SUMMARY OF THE REMEDIAL ALTERNATIVE SELECTION

ENDICOTT VILLAGE WELL FIELD

NEW YORK

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
NEW YORK

TABLE OF CONTENTS

FIGURES

TABLES

I. SITE LOCATION AND DESCRIPTION

The Endicott Village Well Field site is located in the Village of Endicott, Broome County, New York. The site essentially consists of a Ranney Well and its zone of influence on area ground water. The boundaries of this zone have been generally delineated in the RI by the Susquehanna River to the south, West Main Street to the north, Grippen Park to the east and the Endicott Landfill to the west. (See Figure 1.)

The project site is comprised primarily of open land associated with the Enjoie Golf Course and the facilities of the Village of Endicott Sewage Treatment Plant. Private homes are not located within the project study area. However, there are landfill areas and industrial tracts to the northwest and west of the study area, including the Endicott Landfill, identified in the RI as the probable source of contamination. The site is underlain by over 100 feet of unconsolidated glacial and alluvial deposits which mantle shale and sandstone bedrock.

II. SITE HISTORY

The well was designed over 30 years ago, by the Ranney Well Collector Corporation, to draw water primarily by infiltration from the nearby Susquehanna River, with the balance contributed by area ground water. The Ranney Well has been in continuous use since 1950 at various production levels ranging from 3500 to 7000 gpm. The Ranney Well consists of a 13 foot diameter central caisson, approximately 108 feet deep, with twenty four 8 inch diameter horizontal well screens projecting from the central caisson in four tiers. (See Figure 2.)

The Ranney Well operated without major problems until May 1981, when the USEPA detected vinyl chloride (8.4 ppb) and trace amounts of other volatile organic compounds in the well's discharge. Sampling of area wells was undertaken after a chemical spill at IBM's Endicott plant in 1978. Subsequent sampling by the USEPA and the New York State Department of Health (NYSDOH) confirmed these initial results.

Site remediation efforts were initiated on a local level by the Public Works Department for the Village of Endicott. These efforts included engaging the services of D.W. Friend Laboratories of Waverly, New York to sample the Ranney Well discharge and various points along the distribution system on a weekly basis. As part of the testing program, a Village employee donned scuba equipment and collected samples from selected radials of the Ranney Well. Sample results indicated that radials projecting to the west exhibited elevated levels of contamination. Based on this investigation, some radials were valved shut and the conclusion made that the source of contamination existed to the west of the well. In addition, an aeration system was installed in the well as an immediate

remedial measure to reduce vinyl chloride levels.

Additional studies were undertaken by the NYSDEC Division of Water, beginning in April 1983. The first study included a review of available data, the installation of nine monitoring wells, and the sampling and analytical testing of groundwater from selected wells. A pump test was also performed in September 1983 by turning the Ranney Well off for a period of 24 hours and measuring recovery rates in nearby wells. Pumping was then resumed at a rate of 3700 gpm and resulting drawdowns were measured. The results of this study indicated that the source of contamination was located west or northwest of the Ranney Well. It concluded that pumping 3700 gpm at the Ranney Well has a significant impact upon area ground water flow paths, reversing the direction of flow on the golf course and drawing ground water toward the well.

Based on the results of this investigation, a 10-inch purge well designed to pump approximately 600 gpm and three additional monitoring wells were installed on the Enjoie Golf Course to intercept and monitor contamination affecting the Ranney Well. However, an additional study to evaluate the effectiveness of the purge well revealed that it was not performing efficiently enough to capture the contaminant plume and prevent migration to the Ranney Well. The Village of Endicott redeveloped the purge well under NYSDEC supervision and installed four additional monitoring wells. Further investigation revealed that the purge well has been removing significant quantities of contaminants from the aquifer.

Since redevelopment, the pumping rate of the purge well has increased to 600 gpm. Contaminated water from the purge well is aerated through a spray nozzle and discharged into a series of clay lined ponds, which overflow into the Susquehanna River. The final pond outfall was monitored during the NYSDEC investigations as well as discharge at the purge well. Table 1 from the final NYSDEC Division of Water report of August 1985, shows concentrations of four chemicals measured at the purge well and at the final pond outfall for four different sampling events. This treatment system was permitted by the NYSDEC.

A. Current Site Status

The Ranney Well is currently pumping water at 3700 gallons per minute (gpm) and delivering approximately 47 percent of the total water supply to Endicott's municipal system, which serves an estimated 45,000 people in the area. Local officials indicate that approximately half of the Ranney Well discharge is routed to local industries for use as process water in manufacturing. The balance is consumed by local residents.

The Village of Endicott has been monitoring the Ranney Well discharge on a weekly basis since 1985. Analytical results

indicate that the MCL for vinyl chloride has been exceeded in the Ranney discharge on several occasions. This is evidence that the existing aeration system is not adequate to ensure compliance with the MCL and therefore not adequately protective of human health.

A major objective of the remedial investigation was to identify the source of contamination to the Ranney Well. Five potential sources were identified by the NYSDEC and USEPA, prior to the RI. (See Figure 3.) The RI determined that the most probable source of contamination was the Endicott Landfill. However, additional data will be required to further evaluate contaminant distribution and conclusively identify the source. An RI/FS for a second operable unit to evaluate the nature and extent of contamination in suspected source areas and to evaluate possible source control measures has been initiated. This RI/FS will also investigate the extent of contamination in the aquifer and evaluate all feasible alternatives for its restoration.

The completed RI was successful in characterizing geologic and hydrogeolgic conditions in the area. In addition, a scenario was proposed to describe the origins of contamination presently affecting the Ranney Well. The RI attributes the identified contaminant plume to inundation of the Endicott Landfill by the Susquehanna River during flood events. The report concludes that this could cause a reversal in ground water flow patterns, which would allow a contaminant slug to move into the catchments of the Ranney and purge wells. The contaminant slug then travels as shown in Figures 4, 5, and 6 for the three contaminants of concern. These areal contaminant distributions represent the results of data collected from monitoring wells during the RI.

Data which support this conclusion include water level records obtained from the the Village of Endicott Sewage Treatment Plant, a surface water level gauge located at Nanticoke Creek and historical analytical test results. These data were reviewed and flood occurrences correlated with high levels of contamination present at the purge well.

Another explanation for the contamination affecting the Ranney Well can be derived from ground water flow patterns identified in the RI. A large post glacial kettle deposit was identified in the RI and previous NYSDEC studies. This large impermeable soil mass exists below Nanticoke Creek, between the Ranney and purge wells and the Endicott Landfill. (See Figure 7.) The combined pumping effects of the Ranney and purge wells (currently approximately 6.2 MGD) draw ground water to the east, from the direction of the Endicott Landfill, underneath and around the impermeable kettle deposit and toward the wells. (See Figure 8 & 9.) This would cause contamination existing in the area of the Endicott Landfill to be drawn toward the Ranney Well.

This scenario can also explain why some contamination is bypassing the purge well. The depth of the kettle deposit was determined in the RI to be approximately equivalent to the depth of the purge well. Thus, contaminated ground water pumped under the kettle deposit by the combined influence of the Ranney and purge well could circumvent the purge well and reach the catchment of the Ranney Well. These conclusions will be carefully scrutinized in the RI/FS addressing the source of contamination and aquifer restoration.

B. Risk Assessment

The primary potential human health impact at the Endicott Village Well Field site is through ingestion of contaminated ground water. In order to assess the level of risk to the public associated with the contamination, a risk assessment was conducted. This assessment provides a quantitative estimate of risk levels under existing conditions, in the absence of remedial action. This is used to determine whether remedial action at the site is warranted. The risk assessment was developed as follows: identify contaminants of concern; select appropriate indicator chemicals; describe pathways of exposure associated with indicator chemicals; estimate levels of exposure and determine populations affected; and characterize current and potential risks to human health.

Exposure Pathways

The risk assessment performed as part of the remedial invesigation determined that ingestion of contaminated Ranney Well water poses the greatest human health risk at the Endicott Village Well Field site. The Ranney Well draws water primarily from the Susquehanna River, with the balance derived from area ground water. The remedial investigation identified a potential source of contamination to the west of the Ranney Well, i.e the Endicott Landfill. Pumping of the Ranney and purge wells combine to reverse area ground water flow paths and draw contaminated ground water from the direction of this suspected source. There are no production wells in the flow path, other than the Ranney and purge wells. An RI/FS will be performed on a second operable unit to identify the nature and extent of contamination in suspected source areas and to evaluate possible source control measures.

Contaminants of Concern

To develop a quantitative risk assessment for the Endicott Village Wellfield site appropriate indicator chemicals were selected. Indicator chemicals were selected based on the following criteria: the chemical must have been detected in at least one valid sample since the installation of the existing treatment systems (Febuary 1985 to present); the chemical must have known toxic or carcinogenic effects; and there must be

quantitative data available on toxicity or carcinogenicity of the chemical.

