	7.3669	289.74	5.3561	222.97	ERR	ERR	219.3	242.06	2 <	2	0.9009	48.951	19.361 <	0.88	1.9095	-0.3 <	0.016 <	-0.178 <	-0.001	
Avg. +1 Std. Dev.		0.0028	8.2961	543.92	10.144	261.43	ERR	ERR	257.7	270.74	2 <	3	11.899	71.649	22.15 <	1.06	2.8305	-0.3 <	0.022 <	0.6496 <	0.0297	
Avg. -2 Std. Dev.		[illegible]004	6.9052	162.65	2.9622	203.73	ERR	ERR	200.11	227.72	2	1.5	-4.598	37.601	17.967 <	0.79	1.4489	-0.3 <	0.013 <	-0.591 <	-0.016	
Avg. +2 Std. Dev.		[illegible]005	8.7598	671.01	12.538	280.67	ERR	ERR	276.89	285.08	2	3.5	17.398	82.999	23.545 <	1.15	3.2911	-0.3 <	0.025 <	1.0631 <	0.045	

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

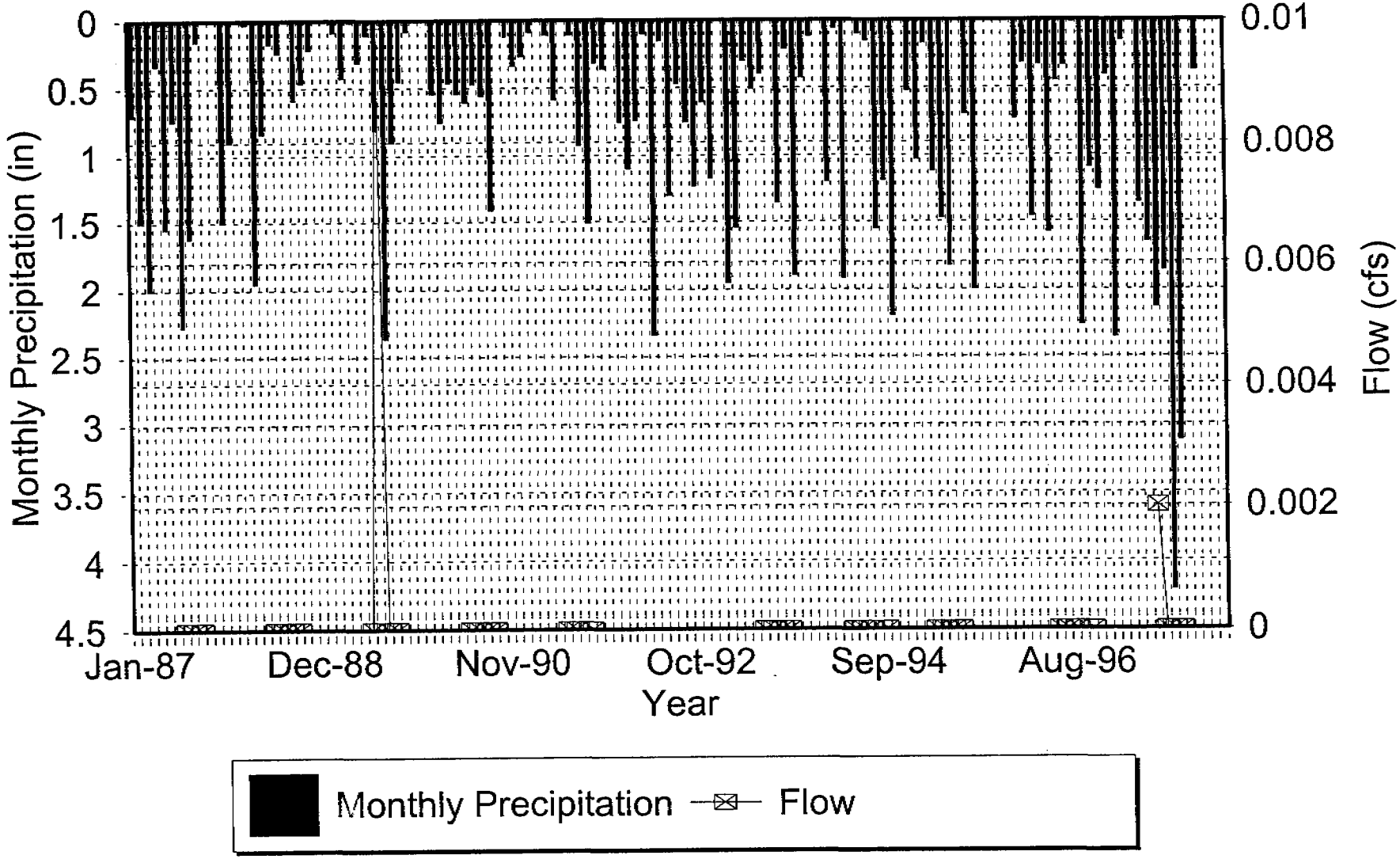
Station: 500 | Property: Star Point | Location: 100' S 1300' W of NE com. Sec 18, T15S, R8E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: Price River | Elevation: 9460

Date		Field Measurements				Laboratory Measurements																Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

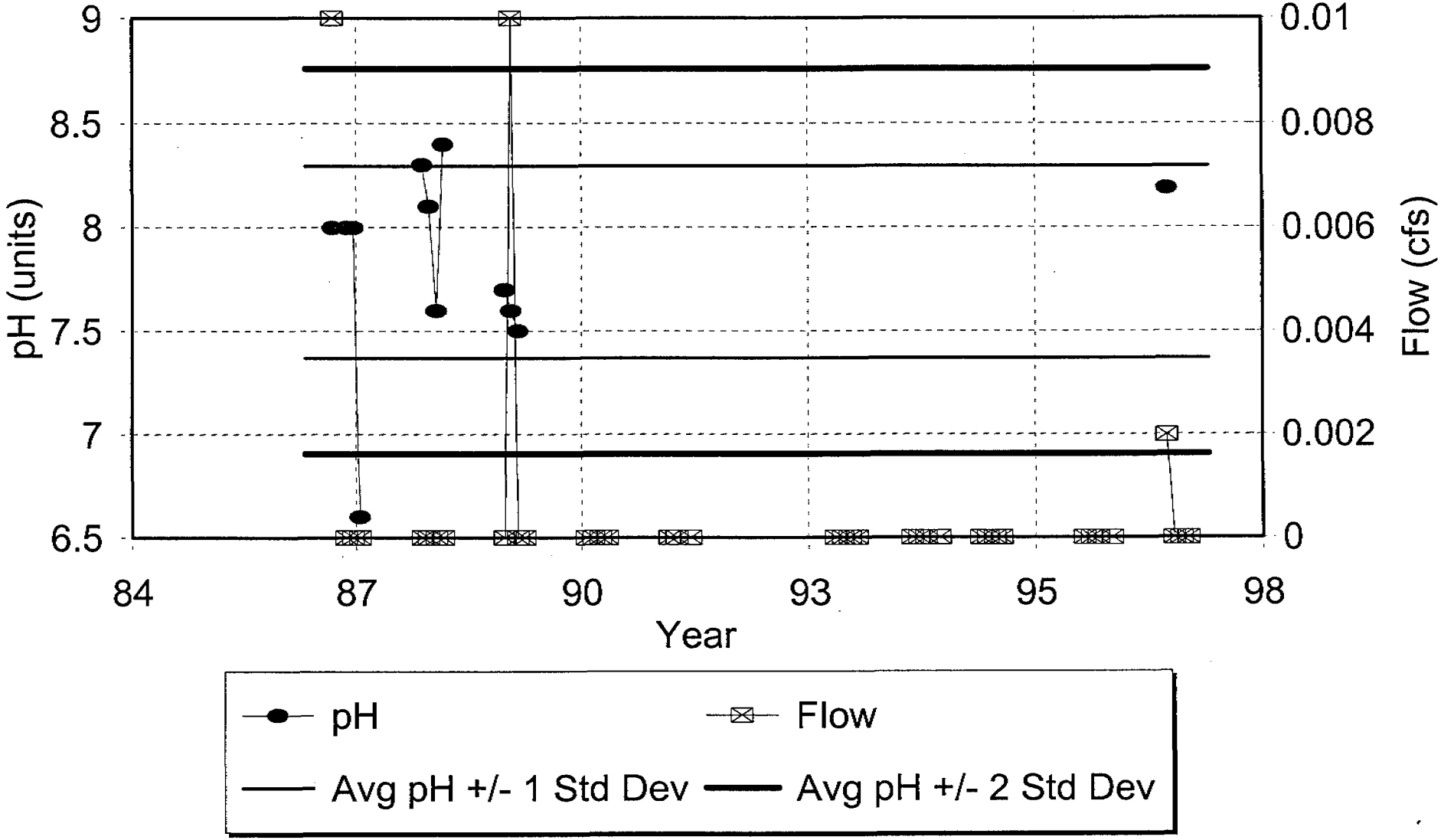
Station 500

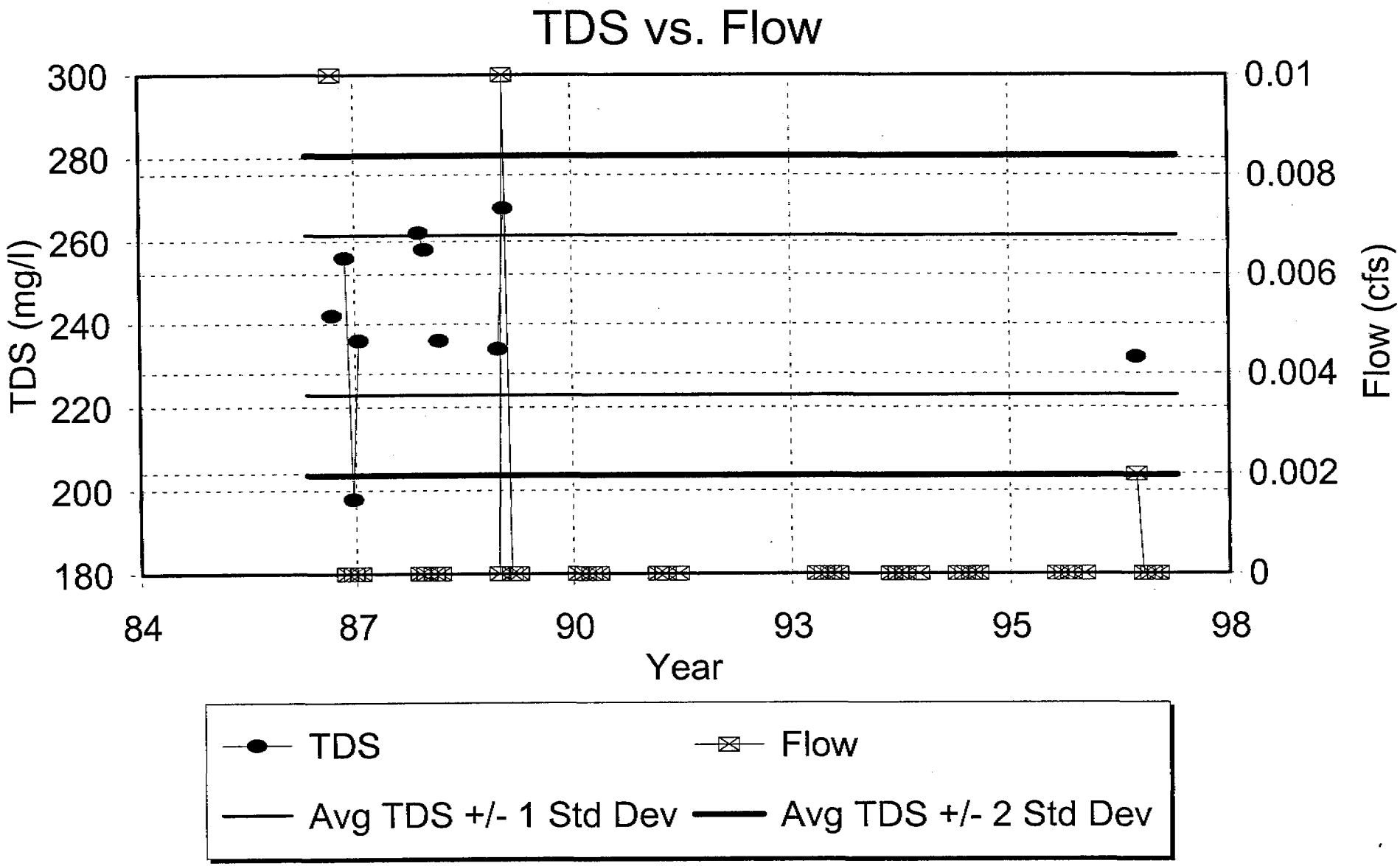
Monthly Precipitation vs. Flow

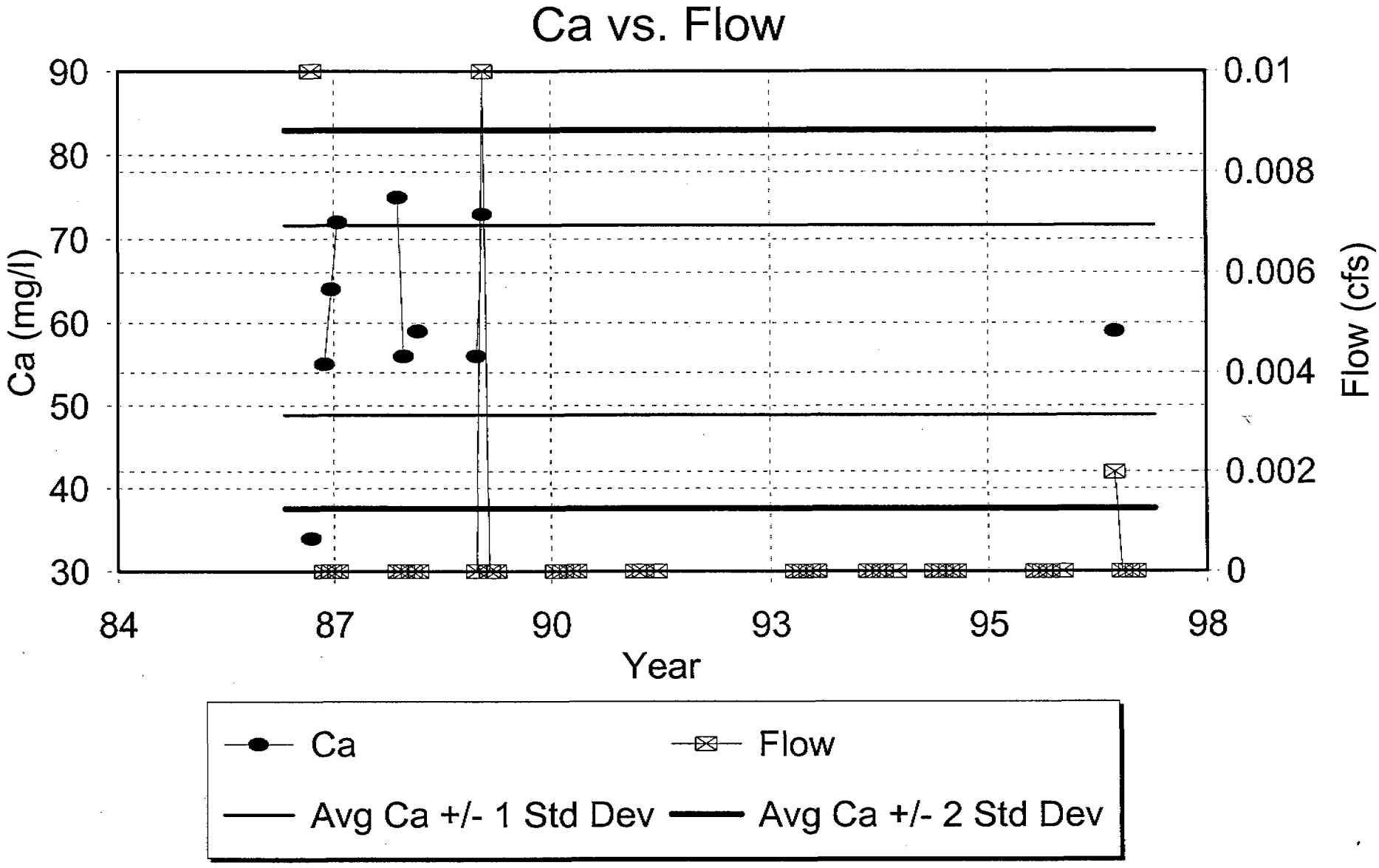


Station 500

pH vs. Flow

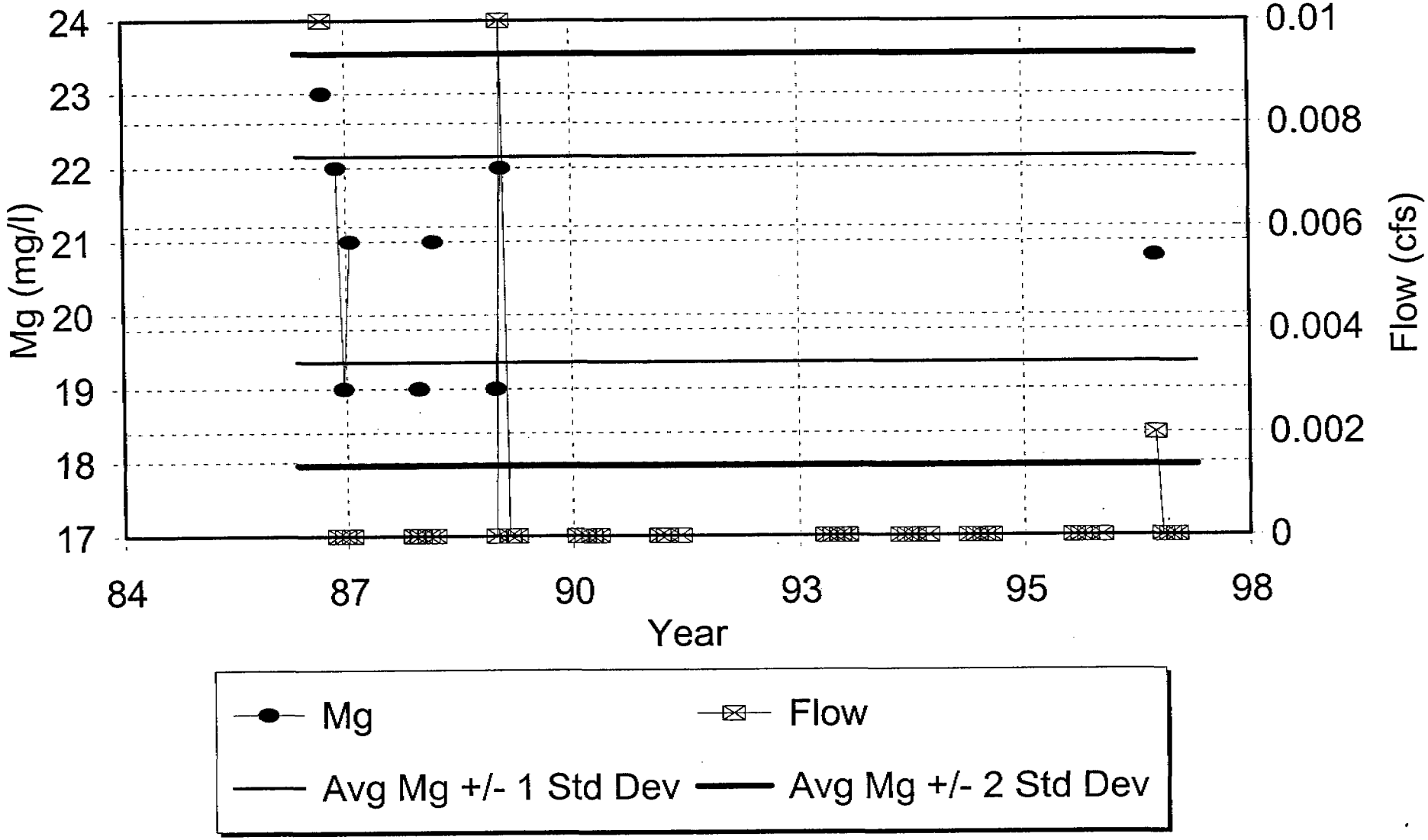



Station 500
TDS vs. Flow
TDS (mg/l)
300
280
260
240
220
200
180
Flow (cfs)
0.01
0.008
0.006
0.004
0.002
0
84
87
90
93
95
98
Year
TDS
Flow
Avg TDS +/- 1 Std Dev
Avg TDS +/- 2 Std Dev


Station 500
Ca vs. Flow
Ca (mg/l)
90
80
70
60
50
40
30
Flow (cfs)
0.01
0.008
0.006
0.004
0.002
0
84
87
90
93
95
98
Year
Ca
Flow
Avg Ca +/- 1 Std Dev
Avg Ca +/- 2 Std Dev

