

# Rio Algom Mining LLC

July 7, 2005

## ADDRESSEE ONLY

Gary Janosko, Chief  
Fuel Cycle Facilities Branch, NMSS  
Mail Stop T-8A33  
U.S. Nuclear Regulatory Commission  
Washington, DC 20850

**Subject: Rio Algom Mining, LLC; Docket 40-8905  
Response to Nuclear Regulatory Commission's February 10, 2005 Request  
to Incorporate Non-Hazardous Constituents as part of Site Alternate  
Concentration Limit Petition**

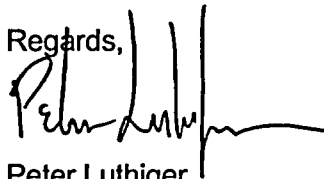
Dear Mr. Janosko,

Rio Algom Mining LLC (RAM) provides the following information in response to the Nuclear Regulatory Commission's (NRC) February 10, 2005 request to address the non-hazardous constituents as part of Alternate Concentration Limit petition for the Ambrosia Lake site.

This submittal utilizes the statistical methodologies and conceptual approach to address the non-hazardous constituents that were discussed with Mr. Stephen Cohen of the NRC during conference calls on June 14<sup>th</sup> and June 23<sup>rd</sup> of 2005.

RAM believes this submittal addresses the remaining item that will allow NRC to proceed with finalizing the ACL petition for the site. RAM will work closely with NRC to achieve this goal and welcomes any questions NRC may have on this submittal. Please contact me at 505 287 8851, extension 205 if you have questions.

Regards,



Peter Luthiger  
Manager, Radiation Safety  
and Environmental Affairs

Attachment: As stated

xc: R. Nelson (NRC)  
B. Law  
K. Myers (NMED)  
File

**Rio Algom Mining LLC  
Ambrosia Lake Operation  
Incorporation of Non-Hazardous Constituents into  
Alternate Concentration Limit Licensing Action**

## **Introduction**

In response to a February 10, 2005 Nuclear Regulatory Commission (NRC) request that non-radiological constituents be considered as part of the Alternate Concentration Limit (ACL) application approval process, Rio Algom Mining LLC (RAM) proposes to incorporate the following non-hazardous constituents and concentration values (Table 1) into the facility ACL application and add them to the stability monitoring plan requirements to be implemented following approval of the ACL for the Ambrosia Lake site.

<b>Table 1. Proposed Site Standards – Non-hazardous Constituents</b>	
<b>Parameter</b>	<b>Standard (mg/L)</b>
Chloride	3,487
Nitrate	1,627
Sulfate	5,417
Total Dissolved Solids(TDS)	13,511

In comments on NRC's draft Environmental Assessment (February, 2005) associated with the RAM's ACL application, the State of New Mexico indicated that they were concerned that non-hazardous constituents were not addressed within the ACL application and review process. As a result of the State concerns and NRC's requirement to address non radiological impacts of the action, NRC requested Rio Algom develop a proposal to address the non-hazardous constituents present in the groundwater.

In order to minimize State of New Mexico's concerns regarding this NRC licensing action and facilitate ongoing negotiations with the State, RAM has opted to establish ACL values based on specific language contained within the New Mexico Water Quality Control Commission Regulations that defines background/baseline conditions as those that existed at the site when the State Groundwater Protection Regulations became effective in 1977.

To assist NRC's expeditious approval of the ACL application, the information presented in subsequent sections of this document provides a brief review of the conceptual model describing fate and transport properties of ground water constituents under NRC's regulation, descriptions of RAM's approach to establishing background/baseline conditions that existed in 1977 and statistical methods used to define concentration values. This document also proposes specific steps to improve the current Stability Monitoring Plan. The foregoing information is presented under the following four headings:

- 1) Overview of Hydrologic and Geochemical Conditions
- 2) Approach and Statistical Methods
- 3) Statistical Results and Proposed Concentration Values
- 4) Proposed Improvements to Stability Monitoring Plan

## **Overview of Hydrologic and Geochemical Conditions**

The RAM tailings facility is among a few major features visible from the air above the Ambrosia Lake Valley (Figure 1). The former Phillips Petroleum Uranium Mill Site (a responsibility of the US Department of Energy under Title 1 of UMTRCA) is another notable landmark. Other features highlighted on Figure 1 are various wells that have been identified in the area, locations of major mines marking the Ambrosia Lake Mining District. The last major features visible on the Orthophoto are a series of lined evaporation ponds in Section 4, Township 13 North, Range 9 West (Section 4 Evaporation Ponds).

The Ambrosia Lake Mining District consists of approximately 30 to 40 mines that are or were owned and operated by a number of different companies. The Westwater Canyon Member of the Morrison Formation is the principal uranium

ore-bearing unit in the region. In order to mine underground, the Westwater Canyon Member was dewatered by pumping all groundwater out and discharging it to the surface. A regional cone of depression has formed within bedrock units as a result of mine dewatering. The bedrock formations above the Westwater Canyon have essentially been dewatered within this cone of depression

The conceptual model describing hydrologic and geochemical conditions impacting the fate and transport of non-hazardous constituents has been developed from large amounts of regional data collected by numerous investigators. The currently accepted conceptual model of site conditions is documented in numerous publications by scientific research groups and regulatory agencies. Examples include publications by the New Mexico Environment Department (Goad, et. al., 1980; Bostick, 1985; Gallaher and Cary, 1986), the US Environmental Protection Agency (USEPA, 1975), the US Geological Survey (Kernoodle, 1996; Dam, 1995; Dam, et. al., 1990; Craig et. al., 1989), Los Alamos National Laboratory (Purtymun et. al., 1977), the US Department of Energy (USDOE, 1987; USDOE, 1994), and the New Mexico Bureau of Mines and Mineral Resources (Stone et. al., 1983; Lyford et. al., 1980) among others

### ***Site Conceptual Model***

The Alluvium was dry when mining began and was not considered to be a groundwater resource (Bostik, 1985). Saturated conditions are a result of mine water discharge to the surface during the 40 years of uranium mining throughout the Ambrosia Lake district. Conventional underground uranium mining by numerous mining companies working in very close proximity to one another within the Ambrosia Lake Mining District caused regional de-watering and depressurization of the Westwater Canyon member of the Morrison Formation, the primary ore bearing unit in the region.

In a 1983 New Mexico Bureau of Mines Publication, Stone et. al., notes:

*"A large quantity of freshwater is currently being pumped to keep the mines dewatered. The quantity will increase as more and deeper mines*

*are constructed. Dewatering will, in turn, cause large declines in water wells completed in the Morrison Formation”*

Stone et al. (1983) estimates water production by uranium mines in the Ambrosia Lake Area during the period 1955-1977 to be well over a quarter of a million acre-feet of water.

Bostick (1985) observes that:

*“The bedrock formations above the Westwater Canyon Member of the Morrison Formation (hereafter designated the WCM) have been dewatered by ventholes and mine shafts located to the north of QMC’s mill and tailings facility [the Rio Algom Mill Site]. Recharge to the bedrock aquifer occurs along the outcrop areas and flows northeast toward potentiometric depressions caused by mine dewatering. Aquifers below the WCM will not be discussed because dewatering of the WCM in the Ambrosia Lake mining area has created an upward hydraulic gradient, thereby precluding water quality impacts in aquifers lower than the Westwater.”*

The net effect of this hydrologic regime is that groundwater in the alluvium drains to the cone of depression caused by dewatering of the bedrock aquifers during mining and is captured within the site boundaries. The volume of water with milling related constituents present is small compared to the volume of water that will refill the depression during the next six or seven hundred years, resulting in overall water quality changes that will be too small to measure.

The volume of water pumped from mines has declined during the time period following the decline in uranium prices in the early 1980's. Rio Algom is the last operator still pumping mine water. This pumping is mandated by the current NRC Groundwater Corrective Action Plan and will be discontinued after approval of the Alternate Concentration Limits (ACL) application. Once the discharge of treated mine water to the Arroyo del Puerto is halted, the calibrated groundwater flow model presented in the Alluvial ACL predicts that alluvial materials will dewater within approximately 60 years, and naturally occurring, geochemical processes will reduce constituent concentrations within the QMC restricted area

boundary, resulting in the protection of human health and the environment at the Point of Exposure.

Evidence that the alluvium will drain as predicted by the ACL groundwater flow model and that the processes described above are already occurring can be found in documentation and response to Request for Additional Information accompanying Rio Algom's 2005 submittal to the NRC: *Relocation Plan for Lined Evaporation Ponds* (RPLEP). This document described conditions at the Section 4 Ponds which are located above alluvial materials in a tributary channel to the Arroyo del Puerto (the primary alluvial drainage adjacent to the tailings facility), but not directly downgradient of current mine pumping.

Saturation of soils in the paleochannel underlying the location of the future Section 4 Ponds was observed during pond pre-construction investigations, confirming that groundwater flow in the alluvial materials existed in 1979 (more than 20 years after mine discharge had begun). Mine pumping to this drainage ended in the early to mid 1980's and the RPLEP documents steadily declining groundwater levels in the tributary alluvial paleochannel from the beginning of data availability in 1982 to the point that most wells went dry in the late 1980's and early 1990's.

The conceptual model described above was the basis for the groundwater corrective action has been accepted and approved by the NRC at the DOE Ambrosia Lake Uranium Mill Tailings Remedial Action (UMTRA) facility located above the same alluvial unit one mile east of the QMC Facility (Figure 1).

## **Approach and Statistical Methods**

The New Mexico Water Quality Control Commission Regulations (20 NMAC 6.2) were enacted in 1977 to protect all groundwater in the State of New Mexico which has an existing concentration of 10,000 mg/L or less TDS for present or potential future use. These regulations state that water quality standards for groundwater of 10,000 TDS concentration or less will be those specified in 20 NMAC 6.2.3103 unless the existing condition exceeds listed standards:

*"if the existing concentration of any water contaminant in ground water exceeds the standard of Section 20.6.2.3103 NMAC, no degradation of the ground water beyond the existing concentration will be allowed. "* (20.6.2.3103 NMAC A. (2)).

### ***Existing Conditions***

It is no small task to arrive at concentration values for constituents that represent "existing conditions" in 1977. An early regulatory approach at Ambrosia Lake made the assumption that the cleanest wells at the site must represent "background" and resulted in current site standards included in NRC License conditions. However, as documented in the ACL application, we have since come to understand that all of the water currently residing in alluvial materials is from anthropogenic sources and much of it is not related to the RAM milling operation.

As discussed earlier, the alluvial materials were unsaturated before mining began in the Ambrosia Lake Valley (Bostick 1985). Mine-dewatering discharges from underlying geologic units created saturated conditions within the Alluvium during the development of numerous mines in the vicinity. The mine water carried many of the same constituents found in tailings seepage, making separation of the two sources problematic. Seepage from the nearby Title I facility (Figure1) and potential infiltration of leachate from abandoned and unreclaimed mine spoils and ore piles further complicate any attempts to define a single value for each constituent.

At Ambrosia Lake, the number of different source terms combined with the high attenuation capacity and fine-grained, sand-clay-silt composition of the alluvial materials causes wide variability in water quality across the site. Further complications come with the necessity to make judgments on data quality: i.e., is that data point a true outlier or does it represent the high variability known to occur in groundwater in Ambrosia Lake alluvial material?

Bias of data sets has to be carefully considered when performing statistical analysis of this type. Discussing outliers, the USEPA (2000) cautions against

being quick to remove high values from the data set. They note that it is common for the distribution of concentration data at a site to be strongly skewed, with a few very high values corresponding to local hot spots of contamination. In addition, monitor wells are often located for a specific purpose, such as to define the plume (which would bias "existing conditions" toward higher concentrations) or to define background (bias toward lower values).

### ***Treatment of Non Detects and Outliers***

USEPA (2000) guidance emphasizes the necessity of focusing on treatment of non detects and outliers before proceeding to statistical tests. The treatment of non detects does not pose a problem for the data under consideration because chloride, nitrate, sulfate, and TDS are generally present in groundwater in more than trace amounts and there were no non detects in the data set. Treatment of outliers was accomplished by identifying all monitor wells that were present in 1977 (Figure 2) and evaluating concentration trends in each well for the period from installation through 1977 (Attachment 1). Trends were visually inspected for outliers and several order of magnitude errors were identified and the data removed (see Attachment 1). However, trends in most wells were relatively constant.

### ***Data Synthesis***

Figure 2 shows the monitor wells that were installed in 1977 and prior years. These are the wells with data available to establish concentrations that existed in 1977. There are no wells through the tailings impoundments which would likely have been the locus of highest existing concentrations in 1977. Also, there are no wells in the data set from the vicinity of the DOE's Title I tailings facility situated on the alluvial materials just east of the RAM site (this facility existed in 1977 and had yet to be reclaimed) However, wells that do exist are broadly distributed across the area covered by the RAM's projected DOE withdrawal boundary.

In spite of good spatial coverage, there is potential for bias in statistical analysis because there is not uniform temporal coverage in the data set. Some of these

monitor wells were sampled numerous times during the period of interest and other wells were sampled only once, raising the possibility that wells close to seepage with abundant data (located to define the plume) could bias analysis of existing conditions to the high side. For this reason a decision was made to give all sample locations equal weight, and use a representative value from each well (in this case the mean value of each constituent in each well) to preserve the spatial variations that existed in 1977.

### ***Normality of data***

Most statistical tests assume that data represent a normal distribution. However, EPA Guidance (1992) suggests that a lognormal distribution is a more appropriate default statistical model for most groundwater data (USEPA, 1992). It is important to identify the distribution of the data because data that do not fit assumptions made in designing statistical operations can lead to false conclusions.

Therefore, following EPA guidance for statistical analysis of groundwater monitoring data (USEPA, 2000), data sets represented herein were first tested for Normality and then, if the assumption of Normality failed, tested for Lognormality. Data distributions were screened visually using Probability Plots and tested using the Shapiro-Wilk W Test, USEPA's (2000) most highly recommended test for normality in data sets comprised of less than 50 data points (Figure 3). If the Shapiro-Wilk statistic (W) is less than the 10 percent critical value for the sample size, the assumption of Normality can be rejected. Data that did not meet the assumptions of Normality or Lognormality were evaluated using non-parametric statistics.

