

HYDROGEOLOGIC INVESTIGATION

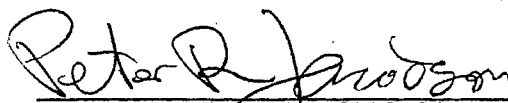
FOR

BISHOP TUBE CORPORATION  
ROUTE 30 AND MALIN ROAD  
FRAZER, PENNSYLVANIA 19355


OCTOBER 1981

BCM PROJECT NO. 00-5265-01

PREPARED BY

  
\_\_\_\_\_  
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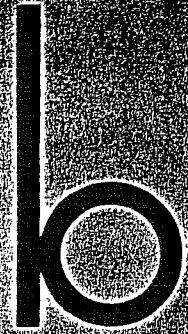
APPROVED BY

  
\_\_\_\_\_  
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ASSISTANT VICE PRESIDENT

BETZ • CONVERSE • MURDOCH • INC.  
ONE PLYMOUTH MEETING MALL  
PLYMOUTH MEETING, PENNSYLVANIA 19462

**REPORT**

**Bishop Tube Co.**  
FRAZER, PENNSYLVANIA



**Hydrogeologic  
Study**



**Betz·Converse·Murdoch·Inc.**  
Consulting Engineers, Planners and Scientists

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## 1.0 BACKGROUND

### 1.1 General

The Bishop Tube Company operates a stainless steel tube manufacturing plant in Frazer, Pennsylvania. The Pennsylvania Department of Environmental Resources (DER) instructed Bishop Tube to conduct a hydrogeologic study of surface water and groundwater conditions at the plant. Betz•Converse•Murdoch•Inc. (BCM) of Plymouth Meeting, Pennsylvania, was retained to conduct the investigation, which was performed with the approval of the DER. This report describes the work performed and the results obtained, and contains recommendations for future action.

### 1.2 Monitoring Well Installation

Between June 3, 1981 and June 5 1981, four monitoring wells were installed on the plant site by Thomas G. Keyes, Inc. under the supervision of a BCM geologist. The well locations are shown in Figure 1; copies of the original well logs are contained in Appendix 1.

Well 1, which serves to monitor background groundwater quality conditions, is finished in the Wissahickon Schist, a lower Paleozoic metamorphic formation. Wells 2 and 4 are finished in colluvium, alluvium, or residual soils above the Conestoga Formation, an Ordovician limestone containing minor amounts of shale and phyllite. Well 2 extends into the Conestoga Formation to a depth of 24 feet. Wells 2 and 3, located on the north side of Plant Building 8, are 24 feet and 13.5 feet deep, respectively. Well 3 monitors the uppermost water-bearing zone, and Well 2 monitors a lower, apparently separate, water-bearing zone. The locations of Wells 2, 3, and 4 were selected, with the DER's agreement, to be the closest feasible downgradient sites to the deactivated and closed waste impoundments identified in Figure 1.

### 1.3 Monitoring Well Sampling Method

On June 16, 1981, all four monitoring wells were sampled. Because of the generally turbid conditions of the water samples, the wells were resampled on July 31, 1981. A standard procedure was followed, using a submersible pump to purge the wells and collect the samples. Also, to eliminate the uncertainties that arise from the turbid samples, all samples were filtered through an 0.45  $\mu$ m filter using a vacuum pump before filling the pre-fixed bottles.

All samples were transported immediately to the BCM laboratory in Norristown, Pennsylvania, where they were analyzed.