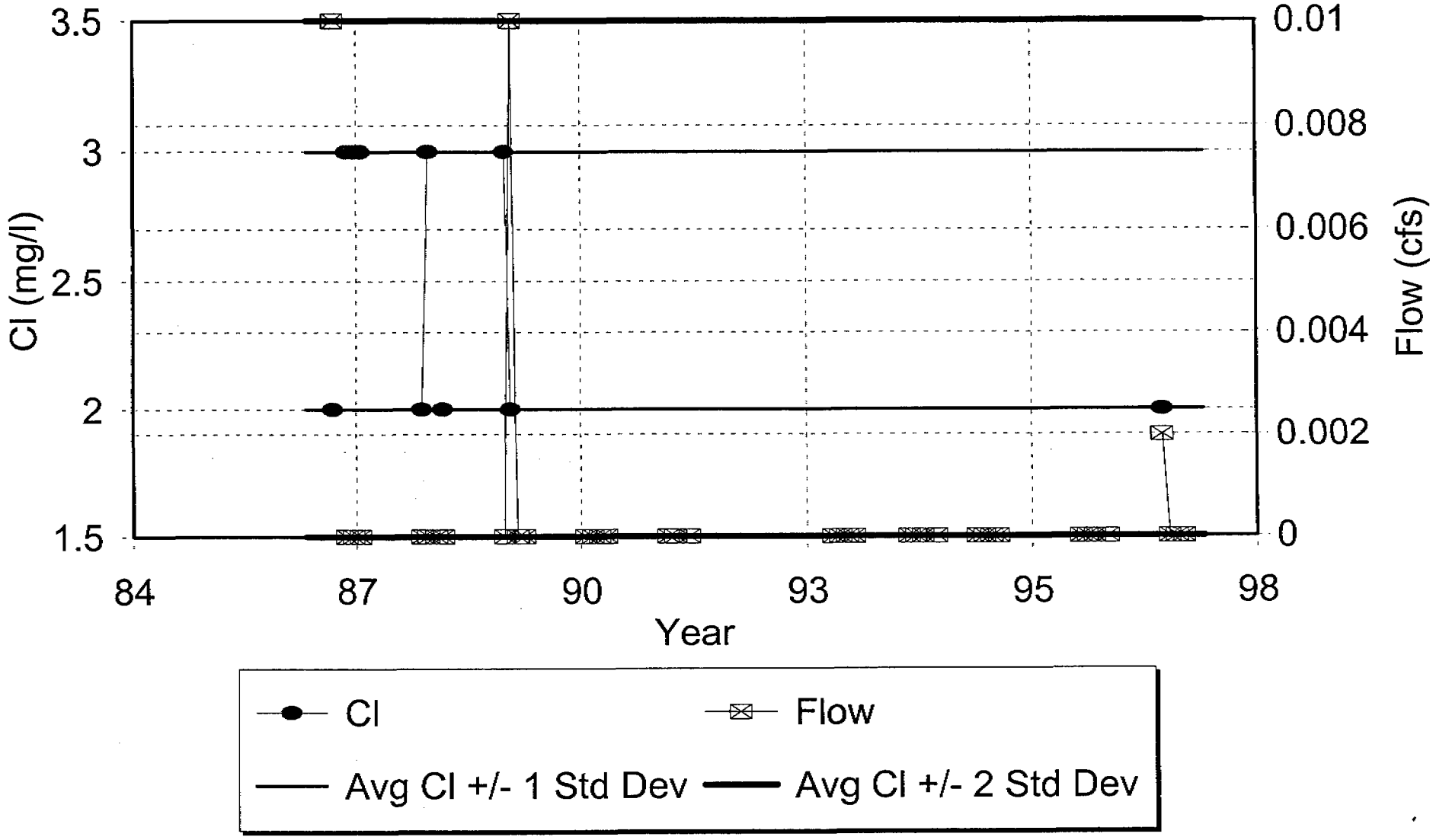
Station 500

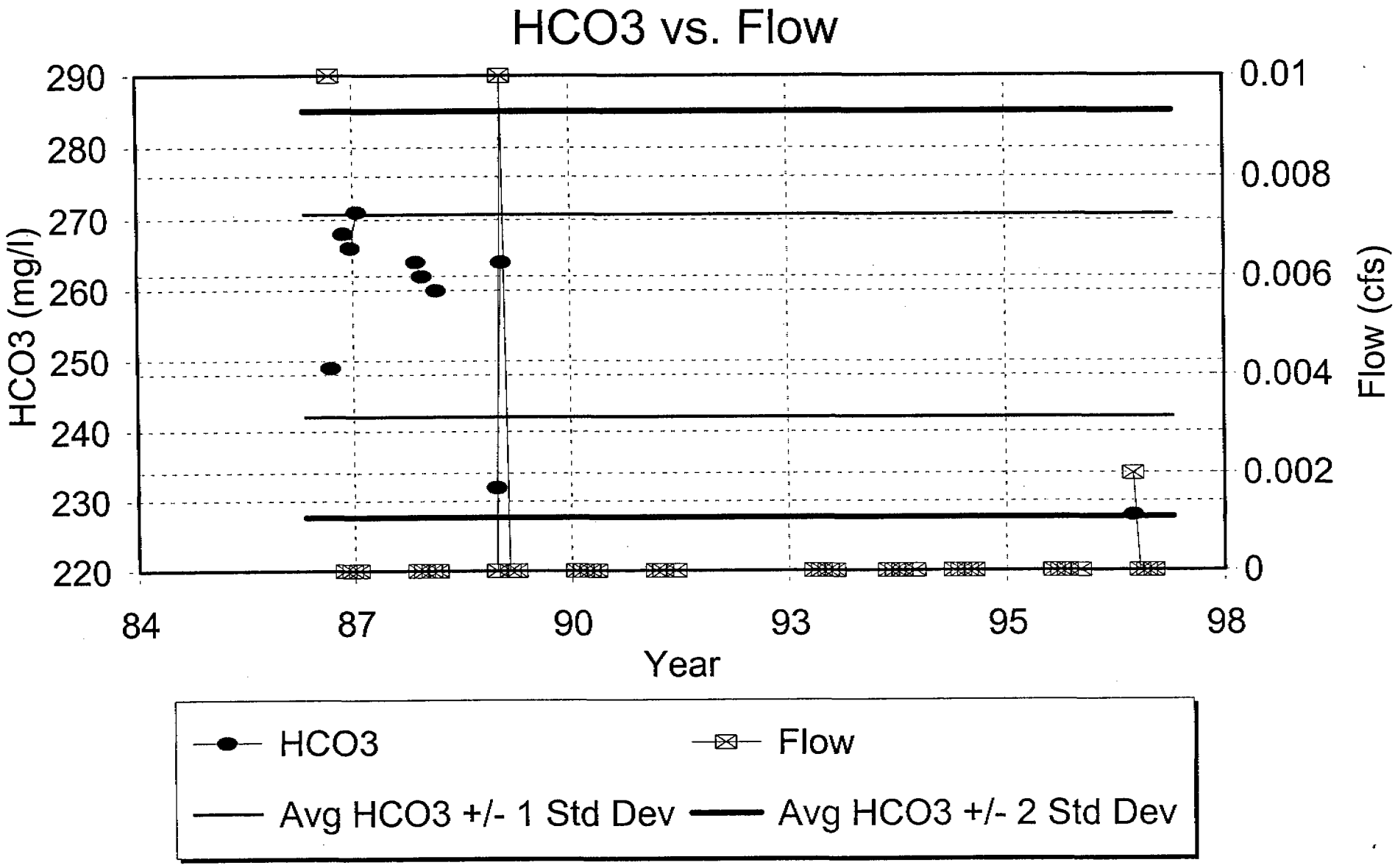
Mg vs. Flow

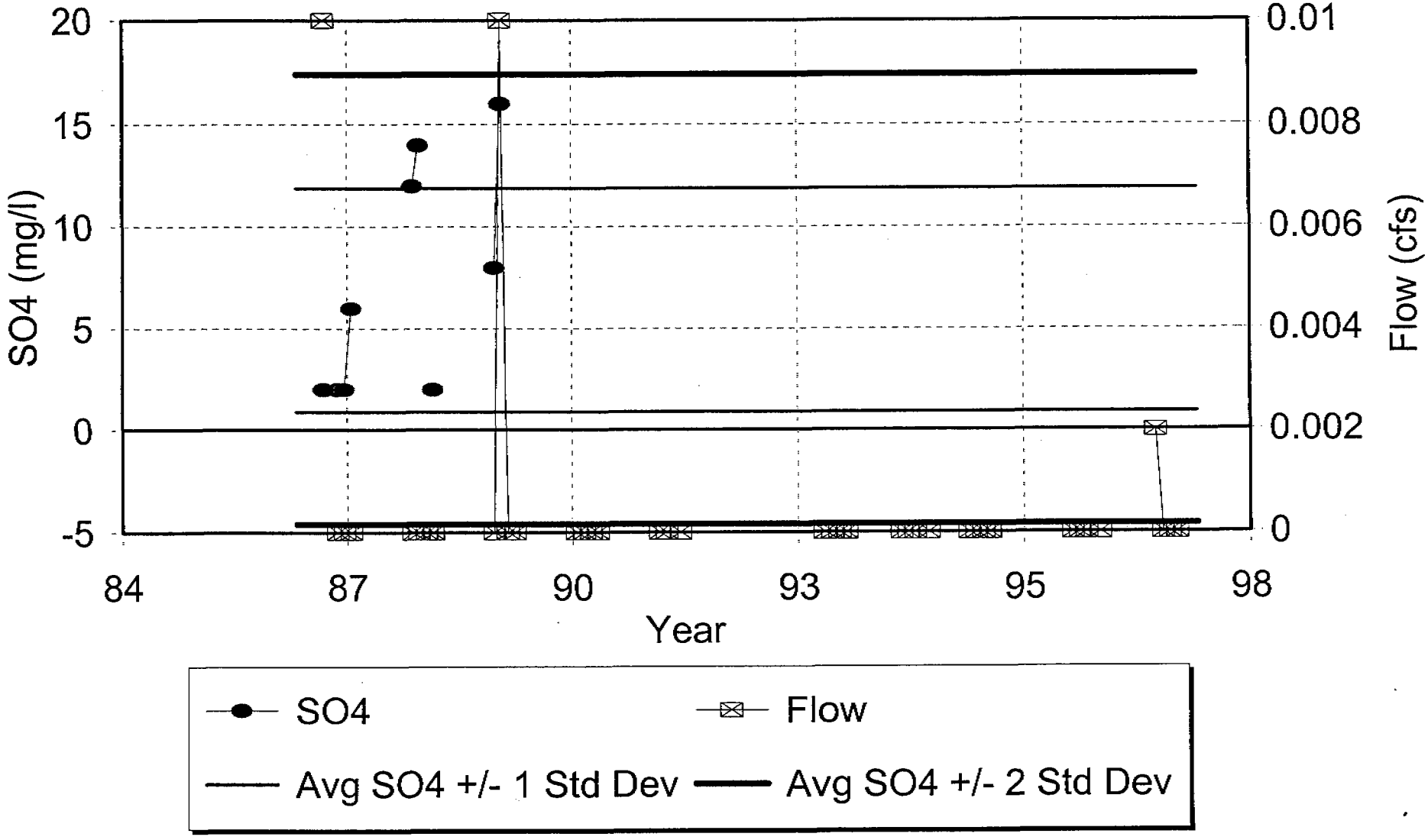


Station 500

Cl vs. Flow




Station 500
HCO3 vs. Flow
HCO3 (mg/l)
290
280
270
260
250
240
230
220
Flow (cfs)
0.01
0.008
0.006
0.004
0.002
0
84
87
90
93
95
98
Year
HCO3
Flow
Avg HCO3 +/- 1 Std Dev
Avg HCO3 +/- 2 Std Dev


Station 500
SO4 vs. Flow
SO4 (mg/l)
Flow (cfs)
Year
20
15
10
5
0
-5
0.01
0.008
0.006
0.004
0.002
0
84
87
90
93
95
98
SO4
Flow
Avg SO4 +/- 1 Std Dev
Avg SO4 +/- 2 Std Dev

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: S111 | Property: Star Point | Location: 2000' S 1875' W of NE corn. Sec 11, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9640

Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92																						
Jun-92	06/17/92	0.001	7	343	9	178			167	195	0	1	29	42	15	1	2	<	0.02	0.02		
Jul-92	07/15/92	0.001	6.9	345	10.5	156			162	207	0	1	2	42	14 <	1	2	<	0.02	0.03		
Aug-92	08/26/92	0.001	6.9	350	9.7																	
Sep-92	09/22/92	0.001	6	4	9.5	186			192	188	5	1	16	49	17	1	2	<	0.02 <	0.02		
Oct-92																						
Nov-92																						
Dec-92																						
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/21/93	0.001	5.9	238	10.2	116			139	168	0	2	4	36	12 <	1	2	<	0.02	0.12 <	0.01	
Jul-93	07/26/93	0.001	6	323	11.1	168			177	207	0	2	4	46	15 <	1	2	<	0.02	0.03 <	0.01	
Aug-93	08/17/93	0.001	6	338	9																	
Sep-93	09/27/93	0.001	6.2	353	8.3	176			160	190	0	2	5	41	14 <	1	2	<	0.02	0.08 <	0.01	
Oct-93																						
Nov-93																						
Dec-93																						
Jan-94																						
Feb-94																						
Mar-94																						
Apr-94																						
May-94																						
Jun-94	06/20/94	0.001	7	360	8.6	178			172	200	0	2	2	44	15 <	1	2	<	0.02	0.1 <	0.01	
Jul-94	07/19/94	< 0.01	7.4	361	13.9	190			190	226	0	2	4	48	17	1	2	* <	0.02	0.06 <	0.01	
Aug-94	08/31/94	0.001	7.7	318	13.1																	
Sep-94	09/21/94	0.002	7.5	412	10.9	192			220	207	0	48	2	55	20	2	3		0.03	0.05 <	0.01	
Oct-94																						
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95																						
Mar-95																						
Apr-95																						
May-95																						
Jun-95	06/22/95	0.002	6.5	193	4.8	120			104	97 <	2	2 <	10	26.6	9.1	0.8	1.9	4.5	0.09	0.38 <	0.005	
Jul-95	07/27/95	0.002	7	313	9	190			174	165 <	2	3	10	44.4	15.3	0.6	2.2	-0.1	0.05	0.02 <	0.005	
Aug-95	08/23/95	0.002	6.42	314	10																	calibrated ph meter
Sep-95	09/27/95	0.002	6.9	504	8	190			196	172 <	2	5	8	50.3	17.1	0.7	2.2	3.7 <	0.01	0.02 <	0.005	
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/12/96	0.001	6.94	302	9	134			145	132	2 <	2	10 <	36.9	12.9	0.5	2	5.4	0.04	0.26	0.005	
Jul-96	07/27/96	0.0006	7.56	343	10	201			200	180	2 <	2	20	50.9	17.7	0.6	2.2	0.4	0.01	0.03	0.005	
Aug-96	08/19/96	0.001	7.75	304	10																	
Sep-96	09/30/96	0.0006	7.6	372	9	184			191	189	2 <	2	10 <	49.3	16.6	0.8	2.1	1.3	0.01 <	0.03	0.005	
Oct-96																						
Nov-96																						
Dec-96																						
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/17/97	0.002	8.6	271	6.5	139			151	136	2 <	2	10 <	40	12.5	0.8	2	6.1	0.02	0.23	0.005	
Jul-97	07/30/97	0.001	7.41	332	9.5	350			340	160	10 <	0.5 <	5 >	43	15	1	2.1	4.4	0.01 <	0.05	0.005	
Aug-97	08/13/97	0.001	7.53	338	11																	
Sep-97	09/17/97	0.0011	7.71	399	9	150			180	180	10 <	3.9	5 <	47	15	1.3	2.6	0.2	0.01 <	0.04	0.005	
Oct-97																						
Nov-97																						
Dec-97																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

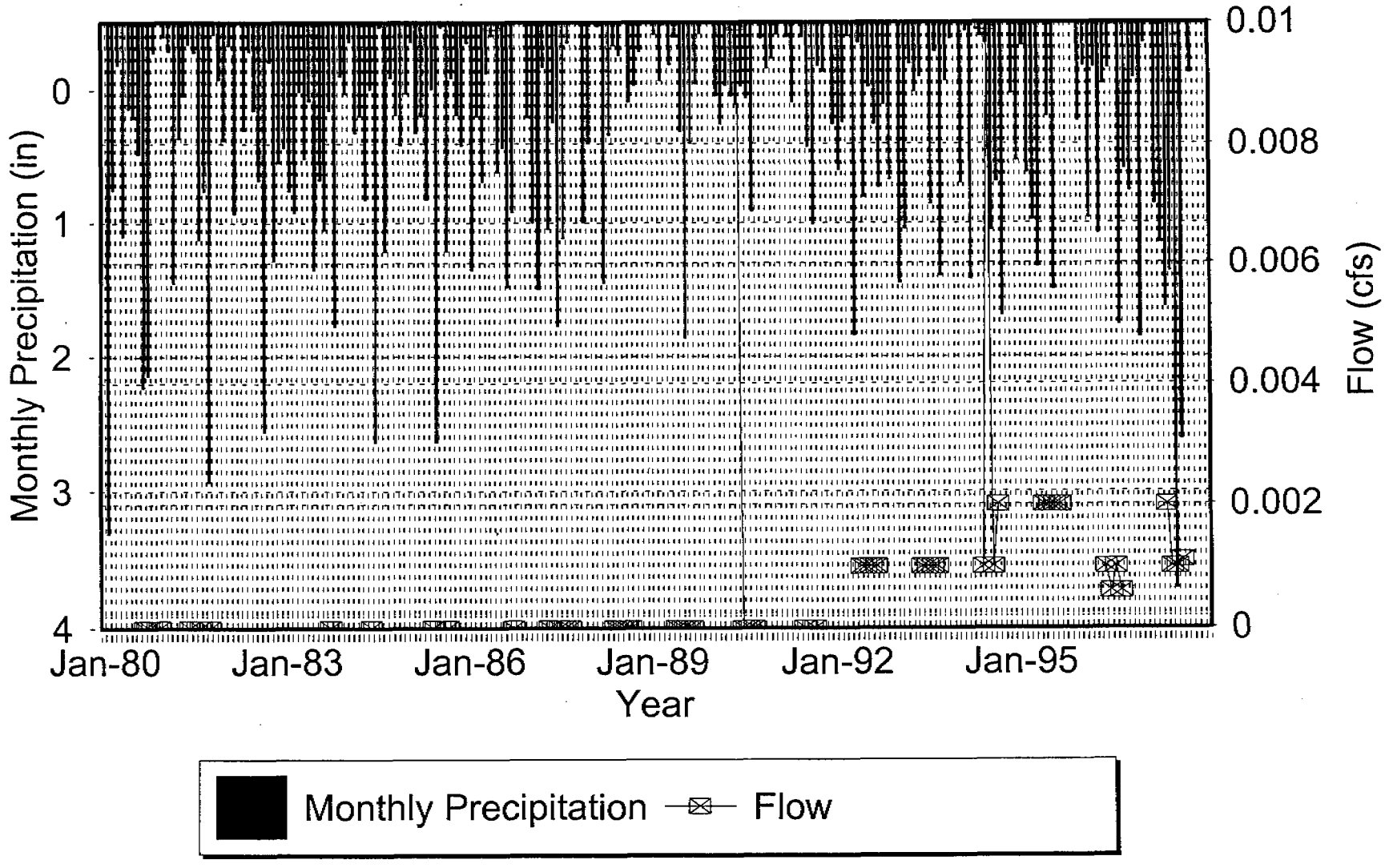
Station: S111 | Property: Star Point | Location: 2000' S 1875' W of NE corn. Sec 11, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9640

Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
END DATA																						
Count		54	26	26	26	45	0	0	20	20	20	20	20	20	20	20	20	9	20	20	17	
Minimum		< 0	5.9	4	4.8	116	ERR	ERR	104	97	< 0	< 0.5	< 2	< 26.6	9.1	< 0.5	1.9	-0.1	< 0.01	< 0.02	< 0.005	
Maximum		< 0.01	6.6	504	15	686	ERR	ERR	340	226	< 10	< 46	< 29	< 55	20	< 2	3	6.1	< 0.09	< 0.38	< 0.01	
Average		< 0.0011	7.0431	324.62	9.7923	198.87	ERR	ERR	162.2	160.7	< 1.95	< 5.72	< 8	< 44.47	15.21	< 0.955	2.165	2.6778	< 0.0245	< 0.0615	< 0.0074	
Standard Deviation		< 0.0023	0.661	84.749	1.9664	85.456	ERR	ERR	44.215	30.674	< 2.9745	< 11.373	< 6.7971	< 6.306	2.3763	< 0.3024	0.3135	2.2861	< 0.018	< 0.0949	< 0.0025	
Avg. -1 Std. Dev.		< -0.001	6.382	239.87	7.8239	113.41	ERR	ERR	137.99	150.03	< -1.024	< -5.653	< 1.2029	< 38.164	12.834	< 0.6526	1.8515	0.5917	< 0.0065	< -0.013	< 0.0049	
Avg. +1 Std. Dev.		< 0.0033	7.7041	409.36	11.761	284.32	ERR	ERR	226.41	211.37	< 4.9245	< 17.093	< 14.797	< 50.776	17.586	< 1.2574	2.4785	5.1639	< 0.0425	< 0.1764	< 0.0098	
Avg. -2 Std. Dev.		< -0.003	5.721	155.12	5.8555	27.955	ERR	ERR	93.77	119.35	< -3.999	< -17.03	< -5.594	< 31.858	10.457	< 0.3501	1.538	-1.694	< -0.012	< -0.108	< 0.0024	
Avg. +2 Std. Dev.		< 0.0056	8.3651	494.11	13.729	369.78	ERR	ERR	270.63	242.05	< 7.8989	< 28.467	< 21.594	< 57.082	19.963	< 1.5599	2.792	7.4499	< 0.0605	< 0.2714	< 0.0123	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

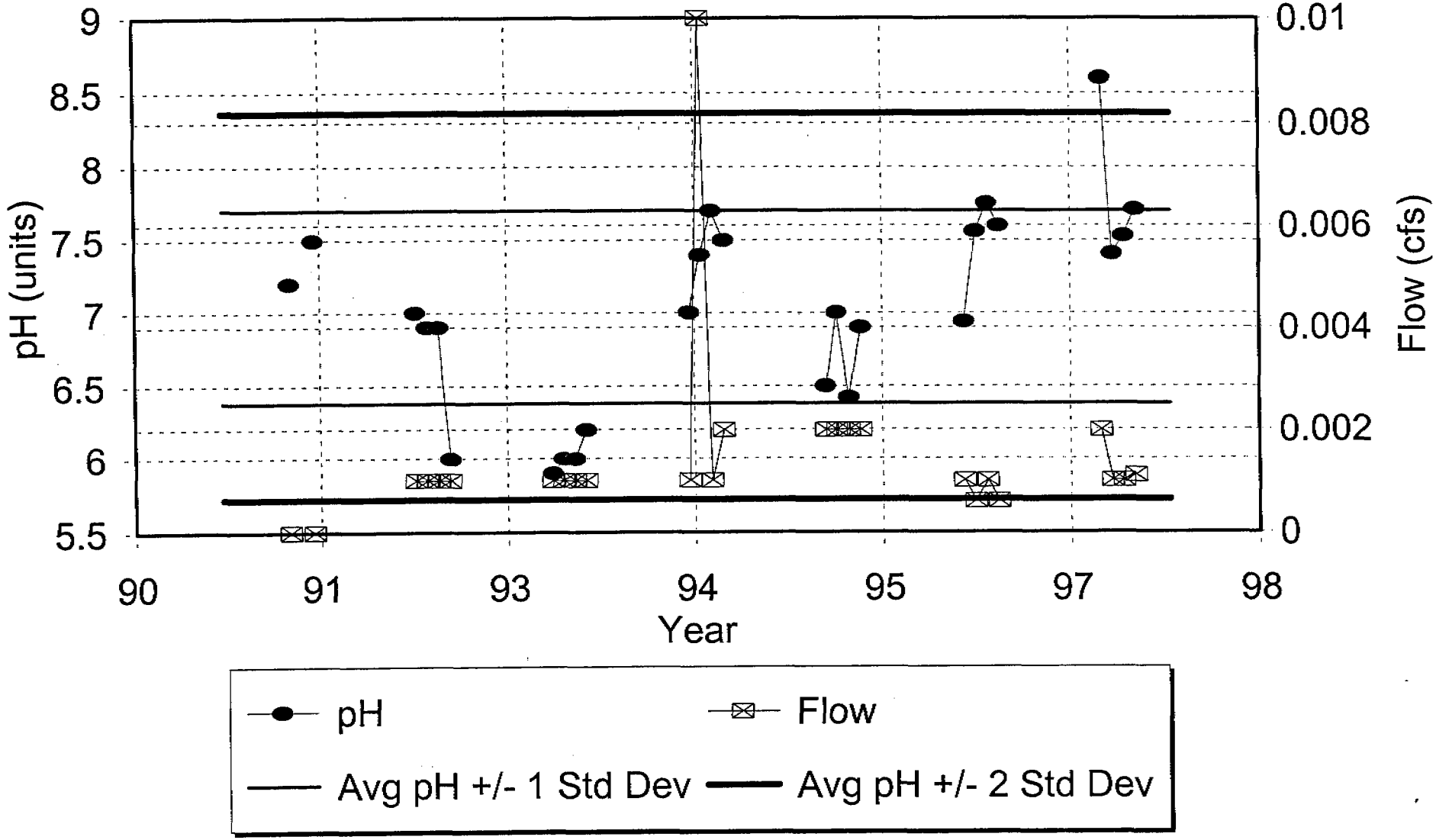
Station S111

Monthly Precipitation vs. Flow



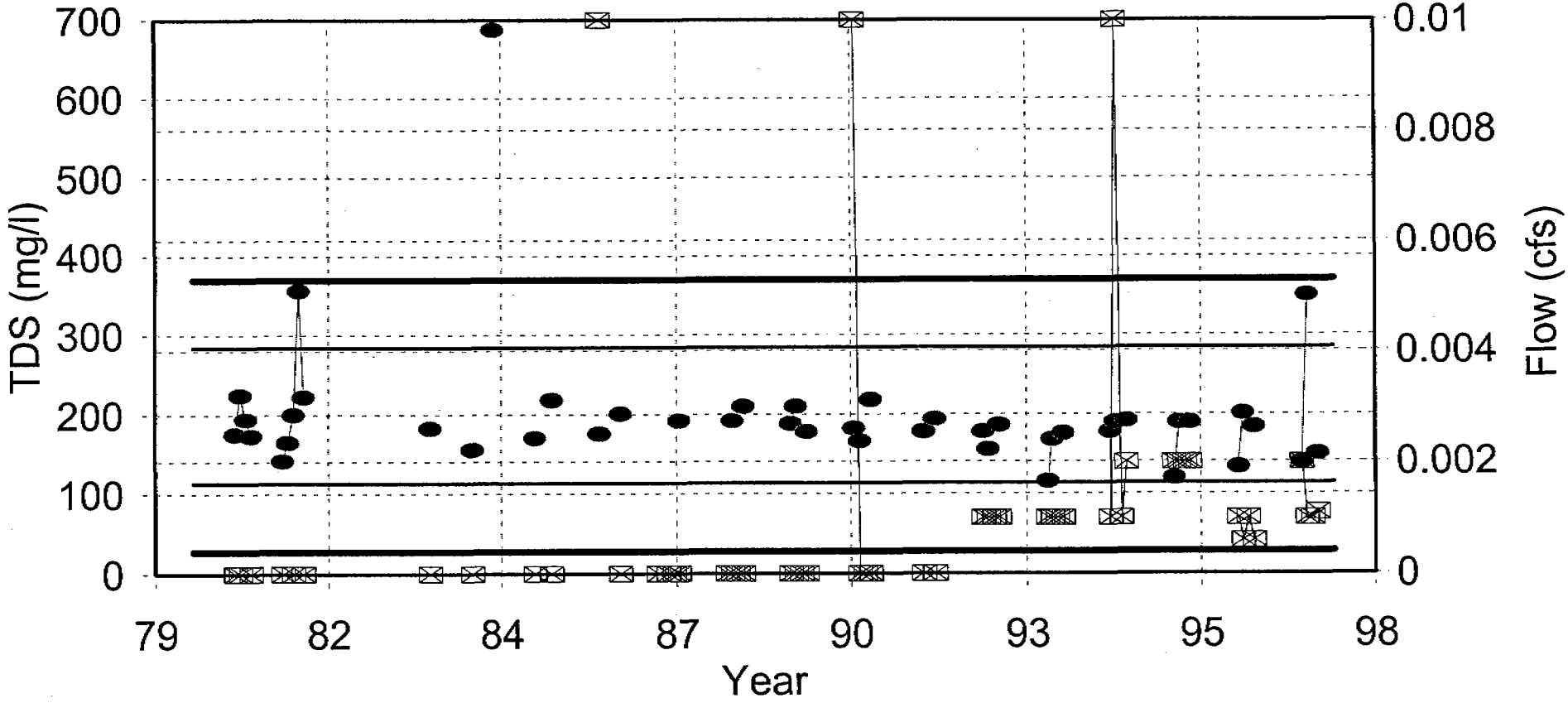
Station S111

pH vs. Flow



Station S111

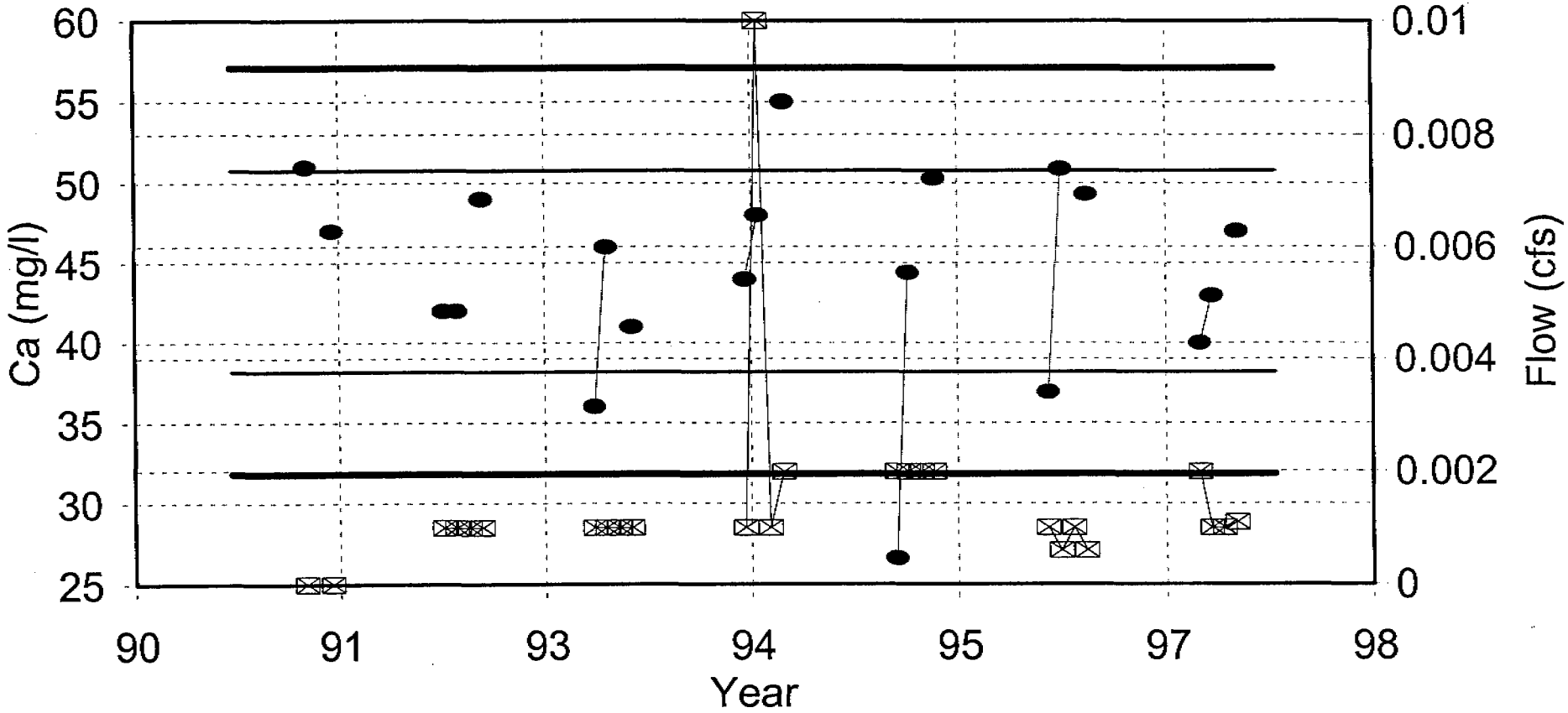
TDS vs. Flow



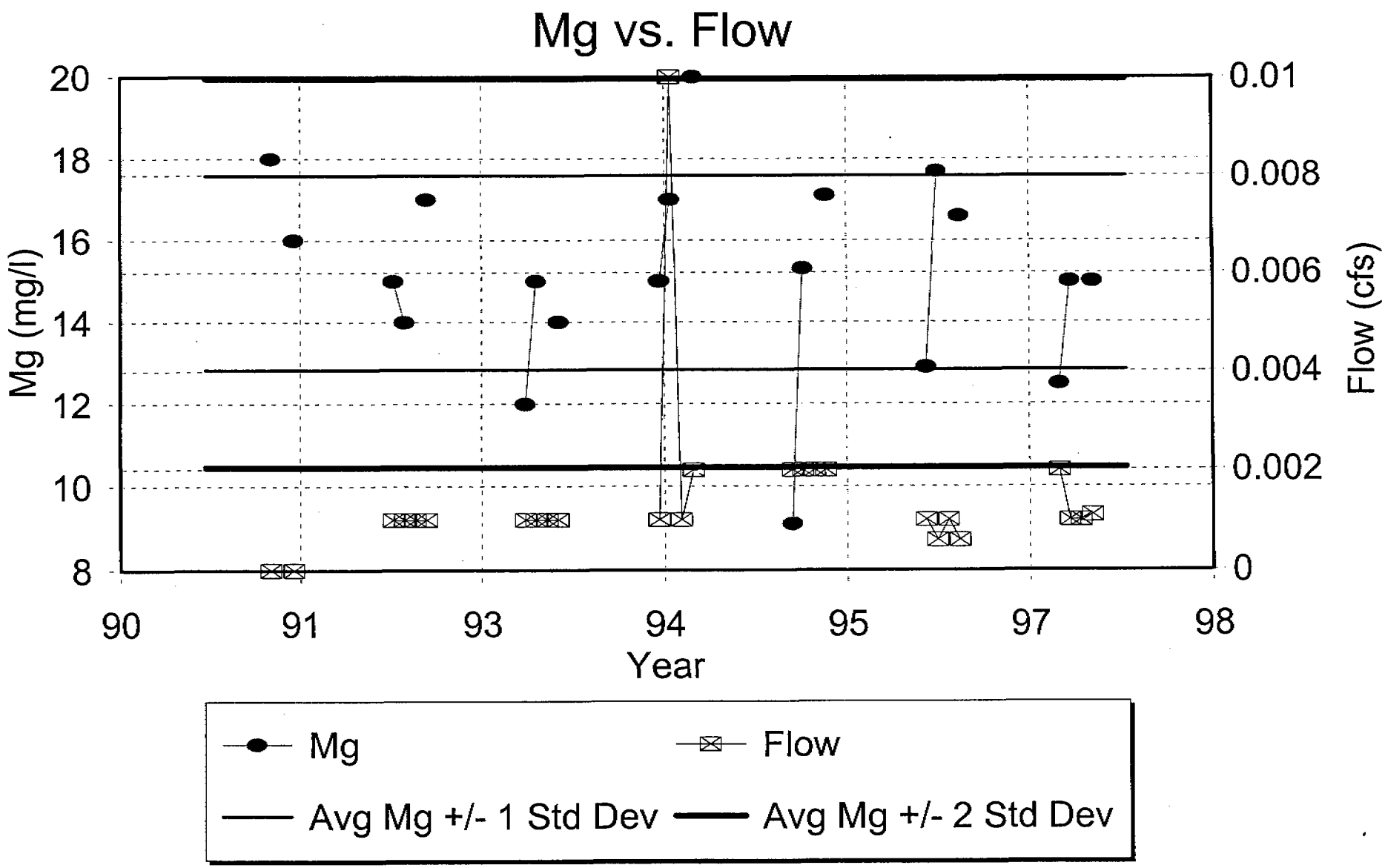
TDS
Flow
Avg TDS +/- 1 Std Dev
Avg TDS +/- 2 Std Dev