### ***Choice of Analysis Method***

Guidance from numerous sources refers to establishment of statistically based background values by application of one of three types of upper concentration limit: an Upper Confidence Limit (UCL), an Upper Prediction Limit (UPL), and an Upper Tolerance Limit (UTL). However, the interpretations that are made based

on these analyses can be quite different. RAM chose to use the UTL analysis for the reasons listed below.

The UCL is focused on the average concentration level at a particular well or group of wells and offers little information about the highest or most extreme sample concentrations one is likely to observe over time. This approach is inappropriate of the RAM site because any analysis based on the average concentration ignores the documented wide spatial variability of concentrations across the site, giving a high probability that standards set using this method will be exceeded by some wells at the site.

The UPL is constructed to contain the next sample value(s) from a population or distribution with a specified probability (USEPA 1992). That is, after sampling a background well for some time and measuring the concentration of an analyte, the data can be used to construct an interval that will contain the next sampled concentration. Again, the wide spatial variability of groundwater concentrations in Ambrosia Lake alluvial materials makes this analysis method inappropriate since it would require separate ACL values for each well that is sampled and any new well that might be installed.

### ***Tolerance Intervals***

The UTL approach was chosen because, unlike the UCL, which estimates the range in which a population parameter falls, the UTL estimates the range that should contain a certain percentage of each individual measurement in the population. Because UTLs are based upon only a sample of the entire population, we cannot be 100% confident that that interval will contain the specified proportion. Thus there are two different proportions associated with the tolerance interval: a degree of confidence, and a percent coverage. For instance, using parameters from the current analysis, we can be 95% confident that 95% of the population will fall within the range specified by the tolerance interval.

UTLs are useful for ground-water data analysis precisely because they do allow for wide variability. Since a UTL is designed to cover all but a small percentage of the population measurements, observations should very rarely exceed the

UTL, while allowing us to gauge whether or not too many extreme concentration measurements are being sampled from compliance point wells.

USEPA (1992) Guidance states:

*"Tolerance intervals can be used in detection monitoring when comparing compliance data to background values. They also should be used in compliance monitoring when comparing compliance data to certain Ground-Water Protection Standards. Specifically, the tolerance interval approach is recommended for comparison with a Maximum Contaminant Level (MCL) or with an ACL if the ACL is derived from health-based risk data."*

The UTL can be calculated as follows:

$$UTL = M + K \cdot s$$

With:

M = the mean value of a constituent data set,

K = the factor to adjust the width of the interval (found in tables or calculated by the following equation), and

$$K = t_{n-1, 1-\alpha} \sqrt{1 + \frac{1}{n}}$$

1-alpha = the percent coverage, and not the level of confidence.

## Statistical Results and Proposed Concentration Values

Calculated UTLs, descriptive statistics for each constituent and whether or not the assumption of Normal or Lognormal distribution could be rejected are presented in Table 2. RAM proposes that the UTL values listed there be incorporated in to the license as ACL Values for the Alluvium at the RAM site.

We further propose that these same values serve as the ACL values for the bedrock units based on the following observations:

- 1) The tailings impoundments rest almost entirely on alluvial materials or weathered Mancos shale
- 2) Alluvial materials see the highest concentrations from tailings seepage because any seepage moves through these materials to reach other units

(the primary route to the bedrock units was seepage from ponds 7 and 8 were a small exposure of bedrock outcrop occurs).

- 3) Groundwater in the alluvium drains to the cone of depression caused by dewatering of the bedrock aquifers during mining and is captured within the site boundaries. Regulated seepage in bedrock units shares the same fate.

Table 2. Statistical Results for Data Derived from the Mean Concentration in Each Well During the Period from Well Installation Through 1977.

Non-Hazardous Parameter	Proposed ACL Values	Upper 95% limit of a 95%-content one-sided Tolerance Interval (mg/L)	1977 Existing Concentration Maximum Value (mg/L)	1977 Existing Concentration Minimum Value (mg/L)
Chloride (mg/L)	3,487	3,538	3,487	33
Nitrate (mg/L)	1,627	3,361	1,627	8
Sulfate (mg/L)	5,417	5,417	6,033	847
Total Dissolved Solids (mg/L)	13,511	13,511	14,507	1,690
	1977 Existing Concentration Mean Value (mg/L)	1977 Existing Concentration Standard deviation	1977 Number of valid data values	Normality Rejected?
Chloride (mg/L)	999	1,131	28	yes
Nitrate (mg/L)	342	718	5	Yes
Sulfate (mg/L)	2,789	1,171	28	No
Total Dissolved Solids (mg/L)	6,232	3,241	28	No

## Proposed Improvements to Stability Monitoring Plan

RAM has re-evaluated the stability monitoring plan (RAM submittal dated October 16, 2003) to ensure that it incorporates the proposed non-hazardous constituents and is adequate to monitor for the additional constituents. In addition, re-evaluation of the stability monitoring plan allowed incorporation of updated site reclamation plans. As a result, RAM believes that modifications are warranted to ensure that appropriate wells are included to incorporate the

characteristics of the added parameters and to ensure that data quality is preserved.

### **Point of Compliance Wells - Alluvium**

Within the October 16, 2003 submittal, RAM proposed monitor well S-9 as a point of compliance ("POC") well. In light of the stability monitoring plan re-evaluation, RAM believes that well S-9 is not an appropriate well for the following reasons.

A part of stability monitoring re-evaluation was reviewing well completion records for data quality and completeness. This review revealed that S-9 was one of the original wells installed at the site (1962) and well construction/completion methods are not documented. Therefore, its integrity can not be relied upon. Further, exposed well casing in S-9 consists of thin wall metal pipe whose integrity in the subsurface is suspect, especially in the acidic environment associated with the site due to the acid leach circuit utilized at the mill.

Rio Algom proposes to use well 32-72 as a replacement for well S-9 as part of the site stability monitoring plan. Well 32-72 was installed in 1989 during the characterization and development of the site Detection Monitoring Plan and subsequent NRC approval of the Corrective Action Plan, making it one of the newest alluvial monitoring wells at the site. It was completed using 4 inch Schedule 40 PVC casing and records of screen interval, sand pack, and bentonite seal are available, assuring that data quality will be maintained and can be documented.

Monitor well S-9 and monitor well 32-72 are both 1400 feet from the seepage intercept trench at the toe of Pond 3, providing similar seepage detection capabilities. Both wells also monitor any potential seepage from Pond 9 prior to planned relocation of Pond 9 materials to Impoundment 2. However, unlike S-9, monitor well 32-72 is positioned to monitor constituents along a flow path from the area near POC well 31-61 where highest observed site concentrations exist. Therefore, monitor well 32-72 is ideally situated to act as a monitoring point for potential impacts from areas of current highest concentrations and any that may arise from the Pond 9 closure project.

## Analyte List

With the inclusion of the non-hazardous constituents into the ACL licensing action, Rio Algom proposes to amend the list of parameters to be included within the Stability Monitoring Plan for the alluvium and the bedrock units to reflect this modification. No changes are being proposed to the bedrock monitoring wells. Additionally, no changes are being proposed to the monitoring frequency for the bedrock or alluvium.

The parameters to be monitored in the bedrock units will be amended by addition of chloride, nitrate, sulfate, and TDS. The parameters that Rio Algom proposes to monitor in the alluvium are listed in Table 3.

Table 3. Analytes proposed for the post remediation groundwater monitoring plan requested by the NRC.			
Dakota	TRA	TRB	Alluvium
Chloride (mg/L)	Chloride (mg/L)	Chloride (mg/L)	Chloride (mg/L)
Nitrate (mg/L)	Nitrate (mg/L)	Nitrate (mg/L)	Nitrate (mg/L)
Sulfate(mg/L)	Sulfate(mg/L)	Sulfate(mg/L)	Sulfate(mg/L)
TDS (mg/L)	TDS (mg/L)	TDS (mg/L)	TDS (mg/L)
pH (s.u.)	pH (s.u.)	pH (s.u.)	pH (s.u.)
Ra-226 + 228 (pCi/L)	Ra-226 + 228 (pCi/L)	Ra-226 + 228 (pCi/L)	Ra-226 + 228 (pCi/L)
Th-230 (pCi/L)	Th-230 (pCi/L)	Th-230 (pCi/L)	Th-230 (pCi/L)
Pb-210 (pCi/L)	Pb-210 (pCi/L)	Pb-210 (pCi/L)	Pb-210 (pCi/L)
U-nat (mg/L)		U-nat (mg/L)	U-nat (mg/L)
Nickel (mg/L)		Nickel (mg/L)	Nickel (mg/L)
			Selenium (mg/L)
			Molybdenum (mg/L)
			Gross Alpha (pCi/L)

Based on the information presented above, Rio Algom believes that the following proposed actions are warranted:

- 1) Replace monitor well S-9 with well 32-72.
- 2) Add the non-hazardous constituents listed above to the monitoring plan.
- 3) Incorporate the statistically derived concentration values (based on existing conditions when the New Mexico regulations were promulgated) presented in this document into the NRC License.

## References

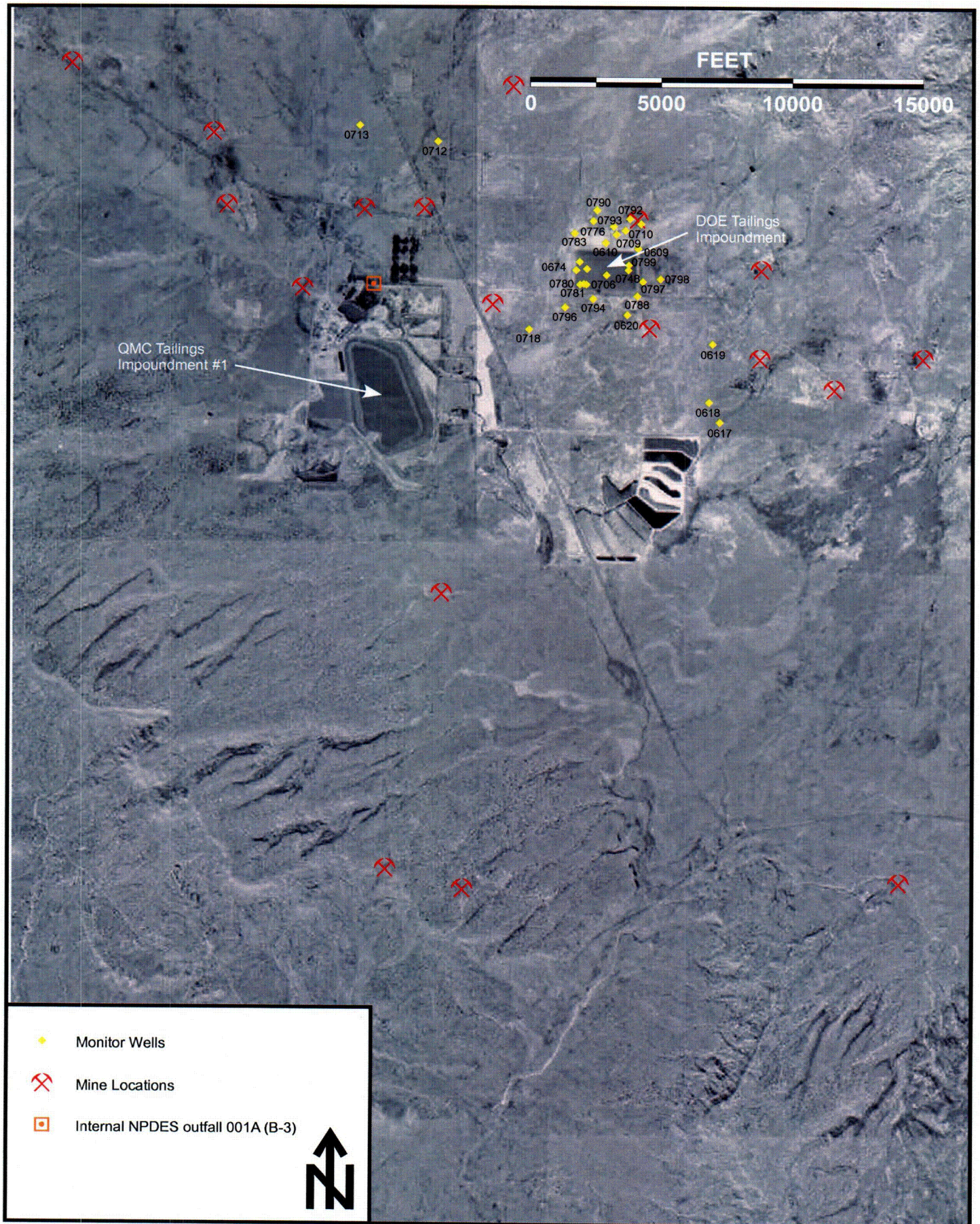
- Bostick, K. 1985. Ground-water discharge plan analysis for Kerr-McGee Nuclear Corporation, Ambrosia Lake Uranium Mill, Quivira Mining Company, New Mexico. Environmental Improvement Division Unpublished Report. 86p.
- Craig, S.D., Dam, W.L., Kernodle, J.M., and Levings, G.W., 1989, Hydrogeology of the Dakota Sandstone in the San Juan structural basin, New Mexico, Colorado, Arizona, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-720-I, 2 sheets.
- Dam, W.L., 1995 Geochemistry of ground water in the Gallup, Dakota, and Morrison Aquifers, San Juan Basin, New Mexico: U.S. Geological Survey Water-Resource Investigations Report 94-4187, 76 p.
- Dam, W.L., Kernodle, J.M., Thorn, C.R., Levings, G.W., and Craig, S.D., 1990, Hydrogeology of the Morrison Formation in the San Juan structural basin, New Mexico, Colorado, Arizona, and Utah: U.S. Geological Survey Water-Resource Investigations Report 95-4253, 117 p.
- Gallaher, B.M., and Cary, S.J., 1986, Impacts of Uranium Mining on Surface and Shallow Ground Waters, Grants Mineral Belt, New Mexico, New Mexico Environmental Improvement Division EID-GWH-86/2, Santa Fe, New Mexico, September 1986.
- Goad, M.S., Nylander, C.L., Gallaher, B.M., Dudley, J.C., and Perkins, B.L., 1980, Water Quality Data for Discharge from New Mexico Mines and Mills, Water Pollution Control Division, New Mexico Environmental Improvement Division, Santa Fe, New Mexico, July 1980.
- Kernodle, J.M., 1996, Hydrogeology and Steady State Flow in the San Juan Basin, New Mexico, Colorado, Arizona, and Utah: U.S. Geological Survey Hydrologic
- Lyford, F.P., Frenzel, P.F., and Stone, W.J., 1980, Preliminary Estimates of the Effects of Uranium Mine Dewatering on Water Levels in the San Juan Basin, New Mexico, New Mexico Bureau of Mines and Mineral Resources, Mem. 38, p. 320-332.
- Purtymun W.D., Wienke, C.L., Dreeson, D.R., 1977, Geology and Hydrology in the Vicinity of the Inactive Uranium Mill Tailings Pile, Ambrosia Lake, New Mexico, Los Alamos Scientific Laboratory, LA-6839-MS Informal Report.
- Stone, W.J., Lyford, F.P., Frenzel, P.F., Mizell, N.H., and Padgett, E.T., 1983, Hydrology and Water Resources of the San Juan Basin, New Mexico, New Mexico Bureau of Mines and Mineral Resources, Hydrologic Report 6, Socorro, New Mexico, 70p.
- USDOE, 1987 (U.S. Department of Energy), "Remedial Action at the Ambrosia Lake Uranium Mill Tailings Site, Ambrosia Lake, New Mexico", DOE/EA-0322, June 1987.