A variety of organic compounds have been detected in the Ranney Well discharge, after treatment by aeration. Table 2 identifies these contaminants, the number of quantifiable detections for each, the mean and maximum concentrations, and the availability of toxicological or carcinogenic data. Table 3 provides relevant data for indicator chemicals that satisfied the requirements of the selection process.

Five organic compounds and a group of chemicals known as trihalomethanes were selected to determine the excess cancer risk associated with drinking Ranney Well water. Of these chemicals, only vinyl chloride is occasionally present at levels exceeding Applicable or Relevant and Appropriate Requirements (ARARs) established for the site.

Since the Ranney Well serves as a continuous drinking water source for greater than 25 consumers, Maximum Contaminant Levels (MCLs) promulgated under the Safe Drinking Water Act are the applicable or relevant and appropriate cleanup standards for the site. The MCL for vinyl chloride was finalized at 2 ppb in June 1987. This is more stringent than the current New York State ground water standard of 5 ppb (NYS Environmental Conservation Law Part 703). MCLs for 1,2-dichloroethane, trichloroethene, and total trihalomethanes were also finalized in June 1987. (See Table 3.) Currently, the water quality of the Ranney Well is achieving ARARs for these chemicals, with the exception of vinyl chloride.

MCLs do not exist for the two remaining indicator chemicals, tetrachloroethene and 1,1,2-trichloroethane. New York State Department of Health guidelines for these chemicals are 50 ppb for step 1 action and 10 ppb for step 2 action. Federal Water Quality Criteria (FWQC) are available for both chemicals. The FWQC for these chemicals are 0.88 ppb for tetrachloroethene and 0.6 ppb for 1,1,2-trichloroethane. These FWQC are health based estimates that correspond with an increased cancer risk of 10^{-6} for ingestion of contaminated water. The FWQC for these two chemicals have only been exceeded once in the past two years, sampling weekly.

Risk Characteristics

Available analytical data from the Ranney Well indicates that there is an excess cancer risk of 2.5×10^{-5} associated with ingestion of Ranney Well water. This means that one might expect one additional incidence of cancer in a hypothetical population of 40,000 people resulting from ingestion of Ranney Well water. The USEPA currently views a range from 10^{-4} to 10^{-7} as an exceptable cancer risk level.

Environmental Impacts

Potential environmental impacts from the contamination affecting the Ranney Well have not been fully determined. An RI/FS on a second operable unit, addressing source remediation and aquifer restoration, will attempt to further characterize potential environmental impacts of the contamination. The Endicott Landfill was identified as the likely source of contamination in the first RI/FS. Two previous studies by the NYSDEC Division of Water, also identified the landfill as the probable source. Leachate from a surface seep emanating from the landfill and draining into the Susquehanna River demonstrated the highest level of contamination of any sample collected during the RI/FS. Contamination emanating from the landfill could possibly affect the Susquehanna River and nearby Nanticoke Creek.

III. ENFORCEMENT

No enforcement activities have been conducted for the site. The RI/FS identified the Endicott Landfill as the suspected source of contamination. A Notification of Hazardous Waste Activity form for the landfill is available in the administrative record. This form identifies companies that possibly contributed hazardous waste to the landfill, prior to its closing in 1977. The supplemental RI/FS, which will further investigate suspected source areas, will be designed to facilitate the enforcement effort.

At the conclusion of the supplemental RI/FS, notice letters, if appropriate, will be sent to all potentially responsible parties (PRPs). EPA retains the right to seek cost recovery from said PRPs for all response costs, including those associated with the first operable unit.

IV. COMMUNITY RELATIONS

There have been significant contributions toward the remediation of contamination at the Endicott Village Wellfield site from community officials. The Supervisor of the Public Works Department for the Village of Endicott, Mr. Eugene Kudgus, P.E., undertook the first comprehensive study describing contamination at the Ranney Well in 1983. At that time the Town took steps toward remediating the contamination, by closing off highly contaminated radials in the Well. After obtaining the assistance of NYSDEC Division of Water hydrogeologists and engineers, the Town took additional steps including the installation of a purge well to intercept contamination before it reached the Ranney Well, and the installation of an aeration system in the Ranney Well to strip vinyl chloride. Local officials have proved invaluable in providing information and advice during the RI/FS.

The level of public concern over the contamination problem at the

Ranney Well has generally subsided, due mainly to the Town's decisive steps toward remediating the problem. Press coverage of the issue has contributed to public awareness in a responsible manner.

A public meeting was held on August 11, 1987 to discuss the results of the RI/FS and present the recommended remedial alternative to the public. Specific concerns that were raised during the public comment period, including comments made at the public meeting, are answered in the attached Responsiveness Summary. A transcript of the public meeting is available in the Administative Record, located at the information repository and the regional office.

V. ALTERNATIVES EVALUATION

The remedial alternatives for the Endicott Village Well Field site were developed and evaluated using the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC §9601, et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986, the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, and the "Guidance on Feasibility Studies Under CERCLA", as guidance.

The objective of the present operable unit was to develop short term remedial alternatives capable of providing a safe drinking water supply to the community. Seven remedial alternatives were presented in the FS by TAMS Consultants, Inc., all addressing water supply. The alternatives and their associated capital costs, operation and maintenance present worth costs, and total present worth costs are provided in Table 4.

Alternative 1: No Action

The no action alternative would leave the site in its present condition with continued operation of existing systems (i.e. purge well and aeration system) and associated monitoring. However, monitoring data collected during the operation of present treatment systems, over a two year period indicate that the MCL for vinyl chloride has been exceeded on several occasions. This demonstrates that the existing treatment systems are not effective in protecting public health.

Alternative 2: Purge Wells Only

This alternative involves the installation of a number of purge wells upgradient from the Ranney Well. The purge wells would intercept contaminated ground water, before it reaches the Ranney Well, thereby restoring the drinking water quality of the Ranney Well. However, additional studies would be required to demonstrate the technical feasibility, reliability and effectiveness of this alternative. These additional studies

would hinder the implementability of the alternative.

A second operable unit addressing source characterization and remediation has been initiated. Implementation of this alternative would be premature until the source and extent of contamination have been more adequately delineated and an aquifer restoration program has been defined. The cost of this alternative shown in Table 4 does not consider treatment costs that will probably be required prior to discharging contaminated ground water to the environment. The total present worth of implementing this alternative without treatment of the contaminated ground water is estimated to be $1.041 million. Should treatment be required this cost would increase substantially. Thus the merits of this alternative evaluated by performance, reliability, cost, and protectiveness of human health and the environment are questionable.

Alternative 3: Air Stripping

This alternative involves the installation of a treatment facility on site to treat contaminated ground water prior to discharge into the distribution system of the Village of Endicott. The treatment system would remove contaminants detected in the Ranney Well at levels that exceed drinking water standards, i.e. MCLs. The remedy will be effective in protecting human health and the environment and in reducing the toxicity, mobility, and volume of contamination. It is easily implementable and cost effective. Detailed discussion of this remedy is provided later in this document.

Alternative 4: Air Stripping and Additional Purge Wells

This alternative is essentially a combination of alternatives 2 and 3. It was rejected for the same reasons given in the discussion of alternative 2. It was decided that the utility and necessity of purge wells could be better established at the conclusion of the second operable unit after sources of contamination have been properly addressed and an aquifer restoration plan has been developed. The total present worth cost of implementing this alternative is estimated to be $3.625 million. As in alternative 2 this figure does not include costs that would probably be associated with treating contaminated ground water from the purge wells prior to discharge to the environment.

Alternative 5: New Endicott Supply Well

Alternative 5 would provide for the installation of a new drinking water supply well off site. Contaminated ground water would not be remediated under this alternative. It would result in the loss of the Ranney Well to the community. In addition, further study would be required to locate a well capable of providing water in adequate quantity and quality,

hindering the implementability and cost effectiveness of the alternative. The estimated total present worth cost of the alternative presented in Table 4 ($870,000) does not reflect the costs of the study that would be required to locate and test the new supply well proposed under this alternative.

The selection of this alternative would basically result in the loss of a prolific water resource. Neither EPA's ground water protection strategies, nor the community's future water needs would be well served by this alternative. Further, the statutory directive in CERCLA seeking a reduction in the toxicity, mobility, and volume of contamination on Superfund sites would be ignored by the selection of this alternative.

Alternative 6: New Surface Water Supply

This alternative would involve the construction of a 6 million gallon per day (MGD) treatment plant on the north bank of the Susquehanna River, east of Nanticoke Creek. Required water treatment plant processes would include flocculation and clarification, filtration, and chlorination. Additional studies would be required to locate and design the required treatment facility.

Site remediation is not addressed by this alternative. In addition, the method is not cost effective or easily implementable. The estimated total present worth cost of this alternative is $4.104 million. The alternative is much more expensive than the selected remedy and would require additional studies prior to implementation.

Alternative 7: Surrounding Community Supply

Johnson City, located east of Endicott, currently has 4 MGD of water available and would be willing to rehabilitate an existing well at their own expense to supply 6 MGD. Endicott would have to provide for interconnection with the Johnson City system.