Station S111

Ca vs. Flow

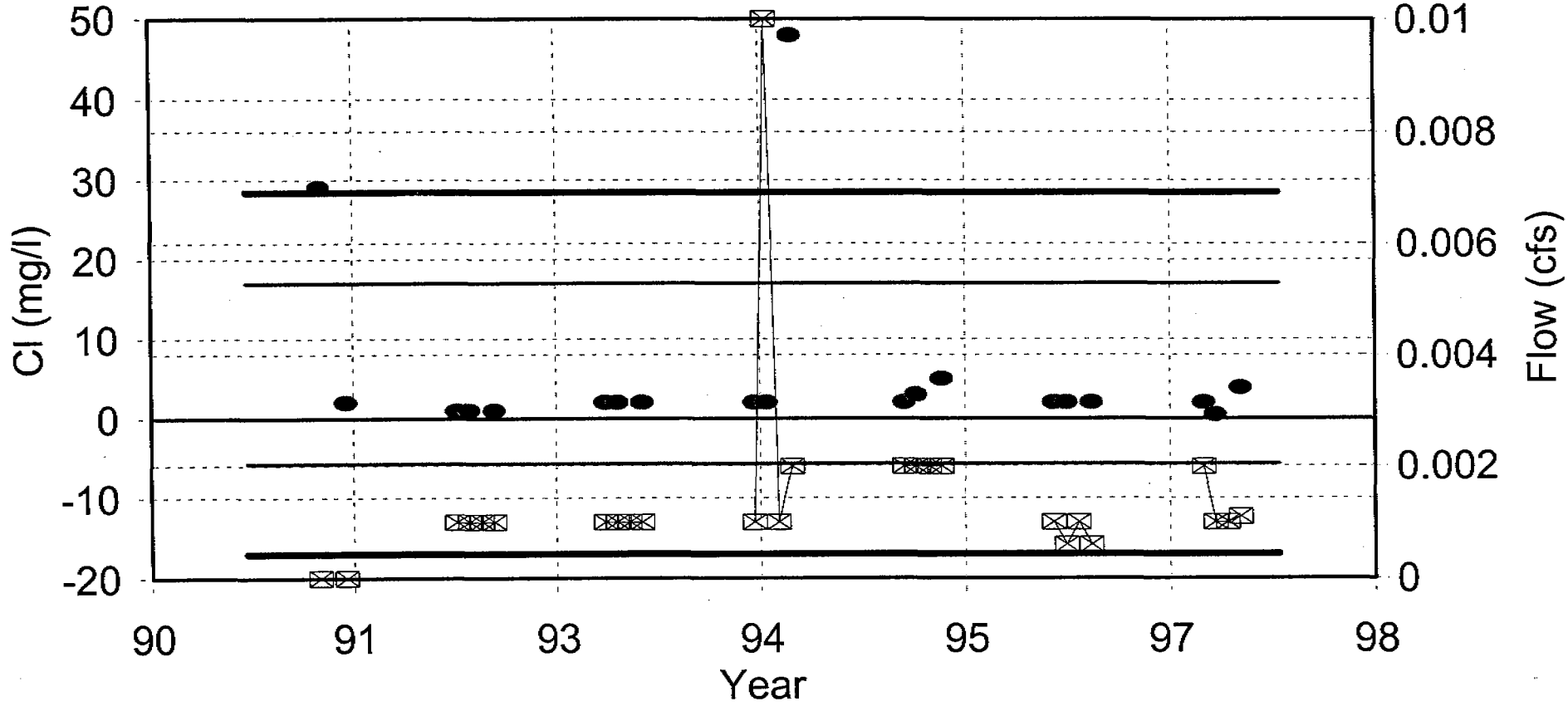


Ca
Flow
Avg Ca +/- 1 Std Dev
Avg Ca +/- 2 Std Dev

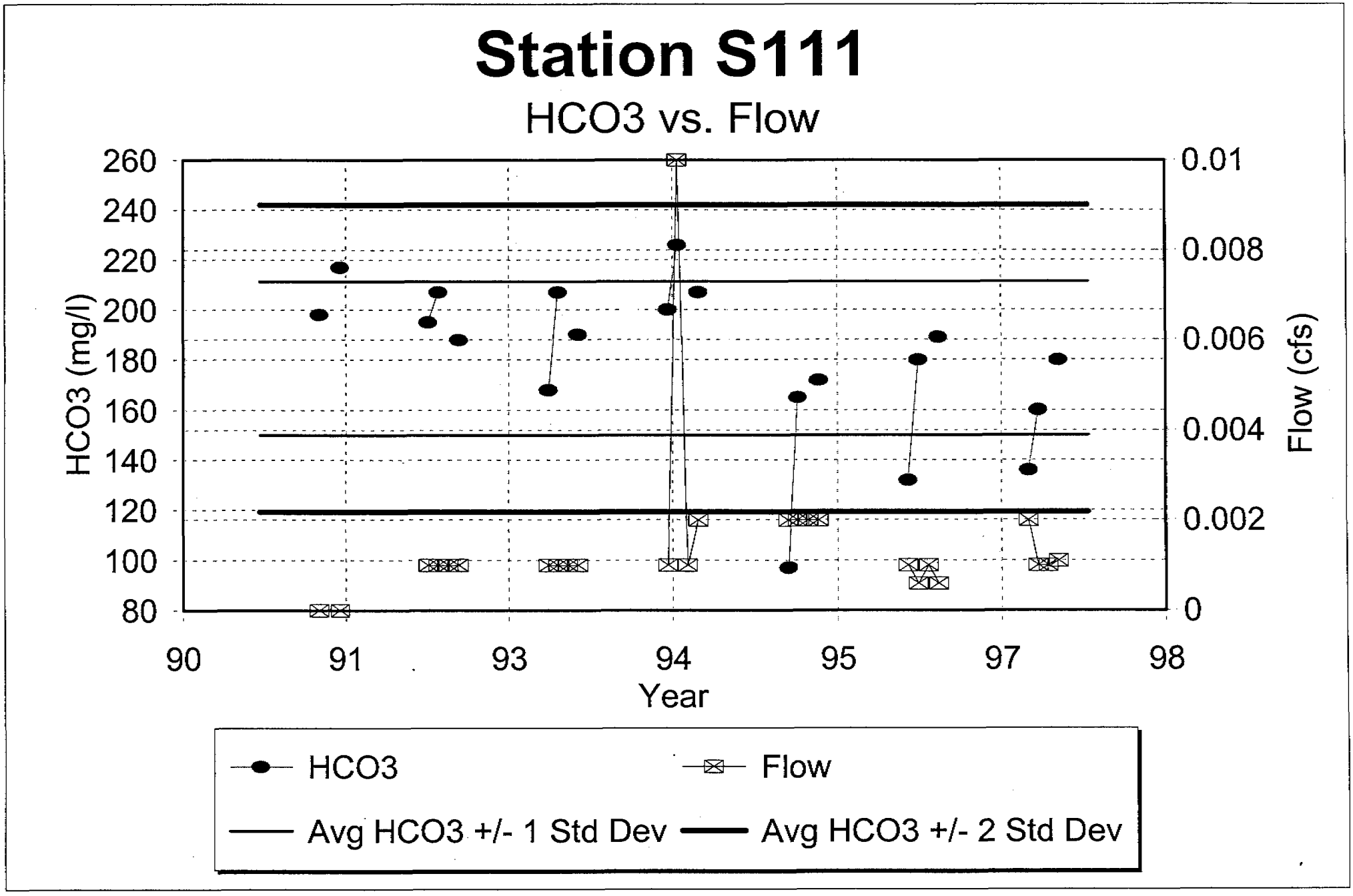

Station S111
Mg vs. Flow
Mg (mg/l)
20
18
16
14
12
10
8
0.01
0.008
0.006
0.004
0.002
0
Flow (cfs)
90
91
93
94
95
97
98
Year
Mg
Flow
Avg Mg +/- 1 Std Dev
Avg Mg +/- 2 Std Dev

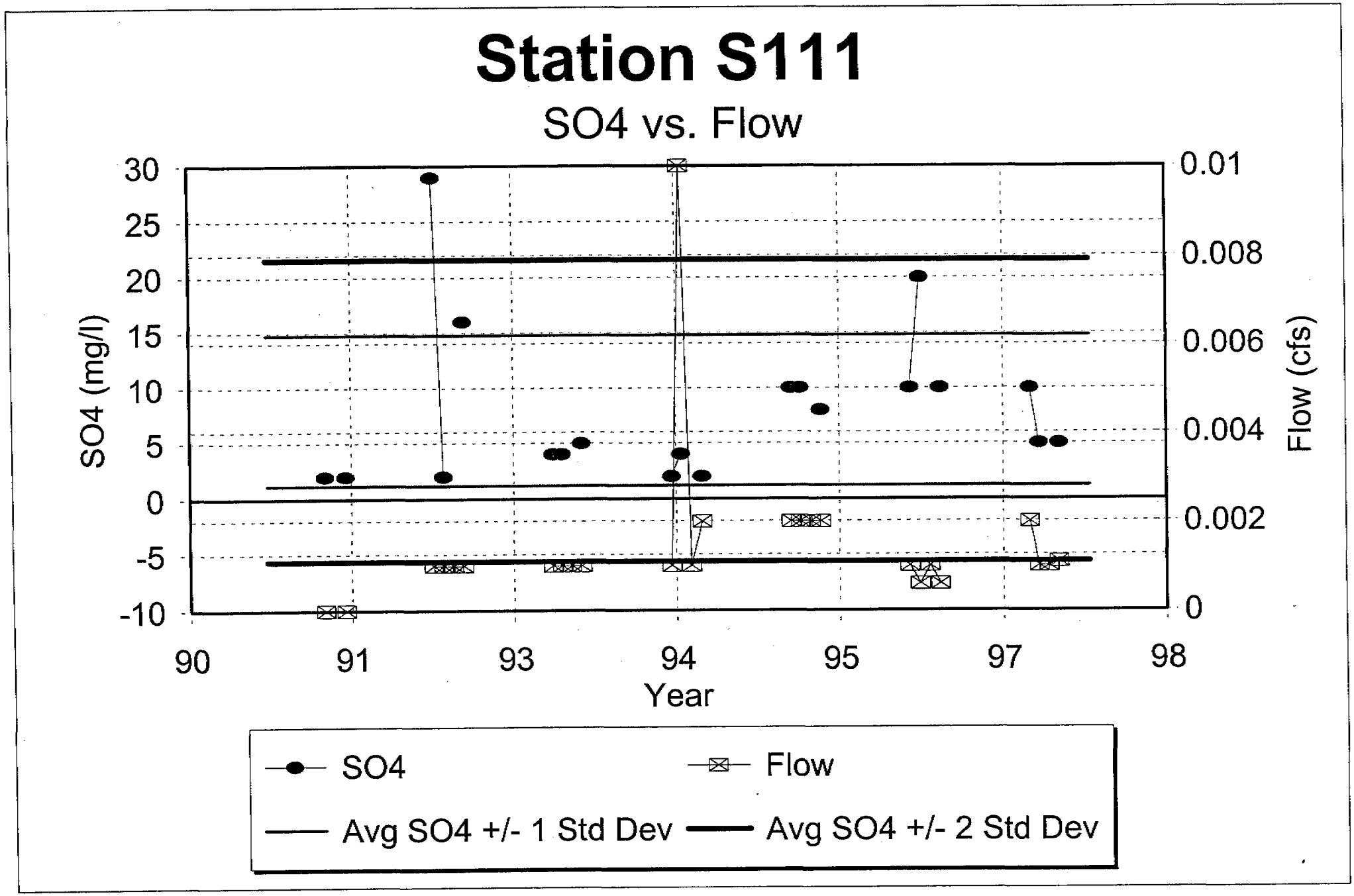
Station S111

Cl vs. Flow



Cl
Flow
Avg Cl +/- 1 Std Dev
Avg Cl +/- 2 Std Dev


Station S111
HCO3 vs. Flow
HCO3 (mg/l)
260
240
220
200
180
160
140
120
100
80
Flow (cfs)
0.01
0.008
0.006
0.004
0.002
0
90
91
93
94
95
97
98
Year
HCO3
Flow
Avg HCO3 +/- 1 Std Dev
Avg HCO3 +/- 2 Std Dev


Station S111
SO4 vs. Flow
SO4 (mg/l)
30
25
20
15
10
5
0
-5
-10
0.01
0.008
0.006
0.004
0.002
0
Flow (cfs)
90
91
93
94
95
97
98
Year
SO4
Flow
Avg SO4 +/- 1 Std Dev
Avg SO4 +/- 2 Std Dev

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 232 | Property: Star Point | Location: 340' N 60' W of SE com. Sec 12, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9775

Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-88																						
Feb-88																						
Mar-88																						
Apr-88																						
May-88																						
Jun-88	06/01/88	0.01																				
Jul-88																						
Aug-88																						
Sep-88	09/03/88	0																				NO FLOW
Oct-88																						
Nov-88																						
Dec-88																						
Jan-89																						
Feb-89																						
Mar-89																						
Apr-89																						
May-89																						
Jun-89	06/05/89	0.01				168																
Jul-89	07/11/89	0																				NO FLOW
Aug-89	08/22/89	0																				NO FLOW
Sep-89	09/15/89	0																				NO FLOW
Oct-89																						
Nov-89																						
Dec-89																						
Jan-90																						
Feb-90																						
Mar-90																						
Apr-90																						
May-90	05/30/90	0.01				208																
Jun-90																						
Jul-90	07/06/90	0				186																
Aug-90	08/22/90	0																				NO FLOW
Sep-90	09/24/90	0																				
Oct-90																						
Nov-90																						
Dec-90																						
Jan-91																						
Feb-91																						
Mar-91																						
Apr-91																						
May-91																						
Jun-91	06/12/91	0.02	7.2	300	4	200			150	154	5	2	29	47	8	2	6		0.03	0.23 <	0.01	
Jul-91	07/15/91	0	6.7	370	10	206			206	251	0	1	2	74	5 <	1	2	<	0.02	0.02 <	0.01	
Aug-91																						
Sep-91	09/18/91	0																				NO FLOW
Oct-91																						
Nov-91																						
Dec-91																						
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92																						
Jun-92	06/17/92	0.006	7.1	360	5.1	198			195	207	0	1	35	65	8	1	2	<	0.02	0.22		
Jul-92	07/15/92	0.002	7	327	7.8	226			178	200	0	2	16	58	8	1	2	<	0.02	19.8		
Aug-92	08/25/92	0.001	6.7	214	7.5																	
Sep-92	09/21/92	0.001	6	333	10.2	170			165	168	5	2	19	53	8	1	2		0.02	1.54		
Oct-92																						
Nov-92																						
Dec-92																						
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/24/93	0.016	6.1	323	4.6	152			179	190	0	2	19	57	9	1	2	<	0.02	0.05 <	0.01	
Jul-93	07/26/93	0.003	6.1	352	5.6	198			173	220	0	2	10	56	8	2	2	<	0.02	0.2 <	0.01	
Aug-93	08/18/93	0																				NO FLOW
Sep-93	09/28/93	0.001	6.2	295	8.1	178			149	171	0	3	8	48	7 <	1	2	<	0.02	2.63	0.13	
Oct-93																						
Nov-93																						
Dec-93																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

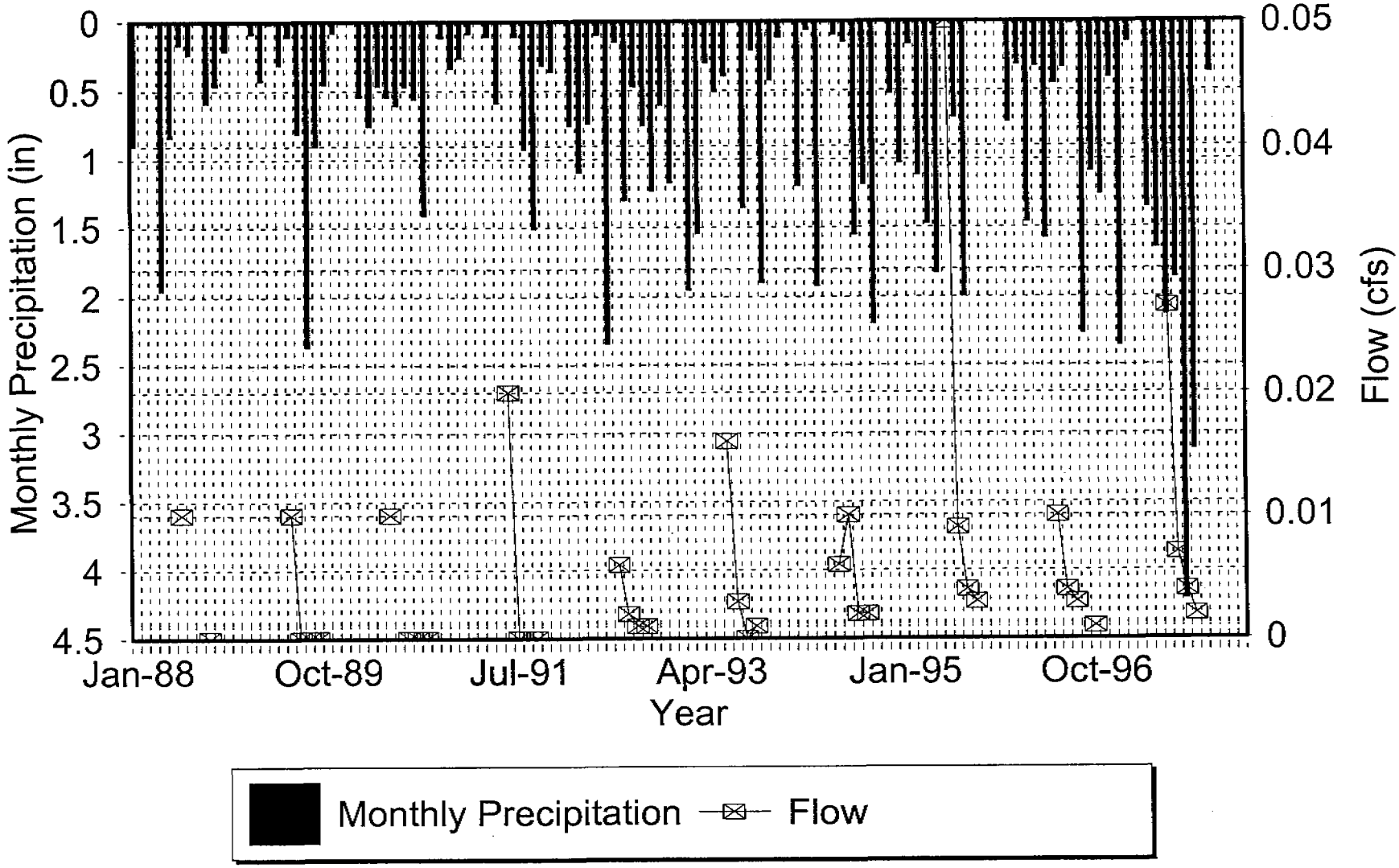
Station: 232 | Property: Star Point | Location: 340' N 60' W of SE corn. Sec 12, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9775

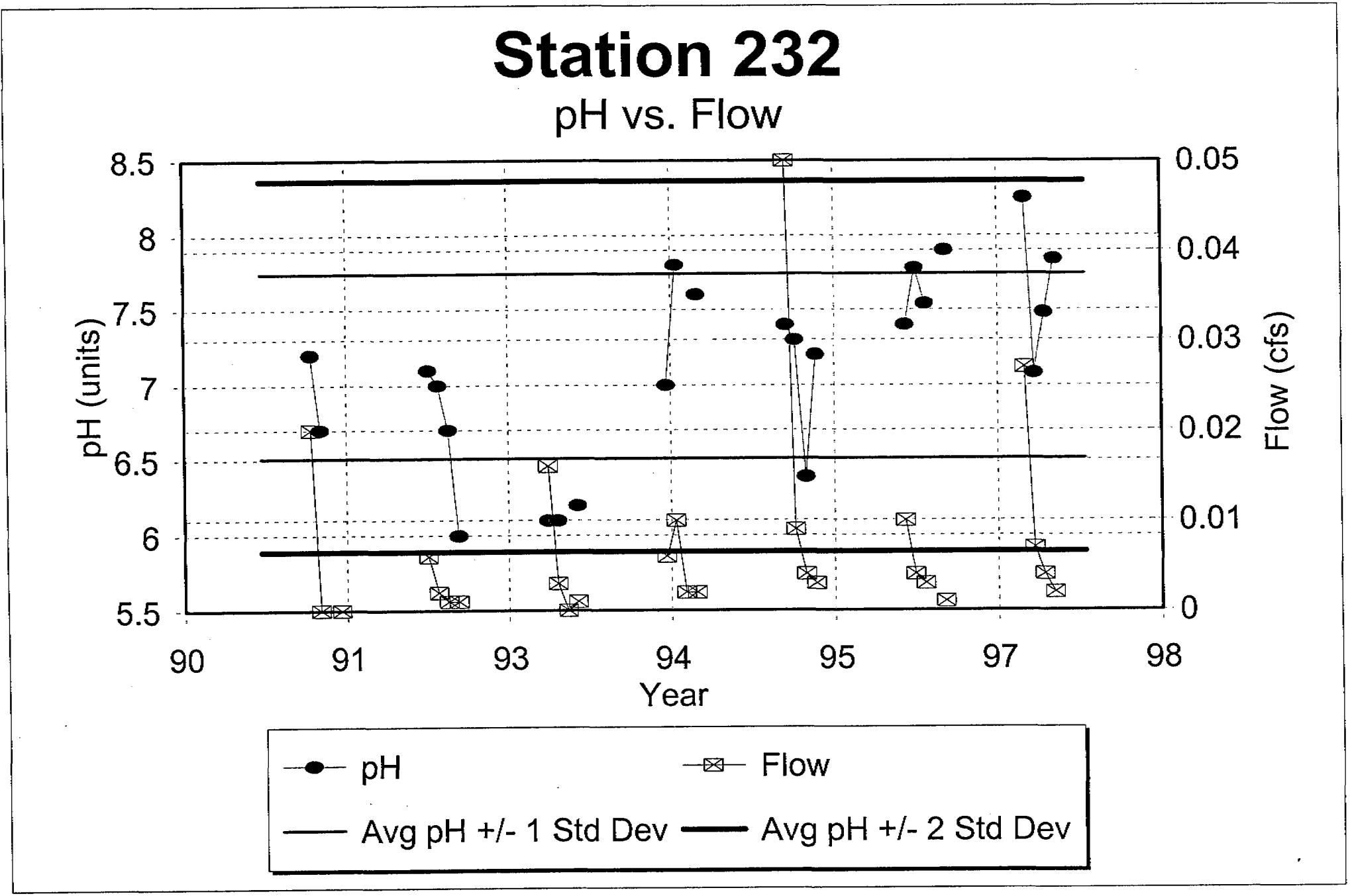
Date		Field Measurements				Laboratory Measurements																	Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	
Jan-94																							
Feb-94																							
Mar-94																							
Apr-94																							
May-94																							
Jun-94	06/09/94	0.006	7	385	3	208			173	212	0	2	2	56	8 <	1	2	<	0.02	0.22 <	0.01		
Jul-94	07/19/94	< 0.01	7.8	340	12.9	160			163	214	0	2	6	52	8	1	2		0.04	0.16 <	0.01		H20 CLEAR, HOWEVER
Aug-94	08/31/94	0.002																					
Sep-94	09/21/94	0.002	7.6	358	12.9	190			187	222	0	2	6	60	9	1	2		0.07	4.22	0.09		
Oct-94																							
Nov-94																							
Dec-94																							
Jan-95																							
Feb-95																							
Mar-95																							
Apr-95																							
May-95																							
Jun-95	06/22/95	0.05	7.4	262	5.2	140			145	128 <	2	2	30	46.8	6.8	1.2	1.8	-3.8	0.04	0.38	0.02		
Jul-95	07/27/95	0.009	7.3	398	6	200			186	170 <	2	2	10	59.6	9.1	1.2	2.2	2.5 <	0.01	0.13 <	0.005		
Aug-95	08/23/95	0.004	6.39	6																			
Sep-95	09/28/95	0.003	7.2	229	6.11	210			191	179 <	2	1	4	61.1	9.2	1.2	2.2	3.2 <	0.01	0.05 <	0.005		
Oct-95																							
Nov-95																							
Dec-95																							
Jan-96																							
Feb-96																							
Mar-96																							
Apr-96																							
May-96																							
Jun-96	06/12/96	0.01	7.4	400	8	167			179	160	2 <	2	10 <	57.6	8.6	0.9	1.9	6.4	0.01 <	0.16	0.01		
Jul-96	07/23/96	0.004	7.76	365	9	208			214	189	2 <	2	10 <	66.3	10.5	1.3	2.4	4.4	0.01 <	0.06	0.005		
Aug-96	08/19/96	0.003	7.54	304	6																		
Sep-96																							
Oct-96	10/01/96	0.001	7.9	423	5	192			202	186	2 <	2	10 <	64.7	9.8	1.3	2.4	5.1	0.14	0.71	0.022		
Nov-96																							
Dec-96																							
Jan-97																							
Feb-97																							
Mar-97																							
Apr-97																							
May-97																							
Jun-97	06/18/97	0.027	8.25	330	7	175			180	156	2 <	1	10 <	58.2	8.5	1.2	2	5.2	0.04	0.29	0.005		
Jul-97	07/30/97	0.007	7.08	399	5	190			190	180	10 <	0.5 <	5 <	62	9.6	1.4	2.3	5.5	0.01	0.3	0.005		
Aug-97	08/13/97	0.004	7.48	405	6																		
Sep-97	09/16/97	0.002	7.84	384	5.5	230			200	180	10 <	0.5 <	5 <	60	11	1.6	2.4	5.8	0.01 <	0.24	0.005		
Oct-97																							
Nov-97																							
Dec-97																							
END DATA																							
Count		37	24	24	23	23	0	0	20	20	20	20	20	20	20	20	20	9	20	20	17		
Minimum		< 0	6	6	3	140	ERR	ERR	145	128 <	0 <	0.5 <	2 <	46.8	5 <	0.9	1.8	-3.8 <	0.01 <	0.02 <	0.005		
Maximum		< 0.05	8.25	423	12.9	230	ERR	ERR	214	251 <	10 <	3 <	35 <	74	11 <	2	6	6.4 <	0.14 <	19.8 <	0.13		
Average		< 0.0061	7.1275	327.58	6.983	190.52	ERR	ERR	180.25	186.85 <	2.2 <	1.7 <	12.3 <	58.215	8.455 <	1.215	2.28	3.6111 <	0.029 <	1.5905 <	0.0213		
Standard Deviation		< 0.0095	0.617	85.532	2.551	21.548	ERR	ERR	18.641	27.995 <	3.01 <	0.6205 <	9.2957 <	6.7375	1.2963 <	0.3119	0.8698	2.9339 <	0.0293 <	4.3057 <	0.0335		
Avg. -1 Std. Dev.		< -0.003	6.5105	242.05	4.432	168.97	ERR	ERR	161.61	158.85 <	-0.61 <	1.0795 <	3.0043 <	51.478	7.1587 <	0.9031	1.4102	0.8772 <	-0.000 <	-2.715 <	-0.012		
Avg. +1 Std. Dev.		< 0.0155	7.7445	413.12	9.534	212.07	ERR	ERR	198.89	214.85 <	5.21 <	2.3205 <	21.596 <	64.952	9.7513 <	1.5269	3.1498	6.745 <	0.0583 <	5.8962 <	0.0547		
Avg. -2 Std. Dev.		< -0.013	5.8935	156.52	1.881	147.42	ERR	ERR	142.97	130.86 <	-3.82 <	0.459 <	-6.291 <	44.74	5.8623 <	0.5912	0.5403	-2.057 <	-0.03 <	-7.021 <	-0.046		
Avg. +2 Std. Dev.		< 0.025	8.3615	498.65	12.085	233.62	ERR	ERR	217.53	242.84 <	8.22 <	2.941 <	30.891 <	71.69	11.048 <	1.8388	4.0197	9.6789 <	0.0876 <	10.202 <	0.0882		