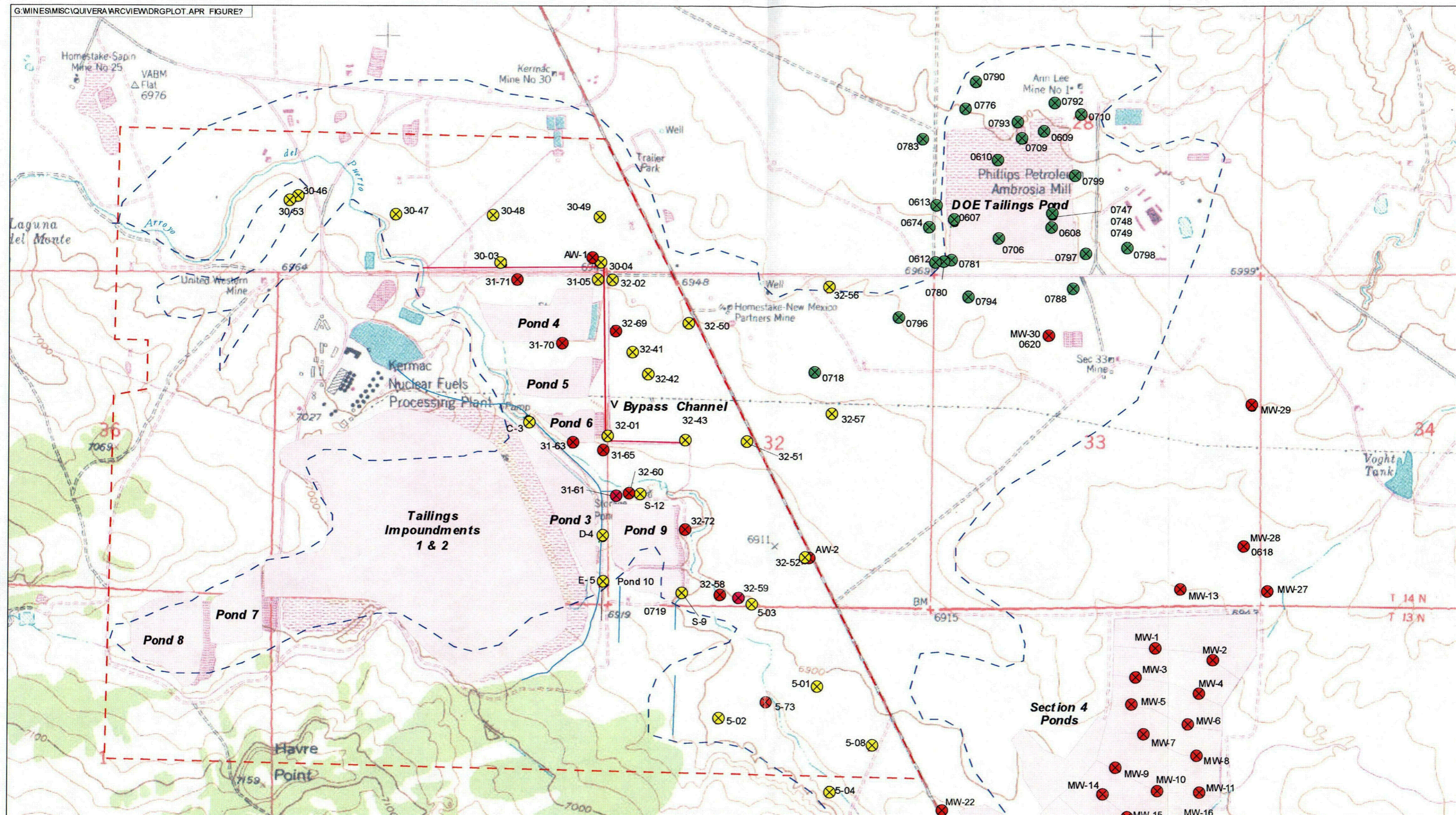
USDOE, 1995 (U.S. Department of Energy), Site Observational Work Plan for the UMTRA Project Site at Ambrosia Lake, New Mexico, DOE/AL/62350-159, Rev. o, February 1995.

USEPA, 1980 (U.S. Environmental Protection Agency), 1992, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance. Office of Solid Waste, Permits and State Programs Division, U.S. Environmental Protection Agency, Washington, D.C., July 1980.

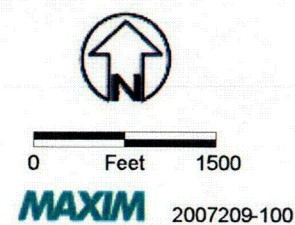
USEPA, 2000 (U.S. Environmental Protection Agency), 2000, Guidance for Data Quality Assessment: Practical Methods for Data Analysis, EPA/600/R-96/084 Office of Environmental Information, Washington, DC 20460, July, 2000.

## FIGURES





USGS 7.5 Minute Quadrangle - Ambrosia Lake (reprojected to stateplane NM West feet, NAD27)

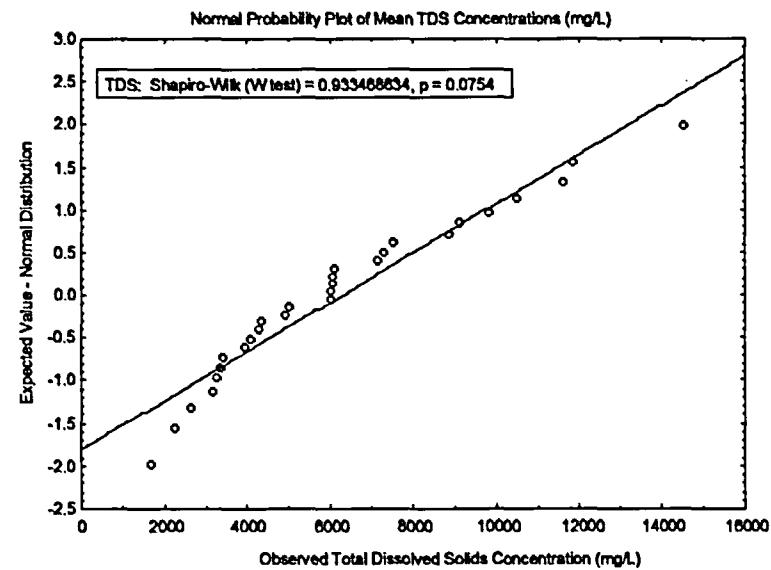
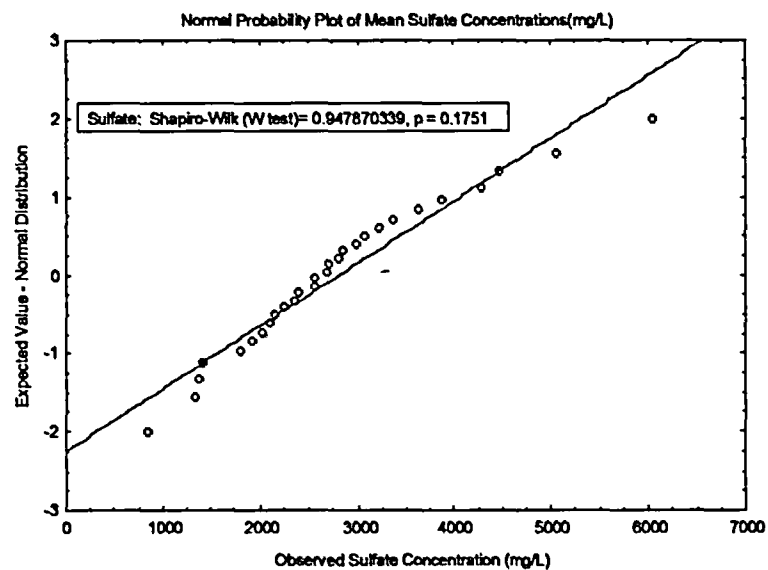
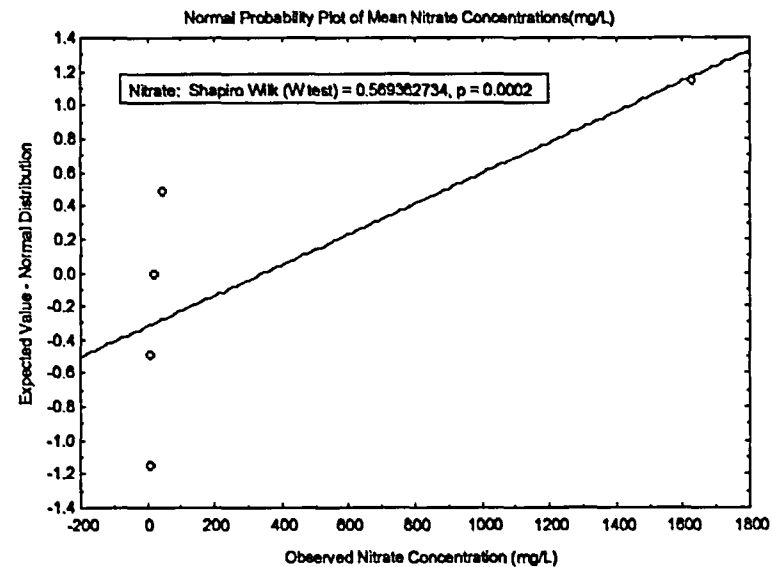
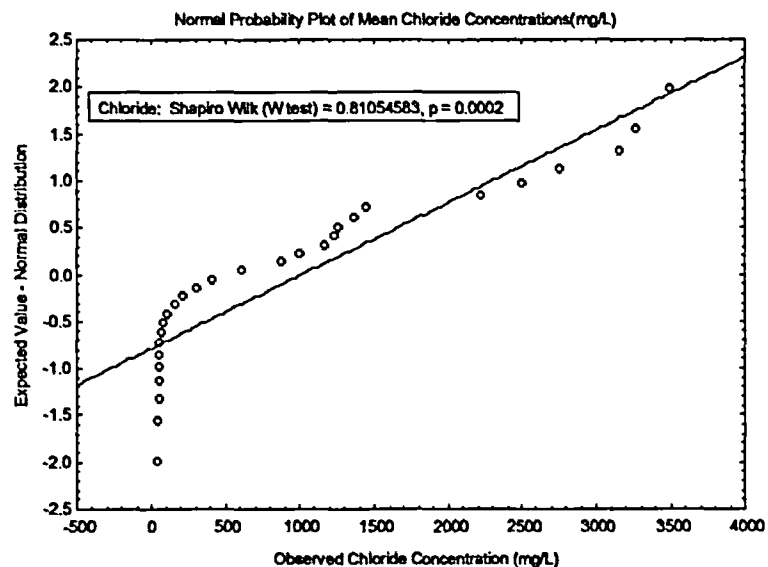


- Longterm Surveillance and Institutional Control Area
- Saturated Alluvium Boundary
- Interception Trenches
- Bypass Channel

- DOE Alluvial Wells
- Quivera Alluvial Wells
- NRC Point of Compliance Wells
- Wells Installed Prior to 1977 (Quivera Alluvial Wells)

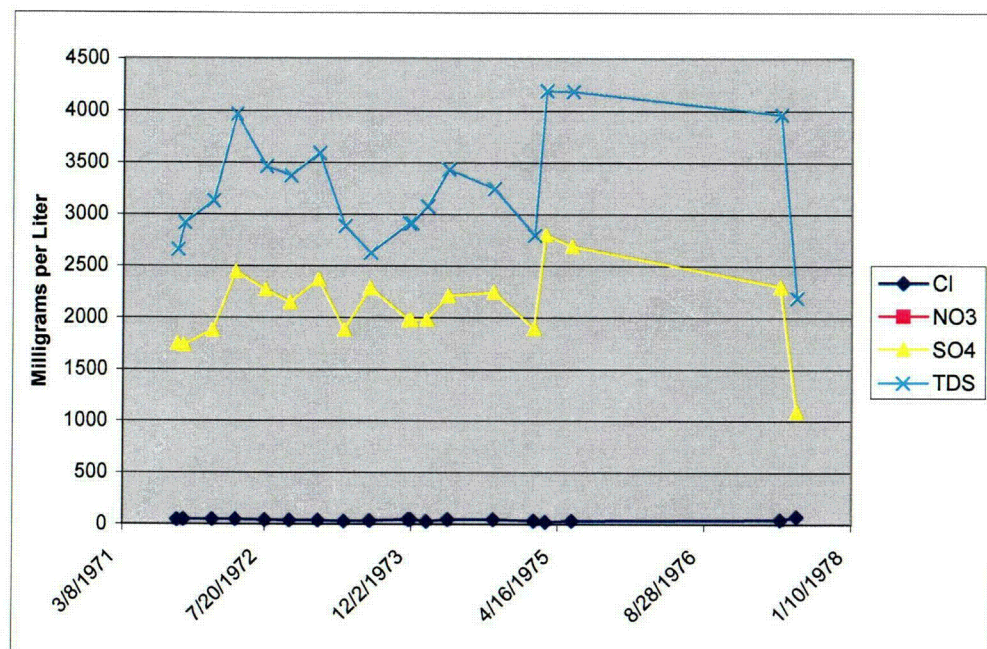
Location of wells installed prior to implementation of New Mexico Water Quality Control Commission Regulations  
Ambrosia Lake Area  
FIGURE 2