This is simply another alternative looking at possible alternative water supplies. The method does not address site remediation and is not cost effective. The total present worth of the alternative is $10.684 million. It was by far the most expensive alternative evaluated and offered little in the way of marginal utility to justify its expense.

VI. SELECTED REMEDY

The selected remedy was arrived at by evaluating the remedial alternatives presented in the feasibility study in accordance with the statutory requirements established in CERCLA, and to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, cost effective, utilizes alternative treatment technologies to the maximum extent practicable to reduce the toxicity, mobility, and

volume of contamination, and attains Federal and State ARARs. The selected remedy for the Endicott Village Well Field site consists of the following components:

1. A ground water treatment facility will be installed near the existing Ranney Well, designed to treat the current use flow rate of approximately 3700 gpm. The treatment facility will utilize air stripping for the removal of volatile organic compounds and chlorination for disinfection. Treated water will then be discharged to the distribution system of the Village of Endicott for use as drinking water.

2. The Village of Endicott will continue to operate the purge well located on the Enjoie Golf Course. This purge well is situated between the Ranney Well and the suspected source of contamination, the Endicott Landfill.

3. The Village of Endicott presently samples the Ranney Well for volatile organic compounds on a weekly basis. This monitoring program is necessary to ensure a safe drinking water supply for the community.

   The well was sampled for full Hazardous Substance List parameters during the RI/FS during two separate sampling events. Analytical results of these samples indicated that the well is presently being affected by only volatile organic compounds. Thus, the existing monitoring program, designed to detect volatile organic compounds in the Ranney Well, is sufficient and should be continued.

4. A supplemental RI/FS will be initiated to further investigate the nature and extent of contamination in suspected source areas and to evaluate possible source control measures. This study will also investigate the extent of aquifer contamination and evaluate alternatives for its restoration. A cooperative agreement allocating resources and responsibility for this proposed project was finalized in August 1987. Under the terms of the agreement, the NYSDEC will be the lead agency in administering the RI/FS and procuring a contractor.

   The proposed scope of work for this project will include an investigation of the Endicott Landfill and potential impacts of this probable source of contamination on the Ranney Well and other receptors, including the aquifer.

The selected remedy has been designed as a short term remedial measure for the Endicott Village Well Field site. This operable unit addresses remediation of a contaminated drinking water supply. A comprehensive site remediation plan will be determined at the conclusion of the second operable unit which will

investigate source control measures and aquifer restoration. Air stripping has been identified by USEPA as the best available technology for the removal of vinyl chloride. The existing aeration system was installed as a short term remedial measure by the Village of Endicott in March 1983 until a long term solution was developed. The system essentially pumps air to the bottom of the well through diffusers to air strip vinyl chloride. However, the amount of air that may be introduced is limited because too much air could damage pumps and piping in the well.

An analysis of the existing aeration system was conducted during the RI/FS. Significant design parameters were compared with available alternative technologies. A major design parameter for any air stripping process is the air to water ratio, since the process essentially volatilizes a chemical dissolved in water into a passing air stream. The existing aeration system maintains an air to water ratio of approximately 0.026, as compared with packed tower air strippers that routinely operate at air to water ratios of 20 to 40. On the basis of these and other performance evaluations, it was concluded that the existing aeration system is not satisfactory from an engineering or public health perspective as a treatment system to remove vinyl chloride and other volatile organic compounds from the Ranney Well water. The selected remedy will make use of state of the art air stripping technologies to ensure a continued safe drinking water supply for the Village of Endicott. The treatment system will achieve MCLs and compliance will be demonstrated by the monitoring program conducted by the Village of Endicott.

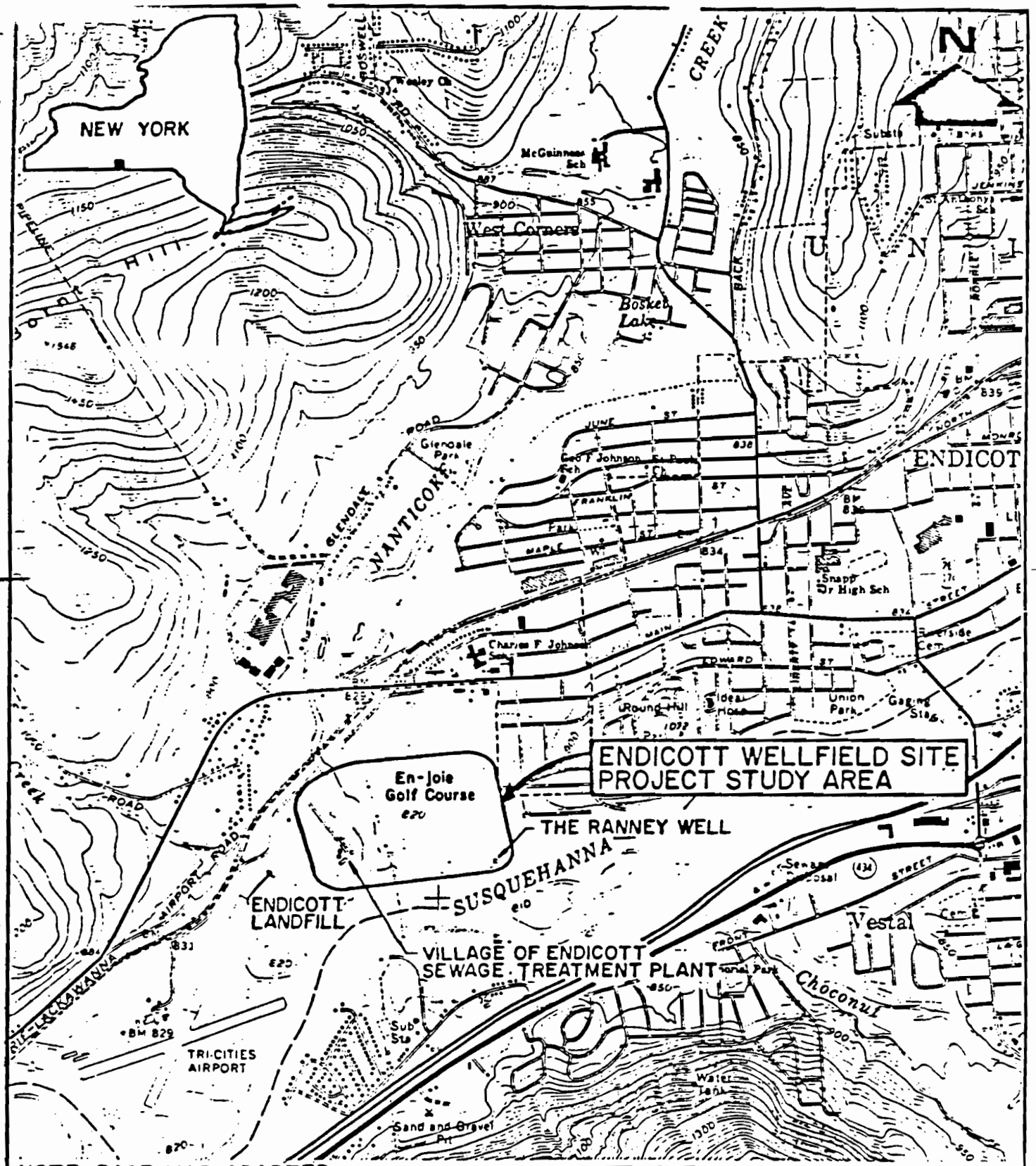
Results of the RI and previous studies indicate that pumping has a significant impact upon contaminant flow paths within the aquifer. Thus, a pump and treat approach will allow for effective management of contaminant migration in ground water and will reduce the discharge of contaminants to the Susquehanna River.

Target treatment levels and ARARs have been established for the site and concurrence on these received from the NYSDEC. Contaminated Ranney Well water will be treated to drinking water quality. Maximum Contaminant Levels (MCLs) promulgated under the Safe Drinking Water Act are the applicable or relevant and appropriate cleanup levels for the site. These required cleanup levels were discussed earlier in this document.

Air emissions from the packed column stripper will consist of extremely low levels of volatile organic compounds. Application of 6 NYCRR 212, commonly referred to as Air Guide 1, was considered applicable or relevant and appropriate in determining acceptable air emission levels for the site. In addition, there is a National Emission Standard for vinyl chloride promulgated under the Clean Air Act of ten parts per million. Calculations performed during the RI/FS indicate that the expected air

emissions levels will be well below those required by New York State and the Federal government.

The selected remedy is protective of human health and the environment, complies with legally applicable or relevant and appropriate requirements in a cost effective manner, and makes use of alternative treatment technologies to the maximum extent practicable. The remedy will pump and treat contaminated ground water to provide safe drinking water for the surrounding community.



NOTE: BASE MAP ADAPTED FROM ENDICOTT, N.Y. - 1969 QUADRANGLE MAP.

