Report
Volume Two
Appendices

RECEIVED

JUN 30 1989

N.Y.S. DEPT. OF
ENVIRONMENTAL CONSERVATION
DIV. ENVIRONMENTAL ENFORCEMENT
BUFFALO FIELD UNIT

# Remedial Investigation
## Cherry Farm Site
## Tonawanda, New York

NIAGARA MOHAWK
Niagara Mohawk Power Corporation
Syracuse, New York

June 1989

O'BRIEN & GERE

1118.057

# REPORT

# REMEDIAL INVESTIGATION

## CHERRY FARM SITE

## TONAWANDA, NEW YORK

NIAGARA MOHAWK POWER CORPORATION

SYRACUSE, NEW YORK

JUNE, 1989

O'BRIEN & GERE ENGINEERS, INC.
1304 BUCKLEY ROAD
SYRACUSE, NEW YORK 13221

# TABLE OF CONTENTS

APPENDICES


A RI/FS Work Plan
B Monitoring Well and Boring Logs
C In-Situ Hydraulic Conductivity Test Forms and Ground Water Flow Volume and Velocity Calculations
D Ground Water Sampling Field Logs
E Health Effects of Common Site Indicators
F Data Validation
G Chemical Loading Calculations

# APPENDIX A

# RI/FS WORK PLAN

Work Plan

# Remedial Investigation/ Feasibility Study

Niagara Mohawk Power Corporation
Syracuse, New York

March 1988

O'BRIEN & GERE

1118.056

# WORK PLAN

## REMEDIAL INVESTIGATION/FEASIBILITY STUDY

CHERRY FARM SITE

TONAWANDA, NEW YORK

NIAGARA MOHAWK POWER CORPORATION

SYRACUSE, NEW YORK

MARCH, 1988

O'BRIEN & GERE ENGINEERS, INC.
1304 BUCKLEY ROAD
SYRACUSE, NEW YORK 13221

# TABLE OF CONTENTS

## RI/FS INVESTIGATION WORK PLAN

## CHERRY FARM SITE


| | Page |
|---|---|
| INTRODUCTION | 1 |
| Site Description and History | 1 |
| Previous Studies | 2 |
| Project Objectives | 4 |
| REMEDIAL INVESTIGATION | 6 |
| TASK 1 - PLANS AND MANAGEMENT | 6 |
| 1.01 Project Work Plan | 6 |
| 1.02 Project Management | 6 |
| 1.03 Health and Safety Plan | 6 |
| 1.04 Sampling Plan | 7 |
| 1.05 Quality Assurance Plan | 7 |
| TASK 2 - HYDROGEOLOGIC INVESTIGATION | 8 |
| 2.01 Background Review | 8 |
| 2.02 Geophysical Survey | 8 |
| 2.03 Soil Borings | 9 |
| 2.04 Monitoring Wells | 12 |
| TASK 3 - SAMPLING AND ANALYSIS | 15 |
| 3.01 Soil/Fill | 15 |
| 3.02 Sediment | 16 |
| 3.03 Surface Water | 17 |
| 3.04 Ground Water | 18 |
| 3.05 Air | 18 |
| 3.06 Sample Analysis | 19 |
| TASK 4 - RISK ASSESSMENT | 22 |
| 4.01 Qualitative Exposure Assessment | 22 |
| 4.02 Quantitative Risk Assessment Process | 25 |
| 4.03 Site-Specific Considerations | 28 |
| TASK 5 - REMEDIAL INVESTIGATION REPORT | 30 |
| FEASIBILITY STUDY | 32 |
| TASK 6 - DESCRIPTION OF PROPOSED RESPONSE | 32 |

TABLE OF CONTENTS

RI/FS INVESTIGATION WORK PLAN

CHERRY FARM SITE
(Continued)


TASK 7 - DEVELOPMENT OF ALTERNATIVES 33

TASK 8 - INITIAL SCREENING OF ALTERNATIVES 38

TASK 9 - DETAILED ANALYSIS OF ALTERNATIVES 42

TASK 10 - CONCEPTUAL DESIGN 45

TASK 11 - FINAL REPORT 46

TABLES

1 Drilling Footnote
2 Sampling and Analysis

FIGURES

1 Site Location Map
2 Proposed Sampling Locations
3 Risk Characterization Process
4 Project Schedule

APPENDICES

A RI/FS Health and Safety Plan
B Field Investigation Protocols
C Quality Assurance Project Plan

# INTRODUCTION

## Site Description and History

The Cherry Farm site is located between River Road and the Niagara River in the Town of Tonawanda, New York (Figure 1). The site encompasses 55.4 acres, 80% of which is covered by fill material. The elevation of the fill area is approximately 20 feet above the original land surface. The fill is surrounded on three sides by two drainage ditches which discharge to the Niagara River. The fourth, northwest, side is bounded by the Niagara River. A designated wetland (BW-6) is located on the eastern side of the fill area.

Information provided to the New York State Department of Environmental Conservation (NYSDEC) by CF&I Steel Corporation (CF&I) in a letter dated October 10, 1985 revealed that between 1945 and 1970 the property was owned by CF & I. Dusts and slags from the CF & I blast and open hearth furnace operations were disposed at the site until operations were ceased in 1963. CF & I then entered into an agreement with INS Equipment Company (INS) which allowed INS to dispose of foundry sand from a nearby Chevrolet Plant on the property.

The site was purchased by Niagara Mohawk Power Corporation (NMPC) in 1970 in conjunction with some additional property. At the time of purchase, foundry sand was exposed at the surface of the fill area. To prevent wind erosion, the surface of the fill was capped with approximately six inches of clay and seeded with rye grass.

Previous Studies

Because of alleged disposal of various industrial wastes, a number of studies and site investigations have been conducted on the Cherry Farm property since 1978. An initial investigation was performed between 1978 and 1980 as part of a state-wide program conducted by the New York State Interagency Task Force on Hazardous Waste. This study was followed up by the combined efforts of the United States Geological Survey (USGS) and New York State Department of Environmental Conservation (NYSDEC) between 1981 and 1983. These initial investigations indicated that various industries may have deposited waste materials, some of which may be hazardous, at the site prior to its acquisition by NMPC. Based on these efforts, NYSDEC completed a Phase I investigation in 1983. The limited analytical data collected during this investigation indicated that the waste materials may contain tars and resins. The Phase I report included a preliminary Hazard Ranking System scoring of the site, which was scored at Sm = 28.95.

As a result of the Phase I investigation and HRS Scoring, NYSDEC determined that a Phase II investigation should be conducted. Thus in 1985, NMPC performed a Phase II investigation of the Cherry Farm property. This investigation included completion of geophysical surveys, installation of seven ground water monitoring wells, completion of five soil borings and the analysis of soil, ground water, surface water and sediment samples.

Results of the Phase II investigation confirmed that the landfilled material is comprised of approximately 20 feet foundry sand, sandcasts, slag and a black sandy material. The fill is underlain by what appears to be a previous marsh mat, which overlies fine to medium grained

sands and silt. Ground water elevation monitoring revealed that approximately 25 percent (5 feet) of the fill material is in contact with ground water. The general direction of ground water flow through the site is to the north-northwest towards the Niagara River. Based on in-situ permeability tests, the hydraulic conductivity of the silt and sand underlying the landfill ranges from $1.5 \times 10^{-5}$ cm/sec ($4.3 \times 10^{-2}$ ft/day) to $3.1 \times 10^{-3}$ cm/sec (8.6 ft/day).

Analyses of ground water samples collected from the site monitoring wells detected trace levels of mercury, nickel, zinc and arsenic. Organic compounds detected in the ground water samples included benzoic acid, polynuclear aromatic hydrocarbons (PAHs) and phthalates. Benzo[a]pyrene was detected in the upgradient monitoring well at higher concentrations than detected at the downgradient wells. PCB concentrations in all ground water samples were below detection limits.

Analysis of the fill material indicated the presence of phenolic compounds, PAHs, and phthalates at part per billion concentrations. PCBs (Aroclor 1248) were identified at part per million concentrations. Sediment and surface water samples contained detectable (low part per billion) concentrations of phenols and PAHs. However, the samples collected at locations upstream to the property contained higher concentrations of these materials than samples collected downstream of the fill area.

The results of the Phase II investigation were used in April 1986 to rescore the site according to the NYSDEC Hazard Ranking System. The result of this evaluation was a total site score of Sm = 13.1. Individual route scores of SGw = 6.12 for the ground water route, Sa = 0 for the air route and Ssw = 21.82 for the surface water route were

calculated. The surface water score was based on the visual observation of exposed waste materials, in the form of foundry sand, present along some of the side slopes of the property and the direct proximity of creeks and the Niagara River to the side slopes of the site. However, the mass transport rate of the pollutants to off-site receptors, especially the Niagara River, was not quantified nor was a risk assessment of the site carried out. Therefore, the NYSDEC determined that an RI/FS should be conducted to address these issues and to determine the appropriate remedial action to be implemented. The program presented within this work plan is designed to satisfy these concerns.

In addition to the information provided by the Phase II investigation completed at the Cherry Farm site, several other documents were reviewed prior to preparing this work plan. These documents include:

Phase II Investigation - INS Equipment Town of Tonawanda (site No. 915031); prepared for NYSDEC by Engineering-Science in association with Dames and Moore, September 1986.

Persistent Toxic Chemicals of potential concern for the Niagara River (Draft); prepared by the Co-ordination Committee of the Niagara River Toxics Management Plan.

The following work plan reflects information gained through this review.

## Project Objectives

This work plan is divided into two sections - Remedial Investigation and Feasibility Study. The purpose of the Remedial Investigation is to supplement the existing data in order to complete a Fea-

sibility Study. The work plan is designed to accomplish the following goals:

A. Determine the nature of, and the areal and vertical distribution of, any hazardous wastes present on the property.

B. Evaluate the on and off site impacts that any past, present or future migration of wastes may have on public health or the environment.

C. Screen feasible response actions in accordance with the 1986 Superfund Amendments Reauthorization Act (SARA) and the National Contingency Plan 40 CFR Section 300.68 using guidelines provided in the document entitled "Interim Guidance on Superfund Selection of Remedy" (USEPA, 1986b).

## REMEDIAL INVESTIGATION

## TASK 1 - PLANS & MANAGEMENT

### 1.01 Project Work Plan

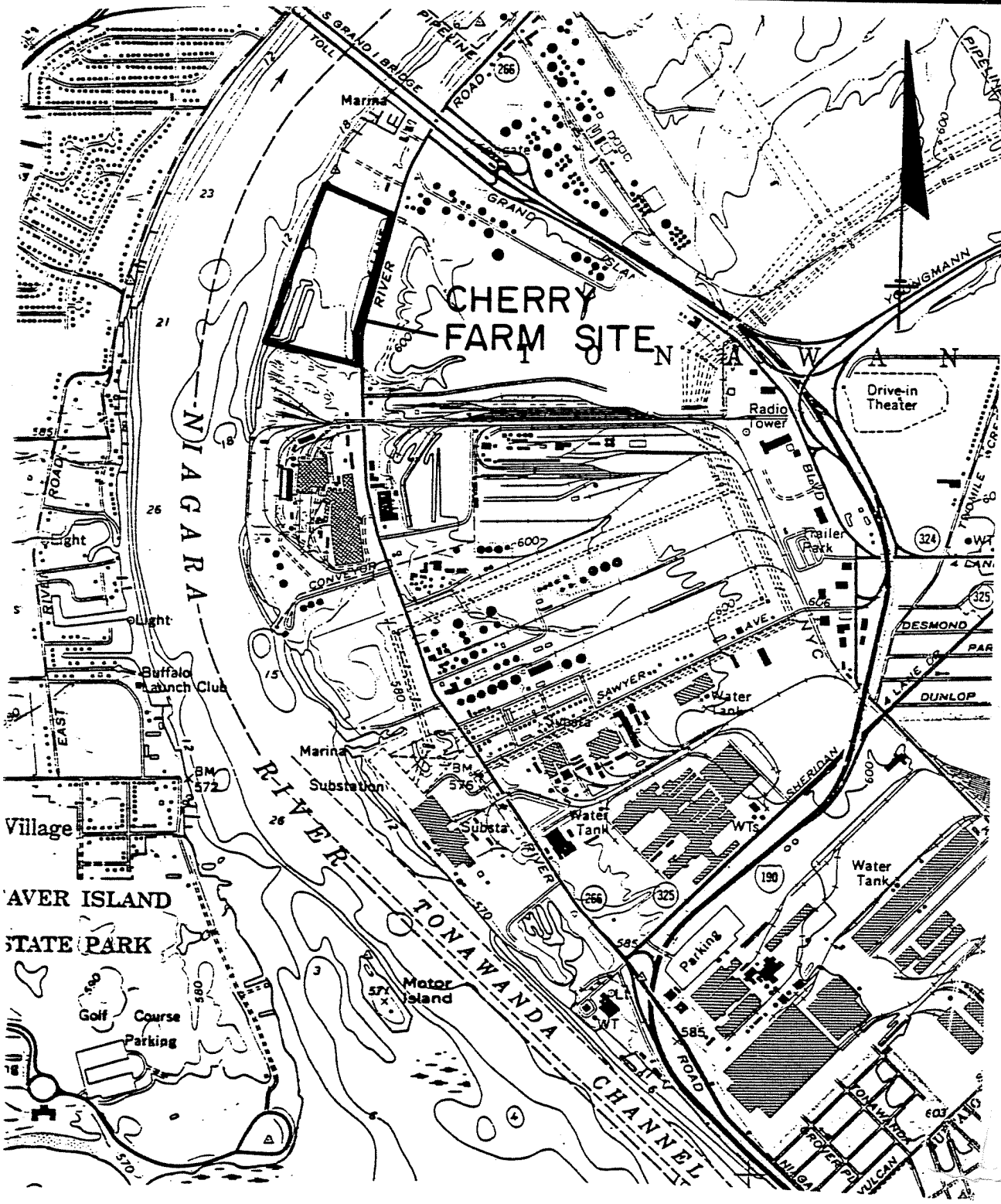
The work plan for the Remedial Investigation is included as Tasks 2 through 5 of this document. The Feasibility Study work plan is discussed in Tasks 6 through 11. These work plans have been prepared in accordance with New York State and USEPA guidelines and discussions with representatives of NYSDEC. The Project Schedule is included as Figure 4.

### 1.02 Project Management

A project manager will be designated to manage all activities associated with the work plan. Progress reports will be submitted by the project manager on a monthly basis. At a minimum, the progress reports will address the following: (1) status of work at the site and progress to date, (2) problems encountered during the reporting period which affect the project schedule, (3) actions being taken to correct problems, (4) activities planned for the next month, (5) changes in key personnel, and (6) percentage completion.

### 1.03 Health & Safety Plan

A site Health & Safety Plan has been developed for the RI/FS investigation in accordance with the August 1987 OSHA Regulations. This plan specifies the protective measures used by investigators and site visitors to minimize exposure to hazardous materials present at the site. The Health and Safety Plan is included as Appendix A.




# CHERRY FARM
# SITE LOCATION MAP
## NIAGARA MOHAWK POWER CORP.
## TONAWANDA, NEW YORK

ADAPTED FROM U.S.G.S. (7.5 MIN.) BUFFALO NW N.Y.-
ONTARIO QUADRANGLE 1965

SCALE 1" = 2,000'

O'BRIEN & GERE ENGINEERS, INC.

## 1.04 Sampling Plan

The site specific sampling plan prepared for the Cherry Farm Site has been prepared and is included as Tasks 2 and 3 of this work plan. These tasks discuss the number, location and types of samples to be collected. Procedures for monitoring well installation and sample collection and handling are included in Appendices B and C.

## 1.05 Quality Assurance Plan

A site specific Quality Assurance Project Plan (QAPP) has been prepared and is included as Appendix C. This plan is consistent with EPA and NYSDEC guidance documents regarding the preparation of quality assurance project plans. The plan addresses the following points:

1. Quality Assurance (QA) objectives for measurement data, in terms of precision, accuracy, completeness, representativeness, and comparability.
2. sampling procedures
3. sample custody
4. calibration procedures, references, and frequency
5. internal Quality Control (QC) checks and frequency
6. QA performance audits, system audits, and frequency
7. QA reports to management
8. preventative maintenance procedures and schedule
9. specific procedures to be used to routinely assess data precision, representativeness, comparability, accuracy, and completeness of specific measurements parameters involved, and
10. corrective action.

## TASK 2 - HYDROGEOLOGIC INVESTIGATION

### 2.01 Background Review

A detailed background information review was completed as part of the Phase II investigation for the Cherry Farm Site. Included in this review were historic aerial photographs and data collected during previous investigations at the site. As part of the work effort associated with the RI/FS study, all of the data pertaining to the Cherry Farm Site and neighboring properties have been reviewed in detail. If new information regarding these sites is obtained after submittal of this work plan, it will be modified as necessary based on the information. Any changes in the work plan as presented in this document will be submitted to NYSDEC for approval prior to initiating the field work.

### 2.02 Geophysical Survey

Electromagnetic and magnetometer surveys were conducted on the Cherry Farm property during completion of the Phase II investigation to determine if buried metallic or ferrous objects were present within the fill material. The results of these surveys are discussed in section 4.02 of the Phase II report. In general, the data produced by these surveys were highly erratic. Some of the higher anomalies observed in the EM survey were due to surface structures such as fencing and sheds. It is likely that the foundry sand and slag material which comprise a majority of the fill material has a high iron content and probably caused the erratic readings observed.

Ten resistivity soundings were completed on the site for the purpose of determining the subsurface geology. The resistivity soundings revealed that the fill is 15 to 20 feet thick and underlain by a lower resistive layer such as silt. Lateral inhomogeneities in the fill material and native soil precluded confidence in interpretation of the depth to bedrock. The subsequent installation of test borings and monitoring wells has further defined the geology.

The geophysical survey data generated during the Phase II investigation has provided sufficient information given the site conditions. Since the full site was included in the previous survey, additional work would not add to the current geophysical data base. Therefore no additional surveys are proposed as part of the RI/FS. The data generated during the Phase II geophysical surveys will be incorporated into the Remedial Investigation Report.

Based on the geophysical surveys, the reported historical usage of the site for waste disposal and the prior sampling and analysis, it is believed that the fill material is primarily uniform in nature with a number of small, localized anomalies. The number of soil borings and monitoring wells set forth in section 2.03 and 2.04, respectively, will be necessary and sufficient to confirm this hypothesis.

## 2.03 Soil Borings

General site history and data suggest that isolated areas of potentially hazardous waste material may be present within the otherwise homogeneous fill material. The 1983 USGS soil sampling and analysis program identified areas along the western portion of the fill area which contained elevated levels of PCBs, specifically Aroclor 1248. A

particularly high concentration, 199 ppm, was found in the vicinity of MW 5. A PCB concentration of 63 ppm was also found in Boring 3 during the Phase II investigation. Other areas of potential concern are the historic holding ponds previously located on the southwestern portion of the fill area and the stream channel which cut diagonally across the site. These features were observed on the 1965 USGS Buffalo N.W., New York - Ontario Quadrangle map and historic aerial photographs. Additionally, two areas were identified as high anomalies during the geophysical surveys completed during the Phase II investigation. These anomalies located in the northwest corner of the site and immediately north of the softball fields could not be explained by surface features and therefore should be investigated further.

To determine whether the above areas contain hazardous materials, seven soil borings will be completed to obtain samples of the fill material for chemical analysis. The proposed locations of these borings, identified as A through G, are shown on Figure 1. Borings A and B are located in areas identified as obvious unexplained anomalies from the EM and magnetometer surveys. Borings C and D are in an area identified by the USGS as being a settling pond at one time. Borings E and F are located in the drainage ditch which once passed through the site. Boring G is located in the area in which previous USGS sampling efforts revealed 199 ppm PCBs. The exact locations of these borings will be selected based on the background review. These locations will be staked in the field following concurrence with an on-site NYSDEC representative prior to initiating the drilling program.

All soil borings will be completed to the base of the fill material using hollow stem auger drilling methods. Based on the Phase II

investigation, the depth of these borings is estimated to be 20 feet. The estimated drilling footage for this Work Plan is summarized in Table 1. The protocols for completion of these borings are included in Appendix B.

All soil/fill generated during completion of the borings will be placed into 55 gallon drums. Material at each boring will be placed in separate drums. Each drum will be sealed, labeled as per location, and placed in a fenced paddock area secured with a locking gate until an appropriate disposal method is determined based on the analytical results. Niagara Mohawk will be responsible for providing the 55 gallon drums, constructing the fenced paddock, moving the drums to the paddock area on a weekly basis and final disposal of the soils (including additional analyses if needed).

Continuous split spoon soil samples will be collected through the approximately 20 feet of waste fill from each boring for field screening and laboratory analyses. The field screening will be conducted using a photoionization analyzer to assess the presence of volatile organics. Laboratory analyses are discussed in Section 3.06 of this work plan.

Following completion of the borings all of the boring locations will be surveyed. The locations will then be plotted on a site map for use in preparation of the report.

If a barrel or drum is encountered during drilling, drilling will be discontinued at this location and procedures outlined in the Health and Safety Plan, Section 3.06 will be followed. If possible, a sample of the material will be collected for analysis. The boring will then be backfilled and marked with a stake for future reference and the boring will be moved to a nearby location.

2.04 Monitoring Wells

To further define the horizontal and vertical ground water flow potential and quality in the site area, additional monitoring wells will be installed. Landfilled areas typically support a mound in the ground water table with accompanying radial flow. Additional wells will be installed to assess the mound and to evaluate the ground water quality around the landfill. Three different zones of groundwater were identified during the Phase II investigation. Different lithologies (fill, silt and sand and silty sand and gravel) occur below the ground water table. Since each lithology had different hydraulic and possibly quality characteristics each zone will be assessed in the ground water investigation.

Shallow - Twelve shallow wells will be installed in the site area as shown on Figure 1. Ten of these wells will be installed within the fill material. The number and locations of these wells were selected to encompass the fill area for determination of horizontal flow direction and ground water quality within the fill. Additionally, these wells will be used in conjunction with deeper wells to determine vertical ground water flow potential. The two remaining shallow wells are proposed to be installed to the south of the site on the opposite side of the drainageway to evaluate ground water quality migrating from off site (Figure 1). These two wells may be located off the property.

Intermediate - Six monitoring wells were installed within the silt and sand material underlying the fill during the Phase II investigation. To enhance the information regarding

the flow direction and quality in this zone, four additional wells (Figure 1) are proposed. Two wells will be located on the northern and southern end of the site, one well will be located on the eastern side of the fill, and one will be located in the center of the site to evaluate ground water mounding and possible radial flow.

Deep - A silty sand and gravel was found to be present just above the till material which mantles the underlying bedrock. To evaluate the horizontal flow direction and quality in this deeper zone and evaluate the vertical ground water flow potential in the site area, five monitoring wells are proposed in locations shown on Figure 1. One well will be located adjacent to the existing upgradient well, MW1. The remaining four wells will be placed adjacent to existing wells MW4, MW5, MW6, and MW7 located along the Niagara River.

All wells will be completed using hollow stem auger drilling methods. Split spoon soil samples will be collected from each boring completed for well installation. These samples shall be field screened using an HNU photoionization analyzer or equivalent. The field screening information will be used to select samples for potential laboratory analysis. Soil samples will be collected continuously through the approximate 20 feet of waste fill. Below the waste fill samples will be collected at 5-foot intervals. For those wells being installed in nested sets of pairs, soil samples will only be collected from the deepest well of the nest. The remaining wells will be drilled without soil sampling.

All drill cuttings generated during completion of the monitoring well will be placed into 55-gallon drums. Material from each monitoring well will be placed in separate drums. Each drum will be sealed and placed in a fenced paddock area secured with a locking gate until an appropriate disposal method is determined based on the analytical results. Niagara Mohawk will be responsible for providing the 55-gallon drums, constructing the fenced paddock, moving the drums to the paddock area and final disposal of the soils (including additional analyses if needed).

The drilling equipment will be decontaminated after completion of each well to avoid cross contamination using high pressure hot water or steam. Decontamination wastes will be placed in 55-gallon drums and secured on-site until an appropriate disposal method is determined. The protocols for these procedures are included in Appendix B.

All wells will be installed and developed in accordance with protocols included in Appendix B. In general, the well screen will be constructed of ten feet of 2-inch diameter, 0.010 inch slotted, schedule 40 PVC. The screen will be attached to 2-inch diameter schedule 40 PVC riser.

In-situ permeability tests will be conducted on all of the newly installed monitoring wells to determine the horizontal hydraulic conductivity of the screened materials. These tests will be conducted in accordance with the protocols included in Appendix B.

Following completion of the wells, all of the locations and elevations will be surveyed. The locations will then be plotted on a site map for use in evaluation of the data and preparation of the report. The elevations of all well casings and ground surface will be determined to 0.01 ft based on a USGS datum.

## TASK 3 - SAMPLING AND ANALYSIS

The following sections describe the sampling and analysis to be performed for the RI/FS. Table 2 summarizes the number of samples to be collected and analyses which will be performed.

### 3.01 Soil/Fill

To characterize the waste material, soil/fill samples will be collected continuously during the completion of the seven soil sampling borings and well installation borings in accordance with ASTM sampling method D-1586-84 "split barrel sampling". Each sample will be visually inspected by the supervising hydrogeologist and field screened using a photoionization analyzer (HNU Model PI-101 or equivalent). A minimum of one grab sample from each of the borings will then be selected for laboratory analysis based on the field screening.

Samples of the fill face will be collected on all four embankments to assess exposure risks. Six samples, to a depth of 6 inches each, will be collected from each of the two short and long sides of the fill. The samples from each side will composited in the field in groups of three, to produce eight samples for laboratory analysis. The locations of the samples will be selected in the field with concurrence of the NYSDEC field representative. In addition, three sand cast samples will be collected, photographed, and composited in the field for laboratory analysis.

Two composite surface soil samples will also be collected from each of the two softball fields located on top of the capped fill material to assess exposure risks. These samples will be collected to a six-inch depth.

One sample will be composited from soils collected at the pitcher's mound and home plate. The second sample will be composited from soils collected at first, second and third bases. The exact location of these samples will be selected in the field with concurrence of the NYSDEC field representative. The two samples collected from each softball field will be composited in the field prior to transport to the laboratory for analysis.

All of the samples will be transported to a NYSDEC approved laboratory for analysis. Chain-of-custody documents will be initiated at the time of sample collection and maintained throughout the transportation to the laboratory. The analyses to be conducted on these samples is discussed in Section 3.06 of this Work Plan.

3.02 Sediment

Two drainage channels flow along the boundaries of the fill area. Both drainageways originate east of the site from across River Road. As they enter the property they diverge to the north and south, respectively, and flow around the fill where they then enter the Niagara River on the northwest and southwest corners of the property.

To verify and supplement the data collected during the Phase II investigation, it is proposed to collect sediment samples from seven locations along the site drainagways (Figure 1). The exact locations of the samples will be dependent upon the presence of water in the drainageways and the determination of shallow ground water flow directions from the monitoring wells to be installed in section 2.04 of this work plan. These locations will be selected in the field with concurrence of the NYSDEC field representative. These samples will be

collected in accordance with the procedures outlined in the protocol included in Appendix B. Chain-of-custody documents will be initiated at the time of sample collection and maintained throughout the transportation to the laboratory. The analyses to be completed on these samples are detailed in Section 3.06 of this Work Plan.

Following collection of the sediment samples, all of the locations will be surveyed. The locations will then be plotted on a site map for use in preparation of the report.

## 3.03 Surface Water

To verify and supplement the data collected during the Phase II investigation, seven surface water samples will be collected from the drainageways surrounding the site as shown on Figure 1. The exact locations of the samples will be dependent upon the presence of water in the drainageways and will be subject to approval at the time of sample collection by the NYSDEC field representative. Surface water samples will be collected on two occasions selected to represent wet and dry periods. These samples will be collected in accordance with the procedures included in Appendix B.

Although the leachate will be characterized by the shallow monitoring well samples, one fill seep location from each side of the fill will also be sampled on one occasion for laboratory analysis. The collection of these samples will be dependent upon the identification of seeps at the beginning of the field program. The location of the seep samples will be with the concurrence of the NYSDEC field representative. Chain-of-custody documents will be initiated at the time of sample collection and maintained throughout the transportation to the laboratory.

Following collection of the surface water samples, all of the locations will be surveyed. The locations will then be plotted on a site map for use in preparation of the report.

## 3.04 Ground Water

Ground water samples will be collected from each of the existing and newly installed monitoring wells on two occasions. The dates on which these samples will be collected will be selected to represent wet and dry conditions. The first sampling event will be scheduled to correspond with a high ground water period. Ground water elevations in all wells will be measured quarterly in order to identify the wet and dry conditions. The procedures for sample collection are included in Appendix B. Two samples from each well will be collected for metal analyses. One sample will be preserved in the unfiltered state. This will satisfy the NYSDEC requirement for total metal concentrations in ground water. The other sample will be filtered in the field prior to preservation. Filtered metal analyses are appropriate for defining metal concentrations in the ground water system, since metal migration is limited to soluble fractions. Each of the collected samples will be placed in coolers with ice for transport to a NYSDEC acceptable laboratory for analysis. Chain-of-custody documents will be initiated at the time of sample collection and maintained throughout the transportation to the laboratory.

## 3.05 Air

An ambient air quality survey was conducted at the site during the Phase II investigation using a photoionization analyzer (HNU model

PI-101 or equivalent). This survey primarily covered the perimeter of the landfill where fill was exposed. Two traverses were made across the top of the clay capped fill to ensure that the air quality was safe for field personnel. The photoionization analyzer readings throughout this investigation were zero.

The findings of the initial survey do not indicate a need for detailed air quality sampling and analysis. Additionally, given the area on which the site is located, air emissions from the nearby manufacturing facilities such as Tonawanda Coke and Dunlop Tire would likely mask any trace volatiles emitted by the fill material during more detailed air quality sampling and analysis. A second survey with the HNU photoionization analyzer will, however, be conducted on and around the landfill as part of the site safety procedure prior to initiating any field work. The photoionization analyzer will also be on-site during all drilling, to be used for periodic air monitoring for determination of the need for respiratory protection.

## 3.06 Sample Analysis

Samples of ground water, surface water, sediment and fill were collected and analyzed during the Phase II Investigation. Similar studies were completed during investigations completed at neighboring properties. The results of these analyses revealed the presence of some or all of the following in each media sample: priority pollutant metals, cyanide, polynuclear aromatic hydrocarbons(PAHs), volatile aromatics, phenols, phthalates, benzoic acid, benzo(a)pyrene, PCBs (Aroclor 1248) and several chlorinated organics.

To ensure identification of all of the substances listed above, it is proposed to analyze all of the collected samples for those substances listed on the NYSDEC Hazardous Substance List (HSL). In addition, the following suspected analytes which are not included in the HSL will be quantified if present:

Monochlorobenzene

Ortho-Chlorotoluene

1,2,3 Trichlorobenzene

Ortho-Chlorophenol

Para-Chlorophenol

The presence of these analytes is suspected based on information obtained by NYSDEC regarding alleged wastes disposed of at the site.

For those samples being collected on two occasions (ground water and surface water), the first set of samples will be analyzed for the substances listed on the HSL and the additional analyses as discussed above. Analysis of the second set of samples will be limited to those substances identified by the first round of analyses. If possible, GC/MS methods will be replaced with GC methods. A modified list of parameters and/or analytical methods will be submitted to the NYSDEC prior to the collection of the second round of sampling.

If the analytical results of the fill/soil samples reveal elevated levels of heavy metals, then up to four soil/fill samples will be analyzed for EP Toxicity. A sufficient amount of each sample will be collected during the boring program to provide the soil/fill need for both total metal and EP Toxicity analyses.

All analyses will be completed by an approved NYSDEC laboratory in accordance with NYSDEC Contract Laboratory Program (CLP) procedures.

Table 2 provides a summary of sampling and analyses to be completed in the Remedial Investigation.

# TASK 4 - RISK ASSESSMENT

A risk assessment will be performed to evaluate the potential for chemical waste components to be transported from the site, and which produce exposures at levels harmful to human health and the environment. A two-phased approach, consistent with current U.S. EPA guidelines for the completion of health assessments under CERCLA, will be utilized in the execution of the assessment. The first phase will be a qualitative element designed to evaluate potential exposure scenarios. The second phase, the quantitative assessment, will provide a quantitative assessment of the magnitude of the exposures and any associated human health and environmental risks.

The risk assessment will evaluate all of the factors associated with the situation which contribute to, or in some cases reduce, the likelihood of a release from the site resulting in harm to human health or the environment. This risk assessment process, outlined in Figure 2, qualitatively unifies the source, transport route, and receptor components associated with an environmental release and evaluates them as an integral process. The completed assessment quantitatively determines the risks and other impacts associated with existing and potential releases of chemical constituents under various exposure and release scenarios.

## 4.01 Qualitative Exposure Assessment

### 4.01.1 Introduction

The first phase of the risk assessment (Level 1) will involve a qualitative evaluation of the Cherry Farm site to identify and

evaluate the potential exposure pathways. This phase will consist of a characterization of each of the possible exposure pathways (air, soil, surface water, and groundwater) for their potential to facilitate exposure of chemical components within the site to receptors identified at on-site and off-site locations. Each of the possible transport and exposure scenarios will be examined and evaluated. Those transport scenarios determined to have a functioning waste source, transport mechanism, and human or wildlife receptor are termed complete. These complete scenarios will be quantitatively evaluated in the second phase of the assessment. The following is a more detailed description of the qualitative assessment approach and methodology.

### 4.01.2 Qualitative Exposure Assessment Approach

A hazardous chemical may represent human or environmental risks only if humans, animals, wildlife or sensitive ecosystems have the potential to be exposed to (i.e. contact) the material in sufficient quantity to affect either the health of individuals or the general ecological balance. Exposures to the waste materials can occur in numerous ways. Examples of potential exposure scenarios related to an uncontrolled hazardous waste site evaluated within the risk assessment will include the following:

- Ingestion of surface water or ground water containing solubilized contaminants or ingestion of contaminated surface water sediments.
- Inhalation of volatile contaminants or contaminants airborne in association with particulates.

- Ingestion of biota (e.g. fish) which have bioaccumulated a contaminant released from the waste site.
- Dermal absorption or ingestion of contaminated materials resulting from direct contact with the source of materials at the waste site.

Four basic exposure pathways will be considered for this assessment of the Cherry Farm study area: the air, surface water, ground water, and direct contact exposure pathways. Each of these exposure pathways may have one or more exposure scenarios associated with it. Although it may be possible to postulate numerous hypothetical scenarios of exposure for each of the basic exposure pathways, a complete exposure scenario ( i.e. one potentially posing a risk) must include the following components:

1. A waste source and a mechanism of release from it. Examples of release mechanisms include volatilization, wind scour, surface runoff, and leaching.
2. A viable transport pathway (air, surface water, or ground water) from the waste source to a potential receptor point.
3. A potential receptor population (humans, plants, or animals) or location (i.e. sensitive ecosystem) for a contaminant released and transported from the waste source.
4. An exposure and uptake route (inhalation, ingestion, or dermal absorption); i.e. a mechanism by which the receptor absorbs the contaminant, allowing it to exert its toxic effect.

If any one or more of these components are missing, an exposure scenario is by definition incomplete and, therefore, poses no risk to health or the environment. Therefore, the first phase of

this risk assessment will be site and waste characterization and the identification of complete exposure pathways. The impacts associated with complete pathways will be further evaluated in the next phase, the "quantitative" assessment.

## 4.02 Quantitative Risk Assessment Process

### 4.02.1 Introduction

The second phase (Level 2) of the risk assessment will be a quantitative estimation of the probability and magnitude of each of the complete exposure scenarios identified, and the human and wildlife health risks associated with those exposures. This approach is consistent with procedures and guidelines appearing in the USEPA Superfund Health Evaluation Manual (USEPA 1986a), the USEPA Superfund Exposure Assessment Manual (USEPA 1986b), the USEPA Interim Guidance on Superfund Selection of Remedy (USEPA 1986c), the USEPA Guidance on Remedial Investigations Under CERCLA (USEPA 1985a), and the USEPA Endangerment Assessment Handbook (USEPA 1985b). The approach and procedures in quantitative risk assessment are discussed in further detail in the following section.

### 4.02.2 Quantitative Risk Assessment Approach

A quantitative risk assessment will be carried out only for potentially complete pathways and their identified scenarios at the Cherry Farm study area. The first step or risk characterization process used in this assessment will involve three steps: 1) selection of waste components to serve as indicators of the potential

environmental and health significance of the waste; 2) measurement or estimates of exposure point concentrations at receptor locations; and 3) the comparison of the predicted or measured exposure point concentrations with relevant action levels for the protection of human health to establish whether the waste represents an unacceptable risk to human health and/or the environment.

Selection of indicator chemicals for use in the quantitative analysis will be based on a waste characterization which considers 1) the nature and history of the waste material and 2) the environmental dynamics, toxicology, and residue levels of the waste's constituents. Exposure point concentrations are then established for each selected indicator chemical. Site-specific monitoring data for each indicator chemical and conservative modelling procedures depicting "worst case" scenarios will be used in this process. The Superfund Amendments and Reauthorization Act of 1986 requires that decision-making regarding remedial action at hazardous waste sites under the authority of the act be guided by health-based standards or criteria that are legally applicable or relevant and appropriate, often termed applicable or relevant and appropriate requirements (ARARs). Therefore, the predicted or measured exposure point concentrations for each indicator species will be compared to the relevant action levels, where available, for the protection of human health. Drinking water maximum contaminant levels (MCL's), National Ambient Air Quality Standards (NAAQS), federally approved state water quality standards developed under the Clean Water Act (e.g. NYS ambient surface water quality standards), EPA Health Advisories (SNARL's: suggested no

adverse impact levels), and EPA ambient water criteria (AWQC) may be used as the applicable or relevant and appropriate ambient concentration requirements for the protection of public health and the environment.

In those cases where the appropriate contaminant action levels or standards are not exceeded by the residue concentrations associated with complete exposure pathways at the Cherry Farm site, it will be concluded that the exposure pathway poses no health risk to the receptor. If, however, the action level is exceeded, a toxicological assessment will be performed, with the objective of identifying the magnitude of toxic impact. First, exposures will be quantified for all active exposure routes (diet, drinking water, inhalation, dermal absorption) to determine intakes for acute, subchronic, and chronic lifetime exposures of the receptor. If carcinogens are among the indicator waste constituents selected for study at the Cherry Farm site, unit risk factors generated from animal test data using recently promulgated guidelines for performing risk assessments of carcinogens (U.S. EPA 1986d), will be combined with intake data to derive a quantitative estimate of the incremental cancer risk. This value will be compared to site circumstances, magnitude of the exposed receptor populations, and other factors in order to determine the acceptability of the exposures. For non-carcinogens (e.g. reproductive and developmental toxins, organ and systemic toxins), acceptable daily intakes (ADI's) established by the U.S. EPA or other agencies will be located for comparison to estimated exposure levels under acute, subchronic, and chronic conditions. In cases where

action levels have not yet been set by regulatory agencies, the quantitative risk assessment will be initiated by deriving scientifically sound acceptable intake levels and carcinogenicity risk factors (if appropriate), followed by a quantitative risk estimation as described above.

## 4.03 Site-specific Considerations

1. The Cherry Farm study area is situated immediately to the north of other waste sites; the River Road site (site no. 9-15-031) which is associated with INS Equipment Co., and the Tonawanda Coke Corp. (site no. 9-15-035), both of which have been the subject of Phase II investigations. Due to this close proximity and potentially common usage and geological characteristics of these sites, Phase II data from these investigations will be employed as appropriate in the Cherry Farm risk assessment to aid in interpretation of site-specific data and in discussions of remedial options and feasibility.

2. In 1987, the governments of the United States, Canada, New York State, and the Province of Ontario initiated the Niagara River Toxic Management Plan. The purpose of this program is to identify persistent chemicals found in the Niagara River which pose concerns for human health and toxicity to aquatic organisms, with the end goal of reducing the loading of these chemicals to the river by 50% within ten years. A draft listing of such chemicals has been recently developed. As part of the performance of this risk assessment, this listing of chemicals will be consulted to identify those waste constituents found at

the Cherry Farm site. The surface and groundwater transport routes which may be contributing to pollutant loading in the Niagara River, and the approximate magnitude of such loading, will be determined.

## TASK 5 - REMEDIAL INVESTIGATION REPORT

Following completion of the site investigation as outlined in Tasks 2, 3 and 4, a report will be prepared presenting the results of the RI. The report will describe the field sampling activities, present the hydrogeologic and analytical data and include the site investigation analysis.

The following specific information will be included:

- all data collected pertaining to the location and construction of nearby residential wells;
- a site survey and a resultant plot plan, including establishment of on-site benchmarks;
- a summary of all environmental conditions, including, but not limited to: site drainage, land use, soil conditions, hydrogeologic characteristics, surface and ground water quality, and air quality; along with any maps, tables, graphics, and any other appropriate means of presenting all information;
- all data collected during the Remedial Investigation and/or used in preparing the Report, including but not limited to: soil boring logs, well data, and the results of chemical analyses performed on samples obtained during the Remedial Investigation; said data will be presented in tabulated and/or graphic form where appropriate;
- summary tables of all previous analytical data collected at the site;

- a determination of the types and quantities of hazardous and other wastes present as well as the areal and vertical extent of such wastes, which determination shall result in the preparation of a waste location map;
- a study and evaluation of the hydrogeologic conditions at and in the vicinity of the Site;
- a determination of the nature and extent of actual and potential release and migration of hazardous and industrial wastes from the site through surface water, ground water, air, soil and sediment to areas at and in the vicinity of the Sites and further off-Site;
- a determination of the areal and vertical extent to which both on-site and off-site surface water, ground water, air, soil and sediment have been, are being or may be contaminated by hazardous or industrial wastes;
- an assessment of the results of the Remedial Investigation and a determination of the current or potential impacts of any threat to the environment or public health which exists, or may exist in the future, at and in the vicinity of the Site as a result of the wastes disposed of at the Site;
- references to all scientific or technical literature used in the preparation of the Report;
- names, titles and disciplines of all professionals engaged in the preparation of the Report.
- a copy of the NYSDEC approved RI/FS Work Plan.

The completed report will be submitted to NYSDEC within 90 days of completion of the Remedial Investigation per the Order on Consent.

## FEASIBILITY STUDY

## TASK 6 - DESCRIPTION OF PROPOSED RESPONSE

The first step of the Feasibility Study will be to define the objectives of the remedial action and develop response actions. This involves the identification of site problems and pathways of contamination based on data generated during the Remedial Investigation, and identifying general response actions that address the site problems. The response actions fall into two categories: source control measures and off-site (management of migration) measures. Once the general response actions are identified, the development and evaluation of alternatives may commence.

## TASK 7 - DEVELOPMENT OF ALTERNATIVES (FS Phase I)

Based on the preliminary results of the Remedial Investigation (Task 3), a number of alternatives for source control or off-site remedial actions, or both, will be developed. Remedial response objectives and appropriate remedial technologies will be identified. Guidance provided in the document entitled "Interim Guidance on Superfund Selection of Remedy" (USEPA, 1986b) will be used. Remedial response objectives for the Cherry Farm site will be based on public health and environmental concerns, information gathered during the Remedial Investigation and the National Contingency Plan (NCP) (40 CFR Part 300). Remedial response actions are defined as those activities which must be accomplished to reduce any threat to human health and the environment resulting from the presence of hazardous constituents identified during the RI.

Once the remedial response objectives are defined, remedial technologies which address site specific problems and/or pathways are identified. The USEPA's Guidance on Feasibility Studies Under CERCLA (April 1985) identifies the following remedial response actions and associated remedial technologies that should be considered:

A. Containment

   1. Capping
   2. Ground water containment barrier walls
   3. Bulkheads
   4. Gas barriers

B. Pumping

1. Ground water pumping
2. Liquid removal
3. Dredging

C. Collection

1. Sedimentation basin
2. French drains
3. Gas vents
4. Gas collection systems

D. Diversion

1. Grading
2. Dikes and berms
3. Stream diversion ditches
4. Trenches
5. Terraces and benches
6. Chutes and downpipes
7. Levels
8. Storage basins

E. Complete Removal

1. Tanks
2. Drums
3. Soils
4. Sediments
5. Liquid wastes
6. Contaminated structures
7. Sewers and water pipes

F. Partial Removal

1. Tanks
2. Drums
3. Soils
4. Sediments
5. Liquid wastes

G. On-Site Treatment

1. Incineration
2. Solidification
3. Land treatment
4. Biological, chemical, and physical treatment

H. Off-Site Treatment

1. Incineration
2. Biological, chemical, and physical treatment

I. In-Situ Treatment

1. Permeable treatment beds
2. Bioreclamation
3. Soil flushing
4. Neutralization
5. Land farming

J. Storage

1. Temporary storage structures

K. On-Site Disposal

1. Landfills
2. Land application

L. Off-Site Disposal

1. Landfills
2. Surface impoundments
3. Land application

M. Alternative Water Supply

1. Cisterns
2. Aboveground tanks
3. Deeper or upgradient wells
4. Municipal water system
5. Relocation of intake structure
6. Individual treatment devices

N. Relocation

1. Relocate residents temporarily or permanently

Each of the technologies is screened with respect to the data gathered during the RI based on the following criteria:

1. Performance. This criterion evaluates the effectiveness of the technology in terms of meeting the pertinent remedial response objective. In order for a technology to meet the performance criterion, it is also necessary that it maintain its function over the expected life of the remedial action. Also considered here is the "track record" of a technology to perform its intended function. For those technologies that do not have a record of performance, such as innovative and alternative technologies, their potential performance given the site conditions will be evaluated. Those technologies that are not applicable based on the performance criterion will be eliminated from further consideration.

2. Reliability. The reliability criterion assesses the ability of a technology to perform its intended function. This includes an appraisal of the frequency and complexity of operation and maintenance activities required for the technology to remain effective over its expected life.

3. Implementability. The feasibility of implementing a technology under the given site conditions is evaluated. This criterion considers both the constructability of a technology and the safety practices required to protect workers, adjacent property, and the environment during and after construction.

4. Applicability. All technologies that pass the technology screening must be applicable to the chemical and physiographic conditions at the site. Technologies whose effectiveness is limited by waste and/or site characteristics are eliminated form further consideration.

A technology must meet all four criteria to pass the technology screening.

## TASKS 8 - INITIAL SCREENING OF ALTERNATIVES (FS Phase II)

Following the development of alternatives the remedial technologies that pass the technology screening are then combined into groups to form remedial alternatives. Each alternative, with the exception of the "No Action" alternative, must address all identified response objectives. In order to ensure that a sufficiently broad range of alternatives is evaluated, the NCP states that:

> "To the extent that it is possible and appropriate, at least one remedial alternative shall be developed as part of the feasibility study (FS) in each of the following categories:
>
> (i) Alternatives for treatment or disposal at an off-site facility, as appropriate;
>
> (ii) Alternatives that attain applicable or relevant and appropriate Federal public health and environmental requirements;
>
> (iii) As appropriate, alternatives that exceed applicable or relevant and appropriate Federal public health and environmental requirements;
>
> (iv) As appropriate, alternatives that do not attain applicable or relevant and appropriate Federal public health and environmental requirements but will reduce the likelihood of present or future threat from the hazardous substances and that provide significant protection to public health and welfare and the environment. This must include an alternative that closely approaches the level of protection provided by the applicable or relevant and appropriate requirements;

(v) No action alternative."

In addition, the 1986 Superfund Amendments Reauthorization Act (SARA) requires that remedial alternatives must consider damage to natural resources. SARA also expresses a strong preference for "permanent" technologies such as chemical or thermal destruction. The selected alternative shall be protective of human health and the environment. These factors will be considered in establishing the list of alternatives for further consideration.

Three broad considerations will be used as a basis for the initial screening: effectiveness, implementability, and cost. More specifically, the following factors will be considered:

1. Effectiveness. The alternatives will be evaluated relative to their effectiveness in protecting human health and the environment, and permanently reducing the toxicity, mobility, or volume of hazardous constituents. Those alternatives that are not protective of human health and the environment shall not be considered further. Alternatives that result in a permanent reduction in the toxicity, mobility, or volume of hazardous constituents shall be considered more effective than those that do not accomplish these permanent reductions. Any alternatives which would result in an increase in the toxicity, mobility, or volume of hazardous constituents shall not be considered further. Other issues which could impact the effectiveness of an alternative shall be evaluated as applicable.

2. Implementability. The alternatives will be evaluated with regard to the technical feasibility and availability of the

individual technologies associated with the alternatives. Alternatives that may prove to be technically unfeasible or unavailable will not be considered further. The technical and institutional ability to monitor, maintain, and replace technologies associated with the alternatives will be evaluated. Those alternatives for which the ability to monitor, maintain, and replace technologies over time are feasible will be considered further, whereas those that are unfeasible will not be considered further. The alternatives will also be evaluated relative to their administrative feasibility of implementation. Alternatives which prove to be administratively unfeasible will not be considered further.

3. Cost. Unit cost estimates will be developed for each of the alternatives. The cost estimates will include capital and long-term operation and maintenance costs. An alternative whose cost far exceeds that of other alternatives which provide similar results will be eliminated from further consideration.

The initial list of alternatives set forth in the RI will be evaluated in this manner. If any of the alternatives require the acquisition of additional data, such as treatability data, these data will be generated at this time.

The alternatives which will be analyzed in detail will include at least one alternative from each of the five categories outlined above. If not included in the five categories, a containment alternative and an alternative with innovative technologies will be analyzed in detail if they

offer the potential for better treatment performance or implementability, fewer adverse impacts than other approaches, or lower costs for similar levels of performance than demonstrated treatment technologies.

## TASK 9 - DETAILED ANALYSIS OF ALTERNATIVES (FS Phase III)

Upon NYSDEC approval of the interim report presenting the initial screening of alternatives, Task 9 shall commence. Alternative remedies which pass through the initial screening will be evaluated in depth prior to selecting the recommended alternative. In addition to using data from the remedial investigation, a literature survey and more data may have to be collected about the Cherry Farm site. These additional data may include bench- or pilot-scale testing of a treatment technology. The alternative evaluation shall include a detailed description, environmental assessment, and cost analysis as presented below.

A detailed description of each alternative will be prepared which will address the following issues.

1. Description of appropriate treatment and disposal technologies considered at this stage.
2. Special engineering considerations required to implement the alternative e.g., additional studies needed to proceed with final remedial design. These studies will include such items as leachate treatability and cover material assessment, including Atterberg liquid and plastic limits, grain size, moisture density relation, and permeability. However, the exact studies cannot be determined until the screening process is completed.
3. Environmental impacts, proposed methods, and costs, for mitigating any adverse effects.
4. Operation, maintenance, and monitoring requirements of the remedy.

5. Off-site disposal needs and transportation plans.

6. Temporary storage requirements.

7. Safety requirements for remedial implementation (including both on-site and off-site health and safety considerations).

8. A description of how the alternative could be phased into individual segments. The description should include a discussion of how various segments of the total remedy could be implemented individually or in groups, resulting in a significant improvement to the environment or savings in costs.

9. A review of any off-site disposal facilities to ensure compliance with applicable RCRA requirements.

Alternatives shall be evaluated using technical, environmental, and economic criteria. As in the Initial Screening of Alternatives, the three considerations of effectiveness, implementability, and cost will be used as the basis of the Detailed Analysis of Alternatives. However, at this point, each alternative will be evaluated in greater detail. The following factors will be used to evaluate the alternatives in detail:

1. Effectiveness. Each alternative will be assessed relative to whether it is adequately protective of human health and the environment, and attains Applicable or Relevant and Appropriate Federal and State Requirements (ARARs). Additionally, an assessment will be made as to whether each alternative would result in a significant reduction in the toxicity, mobility, or volume of hazardous constituents. Finally, each alternative will be assessed with respect to technical reliability.

2. Implementability. The alternatives will be evaluated with respect to the ability to construct, and the short and long-term reliability of the associated technologies. Other considerations that will impact the implementability of the alternatives are the ability to monitor the effectiveness of the alternatives, ability to operate and maintain the alternative, and the availability of equipment and specialists to implement the alternatives.

3. Cost. A detailed cost estimate for each alternative will be developed. The cost estimates will include short-term development and construction costs including operating costs to implement the remedial alternatives, long-term operating and maintenance costs, and five year remedial action reviews. Total costs will be developed as the total present worth of project costs, including appropriate replacement costs.

After each individual alternative is assessed using the above factors, the alternatives will be compared to each other using these factors. The result of the entire exercise will be one alternative which is preferred over all others and recommended for implementation.

In keeping with SARA, the recommended alternative must be protective of human health and the environment, cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The recommended alternative should also attain Federal and State ARARs. The recommended alternative should represent the best balance of the effectiveness, implementability, and cost considerations.

## TASK 10 - CONCEPTUAL DESIGN

A conceptual design of the recommended remedial alternative shall include the engineering approach including implementation schedule, special implementation requirements, institutional requirements, phasing and segmenting considerations, preliminary design criteria, preliminary site and facility layouts, budget cost estimate (including operation and maintenance costs), operating and maintenance requirements and duration, and an outline of the safety plan including cost impact on implementation. Any additional information required as the basis for the completion of the final remedial design for the Cherry Farm site will also be included. The conceptual design of the recommended remedial alternative will be presented in the Feasibility Study report (Task 11).

## TASK 11 - FINAL REPORT

The feasibility study report will recommend the alternative to be implemented for the Cherry Farm site. The report will contain:

- A summary of all health and environmental hazards and potential hazards attributable to the Cherry Farm site.
- Identification of remedial actions necessary to eliminate existing or potential hazards.
- Identification of alternatives capable of achieving the project objectives.
- For each applicable alternative, an evaluation according to Task 9 of the Feasibility Study.
- Identification of a recommended alternative, including conceptual design.

In addition, the feasibility study report will specify the names, titles, and disciplines of all professionals engaged in the preparation of the report, and include references to all scientific or technical literature used in preparing the report.

The feasibility study report will be submitted to NYSDEC within 60 days after receipt of the NYSDEC's approval of the Remedial Investigation Report per the Order on Consent. Following this review a meeting will be held with the NYSDEC to discuss comments. A final report will then be prepared and submitted to NYSDEC.

# Tables

O'BRIEN & GERE

# TABLE 1

## DRILLING FOOTAGE
## CHERRY FARM SITE RI/FS

### Wells

| | Estimated Depth | Number of Wells | Total Footage | Sampling Interval |
|---|---|---|---|---|
| Shallow | 20 feet | 12 | 40 | Continuous |
| | | | 40 | Standard |
| | | | 160 | None |
| Intermediate | 35 feet | 4 | 80 | Continuous |
| | | | 60 | Standard |
| Deep | 60 feet | 5 | 80 | Continuous |
| | | | 220 | Standard |

### Soil Sampling Borings

| | Estimated Depth | Number of Borings | Total Footage | Sampling Interval |
|---|---|---|---|---|
| Fill Borings | 20 feet | 7 | 140 | Continuous |

TABLE 2

SAMPLING AND ANALYSIS
CHERRY FARM SITE RI/FS

| | Number of Samples | Analysis |
|---|---|---|
| **Soil/Fill** | | |
| From Soil Sampling Borings | 7<br>4 (contingent)** | HSL*<br>EP TOX Metals |
| From Well Borings | To be determined ***<br>(contingent)** | HSL*<br>EP TOX Metals |
| Landfill Face Soils | 8 (composites) | HSL* |
| Sand Cast | 1 (composite) | HSL* |
| Softball Fields | 4 (composites) | HSL* |
| **Sediment** | | |
| Drainageways | 7 | HSL* |
| **Surface Water** | | |
| Drainageways | 14 (7/round) | HSL* |
| Seeps | 4 | HSL* |
| **Ground Water** | | |
| All wells | 60 (30/round)<br>120 (60/round) | HSL Organics*#<br>HSL Metals<br>(filtered & unfiltered) |

NOTES:

* - HSL analyses will be completed following CLP, including the following additional parameters:
Monochlorobenzene
ortho-Chlorotoluene
1,2,3 Trichlorobenzene
ortho-Chlorophenol
para-chlorophenol

** - Contingent upon HSL results which indicate elevated levels of metals (Section 3.06)

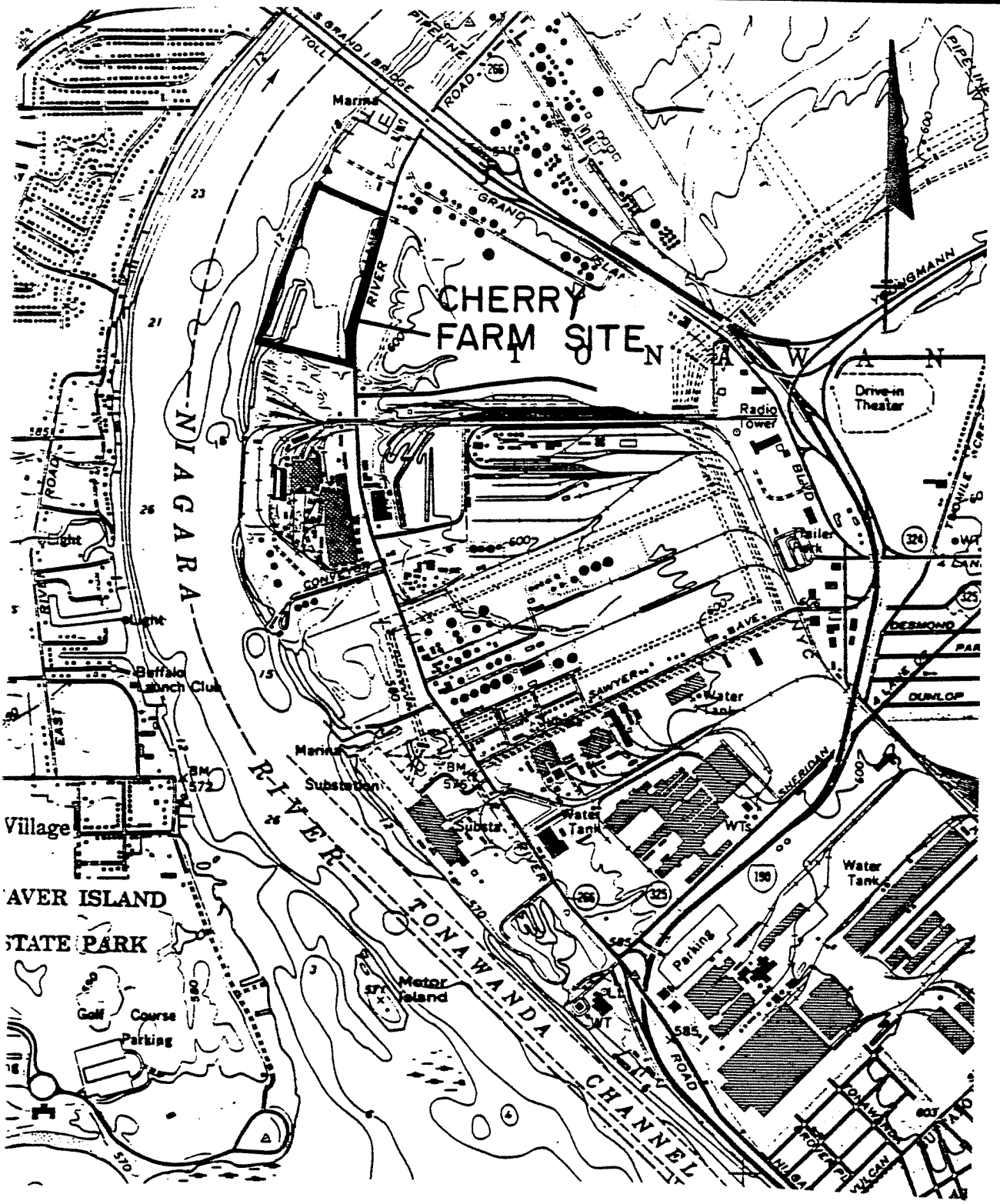
*** - Contingent upon field screening results and discretion of supervising hydrogeologist and NYSDEC Field Representative.

\# - The analysis methods for the second round of ground water samples may change depending on what is found in the first set of samples.

# Figures

O'BRIEN & GERE

FIGURE 1




# CHERRY FARM
# SITE LOCATION MAP
## NIAGARA MOHAWK POWER CORP.
## TONAWANDA, NEW YORK

ADAPTED FROM U.S.G.S. (7.5 MIN.) BUFFALO NW N.Y.-
ONTARIO QUADRANGLE 1965

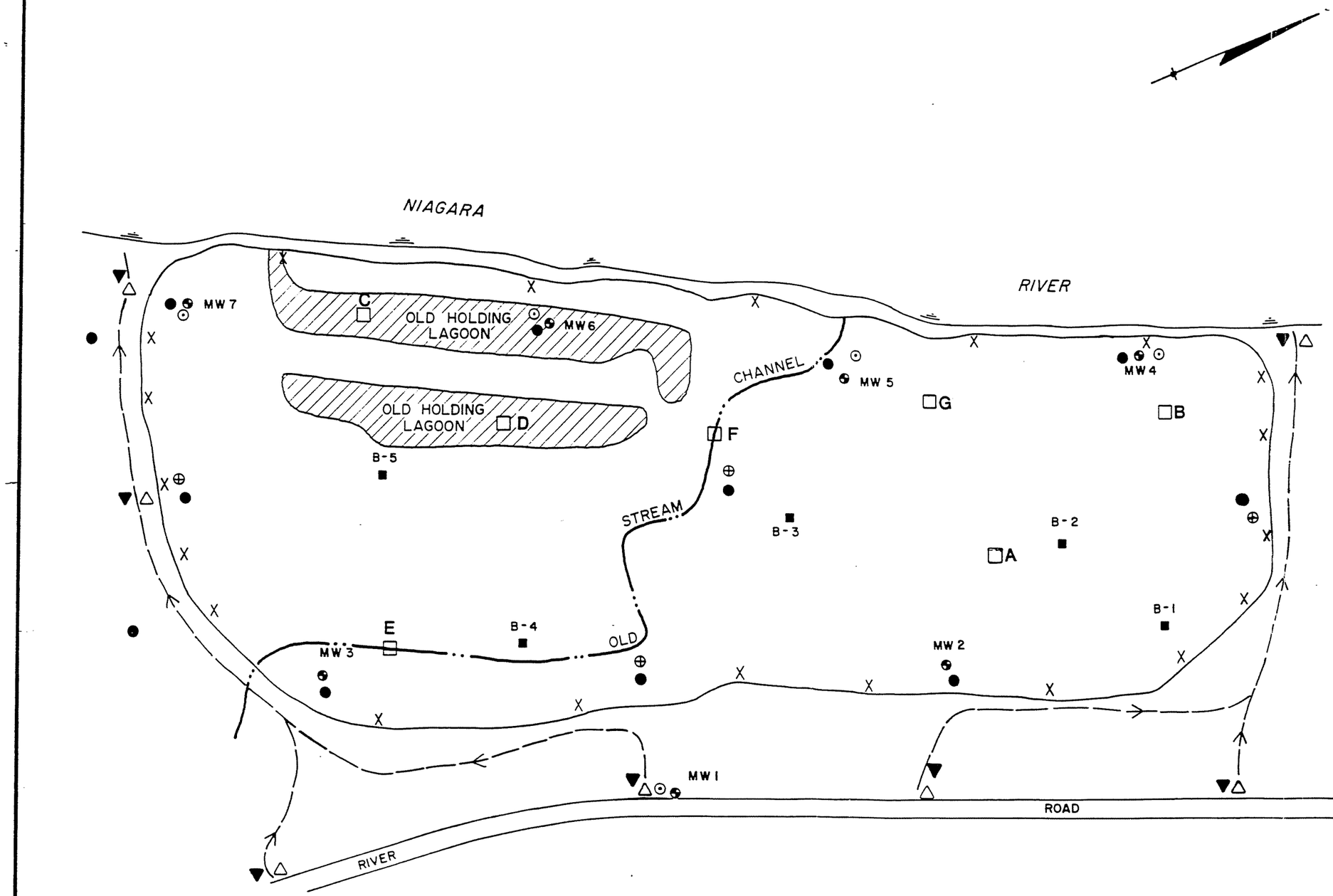
SCALE 1" = 2,000'

O'BRIEN & GERE
ENGINEERS INC

FIGURE 2

# PROPOSED SAMPLING LOCATIONS

CHERRY FARM SITE
NIAGARA MOHAWK POWER COR
TONAWANDA, N.Y.




## Legend

- Existing Intermediate Monitoring Wells
- Phase II Soil Borings
- Proposed Shallow Monitoring Wells
- Proposed Intermediate Monitoring Wells
- Proposed Deep Monitoring Wells
- Proposed Soil Borings
- Proposed Surface Water Sample
- Proposed Sediment Sample
- Landfill Face Samples

Scale
1"=200'
0 100 200 400

O'BRIEN & GERE

# *Risk Characterization Process*

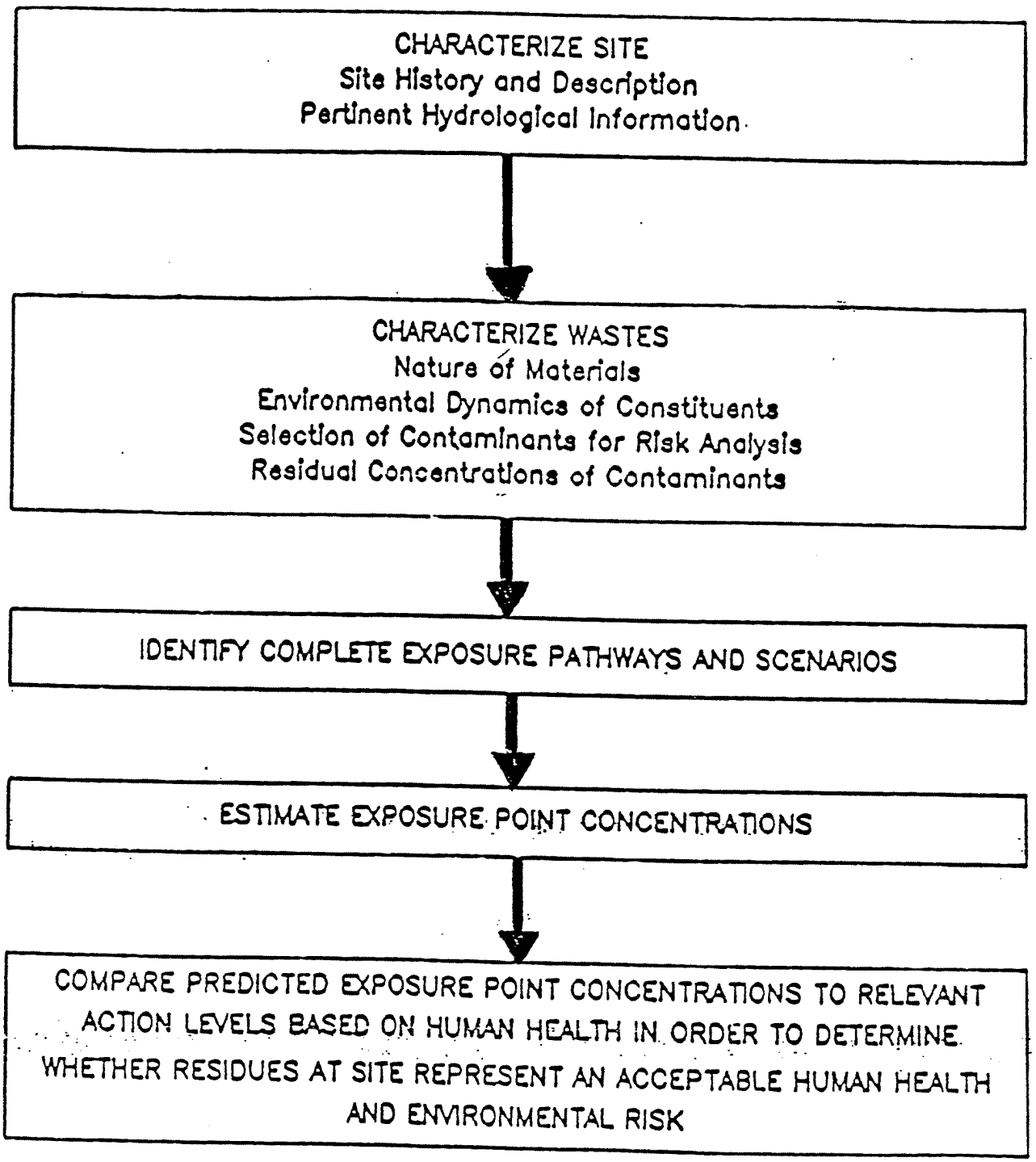
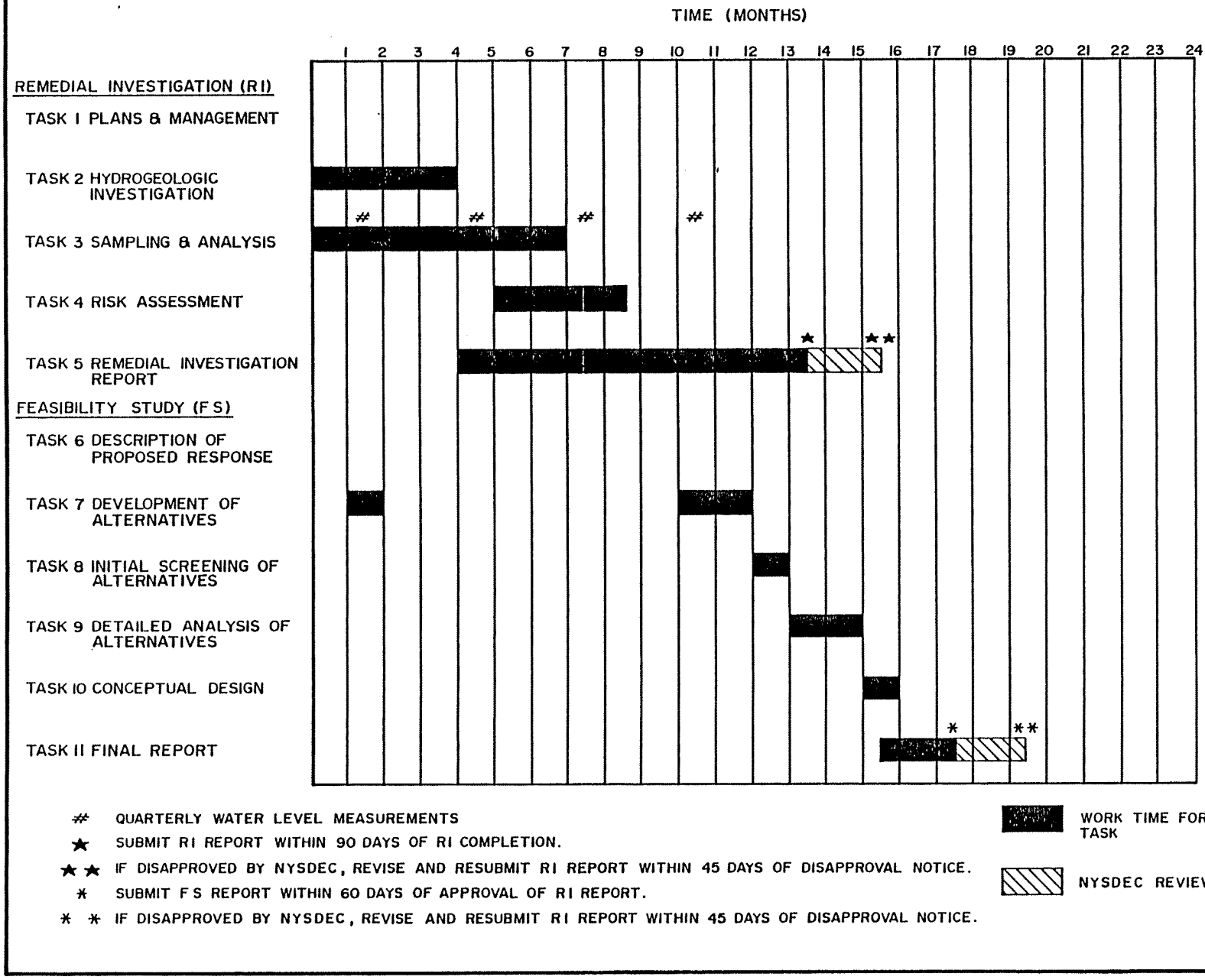


FIGURE 4

CHERRY FARM SITE
NIAGARA MOHAWK POWER CORP
TONAWANDA, N.Y.

# PROJECT SCHEDULE

(ASSUMES NO NYSDEC DISAPPROVAL OF REPORTS)




O'BRIEN & GERE

# Appendices

O'BRIEN & GERE

# Appendix A

# Health and Safety Plan

1118.056

# HEALTH AND SAFETY PLAN

# REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)

# FOR THE

# CHERRY FARM SITE

# TONAWANDA, NEW YORK

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, NEW YORK

MARCH, 1988

O'BRIEN & GERE ENGINEERS, INC.
1304 BUCKLEY ROAD
SYRACUSE, NEW YORK 13221

# TABLE OF CONTENTS


Page

SECTION 1 - INTRODUCTION AND BACKGROUND INFORMATION

1.01 Identification 1
1.02 Key Personnel for Investigation 1
1.03 Site Description 1
1.04 Site History 2
1.05 Project Description and Purpose 2

SECTION 2 - HAZARD EVALUATION

2.01 Previous Monitoring Performed On-Site 3
2.02 Previous Levels of Personnel Protection 3
2.03 Hazardous Materials Known to be On-Site 3
2.04 Summary of Site Hazards 4
2.05 Respiratory Protection (RP) Action Levels 4
2.06 Contact Protection 5

SECTION 3 - PROTOCOLS FOR ROUTINE ACTIVITIES

3.01 Health and Safety Management and Responsibilities 7
3.02 General Requirements for Entry in Work Zones 7
3.03 Site Entry and Exit (E&E) Procedures 8
3.04 Daily Start-Up and Shut-Down Procedures 9
3.05 Air Monitoring 9
3.06 Heat/Cold Stress 10
3.07 Decontamination Procedures 10

SECTION 4 - CONTINGENCY PLAN

4.01 Emergency Telephone Numbers 13
4.02 Directions to Hospital 13
4.03 Procedures for Serious Injury/Exposure 13
4.04 Procedures for Fire 14
4.05 Emergency Signal and Response 14
4.06 Procedures for Suspected Drum Encounter During Drilling 14

SECTION 5 - FIRST AID FOR EXPOSURE

5.01 Inhalation 16
5.02 Dermal 16
5.03 Ingestion 16
5.04 Eye Contact 17

## SECTION 1 - INTRODUCTION AND BACKGROUND INFORMATION

This document is the General Site Safety Plan for RI/FS activities to be conducted at the Niagara Mohawk Cherry Farm Site by the Contractor.

All personnel (here defined as employees of the Contractor, respondents, all visitors and representatives from the EPA, State, local groups, media, etc.) will be required to follow and adhere to the procedures set forth in this plan.

### 1.01 Identification

Site Name: Niagara Mohawk - Cherry Farm Site

Address/Location: River Road (1/4 mile south of Grand Island Bridge)
Town of Tonawanda, New York

Project Description: Remedial Investigation/Feasibility Study

On-Site Work Dates: 4/88 through 4/89

Overall Degree of Hazard: Low

### 1.02 Key Personnel for Investigation

Niagara Mohawk Contacts: Frank Sciortino (315) 428-6618
Mike Sherman (315) 428-6624

Safety Coordinator: To Be Determined

Contractor Contact: To Be Determined

### 1.03 Site Description

Type of Facility: Inactive hazardous waste disposal site.

Size: 55.4 acres.

Buildings: None

Surrounding Land Uses: Industrial.

Layout: The site is located adjacent to the Niagara River.

## 1.04 Site History

Niagara Mohawk (NiMo) purchased the site on July 20, 1970 from C.F.& I. Steel Corporation. According to NiMo, the site was subsequently capped with clay, and rye grass was planted in order to control windblown foundry sand that had existed on the site prior to its purchase. Since the purchase, the site has not been used for waste disposal by NiMo, nor has such use been authorized to anyone else. Since 1978 several investigations, inspections and reports from private, state, and federal agencies have been generated. These include the NYSDEC Phase I investigation and report conducted in June 1983, and a Phase II site investigation conducted in November of 1985.

## 1.05 Project Description and Purpose

The purpose of this field investigation will be to generate additional information on the nature and extent of chemical contamination on the site for a RI/FS. This will be accomplished through the execution of the field program specified in the Work Plan. This new information will be combined with existing data generated during the Phase I and Phase II investigations and interpreted relative to potential impacts on human health and the environment.

## SECTION 2 - HAZARD EVALUATION

### 2.01 Previous Monitoring Performed On-Site

6/8/81 - RECRA Research, Inc. completed a report of analytical results for "DEC Inplace Toxics" sampling at Cherry Farms.

7/82 - USGS sampled soil and surface water. Inorganic (metals) results were reported.

5/83 - USGS sampled soil and surface water. Organic results were reported.

11/85 - Phase II investigation by O'Brien & Gere Engineers, Inc.

### 2.02 Previous Levels of Personnel Protection

Personnel protection employed during most previous site activities was not documented. However, the Phase II site investigation was conducted under level D protection. Periodic air monitoring using an HNU air monitoring unit did not indicate the presence of airborne organics. Therefore, no respiratory protection was required or used.

### 2.03 Hazardous Materials Known to be On-site

The 6/8/81 RECRA Research, Inc. analytical report showed total recoverable phenolics in surface water at .01 ppm to 1.0 ppm and chlorinated benzenes in soil at .02 ppm to 4.5 ppm. The 7/82 USGS sampling results showed the presence of iron, lead, nickel, cadmium and arsenic in soil and surface water samples. Lead concentrations (120 ppm) in one soil sample exceeded background concentrations from

undisturbed soils in the Tonawanda area. Surface water concentrations of iron (4.0 to 4.45 ppm) exceeded USEPA criterion for maximum permissible concentration in drinking water.

Phase II investigations of soils revealed the presence of phenolic compounds and polyaromatic hydrocarbons (PAHs) at part per billion concentrations and phthalates were identified at part per million concentrations. The 5/83 USGS soil sampling results identified PCB-1248 (.32 to 199 ppm), toluene (.013 to .052 ppm), phenol (.133 to 35 ppm), naphthalene (.037 to 5.6 ppm) and benzene (.013 to .018 ppm) as the major priority pollutants. The major non-priority pollutants were 2-methylphenol (3.6 to 11 ppm) and 4-methylphenol (.046 to 7.9 ppm). No chlorinated benzenes were identified.

## 2.04 Summary of Site Hazards

Surface water and soil sampling has revealed the presence of low concentrations of several priority pollutants on the site, including PCB's (1248), toluene, phenol, naphthalene and benzene. These are further detailed in Section 2.03 of this Plan. There are no buildings or unsafe structures present on the site. However, the site is on the banks of the Niagara River. Because the banks are steep and the river current is quite strong, a potential drowning hazard exists.

## 2.05 Respiratory Protection (RP) Action Levels

Level D - no respirator protection is necessary during most activities on the site. Monitoring of the work zone using a calibrated HNU-PI-101 photoionization air monitor will be employed during field activities

which are performed on the grounds surface. Any reading showing an elevation of 1 ppm above background will be cause for an upgrading to Level C.

Level C - a half-face air purifying respirator, with organic vapor HEPA filter cartridges will be used by all site personnel for all ground breaking activities. All site personnel must be fit tested to provide for proper use of respirators. Sustained organic vapor levels in the breathing zone of site personnel in excess of 10 ppm will be cause for the H&S officer to evaluate the need for upgrade to full-face respirators or Level B respiratory protection. Should such an upgrade be warranted, an addendum to this H & S Plan will be prepared, specifying the nature of the vapors and the revised safety measures. HNU monitoring will be performed during all site activities.

## 2.06 Contact Protection

General dress requirements (minimum requirements for Level C) for work in designated work zones are:

1. Rubber safety boots or safety work boots and rubber over boots.
2. Work clothing.
3. Disposable coveralls. (Tyvek)
4. Rubber gloves.
5. Protective eyewear.

6. Hard hats.

7. Noise protection (as necessary - such as during drilling operations).

## SECTION 3 - PROTOCOLS FOR ROUTINE ACTIVITIES

### 3.01 Health and Safety Management and Responsibilities

The Site Health and Safety Officer (SHSO), or an appropriate designee, will have responsibility for the safety of operations and health and safety of all contractor personnel. A representative of the Contractor trained in safety and hygiene aspects of field operations may be designated as the Safety Officer during certain tasks.

### 3.02 General Requirements for Entry in Work Zones

A work zone is an area with a definite perimeter constituting an environmental or human health hazard, in which work is to be conducted. One specific location on the perimeter will be designated as the Entry and Exit (E&E) Point for the work zone. Any passage of personnel and/or equipment into or off of the work zone is permitted only through the E&E point.

No recreational activities will be allowed on the property during the entire period of time that invasive site activities, such as drilling, are being completed. All other site investigation activities, such as sampling, shall be ceased when periodic recreational activities are scheduled.

Before proceeding into the site past the Entry and Exit Point, all Contractor and subcontractor personnel must have completed safety training in accordance with OSHA as specified in 29 CFR 1910.120, and shall:

1. Be advised of the Site Safety Plan, instructed in safety procedures and use of all safety equipment and aware of potential hazards.
2. Be properly dressed and equipped.
3. Notify the SHSO.

All personnel entering into areas or performing Tasks requiring Level C respiratory protection shall:

1. Have been fit tested and have medical approval.
2. Be clean shaven in areas where the mask touches the face.
3. Have had necessary training in the use of respiratory protective devices.
4. Have appropriate respirator cartridges.

## 3.03 Site Entry and Exit (E&E) Procedures

Entry procedures are as follows:

1. Personnel will dress in required safety clothing and activate necessary monitoring equipment.
2. All personnel (or team/Task leader) notify the SHSO of intended operations.
3. SHSO reviews team personnel with respect to Section 3.02 above.
4. Entry time and personnel are logged.
5. Team proceeds through the designated, controlled E&E point (entry and exit).

Exit procedures are:

1. All personnel go through appropriate decontamination. (See Section 3.07)
2. All personnel exit through the designated E&E point.
3. All personnel are logged out and time recorded.

## 3.04 Daily Start-up and Shut-down Procedures

Start-up procedures are:

1. SHSO (or representative) reviews site conditions with respect to modifications of work and safety plans.
2. Personnel and team briefing, review and update of safety procedures.
3. Check out of safety and monitoring equipment.
4. SHSO ensures that first aid station is operable.
5. SHSO initiates appropriate monitoring.
6. Site Entry Procedures (3.03) are followed.

Shut-down procedures are:

1. All personnel decontaminate and exit .
2. SHSO logs all personnel out.
3. When appropriate, the SHSO and OSC performs a site walk to ensure that all personnel are off site and that the site is secure.
4. Equipment and site are secured.

## 3.05 Air Monitoring

Air sampling will not be performed on the site because of the delay in sample analysis. Personal protection levels are designed to protect

from airborne PCBs and low level (LT 1 ppm) organics. Air monitoring for organic vapors will be conducted using a portable photoionization detector (HNU PI-101). Monitoring will be conducted hourly. If greater than 1 ppm above background is detected, continuous monitoring will be maintained.

## 3.06 Heat/Cold Stress

Workers will be routinely observed for symptoms of heat stress or cold exposure, as dictated by weather conditions. Heat stress will be prevented by periodic rest breaks and the availability of cold electrolyte-balanced fluids. At cold temperatures workers will be required to wear adequate warm, dry clothing.

## 3.07 Decontamination Procedures

### Personnel

As a minimum, all personnel entering the Contaminated Zone will go through the following decontamination before exiting:

1. Segregated equipment drop on plastic drop clothes.
2. Outer boot wash (detergent or water).
3. Outer boot rinse.
4. Removal of outer boots and outer gloves.
5. Removal and disposal of outer garment.
6. Removal of respirator and/or change of canisters.

All personnel shall be free of visible contamination prior to leaving the site.

Sample Containers

After obtaining the sample, all containers will be decontaminated with a detergent/water wash and water rinse. Waste sample containers may require additional decontamination with acetone, methanol, or other non-priority pollutant solvent.

Sampling Equipment

All reusable sampling equipment (bailers, buckets, augers, split spoons, etc.) will undergo the following decontamination prior to initial use on site, between each use, and after final use. Equipment shall be cleaned of all visible contamination.

1. Thorough detergent/water rinse.
2. Tap water rinse.
3. Solvent wash/rinse.
4. De-ionized/distilled water rinse.

After decontamination, sample equipment shall be placed in clean plastic bags or other suitable wrapping to prevent recontamination.

Geotechnical Apparatus

All geotechnical apparatus such as augers, rods, drill bits, casings, etc., and backhoe buckets (where used to excavate test pits for sampling) will undergo the following decontamination prior to use on-site, between each use on-site, and prior to removal from the site to remove all visible contamination and soils:

- High pressure hot water (tap water) wash and/or steam cleaning (steam jenny).

Heavy Equipment

All trucks, drill rigs, backhoes, or other equipment will undergo decontamination prior to leaving the site. The decontamination as a minimum will require high pressure hot water (tap water) and/or a steam cleaning of tires and treads to remove all visible muck, soils and contamination.

Collection of Contaminated Materials

A decontamination zone for sampling and drilling equipment will be designated at the site. All decontamination fluids will be collected and contained. All boring cuttings, well development and purge water, will be collected in 55-gallon drums and stored in a secured area pending testing and proper disposal.

# SECTION 4 - CONTINGENCY PLAN

## 4.01 Emergency Telephone Numbers

State Police: (716) 759-6831 (Clarence)

Fire Department: (716) 876-1212

Ambulance Service: (716) 876-5300 (Town Police)

Hospital: Kenmore Mercy Hospital (716) 879-6100

Poison Control Center: (Buffalo Children's Hospital) (716) 878-7654

State your name, location and nature of emergency

For Hospital Victim:

Name and phone of family or emergency physician.