002



## **ATTACHMENT 1**

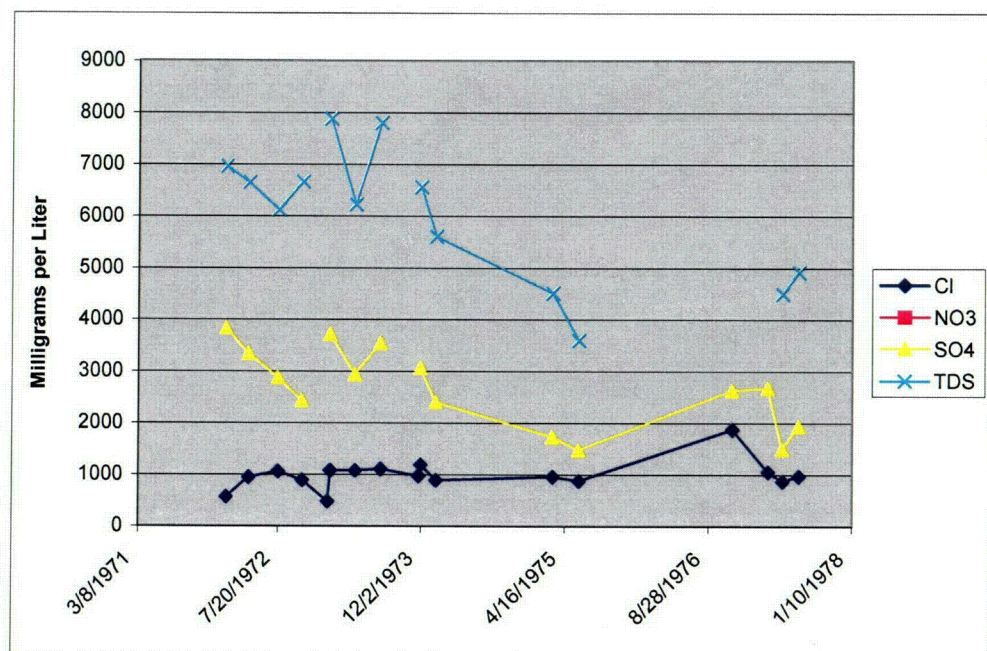
## Monitor Well 5-01



Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
5-01	9/13/1971	48.6		1747	2,664
5-01	10/6/1971	51		1737	2,923
5-01	1/14/1972	50		1879	3,137
5-01	1/14/1972	50		1879	3,137
5-01	4/5/1972	52		2447	3,970
5-01	4/5/1972	52		2447	3,970
5-01	7/17/1972	46		2270	3,470
5-01	10/9/1972	42		2146	3,380
5-01	10/9/1972	42		2146	3,380
5-01	1/15/1973	41		2369	3,596
5-01	1/15/1973	41		2369	3,596
5-01	4/13/1973	33		1882	2,892
5-01	7/10/1973	38		2283	2,636
5-01	11/20/1973	51		1976	2,921
5-01	11/28/1973	51		1976	2,921
5-01	1/21/1974	34		1982	3,086
5-01	4/3/1974	52		2210	3,438
5-01	9/5/1974	52		2246	3,256
5-01	1/22/1975	38		1895	2805
5-01	1/22/1975	38		1895	2,805
5-01	3/3/1975	26		2800	4196
5-01	3/3/1975	26		2800	4,196
5-01	6/1/1975	40		2691	4190
5-01	6/1/1975	40		2691	4,190
5-01	5/11/1977	47		2300	3,970
5-01	7/6/1977	79		1,090	2,200
Mean		44.6		2159.7	3343.3
Std. Dev.		10.5		382.7	564.5
Valid N		26.0	0.0	26.0	26.0
Minimum		26.0		1090.0	2200.0
Maximum		79.0		2800.0	4196.0

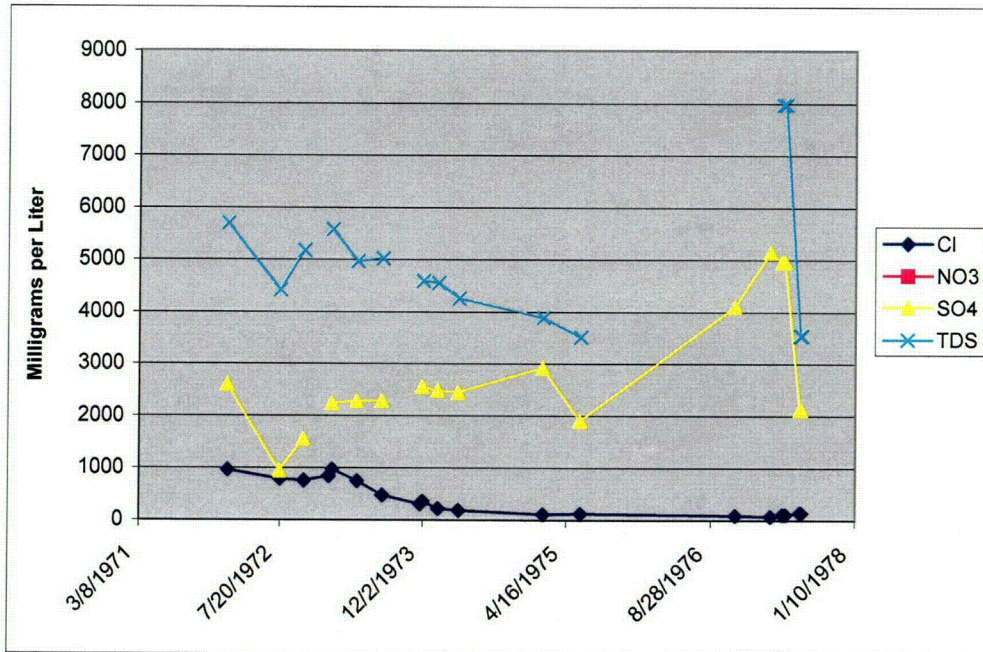
# Monitor Well 5-02



## Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
5-02	1/14/1972	578		3834	6,977
5-02	4/5/1972	954		3345	6,668
5-02	7/17/1972	1067		2874	6,132
5-02	10/9/1972	903		2431	6,678
5-02	1/5/1973	484			
5-02	1/15/1973	1089		3715	7,896
5-02	4/13/1973	1089		2936	6,238
5-02	7/10/1973	1117		3543	7,820
5-02	11/20/1973	983			
5-02	11/28/1973	1201		3068	6,579
5-02	1/21/1974	901		2400	5,623
5-02	3/3/1975	965		1728	4530
5-02	6/1/1975	891		1474	3610
5-02	11/17/1976	1886		2627	
5-02	3/21/1977	1061		2677	
5-02	5/11/1977	880		1,500	4,520
5-02	7/6/1977	977		1,940	4,940
Mean		1001.5		2672.8	6016.2
Std. Dev.		291.2		769.4	1307.1
Valid N		17.0	0.0	15.0	13.0
Minimum		484.0		1474.0	3610.0
Maximum		1886.0		3834.0	7896.0

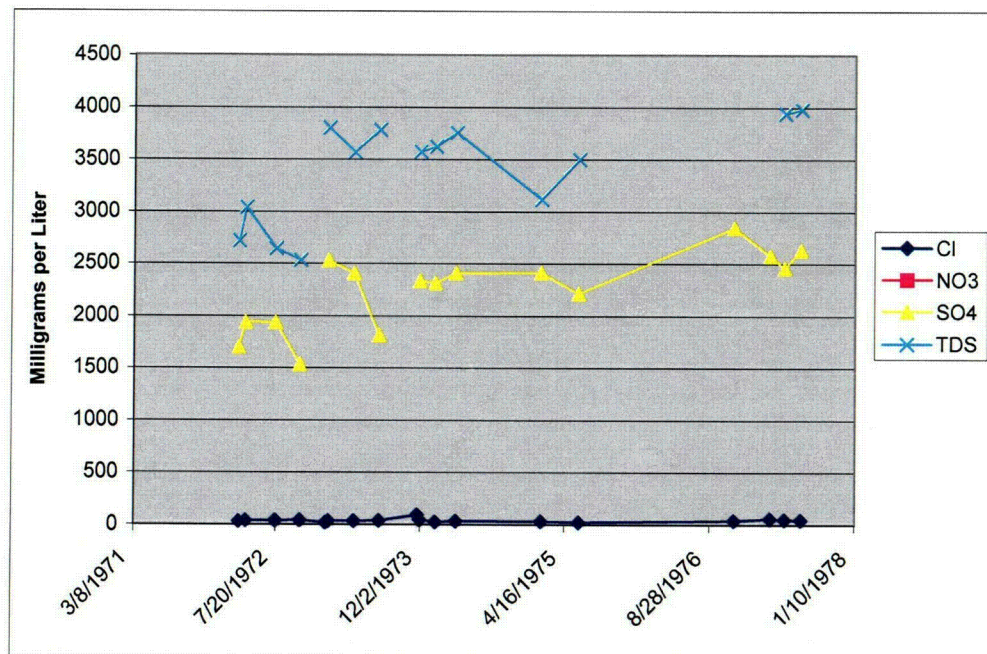
## Monitor Well 5-03



Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
5-03	1/14/1972	975		2602	5,713
5-03	7/17/1972	801		944	4,436
5-03	10/9/1972	765		1552	5,192
5-03	1/4/1973	854			
5-03	1/15/1973	983		2240	5,595
5-03	4/13/1973	755		2277	4,982
5-03	7/10/1973	491		2283	5,037
5-03	11/20/1973	315			
5-03	11/28/1973	373		2556	4,605
5-03	1/21/1974	234		2480	4,574
5-03	4/3/1974	198		2444	4,276
5-03	1/22/1975	118		2916	3905
5-03	6/1/1975	132		1901	3530
5-03	11/17/1976	99		4101	
5-03	3/21/1977	82		5141	
5-03	5/1/1977	120		4960	8,000
5-03	5/10/1977	120		4,960	8,000
5-03	7/2/1977	148		2120	3,560
5-03	7/6/1977	148		2,120	3,560
<b>Mean</b>		405.8		2799.8	4997.7
<b>Std. Dev.</b>		334.0		1235.8	1403.8
<b>Valid N</b>		19.0	0.0	17.0	15.0
<b>Minimum</b>		82.0		944.0	3530.0
<b>Maximum</b>		983.0		5141.0	8000.0

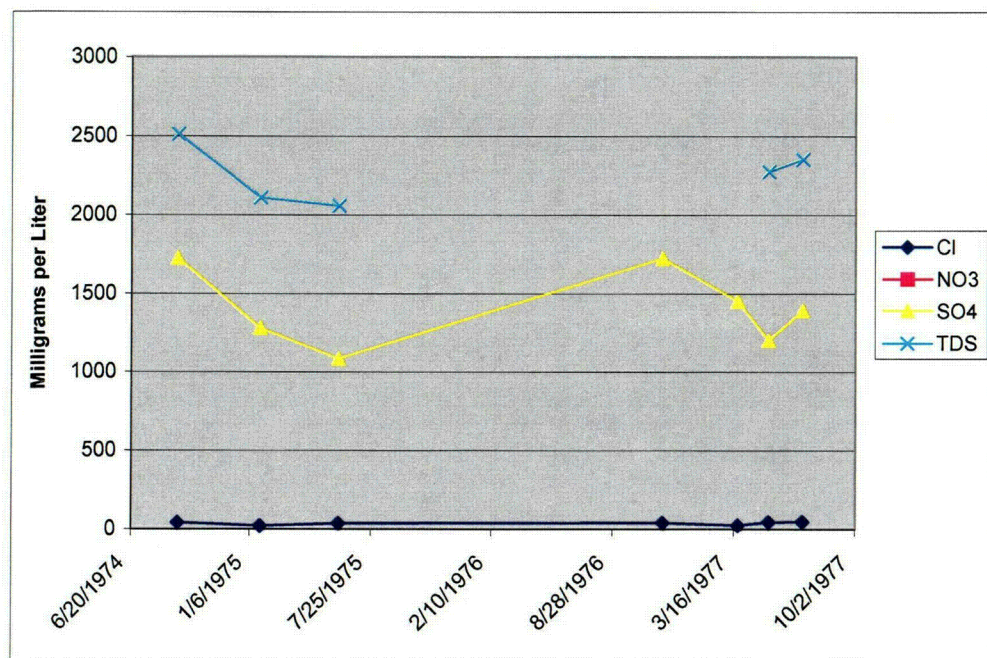
# Monitor Well 5-04



Data Used in Analysis

Monitor Well	Date	CI	NO <sub>3</sub>	SO <sub>4</sub>	TDS
5-04	3/10/1972	35		1701	2,725
5-04	4/5/1972	41		1940	3,048
5-04	7/17/1972	42		1938	2,649
5-04	10/9/1972	44		1533	2,539
5-04	1/5/1973	25			
5-04	1/15/1973	39		2528	3,810
5-04	4/13/1973	40		2405	3,578
5-04	7/10/1973	41		1814	3,791
5-04	11/20/1973	98			
5-04	11/28/1973	51		2334	3,585
5-04	1/21/1974	31		2312	3,632
5-04	4/3/1974	38		2408	3,767
5-04	1/22/1975	36		2410	3127
5-04	6/1/1975	26		2213	3510
5-04	11/17/1976	45		2845	
5-04	3/21/1977	64		2575	
5-04	5/10/1977	53		2,460	3,950
5-04	7/6/1977	51		2,630	3,990
Mean		44.4		2252.9	3407.2
Std. Dev.		16.4		366.2	495.9
Valid N		18.0	0.0	16.0	14.0
Minimum		25.0		1533.0	2539.0
Maximum		98.0		2845.0	3990.0