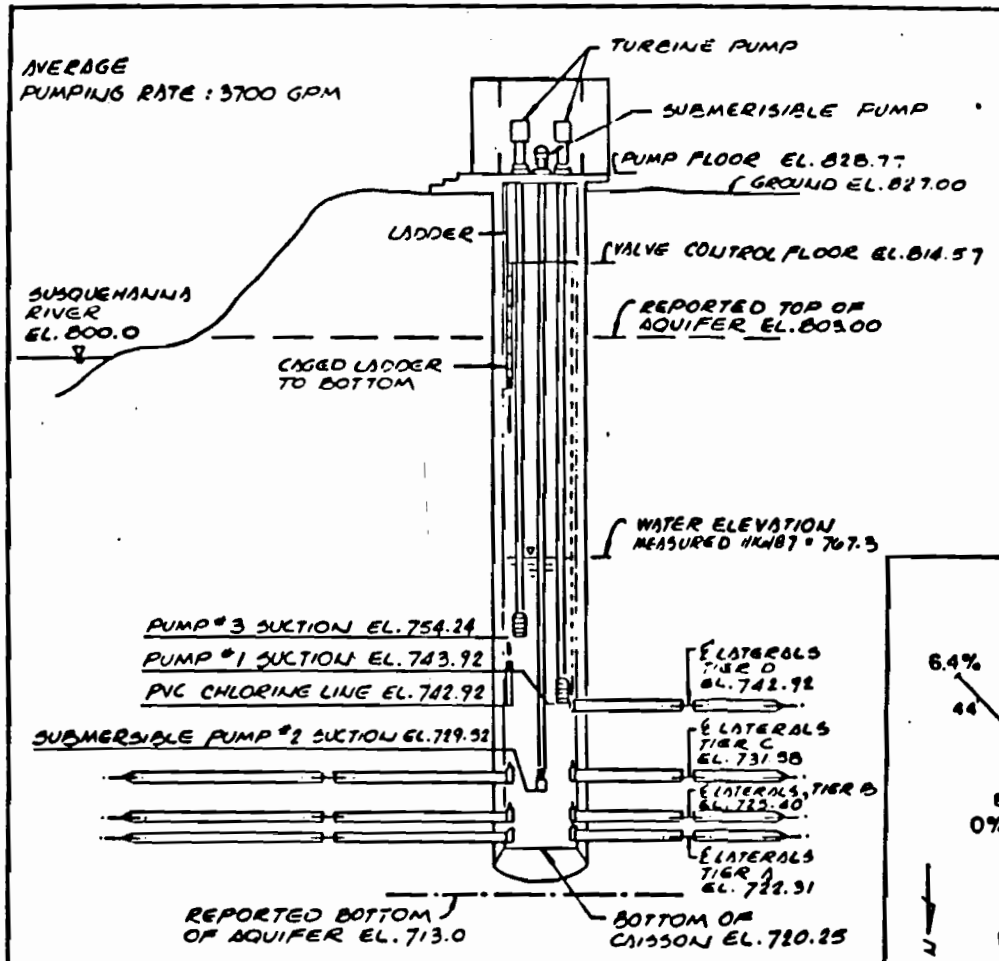
GZA

0 1000 2000 3000 4000
SCALE IN FEET

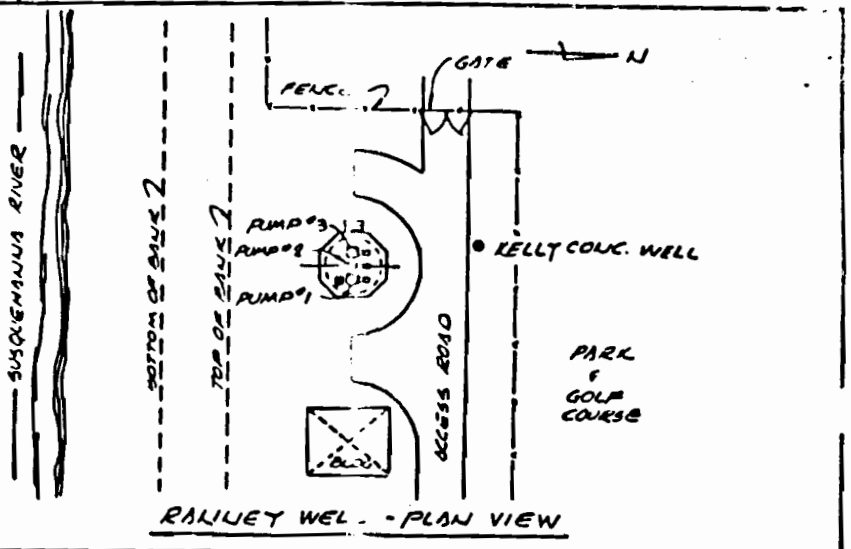
REMEDIAL INVESTIGATION REPORT
ENDICOTT WELLFIELD SITE
ENDICOTT, NEW YORK

SITE & PROJECT LOCUS PLAN

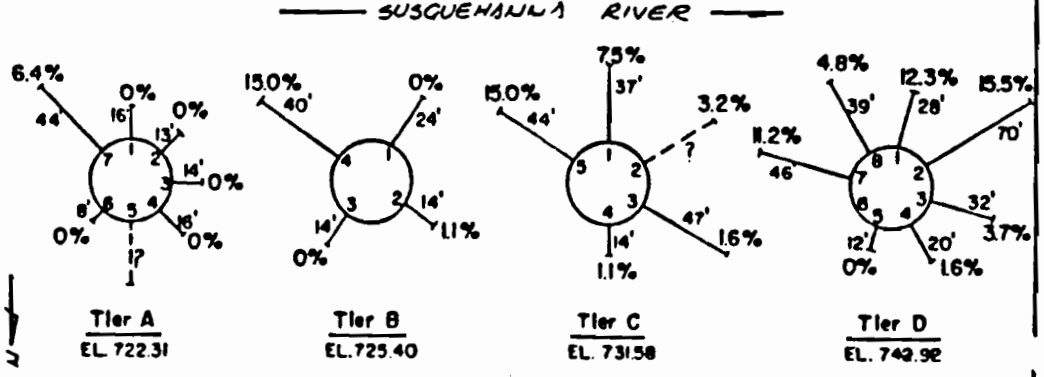
MARCH 1987 FIGURE NO 1



RANNEY WELL - CROSS SECTION



RANNEY WELL - PLAN VIEW



LATERAL PLANS SHOWING ORIENTATION. REPORTED LENGTHS AND PERCENT FLOW CONTRIBUTIONS (MEASURED 4/3/79). FLOW CONTRIBUTIONS MEASURED WHEN RANNEY WELL PUMPING 3700 GPM.

NOT TO SCALE

NOTES:

1. RANNEY WELL CROSS SECTION AND PLAN VIEWS ADAPTED FROM DRAWINGS PROVIDED IN A REPORT PREPARED BY EUGENE A. KUDGUS, P.E., ENTITLED, "VINYL CHLORIDE CONTAMINATION OF THE RANNEY WELL," MARCH 1983.
2. LATERAL LENGTHS AND ORIENTATIONS REPORTED BY NYSDEC DIVISION OF WATER IN A REPORT ENTITLED, "A HYDROGEOLOGICAL INVESTIGATION OF CHLORINATED HYDROCARBON CONTAMINATION OF THE RANNEY COLLECTOR WELL," APRIL 1984. PERCENT FLOW CONTRIBUTIONS MEASURED BY THE LAYNE COMPANY DURING A 4/3/79 INSPECTION OF THE WELL.

REMEDIAL INVESTIGATION REPORT
ENDICOTT WELLFIELD SITE
ENDICOTT, NEW YORK

THE RANNEY WELL

MARCH 1987 FIGURE NO 2

NOTE:

1. BASE MAP ADAPTED FROM USGS ENDICOTT, NEW YORK-1969 QUADRANGLE MAP.
2. SEE TEXT FOR ADDITIONAL INFORMATION REGARDING POTENTIAL SOURCE IDENTIFICATION.