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

Station 232

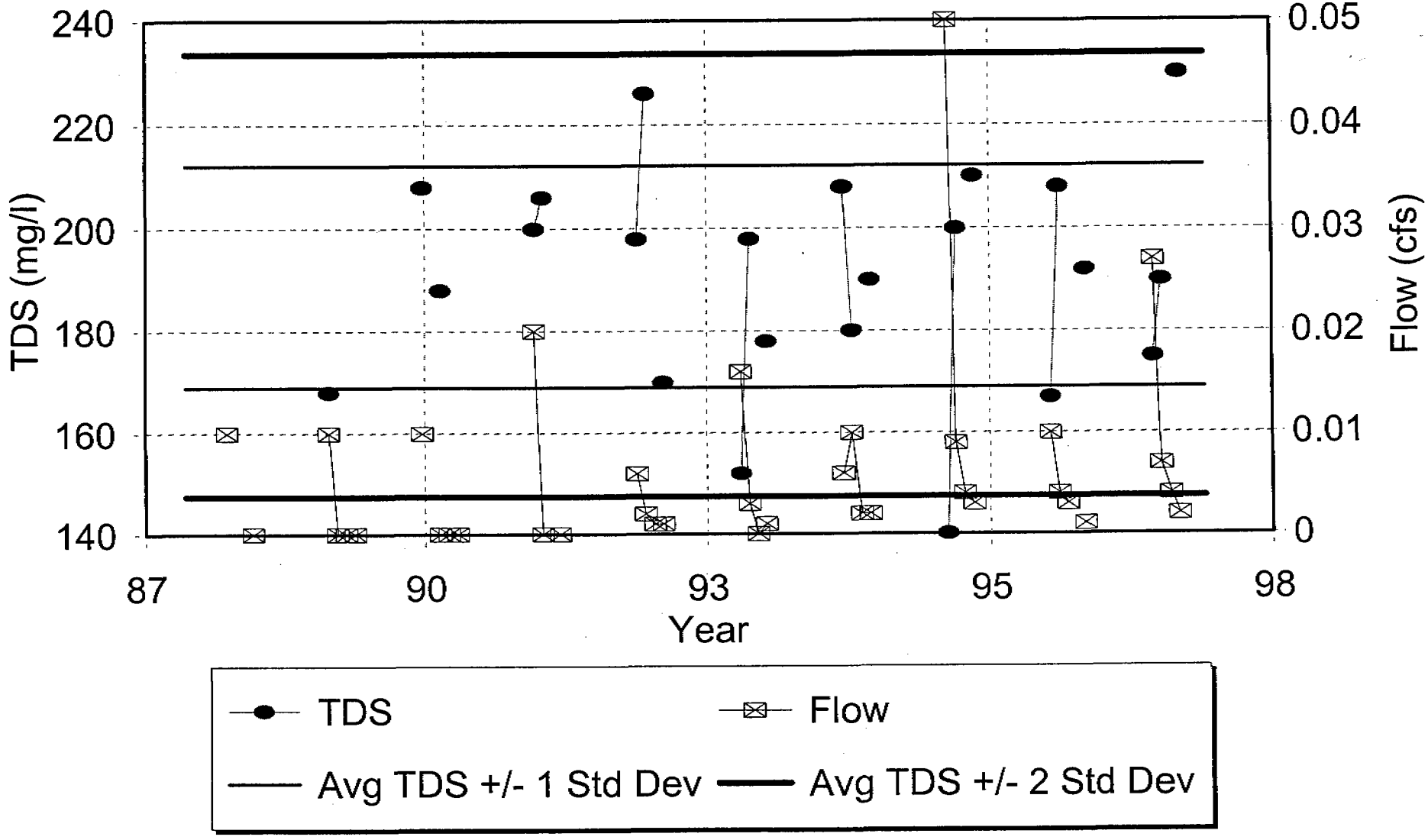
Monthly Precipitation vs. Flow




Station 232
pH vs. Flow
8.5
8
7.5
7
6.5
6
5.5
pH (units)
0.05
0.04
0.03
0.02
0.01
0
Flow (cfs)
90
91
93
94
95
97
98
Year
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev

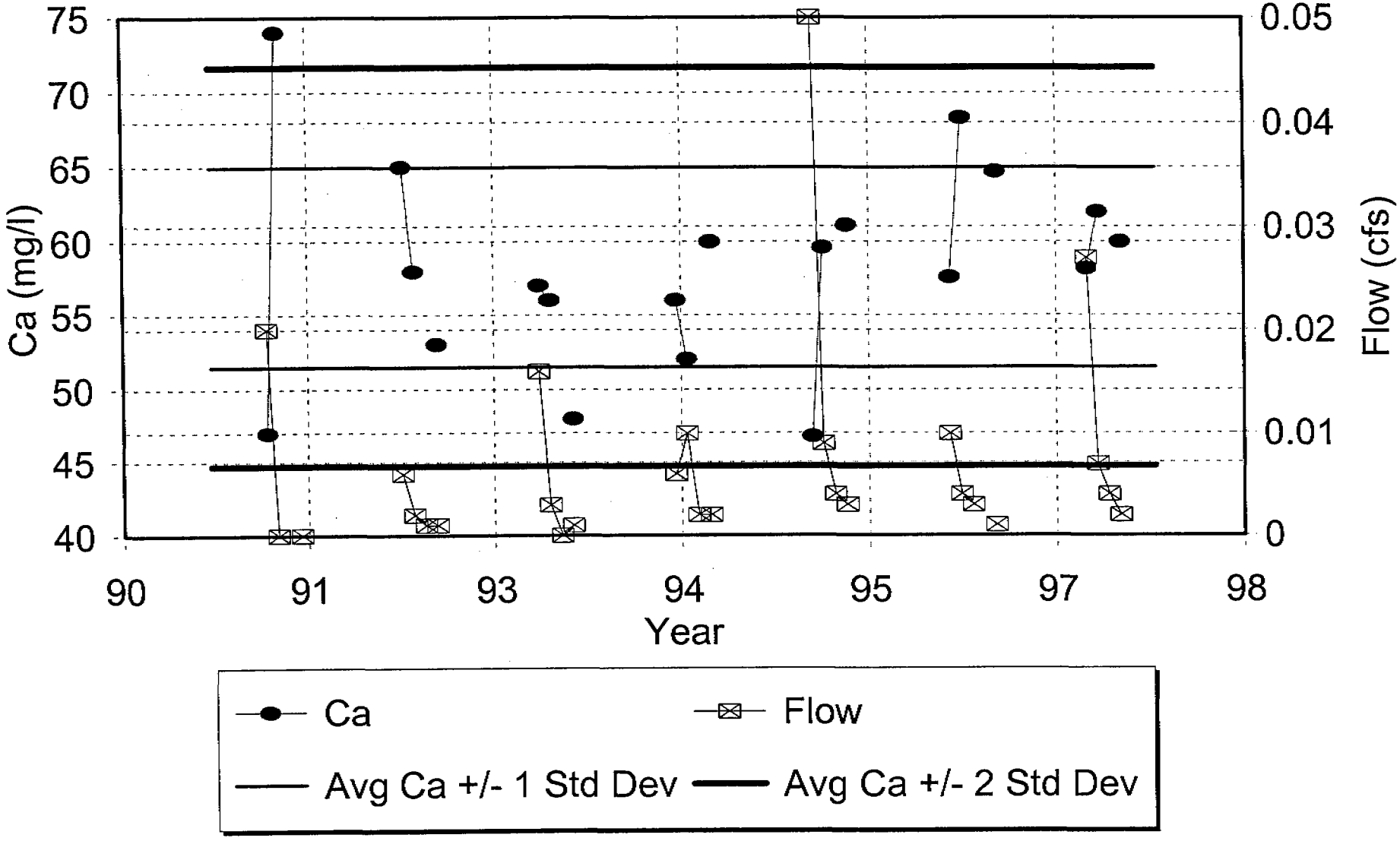
Station 232

TDS vs. Flow

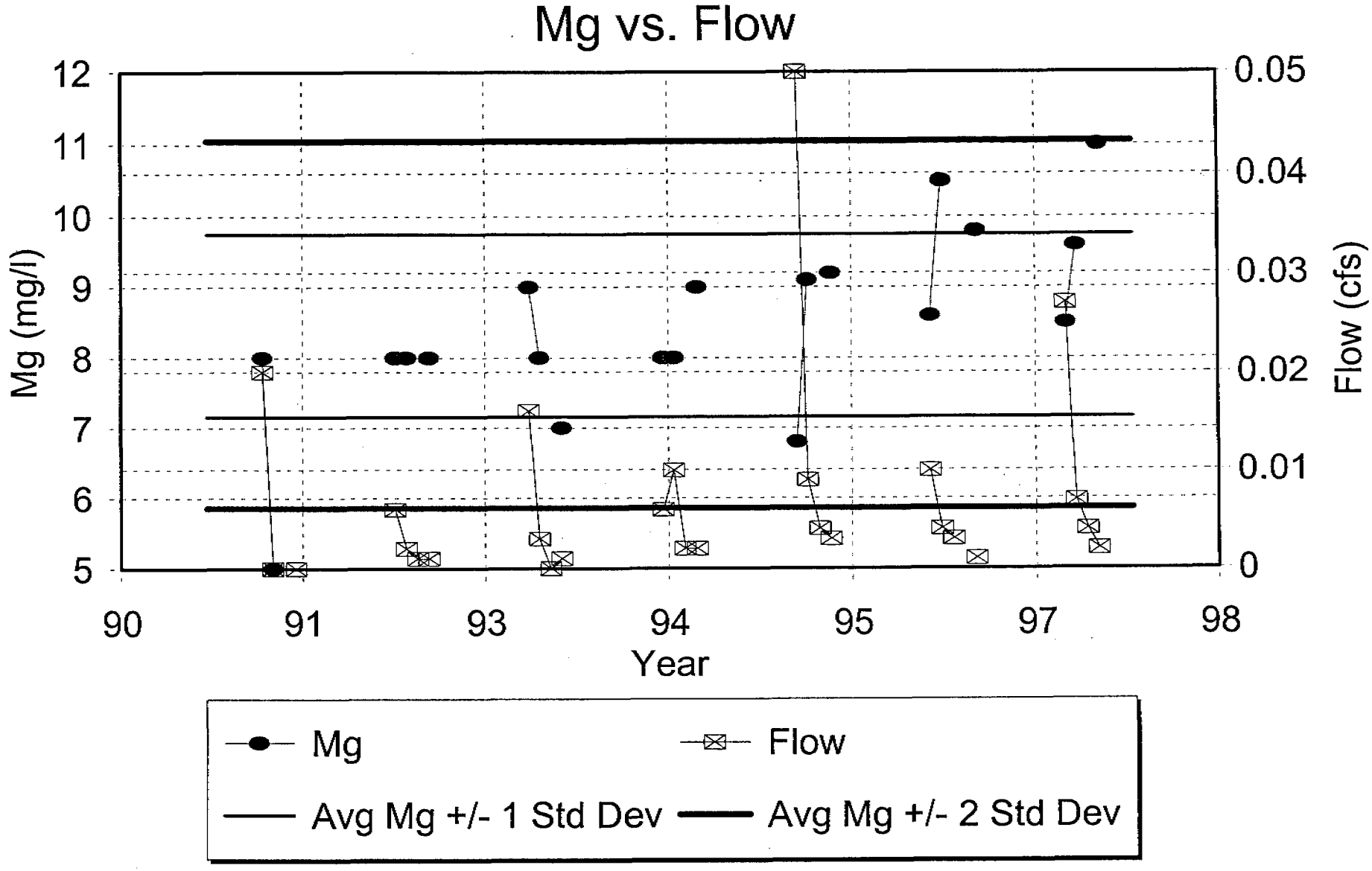


Station 232

Ca vs. Flow

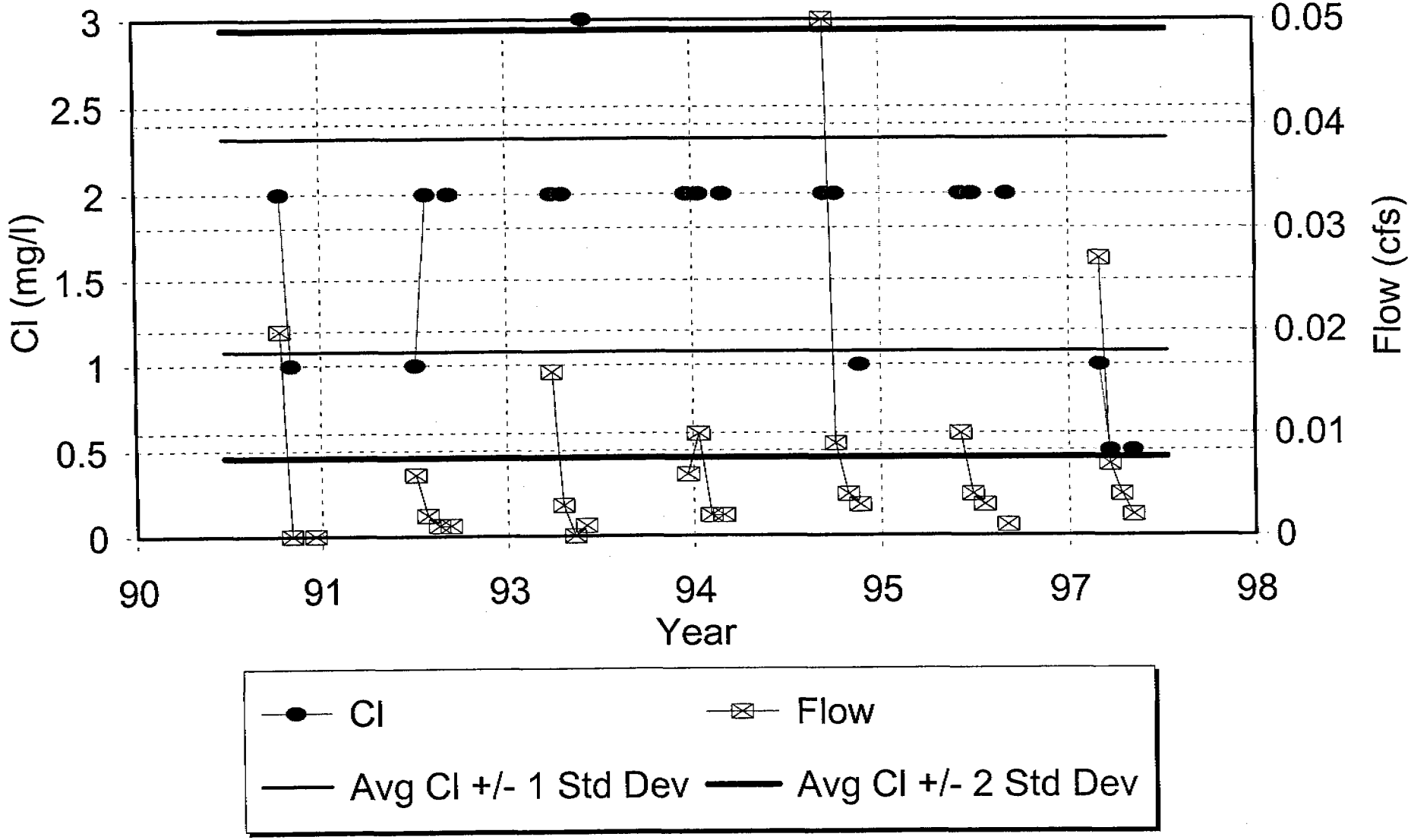


Station 232


Mg vs. Flow
Mg (mg/l)
12
11
10
9
8
7
6
5
0.05
0.04
0.03
0.02
0.01
0
Flow (cfs)
90
91
93
94
95
97
98
Year
Mg
Flow
Avg Mg +/- 1 Std Dev
Avg Mg +/- 2 Std Dev

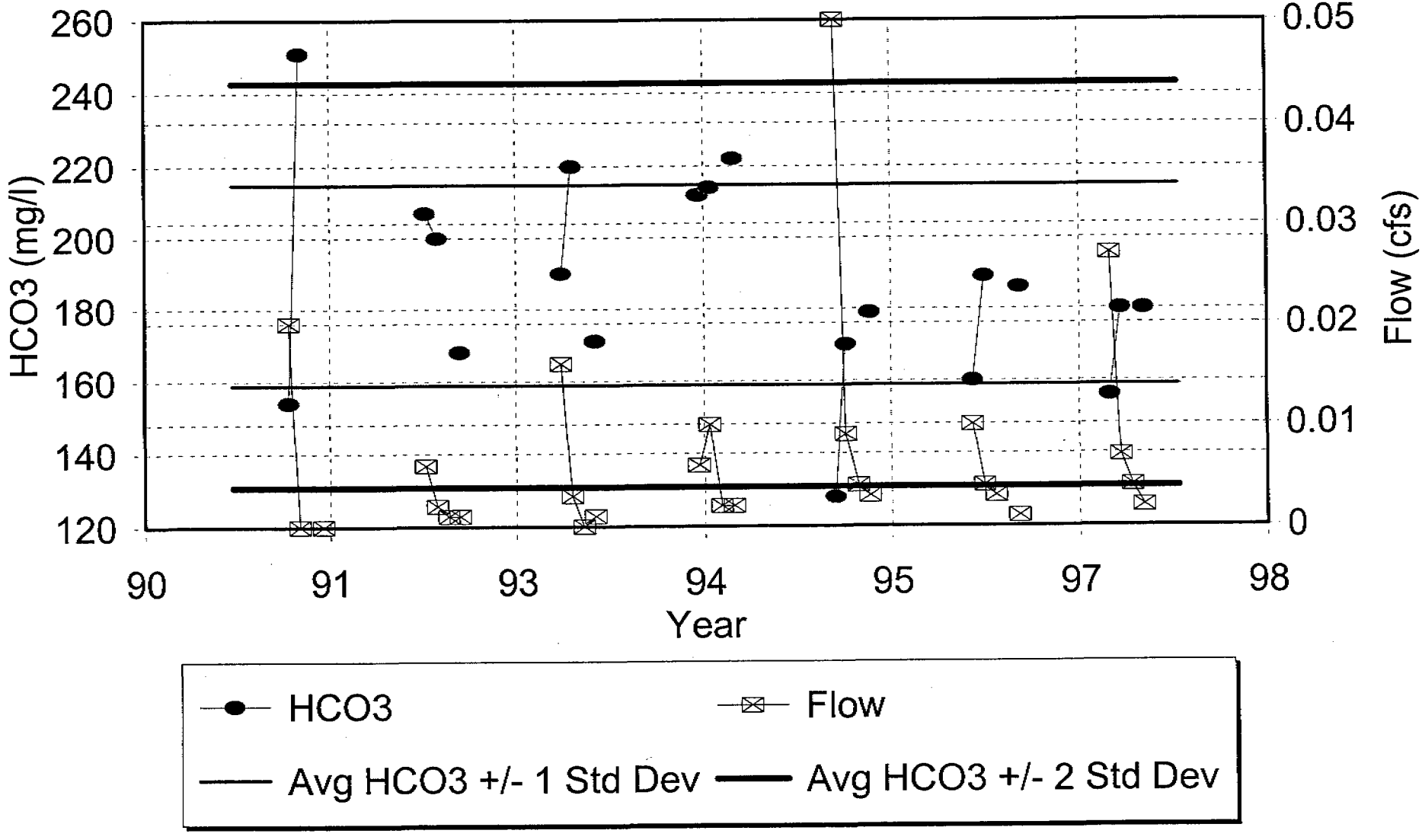
Station 232

Cl vs. Flow



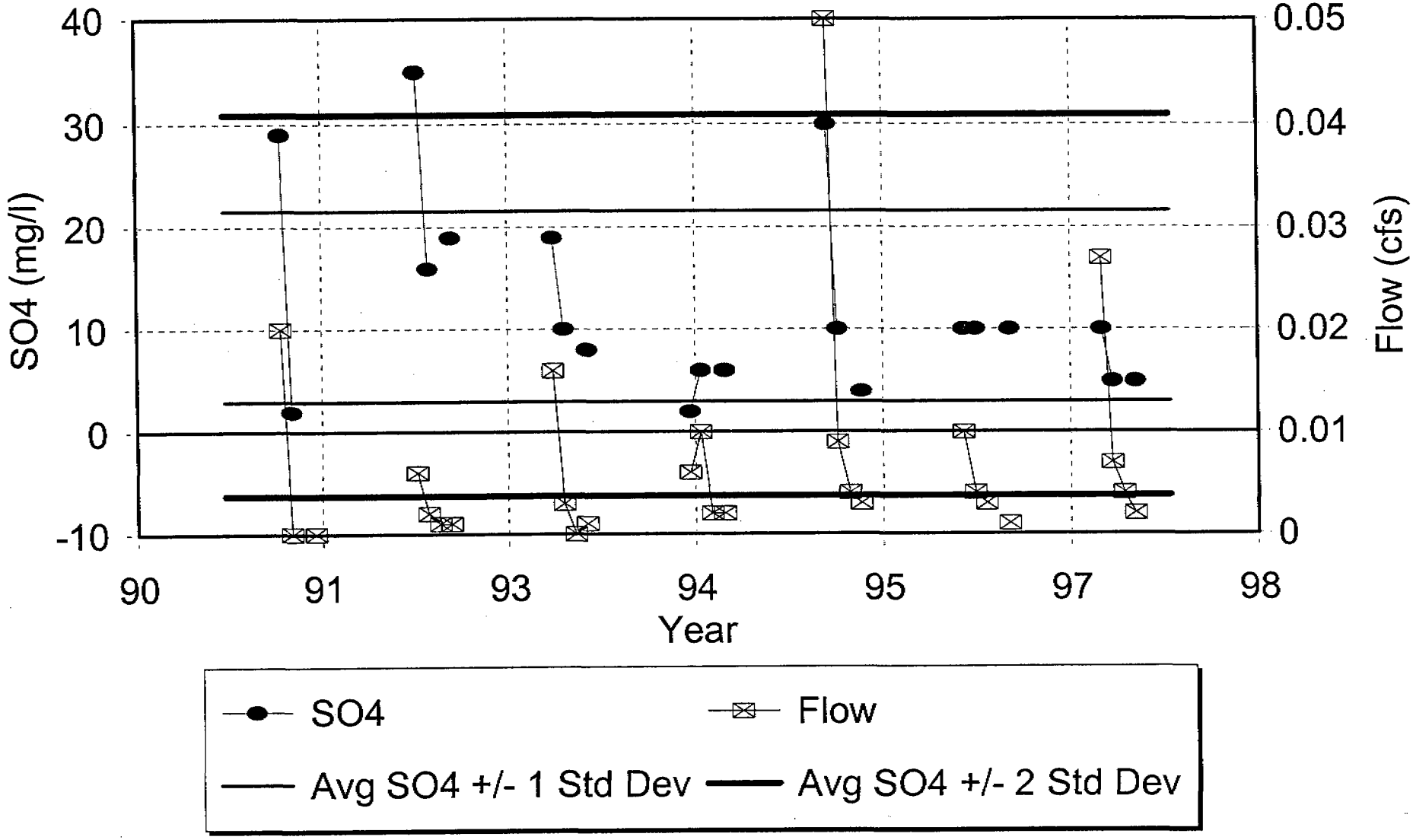
Station 232

HCO3 vs. Flow



Station 232

SO4 vs. Flow



Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 424 | Property: Star Point | Location: 625' S 1875' E of NW corn. Sec 23, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9680

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-91																						
Feb-91																						
Mar-91																						
Apr-91																						
May-91																						
Jun-91																						
Jul-91	07/15/91	0	7.7	470	11																	
Aug-91																						
Sep-91	09/17/91	0																				NO FLOW
Oct-91																						
Nov-91																						
Dec-91																						
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92	05/21/92	0.446	7.4	466	4.5	286			277	266	0	1	29	83	17	1	2	<	0			
Jun-92																						
Jul-92	07/15/92	0.002	7	558	8.4																	
Aug-92	08/26/92	0.002	7.5	525	8.1																	
Sep-92	09/21/92	0.001	6.3	543	8.5				302	250	24	2	29	88	20	1	3	<	0			
Oct-92																						
Nov-92																						
Dec-92																						
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/22/93	0.022	6.3	455	15.56	254			270	317	0	2	4	80	17 <	1	3	<	0.02	0.53 <	0.01	
Jul-93	07/27/93	0.0042				278			284	312	0	2	23	84	18	1	3	<	0.02 <	0.02 <	0.01	
Aug-93	08/17/93	0.003	6.4	471	8																	
Sep-93	09/27/93	0																				COW HAD MUDDY - NO
Oct-93																						
Nov-93																						
Dec-93																						
Jan-94																						
Feb-94																						
Mar-94																						
Apr-94																						
May-94																						
Jun-94	06/09/94	0.005	7.4	619	6.7	324			269	305	7	2	25	78	18	1	3		0.05	0.98 <	0.01	
Jul-94	07/19/94	< 0.01	8	485	19.4	302			266	303	12	3	33	77	18	2	5	<	0.02	0.71	0.03	LAB FILTRATION REQUI
Aug-94	08/31/94	0																				TOO LOW TO MONITOR
Sep-94	09/21/94	0																				NO FLOW
Oct-94																						
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95																						
Mar-95																						
Apr-95																						
May-95																						
Jun-95	06/22/95	0.027	7.7	426	5.5	250			282	250 <	2	2	40	82.8	18.2	1.1	3.1	-0.8 <	0.01	0.03 <	0.005	
Jul-95	07/27/95	0.009	7.6	440	7	310			293	248 <	2	3	30	84	20.2	1.3	3.1	3 <	0.01 <	0.01 <	0.005	
Aug-95	08/23/95																					Damp - No Sample
Sep-95	09/27/95	0.003	8.1	564	12	320			298	252 <	2	3	38	85.4	20.5	1.5	3.4	1.8 <	0.01	0.82 <	0.005	
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/12/96	0.006	8.5	657	9	293			302	266	2 <	2	20	86.6	20.7	1.2	3.2	3.4	0.01 <	0.05	0.005	
Jul-96	07/23/96	0.003	7.72	582	6																	
Aug-96	08/19/96	0																				Damp - No Sample
Sep-96	09/30/96	0.002	7.9	504	8.5	303			291	253	2 <	3	40	83.7	19.9	1.5	3.4	0.2	0.05	0.91	0.007	
Oct-96																						
Nov-96																						
Dec-96																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