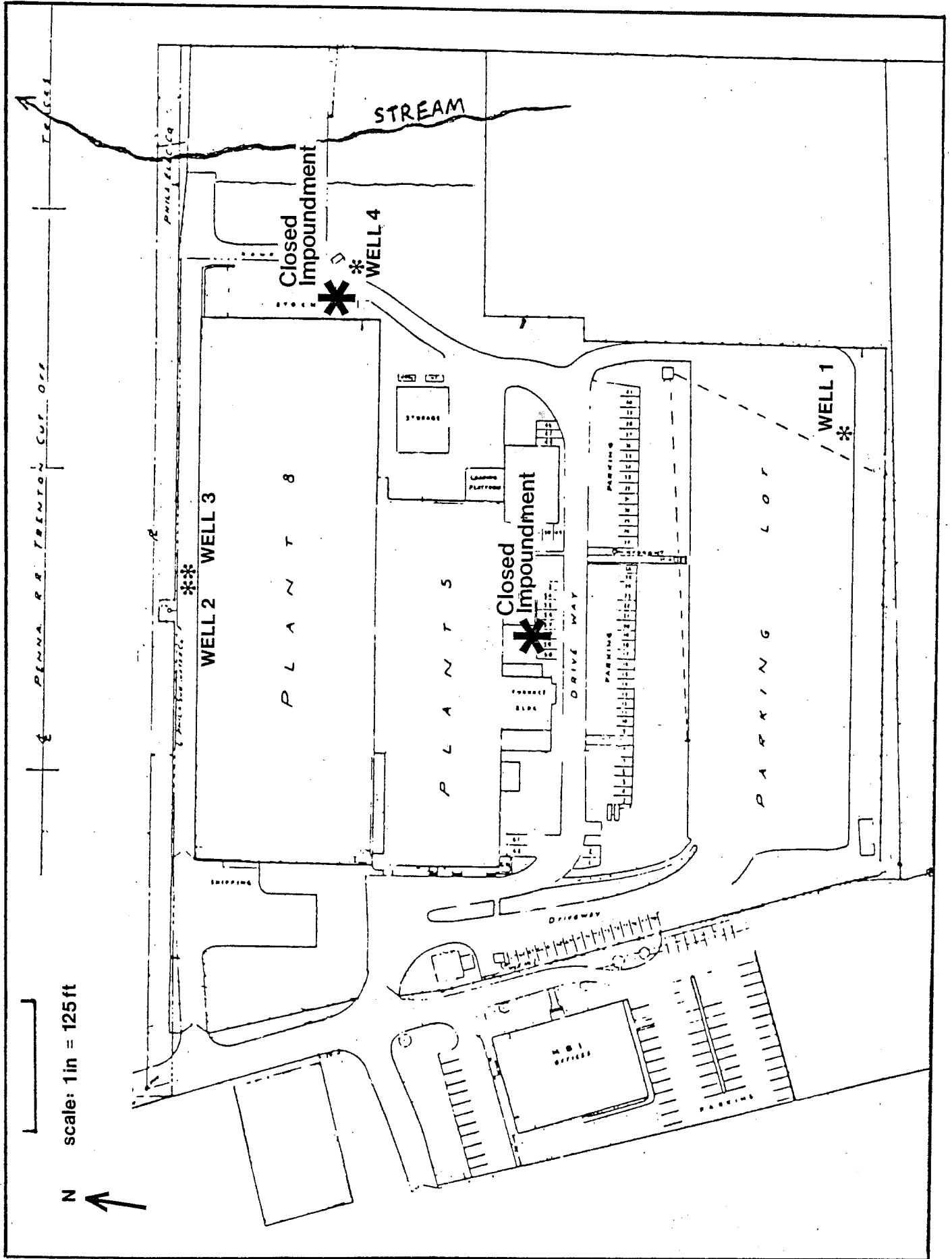


FIGURE 1. LOCATION OF MONITORING WELLS AND CLOSED IMPOUNDMENTS

On July 31, three additional monitoring points were sampled. These were all surface water stations; they were included to help ascertain the interconnection of water quality between the surface and subsurface, and to determine the effect of Bishop Tube's current discharges on the stream. The surface water stations are located as follows:

1. At the discharge line of the cooling water into the unnamed stream
2. On the unnamed stream at the upstream property line
3. On the unnamed stream at the downstream property line

## 2.0 PRESENTATION OF DATA

Table 1 presents the results of the laboratory analyses for the groundwater samples and the surface water samples. The analytical parameters listed in this table were recommended by BCM and approved by the DER. They were selected on the basis of materials used and wastewater generated at Bishop Tube.