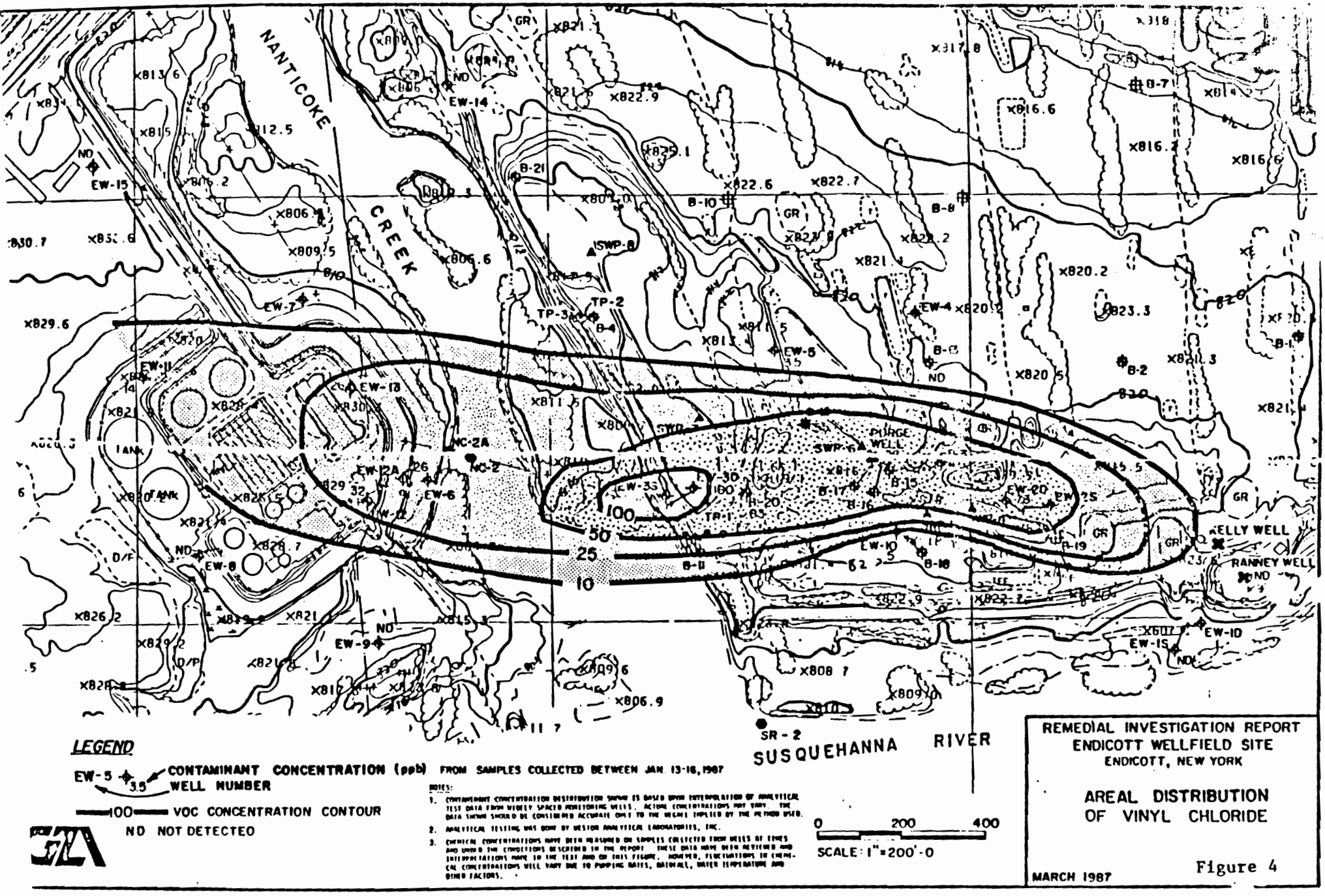
LEGEND

APPROX. LIMITS OF LANDFILL AREA, ACTUAL LIMITS MAY VARY FROM THOSE SHOWN.

0 1000 2000 4000

REMEDIAL INVESTIGATION REPORT
ENDICOTT WELLFIELD SITE
ENDICOTT, NEW YORK

IDENTIFIED POTENTIAL SOURCES OF CONTAMINATION



LEGEND

EW-5 ✦ 35 — CONTAMINANT CONCENTRATION (ppb) FROM SAMPLES COLLECTED BETWEEN JAN 13-16, 1987
WELL NUMBER

—100— VOC CONCENTRATION CONTOUR

ND NOT DETECTED

NOTES:

1. CONTAMINANT CONCENTRATION DISTRIBUTION SHOWN IS BASED UPON INTERPOLATION OF ANALYTICAL TEST DATA FROM WIDELY SPACED MONITORING WELLS. ACTUAL CONCENTRATIONS MAY VARY. THE DATA SHOWN SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
2. ANALYTICAL TESTING WAS DONE BY WESTON ANALYTICAL LABORATORIES, INC.
3. CHEMICAL CONCENTRATIONS HAVE BEEN MEASURED ON SAMPLES COLLECTED FROM WELLS OF TYPES AND UNDER THE CONDITIONS DESCRIBED IN THE REPORT. THESE DATA HAVE BEEN REVIEWED AND INTERPRETATIONS MADE IN THE TEXT AND ON THIS FIGURE. HOWEVER, FLUCTUATIONS IN CHEMICAL CONCENTRATIONS WILL VARY DUE TO PUMPING RATES, RAINFALL, WATER TEMPERATURE AND OTHER FACTORS.

0 200 400

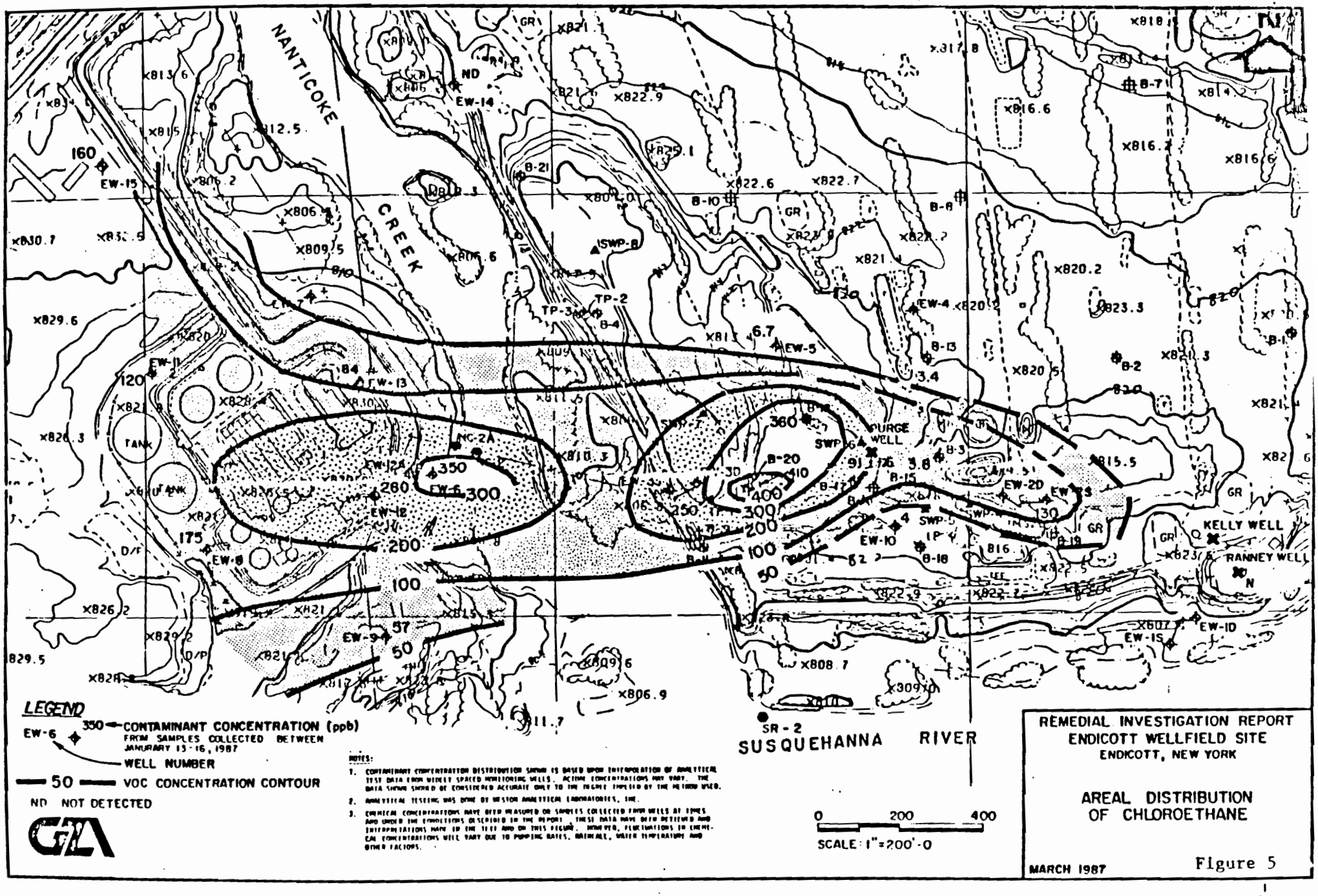
SCALE: 1"=200'-0

REMEDIAL INVESTIGATION REPORT
ENDICOTT WELLFIELD SITE
ENDICOTT, NEW YORK

AREAL DISTRIBUTION
OF VINYL CHLORIDE

MARCH 1987

Figure 4



LEGEND

EW-6 ✦ — WELL NUMBER

350 — CONTAMINANT CONCENTRATION (ppb) FROM SAMPLES COLLECTED BETWEEN JANUARY 13-16, 1987

50 — VOC CONCENTRATION CONTOUR

ND NOT DETECTED

NOTES:

1. CONTAMINANT CONCENTRATION DISTRIBUTION SHOWN IS BASED UPON INTERPOLATION OF ANALYTICAL TEST DATA FROM WIDELY SPACED MONITORING WELLS. ACTUAL CONCENTRATIONS MAY VARY. THE DATA SHOWN SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
2. ANALYTICAL TESTING WAS DONE BY WESTON ANALYTICAL LABORATORIES, INC.
3. CHEMICAL CONCENTRATIONS HAVE BEEN MEASURED OR SAMPLES COLLECTED FROM WELLS AT TIMES AND UNDER THE CONDITIONS DESCRIBED IN THE REPORT. THESE DATA HAVE BEEN RETRIEVED AND INTERPRETATIONS MADE IN THE TEXT AND ON THIS FIGURE. HOWEVER, FLUCTUATIONS IN CHEMICAL CONCENTRATIONS WILL VARY DUE TO PUMPING RATES, RAINFALL, WATER TEMPERATURE AND OTHER FACTORS.