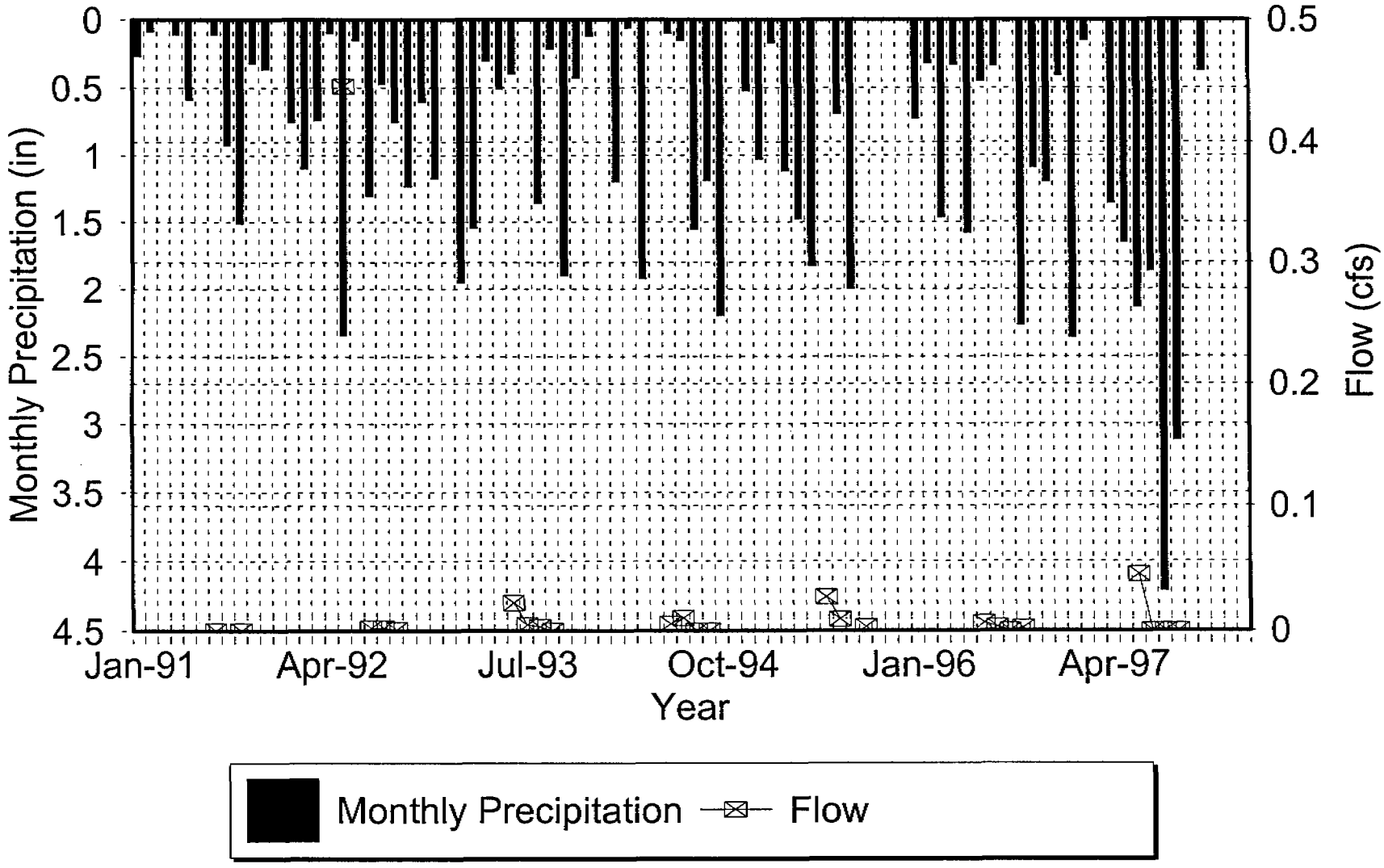
Station: 424 | Property: Star Point | Location: 625' S 1875' E of NW corn. Sec 23, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9680

Date		Field Measurements				Laboratory Measurements																
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/18/97	0.045	7.79	632	4.5	299			305	308	2 <	1	10 <	91.3	18.7	0.9	2.4	0.3	0.01 <	0.07	0.005	
Jul-97	07/30/97	0																				Damp - No Sample
Aug-97	08/13/97	0																				Dry
Sep-97	09/16/97	0																				Dry
Oct-97																						
Nov-97																						
Dec-97																						
END DATA																						
Count		25	16	16	16	11	0	0	12	12	12	12	12	12	12	12	12	6	12	10	10	
Minimum		< 0	6.3	426	4.5	250	ERR	ERR	266	248 <	0 <	1	4 <	77	17 <	0.9	2	-0.8 <	0 <	0.01 <	0.005	
Maximum		< 0.446	8.5	657	19.4	324	ERR	ERR	305	317 <	24 <	3	40 <	91.3	20.7 <	2	5	3.4 <	0.05 <	0.98 <	0.03	
Average		< 0.0236	7.4569	524.81	6.9163	292.64	ERR	ERR	286.58	277.5 <	4.5833 <	2.1667	26.75 <	83.65	18.85 <	1.2083	3.1333	1.3167 <	0.0175 <	0.413 <	0.0092	
Standard Deviation		< 0.0868	0.6266	69.498	3.8551	23.039	ERR	ERR	13.332	27.363 <	6.7139 <	0.6872	10.794 <	3.8737	1.2861 <	0.3068	0.6786	1.5367 <	0.0159 <	0.3936 <	0.0073	
Avg. -1 Std. Dev.		< -0.063	6.8282	455.31	5.0611	269.6	ERR	ERR	273.25	250.14 <	-2.131 <	1.4795	15.956 <	79.776	17.564 <	0.9016	2.4547	-0.22 <	0.0016 <	0.0194 <	0.0019	
Avg. +1 Std. Dev.		< 0.1104	8.0855	594.31	12.771	315.67	ERR	ERR	299.92	304.86 <	11.297 <	2.8539	37.544 <	87.524	20.136 <	1.5151	3.812	2.8533 <	0.0334 <	0.8066 <	0.0165	
Avg. -2 Std. Dev.		< -0.15	6.1996	385.82	1.206	246.56	ERR	ERR	259.92	222.77 <	-8.844 <	0.7923	5.161 <	75.903	16.278 <	0.5948	1.776	-1.757 <	-0.014 <	-0.374 <	-0.005	
Avg. +2 Std. Dev.		< 0.1973	8.7141	663.81	16.626	338.71	ERR	ERR	313.25	332.23 <	18.011 <	3.541	48.339 <	91.397	21.422 <	1.8218	4.4906	4.39 <	0.0493 <	1.2001 <	0.0237	

NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

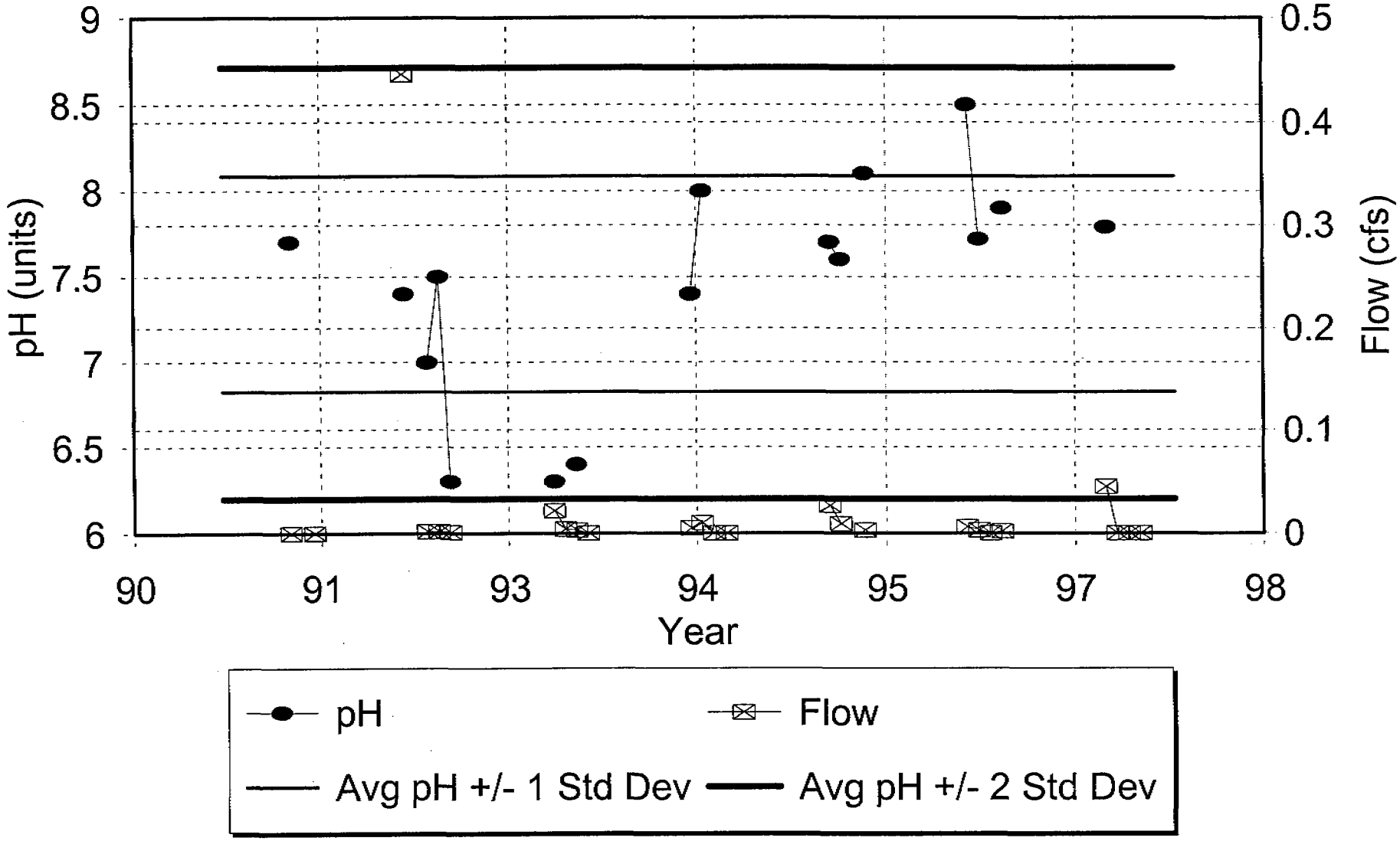
Station 424

Monthly Precipitation vs. Flow



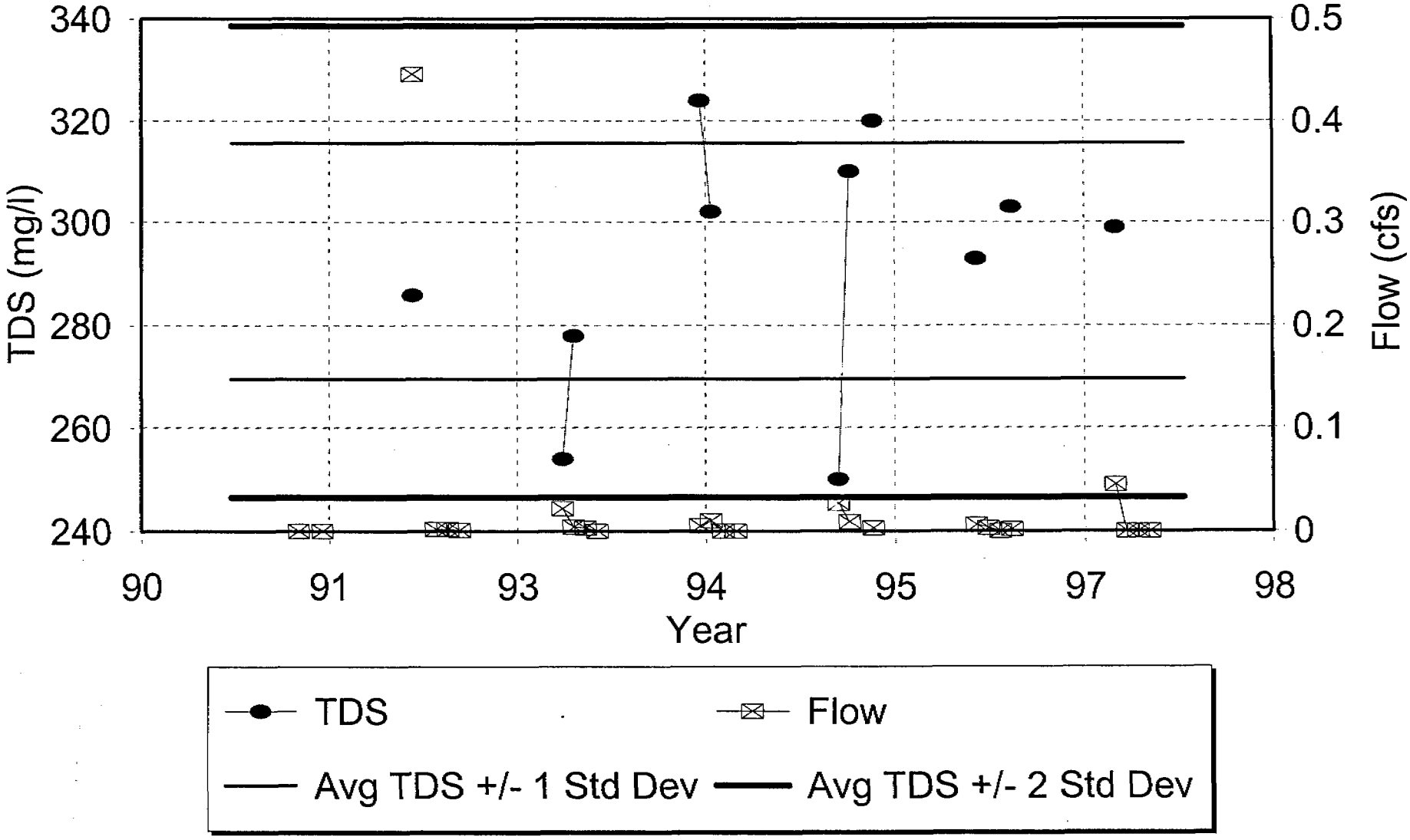
Station 424

pH vs. Flow



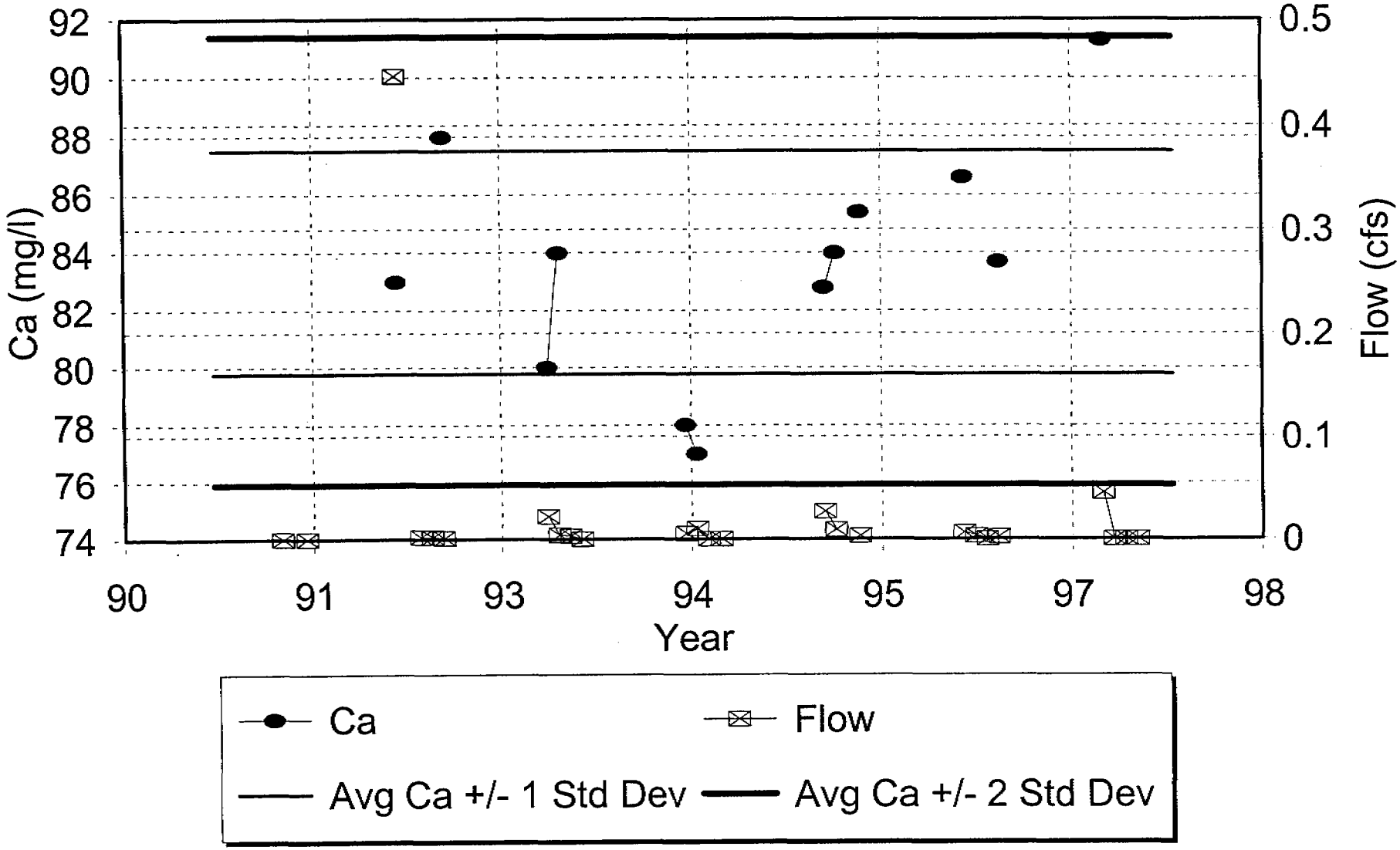
Station 424

TDS vs. Flow



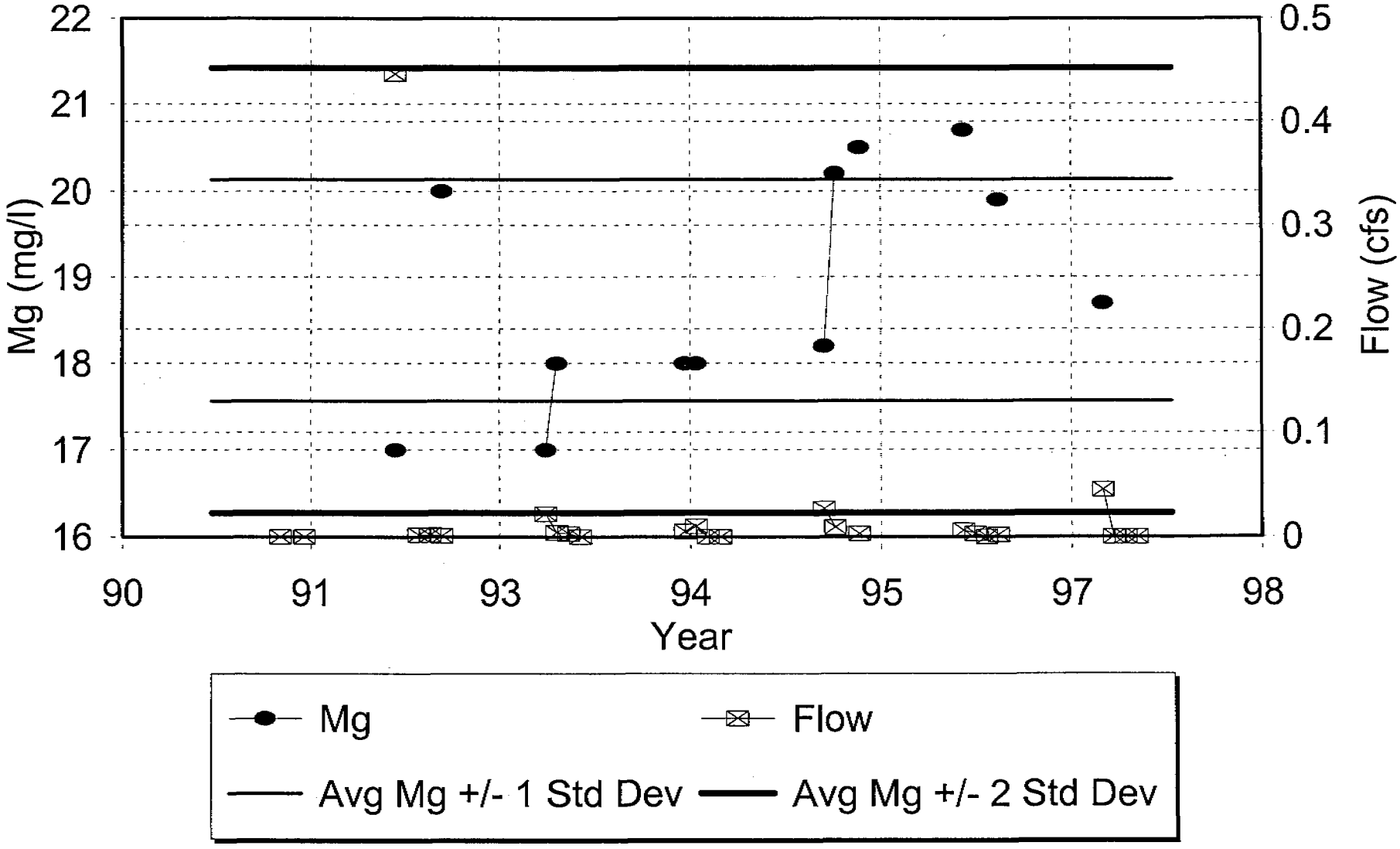
Station 424

Ca vs. Flow



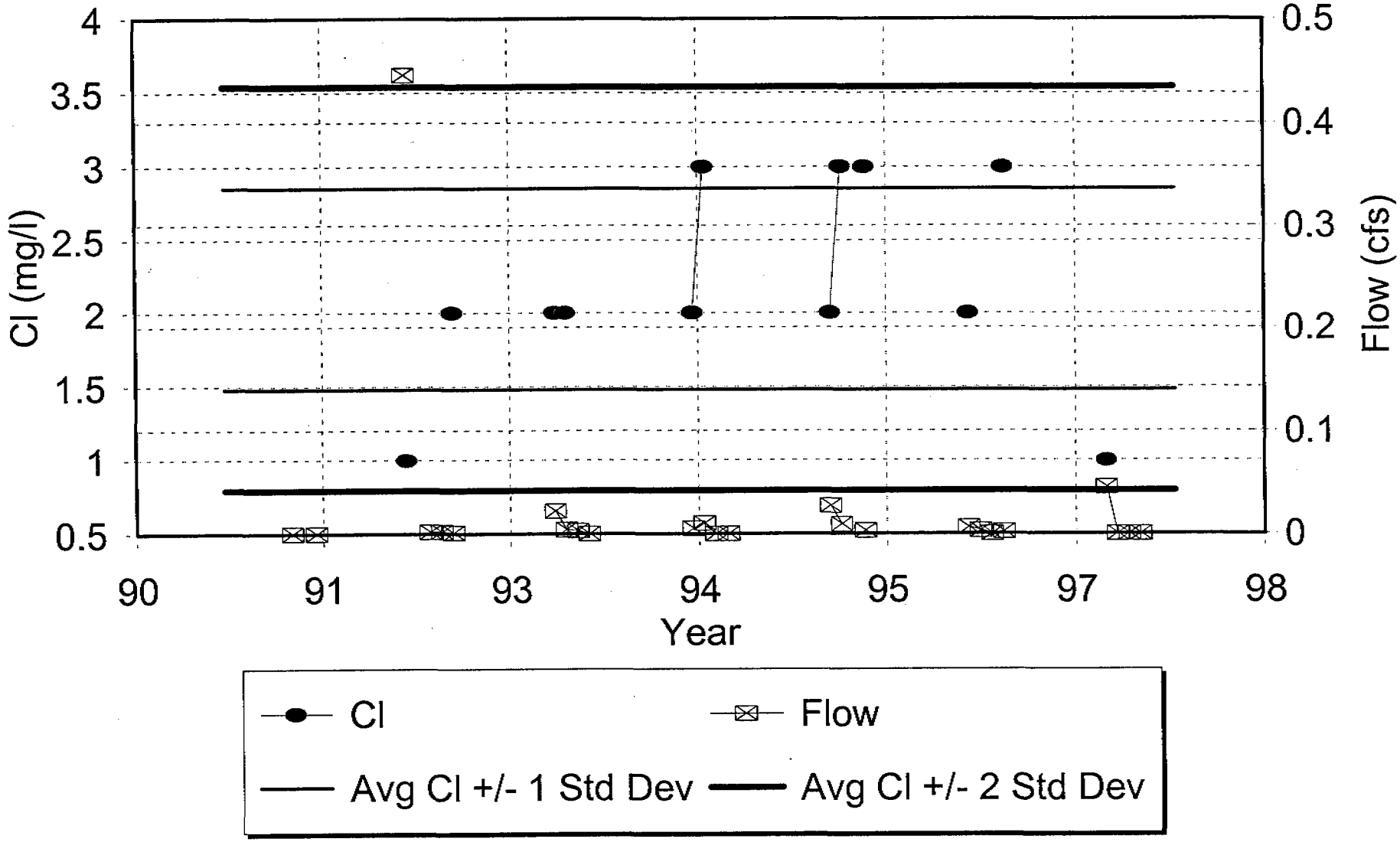
Station 424

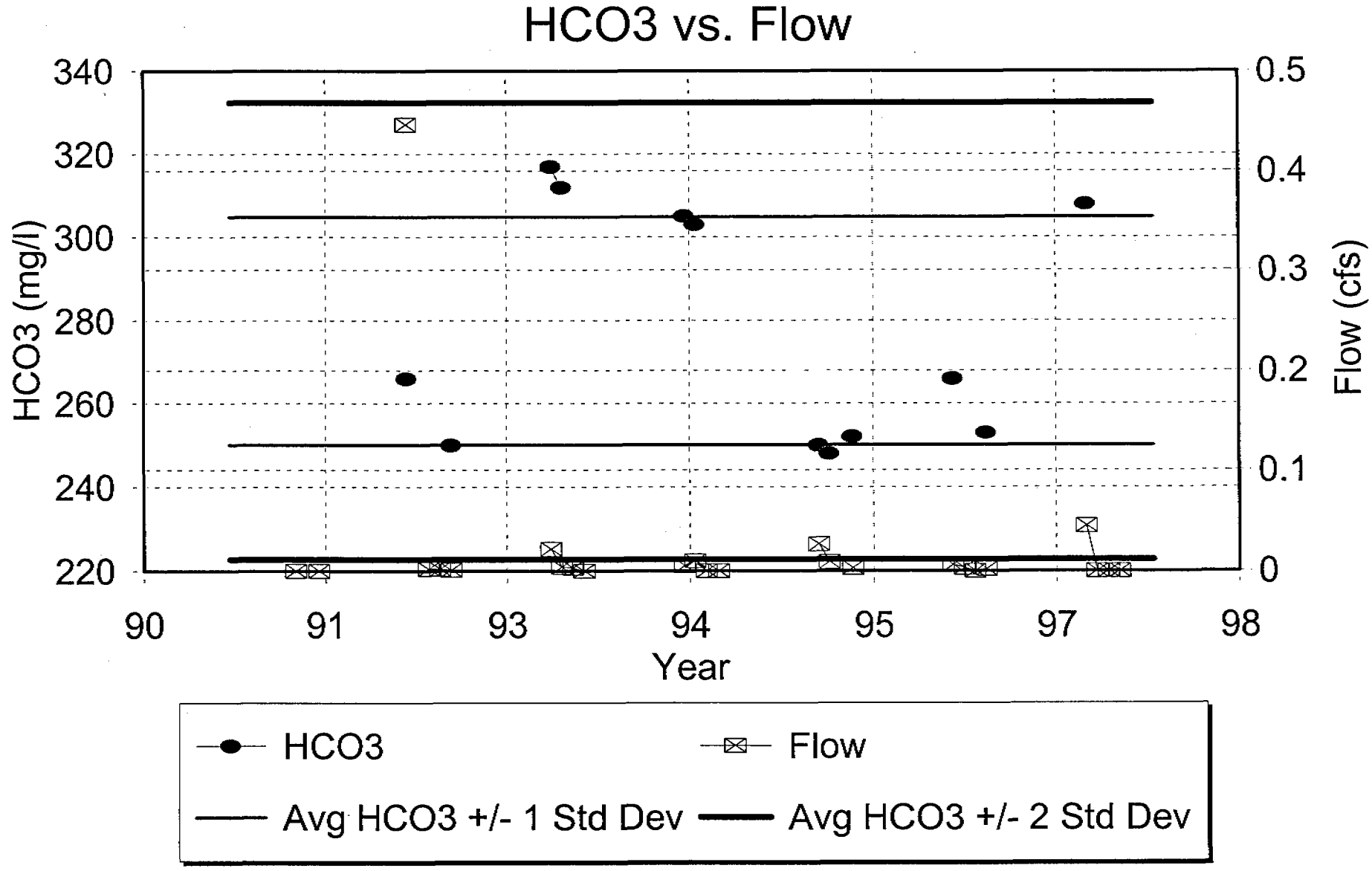
Mg vs. Flow



Station 424

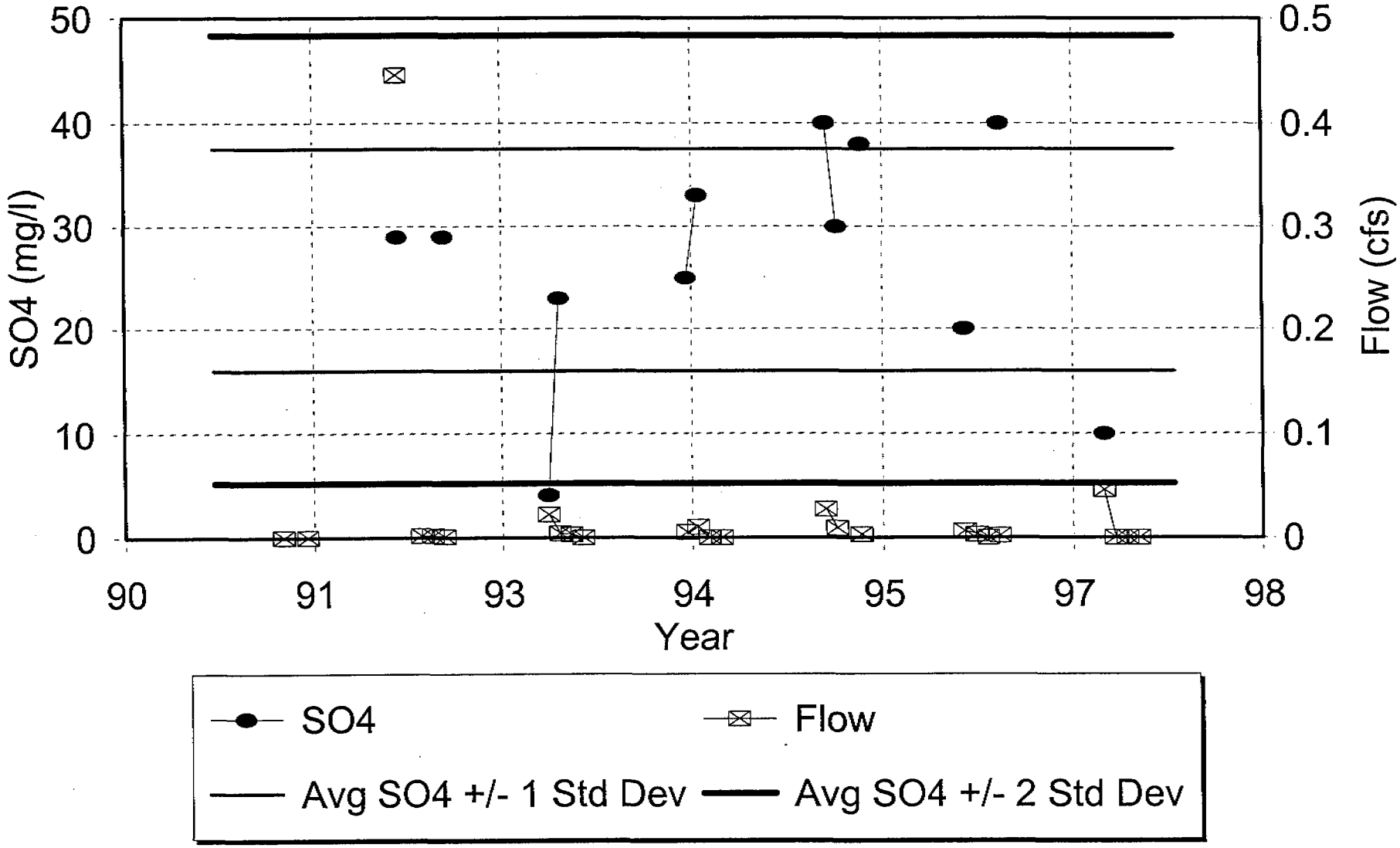
Cl vs. Flow




Station 424
HCO3 vs. Flow
HCO3 (mg/l)
340
320
300
280
260
240
220
Flow (cfs)
0.5
0.4
0.3
0.2
0.1
0
90
91
93
94
95
97
98
Year
HCO3
Flow
Avg HCO3 +/- 1 Std Dev
Avg HCO3 +/- 2 Std Dev

Station 424

SO4 vs. Flow



Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 429 | Property: Star Point | Location: 2000' N 1000' E of SW com. Sec 15, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9800

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-87																						
Feb-87																						
Mar-87																						
Apr-87																						
May-87	05/19/87	0.01																				
Jun-87																						
Jul-87																						
Aug-87																						
Sep-87																						
Oct-87																						
Nov-87																						
Dec-87																						
Jan-88																						
Feb-88																						
Mar-88																						
Apr-88																						
May-88																						
Jun-88	06/01/88	0.01																				
Jul-88	07/16/88	0				252																
Aug-88	08/20/88	0																				
Sep-88	09/03/88	0																				NO FLOW
Oct-88																						
Nov-88																						
Dec-88																						
Jan-89																						
Feb-89																						
Mar-89																						
Apr-89																						
May-89																						
Jun-89	06/05/89	0.01				218																
Jul-89	07/11/89	0																				NO FLOW
Aug-89	08/22/89	0																				NO FLOW
Sep-89	09/15/89	0																				NO FLOW
Oct-89																						
Nov-89																						
Dec-89																						
Jan-90																						
Feb-90																						
Mar-90																						
Apr-90																						
May-90	05/30/90	0.01																				
Jun-90																						
Jul-90	07/07/90	0																				NO FLOW
Aug-90	08/22/90	0																				NO FLOW
Sep-90	09/24/90	0																				NO FLOW
Oct-90																						
Nov-90																						
Dec-90																						
Jan-91																						
Feb-91																						
Mar-91																						
Apr-91																						
May-91																						
Jun-91	06/12/91	0.05	7.2	420	5	272			204	237	10	3	8	62	12 <	1	2	<	0.02	0.06 <	0.01	
Jul-91	07/15/91	0.01	8.3	420	11	248			244	273	7	3	4	66	18	1	4	<	0.02 <	0.02 <	0.01	
Aug-91																						
Sep-91	09/17/91	0																				NO FLOW
Oct-91																						
Nov-91																						
Dec-91																						
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92	05/19/92	0.0267	7.6	447	5.8	270			254	285	0	1	27	77	15	1	3	<	0.02	1.5	0.13	
Jun-92																						
Jul-92	07/16/92	0.005	8.1	525	7.5																	
Aug-92	08/26/92	0.001	8	520	7.6																	
Sep-92																						
Oct-92																						
Nov-92																						
Dec-92																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: February 26, 1998

Station: 429 | Property: Star Point | Location: 2000' N 1000' E of SW com. Sec 15, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9800

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-93																						
Feb-93																						
Mar-93																						
Apr-93																						
May-93																						
Jun-93	06/21/93	0.035	6.8	370	7.9	218			231	261	0	1	41	71	13 <	1	3	<	0.02	0.02 <	0.01	
Jul-93	07/27/93	0.003	7.2	384	7.5	212			217	249	2	1	11	64	14 <	1	3	<	0.02 <	0.02 <	0.01	
Aug-93	08/17/93	0.001	7.3	373	15																	
Sep-93	09/27/93	0																				NO FLOW
Oct-93																						
Nov-93																						
Dec-93																						
Jan-94																						
Feb-94																						
Mar-94																						
Apr-94																						
May-94																						
Jun-94	06/09/94	0.003	8.2	478	4.8	246			228	261	7	2	4	70	13 <	1	3	<	0.02	0.11 <	0.01	
Jul-94	07/19/94	0																				NO FLOW
Aug-94	08/31/94	0																				NO FLOW
Sep-94	09/21/94	0																				NO FLOW
Oct-94																						
Nov-94																						
Dec-94																						
Jan-95																						
Feb-95																						
Mar-95																						
Apr-95																						
May-95																						
Jun-95	06/21/95	0.029	8.4	380	7.5	230			212	194 <	2 <	1	30	65.5	11.7	0.9	2.7	-1.5 <	0.01	0.08 <	0.005	
Jul-95	07/26/95	0.016	8.3	504	10	240			270	236 <	2	2	10	81.1	16.3	0.6	3	5.3	0.12	0.04 <	0.005	
Aug-95	08/23/95	0.006	8.25	447	12																	
Sep-95	09/27/95																					Damp - No Sample
Oct-95																						
Nov-95																						
Dec-95																						
Jan-96																						
Feb-96																						
Mar-96																						
Apr-96																						
May-96																						
Jun-96	06/12/96	0.024	8.42	492	7	227			243	224	2 <	1	10 <	72.7	15	0.7	2.7	5.2	0.02	0.22	0.007	
Jul-96	07/24/96	0.002	8.52	454	10	243			263	225	2 <	2	10	74.2	18.8	0.8	2.6	6.1	0.03	0.15	0.006	
Aug-96	08/19/96	0.002	9.15	372	11																	
Sep-96	09/30/96	0																				Damp - No Sample
Oct-96	10/01/96	0.003	8.2	445	8	196			217	194	2 <	2	10 <	53.8	20	0.7	2.9	6.4	0.01 <	0.01 <	0.005	
Nov-96																						
Dec-96																						
Jan-97																						
Feb-97																						
Mar-97																						
Apr-97																						
May-97																						
Jun-97	06/17/97	0.076	8.6	397	10	214			224	215	2 <	1	10 <	66.9	13.7	0.7	2.2	2.9	0.02	0.09	0.005	
Jul-97	07/30/97	0.004	7.77	405	12	230			230	210	10 <	0.5 <	5 <	64	17	1.1	2.7	6	0.01	0.07	0.005	
Aug-97	08/13/97	0.004	8.38	439	12																	
Sep-97	09/16/97	0.0033	8.33	477	12	280			260	230	10 <	0.5 <	10	69	22	1.8	3.5	6.3	0.01 <	1	0.026	
Oct-97																						
Nov-97																						
Dec-97																						
END DATA																						
Count		39	20	20	20	16	0	0	14	14	14	14	14	14	14	14	14	8	14	14	14	
Minimum		0	6.8	370	4.8	196	ERR	ERR	204	194 <	0 <	0.5 <	4 <	53.8	11.7 <	0.6	2	-1.5 <	0.01 <	0.01 <	0.005	
Maximum		0.076	9.15	525	15	280	ERR	ERR	270	285 <	10 <	3 <	41 <	81.1	22 <	1.8	4	6.4 <	0.12 <	1.5 <	0.13	
Average		0.0088	8.051	437.45	9.18	237.25	ERR	ERR	235.5	235.29 <	4.1429 <	1.5 <	13.571 <	68.514	15.679 <	0.95	2.8786	4.5875 <	0.025 <	0.2421 <	0.0174	
Standard Deviation		0.0156	0.5568	49.016	2.6566	22.898	ERR	ERR	19.794	26.898 <	3.6422 <	0.8018 <	10.601 <	6.5495	3.015 <	0.2797	0.4723	2.532 <	0.0269 <	0.4258 <	0.0317	
Avg. -1 Std. Dev.		-0.007	7.4922	388.43	6.5234	214.35	ERR	ERR	215.71	208.39 <	0.5007 <	0.6982 <	2.9701 <	61.965	12.664 <	0.6703	2.4062	2.0555 <	-0.002 <	-0.184 <	-0.014	
Avg. +1 Std. Dev.		0.0244	8.6098	486.47	11.837	260.15	ERR	ERR	255.29	262.18 <	7.785 <	2.3018 <	24.173 <	75.064	18.694 <	1.2297	3.3509	7.1195 <	0.0519 <	0.6679 <	0.0491	
Avg. -2 Std. Dev.		-0.022	6.9333	339.42	3.6668	191.45	ERR	ERR	195.91	181.49 <	-3.141 <	-0.104 <	-7.631 <	55.415	9.6486 <	0.3907	1.9339	-0.477 <	-0.029 <	-0.609 <	-0.046	
Avg. +2 Std. Dev.		[illegible]0.04	9.1687	535.48	14.493	283.05	ERR	ERR	275.09	289.08 <	11.427	[illegible]036 <	34.774 <	81.613	21.709 <	1.5093	3.8233	9.6515 <	0.0789 <	1.0937 <	0.0807	

Cyprus Plateau Mining Company - Water Quality Data

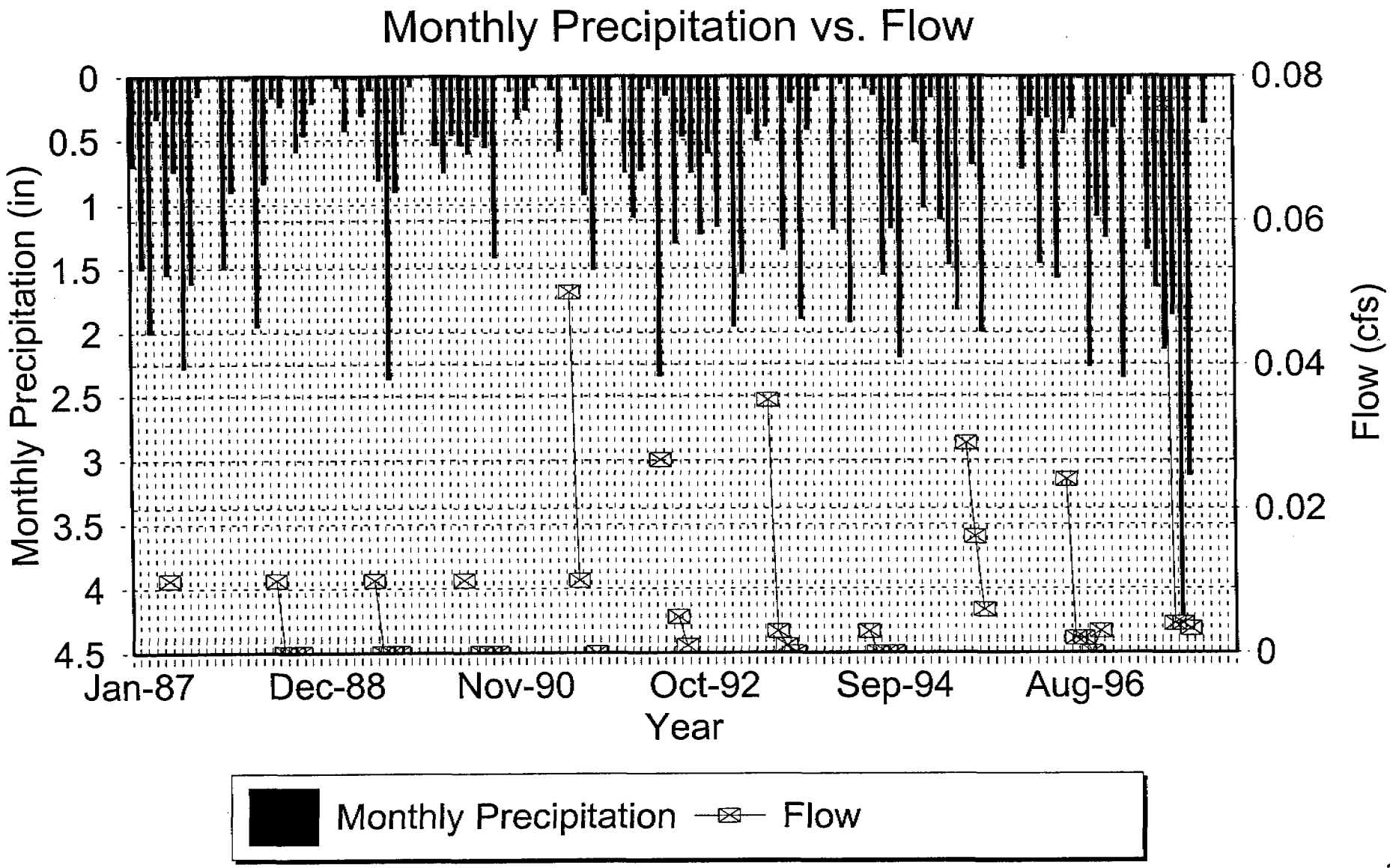
Print Date: February 26, 1998

Station: 429 | Property: Star Point | Location: 2000' N 1000' E of SW com. Sec 15, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9800

Date		Field Measurements				Laboratory Measurements																Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	

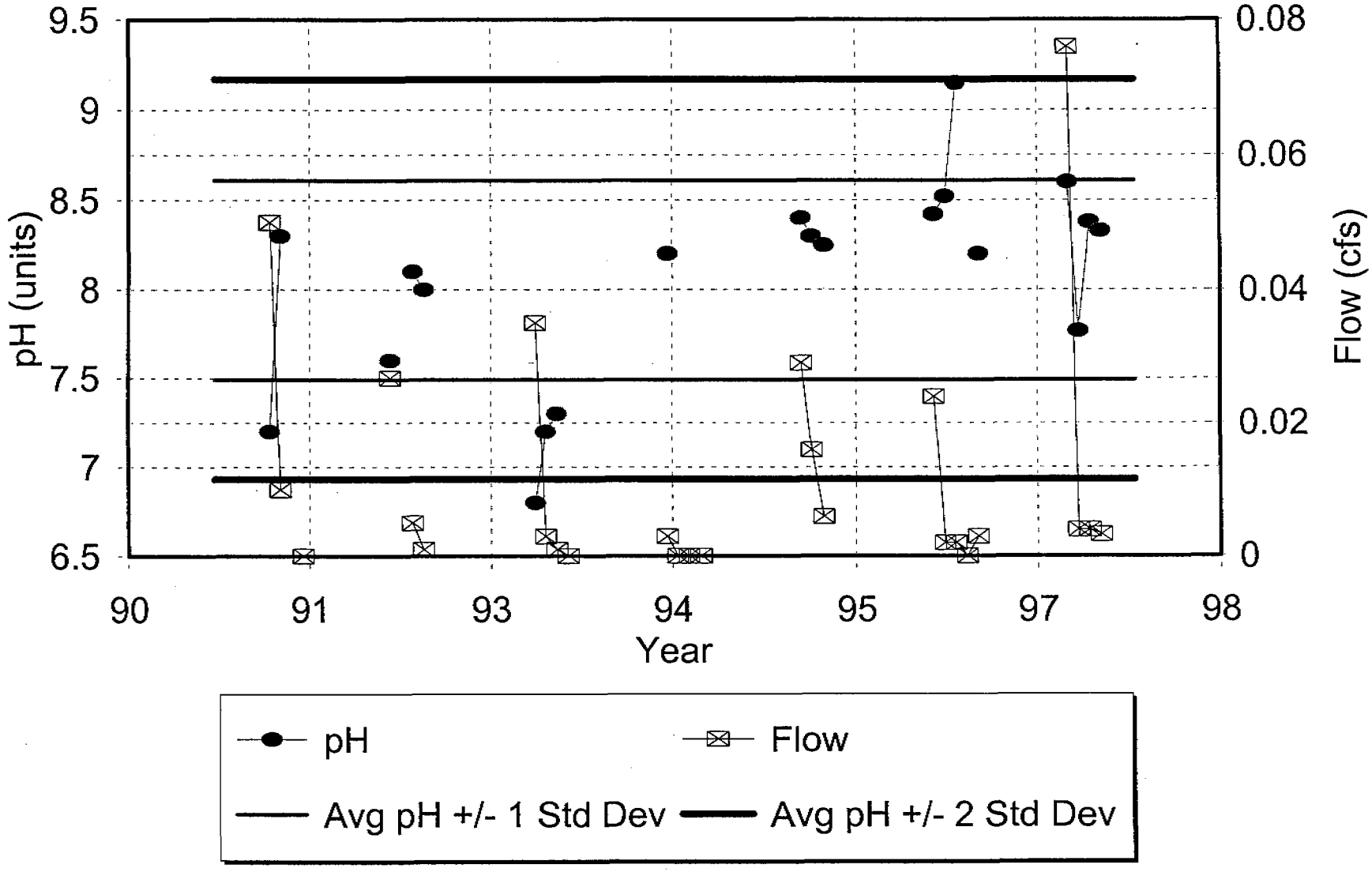
NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

Station 429


Monthly Precipitation vs. Flow
Monthly Precipitation (in)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Flow (cfs)
0.08
0.06
0.04
0.02
0
Jan-87
Dec-88
Nov-90
Oct-92
Sep-94
Aug-96
Year
Monthly Precipitation
Flow