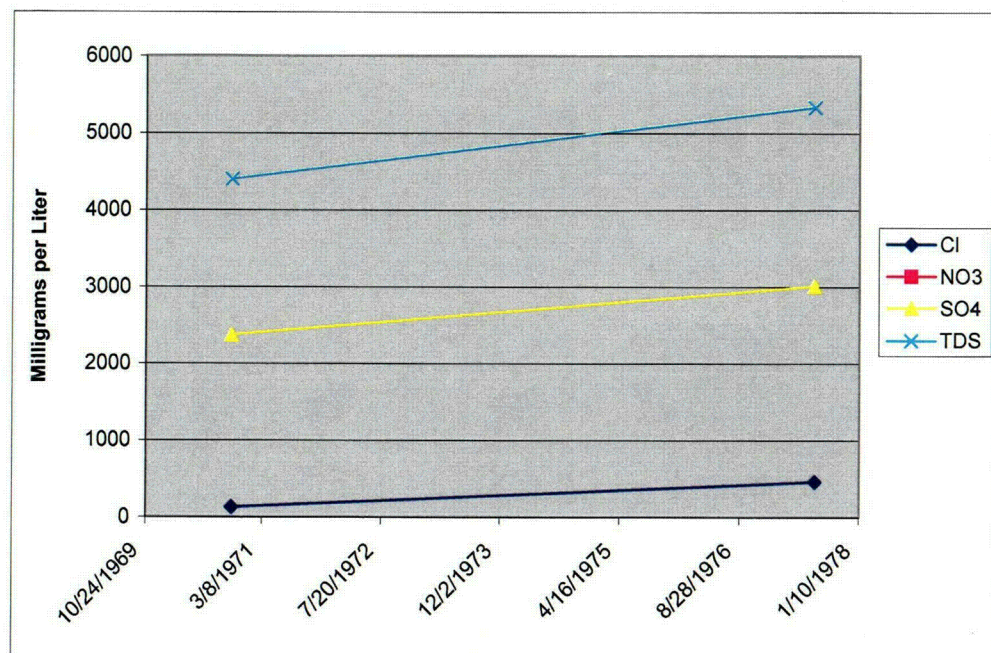
## Monitor Well 5-08



Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
5-08	9/5/1974	44		1722	2516
5-08	1/22/1975	23		1280	2113
5-08	6/1/1975	39		1083	2060
5-08	11/17/1976	44		1720	
5-08	3/21/1977	28		1450	
5-08	5/11/1977	48		1,200	2,280
5-08	7/6/1977	50		1390	2,358
Mean		39.4		1406.4	2265.4
Std. Dev.		10.2		246.1	185.1
Valid N		7.0	0.0	7.0	5.0
Minimum		23.0		1083.0	2060.0
Maximum		50.0		1722.0	2516.0

# Monitor Well 30-03



Data Used in Analysis

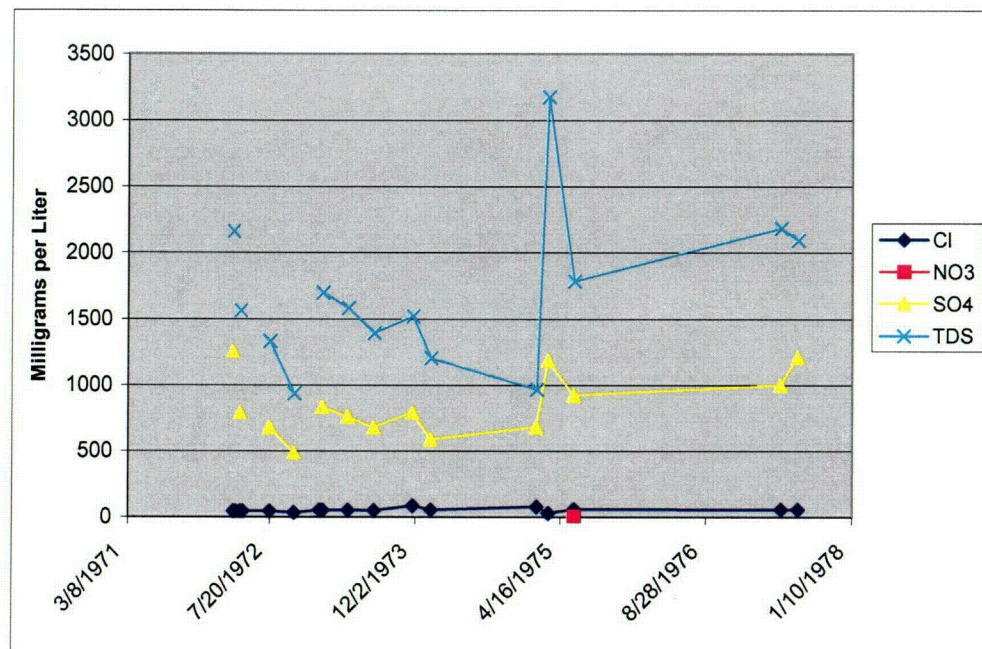
Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
30-03	10/24/1970	139		2375	4410
30-03	7/6/1977	470		3,010	5,350
Mean		304.5		2692.5	4880.0
Std. Dev.		234.1		449.0	664.7
Valid N		2.0	0.0	2.0	2.0
Minimum		139.0		2375.0	4410.0
Maximum		470.0		3010.0	5350.0

## Monitor Well 30-04

### Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
30-04	7/6/1977	1,160		2,850	5,990
Mean		1160.0		2850.0	5990.0
Std. Dev.		0.0		0.0	0.0
Valid N		1.0	0.0	1.0	1.0
Minimum		1160.0		2850.0	5990.0
Maximum		1160.0		2850.0	5990.0

# Monitor Well 30-47



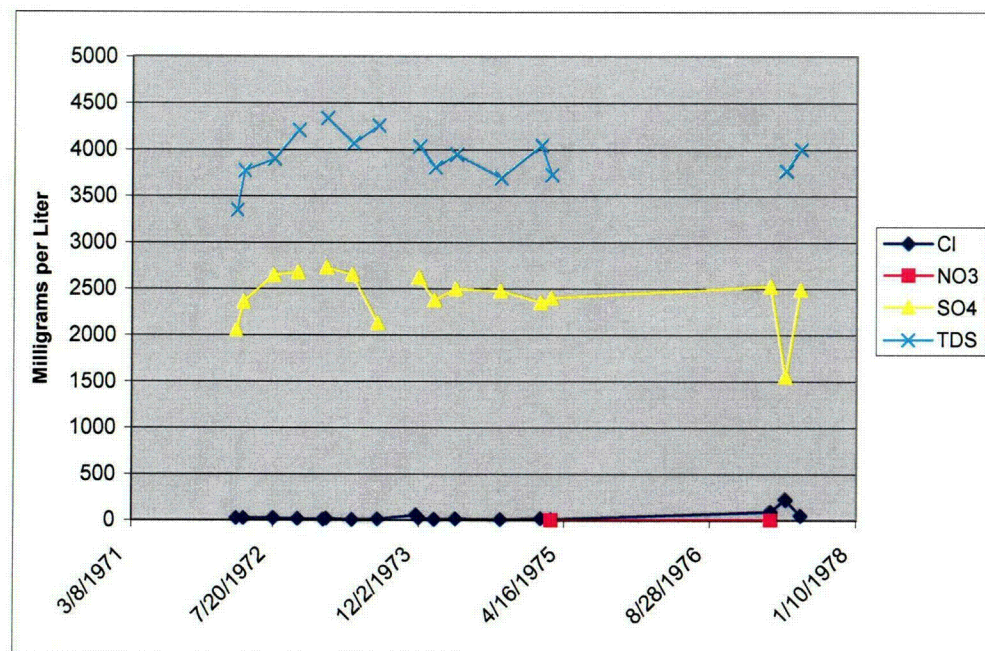
## Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
30-47	3/10/1972	47		1254	2166
30-47	3/20/1972	49			
30-47	4/5/1972	48		791	1567
30-47	4/14/1972	49			
30-47	7/17/1972	50		678	1334
30-47	10/9/1972	37		488	940
30-47	1/4/1973	57			
30-47	1/15/1973	57		832	1704
30-47	4/13/1973	57		761	1586
30-47	7/10/1973	55		679	1398
30-47	11/20/1973	88		790	1524
30-47	1/21/1974	58		588	1208
30-47	1/22/1975	83		680	972
30-47	3/3/1975	34		1184	3182
30-47	6/1/1975	64	11.1	921	1790
30-47	5/9/1977	61		1,000	2,190
30-47	7/6/1977	62		1210	2,100
Mean		56.2		846.9	1690.1
Std. Dev.		13.7		237.7	585.5
Valid N		17.0	1.0	14.0	14.0
Minimum		34.0		488.0	940.0
Maximum		88.0		1254.0	3182.0

## Data not used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
30-47	May-77	61		1000	2,190
30-47	Jul-77	62		1,210	2,100

# Monitor Well 30-48



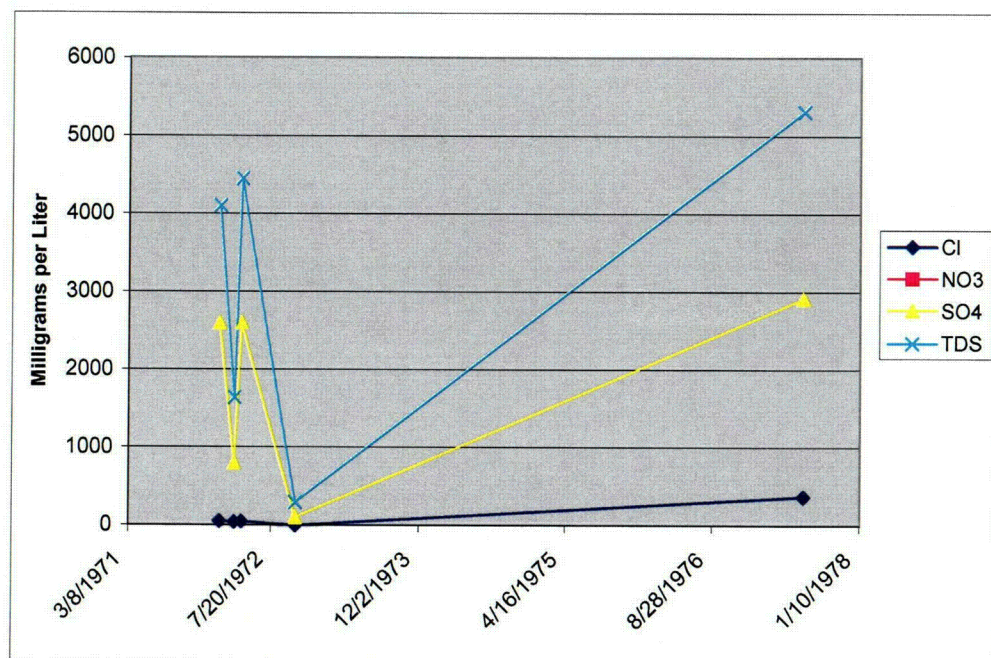
## Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
30-48	3/10/1972	28		2058	3,355
30-48	4/5/1972	26		2358	3,779
30-48	7/17/1972	27		2644	3,904
30-48	10/9/1972	20		2679	4,213
30-48	1/4/1973	14			
30-48	1/15/1973	25		2726	4,344
30-48	4/13/1973	9		2649	4,073
30-48	7/10/1973	16		2127	4,263
30-48	11/20/1973	60			
30-48	11/28/1973	31		2620	4,039
30-48	1/21/1974	15		2376	3,814
30-48	4/3/1974	19		2498	3,954
30-48	9/5/1974	12		2477	3701
30-48	1/22/1975	23		2354	4050
30-48	2/27/1975	12	6	2400	3735
30-48	3/21/1977	97	10	2522	
30-48	5/10/1977	230		1,550	3,780
30-48	5/12/1977	227		1550	3,780
30-48	7/1/1977	58		2490	4,010
Mean		49.9	8.0	2357.5	3924.6
Std. Dev.		66.5	2.8	353.8	247.5
Valid N		19.0	2.0	17.0	16.0
Minimum		9.0	6.0	1550.0	3355.0
Maximum		230.0	10.0	2726.0	4344.0

## Data not used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
30-48	Jul-77	58		2,490	4,010

# Monitor Well 30-49



## Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
30-49	1/17/1972	50		2589	4,110
30-49	3/10/1972	39		794	1,647
30-49	4/5/1972	48		2597	4,457
30-49	10/9/1972	1		94	295
30-49	7/1/1977	371		2910	5,320
Mean		101.8		1796.8	3165.8
Std. Dev.		151.8		1266.1	2106.4
Valid N		5.0	0.0	5.0	5.0
Minimum		1.0		94.0	295.0
Maximum		371.0		2910.0	5320.0

## Data not used in Analysis

Monitor Well	Date	Cl	NO3	SO4	TDS
30-49	Jul-77	371		2,910	5,320

### Monitor Well 30-53

#### Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
30-53	7/1/1977	59		1380	2,650
Mean		59.0		1380.0	2650.0
Std. Dev.		0.0		0.0	0.0
Valid N		1.0	0.0	1.0	1.0
Minimum		59.0		1380.0	2650.0
Maximum		59.0		1380.0	2650.0

#### Data not used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
30-53	Jul-77	59		1,380	2,650

### Monitor Well 31-05

#### Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
31-05	6/24/1977	616		2020	4310
Mean		616.0		2020.0	4310.0
Std. Dev.		0.0		0.0	0.0
Valid N		1.0	0.0	1.0	1.0
Minimum		616.0		2020.0	4310.0
Maximum		616.0		2020.0	4310.0