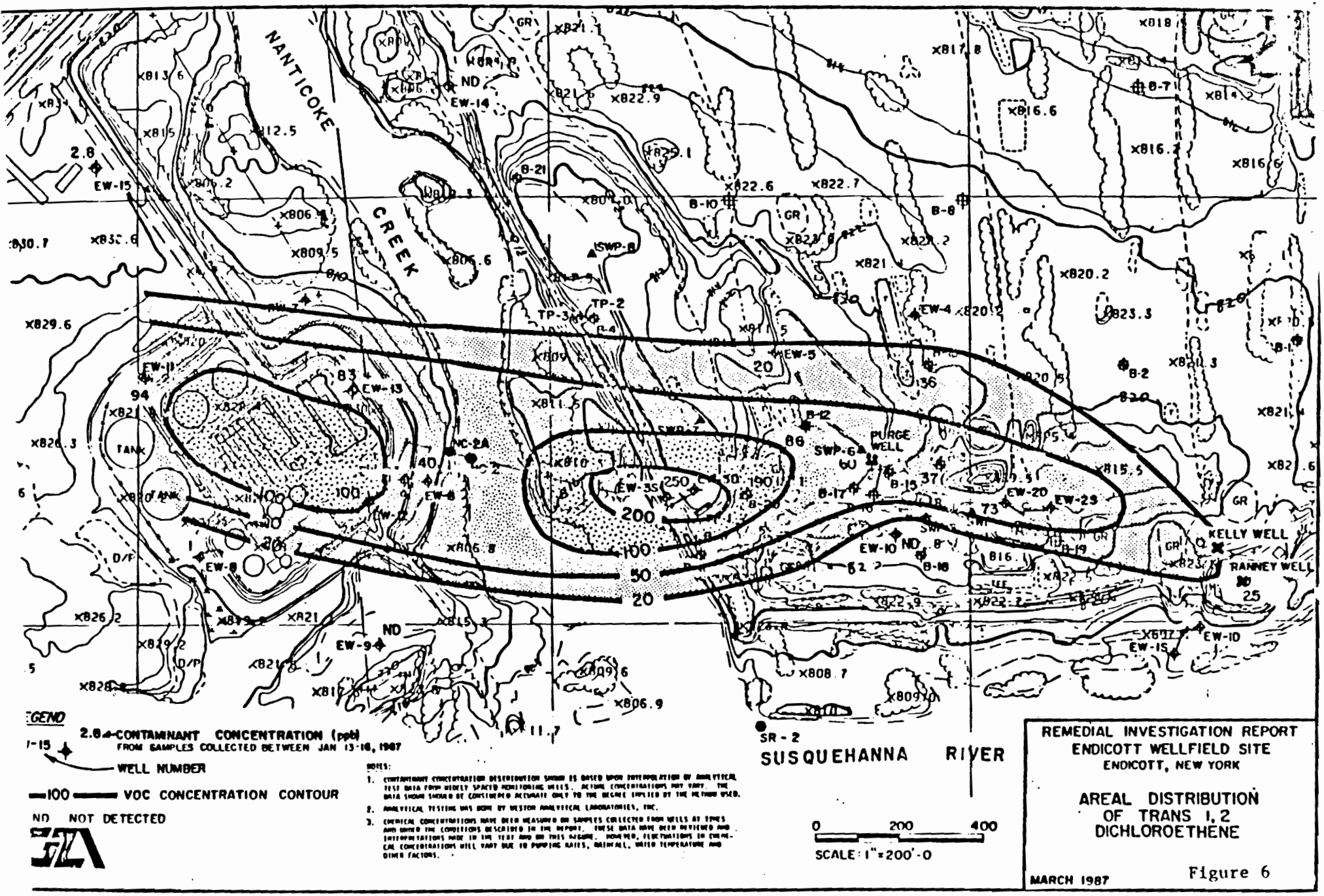
GZA

REMEDIAL INVESTIGATION REPORT
ENDICOTT WELLFIELD SITE
ENDICOTT, NEW YORK

AREAL DISTRIBUTION OF CHLOROETHANE

MARCH 1987

Figure 5

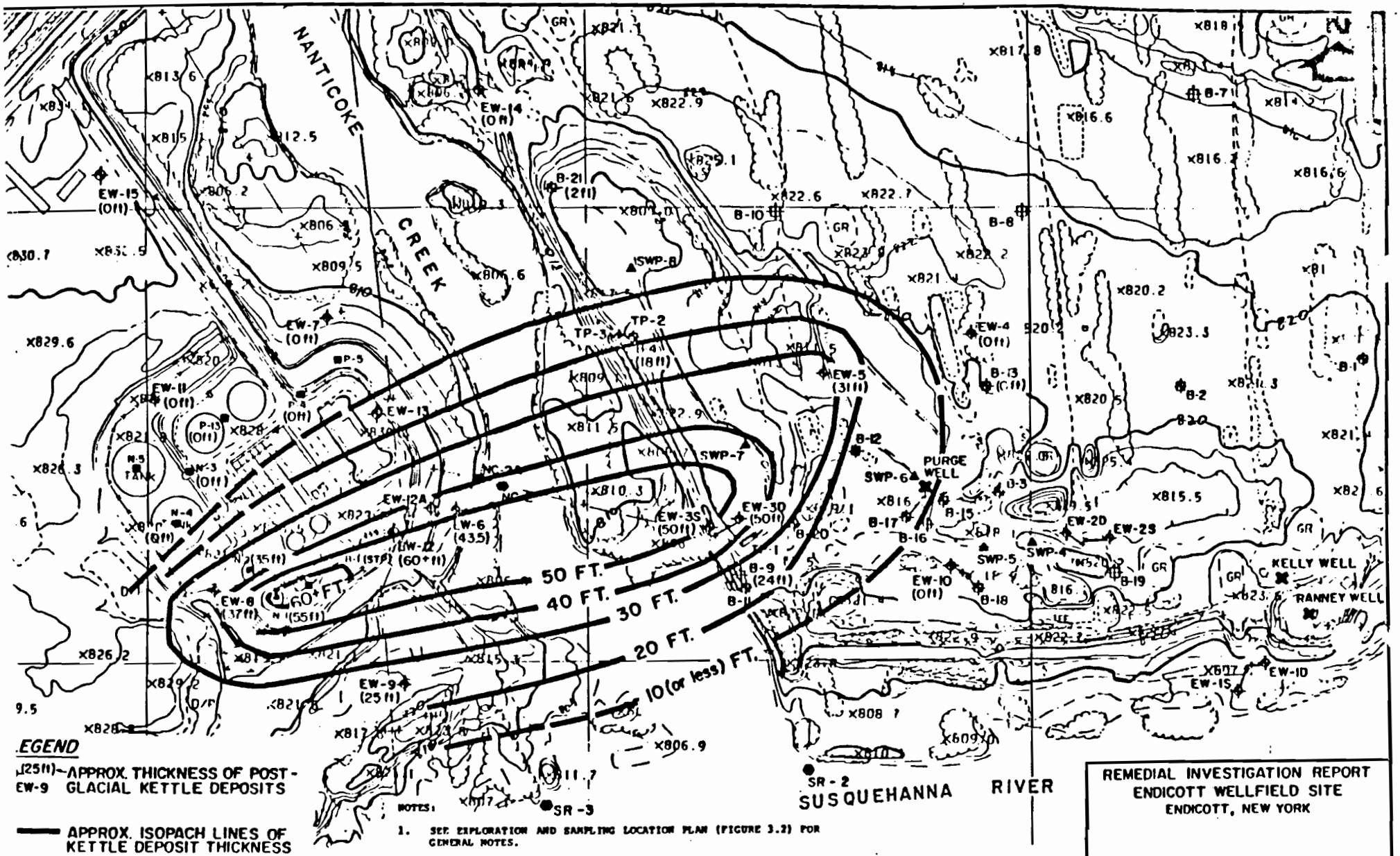


REMEDIAL INVESTIGATION REPORT
ENDICOTT WELLFIELD SITE
ENDICOTT, NEW YORK

AREAL DISTRIBUTION OF TRANS 1,2 DICHLOROETHENE

MARCH 1987

Figure 6



LEGEND

(25ft)~EW-9 APPROX. THICKNESS OF POST-GLACIAL KETTLE DEPOSITS

APPROX. ISOPACH LINES OF KETTLE DEPOSIT THICKNESS

NOTES:

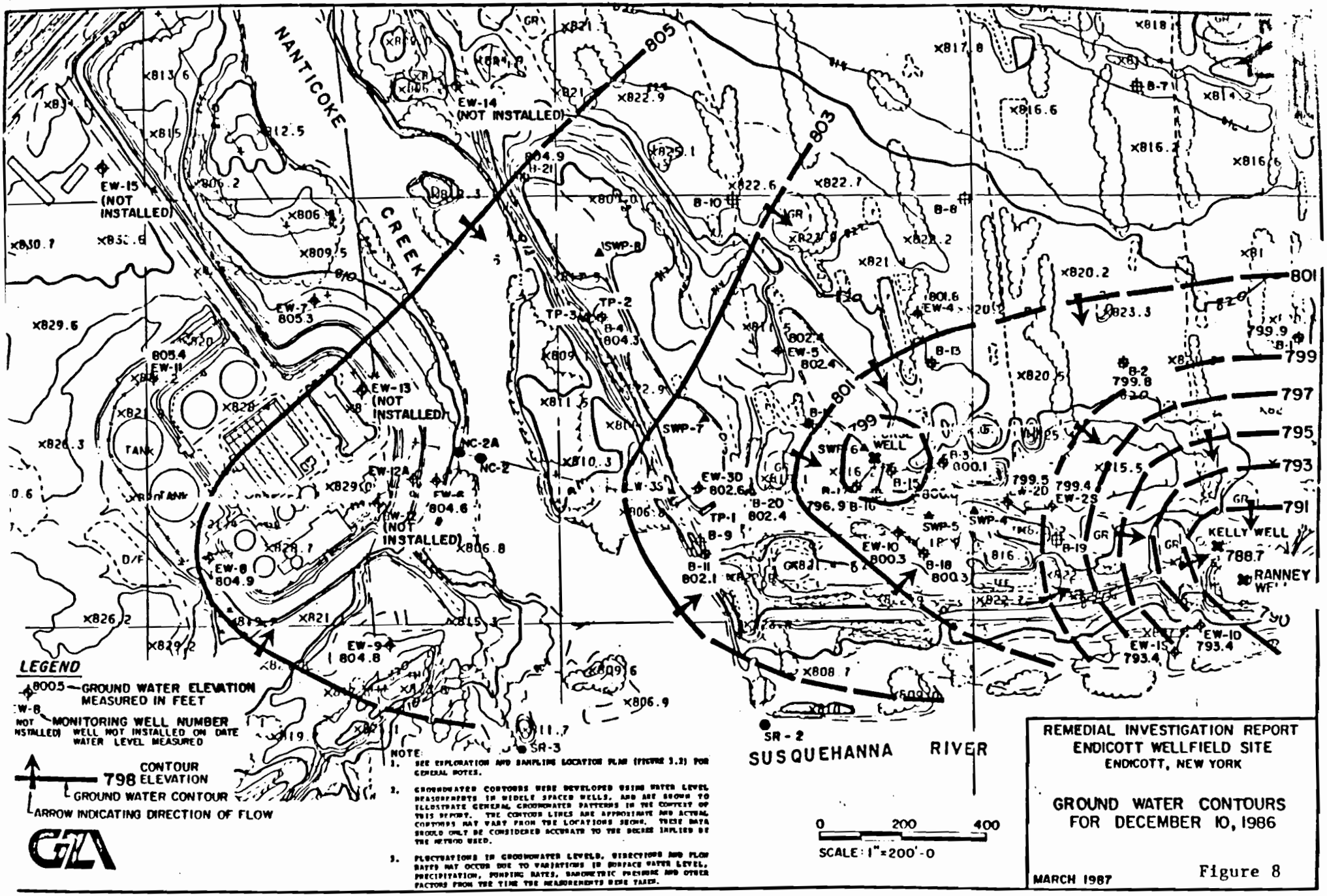
1. SEE EXPLORATION AND SAMPLING LOCATION PLAN (FIGURE 3.2) FOR GENERAL NOTES.
2. ISOPACHS SHOWN ARE INTERPOLATIONS OF WIDELY SPACED TEST BORING DATA COLLECTED DURING THIS RI AND PROVIDED BY OTHERS AND ARE SHOWN TO ILLUSTRATE GENERAL GEOLOGIC CONDITIONS FOR PURPOSES OF THIS REPORT. THE ISOPACHS ARE IDEALIZED AND THE ACTUAL THICKNESS OF KETTLE DEPOSITS MAY VARY FROM THOSE SHOWN. THE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHODS USED.

REMEDIAL INVESTIGATION REPORT
ENDICOTT WELLFIELD SITE
ENDICOTT, NEW YORK

ISOPACH MAP OF
POST-GLACIAL KETTLE DEPOSITS

MARCH 1987

Figure 7



LEGEND

8005 — GROUND WATER ELEVATION MEASURED IN FEET

W-8 (NOT INSTALLED) — MONITORING WELL NUMBER WELL NOT INSTALLED ON DATE WATER LEVEL MEASURED

798 — CONTOUR ELEVATION

GROUND WATER CONTOUR

ARROW INDICATING DIRECTION OF FLOW

NOTE:

1. SEE EXPLORATION AND SAMPLING LOCATION PLAN (FIGURE 3.2) FOR GENERAL NOTES.
2. GROUNDWATER CONTOURS WERE DEVELOPED USING WATER LEVEL MEASUREMENTS IN WIDELY SPACED WELLS, AND ARE SHOWN TO ILLUSTRATE GENERAL GROUNDWATER PATTERNS IN THE CONTEXT OF THIS REPORT. THE CONTOUR LINES ARE APPROXIMATE AND ACTUAL CONTOURS MAY VARY FROM THE LOCATIONS SHOWN. THESE DATA SHOULD ONLY BE CONSIDERED ACCURATE TO THE DEGREE IMPLIED BY THE METHOD USED.
3. FLUCTUATIONS IN GROUNDWATER LEVEL, DIRECTIONS AND FLOW RATES MAY OCCUR DUE TO VARIATIONS IN SURFACE WATER LEVEL, PRECIPITATION, PUMPING RATES, BAROMETRIC PRESSURE AND OTHER FACTORS FROM THE TIME THE MEASUREMENTS WERE TAKEN.