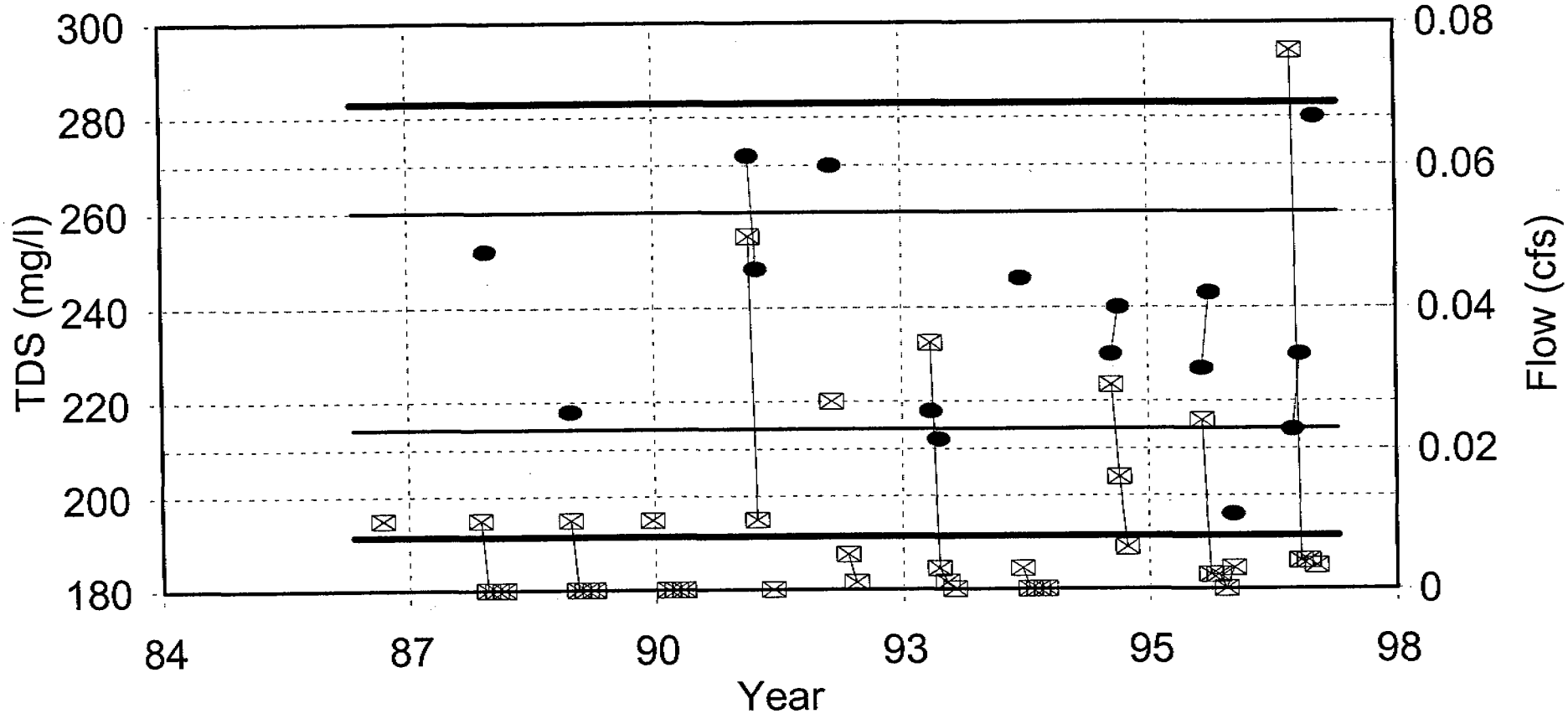
Station 429

pH vs. Flow



Station 429

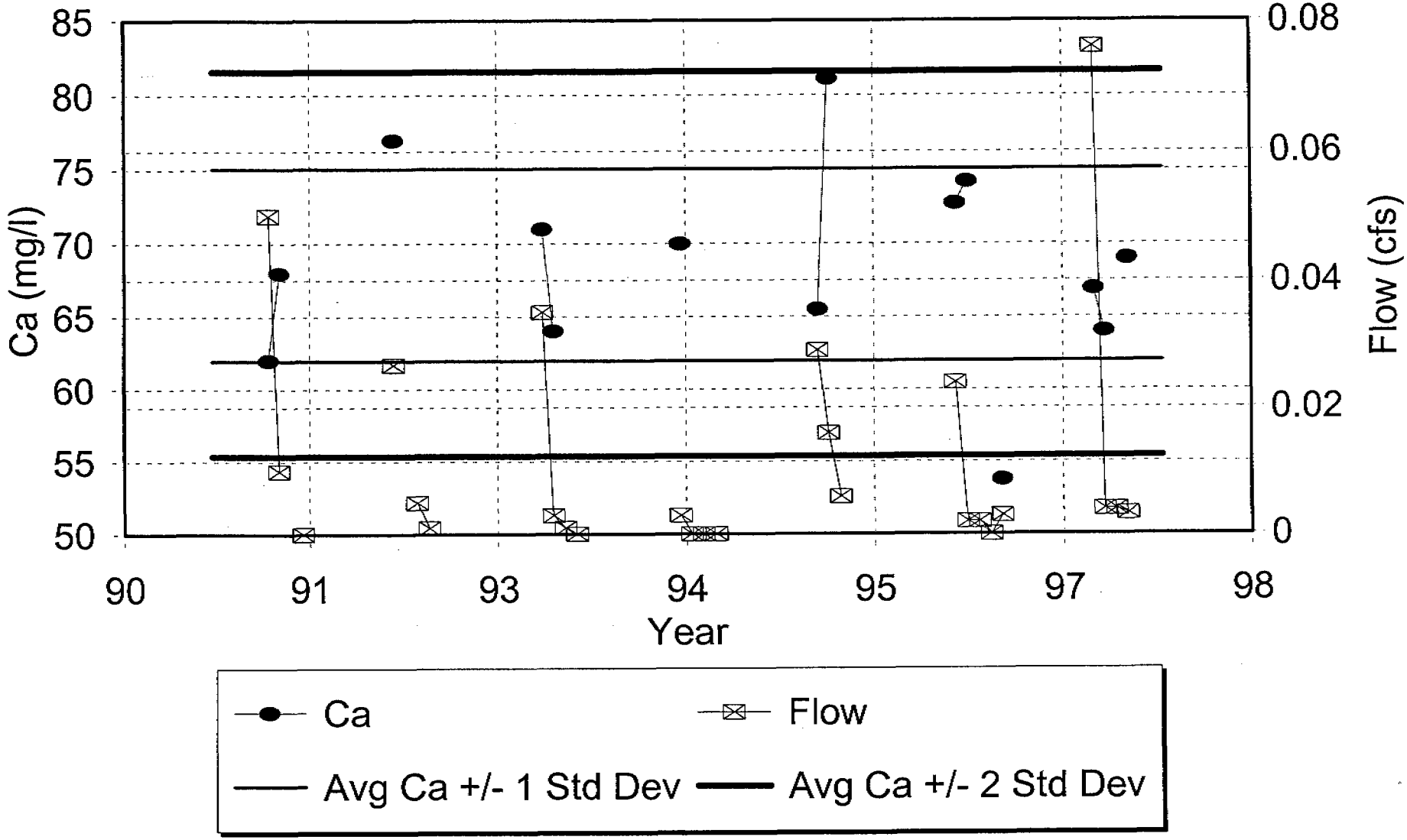
TDS vs. Flow

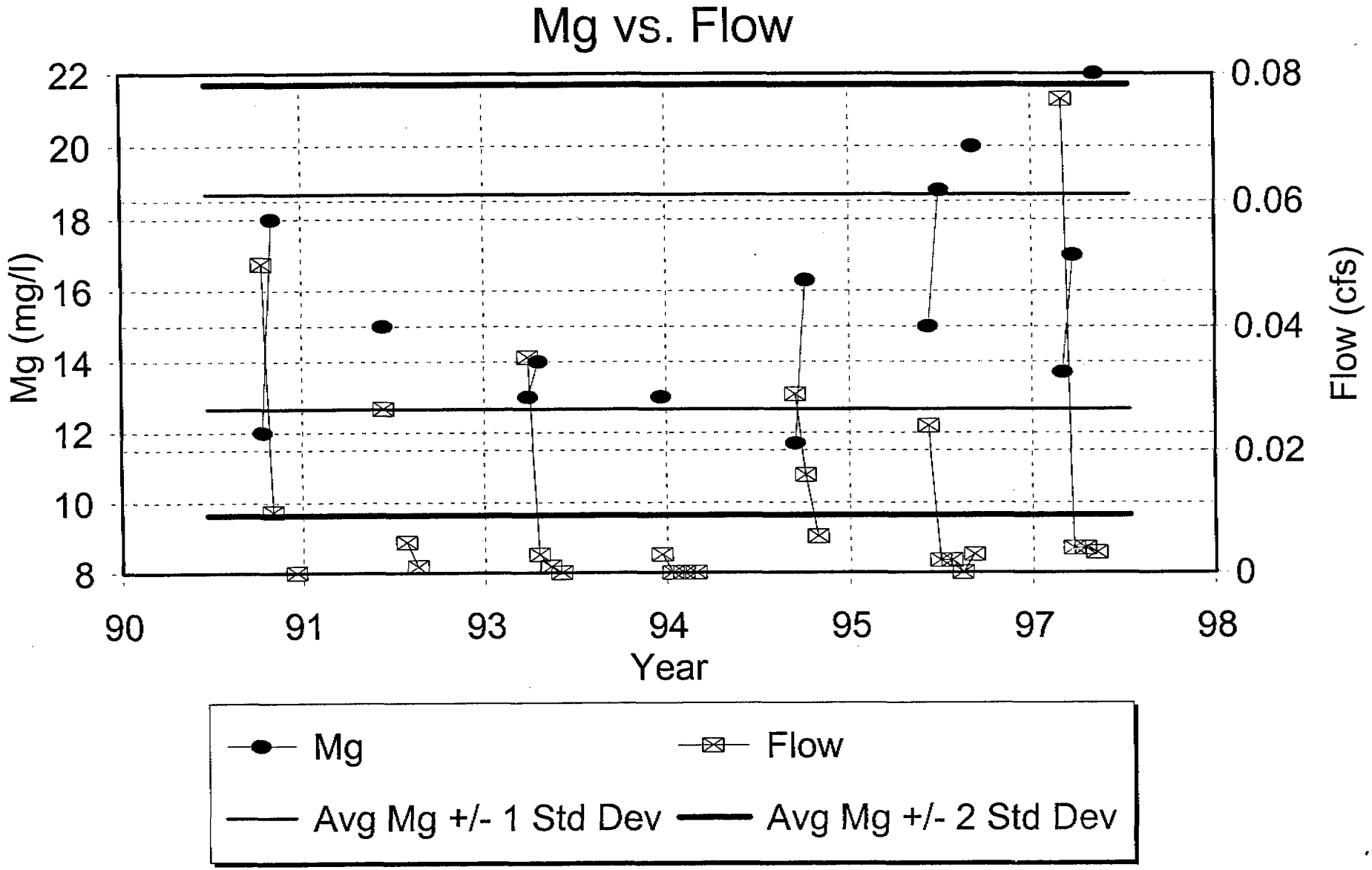


TDS
Flow
Avg TDS +/- 1 Std Dev
Avg TDS +/- 2 Std Dev

Station 429

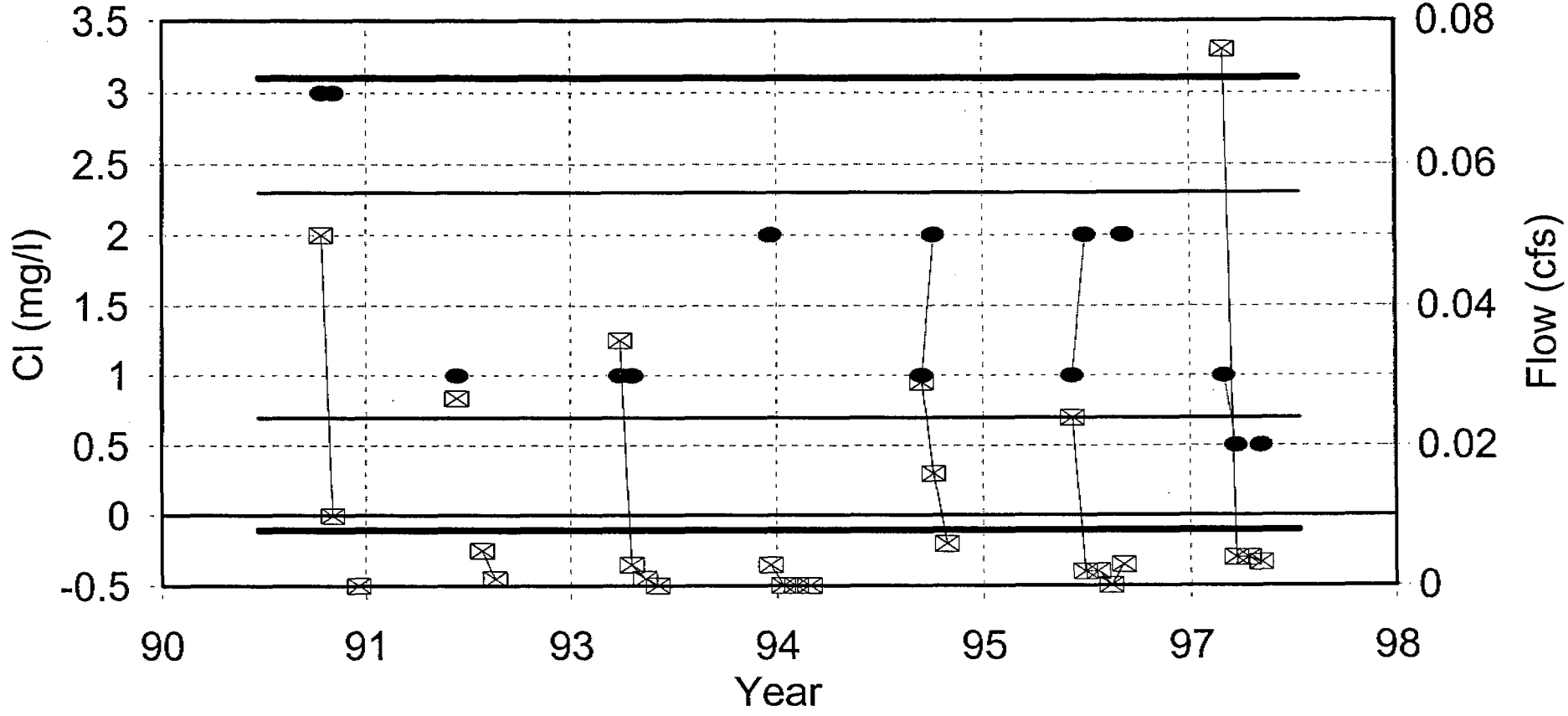
Ca vs. Flow




Station 429
Mg vs. Flow
Mg (mg/l)
22
20
18
16
14
12
10
8
0.08
0.06
0.04
0.02
0
Flow (cfs)
90
91
93
94
95
97
98
Year
Mg
Flow
Avg Mg +/- 1 Std Dev
Avg Mg +/- 2 Std Dev

Station 429

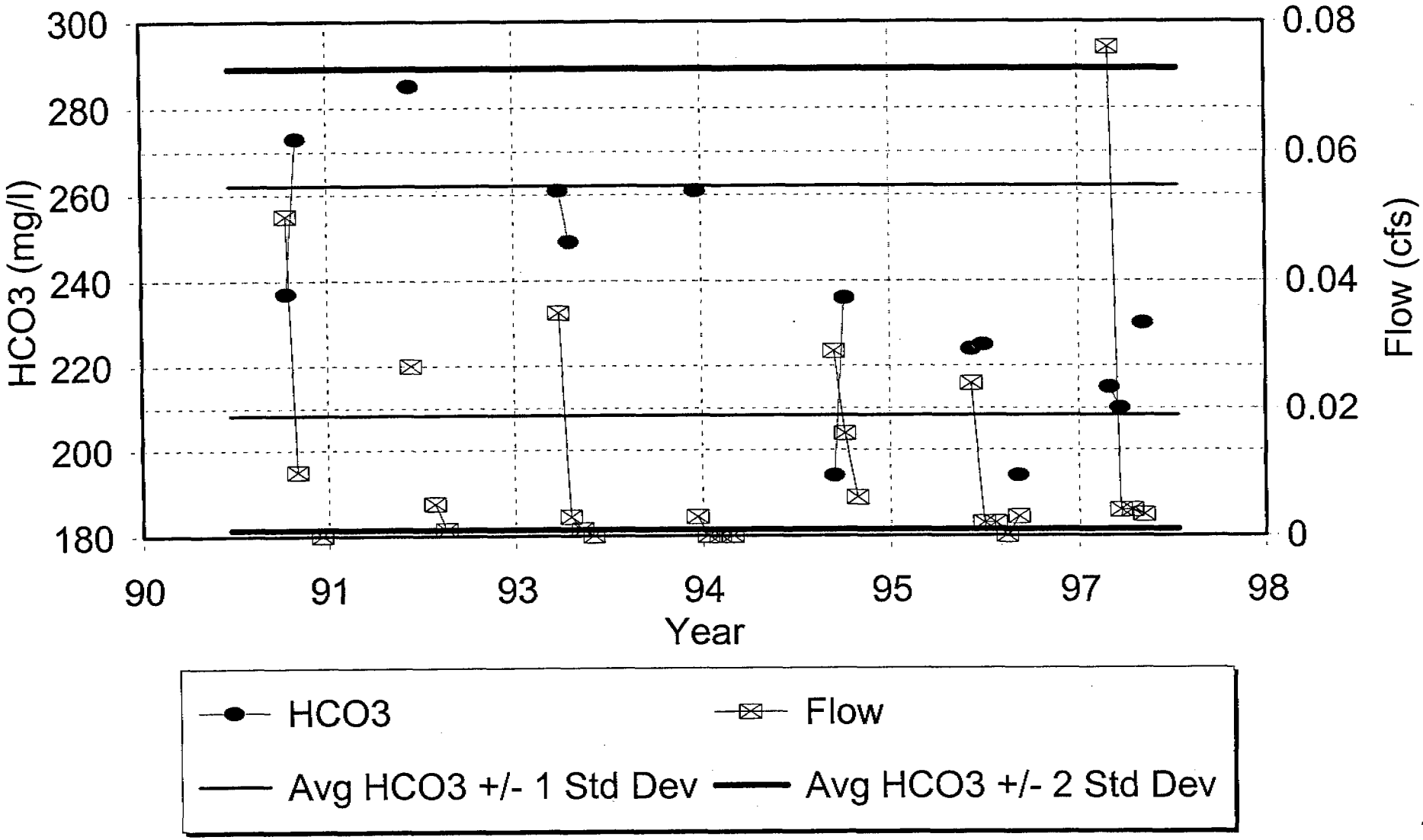
Cl vs. Flow



Cl
Flow
Avg Cl +/- 1 Std Dev
Avg Cl +/- 2 Std Dev

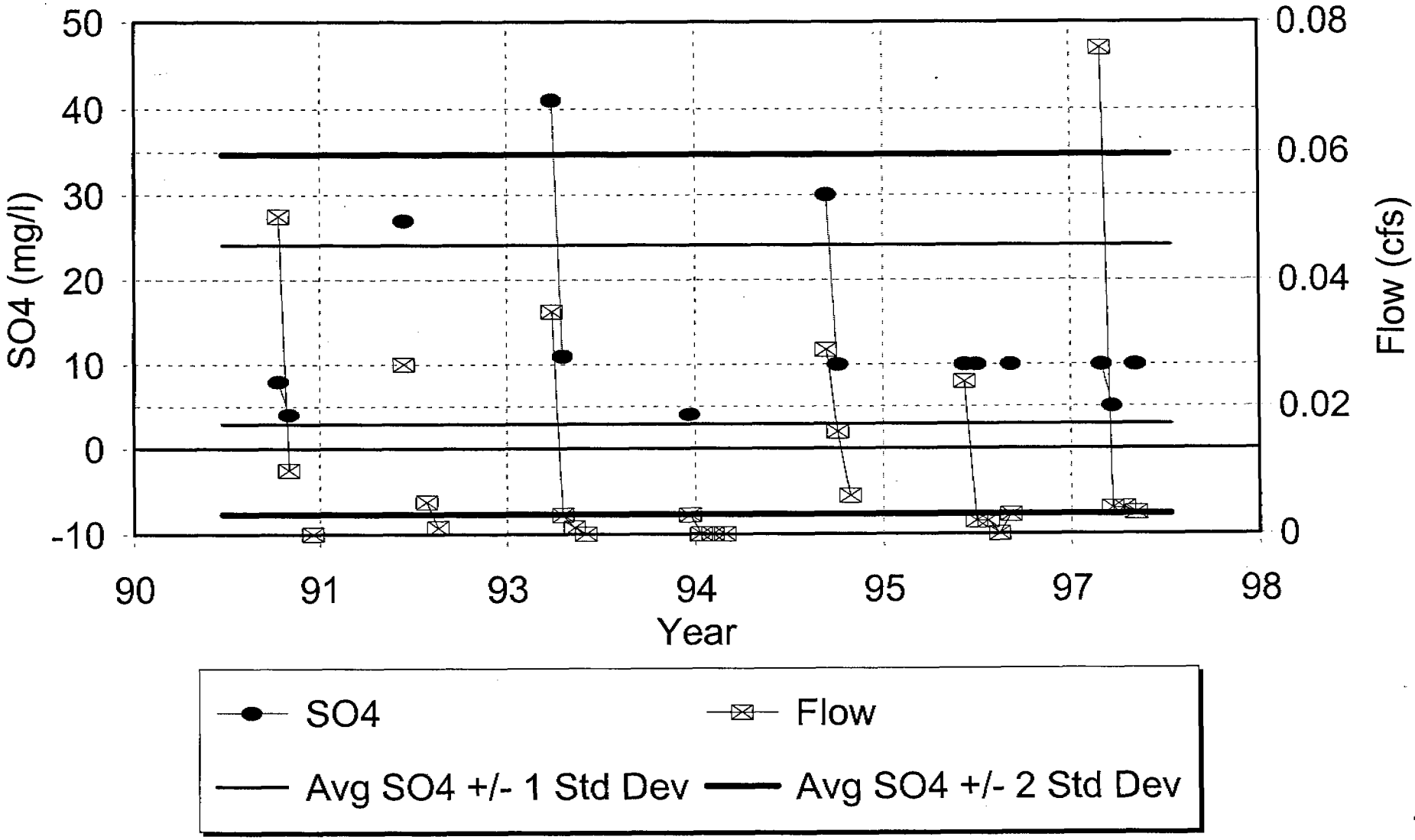
Station 429

HCO3 vs. Flow



Station 429

SO4 vs. Flow



Cyprus Plateau Mining Company - Water Quality Data

Print Date: March 5, 1998

Station: 444 | Property: Star Point | Location: 1625' N 125' W of SE corn. Sec. 15, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9510

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-87																						
Feb-87																						
Mar-87																						
Apr-87																						
May-87	05/19/87	0.03																				
Jun-87																						
Jul-87																						
Aug-87	08/14/87	0.02				256																
Sep-87	09/23/87	0.02				260																
Oct-87																						
Nov-87																						
Dec-87																						
Jan-88																						
Feb-88																						
Mar-88																						
Apr-88																						
May-88																						
Jun-88	06/03/88	0.17																				
Jul-88	07/16/88	0.01				272																
Aug-88	08/20/88	0.02																				
Sep-88	09/10/88	0.03				280																
Oct-88																						
Nov-88																						
Dec-88																						
Jan-89																						
Feb-89																						
Mar-89																						
Apr-89																						
May-89																						
Jun-89	06/05/89	0.01				260																
Jul-89	07/11/89	0.01				254																
Aug-89	08/22/89	0.01																				
Sep-89	09/14/89	0.01				240																
Oct-89																						
Nov-89																						
Dec-89																						
Jan-90																						
Feb-90																						
Mar-90																						
Apr-90																						
May-90	05/30/90	0.02																				
Jun-90																						
Jul-90	07/07/90	0.01																				
Aug-90	08/22/90	0.01																				
Sep-90	09/24/90	0.01																				
Oct-90																						
Nov-90																						
Dec-90																						
Jan-91																						
Feb-91																						
Mar-91																						
Apr-91																						
May-91																						
Jun-91	06/12/91	0.03	7.2	510	4	228			244	251	10	3	8	73	15	1	3	<	0.02	0.04	< 0.01	
Jul-91	07/15/91	0.04	7.8	470	11	298			281	288	7	3	23	83	18	2	5	<	0.02	0.41	< 0.01	
Aug-91																						
Sep-91	09/17/91	0.01	8.3	440	8	250			247	307	0	1	2	74	15 <	1	3	<	0.02	0.07	< 0.01	
Oct-91																						
Nov-91																						
Dec-91																						
Jan-92																						
Feb-92																						
Mar-92																						
Apr-92																						
May-92	05/19/92	0.0267	7.6	473	5.1	270			256	300	0	1	31	76	16	1	3	<	0.02	0.73	< 0.01	
Jun-92																						
Jul-92	07/16/92	0.017	7.3	483	5.8																	
Aug-92	08/26/92	0.015	7	475	7.2																	
Sep-92	09/21/92	0.013	6.1	460	8.2	262			261	288	14	2	4	78	16	1	3	<	0.02	< 0.02		
Oct-92																						
Nov-92																						
Dec-92																						

Cyprus Plateau Mining Company - Water Quality Data

Print Date: March 5, 1998

Station: 444 | Property: Star Point | Location: 1625' N 125' W of SE com. Sec, 15, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9510

Date		Field Measurements				Laboratory Measurements																	
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	Comments
Jan-93																							
Feb-93																							
Mar-93																							
Apr-93																							
May-93																							
Jun-93	06/21/93	0.054	6.2	468	5.4	250			249	315	0	2	8	75	15	1	3	<	0.02	0.43	0.02		
Jul-93	07/27/93	0.027	6.3	449	5.8	256			252	305	0	2	10	76	15 <	1	3	<	0.02	0.18 <	0.01		
Aug-93	08/17/93	0.022	6.3	453	5.7																		
Sep-93	09/27/93	0.017	6.4	461	5.8	266			263	303	0	1	6	79	16	1	3	<	0.02	0.08 <	0.01		
Oct-93																							
Nov-93																							
Dec-93																							
Jan-94																							
Feb-94																							
Mar-94																							
Apr-94																							
May-94																							
Jun-94	06/09/94	0.023	7.3	526	4.4	284			249	312	0	2	2	75	15 <	1	3	<	0.02 <	0.02 <	0.01		
Jul-94	07/19/94	0.02	8	479	10.4	258			244	293	10	2	8	73	15	1	4	<	0.02	0.06 <	0.01		
Aug-94	08/31/94	0.008	7.8	402	10.7																	RAIN IN A.M. = ~.10". LO	
Sep-94	09/21/94	0.01	7.8	487	8.8	270			277	332	0	2	7	83	17	1	3	<	0.02 <	0.02 <	0.01		
Oct-94																							
Nov-94																							
Dec-94																							
Jan-95																							
Feb-95																							
Mar-95																							
Apr-95																							
May-95																							
Jun-95	06/21/95	0.06	7.5	516	5	280			266	235 <	2 <	1	20	81.5	15.2	0.9	3	3.4 <	0.01	0.02 <	0.005		
Jul-95	07/26/95	0.03	7.6	531	7	260			272	245 <	2	2	10	81.4	16.7	0.9	3.2	4.1 <	0.01 <	0.01 <	0.005		
Aug-95	08/23/95	0.022	7.52	459	7																		
Sep-95	09/27/95	0.03	7.5	463	43.5	270			261	242 <	2	2	12	78.9	15.6	0.9	2.9	2.2 <	0.01	0.02 <	0.005		
Oct-95																							
Nov-95																							
Dec-95																							
Jan-96																							
Feb-96																							
Mar-96																							
Apr-96																							
May-96																							
Jun-96	06/12/96	0.018	6.85	602	5	264			283	259	2 <	2	10 <	84.9	17.1	0.9	3.2	5.2	0.03	0.43	0.009		
Jul-96	07/24/96	0.014	8.18	533	5	271			281	256	2 <	2	10	84.6	16.8	0.8	3	3.4	0.01 <	0.16	0.005		
Aug-96	08/19/96	0.022	8.58	400	7																		
Sep-96	09/30/96	0.012	7.6	539	6.5	264			264	254	2 <	2	10	80.4	15.3	0.8	2.8	0.7	0.01 <	0.01 <	0.005		
Oct-96																							
Nov-96																							
Dec-96																							
Jan-97																							
Feb-97																							
Mar-97																							
Apr-97																							
May-97																							
Jun-97	06/17/97	0.04	8.4	495	9	262			269	232	2 <	1	20	80.8	16.4	1.1	3	4.3	0.02	0.35	0.005		
Jul-97	07/30/97	0.03	7.82	537	6	240			240	230	10 <	0.5 <	5 <	72	15	1.1	2.9	4	0.01 <	0.04	0.005		
Aug-97	08/13/97	0.03	8.25	477	7																		
Sep-97	09/16/98	0.003	7.96	522	7	300			260	250 <	10 <	0.5 <	5	76	17	1.3	3.2	3.5 <	0.01	0.09 <	0.005		
Oct-97																							
Nov-97																							
Dec-97																							
END DATA																							
Count		42	27	27	27	27	0	0	20	20	20	20	20	20	20	20	20	9	20	20	19		
Minimum		0.003	6.1	400	4	228	ERR	ERR	240	230 <	0 <	0.5 <	2 <	72	15 <	0.8	2.8	0.7 <	0.01 <	0.01 <	0.005		
Maximum		0.17	8.58	602	43.5	300	ERR	ERR	283	332 <	14 <	3 <	31 <	84.9	18 <	2	5	5.2 <	0.03 <	0.73 <	0.02		
Average		0.0246	7.4504	485.56	8.1963	263.89	ERR	ERR	260.95	274.85 <	3.75 <	1.7 <	10.55 <	78.275	15.905 <	1.035	3.16	3.4222 <	0.017 <	0.1595 <	0.0084		
Standard Deviation		0.0256	0.6945	43.094	7.1641	15.81	ERR	ERR	12.986	31.571 <	4.4258 <	0.6964 <	7.2765 <	3.9426	0.9113 <	0.2455	0.4831	1.2309 <	0.0056 <	0.1963 <	0.0036		
Avg. -1 Std. Dev.		-0.001	6.7559	442.46	1.0322	248.08	ERR	ERR	247.96	243.28 <	-0.676 <	1.0036 <	3.2735 <	74.332	14.994 <	0.7895	2.6769	2.1913 <	0.0114 <	-0.037 <	0.0047		
Avg. +1 Std. Dev.		0.0502	8.1448	528.65	15.36	279.7	ERR	ERR	273.94	306.42 <	8.1758 <	2.3964 <	17.827 <	82.218	16.816 <	1.2805	3.6431	4.6531 <	0.0226 <	0.3558 <	0.012		
Avg. -2 Std. Dev.		[illegible]027	6.0614	399.37	-6.132	232.27	ERR	ERR	234.98	211.71 <	-5.102 <	[illegible]072 <	-4.003 <	70.39	14.082 <	0.544	2.1938	0.9605 <	0.0059 <	-0.233 <	0.0011		
Avg. +2 Std. Dev.		[illegible]59	8.8393	571.74	22.525	295.51	ERR	ERR	286.92	337.99 <	12.602	[illegible]28 <	25.103 <	86.16	17.728 <	1.526	4.1262	5.884 <	0.0281 <	0.5522 <	0.0156		

Cyprus Plateau Mining Company - Water Quality Data

Print Date: March 5, 1998

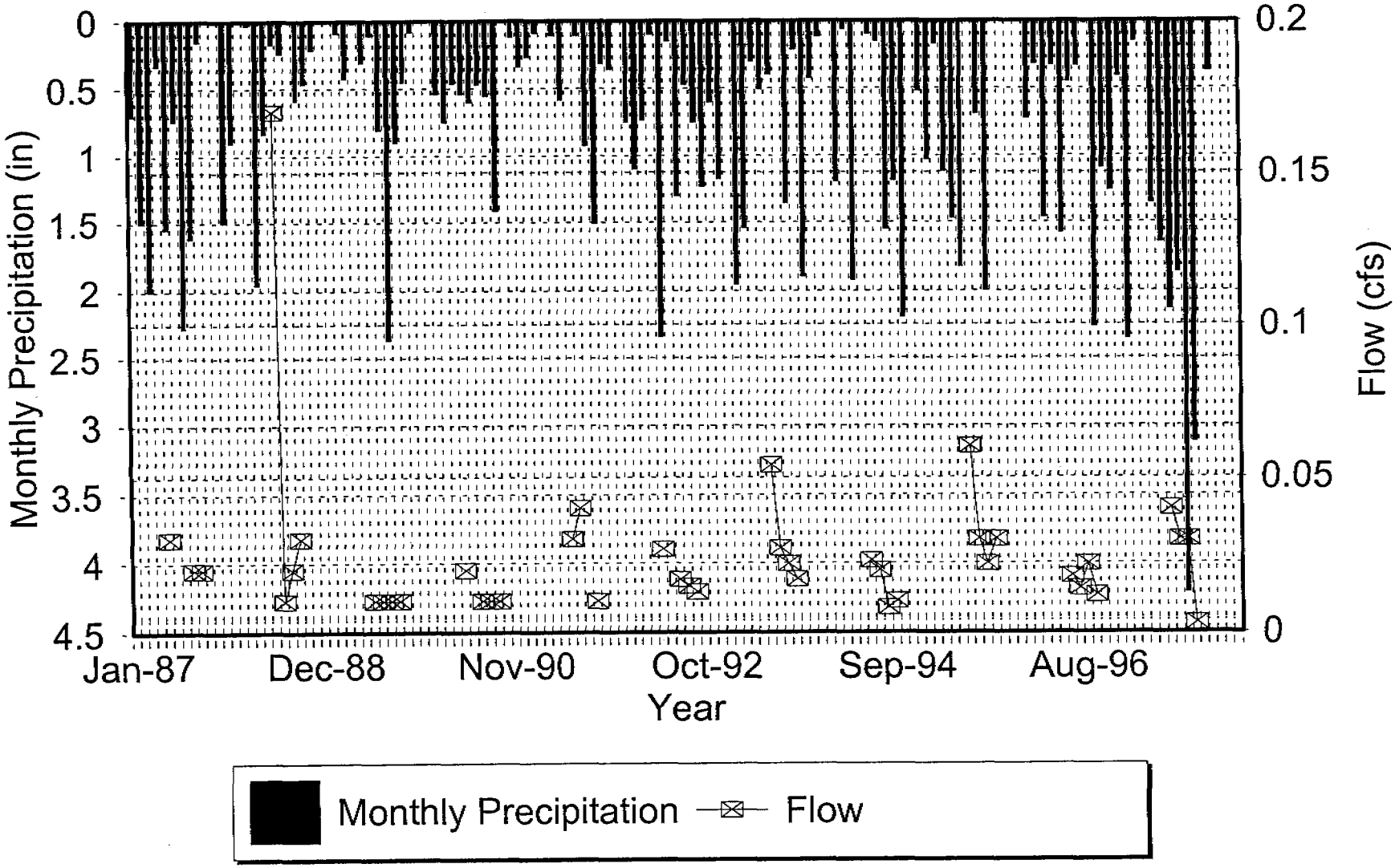
Station: 444 | Property: Star Point | Location: 1625' N 125' W of SE com. Sec, 15, T15S, R7E | Station Type: Spring | Sampling Frequency: Quarterly | Formation: North Horn | Elevation: 9510