Description of incident - chemicals involved, symptoms, nature of injury, proposed treatment, plan of transportation.

## 4.02 Directions to Hospital

River Road north to I-190 south entrance (just before the bridge)

I-190 South to Exit N-16, Youngmann Highway (I-290)

Take I-290 east to Elmwood Ave. exit

Hospital is 1-2 miles down on Elmwood Ave. (straight ahead from exit), on the right, 1/4 mile past Sheridan Drive (major intersection).

## 4.03 Procedures for Serious Injury/Exposure

A first aid kit, fire extinguisher and portable eyewash unit shall be available on-site.

1. Perform necessary emergency first aid.
2. Evacuate all personnel from area if dangerous.

3. Notify SHSO.

4. Call appropriate emergency support.

5. Perform secondary first aid and prepare victim for transport.

6. Evacuate victim to hospital.

7. Notify hospital of the incoming patient and type/severity of injury and/or exposure.

## 4.04 Procedures for Fire

1. Isolate the location of the fire and alert on-site personnel.

2. Evacuate all personnel from the area.

3. If possible, contain the fire. A fire extinguisher will be available at the entry and exit point(s).

4. Notify the fire department.

## 4.05 Emergency Signal and Response

Signal - 5 one-second blasts of auto or air horn.

Action - All personnel immediately evacuate downrange areas and report to the site access point/decontamination line for instruction.

## 4.06 Procedure for Suspected Drum Encounter During Drilling

If a buried barrel is encountered during drilling, the most immediate danger is the release of a flammable or explosive gas mixture. Immediately shut down the drill rig and any other potential ignition sources. Therefore, an instrument to measure flammable or explosive gas will be used to monitor the air in the borehole if it is suspected that a barrel has been hit and ruptured. For this site, an MSA Model 260 portable combustible gas and oxygen alarm (or equivalent) will be

used. The person monitoring the borehole will put on a full face respirator with an organic vapor cartridge (level C contact protection will already be in place) and then use an extension tube to collect a sample without leaning directly over the borehole.

Should the instrument indicate an explosive mixture of gasses, leave the area, taking the explosion instrument along. Notify NYSDEC field personnel and any other appropriate authorities. Keep site investigators away from the borehole.

After allowing time for the explosive gas mixture to disperse, carefully approach the borehole (wearing full face respirator equipped with organic vapor cartridges) while continuously reading the explosion instrument. If the gas has dispersed such that there is not a flammable or explosive mixture, collect a sample of the material in or around the drum while continuously monitoring the borehole to check for a flammable or explosive mixture of gasses until sampling is complete. Under no circumstances should the sampling cause further damage to the drum.

When the area is deemed not to contain a flammable or explosive mixture, backfill the borehole and mark the location in case further investigation is warranted. Backfilling of the hole will occur any time a drum is suspected to have been hit, regardless of whether there was a flammable or explosive mixture present.

## SECTION 5 - FIRST AID FOR EXPOSURE

The following is a general description of first aid measures to be employed on site. In all cases of symptoms of chemical exposure, first aid treatment is to be followed by full medical examination.

### 5.01 Inhalation

Symptoms: dizziness, nausea, choking, gagging, lack of coordination, headache, irregular rapid breathing, weakness, loss of consciousness, coma.

Treatment:

1. Bring victim to fresh air. Rinse eyes or throat if irritated.
2. Be prepared to administer CPR.
3. Evacuate victim to hospital.

### 5.02 Dermal

Symptoms: Same as above. With phenol the affected area is typically white, wrinkled and softened with no pain (may also be reddened). Solvents may produce irritation, rash, or burning.

Treatment:

1. Flush affected area with water for 5 minutes.
2. Cover with a clean dressing.
3. If phenol is suspected or CNS symptoms develop, evacuate victim to hospital.
4. Monitor victim for at least 48 hours.

### 5.03 Ingestion

Symptoms: Same as above, with stomach cramps.

Treatment:

1. Evacuate victim to hospital.
2. Do not induce vomiting.

5.04 Eye Contact

Symptoms: Redness, irritation, pain, impaired vision.

Treatment:

1. Flush with water for at least 5 minutes using a portable eyewash unit.

2. If severe, evacuate victim to a hospital.

# Appendix B

# Field Investigation Protocols

# SOIL BORING PROTOCOL

## I. Drilling/Sampling Procedures

Test borings shall be completed using the hollow stem auger drilling method or rotary drilling method to a depth specified by the supervising geologist/engineer.

If a hollow stem auger drilling method is to be utilized for 2-inch diameter monitoring well completion, the minimum inside diameter of the augers shall be 3-3/4 inches.

Samples of the encountered subsurface materials shall be collected at a minimum of every five (5) feet and/or change in material or at the discretion of the supervising geologist. The sampling method employed shall be ASTM Method D-1586-67/Split Barrel Sampling using either a standard 2 ft. long, 2 in. outside diameter split spoon sampler with a 140 lb. hammer or a 3 in. outside diameter sampler with a 300 lb. hammer. Upon retrieval of the sampling barrel, the collected sample shall be placed in glass jars and labelled, stored on site and stored by O'Brien & Gere for possible testing. If laboratory soil samples are to be analyzed samples shall be placed in the laboratory sample containers as specified by the supervising hydrogeologist, labeled and placed on ice. A portion of each sample shall be placed in a glass jar, covered with aluminum soil and a screw on cap. This sample shall be allowed to reach ambient air temperature for field screening. Chain of custody procedures will be practiced following Section 15, EPA-600/4-82-029. (Handbook for Sampling and Sample Preservation of Water and Wastewaters).

If sample screening procedures are desired, the samples shall be allowed to reach ambient air temperatures at which time an photoionization detection (HNU Model PI-101 or equivalent) will be used to screen the samples in the field for relative levels of volatile organics. Upon completion of the screening procedure, the samples will be placed in storage.

A geologist will be on site during the drilling operations to fully describe each soil sample including 1) Soil type, 2) color, 3) percent recovery, 4) moisture content, 5) odor and 6) miscellaneous observations such as organic content. The supervising geologist will be responsible for retaining a representative portion of each sample in a one pint glass jar labelled with 1) site, 2) boring number 3) interval sample/interval preserved, 4) date, and 5) time of sample collection.

The drilling contractor will be responsible for obtaining accurate and representative samples, informing the supervising geologist of changes in drilling pressure, keeping a separate general log of soils encountered including blow counts (i.e. the number of blows from a soil sampling drive weight (140 pounds) required to drive the split spoon sampler in 6-inch increments and installing monitoring wells to levels directed by

the supervising geologist following specifications further outlined in this protocol.

To prevent cross contamination of soil samples, the split spoon samplers will be cleaned between samples and the drilling equipment (i.e. augers, casing and rods) will be decontaminated between borings. All decontamination procedures will be in accordance with the 'Decontamination Protocol.

Those soil borings which are not to be converted to monitor wells will be backfilled upon completion. The backfilling procedure will consist of a bentonite/cement grout tremied into the borehole from the bottom and continued until the grout flows out at the surface.

# OVERBURDEN DRILLING/SAMPLING PROTOCOL FOR SHALLOW MONITORING WELL COMPLETION

## I. Drilling/Sampling Procedures

Test borings shall be completed using the hollow stem auger drilling method or rotary drilling method to a depth specified by the supervising geologist/engineer.

If a hollow stem auger drilling method is to be utilized for 2-inch diameter monitoring well completion, the minimum inside diameter of the augers shall be 3-3/4 inches.

Samples of the encountered subsurface materials shall be collected at a minimum of every five (5) feet and/or change in material or at the discretion of the supervising geologist. The sampling method employed shall be ASTM Method D-1586-67/Split Barrel Sampling using either a standard 2 ft. long, 2 in. outside diameter split spoon sampler with a 140 lb. hammer or a 3 in. outside diameter sampler with a 300 lb. hammer. Upon retrieval of the sampling barrel, the collected sample shall be placed in glass jars and labelled, stored on site (on ice in a cooler if necessary), and transmitted to the appropriate testing laboratory or storage facility.

A geologist will be on site during the drilling operations to fully describe each soil sample including 1) Soil type, 2) color, 3) percent recovery, 4) moisture content, 5) odor and 6) miscellaneous observations such as organic content. The supervising geologist will be responsible for retaining a representative portion of each sample in a one pint glass jar labelled with 1) site, 2) boring number 3) interval sample/interval preserved, 4) date, and 5) time of sample collection.

The drilling contractor will be responsible for obtaining accurate and representative samples, informing the supervising geologist of changes in drilling pressure, keeping a separate general log of soils encountered including blow counts (i.e. the number of blows from a soil sampling drive weight (140 pounds) required to drive the split spoon sampler in 6-inch increments and installing monitoring wells to levels directed by the supervising geologist following specifications further outlined in this protocol.

## II. Monitoring Well Completion

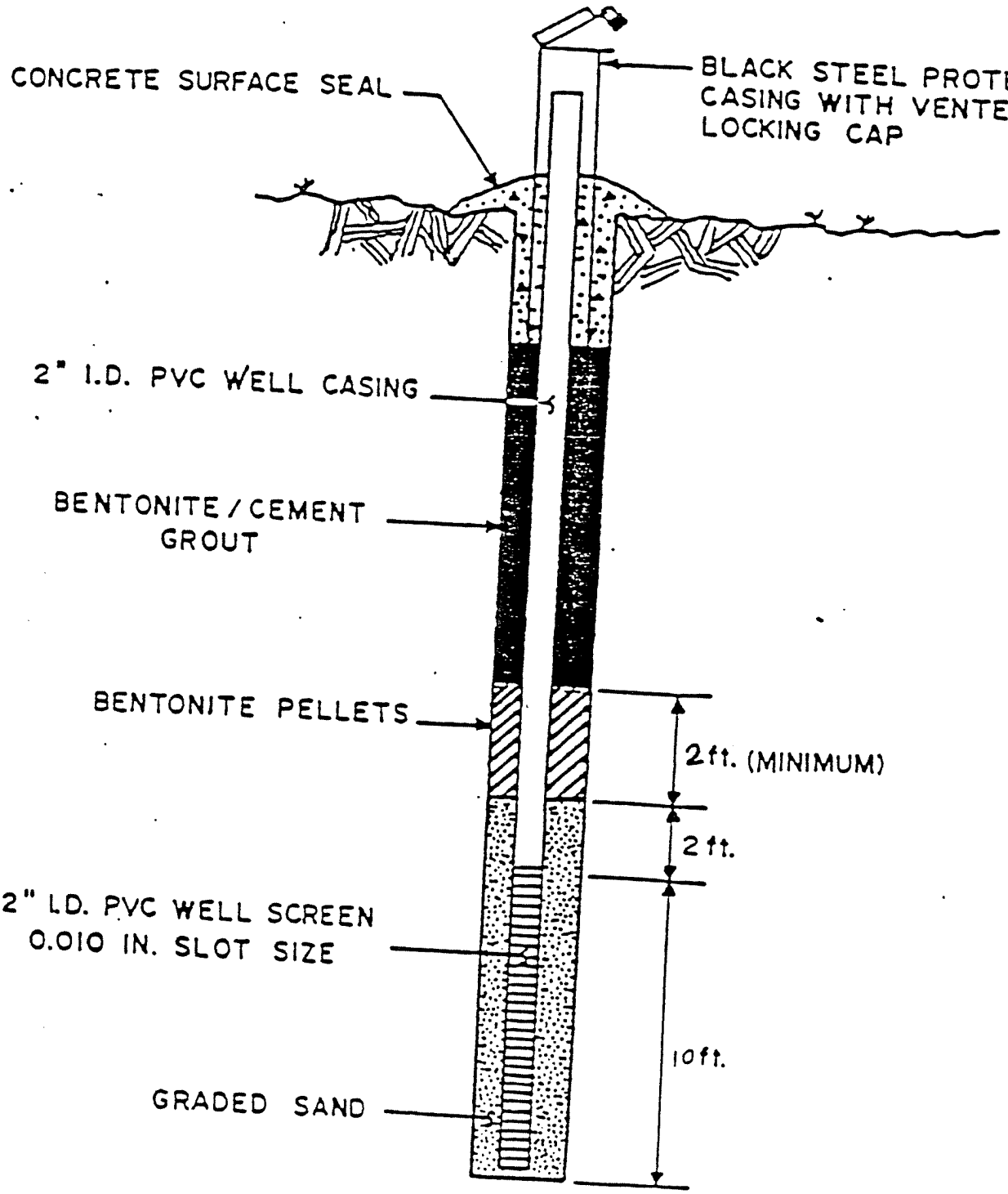
All monitoring wells will be constructed of flush-joint, threaded, schedule 40 PVC well screen and riser casing. The riser casing will extend from the screened interval to 2'-3' above existing grade. The screen will be 10 ft. in length with a slot size of 0.010 inches. Other materials utilized for completion will be washed graded silica sand, bentonite, Portland Cement and a protective steel locking well casing and cap with locks.

The monitoring well installation method for 2-inch wells installed within unconsolidated sediments shall be to place the screen and riser assembly into the casing once the screen interval has been selected. At that time a washed silica sand pack will be placed around the well screen and extended a minimum of 2 ft. above the top of the screen if required to prevent screen plugging. If a sand pack is not warranted, the auger string will be pulled back to allow the native aquifer material to collapse 2-3' above the top of the screen. A minimum of 2 ft. of Bentonite pellets will then be added to the annulus between the casing and the inside auger to insure proper sealing. Cement/Bentonite grout will be added during the extraction of the augers until the entire aquifer thickness has been sufficiently sealed off from horizontal and/or vertical flow above the screened interval. During placement of sand and bentonite pellets frequent measurements will be made to check the height of the sand pack and thickness of bentonite layers by a weighted drop tape measure.

A vented protective steel casing shall be located over the PVC standpipe extending 2 ft. below grade and 2-3 ft. above grade secured by a Portland Cement seal. The cement seal shall extend laterally at least 1 ft. in all directions from the protective casing and shall slope gently away to drain water away from the well. A vented steel cap will be fitted on the protective casing. The cap shall be constructed so it may be secured with a steel lock.

The supervising geologist is responsible for recording the exact well details as relayed by the drilling contractor and actual measurement. Both the supervising geologist and drilling contractor are responsible for tabulating all well materials used such as footage of casing and screen or bags of grout, cement or sand.

A field survey control program will be conducted using standard instrument survey techniques to document well location, ground, inner and outer casing elevations.




TYPICAL WELL DESIGN

# DECONTAMINATION PROTOCOL

All drilling equipment and associated tools including augers, split spoon samplers, drill rods, sampling equipment, wrenches and any other equipment or tools that have come in contact with contaminated materials shall be decontaminated.

Drilling equipment, augers, and split spoon samplers will be decontaminated by a soap solution wash and steam cleaning using clean water. Contaminated sampling equipment will be washed in soapy water and rinsed with a 50 to 75 percent solution of hexane or methanol followed by a clean water rinse. Wash water and rinse solvents will be contained and analyzed to determine the proper method of disposal.

The frequency of the decontamination will be determined by the supervising hydrogeologist. At a minimum, the decontamination will be performed at the completion of the drilling program prior to removing the equipment from the site.

It is preferred that a decontamination area be set up on site. If possible a method of keeping the equipment off the ground shall be arranged.

# WELL DEVELOPMENT PROTOCOL

All monitoring wells will be developed or cleared of all fine grained materials and sediments that have settled in or around the well during installation to insure the screen is transmitting representative portions of the ground water. The development will be by one of three methods, air surging, pumping or bailing ground water from the well until it yields relatively sediment free water.

Air surging will consist of a clean polypropylene tubing extended to the screen portion of the well, attached to an air compressor and allowed to surge until ground water clears. Clean polypropylene tubing will be used for each well developed by this method.

Ground water samples for laboratory analyses will not be collected until at least 14 days has elapsed since air surging development.

In pumping or bailing a decontaminated pump or bailer will be used followed procedures outlined in the Decontamination protocol and subsequently decontaminated after each use. Ground water will be pumped from the bottom of the well using a decontaminated stainless steel submersible pump or centrifugal pump bailed using a stainless steel bailer. Clean plastic will be placed on the ground to avoid surface contamination and new polypropylene rope on the bailer will be used for each well. Pumping or bailing will cease when the ground water yields sediment free water.

Development water will be placed into 55-gallon drums and secured on site until an appropriate disposal method is determined.

# IN-SITU PERMEABILITY TEST PROTOCOL

In-situ permeability tests will be conducted using instantaneous withdrawal or positive displacement methodologies. If the positive displacement method is used, the rod or ban to be placed into the well will be constructed of teflon or comparable inert material.

The water level within the well will be measured prior to withdrawal or displacement and measured at predesignated intervals thereafter. The recorded data is then analyzed using Hvorslov's Method.

# SURFACE SOIL/SHALLOW SEDIMENT SAMPLING PROTOCOL

## Sample Locations

Surface soil and shallow sediment samples will be obtained by compositing subsamples of approximately 40 grams each collected from four (4) equally spaced locations on the arc of a three (3) meter circle. The size of the circle may be modified as necessitated by field conditions. One subsample will be collected at each of the four quadrant points of the circle.

## Sampling Procedures

A disposable 3/4-inch diameter Lexan$^{R}$ core capable of a vertical penetration into mineral soil three (3) inches deep, shall be used to extract the four (4) 3-inch deep core subsamples. The composite samples will consist of all four (4) subsamples placed in the same sample container. A new Lexan$^{R}$ core will be used to collect samples at the same locations representing soils 3-inches to 6-inches below the top of the mineral soils.

The sample shall consist only of mineral soil. If sod layers are encountered, such as grass, remove the vegetative sod material by dissection using a scalpel. Discard the scalpel blade and replace with a clean blade after sampling at all four (4) subsites.

The field sampling team will be responsible for adhering to the following sample collection guidelines.:

a. locate collection sites as far as possible from vehicle activity such as streets, driveways, and parking areas;

b. avoid, if possible collecting samples under or immediately adjacent to trees, shrubs, and/or structures;

c. complete site description forms;

d. a new piece of Lexan$^{R}$ will be used for collecting subsamples at each location. The Lexan$^{R}$ corer will be disposed of appropriately after sampling at each location; and

e. complete a chain of custody form for all samples.

# SURFACE WATER SAMPLING PROTOCOL

When sampling from an open body of water (stream or pond) care must be exercised to collect a representative sample. The sample should cause as little disturbance to the water body as possible. Avoid taking a sample of water which shows evidence of sediment, debris or other material which may have been stirred up by the presence of the sampler.

## Surface Water Sampling

Surface water samples should be taken from 2 to 5 (or more) points spaced equally across the width of the stream of pond. The specific number of points may be determined in the field and should be adequate to accurately reflect the size of the water body being sampled. At each point, subsamples should be collected, representative of the total depth of the stream. The subsamples may then be composited into a single sample for analysis dependent upon the intent of the sampling program. For small, shallow streams, a single sample, collected just below the surface at the stream's midpoint may be adequate for sampling and analyses purposes.

Whether samples are obtained from a boat, a bridge, or by wading into the water body, samples should be taken while facing upstream, away from the influence of the sampler on stream flow.

Collection is accomplished by submerging a clean container at the sampling point to the depth required. For deep streams or ponds, a Kemmer, VanDorn or other sampler specifically designed for this purpose may be used. For shallow (i.e. less than three feet deep) locations, an inverted sample container may be carefully submerged by hand and then slowly allowed to fill.

Samples should then be placed in the proper containers, preserved as necessary for the analyses to be run and stored in an insulated ice cooler at 4°C. All pertinent information should be recorded including sample data and location, sample identification and chain-of-custody forms.

# GROUND WATER SAMPLING PROTOCOL

Prior to obtaining ground water samples for laboratory analysis, all monitoring wells must be developed as described in the Well Development Protocol.

## Sampling Procedures

Use of the following procedures for the sampling of ground water observation wells is dependent upon the size and depth of the well to be sampled and the volume of ground water in the well. To obtain representative ground water samples from wells containing only a few gallons of ground water, the bailing procedures is preferred. To obtain representative ground water samples from wells containing more than a few gallons, the pumping procedure generally facilitates more rapid sampling. Each of these procedures is explained in detail below.

1. Identify the well and record the location on the Ground Water Sampling Field Log, Attachment A.

2. Put on a new pair of disposable gloves.

3. Cut a slit in the center of the plastic sheet, and slip it over the well creating a clean surface onto which the sampling equipment can be positioned.

4. Clean all meters, tools, equipment, etc., before placing on the plastic sheet.

5. Using an electric well probe, measure the depth to the water table and the bottom of the well. If free-phase product is present, use an oil-water interface probe or a clear bottom-valve bailer to determine the thickness of the free product. Record this information in the Ground Water Sampling Field Log.

6. Clean the well depth probe and rinse it with distilled water after use.

7. Compute the volume of water in the well, and record this volume on the Ground Water Sampling Field Log.

8. Attach enough polypropylene rope to a bailer to reach the bottom of the well, and lower the bailer slowly into the well making certain to submerge it only far enough to fill one-half full. The purpose of this is to recover any oil film, if one is present on the water table.

9. Pull the bailer out of the well keeping the polypropylene rope on the plastic sheet. Empty the ground water from the bailer into a glass quart container and observe its appearance. NOTE: This sample will not undergo laboratory analysis, and

is collected to observe the physical appearance of the ground water only.

10. Record the physical appearance of the ground water on the Ground Water Sampling Field Log.

11. Lower the bailer to the bottom of the well, and agitate the bailer up and down to resuspend any material settled in the well.

12. Initiate bailing the well from the well bottom making certain to keep the polypropylene rope on the plastic sheet. All ground water should be dumped from the bailer into a graduate pail to measure the quantity of water removed from the well.

13. Continue bailing the well throughout the water column and from the bottom until a sufficient volume of ground water in the well has been removed, or until the well is bailed dry. If the well is bailed dry, allow sufficient time for the well to recover before proceeding with Step 14. Record this information on the Ground Water Sampling Field Log.

14. Remove the sampling bottles from their transport containers, and prepare the bottles for receiving samples. Inspect all labels to insure proper sample identification. Sample bottles should be kept cool with their caps on until they are ready to receive samples. Arrange the sampling containers to allow for convenient filling. Always fill the containers labeled purgeable priority pollutant first. Filter and add preservatives to appropriate samples.

15. To minimize agitation of the water in the well, initiate sampling by lowering the bailer slowly into the well making certain to submerge it only far enough to fill it completely. Fill each sample container following the instructions listed in the Sample Containerization Procedures, Attachment B. Return each sample bottle to its proper transport container.

16. If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled. The vials (3) labeled purgeable priority pollutant analysis should be filled from one bailer then securely capped. NOTE: Samples must not be allowed to freeze.

17. Record the physical appearance of the ground water observed during sampling on the Ground Water Sampling Field Log.

18. After the last sample has been collected, record the date and time, and, and if required, empty one bailer of water from the surface of the water in the well into the 200 ml beaker and measure and record the pH, conductivity and temperature of the ground water following the procedures outlined in the equipment operation manuals. Record this information on the

Ground Water Sampling Field Log. The 200 ml beaker must then be rinsed with distilled water prior to reuse.

19. Begin the Chain of Custody Record.

20. Replace the well cap, and lock the well protection assembly before leaving the well location.

21. Place the polypropylene rope, gloves, rags, and plastic sheeting into a plastic bag for disposal.

22. Clean the bailer by rinsing with control water and then distilled water. Store the clean bailer in a fresh plastic bag.

Sampling Procedures (PUMP)

1. Identify the well and record the location on the Ground Water Sampling Field Log.

2. Put on a new pair of disposable gloves.

3. Cut a slit in the center of the plastic sheet, and slip it over the well creating a clean surface onto which the sampling equipment can be positioned.

4. Clean all meters, tools, equipment, etc., before placing on the plastic sheet.

5. Using an electric well probe, measure the depth to the water table and the bottom of the well. If free-phase product is present use an oil water interface probe or a clean bottom-valve bailer to determine the thickness of the free product. Record this information in the Ground Water Sampling Field Log.

6. Clean the well depth probe and rinse it with distilled water after use.

7. Compute the volume of water in the well, and record this volume on the Ground Water Sampling Field Log.

8. Attach enough polypropylene rope to a bailer to reach just below the surface of the water table, and lower the bailer slowly into the well making certain to submerge it only far enough to fill it one-half full. The purpose of this is to recover any oil film, if one is present on the water table.

9. Pull the bailer out of the well keeping the polypropylene rope on the plastic sheet. Empty the ground water from the bailer into a glass quart container and observe its appearance. NOTE: This sample will not undergo laboratory analysis, and is collected to observe the physical appearance of the ground water only.

10. Record the physical appearance of the ground water on the Ground Water Sampling Field Log.

11. Prepare the submersible pump for operation.

12. Lower the pump to just below the top of the water column and pump the ground water into a graduated pail. Pumping should continue until sufficient well volumes have been removed or the well is pumped dry. If the well is pumped dry, allow sufficient time for the well to recover before proceeding with Step 16. Record this information on the Ground Water Sampling Field Log.

13. Remove the sampling bottles from their transport containers, and prepare the bottles for receiving samples. Inspect all labels to insure proper sample identification. Sample bottles should be kept cool with their caps on until they are ready to receive samples. Arrange the sampling containers to allow for convenient filling. Always fill the vials labelled purgeable priority pollutant first. Filter and add preservatives to appropriate samples.

14. With submersible pump raised to a level just below the surface of the water in the well, fill each sample container following the instructions listed in the Sample Containerization Procedures. Return each sampling bottle to its proper transport container. NOTE: A clean bottom loading stainless steel or Teflon bailer should be used to collect the sample used to fill the sample vials labeled purgeable priority pollutant analysis. Gently lower the bailer into the water to minimize agitation of the water. The vials (2) should be filled from one bailer.

15. If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled. NOTE: Samples must not be allowed to freeze.

16. Record the physical appearance of the ground water observed during sampling on the Ground Water Sampling Field Log.

17. After the last sample has been collected, record the date and time, and if required, place a sample of well water into a 200 ml beaker and measure and record the pH, conductivity and temperature of the ground water following the procedures outlined in the equipment operation manuals. Record this information on the Ground Water Sampling Field Log. The 200 ml beaker must then be rinsed with distilled water prior to reuse.

18. Begin the Chain of Custody Record.

19. Remove the submersible pump from the well and clean the pump and necessary tubing both internally and externally. Cleaning is comprised of rinses with a source water and acetone or methanol mixture, and distilled water using

disposable towels and separate wash basins. The pump should then be returned to its covered storage box.

20. Clean the bailer by rinsing with control water, soapy water and/or methanol, then distilled water, store the clean bailer in a fresh plastic bag.

21. Replace the well cap, and lock the well protection assembly before leaving the well location.

22. Place the gloves, towels, disposable shoe covers and plastic sheet into a plastic bag for disposal.

# Appendix C

# Quality Assurance Project Plan

# QUALITY ASSURANCE PROJECT PLAN
# REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)
# FOR THE
# CHERRY FARM SITE
# TONAWANDA, NEW YORK

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, NEW YORK

MARCH, 1988

O'BRIEN & GERE ENGINEERS, INC.
1304 BUCKLEY ROAD
SYRACUSE, NEW YORK 13221

# TABLE OF CONTENTS


| | Page |
|---|---|
| SECTION 1 - INTRODUCTION | 1 |
| 1.01 Site Description and History | 1 |
| 1.02 Quality Assurance Project Plan Objectives | 2 |
| 1.03 Project Organization | 3 |
| 1.04 Project Coordinator/Manager | 3 |
| 1.05 Project Quality Assurance Manager | 4 |
| 1.06 Assistant Project Managers | 5 |
| 1.07 Manager of Analytical Services | 5 |
| SECTION 2 - QUALITY ASSURANCE OBJECTIVES | 7 |
| 2.01 Quality Assurance Overall Objectives | 7 |
| 2.02 Field QC Objectives and Procedures | 7 |
| 2.03 Accuracy, Sensitivity and Precision of Analysis | 8 |
| SECTION 3 - SAMPLING PLAN | 9 |
| 3.01 Objective | 9 |
| 3.02 Sample Types | 9 |
| 3.02.1 Matrix Spikes (MS) and Matrix Spike Duplicates (MDS) | 10 |
| 3.02.2 Surrogate Blanks | 10 |
| 3.03 General Sampling Locations and Numbers | 10 |
| 3.03.1 Sampling Locations | 10 |
| 3.03.2 Sample Numbering System | 11 |
| 3.04 Sampling Procedures | 11 |
| 3.04.1 Soil Sampling | 11 |
| 3.04.2 Ground Water Studies and Sampling | 14 |
| 3.04.3 Surface Water Sampling | 27 |
| 3.04.4 Sediment Sampling | 29 |
| 3.05 Decontamination Procedures | 31 |
| 3.05.1 General | 31 |
| 3.05.2 Sampling Equipment | 31 |
| 3.06 Control of Contaminated Sampling Materials | 32 |
| 3.07 Documentation | 33 |
| 3.07.1 Site Location Procedure | 33 |
| 3.07.2 Photographs | 33 |
| 3.07.3 Field Notebooks | 34 |
| 3.08 Sample Control | 35 |
| 3.08.1 Sample Containers and Sample Preservation | 36 |
| 3.08.2 Chain of Custody Procedures | 36 |

TABLE OF CONTENTS
(Continued)


| | Page |
|---|---|
| SECTION 4 - CALIBRATION PROCEDURES | 40 |
| 4.01 Equipment Calibration | 40 |
| 4.02 Standards | 40 |
| 4.03 Records | 41 |
| 4.04 Equipment | 41 |
| 4.05 Calibration Records | 42 |
| SECTION 5 - ANALYTICAL PROCEDURES | 43 |
| 5.01 Laboratory Analytical Procedures | 43 |
| 5.02 Field Procedures | 44 |
| SECTION 6 - DATA REDUCTION, VALIDATION, AND REPORTING | 45 |
| 6.01 General | 45 |
| 6.02 Data Reduction and Reporting | 45 |
| 6.02.1 Data Production | 45 |
| 6.02.2 Data Reduction | 45 |
| 6.02.3 Data Transcription | 46 |
| 6.02.4 Data Verification | 46 |
| 6.02.5 Distribution | 47 |
| 6.02.6 In-House Storage | 47 |
| 6.02.7 Reporting | 47 |
| 6.03 Data Validation | 48 |
| SECTION 7 - INTERNAL QUALITY CONTROL CHECKS | 50 |
| 7.01 Quality Assurance/Quality Control Objectives | 50 |
| 7.02 Field Sampling Quality Control | 50 |
| 7.03 Field Analytical Procedures Quality Control | 51 |
| 7.04 Preventive Maintenance | 51 |
| SECTION 8 - AUDIT PROCEDURES | 52 |
| SECTION 9 - DATA ASSESSMENT PROCEDURES | 53 |
| SECTION 10 - CORRECTIVE ACTION PROCEDURES | 54 |
| SECTION 11 - QUALITY ASSURANCE REPORTS TO MANAGEMENT | 55 |
| TABLES | |
| C1 Primary Contacts | |
| C2 Hazardous Substances List | |

# SECTION 1 - INTRODUCTION

## 1.01 Site Description and History

The Cherry Farm site is located between River Road and the Niagara River in the Town of Tonawanda, New York (Figure 1). The site encompasses 55.4 acres, 80% of which is covered by fill material. The elevation of the fill area is approximately 20 feet above the original land surface. The fill is surrounded on three sides by two drainage ditches which discharge to the Niagara River. The fourth, northwest, side is bounded by the Niagara River. A designated wetland (BW-6) is located on the eastern side of the fill area.

Information provided to the New York State Department of Environmental Conservation (NYSDEC) by CF&I Steel Corporation (CF&I) in a letter dated October 10, 1985 revealed that between 1945 and 1970 the property was owned by CF & I. Dusts and slags from the CF & I blast and open hearth furnace operations were disposed of at the site until operations ceased in 1963. CF & I then entered into an agreement with INS Equipment Company (INS) which allowed INS to dispose of foundry sand from a nearby Chevrolet Plant on the property.

The site was purchased by Niagara Mohawk Power Corporation (NMPC) in 1970 in conjunction with some additional property. At the time of purchase, foundry sand was exposed at the surface of the fill area. To prevent wind erosion the surface of the fill was capped with approximately six inches of clay and seeded with rye grass.

## 1.02 Quality Assurance Project Plan Objectives

This document is a site-specific quality assurance project plan (QAPP). The plan is consistent with United States Environmental Protection Agency (USEPA) and NYSDEC guidance documents (QAMS-005/80) on the preparation of quality assurance project plans and will be submitted to NYSDEC for review. The plan addresses the following points:

1. Quality Assurance (QA) objectives for measurement data, including precision, accuracy, completeness, representativeness, and comparability
2. sampling procedures
3. sample custody
4. calibration procedures, references, and frequency
5. internal Quality Control (QC) checks and frequency
6. QA performance audits, system audits, and frequency
7. QA reports to management
8. preventative maintenance procedures and schedule
9. specific procedures to be used to routinely assess data precision, representativeness, comparability, accuracy, and completeness
10. corrective action

Representativeness refers to the use of EPA-recommended procedures for the collection and preservation of data as specified in EPA 600/4-79-020, Methods for Chemical Analysis of Water and Wastes, and the Federal Register, 26 October 1984. Comparability refers to the use of consistent procedures, reporting units, standardized methods of field

analysis, and standardized data format with document control. Completeness refers to the process of obtaining all required data as outlined in the Site Operations Plan.

This QAPP presents the organization, objectives, functional activities, and specific QA and QC activities associated with the Field Investigation of the site. The objectives of the QAPP are to provide sufficiently thorough and concise descriptions of the measures to be applied during the investigation that the data generated thereby will be of a known and acceptable level of precision and accuracy. This document, therefore, provides a description of the project, identifies the project responsibilities, and sets forth specific procedures to be used during sampling, analysis, and other field activities.

## 1.03 Project Organization

Table C1 lists the primary contacts for the project. Project technical personnel and quality assurance personnel shall be determined by the contractor prior to initiating the investigation.

## 1.04 Project Coordinator/Manager

The project manager will have primary responsibility for overseeing all facets of the project on a day-to-day basis. Specifically, his duties will include:

- project scheduling
- budget control
- subcontractor performance review
- review of interim reports
- responsibility for project coordination and communication

- project deliverables
- responsibility for establishing a project specific record keeping system
- project close-out

1.05 Project Quality Assurance Manager

The Project Quality Assurance (QA) Manager will be responsible for the monitoring and supervision of the QA/QC program. The Project QA/QC Manager will report directly to the Project Manager and his responsibilities will be to:

- Insure that field personnel are both familiar with and are adhering to proper sampling procedures, field measurements, sample identification, and chain-of-custody procedures.
- Contact the laboratory to insure that samples received by them have been properly identified and packaged.
- Monitor and audit the performance of the QA procedures.
- Conduct field and office audits.
- Maintain a record of performance and system audits and inform the Project Manager of any problems encountered in the analytical procedures.

The Project QA/QC Manager in conjunction with the Project and Laboratory Managers will also formulate recommendations on corrective action procedure to correct any deficiency in the analytical protocol, data, or sampling.

## 1.06 Assistant Project Managers

The management team for this project will draw upon the technical expertise and experience of a number of different individuals. The project team will consist of multidisciplined personnel with expertise in aerial photograph interpretation, hydrogeology, geophysical surveys, chemical characterization, soil science, wet chemistry, and toxicology. The firm's toxicologist will be responsible for the development of both the Safety Plan and the Risk Assessment.

## 1.07 Manager of Analytical Services

The Laboratory Manager will be responsible for the overall administration of the analytical operations. The section group leaders will handle the day to day operations and scheduling and report to the manager.

The Laboratory Quality Assurance Manager will be responsible for the implementation, monitoring, and supervision of the QA/QC program. He will assure that the program is conducted in strict adherence to procedures and requirements outlined for this program. He will report to the Laboratory Manager and interact daily with other group leaders and laboratory staff. His duties will include:

- Insuring laboratory custody procedures are followed.
- Monitoring daily precision and accuracy records.
- Maintaining copies of all procedures routinely used.
- Implementing correction measures if results are unacceptable
- Rescheduling analysis based upon unacceptable accuracy or precision data.

The Laboratory QA Manager will conduct an initial data validation and assessment on analytical results. A final data validation and assessment will be conducted by the Project Quality Assurance Manager, for review and approval by the Project Manager.

# SECTION 2 - QUALITY ASSURANCE OBJECTIVES

## 2.01 Quality Assurance Overall Objectives

The general quality assurance objective for analytical and field data is to obtain environmental monitoring data of known and acceptable quality. For this project, the specific objectives for measurement data include precision, accuracy, and completeness, and are contained in the New York State Contract Laboratory Protocol (NYS CLP), which states that the purpose of the QA/QC program "is the definition of procedures for the evaluation and documentation of sampling and analytical methodologies and the reduction and reporting of data. The objective is to provide a uniform basis for sample collection and handling, instrument and methods maintenance, performance evaluation, and analytical data gathering and reporting." This QAPP for sampling, analysis and data handling is consistent with the requirements set forth by all State and USEPA requirements.

## 2.02 Field QC Objectives and Procedures

The objective of field sampling procedures is to obtain samples that represent the environmental matrix being investigated. Trace levels of contaminants from external sources will be eliminated through the use of good sampling techniques and proper selection of sampling equipment.

## 2.03 Accuracy, Sensitivity and Precision of Analysis

Samples collected during the investigation will be analyzed for compounds on the New York State Hazardous Substances List (NYS HSL) using methods outlined in the NYS CLP. The NYS HSL, method detection limits, and audit, frequency and control limits for the analysis of the NYS HSL compounds are compiled in Table C2.

# SECTION 3 - SAMPLING PLAN

## 3.01 Objective

The objective of this sampling plan is to document the sampling locations, procedures, and practices that will be used in the RI/FS field investigation of the site. Information will be obtained as to the amount and the vertical and horizontal extent of NYS HSL compound contamination of the site.

The sampling plan describes the following protocols and documentation:

- Number of locations to be sampled
- Sampling procedures to be used at the site
- Tests to be completed at each sampling location
- Sampling equipment required at the site
- Sample containers required at the site
- Preservation methods to be used at the site for various types of samples
- Reagents, etc. required at the site for sample preservation
- Shipping containers required at the site
- Chain-of-custody procedures to be used at the site
- Shipping methods and destinations, marking instructions, special labels, etc.

## 3.02 Sample Types

Various matrices will be sampled and analyzed as part of the Field Investigation. These include the following:

1. Waters (ground water and surface water),

2. Sediments,

3. Soil/fill, and

4. Leachate.

### 3.02.1 Matrix Spikes (MS) and Matrix Spike Duplicates (MSD)

MS and MSD samples will be collected at a rate of one in twenty of similar concentration or matrix. These samples are essentially duplicate samples to which are added matrix spiking solutions, as described in the NYS CLP. Percent recovery indicates extraction efficiency or matrix interferences.

### 3.02.2 Surrogate Blanks

Surrogate blanks will be prepared by the laboratory per group of 20 or less samples, or as 5% of sample shipment. Blanks will consist either of diatomaceous earth or pure water. These blanks will be spiked with a surrogate to determine a percent recovery for comparison purposes.

## 3.03 General Sampling Locations and Numbers

### 3.03.1 Sample Locations

The sampling locations were specified in the September 1987 Work Plan and will not be reiterated here. A log book listing the various samples to be collected will be prepared for use on-site. The log book will also contain the type of sample and analytical matrix for each of the samples to be collected. Pre-printed peel-off labels will be included in the log book for tagging the various containers to be used for sample collection. The sample team

leader will be responsible for recording the exact sampling location in the field sampling notebook. The location will be described in the log book with a sketch that includes distances from numbered field reconnaissance stakes and other landmarks.

### 3.03.2 Sample Numbering System

A sample numbering system will be used to identify each sample taken during the field investigation sampling program. This numbering system will provide a tracking procedure to allow retrieval of information regarding a particular sample and to assure that each sample is uniquely numbered. A listing of the sample identification numbers will be maintained by the sample team leader.

## 3.04 Sampling Procedures

### 3.04.1 Soil Sampling

Task 3 of the Work Plan describes the soil boring program designed for sampling on the site. Seven (7) soil borings will be performed and sampled according to the following protocol.

Soil Boring Protocol

Test borings shall be completed using the hollow stem auger drilling method or rotary drilling method to a depth specified by the supervising geologist/engineer.

If a hollow stem auger drilling method is to be utilized for 2-inch diameter monitoring well completion, the minimum inside diameter of the augers shall be 3 3/4 inches.

Samples of the encountered subsurface materials shall be collected continuously through the waste fill thickness (approximately 20 feet) and at a minimum of every five (5) feet and/or change in material below the waste fill or at the discretion of the supervising geologist. The sampling method employed shall be ASTM Method D-1586-67/Split Barrel Sampling using either a standard 2 ft. long, 2 in. outside diameter split spoon sampler with a 140 lb. hammer or a 3 in. outside diameter sampler with a 300 lb. hammer. Upon retrieval of the sampling barrel, the collected sample shall be placed in glass jars and labelled, stored on site and stored by O'Brien & Gere for possible testing. If laboratory soil samples are to be analyzed samples shall be placed in the laboratory sample containers as specified by the supervising hydrogeologist, labeled with location, time and date, and placed on ice. A portion of each sample shall be placed in a glass jar, covered with aluminum foil and a screw on cap. This sample shall be allowed to reach ambient air temperature for field screening. Chain of custody procedures will be practiced following Section 15, EPA-600/4-82-029. (Handbook for Sampling and Sample Preservation of Water and Wastewaters).

If sample screening procedures are desired, the samples shall be allowed to reach ambient air temperatures at which time an photoionization detection (HNU meter Model PI-101 or equivalent) will be used to screen the samples in the field for relative levels of volatile organics. Upon completion of the screening procedure, the results will be recorded in the field book and the samples will be placed in storage.

A geologist will be on site during the drilling operations to fully describe each soil sample including 1) soil type, 2) color, 3) percent recovery, 4) moisture content, 5) odor and 6) miscellaneous observations such as organic content. The supervising geologist will be responsible for retaining a representative portion of each sample in a one pint glass jar labelled with 1) site, 2) boring number 3) interval sample/interval preserved, 4) date, and 5) time of sample collection.

The drilling contractor will be responsible for obtaining accurate and representative samples, informing the supervising geologist of changes in drilling pressure, keeping a separate general log of soils encountered including blow counts (i.e. the number of blows from a soil sampling drive weight (140 pounds) required to drive the split spoon sampler in 6-inch increments) and installing monitoring wells to levels directed by the supervising geologist following specifications further outlined in this protocol.

To prevent cross contamination of soil samples, the split spoon samplers will be decontaminated between samples and the drilling equipment (i.e. augers, casing and rods) will be decontaminated between borings. All decontamination procedures will be in accordance with the Decontamination Protocol in Section 3.05.

Those soil borings which are not to be converted to monitor wells will be backfilled upon completion. The backfilling procedure will consist of a bentonite/cement grout tremied into the borehole from the bottom and continued until the grout flows out at the surface.

### 3.04.2 Ground Water Studies and Sampling

To further define the horizontal and vertical ground water flow potential and quality in the site area, additional monitoring wells will be installed. Twelve (12) shallow, four (4) intermediate and five (5) deep monitoring wells will be drilled around the site in the locations specified in the September 1987 Work Plan.

Monitoring wells will be installed and sampled according to the following protocols:

Test borings shall be completed using the hollow stem auger drilling method or rotary drilling method to a depth specified by the supervising geologist/engineer.

If a hollow stem auger drilling method is to be utilized for 2-inch diameter monitoring well completion, the minimum inside diameter of the augers shall be 3 3/4 inches.

Samples of the unconsolidated subsurface materials shall be collected continuously through the waste fill (approximately 20 feet) and at a minimum of every five (5) feet and/or change in material below the waste fill or at the discretion of the supervising geologist. The sampling method employed shall be ASTM Method D-1586-67/Split Barrel Sampling using either a standard 2 ft. long, 2 in. outside diameter split spoon sampler with a 140 lb. hammer or a 3 in. outside diameter sampler with a 300 lb. hammer. Upon retrieval of the sampling barrel, the collected sample shall be placed in glass jars and labelled, stored on site (on ice in a cooler if necessary), and transferred to the appropriate testing laboratory or storage facility.

A geologist will be on site during the drilling operations to fully describe each soil sample including 1) soil type, 2) color, 3) percent recovery, 4) moisture content, 5) odor and 6) miscellaneous observations such as organic content. The supervising geologist will be responsible for retaining a representative portion of each sample in a one pint glass jar labelled with 1) site, 2) boring number 3) interval sample/interval preserved, 4) date, 5) time of sample collection, 6) preservation, and 7) signature of sample collector.

The drilling contractor will be responsible for obtaining accurate and representative samples, informing the supervising geologist of changes in drilling pressure, keeping a separate general log of soils encountered including blow counts (i.e. the number of blows from a soil sampling drive weight (140 pounds) required to drive the split spoon sampler in 6-inch increments) and installing monitoring wells to levels directed by the supervising geologist.

Monitoring Well Completion

All monitoring wells will be constructed of flush-joint, threaded, schedule 40 PVC well screen and riser casing. The riser casing will extend from the screened interval to 2'-3' above existing grade. The screen will be 10 ft. in length with a slot size of 0.010 inches. Other materials utilized for completion will be washed graded silica sand, bentonite, Portland Cement and a protective steel locking well casing and cap with locks.

The monitoring well installation method for 2-inch wells installed within unconsolidated sediments shall be to place the screen and riser assembly into the auger casing once the screen interval has been selected. At that time, a washed silica sand pack will be placed around the well screen and extended a minimum of 2 ft. above the top of the screen, if required, to prevent screen plugging. If a sand pack is not warranted, the auger string will be pulled back to allow the native aquifer material to collapse 2-3' above the top of the screen. A minimum of 2 ft. of Bentonite pellets will then be added to the annulus between the casing and the inside auger to insure proper sealing. Cement/Bentonite grout will be added during the extraction of the augers until the entire aquifer thickness has been sufficiently sealed off from horizontal and/or vertical flow above the screened interval. During placement of sand and bentonite pellets, frequent measurements will be made to check the height of the sand pack and thickness of bentonite layers by a weighted drop tape measure.

A vented protective steel casing shall be located over the PVC standpipe extending 2 ft. below grade and 2-3 ft. above grade secured by a Portland Cement seal. The cement seal shall extend laterally at least 1 ft. in all directions from the protective casing and shall slope gently away to drain water away from the well. A vented steel cap will be fitted on the protective casing. The cap shall be constructed so it may be secured with a steel lock.

The supervising geologist is responsible for recording the exact well details as relayed by the drilling contractor and actual measurement. Both the supervising geologist and drilling contractor are responsible for tabulating all well materials used such as footage of casing and screen or bags of grout, cement or sand.

A field survey control program will be conducted using standard instrument survey techniques to document well location, ground, and inner and outer casing elevations.

A field survey control program will be conducted using standard survey techniques and documents.

Well Development

All monitoring wells will be developed or cleared of all fine grained materials and sediments that have settled in or around the well during installation to insure the screen is transmitting representative portions of the ground water. The development will be by one of three methods, air surging, pumping, or bailing ground water from the well until it yields relatively sediment free water.

The air surging apparatus will consist of a clean polypropylene tubing extended to the screen portion of the well and attached to an air compressor. Clean polypropylene tubing will be used for each well developed by this method.

Ground water samples for laboratory analyses will not be collected until at least 14 days have elapsed since air surging development.

In pumping or bailing a decontaminated pump or bailer will be used following procedures outlined in the Decontamination protocol after each use. Ground water will be pumped from the bottom of the well using a decontaminated stainless steel submersible pump or centrifugal pump or bailed using a stainless steel bailer. Clean plastic will be placed on the ground to avoid surface contamination and new polypropylene rope on the bailer will be used for each well. Pumping or bailing will cease when the ground water yields sediment free water.

Development water will be placed into 55-gallon drums and secured on site until an appropriate disposal method is determined.

In-situ hydraulic conductivity tests will be conducted on each of the newly installed wells for the purpose of estimating ground water flow rates. These tests will be performed in accordance with the following protocol:

In-Situ Permeability Test

In-situ permeability tests will be conducted using instantaneous withdrawal or positive displacement methods. The rod or ban to be placed into the well will be constructed of Teflon or comparable inert material.

The water level within the well will be measured prior to withdrawal or displacement and measured at predesignated intervals thereafter. The recorded data will then be analyzed using Hvorslov's Method.

Water Level Measurements

The locations and elevations of all the newly installed wells will be surveyed. All elevations will be determined based on USGS benchmarks. Additional water level measurements will be taken from the existing wells. To insure the accuracy of the water level measurements on each occasion, the measurements shall be made from the same reference point located on the top of the riser casing each time. This reference point will be marked and its elevation will be determined during the survey.

Ground Water Sampling

Prior to obtaining ground water samples for laboratory analysis, all monitoring wells must be developed as described in the previous section.

Ground water samples will be collected from each of the existing and newly installed monitoring wells on two occasions. The dates on which these samples will be collected will be selected to represent wet and dry conditions. Ground water elevations in all wells will be measured quarterly in order to identify the wet and dry conditions. Each of the collected samples will be placed in coolers with ice for transport to an NYSDEC acceptable laboratory for analysis. Chain-of-custody documents will be initiated at the time of sample collection and maintained throughout the transportation to the laboratory.

Sampling Procedures

Use of the following procedures for the sampling of ground water observation wells is dependent upon the size and depth of the well to be sampled and the volume of ground water in the well. To obtain representative ground water samples from wells containing only a few gallons of ground water, the bailing procedure is preferred. To obtain representative ground water samples from wells containing more than a few gallons, the pumping procedure generally facilitates sampling. Each of these procedures is explained in detail below.

1. Identify the well and record the location on the Ground Water Sampling Field Log, Attachment A.
2. Put on a new pair of disposable gloves.
3. Cut a slit in the center of the plastic sheet, and slip it over the well creating a clean surface onto which the sampling equipment can be positioned.
4. Clean all meters, tools, equipment, etc., before placing on the plastic sheet. Cleaning procedure shall consist of a methanol rinse followed by a distilled water rinse.
5. Using an electric well probe, measure the depth to the water table and the bottom of the well. If free-phase product is present, use an oil-water interface probe or a clear bottom-valve bailer to determine the thickness of the free product. Record this information in the Ground Water Sampling Field Log.

6. Clean the well depth probe with methanol and rinse it with distilled water after use.

7. Compute the volume of water in the well, and record this volume on the Ground Water Sampling Field Log.

8. Attach enough polypropylene rope to a bailer to reach the bottom of the well, and lower the bailer slowly into the well making certain to submerge it only far enough to fill one-half full. The purpose of this is to recover any oil film, if one is present, on top of the water table.

9. Pull the bailer out of the well keeping the polypropylene rope on the plastic sheet. Empty the ground water from the bailer into a glass quart container and observe its appearance. NOTE: This sample will not undergo laboratory analysis, and is only collected to observe the physical appearance of the ground water.

10. Record the physical appearance of the ground water on the Ground Water Sampling Field Log.

11. Lower the bailer to the bottom of the well, and agitate the bailer up and down to resuspend any material settled in the well.

12. Initiate bailing the well from the well bottom making certain to keep the polypropylene rope on the plastic sheet. All ground water should be dumped from the bailer into a graduated pail to measure the quantity of water removed from the well.

13. Continue bailing the well throughout the water column and from the bottom until a minimum of 3 well volumes of ground water in the well has been removed, or until the well is bailed dry. If the well is bailed dry, allow sufficient time for the well to recover before proceeding with Step 14. Record this information on the Ground Water Sampling Field Log.

14. Remove the sampling bottles from their transport containers, and prepare the bottles for receiving samples. Inspect all labels to insure proper sample identification. Sample bottles should be kept cool with their caps on until they are ready to receive samples. Arrange the sampling containers to allow for convenient filling. Always fill the containers labeled purgeable priority pollutant first. Filter and add preservatives to appropriate samples.

15. To minimize agitation of the water in the well, initiate sampling by lowering the bailer slowly into the well making certain to submerge it only far enough to fill it completely. Fill each sample container following the instructions listed in the Sample Container Procedures, Attachment B. Return each sample bottle to its proper transport container.

16. If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled. The (3) vials labeled purgeable priority pollutant analysis should be filled from one bailer then securely capped. NOTE: Samples must not be allowed to freeze.

17. Record the physical appearance of the ground water observed during sampling on the Ground Water Sampling Field Log.

18. After the last sample has been collected, record the date and time, and, if required, empty one bailer of water from the surface of the water in the well into a 200 ml beaker and measure and record the pH, conductivity and temperature of the ground water following the procedures outlined in the equipment operation manuals. Record this information on the Ground Water Sampling Field Log. The 200 ml beaker must then be rinsed with distilled water prior to reuse.

19. Begin the Chain of Custody Record.

20. Replace the well cap, and lock the well protection assembly before leaving the well location.

21. Place the polypropylene rope, gloves, rags, and plastic sheeting into a plastic bag for disposal.

22. Clean the bailer by rinsing with control water and then distilled water. Store the clean bailer in a fresh plastic bag.

Sampling Procedures (PUMP)

1. Identify the well and record the location on the Ground Water Sampling Field Log.

2. Put on a new pair of disposable gloves.

3. Cut a slit in the center of the plastic sheet, and slip it over the well creating a clean surface onto which the sampling equipment can be positioned.

4. Clean all meters, tools, equipment, etc., before placing on the plastic sheet.

5. Using an electric well probe, measure the depth to the water table and the bottom of the well. If free-phase product is present use an oil water interface probe or a clean bottom-valve bailer to determine the thickness of the free product. Record this information in the Ground Water Sampling Field Log.

6. Clean the well depth probe and rinse it with distilled water after use.

7. Compute the volume of water in the well, and record this volume on the Ground Water Sampling Field Log.

8. Attach enough polypropylene rope to a bailer to reach just below the surface of the water table, and lower the bailer slowly into the well making certain to submerge it only far enough to fill it one-half full. The purpose of this is to recover any oil film, if one is present on the water table.

9. Pull the bailer out of the well keeping the polypropylene rope on the plastic sheet. Empty the ground water from the bailer into a glass quart container and observe its appearance. NOTE: This sample will not undergo laboratory analysis, and is collected to observe the physical appearance of the ground water only.

10. Record the physical appearance of the ground water on the Ground Water Sampling Field Log.

11. Prepare the submersible pump for operation.

12. Lower the pump to just below the top of the water column and pump the ground water into a graduated pail. Pumping should continue until sufficient well volumes have been removed or the well is pumped dry. If the well is pumped dry, allow sufficient time for the well to recover before proceeding with Step 16. Record this information on the Ground Water Sampling Field Log.

13. Remove the sampling bottles from their transport containers, and prepare the bottles for receiving samples. Inspect all labels to insure proper sample identification. Sample bottles should be kept cool with their caps on until they are ready to receive samples. Arrange the sampling containers to allow for convenient filling. Always fill the vials labelled purgeable priority pollutant first. Filter and add preservatives to appropriate samples.

14. With submersible pump raised to a level just below the surface of the water in the well, fill each sample container following the instructions listed in the Sample Container Procedures. Return each sampling bottle to its proper transport container. NOTE: A clean bottom loading stainless steel or Teflon bailer should be used to collect the sample used to fill the sample vials labeled

purgeable priority pollutant analysis. Gently lower the bailer into the water to minimize agitation of the water. The (2) vials should be filled from one bailer.

15. If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled. NOTE: Samples must not be allowed to freeze.

16. Record the physical appearance of the ground water observed during sampling on the Ground Water Sampling Field Log.

17. After the last sample has been collected, record the date and time, and if required, place a sample of well water into a 200 ml beaker and measure and record the pH, conductivity and temperature of the ground water following the procedures outlined in the equipment operation manuals. Record this information on the Ground Water Sampling Field Log. The 200 ml beaker must then be rinsed with distilled water prior to reuse.

18. Begin the Chain of Custody Record.

19. Remove the submersible pump from the well and clean the pump and necessary tubing both internally and externally. Cleaning is comprised of rinses with a source water and acetone or methanol mixture, and distilled water using disposable towels and separate wash basins. The pump should then be returned to its covered storage box.

20. Clean the bailer by rinsing with control water, soapy water and/or methanol, then distilled water, and store the clean bailer in a fresh plastic bag.
21. Replace the well cap, and lock the well protection assembly before leaving the well location.
22. Place the gloves, towels, disposable shoe covers and plastic sheet into a plastic bag for disposal.

### 3.04.3 Surface Water Sampling

Seven surface water samples will be collected from the drainageways surrounding the site. The locations of these samples are shown on Figure 1. The exact locations of the samples will be dependent upon the presence of water in the drainageways and will be subject to approval at the time of sample collection by the NYSDEC field representative. Surface water samples will be collected on two occasions selected to represent wet and dry periods. These samples will be collected in accordance with the following protocol:

#### Surface Water Sampling Protocol

When sampling from an open body of water (stream or pond) care must be exercised to collect a representative sample. The sample should cause as little disturbance to the water body as possible. Avoid taking a sample of water which shows evidence of sediment, debris or other material which may have been stirred up by the presence of the sampler.

## Surface Water Sampling

Surface water samples should be taken from 2 to 5 (or more) points spaced equally across the width of the stream or pond. The specific number of points may be determined in the field and should be adequate to accurately reflect the size of the water body being sampled. At each point, subsamples should be collected, representative of the total depth of the stream. The subsamples may then be composited into a single sample for analysis dependent upon the intent of the sampling program. For small, shallow streams, a single sample, collected just below the surface at the stream's midpoint, may be adequate for sampling and analytical purposes.

Whether samples are obtained from a boat, bridge, or by wading into the water body, samples should be taken while facing upstream, away from the influence of the sampler on stream flow.

Collection is accomplished by submerging a clean container at the sampling point to the depth required. For deep streams or ponds, a Kemmer or VanDorn sample or other sampler, specifically designed for this purpose may be used. For shallow (i.e. less than three feet deep) locations, an inverted sample container may be carefully submerged by hand and then slowly allowed to fill.

Samples should then be placed in the proper containers, preserved as necessary for the analyses to be run, and stored in an insulated ice cooler at 4°C. All pertinent information should be recorded including sample date and location, sample identification and chain-of-custody forms.

Leachate was observed at the Cherry Farm site. One leachate sample will be collected from each observed location. The leachate samples will be analyzed for NYS HSL compounds using NYS CLP.

### 3.04.4 Sediment Sampling

Seven sediment samples will be collected from locations along the site drainageways, as seen in Figure 1. The exact location of the samples will be dependent upon the presence of water in the drainageways and the determination of shallow ground water flow directions from the monitoring wells to be installed (Section 2.04 of this work plan). These locations will be selected in the field with concurrence of the NYSDEC field representative. These samples will be collected in accordance with the procedures outlined in the following protocol:

SURFACE SOIL/SHALLOW SEDIMENT SAMPLING PROTOCOL

Sample Locations

Surface soil and shallow sediment samples will be obtained by composting subsamples of approximately 40 grams each collected from four (4) equally spaced locations on the arc of a three (3) meter circle. The size of the circle may be modified as required by field conditions. One subsample will be collected at each of the four quadrant points of the circle.

Sampling Procedures: A disposable 3/4-inch diameter Lexan$^{R}$ core capable of a vertical penetration into mineral soil three (3) inches deep, shall be used to extract the four (4) 3-inch deep core subsamples. The composite samples will consist of all four (4) subsamples placed in the same sample container. A new Lexan$^{R}$

core will be used to collect samples at the same locations representing soils 3-inches to 6-inches below the top of the mineral soils.

The sample shall consist only of mineral soil. If sod layers are encountered, such as grass, remove the vegetative sod material by dissection using a scalpel. Discard the scalpel blade and replace with a clean blade after sampling at all four (4) subsites.

The field sampling team will be responsible for adhering to the following sample collection guidelines:

a. locate collection sites as far as possible from vehicle activity such as streets, driveways, and parking areas;

b. avoid, if possible, collecting samples under or immediately adjacent to trees, shrubs, and/or structures;

c. complete site description forms;

d. a new piece of Lexan$^{R}$ will be used for collecting subsamples at each location. The Lexan$^{R}$ core will be disposed of appropriately after sampling at each location; and

e. complete a chain-of-custody form for all samples.

Chain-of-custody documents will be initiated at the time of sample collection and maintained throughout the transportation to the laboratory. The analyses to be completed on these samples are detailed in Section 3.06 of this Work Plan.

Following collection of the sediment samples, all of the locations will be surveyed. The locations will then be plotted on a site map for use in preparation of the report.

## 3.05 Decontamination Procedures

### 3.05.1 General

Decontamination of personal gear (boots, gloves, and waders), sample jars and sampling equipment will be as follows:

1. Personal gear or sample containers will be washed in a bucket or tub filled between 50 and 75 percent with a trisodium phosphate (TSP) solution (2 lb of TSP per 10 gallons of clean water). The entire exterior surface of the article undergoing decontamination will be brushed.
2. Personal gear or sample containers will then be rinsed in a bucket or tub filled between 50 and 75 percent with clean water. The entire exterior surface of the article undergoing decontamination will be completely brushed.
3. Wash water will be contained and analyzed to determine the proper method of disposal.

### 3.05.2 Sampling Equipment

1. Sampling equipment will be brush washed in a bucket or tub filled between 50 and 75 percent with a TSP solution (2 lbs of TSP per 10 gallons of clean water). The entire exterior surface of the article undergoing decontamination will be completely brushed. Interior wetted

surfaces will be washed as required. Drilling equipment, augers and split spoon samplers will be decontaminated by a soap solution wash and a steam cleaning using clean water.

2. Contaminated sampling equipment will be rinsed in a bucket or tub filled between 50 and 75 percent with hexane or methanol. The entire exterior surface of the article undergoing decontamination will be completely brushed. Interior wetted surfaces will be rinsed as required.

3. Following step 2 above, all sampling equipment will be rinsed in a bucket or tub filled between 50 and 75 percent with clean water. The entire exterior surface of the article undergoing decontamination will be completely brushed. Interior wetted surfaces will be rinsed as required.

4. Wash water will be contained and analyzed to determine the proper method of disposal. Protective clothing will be contained for proper disposal.

5. Rinse solvents will be contained for proper disposal.

## 3.06 Control of Contaminated Sampling Materials

Disposable sampling and safety equipment and excess samples may be generated during sampling operations. These materials will be placed into drums (separate drums for solids, decontamination solvents, debris, and disposable equipment).

Decontamination liquids should also be separated based on those containing solvents and those containing only detergents. The drums will be sealed, labelled, and properly stored in a secure area for proper disposal. Bailed well water and contaminated drilling materials will be contained and analyzed to determine the proper method of disposal.

## 3.07 Documentation

### 3.07.1 Site Location Procedure

Following sampling location identification, a wood stake (approximately 2" X 2" X 24") will be driven into the ground, allowing approximately 8 to 10 inches of the stake to remain visible above ground. The top portion of the stake will be painted orange and labeled for identification. The label will contain sample number and sample type. The location of each stake will be recorded. Sample locations will eventually be surveyed and tied into the site grid system.

### 3.07.2 Photographs

Photographs will be taken, in addition to field notes, at the test pits to illustrate sampling locations. Photographs will show the surrounding area and reference objects which help to locate sampling sites. The picture number and roll number (if more than one roll of film is used) will be logged in the field notebook to identify which sampling site is depicted in the photograph. The film roll number will be identified by taking a photograph of an

informational sign on the first frame of the roll. This sign will have the job and film roll number written on it to identify the pictures contained on the roll.

### 3.07.3 Field Notebooks

Field notebooks will provide the means of recording data on collecting activities performed at a site. As such, entries will be described in as much detail as possible so that anyone going to the site could reconstruct a particular situation without reliance on memory.

Field notebooks will be bound. Notebooks will be assigned to field personnel, but will be stored in the document control center when not in use. Each notebook will be identified by the project-specific document number.

The cover of each notebook will contain:

Person or Organization to whom the book is assigned.

Book Number

Project Name

Start Date

End Date

Entries into the notebook will contain a variety of information. At the beginning of each entry, the date, start time, weather, all field personnel present, level of personal protection being used onsite, and the signature of the person making the entry will be entered. The names of visitors to the site, all field sampling team personnel, and the purpose of their visit will be recorded in the field notebook.

All measurements made and samples collected will be recorded. All entries will be made in ink with no erasures allowed. If an incorrect entry is made, it will be crossed out with a single strike mark. Wherever a sample is collected or a measurement is made, a detailed description of the location of the station, which includes compass and distance measurements, will be recorded. The film roll number and number of photographs taken of the station will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

Samples will be collected following the procedures documented in this plan. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, and volume and number of containers. In addition, the cooler number into which the sample is placed in the field will be recorded. Sample numbers will be assigned prior to going onsite. Significant field notebook entries (samples collected, significant observations) will be countersigned by another member of the project team.

## 3.08 Sample Control

Serialized sample tags will be used to label each sample for analysis. Chain-of-custody records will be completed for all samples according to EPA requirements and procedures set forth in NEIC Policies and Procedures EPA-330-19-78-001R (Revised 1986). Custody seals will be placed on all shipping coolers containing samples.

### 3.08.1 Sample Containers and Sample Preservation

A variety of factors affect the choice of containers and cap material. These include resistance to breakage, size, weight, interference with constituents, cost, and availability. There are also various procedures for cleaning and preparing bottles depending upon the analyses to be performed on the sample as required by CLP.

The sample containers, filling instructions, and preservation procedures will be as required by CLP. The collected samples will be kept out of direct sunlight and, after decontamination and labeling, will be placed in coolers for shipment to the analytical laboratory.

Sixteen ounce, wide-mouth glass sample containers with Teflon liners will be supplied by OBG Laboratories. Samples will be packed and labelled according to DOT regulations and personally delivered by O'Brien & Gere personnel to the analytical laboratory so that the samples can be extracted within allowable time limits.

### 3.08.2 Chain of Custody Procedures

Chain of custody procedures will be instituted and followed throughout the study.

These procedures include field custody, laboratory custody, and evidence files. Samples are physical evidence and will be handled according to procedural safeguards. The project coordinator must be prepared to produce documentation that traces the samples from the field to the laboratory and through the analysis.

The National Enforcement Investigation Center (NEIC) of the U.S. EPA defines custody of evidence in the following ways:

- In actual physical possession
- In view after being in physical possession
- In a locked respiratory
- In a secure, restrict area

Chain of custody records begin in the field when sample collection has been completed. See Figure 4, "Chain of Custody Form" for a typical arrangement of the form samplers use to complete their field logs. On that form, they will note meteorological data, equipment employed during collection, evacuation techniques and any calculations, physical characteristics of sample, date, time of day and location, and any abnormalities during sampling.

The sampler will complete the custody form, package the samples including the custody form, and seal the package with evidence tape. Shipment may be made by commercial vendors, and their policy will be to document the transfer to the package within their organization. Therefore, when the sample arrives at the laboratory, the sample custodian will sign the vendor's air bill or bill of lading. The sample custodian's duties and responsibilities upon sample receipt will be to:

- Document receipt of samples.
- Inspect sample shipping containers for presence or absence of custody seals, locks, evidence tape, container integrity.
- Record condition of shipping and sample containers in logs.

- Sign appropriate forms or documents.
- Verify and record agreement or disagreement of information on sample documents. If there is any discrepancy, record the problem and notify the project officer.
- Label sample with laboratory sample number.
- Place samples in storage, including secure storage, if appropriate.

The hand-to-hand custody of samples in the laboratory will be maintained through preparation and analysis. The analyst will be required to log samples into and from secure storage as the analysis proceeds. Samples will be returned to secure storage at the close of business. Log sheets will incorporate options for multiple entries, because several people will handle the samples throughout the analytical scheme.

The laboratory records may also be used as evidence in enforcement proceedings. Care must be exercised, therefore, to properly complete, date, and sign items needed to generate data. Copies of the following items will be stored:

- Documentation of the preparation and analysis of samples, including copies of the analyst's notebooks.
- Bench sheets, graphs, computer printouts, chromatographic outputs, mass spectral outputs.
- Copies of all QA/QC data.
- Instrument logs showing date, time and analyst.
- Analytical tracking forms which record date, time, and analyst for each step of sample preparation and analysis.

Upon completion of analysis, the project officer or his assignee will commence assimilating all the field and laboratory notes. It is they who will generate the evidence file for the project. The package will be arranged in chronological order for ease of review. When all the information has been gathered, the package will be inventoried, numbered, and stored for future reference.

The sample custodian will log in the samples on a log-in form and note the appropriate information, including sample identification and condition of the samples. Any inconsistencies in paperwork or comments on the condition of the samples will be duly noted on the form and filed with the case. To further document the custody of each sample, the analyst will complete Figures 6, 7 and 8, in the Sample Preparation and Extraction Log, Surrogate Standard Work Sheet, and GC Logbook, respectively. In all cases, the chemist or technician will sign and date the appropriate forms when handling the samples.

During the analysis, these forms will be maintained in a secure file. Following the completion of a group of samples, all appropriate forms and data sheets will be gathered and stored in the files. If necessary, the files will be purged of all the appropriate records and transmitted to the QA/QC Manager.

## SECTION 4 - CALIBRATION PROCEDURES

### 4.01 Equipment Calibration

Complete calibration procedures and frequency of calibration for laboratory equipment are detailed in the NYS CLP. Generally, a GC/MS should be initially calibrated at a minimum of five concentrations to determine the linearity of response utilizing NYS HSL compound standards. This calibration curve should encompass the concentrations of extracted samples that will be injected into the GC. For GC/MS analysis, typical linear ranges are 0-400 ng for base neutrals, 0-1000 ng for phenols and 0-1000 ng for volatiles. Once the system has been calibrated, the calibration must be verified each twelve hour time period for each GC/MS system. For the analysis of metals by furnace atomic absorption, the instrument must be calibrated daily and each time the instrument is set up. Further details are given in the NYS CLP.

All field equipment used during this project will be calibrated and operated in accordance with the manufacturer's instructions. Any field equipment used during this project that is not covered by the investigator's standard operating procedures will have a specific calibration and operation instruction sheet prepared for it.

### 4.02 Standards

Standards may be generally grouped into two classifications: primary and secondary. Primary standards include USP drugs, NBS and ASTM materials, and certain designated EPA reference materials. All other standards will be considered secondary.

No testing of primary standards is necessary. Primary standards should not be used if there is any physical indication of contamination or decomposition (i.e. partially discolored, etc.). Secondary standards should be examined when first received, either by comparison to an existing primary standard or by comparing known physical properties to literature values. The less stable standards will be rechecked at appropriate intervals, usually six months to one year.

## 4.03 Records

A records book will be kept for each standard and will include:

1. Name and date received
2. Source
3. Code or lot number
4. Purity
5. Testing data including all raw work and calculations
6. Special storage requirements
7. Storage location

These records will be checked periodically as part of the Laboratory Controls Review.

## 4.04 Equipment

A. General

1. Each major piece of analytical laboratory instrumentation that will be used on this project has been documented and is on file with the analytical laboratory.

2. A form will be prepared for each new purchase and old forms will be discarded when the instrument is replaced.

B. Testing

1. Each form will detail both preventative maintenance activities and the required QA testing and monitoring.
2. In the event the instrument does not perform within the limits specified on the monitoring form, the Laboratory Manager will be notified and a decision will be made as to what action to take.
3. If repair is deemed necessary, an "out of order" sign will be placed in the instrument until repairs are effected.

## 4.05 Calibration Records

A bound notebook will be kept with each instrument requiring calibration to record all activities associated with a maintained QA monitoring and repairs program. Additionally, these records will be checked during periodic equipment review.

# SECTION 5 - ANALYTICAL PROCEDURES

## 5.01 Laboratory Analytical Procedures

The analysis and methods detection limits for analytical parameters are given in Table C2. Specific procedures associated with parameters requiring special analytical services are provided.

When analyzing samples by the above standardized methods, the accuracy or precision of the data generated by the laboratory will be determined through analysis of replicates, spiked samples, synthetic reference standard samples, and/or field or laboratory blanks along with each set of samples. Any interference will be identified and documented.

In general, the methods accuracy will be determined by spiking the sample matrix with the analyte at a minimum of three concentration levels. The range of the spiking levels will be selected to bracket the concentration of interest. Percent recoveries of the spikes will be calculated and compared with synthetic standards. The methods precision will be determined by analyzing a minimum of three replicates at each spiking level. The precision will be evaluated by calculating the standard deviation.

The data generated will, whenever possible, be input to the laboratory base data management system. Analyst's work sheets will be filed for one year as a temporary record. When approved and signed, data reports and pertinent information will be reported to the client.

## 5.02 Field Procedures

Field analyses of ground water will consist of pH, specific conductance, and temperature measurements.

## SECTION 6 - DATA REDUCTION, VALIDATION, AND REPORTING

### 6.01 General

The contract laboratory will be performing analysis on all collected samples. Data reduction and validation will be incorporated into the in-house effort for all parameters.

### 6.02 Data Reduction and Reporting

The following data handling procedures may be employed by the contract laboratory:

#### 6.02.1 Data Production

A Hewlett-Packard Model 5996 GC/MS equipped with a 7672A HP Auto Sampler and a RTE6 VM operating system that uses an Aquarius software package will be used for the positive identification and quantification of NYS HSL compounds in sample extracts. Output from the determination is a chromatogram recorded on thermal printer paper. A Perkin-Elmer Model 3030B atomic absorption (AA) spectrophotometer will be used for the quantification of NYS HSL metals.

#### 6.02.2 Data Reduction

Output from the GC will be processed for presentation in two formats:

1. A real-time chromatogram

2. A post-run integration report containing the following:

    a. Retention time

    b. Response factor

    c. Concentration

Reduction of data from the analyses of the metals and fluoride will be minimal and will consist primarily of tabulating the results and performing basic descriptive statistics on the data.

### 6.02.3 Data Transcription

The post integration report will contain the following:

1. A list of all compounds.

2. Relative retention times.

3. Relative response factor to their internal standards.

4. Concentrations of compounds, surrogate and internals.

Quality Control/Quality Assurance data such as resolution and calibration standards will also be processed and stored in the above manner.

### 6.02.4 Data Verification

The processed transcribed information and the hard copied raw data will then be evaluated by the Group Leader to verify the validity of the data and determine whether reinjection or additional cleanup steps are required. The results of the evaluation will be recorded in a notebook and placed in the Sample Status File.

### 6.02.5 Distribution

Following final review of the GC Group Leader and Manager of Analytical Services, the results of the analytical determination will be shipped to the Contractor. The format that will be used for presentation of data is presented in the IFB forms. Additional data such as copies of raw data and chromatograms will be provided upon request.

### 6.02.6 In-House Storage

Results of all analytical determinations will be stored in the RTE6 computer. Raw data tapes will be logged into the computer on a separate file and listed by tape number and its contents. The data tapes will be stored indefinitely. Should a request be made for a particular raw data tape, the tape will be copied and the copy kept in the archive while the original is sent to the Contractor. All notebooks will also be archived and stored in the O'Brien & Gere Central File.

### 6.02.7 Reporting

Once a sample has been tagged and input to the laboratory data management system, we have the ability to determine its exact status. With the available maintenance programs and tracking forms, the group leaders can trace the progress of one sample or an entire group of samples. Therefore, a client is able to receive partial data before the entire program is complete.

For a program that covers the course of several months, it is imperative that interim reports be submitted. It is anticipated that

turnaround for a batch of samples will be 28 days from sample arrival. The RTE6 computer system, with the Aquarius software will generate a final report following injection and data evaluation.

There may be certain instances requiring faster turnaround and we shall make every attempt to meet those needs. Our past experience on similar programs have proven our capability to supply information in a timely manner.

## 6.03 Data Validation

Prior to submittal of the data to the Project Manager for his review, data will be validated by the individual laboratory group leaders and the Project QA/QC Manager.

The validation process by group leaders will include the review of spike recoveries and surrogate recovery. Additionally, the group leaders will check for the adherence to accuracy and precision criteria, unusually high or low parameter values and possible transmittal errors.

The Laboratory Quality Assurance Manager identified in Figure 2 will perform validation of the data from all laboratories.

The requirements to be checked in validation, in order, will be as follows:

I. Sample Holding Times

II. Calibration

   a. Initial Calibration and Calibration Verification

   b. Continuing Calibration Verification

   c. Calibration Blank

III. Blanks

   a. Laboratory preparation blank

   b. Procedural Blank

IV. Interference Check Sample Analysis

V. Laboratory Control Sample Analysis

VI. Specific Sample Results

a. Spiked Sample Analysis

b. QA/QC Analysis

1). Analytical Spikes

c. Sample Result Verification

VII. Field and Other QC

VIII. Quarterly Submissions

IX. Overall Case (Batch) Assessment

The Project QA/QC Manager will review the Laboratory QA/QC report and documentation and compare the performance to the requirements of the protocols and program objectives.

# SECTION 7 - INTERNAL QUALITY CONTROL CHECKS

## 7.01 Quality Assurance/Quality Control Objectives

The requirements listing identifies the frequency and control limits for acceptability. Upon completion of analysis, the results of quality control data will be reviewed to verify compliance with the criteria listed. The goal is to achieve compliance with the criteria, 88% completeness on the matrix spike and matrix spike duplicate. When results are reported to the project team, quality control data will be included in the package for review. The review will include the analysis of EPA standard reference materials where available to verify initial calibration of non CLP analysis. The criteria for acceptance will be ±10% of known values. Matrix spikes will monitor the methodology and recoveries will be compared to Exhibit E of the WA-85-177 CLP protocols. Matrix spike duplicates will be incorporated to be an indicator of the precision of sample results. The relative percent difference calculations will be compared to Exhibit E of the CLP protocol.

## 7.02 Field Sampling Quality Control

Field sampling crews will always be under the direct supervision of a crew chief. Bound log books and appropriate data sheets will be used to document the collection of samples so that any individual sample can be traced back to its point of origin; sampler and sampling equipment.

## 7.03 Field Analytical Procedures Quality Control

Field measurements of pH, temperature and specific conductance will be taken on water samples only. The pH meter will be checked against two known standard pH buffers (7 and 10) before and after each days use.

Temperature measurements will be made with a mercury-filled Celsius thermometer. At a minimum, the thermometer will have a scale marked for every 0.1C, with marking etched on the capillary glass. Field operations will require a thermometer with a protective case to prevent breakage. The thermometer will be checked periodically against a precision thermometer certified by the National Bureau of Standards.

Conductivity reading will be made with a portable specific conductivity meter. The meter will be calibrated against a 0.010 normal potassium chloride solution at least once per day.

## 7.04 Preventive Maintenance

Preventive maintenance procedures will be carried out on all field equipment in accordance with the procedures outlined by the manufacturer's equipment manuals. Any field equipment used during this project that is not covered by the standard operating procedures will have a specific maintenance instruction sheet prepared for it.

## SECTION 8 - AUDIT PROCEDURES

The Contractor Project Manager and the DEC Project Manager will monitor the performance of the QA audit listed in this plan. The Contractor will conduct an initial audit of all analytical data, with the final audit performed by the contractor and NYSDEC Quality Assurance Officer (QAO).

The contractor will designate a Project QA/QC Manager. A performance audit consisting of analysis of appropriate blanks, fortified samples and standard solutions will be performed. The contractor's Project QA/QC Manager will maintain a record of such audits and will inform the DEC of significant deviations from established control limits. These audits will test not only the total system's response, but inherently all major measurement methods.

The contractor's Project QA/QC Manager will report to the Project Manager and the DEC the result of assessment of: the accuracy, precision and completeness of the data, results of the performance and system audits, and any problems encountered in the analytical procedures. The Project QA/QC Manager, in conjunction with the Laboratory QA/QC Manager, the analyst, analyst's supervisor, and Project Manager will formulate recommendations to correct any deficiencies in the analytical protocol or data. These corrective measures will be in accord with ongoing good laboratory practices and the overall Quality Assurance Program.

## SECTION 9 - DATA ASSESSMENT PROCEDURES

The Contractor Laboratory QA/QC Manager will be responsible for data assessment. His assessment will be based upon instrument tuning criteria, surrogate recoveries, matrix spikes and matrix spike duplicates. Procedures for data assessment will be consistent with those used by USEPA CRL.

The Laboratory QA/QC Manager, with individual laboratory group leaders, will identify any data that should be rated as "unacceptable" or "preliminary", and take corrective actions, if deemed necessary.

## SECTION 10 - CORRECTIVE ACTION PROCEDURES

Corrective action procedures that might be implemented from audit results or upon detection of data unacceptability will be developed on a case-by-case basis.

The actions may include:

- Reanalyzing samples if holding time requirements have not been exceeded.
- Altering field or handling procedures.
- Resampling.
- Using a different batch of sample containers.
- Recommending an audit of laboratory procedures.
- Accepting data with known levels of uncertainty.
- Discard data.

The Project Manager will discuss corrective actions with the Regional Resource Contaminants Assessment Coordinator prior to initiating them.

## SECTION 11 - QUALITY ASSURANCE REPORTS TO MANAGEMENT

The final Field Investigation report will contain separate QA sections that summarize data quality information collected during the project. Specifically, the reports will include the:

1. Project QA/QC Manager report to DEC on the accuracy, precision, completeness of data and results of the performance and system audit.
2. Report to DEC on the results of data assessments.

TABLE C1

PRIMARY CONTACTS

| Name and Responsibility | Organization and Address | Phone Number |
|---|---|---|
| Mike Sherman | Niagara Mohawk Power Corp.<br>Erie Boulevard West<br>Syracuse, New York | (315) 428-6624 |

HAZARDOUS SUBSTANCES LIST

CLP TCL VOLATILES - MATRIX: WATER/WELLS

| CHEMICAL COMPOUND | METHOD | QUANTITATION LIMIT + | AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|---|---|---|
| | (CLP) | ppb | | | |
| chloromethane | IFB WA 87-K* | 10 | SEE BELOW | SEE BELOW | SEE BELOW |
| bromomethane | IFB WA 87-K* | 10 | " | " | " |
| vinyl chloride | IFB WA 87-K* | 10 | " | " | " |
| chloroethane | IFB WA 87-K* | 10 | " | " | " |
| methylene chloride | IFB WA 87-K* | 5 | " | " | " |
| acetone | IFB WA 87-K* | 10 | " | " | " |
| carbon disulfide | IFB WA 87-K* | 5 | " | " | " |
| 1,1-dichloroethene | IFB WA 87-K* | 5 | " | " | " |
| 1,1-dichloroethane | IFB WA 87-K* | 5 | " | " | " |
| 1,2-dichloroethene | IFB WA 87-K* | 5 | " | " | " |
| chloroform | IFB WA 87-K* | 5 | " | " | " |
| 1,2-dichloroethane | IFB WA 87-K* | 5 | " | " | " |
| 2-butanone | IFB WA 87-K* | 10 | " | " | " |
| 1,1,1-trichloroethane | IFB WA 87-K* | 5 | " | " | " |
| carbon tetrachloride | IFB WA 87-K* | 5 | " | " | " |
| vinyl acetate | IFB WA 87-K* | 10 | " | " | " |
| bromodichloromethane | IFB WA 87-K* | 5 | " | " | " |
| 1,2-dichloropropane | IFB WA 87-K* | 5 | " | " | " |
| c-1,3-dichloropropene | IFB WA 87-K* | 5 | " | " | " |
| trichloroethene | IFB WA 87-K* | 5 | " | " | " |
| dibromochloromethane | IFB WA 87-K* | 5 | " | " | " |
| 1,1,2-trichloroethane | IFB WA 87-K* | 5 | " | " | " |
| benzene | IFB WA 87-K* | 5 | " | " | " |
| t-1,3-dichloropropene | IFB WA 87-K* | 5 | " | " | " |
| bromoform | IFB WA 87-K* | 5 | " | " | " |
| 4-methyl-2-pentanone | IFB WA 87-K* | 10 | " | " | " |
| 2-hexanone | IFB WA 87-K* | 10 | " | " | " |
| tetrachloroethene | IFB WA 87-K* | 5 | " | " | " |
| toluene | IFB WA 87-K* | 5 | " | " | " |
| 1,1,2,2-tetrachloroethane | IFB WA 87-K* | 5 | " | " | " |
| chlorobenzene | IFB WA 87-K* | 5 | " | " | " |
| ethyl benzene | IFB WA 87-K* | 5 | " | " | " |
| styrene | IFB WA 87-K* | 5 | " | " | " |
| xylenes (total) | IFB WA 87-K* | 5 | " | " | " |

+ Specific quantitation limits are highly matrix dependent. The quantitation limits listed here are provided for guidance and may not always be achievable.

* U.S.EPA Contract Laboratory Program Statement of Work For Organics Analysis Multi-media Multi-concentration. 10/86. Revised: 1/87, 2/87, 7/87. IFB-WA87-K236, IFB WA87-K237, IFB WA87-K238.