## 3.0 DISCUSSION OF RESULTS

### 3.1 Groundwater Quality

To determine the significance of the data in Table 1, the concentrations should be compared to water quality standards. Because Pennsylvania has no state-wide groundwater standards, the convention is to use drinking water standards. The relevant standards are the Well Water Drinking Standards promulgated by the Chester County Health Department. These standards, which are essentially the same as the U.S. Public Health Service Drinking Water Standards are presented in Table 2.

A comparison of the data in Table 1 with the standards in Table 2 indicates that the values for zinc, chromium, and copper are significantly below the standards for all the wells. The nitrate levels in Wells 1 and 4 are also below the standards, but are at levels approaching the limit. The 6.77 ppm in the background Well 1 indicate that high nitrates are originating from upgradient, probably as a result of septic systems in the properties to the south. The only parameters that are above the standards are aluminum and fluoride in Well 4 and managanese and iron in Wells 2 and 4. Although no standard exists for nickel, the 0.454 parts per million (ppm) in Well 4 is higher than normal background levels.

TABLE 1  
 ANALYTICAL RESULTS FOR SAMPLES COLLECTED JULY 31, 1981  
 (All values except pH in mg/l)

Parameter	Sampling Station						
	Well 1	Well 2	Well 3	Well 4	Upstream	Discharge	Downstream
Total Dissolved Solids	63	303	151	353	144	205	156
Copper	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Aluminum	<0.250	<0.250	<0.250	4.10	<0.250	<0.250	<0.250
Zinc	0.057	0.050	0.050	0.065	0.046	0.073	0.046
Chromium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Manganese	<0.014	2.22	<0.014	2.10	<0.014	<0.014	<0.014
Iron	0.054	1.01	<0.040	.173	<0.040	<0.040	<0.040
Nickel	<0.10	<0.10	<0.10	0.454	<0.10	<0.10	<0.10
Chemical Oxygen Demand	1	34	16	19	6	5	4
Nitrate - Nitrogen	6.77	<0.10	0.05	7.22	2.76	2.22	2.72
Ammonia - Nitrogen	0.02	0.16	0.10	2.1	0.02	0.12	0.07
Fluoride	<0.10	0.2	0.5	23.1	0.2	1.0	2.2
pH	6.3	7.4	8.7	6.8	7.3	7.8	7.5



TABLE 2

CHESTER COUNTY HEALTH DEPARTMENT WELL WATER STANDARDS  
FOR SELECTED PARAMETERS  
(All values in parts per million)

---

Parameter	Well Water Standard
Total Dissolved Solids	500
Copper	1.0
Aluminum	Not available
Zinc	5.0
Chromium (hexavalent)	0.05
Manganese	0.05
Iron	0.3
Nickel	Not available
Carbon Oxygen Demand	Not available
Nitrate	10
Ammonia	Not available
Fluoride	0.6 to 1.7*
pH	Not available

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\* Depends on daily air temperature

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### 3.2 Surface Water Quality

Table 1 presents the data on the water quality samples taken from the Bishop Tube cooling water discharge and two sampling stations on the unnamed stream--one upstream and one downstream. The purpose of sampling these three points was to determine if there is a significant difference in stream water quality between the upstream and downstream points that can be attributed to the cooling water and/or groundwater discharge.

A comparison of the data from the three stations shows that only the fluoride concentration increases significantly between the upstream station and the downstream station. The 1.0 ppm of fluoride in the cooling water discharge probably is partially responsible for this increase, but it cannot completely account for the 2.2 ppm at the downstream station. Some of the fluoride contribution probably is from recharge by groundwater (that contains 23.1 ppm fluoride near Well 4).

### 3.3 Deep Groundwater Quality

The quality of groundwater at a depth of 300 feet below the ground surface has been determined by U.S. Geologic Survey (USGS) personnel who sampled Bishop Tube's east well on June 3, 1981 as part of a county-wide USGS study. The USGS report is contained in Appendix 2.