#### Data not used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
31-05	Jul-77	616		2,020	4,310

## Monitor Well 32-01

### Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
32-01	6/28/1977	2220		4470	11600
Mean		2220.0		4470.0	11600.0
Std. Dev.		0.0		0.0	0.0
Valid N		1.0	0.0	1.0	1.0
Minimum		2220.0		4470.0	11600.0
Maximum		2220.0		4470.0	11600.0

### Data not used in Analysis

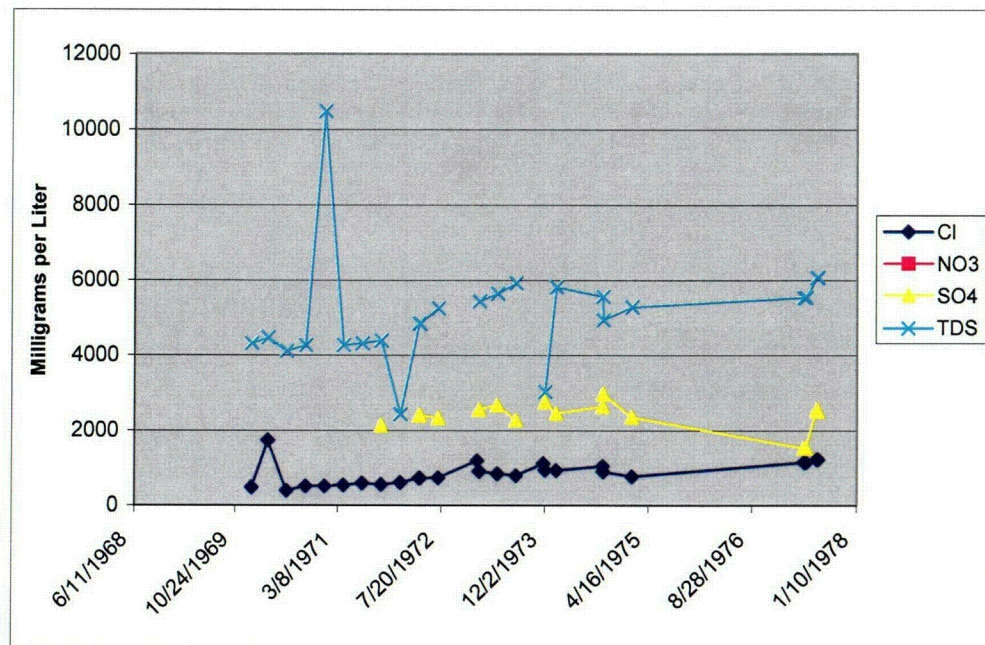
Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
32-01	7/6/77	2,220		4,470	11,600

## Monitor Well 32-02

### Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
32-02	1/28/1977	1230		3220	7530
Mean		1230.0		3220.0	7530.0
Std. Dev.		0.0		0.0	0.0
Valid N		1.0	0.0	1.0	1.0
Minimum		1230.0		3220.0	7530.0
Maximum		1230.0		3220.0	7530.0

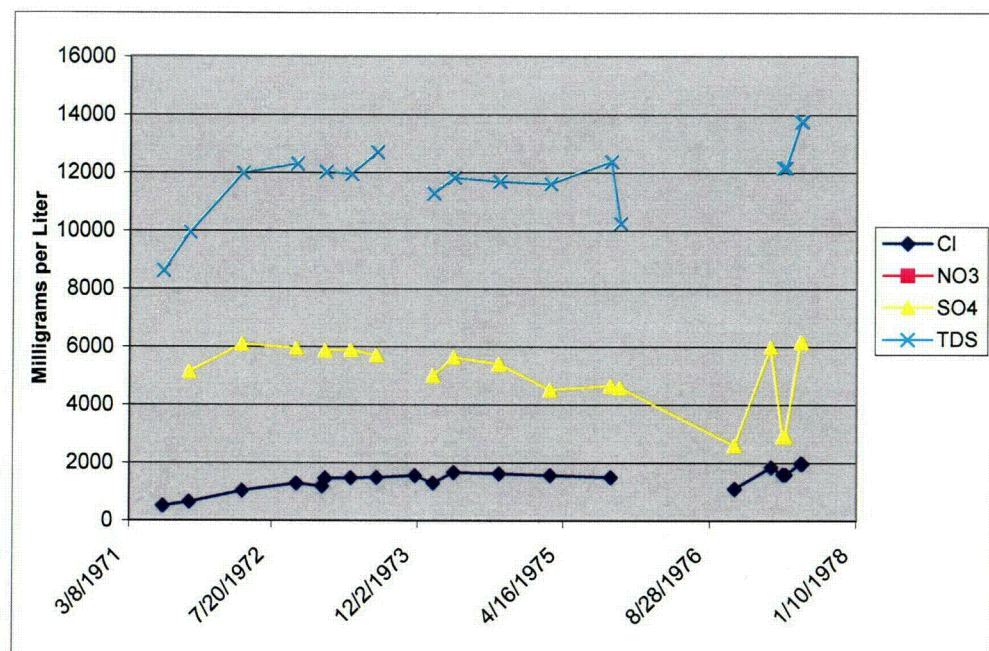
# Monitor Well 32-41



Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
32-41	1/12/1970	494			4340
32-41	4/1/1970	1750			4491
32-41	7/1/1970	405			4133
32-41	10/1/1970	525			4289
32-41	1/1/1971	530			10498
32-41	4/1/1971	551			4298
32-41	7/1/1971	599			4339
32-41	10/1/1971	572		2130	4417
32-41	1/1/1972	615			2450
32-41	4/1/1972	740		2396	4867
32-41	4/5/1972	740		2396	4867
32-41	7/1/1972	755		2328	5276
32-41	1/4/1973	1204			
32-41	1/15/1973	922		2551	5454
32-41	1/15/1973	922		2551	5454
32-41	4/13/1973	859		2669	5664
32-41	7/10/1973	806		2268	5940
32-41	11/20/1973	1130			
32-41	11/28/1973	960		2760	3053
32-41	1/21/1974	948		2454	5836
32-41	9/3/1974	1053		2636	5591
32-41	9/3/1974	1053		2636	5591
32-41	9/5/1974	920		2972	4971
32-41	1/22/1975	782		2355	5306
32-41	5/1/1977	1160		1530	5,560
32-41	5/10/1977	1,160		1,530	5,560
32-41	7/1/1977	1240		2560	6,090
32-41	7/6/1977	1,240		2,500	6,090
Mean		879.8		2401.2	5170.2
Std. Dev.		302.0		370.7	1404.8
Valid N		28.0	0.0	18.0	26.0
Minimum		405.0		1530.0	2450.0
Maximum		1750.0		2972.0	10498.0

# Monitor Well 32-42



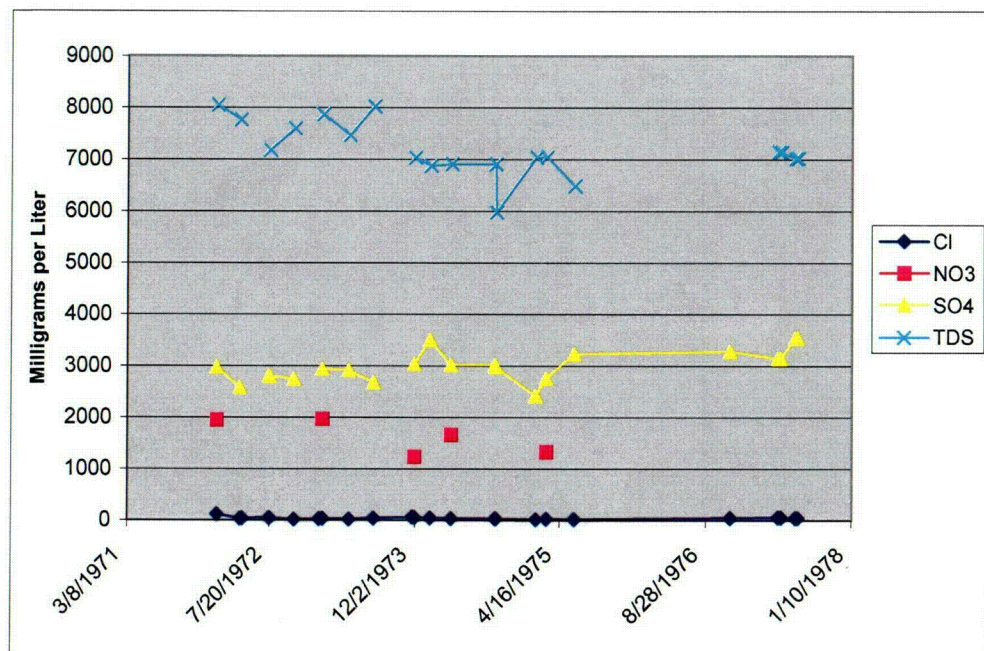
## Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
32-42	7/1/1971	524			8645
32-42	10/1/1971	665		5133	9972
32-42	4/5/1972	1052		6098	12013
32-42	10/9/1972	1305		5947	12334
32-42	1/4/1973	1204			
32-42	1/15/1973	1481		5873	12058
32-42	4/13/1973	1498		5898	11981
32-42	7/10/1973	1513		5702	12735
32-42	11/20/1973	1573			
32-42	1/21/1974	1316		5004	11314
32-42	4/3/1974	1684		5634	11858
32-42	9/5/1974	1640		5401	11725
32-42	2/27/1975	1588		4514	11642
32-42	9/22/1975	1519		4655	12421
32-42	10/24/1975			4592	10,274
32-42	11/17/1976	1122		2602	
32-42	3/21/1977	1859		5993	
32-42	5/1/1977	1610		2900	12,200
32-42	5/10/1977	1,610		2,900	12,200
32-42	7/1/1977	1990		6160	13,800
32-42	7/6/1977	1,990		6,160	13,800
Mean		1437.2		5064.8	11821.9
Std. Dev.		382.1		1174.2	1272.2
Valid N		20.0	0.0	18.0	17.0
Minimum		524.0		2602.0	8645.0
Maximum		1990.0		6160.0	13800.0

## Data not used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
32-42	Jan-73	R-1481		R-5873	R-12058

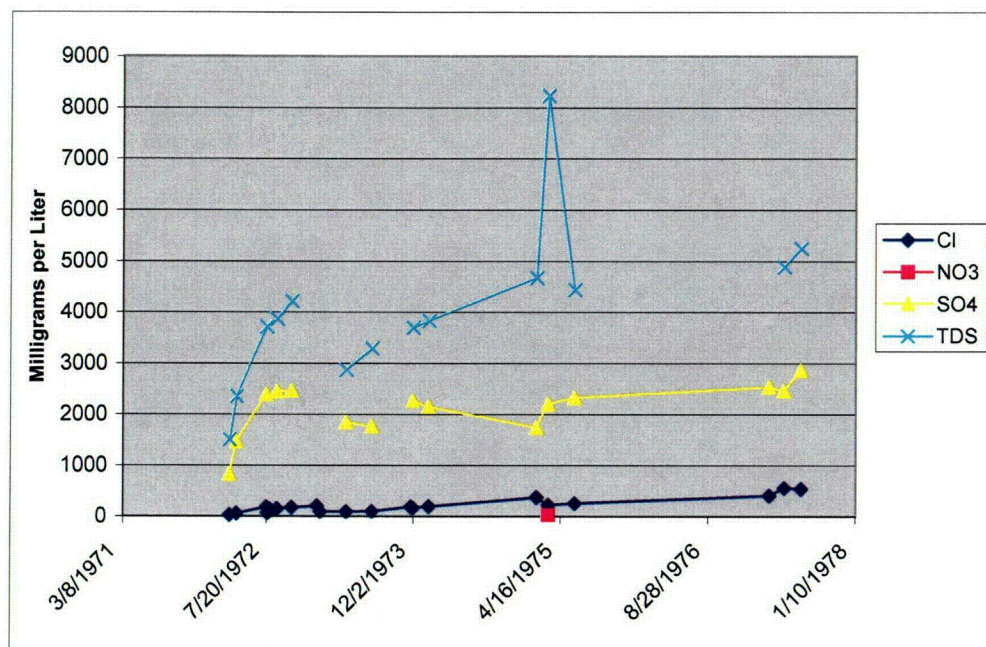
# Monitor Well 32-43



## Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
32-43	1/14/1972	126	1949	2978	8064
32-43	1/14/1972	126		2978	8064
32-43	4/5/1972	41		2580	7778
32-43	4/5/1972	41		2580	7778
32-43	4/14/1972	49			
32-43	7/17/1972	57		2805	7188
32-43	10/9/1972	24		2745	7610
32-43	1/4/1973	36			
32-43	1/15/1973	43	1967	2933	7881
32-43	1/15/1973	43		2933	7881
32-43	4/17/1973	28		2910	7478
32-43	7/10/1973	46		2680	8040
32-43	11/20/1973	74			
32-43	11/28/1973	64	1232	3040	7044
32-43	11/28/1973	64		3040	7044
32-43	1/21/1974	57		3500	6891
32-43	4/3/1974	45	1658	3022	6919
32-43	9/3/1974	45		3022	6919
32-43	9/5/1974	44		2975	5988
32-43	1/22/1975	26		2421	7051
32-43	2/27/1975	37	1328	2755	7054
32-43	6/1/1975	33		3225	6500
32-43	11/17/1976	55		3277	
32-43	5/1/1977	65		3140	7,160
32-43	5/10/1977	65		3,140	7,160
32-43	6/29/1977	55		3540	7,030
32-43	7/6/1977	55		3,540	7,030
Mean		53.5	1626.8	2990.0	7284.9
Std. Dev.		24.5	341.2	292.9	532.6
Valid N		27.0	5.0	24.0	23.0
Minimum		24.0	1232.0	2421.0	5988.0
Maximum		126.0	1967.0	3540.0	8064.0