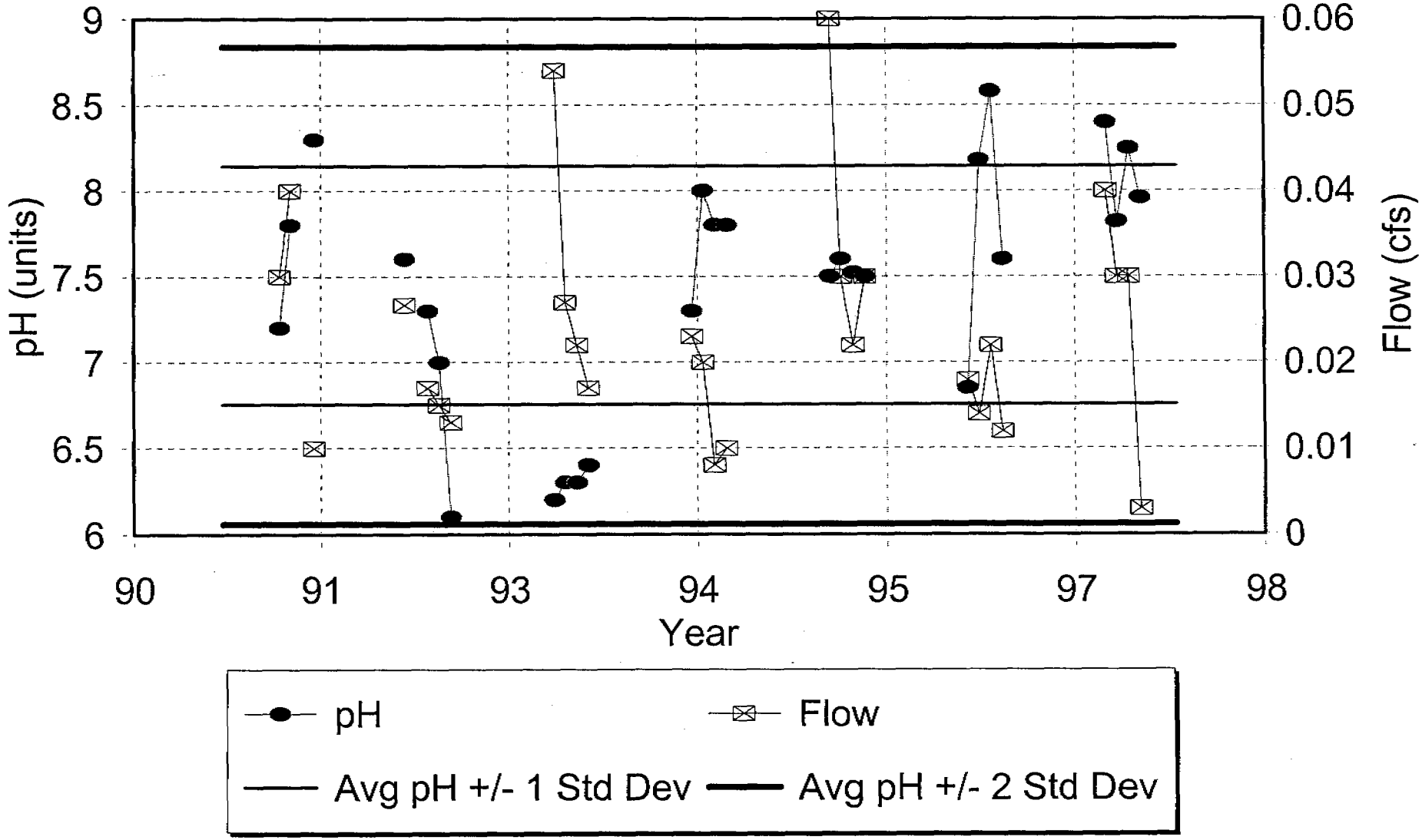
Date		Field Measurements				Laboratory Measurements																Comments
Mo-Yr	Sample Date	Flow (cfs)	Ph (units)	Sp. Cond. (ohms)	Temp. (C)	TDS (mg/l)	TSS (mg/l)	O&G (mg/l)	Hd-CaCO3 (mg/l)	HCO3 (mg/l)	CO3 (mg/l)	Cl (D) (mg/l)	SO4 (D) (mg/l)	Ca (D) (mg/l)	Mg (D) (mg/l)	K (D) (mg/l)	Na (D) (mg/l)	Cat/An Bal (%)	Fe (D) (mg/l)	Fe (T) (mg/l)	Mn (T) (mg/l)	

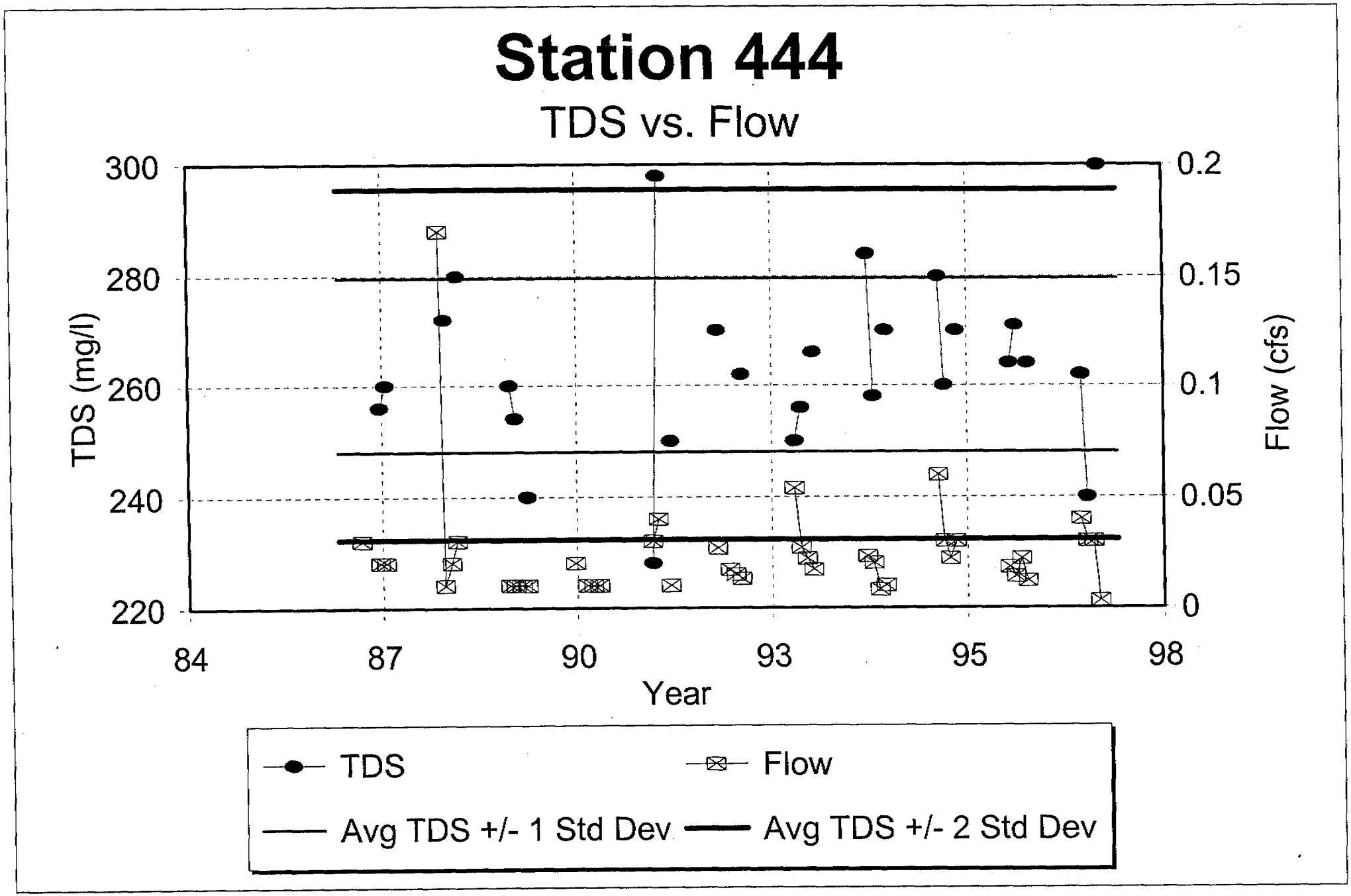
NOTE: The "<" symbol indicates that "Less Than" data was found in the data set; statistics are approximate.

Station 444

Monthly Precipitation vs. Flow

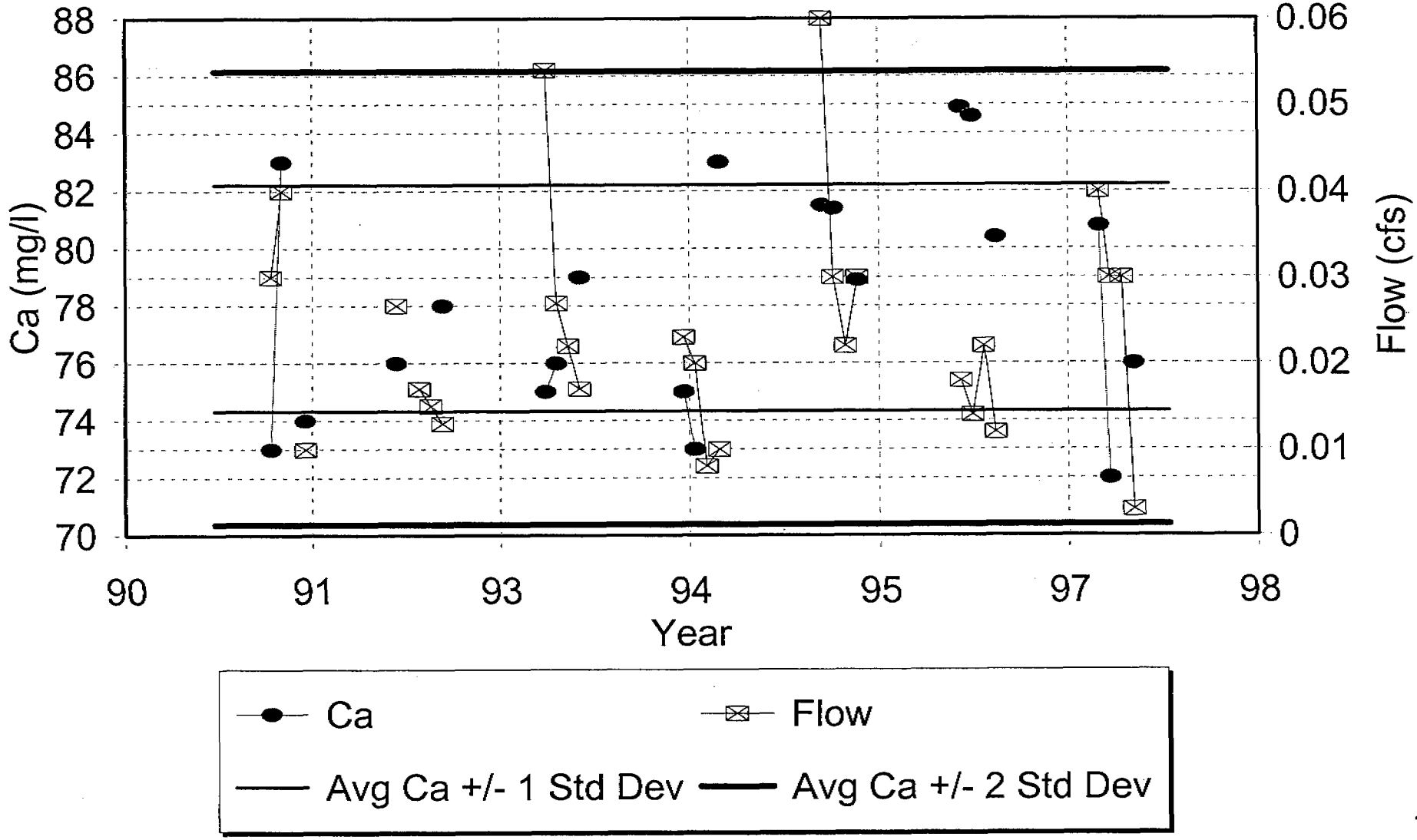



Station 444
pH vs. Flow
pH (units)
Flow (cfs)
Year
9
8.5
8
7.5
7
6.5
6
0.06
0.05
0.04
0.03
0.02
0.01
0
90
91
93
94
95
97
98
pH
Flow
Avg pH +/- 1 Std Dev
Avg pH +/- 2 Std Dev


Station 444
TDS vs. Flow
300
280
260
240
220
TDS (mg/l)
0.2
0.15
0.1
0.05
0
Flow (cfs)
84
87
90
93
95
98
Year
TDS
Flow
Avg TDS +/- 1 Std Dev
Avg TDS +/- 2 Std Dev

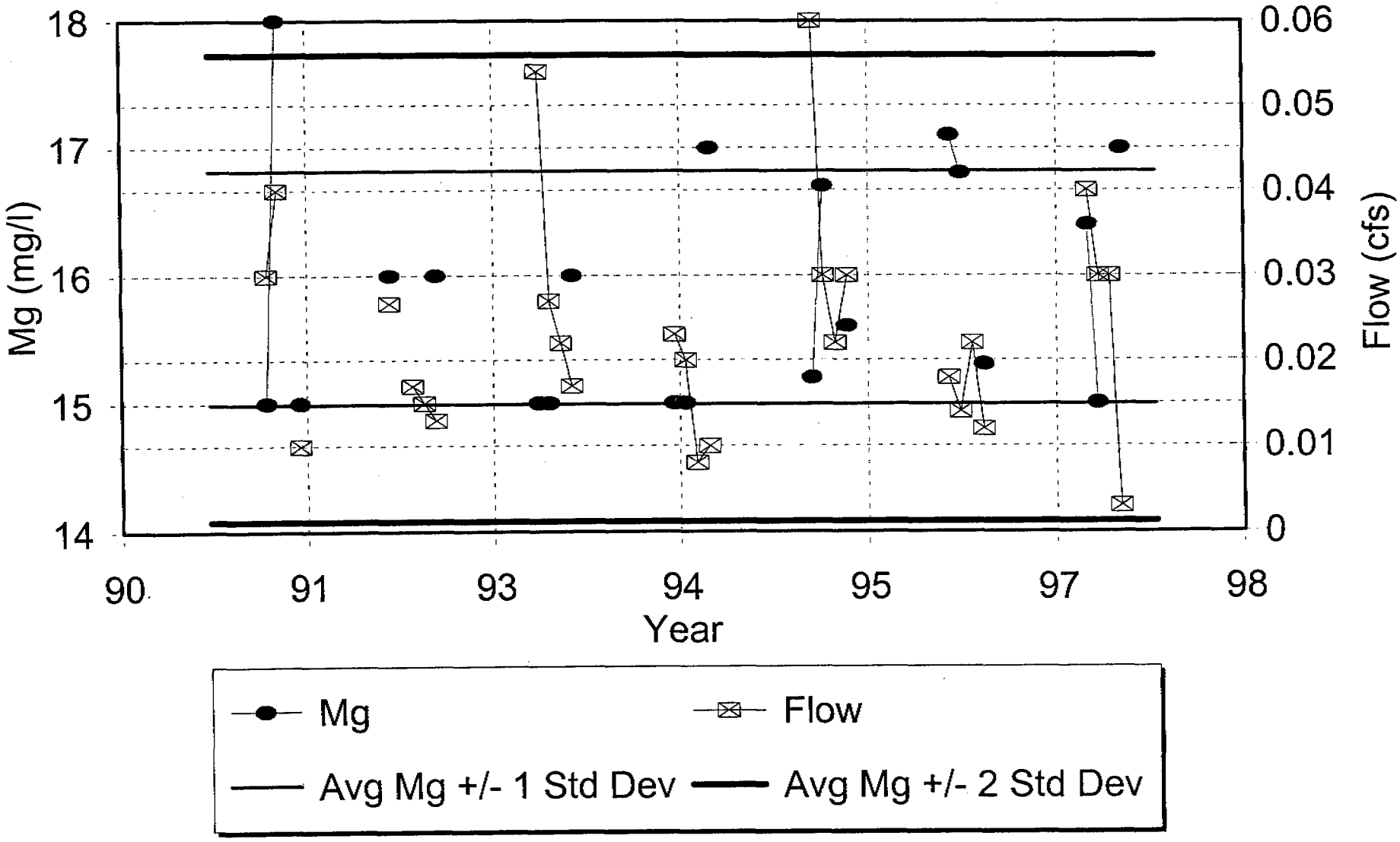
Station 444

Ca vs. Flow



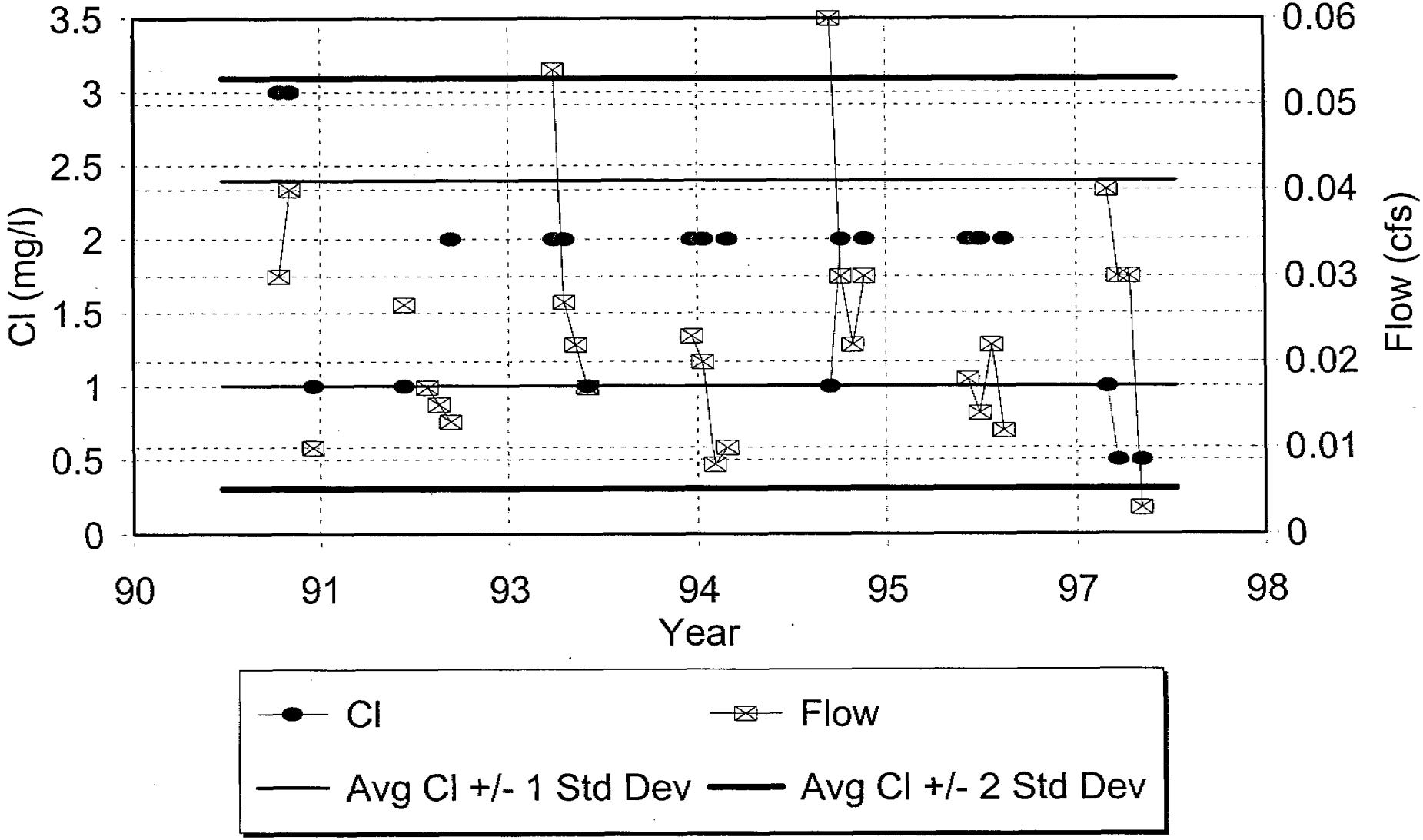
Station 444

Mg vs. Flow



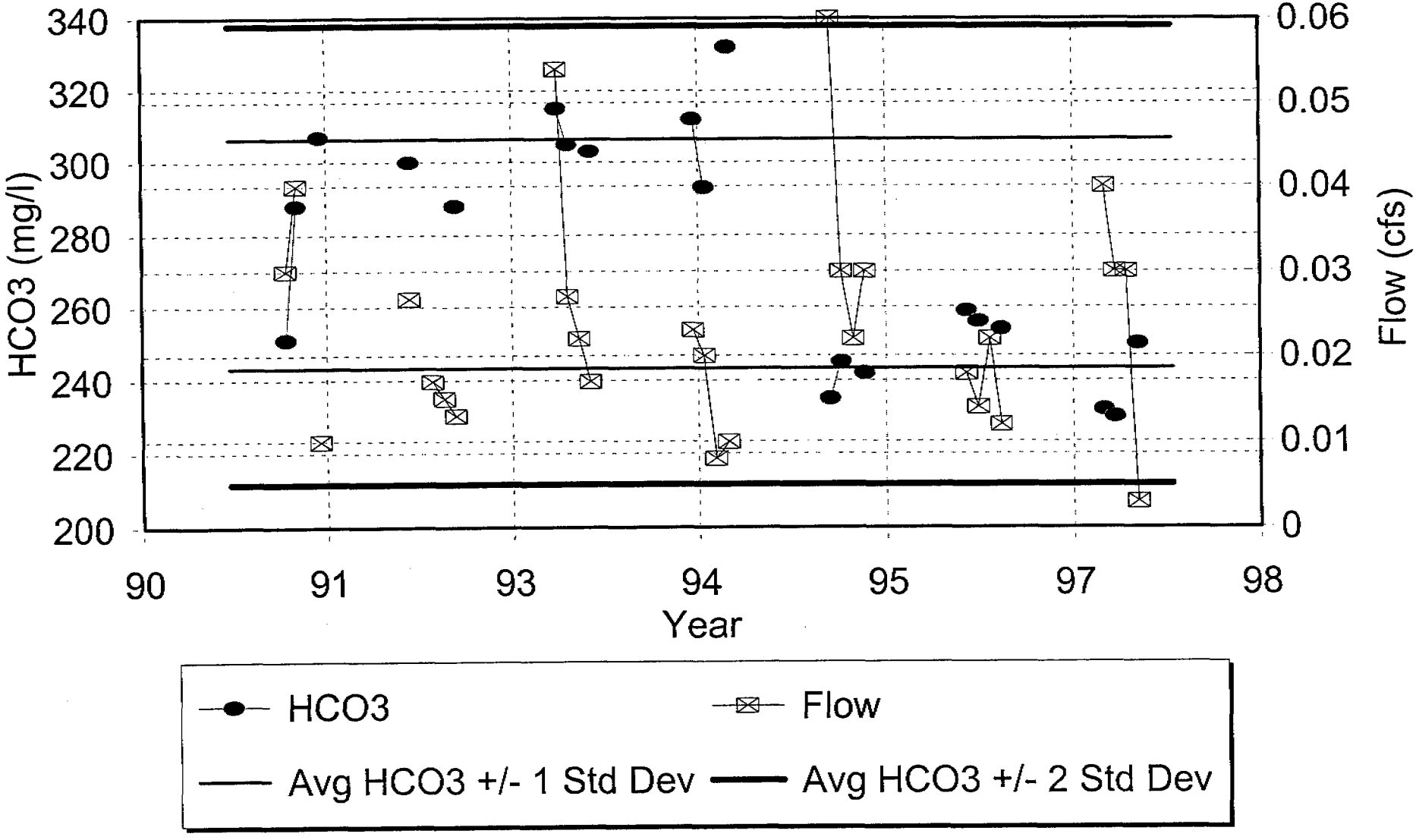
Station 444

Cl vs. Flow



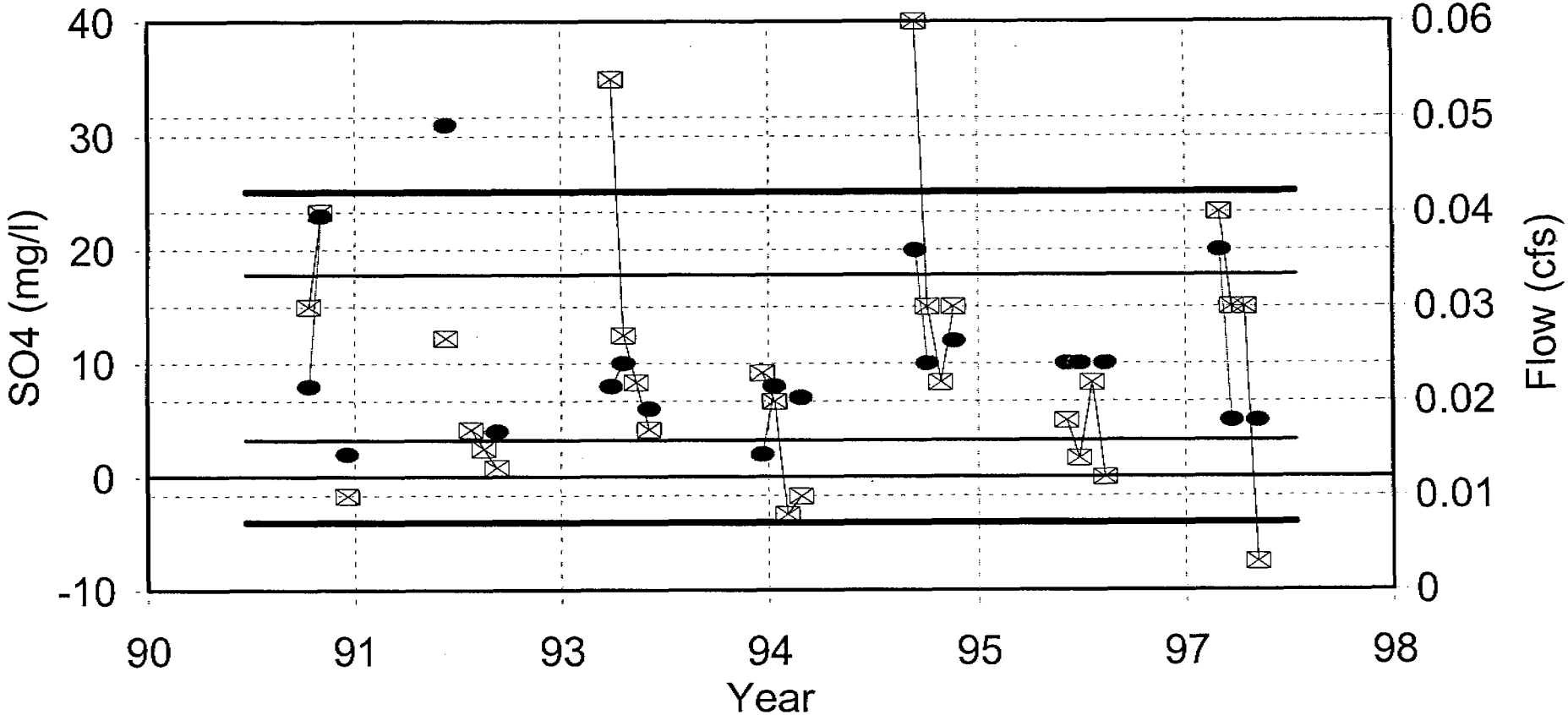
Station 444

HCO3 vs. Flow



Station 444

SO4 vs. Flow



SO4 | Flow

Avg SO4 +/- 1 Std Dev | Avg SO4 +/- 2 Std Dev