The USGS analyses show that all concentrations of constituents studied to be lower than the Chester County Health Department standards presented in Table 2, except for fluoride. The fluoride concentration in the well was 1.0 ppm. This level is within the range of acceptable limits, and is approximately at the recommended concentration for intentionally-fluoridated water.

It is not clear from the available data if the east well is monitoring groundwater that is potentially affected by the plant operations or if the well takes water that is upgradient from the plant. It is possible that the values shown in the USGS report are representative of regional background levels.

## 4.0 SUMMARY OF FINDINGS

1. Compared to background conditions (as shown in Well 1) and drinking water standards, the groundwater beneath the site exhibits no contamination for most of the parameters.

2. Well 1 exhibits generally high quality water representative of background conditions. Elevated nitrate levels are the result of upgradient influences off Bishop Tube property.
3. Well 2 exhibits levels of iron and manganese in excess of background conditions as measured in Well 1. It appears that these levels do not represent natural background conditions.
4. Well 3, which monitors the shallow groundwater zone on the north side of the plant, exhibits no contamination. No contaminants are present in this well near levels of concern.
5. Well 4 exhibits elevated concentrations of fluoride, aluminum, manganese, iron, and nickel above background levels.
6. With the exception of fluoride, the surface water samples, including the cooling water discharge, showed no problems that warrant further investigation. The fluoride levels at the downstream sampling station suggest that fluoride is being added to the stream from the cooling water discharge and from groundwater discharge.
7. The deep groundwater beneath the site exhibits no significant contamination. The highest value is for fluoride, which, at 1.0 ppm, is within the range of acceptability for fluoridated drinking water.

## 5.0 CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Conclusions

1. The groundwater near Well 4 is moving towards, and discharges into, the unnamed stream. This is evident by the increase in fluoride concentration in the stream that cannot be attributed to the cooling water discharge. In recharging the stream, the fluoride-enriched groundwater becomes greatly diluted by the stream water.
2. The groundwater conditions at Bishop Tube are not a hazard to public health. The area of high fluoride concentrations is probably limited to the immediate vicinity around Well 4 and adjacent parts of the stream. The stream is not used for water supply and it shows significantly lower values for all parameters. The nearest public water supply well is about 1.5 miles away. Any surface or groundwater traveling from the Bishop Tube area to the public well would be diluted by several orders of magnitude before it was taken up in the well, and should be within drinking water standards.

3. It is possible that the groundwater near Well 4, which was monitored in the overburden, could move downward into the limestone. If this were to happen, any contamination in the groundwater would become very diluted before being taken up in any public water supply well.

#### 5.2 Recommendations

Based on the conditions described previously, the surface and groundwater quality at the Bishop Tube site should be periodically monitored. This monitoring should include sampling water from the stream and from all four wells, as before. The samples should be analyzed for the key parameters shown to be important: fluoride, iron, manganese, aluminum, and nickel. This periodic monitoring will determine if changes in the system occur over time. Further action beyond this is not warranted at this time.

APPENDIX 1

WELL LOGS



DRILLING LOG

WELL NUMBER: 1 Background

WELL OWNER: Bishop Tube

LOCATION: upper parking lot

ADDRESS: Malvern, PA

TOTAL DEPTH: 48 Ft

SURFACE ELEVATION: \_\_\_\_\_

STATIC WATER LEVEL: 15' 0" DATE: 6-3-81  
1100

DRILLER: \_\_\_\_\_

DRILLING METHOD: air rotary

COMPANY: Thomas Keyes  
Malvern, PA

DATE DRILLED: 6-3-81 START 0818  
STOP 0915

LOGGED BY: Bill Neuback

COMMENTS: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SKETCH MAP

LOCATION: \_\_\_\_\_

DEPTH FROM SURFACE (FEET)	GRAPHIC LOG	SAMPLES	I.D. NUMBER	SPOON BLOWS	DESCRIPTION OF MATERIALS
0-20'					weathered schist; mica, quartz pebbles, lt brown, dry, iron stains
20'					moisture encountered, waited a few minutes, no free water
30'					hit water @ approx 30 Ft
48'					total depth 48'
					- one soil sample taken at 30 Ft -
					20' of 4" PVC screen set from 48' to 28', gravel packed
					30' of 4" PVC pipe set above

*William [Signature]*



DRILLING LOG

WELL NUMBER: 2 Downgradient

WELL OWNER: Bishop Tube

LOCATION: N side of main plant building  
approx. midway on building, ~5' from build

ADDRESS: Malvern, Pa.