HAZARDOUS SUBSTANCES LIST
CLP TCL VOLATILES - MATRIX: WATER/WELLS

| AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|
| Reagent Blank | 1 per case or 5% of sample shipment. | Less than 5x CRDL for solvents, less than CRDL for all others |
| Surrogate Spike | All samples and blank (including MS/MSD). | Recovery limits within those of Table 4.2, Exhibit E WA 87-K*. |
| MS/MSD | 1 per case or 1 in 20 of similar concentration/matrix. | Recovery limits within those of Table 5.2, Exhibit E WA 87-K*. |
| Calibration Continuing | Each 12 hours | Minimum RF 0.300; must be less than 30% difference for any check compound. |
| Method Blank | 1 in 20-provided by sampling crew | Same as reagent blank |
| MS Tuning | One per day. | BFB key ions and abundance criteria must be met for all 9 ions. |
| Calibration Verification | Once | Five concentrations - linear range volatiles 20 - 200 mg/L. |

HAZARDOUS SUBSTANCES LIST
CLP TCL VOLATILES - MATRIX: SOIL/SEDIMENT

| CHEMICAL COMPOUND | METHOD (CLP) | QUANTITATION LIMIT + ppb | AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|---|---|---|
| chloromethane | IFB WA 87-K* | 10 | SEE BELOW | SEE BELOW | SEE BELOW |
| bromomethane | IFB WA 87-K* | 10 | " | " | " |
| vinyl chloride | IFB WA 87-K* | 10 | " | " | " |
| chloroethane | IFB WA 87-K* | 10 | " | " | " |
| methylene chloride | IFB WA 87-K* | 5 | " | " | " |
| acetone | IFB WA 87-K* | 10 | " | " | " |
| carbon disulfide | IFB WA 87-K* | 5 | " | " | " |
| 1,1-dichloroethene | IFB WA 87-K* | 5 | " | " | " |
| 1,1-dichloroethane | IFB WA 87-K* | 5 | " | " | " |
| 1,2-dichloroethene | IFB WA 87-K* | 5 | " | " | " |
| chloroform | IFB WA 87-K* | 5 | " | " | " |
| 1,2-dichloroethane | IFB WA 87-K* | 5 | " | " | " |
| 2-butanone | IFB WA 87-K* | 10 | " | " | " |
| 1,1,1-trichloroethane | IFB WA 87-K* | 5 | " | " | " |
| carbon tetrachloride | IFB WA 87-K* | 5 | " | " | " |
| vinyl acetate | IFB WA 87-K* | 10 | " | " | " |
| bromodichloromethane | IFB WA 87-K* | 5 | " | " | " |
| 1,2-dichloropropane | IFB WA 87-K* | 5 | " | " | " |
| c-1,3-dichloropropene | IFB WA 87-K* | 5 | " | " | " |
| trichloroethene | IFB WA 87-K* | 5 | " | " | " |
| dibromochloromethane | IFB WA 87-K* | 5 | " | " | " |
| 1,1,2-trichloroethane | IFB WA 87-K* | 5 | " | " | " |
| benzene | IFB WA 87-K* | 5 | " | " | " |
| t-1,3-dichloropropene | IFB WA 87-K* | 5 | " | " | " |
| bromoform | IFB WA 87-K* | 5 | " | " | " |
| 4-methyl-2-pentanone | IFB WA 87-K* | 10 | " | " | " |
| 2-hexanone | IFB WA 87-K* | 10 | " | " | " |
| tetrachloroethene | IFB WA 87-K* | 5 | " | " | " |
| toluene | IFB WA 87-K* | 5 | " | " | " |
| 1,1,2,2-tetrachloroethane | IFB WA 87-K* | 5 | " | " | " |
| chlorobenzene | IFB WA 87-K* | 5 | " | " | " |
| ethyl benzene | IFB WA 87-K* | 5 | " | " | " |
| styrene | IFB WA 87-K* | 5 | " | " | " |
| xylenes (total) | IFB WA 87-K* | 5 | " | " | " |

+ Specific quantitation limits are highly matrix dependent. The quantitation limits listed here are provided for guidance and may not always be achievable.

Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 125 times the individual Low Soil/Sediment CRQL. Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

* U.S.EPA Contract Laboratory Program Statement of Work For Organics Analysis Multi-media Multi-concentration. 10/86. Revised: 1/87, 2/87, 7/87. IFB-WA87-K236, IFB WA87-K237, IFB WA87-K238.

HAZARDOUS SUBSTANCES LIST
CLP TCL VOLATILES - MATRIX: SOIL/SEDIMENT

| AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|
| Reagent Blank | 1 per case or 5% of sample shipment. | Less than 5x CRDL for solvents, less than CRDL for all others |
| Surrogate Spike | All samples and blank (including MS/MSD). | Recovery limits within those of Table 4.2, Exhibit E WA 87-K*. |
| MS/MSD | 1 per case or 1 in 20 of similar concentration/matrix. | Recovery limits within those of Table 5.2, Exhibit E WA 87-K*. |
| Calibration Continuing | Each 12 hours | Minimum RF 0.300; must be less than 30% difference for any check compound. |
| Method Blank | 1 in 20-provided by sampling crew | Same as reagent blank |
| MS Tuning | One per day. | BFB key ions and abundance criteria must be met for all 9 ions. |
| Calibration Verification | Once | Five concentrations - linear range volatiles 20 - 200 mg/L. |

HAZARDOUS SUBSTANCES LIST
CLP TCL SEMI-VOLATILES - MATRIX: WATER/WELLS

| CHEMICAL COMPOUND | METHOD (CLP) | QUANTITATION LIMIT + ppb | AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|---|---|---|
| phenol | WA 87-K* | 10 | SEE BELOW | SEE BELOW | SEE BELOW |
| bis(2-chloroethyl) ether | WA 87-K* | 10 | " | " | " |
| 2-chlorophenol | WA 87-K* | 10 | " | " | " |
| 1,3-dichlorobenzene | WA 87-K* | 10 | " | " | " |
| 1,4-dichlorobenzene | WA 87-K* | 10 | " | " | " |
| benzyl alcohol | WA 87-K* | 10 | " | " | " |
| 1,2-dichlorobenzene | WA 87-K* | 10 | " | " | " |
| 2-methylphenol | WA 87-K* | 10 | " | " | " |
| bis(2-chloroisopropyl) ether | WA 87-K* | 10 | " | " | " |
| 4-methylphenol | WA 87-K* | 10 | " | " | " |
| N-nitroso-di-n-propylamine | WA 87-K* | 10 | " | " | " |
| hexachloroethane | WA 87-K* | 10 | " | " | " |
| nitrobenzene | WA 87-K* | 10 | " | " | " |
| isophorone | WA 87-K* | 10 | " | " | " |
| 2-nitrophenol | WA 87-K* | 10 | " | " | " |
| 2,4-dimethylphenol | WA 87-K* | 10 | " | " | " |
| benzoic acid | WA 87-K* | 50 | " | " | " |
| bis(2-chloroethoxy)methane | WA 87-K* | 10 | " | " | " |
| 2,4-dichlorophenol | WA 87-K* | 10 | " | " | " |
| 1,2,4-trichlorobenzene | WA 87-K* | 10 | " | " | " |
| naphthalene | WA 87-K* | 10 | " | " | " |
| 4-chloroaniline | WA 87-K* | 10 | " | " | " |
| hexachlorobutadiene | WA 87-K* | 10 | " | " | " |
| 4-chloro-3-methylphenol | WA 87-K* | 10 | " | " | " |
| 2-methylnaphtalene | WA 87-K* | 10 | " | " | " |
| hexachlorocyclopentadiene | WA 87-K* | 10 | " | " | " |
| 2,4,6-trichlorophenol | WA 87-K* | 10 | " | " | " |
| 2,4,5-trichlorophenol | WA 87-K* | 10 | " | " | " |
| 2-chloronaphthalene | WA 87-K* | 10 | " | " | " |
| 2-nitroaniline | WA 87-K* | 50 | " | " | " |
| dimethyl phthalate | WA 87-K* | 10 | " | " | " |
| acenaphthylene | WA 87-K* | 10 | " | " | " |
| 2,6-dinitrotoluene | WA 87-K* | 10 | " | " | " |
| 3-nitroaniline | WA 87-K* | 50 | " | " | " |
| acenaphthene | WA 87-K* | 10 | " | " | " |
| 2,4-dinitrophenol | WA 87-K* | 50 | " | " | " |
| 4-nitrophenol | WA 87-K* | 50 | " | " | " |
| dibenzofuran | WA 87-K* | 10 | " | " | " |
| 2,4-dinitrotoluene | WA 87-K* | 10 | " | " | " |
| diethyl phthalate | WA 87-K* | 10 | " | " | " |
| 4-chlorophenyl phenyl ether | WA 87-K* | 10 | " | " | " |
| fluorene | WA 87-K* | 10 | " | " | " |
| 4-nitroaniline | WA 87-K* | 50 | " | " | " |
| 4,6-dinitro-2-methylphenol | WA 87-K* | 50 | " | " | " |
| N-nitrosodiphenylamine | WA 87-K* | 10 | " | " | " |
| 4-bromophenyl phenyl ether | WA 87-K* | 10 | " | " | " |
| hexachlorobenzene | WA 87-K* | 10 | " | " | " |
| pentachlorophenol | WA 87-K* | 50 | " | " | " |
| phenanthrene | WA 87-K* | 10 | " | " | " |
| anthracene | WA 87-K* | 10 | " | " | " |
| di-n-butylphthalate | WA 87-K* | 10 | " | " | " |
| fluoranthene | WA 87-K* | 10 | " | " | " |
| pyrene | WA 87-K* | 10 | " | " | " |

HAZARDOUS SUBSTANCES LIST
CLP TCL SEMI-VOLATILES - MATRIX: WATER/WELLS

| CHEMICAL COMPOUND | METHOD | QUANTITATION LIMIT + | AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|---|---|---|
| butyl benzyl phthalate | WA 87-K* | 10 | SEE BELOW | SEE BELOW | SEE BELOW |
| 3,3'-dichlorobenzidine | WA 87-K* | 20 | " | " | " |
| benzo(a)anthracene | WA 87-K* | 10 | " | " | " |
| chrysene | WA 87-K* | 10 | " | " | " |
| bis(2-ethylhexyl)phthalate | WA 87-K* | 10 | " | " | " |
| di-n-octyl phthalate | WA 87-K* | 10 | " | " | " |
| benzo(b)fluoranthene | WA 87-K* | 10 | " | " | " |
| benzo(k)fluoranthene | WA 87-K* | 10 | " | " | " |
| benzo(a)pyrene | WA 87-K* | 10 | " | " | " |
| indeno(1,2,3-c,d)pyrene | WA 87-K* | 10 | " | " | " |
| dibenzo(a,h)anthracene | WA 87-K* | 10 | " | " | " |
| benzo(g,h,i)perylene | WA 87-K* | 10 | " | " | " |

+ Specific quantitation limits are highly matrix dependent. The quantitation limits listed here are provided for guidance and may not always be achievable.

* U.S.EPA Contract Laboratory Program Statement of Work For Organics Analysis Multi-media Multi-concentration. 10/86. Revised: 1/87, 2/87, 7/87. IFB-WA87-K236, IFB WA87-K237, IFB WA87-K238.

| AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|
| Reagent Blank | 1 per case or 5% of sample shipment. | Less than 5x CRDL for solvents, less than CRDL for all others |
| Surrogate Spike | All samples and blank (including MS/MSD). | Recovery limits within those of Table 4.2, Exhibit E WA 87-K*. |
| MS/MSD | 1 per case or 1 in 20 of similar concentration/matrix. | Recovery limits within those of Table 5.2, Exhibit E WA 87-K*. |
| Calibration Continuing | Each 12 hours | Minimum RF 0.05; must be less than 30% difference for any check compound. |
| Method Blank | 1 in 20-provided by sampling crew | Same as reagent blank |
| MS Tuning | One per day. | DFTPP key ions & abundance criteria must be met for all 13 ions. |
| Calibration Verification | Once | Five concentrations - linear range 20 - 160 ng.<br>Four concentrations - nine compounds (phenols and aniline) 50 - 160 ng/L. |

HAZARDOUS SUBSTANCES LIST

CLP TCL SEMI-VOLATILES - MATRIX: SOIL/SEDIMENT

| CHEMICAL COMPOUND | METHOD | QUANTITATION LIMIT + | AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|---|---|---|
| | (CLP) | ppb** | | | |
| phenol | WA 87-K* | 330 | SEE BELOW | SEE BELOW | SEE BELOW |
| bis(2-chloroethyl) ether | WA 87-K* | 330 | " | " | " |
| 2-chlorophenol | WA 87-K* | 330 | " | " | " |
| 1,3-dichlorobenzene | WA 87-K* | 330 | " | " | " |
| 1,4-dichlorobenzene | WA 87-K* | 330 | " | " | " |
| benzyl alcohol | WA 87-K* | 330 | " | " | " |
| 1,2-dichlorobenzene | WA 87-K* | 330 | " | " | " |
| 2-methylphenol | WA 87-K* | 330 | " | " | " |
| bis(2-chloroisopropyl) ether | WA 87-K* | 330 | " | " | " |
| 4-methylphenol | WA 87-K* | 330 | " | " | " |
| N-nitroso-di-n-propylamine | WA 87-K* | 330 | " | " | " |
| hexachloroethane | WA 87-K* | 330 | " | " | " |
| nitrobenzene | WA 87-K* | 330 | " | " | " |
| isophorone | WA 87-K* | 330 | " | " | " |
| 2-nitrophenol | WA 87-K* | 330 | " | " | " |
| 2,4-dimethylphenol | WA 87-K* | 330 | " | " | " |
| benzoic acid | WA 87-K* | 1600 | " | " | " |
| bis(2-chloroethoxy)methane | WA 87-K* | 330 | " | " | " |
| 2,4-dichlorophenol | WA 87-K* | 330 | " | " | " |
| 1,2,4-trichlorobenzene | WA 87-K* | 330 | " | " | " |
| naphthalene | WA 87-K* | 330 | " | " | " |
| 4-chloroaniline | WA 87-K* | 330 | " | " | " |
| hexachlorobutadiene | WA 87-K* | 330 | " | " | " |
| 4-chloro-3-methylphenol | WA 87-K* | 330 | " | " | " |
| 2-methylnaphtalene | WA 87-K* | 330 | " | " | " |
| hexachlorocyclopentadiene | WA 87-K* | 330 | " | " | " |
| 2,4,6-trichlorophenol | WA 87-K* | 330 | " | " | " |
| 2,4,5-trichlorophenol | WA 87-K* | 1600 | " | " | " |
| 2-chloronaphthalene | WA 87-K* | 330 | " | " | " |
| 2-nitroaniline | WA 87-K* | 1600 | " | " | " |
| dimethyl phthalate | WA 87-K* | 330 | " | " | " |
| acenaphthylene | WA 87-K* | 330 | " | " | " |
| 2,6-dinitrotoluene | WA 87-K* | 330 | " | " | " |
| 3-nitroaniline | WA 87-K* | 1600 | " | " | " |
| acenaphthene | WA 87-K* | 330 | " | " | " |
| 2,4-dinitrophenol | WA 87-K* | 1600 | " | " | " |
| 4-nitrophenol | WA 87-K* | 1600 | " | " | " |
| dibenzofuran | WA 87-K* | 330 | " | " | " |
| 2,4-dinitrotoluene | WA 87-K* | 330 | " | " | " |
| diethyl phthalate | WA 87-K* | 330 | " | " | " |
| 4-chlorophenyl phenyl ether | WA 87-K* | 330 | " | " | " |
| fluorene | WA 87-K* | 330 | " | " | " |
| 4-nitroaniline | WA 87-K* | 1600 | " | " | " |
| 4,6-dinitro-2-methylphenol | WA 87-K* | 1600 | " | " | " |
| N-nitrosodiphenylamine | WA 87-K* | 330 | " | " | " |
| 4-bromophenyl phenyl ether | WA 87-K* | 330 | " | " | " |
| hexachlorobenzene | WA 87-K* | 330 | " | " | " |
| pentachlorophenol | WA 87-K* | 1600 | " | " | " |
| phenanthrene | WA 87-K* | 330 | " | " | " |
| anthracene | WA 87-K* | 330 | " | " | " |
| di-n-butylphthalate | WA 87-K* | 330 | " | " | " |
| fluoranthene | WA 87-K* | 330 | " | " | " |
| pyrene | WA 87-K* | 330 | " | " | " |

HAZARDOUS SUBSTANCES LIST

CLP TCL SEMI-VOLATILES - MATRIX: SOIL/SEDIMENT

| CHEMICAL COMPOUND | METHOD | QUANTITATION LIMIT + | AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|---|---|---|
| butyl benzyl phthalate | WA 87-K* | 330 | SEE BELOW | SEE BELOW | SEE BELOW |
| 3,3'-dichlorobenzidine | WA 87-K* | 660 | " | " | " |
| benzo(a)anthracene | WA 87-K* | 330 | " | " | " |
| chrysene | WA 87-K* | 330 | " | " | " |
| bis(2-ethylhexyl)phthalate | WA 87-K* | 330 | " | " | " |
| di-n-octyl phthalate | WA 87-K* | 330 | " | " | " |
| benzo(b)fluoranthene | WA 87-K* | 330 | " | " | " |
| benzo(k)fluoranthene | WA 87-K* | 330 | " | " | " |
| benzo(a)pyrene | WA 87-K* | 330 | " | " | " |
| indeno(1,2,3-c,d)pyrene | WA 87-K* | 330 | " | " | " |
| dibenzo(a,h)anthracene | WA 87-K* | 330 | " | " | " |
| benzo(g,h,i)perylene | WA 87-K* | 330 | " | " | " |

+ Specific quantitation limits are highly matrix dependent. The quantitation limits listed here are provided for guidance and may not always be achievable.

* U.S.EPA Contract Laboratory Program Statement of Work For Organics Analysis Multi-media Multi-concentration. 10/86. Revised: 1/87, 2/87, 7/87. IFB-WA87-K236, IFB WA87-K237, IFB WA87-K238.

**Medium Soil/Sediment Contract required Quantitation Limits (CRQL) for Semi-volatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

| AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|
| Reagent Blank | 1 per case or 5% of sample shipment. | Less than 5x CRDL for solvents, less than CRDL for all others |
| Surrogate Spike | All samples and blank (including MS/MSD). | Recovery limits within those of Table 4.2, Exhibit E WA 87-K*. |
| MS/MSD | 1 per case or 1 in 20 of similar concentration/matrix. | Recovery limits within those of Table 5.2, Exhibit E WA 87-K*. |
| Calibration Continuing | Each 12 hours | Minimum RF 0.05; must be less than 30% difference for any check compound. |
| Method Blank | 1 in 20-provided by sampling crew | Same as reagent blank |
| MS Tuning | One per day. | DFTPP key ions & abundance criteria must be met for all 13 ions. |
| Calibration Verification | Once | Five concentrations - linear range 20 - 160 ng.<br>Four concentrations - nine compounds (phenols and aniline) 50 - 160 ng/L. |

HAZARDOUS SUBSTANCES LIST
CLP TCL METALS - MATRIX: WATER/WELLS

| CHEMICAL COMPOUND | METHOD | QUANTITATION LIMIT + | AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|---|---|---|
| | | ppb | | | |
| aluminum | WA87-K* | 200 | SEE BELOW | SEE BELOW | SEE BELOW |
| antimony | WA87-K* | 60 | " | " | " |
| arsenic | WA87-K* | 10 | " | " | " |
| barium | WA87-K* | 200 | " | " | " |
| beryllium | WA87-K* | 5 | " | " | " |
| cadmium | WA87-K* | 5 | " | " | " |
| calcium | WA87-K* | 5000 | " | " | " |
| chromium | WA87-K* | 10 | " | " | " |
| cobalt | WA87-K* | 50 | " | " | " |
| copper | WA87-K* | 25 | " | " | " |
| iron | WA87-K* | 100 | " | " | " |
| lead | WA87-K* | 5 | " | " | " |
| magnesium | WA87-K* | 5000 | " | " | " |
| manganese | WA87-K* | 15 | " | " | " |
| mercury | WA87-K* | 0.2 | " | " | " |
| nickel | WA87-K* | 40 | " | " | " |
| potassium | WA87-K* | 5000 | " | " | " |
| selenium | WA87-K* | 5 | " | " | " |
| silver | WA87-K* | 10 | " | " | " |
| sodium | WA87-K* | 5000 | " | " | " |
| thallium | WA87-K* | 10 | " | " | " |
| vanadium | WA87-K* | 50 | " | " | " |
| zinc | WA87-K* | 20 | " | " | " |
| cyanide | WA87-K* | 10 | " | " | " |

* U.S.EPA Contract Laboratory Program Statement of Work For Inorganics Analysis Multi-media Multi-concentration. SOW NO. 787. IFB-WA87-K025, IFB WA87-K026, IFB WA87-K027.

+ Subject to the Restrictions specified in the first page of Part G, Section IV of Exhibit D (Alternate Methods - Catastrophic Failure) any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits may only be used in the following circumstances:

If the sample concentration exceeds 5 times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the Contract Required Detection Limit. This is illustrated in the example below:

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 220
Contract Required Detection Limit (CRDL) = 5

The value of 220 may be reported even though instrument detection limit is greater than CRDL. The instrument or method detection limit must be documented as described in Exhibit E.

The CRDL are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The detection limits for samples may be considerably higher depending on the sample matrix.

HAZARDOUS SUBSTANCES LIST

CLP TCL METALS - MATRIX: WATER/WELLS

| AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|
| Calibration Verification | Calibrated daily and each time instrument is set up; verify at at a frequency of 10% or every 2 hr, whichever is greater. | Within ±10% of true value for all except tin and mercury (±20% of true value). |
| Calibration Blank | During calibration at a frequency of 10% during run and at end of run. | No more than CRDL. |
| Preparation Blank | 1 per batch of samples digested or 1 in 20 whichever is greater | No more than CRDL. |
| Spiked Sample Analysis | 1 per group of similar concentration and matrix, 1 per case of samples, or 1 in 20, whichever is greater. | Within ±25% recovery |
| Lab Control Sample (aqueous) | 1 for each procedure for each case of samples received; 1 in 20 or 1 per batch digested, whichever is greater. | Within 80-120% recovery |

Dissolved Metals: Those constituents (metals) which will pass through a 0.45μ membrane filter.

Field Filtration Protocol:

An aliquot of sample will be passed through a 0.45μ membrane filter by one of the following methods:

1) Plastic syringe equipped with a filter holder (Swinnex Filter Holder).
2) Hand vacuum pump and a 500 ml .side arm, glass filtration flask.
3) Bench top (electric) filtration system.

•Standards and samples will be matrix-matched to the concentration of the mineral acid.

•Calibration curves, continuing calibration and corrective measures records will be documented.

•One medium range internal synthetic standard will be analyzed to verify calibration and will be within ±10% of true value

•Furnace work will require duplicate analysis of each sample to verify recovery of spiked material. If recoveries are within ±10%, methods of addition will not be required. If outside this criterion, methods of standard addition will be required.

•For chromium analysis, a nitrous oxide flame will be used.

HAZARDOUS SUBSTANCES LIST

CLP TCL METALS - MATRIX: SOIL/SEDIMENT

| CHEMICAL COMPOUND | METHOD | QUANTITATION LIMIT + | AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|---|---|---|
| | | ppm | | | |
| aluminum | WA87-K* | 40 | SEE BELOW | SEE BELOW | SEE BELOW |
| antimony | WA87-K* | 12 | " | " | " |
| arsenic | WA87-K* | 2 | " | " | " |
| barium | WA87-K* | 40 | " | " | " |
| beryllium | WA87-K* | 1 | " | " | " |
| cadmium | WA87-K* | 1 | " | " | " |
| calcium | WA87-K* | 1000 | " | " | " |
| chromium | WA87-K* | 2 | " | " | " |
| cobalt | WA87-K* | 10 | " | " | " |
| copper | WA87-K* | 5 | " | " | " |
| iron | WA87-K* | 20 | " | " | " |
| lead | WA87-K* | 1 | " | " | " |
| magnesium | WA87-K* | 1000 | " | " | " |
| manganese | WA87-K* | 3 | " | " | " |
| mercury | WA87-K* | 0.04 | " | " | " |
| nickel | WA87-K* | 8 | " | " | " |
| potassium | WA87-K* | 1000 | " | " | " |
| selenium | WA87-K* | 1 | " | " | " |
| silver | WA87-K* | 2 | " | " | " |
| sodium | WA87-K* | 1000 | " | " | " |
| thallium | WA87-K* | 2 | " | " | " |
| vanadium | WA87-K* | 10 | " | " | " |
| zinc | WA87-K* | 4 | " | " | " |
| cyanide | WA87-K* | 2 | " | " | " |

* U.S.EPA Contract Laboratory Program Statement of Work For Inorganics Analysis Multi-media Multi-concentration. SOW NO. 787. IFB-WA87-K025, IFB WA87-K026, IFB WA87-K027.

**Subject to the Restrictions specified in the first page of Part G, Section IV of Exhibit D (Alternate Methods - Catastrophic Failure) any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits may only be used in the following circumstances:

If the sample concentration exceeds 5 times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the Contract Required Detection Limit. This is illustrated in the example below:

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 220
Contract Required Detection Limit (CRDL) = 5

The value of 220 may be reported even though instrument detection limit is greater than CRDL. The instrument or method detection limit must be documented as described in Exhibit E.

The CRDL are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The detection limits for samples may be considerably higher depending on the sample matrix.

HAZARDOUS SUBSTANCES LIST
CLP TCL METALS - MATRIX: SOIL/SEDIMENT

| AUDIT | FREQUENCY | CONTROL LIMITS |
|---|---|---|
| Calibration Verification | Calibrated daily and each time instrument is set up; verify at at a frequency of 10% or every 2 hr, whichever is greater. | Within ±10% of true value for all except tin and mercury (±20% of true value). |
| Calibration Blank | During calibration at a frequency of 10% during run and at end of run. | No more than CRDL. |
| Preparation Blank | 1 per batch of samples digested or 1 in 20 whichever is greater | No more than CRDL. |
| Spiked Sample Analysis | 1 per group of similar concentration and matrix, 1 per case of samples, or 1 in 20, whichever is greater. | Within ±50% recovery |
| Lab Control Sample (soils) | once a month for each of the procedures (applied) to solid sample analysis. | Within recovery of ±35%. |

Dissolved Metals: Those constituents (metals) which will pass through a 0.45μ membrane filter.

Field Filtration Protocol:
An aliquot of sample will be passed through a 0.45μ membrane filter by one of the following methods:
1) Plastic syringe equipped with a filter holder (Swinnex Filter Holder).
2) Hand vacuum pump and a 500 ml side arm, glass filtration flask.
3) Bench top (electric) filtration system.

- Standards and samples will be matrix-matched to the concentration of the mineral acid.
- Calibration curves, continuing calibration and corrective measures records will be documented.
- One medium range internal synthetic standard will be analyzed to verify calibration and will be within ±10% of true value
- Furnace work will require duplicate analysis of each sample to verify recovery of spiked material. If recoveries are within ±10%, methods of addition will not be required. If outside this criterion, methods of standard addition will be required.

# APPENDIX B

# MONITORING WELL AND BORING LOGS

WELL SPECIFICATIONS TABLE
CHERRY FARM SITE
NIAGARA MOHAWK POWER CO.
TONAWANDA, NY

| WELL NUMBER | TOP OF CASING ELEV. (FT) | TOP OF PVC ELEV. (FT) | GROUND ELEV. (FT) | SCREENED-ELEV. (FT) | AQUIFER MATERIAL SCREENED |
|---|---|---|---|---|---|
| MW-1I | 573.79 | 573.79 | 572.00 | 547.79 - 557.79 | SILT, SAND, CLAY |
| MW-1D | 574.74 | 574.64 | 572.40 | 526.90 - 536.90 | SAND-GRAVEL, SOME SILT |
| MW-2S | 582.60 | 582.45 | 580.70 | 562.70 - 572.70 | FILL |
| MW-2I | 582.36 | 582.36 | 580.30 | 552.04 - 562.04 | F/M SAND, LITTLE SILT |
| MW-3S | 582.68 | 582.55 | 580.20 | 563.20 - 573.20 | FILL |
| MW-3I | 582.05 | 582.05 | 580.20 | 552.05 - 562.05 | F/M SAND, SOME SILT |
| MW-4S | 584.23 | 583.97 | 581.80 | 559.80 - 569.80 | FILL |
| MW-4I | 583.31 | 583.31 | 581.70 | 551.81 - 561.81 | F/SAND, SOME SILT |
| MW-4D | 584.14 | 583.87 | 581.80 | 527.30 - 537.30 | F/M SAND, TRACE SILT |
| MW-5S | 578.68 | 578.54 | 576.50 | 562.50 - 570.50 | FILL |
| MW-5I | 578.56 | 578.56 | 576.60 | 550.51 - 560.51 | F/M SAND, TRACE SILT |
| MW-5D | 579.04 | 578.85 | 576.70 | 523.50 - 533.50 | F/M SAND, TRACE SILT |
| MW-6S | 581.85 | 581.55 | 579.50 | 562.50 - 572.50 | FILL |
| MW-6I | 579.05 | 578.6 | 577.90 | 548.79 - 558.79 | F/SAND, LITTLE SILT |
| MW-6D | 581.27 | 581.05 | 579.10 | 525.10 - 535.10 | SILT AND F/M SAND |
| MW-7S | 583.56 | 583.38 | 581.10 | 561.40 - 571.40 | FILL |
| MW-7I | 584.08 | 584.08 | 583.10 | 552.08 - 562.08 | F/M SAND, AND SILT |
| MW-7D | 583.75 | 583.72 | 581.20 | 529.50 - 539.50 | F/SAND AND SILT |
| MW-8S | 588.38 | 588.19 | 585.70 | 564.20 - 574.20 | FILL |
| MW-8I | 588.38 | 588.38 | 585.90 | 544.40 - 554.40 | F/M SAND |
| MW-9S | 578.16 | ---- | 578.30 | 563.30 - 573.30 | FILL |
| MW-9I | 578.13 | ---- | 578.30 | 543.30 - 553.30 | F/M SAND, AND SILT |
| MW-10S | 582.64 | 582.52 | 580.20 | 560.20 - 570.20 | FILL |
| MW-10I | 582.52 | 582.29 | 580.20 | 537.70 - 547.70 | SILT, SOME F/M SAND |
| MW-11S | 582.77 | 582.49 | 580.20 | 562.20 - 572.20 | FILL |
| MW-11I | 582.74 | 582.57 | 580.60 | 540.10 - 550.10 | SILT, AND F/SAND |
| MW-12 | 582.96 | 582.49 | 581.00 | 581.00 - 591.00 | FILL |
| MW-13 | 585.56 | 585.73 | 584.10 | 562.10 - 572.10 | FILL |

O'BRIEN & GERE ENGINEERS, INC.

# TEST BORING LOG

REPORT OF BORING NUMBER MW-1I
SHEET 1 OF 2
DATE FILE

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE: Split Barrel
HAMMER FALL

GROUNDWATER READINGS

| DATE | DEPTH | | |
|---|---|---|---|
| | | | |

BORING CO. Empire Soils Investigations
FOREMAN Joe Genovese
OBG ENGINEER Deborah Wright

BORING LOCATION MW-1I
GROUND ELEV. 572.00
DATE STARTED 8/2/85 DATE ENDED 8/5/85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2'/2' | 0-2' | 9-11- | Red brown, dry, SILT, little CLAY | | | HNU | 0 | |
| | | | | | 12-14 | | | | | | |
| | | 2 | 2'/2' | 2'-4' | 12-14- | (piece of slag at 3.8') | | | HNU | 0 | |
| | | | | | 16-16 | 4.0' | | | | | |
| 5 | | 3 | 2'/1' | 4'-6' | 6-7-9- | Brown, dry to moist, CLAY, some SILT | | | HNU | 0 | |
| | | | | | 10 | | | | | | |
| | | 4 | 2'/1.5' | 6'-8' | 9-9-10- | (silt lens at 7') 7.0' | | | HNU | .4 | |
| | | | | | 9 | Brown, moist, CLAY & SILT, trace GRAVEL, some lenses of SAND & SILT | | | | | |
| | | 5 | 2'/1' | 8-10' | 2-2-2- | | | | HNU | 3 | |
| 10 | | | | | 4 | | | | | | |
| | | 6 | 2'/.8' | 10-12' | 3-4-5- | | | | HNU | .8 | |
| | | | | | 6 | Black, wet, fine-med. SAND, little SILT, little CLAY (odor) 11.0' | | | | | |
| | | 7 | 2'/2' | 12-14' | 3-2-1- | Red brown, moist, SILT & CLAY | | | HNU | 0 | |
| | | | | | 2 | 12.0' | | | | | |
| 15 | | 8 | 2'/2' | 14-16' | 2-3-3- | Gray, wet, fine SAND. Some SILT. | | | HNU | 0 | |
| | | | | | 3 | (CLAY layer at 15'-15.3') | | | | | |
| | | 9 | 2'/2' | 16-18' | 1-2-2- | (wet layer at 16-16.5') | | | HNU | 0 | |
| | | | | | 2 | 17.0' | | | | | |
| | | 10 | 2'/2' | 18-10' | WR-WH | Gray, wet, SILT, some CLAY, some fine SAND (varved) | | | HNU | 0 | |
| 20 | | | | | 21 | | | | | | |
| | | 11 | 2'/2' | 20-22' | WH-2-1- | | | | HNU | 0 | |
| | | | | | 1 | | | | | | |
| | | 12 | 2'/2' | 22-24' | 1-2-2- | | | | HNU | 0 | |
| | | | | | 6 | | | | | | |
| 25 | | 13 | 2'/2' | 24-26' | 1-1-1- | | | | HNU | 0 | |
| | | | | | 1 | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | (running SAND) | | | | | |
| 30 | | 14 | 2'/2' | 29-31 | WR/1'- | 29.5' | | | HNU | 0 | |
| | | | | | 3-4 | Gray, wet, CLAY, some SILT 30.5' | | | | | |
| | | | | | | Gray, wet, fine-med. SAND (sorted) | | | | | |
| | | | | | | 31.0' | | | | | |
| | | | | | | 34.0' | | | | | |
| 35 | | 15 | 2'/2' | 34-36' | WR/1'- 3-3 | Gray, wet, fine-med. SAND & SILT, some CLAY (in 4" layers) | | | HNU | 0 | |

REMARKS:

O'BRIEN & GERE ENGINEERS INC.

# TEST BORING LOG

REPORT OF BORING NUMBER MW-1I
SHEET 2 OF 2
DATE FILE

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER
FALL

GROUNDWATER READINGS

| DATE | DEPTH | | |
|---|---|---|---|
| | | | |

BORING CO. Empire Soils Investigations

FOREMAN Joe Genovese

OBG ENGINEER Deborah Wright

BORING LOCATION MW-1I

GROUND ELEV. 572.00

DATE STARTED 8/2/85 DATE ENDED 8/5/85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~25~~ | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | 16 | 2'/2' | 38-40' | 4-4 | 38.5' | | | | |
| 40 | | | | | | Gray,wet,f-c SAND,little f GRAVEL (hydrogen sulfide odor) 40.0' | | | HNU 0 | |
| | | | | | | Gray,wet f-c GRAVEL (hydrogen sulfide odor) | | | | |
| | | | | | | (Boulder at 42.5') | | | | |
| | | | | | | 44.0' | | | | |
| 45 | | 17 | 2'/2' | 44-46' | 9-3-2- | Gray,wet,f-c GRAVEL,little f-c SAND,little SILT | | | HNU 0 | |
| | | | | | 2 | | | | | |
| | | 18 | .5'/.3' | 47-47.3 | 100/.2' | 47.3' | | | | |
| | | | | | | BEDROCK, Shale and Gypsum 47.5' | | | | |
| | | | | | | BOTTOM OF BORING @47.5' | | | | |
| 50 | | | | | | | | | | |

REMARKS:

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-1D Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 565.07 Date 7/19/88<br>Elev. 565.37 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Peter Bogardus

Boring Location: Near River Road
Ground Elevation: 572.40 ft.
Dates Started: 5/09/88 Ended: 5/09/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-1.5 | 2-2 | 12 | 7 | Moist brown-red medium stiff SILT, little black fine to medium sand, trace of clay, (FILL). | | | | 0 | |
| | | | 5 | | | | | | | | |
| | | | | | | | 2.5' | | | | |
| | | | | | | Moist brown-red stiff SILT, some clay, trace medium to coarse sand. | | | | | |
| 5 | 2 | 5-6.5 | 4-5 | 10 | 10 | Becomes Stiffer. | | | | 0 | |
| | | | 5 | | | | | | | | |
| | | | | | | | 8.0' | | | | |
| | | | | | | Very saturated soft black SILT, little clay, few gray fine to medium sand lenses. (Odorous). | | | | | |
| 10 | 3 | 10-11.5 | 2-2 | 15 | 4 | | | | | 2 | |
| | | | 2 | | | | | | | | |
| 15 | 4 | 15-16.5 | 1-1 | 15 | 2 | Wet very soft gray SILT, some fine sand, trace of clay. | | | | 0 | |
| | | | 1 | | | | | | | | |
| 20 | 5 | 20-21.5 | WR-1 | 15 | 3 | Wet soft gray SILT and CLAY, few fine to medium sand seams. | | | | 0 | |
| | | | 2 | | | | | | | | |
| 25 | 6 | 25-26.5 | WOH | 15 | 1 | Wet very soft gray SILT and CLAY, few fine to medium sand seams. | | | | 0 | |
| 30 | 7 | 30-30.5 | 1-2 | 15 | 7 | Wet loose gray fine SAND, some medium sand, varved with silt. | | | | 0 | |

Well: 45.5' - 35.5' .010 slot PVC screen
45.5' - 33.0' Washed silica sand #0
33.0' - 31.5' Bentonite pellets
31.5' - 0' Cement/bentonite grout

File Name: NIMOMW1.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-1D Sheet 2 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Depth Date<br>Depth Date<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Peter Bogardus

Boring Location: Near River Road
Ground Elevation: 572.40 ft.
Dates Started: 5/09/88 Ended: 5/09/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | | | | | 0 | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 35 | 8 | 35-35.5 | 2-5 | 12 | 12 | - Same as above with trace of clay. | | | | 0 | |
| | | | 7 | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | 38.5' | | | | |
| | | | | | | Wet gray medium dense fine to medium GRAVEL, some medium to coarse sand. | | | | | |
| 40 | 9 | 40-41.5 | 6-8 | 12 | 16 | | | | | 0 | |
| | | | 8 | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 45 | 10 | 45-46.5 | 7-50/.1' | 7 | 50+ | - Same as above with broken rock fragments (hydrogen sulfide odor). | | | | 0 | |
| | | | | | | | 46.0' | | | | |
| | | | | | | - Auger refusal - | | | | | |

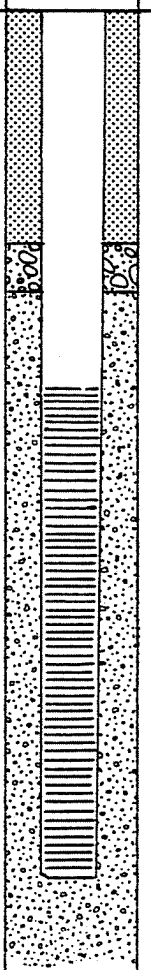
File Name: NIMOMW1B.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-2S Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 568.41 Date<br>Elev. 568.43 Date<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Jeff Thew
OBG Hydrogeologist: Susan Cox

Boring Location: Northeast Portion of Site
Ground Elevation: 580.7 ft.
Dates Started: 5/11/88 Ended: 5/11/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Remks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 2/5/4/5 | | 9 | Moist, brown, hard, SILT, clay. | | | | 0 | |
| | | | | | | | 0.6' | | | | |
| | | | | | | Damp, loose, black, fine-medium SAND, some loose fill, little silt. (Sand appears to be foundry material) | | | | | |
| 2 | 2 | 2-4 | 3/4/2/2 | | 6 | Some rust and tan, color throughout. | | | | 0 | |
| | | | | | | | | | | | |
| 4 | 3 | 4-6 | 2/2/1 | | 3 | Same as above (becomes very loose). | | | | 0 | |
| | | | | | | | | | | | |
| | | | | | | | 6.0' | | | | |
| 6 | 4 | 6-8 | 2/1/1/1 | | 1 | Moist, very loose, black, fine-medium SAND, some silt, cohesive. (Sand appears to be foundry material) | | | | 0 | |
| | | | | | | | | | | | |
| 8 | 5 | 8-10 | 2/4/3/2 | | 7 | | | | | 0 | |
| | | | | | | | | | | | |
| 10 | 6 | 10-12 | 1/1/2/2 | | 3 | | | | | 0 | |
| | | | | | | | | | | | |
| | | | | | | | 12.0' | | | | |
| 12 | 7 | 12-14 | 1/2/2/2 | | 4 | Wet, very loose, black, fine-medium SAND, some silt, loose. (Sand appears to be foundry material) | | | | 0 | |
| | | | | | | | 14.0' | | | | |
| 14 | 8 | 14-16 | 4/3/2/2 | | 5 | Moist, black, fine-medium SAND, some silt loose. (Sand appears to be foundry mat.) | | | | 0 | |
| | | | | | | | 15.5' | | | | |
| | | | | | | Small pieces of silver/black slag material. | | | | | |
| 16 | 9 | 16-18 | 2/4/4/4 | | 8 | | | | | 0 | |
| | | | | | | Moist, dense, black, fine-medium SAND, some silt. | | | | | |
| 18 | 10 | 18-20 | 3/3/4/4 | NR | 7 | | 17.0' | | | 0 | |
| | | | | | | Moist, black, SILT, little clay, dense, natural material. | | | | | |
| | | | | | | | 17.5' | | | | |
| | | 20-22 | 3/3/3/4 | | 6 | Moist, brown, silt, little clay, dense. | | | | 0 | |
| | | | | | | | 20.0' | | | | |
| | | | | | | Wet, loose, gray, fine SAND, some silt. | | | | | |
| | | | | | | Bottom of Hole at 22.0 ft | | | | 0 | |



MW-2S
18-8 .010 Slot PVC Screen
18-6 Washed Silic Sand 4Q
6-5 Bentonite Pellets
5-0 Cement/Bentonite Grout

File Name: NIMOMW2.MEQ

O'BRIEN & GERE ENGINEERS, INC.

# TEST BORING LOG

REPORT OF BORING NUMBER MW-2 I
SHEET 1 OF 1
DATE FILE

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER FALL

GROUNDWATER READINGS

| DATE | DEPTH | | |
|---|---|---|---|
| | | | |

BORING CO. Empire Soils
FOREMAN Joe Genovese
OBG ENGINEER Deborah Wright

BORING LOCATION MW-2 I
GROUND ELEV. 580.30
DATE STARTED 8-6-85 DATE ENDED 8-6-85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2'/1.5' | 0-2 | 4-7-7- | Brown, dry CLAY cap 0.5' | | | HNU | 0.2 | |
| | | | | | 12 | Black/Dk Brown, dry f/m SAND & SILT cinders 3.0' | | | HNU | 0 | |
| | | 2 | 2'/.9' | 2-4' | 7-11- | Tan, dry, f/m SAND 3.2' | | | | | |
| | | | | | 15-12 | | | | | | |
| 5 | | 3 | 2'/1' | 4-6' | 3-4-4- | Black, moist f/m SAND, little SILT trace fine GRAVEL 6.0' | | | HNU | 0 | |
| | | | | | 4 | | | | | | |
| | | 4 | 2'/2' | 6-8 | 2-2-2- | Black, moist, f/c SAND, little SILT, little f/m GRAVEL (2" m/c SAND LENSE @ 7.0') | | | HNU | 0 | |
| | | | | | 2 | | | | HNU | 0 | |
| | | 5 | 2'/.5' | 8-10' | 5-4-3- | Piece of wood @ 9.0' | | | HNU | 0 | |
| 10 | | | | | 2 | Piece of wood @ 10.0' | | | | | |
| | | 6 | 2'/.2' | 10-12 | 5-5-20- | | | | HNU | 0 | |
| | | | | | 24 | | | | | | |
| | | 7 | 2'/.8' | 12-14' | 14-4 | 13.0' | | | HNU | 0 | |
| | | | | | 3-3 | Black, wet, f/m SAND. | | | | | |
| 15 | | 8 | 2'/2' | 14-16 | 1-1-1- | 15.5' | | | HNU | 0 | |
| | | | | | 1 | Black, moist, SILT, tr CLAY, roots 16.0' | | | HNU | 0 | |
| | | 9 | 2'/2' | 16-18 | 4-5-7- | Gray, mst, SILT, some CLAY, roots 17.0' | | | | | |
| | | | | | 9 | | | | | | |
| | | 10 | 2'/2' | 18-20 | 1-3-1- | Gray, wet, fine/medium SAND. | | | HNU | 0 | |
| 20 | | | | | 1 | Some silty fine CLAYEY layers. | | | | | |
| | | 11 | 2'/2' | 20-22 | 1-1-1- | | | | HNU | 0 | |
| | | | | | 2 | | | | | | |
| | | 12 | 2'/2' | 22-24 | 1-2-1- | | | | HNU | 0 | |
| | | | | | 2 | | | | | | |
| 25 | | 13 | 2'/ | 24-26 | WR-1-2 | Runny fine SAND 24-26' | | | HNU | 0 | |
| | | | | | 3 | | | | | | |
| | | 14 | 2'/ | 26-28 | 2-3-4- | Stiff fine SAND, little SILT 26-28' | | | | | |
| | | | | | 6 | | | | | | |
| | | | | | | BOB @ 28' | | | | | |
| 30 | | | | | | | | | | | |

REMARKS:

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-3S Sheet 1 of 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 569.20' Date 7/19/88<br>Elev. 569.33' Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Jeff Thew
OBG Hydrogeologist: Deborah Wright

Boring Location: South Eastern Corner
Ground Elevation: 580.20'
Dates Started: 5/13/88 Ended: 5/13/88

| Depth | Sample No | Depth in ft. | Blows /6" | Penetr/ Recovry | "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2' | 0-5-5-6 | 2'/0.3' | 10 | Moist, rusty brown, CLAY and SILT. | 0.5' | | | 0 | |
| | 2 | 2-4' | 1-1-3-11 | 2'/18' | 4 | Moist, brown/black, fine to medium SAND, some fine to medium gravel, silt, cinders | | | | 0 | |
| | 3 | 4-6' | 7-7-3-2 | 2'/24' | 10 | Brown/black, dry, fine to coarse SAND, some fine to medium gravel, cinders. Iron staining at ~7.0'; silty 8-8.5'. | 4.0' | | | 0 | |
| 5 | | | | | | | | | | | |
| | 4 | 6-8' | 5-7-14-9 | 2'/6' | 21 | | | | | 0 | |
| | 5 | 8-10' | 12-28- | 2'/24' | 58 | Brown/orange, moist, fine to medium SAND. | 8.5' | | | 0 | |
| | | | 30-12 | | | Black, wet, fine to medium FOUNDRY SAND, some silt, pieces of brick and slag. | 9.5' | | | | |
| 10 | | | | | | | | | | | |
| | 6 | 10-12' | 4-3-8-16 | 2'/12' | 11 | | | | | 0 | |
| | 7 | 12-14' | 32-100/.4 | 2'/0.9' | 132+ | Brick and slag ~12.4'. Odor ~12.9'. | | | | 0 | |
| 15 | 8 | 14-16' | NO SAMPLE. | | | Large cobbles, boulders, or slag (no samples). | | | | 0 | |
| | 9 | 16-18' | 5-3-2-1 | 2'/12' | 5 | Black, wet SILT, little fine sand. | 16.5' | | | 0 | |
| | | | | | | BOH @ 18.0 ft. | 18.0' | | | | |

MW-3S 17'-7' .010 Slot PVC Screen
17'-5' Washed Silica Sand. (#0)
5'-2' Bentonite Pellets
2'-0' Cement/Bentonite Grout.

NOTE: Lithologic samples collected during Phase II Investigation.

O'BRIEN & GERE ENGINEERS, INC.

# TEST BORING LOG

REPORT OF BORING NUMBER MW-3I
SHEET 1 OF 1
DATE FILE

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER FALL

GROUNDWATER READINGS

| DATE | DEPTH |
|---|---|
| | |

BORING CO. Empire Soils
FOREMAN Joe Genovese
OBG ENGINEER Deborah Wright

BORING LOCATION MW-3I
GROUND ELEV. 580.20
DATE STARTED 8-7-85 DATE ENDED 8-7-85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2'/.3' | 0-2' | 10-5 | Brown, dry CLAY cap 0.5' | | | HNU 0 | |
| | | | | | 5-6 | Brown, dry, SILT, some f/m SAND 2.0' | | | HNU 0 | |
| | | 2. | 2'/1.5' | 2-4 | 1-1-3- | Black, dry, f/c SAND, some f/m GRAVEL SILT, CINDERS 3.5' | | | | |
| | | | | | 11 | Brown/Black, dry f/c SAND 4.0' | | | HNU 0 | |
| 5 | | 3 | 2'/2; | 4-6 | 7-7-3- | Brown & Black, f/c SAND, some SILT some f/m GRAVEL, cinders | | | | |
| | | | | | 2 | Iron Oxide @ 7.0' | | | HNU 0 | |
| | | 4 | 2/.5' | 6-8 | 5-7-14 | Silty @ 8-8.5' | | | | |
| | | | | | 9 | 8.5' | | | | |
| | | 5 | 2'/2' | 8-10' | 12-28 | Brown/Orange, moist, f/m SAND 9.5' | | | HNU 2 | |
| 10 | | | | | 30-12 | | | | | |
| | | 6 | 2'/1' | 10-12 | 4-3-8- | Black, moist, f/m SAND, some SILT, cinders. Large piece of slag @ 12' | | | HNU 0.2 | |
| | | | | | 16 | 12.0' | | | HNU 0 | |
| | | 7 | .9/.9' | 12-12.9 | 32-100/ | Black, wet, f/m SAND, some SILT, pieces of brick & slag 12.4' | | | HNU 0 | |
| | | | | | .4 | Black, wet f/c GRAVEL, lt. f/c SAND, odor 12.9' | | | HNU 0 | |
| 15 | | | | | | 13.0 | | | | |
| | | 8 | 2'/1' | 16-18 | 5-3-2- | Large COBBLES, BOULDER or pieces of slag (no sample) 15.5 | | | | |
| | | | | | 1 | Black, wet, SILT, little f SAND 16.5 | | | | |
| | | 9 | 2'/1.5' | 18-20 | 1-2-2- | Gray, wet, f SAND & SILT, organics 18.0' | | | | |
| | | | | | 5 | Gray, wet, f/m SAND, some SILT, | | | | |
| 20 | | 10 | 2'/1.8' | 20-22 | 3-3-3- | organics | | | HNU 0 | |
| | | | | | 2 | | | | HNU 0 | |
| | | 11 | 2'/2' | 22-24 | 1-1-1- | | | | HNU 0 | |
| | | | | | 2 | | | | | |
| | | 12 | 2'/2' | 24-26 | 2/2' | 24.0 | | | | |
| 25 | | | | | | Gray, wet, f/m SAND & SILT | | | | |
| | | 13 | 2'/2' | 26-28 | 3-3-2- | | | | HNU 0 | |
| | | | | | 3 | | | | | |
| | | | | | | BOB @ 28.5' | | | | |
| 30 | | | | | | | | | | |

REMARKS:

O'BRIEN & GERE ENGINEERS INC.

# TEST BORING LOG

REPORT OF BORING NUMBER MW-4I
SHEET 1 OF 1
DATE FILE

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER FALL

GROUNDWATER READINGS

| DATE | DEPTH |
|---|---|
| | |

BORING CO. Empire Soils
FOREMAN Joe Genovese
OBG ENGINEER D. Wright

BORING LOCATION MW-4I
GROUND ELEV. 581.70
DATE STARTED 8-8-85 DATE ENDED 8-8-85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2'/ | 0-2' | 4-5-8- | Brown,dry CLAY cap .5' | | | HNU .6 | |
| | | | | | 15 | Drk brown,dry, f/m SAND, some SILT, pieces of cinders & slag | | | | |
| | | 2 | .5'/ | 2-2.5 | 18-50/0 | Tan sand at 4.5-4.8' | | | HNU 0 | |
| | | | .5' | | | | | | | |
| 5 | | 3 | 2'/2' | 4-6 | 15-12-9- | | | | HNU 0 | |
| | | | | | 12 | | | | | |
| | | 4 | 2'/2' | 6-8 | 9-12- | Dk brown & Black,moist f/m SAND; some SILT,piece of wood @ 7', cinders, tan sand @ 7.8',piece of sand cast at 8.2-8.4' 9.6' | | | HNU 0 | |
| | | | | | 12-12 | | | | HNU 0 | |
| | | 5 | 2'/2' | 8-10 | 5-4-2- | | | | | |
| 10 | | | | | 2 | Gray,dry,ash & cinders 10.0' | | | HNU 0 | |
| | | 6 | 2'/.4' | 10-12 | 3-4-3- | Dk brown,tan & gray,moist layered f/m SAND & SILT,sand cast @ 10.2' 12' | | | | |
| | | | | | 4 | | | | HNU .6 | |
| | | 7 | 2'/2' | 12-14' | 3-3-2- | Black,moist,SILT 12.4' | | | | |
| | | | | | 3 | Black,moist,f SAND & SILT,some c SAND & f/m GRAVEL,sand cast @13.8' 14.0' | | | HNU 2 | |
| 15 | | 8 | 1.6/1.3 | 14- | 4-4-40 | | | | | |
| | | | | 15.6 | 50/.1 | Black,moist,f SAND & SILT,some c SAND & f/m GRAVEL,sand cast @ 13.8 15.2' | | | HNU 3 | |
| | | 9 | 2'/ 2' | 18-20 | 1-2-3- | | | | | |
| | | | | | 2 | Black,wet, f/c GRAVEL,tr f/c SAND cinders @ 15.6' 16.0' | | | | |
| | | 10 | 2'/2' | 20-22 | 1-1-2- | Hard cinders or slag (metal) 17.0' | | | | |
| 20 | | | | | 3 | Gray,moist-wet,SILT,lt CLAY,lt f SAND (finer @ top) 20.0' | | | | |
| | | | | | | | | | | |
| | | 11 | 2'/1.8' | 22-24 | 2-3-5 | Gray,moist to wet SILT,some f SAND 22.0' | | | HNU 2 | |
| | | | | | 7 | | | | | |
| | | 12 | 2'/1.8' | 24-26 | 2-4-5- | | | | | |
| 25 | | | | | 9 | Gray,wet, f SAND,some SILT | | | HNU .4 | |
| | | 13 | 2'/ 1.8 | 26-28 | 5-5-7 | | | | HNU 0 | |
| | | | | | 11 | | | | | |
| | | | | | | | | | HNU 0 | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 30 | | | | | | 30.0' | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

REMARKS:

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-4D, MW-4S Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 565.02 Date 7/19/88<br>MW-4D Elev. 565.24 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Peter Bogardus

Boring Location: Northern Portion of Site Along River
Ground Elevation: 581.8 ft - MW-4D
Dates Started: 5/11/88 Ended: 5/11/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 3-5 | 12 | 10 | Topsoil | | | | 1.2 | |
| | | | 5-6 | | | | 0.5' | | | | |
| | 2 | 2-4 | 6-15 | 12 | 34 | Dry, very dense, black, fine-medium SAND, some red granular pieces, trace of silt. (Sand appears to be foundry material) | | | | 6 | |
| | | | 19-13 | | | | | | | | |
| | 3 | 4-6 | 6-7 | 12 | 16 | - Same as above. | | | | 1.2 | |
| 5 | | | 9-8 | | | | | | | | |
| | 4 | 6-8 | 8-7 | 12 | 11 | - Same as above. | | | | 1.2 | |
| | | | 4-3 | | | | | | | | |
| | 5 | 8-10 | 1-1 | 12 | 2 | Becomes coarser - medium/coarse SAND, trace of silt. (Sand appears to be foundry material) | | | | 1.2 | |
| | | | 1-2 | | | | | | | | |
| 10 | 6 | 10-12 | 50/0 | NR | 50+ | | | | | | |
| | | | | | | | | | | | |
| | 7 | 12-14 | 3-4 | 15 | 7 | | | | | 2 | |
| | | | 3-7 | | | Wet @ 14 ft. | | | | | |
| | 8 | 14-16 | 1-3 | 15 | 7 | Black, loose, SAND, trace of silt. (Sand appears to be foundry material) | | | | 2 | |
| 15 | | | 4-5 | | | | | | | | |
| | 9 | 16-18 | 2-6 | 15 | 12 | | | | | 1.2 | |
| | | | 6-6 | | | | | | | | |
| | 10 | 18-20 | WR | 1 | 2 | Wet, very soft, black SILT, little fine sand, trace of clay. | 18.0' | | | | |
| | | | 2-2 | | | | | | | | |
| 20 | 11 | 20-22 | 2-2 | 15 | 6 | Wet, loose, gray fine SAND, little medium sand, trace of silt. | 20.0' | | | 1.2 | |
| | | | 4-2 | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 25 | 12 | 25-26.5 | 2-3 | 15 | 8 | - Same as above | | | | 1.2 | |
| | | | 5 | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | 28.5' | | | | |
| | | | | | | | | | | | |
| 30 | 13 | 30-31.5 | | | | Gray fine SAND, verved with silt layers. | | | | 1.2 | |

MW-4D: 54.5'-44.5' .010 Slot PVC screen
54.5'-42.0' Washed silica sand #0
42.0'-~37.0' Bentonite slurry
37.0'-0.0' Cement/bentonite grout

MW-4S: 22.0'-12.0' .010 Slot PVC screen
22.0'- 8.7' Washed silica sand #0
8.7'-6.3' Bentonite pellets
6.3'-0.0 Cement/bentonite grout

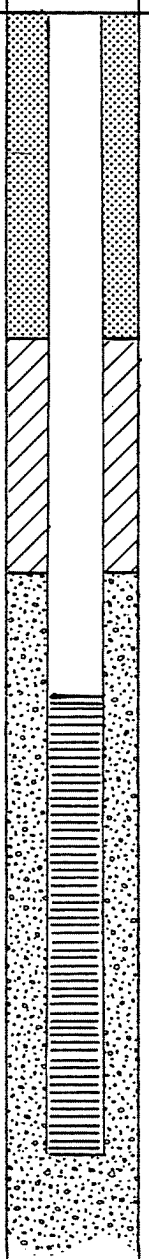
File Name:NIMOMW4.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-4D, MW-4S Sheet 2 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 567.71 Date 7/19/88<br>MW-4S Elev. 567.68 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Peter Bogardus

Boring Location: Northern Portion of Site Along River
Ground Elevation: 581.80
Dates Started: 5/11/88 Ended: 5/11/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 14 | 35-36.5 | 3-5 | 15 | 11 | Wet, medium dense gray fine SAND, trace medium gravel, some silt. | | | | | |
| | | | 6 | | | | | | | | |
| 40 | 15 | 40-41.5 | 2-3 | 15 | 6 | | | | | | |
| | | | 3 | | | | 41.5' | | | | |
| | | | | | | Wet, loose, black gray fine SAND to medium SAND, trace of gravel, trace of silt. | | | | | |
| 45 | 16 | 45-46.5 | 2-1 | 15 | 2 | Wet, very loose, gray SILT and fine SAND, little to trace of clay. | | | | | |
| | | | 1 | | | | | | | | |
| 50 | 17 | 50-51.5 | WR-WH | | 2 | Wet, very loose, gray fine to medium SAND trace of silt, varved with silt. | | | | | |
| | | | 1 | | | | 51.5' | | | | |
| | | | | | | - Hard Drilling Till - | | | | | |
| | | | | | | - Auger Refusal - | 53.0' | | | | |



File Name: NIMOMW4B.MEQ

O'BRIEN & GERE ENGINEERS INC.

# TEST BORING LOG

REPORT OF BORING NUMBER MW-5I
SHEET 1 OF 2
DATE FILE

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER FALL

GROUNDWATER READINGS

| DATE | DEPTH | | |
|---|---|---|---|
| | | | |

BORING CO. Empire Soils
FOREMAN Joe Genovese
OBG ENGINEER Deborah Wright

BORING LOCATION MW-5 I
GROUND ELEV. 576.60
DATE STARTED 8-5-85 DATE ENDED 8-5-85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | | REMKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2'/.8' | 0-2' | 20-14- | Brown, dry CLAY cap 0.5' | | | HNU | 0.6 | |
| | | | | | 14-20 | Dk Brown, dry SILT, tr cinders, glass chips 0.8' | | | HNU | 5 | |
| | | 2 | 2'/.5' | 2-4' | 30-34 | 2.0' | | | | | |
| | | | | | 8-8 | Black, moist, f/m SAND, some SILT Pieces of cloth | | | | | |
| 5 | | 3 | 2'/2' | 4-6' | 5-3-2- | | | | HNU | 0.8 | |
| | | | | | 2 | 6.5' | | | | | |
| | | 4 | 1.3/1.3' | 6-7.3 | 5-7- | Dk Brown-Black, wet f/m SAND, some SILT, some cinders, piece of brick 7.0' | | | HNU | 0 | |
| | | | | | 100/.3 | BOULDER, concret or cinder or slag (no sample) 10.0' | | | HNU | 0.8 | |
| 10 | | 5 | 2'/1' | 10-12 | 14-70- | Black & Brown, moist to wet, f/c SAND, some f/m GRAVEL (cobble @ 10-10.5') Piece of slag & metal. Wet at 12.5' 13.0' | | | HNU | 0 | |
| | | | | | 33-21 | Brown, wet, f/c SAND, some SILT. 14.0' | | | HNU | 0 | |
| | | 6 | 2/1' | 12-14 | 30-33- | Gray/Black, wet f SAND & SILT, organics (Black sandy lense @ 14.5' 16.0' | | | HNU | 0 | |
| | | | | | 10-5 | Gray, wet f/m SAND (layered f/m SAND, SILT) 20.0' | | | HNU | 0.8 | |
| | | 7 | 2'/ | 14-16' | WR-1.3 | Gray, wet, f/m SAND, trace SILT | | | HNU | 0 | |
| 15 | | | | | 5 | | | | HNU | 0 | |
| | | 8 | 2'/ | 16-18 | 2-2-3 | | | | HNU | 0 | |
| | | | | | 4 | | | | HNU | 0 | |
| | | 9 | 2'/1' | 18-20 | 1-3-8 | | | | HNU | 0.8 | |
| | | | | | 8 | | | | | | |
| 20 | | 10 | 2'/2' | 20-22 | 2-2-6 | | | | HNU | 0 | |
| | | | | | 8 | | | | | | |
| | | 11 | 2'/2' | 22-24 | 2-5-4 | | | | HNU | 0 | |
| | | | | | 5 | | | | | | |
| | | 12 | 2'/.5' | 24-26 | WR/1'-1 | | | | HNU | 0 | |
| 25 | | | | | 7 | | | | | | |
| | | 13 | 2'/ | 26-28 | NONE | 26.0' | | | HNU | 0 | |
| | | | | | RunUp in | Gray, wet, f/m SAND (running into augers - 5') | | | | | |
| | | | | | Augers | | | | | | |
| | | | | | | 31.0' | | | | | |
| 30 | | | | | | Gravelly layer indicated by auger noise. | | | HNU | 0 | |
| | | 14 | 1.5'/ NR | 34-35.5 | 10-6-6 | 34.0' | | | | | |
| 35 | | | | | | | | | | | |

REMARKS:

O'BRIEN & GERE ENGINEERS INC.

# TEST BORING LOG

REPORT OF BORING NUMBER MW-5 I
SHEET 2 OF 2
DATE FILE

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER FALL

GROUNDWATER READINGS

| DATE | DEPTH | | |
|---|---|---|---|
| | | | |

BORING CO. Empire Soils
FOREMAN Joe Genovese
OBG ENGINEER Deborah Wright

BORING LOCATION MW-5 I
GROUND ELEV. 576.60
DATE STARTED 8-5-85 DATE ENDED 8-5-85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 39.0' | | | | |
| 40 | | 15 | 2'/2' | 39-41 | WR/1-5-6 | Gray, wet, c/m SAND 40.0' | | | HNU 0 | |
| | | | | | | Gray, wet, CLAY (thin f/m SAND lenses @ 4" intervals) | | | | |
| | | 16 | 2'/2' | 44-46 | 4-2-2-4 | | | | HNU 0 | |
| 45 | | | | | | | | | | |
| | | 17 | 1.5'/ | 49-50.5 | 22-100 58 | Gray, wet f/m SAND 49.5' | | | | |
| 50 | | | | | | Gray, moist-wet, silty till (silt & f/m gravel) | | | HNU 0 | |
| | | | | | | Gray, wet, f/c GRAVEL, some COBBLES | | | | |
| | | | | | | Refusal @ 51.5 | | | | |
| 55 | | | | | | | | | | |

REMARKS:

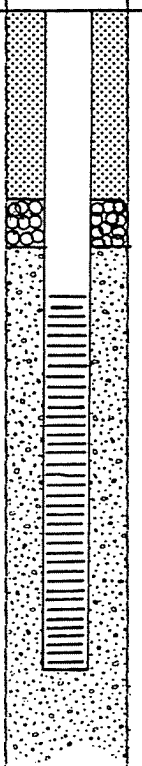
| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-5D, MW-5S Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 564.88 Date 7/19/88<br>MW-5D Elev. 565.24 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Peter Bogardus

Boring Location: Center of Site Along River
Ground Elevation: 576.70: MW-5D
Dates Started: 5/12/88 Ended: 5/12/88

| Depth | Sample No | Depth in ft. | Blows /6" | Penetr/ Recovry | "N" Value | Sample Description | Stratum Change General Descript |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 2-5 | 10 | 13 | Topsoil - Root hairs | .5' |
| | | | 7-6 | | | Dry medium dense black fine to medium SAND, little silt, trace of coarse sand (cinders). (Sand appears to be foundry material) | |
| | 2 | 2-4 | 6-8 | 12 | 18 | | |
| | | | 10-10 | | | Pieces of wood ~ 3.5 ft. | |
| | 3 | 4-6 | 5-3 | 2 | 6 | Piece of wood in nose of spoon 4-6 ft. | |
| 5 | | | 3-3 | | | | |
| | 4 | 6-8 | 10-50/.2 | 10 | 50+ | | 6.0' |
| | | | | | | Dry very dense black SILT, some fine to medium sand (cinders). | |
| | 5 | 8-10 | 16-20 | 12 | 36 | | 7.0' |
| | | | 16-17 | | | Very hard drilling (slag) - Moist black dense, cinders and slag. | |
| 10 | 6 | 10.5-12 | 5-8 | NR | 23 | Boulder or slag at ~ 10 ft.<br>Water ~ 10.8 ft. | |
| | | | 15 | | | | |
| | 7 | 12-14 | 4-3 | 12 | 6 | | 13.0' |
| | | | 3-3 | | | Wet black medium stiff fine to medium SAND, some silt, trace of clay (root fragments). | |
| | 8 | 14-16 | 1-1 | 15 | 3 | | |
| 15 | | | 2-3 | | | | |
| | 9 | 16-18 | 3-3 | 15 | 6 | Wet gray loose fine SAND, little to trace of silt. | |
| | | | 3-6 | | | | |
| | | | | | | | |
| | | | | | | | |
| 20 | 10 | 20-21.5 | 4-6 | 15 | 12 | - Same as above with root hairs. | |
| | | | 6 | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | 23.0' |
| 25 | 11 | 25-26.5 | WOH-1 | 15 | 3 | Wet gray very loose fine to medium SAND. | |
| | | | 2 | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 30 | 12 | 30-30.5 | 5-9-12 | 15 | 21 | | |

Equipment Installed



| HNU | Rmks* |
|---|---|
| 1 | |
| 1 | |
| 1 | |
| 1 | |
| 1 | |
| 1 | |
| 1 | |
| 1 | |
| 1 | |
| 1 | |
| 1 | |
| 1 | |

MW-5D: 53.2'-43.2' .010 Slot PVC screen
53.2'-40.2' Washed silica sand 4Q
40.2'~36.2' Bentonite slurry
36.2'-0.0' Cement/bentonite grout

MW-5S: 14.0'-6.0' .010 Slot PVC screen
14.0'-5.0' Washed silica sand 4Q
5.0'-4.0' Bentonite pellets
4.0' Cement/bentonite grout

NIMOMW5.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-5D, MW-5S Sheet 2 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 564.88 Date 7/19/88<br>MW-5S Elev. 565.24 Date 12/2/88<br>File No. 1118.057.130 |
| Boring Co. North Star Drilling<br>Foreman: Harry Lyons<br>OBG Hydrogeologist: Peter Bogardus | Boring Location: Center of Site Along River<br>Ground Elevation: 576.50: MW-5S<br>Dates Started: 5/12/88 | Ended: 5/12/88 |

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | Wet gray medium dense medium to coarse SAND, trace fine gravel. | | | | 1 | |
| 35 | 13 | 35-36.5 | 1-2 | 15 | 3 | Wet gray very loose medium to coarse SAND, .1" brown silt seam ~ 36.2'. | | | | 1 | |
| | | | 1 | | | | | | | | |
| 40 | 14 | 40-41.5 | WOH-1 | 15 | 3 | Wet gray very loose medium to caorse SAND, trace of silt (1" piece of gravel well rounded). | | | | 1 | |
| | | | 2 | | | | | | | | |
| 45 | 15 | 45-46.5 | 1-1 | 15 | 1 | Wet gray very loose, fine to medium SAND, trace of silt. | | | | 1 | |
| | | | WOH | | | | | | | | |
| | 16 | 50-52 | 43-30 | 12 | | | | | | 1 | |
| 50 | | | 45 | | | Small shell~ 50 ft. | | | | | |
| | | | | | | Moist gray haed SILT, some clay (broken rock fragments). (Till) | 51.5' | | | | |
| | | | | | | - Auger Refusal - | 52.0' | | | | |

File Name: NIMOMW5B.MEQ

O'BRIEN & GERE ENGINEERS, INC.

# TEST BORING LOG

REPORT OF BORING NUMBER MW-6I
SHEET 1 OF 1
DATE FILE

PROJECT LOCATION Cherry Farm
CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER FALL

GROUNDWATER READINGS

| DATE | DEPTH | | |
|---|---|---|---|
| | | | |

BORING CO. Empire Soils
FOREMAN Joe Genovese
OBG ENGINEER Deborah Wright

BORING LOCATION MW-6 I
GROUND ELEV. 557.90
DATE STARTED 8/8/85 DATE ENDED 8/8/85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2'/1.5' | 0-2' | 15-15 | Brown, moist CLAY cap 0.2' | | | HNU 0 | |
| | | | | | 15-15 | Brown, dry-moist, f/c SAND, some SILT, little f/c GRAVEL, cinders piece of metal. | | | | |
| | | 2 | 2'/1.5' | 2-4' | 15-15 | Blue med SAND @ 3.5' | | | HNU 1-3 | |
| | | | | | 15-19 | Lt Brown f/m SAND @ 4.2' | | | | |
| 5 | | 3 | 1.3'/ | 4-5.3 | 8-18 | Tan f/m SAND @ 4.6' 5.0' | | | HNU 1 | |
| | | | 1.3' | | 50/.3 | Cinders or slag (no samples) 7.0' | | | | |
| | | 4 | .9'/.7' | 8-8.9 | 28- | Dk. Brown, dry, f/c SAND, some SILT, little f/m GRAVEL. Clayey SILT layer @ 8.8' 9.0' | | | HNU .4 | |
| | | | | | 100/.4 | | | | | |
| 10 | | | | | | Slag, cinders or boulders. 13.5' | | | HNU .6 | |
| 15 | | 5 | 2'/.5 | 14-16 | 4-3-4- | | | | | |
| | | | | | 3 | Brown, wet, f/c SAND & f/c GRAVEL (fill) trace SILT, odor. 17.0' | | | HNU 0 | |
| | | 6 | 2'/2' | 16-18 | 1-2-2- | | | | | |
| | | | | | 2 | Gray, wet SILT, little CLAY, f SAND, Organics 18.0' | | | HNU .4 | |
| | | 7 | 2'/2' | 18-20 | 1-1-2- | | | | HNU .4 | |
| | | | | | 4 | | | | | |
| 20 | | 8 | 2'/2' | 20-22 | 1-2-2- | Gray, wet, fine SAND, some SILT (lenses of fine SAND, SILT & CLAY) | | | HNU .6 | |
| | | | | | 1 | | | | | |
| | | 9 | 2'/2' | 22-24 | 4-4-2 | | | | HNU 1 | |
| | | | | | 4 | 24.0' | | | | |
| 25 | | 10 | 2'/ 2' | 24-26 | WH-WH | | | | | |
| | | | | | 1-3 | Gray, wet f/m SAND, little SILT. | | | HNU 0 | |
| | | 11 | 2'/ 2' | 26-28 | 3-3-4- | | | | | |
| | | | | | 4 | | | | | |
| 30 | | | | | | BOB @ 30' | | | | |

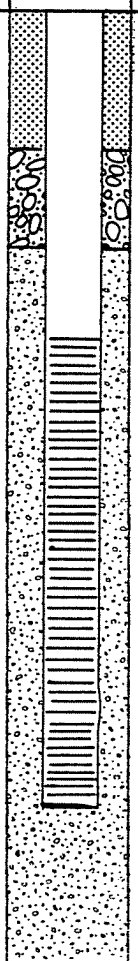
REMARKS:

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-6D, MW-6S<br>Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 564.77 Date 7/19/88<br>MW-6D Elev. 564.97 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: Southwest Portion of Site
Ground Elevation: 579.10 MW-6D
Dates Started: 5/17/88 Ended: 5/17/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 2/5/8/12 | | 13 | Moist stiff brown SILT, some clay organics. | | | | 0 | |
| | | | | | | | 0.4' | | | | |
| 2 | 2 | 2-4 | 6/9/9/10 | | 18 | Moist medium dense black/light yellow/ rust fine-medium SAND, silt. (Sand appears to be foundry material) | | | | 0 | |
| 4 | 3 | 4-6 | 2/4/5/5 | | 9 | Moist loose black/light orange/rust fine-medium SAND, some silt. (Sand appears to be foundry material) | | | | 0 | |
| 6 | 4 | 6-8 | 4/6/5/5 | | 11 | Moist medium dense black SAND, some silt. (Sand appears to be foundry material) | | | | 0 | |
| 8 | 5 | 8-10 | 5/6/7/11 | | 13 | Moist medium dense SILT, some fine-medium SAND, little silver/black ash material. (Sand appears to be foundry material) | | | | 0 | |
| | | | | | | | 9.5' | | | | |
| 10 | 6 | 10-12 | | | | Moist, brown, SILT, little fine sand, stiff, hard.<br>- NR - | | | | | |
| 12 | 7 | 12-14 | | | | - NR - | | | | | |
| 14 | 8 | 14-16 | 7/10/5/6 | | 15 | Wet medium dense dark brown some fine-coarse GRAVEL mixed with cinders. | | | | 0 | |
| | | | | | | | 15.5' | | | | |
| 16 | 9 | 16-18 | 4/3/1/2 | | 4 | Moist, rust SILT, clay. | 15.9' | | | 0 | |
| | | | | | | Wood | 16.0' | | | | |
| 18 | 10 | 18-20 | | | | Wet, black, fine-medium SAND, some silt. | 17.0' | | | | |
| | | | | | | Wet, black, SILT, trace of fine sand, trace of clay. | | | | | |
| 25 | 11 | 25-26.5 | WOH | | 1 | Wet, black, fine-medium SAND, some silt. | | | | 0 | |
| 30 | 12 | 30-31.5 | 4/7/8 | | 15 | Wet light gray, fine-medium SAND, some silt. | | | | 0 | |



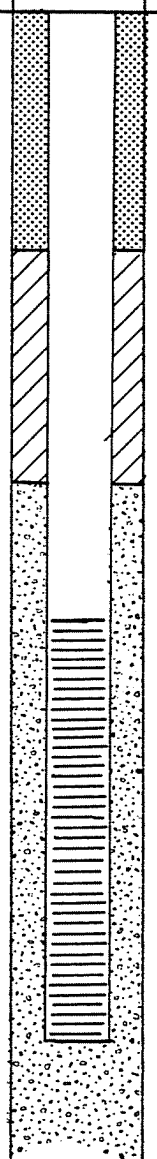

MW-6D: 54.0'-44.0' .010 Slot PVC screen
54.0'-41.0' Washed silica sand 4Q
41.0'-36.0' Bentonite slurry
36.0'-0.0' Cement/bentonite grout

MW-6S: 17.0'-7.0' .010 Slot PVC screen
17.0'-5.0' Washed silica sand 4Q
5.0'-3.0' Bentonite pellets
3.0'-0.0' Cement/bentonite grout

File Name:NIMOMW6.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-6D, MW-6S Sheet 2 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 565.45 Date 7/19/88<br>MW-6S Elev. 564.91 Date 12/2/88<br>File No. 1118.057.130 |
| Boring Co. North Star Drilling<br>Foreman: Harry Lyons<br>OBG Hydrogeologist: Susan Cox | Boring Location: Southwest Portion of Site<br>Ground Elevation: 579.50<br>Dates Started: 5/17/88 | Ended: 5/17/88 |

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 13 | 35-36.5 | 3/5/7 | | 12 | - Same as above. | | | | 0 | |
| 40 | 14 | 40-41.5 | 11/2/4 | | 6 | - Same as above. | | | | 0 | |
| 45 | 15 | 45-46.5 | | | | Saturated brown SILT, fine-medium sand. | | | | 0 | |
| 50 | 16 | 50-5/.5 | WOH/4/6 | | 10 | Wet brown, fine SAND, silt, trace of clay. | 50.0' | | | 0 | |
| | | | | | | - Auger Refusal - | 53.5' | | | | |



File Name: NIMOMW6B.MEQ

O'BRIEN & GERE ENGINEERS INC.