GZA

REMEDIAL INVESTIGATION REPORT
ENDICOTT WELLFIELD SITE
ENDICOTT, NEW YORK

GROUND WATER CONTOURS FOR DECEMBER 10, 1986

MARCH 1987

Figure 8

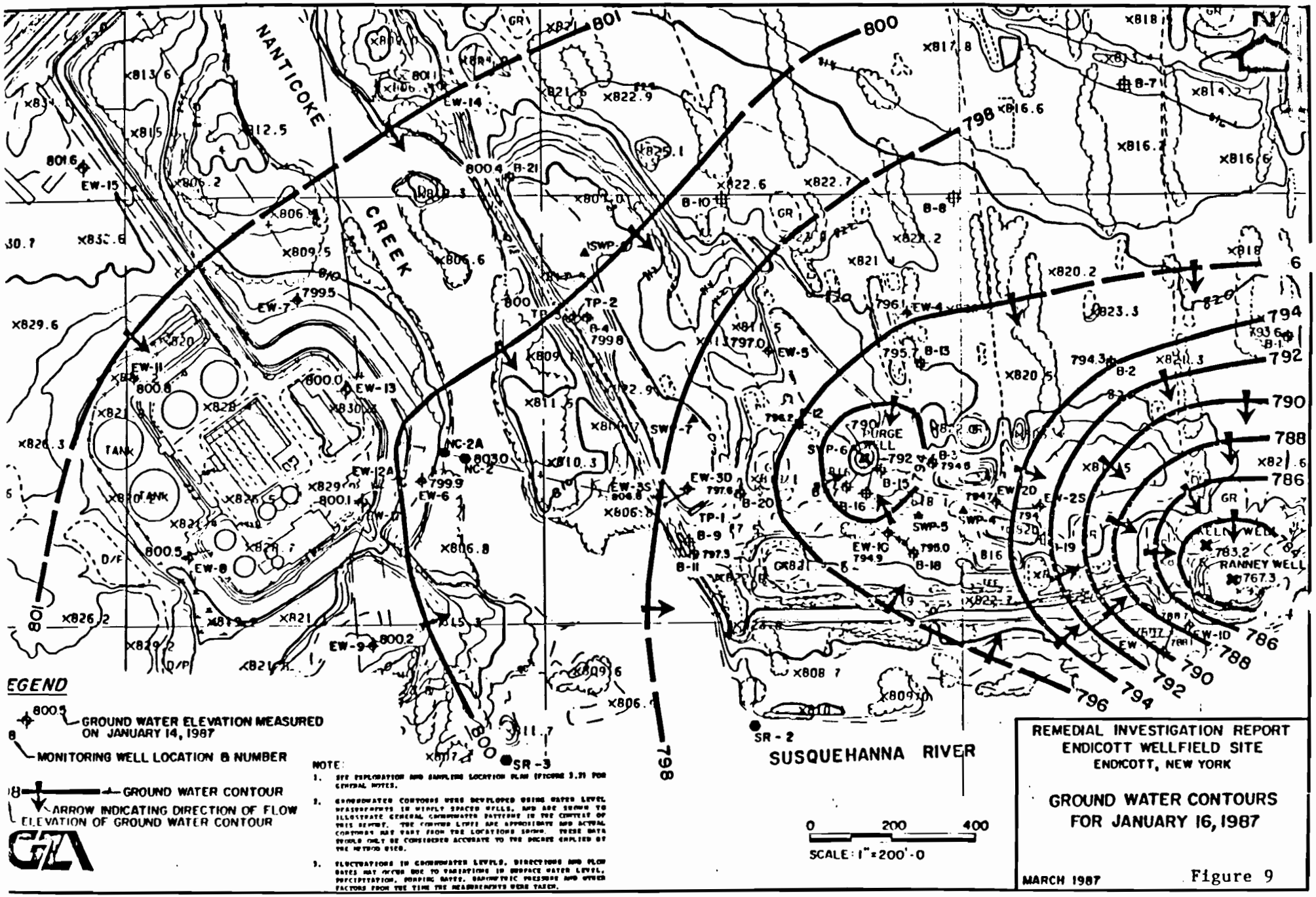

NANTICOKE CREEK
SUSQUEHANNA RIVER
SR-2
SR-3
NC-2
NC-2A
TANK
PURGE WELL
RANNEY WELL
LEGEND
GROUND WATER ELEVATION MEASURED ON JANUARY 14, 1987
MONITORING WELL LOCATION & NUMBER
GROUND WATER CONTOUR
ARROW INDICATING DIRECTION OF FLOW
ELEVATION OF GROUND WATER CONTOUR
NOTE:
1. SEE EXPLORATION AND SAMPLING LOCATION PLAN (FIGURE 3.2) FOR GENERAL NOTES.
2. GROUNDWATER CONTOURS WERE DEVELOPED USING WATER LEVEL MEASUREMENTS IN WIDELY SPACED WELLS, AND ARE SHOWN TO ILLUSTRATE GENERAL GROUNDWATER PATTERNS IN THE CONTEXT OF THIS REPORT. THE CONTOUR LINES ARE APPROXIMATE AND ACTUAL CONDITIONS MAY VARY FROM THE LOCATIONS SHOWN. THESE DATA SHOULD ONLY BE CONSIDERED ACCURATE TO THE DEGREE IMPLIED BY THE METHOD USED.
3. FLUCTUATIONS IN GROUNDWATER LEVELS, DIRECTIONS AND FLOW RATES MAY OCCUR DUE TO VARIATIONS IN SURFACE WATER LEVEL, PRECIPITATION, PUMPING RATES, BAROMETRIC PRESSURE AND OTHER FACTORS FROM THE TIME THE MEASUREMENTS WERE TAKEN.
0 200 400
SCALE: 1"=200'-0
REMEDIAL INVESTIGATION REPORT
ENDICOTT WELLFIELD SITE
ENDICOTT, NEW YORK
GROUND WATER CONTOURS
FOR JANUARY 16, 1987
MARCH 1987

Figure 9

Table 1

Contaminant Reduction by the Purge Well System

Purge Well	8/3/84	1/15/85	4/9/85	5/7/85	
Vinyl Chloride	210	110	40	44	
Chloroethane	640	93	270	77	
1,1-Dichloroethane	11	14	8	14	
Trans-1,2-Dichloroethene	110	65	66	15	
Final Pond					**% Removal**
Vinyl Chloride	9	30	4	4	87.4
Chloroethane	19	31	42	23	79.6
1,1-Dichloroethane	ND	4	2	1	84.8
Trans-1,2-Dichloroethene	4	21	10	13	65.6

* All concentrations in ppb.

** ND = not detected

TABLE 2
CONTAMINANTS DETECTED AT RANNEY WELL

	QUANTIFIABLE DETECTIONS		MAXIMUM CONCENTRATION		MEAN CONCENTRATION		CLASSIFICATION (NOTE 1)	TOXICITY/ CARCINOGENICITY DATA EXISTS
	TOTAL	VALID	TOTAL	VALID	TOTAL	VALID		
1,1-Dichloroethane	19	16	13	13	0.65	0.66	T	Yes
1,2-Dichloroethane	1	1	2	2	0.03	0.04	C	Yes
trans-1,2-Dichloroethene	38	33	8	4	1.52	1.40	Note 2	No
Vinyl chloride	12	11	3	3	0.27	0.29	C	Yes
1,1,1-Trichloroethane	12	9	24	24	0.80	0.68	T	Yes
1,1,2-Trichloroethane	1	1	2	2	0.03	0.04	C	Yes
Trichloroethylene	17	14	2	2	0.33	0.32	C	Yes
1,1-Dichloroethene	3	3	19	19	0.40	0.45	Note 3	Note 3
Chloroethane	6	4	2	2	0.13	0.09	N	N/A
Chloromethane	2	2	5	5	0.15	0.17	Note 2	No
Methylene chloride	4	3	2	2	0.08	0.08	Note 3	Note 3
Tetrachloroethene	1	1	2	2	0.03	0.04	C	Yes
Chloroform	23	19	81	81	1.98	2.13	C	Yes
Other Trihalomethanes	10	8	7	7	0.42	0.42	Note 4	Note 4
Bromodichloromethane	(9)	(8)	(4)	(4)	(0.27)	(0.26)	Note 4	Note 4
Dibromochloromethane	(2)	(1)	(2)	(2)	(0.05)	(0.04)	Note 4	Note 4
Bromoform	(1)	(1)	(5)	(5)	(0.08)	(0.09)	Note 4	Note 4
Dichlorodifluoromethane	2	1	3	3	0.19	0.14	ND	No
Trichlorofluoromethane	4	3	2	2	0.08	0.07	ND	No

All concentrations in ug/l (ppb).
Analyses by Friend Laboratories, Waverly, NY.
Data from 60 most recent (53 valid) analyses since purge well and diffused air operational, February 1985 - June 1987.

Notes:

(1) T : Toxic
C : Carcinogenic
ND : Not determined
N : No evidence of toxicity or carcinogenicity

(2) Still under study; probable carcinogen.

(3) Carcinogen via inhalation; no ingestion (oral) data available.

(4) Carcinogenicity for trihalomethanes calculated as chloroform.

TABLE 3

CONTAMINANTS EVALUATED IN QUANTITATIVE
RISK ASSESSMENT OF RANNEY WELL WATER

A. TOXINS	Acceptable Intake Concentrations		Maximum Concentration (Valid Data)	Mean Concentration (Valid Data)	Mean Concentration (All Data)	Maximum Contaminant Level (MCL)	MCLG
	Subchronic	Chronic					
1,1-Dichloroethane	40,000	4,000	13	0.66	0.65	-	-
1,1,1-Trichloroethane	ND	19,000	24	0.68	0.80	200*	200

B. CARCINOGENS	Concentration at 10^{-6} Cancer Risk	Carcinogenic Potency (kg day/mg)	Maximum Concentration (Valid Data)	Mean Concentration (Valid Data)	Mean Concentration (All Data)	Maximum Contaminant Level (MCL)	MCLG
Vinyl chloride	0.015	2.3	3	0.29	0.27	2*	0
1,2-Dichloroethane	0.51	0.069	2	0.038	0.033	5*	0
Trichloroethene	3.2	0.011	2	0.32	0.33	5*	0
Total Trihalomethanes (as chloroform)	0.50	0.07	81	2.55	2.40	100	-
Tetrachloroethene	0.87	0.040	2	0.038	0.033	-	-
1,1,2-Trichloroethane	0.61	0.057	2	0.038	0.033	-	-

Notes:

All data in ug/l (ppb) except as noted.

Toxicity and Carcinogenicity values from USEPA, Toxicity Values for Use at Superfund Remedial Sites, July 18, 1985; except values for trichloroethene based on update from EPA (Karen Blackburn, ECAO, telephone conversation, March 4, 1987). Values cited are for ingestion.

Maximum Contaminant Levels from Safe Drinking Water Act, 40 CFR 141.12.

Analytical Data From Table 1.

* Final value under Safe Drinking Water Act, signed June 19, 1987; to be included as 40 CFR 141.61(a).

Table 4

Endicott Village Wellfield

Cost* ($1,000)

Remedial Alternative	Capital	Annual O/M#	Total PW$
1. No Action	0	34.4	324.5
2. Additional Purge Wells	625	44.1	1,041
3. Air Stripping	1,200	147	2,586
4. Air Stripping and Additional Purge Wells	1,825	191	3,625
5. New Endicott Supply Well	1,000	-35	870
6. New Surface Water Supply	5,000	-95	4,104
7. Surrounding Community Supply	2,200	900	10,684

* None of the above alternatives includes costs for required long term environmental monitoring. However, the Village of Endicott currently conducts weekly sampling of the Ranney Well.

Annual O & M costs represent incremental expense above or below present O & M costs for Ranney Well.

$ Total present worth costs based on 30 year project period.