TOTAL DEPTH: 24'

SURFACE ELEVATION: \_\_\_\_\_

STATIC WATER LEVEL: \_\_\_\_\_ DATE: \_\_\_\_\_

DRILLER: Thomas Keymes Jack

DRILLING METHOD: air rotary, air hammer

COMPANY: Thomas Keymes  
Malvern, Pa.

DATE DRILLED: 6/4/81

LOGGED BY: Alan Robinson

COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SKETCH MAP

LOCATION: \_\_\_\_\_  
\_\_\_\_\_

DEPTH FROM SURFACE (FEET)  
GRAPHIC LOG

SAMPLES  
I.D. SPOON  
NUMBER BLOWS

DESCRIPTION OF MATERIALS

0-6'	} 8" air rotary		Fill - limestone pebbles, brown soil matrix
6-13'			Weathered limestone and schist (?), platy weathered limestone fragments water moisture encountered at 8'
13-19'	} 6" air hammer		Limestone, blue-grey, platy, dry
19-24'			Same lithology as above, much water
			9' of 4" PVC screen set from 24'-15', gravel packed to 14'
			bentonite from 14'-8', cuttings to 1', cement to surface
			15' PVC pipe set from 15 to surface +
			Development time 35 min on 6/5/81

*Alan M. Robinson*

DRILLING LOG

WELL NUMBER: 3 Downgradient

WELL OWNER: Bishop Tub

LOCATION: N side of main plant building  
approx. 4' E of well #2

ADDRESS: Frazier Pa

TOTAL DEPTH: 13.5

SURFACE ELEVATION: \_\_\_\_\_

STATIC WATER LEVEL: \_\_\_\_\_ DATE: \_\_\_\_\_

DRILLER: Jack

DRILLING METHOD: Air rotary

COMPANY: Thomas Keynes  
Malvern, Pa

DATE DRILLED: 6/4/81

LOGGED BY: Alan M. Robinson

COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SKETCH MAP

LOCATION: \_\_\_\_\_  
\_\_\_\_\_

DEPTH FROM SURFACE (FEET) GRAPHIC LOG	SAMPLES		DESCRIPTION OF MATERIALS
	I.D. NUMBER	SPOON BLOWS	
0-1'			Road gravel
1'-6'			Fill - limestone + schist pebbles w/ brown 'soil' matrix, dry
6'-10'			Brown matrix of silt + sand, some schist fragments, water at 8'
10-13			Grey matrix, platy limestone fragments, moist
13-13 1/2			Fresh unweathered limestone, blue-grey, dry
			4" PVC screen 13 1/2' - 8', gravel packed to 6'
			4" PVC pipe 8' to surface + bentonite 6' - 1'
			Cement to surface
			Developed for 30 minutes but probably poorly due to problem w/ pump



DRILLING LOG

WELL NUMBER: 4 Downgradient

WELL OWNER: Bishop Tub

LOCATION: East of plant in finished product storage area ~20' N of SE corner of build

ADDRESS: Frazier Pa

TOTAL DEPTH: 20'