# TEST BORING LOG

REPORT OF BORING NUMBER MW-7I
SHEET 1 OF 1
DATE FILE

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER FALL

GROUNDWATER READINGS

| DATE | DEPTH |
|---|---|
| | |

BORING CO. Empire Soils
FOREMAN Joe Genovese
OBG ENGINEER Deborah Wright

BORING LOCATION MW-7I
GROUND ELEV. 583.10
DATE STARTED 8-7-85 DATE ENDED 8-7-85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2'/2' | 0-2' | 5-7-9- | Brown, dry CLAY cap 0.5' | | | HNU 0 | |
| | | | | | 14 | Brown, dry, f/m SAND, tr. SILT, some cinders 2.5' | | | HNU 0 | |
| | | 2 | 2'/6" | 2-4 | 7-5-4- | Tan, dry f/m SAND 2.7' | | | HNU 0 | |
| | | | | | 1 | Black/Brown f/c SAND, trace fine GRAVEL, trace SILT 6.0' | | | HNU .4 | |
| 5 | | 3 | 2'/6" | 4-6 | 1-1-4- | Black/White dry f/c SAND & f/c GRAVEL 6.5' | | | HNU .4 | |
| | | 4 | 2/6" | 6-8 | 14-2-2 | Black, moist, f/m SAND & SILT 8.2' | | | HNU 0 | |
| | | 5 | 2'/1.5 | 8-10 | 2-2-11 | | | | HNU 0 | |
| 10 | | 6 | 2'/.5' | 10-12 | 4-7-9 | Black, dry, f/c SAND, f/c GRAVEL, cinders, slag and little SILT. 12.5' | | | HNU 0 | |
| | | | | | 10 | | | | | |
| | | 7 | .9/.7' | 12- | 12- | BOULDER or ROCK 13.5' | | | | |
| | | | | 2.9 | 100/.3 | | | | | |
| 15 | | 8 | 1.1/1' | 14- | 21-30- | Black, brown, red miscellaneous fill cinders, pieces of brick & slag little SAND. 17.5' | | | HNU 0 | |
| | | | | 15.1 | 80/.1 | | | | | |
| | | 9 | 2'/ | 18-20 | 21-18 | 19.0' | | | HNU 0 | |
| | | | NR | | 21-25 | | | | | |
| 20 | | 10 | 2'/2' | 20-22 | 17-8- | Gray, wet f/m SAND & SILT (some SILT & CLAY LENSES) occasional pebbles | | | HNU 0 | |
| | | | | | 14-11 | | | | | |
| | | 11 | 2'/2' | 22-24 | 17-17- | | | | HNU 0 | |
| | | | | | 14-4 | | | | | |
| 25 | | 12 | 2'/1.5' | 24-26 | 50-25 | | | | HNU 0 | |
| | | | | | 5-5 | | | | | |
| | | 13 | 2'/1' | 26-28 | 5-4- | | | | HNU 0 | |
| | | | | | 7-14 | | | | | |
| | | 14 | 2'/1.7' | 28-30 | WR/1' | | | | HNU 0 | |
| 30 | | | | | 2-2 | | | | | |
| | | | | | | BOB @ 31' | | | | |

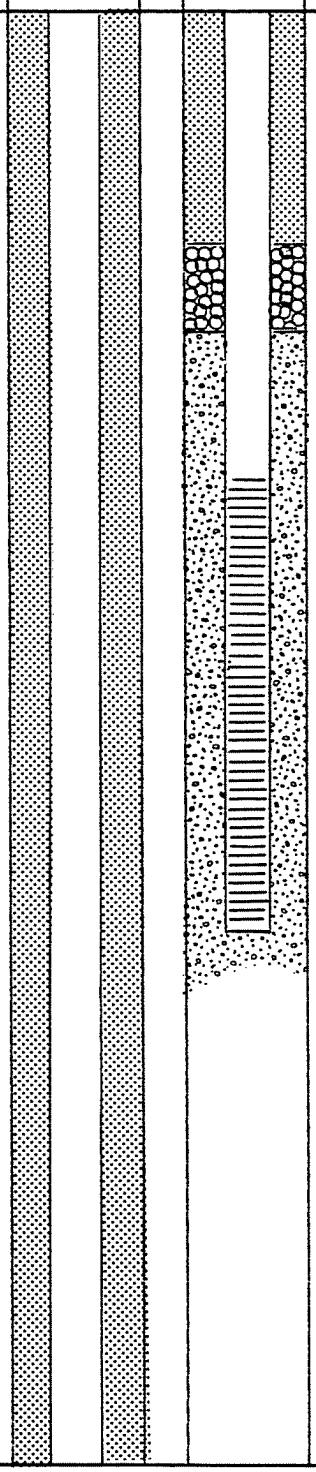
REMARKS:

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-7D, MW-7S Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. Date 7/19/88<br>MW-7D Elev. Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: Southwest Corner of Site
Ground Elevation: 581.20=MW-7D
Dates Started: 5/13/88 Ended: 5/13/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 2/4/7/10 | | 11 | Moist, rusty brown, SILT, little clay, hard, stiff. | |
| | | | | | | | 0.5' |
| 2 | 2 | 2-4 | 6/9/8/8 | | 17 | Moist, medium dense, black/tan layered SAND, some silt. | |
| | | | | | | | 2.0' |
| 4 | 3 | 4-6 | 2/2/1/1 | | 3 | Moist black/tan/rust fine-medium SAND, little silt slag. (Sand appears to be foundry material) | |
| 6 | 4 | 6-8 | 1/1/1/1 | | 2 | Moist very loose black/brown, fine-medium SAND, little silt, organics. (Sand appears to be foundry material) | |
| 8 | 5 | 8-10 | 1/1/1/WH | | 2 | Moist very loose black, fine-medium SAND, little silt. (Sand appears to be foundry material) | |
| 10 | 6 | 10-12 | 1/4/14/11 | | 18 | Moist black, fine-coarse SAND, little silt. | |
| 12 | 7 | 12-14 | 13/10/ | | 19 | | |
| | | | 9/14 | | | | 13.5' |
| 14 | 8 | 14-16 | 7/10/ | | 22 | Wet medium dense rust, fine-coarse SAND, slag, little silt. (Sand appears to be foundry material) | |
| | | | 12/15 | | | | |
| 16 | 9 | 16-16.3 | 10/ref. | | | | |
| | | | | | | | 17.0' |
| 18 | 10 | 18-20 | 8/7/6/5 | | 13 | Wet medium dense gray fine SAND, some silt. | |
| 20 | 11 | 20-22 | 2/4/6/4 | | 10 | | |
| 25 | 12 | 25-26.5 | 2/1/1 | | 2 | - Same as above with little to trace of silt. | |
| 30 | 13 | 30-31.5 | 2/1/1 | | 2 | | |




MW-7D:
51.7'-41.7' .010 Slot PVC screen
51.7'-38.0' Washed silica sand 4Q
38.0'-33.0' Bentonite slurry
33.0'-0.0' Cement/bentonite grout

MW-7S:
19.7'-9.7' .010 Slot PVC screen
19.7'-7.0' Washed silica sand 4Q
7.0'-5.0' Bentonite pellets
5.0'-0.0' Cement/bentonite grout

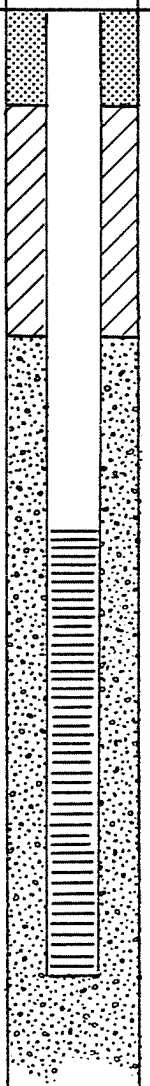
File Name:NIMOMW7.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-7D, MW-7S Sheet 2 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 567.70 Date 7/19/88<br>MW-7S Elev. 568.07 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: Souothwest Corner of Site
Ground Elevation: 581.10' MW-7S
Dates Started: 5/13/88 Ended: 5/13/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Remks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 14 | 35-36.5 | 3/8/10 | | 18 | Wet, gray, medium dense fine-medium SAND, trace of silt, trace of gravel. | 35.0' | | | 0 | |
| 40 | 15 | 40-41.5 | 3/14/6 | | 20 | Wet gray, medium dense fine SAND and SILT trace of gravel, small wood layer. | 40.0' | | | 0 | |
| | | | | | | Wet, gray, fine SAND and SILT, trace of gravel. | 40.5' | | | | |
| 45 | 16 | 45-46.5 | 4/3/6 | | 9 | | | | | 0 | |
| | | | | | | Wet stiff gray, CLAY and SILT. | 46.0' | | | | |
| 50 | | | | | | | | | | | |
| | | | | | | - Auger Refusal - | 51.7' | | | | |



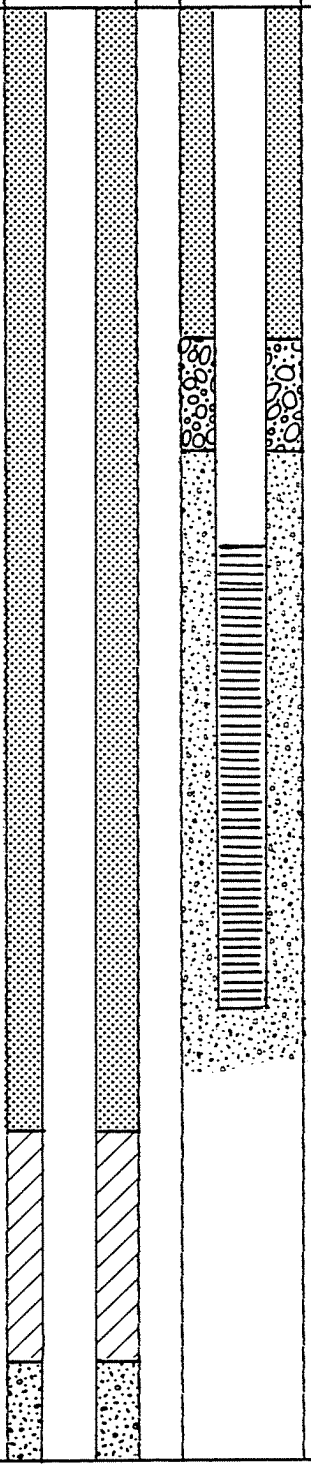
File Name: NIMOMW7B.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-8I, MW-8S Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 566.16 Date 7/19/88<br>Elev. 566.23 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: Along North Central Portion of Site
Ground Elevation: 585.90': MW-8I
Dates Started: 5/11/88 Ended: 5/11/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 2/3/3/4 | | 6 | Damp, brown, SILT and CLAY, root hairs. | |
| | | | | | | Dry, brown, fine-medium SAND, trace silt. (Sand appears to be foundry material). | 0.5' |
| 2 | 2 | 2-4 | 4/5/6/4 | | 11 | Dry, medium dense tan, SAND, trace silt. (Sand appears to be foundry material). | |
| | | | | | | | 3.5' |
| 4 | 3 | 4-6 | 3/3/3/4 | | 6 | Moist, brown, fine-medium SAND, trace of silt. (Sand appears to be of foundry material). | |
| 6 | 4 | 6-8 | 2/3/3/4 | | 6 | Moist, loose, black/tan/rust layered, fine-medium SAND, trace silt, slight odor. | |
| 8 | 5 | 8-10 | 3/4/4/5 | | 8 | Metal plate and pieces of heavy fabric found in drill cuttings. | |
| 10 | 6 | 10-12 | 4/4/4/4 | | 8 | - Same as above. | |
| 12 | 7 | 12-14 | 4/4/3/3 | | 7 | - Same as above. | |
| 14 | 8 | 14-16 | 4/4/5/6 | | 9 | | |
| 16 | 9 | 16-18 | 3/4/4/4 | | 8 | | |
| 18 | 10 | 18-20 | 21/18/2/2 | | 20 | Wet, medium dense black, fine-medium SAND, trace silt, odor. | |
| 20 | 11 | 20-22 | 2/3/3/4 | | 6 | | |
| | | | | | | Wet, black, light gray, SILT, some clay, stiff, (natural material). | 21.5' |
| | | | | | | | 25.0' |
| 25 | 12 | 25-26.5 | 3/4/5/6 | | 9 | Wet, loose, brown, fine-medium SAND, loose. | |
| 30 | 13 | 30-31.5 | 3/5/7/9 | | 13 | Wet, medium dense fine-medium SAND, little silt. | |




MW-8I: 41.5'-31.5' .010 Slot PVC screen
41.5'-37.5' Natural sand pack
37.5'-29.0' Washed silica sand 4Q
29.0'-24.0' Bentonite slurry
24.0'-0.0' Cement/bentonite grout

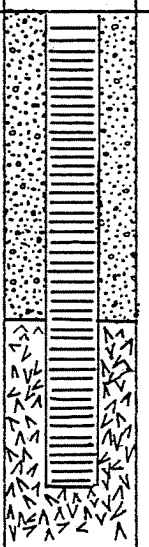
MW-8S: 21.5'-11.5' .010 Slot PVC screen
21.5'- 9.5' Washed silica sand 4Q
9.5'- 7.0' Bentonite pellets
7.0'- 0.0' Cement/bentonite grout

File Name:NIMOMW8.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-8I, MW-8S Sheet 2 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 569.46 Date 7/19/88<br>Elev. 569.15 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: Along North Central Portion of Site
Ground Elevation: 585.70'
Dates Started: 5/11/88 Ended: 5/11/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 14 | 35-36.5 | 3/4/5/7 | | 9 | Wet, loose, brown, fine-medium SAND. | 35.0' |  | | 0 | |
| 40 | 15 | 40-41.5 | 3/4/5/5 | | 9 | | | | | 0 | |
| | | | | | | Bottom of Hole at 41.5 ft. | | | | | |

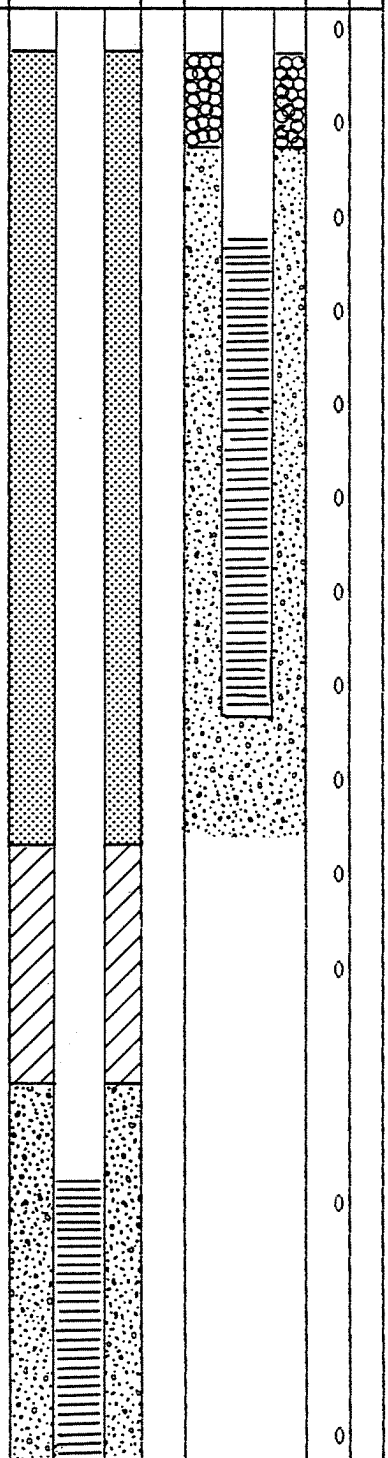
File Name: NIMOMW8B.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-9I, MW-9S Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 565.32 Date 7/19/88<br>MW-9I Elev. 565.27 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: Softball Field #1 L. Field
Ground Elevation: 578.30': MW-9I
Dates Started: 5/12/88 Ended: 5/12/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 4/5/6/12 | | 11 | Moist, very stiff, brown, SILT and clay. | |
| | | | | | | Moist, black, fine-medium SAND, little silt, loose, odor. | 0.3' |
| 2 | 2 | 2-3 | 10/14/ref | | 14 | | |
| 4 | 3 | 4-6 | 3/4/6/6 | | 10 | | |
| | | | | | | Moist, tan, medium dense fine-medium SAND, solid. | 5.5' |
| 6 | 4 | 6-8 | 5/6/6/15 | | 12 | | 5.7' |
| | | | | | | Moist, black, medium dense, fine-medium SAND, little silt. | |
| 8 | 5 | 8-10 | | NR | | Moist, black, medium dense, SILT, some fine sand, trace of clay. | 7.0' |
| 10 | 6 | 10-12 | 2/2/3/6 | | 5 | | |
| 12 | 7 | 12-14 | 6/4/4/6 | | 8 | Wet, black, medium stiff SILT, some clay, soft, cohesive, organics. | |
| 14 | 8 | 14-16 | 6/7/8/6 | | 15 | | 15.0' |
| | | | | | | Wet, gray, medium stiff SILT, some fine sand, some clay. | |
| 16 | 9 | 16-18 | 2/3/2/3 | | 5 | Wet, gray, medium stiff SAND and silt. | |
| 18 | 10 | 18-20 | 2/3/5/9 | | 8 | Wet, gray, fine SAND, some silt. | |
| 20 | 11 | 20-22 | 3/3/3/6 | | 6 | | |
| 25 | 12 | 25-26.5 | 3/3/4/3 | | 7 | - Same as above. | |
| 30 | 13 | 30-31.5 | 2/3/3/4 | | 6 | | |




MW-9I: 35.0'-25.0' .010 Slot PVC screen
35.0'-23.0' Washed silica sand 4Q
23.0'-18.0' Bentonite slurry
18.0'- 1.0' Cement/bentonite grout

MW-9S: 15.0'-5.0' .010 Slot PVC screen
15.0'-3.0' Washed silica sand 4Q
3.0'-1.0' Bentonite pellets

File Name:NIMOMW9.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-9I, MW-9S Sheet 2 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 569.46 Date 7/19/88<br>MW-9S Elev. 569.15 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: Softball Field #1 L. Field
Ground Elevation: 578.30': MW-9S
Dates Started: 5/12/88 Ended: 5/12/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | . | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | Wet. gray, loose, fine-coarse SAND and silt, some fine gravel. | | | | | | |
| 35 | 14 | 35-36.5 | 1/1/3/2 | | 4 | | 36.0' | | | | 0 | |
| | | | | | | Bottom of Hole @ 36.5 ft. | | | | | | |

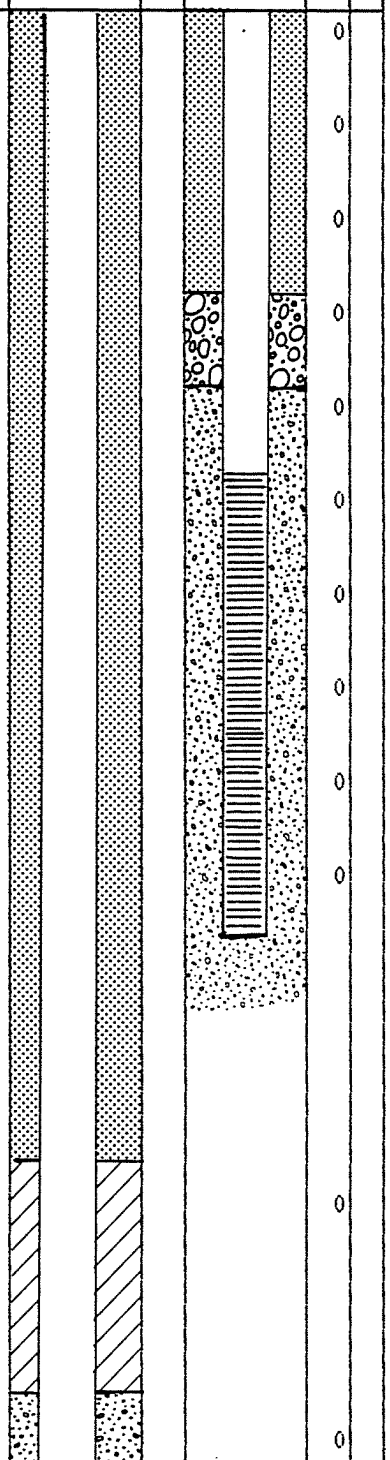
File Name: NIMOMW9B.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-10I, MW-10S Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 565.27 Date 7/19/88<br>Elev. 564.42 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: South Central Portion of Site
Ground Elevation: 580.20': MW-10I
Dates Started: 5/18/88 Ended: 5/18/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 1/2/3/3 | | 5 | Moist, black/brown, SILT, clay. | 0.3' |
| | | | | | | Moist, brown/black/rust, fine-medium SAND, little silt. | 1.8' |
| 2 | 2 | 2-4 | 2/3/4/4 | | 7 | Moist, black, SILT, little clay. | 2.0' |
| | | | | | | Moist, black, rust/brown, fine-medium SAND, some silt, ash material at approx. 3.0 ft. | |
| 4 | 3 | 4-6 | 4/6/4/4 | | 10 | | 6.0' |
| | | | | | | Moist, black/tan/orange, fine-medium SAND, little silt. | 6.5' |
| 6 | 4 | 6-8 | 3/3/4/7 | | 7 | Moist, black, rust, fine-medium SAND, little silt. | 9.0' |
| | | | | | | Moist, orange/tan, hard pieces of slag, fine-medium SAND, trace of silt. | 10.0' |
| 8 | 5 | 8-10 | 7/6/5/5 | | 11 | Moist, orange/tan, fine-medium SAND, trace of silt. | 11.0' |
| | | | | | | Moist, black, fine-medium sand. | 14.0' |
| 10 | 6 | 10-11.1 | 2/4/15/.1 | | 19 | - No recovery at 12.0 ft. - | 15.0' |
| | | | | | | Moist, tan/rust/black, fine-medium SAND, little silt. | 19.0' |
| 12 | 7 | 12-14 | | NR | | Fill material - paper. ash, cinders, some fine-medium sand, little silt. | 22.5' |
| | | | | | | | |
| 14 | 8 | 14-16 | 15/11/8/8 | | 19 | | |
| | | | | | | | |
| 16 | 9 | 16-18 | 15/9/4/11 | | 13 | | |
| | | | | | | | |
| 18 | 10 | 18-20 | 7/4/4/3 | | 8 | | |
| | | | | | | Wet, black, brown, SILT, some clay, organics. | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 25 | 11 | 25-26.5 | 2/3/4 | | 7 | Wet, light gray, medium stiff fine SAND silt, little clay. | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 30 | 12 | 30-31.5 | WOR-4 | | 1 | Wet, gray, very loose, fine-coarse SAND, little silt. | |



| Equipment Installed | HNU | Rmks* |
|---|---|---|
| | 0 | |
| | 0 | |
| | 0 | |
| | 0 | |
| | 0 | |
| | 0 | |
| | 0 | |
| | 0 | |
| | 0 | |
| | 0 | |
| | 0 | |
| | 0 | |

MW-10I: 42.5'-32.5' .010 Slot PVC screen
42.5'-29.5' Washed silica sand 4Q
29.5'-24.5' Bentonite slurry
24.5'-0.0' Cement/bentonite grout

MW-10S: 20.0'-10.0' .010 Slot PVC screen
20.0'- 8.0' Washed silica sand 4Q
8.0'-6.0' Bentonite pellets
6.0'-0.0' Cement/bentonite grout

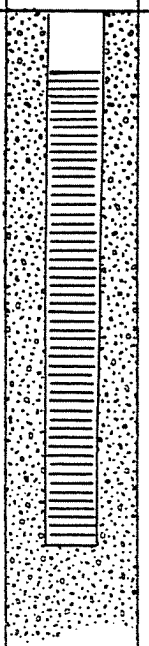
File Name:NIMO10I.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-10I, MW-10S Sheet 2 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 568.17 Date 7/19/88<br>MW-10S Elev. 568.58 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: South Central Portion of Site
Ground Elevation: 580.20': MW-10S
Dates Started: 5/18/88 Ended: 5/18/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 13 | 35-36.5 | 2/2/3 | | 5 | Moist, black/brown, SILT, clay. | | | | 0 | |
| 40 | 14 | 40-41.5 | 2/5/7 | | 12 | Moist, gray, stiff, SILT, some fine-coarse sand, little clay. | | | | 0 | |
| | | | | | | Bottom of Hole @ 41.5 ft | | | | | |



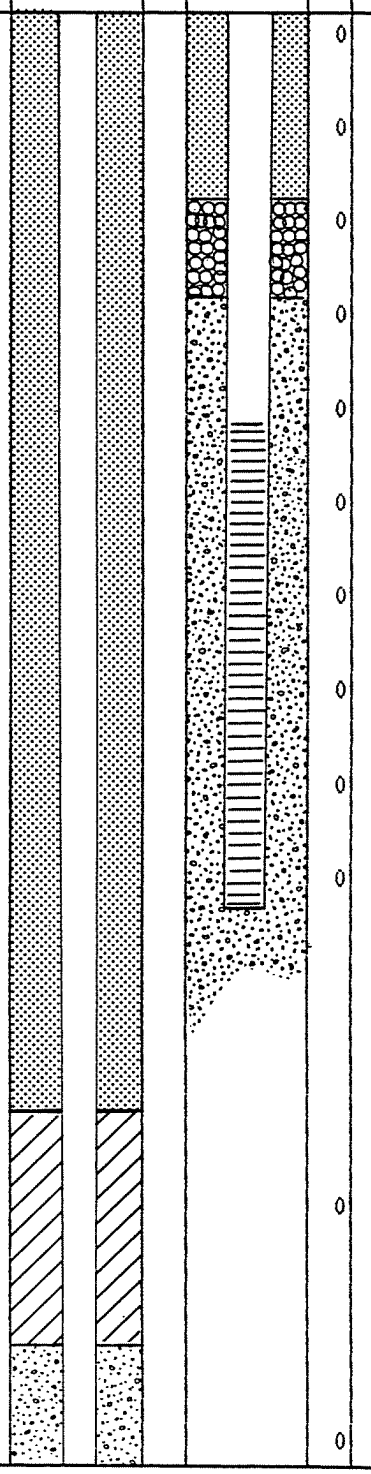
File Name: NIMO10IB.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-11I, MW-11S Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 565.97 Date 7/19/88<br>Elev. 565.88 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: South of Entrance Road
Ground Elevation: 580.60': MW-11I
Dates Started: 5/19/88 Ended: 5/19/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 2/10/ | | 25 | Damp, brown, very stiff, CLAY, some silt. | 0.4' | | | 0 | |
| | | | 15/17 | | | Damp, black/rust/tan fine-medium SAND, little silt. | 3.0' | | | 0 | |
| 2 | 2 | 2-4 | 20/22/ | | 52 | Damp, tan/orange very dense, fine-medium SAND, little silt. | 3.5' | | | 0 | |
| | | | 30/28 | | | | | | | | |
| 4 | 3 | 4-6 | 4/4/4/4 | | 8 | Damp, black, fine-medium SAND, some silt. | | | | 0 | |
| | | | | | | | | | | | |
| 6 | 4 | 6-8 | 3/3/2/2 | | 5 | | 7.0' | | | 0 | |
| | | | | | | Damp, black, loose, fine-medium SAND, silt. | | | | | |
| 8 | 5 | 8-10 | 3/2/1/1 | | 3 | Damp, black, very loose, fine-medium SAND, some silt. | | | | 0 | |
| | | | | | | | | | | | |
| 10 | 6 | 10-12 | 1/WH/7/5 | | 7 | Wet, black, loose, fine-medium SAND, some silt, ash material. | | | | 0 | |
| | | | | | | | | | | | |
| 12 | 7 | 12-14 | 3/4/5 | | 7 | | 13.0' | | | 0 | |
| | | | | | | Wet, black, loose, SILT, some fine-medium SAND, trace clay, organic material paper. | 13.5' | | | | |
| 14 | 8 | 14-16 | 2/3/4/6 | | 7 | Wet, black, loose, fine-medium SAND, some silt, ash material. | 15.5' | | | 0 | |
| | | | | | | | | | | | |
| 16 | 9 | 16-18 | 2/3/3/4 | | 6 | Wet, black, loose medium stiff SILT, trace of fine sand, hard. | 16.0' | | | 0 | |
| | | | | | | | | | | | |
| 18 | 10 | 18-20 | 1/WH/2/2 | | 2 | Wet, black, fine-medium SAND, some silt, ash material. | 17.0' | | | 0 | |
| | | | | | | Wet, black, loose some fine-medium SAND, ash cinders, organic material. | 17.5' | | | | |
| | | | | | | Wet, light brown, soft SILT and fine sand trace of clay. | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 25 | 11 | 25-26.5 | 2/2/1 | | 3 | | 26.0' | | | 0 | |
| | | | | | | Wet, medium brown, black, soft SILT, some fine-medium sand and gravel. | 26.5' | | | | |
| | | | | | | Wet, light brown, medium SILT and stiff fine sand, trace of clay. | | | | | |
| | | | | | | | | | | | |
| 30 | 12 | 30.5-32 | 3/2/5 | | 7 | | | | | 0 | |



MW-11I: 40.5'-30.5' .010 Slot PVC screen
40.5'-27.5' Washed silica sand 4Q
27.5'-22.5' Bentonite slurry
22.5'- 0.0' Cement/bentonite grout

MW-11S: 18.0'-8.0' .010 Slot PVC screen
18.0'-5.0' Washed silica sand
5.0'-3.0' Bentonite pellets
3.0'-0.0' Cement/bentonite grout

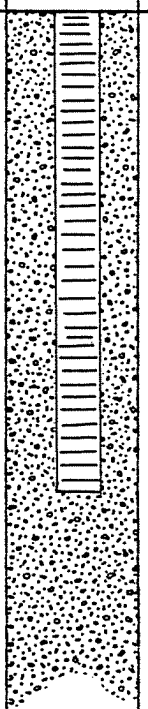
File Name:NIMO11I.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-11I, MW-11S Sheet 2 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 568.76 Date 7/19/88<br>MW-11S Elev. 568.78 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: South of Entrance Road
Ground Elevation: 580.20': MW-11S
Dates Started: 5/19/88 Ended: 5/19/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | Wet, medium brown, medium stiff SILT, some fine-medium sand, trace of clay. | 31.3' | | | | |
| | | | | | | Wet, light brown medium stiff SILT and fine sand, trace of clay. | 31.9' | | | | |
| 35 | 13 | 35-36.5 | 2/3/6 | | 9 | - Same as above. | | | | 0 | |
| 40 | 14 | 40-41.5 | 2/1/2 | | 3 | - Same as above. | | | | 0 | |
| | | | | | | Botton of Hole @ 41.5 ft. | | | | | |



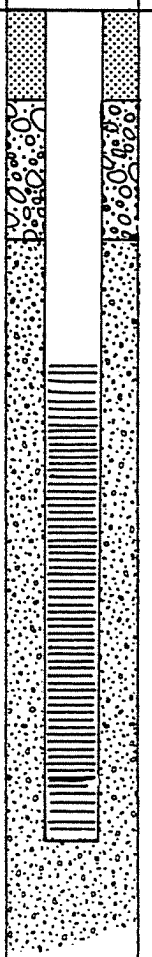
File Name: NIMO11IB.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-12 Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 568.78 Date 7/19/88<br>Elev. 568.85 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: Across South Drainage Ditch:Near Road
Ground Elevation: 581.00'
Dates Started: 7/05/88 Ended: 7/06/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Equipment Installed | HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 1/1 | | 13 | Dry, gray, stiff SILT, some-little fine sand powder like. | | | | 0 | |
| | | | 12 | | | | | | | | |
| 2 | 2 | 2-4 | 9/10 | | 20 | Dry, brown, very stiff SILT, some-little fine sand, - powder like - small pieces of slag throughout. | | | | 0 | |
| | | | 10/19 | | | | | | | | |
| | | | | | | | | | | | |
| 5 | 3 | 5-7 | 10/11 | | 22 | | | | | 0 | |
| | | | 11/14 | | | | | | | | |
| 7 | 4 | 7-9 | 14/11 | | 22 | Dry, dark brown, very stiff SILT, fine-medium sand, some fine-very coarse pieces of slag (orange and white). | 7.0' | | | 0 | |
| | | | 11/15 | | | | | | | | |
| 9 | 5 | 9-11 | 4/6 | | 13 | Dry, gray, SILT, some fine sand, organics powder like little fine-coarse slag. | 9.0' | | | 0 | |
| | | | 7/7 | | | | 10.0' | | | | |
| 11 | 6 | 11-11.8 | 6-25/3 | | 31+ | Very moist, brown/orange/rust, coarse SAND, trace silt. | | | | 0 | |
| | | | | | | | 11.5' | | | | |
| | | | | | | Very moist, gray, SILT, trace of medium sand slightly plaster, white speckled material throughout, slag (hand drilling) | | | | | |
| 14 | 7 | 14-14.8 | 14-20/.3 | | 34+ | | 14.5' | | | 0 | |
| | | | | | | Moist, black, SILT, some fine-medium sand, slight trace of clay, slag (hard drilling). | | | | | |
| | | | | | | | | | | | |
| | | | | | | | 17.5' | | | | |
| 18 | 8 | 18-20 | WR/2/2 | | 4 | Wet, dark gray, soft SILT, some fine sand soft. | | | | 0 | |
| | | | | | | | | | | | |
| 20 | 9 | 20-22 | 2/2 | | 4 | - NR - | | | | 0 | |
| | | | 2/2 | | | | | | | | |
| | | | | | | | 22.0' | | | | |
| | | | | | | Bottom of Hole at 22 ft. | | | | | |
| 25 | | | | | | | | | | | |



MW-12: 17.5'-7.5' .010 Slot PVC screen
17.5'-5.0' Washed silica sand 4Q
5.0'-2.0' Bentonite pellets
2.0'-0.0' Cement/bentonite grout

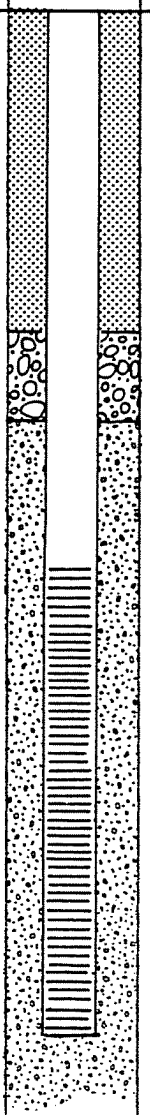
File Name: NIMOMW12.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No. MW-13 Sheet I |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Elev. 568.43 Date 7/19/88<br>Elev. 568.04 Date 12/2/88<br>File No. 1118.057.130 |

Boring Co. North Star Drilling
Foreman: Harry Lyons
OBG Hydrogeologist: Susan Cox

Boring Location: Across South Drainage Ditch: Western Area
Ground Elevation: 584.10'
Dates Started: 7/06/88 Ended: 7/06/88

| Depth | Sample No | Sample Depth in ft. | Blows /6" | Penetr/ Recovry | "N" Value | Sample Description | Stratum Change General Descript |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 2/5 | | 18 | Dry, black, medium dense SAND, some fine sand, powder like. | |
| | | | 13/16 | | | | 1.5' |
| 2 | 2 | 2-4 | 14/14 | | 20 | Dry, white, SAND like material small to medium conglamerates of material. (Sand appears to be foundry material). | |
| | | | 6/6 | | | | 1.8' |
| 4 | 3 | 4-6 | 4/5 | | 15 | Damp, black, medium dense SAND, some silt little pieces of slag throuhout. (Sand appears to foundry material). | |
| | | | 10/27 | | | Dry medium-dark, medium dense, brown, fine-medium SAND, little silt. (Sand appaers to foundry material). | |
| 6 | 4 | 6-8 | 18/21 | | 39 | | 5.5' |
| | | | 18/20 | | | Dry, white, SAND like material small to medium conglamerates of material. | |
| 8 | 5 | 8-10 | 18/44 | | 94 | | 5.8' |
| | | | 50/50 | | | Damp, black with some small brown layers throughout, coarse SAND. 8-10' Drain spoon on wood. | |
| 10 | 6 | 10-12 | 13/15 | | 20 | | 10.5' |
| | | | 5/7 | | | Solid wood. | 11.5' |
| 12 | 7 | 12-14 | 3/6 | | 15 | Damp, black, medium dense, coarse SAND, little silt, small pieces of wood and tan slag pieces throuhout. (Sand appears to be foundary material). | |
| | | | 9/15 | | | | 14.0' |
| 14 | 8 | 14-16 | 3/3 | | 9 | Moist, black, loose, fine-medium SAND, little silt, some pieces of slag. | |
| | | | 6/7 | | | | 16.0' |
| 16 | 9 | 16-18 | 12/14 | | 25 | Wet, black/light gray, fine-medium SAND, little silt. | |
| | | | 11/24 | | | | 18.0' |
| | | 18-20 | | | | | |
| | | | | | | | |
| | | 20-22 | | | | | |
| | | | | | | | |
| | | 22-24 | | | | | |



Equipment Installed | Equipment Installed | HNU | Rmks*

MW-13: 22.0'-12.0' .010 Slot PVC screen
22.0'- 9.0' Washed silica sand 40
9.0'-7.0' Bentonite pellets
7.0'-0.0' Cement/bentonite grout

File Name: NIMOPMW13.MEQ

BORING ELELVATION SUMMARY
CHERRY FARM SITE
NIAGARA MOHAWK POWER CO.
TONAWANDA, NY

| BORING NUMBER | GROUND ELEVATION (FT) | FILL DEPTH (FT) | BOTTOM OF FILL ELEVATION (FT) |
|---|---|---|---|
| B-1 | 585.1 | 19.5 | 565.6 |
| B-2 | 581.9 | 19.5 | 562.4 |
| B-3 | 578.9 | 15.5 | 563.4 |
| B-4 | 583.0 | 19.5 | 563.5 |
| B-5 | 579.4 | 11.5 | 567.9 |
| A | 580.6 | 17.0 | 563.6 |
| B | 580.9 | 19.5 | 561.4 |
| C | 580.4 | 18.0 | 562.4 |
| D | 578.9 | 25.0 | 553.9 |
| E | 582.1 | 16.6 | 565.5 |
| F | 577.6 | 19.0 | 558.6 |
| G | 577.6 | 17.0 | 560.6 |

O'BRIEN & GERE ENGINEERS, INC.

# TEST BORING LOG

REPORT OF BORING NUMBER B-1
SHEET ____ OF ____
DATE ____ FILE ____

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE: ____
HAMMER FALL ____

GROUNDWATER READINGS

| DATE | DEPTH | | |
|---|---|---|---|
| | | | |

BORING CO. Empire Soils
FOREMAN Joe Genovese
OBG ENGINEER Deborah Wright

BORING LOCATION B-1
GROUND ELEV. ____
DATE STARTED 7-31-85 DATE ENDED 7-31-85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2.0/2.0 | 0-2 | 5-11-68- | Brown, dry CLAY .5' | | | HNU 1.2 | |
| | | | | | 50 | Dk. Brown, dry SILT & f SAND 1.5' | | | | |
| | | | | | | Pink, dry, f/m SAND 1.6' | | | | |
| | | | | | | Black, dry, SILT & f SAND (slight odor) 2.0' | | | HNU 3.1 | |
| 5 | | 2 | 2.0/2.0 | 4.5- | 4-6-4 | 5.0' | | | | |
| | | | | 6.5 | | | | | | |
| 10 | | 3 | 2.0/6" | 9.5- | 5-4-3- | | | | | |
| | | | | 11.5 | 3 | Black, moist f/c SAND (odor) silty layer 12.0' | | | HNU .8 | |
| | | | | | | 14.5' | | | | |
| 15 | | 4 | 2.0/6" | 14.5- | 5-5-5- | | | | | |
| | | | | 16.5 | 6 | Black, moist f/c SAND. Misc wood, CLAY, GRAVEL 17.0' | | | HNU 1.8 | |
| | | | | | | 19.5' | | | | |
| 20 | | 5 | 1.0' | 19.5- | 1-2-3-4 | Black, wet, f/c SAND 19.8' | | | HNU 0 | |
| | | | | 20.5 | | Gray, wet, m/c SAND 20.8' | | | | |
| 25 | | 6 | | 24.5- | 3-5-6- | Gray, moist, SILT & CLAY 25.2' | | | HNU 0 | |
| | | | | 26.5 | 9 | Gray, wet, f/m SAND, Organics, some SILT 26.0' | | | | |
| | | | | | | Gray, wet, f/m SAND 26.5' | | | | |
| | | | | | | BOB | | | | |

REMARKS:

O'BRIEN & GERE ENGINEERS, INC.

# TEST BORING LOG

REPORT OF BORING NUMBER B-2
SHEET 1 OF 1
DATE FILE

PROJECT LOCATION Cherry Farms

CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER FALL

GROUNDWATER READINGS

| DATE | DEPTH | | |
|---|---|---|---|
| | | | |

BORING CO. Empire Soils

FOREMAN Joe Genovese

OBG ENGINEER Deborah Wright

BORING LOCATION B-2

GROUND ELEV.

DATE STARTED 7-31-85 DATE ENDED 7-31-85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | 0-2 | 7-9-19 | Clay Cap .5' | | | HNU 0 | |
| | | | 1.5' | | 38 | Brown,dry,f/c SAND,some GRAVEL 1.2 | | | | |
| | | | | | | Black,dry,f/c SAND,tr.GRAVEL 1.5' | | | | |
| 5 | | 2 | | 4.5-6.5 | 6-6-6-4 | Black,moist,f/c SAND 5.0' | | | HNU 0 | |
| | | | 2' | | | Tan,moist f/m SAND,lt.br.moist 5.2 | | | | |
| | | | | | | Black,moist f/c SAND 6.2 | | | | |
| | | | | | | Dk Brown,dry-moist,f/m SAND 6.5 | | | | |
| | | | | | | 9.5 | | | | |
| 10 | | 3 | | 9.5- | 21-24 | Black,moist DILT,lt SAND(Odor) 10.0 | | | HNU .8 | |
| | | | 1' | 11.5 | 29-17 | Red,dry piece concrete/slag(?) 10.2 | | | | |
| | | | | | | Tan-dk brown,f/m SAND(casting) 10.5 | | | | |
| | | | | | | 14.5 | | | | |
| 15 | | 4 | | 14.5- | 2-3-2- | Black,wet,f/c SAND (Brown sand lense cemented) 16.5 | | | HNU 0 | |
| | | | | 16.5 | 3 | | | | | |
| | | | | | | 19.5 | | | | |
| 20 | | 5 | | 19.5- | 9-8-7- | Brown/Gray,wet,f SAND and SILT trace ORGANICS | | | HNU 0 | |
| | | | | 21.5 | 6 | 21.5' | | | | |
| | | | | | | BOB | | | | |
| 25 | | | | | | | | | | |
| 30 | | | | | | | | | | |

REMARKS:

O'BRIEN & GERE ENGINEERS INC.

# TEST BORING LOG

REPORT OF BORING NUMBER B-3
SHEET 1 OF 1
DATE FILE

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER
FALL

GROUNDWATER READINGS

| DATE | DEPTH | | |
|---|---|---|---|
| | | | |

BORING CO. Empire Soils
FOREMAN Joe Genovese
OBG ENGINEER Deborah Wright

BORING LOCATION B-3
GROUND ELEV.
DATE STARTED 8-1-85 DATE ENDED 8-1-85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2'/ | 0-2' | 8-18- | Dry CLAY cap .33' | | | HNU 3 | |
| | | | 2' | | 24-50 | Brown,dry,f SAND & SILT .8' | | | | |
| | | | | | | Black,dry,f SAND & SILT (HARD) some metal pieces & dust(iron oxide stain @1.8' 2' | | | | |
| | | | | | | | FILL | | HNU 3 | |
| 5 | | | 2'/ | 4.5- | 8-14- | Brown,moist,f/m SAND 4.5' 4.9' | | | | |
| | | | 2' | 6.5' | 36-20 | Black,moist,f/m SAND,tr GRAVEL, lt SILT (blue cloth piece) 6.5' | | | HNU .5 | |
| | | | | | | 9.5' | | | | |
| 10 | | | 2'/ | 9.5-11.5 | 5-6-6-7 | | | | | |
| | | | .5' | NR-went | back & | | | | | |
| | | | | picked up some in spoon | | | | | | |
| | | | | | | | | | | |
| 15 | | | 2'/ | 14.5- | 3-4-5- | Black,wet f/m SAND, tr GRAVEL 15.5' | | | | |
| | | | .5 | 16.5 | 4 | Gray/green,wet f SAND,little SILT (organics in top 2") 16.5' | | | HNU 0 | |
| | | | | | | Gray/green, wet, f SAND | | | | |
| 20 | | | 2'/ | 19.5- | 10-4- | | | | | |
| | | | 2' | 21.5 | 4-13 | | | | HNU 0 | |
| | | | | | | | | | | |
| 25 | | | 2'/ | 24.5- | 1-3-6 | | | | | |
| | | | 2' | 26.5 | 8 | | | | HNU 0 | |
| | | | | | | 26.5' | | | | |
| | | | | | | BOB | | | | |

REMARKS: Samples 1-3 composited for analysis.

WL 18'

O'BRIEN & GERE ENGINEERS, INC.

# TEST BORING LOG

REPORT OF BORING NUMBER B-4
SHEET 1 OF 1
DATE FILE

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER
FALL

GROUNDWATER READINGS

| DATE | DEPTH | | |
|---|---|---|---|
| | | | |

BORING CO. Empire Soils
FOREMAN Joe Genovese
OBG ENGINEER Deborah Wright

BORING LOCATION - B-4
GROUND ELEV.
DATE STARTED 8-1-85 DATE ENDED 8-1-85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2'/ | 0-2' | 9-19- | CLAY cap dry .33 | | | HNU 2 | |
| | | | | | 30-70 | Brown & tan, layered, dry f/m SAND, foundry sand 1' | | | | |
| | | | | | | Black, silty material (cloth layers) 1.5 | | | | |
| | | | | | | Br, dry f/m SAND, s GRAVEL (slag) 2.0 | | | | |
| 5 | | 2 | 2'/ | 4.5- | 7-5- | 4.5' | | | | |
| | | | | 6.5 | 4-2 | Black, moist, f/c SAND, s GRAVEL (slag) (wet SILT layer 5-'5.3') 6.0' | | | HNU 14 | |
| | | | | | | Black, moist, f/m SAND 6.5' | | | | |
| | | 3 | 1.7/ | 9.5- | 5-10- | | | | | |
| 10 | | | 1.7 | 11.5 | 21-100/.3 | Black, moist, f/m SAND, pieces of slag, brick, metal 11.0' | | | HNU .8-2.8 Layered | |
| | | | | | | Hard, Boulder or piece of Slag 12.3' | | | | |
| | | 4 | 2/.5" | 14.5- | 2-2-2 | 14.5 | | | | |
| 15 | | | | 16.5 | | Red brown, SILT, some f SAND, trace CLAY, odor 15 ?- | FILL | | HNU 2.6 | |
| | | | | | | 19.5' | | | | |
| 20 | | 5 | 2'/2' | 19.5- | 4-4- | Gray, wet, f/m SAND | | | | |
| | | | Rec | 20.5 | 4-4 | | | | HNU 4.8 | |
| | | | Disturbed | | | | | | | |
| | | | | | | | | | HNU 2.5 | |
| 25 | | 6 | 2'/2' | 24.5- | 4-4- | | | | | |
| | | | | 26.5 | 7-7 | | | | | |
| | | | | | | 26.5' | | | | |

REMARKS: Samples 1 - 5 composited for analysis
WL 231

O'BRIEN & GERE ENGINEERS, INC.

# TEST BORING LOG

REPORT OF BORING NUMBER B-5
SHEET 1 OF 1
DATE FILE

PROJECT LOCATION Cherry Farm

CLIENT: Niagara Mohawk

SAMPLER
TYPE:
HAMMER FALL

GROUNDWATER READINGS

| DATE | DEPTH |
|---|---|
| | |

BORING CO. Empire Soils
FOREMAN Joe Genovese
OBG ENGINEER Deborah Wright

BORING LOCATION Boring 5
GROUND ELEV.
DATE STARTED 8/9/85 DATE ENDED 8/9/85

| DEPTH | "N" Value | SAMPLE NO. | SAMPLE PEN./REC. | SAMPLE DEPTH | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION | STRA. CHG. GEN. DESC. | EQUIPMENT INSTALLED | FIELD TESTING | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2'/1' | 0-2' | 27-35 | Brown, dry, CLAY cap .3' | | | | |
| | | | | | 60-66 | Dk. brown, dry, SILT & f/c SAND .7' | | | | |
| | | | | | | Black/gray, dry ash and cinders .9' | | | HNU | |
| | | | | | | Dk. brown, moist, SILT & f SAND | | | Broken | |
| 5 | | | | | | 4.5' | | | | |
| | | 2 | 2'/2' | 4.5- | 6-6-8- | | | | | |
| | | | | 6.5' | 8 | Black, moist, f/c SAND, some SILT | | | | |
| | | | | | | 9.5' | | | | |
| 10 | | 3 | 2'/1' | 9.5'- | 1-2-6- | Blk. moist, f SAND & SILT 10.0' | | | | |
| | | | | 11.5' | 9 | Red brown, moist, SILT, lt CLAY, piece of slag 10.5' | | | | |
| | | | | | | Gray, moist to wet, f/m SAND, some SILT 11.5 | | | | |
| | | | | | | BOB | | | | |
| 15 | | | | | | | | | | |

REMARKS: Due to presence of red brown clayey material, this sample will be analyzed regardless of HNU reading.

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No.: Boring A Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Depth NA Date<br>Depth NA Date<br>File No.: 1118.057.130 |

Boring Co.: North Star Drilling
Foreman: Jeff Thew
OBG Geologist: Peter Bogardus

Boring Location: North Central Portion of Site
Ground Elevation: 580.66 ft.
Dates: Started: 5/18/88 Ended: 5/18/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Field Testing pH | Field Testing Sp Cond | Field Testing HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 2-12-15-15 | 18 | 27 | Topsoil - Red SILT and CLAY, plant fragments. | | | | | 1 | |
| | | | | | | Black moist SAND. Slight odor 2'-4'. | 0.5' | | | | | |
| | 2 | 2-4 | 12-20-18-18 | 12 | 38 | (Sand appears to be foundry material.) | | | | | 1 | |
| | 3 | 4-6 | 8-6-5-3 | 18 | 11 | - Same as above with little clay. | | | | | 2 | |
| 5 | | | | | | | | | | | | |
| | 4 | 6-8 | 2-2-2-3 | 18 | 4 | - Same as above with little broken glass. | | | | | 4 | |
| | 5 | 8-10 | 3-11-8-6 | 8 | 19 | - Same with little slag and sand, casting fragments. | | | | | 4 | |
| 10 | 6 | 10-12 | 2-1-2-2 | 8 | 3 | Wet at ~ 10 ft. - Same as above | | | | | 4 | |
| | 7 | 12-14 | 2-1-2-2 | 8 | 3 | - Same as above. | | | | | 1 | |
| | 8 | 14-16 | 1-2-2-3 | 12 | 4 | - Same as above. | | | | | 1 | |
| | 9 | 16-18 | 2-3-3-4 | 12 | 6 | Gray fine SAND, some silt, plant fragments. | 17.0' | | | | 1 | |
| | | | | | | B.O.B. at 18 ft. | | | | | | |

Boring tremmied with cement/bentonite grout.
Sample 10 ft-12 ft submitted to laboratory for full HSL-CLP analysis.

File Name: NIMOBA.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No.: Boring B Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Depth NA Date<br>Depth NA Date<br>File No.: 1118.057.130 |

Boring Co.: North Star Drilling
Foreman: Jeff Thew
OBG Geologist: Peter Bogardus

Boring Location: Northwest Portion of Site
Ground Elevation: 580.9 ft.
Dates: Started: 5/17/88 Ended: 5/17/88

| Depth | Sample No | Sample Depth in ft. | Blows /6" | Penetr/ Recovry | "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Field Testing pH | Field Testing Sp Cond | Field Testing HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 1-3 | 18 | 18 | Topsoil/-brown Silt and Clay. | | | | | 1 | |
| | | | 15-13 | | | 6" Black-gray moist SAND, 1" wood pieces, little slag and cinder. (Sand appears to be | 0.5' | | | | | |
| | 2 | 2-4 | 15-20 | 18 | 38 | foundry material) | | | | | 22 | |
| | | | 18-15 | | | | | | | | | |
| | 3 | 4-6 | 8-7 | 18 | 12 | | | | | | 3 | |
| 5 | | | 5-4 | | | | | | | | | |
| | 4 | 6-8 | 4-5 | 24 | 11 | - Same - 2" Dark brown moist SAND zone (odorous) sand cast fragments. | | | | | 6 | |
| | | | 6-6 | | | | | | | | | |
| | 5 | 8-10 | 4-5 | 15 | 8 | - Same with little cinders and slag, cast fragments, slight odor. | | | | | 2 | |
| | | | 3-3 | | | | | | | | | |
| 10 | 6 | 10-12 | 3-4 | 15 | 9 | - Same 2" Dark brown FOUNDRY SAND, chemical odor. Wet at 11.0 ft. | | | | | 1 | |
| | | | 5-5 | | | | | | | | | |
| | 7 | 12-14 | 5-7 | 15 | 14 | - Same little slag, fragments and cinders. | | | | | 1 | |
| | | | 7-5 | | | | | | | | | |
| | 8 | 14-16 | 5-5 | 18 | 11 | - Same | | | | | 1 | |
| 15 | | | 6-7 | | | | | | | | | |
| | 9 | 16-18 | 4-4 | NR | 7 | | | | | | | |
| | | | 3-2 | | | | | | | | | |
| | 10 | 18-20 | 4-3 | 10 | 7 | Gray SILT, fine sand, plant matter. | 19.5' | | | | 1 | |
| | | | 4-3 | | | B.O.B at 20 ft. | | | | | | |

Boring tremmied with cement/bentonite grout.
Sample 4 ft- 6 ft submitted to laboratory for full HSL-CLP analysis.

File Name: NIMOBB.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No.: Boring C<br>Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Depth NA Date<br>Depth NA Date<br>File No.: 1118.057.130 |

Boring Co.: North Star Drilling
Foreman: Jeff Thew
OBG Geologist: Peter Bogardus

Boring Location: Southern Portion of Site Along River
Ground Elevation: 580.4 ft.
Dates: Started: 5/18/88 Ended: 5/18/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Field Testing pH | Field Testing Sp Cond | Field Testing HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 5-5-10-12 | 8 | 15 | Topsoil brown SILT and CLAY. | | | | | 1 | |
| | | | | | | Black CINDERS and SAND. (Sand appears to be foundry material) | 0.5' | | | | | |
| | 2 | 2-4 | 20-28- | 8 | 46 | | | | | | 1 | |
| | | | 18-12 | | | | | | | | | |
| | 3 | 4-6 | 10-12-8-6 | 15 | 50 | SAND which appears to be foundry material. | | | | | 1 | |
| 5 | | | | | | | | | | | | |
| | 4 | 6-8 | 4-4-4-4 | 15 | 8 | - Same | | | | | 1 | |
| | 5 | 8-10 | 4-5-4-6 | 15 | 9 | - Same as above with some sand castings. | | | | | 4 | |
| 10 | 6 | 10-12 | 4-4-3-2 | 12 | 7 | - Same | | | | | 9 | |
| | 7 | 12-13.8 | 4-7 | | 19 | Brown and red SAND which appears to be foundry material. | | | | | 1 | |
| | | | 50/.3' | | | | | | | | | |
| 15 | 8 | 15-17 | 30-12-4-2 | 15 | 16 | Black sludge material, fibers wet ~ 15 ft. | | | | | 1 | |
| | 9 | 17-19 | 4-4-3-3 | 12 | 7 | | | | | | 1 | |
| | | | | | | Gray fine SAND, some silt, plant fragments. | 18.0' | | | | | |
| | | | | | | B.O.B. at 19 ft. | | | | | | |

Boring tremmied with cement/bentonite grout.
Sample 2 ft-4 ft submitted to laboratory for full HSL-CLP analysis.

File Name: NIMOBC.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No.: Boring D Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Depth NA Date<br>Depth NA Date<br>File No.: 1118.057.130 |

Boring Co.: North Star Drilling
Foreman: Jeff Thew
OBG Geologist: Peter Bogardus

Boring Location: South Central Portion of Site
Ground Elevation: 578.9 ft.
Dates: Started: 5/19/88 Ended: 5/19/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Field Testing pH | Field Testing Sp Cond | Field Testing HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 3-8-15-24 | 18 | 23 | Topsoil - Clay brown (plant matter). | | | | | 1 | |
| | | | | | | Dark black SAND, some ash. (Sand appears to be foundry material) | 0.5' | | | | | |
| | 2 | 2-4 | 20-30- | 18 | 64 | | | | | | 2.5 | |
| | | | 34-22 | | | | | | | | | |
| | 3 | 4-6 | 15-15- | 12 | 29 | - Same | | | | | 2.5 | |
| 5 | | | 14-12 | | | | | | | | | |
| | 4 | 6-8 | 4-4-5-5 | 12 | 9 | - Same | | | | | 2.5 | |
| | | | | | | | | | | | | |
| | 5 | 8-10 | 5-30- | 6 | 64 | Drillers said felt spongy - Same with petroleum odor. | | | | | 20 | |
| | | | 34-36 | | | | | | | | | |
| 10 | 6 | 10-10.8 | 19-50/.3' | 8 | 50+ | Piece of wood. | | | | | 1 | |
| | | | | | | | | | | | | |
| | 7 | 12-14 | 50/.3' | NR | 50+ | - Same | | | | | | |
| | | | | | | | 14.0' | | | | | |
| | 8 | 14-16 | 21-11-3-2 | 12 | 14 | Wet red sludge Varved with pink, black layers. | | | | | 1 | |
| 15 | | | | | | | | | | | | |
| | 9 | 16-18 | WOR/1.5-1 | 12 | 1.5 | - Same | | | | | 1 | |
| | | | | | | | | | | | | |
| | 10 | 18-20 | WOR/1-1-1 | 12 | 2 | - Same | | | | | 1 | |
| | | | | | | | | | | | | |
| 20 | 11 | 20-22 | WOR/1-1-1 | 12 | 2 | - Same | | | | | 1 | |
| | | | | | | | | | | | | |
| | 12 | 22-24 | 6-12/ | 12 | 2 | - Same | | | | | 1 | |
| | | | 1-1-1 | | | | | | | | | |
| | 13 | 24-26 | WOR/1-4-5 | 15 | 5 | | | | | | 1 | |
| | | | | | | | 25.0' | | | | | |
| | | | | | | Gray wet fine SAND, little silt, trace of rock fragments. | | | | | | |

Boring tremmied with cement/bentonite grout.
Sample 14 ft-16 ft submitted to laboratory for full HSL-CLP analysis.

File Name: NIMOBD.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No.: Boring E Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Depth NA Date<br>Depth NA Date<br>File No.: 1118.057.130 |

Boring Co.: North Star Drilling
Foreman: Jeff Thew
OBG Geologist: Peter Bogardus

Boring Location: Southeast Portion of Site
Ground Elevation: 582.10 ft.
Dates: Started: 5/19/88 Ended: 5/19/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Field Testing pH | Field Testing Sp Cond | Field Testing HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 2-3-4-3 | 15 | 7 | Topsoil - Clay brown (plant matter). | | | | | 1 | |
| | | | | | | Mixed ash and cinders, with dark brown sand which appears to be foundry material. | 0.5' | | | | | |
| | 2 | 2-4 | 3-4-4-10 | 18 | 8 | | | | | | 1 | |
| | 3 | 4-6 | 10-14- | 16 | 28 | - Same with silt layer (petroleum odor). | | | | | 1 | |
| 5 | | | 14-10 | | | | | | | | | |
| | 4 | 6-8 | 10-5-5-4 | 13 | 10 | Black SAND, trace of casting. (Sand appears to be foundry material) | | | | | 1 | |
| | 5 | 8-10 | 6-20- | 14 | 35 | Black fine to medium SAND, silt layer with petroleum odor. (Sand appears to be foundry material) | | | | | 1 | |
| | | | 15-12 | | | | | | | | | |
| 10 | 6 | 10-12 | 10-5-6-5 | 14 | 11 | - Same | | | | | 1 | |
| | 7 | 12-14 | 6-10-8-6 | 10 | 18 | Layered black and brown SAND and CLAY with granular dark brown sand, fine little cinders and brick. (Sand appears to be foundry material) | 12.0' | | | | 1 | |
| | 8 | 14-16 | 8-6-5-5 | 8 | 11 | Fine grading to SAND, wet. (Sand appears to be foundry material) | | | | | 1 | |
| 15 | | | | | | | | | | | | |
| | 9 | 16-18 | 3-4-3-4 | 12 | 7 | - Same trace of cinders, petroleum odor. | | | | | 1 | |
| | | | | | | Gray fine SAND, moist to wet. | 16.6' | | | | | |
| | 10 | 18-20 | 4-5-4-6 | 12 | 9 | - Same with plant matter. | | | | | 1 | |
| | | | | | | B.O.B at 20 ft. | | | | | | |
| 20 | | | | | | | | | | | | |

Boring backfilled with cement/bentonite grout.
Sample 8 ft-10 ft submitted to laboratory for full HSL-CLP analysis.

File Name: NIMOBE.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No.: Boring F<br>Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Depth NA Date<br>Depth NA Date<br>File No.: 1118.057.130 |

Boring Co.: North Star Drilling
Foreman: Jeff Thew
OBG Geologist: Peter Bogardus

Boring Location: Central Western Portion of Site
Ground Elevation: 577.60 ft.
Dates: Started: 5/17/88 Ended: 5/17/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Field Testing pH | Field Testing Sp Cond | Field Testing HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 3-16-6-8 | 15 | 22 | Topsoil - Brown SILT and CLAY. | | | | | 1 | |
| | | | | | | Brown SAND and CINDERS. (Sand appears to be foundry material) | 0.5' | | | | | |
| | 2 | 2-4 | 20-20- | 15 | 35 | | | | | | 1 | |
| | | | 15-18 | | | | | | | | | |
| | 3 | 4-6 | 12-16-8-5 | 15 | 24 | - Same | | | | | 4 | |
| 5 | | | | | | | | | | | | |
| | 4 | 6-8 | 4-7-8-40 | 15 | 15 | - Same | | | | | 4 | |
| | | | | | | | | | | | | |
| | 5 | 8-8.2 | 50/.2' | NR | 50+ | Black cinders and gravel. | | | | | | |
| | | | | | | | | | | | | |
| 10 | 6 | 10-12 | 10-11- | 15 | 21 | Wet ~10 ft. Brown cinders and sand which appears to be foundry material. | | | | | 1 | |
| | | | 9-18 | | | | | | | | | |
| | 7 | 12-14 | 22-20- | 12 | 38 | Crushed rock fragments, some slag. | | | | | 1 | |
| | | | 18-14 | | | | | | | | | |
| | 8 | 14-16 | 2-2-3-3 | 15 | 5 | - Same as above. | | | | | 1 | |
| 15 | | | | | | | | | | | | |
| | 9 | 16-18 | 2-3-3-5 | 12 | 6 | Black wet CINDERS and SAND. (Sand appears to be foundry material) | | | | | 1 | |
| | | | | | | | 19.0' | | | | | |
| | 10 | 18-20 | 3-3-2-3 | 15 | 5 | Gray fine SAND, some silt. trace plant fragments. | | | | | 1 | |
| | | | | | | B.O.B at 20 ft. | | | | | | |
| 20 | | | | | | | | | | | | |

Boring backfilled with cement/bentonite grout
Sample 6 ft-8 ft submitted to laboratory for full HSL-CLP analysis.

File Name: NIMOBF.MEQ

| O'BRIEN & GERE ENGINEERS, INC. | TEST BORING LOG | Report of Boring No.: Boring G<br>Sheet 1 |
|---|---|---|
| Project Location: Cherry Farms<br>Client: Niagara Mohawk | SAMPLER<br>Type: Split Spoon<br>Hammer: 140 lbs. Fall: 30 inches | Ground Water Depth NA Date<br>Depth NA Date<br>File No.: 1118.057.130 |

Boring Co.: North Star Drilling
Foreman: Jeff Thew
OBG Geologist: Peter Bogardus

Boring Location: North Central Portion of Site
Ground Elevation: 577.60 ft.
Dates: Started: 5/17/88 Ended: 5/17/88

| Depth | Sample No | Sample Depth in ft. | Sample Blows /6" | Sample Penetr/ Recovry | Sample "N" Value | Sample Description | Stratum Change General Descript | Equipment Installed | Field Testing pH | Field Testing Sp Cond | Field Testing HNU | Rmks* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0-2 | 2-4-8-6 | 24 | 12 | Topsoil - red SILT and CLAY, plant fragments. | | | | | 1 | |
| | | | | | | | 0.5' | | | | | |
| | 2 | 2-4 | 10-20- | 15 | 42 | Dark brown and black SAND which appears to be foundry material. | | | | | 1 | |
| | | | 22-10 | | | | | | | | | |
| | 3 | 4-6 | 4-8-6-4 | 15 | 14 | - Same with black silty material. | | | | | | |
| 5 | | | | | | | | | | | | |
| | 4 | 6-8 | 3-3-2-2 | 20 | 5 | - Same | | | | | 1 | |
| | | | | | | | | | | | | |
| | 5 | 8-10 | 2-1-1-1 | 18 | 2 | Sand cast fragments. | | | | | 1 | |
| | | | | | | | 9.2' | | | | | |
| 10 | 6 | 10-12 | 1-2-1-1 | 18 | 3 | Black silty material, slight chemical odor, wet at ~ 11.0 ft. | | | | | 1 | |
| | | | | | | | | | | | | |
| | 7 | 12-14 | 1-2-1-2 | 13 | 3 | - Same with little cinder, odor. | | | | | 1 | |
| | | | | | | | | | | | | |
| | 8 | 14-16 | 1-2-3-4 | 18 | 5 | Oil sheen ~ 17 ft. | | | | | 1 | |
| 15 | | | | | | | | | | | | |
| | | 16-18 | | | | | | | | | | |
| | | | | | | | 17.0' | | | | | |
| | | | | | | Gray fine SAND, some silt, trace of plant fragments. | | | | | | |
| | | | | | | B.O.B. at 18 ft. | | | | | | |

Boring tremmed with cement/bentonite grout.
Sample 14 ft-16 ft submitted to laboratory for full HSL-CLP analysis.

File Name: NIMOBG.MEQ

# APPENDIX C

## IN-SITU HYDRAULIC CONDUCTIVITY TEST FORMS AND GROUND WATER FLOW VOLUME AND VELOCITY CALCULATIONS

# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-1I
DATE: PHASE II

METHOD: RECOVERY
PERSONNEL: D. WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 19.87 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.25 ft

SCREEN LENGTH (L)= 10 ft

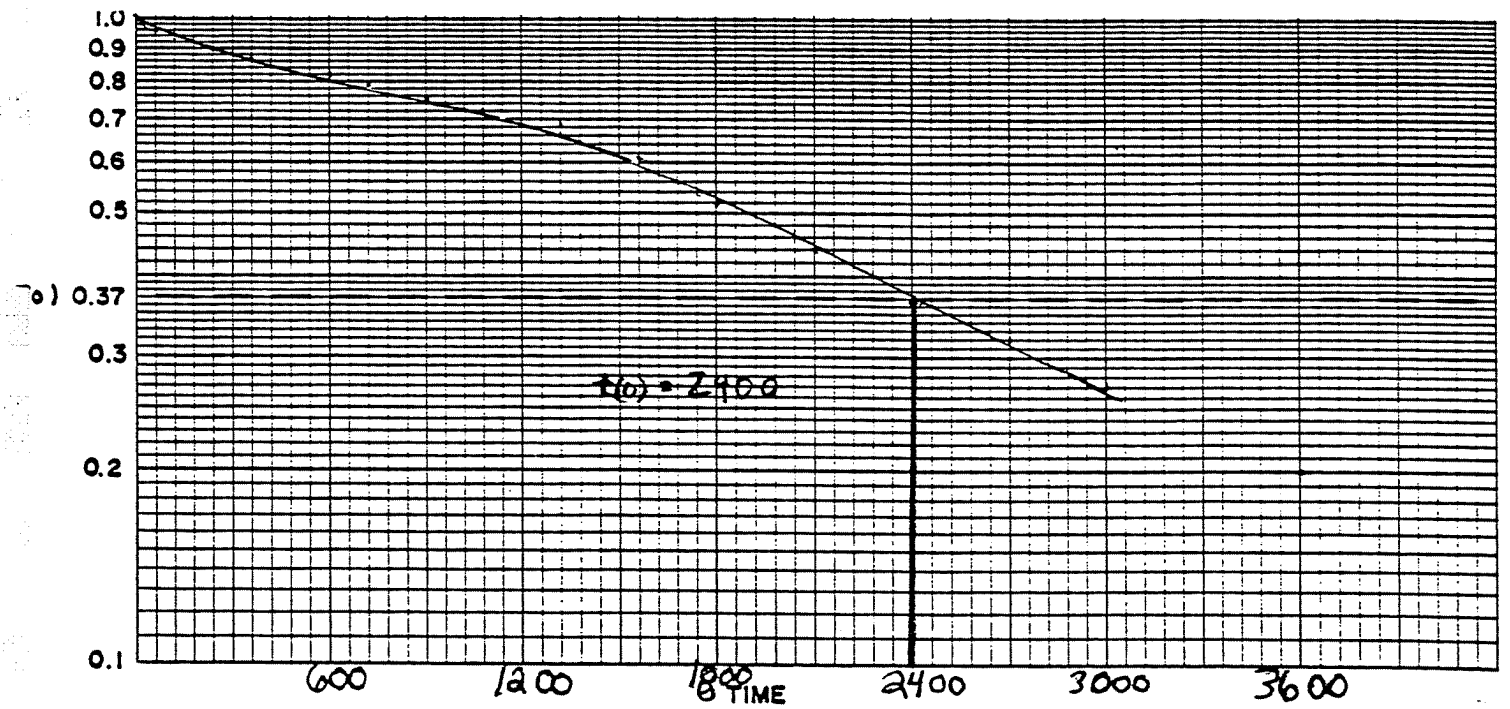
INITIAL HEAD (Ho)= 5.42 ft

To (from graph) = min
2400 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 5.3E\text{-}7 \text{ ft/sec} = 1.6E\text{-}5 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 5.42 | 1 |
| 60 | 6.12 | 0.95 |
| 120 | 6.48 | 0.93 |
| 180 | 6.68 | 0.91 |
| 240 | 6.95 | 0.89 |
| 360 | 7.32 | 0.87 |
| 480 | 7.82 | 0.83 |
| 600 | 8.07 | 0.82 |
| 720 | 8.5 | 0.79 |
| 900 | 9 | 0.75 |
| 1080 | 9.45 | 0.72 |
| 1320 | 9.94 | 0.69 |
| 1560 | 11.01 | 0.61 |
| 1800 | 12.39 | 0.52 |
| 2100 | 13.54 | 0.44 |
| 2430 | 14.56 | 0.37 |
| 2700 | 15.25 | 0.32 |
| 3000 | 15.93 | 0.27 |
| 3600 | 16.95 | 0.20 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-1D
DATE: 6/29/88

METHOD: SLUG
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.8 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 10 ft

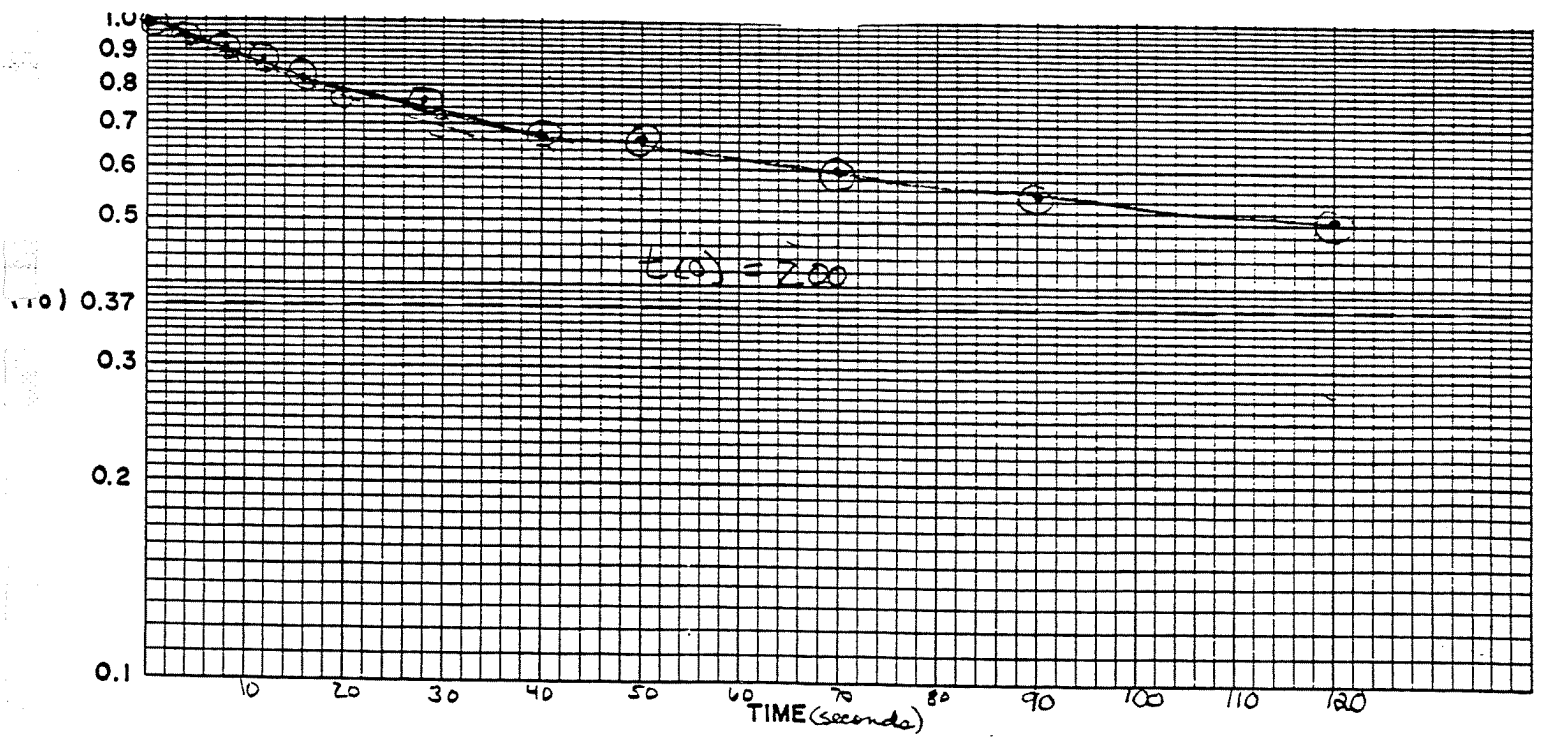
INITIAL HEAD (Ho) = 11.17 ft

To (from graph) = min
200 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 4.7E\text{-}6 \text{ ft/sec} = 1.4E\text{-}4 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 11.17 | 1 |
| 4 | 11.06 | 0.95 |
| 8 | 10.97 | 0.92 |
| 12 | 10.89 | 0.88 |
| 20 | 10.75 | 0.82 |
| 30 | 10.61 | 0.76 |
| 40 | 10.41 | 0.68 |
| 50 | 10.38 | 0.67 |
| 70 | 10.22 | 0.60 |
| 90 | 10.1 | 0.55 |
| 120 | 10.01 | 0.51 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-2S
DATE: 4/27/89

METHOD: SLUG
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 5.52 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 6.2 ft

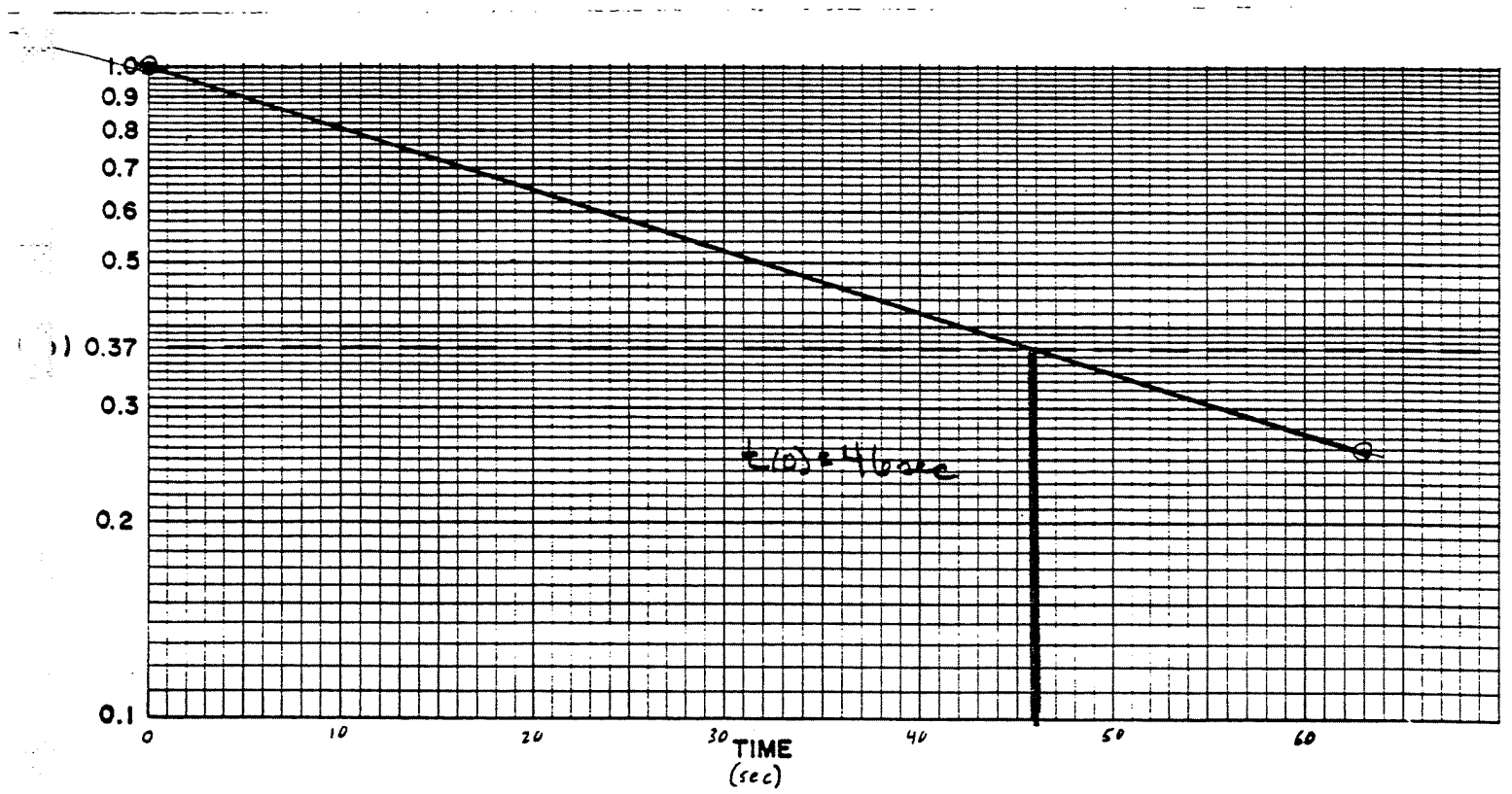
INITIAL HEAD (Ho) = 6.38 ft

To (from graph) = min
46 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 2.7E\text{-}5 \text{ ft/sec} = 8.2E\text{-}4 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.38 | 1 |
| 63 | 5.74 | 0.26 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-2S
DATE: 4/27/89

METHOD: SLUG WITHDRAWL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 5.59 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 6.2 ft

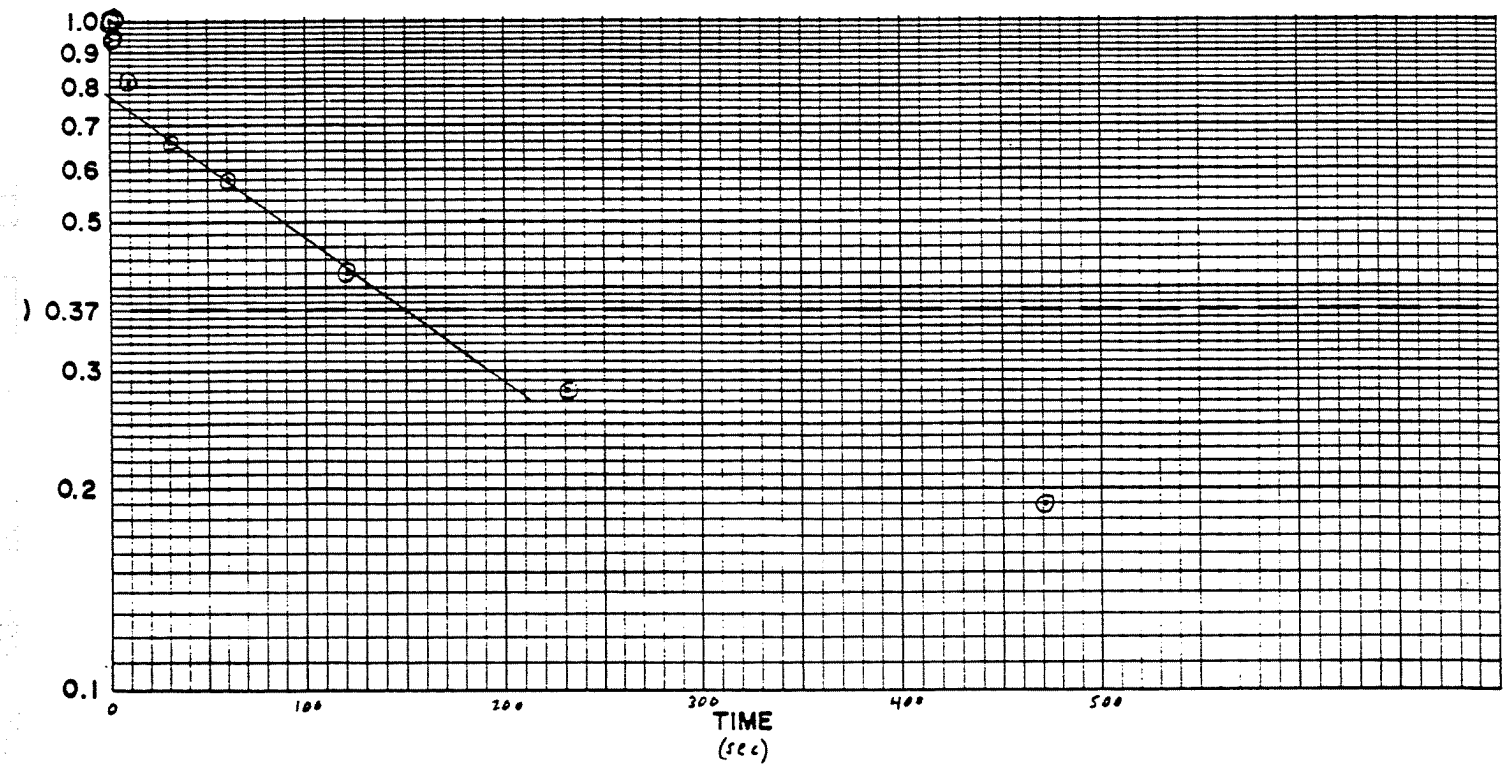
INITIAL HEAD (Ho) = 4.22 ft

To (from graph) = min
150 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 8.3E\text{-}6 \text{ ft/sec} = 2.5E\text{-}4 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 4.22 | 1 |
| 1 | 4.3 | 0.94 |
| 10 | 4.47 | 0.82 |
| 32 | 4.66 | 0.68 |
| 62 | 4.77 | 0.60 |
| 122 | 4.98 | 0.45 |
| 232 | 5.15 | 0.32 |
| 472 | 5.27 | 0.23 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-2I
DATE: PHASE II

METHOD: SLUG
PERSONNEL: DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 8.44 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.104 ft

SCREEN LENGTH (L) = 10 ft

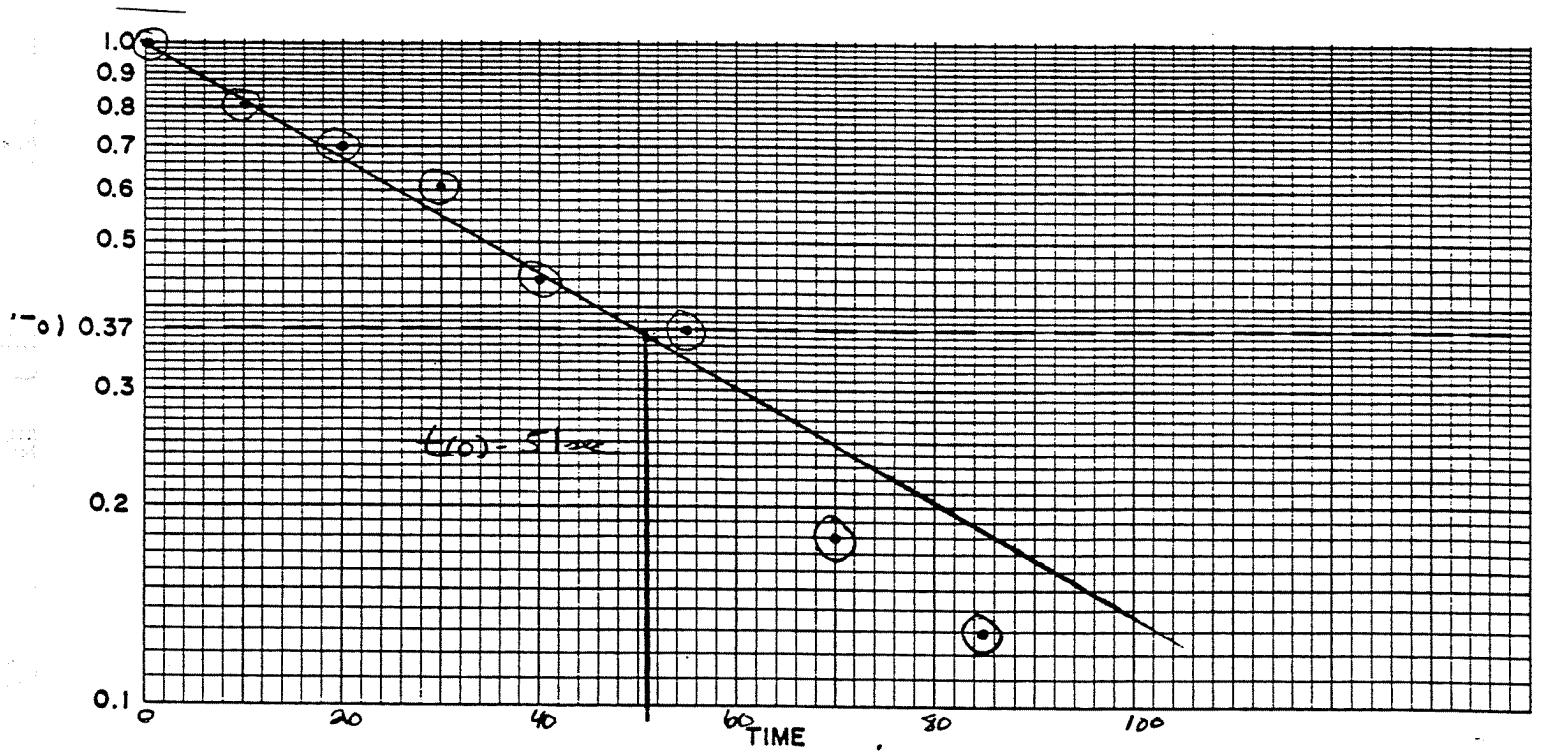
INITIAL HEAD (Ho) = 9.88 ft

To (from graph) = min
51 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 3.1E\text{-}5 \text{ ft/sec} = 9.4E\text{-}4 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 9.88 | 1 |
| 12 | 9.61 | 0.81 |
| 20 | 9.45 | 0.70 |
| 30 | 9.32 | 0.61 |
| 40 | 9.08 | 0.44 |
| 55 | 8.97 | 0.37 |
| 70 | 8.7 | 0.18 |
| 85 | 8.62 | 0.13 |
| 100 | 8.56 | 0.08 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-2I
DATE: 6/29/88

METHOD: SLUG WITHDRAWL
PERSONNEL: DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 8.44 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.104 ft

SCREEN LENGTH (L) = 10 ft

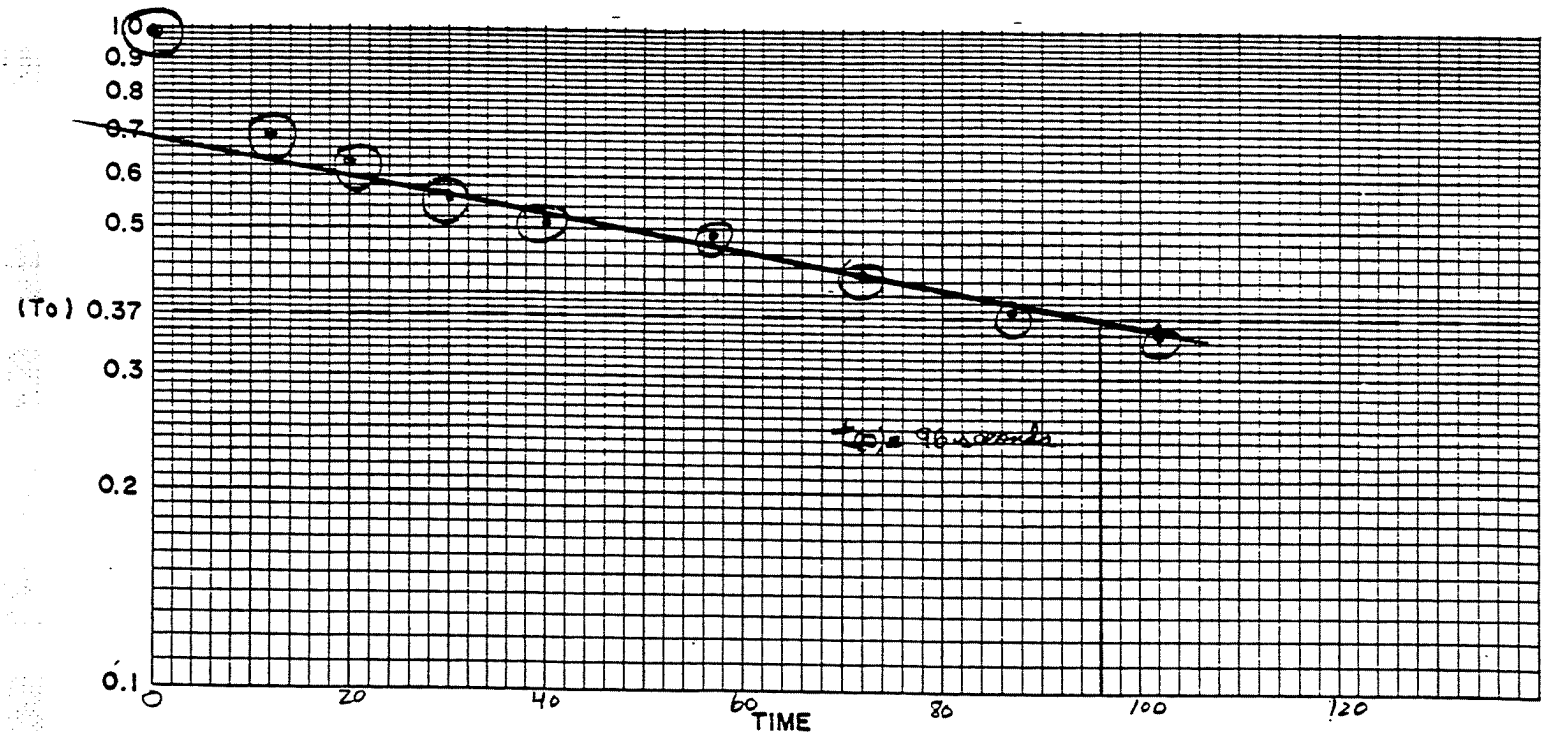
INITIAL HEAD (Ho) = 6.68 ft

To (from graph) = min
96 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.6E\text{-}5 \text{ ft/sec} = 5.0E\text{-}4 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.68 | 1 |
| 12 | 7.23 | 0.69 |
| 20 | 7.34 | 0.63 |
| 30 | 7.45 | 0.56 |
| 40 | 7.54 | 0.51 |
| 57 | 7.57 | 0.49 |
| 72 | 7.69 | 0.43 |
| 87 | 7.77 | 0.38 |
| 102 | 7.83 | 0.35 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-3S
DATE: 4/27/89

METHOD: SLUG
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 5.53 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 6.42 ft

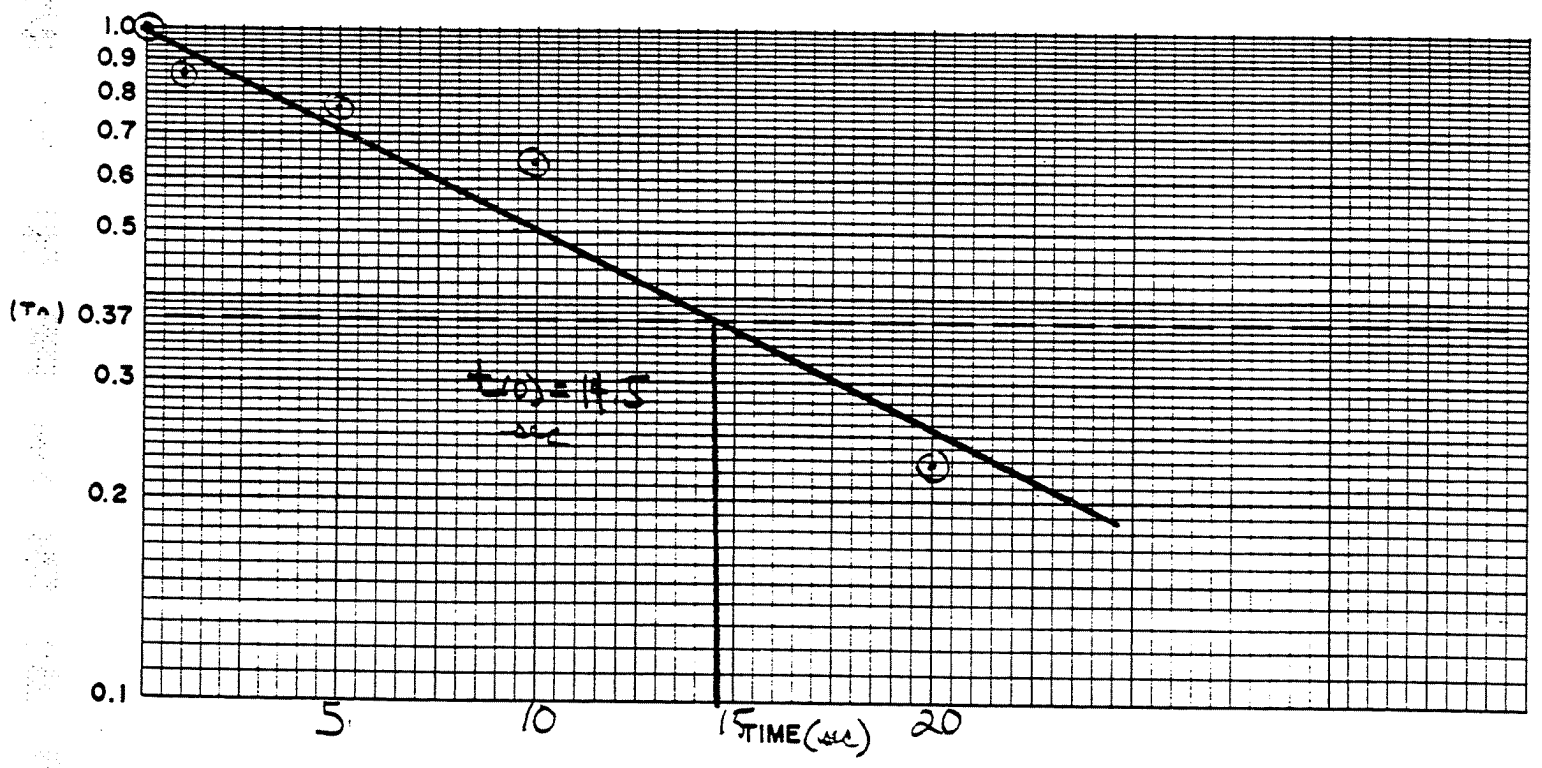
INITIAL HEAD (Ho) = 5.75 ft

To (from graph) = min
14.5 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 8.4E-5 \text{ ft/sec} = 2.6E-3 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 5.75 | 1 |
| 1 | 5.72 | 0.86 |
| 5 | 5.7 | 0.77 |
| 10 | 5.67 | 0.64 |
| 20 | 5.58 | 0.23 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-3S
DATE: 4/27/89