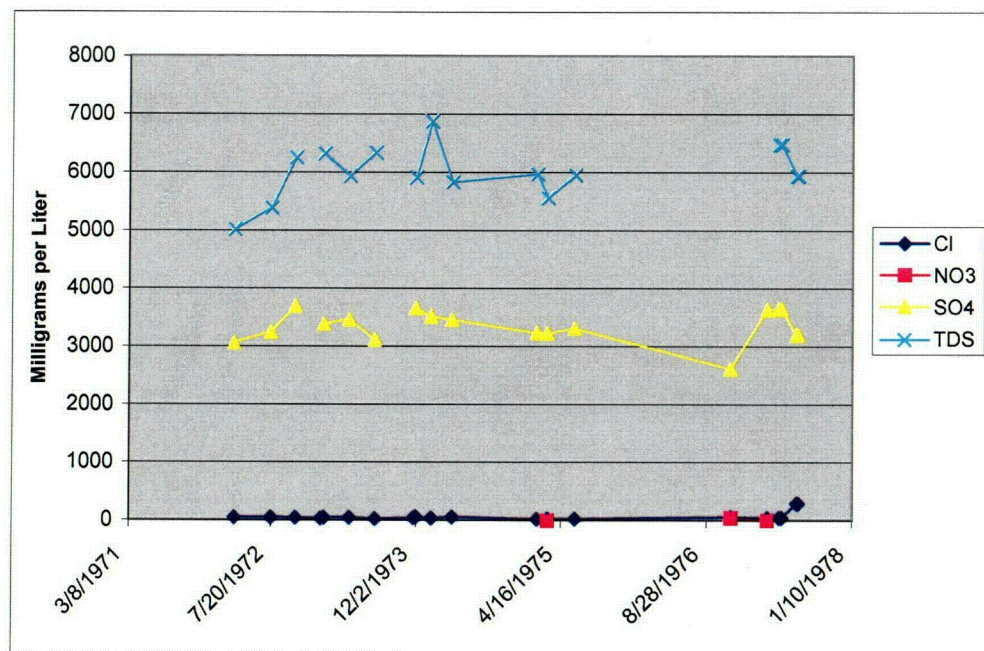
## Monitor Well 32-50



## Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
32-50	3/10/1972	37		823	1521
32-50	4/5/1972	67		1465	2362
32-50	7/17/1972	191		2389	3724
32-50	7/21/1972	76			
32-50	7/25/1972	110			
32-50	7/28/1972	150			
32-50	8/21/1972	156		2446	3882
32-50	10/9/1972	184		2457	4228
32-50	1/4/1973	212			
32-50	1/15/1973	101			
32-50	4/13/1973	102		1838	2885
32-50	7/10/1973	108		1764	3304
32-50	11/20/1973	192			
32-50	11/28/1973	179		2268	3712
32-50	1/21/1974	208		2144	3842
32-50	1/22/1975	383		1739	4681
32-50	3/3/1975	235	45.5	2197	8245
32-50	6/1/1975	267		2318	4450
32-50	3/21/1977	420		2532	
32-50	5/10/1977	570		2,460	4,900
32-50	7/6/1977	552		2,860	5,260
Mean		214.3	45.5	2113.3	4071.1
Std. Dev.		149.2	0.0	510.9	1564.5
Valid N		21.0	1.0	15.0	14.0
Minimum		37.0	45.5	823.0	1521.0
Maximum		570.0	45.5	2860.0	8245.0

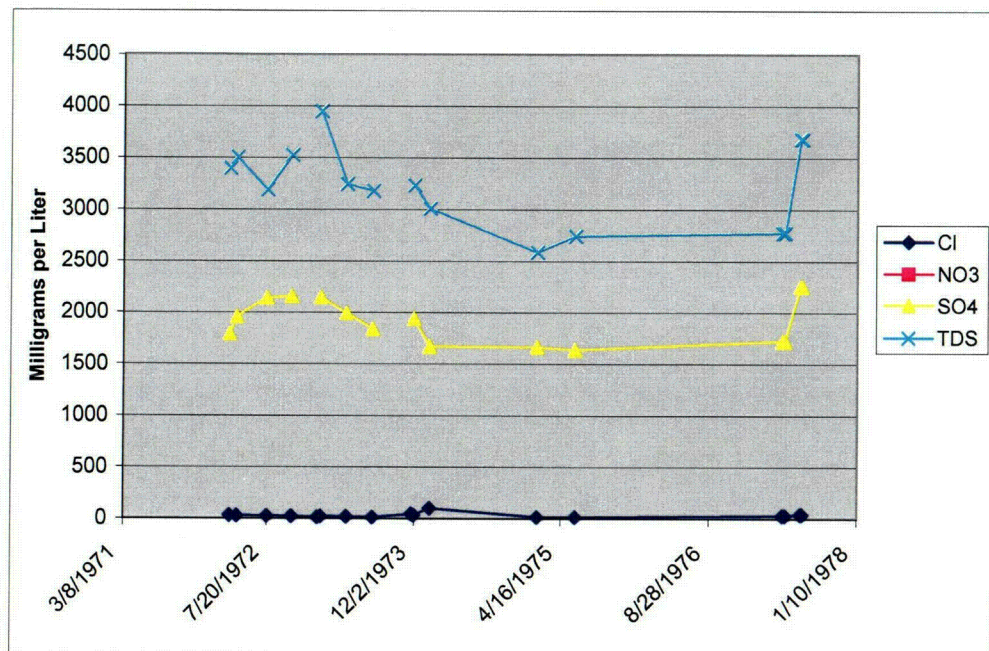
# Monitor Well 32-51



## Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
32-51	3/10/1972	54		3061	5,026
32-51	7/17/1972	51		3238	5,395
32-51	10/9/1972	49		3690	6,260
32-51	1/4/1973	39			
32-51	1/15/1973	55		3384	6,329
32-51	4/13/1973	56		3462	5,946
32-51	7/10/1973	30		3113	6,345
32-51	11/20/1973	47			
32-51	11/28/1973	64		3660	5,923
32-51	1/21/1974	43		3514	6,887
32-51	4/3/1974	62		3455	5,844
32-51	1/22/1975	29		3231	5982
32-51	2/27/1975	34	2	3223	5572
32-51	6/1/1975	33		3305	5960
32-51	11/17/1976	63	48	2608	
32-51	3/21/1977	46	4	3633	
32-51	5/1/1977	56		3640	6,490
32-51	5/10/1977	56		3,640	6,490
32-51	7/1/1977	300		3200	5,950
32-51	7/6/1977	300		3,200	5,950
Mean		73.4	18.0	3347.6	6021.8
Std. Dev.		78.2	26.0	275.6	454.0
Valid N		20.0	3.0	18.0	16.0
Minimum		29.0	2.0	2608.0	5026.0
Maximum		300.0	48.0	3690.0	6887.0

## Monitor Well 32-52



## Data Used in Analysis

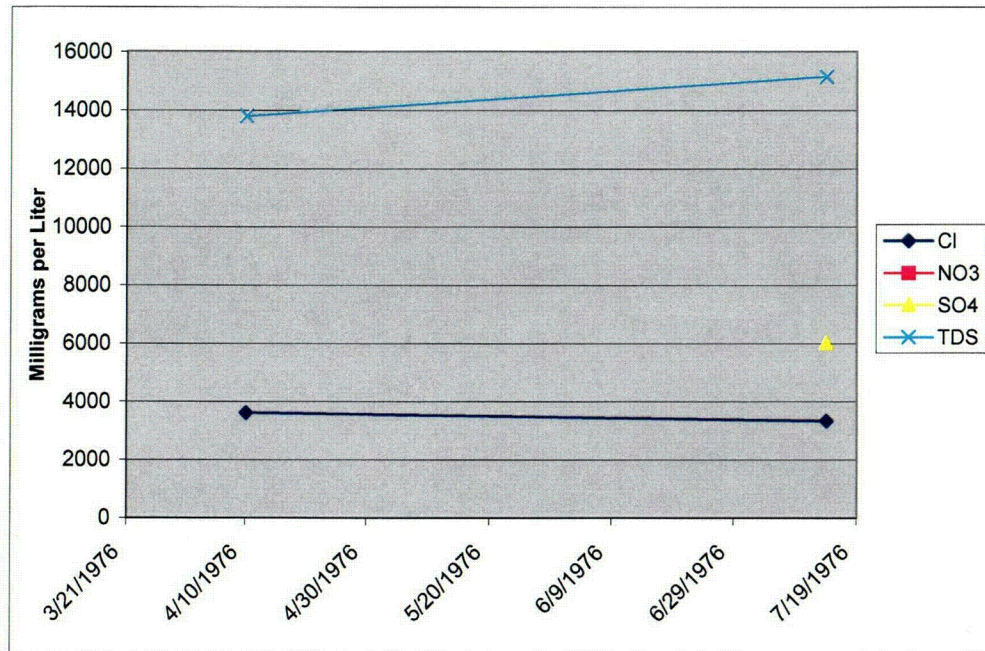
Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
32-52	3/10/1972	32		1789	3,402
32-52	4/5/1972	30		1958	3,509
32-52	7/17/1972	27		2140	3,198
32-52	10/9/1972	23		2154	3,531
32-52	1/4/1973	14			
32-52	1/15/1973	23		2146	3,958
32-52	4/13/1973	22		1991	3,251
32-52	7/10/1973	16		1837	3,186
32-52	11/20/1973	47			
32-52	11/28/1973	37		1936	3,241
32-52	1/21/1974	101		1670	3,014
32-52	1/22/1975	19		1663	2594
32-52	6/1/1975	19		1637	2750
32-52	5/1/1977	32		1720	2,780
32-52	5/10/1977	32		1,720	2,780
32-52	7/1/1977	46		2250	3,690
32-52	7/6/1977	46		2,250	3,690
Mean		33.3		1924.1	3238.3
Std. Dev.		20.3		222.2	400.0
Valid N		17.0	0.0	15.0	15.0
Minimum		14.0		1637.0	2594.0
Maximum		101.0		2250.0	3958.0

### Monitor Well 32-57

Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
32-57	7/1/1977	158		3630	6,010
Mean		158.0		3630.0	6010.0
Std. Dev.		0.0		0.0	0.0
Valid N		1.0	0.0	1.0	1.0
Minimum		158.0		3630.0	6010.0
Maximum		158.0		3630.0	6010.0

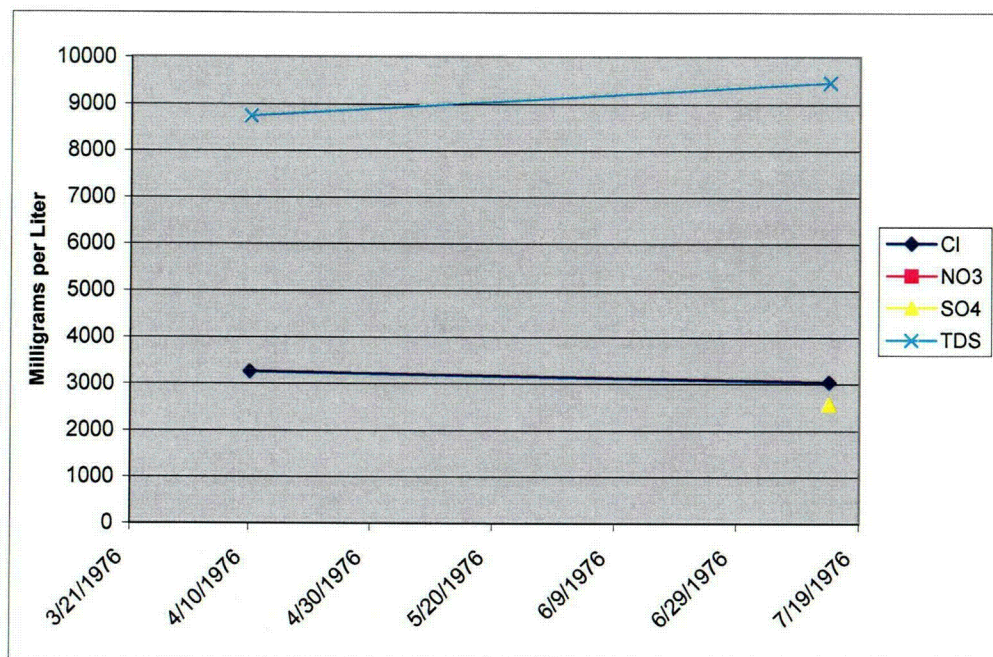
## Monitor Well A-1



Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
A-1	4/10/1976	3630			13827
A-1	7/14/1976	3344		6033	15186
Mean		3487.0		6033.0	14506.5
Std. Dev.		202.2		6033.0	961.0
Valid N		2.0	0.0	1.0	2.0
Minimum		3344.0		6033.0	13827.0
Maximum		3630.0		6033.0	15186.0

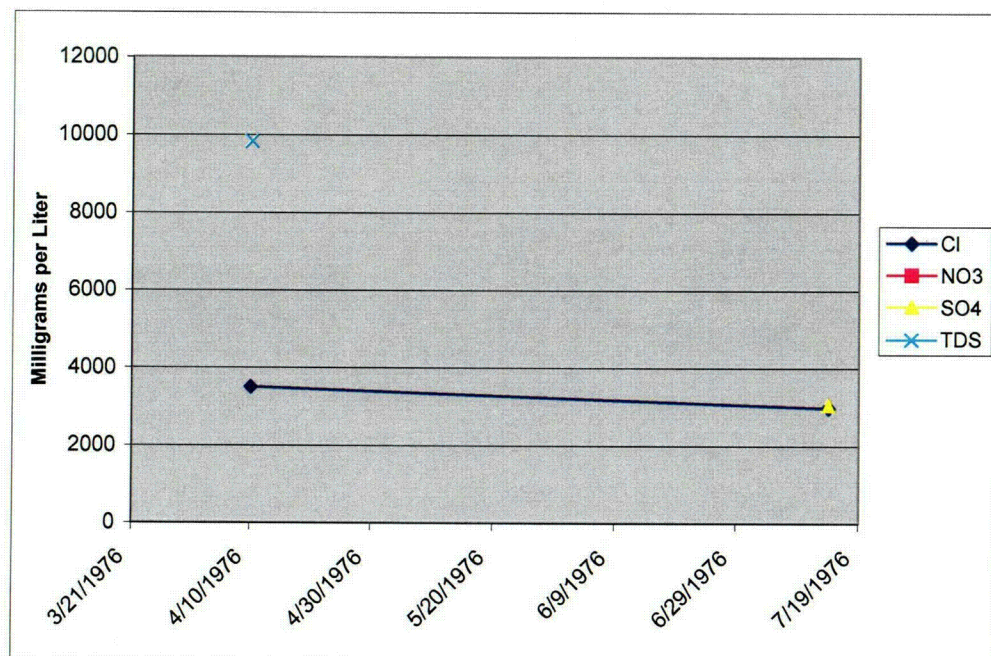
## Monitor Well B-2



Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
B-2	4/10/1976	3270			8759
B-2	7/14/1976	3056		2565	9477
Mean		3163.0		2565.0	9118.0
Std. Dev.		151.3	#DIV/0!		507.7
Valid N		2.0	0.0	1.0	2.0
Minimum		3056.0		2565.0	8759.0
Maximum		3270.0		2565.0	9477.0