SURFACE ELEVATION: \_\_\_\_\_

STATIC WATER LEVEL: \_\_\_\_\_ DATE: \_\_\_\_\_

DRILLER: Jack

DRILLING METHOD: Air rotary

COMPANY: Thomas Keynes

DATE DRILLED: 6/5/81

LOGGED BY: Alan M. Robinson

COMMENTS: \_\_\_\_\_

SKETCH MAP

LOCATION: \_\_\_\_\_

DEPTH FROM SURFACE (FEET)  
GRAPHIC LOG

SAMPLES

I.D. SPOON NUMBER BLOWS

DESCRIPTION OF MATERIALS

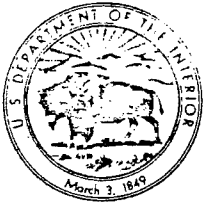
0-4'			Road gravel + finer limestone fill
4-7.5'			More fill, encountered moisture at 4'
7.5-20'			Combination of limestone + phyllite flakes within a finer matrix
			4" PVC screening from 20' to 7'
			4" casing 7' to 0'
			Gravel pecked to ~5', bentonite to 1', cement to surface
			Developed for ~40 min. on 6/5/81

*Alan M. Robinson*

Betz • Converse • Murdoch • Inc.

APRENDIX 2

USGS REPORT ON EAST WELL



# United States Department of the Interior

GEOLOGICAL SURVEY  
Water Resources Division  
35 Great Valley Parkway  
Great Valley Corporate Center  
Malvern, PA 19355

Bishop Tube  
Route 30 & Malin Road  
Frazer, PA 19355

Attention: Mr. Chuck Thompson

Dear Mr. Thompson:

Thank you for allowing us to sample your well as part of the Chester County Ground Water Quality Monitoring Program. Enclosed is a copy of the laboratory report. Your well water meets EPA's safe drinking water standards. We may wish to sample your well again in the future as part of the program.

The quantity of dissolved substances in your well water are shown in quantities of milligrams per liter (MG/L) and micrograms per liter (UG/L). One milligram per liter of dissolved substance is equivalent to one part of the substance in one million parts of water. One microgram per liter of dissolved substance is equivalent to one part of the substance in one billion parts of water.

If you have any questions concerning the sampling procedure, please call me anytime at 647-9008. If you have any questions concerning health related problems and contaminants, please call Philip Terry, Chester County Health Department, at 431-6247.

Sincerely,

Charles R. Wood  
Subdistrict Chief

DKD/cdk  
Encl.

UNITED STATES DEPARTMENT OF THE INTERIOR  
 GEOLOGICAL SURVEY  
 CENTRAL LABORATORY ATLANTA, GEORGIA

WATER QUALITY ANALYSIS  
 LAB-ID # 161031 RECORD-# 58682

SAMPLE LOCATION: 2432  
 STATION ID: 400221075321201 LAT.LONG.SEQ.: 400221 0753212 01  
 DATE OF COLLECTION: BEGIN--810603 END-- TIME--1100  
 STATE CODE: 42 COUNTY CODE: 029 PROJECT IDENTIFICATION: 444209300  
 DATA TYPE: 2 SOURCE: GROUND WATER GEOLOGIC UNIT:  
 COMMENTS: UNIQUE-#:  
 OWNER BISHOP TUBE