METHOD: SLUG WITHDRAWL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 5.55 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 6.42 ft

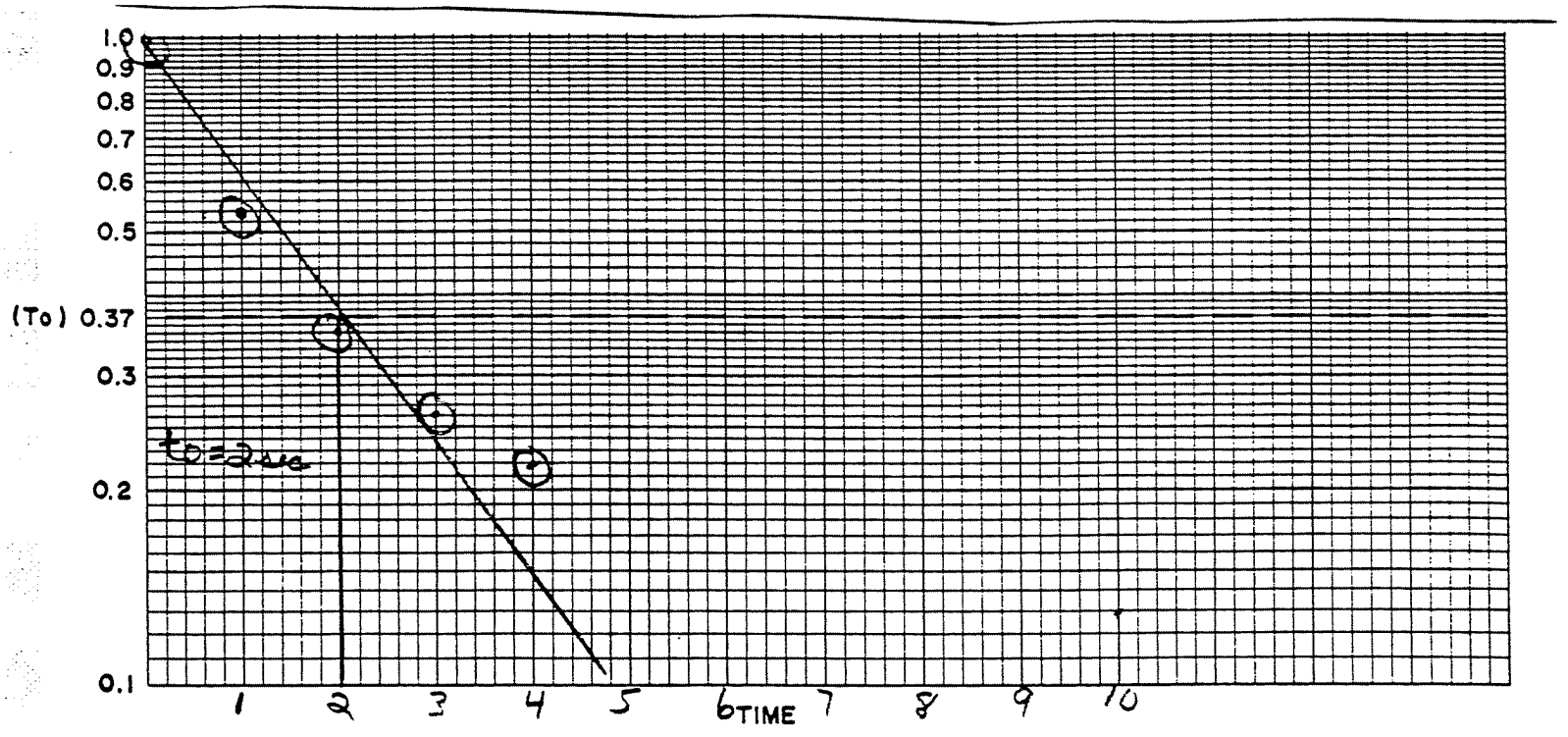
INITIAL HEAD (Ho) = 5.09 ft

To (from graph) = min
2 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 6.1E\text{-}4 \text{ ft/sec} = 1.9E\text{-}2 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 5.09 | 1 |
| 1 | 5.3 | 0.54 |
| 2 | 5.39 | 0.35 |
| 3 | 5.43 | 0.26 |
| 4 | 5.45 | 0.22 |
| 10 | 5.49 | 0.13 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-3I
DATE: PHASE II

METHOD: SLUG
PERSONNEL: DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 8.84 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.104 ft

SCREEN LENGTH (L) = 10 ft

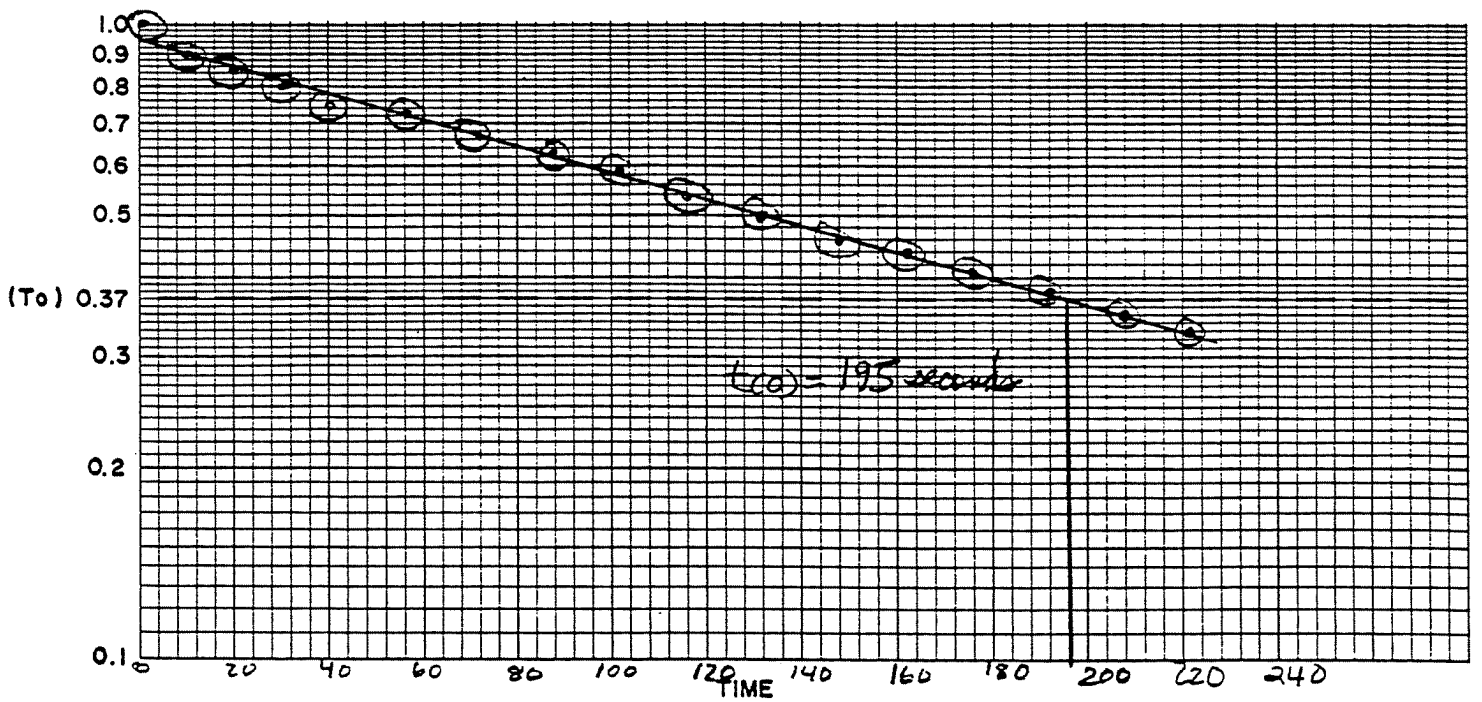
INITIAL HEAD (Ho) = 10.25 ft

To (from graph) = min
180 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 8.7E\text{-}6 \text{ ft/sec} = 2.7E\text{-}4 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 10.25 | 1 |
| 10 | 10.01 | 0.83 |
| 20 | 9.92 | 0.77 |
| 30 | 9.86 | 0.72 |
| 40 | 9.8 | 0.68 |
| 57 | 9.78 | 0.67 |
| 72 | 9.7 | 0.61 |
| 87 | 9.64 | 0.57 |
| 102 | 9.58 | 0.52 |
| 117 | 9.53 | 0.49 |
| 132 | 9.48 | 0.45 |
| 147 | 9.44 | 0.43 |
| 162 | 9.4 | 0.40 |
| 177 | 9.37 | 0.38 |
| 192 | 9.34 | 0.35 |
| 207 | 9.31 | 0.33 |
| 222 | 9.28 | 0.31 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-3I
DATE: PHASE II

METHOD: SLUG WITHDRAWL
PERSONNEL: DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 8.84 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.104 ft

SCREEN LENGTH (L) = 10 ft

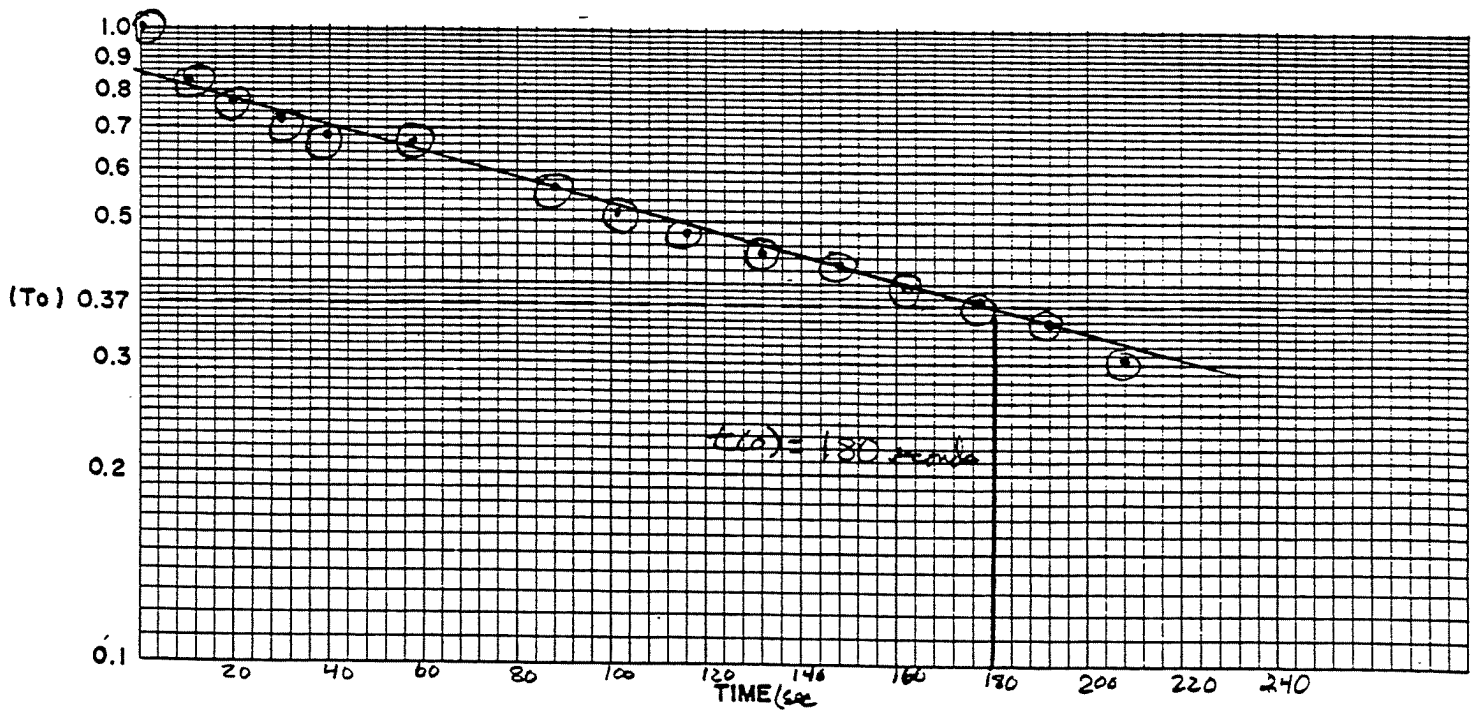
INITIAL HEAD (Ho) = 7.61 ft

To (from graph) = min
195 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 8.1E\text{-}6 \text{ ft/sec} = 2.5E\text{-}4 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 7.61 | 1 |
| 10 | 7.73 | 0.90 |
| 20 | 7.8 | 0.85 |
| 30 | 7.86 | 0.80 |
| 40 | 7.92 | 0.75 |
| 57 | 7.94 | 0.73 |
| 72 | 8.01 | 0.67 |
| 87 | 8.07 | 0.63 |
| 102 | 8.12 | 0.59 |
| 117 | 8.18 | 0.54 |
| 132 | 8.22 | 0.50 |
| 147 | 8.27 | 0.46 |
| 162 | 8.3 | 0.44 |
| 177 | 8.34 | 0.41 |
| 192 | 8.37 | 0.38 |
| 207 | 8.41 | 0.35 |
| 222 | 8.44 | 0.33 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: Cherry Farm
WELL NUMBER: MW-4S
DATE: 4/27/89

METHOD: Slug
PERSONNEL: P M Haff
DATUM USED FOR CALCULATIONS: Transducer

STATIC HEAD (H) = 6.29 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 8.13 ft

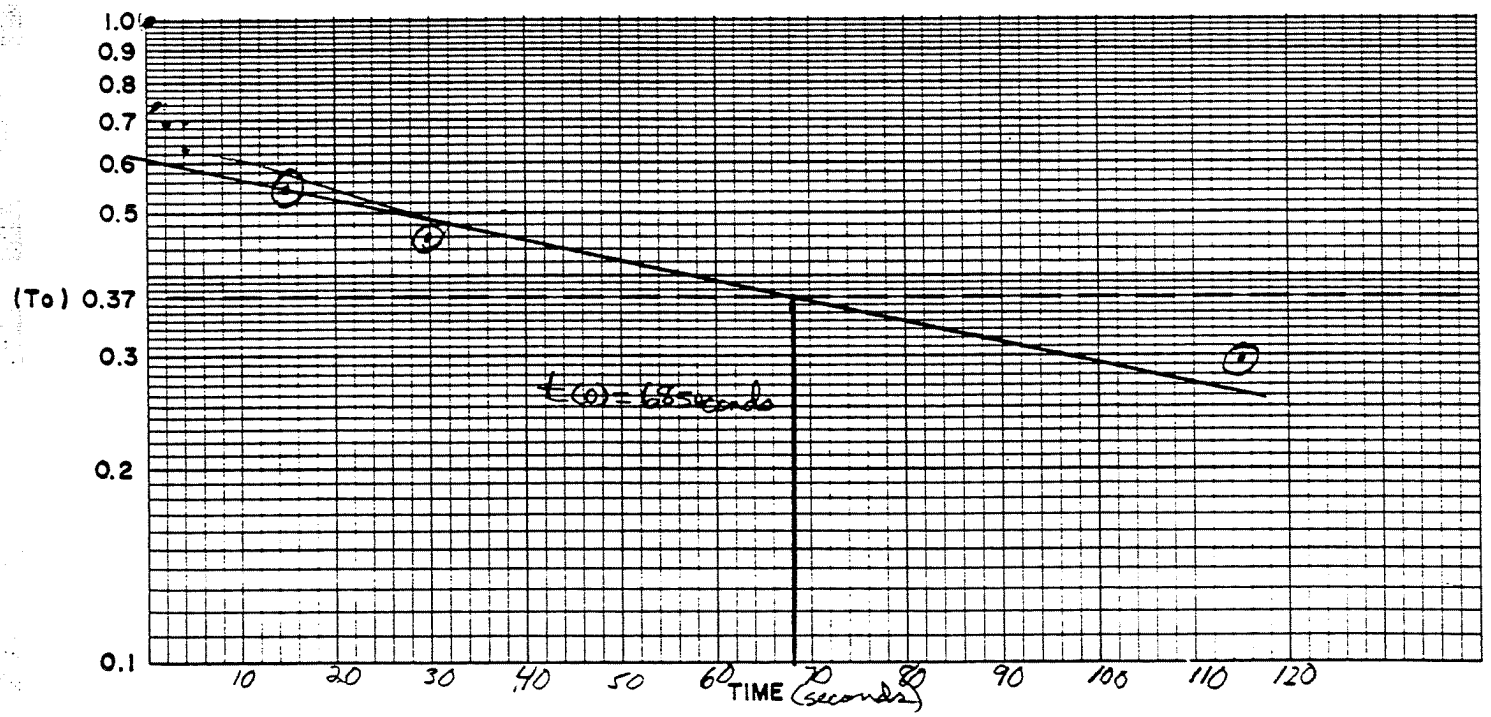
INITIAL HEAD (Ho) = 6.64 ft

To (from graph) = min
68 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.6E\text{-}5 \text{ ft/sec} = 4.8E\text{-}4 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.64 | 1 |
| 1 | 6.55 | 0.74 |
| 2 | 6.53 | 0.69 |
| 4 | 6.51 | 0.63 |
| 15 | 6.48 | 0.54 |
| 30 | 6.45 | 0.46 |
| 115 | 6.39 | 0.29 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-4S
DATE: 4/27/89

METHOD: SLUG WITHDRAWAL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCEF

STATIC HEAD (H) = 6.34 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 8.13 ft

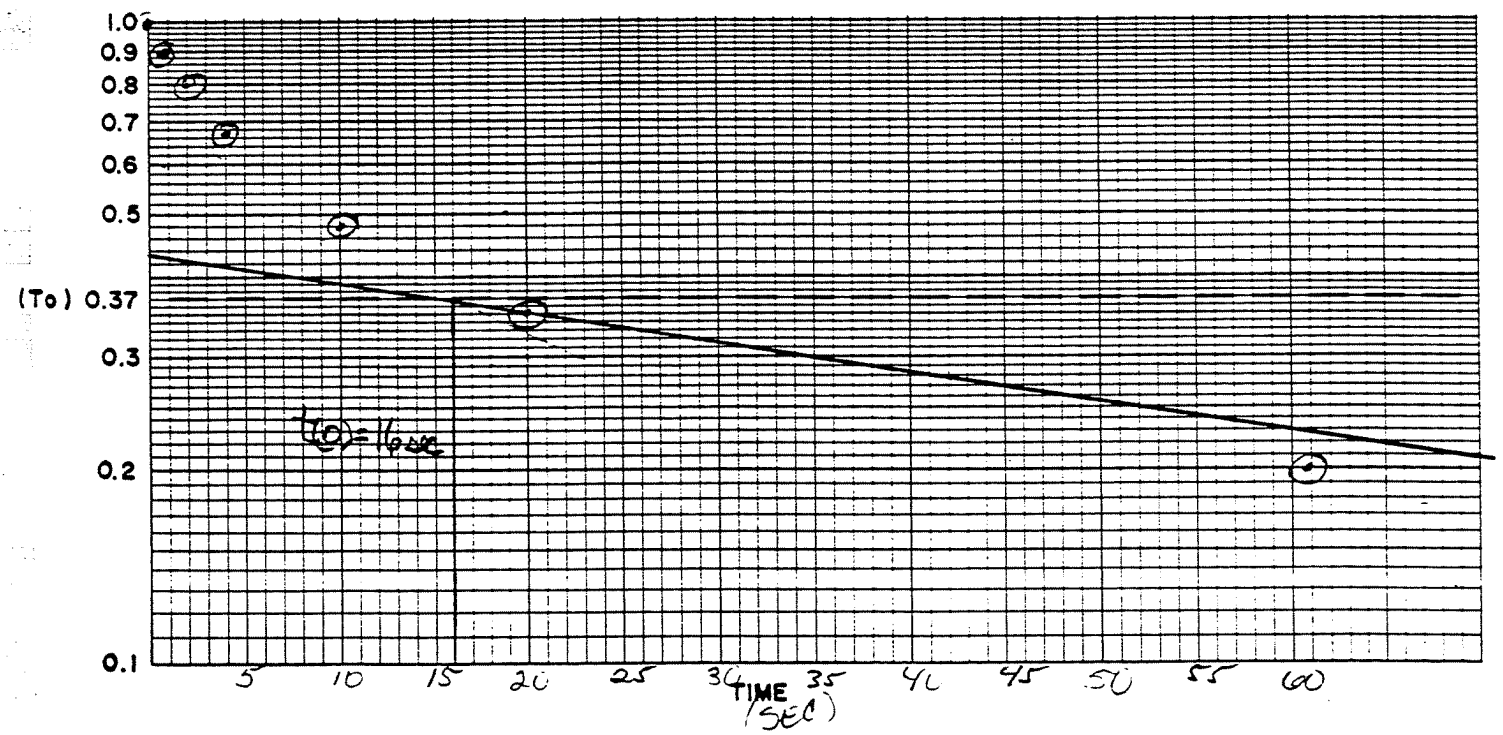
INITIAL HEAD (Ho) = 5.65 ft

To (from graph) = min
16 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 6.6E\text{-}5 \text{ ft/sec} = 2.0E\text{-}3 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 5.65 | 1 |
| 1 | 5.72 | 0.90 |
| 2 | 5.79 | 0.80 |
| 4 | 5.88 | 0.67 |
| 10 | 6.01 | 0.48 |
| 20 | 6.1 | 0.35 |
| 61 | 6.2 | 0.20 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-4I
DATE: PHASE II

METHOD: SLUG
PERSONNEL: DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 8.78 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.104 ft

SCREEN LENGTH (L) = 10 ft

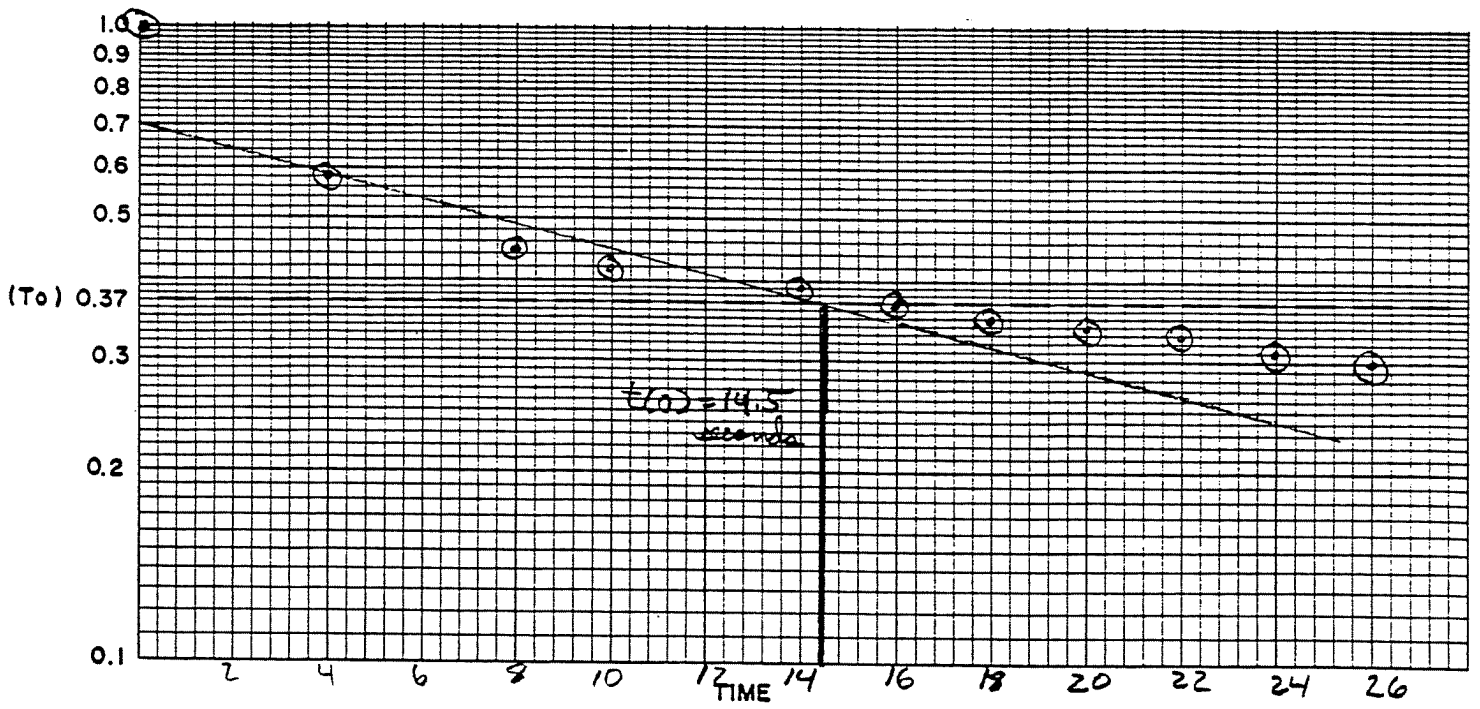
INITIAL HEAD (Ho) = 12 ft

To (from graph) = min
14.5 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.1E-4 \text{ ft/sec} = 3.3E-3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 12 | 1 |
| 4 | 10.65 | 0.58 |
| 8 | 10.23 | 0.45 |
| 10 | 10.14 | 0.42 |
| 12 | 10.08 | 0.40 |
| 14 | 10.02 | 0.39 |
| 16 | 9.97 | 0.37 |
| 18 | 9.92 | 0.35 |
| 20 | 9.87 | 0.34 |
| 22 | 9.83 | 0.33 |
| 24 | 9.79 | 0.31 |
| 26 | 9.76 | 0.30 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-4I
DATE: PHASE II

METHOD: SLUG WITHDRAWL
PERSONNEL: DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 8.78 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.104 ft

SCREEN LENGTH (L) = 10 ft

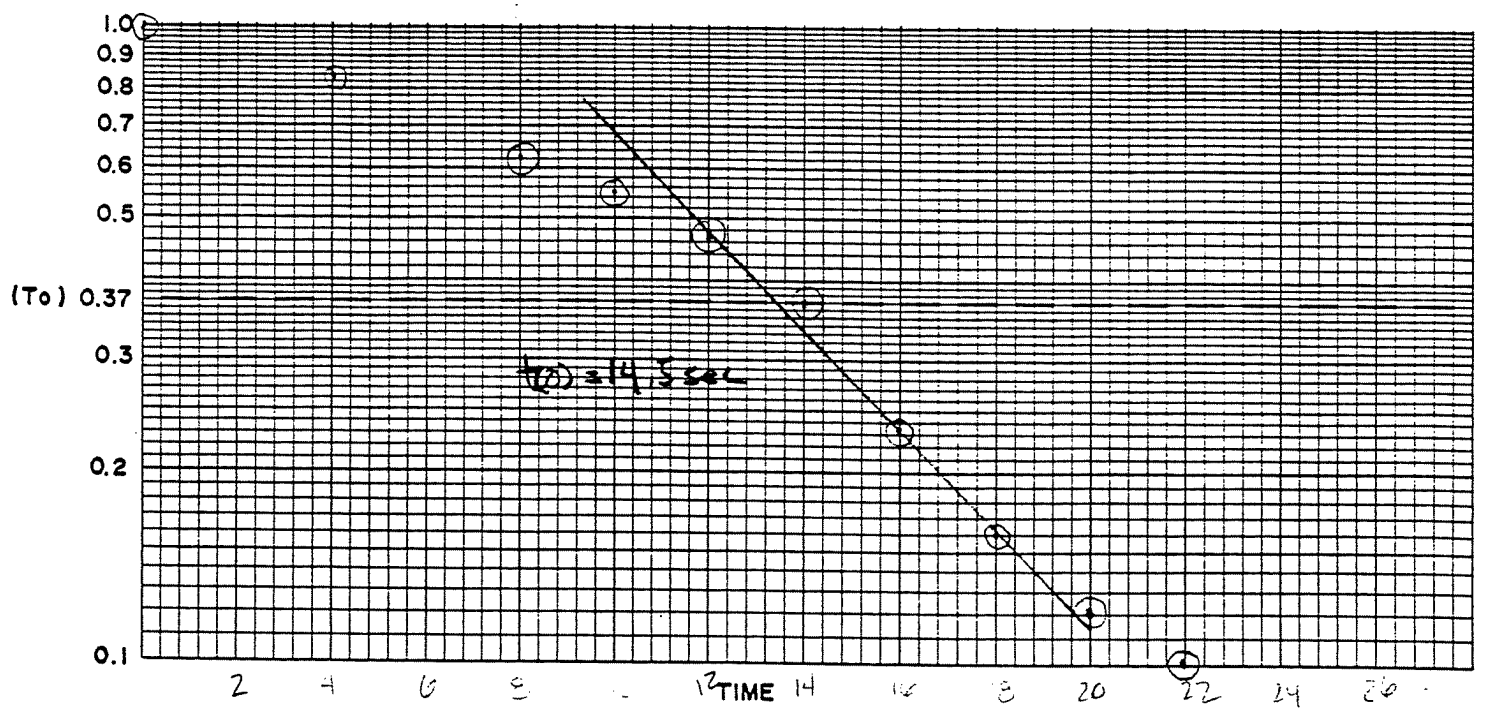
INITIAL HEAD (Ho) = 8.29 ft

To (from graph) = min
14.5 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.1E-4 \text{ ft/sec} = 3.3E-3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 8.29 | 1 |
| 4 | 8.37 | 0.84 |
| 8 | 8.47 | 0.63 |
| 10 | 8.51 | 0.55 |
| 12 | 8.55 | 0.47 |
| 14 | 8.6 | 0.37 |
| 16 | 8.65 | 0.27 |
| 18 | 8.67 | 0.22 |
| 20 | 8.71 | 0.14 |
| 22 | 8.73 | 0.10 |
| 24 | 8.75 | 0.06 |
| 26 | 8.77 | 0.02 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-4D
DATE: 6/29/88

METHOD: SLUG
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 9.8 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 10 ft

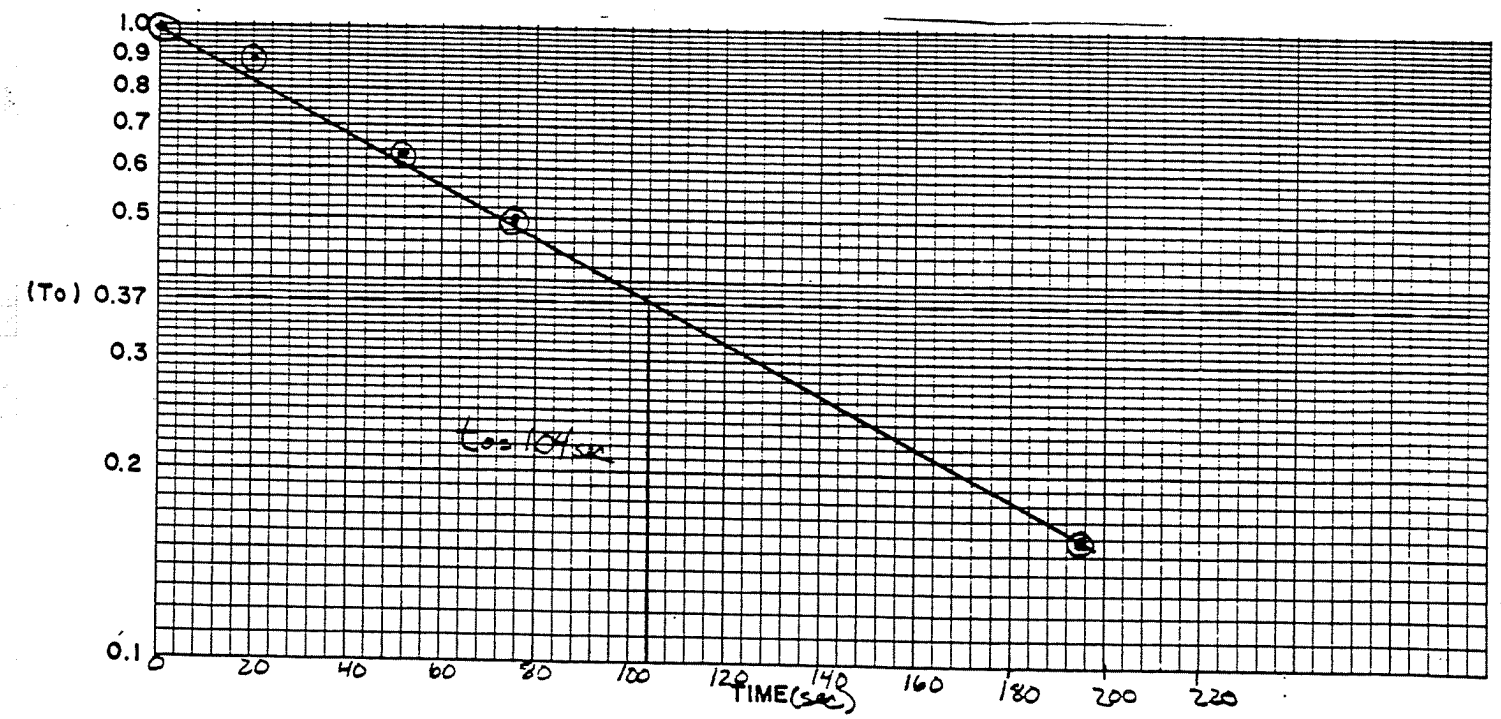
INITIAL HEAD (Ho) = 11.78 ft

To (from graph) = min
104 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 9.0E\text{-}6 \text{ ft/sec} = 2.7E\text{-}4 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 11.78 | 1 |
| 20 | 11.57 | 0.89 |
| 52 | 11.04 | 0.63 |
| 76 | 10.79 | 0.50 |
| 194 | 10.11 | 0.16 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-4D
DATE: 6/29/88

METHOD: SLUG WITHDRAWAL
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 9.8 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 10 ft

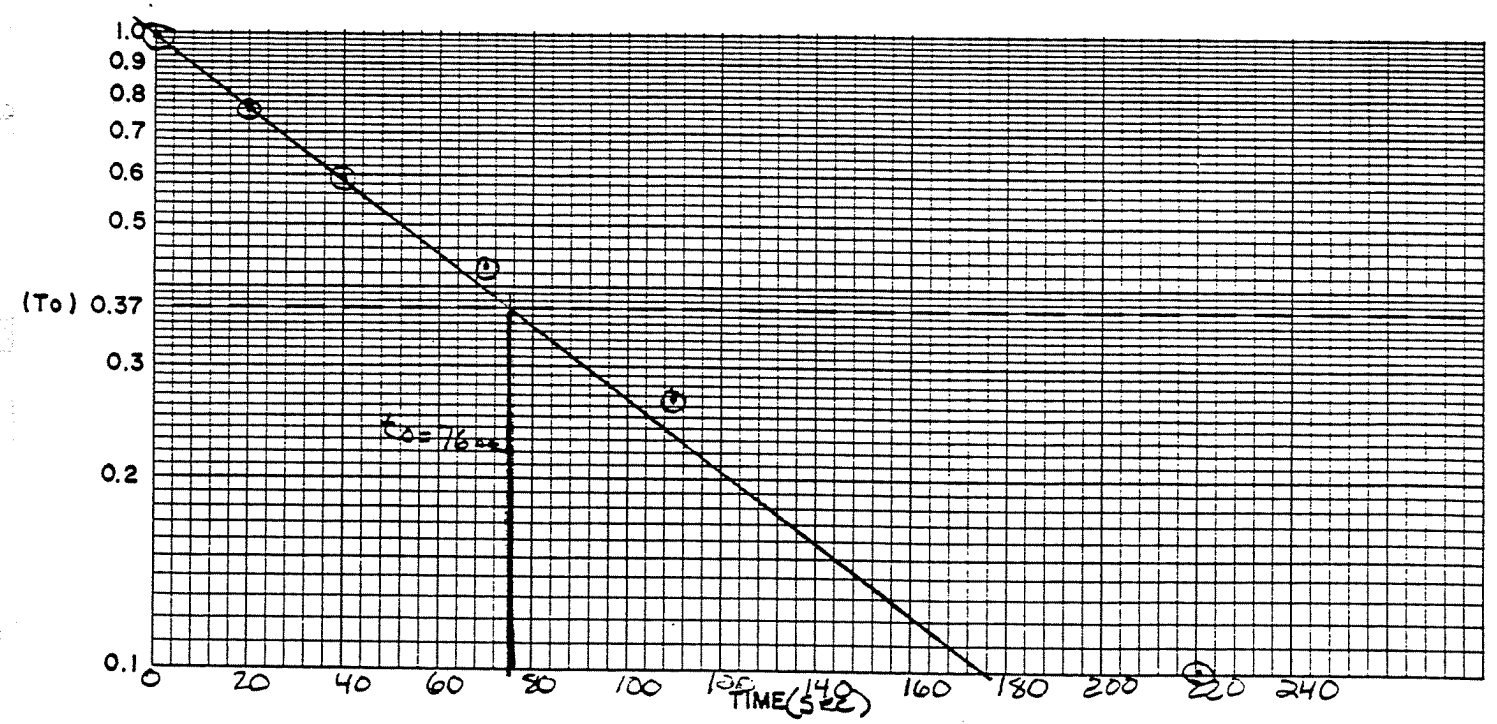
INITIAL HEAD (Ho) = 7.36 ft

To (from graph) = min
76 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.2E-5 \text{ ft/sec} = 3.8E-4 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 7.36 | 1 |
| 20 | 7.95 | 0.76 |
| 40 | 8.33 | 0.60 |
| 70 | 8.75 | 0.43 |
| 110 | 9.13 | 0.27 |
| 220 | 9.56 | 0.10 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-5S
DATE: 4/27/89

METHOD: SLUG
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 2.76 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 2.9 ft

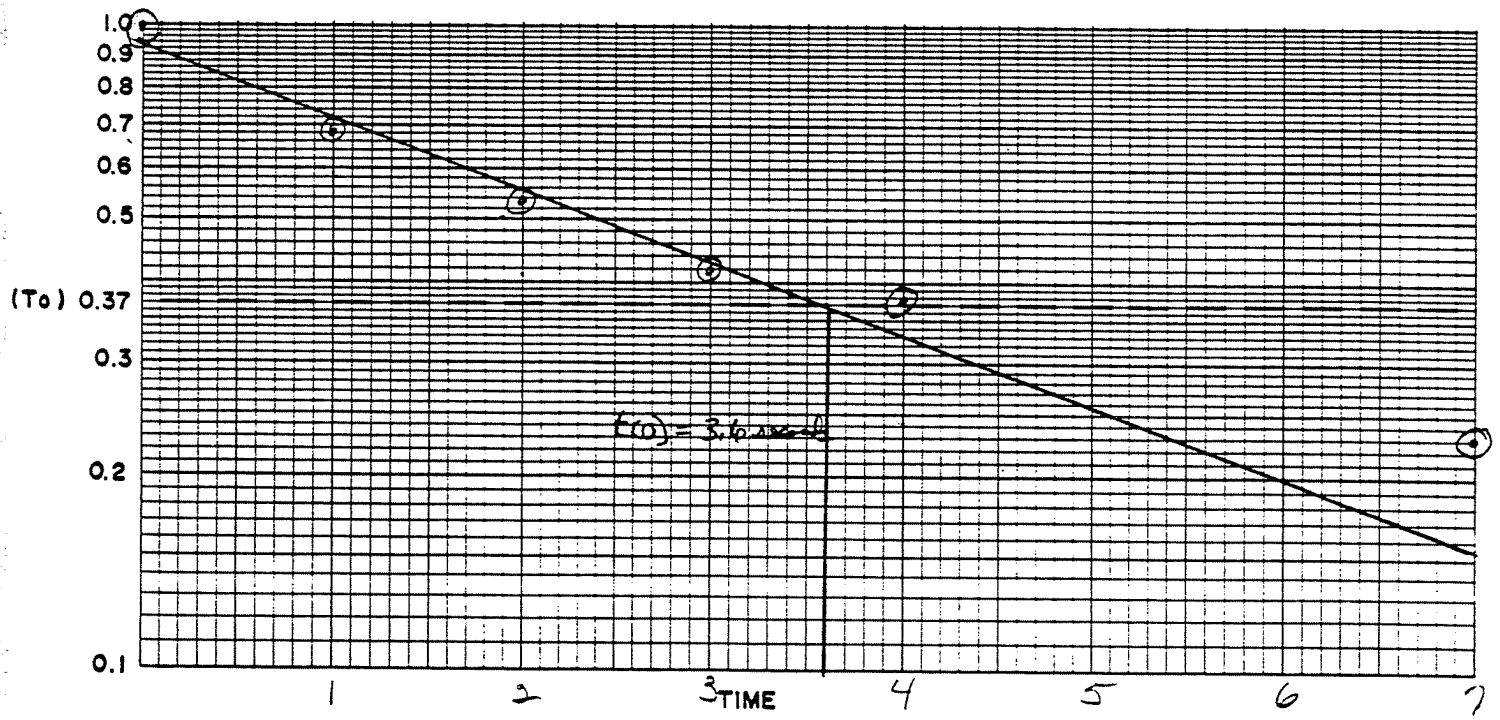
INITIAL HEAD (Ho) = 3.02 ft

To (from graph) = min
3.6 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 4.9E\text{-}4 \text{ ft/sec} = 1.5E\text{-}2 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 3.02 | 1 |
| 1 | 2.94 | 0.69 |
| 2 | 2.9 | 0.54 |
| 3 | 2.87 | 0.42 |
| 4 | 2.86 | 0.38 |
| 7 | 2.82 | 0.23 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-5S
DATE: 4/27/89

METHOD: SLUG WITHDRAWAL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 2.76 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 2.9 ft

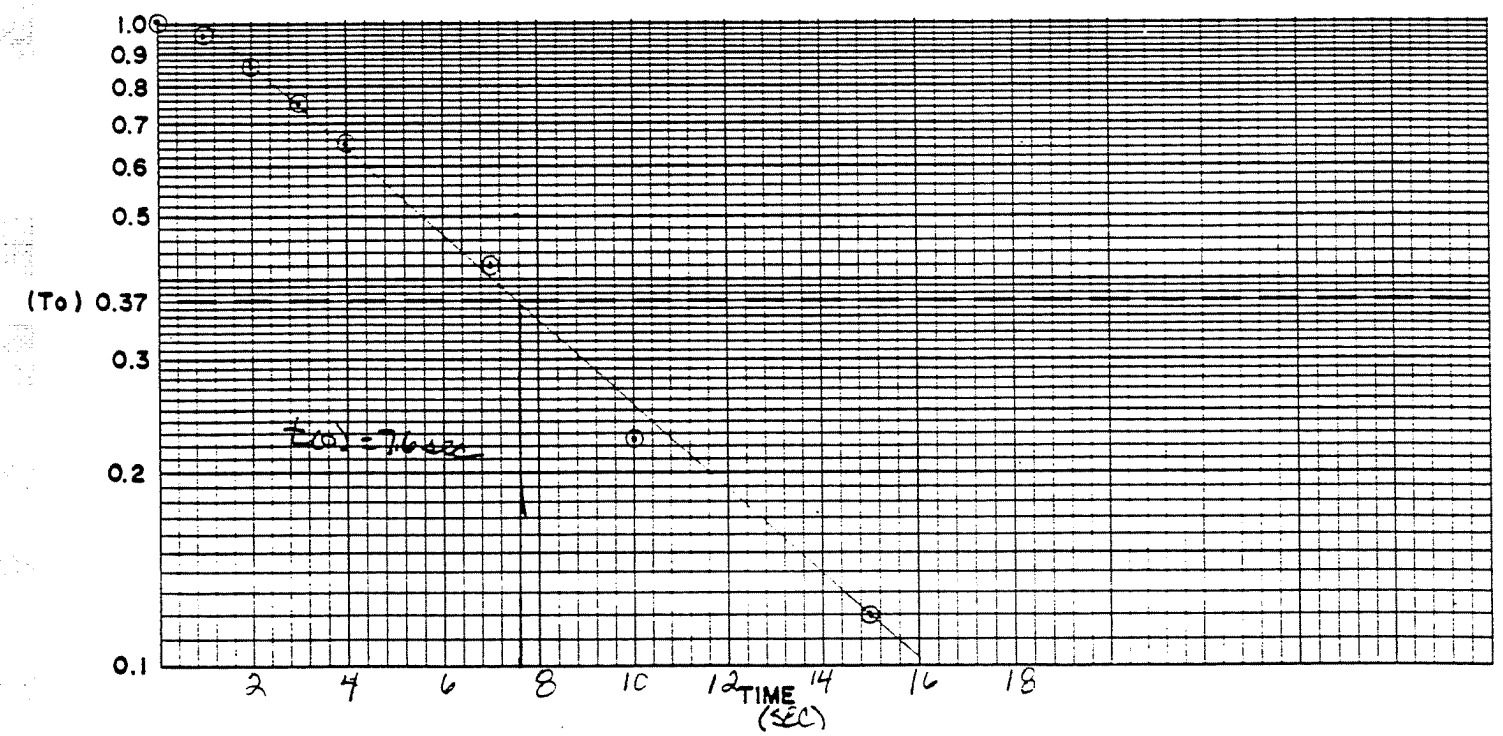
INITIAL HEAD (Ho) = 1.92 ft

To (from graph) = min
7.6 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 2.3E\text{-}4 \text{ ft/sec} = 7.1E\text{-}3 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 1.92 | 1 |
| 1 | 1.95 | 0.96 |
| 2 | 2.04 | 0.86 |
| 3 | 2.13 | 0.75 |
| 4 | 2.21 | 0.65 |
| 7 | 2.41 | 0.42 |
| 10 | 2.55 | 0.25 |
| 15 | 2.66 | 0.12 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-5I
DATE: PHASE II

METHOD: SLUG
PERSONNEL: DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 9.46 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.104 ft

SCREEN LENGTH (L) = 10 ft

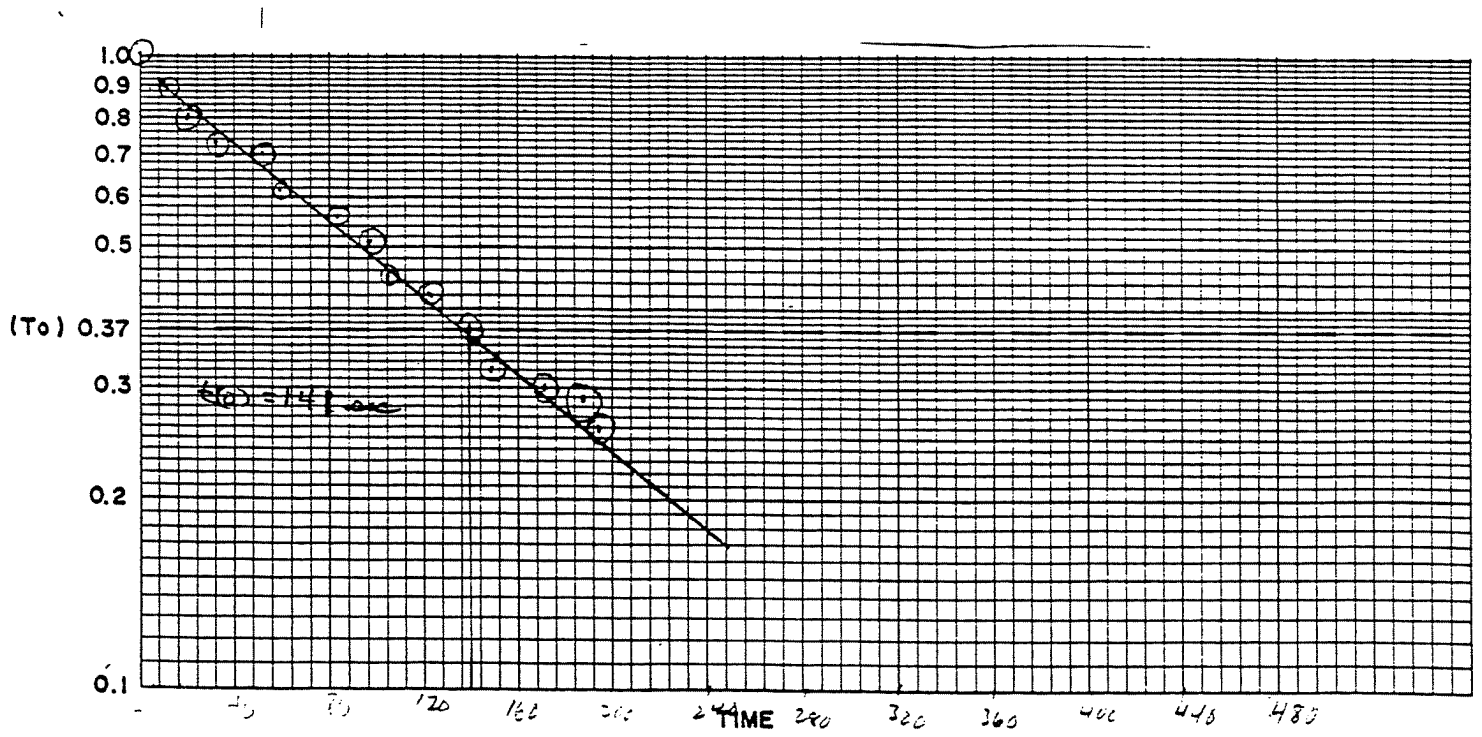
INITIAL HEAD (Ho) = 10.32 ft

To (from graph) = min
141 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.1E\text{-}5 \text{ ft/sec} = 3.4E\text{-}4 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 10.32 | 1 |
| 10 | 10.22 | 0.88 |
| 20 | 10.15 | 0.80 |
| 30 | 10.09 | 0.73 |
| 51 | 10.07 | 0.71 |
| 66 | 10 | 0.63 |
| 81 | 9.94 | 0.56 |
| 96 | 9.9 | 0.51 |
| 111 | 9.86 | 0.47 |
| 126 | 9.82 | 0.42 |
| 141 | 9.78 | 0.37 |
| 156 | 9.75 | 0.34 |
| 171 | 9.72 | 0.30 |
| 186 | 9.7 | 0.28 |
| 192 | 9.67 | 0.24 |
| 406 | 9.06 | -0.47 |
| 436 | 9.08 | -0.44 |
| 466 | 9.1 | -0.42 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-5I
DATE: PHASE II

METHOD: SLUG WITHDRAWL
PERSONNEL:DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 9.43 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.104 ft

SCREEN LENGTH (L)= 10 ft

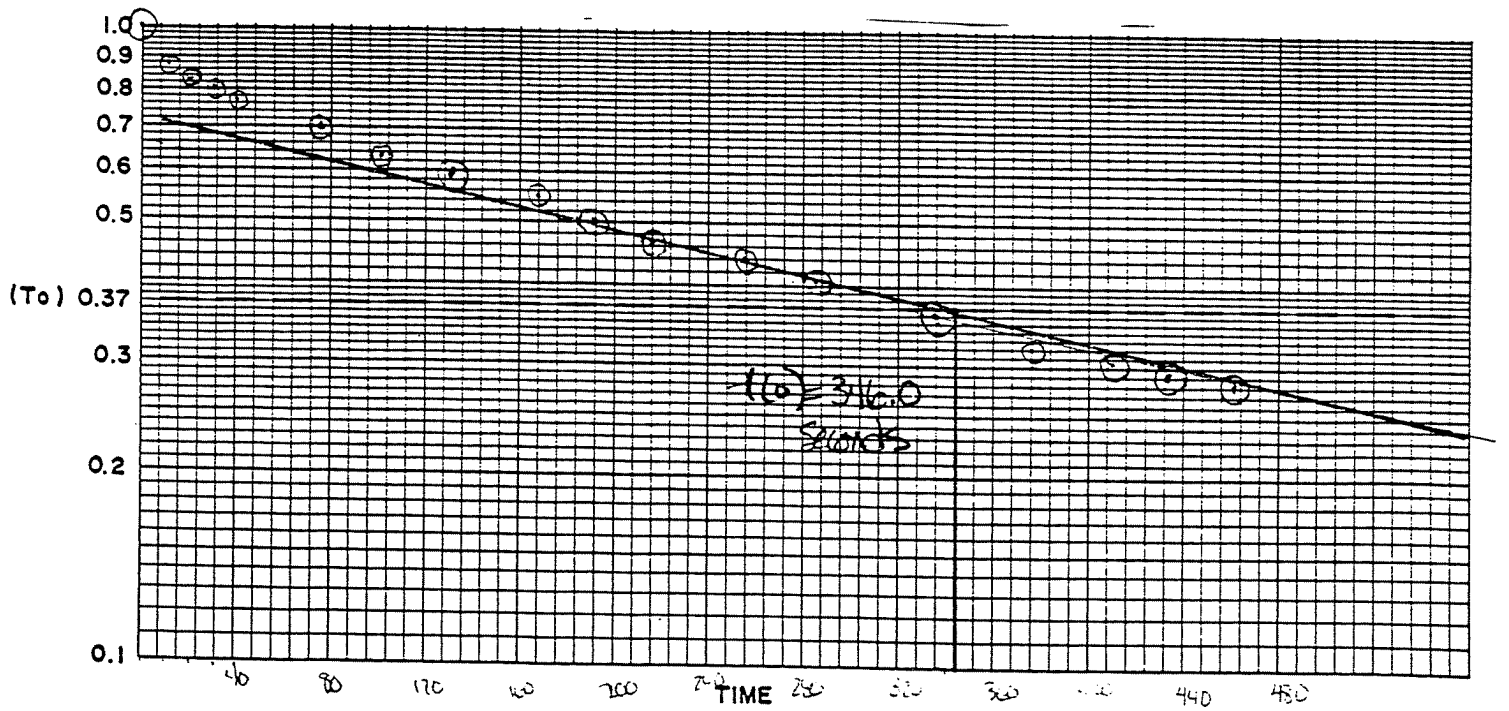
INITIAL HEAD (Ho)= 8.24 ft

To (from graph) = min
346 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} =$$ 4.5E-6 ft/sec
1.4E-4 cm/sec

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 8.24 | 1 |
| 10 | 8.38 | 0.88 |
| 20 | 8.44 | 0.83 |
| 30 | 8.48 | 0.80 |
| 40 | 8.51 | 0.77 |
| 76 | 8.6 | 0.70 |
| 106 | 8.67 | 0.64 |
| 136 | 8.72 | 0.60 |
| 166 | 8.78 | 0.55 |
| 196 | 8.83 | 0.50 |
| 221 | 8.87 | 0.47 |
| 256 | 8.91 | 0.44 |
| 286 | 8.94 | 0.41 |
| 346 | 9 | 0.36 |
| 376 | 9.03 | 0.34 |
| 406 | 9.06 | 0.31 |
| 436 | 9.08 | 0.29 |
| 466 | 9.1 | 0.28 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-5D
DATE: 6/29/88

METHOD: SLUG
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.39 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 10 ft

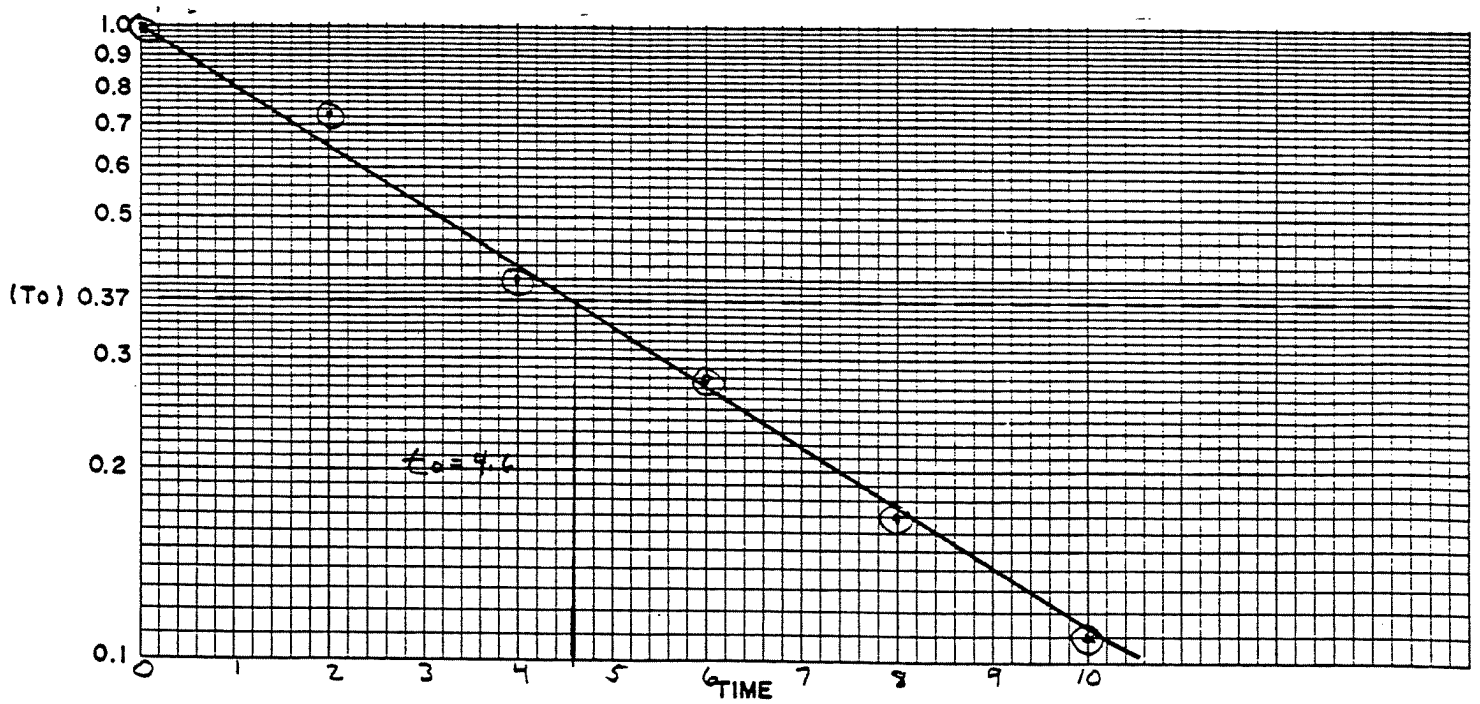
INITIAL HEAD (Ho) = 10.23 ft

To (from graph) = min
4.6 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 2.0E\text{-}4 \text{ ft/sec} = 6.2E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 10.23 | 1 |
| 2 | 9.73 | 0.73 |
| 4 | 9.12 | 0.40 |
| 6 | 8.91 | 0.28 |
| 8 | 8.71 | 0.17 |
| 10 | 8.6 | 0.11 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-5D
DATE: 6/29/88

METHOD: SLUG WITHDRAWAL
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.39 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 10 ft

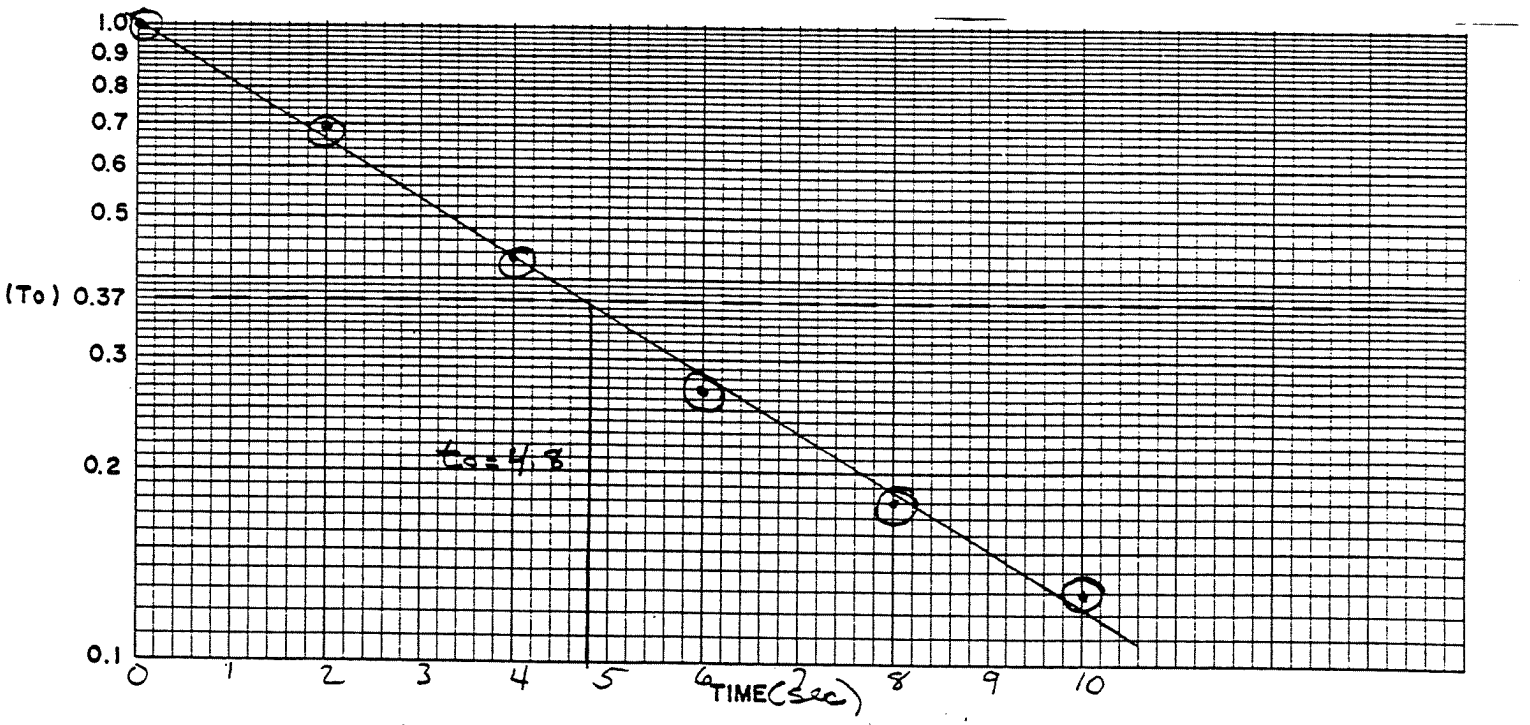
INITIAL HEAD (Ho) = 6.57 ft

To (from graph) = min
4.8 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 2.0E\text{-}4 \text{ ft/sec} = 5.9E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.57 | 1 |
| 2 | 7.11 | 0.70 |
| 4 | 7.61 | 0.43 |
| 6 | 7.9 | 0.27 |
| 8 | 8.06 | 0.18 |
| 10 | 8.16 | 0.13 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-6S
DATE: 4/29/89

METHOD: SLUG
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

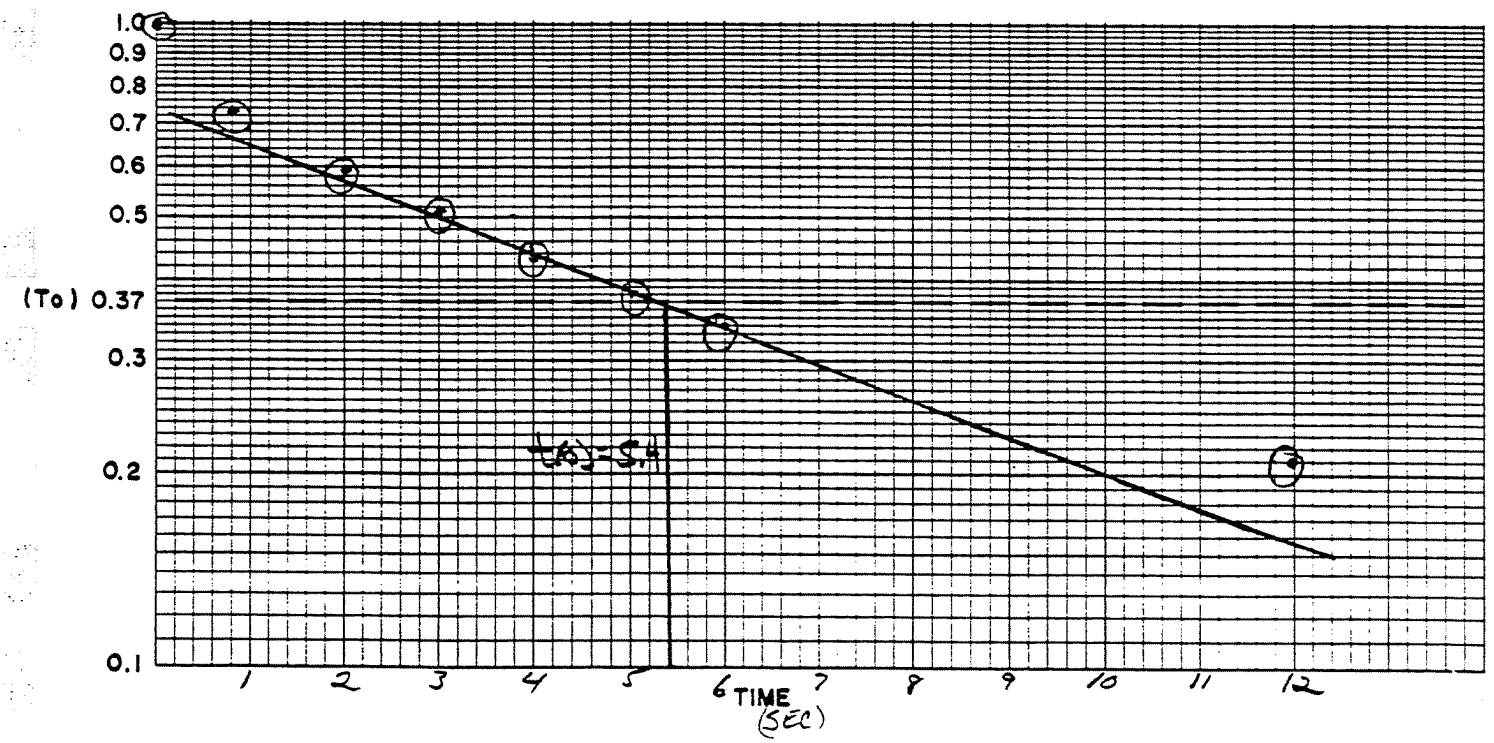
| | | |
|---|---|---|
| STATIC HEAD (H) = | 3.55 | ft |
| PIPE RADIUS (r) = | 0.083 | ft |
| SCREEN RADIUS (R) = | 0.66 | ft |
| SCREEN LENGTH (L) = | 3.82 | ft |
| INITIAL HEAD (Ho) = | 4.52 | ft |
| To (from graph) = | | min |
| | 5.4 | sec |

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} =$$

2.9E-4 ft/sec
8.9E-3 cm/sec

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 4.52 | 1 |
| 1 | 4.26 | 0.73 |
| 2 | 4.12 | 0.59 |
| 3 | 4.04 | 0.51 |
| 4 | 3.97 | 0.43 |
| 5 | 3.92 | 0.38 |
| 6 | 3.88 | 0.34 |
| 12 | 3.75 | 0.21 |
| 27 | 3.65 | 0.10 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-6S
DATE: 4/29/89

METHOD: SLUG WITHDRAWAL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 3.6 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 3.82 ft

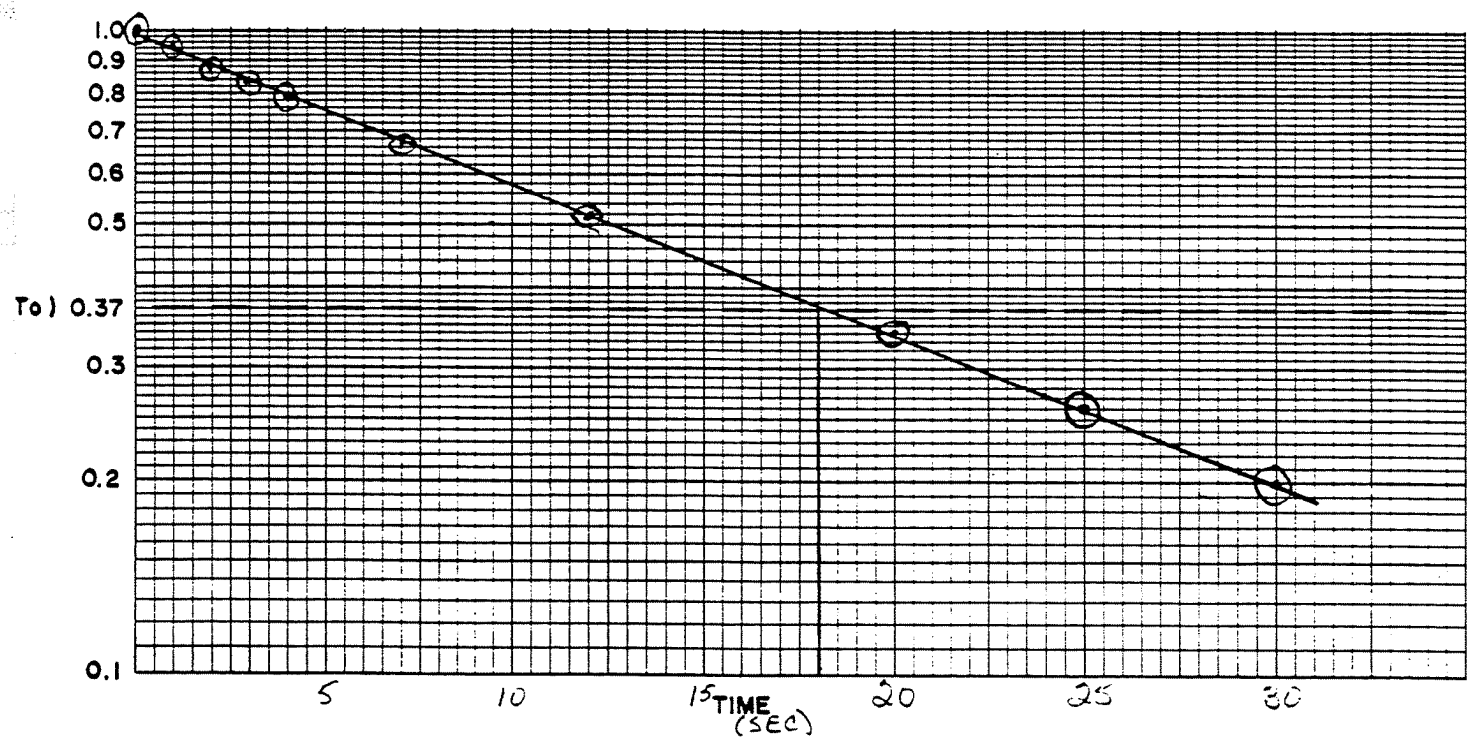
INITIAL HEAD (Ho) = 2.38 ft

To (from graph) = min
18 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 8.8E\text{-}5 \text{ ft/sec}$$
2.7E-3 cm/sec

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 2.38 | 1 |
| 1 | 2.44 | 0.95 |
| 2 | 2.52 | 0.89 |
| 3 | 2.57 | 0.84 |
| 4 | 2.62 | 0.80 |
| 7 | 2.77 | 0.68 |
| 12 | 2.96 | 0.52 |
| 20 | 3.18 | 0.34 |
| 25 | 3.28 | 0.26 |
| 30 | 3.35 | 0.20 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-6I
DATE: PHASE II

METHOD: SLUG
PERSONNEL: DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 10.35 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.104 ft

SCREEN LENGTH (L) = 10 ft

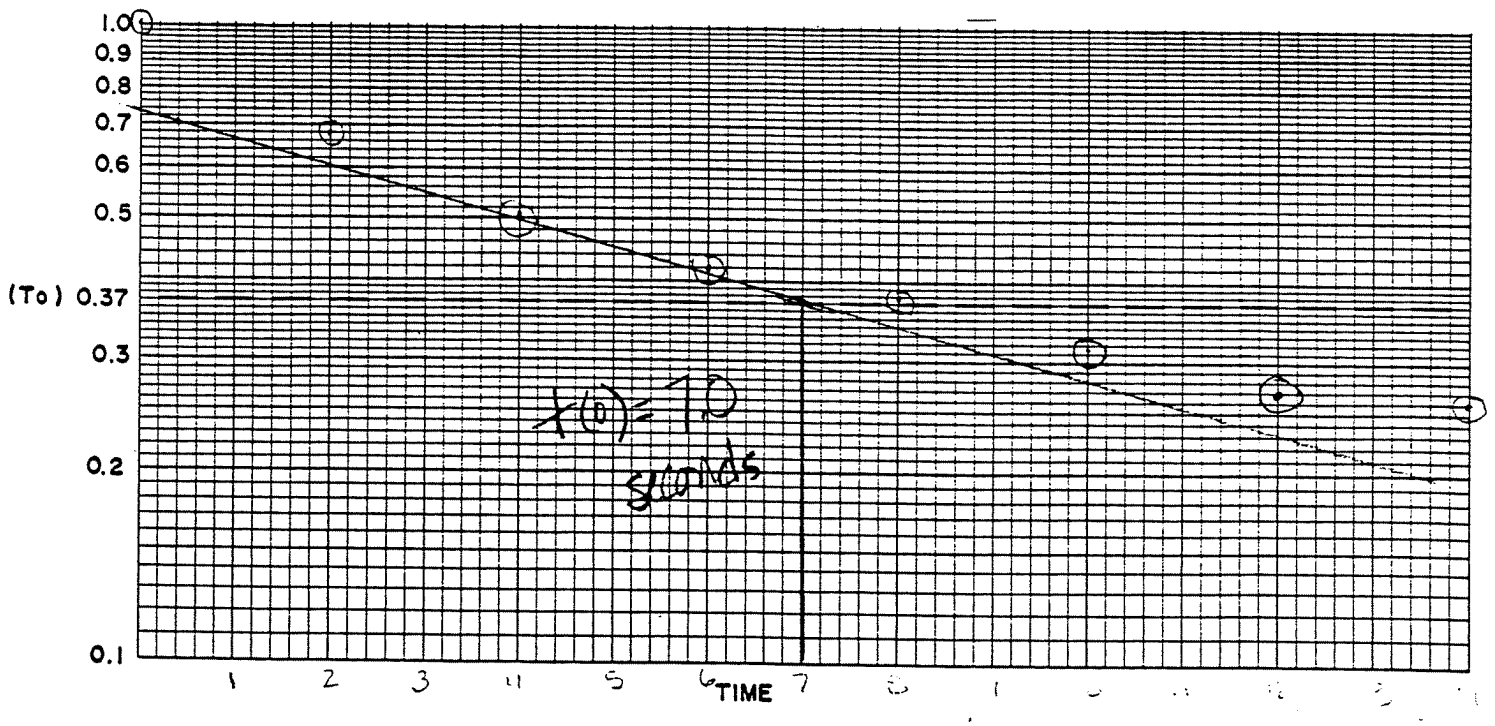
INITIAL HEAD (Ho) = 11.01 ft

To (from graph) = min
7 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 2.2E\text{-}4 \text{ ft/sec} = 6.8E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 11.01 | 1 |
| 2 | 10.8 | 0.68 |
| 4 | 10.68 | 0.50 |
| 6 | 10.63 | 0.42 |
| 8 | 10.6 | 0.38 |
| 10 | 10.57 | 0.33 |
| 12 | 10.53 | 0.27 |
| 14 | 10.52 | 0.26 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-6I
DATE: PHASE II

METHOD: SLUG WITHDRAWL
PERSONNEL:DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 10.35 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.104 ft

SCREEN LENGTH (L)= 10 ft

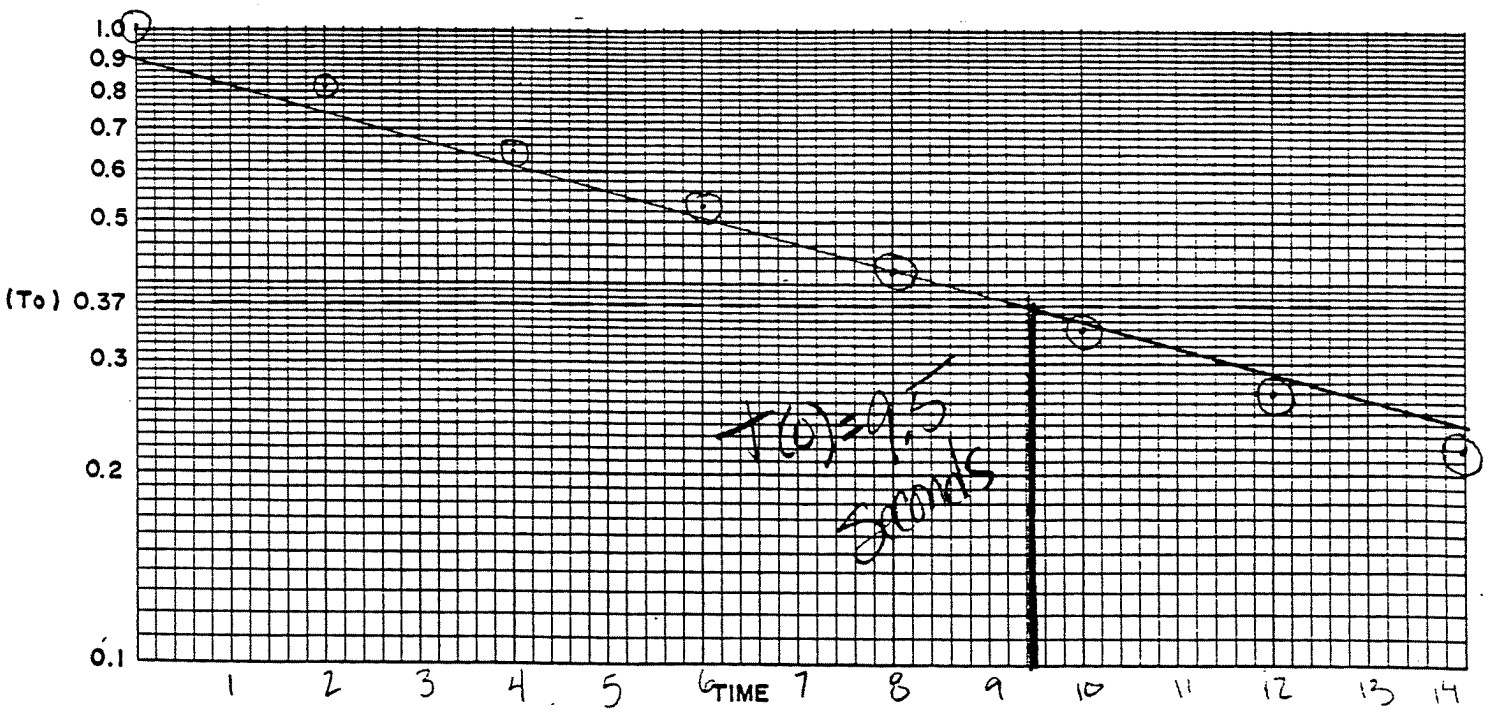
INITIAL HEAD (Ho)= 9.61 ft

To (from graph) = min
9.5 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.7E-4 \text{ ft/sec} = 5.0E-3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 9.61 | 1 |
| 2 | 9.74 | 0.82 |
| 4 | 9.87 | 0.65 |
| 6 | 9.96 | 0.53 |
| 8 | 10.04 | 0.42 |
| 10 | 10.1 | 0.34 |
| 12 | 10.15 | 0.27 |
| 14 | 10.19 | 0.22 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-6D
DATE: 6/29/88

METHOD: SLUG
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.53 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.66 ft

SCREEN LENGTH (L)= 10 ft

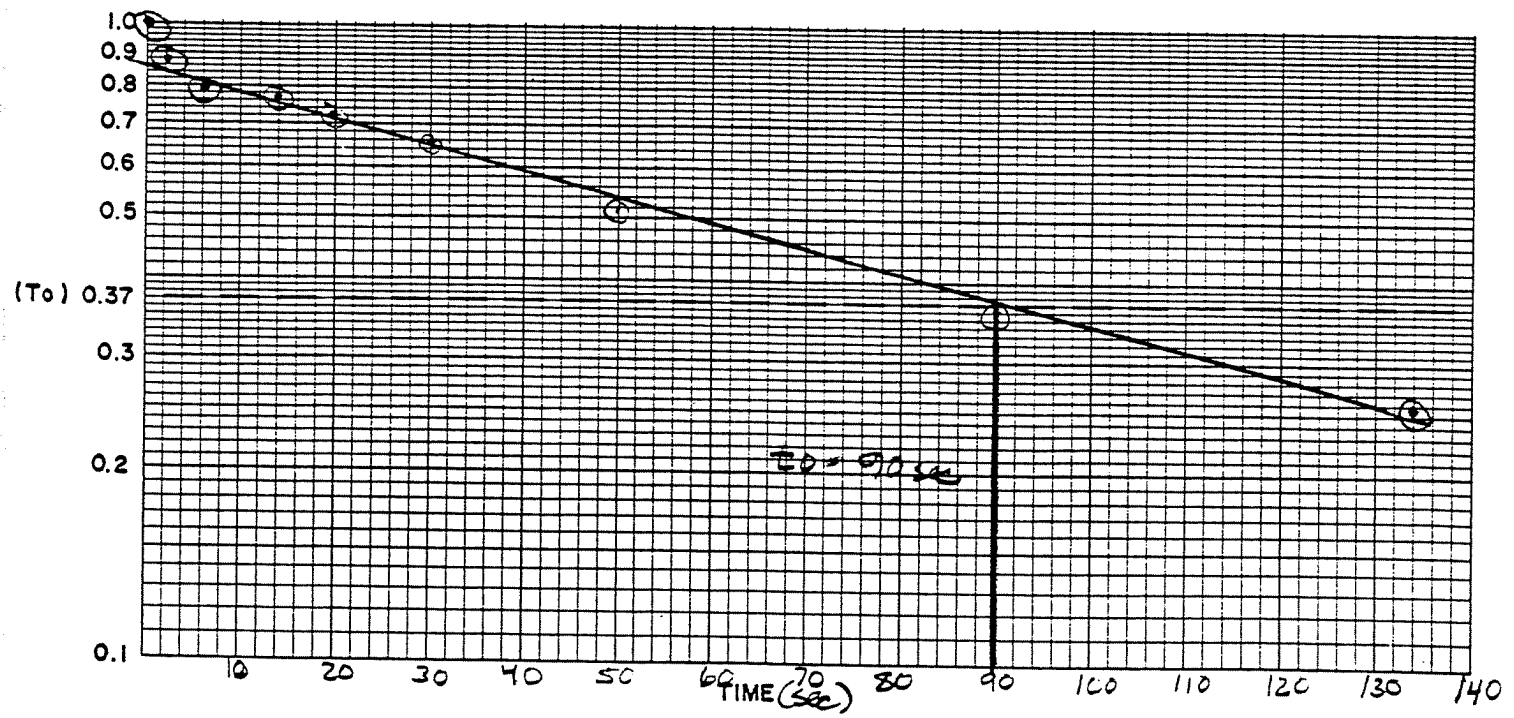
INITIAL HEAD (Ho)= 11.43 ft

To (from graph) = min
90 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.0E\text{-}5 \text{ ft/sec} = 3.2E\text{-}4 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 11.43 | 1 |
| 2 | 11.10 | 0.89 |
| 6 | 10.86 | 0.80 |
| 14 | 10.76 | 0.77 |
| 20 | 10.62 | 0.72 |
| 30 | 10.44 | 0.66 |
| 50 | 10.05 | 0.52 |
| 90 | 9.57 | 0.36 |
| 136 | 9.22 | 0.24 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-6D
DATE: 6/29/88

METHOD: SLUG WITHDRAWAL
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.53 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.66 ft