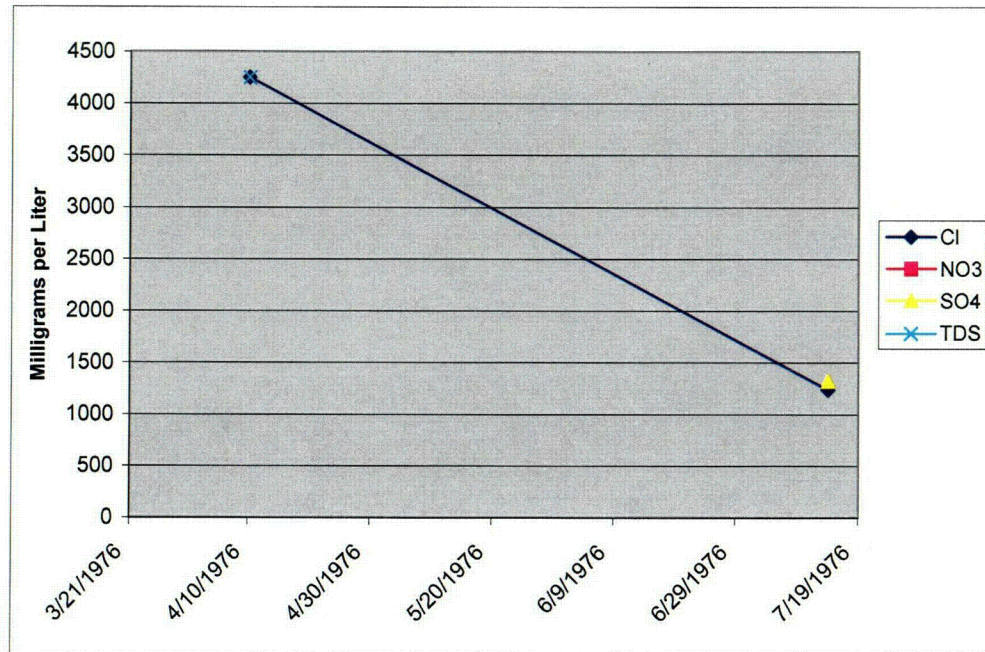
# Monitor Well C-3



Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
C-3	4/10/1976	3520			9845
C-3	7/14/1976	3004		3064	
Mean		3262.0		3064.0	#DIV/0!
Std. Dev.		0.0		0.0	0.0
Valid N		1.0	0.0	1.0	0.0
Minimum		3004.0		3064.0	0.0
Maximum		3004.0		3064.0	0.0

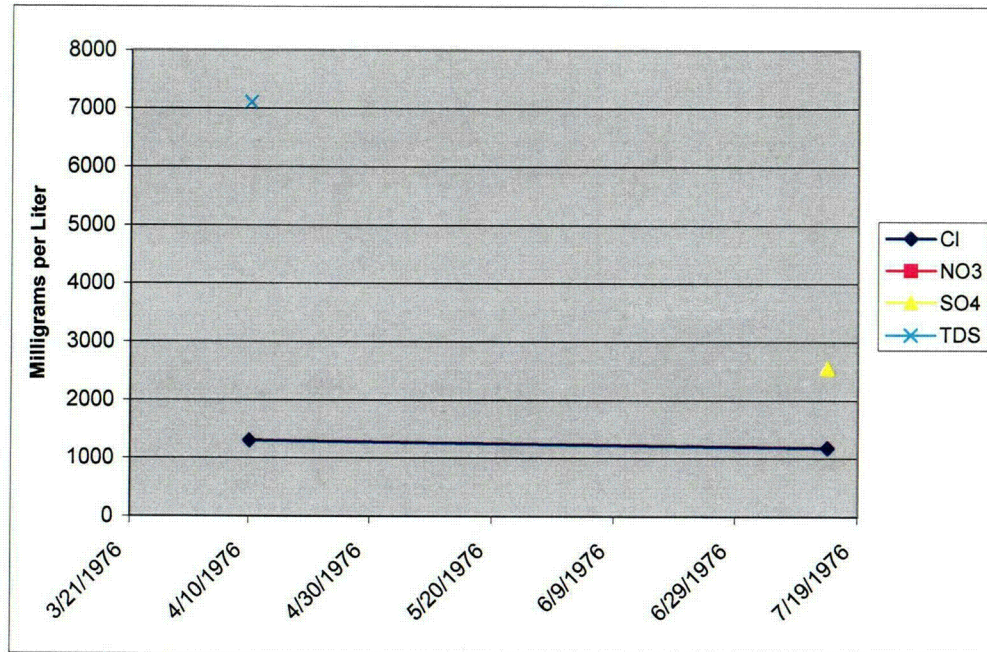
## Monitor Well D-4



Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
D-4	4/10/1976	4257			4257
D-4	7/14/1976	1244		1324	
Mean		2750.5		1324.0	4257.0
Std. Dev.		2130.5		#DIV/0!	#DIV/0!
Valid N		2.0	0.0	1.0	1.0
Minimum		1244.0		1324.0	4257.0
Maximum		4257.0		1324.0	4257.0

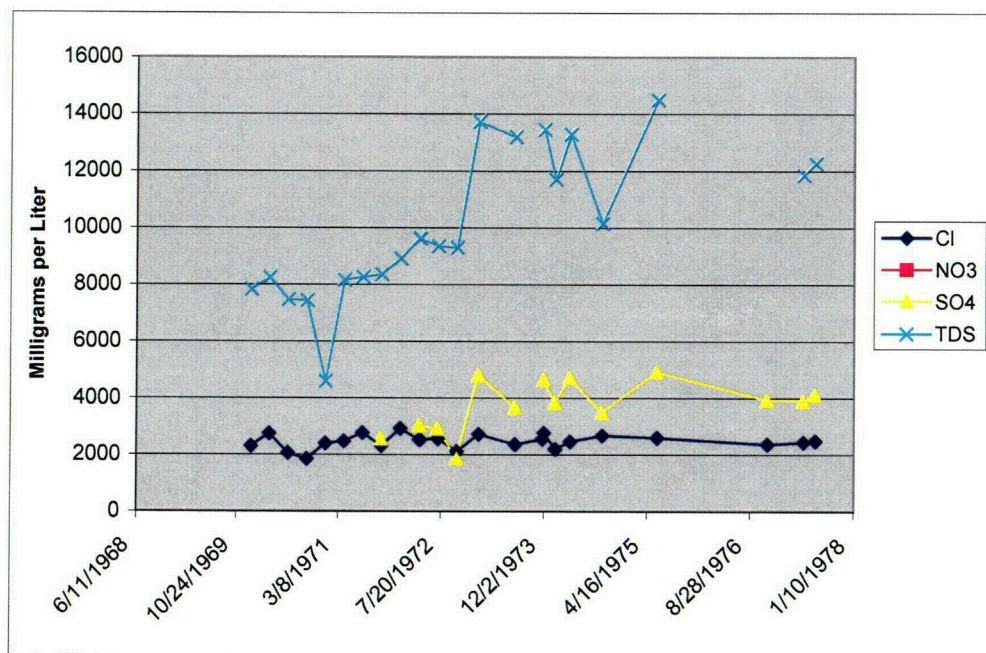
# Monitor Well E-5



Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
E-5	4/10/1976	1310			7119
E-5	7/14/1976	1192		2553	
Mean		1251.0		2553.0	7119.0
Std. Dev.		83.4	#DIV/0!	#DIV/0!	#DIV/0!
Valid N		2.0	0.0	1.0	1.0
Minimum		1192.0		2553.0	7119.0
Maximum		1310.0		2553.0	7119.0

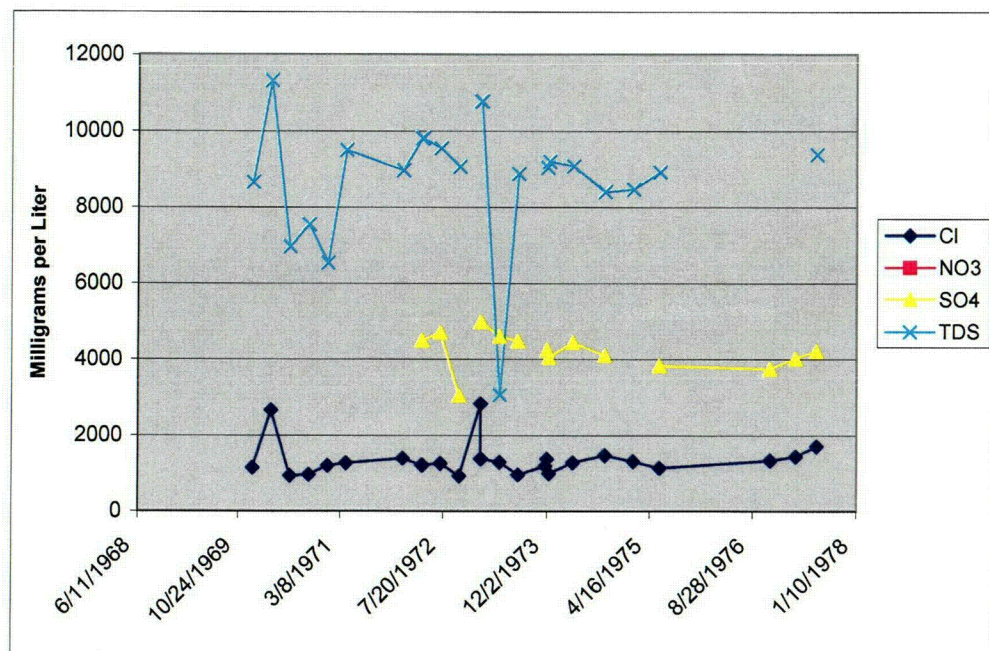
## Monitor Well S-12



## Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
S-12	1/1/1970	2317			7861
S-12	4/1/1970	2762			8268
S-12	7/1/1970	2078			7498
S-12	10/1/1970	1865			7466
S-12	1/1/1971	2411			4615
S-12	4/1/1971	2485			8182
S-12	7/1/1971	2784			8297
S-12	10/1/1971	2328		2573	8381
S-12	1/1/1972	2937			8939
S-12	4/1/1972	2546		3021	9664
S-12	4/5/1972	2546		3021	9,644
S-12	7/1/1972	2574		2922	9387
S-12	10/1/1972	2129		1873	9329
S-12	1/15/1973	2741		4807	13763
S-12	1/15/1973	2741		4807	13,763
S-12	7/10/1973	2374		3672	13,228
S-12	11/20/1973	2565			
S-12	11/28/1973	2788		4658	13,490
S-12	11/28/1973	2788		4658	13,490
S-12	1/21/1974	2219		3816	11,737
S-12	4/3/1974	2478		4715	13,330
S-12	4/3/1974	2478		4715	13,330
S-12	9/5/1974	2699		3491	10,179
S-12	6/1/1975	2607		4917	14530
S-12	11/17/1976	2390		3929	
S-12	5/10/1977	2,460		3900	11,900
S-12	7/6/1977	2500		4120	12,300
Mean		2503.3		3867.5	10502.8
Std. Dev.		247.0		900.5	2674.7
Valid N		27.0	0.0	18.0	25.0
Minimum		1865.0		1873.0	4615.0
Maximum		2937.0		4917.0	14530.0

## Monitor Well S-9



## Data Used in Analysis

Monitor Well	Date	Cl	NO <sub>3</sub>	SO <sub>4</sub>	TDS
S-9	1/1/1970	1162			8679
S-9	4/1/1970	2668			11345
S-9	7/1/1970	951			6975
S-9	10/1/1970	975			7556
S-9	1/1/1971	1207			6556
S-9	4/1/1971	1273			9518
S-9	1/1/1972	1406			8987
S-9	4/1/1972	1224		4490	9833
S-9	4/5/1972	1224		4490	9833
S-9	7/1/1972	1265		4706	9574
S-9	10/1/1972	940		3044	9088
S-9	1/12/1973	2840			
S-9	1/12/1973	1389		4971	10797
S-9	1/15/1973	1389		4971	10797
S-9	4/13/1973	1298		4609	3073
S-9	7/10/1973	975		4473	8899
S-9	11/20/1973	1201			
S-9	11/28/1973	1394		4248	9066
S-9	11/28/1973	1394		4248	9066
S-9	12/7/1973	1007		4052	9216
S-9	4/3/1974	1294		4443	9106
S-9	4/3/1974	1294		4443	9106
S-9	9/5/1974	1484		4102	8428
S-9	1/22/1975	1326			8490
S-9	6/1/1975	1152		3829	8940
S-9	11/17/1976	1349		3740	
S-9	3/21/1977	1451		4016	
S-9	6/29/1977	1720		4210	9,410
Mean		1366.1		4282.5	8847.4
Std. Dev.		431.3		460.6	1636.9
Valid N		28.0	0.0	18.0	24.0
Minimum		940.0		3044.0	3073.0
Maximum		2840.0		4971.0	11345.0