ALDRIN, TOT (WATER) UG/L	<	0.01	LEAD, DIS.	UG/L	1
ANALYZING AGENCY		80010	LINDANE, TOT (WATER) UG/L	<	0.01
ARSENIC, DISSOLVED UG/L		1	MANGANESE, DISSOLV. UG/L		1
BENZENE, TOTAL UG/L		0.0	MERCURY, DISSOLVED UG/L		0.3
BROMOFORM, TOTAL UG/L		0.0	METALS DISS CHE-EXT		0
CADMIUM, DIS. UG/L		1	METHOXYCHLOR T.(WAT) UG/L	<	0.01
CARBON TETRA., TOT. UG/L		0.0	METHYLBROMIDE, TOTAL UG/L		0.0
CHLORDANE, T (WATER) UG/L	<	0.1	METHYLENE CHLORIDE, T UG/L		0.0
CHLOROBENZENE, TOTAL UG/L		0.0	MIREX, TOT. UG/L	<	0.01
CHLORODIBROMO., TOT. UG/L		0.0	NICKEL, DIS. UG/L		8
CHLOROETHANE, TOTAL UG/L		0.0	PERTHANE, TOT. UG/L	<	0.01
CHLOROFORM, TOTAL UG/L		0.0	PH FIELD	UNITS	7.1
CHROMIUM, DISSOLVED UG/L		0	PHENOLS, TOTAL UG/L		0
CONFIRMATION ABOVE 2 UG/L		0	SP. CONDUCTANCE FLD	UMHOS	325
CYANIDE, TOTAL	DETR. DELETED		TETRACHLOROETHYLEN, T UG/L		0.0
DDD, TOTAL (WATER) UG/L	<	0.01	TOLUENE, TOTAL UG/L		0.0
DDE, TOTAL (WATER) UG/L	<	0.01	TOXAPHENE, T (WATER) UG/L	<	0.1
DDT, TOTAL. (WATER) UG/L	<	0.01	TRICHLOROETHYLENE, T UG/L		0.0
DICHLOROBROMOMETHA, T UG/L		0.0	TRICHLOROFLUOROMET, T UG/L		0.0
DICHLORODIFLUOROME, T UG/L		0.0	VINYL CHLORIDE, TOTA UG/L		0.0
DIELDRIIN, T. (WATER) UG/L	<	0.01	WATER TEMPERATURE	DEG C	12.0
ENDOSULFAN I TOTAL UG/L	<	0.01	1,1-DICHLORETHYLEN, T UG/L		0.0
ENDRIN, TOTAL(WATER) UG/L	<	0.01	1,1-DICHLOROETHANE, T UG/L		0.0
ETHYLBENZENE, TOTAL UG/L		0.0	1,1,1-TRICHLOROETH, T UG/L		0.0
FLUORIDE, DISSOLVED MG/L		1.0	1,1,2-TRICHLOROETH, T UG/L		0.0
GROSS PCBS T (WATER) UG/L	<	0.1	1,1,2,2-TETRCHLORO, T UG/L		0.0
GROSS PCNS T (WATER) UG/L	<	0.1	1,2-DICHLOROETHANE, T UG/L		0.0
HEPT EPOX, T (WATER) UG/L	<	0.01	1,2-DICHLOROPROPAN, T UG/L		0.0
HEPTACHLOR T.(WATER) UG/L	<	0.01	1,3-DICHLOROPROPAN, T UG/L		0.0
IRON, DIS. UG/L		10	12TRANSDICL-ETHYLENE UG/L		0.0
			2-CL-ETHYLVINYLEETHER UG/L		0.0

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UNITED STATES DEPARTMENT OF THE INTERIOR  
 GEOLOGICAL SURVEY  
 CENTRAL LABORATORY ATLANTA, GEORGIA

WATER QUALITY ANALYSIS  
 LAB-ID # 162811 RECORD-# 58928

SAMPLE LOCATION: 2432  
 STATION ID: 400221075321201 LAT.LONG.SEQ.: 400221 0753212 01  
 DATE OF COLLECTION: BEGIN--810603 END-- TIME--1100  
 STATE CODE: 42 COUNTY CODE: 029 PROJECT IDENTIFICATION: 444240300  
 DATA TYPE: 2 SOURCE: GROUND WATER GEOLOGIC UNIT:  
 COMMENTS: UNIQUE-#:  
 OWNER BISHOP TUBE

ANALYZING AGENCY	80010	NITR DISS NH4 AS N	MG/L	0.02
CARBON, ORGANIC, TOT	0.9	NITR. DIS NH4 AS NH4	MG/L	0.03
NITR DIS NO2 AS N	< 0.01	PH FIELD	UNITS	7.1
NITR DIS NO2+NO3 -N	0.14	SP. CONDUCTANCE FLD	UMHOS	325
		WATER TEMPERATURE	DEG C	12.0

CATIONS

(MG/L) (MEQ/L)

TOTAL

ANIONS

(MG/L) (MEQ/L)

NITR DIS NO2+N

0.14

0.010

TOTAL 0.010