SCREEN LENGTH (L)= 10 ft

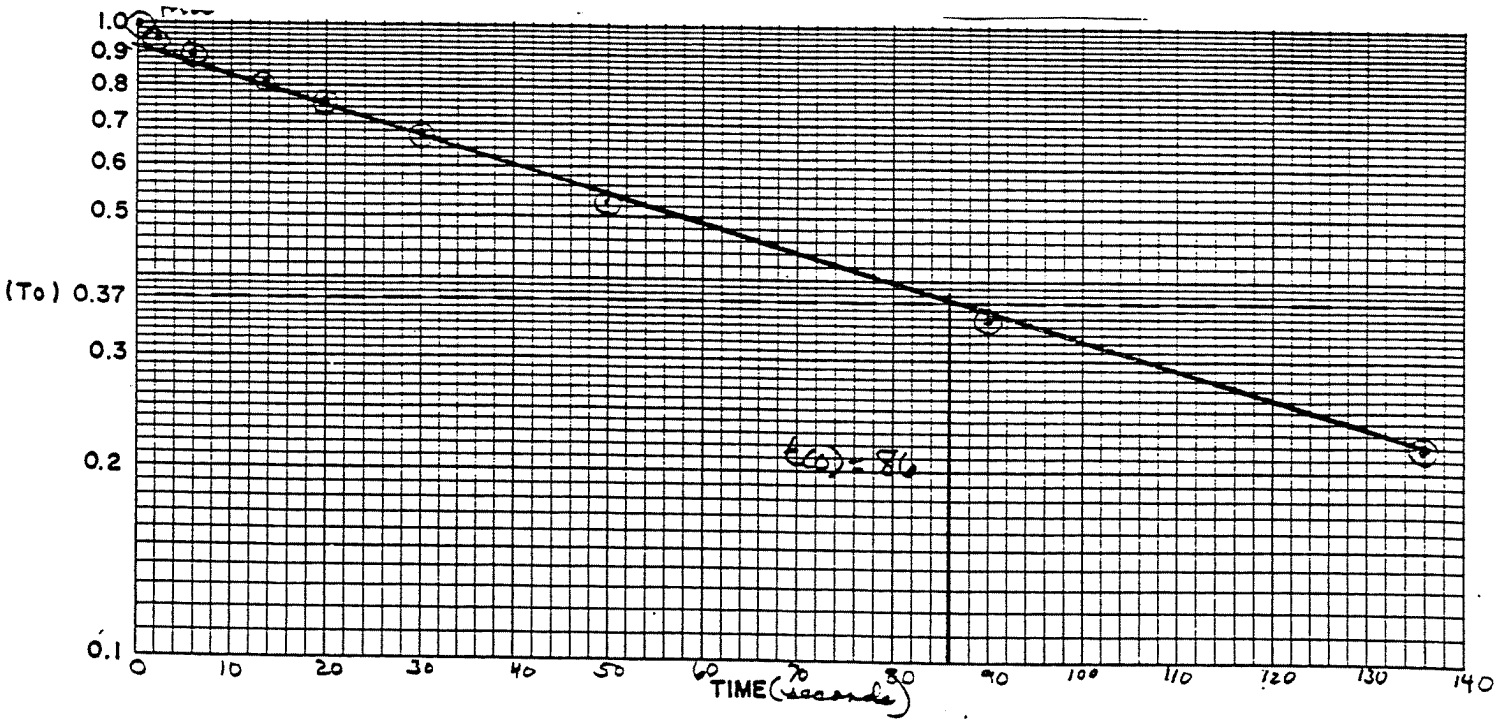
INITIAL HEAD (Ho)= 6.03 ft

To (from graph) = min
86 sec

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.03 | 1 |
| 2 | 6.15 | 0.95 |
| 6 | 6.28 | 0.90 |
| 14 | 6.50 | 0.81 |
| 20 | 6.64 | 0.76 |
| 30 | 6.84 | 0.68 |
| 50 | 7.20 | 0.53 |
| 90 | 7.66 | 0.35 |
| 136 | 7.97 | 0.22 |

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.1E\text{-}5 \text{ ft/sec} = 3.3E\text{-}4 \text{ cm/sec}$$



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-7S
DATE: 4/29/89

METHOD: SLUG
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 5.2 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 7.07 ft

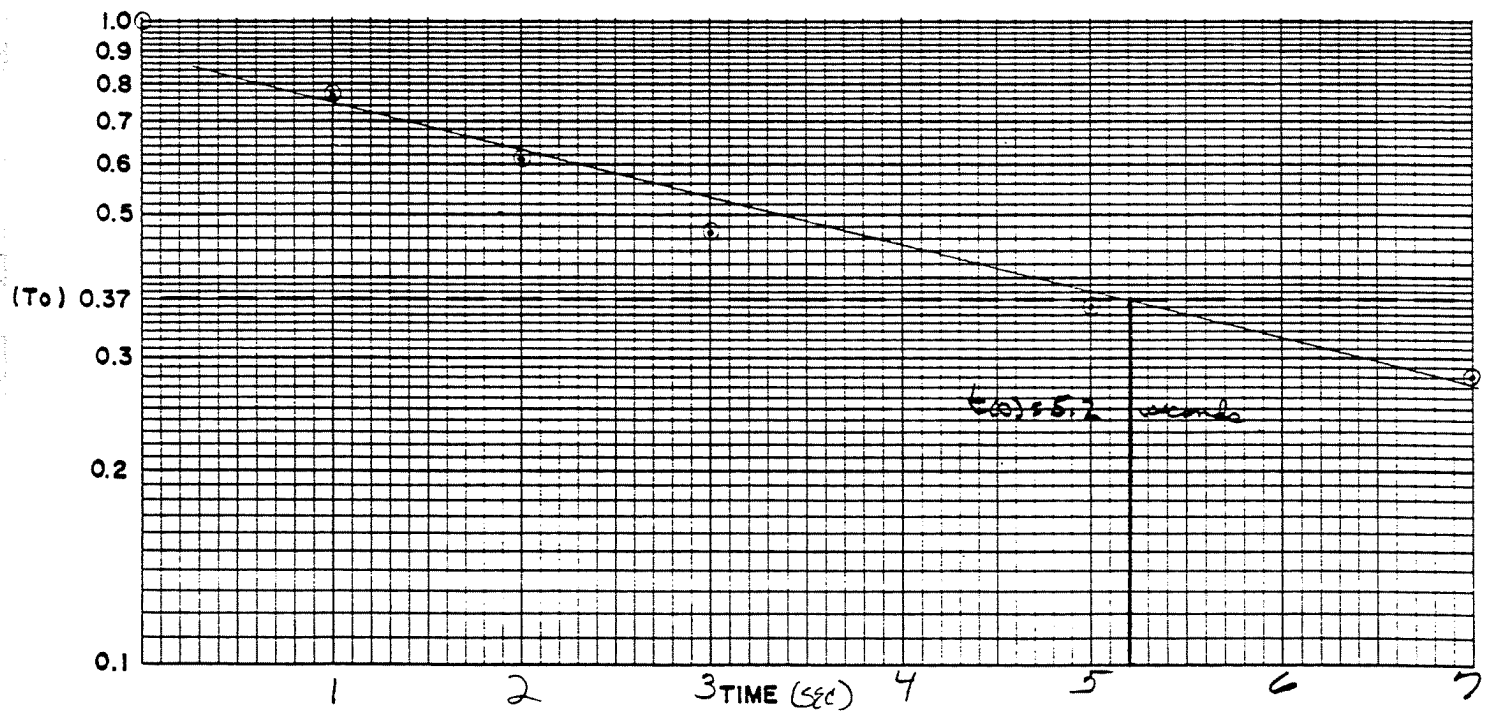
INITIAL HEAD (Ho) = 5.84 ft

To (from graph) = min
5.2 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 2.2E\text{-}4 \text{ ft/sec} = 6.8E\text{-}3 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 5.84 | 1 |
| 1 | 5.69 | 0.77 |
| 2 | 5.59 | 0.61 |
| 3 | 5.5 | 0.47 |
| 5 | 5.43 | 0.36 |
| 7 | 5.38 | 0.28 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-7S
DATE: 4/27/89

METHOD: SLUG WITHDRAWAL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 5.2 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 7.07 ft

INITIAL HEAD (Ho) = 3.6 ft

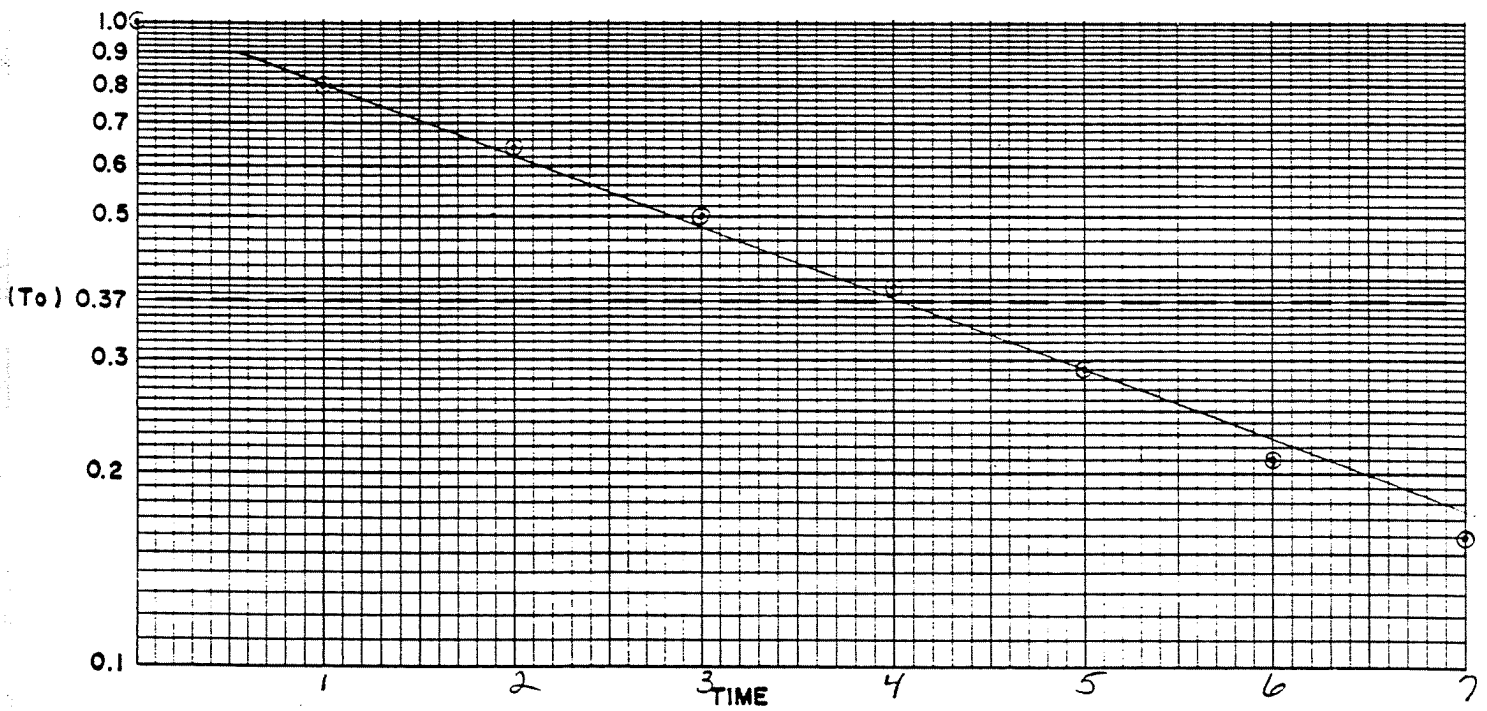
To (from graph) = min
4 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} =$$

2.9E-4 ft/sec
8.8E-3 cm/sec

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 3.6 | 1 |
| 1 | 3.92 | 0.80 |
| 2 | 4.18 | 0.64 |
| 3 | 4.4 | 0.50 |
| 4 | 4.58 | 0.39 |
| 5 | 4.73 | 0.29 |
| 6 | 4.86 | 0.21 |
| 7 | 4.95 | 0.16 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-7I
DATE: PHASE II

METHOD: SLUG
PERSONNEL: DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 8.82 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.104 ft

SCREEN LENGTH (L) = 10 ft

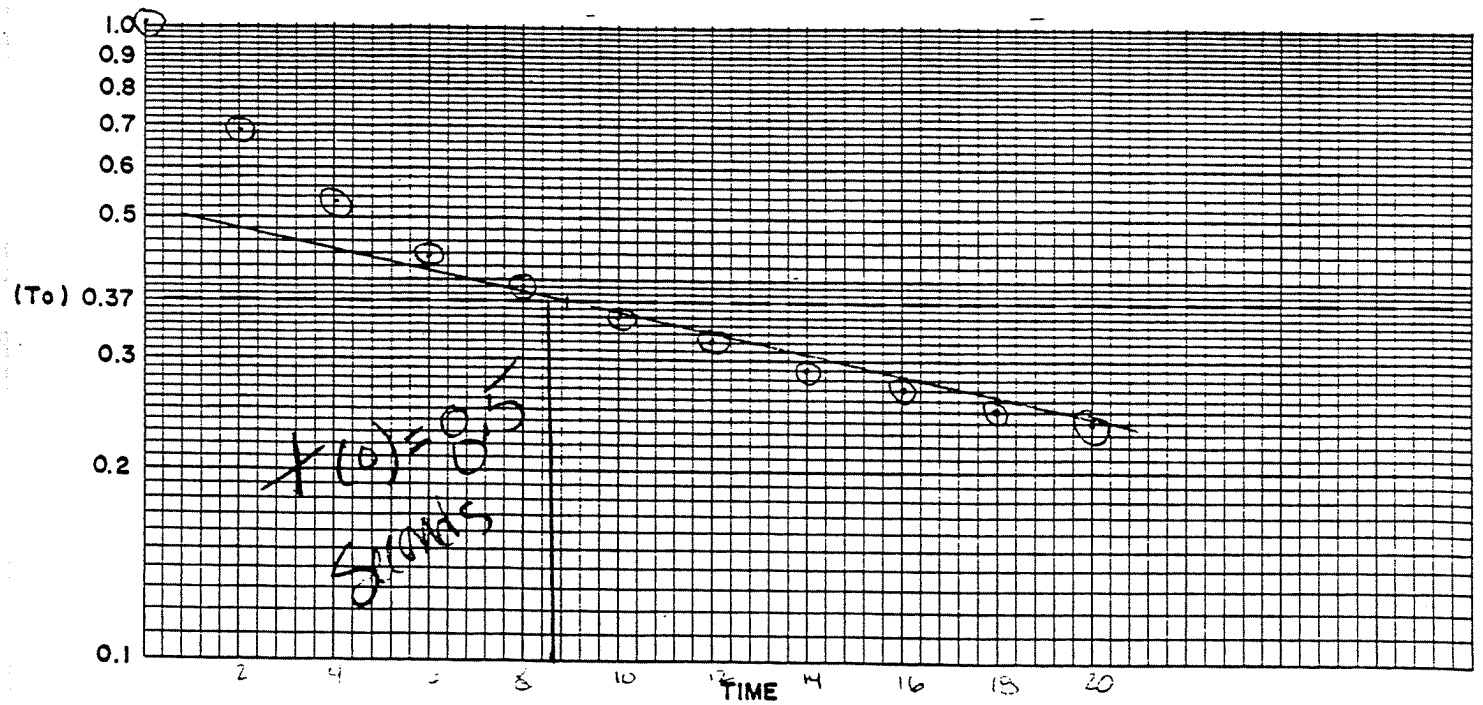
INITIAL HEAD (Ho) = 9.57 ft

To (from graph) = min
8.5 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.9E-4 \text{ ft/sec} \quad 5.6E-3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 9.57 | 1 |
| 2 | 9.34 | 0.69 |
| 4 | 9.22 | 0.53 |
| 6 | 9.15 | 0.44 |
| 8 | 9.11 | 0.39 |
| 10 | 9.08 | 0.35 |
| 12 | 9.06 | 0.32 |
| 14 | 9.04 | 0.29 |
| 16 | 9.02 | 0.27 |
| 18 | 9.01 | 0.25 |
| 20 | 9 | 0.24 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-7I
DATE: PHASE II

METHOD: SLUG WITHDRAWL
PERSONNEL: DEBORAH WRIGHT
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 8.82 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.104 ft

SCREEN LENGTH (L) = 10 ft

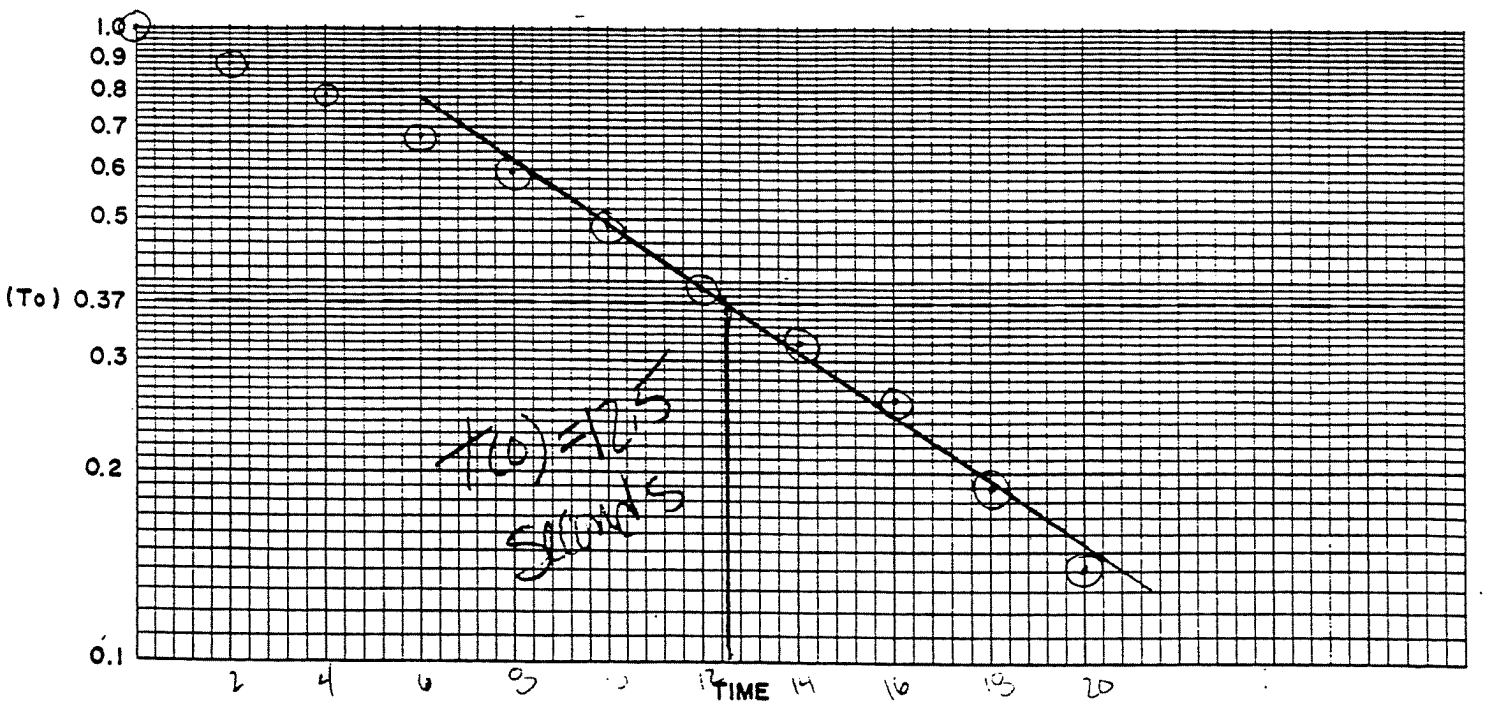
INITIAL HEAD (Ho) = 8.25 ft

To (from graph) = min
12.5 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.3E-4 \text{ ft/sec} = 3.8E-3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 8.25 | 1 |
| 2 | 8.32 | 0.88 |
| 4 | 8.37 | 0.79 |
| 6 | 8.43 | 0.68 |
| 8 | 8.48 | 0.60 |
| 10 | 8.54 | 0.49 |
| 12 | 8.6 | 0.39 |
| 14 | 8.64 | 0.32 |
| 16 | 8.67 | 0.26 |
| 18 | 8.71 | 0.19 |
| 20 | 8.74 | 0.14 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-7D
DATE: 6/29/88

METHOD: SLUG
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.53 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 10 ft

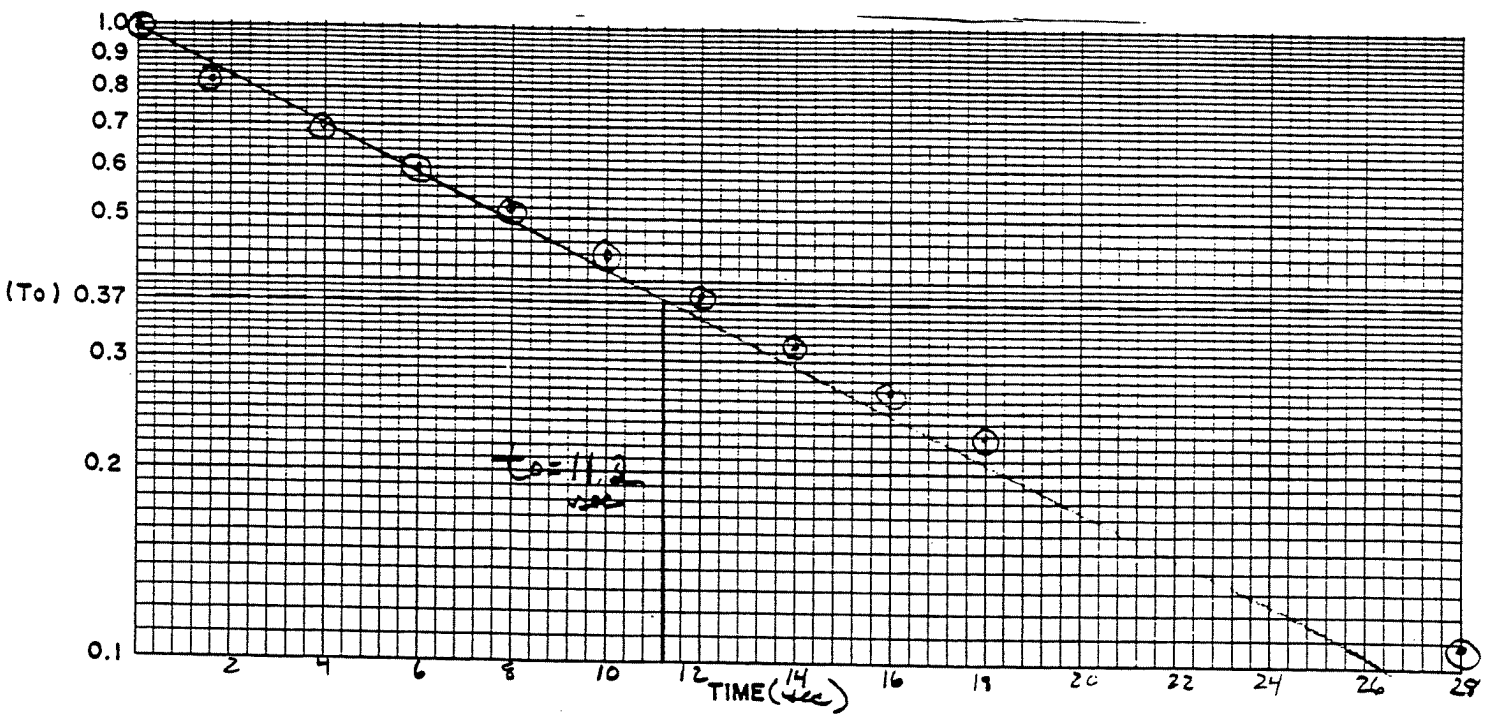
INITIAL HEAD (Ho) = 10.58 ft

To (from graph) = min
11.2 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 8.4E\text{-}5 \text{ ft/sec} = 2.5E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 10.58 | 1 |
| 2 | 10.21 | 0.82 |
| 4 | 9.97 | 0.70 |
| 6 | 9.77 | 0.60 |
| 8 | 9.59 | 0.52 |
| 10 | 9.43 | 0.44 |
| 12 | 9.30 | 0.38 |
| 14 | 9.19 | 0.32 |
| 16 | 9.09 | 0.27 |
| 18 | 9.00 | 0.23 |
| 28 | 8.75 | 0.11 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-7D
DATE: 6/29/88

METHOD: SLUG WITHDRAWAL
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.53 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.66 ft

SCREEN LENGTH (L)= 10 ft

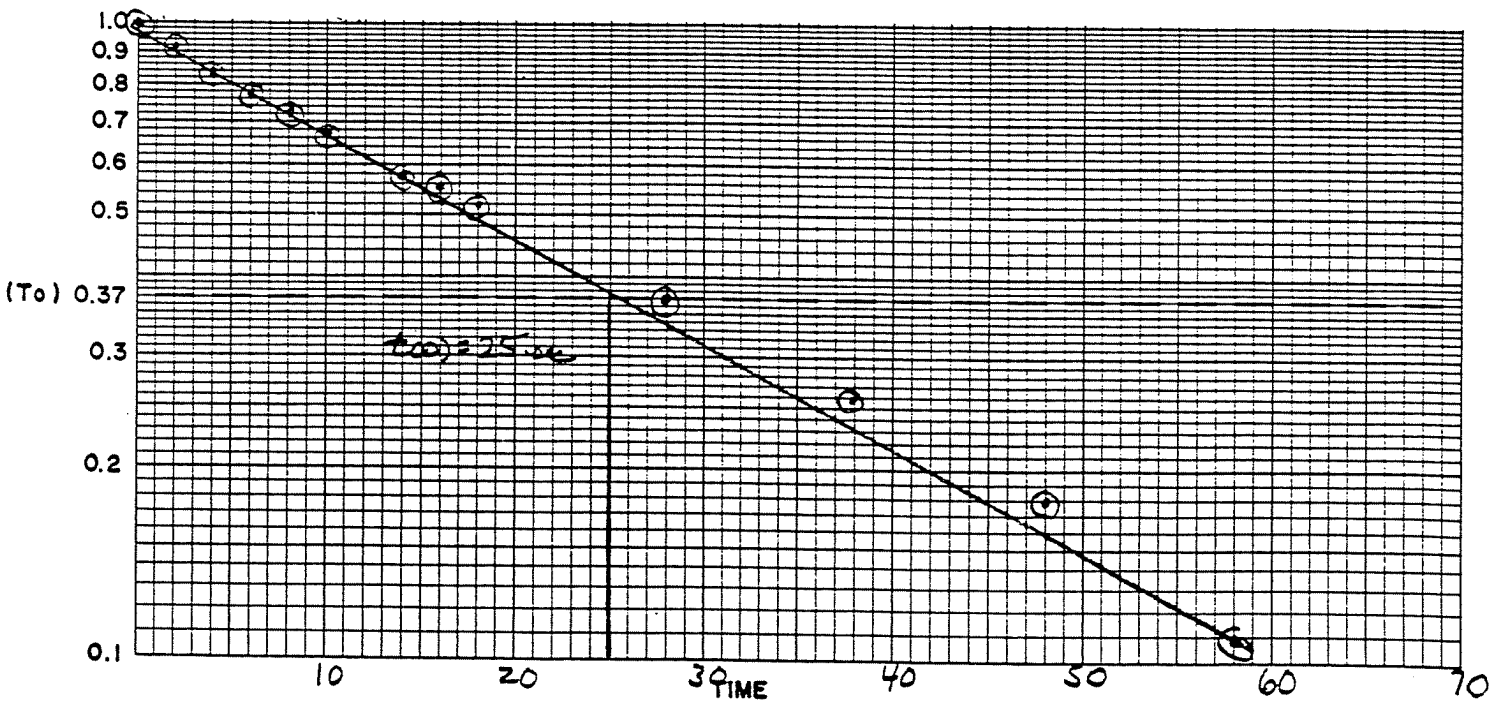
INITIAL HEAD (Ho)= 6.16 ft

To (from graph) = min
25 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 3.7E\text{-}5 \text{ ft/sec} = 1.1E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.16 | 1 |
| 2 | 6.37 | 0.91 |
| 4 | 6.53 | 0.84 |
| 6 | 6.68 | 0.78 |
| 8 | 6.80 | 0.73 |
| 10 | 6.92 | 0.68 |
| 12 | 7.02 | 0.64 |
| 14 | 7.12 | 0.59 |
| 16 | 7.21 | 0.56 |
| 18 | 7.29 | 0.52 |
| 28 | 7.65 | 0.37 |
| 38 | 7.91 | 0.26 |
| 48 | 8.11 | 0.18 |
| 58 | 8.27 | 0.11 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-8S
DATE: 4/27/89

METHOD: SLUG
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 4.03 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.66 ft

SCREEN LENGTH (L)= 5.42 ft

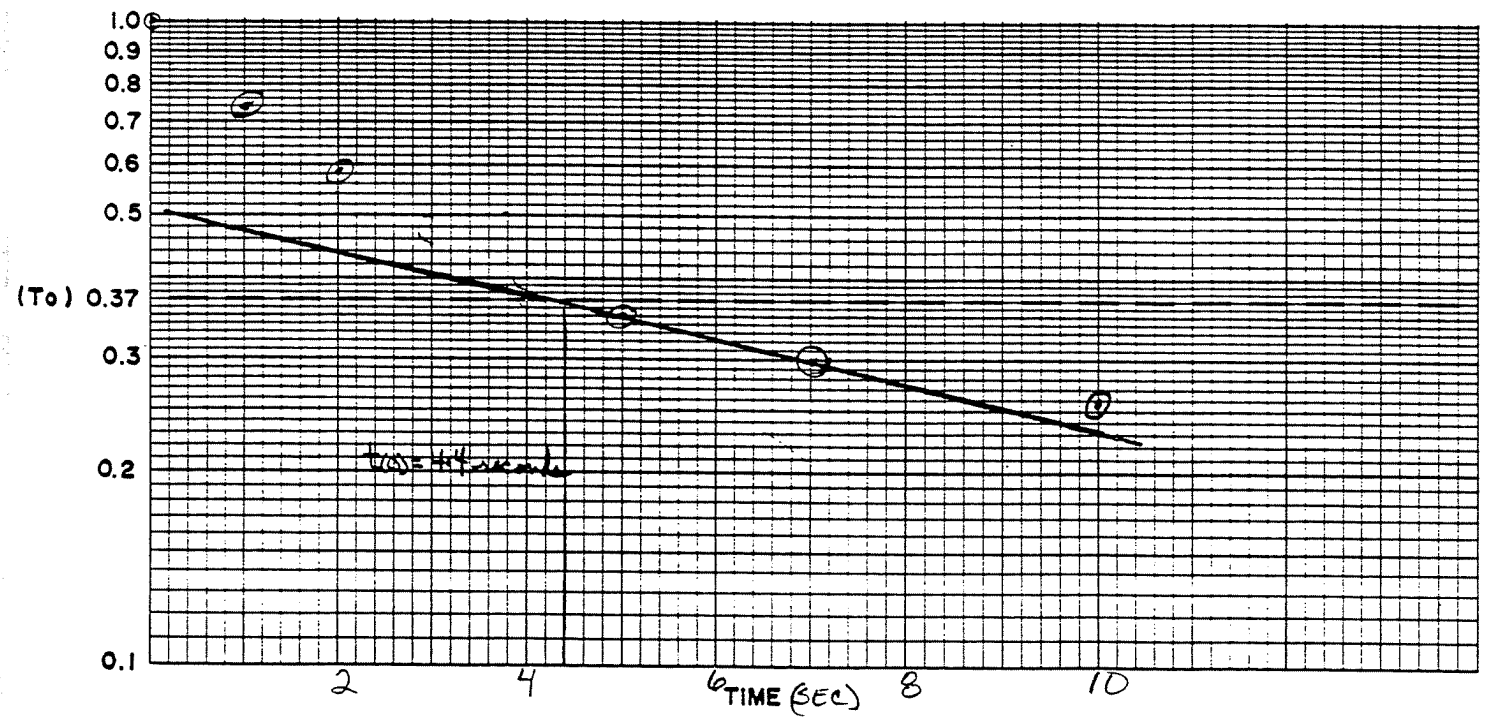
INITIAL HEAD (Ho)= 4.69 ft

To (from graph) = min
4.4 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 3.0E\text{-}4 \text{ ft/sec} = 9.3E\text{-}3 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 4.69 | 1 |
| 1 | 4.52 | 0.74 |
| 2 | 4.42 | 0.59 |
| 3 | 4.35 | 0.48 |
| 4 | 4.3 | 0.41 |
| 5 | 4.26 | 0.35 |
| 7 | 4.23 | 0.30 |
| 10 | 4.2 | 0.26 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-8S
DATE: 4/27/89

METHOD: SLUG WITHDRAWAL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 4.03 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 5.42 ft

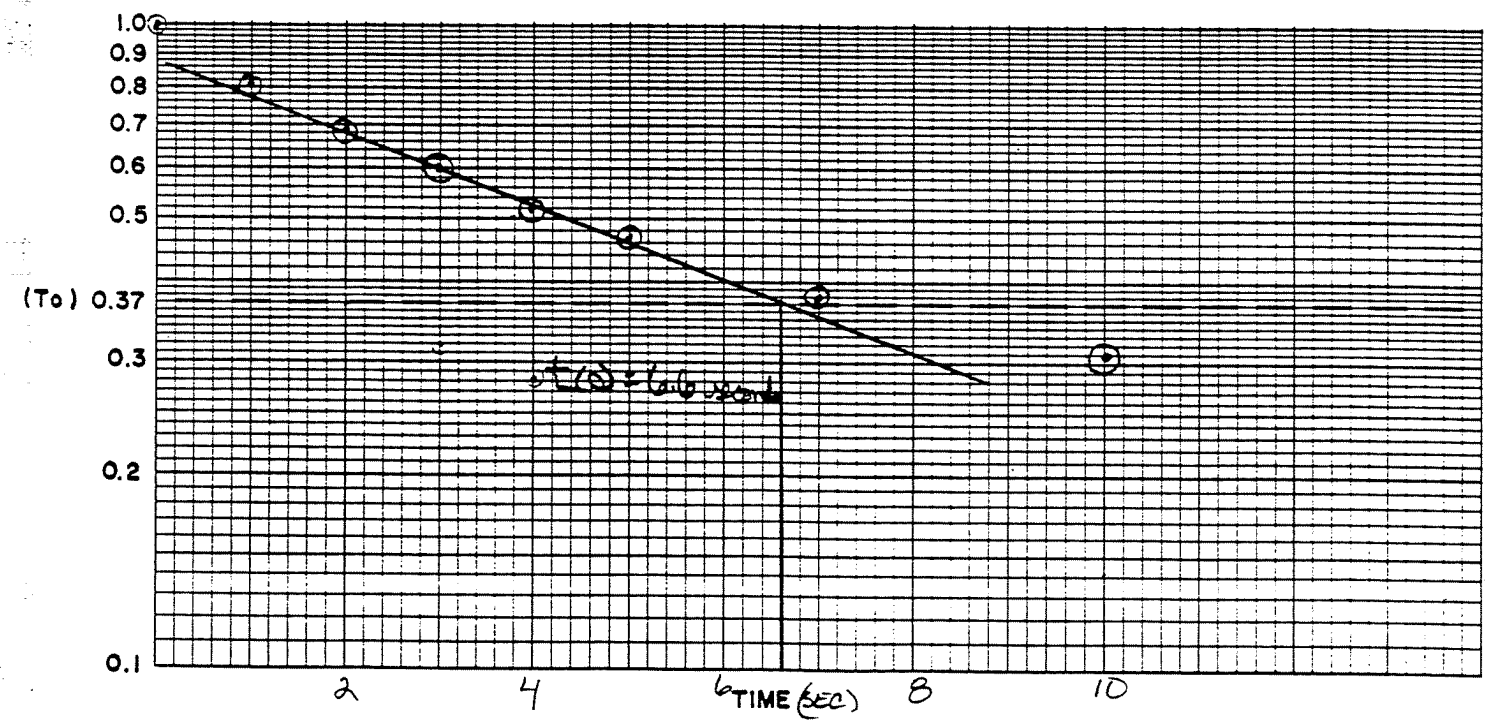
INITIAL HEAD (Ho) = 2.92 ft

To (from graph) = min
6.6 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 2.0E\text{-}4 \text{ ft/sec} = 6.2E\text{-}3 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 2.92 | 1 |
| 1 | 3.13 | 0.81 |
| 2 | 3.26 | 0.69 |
| 3 | 3.36 | 0.60 |
| 4 | 3.45 | 0.52 |
| 5 | 3.51 | 0.47 |
| 7 | 3.61 | 0.38 |
| 10 | 3.69 | 0.31 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-8I
DATE: 6/29/88

METHOD: SLUG
PERSONNEL: PETER BOGARDUS - SUSAN
DATUM USED FOR CALCULATIONS: TRANS

STATIC HEAD (H) = 9.57 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.66 ft

SCREEN LENGTH (L)= 10 ft

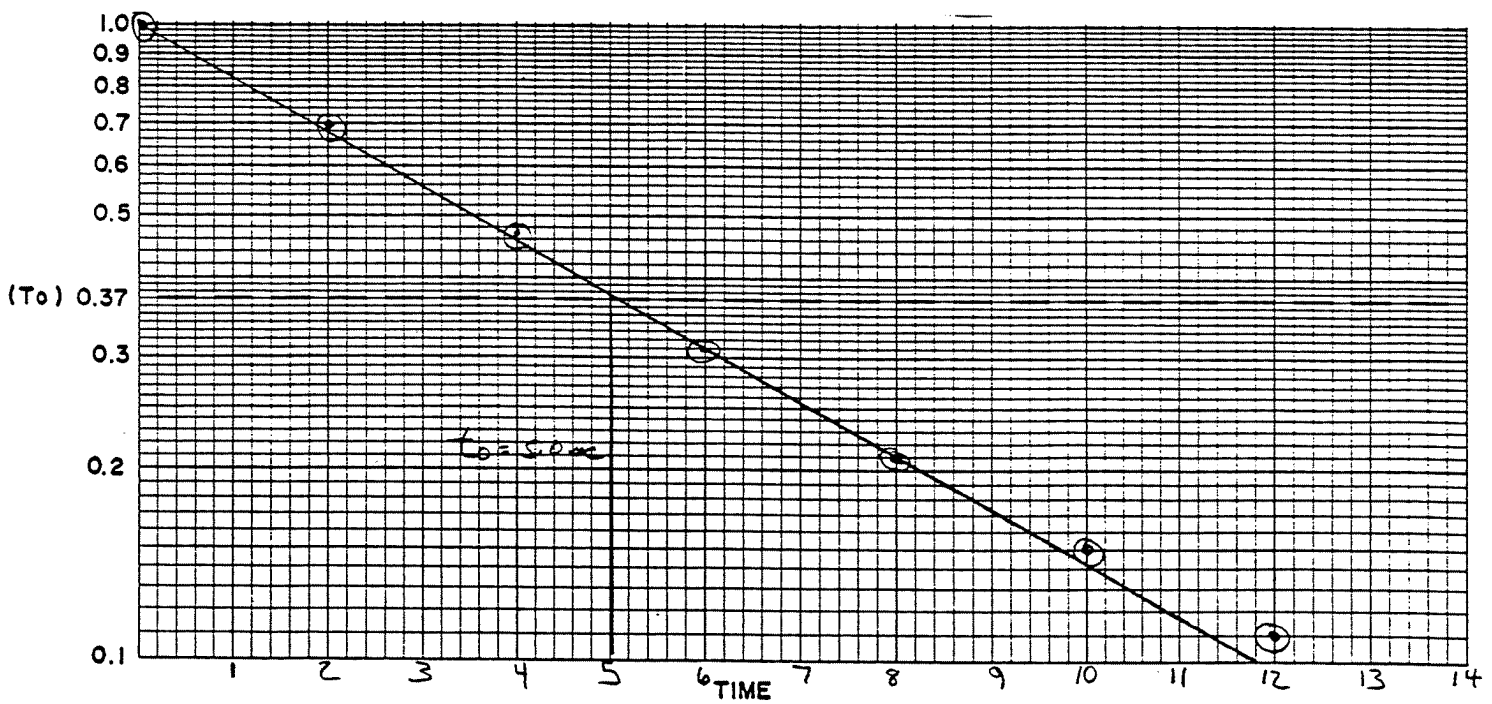
INITIAL HEAD (Ho)= 10.56 ft

To (from graph) = min
5 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.9E\text{-}4 \text{ ft/sec} = 5.7E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 10.56 | 1 |
| 2 | 10.26 | 0.70 |
| 4 | 10.04 | 0.47 |
| 6 | 9.88 | 0.31 |
| 8 | 9.78 | 0.21 |
| 10 | 9.72 | 0.15 |
| 12 | 9.68 | 0.11 |
| 14 | 9.65 | 0.08 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-8I
DATE: 6/29/88

METHOD: SLUG WITHDRAWAL
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 9.57 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 10 ft

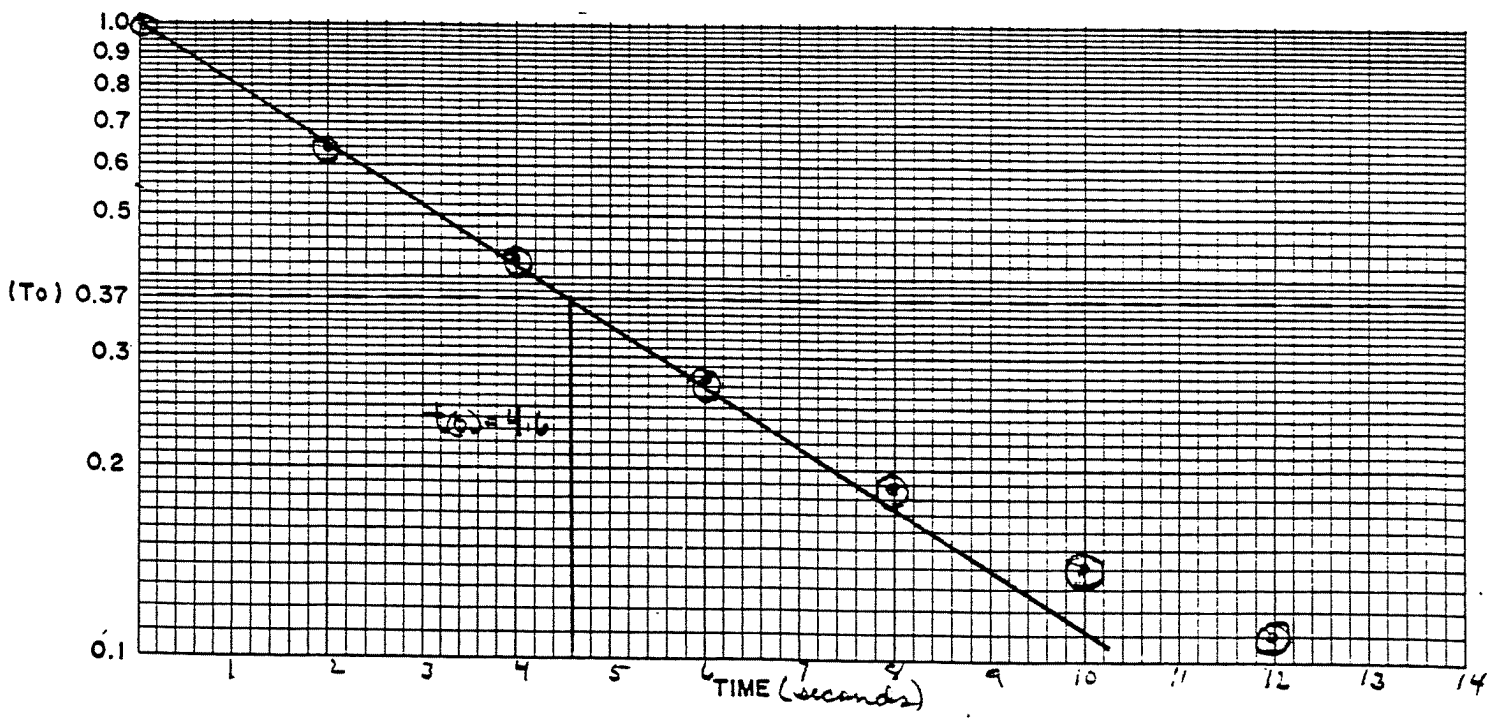
INITIAL HEAD (Ho) = 8.09 ft

To (from graph) = min
4.6 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 2.0E\text{-}4 \text{ ft/sec} = 6.2E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 8.09 | 1 |
| 2 | 8.62 | 0.64 |
| 4 | 8.93 | 0.43 |
| 6 | 9.15 | 0.28 |
| 8 | 9.29 | 0.19 |
| 10 | 9.36 | 0.14 |
| 12 | 9.41 | 0.11 |
| 14 | 9.46 | 0.07 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-9S
DATE: 4/27/89

METHOD: SLUG
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 2.49 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.66 ft

SCREEN LENGTH (L)= 2.4 ft

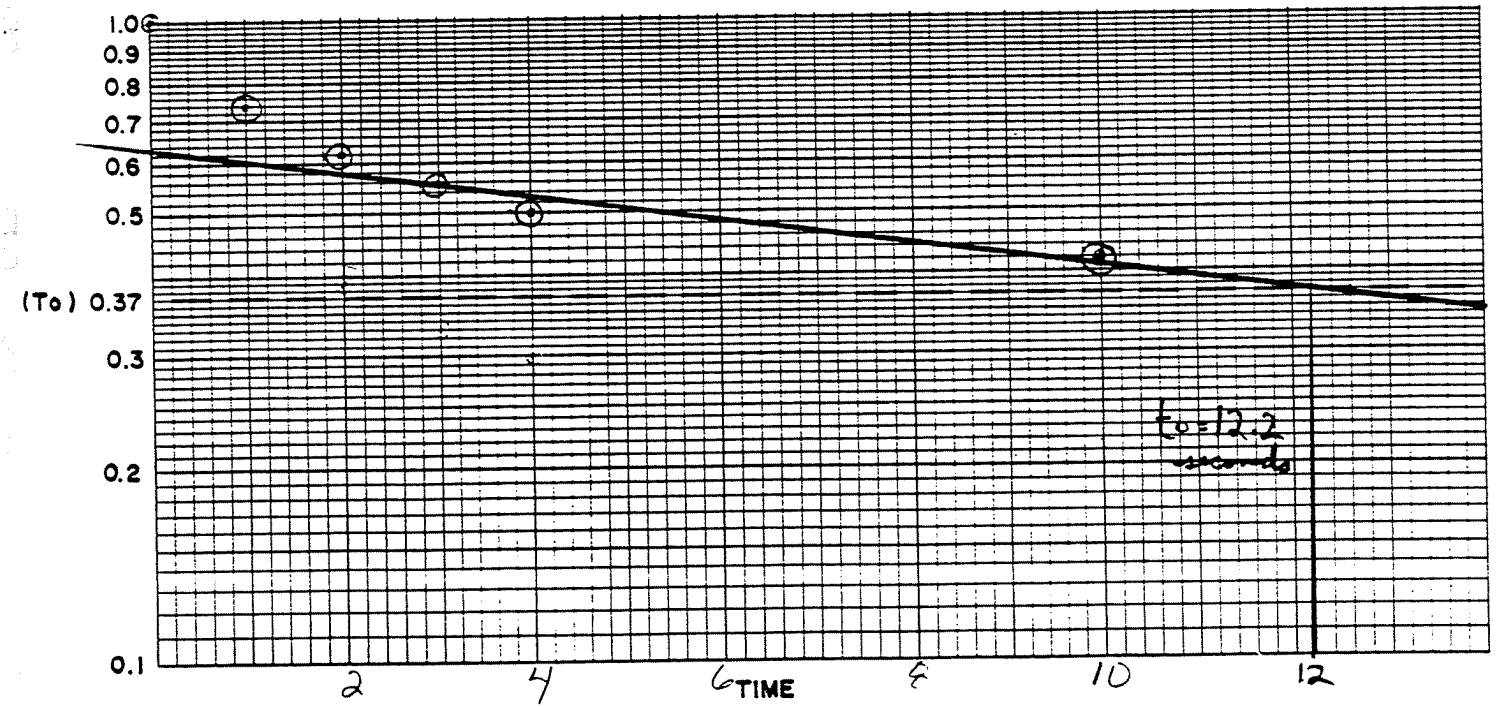
INITIAL HEAD (Ho)= 2.99 ft

To (from graph) = min
12.2 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.5E\text{-}4 \text{ ft/sec} = 4.6E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 2.99 | 1 |
| 1 | 2.86 | 0.74 |
| 2 | 2.8 | 0.62 |
| 3 | 2.77 | 0.56 |
| 4 | 2.74 | 0.50 |
| 10 | 2.7 | 0.42 |
| 83 | 2.64 | 0.30 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-9S
DATE: 4/28/89

EVACUATION METHOD: SLUG WITHDRAWL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 2.49 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 2.4 ft

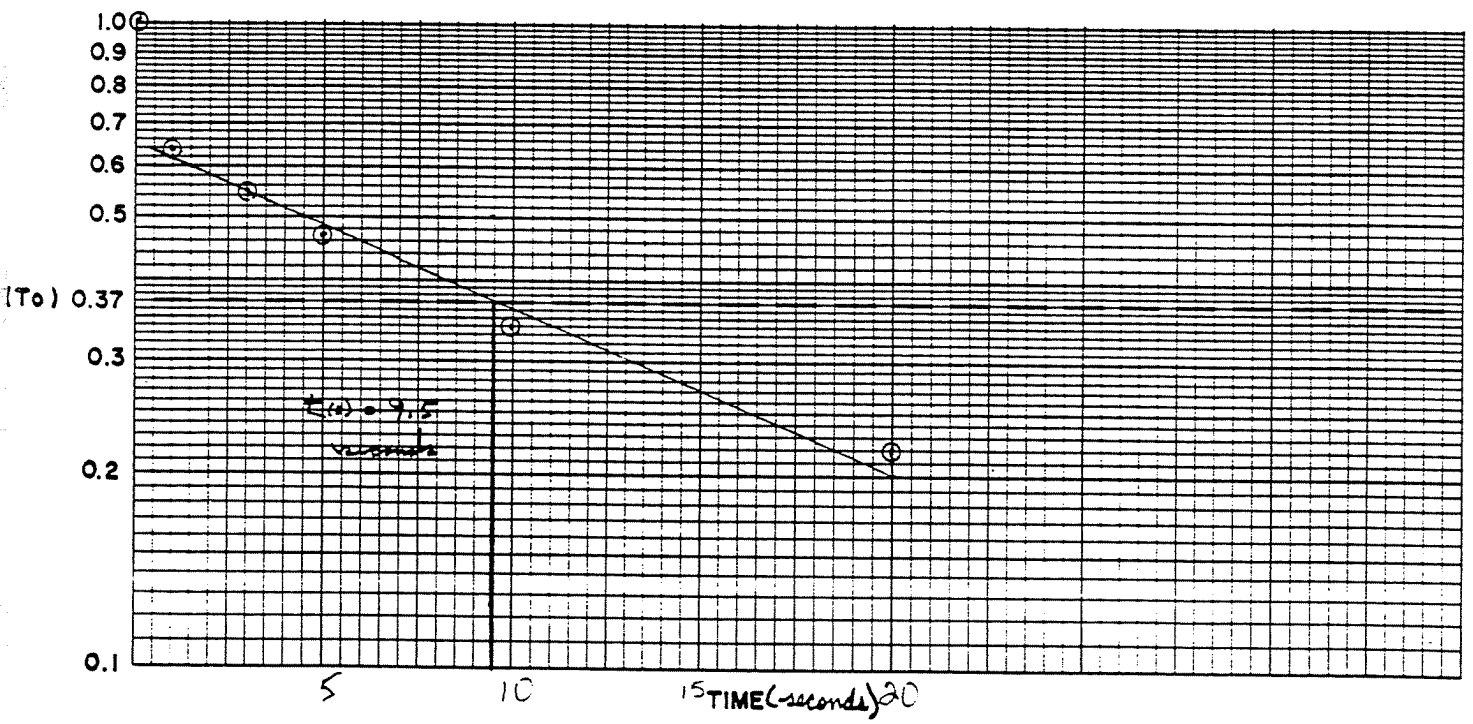
INITIAL HEAD (Ho) = - 1.3 ft

To (from graph) = min
9.5 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 2.0E\text{-}4 \text{ ft/sec} = 5.9E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 1.3 | 1 |
| 1 | 1.73 | 0.64 |
| 3 | 1.84 | 0.55 |
| 5 | 1.93 | 0.47 |
| 10 | 2.09 | 0.34 |
| 20 | 2.23 | 0.22 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-9I
DATE: 6/29/88

METHOD: SLUG
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.56 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.66 ft

SCREEN LENGTH (L)= 10 ft

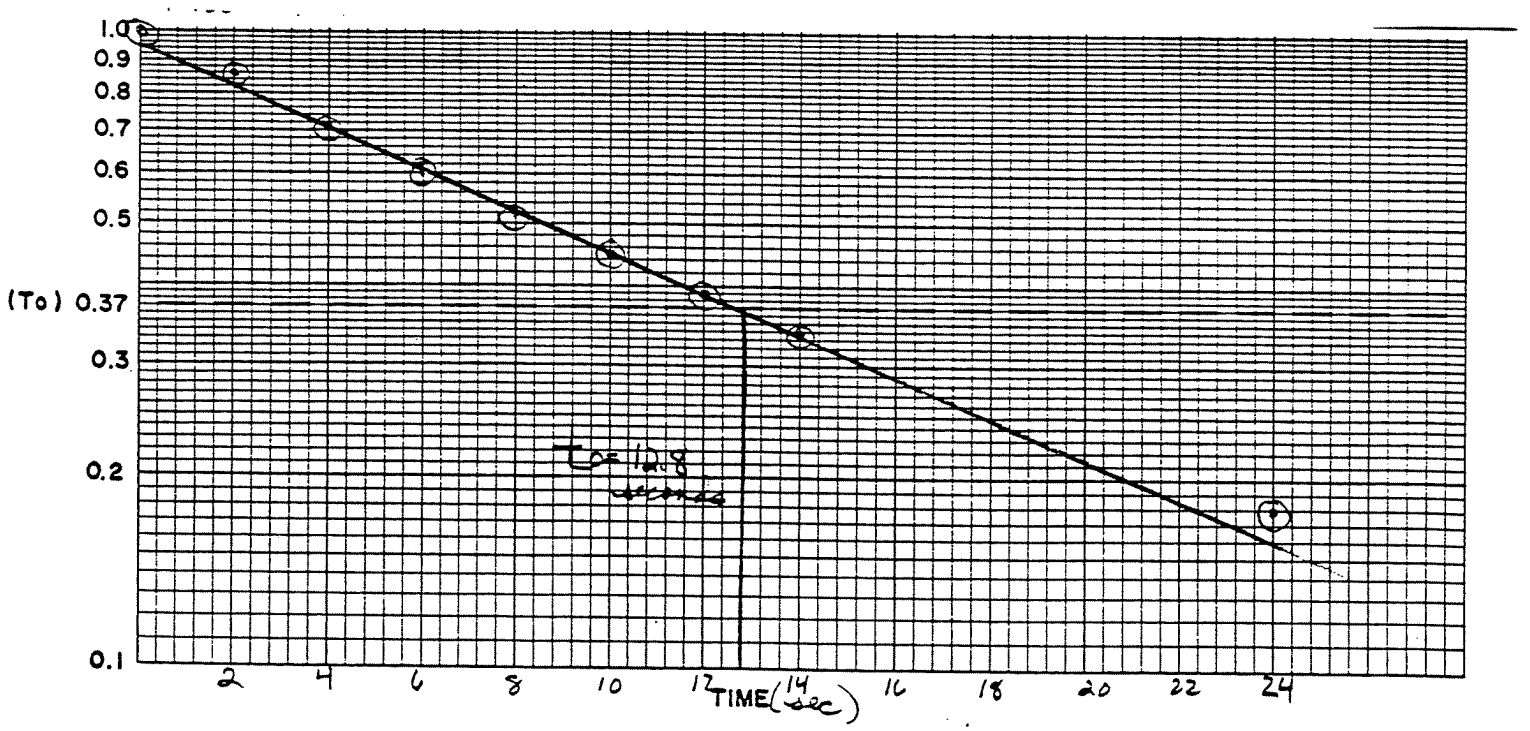
INITIAL HEAD (Ho)= 9.5 ft

To (from graph) = min
12.8 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 7.3E\text{-}5 \text{ ft/sec} = 2.2E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 9.5 | 1 |
| 2 | 9.37 | 0.86 |
| 4 | 9.23 | 0.71 |
| 6 | 9.13 | 0.61 |
| 8 | 9.05 | 0.52 |
| 10 | 8.98 | 0.45 |
| 12 | 8.93 | 0.39 |
| 14 | 8.88 | 0.34 |
| 24 | 8.73 | 0.18 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-9I
DATE: 6/29/88

METHOD: SLUG WITHDRAWAL
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.56 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 10 ft

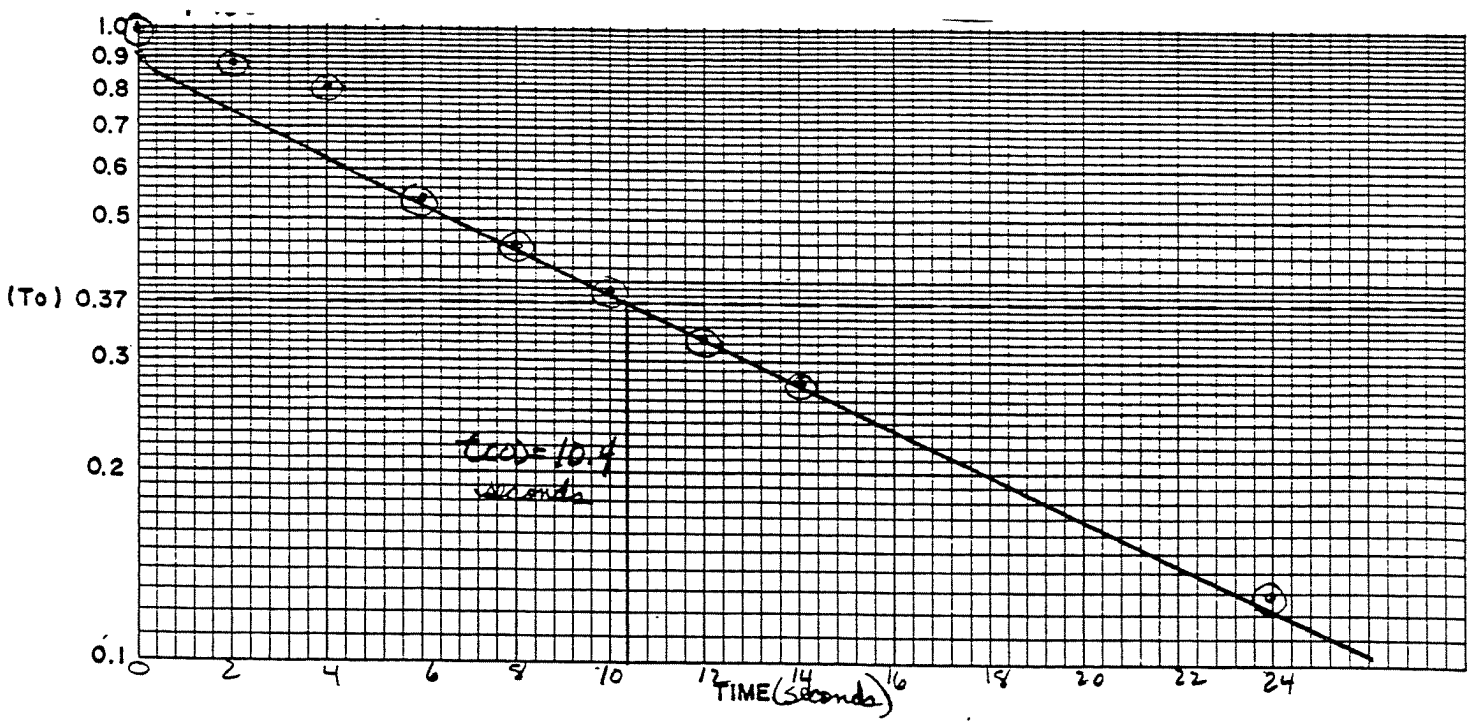
INITIAL HEAD (Ho) = 6.28 ft

To (from graph) = min
10.4 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 9.0E\text{-}5 \text{ ft/sec} = 2.7E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.28 | 1 |
| 2 | 6.54 | 0.89 |
| 4 | 6.71 | 0.81 |
| 6 | 7.32 | 0.54 |
| 8 | 7.52 | 0.46 |
| 10 | 7.68 | 0.39 |
| 12 | 7.81 | 0.33 |
| 14 | 7.92 | 0.28 |
| 24 | 8.26 | 0.13 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-10S
DATE: 4/27/89

EVACUATION METHOD: SLUG WITHDRAWL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 5.09 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 8.8 ft

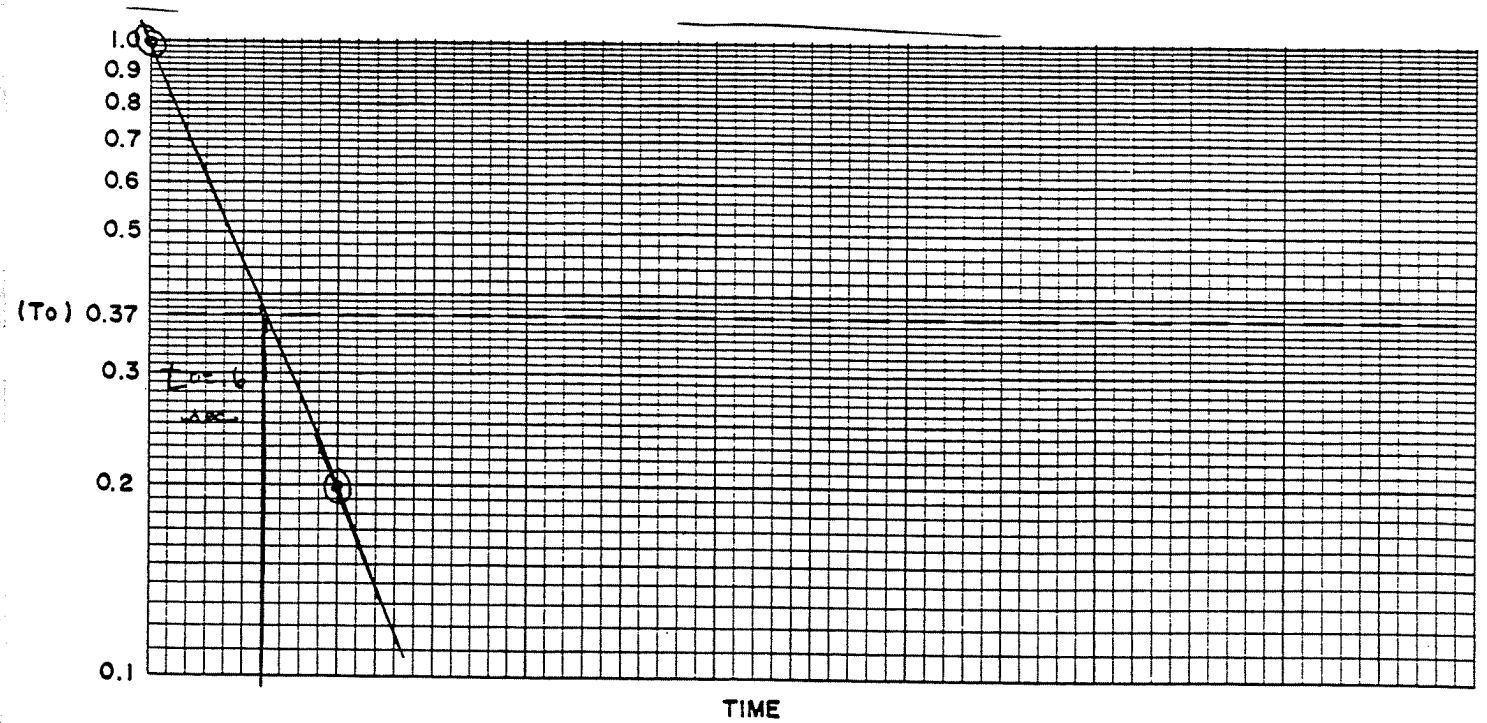
INITIAL HEAD (Ho) = 4.94 ft

To (from graph) = min
0.6 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.7E\text{-}3 \text{ ft/sec} = 5.2E\text{-}2 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 4.94 | 1 |
| 1 | 5.06 | 0.20 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-10I
DATE: 6/29/88

METHOD: SLUG
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.63 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.66 ft

SCREEN LENGTH (L)= 10 ft

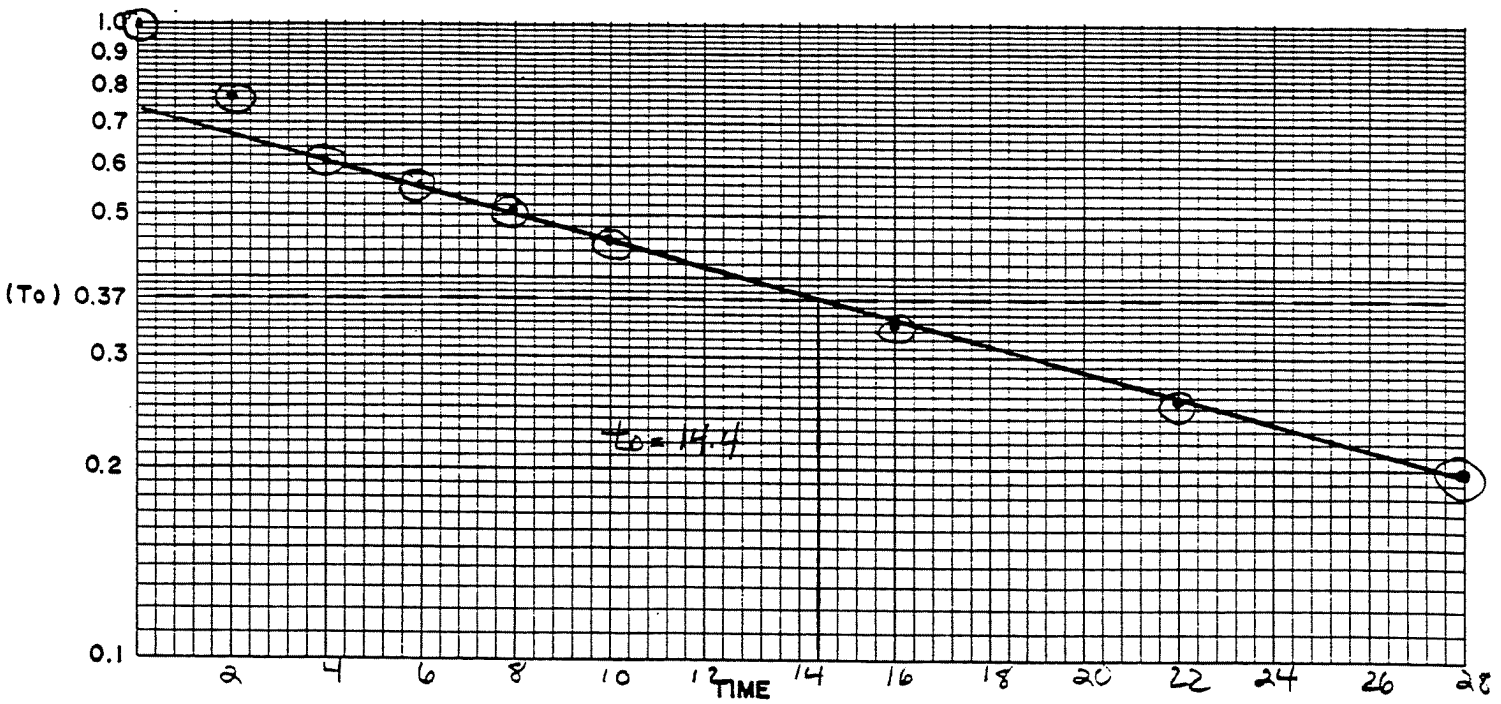
INITIAL HEAD (Ho)= 11.81 ft

To (from graph) = min
14.4 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 6.5E\text{-}5 \text{ ft/sec} = 2.0E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 11.81 | 1 |
| 2 | 11.09 | 0.77 |
| 4 | 10.56 | 0.61 |
| 6 | 10.41 | 0.56 |
| 8 | 10.24 | 0.51 |
| 10 | 10.09 | 0.46 |
| 16 | 9.71 | 0.34 |
| 22 | 9.45 | 0.26 |
| 28 | 9.26 | 0.20 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-10I
DATE: 6/29/88

METHOD: SLUG WITHDRAWAL
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.63 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.66 ft

SCREEN LENGTH (L)= 10 ft

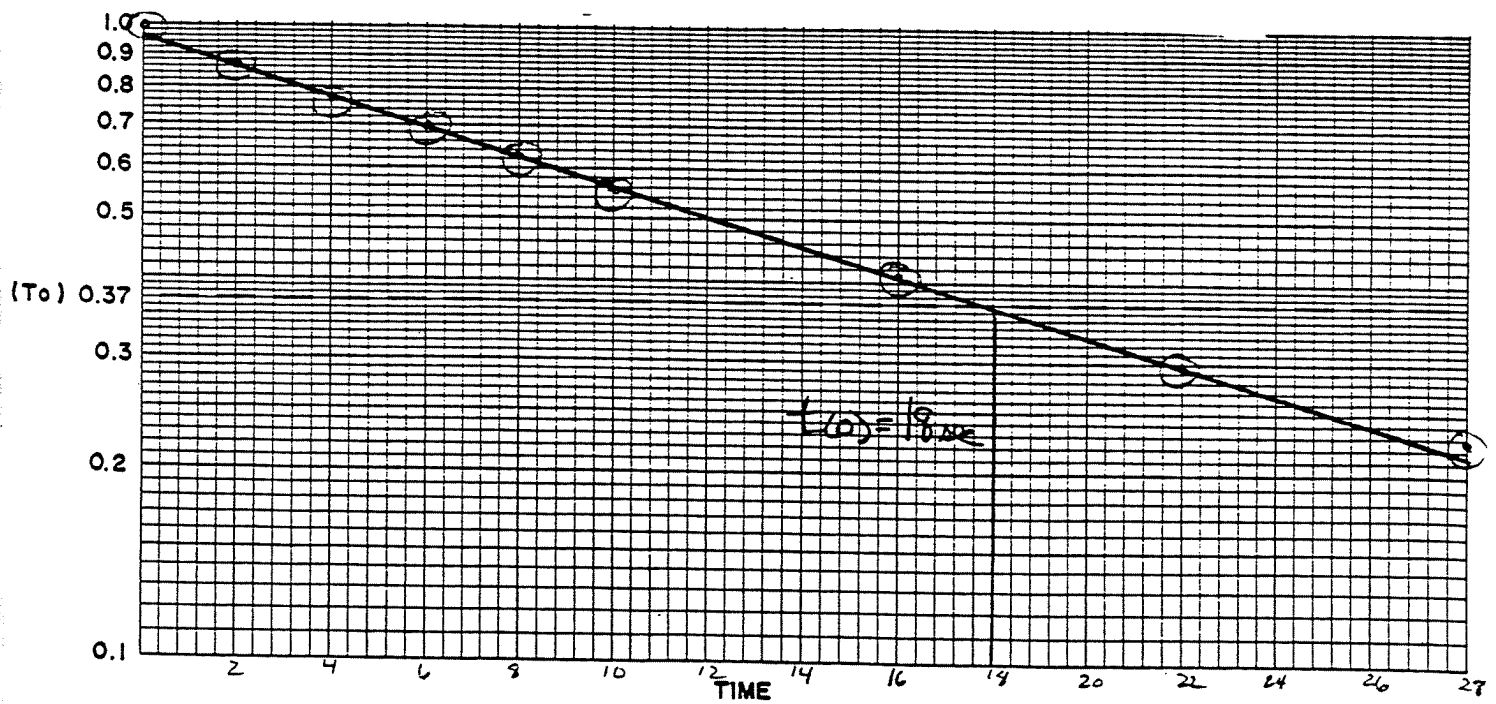
INITIAL HEAD (Ho)= 6.33 ft

To (from graph) = min
18 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 5.2E\text{-}5 \text{ ft/sec} = 1.6E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.33 | 1 |
| 2 | 6.62 | 0.87 |
| 4 | 6.85 | 0.77 |
| 6 | 7.03 | 0.70 |
| 8 | 7.19 | 0.63 |
| 10 | 7.34 | 0.56 |
| 16 | 7.68 | 0.41 |
| 22 | 7.93 | 0.30 |
| 28 | 8.11 | 0.23 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-11S
DATE: 4/27/89

METHOD: SLUG
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 5.61 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 7.49 ft

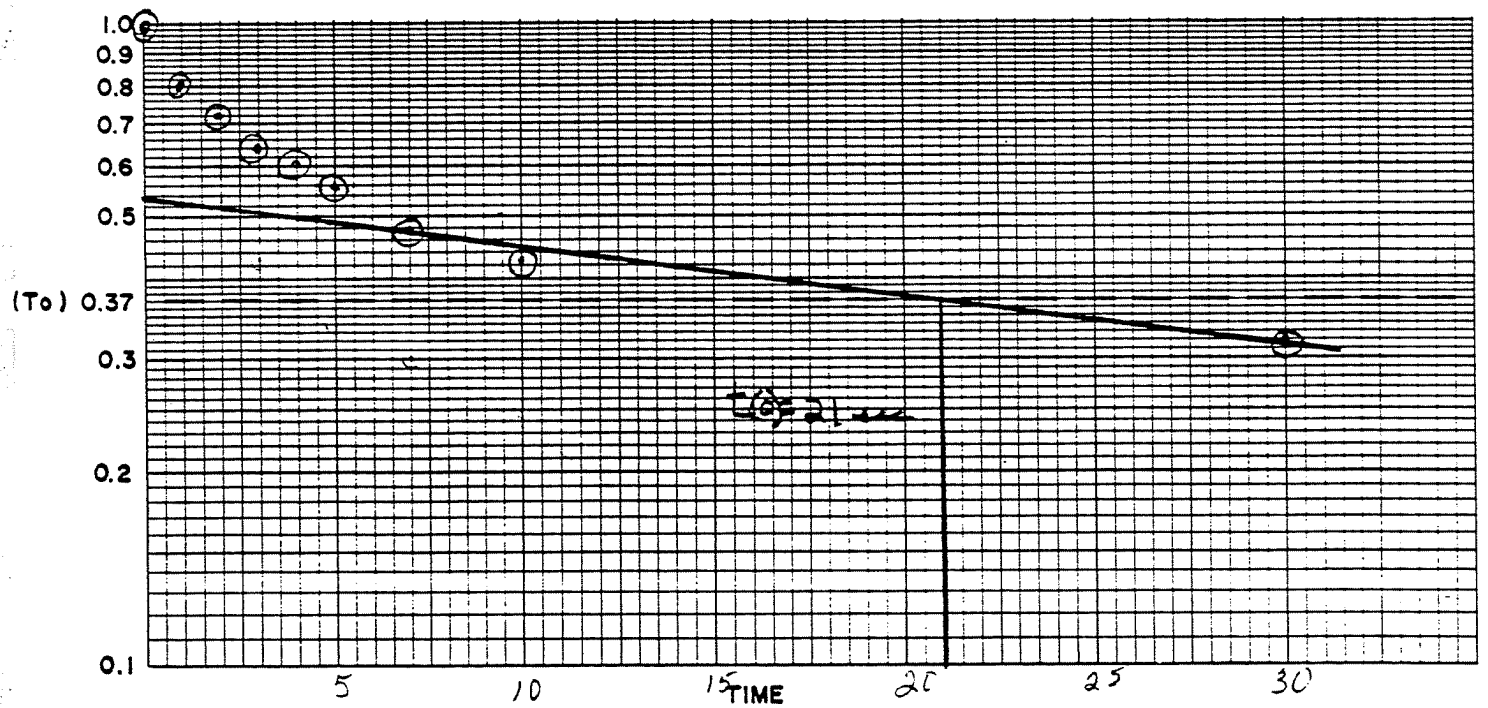
INITIAL HEAD (Ho) = 6.61 ft

To (from graph) = min
21 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 5.3E\text{-}5 \text{ ft/sec} = 1.6E\text{-}3 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.61 | 1 |
| 1 | 6.42 | 0.81 |
| 2 | 6.33 | 0.72 |
| 3 | 6.25 | 0.64 |
| 4 | 6.22 | 0.61 |
| 5 | 6.17 | 0.56 |
| 7 | 6.1 | 0.49 |
| 10 | 6.04 | 0.43 |
| 30 | 5.93 | 0.32 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-11S
DATE: 4/27/89

METHOD: SLUG WITHDRAWAL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

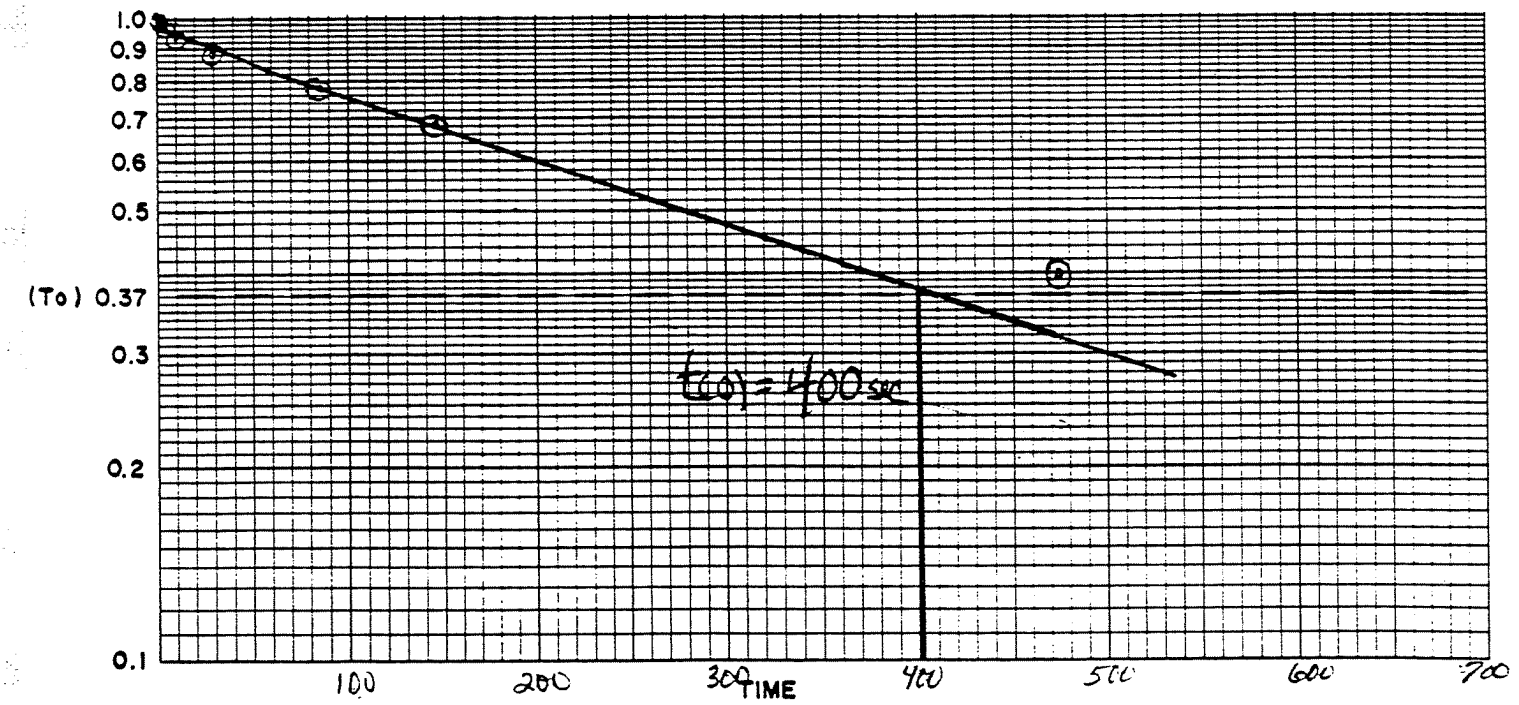
| | | |
|---|---|---|
| STATIC HEAD (H) = | 5.66 | ft |
| PIPE RADIUS (r) = | 0.083 | ft |
| SCREEN RADIUS (R) = | 0.66 | ft |
| SCREEN LENGTH (L) = | 7.49 | ft |
| INITIAL HEAD (Ho) = | 3.92 | ft |
| To (from graph) = | | min |
| | 400 | sec |

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} =$$

2.8E-6 ft/sec
8.5E-5 cm/sec

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 3.92 | 1 |
| 1 | 3.94 | 0.99 |
| 10 | 4.02 | 0.94 |
| 31 | 4.11 | 0.89 |
| 86 | 4.3 | 0.78 |
| 146 | 4.46 | 0.69 |
| 476 | 4.97 | 0.40 |
| 776 | 5.18 | 0.28 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-11I
DATE: 6/29/88

METHOD: SLUG
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.63 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.66 ft

SCREEN LENGTH (L)= 10 ft

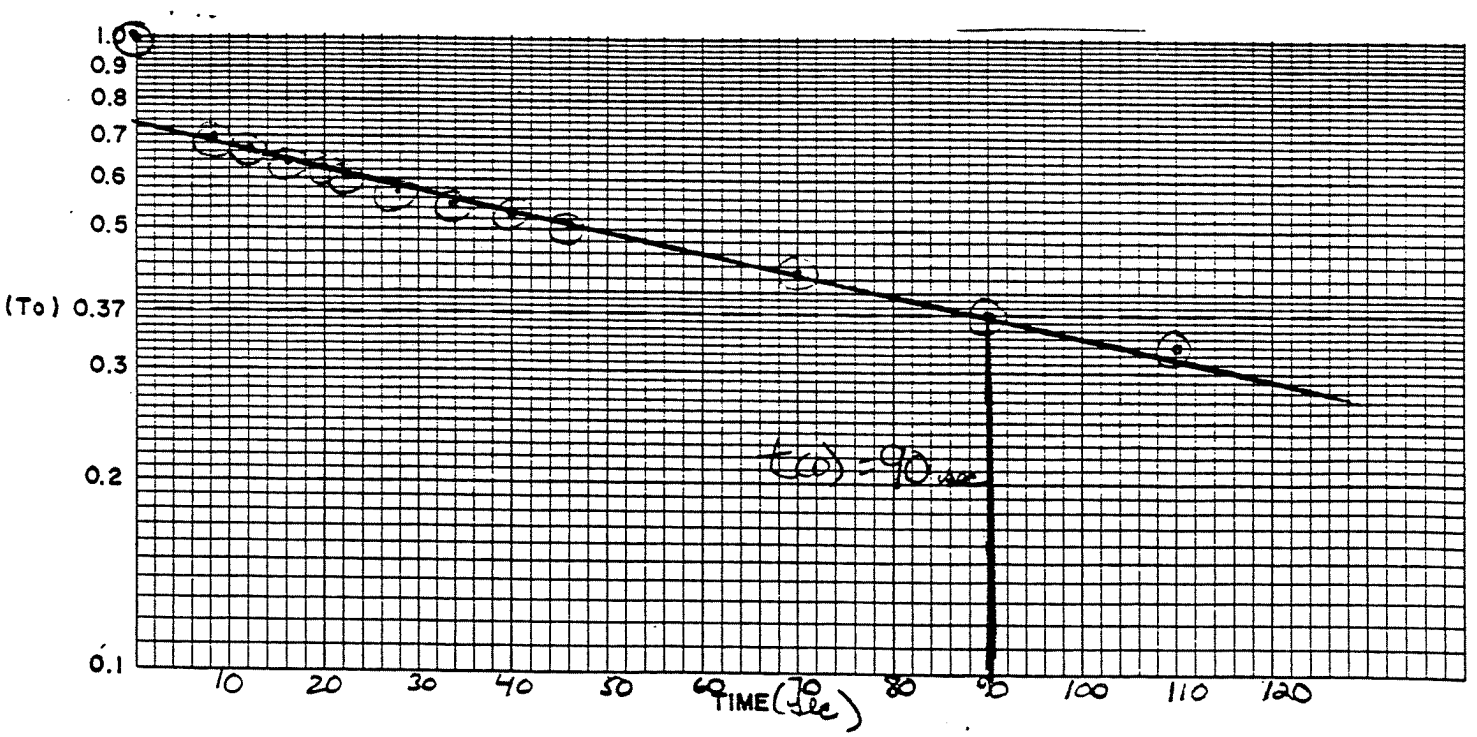
INITIAL HEAD (Ho)= 11.81 ft

To (from graph) = min
90 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 1.0E\text{-}5 \text{ ft/sec} = 3.2E\text{-}4 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 11.81 | 1 |
| 8 | 10.86 | 0.70 |
| 12 | 10.75 | 0.67 |
| 16 | 10.68 | 0.64 |
| 20 | 10.62 | 0.63 |
| 22 | 10.56 | 0.61 |
| 28 | 10.47 | 0.58 |
| 34 | 10.39 | 0.55 |
| 40 | 10.31 | 0.53 |
| 46 | 10.24 | 0.51 |
| 70 | 9.99 | 0.43 |
| 90 | 9.82 | 0.37 |
| 110 | 9.67 | 0.33 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-11I
DATE: 6/29/88

METHOD: SLUG WITHDRAWAL
PERSONNEL: PETER BOGARDUS - SUSAN COX
DATUM USED FOR CALCULATIONS: TRANSDUCE

STATIC HEAD (H) = 8.11 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R)= 0.66 ft

SCREEN LENGTH (L)= 10 ft

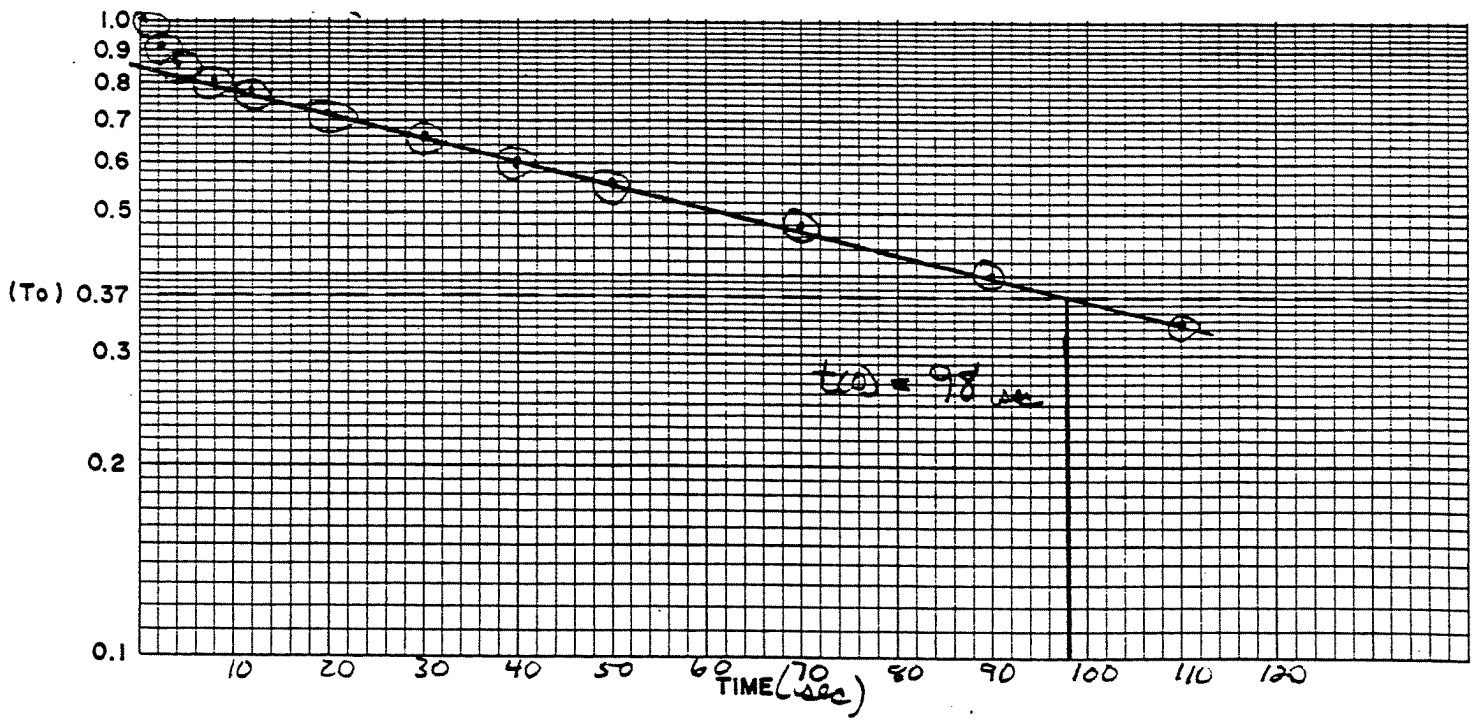
INITIAL HEAD (Ho)= 6.24 ft

To (from graph) = min
98 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 9.6E\text{-}6 \text{ ft/sec} = 2.9E\text{-}4 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.24 | 1 |
| 2 | 6.41 | 0.91 |
| 4 | 6.5 | 0.86 |
| 8 | 6.6 | 0.81 |
| 12 | 6.66 | 0.78 |
| 20 | 6.76 | 0.72 |
| 30 | 6.88 | 0.66 |
| 40 | 6.98 | 0.60 |
| 50 | 7.06 | 0.56 |
| 70 | 7.22 | 0.48 |
| 90 | 7.36 | 0.40 |
| 110 | 7.48 | 0.34 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-12
DATE: 4/27/89

METHOD: SLUG
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 6 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 5.78 ft

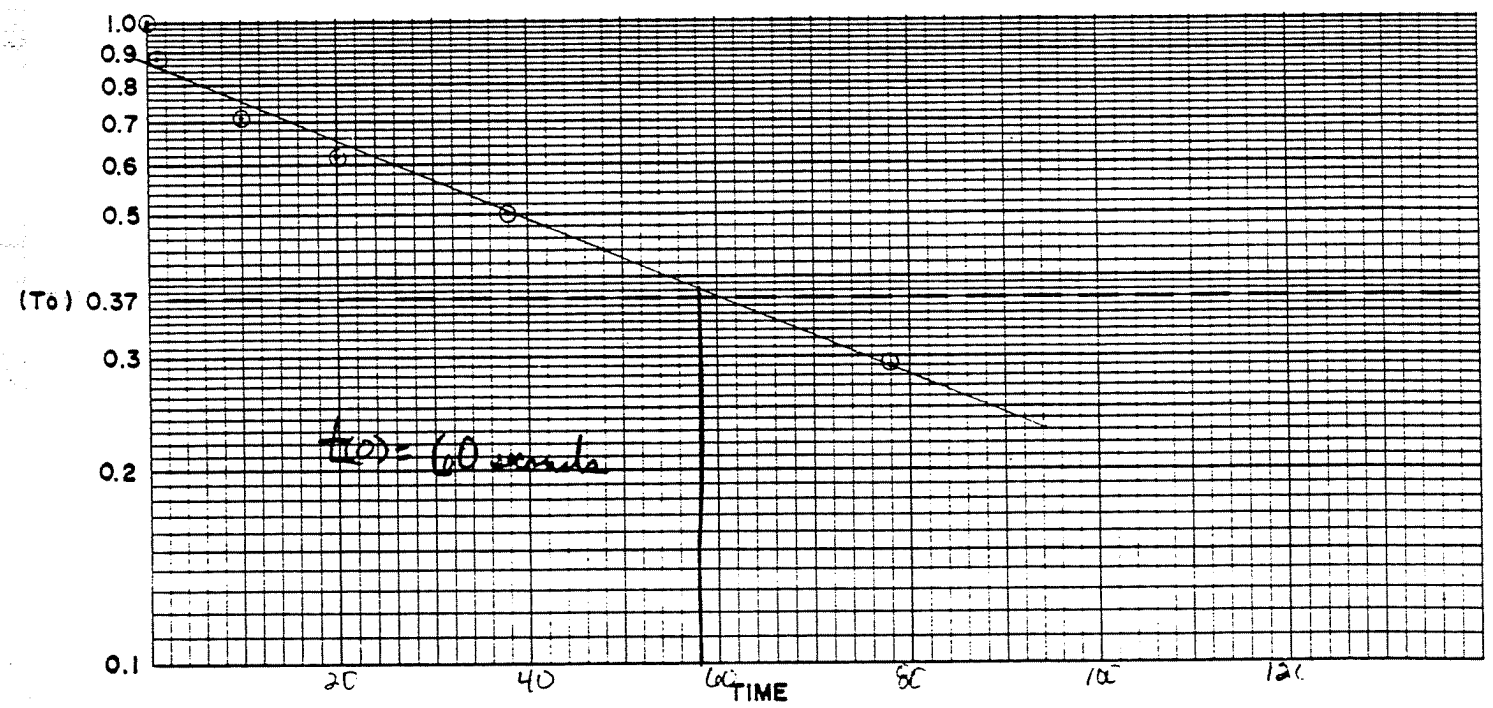
INITIAL HEAD (Ho) = 6.34 ft

To (from graph) = min
60 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 2.2E\text{-}5 \text{ ft/sec} = 6.6E\text{-}4 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.34 | 1 |
| 1 | 6.3 | 0.88 |
| 10 | 6.24 | 0.71 |
| 20 | 6.21 | 0.62 |
| 78 | 6.1 | 0.29 |
| 143 | 6.03 | 0.09 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-12
DATE: 4/28/89

METHOD: SLUG WITHDRAWAL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 6 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 5.78 ft

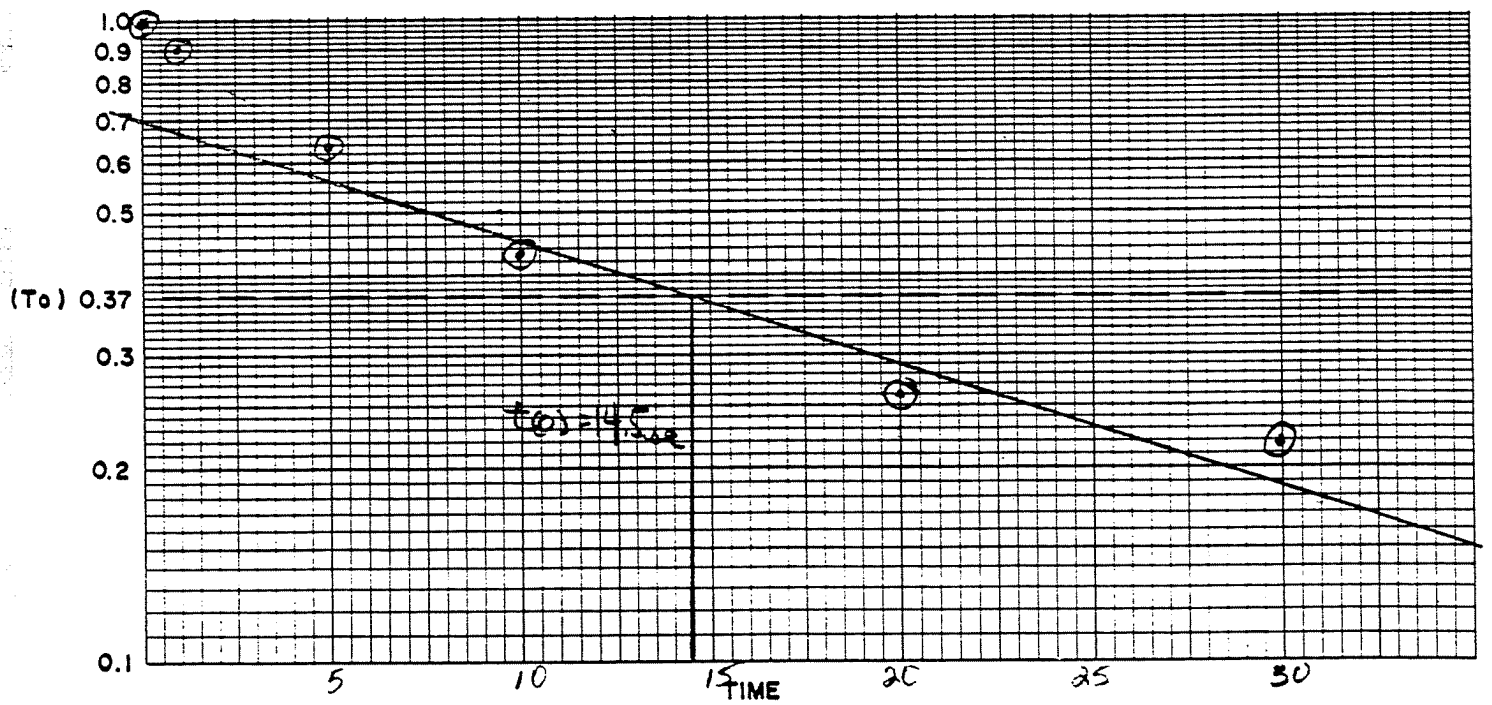
INITIAL HEAD (Ho) = 4.6 ft

To (from graph) = min
14.5 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 8.9E\text{-}5 \text{ ft/sec} = 2.7E\text{-}3 \text{ cm/sec}$$

| TIME (sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 4.6 | 1 |
| 1 | 4.73 | 0.91 |
| 5 | 5.11 | 0.64 |
| 10 | 5.4 | 0.43 |
| 20 | 5.63 | 0.26 |
| 30 | 5.69 | 0.22 |



Q

# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-13
DATE: 4/27/89

EVACUATION METHOD: SLUG
PERSONNEL: PM HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 5.95 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 6.35 ft

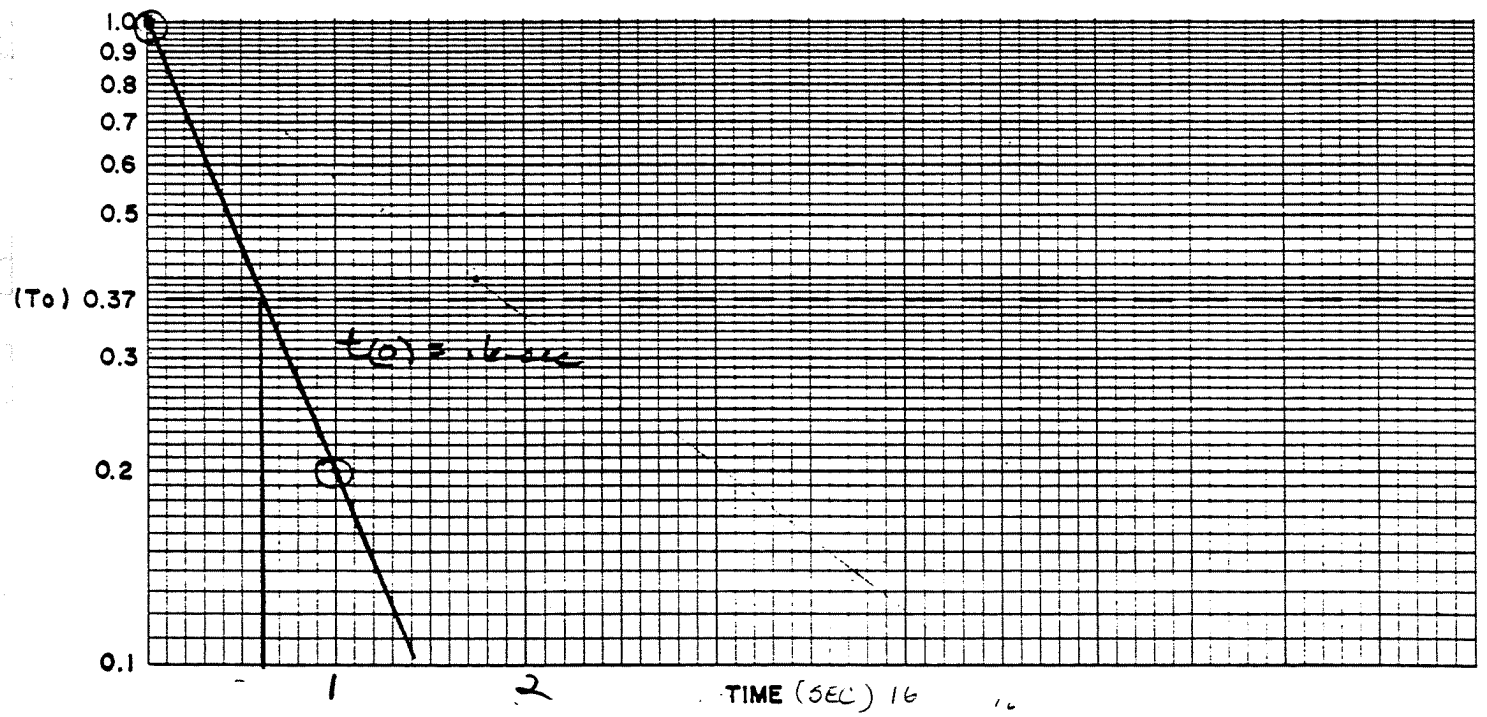
INITIAL HEAD (Ho) = 6.59 ft

To (from graph) = min
0.6 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 2.0E\text{-}3 \text{ ft/sec} = 6.2E\text{-}2 \text{ cm/sec}$$

| TIME ( ) | h | H-h / H-Ho |
|---|---|---|
| 0 | 6.59 | 1 |
| 1 | 6.08 | 0.20 |
| 2 | 5.95 | 0.00 |



# IN-SITU PERMEABILITY TEST
## FIELD LOG

PROJECT: CHERRY FARM
WELL NUMBER: MW-13
DATE: 4/28/89

METHOD: SLUG WITHDRAWL
PERSONNEL: P M HAFF
DATUM USED FOR CALCULATIONS: TRANSDUCER

STATIC HEAD (H) = 5.95 ft

PIPE RADIUS (r) = 0.083 ft

SCREEN RADIUS (R) = 0.66 ft

SCREEN LENGTH (L) = 6.35 ft

INITIAL HEAD (Ho) = 5.31 ft

To (from graph) = min
2.2 sec

HYDRAULIC CONDUCTIVITY

$$\frac{r^2 \ln(L/R)}{2LTo} = 5.6E\text{-}4 \text{ ft/sec} = 1.7E\text{-}2 \text{ cm/sec}$$

| TIME (Sec) | h | H-h / H-Ho |
|---|---|---|
| 0 | 5.31 | 1 |
| 1 | 5.41 | 0.84 |
| 2 | 5.69 | 0.41 |
| 3 | 5.81 | 0.22 |
| 4 | 5.86 | 0.14 |

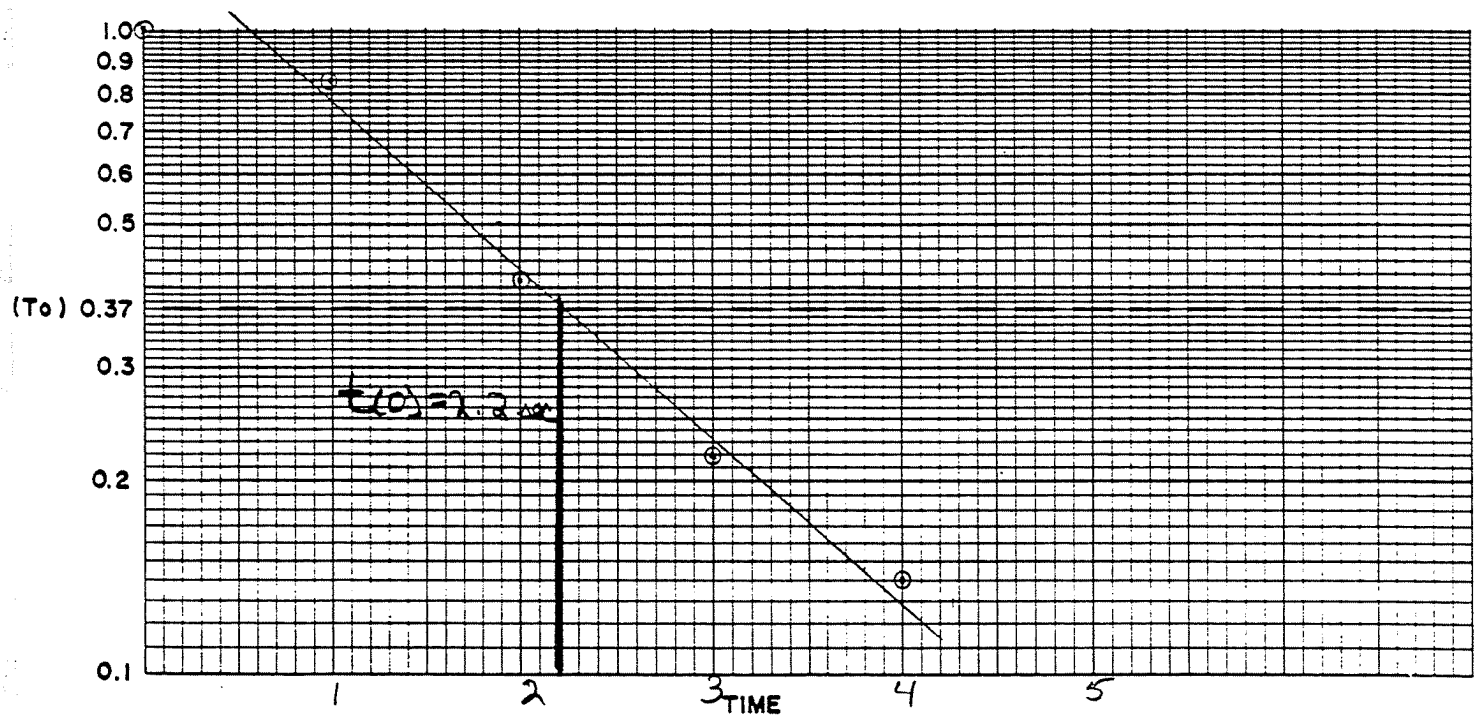


TABLE C-1

GROUND WATER DISCHARGE CALCULATIONS

Cherry Farm Site
Niagara Mohawk Power Company
Tonawanda, New York

| ZONE | VALUE | K(gpd/ft2) | x | I (ft/ft) | x | A (ft2) | = | Q(gpd) |
|---|---|---|---|---|---|---|---|---|
| SHALLOW | | | | | | | | |
| | MEDIAN | 1.42E2 | | 0.006 | | 12000 | | 10231 |
| | HIGH | 1.1E3 | | 0.006 | | 12000 | | 79200 |
| | LOW | 1.8 | | 0.006 | | 12000 | | 130 |
| INTERMEDIATE | | | | | | | | |
| | MEDIAN | 3.8E1 | | 0.0016 | | 36000 | | 2189 |
| | HIGH | 1.3E2 | | 0.0016 | | 36000 | | 7488 |
| | LOW | 3.4E-1 | | 0.0016 | | 36000 | | 19.6 |
| DEEP | | | | | | | | |
| | MEDIAN | 4.0E1 | | 0.0003 | | 36000 | | 432 |
| | HIGH | 1.3E2 | | 0.0003 | | 36000 | | 1404 |
| | LOW | 3.0 | | 0.0003 | | 36000 | | 32 |

TABLE C-2

GROUND WATER VELOCITY CALCULATIONS

Cherry Farm Site
Niagara Mohawk Power Company
Tonawanda, New York

| ZONE | VALUE | K(gpd/ft2) | x | I (ft/ft) | / | n | = | V (ft/day) |
|---|---|---|---|---|---|---|---|---|
| SHALLOW | | | | | | | | |
| | MEDIAN | 1.4E2 | | 0.006 | | 0.25 | | 0.45 |
| | HIGH | 1.1E3 | | 0.006 | | 0.25 | | 3.33 |
| | LOW | 1.8 | | 0.006 | | 0.25 | | 5.80E-3 |
| INTERMEDIATE | | | | | | | | |
| | MEDIAN | 3.8E1 | | 0.0016 | | 0.45 | | 0.018 |
| | HIGH | 1.3E2 | | 0.0016 | | 0.45 | | 0.062 |
| | LOW | 3.4E-1 | | 0.0016 | | 0.45 | | 2.00E-4 |
| DEEP | | | | | | | | |
| | MEDIAN | 4.0E1 | | 0.0003 | | 0.35 | | 4.60E-3 |
| | HIGH | 1.3E2 | | 0.0003 | | 0.35 | | 0.015 |
| | LOW | 3.0 | | 0.0003 | | 0.35 | | 3.00E-4 |

# APPENDIX D

# GROUND WATER SAMPLING FIELD LOGS

GROUND WATER FIELD INDICATOR SUMMARY
CHERRY FARM SITE
NIAGARA MOHAWK POWER CO.
TONAWANDA, NY

| WELL | DATE | pH | CONDUCTIVITY |
|---|---|---|---|
| MW-1I | 6/27/88 | 7.1 | 1,350 |
| | 11/28/88 | 7.3 | 1,690 |
| MW-1D | 6/27/88 | 7.2 | 1,950 |
| | 11/28/88 | 7.5 | )2,000 |
| MW-2S | 6/30/88 | 11.2 | 1,020 |
| | 11/29/88 | 10.9 | 1,080 |
| MW-2I | 6/27/88 | 7.5 | 1,500 |
| | 11/28/88 | 7.4 | 1,460 |
| MW-3S | 7/1/88 | 11.2 | 640 |
| | 11/30/88 | 10.6 | 900 |
| MW-3I | 7/1/88 | 10.9 | 690 |
| | 11/30/88 | 10.6 | 880 |
| MW-4S | 6/28/88 | 9.6 | 490 |
| | 11/29/88 | 9.5 | 540 |
| MW-4I | 6/28/88 | 7.2 | )2,000 |
| | 11/29/88 | 7.0 | )2,000 |
| MW-4D | 6/28/88 | 7.3 | 1,220 |
| | 11/29/88 | 7.5 | 1,129 |
| MW-5S | 6/28/88 | 10.8 | 1,600 |
| | 12/1/88 | 11.8 | )2,000 |
| MW-5I | 6/30/88 | 7.5 | 1,120 |
| | 12/1/88 | 7.4 | 1,300 |
| MW-5D | 6/28/88 | 7.6 | 1,060 |
| | 12/1/88 | 7.5 | 970 |
| MW-6S | 7/5/88 | 11.7 | 1,820 |
| | 12/1/88 | 10.9 | )2,000 |
| MW-6I | 7/5/88 | 8.0 | 770 |
| | 12/1/88 | 8.7 | 980 |
| MW-6D | 7/5/88 | 7.2 | 1,030 |
| | 12/1/88 | 7.8 | 1,120 |
| MW-7S | 6/30/88 | 11.2 | 1,020 |
| | 11/29/88 | 10.9 | 1,080 |
| MW-7I | 6/30/88 | 7.3 | 1,160 |
| | 11/29/88 | 7.2 | 1,180 |
| MW-7D | 6/30/88 | 7.2 | 1,290 |
| | 11/29/88 | 7.5 | 1,144 |
| MW-8S | 6/28/88 | 10.9 | 540 |
| | 11/29/88 | 10.9 | 620 |
| MW-8I | 6/28/88 | 7.4 | 1,650 |
| | 11/29/88 | 7.4 | 1,610 |
| MW-9S | 7/6/88 | 7.2 | 950 |
| | 11/30/88 | 7.4 | 1,000 |
| MW-9I | 7/6/88 | 7.0 | 1,600 |
| | 11/30/88 | 7.3 | 1,165 |
| MW-10S | 6/30/88 | 11.4 | 1,000 |
| | 11/30/88 | 11.0 | 990 |
| MW-10I | 7/5/88 | 7.1 | 1,100 |
| | 11/30/88 | 7.3 | 1,130 |
| MW-11S | 7/1/88 | 9.6 | 360 |
| | 11/30/88 | 9.3 | 390 |
| MW-11I | 7/1/88 | 7.4 | 700 |
| | 11/30/88 | 7.2 | 780 |
| MW-12 | 7/19/88 | 11.5 | 2,200 |
| | 12/2/88 | 11.7 | 1,400 |
| MW-13 | 7/19/88 | 11.0 | 1,500 |
| | 12/1/88 | 10.9 | 1,650 |

New York State Department of Environmental Conservation
600 Delaware Avenue, Buffalo, New York 14202

June 17, 1988

Thomas C. Jorling
Commissioner

Michael Sherman
Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse, NY 13202

Re: Niagara Mohawk - Cherry Farm
Site I.D. #915063

Dear Mr. Sherman:

This letter will confirm the decisions made as a result of our telephone conversation of June 15, 1988 concerning the analytical requirements for the media that will undergo two rounds of sampling as part of the remedial investigation (RI). The full Hazardous Substance List (HSL) of analytes will be tested for on both rounds of ground water and surface water sampling. The Department agrees with your reasoning for this approach in that unseasonably dry weather has lowered the water table prematurely and therefore jeopardizes the chances of obtaining the most representative samples of those media. Without the guarantee of representative samples the validity of the planned analyte list reduction would be in question.

With regard to the sampling schedule it is our understanding that soil sampling will begin on Monday, June 20th and continue to Wednesday, June 22nd. On the next two days the two off-site monitoring wells will be installed and developed. Sampling of monitoring wells will then commence on Monday, June 27th starting with the on-site wells. The off-site wells will be the last sampled at the end of that week. This will allow enough time to pass to meet the equilibration period required by the work plan.

If there are any questions regarding this matter, contact this office as soon as possible.

Very truly yours,

John L. Krajewski

John L. Krajewski
Senior Engineering Geologist
Division of Environmental
Enforcement

JLK/mf

cc: J. Tygert - Region 9
M. Brinkman - DEC, Albany
G. Meehan - NYDOH, Albany
Linda Rusin - NYDOH, Buffalo

CC: DEBBY WRIGHT - O'B&G

**New York State Department of Environmental Conservation**
600 Delaware Avenue, Buffalo, NY 14202-1073

Thomas C. Jorling
Commissioner

November 17, 1988

Michael Sherman
Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse, NY 13202

Re: Niagara Mohawk - Cherry Farm
Site #915063

Dear Mr. Sherman:

Under the requirements of the Remedial Investigation Work Plan a round of ground water samples are to be taken during the seasonally high ground water period. Based on the water level measurements taken at the site over the last 3 months the indications are that the high ground water period for this year is now extant. Therefore, the Department agrees that high ground water sampling may take place at the end of November.

Your consultant, O'Brien and Gere, should contact this office at least three days before sampling so our equipment and personnel can be prepared to take split samples. Any questions regarding this matter can be directed to this office.

Very truly yours,

John L. Krajewski
Senior Engineering Geologist
Division of Environmental
Enforcement

JLK/mf

cc: Deborah Wright
O'Brien & Gere
1304 Buckley Road
Syracuse, NY 13221

Michael Brinkman - DEC, Albany
Jack Tygert - DEC, Region 9

# GROUND WATER SAMPLING FIELD LOG

Sample Location Nimo Cherry Farms Well No. MW-II
Sampled By S.Cox Date 6/27/88 Time 12:30
Weather Sunny, 75° Sampled with Bailer X Pump ____

A. WATER TABLE:

Well depth: (below top of casing) ~~26.80~~ 26.70 ft.
Well elevation: (top of casing) ____ ft.
Depth to water table: (below top of casing) 5.87 ft.
Water table elevation: ____ ft.
Length of water column (LWC) 20.13 ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 3.28 gallons 9.48
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Cloudy - red Odor None Turbidity ____
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 10 gallons.
Did well go dry? Bailed down

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Cloudy Odor None Turbidity ____
Was an oil film or layer apparent? No

E. CONDUCTIVITY 1350.

F. pH 7.1

G. TEMPERATURE 13

H. WELL SAMPLING NOTES:

Filtered on Field

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farm Well No. mw-1I

Sampled By P.G.B. J.A.M Date 11/24 Time 2:10

Weather 35° - Cloudy light snow Sampled with Bailer V Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 26.0 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 5.23 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 20.77 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 3.33 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor none Turbidity Slight

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~10 gallons.

Did well go dry? no - bailed down

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color light Brown Odor Slight Sulfur Turbidity Brown - Fine

Was an oil film or layer apparent? No

E. CONDUCTIVITY 1,690

F. pH 7.3

G. TEMPERATURE 9°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-1D
Sampled By S. Cox P. Bagadus Date 6/27/98 Time _____
Weather 75° Sunny Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth: (below top of casing) 470 ft. Well elevation: (top of casing) _____ ft.

Depth to water table: (below top of casing) 9.55 ft. Water table elevation: _____ ft.

Length of water column (LWC) 37.45 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 6.10 gallons 18.3gal
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Sandy clear Odor slight sulfur Turbidity _____

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 18 gallons.

Did well go dry? bailed dum

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color cloudy Odor sulfur Turbidity _____

Was an oil film or layer apparent? No

E. CONDUCTIVITY 1950

F. pH 7.2

G. TEMPERATURE 13

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Army Fac. Well No. MW-10

Sampled By P.G.B. Date 1/87 Time 1:45

Weather ~35 cloudy light snow Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 47 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 9.69 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 37.31 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 6.08 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color clear Odor Sulf. Turbidity low

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~ 18 gallons.

Did well go dry? No - bailed down

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color brown Odor Sulfur Turbidity high

Was an oil film or layer apparent? no

E. CONDUCTIVITY >2,000

F. pH 7.5

G. TEMPERATURE 8°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-25
Sampled By SCI/PCB Date 6/28/88 Time _____
Weather Sunny 75° Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth: (below top of casing) 20 ft. Well elevation: (top of casing) _____ ft.

Depth to water table: (below top of casing) 14.07 ft. Water table elevation: _____ ft.

Length of water column (LWC) 5.93 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .96 gallons = 2.89
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Black Odor Yes -(?) Turbidity _____

Was an oil film or layer apparent? ~~Slight~~ No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 3 gallons.

Did well go dry? No bailed dry

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Yes Turbidity _____

Was an oil film or layer apparent? Slight sheen

E. CONDUCTIVITY 1020.

F. pH 11.2

G. TEMPERATURE 9°

H. WELL SAMPLING NOTES:

Slight effervescence

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chem Farm Well No. mw-25

Sampled By P.C.B / T.A.M Date 11/28 Time 4:00

Weather ~35 Cloudy Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 30.20 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 13.96 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 16.04 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .98 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Fuel Turbidity low

Was an oil film or layer apparent? no

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~1 gallons.

Did well go dry? ____

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Fuel Turbidity high

Was an oil film or layer apparent? no

E. CONDUCTIVITY 1080

F. pH 10.9

G. TEMPERATURE ____

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-II
Sampled By P. Parker Date 6/27/92 Time _____
Weather Sunny, 75° Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth: (below top of casing) 30 ft. Well elevation: (top of casing) _____ ft.
Depth to water table: (below top of casing) 16.16 ft. Water table elevation: _____ ft.
Length of water column (LWC) 13.84 ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 2.25 gallons 6.76 gal
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Black Odor Yes Turbidity _____
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling No 7 gallons.
Did well go dry? _____

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Yes Turbidity _____
Was an oil film or layer apparent? Slight sheen

E. CONDUCTIVITY 1500

F. pH 7.5

G. TEMPERATURE _____

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farm Well No. mw-2I

Sampled By P. GB / J. Am Date 11/25/96 Time 3:30

Weather ~35 Cloudy Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 30 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 15.98 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 14.02 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 2.2 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor no Turbidity Slight

Was an oil film or layer apparent? no

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 7 gallons.

Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Brown Odor No Turbidity high

Was an oil film or layer apparent? no

E. CONDUCTIVITY 1460

F. pH 7.4

G. TEMPERATURE 8°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. 35
Sampled By P.G.B / S.E.C Date 7/1/80 Time
Weather ~ 65 Cloudy Sampled with Bailer X Pump

A. WATER TABLE:

Well depth: (below top of casing) 19 ft.
Well elevation: (top of casing) ft.
Depth to water table: (below top of casing) 13.34 ft.
Water table elevation: ft.
Length of water column (LWC) 5.66 ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .922 gallons 2.>6
4" diameter wells = 0.653 X (LWC) = gallons
6" diameter wells = 1.469 X (LWC) = gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Slight fuel Turbidity Slight
Was an oil film or layer apparent?

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~4 gallons.
Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor fuel Turbidity high
Was an oil film or layer apparent? no

E. CONDUCTIVITY ~~69~~ 640

F. pH ~~10.9~~ 11.2

G. TEMPERATURE ~~17~~ 13

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-2S

Sampled By F. G. B/J. A.M Date 11/30/88 Time 7:15

Weather ~35° Clear Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) ~19.0 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 13.17 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 5.83 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .95 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color clear Odor Fuel Turbidity low

Was an oil film or layer apparent? slight sheen

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~3 gallons.

Did well go dry? yes

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor fuel Turbidity high

Was an oil film or layer apparent? slight sheen

E. CONDUCTIVITY 900

F. pH 12.6

G. TEMPERATURE 9°C

H. WELL SAMPLING NOTES:

Split with DEC.

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. 3I
Sampled By P.G.D/S.E.C Date 7/1 Time _____
Weather ~60 Cloudy Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth: (below top of casing) ~30 ft.
Well elevation: (top of casing) _____ ft.
Depth to water table: (below top of casing) 16 ft.
Water table elevation: _____ ft.
Length of water column (LWC) 14 ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 2.28 gallons 7
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color light yellow Odor None Turbidity Slight
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 7 gallons.
Did well go dry? Baled down

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color brown Odor None Turbidity _____
Was an oil film or layer apparent? No

E. CONDUCTIVITY 690

F. pH 10.9

G. TEMPERATURE 12

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-3I

Sampled By P. G. B / J. A. M Date 11/22/88 Time 8:20

Weather ~35 Cloudy Sampled with Bailer _____ Pump _____

A. WATER TABLE:

Well depth:
(below top of casing) ~30 ft.

Well elevation:
(top of casing) _____ ft.

Depth to water table:
(below top of casing) 15.79 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 14.21 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 2.3 gallons
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear - light yellow Odor Fuel / Sulfur Turbidity Med.

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~5 gallons.

Did well go dry? Yes

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color _____ Odor _____ Turbidity _____

Was an oil film or layer apparent? _____

E. CONDUCTIVITY .880

F. pH 10.6

G. TEMPERATURE 9

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-4S
Sampled By SEC/PGB Date 6/28/88 Time _____
Weather 75° Sunny Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth:
(below top of casing) 23.5 ft.

Well elevation:
(top of casing) _____ ft.

Depth to water table:
(below top of casing) 16.18 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 7.32 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 1.19 gallons 3.5
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color little cloudy Odor No live - musty Turbidity _____
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 4 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color brown-cloudy Odor No live - musty Turbidity _____
Was an oil film or layer apparent? No

E. CONDUCTIVITY 490

F. pH 9.6

G. TEMPERATURE 13

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms I Well No. MW-45

Sampled By P.C.B / J.A.M Date 11/29/88 Time 9:45

Weather ~35° Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 23.5 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 16.35 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 7.15 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 1.1 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Light Yellow Odor foul-sweet Turbidity slight

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~3 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Brown Odor foul-sweet Turbidity slight

Was an oil film or layer apparent? Yes

E. CONDUCTIVITY 540

F. pH 9.5

G. TEMPERATURE 9

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-4T
Sampled By SCI/PGB Date 6/28/84 Time _____
Weather Sunny 75° Sampled with Bailer ✓ Pump _____

A. WATER TABLE:

Well depth:
(below top of casing) 32 ft.

Well elevation:
(top of casing) _____ ft.

Depth to water table:
(below top of casing) 18.38 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 13.62 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 2.22 gallons 6.5 gal
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Slightly cloudy Odor None Turbidity _____
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 6.5 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Slight cloudy Odor None Turbidity _____
Was an oil film or layer apparent? No

E. CONDUCTIVITY 6280 7200?

F. pH 7.2

G. TEMPERATURE 13

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. mw-41

Sampled By PGB/J.AM Date 11/23/88 Time 11:30

Weather ~35 cloudy Sampled with Bailer / Pump ____

A. WATER TABLE:

Well depth: (below top of casing) ~37 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 18.76 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 18.3 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 2.9 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color yellow Odor slight sulfur Turbidity slight

Was an oil film or layer apparent? slight sheen

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~10 gallons.

Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Grey Odor Sulfur/fuel Turbidity high

Was an oil film or layer apparent? Slight sheen.

E. CONDUCTIVITY ~~X~~ 2000

F. pH 7.0

G. TEMPERATURE 8°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-4D
Sampled By SEC / POB Date 6/28/88 Time _____
Weather Sunny 75° Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth:
(below top of casing) 56.5 ft.

Well elevation:
(top of casing) _____ ft.

Depth to water table:
(below top of casing) 18.81 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 37.69 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 6.14 gallons 18.4
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Slightly Cloudy Odor None Turbidity _____
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 18 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Cloudy brown Odor None Turbidity _____
Was an oil film or layer apparent? No

E. CONDUCTIVITY 1220

F. pH 7.3

G. TEMPERATURE 13

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cheng Farms MW-8 4D Well No. MW-4D

Sampled By PGB / J. AM. Date 11/29/88 Time 10:45

Weather -35 Sampled with Bailer 1 Pump ____

A. WATER TABLE:

Well depth:
(below top of casing) 56.5 ft.

Well elevation:
(top of casing) ____ ft.

Depth to water table:
(below top of casing) 19.04 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 37.46 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 6.1 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Slight sulfur Turbidity low

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~20 gallons.

Did well go dry? ~~-20~~ No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Grayish Odor sulfur Turbidity medium

Was an oil film or layer apparent? No

E. CONDUCTIVITY 1129.

F. pH 7.5

G. TEMPERATURE 8

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-55
Sampled By P.G.B / S.E.C Date 6/28/88 Time _____
Weather 75° Sunny Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth: (below top of casing) 16.00 ft.
Well elevation: (top of casing) _____ ft.
Depth to water table: (below top of casing) 13.33 ft.
Water table elevation: _____ ft.
Length of water column (LWC) 2.67 ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .43 gallons 1.3
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Slight Turbidity Low
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~1.5 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Slight - full Turbidity high
Was an oil film or layer apparent? No

E. CONDUCTIVITY 1600

F. pH 10.8

G. TEMPERATURE 13

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cheney Farms Well No. MW-5S

Sampled By P.G.B / J.Aim Date 12/1/86 Time 9:15

Weather ~35 overcast Sampled with Bailer ____ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 16.00 ft. Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 13.84 ft. Water table elevation: ____ ft.

Length of water column (LWC) 2.16 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .35 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color clear Odor fish + musty Turbidity low

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~.5 gallons.

Did well go dry? Yes

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Brown Odor fish + musty Turbidity high

Was an oil film or layer apparent? No

E. CONDUCTIVITY 73 000.

F. pH 11 9

G. TEMPERATURE 90°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-5I
Sampled By PGB/SEC Date 6/30/88 Time 9:00
Weather 60°-Cloudy Sampled with Bailer X Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 30 ft.
Well elevation: (top of casing) ____ ft.
Depth to water table: (below top of casing) 13.75 ft.
Water table elevation: ____ ft.
Length of water column (LWC) 16.25 ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 2.64 gallons 8.0
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color light yellow Odor No Turbidity low
Was an oil film or layer apparent? None

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 2.5 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Grey Odor None Turbidity high
Was an oil film or layer apparent? No

E. CONDUCTIVITY 1120

F. pH 7.5

G. TEMPERATURE 10

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cheney Farms Well No. mw-5I

Sampled By P.G.B / J.A.M Date 12/1/88 Time 10:00

Weather ~35 overcast Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 30 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 14.04 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 15.96 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 2.6 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Slight Sulfur - fuel Turbidity Clear

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 8 gallons.

Did well go dry? X No bailed dry

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Slight Gray Odor ____ Turbidity Mod.

Was an oil film or layer apparent? No

E. CONDUCTIVITY 1300.

F. pH 7.4

G. TEMPERATURE 8°C

H. WELL SAMPLING NOTES:

Split with N.Y.S.D.E.

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-5D
Sampled By SEC/PGCB Date 6/29/88 Time _____
Weather Sunny 75 Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth:
(below top of casing) 55.2 ft.

Well elevation:
(top of casing) _____ ft.

Depth to water table:
(below top of casing) 13.63 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 41.57 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 6.7 gallons = 20
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Slight Turbidity _____
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 20 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Brown-Orange Odor Slight Turbidity _____
Was an oil film or layer apparent? No

E. CONDUCTIVITY 1060

F. pH 7.6

G. TEMPERATURE 12

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Berry Farms Well No. MW-5D

Sampled By PGB / J.A.M Date 12/11/98 Time 8:00

Weather ~35 overcast Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 54 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 14.28 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 39.72 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 6.4 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Sulfur Turbidity low

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 19.5 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING.

Color Grey Odor Sulfur Turbidity high

Was an oil film or layer apparent? No

E. CONDUCTIVITY 970

F. pH 7.5

G. TEMPERATURE 8°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chem Fabs Well No. MW-65

Sampled By D&B Date 7/16 Time

Weather Sunny Sampled with Bailer ✓ Pump

A. WATER TABLE:

Well depth: (below top of casing) 26. ft.

Well elevation: (top of casing) ft.

Depth to water table: (below top of casing) 15.93 ft.

Water table elevation: ft.

Length of water column (LWC) 10.07 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 1.64 gallons 5.0

4" diameter wells = 0.653 X (LWC) = gallons

6" diameter wells = 1.469 X (LWC) = gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Slight Turbidity

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 15 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Brown Odor Slight-Mild Turbidity Moderate

Was an oil film or layer apparent? No

E. CONDUCTIVITY 1820

F. pH 11.7

G. TEMPERATURE 16

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chem. Fac. Well No. MW-6S

Sampled By P.G. B/ J.A. M Date 12/1/94 Time 1:10

Weather ~35° Sunny Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) ~~~~ ~20 ft. Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 16.67 ft. Water table elevation: ____ ft.

Length of water column (LWC) 3.33 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 54 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Fuel - musty Turbidity low

Was an oil film or layer apparent? Yes - slight sheen

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~1.5 gallons.

Did well go dry? Bailer down

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor fuel - musty Turbidity high

Was an oil film or layer apparent? Yes slight sheen

E. CONDUCTIVITY Meter >2,000

F. pH ~~7-2,000~~ 10.9

G. TEMPERATURE 10°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-6I
Sampled By PGB Date 7/6/88 Time _____
Weather 90° Sunny Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth: (below top of casing) 30 ft.
Well elevation: (top of casing) _____ ft.
Depth to water table: (below top of casing) 13.95 ft.
Water table elevation: _____ ft.
Length of water column (LWC) 16.05 ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 2.6 gallons 8
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Brown Odor Mothball Turbidity Slight
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 8 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Brown Odor Mothball Turbidity high-foamy
Was an oil film or layer apparent? No

E. CONDUCTIVITY 770

F. pH 8.0

G. TEMPERATURE 14

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chevy Fairmont Well No. MW-6E

Sampled By P.G.B / J.A.M Date 12/11/85 Time 1:45

Weather -35 sunny Sampled with Bailer J Pump ____

A. WATER TABLE:

Well depth: (below top of casing) -30 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 14.14 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 15.6 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 2.5 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Brown - Red Odor Fuel - Sulfur Turbidity low

Was an oil film or layer apparent? no

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling -8 gallons.

Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Brown Odor Fuel - Chemical Turbidity high

Was an oil film or layer apparent? no

E. CONDUCTIVITY 980

F. pH 8.7

G. TEMPERATURE 9°C

H. WELL SAMPLING NOTES:

Split with D.E.C.

Sample still red after filtering

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-6D
Sampled By PGBSEC Date 7/5/84 Time _____
Weather 90° hot Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth: (below top of casing) 54 ft.
Well elevation: (top of casing) _____ ft.
Depth to water table: (below top of casing) 16.45 ft.
Water table elevation: _____ ft.
Length of water column (LWC) 37.55 ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 6.12 gallons 18
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor None Turbidity Low
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 18 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Brown Odor None Turbidity Low
Was an oil film or layer apparent? No

E. CONDUCTIVITY 1030

F. pH 7.2

G. TEMPERATURE 16

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chem Fa... Well No. MW-6D

Sampled By P.G.B./T.A.M. Date 10/1/93 Time 12:00

Weather ~35 Sunny Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) ~54 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 16.59 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 37.41 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 6.09 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor no Turbidity slight

Was an oil film or layer apparent? no

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~20 gallons.

Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color ~~light Grey~~ Odor None Turbidity slight & medium

Was an oil film or layer apparent? no

E. CONDUCTIVITY 1120

F. pH 7.8

G. TEMPERATURE 9°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Clear Farms Well No. MW-2S
Sampled By Peter G. Bergstrom Date 6/30/88 Time
Weather ~60 Cloudy Sampled with Bailer ✓ Pump

A. WATER TABLE:

Well depth:
(below top of casing) 21.5 ft.

Well elevation:
(top of casing) ft.

Depth to water table:
(below top of casing) 15.67 ft.

Water table elevation: ft.

Length of water column (LWC) 5.83 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .95 gallons 2.8
4" diameter wells = 0.653 X (LWC) = gallons
6" diameter wells = 1.469 X (LWC) = gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Yes - old fill Turbidity Slight
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~3 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Clear Odor Yes - old fill Turbidity Slight
Was an oil film or layer apparent? No

E. CONDUCTIVITY 1020

F. pH 11.2

G. TEMPERATURE 11

H. WELL SAMPLING NOTES:

Split with D.E.C.

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. mw-7s

Sampled By PGB / J. AM Date 11/29/88 Time 1330

Weather ~40 Sampled with Bailer √ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 21.5 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 15.31 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 6.19 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 1.55 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Pet. - sweet Turbidity low

Was an oil film or layer apparent? no

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 3 gallons.

Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Clear Odor Pet Turbidity low

Was an oil film or layer apparent? no

E. CONDUCTIVITY 1080

F. pH 10.9

G. TEMPERATURE 8°C

H. WELL SAMPLING NOTES:

* MS, MSD

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-II
Sampled By Peter G. Boyle / Susan Cox Date 6/30/88 Time _____
Weather ~65 Cloudy Sampled with Bailer ✓ Pump _____

A. WATER TABLE:

Well depth: (below top of casing) 31.0 ft.
Well elevation: (top of casing) _____ ft.
Depth to water table: (below top of casing) 18.90 ft.
Water table elevation: _____ ft.
Length of water column (LWC) _____ ft.
Volume of water in well:
2" diameter wells = 0.163 x (LWC) = 1.97 gallons 6.0
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor None Turbidity Slight
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~6 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Cloudy-Grey Odor Little sulfur Turbidity High
Was an oil film or layer apparent? No

E. CONDUCTIVITY 1160

F. pH 7.3

G. TEMPERATURE 13

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chevy Farms Well No. MW-7I

Sampled By P.G.B / J.A.M. Date 11/29/84 Time 3:30

Weather ~ 40 Cloudy Sampled with Bailer / Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 31 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 19.12 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 11.88 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 1.93 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor No. Turbidity Slight

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~6 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Grey-Beige Odor Sulfur Turbidity high

Was an oil film or layer apparent? No

E. CONDUCTIVITY ~~@ ~2000~~ 1180

F. pH ~~7.0~~ 7.2

G. TEMPERATURE ~~@~~ 8°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chevy Farms Well No. MW-7D
Sampled By Peter G. Bryan / Sweet-Edwards Date 6/30/88 Time _____
Weather ~60 Clear Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth:
(below top of casing) 53.7 ft.

Well elevation:
(top of casing) _____ ft.

Depth to water table:
(below top of casing) 18.98 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 34.72 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 5.66 gallons 17
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor None Turbidity Slight

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 17 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Brown Odor No Turbidity high

Was an oil film or layer apparent? No

E. CONDUCTIVITY 1290

F. pH 7.2

G. TEMPERATURE 17

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-20

Sampled By PGB / J. AM Date 11/29/85 Time 2:45

Weather ~40 Cloudy Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 53.7 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 19.18 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 34.52 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 5.6 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor no Turbidity low

Was an oil film or layer apparent? no

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~17 gallons.

Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Light Grey Odor ~~*~~ Sulfur Turbidity low

Was an oil film or layer apparent? no

E. CONDUCTIVITY 1144

F. pH 7.5

G. TEMPERATURE 10

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-85
Sampled By SEC/PGB Date 6/28/88 Time _____
Weather 75° Sunny Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth: (below top of casing) 23.5 ft. Well elevation: (top of casing) _____ ft.
Depth to water table: (below top of casing) 18.6 ft. Water table elevation: _____ ft.
Length of water column (LWC) 4.9 ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .79 gallons 2.5
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Yes ? Hydrocarbon Turbidity Low
Was an oil film or layer apparent? slight sheen

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 3.0 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Yes ? Turbidity High
Was an oil film or layer apparent? slight sheen

E. CONDUCTIVITY 540

F. pH 10.9

G. TEMPERATURE 12

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cheng Farms Well No. mw-85

Sampled By P.G.B/J.A.M Date 11/29/86 Time 8:15

Weather ~35 Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth:
(below top of casing) 23.5 ft.

Well elevation:
(top of casing) ____ ft.

Depth to water table:
(below top of casing) 19.07 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 4.43 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .72 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color light yellow Odor fuel + sweet, musty Turbidity Slight

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~2 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color light black Odor fuel, sweet Turbidity high

Was an oil film or layer apparent? Yes- slight sheen

E. CONDUCTIVITY 620

F. pH 10.9

G. TEMPERATURE 7

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-8I
Sampled By SCDHEC Date 6/28/88 Time ~~0925-0929~~
Weather Sunny 75° Sampled with Bailer X Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 43.5 ft.
Well elevation: (top of casing) ____ ft.
Depth to water table: (below top of casing) 22.89 ft.
Water table elevation: ____ ft.
Length of water column (LWC) 20.61 ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 3.35 gallons 10
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor yes Turbidity ____
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 10 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Yes Turbidity ____
Was an oil film or layer apparent? slight sheen

E. CONDUCTIVITY 1050

F. pH 7.4

G. TEMPERATURE 12° C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. mw-8I

Sampled By P.G.B Date 11/27/84 Time 8:30

Weather ~35 cloudy Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 43.5 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 22.14 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 21.36 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 3.4 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Sulfur Turbidity low

Was an oil film or layer apparent? no

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~10 gallons.

Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Grey-Brown Odor musty Turbidity high

Was an oil film or layer apparent? no

E. CONDUCTIVITY 1610

F. pH 7.4

G. TEMPERATURE 8°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-95

Sampled By PGB Date 7/6/88 Time _____

Weather 90° Sunny Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth: (below top of casing) 15.00 ft.

Well elevation: (top of casing) _____ ft.

Depth to water table: (below top of casing) 12.51 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 2.49 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .40 gallons 1.21
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear - Yellow Odor Fuel - Musty Turbidity Slight

Was an oil film or layer apparent? Slight sheen

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~1 gallons.

Did well go dry? Yes

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Fuel Turbidity Medium

Was an oil film or layer apparent? Slight sheen

E. CONDUCTIVITY 950.

F. pH 7.2

G. TEMPERATURE 15

H. WELL SAMPLING NOTES:

~ 1 hour for recovery

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-93

Sampled By P.G.B / T.A.M Date 12/2/88 Time 9:30

Weather ~40 clear/windy Sampled with Bailer 1 Pump ____

A. WATER TABLE:

Well depth: (below top of casing) ~15 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 12.61 lowest ft.

Water table elevation: ____ ft.

Length of water column (LWC) 2.39 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .39 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color clear - yellow Odor fuel Turbidity low

Was an oil film or layer apparent? Slight sheen

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 1 gallons.

Did well go dry? Yes

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Fuel Turbidity Very high

Was an oil film or layer apparent? Slight sheen

E. CONDUCTIVITY 7.4

F. pH 1000

G. TEMPERATURE ____

H. WELL SAMPLING NOTES:

Drop bailer down well on 11/30/88 returned 12/2/88.
Sample collected on 12/2/88.

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chevy Farms Well No. MW-9I

Sampled By PGB Date 7/6/88 Time _____ MS

Weather 90° Sunny Sampled with Bailer ____ Pump ____ MSD

A. WATER TABLE:

Well depth: (below top of casing) 33.0 ft.

Well elevation: (top of casing) _____ ft.

Depth to water table: (below top of casing) 12.8 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 20.2 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 3.29 gallons 9.8

4" diameter wells = 0.653 X (LWC) = _____ gallons

6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor slight sulfur Turbidity low

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 10 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Brown Odor slight sulfur Turbidity high

Was an oil film or layer apparent? No

E. CONDUCTIVITY 1600

F. pH 7.0

G. TEMPERATURE 14

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chevy Farms Well No. MW-9I

Sampled By Peter Bazarchuk Date 11/30 Time 10:15

Weather ~ 40 windy Cloudy Sampled with Bailer √ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 33.00 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 12.85 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 20.15 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 3.28 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor None Turbidity low

Was an oil film or layer apparent? no

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~ 16 gallons.

Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Grey Odor None Turbidity high

Was an oil film or layer apparent? no

E. CONDUCTIVITY 1165

F. pH 7.3

G. TEMPERATURE 9

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW88-105

Sampled By PGB/sec Date 6/30/88 Time _____

Weather 65° Cloudy Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth: (below top of casing) ~~1000~~ 20.0 ft.

Well elevation: (top of casing) _____ ft.

Depth to water table: (below top of casing) 14.51 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 5.49 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .89 gallons 2.68

4" diameter wells = 0.653 X (LWC) = _____ gallons

6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Yellow Clear Odor No Turbidity _____

Was an oil film or layer apparent? None

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~3 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Fuel Turbidity Hi

Was an oil film or layer apparent? No

E. CONDUCTIVITY 1000

F. pH 11.4

G. TEMPERATURE 13

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chevron Facility Well No. MW-105

Sampled By R.C.B / T.A.M Date 11/30/94 Time 2:30

Weather ~35°F Windy / Sleet Sampled with Bailer 1 Pump ____

A. WATER TABLE:

Well depth: (below top of casing) ~20 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 14.93 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 5.07 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .82 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color clear Odor full - musty Turbidity low

Was an oil film or layer apparent? no

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~2.5 gallons.

Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color light brown Odor full - musty Turbidity medium

Was an oil film or layer apparent? no

E. CONDUCTIVITY 990

F. pH 11.3

G. TEMPERATURE 9°C.

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chapin Farms Well No. MW-10I

Sampled By P.G.B / S.E.C Date 7/5/88 Time _____

Weather ~90 Sunny Sampled with Bailer X Pump _____

A. WATER TABLE:

Well depth: (below top of casing) 42.00 ft.

Well elevation: (top of casing) _____ ft.

Depth to water table: (below top of casing) 22.10 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 20 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 4.98 gallons 10 gallons

4" diameter wells = 0.653 X (LWC) = _____ gallons

6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor No Turbidity Slight

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 10 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Gray Odor No Turbidity Lt.

Was an oil film or layer apparent? No

E. CONDUCTIVITY 1100

F. pH 7.1

G. TEMPERATURE 16

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chem Fa Well No. MW-10E

Sampled By P.L.B. Date 11-1-2 Time 3:15

Weather _____ Sampled with Bailer ____ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) ~42.33 ft.

Well elevation: (top of casing) _____ ft.

Depth to water table: (below top of casing) 16.89 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 25.44 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 4.09 gallons
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Brown Odor Fuel - Sulfur Turbidity Low

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~12 gallons.

Did well go dry? _____

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Light Brown Odor Sulfur Turbidity Medium

Was an oil film or layer apparent? No

E. CONDUCTIVITY 1100

F. pH 7.3

G. TEMPERATURE ?

H. WELL SAMPLING NOTES:

Split with N.V.E.C.

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-11S
Sampled By PGD&E Date 7/1/88 Time 11:30
Weather 65° Cloudy Sampled with Bailer X Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 20 ft.
Well elevation: (top of casing) ____ ft.
Depth to water table: (below top of casing) 13.51 ft.
Water table elevation: ____ ft.
Length of water column (LWC) 6.49 ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 1.05 gallons 3.2 gal
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Light Brown Odor Fuel Turbidity Slight
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~2 gallons.
Did well go dry? Yes

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Sweet Turbidity high
Was an oil film or layer apparent? Slight Sheen

E. CONDUCTIVITY 360

F. pH 9.6

G. TEMPERATURE 11

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location _____ Well No. _____

Sampled By _____ Date _____ Time 12:00

Weather _____ Sampled with Bailer _____ Pump _____

A. WATER TABLE:

Well depth: (below top of casing) ~20 ft.

Well elevation: (top of casing) _____ ft.

Depth to water table: (below top of casing) 13.71 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 6.29 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 1. gallons
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color light Brown Odor Fuel - musty - sweet Turbidity Muddy

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~1 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Fuel - musty - sweet Turbidity Sup.

Was an oil film or layer apparent? No

E. CONDUCTIVITY 390

F. pH 9.3

G. TEMPERATURE 8

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cherry Farms Well No. MW-11
Sampled By SEC/PCB Date 7/1/88 Time 11:00
Weather 65°/Cloudy Sampled with Bailer X Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 43.5 ft.
Well elevation: (top of casing) ____ ft.
Depth to water table: (below top of casing) 14.72 ft.
Water table elevation: ____ ft.
Length of water column (LWC) ____ ft.
Volume of water in well:

2" diameter wells = 0.163 x (LWC) = ____ gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Swampy Turbidity Slight
Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling 13 gallons.
Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Light Brown Odor Swampy Turbidity Light
Was an oil film or layer apparent? ____

E. CONDUCTIVITY 700

F. pH 7.9

G. TEMPERATURE 11

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chem Fa... Well No. MW-11 I

Sampled By P.C.B.J. T.A.M. Date 1/31/96 Time 1:30

Weather ~35° Cloudy Sampled with Bailer / Pump ____

A. WATER TABLE:

Well depth: (below top of casing) 43.50 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 16.74 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 26.76 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = 4.3 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Light Brown Odor ~ Swampy Turbidity ~Medium

Was an oil film or layer apparent? No - Has iron particles

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~13 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Light Brown Odor Swampy Turbidity Medium

Was an oil film or layer apparent? ____

E. CONDUCTIVITY 730

F. pH 7.2

G. TEMPERATURE 8°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Cheney Farms Well No. MW-12

Sampled By P.G.B / S.E.C Date 7/19/89 Time _____

Weather ~ 65 Cloudy Sampled with Bailer ✓ Pump _____

A. WATER TABLE:

Well depth: (below top of casing) 19.00 ft.

Well elevation: (top of casing) _____ ft.

Depth to water table: (below top of casing) 13.71 ft.

Water table elevation: _____ ft.

Length of water column (LWC) ~~5.29~~ 5.29 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .86 gallons
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color ~~Black~~ Clear Odor Hill. Turbidity ~~Sig~~ Slight

Was an oil film or layer apparent? no

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~ 4 gallons.

Did well go dry? ~~yes~~ no.

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black-brown Odor Hill Turbidity Slight

Was an oil film or layer apparent? no

E. CONDUCTIVITY 2200

F. pH 11.5

G. TEMPERATURE 18°C

H. WELL SAMPLING NOTES:

Split with D.E.C.

# GROUND WATER SAMPLING FIELD LOG

Sample Location Clay Farm Well No. MW 12

Sampled By P.G.B / J.R.M Date 12/1/88 Time 3:30

Weather ~30 sunny/Cloudy Sampled with Bailer ✓ Pump ____

A. WATER TABLE:

Well depth: (below top of casing) -19.00 ft.

Well elevation: (top of casing) ____ ft.

Depth to water table: (below top of casing) 14.64 ft.

Water table elevation: ____ ft.

Length of water column (LWC) 4.36 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = .71 gallons
4" diameter wells = 0.653 X (LWC) = ____ gallons
6" diameter wells = 1.469 X (LWC) = ____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Light Brown Odor Fuel-like Turbidity low

Was an oil film or layer apparent? no

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~2.5 gallons.

Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Brown Odor fuel-like Turbidity high

Was an oil film or layer apparent? ____

E. CONDUCTIVITY 1400

F. pH 11.7

G. TEMPERATURE 6°C

H. WELL SAMPLING NOTES:

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chem Farms Well No. MW-13

Sampled By P.G.B/SEC Date 7/19/90 Time _____

Weather ~65 Cloudy Sampled with Bailer ✗ Pump _____

Triplicate

A. WATER TABLE:

Well depth: (below top of casing) ~~23~~ 24 ft.

Well elevation: (top of casing) _____ ft.

Depth to water table: (below top of casing) 17.31 ft.

Water table elevation: _____ ft.

Length of water column (LWC) 6.69 ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = _____ gallons
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color Clear Odor Fuel Turbidity Slight

Was an oil film or layer apparent? No

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~4.0 gallons.

Did well go dry? No

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Fuel - oil Turbidity High

Was an oil film or layer apparent? No

E. CONDUCTIVITY 1500

F. pH 11

G. TEMPERATURE 15°

H. WELL SAMPLING NOTES:

M.S, MSD

Split with D.E.C.

# GROUND WATER SAMPLING FIELD LOG

Sample Location Chem Farms Well No. MW-13
Sampled By P. G. B / J. A. M Date 12/1/94 Time _____
Weather ~35 over cast Sampled with Bailer ✓ Pump _____

A. WATER TABLE:

Well depth:
(below top of casing) 24.00 ft.

Well elevation:
(top of casing) _____ ft.

Depth to water table:
(below top of casing) 17.69 ft.

Water table elevation: _____ ft.

Length of water column (LWC) _____ ft.

Volume of water in well:

2" diameter wells = 0.163 x (LWC) = _____ gallons
4" diameter wells = 0.653 X (LWC) = _____ gallons
6" diameter wells = 1.469 X (LWC) = _____ gallons

B. PHYSICAL APPEARANCE AT START:

Color ~~light~~ clear Odor Fuel Turbidity low
Was an oil film or layer apparent? Slight sheen

C. PREPARATION OF WELL FOR SAMPLING:

Amount of water removed before sampling ~4 gallons.
Did well go dry? no

D. PHYSICAL APPEARANCE DURING SAMPLING:

Color Black Odor Fuel Turbidity high
Was an oil film or layer apparent? Heavy sheen.

E. CONDUCTIVITY 1650.

F. pH 10.9

G. TEMPERATURE _____

H. WELL SAMPLING NOTES:

Split with D.E.C.

# APPENDIX E

# HEALTH EFFECTS OF SITE INDICATORS

# Appendix E

## Health Effects of Common Site Contaminants

Except where otherwise noted, the following information is excerpted from Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites, prepared for the U.S. EPA by Clement Associates, Inc., in 1985.

### Arsenic

This chemical is a human carcinogen (Sax, 298). Compounds of arsenic may be absorbed after ingestion or by inhalation. Oral ingestion of arsenic in drinking water has been associated with an increased risk of skin cancer in humans (U.S. Public Health Service 1987c). Ingestion may result in systemic skin and gastrointestinal effects. Extensive evidence implicates inhalation of arsenic compounds in the incidence of lung cancer in human workers. No information was located on the specific form(s) of arsenic responsible for these effects.

Arsenic compounds can also cause chromosome damage in animals and increased incidence of chromosomal aberrations in humans. Arsenic compounds are reported to be teratogenic, fetotoxic, and embryotoxic in several animal species. Increased incidence of multiple malformations in children born to women occupationally exposed to arsenic has been observed. Damage to peripheral nervous system neurons has been observed following occupational exposure to arsenic.

### Benzene

Due to its volatility, the major route of entry of benzene is by vapor inhalation (Casarett, 486). Benzene is a known human carcinogen which produces myeloid leukemia and lymphomas by inhalation (Sax, 365). The air concentrations of benzene in one of these studies ranged from 10 ppm (1969) to 100 ppm (1941) (USEPA 1984). Other blood system effects of benzene in humans include aplastic anemia, leukopenia, and thrombocytopenia, which may produce pancytopenia. Irritation of the nose, throat, and lungs may occur (3,000 ppm may be tolerated for only 30 to 60 minutes). At high levels, slowed breathing and death may result. Death has occurred at 20,000 ppm for 5 to 10 minutes, or 7,500 ppm for 30 minutes.

In animals exposed to benzene, similar effects on the blood cell-producing system occur. In humans and animals, benzene exposure is associated with chromosomal damage, but is not mutagenic in microorganisms. Benzene is fetotoxic by inhalation in mice (156-500 ppm), rats (47-2200 ppm), and rabbits (156-500 ppm) (U.S. Public Health Service 1987a).

Benzene is moderately toxic by ingestion. Systemic effects include euphoria, somnolence, nausea, unspecified blood effects, and dermatitis. Ingestion may cause irritation of the mouth, throat, and stomach. One tablespoon may cause collapse, bronchitis, pneumonia, and death.

Poisoning occurs most commonly via inhalation of the vapor, although benzene can penetrate the skin and cause poisoning. Locally, benzene has a comparatively strong irritating effect, producing erythema and burning, and, in severe cases, blistering. Poisoning by skin contact has been reported (Sax, 365).

According to the U.S. Public Health Service (1987a), insufficient data are available to positively link ingestion of benzene in water to an increased risk of cancer in humans. Rats exposed to benzene in drinking water, however, exhibited a carcinogenic response.

Long-term exposures may cause nausea, fatigue, dizziness, and irritability. Mild anemia has been reported from exposures of 25 ppm for several years and 100 ppm for 3 months. At levels between 100 and 200 ppm for periods of 6 months or more, several irreversible blood changes and damage to liver and heart may occur. Temporary partial paralysis has been reported.

Bis(2-ethylhexyl)phthalate (DEHP)

DEHP is reported to be carcinogenic in rats and mice, causing increases of hepatocellular carcinomas or neoplastic nodules after oral administration (NTP 1982). Its status as a human carcinogen is considered indeterminate by the International Agency for Research on Cancer (IARC). The results of dominant lethal experiments with mice suggest that DEHP is mutagenic when injected intraperitoneally. However, most experiments conducted with microorganisms and mammalian cells have failed to demonstrate genotoxic activity. Teratogenic and fetotoxic effects have been observed in experimental animals after oral and intraperitoneal administration. Other reproductive effects, including testicular changes in rats and mice, have also been reported.

DEHP appears to have a relatively low toxicity in experimental animals. The oral, intraperitoneal, and intravenous $LD_{50}$ values reported for DEHP in rats are 31 g/kg, 30.7 g/kg, and 0.25 g/kg, respectively. DEHP is poorly absorbed through the skin, and no irritant response or sensitizing potential from dermal application has been noted in experimental animals or humans.

Chronic exposure to relatively high concentrations of DEHP in the diet has caused retardation of growth and increased live and kidney weights in experimental animals.

Cadmium

There is suggestive evidence linking cadmium with cancer of the prostrate in humans. In animal studies, exposures to cadmium by inhalation caused lung tumors in rats, and exposure by injection produced injection-site sarcomas and/or Leydig-cell tumors. An increased incidence of tumors has not been seen in animals exposed to cadmium orally, but four of the five available studies were inadequate by current standards.

The evidence from a large number of studies on the mutagenicity of cadmium is equivocal, and it has been hypothesized that cadmium is not directly mutagenic but impedes repair. Cadmium is a known animal teratogen and reproductive toxin. It has been shown to cause renal dysfunction in both humans and animals. Other toxic effects attributed to cadmium include immunosuppression (in animals), anemia (in humans), pulmonary disease (in humans), possible effects on the endocrine system, defects in sensory function, and bone damage. The oral $LD_{50}$ in the rat was 225 mg/kg.

Chromium

Chromium exists in several valence states. Only the trivalent and hexavalent are biologically significant. Chromate salts are human and experimental carcinogens of the lungs, nasal cavity and paranasal sinus, and are also experimental carcinogens of the stomach and larynx. Hexavalent compounds are more toxic than the trivalent.

Chromic acid and its salts have a corrosive action of the skin and mucous membranes. The lesions are confined to the exposed parts, affecting chiefly the skin of the hands and forearms and the mucous membranes of the nasal septum. The characteristic lesion is a deep, penetrating ulcer, which, for the most part, does not tend to suppurate, and which is slow in healing. Small ulcers, about the size of a matchhead, may be found, chiefly around the base of the nails, on the knuckles, dorsum of the hands and forearms. On the mucous membranes of the nasal septum, the ulcers are usually accompanied by purulent discharge and crusting. If exposure continues, perforation of the nasal septum may result but prpoduces no deformity of the nose (Sax, 912).

Ethyl Benzene

This chemical is mildly toxic by inhalation (Sax, 1601). Short-term inhalation exposures

of 200 ppm for 30 minutes can cause irritation of the nose and throat, dizziness, difficult breathing, and depression. Very high levels can cause unconsciousness. A concentration of 0.1% of the vapor in air is an irritant to human eyes, and a concentration of 0.2% is extremely irritating at first, then causes dizziness, irritation of the nose and throat and a sense of constriction in the chest.

Exposure of guinea pigs to 1% concentration has been reported as causing ataxia, loss of consciousness, tremor of the extremities, and finally death through respiratory failure (Sax, 1601).

Ethyl benzene is mildly toxic by skin contact. It may cause irritation, inflammation, blisters, and burns.

It is moderately toxic by ingestion. It may cause headache, sleepiness, and coma. Long-term exposures may cause skin rash and irritation of eyes, nose, and throat. Slight changes in liver and kidney weights were observed in rats on a diet including 408 and 680 mg/kg/day for 6 months.

Iron

Some iron compounds are suspected carcinogens. In general, ferrous compounds are more toxic than ferric compounds. Acute exposure to excessive levels of ferrous compounds can cause liver and kidney damage, altered respiratory rates, and convulsions (Sax, 2011).

Short-term inhalation exposures to iron dust may cause respiratory irritation and metal fume fever, characterized by metallic taste, dry irritated throat, coughing, shortness of breath, weakness, fatigue, fever, chills, sweating and pain in the muscles and joints. Onset may be delayed up to 12 hours and symptoms may last for up to 48 hours. Ingestion may cause drowsiness, sluggishness, increased heart and respiration rates, shock, and diarrhea. Ingestion of 1/2 ounce may cause death in an adult.

Over an extended period of time, excessive intake of iron compounds may result in increased accumulation of iron in the body, especially the liver, spleen, and lymphatic system. Long-term inhalation exposures may cause mottling of the lungs.

Lead

Some lead compounds are carcinogens of the lungs and kidneys. Others are experimental neoplastigens and tumorigens (Sax, 2102).

Short-term inhalation exposures to dusts of inorganic lead may include fatigue, headache, abdominal pains, and de creased appetite. These effects are reported to be reversible if exposure ceases. Inhalation of large amounts of lead may lead to seizures, coma, and death.

Short-term skin or eye exposures may result in irritation. Ingestion of large amounts of lead may result in seizures, coma, and death.

Lead is a cumulative poison. Therefore, long-term exposures to lower levels can result in a build up of lead in the body and more severe symptoms. These may include anemia, abdominal pain, severe constipation, and vomiting. Prolonged exposure may also result in kidney damage. If the nervous system is affected (usually due to very high exposures) the resulting effects include severe headache, convulsions, coma, delirium, and death. In non-fatal cases, recovery is slow and not always complete. Continuous exposure can result in decreased fertility. Elevated lead exposure of either parent before pregnancy can increase the chances of miscarriage or birth defects.

Manganese

Inhalation of dusts and fumes of manganese compounds can cause CNS and pulmonary system damage. Chronic manganese poisoning is a clearly characterized disease which results from inhalation of fumes or dusts of manganese. Exposure to heavy concentrations of dusts or

fumes for as little as three months may produce the condition, but cases usually develop after 1-3 years of exposure. The CNS is the chief site of damage. If cases are removed from exposure shortly after the appearance of symptoms, some improvement in the patient's condition frequently occurs, though there may be some residual disturbances is gait and speech. When well established, the disease results in permanent disability. Exposure to dusts add fumes can possibly increase the incidence of upper respiratory infections and pneumonia (Sax, 2161).

Polychlorinated Biphenyls

In humans exposed to PCBs (in the workplace or via accidental contamination of food), reported adverse effects include chloracne (a long-lasting, disfiguring skin disease), impairment of liver function, a variety of neurobehavioral and affective symptoms, menstrual disorders, minor birth abnormalities, and probably increased incidence of cancer. Animals experimentally exposed to PCBs have shown most of the same symptoms, as well as impaired reproduction; pathological changes in the liver, stomach, skin and other organs; and suppression of immunological functions. PCBs are carcinogenic in rats and mice and, in appropriate circumstances, enhance the effects of other carcinogens. Reproductive and neurobiological effects of PCBs have been reported in rhesus monkeys at the lowest dose level tested, 11 ug/kg body weight/day over a period of several months.

Trichloroethylene

It is considered a cancer suspect agent because high levels cause liver cancer in mice. Whether it causes cancer in humans is unknown.

Trichloroethylene is mildly toxic to humans by ingestion and inhalation. Human systemic effects by ingestion and inhalation include eye effects, somnolence, hallucinations, gastrointestinal changes and jaundice. Inhalation of high concentrations cause narcosis and anesthesia (Sax, 3330). Short-term inhalation exposures may result in headache, sleepiness, nausea, and coughing at levels around 100 ppm. Unconsciousness can result at 3,000 ppm. Exposure to 8,000 ppm can cause death.

Long-term inhalation exposures to vapor levels near 100 ppm can cause nervous exhaustion, the ability to become addicted to the vapor, sleepiness, nausea, and coughing. Higher levels can alter one's heart rate.

It is an eye and severe skin irritant (Sax, 3330). The chemical can be absorbed through the skin, and may cause irritation, burning, or redness. Eye exposures may result in irritation, burning, or watering. Repeated hand contact can result in excessive dryness, cracking, burning, loss of sense of touch or temporary paralysis of fingers. Most of these effects seem to go away after exposure has stopped.

Zinc

Zinc compounds are of varying toxicity, but generally of low toxicity. Zinc salts (such as chromates and arsenates) are experimental carcinogens.

Soluble salts of zinc have a harsh metallic taste. Small doses can cause nausea and vomiting, while larger doses cause violent vomiting and purging. In general, the continued administration of zinc salts in small doses has no effect in man except those of disordered digestion and constipation (Sax, 3514).

## Toxicological Profile - Environmental Effects

As noted in the toxicity profiles contained in Exhibit E (Clement 1985), information on the environmental effects of the indicator chemicals is limited.

Arsenic

Various inorganic forms of arsenic appear to have similar levels of toxicity; they all seem to be much more toxic than organic forms. Acute toxicity to adult freshwater animals occurs at levels of arsenic trioxide as low as 812 ug/L and at levels as low as 40 ug/L in early life stages of aquatic organisms. Acute toxicity to saltwater fish occurs at levels around 15 mg/L, while some invertebrates are affected at much lower levels (508 ug/L). Arsenic toxicity does not appear to increase greatly with chronic exposures, and it does not seem that arsenic is bioconcentrated to a great degree.

Arsenic poisoning is a rare but not uncommon toxic syndrome among domestic animals. Arsenic causes hyperemia and edema of the gastrointestinal tract, hemorrhage of the cardiac serosal surfaces and peritoneum, and pulmonary congestion and edema; and it may cause liver necrosis.

Benzene

The $EC_{50}$ values for benzene in a variety of invertebrate and vertebrate freshwater aquatic species range from 5,300 ug/L to 386,000 ug/L. However, only values for the rainbow trout (5,300 ug/L) were obtained from a flow through test and were based on measured concentrations. Results based on unmeasured concentrations in static tests are likely to underestimate toxicity for relatively volatile compounds like benzene. A chronic test with Daphnia magna was incomplete, with no adverse effects observed at test concentrations as high as 98,000 ug/L. Freshwater and saltwater plant species that have been studied exhibit toxic effects at benzene concentrations ranging from 20,000 ug/L to 525,000 ug/L.

Bis(2-ethylhexyl)phthalate

Acute median effect values ranged from 1,000 to 11,100 ug/liter DEHP for the freshwater cladoceran Daphnia magna. The $LC_{50}$ values for the midge, scud, and bluegill all exceeded the highest concentration tested, which were 18,000, 32,000, and 770,000 ug/liter, respectively. As these values are greater than the water solubility of the chemical, it is unlikely that DEHP will be acutely toxic to organisms in natural waters. In a chronic toxicity test with Daphnia magna, significant reproductive impairment was found at the lowest concentration tested, 3 ug/liter. A chronic toxicity vale of 8.4 ug/liter was reported for the rainbow trout. No acute or chronic values were reported for saltwater invertebrates or vertebrates. Reported bioconcentration factors for DEHP in fish and invertebrates range from 14 to 2,680.

Although insufficient data were presented to calculate the acute-chronic ratio for DEHP, it is presented on the order of 100-1,000. Therefore, acute exposure to the chemical is unlikely to affect aquatic organisms adversely, but chronic exposure may have detrimental effects on the environment.

Cadmium

Laboratory experiments suggest that cadmium may have adverse effects on reproduction in fish at levels present in lightly to moderately polluted waters.

The acute $LC_{50}$ for freshwater fish and invertebrates generally ranged from 100 to 1,000 ug/liter; salmonids are much more sensitive than other organisms. Saltwater species were in general 10-fold more tolerant to the acute effects of cadmium. Chronic tests have been performed and show that cadmium has cumulative toxicity in acute-chronic ratios that from 66 to 431. Bioconcentration factors were generally less than 1,000 but were as high as 10,000 for some freshwater fish species.

No adverse effects on domestic or wild animals were reported in the study review.

Chromium

Chromium is an essential nutrient and is accumulated in a variety of aquatic and marine biota, especially benthic organisms, to levels much higher than in ambient water. Levels in biota, however, usually are lower than levels in the sediments. Passage of chromium through the food chain can be demonstrated. The food chain appears to be a more efficient pathway for chromium uptake than direct uptake from seawater.

Water hardness, temperature, dissolved oxygen, species, and age of the test organism all modify the toxic effects of chromium on aquatic life. Cr III appears to be more acutely toxic to fish than Cr VI; the reverse is true in long-term chronic exposure studies.

Little information concerning the toxic effects of chromium on mammalian wildlife and domestic animal species is available.

Ethylbenzene

Ethylbenzene is acutely toxic to freshwater species at levels greater than 32 mg/L. No chronic toxicity was reported, but the highest test dose (440 ug/L) was only one-hundredth of the 96-hour $LC_{50}$ for the particular species being tested. No studies on the bioaccumulation of ethylbenzene were reported in the information reviewed, but a bioconcentration factor of 95 was calculated using the log octanol/water partition coefficient. No information on the toxicity of ethylbenzene to domestic animals and terrestrial wildlife was found in the sources reviewed.

Iron

The available data are not adequate to characterize the toxicity of iron to wildlife or domestic animals. Iron is unlikely to cause ecological toxicity.

Lead

Freshwater vertebrates and invertebrates are more sensitive to lead in soft water than in hard water. Chronic values for Daphnia magna and the rainbow trout are 12.26 ug/L and 83.08 ug/L, respectively, at a hardness of about 50 mg/L. Acute-chronic ratios calculated for three freshwater species ranged from 18 to 62. Bioconcentration factors, ranging from 42 for young brook trout to 1,700 for a snail, were reported.

Although lead is known to occur in the tissue of many free-living wild animals, including birds, mammals, fishes, and invertebrates, reports of poisoning usually involve waterfowl. There is evidence that lead, at concentrations occasionally found near roadsides and smelters, can eliminate or reduce populations of bacteria and fungi on leaf surfaces and in soil. Many of these microorganisms play key roles in the decomposer food chain.

Cases of lead poisoning have been reported for a variety of domestic animals, including cattle, horses, dogs, and cats. Several types of anthropogenic sources are cited as the source of lead in these reports. Because of their curiosity and their indiscriminate eating habits, cattle experience the greatest incidence of lead toxicity among domestic animals.

Manganese

Adequate data for characterization of the toxicity of manganese to wildlife or domestic animals are not available. A 48-hour $LC_{50}$ value of 16 mg/L of manganese is reported for embryos of the oyster Crassostrea virginica. For the softshell clam Mya arenaria a 168-hour $LC_{50}$ value of 300 mg/L is reported.

Polychlorinated Biphenols

Polychlorinated biphenyls are bioaccumulated and can be biomagnified. Therefore, their toxicity increases with length of exposure and position of the exposed species on the food chain. The toxicity of the various PCB mixtures is also dependent on their composition. Because of the complexity of PCB toxicity, only general effects can be discussed in the following text.

The 96-hour $LC_{50}$ values for rainbow trout, bluegills, and channel catfish were around 20 mg/liter. The same species exposed for 10 to 20 days had $LC_{50}$ values of about 0.1 mg/liter. Invertebrate species were also adversely affected, with some species having 7-day $LC_{50}$ values as low as 1 ug/liter. In general, juvenile organisms appeared more susceptible to the effects of PCBs than either eggs or adults.

Three primary ways in which PCBs can affect terrestrial wildlife are outright mortality, adversely affecting reproduction, and changing behavior. PCb doses greater than 200 ppm in the diet or 10 mg/kg body weight (bw) caused some mortality in sensitive bird species for several days. Doses around 1,500 ppm (diet) or about 100 mg/kg (bw) caused extensive mortality in these sensitive species. They generally caused some mortality in all species, with the level being dependent on the length of exposure and the particular PCB mixture. Some mammalian species are especially susceptible to PCBs. For example, mink died when fed as little as 5 ppm in the diet (equivalent to less than 1 mg/kg bw/day). PCBs caused lower egg production, deformities, decreased hatchability, growth, and survival, and some eggshell thinning in reproductive studies on chickens fed doses of 20 ppm in the diet (1 mg/kg bw). Mink fed 1 ppm in the diet (0.2 mg/kg bw) had lower reproductive success, and there are indications that an increased incidence of premature births in some marine mammals was linked to PCB exposure. Behavioral effects on wildlife include increased activity, decreased avoidance response, and decreased nesting, all of which could significantly influence survival in the wild.

No toxic effects in domestic animals other than chickens were reported in the sources reviewed, but susceptible species would probably be affected in a similar manner to laboratory animals and wildlife.

Trichloroethylene

There was only limited information on the toxicity of TCE to aquatic organisms. The acute toxicity to freshwater species was similar in the three species tested, with $LC_{50}$ values of about 50 mg/L. No $LC_{50}$ values were available for saltwater species. However, a dose of 2 mg/L caused erratic swimming and loss of equilibrium in the grass shrimp. No chronic toxicity tests were reported.

No information on the toxicity of TCE to domestic animals or terrestrial wildlife was available in the literature reviewed.

Zinc

Zinc produces acute toxicity in freshwater organisms over a range of concentrations from 90 to 58,100 ug/L and appears to be less toxic in harder water. Acute toxicity is similar for freshwater fish and invertebrates. Chronic toxicity values range from 47 to 852 ug/L and appear to be relatively unaffected by hardness. A final acute-chronic ratio for freshwater species of 3.0 has been reported. Although most freshwater plants appear to be insensitive to zinc, one species, the alga Selenastrum capricornutum, exhibited toxic effects at concentrations from 30 to 700 ug/L. Bioconcentration factors of edible portions of aquatic organisms ranging from 43 for the soft-shell clam to 16,700 for the oyster were reported.

Zinc poisoning has occurred in cattle. In one outbreak, poisoning was caused by food accidentally contaminated with zinc at a concentration of 20 g/kg. An estimated intake of 140 g of zinc per cow per day for about 2 days was reported. The exposed cows exhibited severe enteritis, and some died or had to be slaughtered.

# APPENDIX F

# DATA VALIDATION

# APPENDIX F

# CHERRY FARM

# DATA VALIDATION

Prepared by

O'Brien & Gere Engineers, Inc.
Syracuse, NY.

June, 1989

## INTRODUCTION

The intent of this report is to document any discrepancies between the required analytical procedures and the Quality Control results outlined in the data package presented by the contract laboratories. This document is divided into individual physiochemical groups, for example, organic compounds, pesticides and inorganics will be addressed separately. This data validation will address the items identified in Standard Operating Procedure (SOP) No. HW-4 (Revision #3) *CLP Organics Data Review and Preliminary Review* and SOP No. HW-2 *Evaluation of Metals Data for the Contract Laboratory Program (CLP)* Revision #8. Both of these references provide a checklist approach to validating CLP data. In general, the format of this report parallels the sections contained in SOP No. HW-4 and SOP No. HW-2.

## 1.0 ROUND 1 - VALIDATION OF ANALYTICAL DATA

The following validation of analytical data has been completed for round 1 sampling activities at the Cherry Farm Site owned by Niagara Mohawk. Twenty-eight soil samples and thirty-three water samples were collected between May and July. The samples were analyzed by OBG Laboratories, Inc. between May 24, 1988 and July 21, 1988. Analysis consisted of the quantification of volatile and base neutral compounds as well as pesticides, PCBs, and inorganics. All analytical tests were performed to meet criteria contained within the Hazardous Waste Site Contract Laboratory Program (CLP). A list of samples and associated laboratory identification numbers are given as Table 1.

### 1.01 VOLATILE ORGANICS

#### 1.01.1 Case Narrative

A one-page case narrative was presented as a preface to the volatile organic data package. This page noted any excursions of the QC data from acceptable limits. Excursions encountered during this phase of the laboratory analyses consisted of:

* two samples analyzed outside of the required holding time
* two sample surrogate recoveries outside limits
* continuing calibration outside limits for bromoform response factor.

#### 1.01.2 Chain of custody

The chain of custody forms were included in the data package. Along with the field chain of custody forms were the shipping receipts for those samples delivered to the laboratory by Federal Express or Purolator Courier, the Laboratory Sample Log, the Laboratory Report, and the Sample Control Record. A review of the custody forms indicated that sample custody had been handled appropriately except that the signature for laboratory receipt was located in the wrong place for the May 19, 1988 Chain of custody record. This was noted on the custody form.

TABLE 1

ROUND I SAMPLING

OBG FIELD SAMPLE AND IDENTIFICATION LIST

| Soil Samples | Laboratory Identification |
|---|---|
| Boring B (4-6') | G9088 |
| Boring B (4-6')MS | G9089 |
| Boring B (4-6')MSD | G9090 |
| Boring G (4-6') | G9091 |
| Boring F (6-8') | G9092 |
| Boring A | G9200 |
| Boring C | G9201 |
| Boring D | G9202 |
| Boring E | G9203 |
| S#1 Field #1 | H0506 |
| S#2 Field #1 | H0507 |
| S#3 Field #2 | H0508 |
| S#4 Field #2 | H0509 |
| Soil Sample #1 | H0541 |
| Soil Sample #2 | H0542 |
| Soil Sample #3 | H0543 |
| Soil Sample #4 | H0544 |
| Soil Sample #4(MS) | H0455 |
| Soil Sample #4(MSD) | H0546 |
| Soil Sample #5 | H0547 |
| Soil Sample #6 | H0548 |
| Soil Sample #7 | H0549 |
| Soil Sample #8 | H0618 |
| Sand Cast | H0619 |
| Surface Soil #6 (Resample) | H2385 |
| Surface Soil #7 (Resample) | H2386 |
| Surface Soil #8 (Resample) | H2387 |
| Sand Cast | H2388 |

| Liquid Samples | Laboratory Identification |
|---|---|
| 1D | H0852 |
| 1I | H0853 |
| 2S | H0854 |
| 2I | H0855 |
| MW-8S | H0886 |
| MW-8I | H0887 |
| MW-4I | H0888 |
| MW-4D | H0889 |
| MW-4S | H0890 |
| MW-5S | H0891 |
| MW-5D | H0892 |
| MW-5I | H1164 |
| MW-7S | H1165 |
| MW-7D | H1166 |

| | |
|---|---|
| MW-7I | H1167 |
| MW-7I(MS) | H1168 |
| MW-7I(MSD) | H1169 |
| MW-10S | H1170 |
| MW-2I (Resample) | H1171 |
| MW-3S | H1273 |
| MW-3I | H1274 |
| MW-11I | H1275 |
| MW-11S | H1276 |
| MW-10I | H1336 |
| MW-6D | H1337 |
| MW-6S | H1338 |
| MW-6I | H1414 |
| MW-9I | H1415 |
| MW-9I(MS) | H1416 |
| MW-9I(MSD) | H1417 |
| MW-9S | H1418 |
| Surface Water #1 | H2373 |
| Surface Water #2 | H2374 |
| Surface Water #3 | H2375 |
| Surface Water #4 | H2376 |
| Surface Water #5 | H2377 |
| Surface Water #6 | H2378 |
| Surface Water #7 | H2379 |
| MW-12 | H2380 |
| MW-13 | H2381 |
| MW-13(MS) | H2382 |
| MW-13(MSD) | H2383 |
| MW-9S (Resample) | H2384 |

The Laboratory Sample Log was present for each group of samples submitted to the laboratory. Problems noted on this form consisted of:

* No custody seals on sample containers and the cooler for shipment received on 5/19/88
* No evidence tape on containers in first cooler submitted to the laboratory on 6/22/88
* No custody seals on the second cooler and containers which were submitted to the laboratory on 6/22/88
* No custody seals on containers submitted to the laboratory on 6/28/88
* No custody seals present on sample containers and broken custody seals on the cooler received by the laboratory on 7/20/88.

1.01.3 Holding Time

As described in the case narrative, two samples were not analyzed within the required holding time. These samples were soil sample #8 and a sand cast. Both of these matrices were resampled and analyzed within the required holding times. All other samples submitted for volatile organic analysis were within the CLP required holding time of 10 days.

1.01.4 Surrogate Spike Recoveries

The surrogate spike recoveries were reviewed for completeness and transcription accuracy. Form II VOA-1 was completed for each sample, duplicate, and blank. As noted in the case narrative for this section, two samples were outside of the required QC limits. These were soil sample #6 and soil sample #7. In both cases, the limit for the toluene-d8 spike was exceeded. These matrices were resampled. The analysis of the resampled matrix yielded a low bromoflurobenzene limit in sample #6, while sample #7 was within limits for all three spiked compounds. No other sample was outside the acceptable levels. No laboratory corrections were noted.

1.01.5 Matrix Spike/Matrix Spike Duplicate Recovery

The completeness of the matrix spike and matrix spike duplicate (MS/MSD) analysis was

verified. Form III VOA-1 was present for each MS/MSD sample split. In total, five samples, water samples #7, #9 and #13 and soil samples B and #4, were spiked with the five required spiking compounds. The percent recovery (% REC) of the matrix spike and matrix spike duplicates were within the required limits for each compound. The relative percent difference (% RPD) was also within the required QC limits for each spike in each MS/MSD sample.

1.01.6 Blanks

The Blank Method Summary, Form IV VOA, was present as part of the laboratory data package. This form was adequately completed with each associated sample, MS, and MSD listed below the appropriate method blank. The frequency of blank analyses varied between 1 to 9 samples per day; as such, the 20 sample per blank limit was not exceeded.

For the VOA analysis, the instrument blank and the method blank referred to the same blank solution. The sample injection log indicated that a method/instrument blank was analyzed each day following the instrument calibration. At this frequency, the procedure was in conformance with the one blank per 12 hour requirement.

The method blanks were analyzed, and the results were reported on Form I VOA. For the *Low Soil* blank samples, the Data Sheets were not completed accurately. The sample weight/volume entry was noted at 5.0 ml for the blank soil samples; however, the concentration units were reported as ug/kg. The laboratory acknowledged that these samples were run inaccurately in so much as the soil blanks were actually carbon column water blanks without a soil matrix. An appropriate method for blank soil analysis is to add 5.0 ml of water to 5.0 g of purified soil. The analysis would then be run on this matrix.

The laboratory reported the results of the analysis on *low soil* blanks at five times the actual detected values. These results should have been reported as those detected by the GC/MS; however, it is believed that the results obtained from the GC/MS are representative of the analyte concentrations for the associated soil samples. The soil blanks which were analyzed

in the form of a water matrix were:

VBLK05241

VBLK05251

VBLK05271

VBLK06271

VBLK06281

VBLK07051

All detected analytes in the *low soil* blanks were correctly flagged by a *B* indicating that the analyte had been found in the blank and the sample.

The remaining method blanks listed below were used for volatile compound analysis of water samples. In general, the analytical results for these samples did not document any detectable compounds. However, the analytical result of sample VBLK07131 indicated the presence of methylene chloride at 1 ug/l. This value was flagged by *BJ* signifying that the value was estimated and was found in both the samples and the blank. Methylene chloride is a common laboratory contaminant; therefore, this compound should not influence the validity of the sample. The other blanks used for water analysis consisted of:

VBLK07061

VBLK07071

VBLK07111

VBLK07122

VBLK07201B

VBLK07211

These blanks did not show any contamination.

1.01.7 GC/MS Tuning Criteria

The tuning of the GC/MS for volatile organic analysis was accomplished through the use of a bromofluorobenzene *(BFB)* standard solution. The results of each GC/MS tuning and mass calibration were summarized on Form V VOA. The GC/MS was tuned each morning and on occasion in the afternoon as recorded by the sample injection log. At this frequency, the tuning operation conforms to the requirements of the CLP Method, specifically one run each 12 hours.

Form V VOA was included as a summary of the results of the daily BFB tuning. The percent relative abundance was documented for each tuning along with the samples, MS/MSD, blanks, and standards to which the tuning applied. The percent relative abundance for each tuning was inspected and was found to be within the acceptable range. There were no transcription errors between the documented value and the abundance value indicated by the performance standard printouts.

1.01.8 Sample Data

Form I was included in the laboratory data package for volatile organic compounds. This form was completed with the required information. The quantitation report was included for each run in the data package. In addition, the raw ion chromatogram was present along with the standard spectra for each run. No excursions from CLP requirements for organic data sheets, reconstructed ion chromatograms, or mass spectra were noted.

1.01.9 GC/MS Evaluation

The mass spectra for tentatively identified compounds *(TIC)* were included in the data package. Along with the TIC were the "best match" spectra for runs in which TIC's were observed. No transcription errors or deviations were noted.

1.01.10 Initial Calibration

An initial calibration was run four times during the analysis of volatile organic compounds. Form VI was included in the data package. A review of these sheets indicated that all

compounds for the volatile organic fraction had been documented.

For all non-calibration check compounds *(n-CCC)* the percent relative standard deviation was less than 50% which is the acceptable limit. In addition, there were no non-System Performance Check Compounds *(n-SPCC)* that had an average response factor equal to or near zero *(<0.025);* therefore, these values were also within acceptable limits.

A number of the response factors and percent relative standard deviations were recalculated and were compared against the figures in Form VI. In all cases, the figures were comparable to those stated on Form VI. There were no transcription errors noted during this review.

System Performance Check Compounds *(SPCC)* and Calibration Check Compounds *(CCC)* were reviewed to determine if any compound was outside the acceptable limits. For SPCCs the acceptable minimum limit of 0.300 (0.250 for bromoform) was maintained except for bromoform which was below acceptable limits on two occasions (0.24091). Similarly, the maximum %RSD of 30.0% was not exceeded for any CCC.

1.01.11 GC/MS Continuing Calibration

Form VII (Continuing Calibration Check) was reviewed for completeness and accuracy. A continuing calibration was run each morning following BFB tuning. At this frequency, the calibration operation met the once per 12 hour criteria for CLP analysis.

The criteria for SPCCs of 0.300 for VOA *(0.25 for bromoform)* was for the most part maintained. Bromoform was consistently low for the daily response factor; however, the average response factor was within limits. The Average and Daily response factors for bromoform are presented below.

| Daily RF | Average RF | Calibration Data |
|---|---|---|
| 0.23292 | 0.25323 | 5/24/88 |
| 0.21149 | 0.25323 | 5/25/88 |

| | | |
|---|---|---|
| 0.21180 | 0.25323 | 5/27/88 |
| 0.22054 | 0.24091 | 6/27/88 |
| 0.22698 | 0.24091 | 6/28/88 |
| 0.25967 | 0.26445 | 7/05/88 |
| 0.23179 | 0.26445 | 7/05/88 |
| 0.23605 | 0.26445 | 7/06/88 |
| 0.24305 | 0.26445 | 7/07/88 |
| 0.24382 | 0.26445 | 7/11/88 |
| 0.23955 | 0.26445 | 7/12/88 |
| 0.23866 | 0.26445 | 7/13/88 |
| 0.27456 | 0.27107 | 7/20/88 |
| 0.25124 | 0.27107 | 7/21/88 |

The average response factor *(Average RF)* in the above list refers to the initial calibration.

For Calibration Check Compounds, in general, the results were within acceptable ranges. In a few instances, vinyl chloride *(VC)* was above the acceptable limit of 25.0% maximum. These excursions and the date of occurrence are listed below.

| % Difference (VC) | Calibration Date |
|---|---|
| 62.96% | 5/27/88 |
| 41.08% | 6/27/88 |
| 31.80% | 6/28/88 |

There were no transcription errors observed in this section. No corrective actions were taken by the laboratory to change the GC/MS response factors of the abovementioned compounds. However, the excursion of these two compounds should not affect the validity of the sample data due to the acceptance of the other eight calibration compounds. The excursion of two calibration compounds is within CLP guidelines.

1.01.12 Internal Standard Area Summary

The Volatile Internal Standard Area Summary sheets *(Form VIII VOA)* were present and complete for the Cherry Farm data package. The standard spike area of each sample, matrix spike, matrix spike duplicate, and blank was within the required range for the internal standard recovery area. The retention times of the internal standards used in the area summary were compared against the response in each sample, matrix spike, matrix spike duplicate, and blank. All retention times were within a few seconds of the internal standard retention time. The retention times were well within the acceptable 30 second limit.

1.01.13 Summary of Volatile Analysis

The data for the volatile organic section of the Cherry Farm Laboratory Package are valid based on the overall adherence to CLP quality control criteria. The only uncorrected excursion from the CLP protocols was in the area of continuing calibration. This item does not invalidate the data because the other calibration compounds were within acceptable limits. As stated in the case narrative for this section, the calibration compounds in exceedence of the protocols should be flagged as *J* to indicate that the concentration is estimated. All data were correctly flagged in this section.

## 1.02 BASE NEUTRALS

1.02.1 Case Narrative

The case narrative was not present in the original sample package and was subsequently requested and recieved from the contract laboratory. It did not document the BNA analysis as completely as is required for a full understanding of the laboratory procedures. For instance, the CLP Method used for the analysis was not discussed. In addition, the case number and contract number were not stated. The narrative did, however, indicated that several excursions from accepted CLP protocols had occurred during this phase of laboratory activities. The excursions noted in the case narrative included:

* exceedence of the percent difference for CCC compounds.

* exceedence of surrogate recoveries

* excursions in MS/MSD recoveries.

1.02.2 Chain of Custody

The samples used for this phase of the laboratory analysis were the same as those used for volatile organic analysis *(VOA)*. The chain-of-custody forms and protocols were discussed in the VOA section. The reader should refer to the VOA section for comments on this item.

1.02.3 Holding Time

The sample injection log was present along with the Sample Preparation and Extraction Logbook. A review of these two items indicated that all BNA samples were extracted and analyzed within the required time constraints of 5 day (10 days for soil) before extraction and 40 days before analysis.

1.02.4 Surrogate Recovery

A number of Forms (II SV-2) were included in the data package presented by the contract laboratory. The results, outlined in these sheets, indicate that some of the surrogate recovery analyses were not within the required limits of the procedure. Specifically, the water samples: MW-5S, MW-7I, MW-7I(MS), MW-9I, MW-9I(MS), MW-9I(MSD), MB(7/21/88), and MW-12 were outside the acceptable QC limits for one or more of the surrogate spiking compounds. The excursions encountered for soil semi-volatile surrogate recovery were: Boring B 4'-6', Boring B 4'-6' (MS), Boring E, Boring B 4'-6'(RE), Soil Sample #2, Soil Sample #4(MS), and Soil Sample #7. The table below summarizes the specific excursions for those samples which were outside the required limits of the procedure.

Surrogate Excursions

| Sample ID. | S1 | S2 | S3 | S4 | S5 | S6 |
|---|---|---|---|---|---|---|
| MW-5S | - | - | - | - | - | 126 |
| MW-7I | - | - | 156 | 4 | 8 | 8 |

| | | | | | | |
|---|---|---|---|---|---|---|
| MW-7I(MS) | - | - | - | 5 | 5 | - |
| MW-9I | 30 | - | - | - | - | - |
| MW-9I(MS) | 26 | - | - | - | 12 | - |
| MW-9I(MSD) | 18 | 38 | - | 9 | 10 | - |
| MB (7/21/89) | 154 | - | - | - | - | - |
| MW-12 | 125 | - | - | - | - | - |
| Boring B (4'-6') | 2 | 8 | 8 | 3 | 1 | 2 |
| Boring B (4'-6'MS) | - | - | - | - | 18 | - |
| Boring E | - | - | - | 23 | - | - |
| Boring B (4'-6'RE) | - | - | - | - | - | 18 |
| Boring B (4'-6'MS,RE) | - | - | - | - | 24 | - |
| Soil Sample 2 | - | - | - | - | - | 16 |
| Soil Sample 4 (MS) | 130 | 173 | - | - | - | - |
| Soil Sample 7 | - | - | - | 22 | 24 | 11 |

| Surrogate Spike | QC Limits |
|---|---|
| S1 = Nitrobenzene-d5 | (23-120) |
| S2 = 2-Fluorobiphenyl | (30-115) |
| S3 = Terphenly-d14 | (18-137) |
| S4 = Phenol-d5 | (24-113) |
| S5 = 2-Fluorophenol | (25-121) |
| S6 = 2,4,5-Tribromphenol | (19-122) |

Samples MW-5S, MW-9I, MB (7/21/88), MW-12, Boring B (4'-6'MS), Boring E and Soil Sample 2 can be considered to be within the criteria for CLP validation. Specifically, each of these sample has only one surrogate spike compound which was outside of the required limits, and none of the recoveries was below 10%.

Sample MW-7I was below the QC limits of spikes S3, S4, S5, and S6. Although this sample was not re-extracted and analyzed, a matrix spike of the sample was analyzed and the recovery of this spiked sample was also low. Samples MW-9I, MW-9I(MS) and MW-9I(MSD) were also below recovery limits for a number of spike compounds. Because MW-7I and MW-9I were split into matrix spikes and matrix spike duplicates, the samples had essentially been extracted and analyzed more than once. According to CLP protocols, a sample which has exhibited low recoveries in more than one analysis (the sample is extracted and analyzed a

number of times) should be flagged. Therefore, any positive results ("hits") for samples MW-7I and MW-9I are flagged with a *J* indicating that the result is estimated.

Boring B (4'-6') exhibited the lowest recovery of all the samples. This sample was re-extracted and re-analyzed. The results of the second analysis were within the required QC limits for all spiked compounds except S6. Therefore, for the reasons previously stated (only one surrogate outside limit), the re-analysis was within the CLP guidelines. The recoveries for Soil Sample #7 did not meet the acceptable requirements for S4, S5 and S6. This sample was not re-extracted or re-analyzed. As a result, the sample did not meet CLP criteria for surrogate spike recoveries, and any positive hits for this sample must be labeled with a *J* indicating an estimated result.

The reason given for the low recoveries on a number of samples was hypothesized in the case narrative. The problem was attributed to silt in soil sample #7 and to heavy emulsions in water sample 7I.

A final discrepancy from accepted CLP protocol is the use of the letter *D* to indicate that the spike was diluted. The correct lettering in this case should be "0 *D*" and a 0 should have been entered in the "Total Out" column. The deviation from this convention does not alter the validity of the data.

1.02.5 Matrix Spikes

Form III SV-2 was present in data package. This form detailed the results of the matrix spike and matrix spike duplicates. A preliminary review of the sample log confirmed that a matrix spike and matrix spike duplicate were analyzed at the required frequency (1 in 20 samples).

A number of excursions from the required QC limits were noted in each analysis. The table below illustrates the number of excursion for spike recoveries (REC) and relative percent (RPD) differences in each sample.

Soil Semi-volatile Matrix Spike/Matrix Spike Duplicate Recovery

| Sample | Number of Excursions |
|---|---|
| Boring B (4'-6') | RPD: 11 out of 11 outside limit<br>REC: 20 out of 22 outside limit |
| Soil Sample #4 | RPD: 1 out of 11 outside limit<br>REC: 1 out of 22 outside limit |
| MW-7I | RPD: 5 out of 11 outside limit<br>REC: 6 out of 22 outside limit |
| MW-9I | RPD: 3 out of 11 outside limit<br>REC: 12 out of 22 outside limit |
| MW-13 | RPD: 5 out of 11 outside limit<br>REC: 3 out of 22 outside limit |
| MW-13 (1:10 dilution) | RPD: 4 out of 11 outside limit<br>REC: 10 out of 22 outside limit |

As described in the case narrative, the results of the MS/MSD recovery can be attributed to the sample matrix and to operator error. The low recoveries of sample MW-9I were thought to be due to a heavy emulsion in the sample. Sample MW-13 had low recoveries due to a high phenol concentration in the original sample. This sample had to be diluted because of the phenol concentrations that lowered the recovery result. Boring B (4'-6') failed to meet the QC limits because the solution spike was not added; therefore, this excursion was attributable to operator error.

As stated in the CLP Data Assessment checklist, the failure to achieve the QC recovery limits does not in itself invalidate the data. The results presented in this section must be evaluated in conjunction with the other QC criteria to assess the data validity.

1.02.6 Semi-volatile Method Blank Summary

The Semi-Volatile Method Blank Summary, Form IV SV, was presented as part of the laboratory data presentation. This form was adequately completed with each associated sample, MS, and MSD listed below the appropriate method blank. The appropriate blank analysis frequency of 1 per 20 samples of similar matrix and extraction technique was maintained as

required.

Each of the samples and blanks were run on the same instrument. The instrument was identified as Hewlett Packard 5441 (HP5441).

The results of the blank analysis were recorded on FORM I SV-1. The semi-volatile blanks are listed below. A review of the raw QC data indicated that the form had been completed accurately and that all the necessary information (Sample Wt., Level, % Moisture, ID, Dates, etc.) was present.

Blanks used for BNA analysis: MB 5/20/88*

MB 6/22/88

MB 6/29/88*

MB 7/05/88*

MB 7/08/88

MB 7/21/88

MB 7/22/88*

* Indicates blank analysis showed the presence of contaminants.

In addition to the hazardous substance list, a list of tentatively identified compounds was included for each blank (Form I SV-TIC).

1.02.7 Blank Contamination

A number of the method blanks used during the BNA analysis displayed some degree of contamination as noted on Form I SV-2. The detected concentrations were recorded as actual or estimated with concentrations below the detection limit of the instrument being labeled as estimated. Contamination of the blanks was generally confined to compounds in the phthalate group. Blank MB 5/20/88 showed contamination by diethylphthalate, di-n-butylphthalate, and bis(2-ethylhexyl)phthalate in addition to contamination by thirteen tentatively identified compounds. Similar contamination by bis(2-ethylhexyl)phthalate was observed in the

blanks marked above with an asterisk.

The result of such contamination is that positive hit in samples for the abovementioned compounds are marked with a *B* indicating that the compound was also found in the blank.

1.02.8 Semi-volatile Organic GC/MS Tuning and Mass Calibration - Decafluorotriphenylphosphine (DFTPP)

Form V SV was included in the QC summary package. This form was used to summarize the results of the GC/MS tuning and Mass Calibration. Calibration was completed on a daily basis in the morning. On one occasion (7/6/88), the calibration was performed at 8:58 a.m. and was repeated at 3:56 p.m. As such, the 12-hour maximum time between calibrations runs was maintained.

The enhanced bar graph spectrum and mass/charge (m/z) listings for DFTPP were provided for each calibration.

The transcription and multiplication accuracy was checked on a number of the calibration summaries. No errors were found in any of the raw calibration forms, and the transcription of data to the calibration summary sheets (Form V SV) was accurate. The correct number of significant figures (3) was used in the transcription.

1.02.9 Initial Calibration Data

Initial calibration of instrument HP5995 was performed on 6/17/88, 7/7/88 and 7/19/88. Form VI was included in the QC package as a summary of the calibration results. This form was filled out completely for all compounds of the semi-volatile organic fraction. Form VI summarized the response factors, average relative retention time, average response factor and percent relative standard deviation for each semi-volatile compound during the instrument calibration. The mathematical accuracy for this form as generated from the associated raw data was reviewed on two entries for each of the days. The supporting data included the "Quant Reports" and the appropriate chromatograms.

All the calibration check compounds were reviewed to assure that a percent relative difference of 30% was not exceeded. There were no excursions in this analytical area.

All the system performance check compounds were reviewed to assure that a minimum average response factor of 0.05 was maintained. There were no excursions in this section of the data package.

1.02.10 GC/MS Continuing Calibration

Continuing calibration, Form VII, was included in the data package. This form summarized the results of the daily calibration of instrument HP5995. The data sheet for each day that the instrument was used for the Cherry Farm project were present and completely filled out. A review of the injection log indicated that the instrument had been calibrated at least once every 12 hours of operation.

As stated in the CLP protocols, the SPCCs must meet a minimum average response factor of 0.05. The SPCCs for each days calibration were compared against the CLP criteria. In all cases, the minimum requirement for SPCC's was met.

A number of excursions were noted in the continuing calibration for the calibration check compounds. These excursions are noted below. The other calibration check compounds met the CLP criteria for maximum percent difference of 25%. The excursion on 8/12/88 was not noted in the case narrative for this section, however, 4,6-dinitro-2-methylphenol is noted as exceeding the 25% criteria even though this is not a calibration check compound.

As a result of these excursions, positive hits in samples run on days 6/20/88 and 8/12/88 were flagged with a *J* indicating that the result was estimated.

| Date | Compound | % Difference |
|---|---|---|
| 6/20/88 | di-n-octyl phthalate | 28.62 |
| 8/12/88 | 4-chloro-3-methylphenol | 29.92 |

1.02.11 Internal Standard Area Summary/Retention Times

Form VIII SV-1 was included in the data package as a semi-volatile internal area summary. Each sample, MS/MSD and blank was compared against the area of three internal standard compounds: 1,4-dichlorobenzene-d4 (IS1), naphthalene-d8 (IS2), acenephthene-d8 (IS3), phenanthrene-d10 (IS4), chrysene-d12 (IS5) and perylene-d12 (IS6). The excursions for this criterion are noted below.

| Date | Criteria | Sample |
|---|---|---|
| 6/17/88 | IS4 | Boring B (4-6') |
| 6/17/88 | IS4, IS5 | Boring B (4-6'MS) |
| 6/17/88 | IS4, IS5 | Boring B (4-6'MSD) |
| 6/17/88 | IS4, IS5 | Boring F (6-8') |
| 6/17/88 | IS4, IS5 | Boring C |
| 6/24/88 | IS4 | Boring B (4-6') |
| 7/19/88 | IS3, IS4 | Surface Soil #8 |
| 7/20/88 | IS4 | MW-8s |
| 7/20/88 | IS5 | MW-5s |
| 7/21/88 | IS4 | S#1 (Field #1) |
| 7/21/88 | IS4 | Soil Samp. #1 |
| 7/21/88 | IS4, IS5, IS6 | Soil Samp. #2 |
| 7/21/88 | IS4 | Soil Samp. #3 |
| 8/10/88 | IS2 | MW-12 |
| 8/11/88 | IS3, IS4, IS5, IS6 | MW-13(MS) |
| 8/11/88 | IS3, IS4, IS5, IS6 | MW-13(MSD) |
| 8/11/88 | IS3, IS4, IS5, IS6 | MW-9S(RE) |
| 8/12/88 | IS5, IS6 | MW-13(MS) |
| 8/12/88 | IS5, IS6 | MW-13(MSD) |

As stated in the CLP Data Assessment Checklist, the acceptance or rejection of data

should not be based solely on the internal standards areas. The quality of these results should be judged in conjunction with other QC Data (e.g. surrogate recoveries or calibration data).

For the purposes of this validation, all positive hits resulting from the above samples were be flagged with a *J* to indicate that the result was estimated.

For retention times, a review of the internal standard retention times on form VIII indicated that all times were well within the QC requirements of +/- 30 seconds.

1.02.12 Summary of Semi-volatile Organic Analysis

The validation presented above was performed for semi-volatile organic data submitted by OBG Laboratories for the Cherry Farm, Niagara Mohawk Site. In general, the data package indicated that a protocol, which conforms to CLP requirements, was used. A number of excursions from the required QC limits were identified. The result of these excursions is that a number of positive "hits" in detected in the samples were recorded as estimated values. Based on the results of the surrogate recoveries and MS/MSDs for this section, the analytical results may be biased and low for semi-volatile constituents.

## 1.03 PESTICIDES/PCBs

The Pesticide/PCB package for round 1 sampling data was divided into two sections: Boring samples from 5-17-88 and samples collected between 6-20-88 and 7-18-88. Although both sets of data were reviewed in depth during the data validation, only the excursions noted in the second set (6/20-7/18) of data were discussed in depth. The reason that the other section is not discussed is to minimize the repitition of criteria which do not influence data validity. As such, a detailed discussion is presented for boring samples while a brief discussion, focusing only on excursions from CLP protocols, is presented for the other pesticide/PCB samples.

1.03.1 Case Narrative

A case narrative was included with the data package submitted by the contract laboratory. Included in this package was a brief description of the problems encountered in the laboratory while performing the analyses.

The narrative confirmed that the samples were extracted and analyzed within the required holding times.

A number of problems were cited in the discussion. These were:

* Excursions from required recovery limits
* Contamination of the primary analytical column
* Difficulty in compound identification
* Interferences in the sample matrix.

The following is a discussion of each of the quality control requirements for CLP procedures in analyzing PCBs and pesticides. This discussion is based on the review of raw and final data submitted by OBG Laboratories, Inc., the contract laboratory.

1.03.2 Chain of Custody

The chain of custody records are discussed in the data validation for volatile organic compounds (*VOC*). The samples collected and analyzed for the VOC study were used in the Pesticide/PCB portion of the analysis. The reader should refer to the VOC section of this data validation for a description of the custody excursions.

1.03.3 Holding Time

As discussed in the case narrative, the holding times for extraction and analysis of Pesticide/PCB samples were all met. This fact was substantiated upon the review of Form VIII Pest-2.

1.03.4 Surrogate Spike

Form II Pest-2 was present as a summary of the soil pesticide surrogate recovery. This form was completed with the contract laboratory's name (OBG Laboratories, Inc.) and the matrix

level (low). Each sample, blank, matrix spike, and matrix spike duplicate were recorded on this form along with the associated recovery limits. The excursions from the required QC limit of 20-150% recovery are listed below.

| Sample | % Recovery |
|---|---|
| Boring D | 177 |
| PBLK (G8774)RE | 166 |
| Boring E DL RE | 0 |

These samples were flagged with an *I* due to an interference in the analysis by the sample matrix.

A number of samples were flagged as *D* to signify that the spike was diluted from the sample. Therefore, the results of these samples may be biases; consequently, positive results for these samples should be estimted (flagged by J). Samples which were diluted are:

Samples in which the spike was diluted

Boring G DL
Boring F DL
Boring A DL
Boring D DL
Boring A DL RE
Boring D DL RE
Boring F DL RE
Boring G DL RE

1.03.5 Soil Pesticide Matrix Spike/Matrix Spike Duplicate Recovery

Form III Pest-2 was included in the QC summary package as a review of the MS/MSD analysis. Three samples were analyzed as Matrix Spikes and Matrix Spike Duplicates. These samples fulfilled the frequency requirements for this section of the analysis. Only one sample, PBLK (G8774)RE was outside the required limits for percent recovery. The excursions for this sample are listed below.

| Sample | Compound | Excursion | Observed | QC Limit |
|---|---|---|---|---|
| PBLK (G8774) RE | Heptachlor | MS % REC | 165 | 35-130 |
| PBLK (G8774) RE | Aldrin | MS % REC | 195 | 34-132 |
| PBLK (G8774) RE | Heptachlor | % RPD | 54 | < 31 |
| PBLK (G8774) RE | Aldrin | MSD % REC | 140 | 34-132 |

1.03.6 Pesticide Method Blank Summary

A method blank summary (Form IV-Pest) was provided at the required frequency for each sample, matrix spike, and matrix spike duplicate. Two blanks were analyzed, G8774 and G8774 RE. The same instrument, HP 5880, was used to analyze each blank and all the samples.

1.03.7 Blank Contamination

A review of the Raw QC data did not reveal any contamination in the blanks.

1.03.8 Pesticides Data Package

The Pesticide Evaluation Check for Linearity Summary (Form VIII) was present as part of the summary data for pesticides. As a part of this form, the evaluation check for 4,4'-DDT/endrin breakdown was completed. Other forms included with the summary package include:

1. The Pesticide/PCB Standard Summary (Form IX)
2. The Pesticide/PCB Identification summary (Form X)
3. The gas chromatography and Data System printouts for each of the standard mixes and Aroclors 1016/1260, 1221, 1233, 1242, 1248, and 1254

1.03.9 GC Performance and Calibration

A review of the retention times as noted on Form IX indicated that 4,4'-DDT had a retention time above the QC limit of 12 minutes for each run.

A review of Form VIII indicated that all samples had been run within the required time criteria. The same form indicated that the correct sequence of standards and samples had been followed.

Form VIII Pest-2 detailed the percent breakdown of endrin and 4,4'-DDT. Two samples exceeded the QC limit of less than 20% for the total percent breakdown of DDT/endrin. These samples are: Eval Mix B (June 21,1988;2:02) and Eval Mix B (June 21,1988;14:57). The excursions were 29.0 and 34.0 respectively.

For one sample (Eval Mix, June 2,1988; 1:45), the percent breakdown was not calculated due to carryover from the previous sample.

The above excursions necessitate that all positive results for DDT being flagged with a *J*. In addition, the DDD and DDE results should be rejected in the associated samples.

1.03.10 DBC Retention Time Check

The DBC retention time check was noted on Form VIII Pest-2. For all samples the percent difference was less than 2% for packed columns and less than 0.3% for capillary columns.

1.03.11 Initial Calibration

As a check of linearity, the percent RSD (Form VIII Pest-1) was compared against the QC limits of <10%. In all cases, 4,4'-DDT was above this limit. As specified on form VIII Pest-1, the standard curve was plotted to determine the mass for each sample in the set. All associated positive results for the set should be flagged with a *J*. There were no other excursions.

1.03.12 Continuing Calibration

The alternating standards' calibration factors were reviewed on form IX-Pest. The control limit of 15% (20% for non-quantitation) of calibration factors for Ind. A and Ind. B was exceeded in a number of analytes. The table below summarizes the excursions.

| Date | Time | Standard | %D | Analyte |
|---|---|---|---|---|
| June 13 - June 15 | 13:57-19:07 | Ind. A | 21 | Endrin |
| June 20 - June 22 | 10:17-00:42 | Ind. A | 58 | 4,4'-DDT |
| " | " | Ind. A | 56 | Methoxychlor |
| " | " | Ind. B | 22.2 | 4,4'-DDE |
| " | " | Ind. A | 41 | 4,4'-DDT |
| " | " | Ind. A | 40 | Methoxychlor |
| June 30 - July 22 | 19:40-20:00 | Ind. B | 27.3 | Endosulfate |
| " | " | Ind. A | 52.5 | 4,4'-DDT |
| " | " | Ind. A | 20.8 | Methoxychlor |
| " | " | Ind. B | 21.6 | Endosulfate |
| " | " | Ind. A | 24.3 | Aldin |

As a result of the above excursions, positive hits in the related samples were flagged with a *J* to indicate that the results were estimated.

1.03.13 GC Evaluation

Form X-Pest details the retention times and retention time windows for each sample. Where applicable, the standards or sample compounds are within the calculated retention time windows for the quantitation column and the confirmation column.

1.03.14 Specific Excursions for Samples Collected from 6/20/88-7/18/88

The following sections represent only the excursions observed during a review of the Pesticide/PCB data from 6/20/88 to 7/18/88. For those items not addressed here but described above in the earlier data (5/17/88), it can be assumed that no significant excursions from acceptable CPL protocols were found.

1.03.14.1 Surrogate Spikes

Surrogate spike recovery excursions were noted on Form II Pest (1 & 2). A number of excursions were attributed to sample matrix interference or dilution resulting from naturally high PCB concentrations in the original sample. The samples in which excursions from the 24-154 (water) or 20-150 (soil) QC limits are noted below. Those sample which initially had a poor recovery were reinjected. Consequently, samples which were repeatedly outside the QC limit were flagged with a *J* on all positive hits.

| Sample | DBC Excursion |
|---|---|
| MW 2I | 236 |
| MW 4S | 21 |
| PBLK(H1258) | 190 |
| MW 6D | 17 |
| MW 12 | 11 |
| MW 13 | - |
| MW 13 MS | - |
| MW 13 MSD | - |
| MW 8I | 4 |
| MW 4D RE | 5 |
| MW 5D RE | 3 |
| MW 5I RE | - |
| MW 7I MS RE | - |
| MW 6S DL RE | - |
| FLD 1 HP | - |
| S3 | - |
| SITE 1 | 0 |
| SITE 2 MS | 0 |
| SITE 3 | 9 |
| PBLK | 15 |
| SS7 RE | 16 |
| PBLK(H1459)RE | 161 |
| FIELD1-123 BASE RE | 254 |
| FIELD2 HOME PLATE RE | 162 |
| FIELD2-123 BASE RE | 321 |
| SURFACE SOIL 4 DL RE | - |
| SURFACE SOIL 7 RE | 13 |
| SURFACE SOIL 9 RE | 153 |

1.03.14.2 Matrix Spike/Matrix Spike Duplicates

A number of excursions were noted in the area of matrix spikes and matrix spike duplicates. The excursions were attributed to matrix interference or the presents of high concentrations of PCBs in the sample. The excursions are noted below.

| Sample | Excursion |
|---|---|

| | |
|---|---|
| MW 7I | RPD: 6 out of 6 outside limits |
| MW 9I | RPD: 3 out of 6 outside limits<br>Spike Recovery: 6 out of 12 outside limits |
| SS 4 | Spike Recovery: 2 out of 12 outside limits |
| MW 13 | Could not be calculated due to PCBs in sample |
| SS 4 DL RE | Spike Recovery: 7 out of 12 outside limits |
| MW 7I RE | RPD: 3 out of 6 outside limits<br>Spike Recovery: 3 out of 12 outside limits |
| MW 13 DL | All spiking compounds diluted out |

1.03.14.3 GC Performance and Calibration

Two samples exceeded the criteria for 4,4'-DDT/endrin breakdown of less than 20%. These were Eval Mix B (July 12, 1988; 12:41) and Eval Mix B (July 14, 1988; 2:59). The excursions were 22.6% and 25.3%, respectively. The individual % breakdowns for 4,4'-DDT and endrin did not exceed 20% in either sample. Therefore, no corrective action was taken.

1.03.14.4 Initial Calibration

As a check of linearity, the % RSD (Form VIII PEST-1) was compared to the QC limit of <=10%. 4,4'-DDT (13.4, 15.7, 13.4) and Aldrin (56.0, 87.0, 18.3, 58.6) had excursions from the required limit. The reason for aldrin being out of the acceptable limit is due to interference with a solvent. The standard curve was plotted to determine the ng for each 4,4'-DDT sample in the set. All associated positive results for the set are flagged with a *J*.

1.03.14.5 Continuing Calibration

A number of excursions were observed for the percent difference of calibration factors. The result of these excursions was that some analytes for the run were above the QC requirement for quantitation. Any possitve hits for these analytes were flagged by a *J* indicating that the result was estimated.

1.03.15 Summary of Pesticide/PCB Package

The information presented in the Pesticide/PCB section of the data package was

independently reviewed for accuracy, precision, and compliance with CLP protocols. The data were generally of good quality; however, a few excursions resulted in positive detection values being labeled as estimated for a few samples. A review of the MS/MSDs indicates that the results may be biased above the actual value due to interference by PCB mixtures and contamination.

## 1.04 INORGANIC COMPOUNDS

### 1.04.1 Introduction

The inorganic package was submitted in six groups:

Soils from 5-17-88
Soils from 6-20-88
Filtered water from 7-1-88
Total water from 7-1-88
Filtered water from 7-5-88
Total water from 7-5-88

Each of these groups was completely reviewed during the validation process to determine its accuracy and compliance with CLP protocols. In order to minimize the discussion of CLP items which were not found to affect the validity of the data, only the group entitled "Total Water from 7-1-88" is discussed in this report in detail. This group, which was chosen at random, contained 22 samples. The other five groups were combined into a single section. The excursions for these groups are presented at the end of the inorganic validation.

### 1.04.2 Case Narrative

A case narrative was provided as an introduction into the inorganic data package. This narrative did not contain all the elements required for a complete understanding of the project. Specifically, the narrative did not describe the project name, case number and contract number.

The case narrative identified a number of areas in which the laboratory analysis did not meet CLP requirements or fall within QC limits. These excursions included:

* contaminated preparation blanks
* exceedance of initial calibration limits

* exceedance of continued calibration limits

* poor spike recoveries.

TOTAL WATER SAMPLES FROM 7-1-88

1.04.3 Cover Page

A cover page (Cover Page - IN) that displayed the Laboratory Sample ID and identifies the corresponding EPA Sample No. was included in the Inorganic Data Package. This page was not fully complete; however, it did contain the laboratory name (OBG Laboratories, Inc.) and the contract number (1118-046-517). This form also answered to question:

Were ICP inter-element corrections applied?

Were ICP background corrections applied?

These questions were answered as YES and NO respectively.

The rest of the cover page items, including lab code, case no., SAS no., Lab Manager, and Date, were not filled in properly.

1.04.4 Inorganic Analysis Data Sheet

FORM I - IN was present for each sample in the set. The form contained the correct EPA sample ID, laboratory sample ID and contract number. The form also contained the matrix type (water), Level (Low) and precent solids (0). The concentration units were given in ug/L. At the bottom of the form, the color before and after sampling and the clarity before and after sampling were noted.

1.04.5 Holding Times

A review of the traffic reports and digestion/distillation logs indicated that the holding times for mercury (28 days), cyanide (14 days), and other metals (6 months) were not exceeded. Form X -IN was included in the data package as a summary of holding times for mercury and cyanide.

1.04.6 Calibration

A two-point calibration was used for ICP analysis. The calibration was accomplished using a number of standards containing different analytes. The reason for this is based on the tendency of some elements to precipitate from solution.

A five-point calibration was used for mercury. This is substantiated by the Atomic Absorption Furnace Injection Logbook.

A four-point calibration was present for flame AA, furnace AA, and cyanides. The correlation coefficient for analyses were not provided by the contract laboratory. However, upon the data reviewer's request and under his observation, the laboratory calculated the coefficients for a representative number of analyses. There were no excursions from the QC requirement of 0.995 or greater.

1.04.7 Initial and Continuing Calibration Verification

Form II (Part 1) - IN was present for the initial calibration and continuing calibration verification. A number of excursions from the control limits were identified. The excursions for this section of the inorganic data are provided below. The result of such excursions is that all positive data (not flagged with a U) is flagged with a *J* to indicate that the result is estimated.

| Date | Element | Excursion | Reported | QC limit |
|---|---|---|---|---|
| 8-09-88 | Pb | CCV | 125.0% | 90-110% |
| 8-09-88 | Pb | CCV | 114.3% | 90-110% |
| 8-30-88 | Tl | ICV | 110.5% | 90-110% |
| 8-30-88 | Tl | CCV | 111.9% | 90-110% |
| 8-30-88 | Tl | CCV | 115.6% | 90-110% |
| 8-30-88 | Tl | CCV | 110.7% | 90-110% |
| 8-30-88 | Tl | CCV | 111.1% | 90-110% |
| 8-31-88 | Tl | CCV | 118.1% | 90-110% |
| 8-31-88 | Tl | ICV | 119.1% | 90-110% |
| 8-31-88 | Tl | CCV | 125.1% | 90-110% |
| 9-08-88 | Pb | ICV | 115.3% | 90-110% |
| 9-08-88 | Pb | CCV | 112.2% | 90-110% |
| 9-08-88 | Pb | CCV | 125.5% | 90-110% |

1.04.8 CRDL Standards for AA and ICP

Form II (Part 2) - IN was present as a summary of the CRDL standards for AA and ICP. This list covered the following elements: An, Ar, Be, Cd, Cr, Co, Cu, Pb, Mn, Hg, Ni, Se, Ag, Tl,

V, and Zn. Cyanide was not included on the list of substances. Excursions to the laboratory QC limits were not flagged. The laboratories reasoning for this was that it is not a part of the CLP contract. A list of excursions is provided below.

| Metal | Analysis | % Recovery | QC Limit |
|---|---|---|---|
| Arsenic | CRA | 115.0% | 90-110% |
| Chromium | CRI | 115.0% | 90-110% |
| Copper | CRI | 112.0% | 90-110% |
| Lead | CRA | 88.0% | 90-110% |
| Nickel | CRI | 113.8% | 90-110% |
| Selenium | CRA | 84.0% | 90-110% |
| Thallium | CRA | 75.0% | 90-110% |
| Lead | CRA | 76.0% | 90-110% |
| Thallium | CRA | 78.0% | 90-110% |
| Lead | CRA | 84.0% | 90-110% |
| Thallium | CRA | 84.0% | 90-110% |

CRA: CRDL Standard for AA
CRI: CRDL Standard for ICP

Due to the recoveries being low for the above stated analyses, the affected data should be flagged with a *J* to indicated that the result is estimated.

1.04.9 Blanks

Form III summarized the initial and continuing calibration blanks. This form was completed appropriately for the required metals. As demonstrated by the sample injection log, an initial calibration blank was analyzed at the start of the procedure and a continuing calibration blank was ran at a frequency of one blank (CCB) in approximately ten samples. A number of elements were flagged with a *B* indicating that the result was above the instrument detection limit (IDL) but below the contract required detection limit (CRDL).

The preparation blanks were listed on Form III along with the initial and continuing calibration blanks. A number of these blanks were also flagged with a *B* indicating that the result had been between the IDL and the CRDL.

1.04.10 ICP Interference Check Sample

Form IV was included in the inorganic data package. This form contained the results of the check sample analysis. There were no values more than +/- 20% of the true value.

1.04.11 Spike Sample Recovery - Pre-Digestion/Pre-Distillation

Form V was present and complete for spike sample recovery. The values which exceeded the QC limits of 75%-125% are listed below.

| Analyte | Spiked Sample | Sample Result | Spike Added | % Rec. | Q |
|---|---|---|---|---|---|
| Antimony | 396.0 | 72.0 | 500 | 59.4 | N |
| Arsenic | 52.5 | 31.6 | 40 | 52.3 | N |
| Selenium | 20.0 | 20.0 | 10 | 0.0 | N |
| Thallium | 34.2 | 5.0 | 50 | 68.4 | N |

Samples which failed to meet the QC limit for spike recovery were correctly labled with an *N*. Those analytes which have a recovery of less than 30% as above (0.0) or have a recovery of greater than 150% should be rejected. The positive results were flagged with a *J* for all associated data. This was in accordance with the laboratory procedure.

1.04.12 Duplicates

A duplicate of sample H1167 (see Sample List) was used to fulfill the one duplicate in twenty sample criteria for this data set. Two analytes, barium and lead, did not fall within the required limits of 20% or +/-CRDL. Both values were flagged with an asterisk to indicate that there was interference with the analytes.

1.04.13 Laboratory Control Sample

Form VII-IN summarized the analysis of the laboratory control sample (LCS). For this phase of the inorganic analysis, one LCS was analyzed. This single LCS satisfied the frequency criteria of one in 20 water samples.

No excursions from the required QC limits of 80-120% recovery were noted in this section.

1.04.14 ICP Serial Dilution

Form IX was present in the data package as a summary of the ICP Serial Dilution. Sample H1170 was used for this item to fulfill the one in twenty frequency requirement. One

analyte (potassium) was outside the QC limit of +/- 10% (12.3%). This value was correctly flagged with an *E* indicating that there was some matrix interference.

1.04.15 Furnace Atomic Absorption (AA) QC Analysis

As demonstrated by the atomic absorption furnace injection logbook, duplicate injections were performed for each sample analyzed by AA. A review of the relative standard deviation and coefficient of variation did not reveal any values above the QC limit of 20%.

1.04.16 Method of Standard Addition Result

Form VIII was not present in the data package. A review of Form I's did not show any S or + symbols.

1.04.17 Dissolved/Total or Inorganic/Total Analytes

There were no analyses performed for dissolved as well as total analytes on the same sample.

1.04.18 Form I to IX

All forms were labeled with the following information:

- Laboratory Name
- Case Number
- EPA (Or Field) Sample ID
- SDG No.
- Contract No.
- Units
- Matrix

There were no transcription errors encountered during the data review.

1.04.19 Forms XI, XII, XIII (Quarterly Verification of Instrumental Parameters)

Included in the quarterly verification report were the following documents:

- Instrument Detection Limits (Form XI)
- ICP Inter-element Correction Factors (Form XII)
- ICP Linear Ranges (Form XIII)

1.04.20 Form XI

The instrument detection limit form was present for each analyte detected by the instrument. The IDL was less than or equal to the CRDL for all elements.

1.04.21 Form XII

The sample results were not higher than the high linear range of the ICP by more than 10%. In addition, there were no sample results higher than the highest calibration standard for non-ICP parameters.

1.04.22 General Excursions for Inorganics other than Total Water from 7-1-88

This section identifies and describes the excursions found during the inorganic data validation of soil and water other than total water from 7-1-88. Only those items (e.g. calibration, ICP interference, or spike recovery) in which excursions from accepted QC limits were identified will be discussed.

1.04.22.1 Initial and Continuing Calibration Verification

The forms for initial and continuing calibration (Form II Part 1 - IN) were checked for each group of samples submitted for inorganic analysis. The excursions for these samples are provided below. The result of these excursions is that all positive data (not flagged with a U) is flagged with a *J* indicating that the results are estimated.

| Data | Element | Excursion | Reported% | QC limit% |
|---|---|---|---|---|
| 7-7-88 | Pb | CCV | 110.2 | 90-110 |
| 7-11-88 | Se | CCV | 115.4 | 90-110 |
| 7-12-88 | Se | ICV | 111.5 | 90-110 |
| 7-14-88 | Hg | CCV | 120.5 | 90-110 |
| 7-26-88 | Se | CCV | 113.5 | 90-110 |
| 7-27-88 | Se | CCV | 82.7 | 90-110 |
| 7-29-88 | Se | ICV | 89.4 | 90-110 |
| 7-31-88 | Se | CCV | 76.9 | 90-110 |
| 8-1-88 | Tl | ICV | 86.2 | 90-110 |
| 8-4-88 | Pb | ICV | 113.8 | 90-110 |
| 8-4-88 | Pb | CCV | 116.8 | 90-110 |
| 8-4-88 | Pb | CCV | 121.4 | 90-110 |
| 8-5-88 | Tl | CCV | 138.4 | 90-110 |
| 8-5-88 | Tl | CCV | 140.7 | 90-110 |
| 8-8-88 | Tl | ICV | 112.9 | 90-110 |

| | | | | |
|---|---|---|---|---|
| 8-8-88 | Tl | CCV | 120.3 | 90-110 |
| 8-8-88 | Tl | CCV | 122.8 | 90-110 |
| 8-8-88 | Tl | CCV | 117.5 | 90-110 |
| 8-8-88 | Tl | CCV | 134.7 | 90-110 |
| 8-11-88 | Se | CCV | 86.5 | 90-110 |
| 8-11-88 | Se | ICV | 81.7 | 90-110 |
| 8-11-88 | Se | CCV | 85.6 | 90-110 |
| 8-15-88 | As | CCV | 89.8 | 90-110 |
| 8-16-88 | Se | CCV | 77.9 | 90-110 |
| 8-17-88 | Se | CCV | 89.4 | 90-110 |
| 8-23-88 | Pb | CCV | 110.2 | 90-110 |
| 8-23-88 | Pb | CCV | 111.7 | 90-110 |
| 8-29-88 | Tl | CCV | 110.5 | 90-110 |
| 8-29-88 | Tl | CCV | 112.1 | 90-110 |

1.04.22.3 Blanks

Form III summarized the initial and continuing calibration blanks as well as the preparation blanks. The continuing calibration blank for 7-7-88 was found to be contaminated with aluminum at a concentration of 357 ppm. The preparation blank for the same day was contaminated with iron and lead at a concentration of 11.6 ppm and 2.8 ppm, respectively. Although these blanks should have been redigested and reanalyzed by the laboratory they were not. As a result, positive hits in the samples associated with these blanks should have been flagged with a *J* for aluminum, lead, and iron.

1.04.22.4 Spike Sample Recovery - Pre-Digestion/Pre-Distillation

Form V was reviewed for each spiked sample. The excursions for percent recovery were correctly flagged with an *N* by the laboratory. *N* symbolized that the samples were not within QC limits and were not less than four times the detection limit. Samples with a recovery of less than 30% for liquids or 10% for solids were rejected. Samples with a recovery of greater than 150% for liquids or 200% for solids were rejected. All other data associated with poor spike recoveries were flagged with a *J*.

1.04.22.5 Laboratory Control Sample

One laboratory control sample was outside the limit. This was the control sample for the group identified as soil from 5-17-88. The "Found" value was 15 ppm; however, the limit for this

analyte was 19.1 to 59.4 ppm. The associated data for this analyte is flagged as estimated.

1.04.23 Summary of Inorganic Package

The above report represents a summary of the data validation conducted on the inorganic data package submitted for review by OBG Laboratories, Inc. The procedure by which the inorganic analysis was performed is in accordance with the requirements for Contract Laboratory Procedures. None of the data was rejected; however, a number of interferences between the matrix and specific analytes warranted an estimation of most analytical results. The data are; therefore, of acceptable quality.

## 2.0 ROUND 2 - VALIDATION OF ANALYTICAL DATA

The following validation of analytical data has been completed for round 2 sampling activities at the Cherry Farm Site owned by Niagara Mohawk. Forty-three liquid samples and seven sediment samples were collected during November and December of 1988. The samples were analyzed by Versar, Inc. Analysis consisted of the quantitation of volatile, base neutral, pesticide/PCB, and inorganic compounds. The method used to analyze for specific groups of compounds was in accordance with the requirements contained within the Hazardous Waste Site Contract Laboratory Program (CLP).

The intent of this report is to document any discrepancies between the required analytical procedures and the quality control results contained in the data package presented by the contract laboratory. For the purposes of this document, organic compounds, pesticides/PCBs, and inorganic compounds will be addressed separately.

Unlike the round I sample package submitted by OBG Laboratories, Inc., volatile organic compounds and semi-volatile organic compounds were presented together. Consequently, these analyses are validated in the same section of the document (Organics).

### 2.01 ORGANICS

The organic analysis data package submitted by Versar, Inc. was divided into seven batches of samples starting with batch 2. The following samples were attributed to each batch:

| | | |
|---|---|---|
| Batch 2 | MW 1D | MW 1I |
| | MW 2I | MW 2S |
| | Trip Blank | |
| Batch 3 | MW 4D | MW 4I |
| | MW 4S | MW 7D |
| | MW 7I | MW 7S |
| | MW 8I | MW 8S |
| | Trip Blank | |
| Batch 4 | MW 3I | MW 3S |
| | MW 9I | MW 10I |
| | MW 10S | MW 11I |
| | MW 11S | |

| | | |
|---|---|---|
| | Trip Blank | |
| Batch 5 | MW 5D | MW 5S |
| | MW 5I | MW 6D |
| | MW 6S | MW 6I |
| | MW 13 | |
| | Trip Blank | |
| Batch 6 | MW 12 | MW 9S |
| Batch 7 | SW 1 | SW 2 |
| | SW 4 | SW 5 |
| | SW 6 | SW 7 |
| | SED 1 | SED 2 |
| | SED 4 | SED 5 |
| | SED 6 | SED 7 |
| Batch 8 | SW 3 | SED 3 |

2.01.1 Case Narrative

A two-page case narrative was included with each batch of samples as a preface to the organic data package. These pages noted the particular samples for each batch and any excursions of the QC data from acceptable limits. A number of excursions from accepted CLP criteria were noted in this item. These excursions consisted of:

* A number of volatile samples were outside the required holding times by one day.

* Surrogate recoveries outside required limits for volatile and semi volatile constituents

* Matrix spike/Matrix spike duplicate excursions for Batch 3 and 5.

2.01.2 Chain-of-Custody

A field chain of custody form was not present in the original organic package; however, they were requested from the contracting laboratory. The forms were immediately provided by the laboratory upon request. A review of the custody forms indicated that sample custody had been handled appropriately.

Parameter request sheets were included in each batch of samples. These forms included the associated samples, the matrix, and required analyses. For batch 7, handwritten notes were

included in the margin of the form. The following problems with the samples were noted:

* Air bubbles in the VOC samples
* Impending expiration of the holding time.

2.01.3 Holding Time

As described in the case narrative for batches 6 and 7, three samples were not analyzed within the required holding times. Specifically, MW 12 and MW 9S (batch 6) were analyzed 11 days after they were collected and the Matrix spike/Matrix spike duplicate for sample SW.1 (Batch 7) was analyzed one day after the holding time had expired. These samples were not resampled or reanalyzed. All other organic samples were analyzed within the required holding time of 10 days.

2.01.4 Surrogate Spike Recoveries

Form II VOA-1 and Form II SV-2 (Also refered to as Form II when VOC and Semi-VOC surrogate recoveries were on the same form) was present in the package and contained the surrogate results for each sample, matrix spike, matrix spike duplicate, and blank. A number of samples were not within the required recovery limits. These samples were:

| Volatiles | Excursion (% REC) | QC Limits |
|---|---|---|
| MW 1 D | DCE (63) | 76 - 114 |
| MW 2 I | DCE (64) | " |
| MW 2 S | DCE (67) | " |
| MW 7 D | TOL (86) | 88 - 110 |
| " | DCE (66) | 76 - 114 |
| MW 7 I | DCE (70) | " |
| MW 8 I | TOL (86) | 88 - 110 |
| " | DCE (64) | 76 - 114 |
| MW 8 I RE | TOL (80) | 88 - 110 |
| MW 8 S | TOL (86) | " |
| Trip Blk | TOL (87) | " |
| " | DCE (63) | 76 - 114 |
| MW 7 S MS | TOL (86) | 88 - 110 |
| " | DCE (64) | 76 - 114 |
| MW 7 S MSD | TOL (87) | 88 - 110 |
| " | DCE (64) | 76 - 114 |
| Trip Blk. | DCE (68) | " |
| Semi-Vol. | | |
| MW 1 D | 2-FP (103) | 21 - 100 |

| | | |
|---|---|---|
| MW 1 I | 2-FP (105) | " |
| MW 4 D | NB (31) | 35 - 114 |
| MW 4 I | NB (18) | " |
| MW 7 I | 2-FB (34) | 43 - 110 |
| MW 7 S | 2-FB (42) | " |
| MW 8 I | 2-FB (40) | " |
| MW 3 I | 2-FB (38) | " |
| MW 3 S | 2-FB (21) | " |
| MW 9 I | NB (34) | 35 - 114 |
| " | 2-FB (38) | 43 - 110 |
| MW 11 I | 2-FP (102) | 21 - 100 |
| SW 2 | 2-FP (10) | " |
| SW 1 MS | PHL (96) | 10 - 94 |
| SW 1 MSD | PHL (103) | " |
| SW 7 - DL | All Criteria (0-2) | See above |

DCE: 1,2-dichloroethane
TOL: toluene
2-FP: 2-fluorophenol
PHL: phenol -d5
NB: nitrobenzene - D5
2-FB: 2-fluorobiphenyl

For those compounds listed above which were outside the criteria for volatile recovery, the samples were re-analyzed and were within limits except for sample MW 8 I RE. In a number of the samples which were below semi-volatile recovery limits, the samples were not extracted or re-analyzed. The reason presented for this action is that EPA CLP protocol allows for one acid and one base-neutral surrogate outlier per sample. Sample SW7-DL was diluted; as a result, the surrogate spike was either not detected or detected in concentrations below the contract required detection level. Except for this sample, each field sample passed the QC requirements for surrogate recovery on the first or second analysis.

2.01.5 Matrix Spike/Matrix Spike Duplicate Recovery

Matrix spikes and matrix spike duplicates were analyzed in batches 3, 5, and 7 (solid and liquid). Consequently, a frequency of 1 MS/MSD per 20 samples was maintained. Form III (VOA or SV) was present in the QC summary for these spikes. A number of excursions from the required QC limits were observed and are noted below:

| Batch/Sample (Criterion) | Compound (Result) | QC Limit |
|---|---|---|
| Batch 3/ MW 7S (%RPD) | trichloroethene (17) | +/- 14 |
| " (%RPD) | chlorobenzene (15) | +/- 13 |
| " (%RPD) | toluene (15) | +/- 13 |

| | | | |
|---|---|---|---|
| " | (MS %R) | benzene (60) | 76-127 |
| " | (MSD %R) | benzene (72) | 76-127 |
| " | (%RPD) | benzene (18) | +/- 11 |
| " | (MS %R) | phenol (96) | 12-86 |
| " | (MSD %R) | phenol (103) | 12-86 |
| " | (MS %R) | 4-chloro-3-methylphenol (107) | 23-97 |
| " | (MSD %R) | 4-chloro-3-methylphenol (114) | 23-97 |
| | | | |
| Batch 5/ MW 6D (MS %R) | | N-nitroso-di-n-prop. (39) | 41-116 |
| " | " | 4-nitrophenol (145) | 10-80 |
| " | " | 2,4-dinitrotoluene (99) | 24-96 |
| " | (MSD %R) | phenol (94) | 12-86 |
| " | (%RPD) | phenol (-69) | +/-42 |
| " | " | 2-chlorophenol (-47) | +/-40 |
| " | (MSD %R) | 1,2,4-trichlorobenzene (104) | 39-98 |
| " | " | 4-chloro-3-methylphenol (153) | 23-97 |
| " | (%RPD) | 4-chloro-3-methylphenol (-85) | +/-42 |
| " | " | acenaphthene (35) | +/-31 |
| " | (MSD %R) | 4-nitrophenol (126) | 10-80 |
| " | " | pentachlorophenol (126) | 9-103 |
| | | | |
| Batch 7/ SW 1 (MS %R) | | 1,4-dichlorobenzene (27) | 36-97 |
| " | " | N-nitroso-di-n-prop. (36) | 41-116 |
| " | " | 1,2,4-trichlorobenzene (25) | 39-98 |
| " | " | acenaphthene (30) | 46-118 |
| " | (MSD %R) | 1,4-dichlorobenzene (30) | 36-97 |
| " | " | N-nitroso-di-n-prop. (39) | 41-116 |
| " | " | 1,2,4-trichlorobenzene (27) | 39-98 |
| " | " | acenephthene (31) | 46-118 |
| | | | |
| Batch 7/ SED 1 (MS %R) | | phenol (105) | 26-90 |
| " | " | 4-chloro-3-methylphenol (123) | 26-103 |
| " | " | 4-nitrophenol (130) | 11-114 |
| " | " | 2,4-dinitrotoluene (108) | 28-89 |
| " | (MSD %R) | phenol (102) | 26-90 |
| " | " | 4-chloro-3-methylphenol (126) | 26-103 |
| " | " | 4-nitrophenol (126) | 11-114 |
| " | " | 2,4-dinitrotoluene (110) | 28-89 |

The results of the MS/MSD can probably be attributed to interference with the sample matrix.

As stated in the CLP Data Assessment Checklist, the failure to achieve QC recovery limits does not in itself invalidate the data. These excursions should be viewed in context with other criteria including surrogate spike recovery and standard area summaries.

2.01.6 Method Blank Summary

Blank summary forms (Form IV) were included in the data package presented by Versar, Inc. for organics. A review of these forms indicated that a frequency of one blank per ten

samples (or less) was maintained. A method blank was assigned to each sample, matrix spike, and matrix spike duplicates. There were no transcription errors found in the reported data.

A number of method blanks contained contaminants. The result of these contaminants in the blanks is that positive detections of the contaminants in associated samples are flagged with a *B* indicating the compound could be a laboratory contaminant.

2.01.7 Organic GC/MS Tuning and Mass Calibration (BFB or DFTPP)

The summary forms for GC/MS tuning and calibration were present in the data package. A review was completed of these forms and the associated raw data. There were no transcription errors detected during the data review. The calibration was recalculated for five runs, and no errors were found; consequently, no more calculations were completed. The samples run during the 12-hour period following tuning were noted on the appropriate form. All samples were run within 12 hours of a GC/MS tuning.

The enhanced bar graph spectrum and mass/charge (m/z) listings for volatile and semi-volatile tuning were present in the package.

2.01.8 Initial Calibration Data

Initial calibration was run for each batch of samples at the required frequency. The Initial Calibration data sheets were present and completely filled out for all compounds for the semi-volatile and volatile fraction.

In most cases, the non-CCC compounds were below 50% for percent RSD. For those compounds for which the %RSD was greater than 50% (e.g. benzyl alcohol [52.7%], 1/5/89), positive values were correctly flagged with a *J* for the associated compounds.

There were no observed non-SPCC compounds with an average response factor equal to or near zero (<0.025).

There were no transcription errors detected in the initial calibration data. There were no calculation errors found in reporting the average response factors for SPCC or CCC compounds.

There were no excursions from the required QC limits for SPCC compounds (VOA RF>0.3, >0.25 for bromoform; SV RF >0.05) or from the required QC limits for CCC compounds (<30% RSD).

2.01.9 Continuing Calibration

The continuing calibration data sheets (CC data sheets) were present and completely filled out for all compounds of the volatile and semi-volatile organic fraction. The calibration was run once and the associated samples were then analyzed within 12 hours of the run.

The SPC compounds were checked on each CC data sheet for each batch. There were no excursions noted during this review and no calculation errors observed in generating the response factors.

There were no CCCs with a percent difference of greater than 25%. This was verified by a review of the raw calibration data. At no time were any transcription or calculation errors detected for continuing calibration data.

2.01.10 Internal Standard Area Summary

Form VIII was present in the organics package. This form summarized the internal standard areas. The internal standard areas were within the upper and lower limits for each sample of each batch. There were no excursions observed for this item.

This form was also used to check the retention times for the internal standards. All retention times were within a few seconds of the required time. No standard exceeded the limit of the standard retention time +/- 30 seconds.

2.01.12 General

All photocopies are of a legible quality.

The data package is for the most part complete. The chain of custody forms had to be requested from Versar, Inc.; however, the laboratory was prompt in delivering these pages.

2.01.13 Summary of Organic Data

The organic data were acceptable, and under the CLP guidlines no data were rejected. The majority of excursions were in the areas of surrogate recoveries and matrix spikes. These excursions resulted in a number of samples being flagged by a J indicating that they were estimated.

## 2.02 PESTICIDES/PCBs

The following section discuses the Pesticide/PCB package submitted for review by Versar, Inc. The samples described in this package are from round 2 sampling conducted at Cherry Farm. As in the organic package for round II samples, the pesticide/PCB samples were divided into 7 batches (2 to 8).

2.02.1 Case Narrative

A case narrative was included for each Pesticide/PCB batch. Included in each of these narratives was a brief description of the successes and problems encountered by the chemists while performing the analysis.

The narrative confirmed that the samples were extracted and analyzed within the required holding times.

The problems ecountered during this round of analyses were similar to those of previous analysis for the analytes. They consisted of:

* Excursions from required recovery limits
* Contamination of the primary analytical column
* Difficulty in compound identification
* Interference by the sample matrix.

2.02.2 Chain of Custody

The chain of cusody records are discussed in the data validation for organic compounds. The samples collected for the round 2 organic study were used in the Pesticide/PCB portion of the analysis.

2.02.3 Holding Time

As discussed in the case narrative, the holding times for extraction and analysis of Pesticide/PCB samples were all met. This fact was substantiated upon the review of Form VIII Pest-2 and the chain of custody forms.

2.02.4 Surrogate Spike

Form II Pest-2 was present as a summary of the surrogate recoveries for each batch. Excursions from the required recovery limit (24-154) are listed below. The reason that these samples did not achieve adequate recovery rates was attributed to a tendency for dibutylchlorendate (DBC) to break down in high or low pH.

| Sample | % Recovery |
|---|---|
| MW 2I | 15 |
| MW 3I | 10 |
| MW 3S | 8 |
| MW 9I | 21 |
| MW 11S | 20 |
| MW 4I | 20 |
| MW 4D DL | D |
| MW 8I | 18 |
| MW 5D | 0 |
| MW 5D DL | 0 |
| MW 6I | 4 |
| MW 6I DL | 0 |
| MW 6D | 12 |
| MW 6S | 13 |
| MW 13 DL | 11 |
| MW 6D MS | 15 |
| MW 6D MSD | 17 |
| MW 12 | 4 |
| MW 9S | 6 |

The sample which were not flagged with a *D* indicating dilution of the spike were labled with a I indication matrix interference.

2.02.5 Matrix Spike/Matrix Spike Duplicates

Form III Pest-2 was included inthe QC summary package as a review of the MS/MSD analysis. These data were reviewed and found to be complete; however, some excursions for acceptable criteria were noted. These included:

| Sample | Compound | Excursion | Observed | QC limit |
|---|---|---|---|---|
| MW 7S | Lindane | MS % REC | 132 | 56-123 |
| " | Aldrin | " | 37 | 40-120 |
| " | 4,4'-DDT | " | 28 | 38-127 |
| " | Lindane | MSD % REC | 137 | 56-123 |
| " | Aldrin | " | 37 | 4 0 - 120 |
| " | 4,4'-DDT | " | 34 | 38-127 |
| SED 1 | Hepachlor | MS % REC | 210 | 35-130 |
| " | " | MSD % REC | 189 | 35-130 |
| SED 3 | Lindane | MS % REC | 38 | 46-127 |
| " | Heptachlor | " | 25 | 35-130 |
| " | Aldrin | " | 31 | 34-132 |
| " | Endrin | " | 35 | 42-139 |
| " | Lindane | % RPD | 83 | <50 |
| " | Heptachlor | " | 89 | <31 |
| " | Aldrin | " | 67 | <43 |
| " | Dieldrin | " | 82 | <38 |
| " | Endrin | " | 82 | <45 |
| " | 4,4'-DDT | " | 78 | <50 |

2.02.6 Pesticide Method Blank Summary

A method blank summary (Form IV-Pest) was provided at the required frequency for each sample, matrix spike, and matrix spike duplicates.

2.02.7 Blank Contamination

Blank contamination was not a significant problem in this package.

2.02.8 Pesticides Data Package

The pesticide evaluation check for linearity summary (Form VIII) was present as part of the summary data for pesticides. Part 1 of this form included an evaluation of 4,4'-DDT/Endrin breakdown.

The Pesticide/PCB Standard Summary Form IX was present in the package.

The Pesticide/PBC Identification Summary Form X was present in the package.

The gas chromatograph and data system printouts for each of the standard mixes and required Aroclors was present.

2.02.9 GC Performance and Calibration

The GC Performance and Calibration review consisted of a retention time check of 4,4'-DDT and a breakdown check for endrin and 4,4'-DDT. There were no excursions from required QC limits for each criteria.

2.02.10 DBC Retention Time Check

The DBC retention time check was noted on Form VIII Pest-2. For all analytes, the percent difference was less than 2%.

2.02.11 Continuing Calibration

The alternating standards' calibration factors were reviewed on Form IX-Pest. The control limit of 15% (20% for non-quantitation) of the calibration factors for Ind. A and Ind. B was exceeded in a number of analytes. The table below summarizes the excursions.

| Data | Time | Standard | %D | Analyte |
|---|---|---|---|---|
| 12/27/88 | 15:27-20:13 | Ind A. | 22 | 4,4'-DDT |
| 12/27/88 | " | Ind B. | 33 | Heptachlor |
| " | " | Ind B. | 41 | Methoxychlor |
| 12/30/88 | 17:58-18:29 | Ind B. | 16 | Endrin |
| " | " | Ind B. | 16 | Methoxychlor |
| 1/7/89 | 14:29-18:21 | Ind B. | 17 | Alpha-B HC |
| 1/30/89 | 18:05-21:41 | Ind A. | 22 | 4,4'-DDT |
| " | " | Ind B. | 33 | Methoxychlor |
| 1/13/89 | 20:38-22:15 | Ind B. | -16 | Endrin |
| " | " | Ind B. | -17 | Methoxychlor |
| " | " | Ind A. | -16 | Dieldrin |
| " | " | Ind A. | -19 | Endosulfan II |
| " | " | Ind A. | -18 | Endrin Ketone |
| 2/2/89 | 23:41-1:18 | Ind A. | 16 | 4,4'-DDT |

As a result of the excursions, positive hits in the related samples were flagged with a *J* to indicate that the result are estimated. These result may be biased up to 26% higher than normal.

2.02.12 GC evaluation

Form X-Pest details the retention time and retention time windows for each sample and standard. Where applicable, the standards or sample analytes are within the calculated retention time windows for the quntification column and the confirmation column except for Sediment Sample 1 which was just outside the window (Result = 3.7; Window = 3.71 to 3.78). This minor excursion should not significantly change the validity of the sample, although Aldrin should be flagged as estimated.

### 2.02.13 Summary of Pesticide/PCB Date

The information presented in the Pesticide/PCB section of the data package was independently reviewed for accuracy, precision, and compliance with CLP protocols. These data were generally of good quality. However, a number of excursion in surrogate recoveries, matrix spikes, and calibration data indicated that some of the positive hit should be flagged as estimated. As a result, the data may be biased above the actual concentration levels.

## 2.03 INORGANIC COMPOUNDS

### 2.03.1 Case Narrative

A case narrative was provided as an introduction into the inorganic data package for each batch of samples. This narrative contained the factors required for a general understanding of the project. Specifically, the narrative stated the project name and contract number as well as the client (O'Brien and Gere) and the submission date. In addition, the method of analysis for the inorganic compounds was listed as CLP Inorganic SOW 785 protocol.

The case narrative identified a number of areas in which the laboratory analysis did not meet CLP requirements or fall within QC limits. These excursions were mainly in the area of spike recovery and serial dilution.

The inorganic analysis was divided into four batches. Each batch was reviewed to check the laboratory accuracy and precision. The adherence to CLP protocols was also checked.

2.03.2 Cover Page

A cover page (Cover Page) that displays the Laboratory Sample ID and identifies the corresponding Field Sample No. was included in the Inorganic Data Package. This page was completed correctly for each batch. It contained the Laboratory Name (Versar, Inc.) and the contract number (996.31.1). This form also answered to question:

Were ICP inter-element corrections applied?

Were ICP background corrections applied?

These questions were answered as YES and NO respectively.

The only item not completed on the form was the case number.

2.03.3 Inorganic Analysis Data Sheet

FORM I - IN was present for each sample in each batch. The form contained the correct sample ID, laboratory sample ID and contract number. The form also contained the matrix type (water or soil) and the Level (Low). The concentration units were given in ug/L. At the bottom of the form, the color and clarity of the sample were noted.

2.03.4 Holding Times

A review of the traffic reports and digestion/distillation logs indicated that the holding times for mercury (28 days), cyanide (14 days), and other metals (6 months) was not exceeded. Form X - IN was included in the data package as a summary of holding times for mercury and cyanide.

2.03.5 Calibration

A two-point calibration was used for ICP analysis. The calibration was accomplished using a number of standards containing different elements. The reason for this is based on the tendency of some elements to precipitate out of solution.

A five-point calibration was used for mercury. This is substantiated by the Atomic Absorption Furnace Injection Logbook.

A four-point calibration was present for flame AA, furnace AA, and cyanides. There were no excursions from the QC requirement of 0.995 or greater.

2.03.6 Initial and Continuing Calibration Verification

Forms II A-I were present for the initial calibration and continuing calibration verification. There were no excursions observed for any percent recoveries for this item. All the forms were adequately completed.

2.03.7 Blanks

Form III summarized the initial and continuing calibration for the blanks. This form was completed appropriately for the required metals. As demonstrated by the sample injection log, an initial calibration blank was analyzed at the start of the procedure and a continuing calibration blank was ran at a frequency of one blank (CCB) in approximately ten samples.

The preparation blanks were listed on Form III along with the initial and continuing calibration blanks.

There was no contamination observed in initial, calibration or preparation blanks.

2.03.8 ICP Interference Check Sample

Form IV was included in the inorganic data package. This form contained the results of the check sample analysis. There were no values more than +/- 20% of the true value.

2.03.9 Spike Sample Recovery - Pre-Digestion/Pre-Distillation

Form V was present and complete for spike sample recovery. The values which exceeded the QC limits of 75%-125% are listed below.

| Analyte | Spiked Sample | Sample Result | Spike Added | % Rec. | Q |
|---|---|---|---|---|---|
| Arsenic | 29 | 10U | 20 | 145.0 | N |
| Selenium | 10U | 25U | 10 | 0.0 | N |
| Mercury | 1.2 | 0.62 | 1.0 | 58 | N |
| Thallium | 27 | 10U | 50 | 54 | N |
| Selenium | 5.0U | 25.0U | 10 | 0.0 | N |
| Thallium | 27 | 10.0U | 50 | 54 | N |
| Mercury | 1.2 | 0.62 | 1.0 | 58 | N |

| | | | | | |
|---|---|---|---|---|---|
| Thallium | 27 | 10.0U | 50 | 54 | N |
| Lead | 25 | 12 | 20 | 65 | N |
| Antimony | 78 | [21] | 185 | 31 | N |
| Thallium | 10 | 3.7U | 18 | 56 | N |

Those samples which have a recovery of less than 30% as above (0.0) or have a recovery of greater than 150% as above (925.0) should be rejected. The positive results of the other samples associated with the recoveries noted above should be flagged with a *J* to indicate that the result is estimated.

2.03.10 Duplicates

Form VI was included in the inorganic package of each batch as a summary of the duplicates. Two analytes did not fall within the required limits of 20% or +/- CRDL. These were arsenic (83%) and lead (26%). Both values were flagged with an asterisk to indicate that there was interference with the analytes.

2.03.11 Laboratory Control Sample

Form VII summarized the analysis of the laboratory control sample (LCS). No excursions from the required QC limits of 80-120% recovery were noted in this section.

2.03.12 ICP Serial Dilution

Form IX was present in the data package as a summary of the ICP Serial Dilution. The one in twenty frequency for ICP Serial Dilutions was maintained by the laboratory. Potassium and magnesium were outside the QC limit of +/- 10% (12.3%) in three of the batches. This value was correctly flagged with an E indicating that there was some matrix interference.

2.03.13 Furnace Atomic Absorption (AA) QC Analysis

As demonstrated by the Atomic Absorption Furnace Injection Logbook, duplicate injections were performed for each sample analyzed by AA. A review of the relative standard deviation and coefficient of variation did not reveal any values above the QC limit of 20%.

2.03.14 Method of Standard Addition Result

Form VIII was not present in the data package. A review of Form Is did not show any S or + symbols.

2.03.15 Dissolved/Total or Inorganic/Total Analytes

There were no analyses performed for dissolved as well as total analytes on the same sample.

2.03.16 Form I to IX

All forms were labeled with the following information:

- Laboratory Name
- Case Number
- EPA (Or Field) Sample ID
- SDG No.
- Contract No.
- Units
- Matrix

There were no transcription errors encountered during the data review.

2.03.17 Summary of Inorganic Package

The above report represents a summary of the data validation conducted on the inorganic data package submitted for review by Versar, Inc. In general, the data are of an acceptable quality. The procedure by which the inorganic analysis was performed is in accordance with the requirements for Contract Laboratory Procedures. None of the data were rejected; however, ten samples did have excursions for percent recoveries, serial dilutions, or relative percent differences. In each case, the appropriate parameters for the sample were flagged as estimated. In general, the inorganics package for round 2 sampling was complete.

QUALIFIERS

A number of qualifiers are used by the laboratory and the data validation review team when reporting or validating data. These qualifiers are used extensively throughout this document to classify data as to its usability. The qualifier symbols are *U, J, C, B, E, D, A,* and *X* and are defined as follows:

U - Indicates compound was analyzed for but not detected. The sample quantitation limit must be corrected for dilution and for percent moisture.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound but the result is less than the sample quantitation limit and greater than zero. This flag is also used when a compound is positively identified; however, excursions from QC limits do not enable an accurate concentration to be given. Data flagged with a J can be used; however, the concentration presented may be biased by matrix or compound interference.

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. This flag must be used for a non-TLC's, as well as for a positively identified TCL compound. Data flagged with a B may be used; however, the value may be biased and higher than actual due to contamination introduced during field or laboratory preparation.

E - This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis. If one or more compounds have a response greater than full scale, the sample or extract must be diluted and reanalyzed according to the specifications of the method. All such compounds with a response factor greater than

full scale should have the concentration flagged with an E on the EPA Form I for the original analysis. If the dilution of the extract causes any compounds identified in the first analysis to be below the calibration range inthe second analysis, the results of both analyses shall be reported on separate EPA Forms I. The EPA Form I for the diluted sample shall have the DL suffix appended to the sample number.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor. If a sample or extract is reanalyzed at a higher dilution factor, as in the E flag above, the DL suffix is appended to the sample number on the Form I for the diluted sample, and all concentration values reported on that Form I are flagged with D.

A - This flag indicates that a non-TLC is a suspect aldol-condensation product.

I - This flag indicates that the presented concentration may be biased due to interference by the sample matrix or contaminants.

X - Other specific flags and footnotes may be required to define the results properly. When specific flags other than those above are used in this report, a description of the flag will follow its reference.

TABLE 6.1

CHEMICAL GROUP
ASSIGNMENTS AND REQUIREMENTS FOR ACTION

| CHEMICAL GROUP | MONITORING | | | | CHARACTERISTICS | | | | ASSESSMENT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Source | Conf | Trend | Media | LC50 | LD50 | Log Kow | BCF | Crit | HEC | |
| GROUP I | | | | | | | | | | | |
| Aldrin (S) | X | | S | W,B,S | | | | | S | | |
| Antimony (W) | X | | W | W,B,S | | X | | X | S | X | See Group IID |
| Arsenic (S) | X | | W,B,S | W,B,S | | | | X | | X | See Group IIA |
| Benzene (W) | X | | W | W,B,S | | | | | S | | See Group III |
| Benzo(B)fluoranthene (W) | X | | W | W,B,S | X | X | | X | S | | See Group IIB |
| Benzo(K)fluoranthene (W) | X | | W | W,B,S | X | X | | X | S | | See Group IIF |
| Benz(A)anthracene (W) | X | | W | W,B,S | X | X | | | S | | See Group IIF |
| Benz(A)pyrene (S,W) | X | | W,S | W,B,S | X | | | | | | |
| Beryllium (W) | X | | W | W,B,S | | X | | X | S | X | See Group IID |
| BHC-($\alpha$) (W) | X | | W,B,S | W,B,S | | | | X | B,S | | See Group IIA |
| Bis(2-ethylhexyl) phthalate (S,W) | X | | W,S | W,B,S | | X | | | S | | |
| Cadmium (B,S,W) | X | | W,B,S | W,B,S | | | | | B | | |
| Carbon tetrachloride (W) | X | | W | W,B,S | | | | | | | |
| Chlordane (S,W) | X | | W,B,S | W,B,S | | | | | S | | See Group IIA |
| Chloroform (W) | X | | W,S | W,B,S | | | | X | S | | See Group IIA |
| Chromium (S,W,) | X | | W,B,S | W,B,S | | | X | | B | | See Group IIA |
| Chrysene (W) | X | | W | W,B,S | | | | | S | | See Group IIB |
| Copper (S,W) | X | | W,S | W,B,S | | X | X | X | | | See Group IIF |
| Cyanide (S,W) | X | | W,S | W,B,S | | X | X | X | | X | |
| DDD (p,p) (S,W) | X | | W,B,S | W,B,S | | | | | S | | See Group IIA |
| DDE (S,W) | X | | W,B,S | W,B,S | X | | | | S | | See Group IIA |
| DDT (p,p) (S,W) | X | | W,B,S | W,B,S | | | | | S | | See Group IIA |
| 1,2-Dichloroethane (W) | X | | W | W,B,S | | | | X | | | |
| Dieldrin (S,W) | X | | W,B,S | W,B,S | | | | | S | | See Group IIA |
| Dioctyl phthalate (W) | X | | W | W,B,S | X | | | | S | X | See Group IIC |
| Endosulphan (S,W) | X | | W,B,S | W,B,S | | | | | S | | See Group IIA |
| Endrin (S,W) | X | | W,B,S | W,B,S | | | | | S | | See Group IIA |
| Fluoranthene (W) | X | | W | W,B,S | | | | X | S | | See Group IIE |
| Heptachlor (S) | X | | B,S | W,B,S | | | | | S | | See Group IIA |
| Heptachlor epoxide (S,W) | X | | W,B,S | W,B,S | X | | | | S | | See Group IIA |
| Hexachlorobenzene (B,S) | X | | W,B,S | W,B,S | X | | | | B,S | | See Group IIA |
| Hexachlorobutadiene (B,S,W) | X | | W,B,S | W,B,S | | | | | B,S | | |
| Lead (S,W) | X | | W,B,S | W,B,S | | X | X | | | | See Group IIA |
| Lindane (S,W) | X | | W,B,S | W,B,S | | | | | S | | See Group IIA |
| Mercury (S,W) | X | | W,S | W,B,S | | X | X | | | | |

Report of the Niagara River Toxics Committee, October 1984, pp. 6-11 through 6-19.

TABLE 6.1 (Continued)

| CHEMICAL GROUP | MONITORING | | | | CHARACTERISTICS | | | | ASSESSMENT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Source | Conf | Trend | Media | LC50 | LD50 | Log Kow | BCF | Crit | HEC | |
| GROUP I (Cont'd) | | | | | | | | | | | |
| Methoxychlor (B,S) | X | | B,S | W,B,S | | X | | | B,S | | |
| Methylene chloride (W) | X | | W | W,B,S | | | | X | S | | See Group IIE |
| Mirex (W) | X | | W,B,S | W,B,S | | | | | S | | See Group IIA |
| Nickel (S,W) | X | | W,B,S | W,B,S | | X | X | | B | | See Group IIA |
| Pentachlorobiphenyl (S) | X | | S | W,B,S | | X | | | | | |
| Pentachlorophenol (B,W) | X | | W,B | W,B,S | | | | | B | | |
| Phenol (W) | X | | W,B | W,B,S | | | | X | S | | See Group IIA |
| Polychlorinated Biphenyl-Arochlor 1242 (B,S) | X | | B,S | W,B,S | | | | | | | |
| Polychlorinated Biphenyl-Arochlor 1254 (S) | X | | S | W,B,S | | | | | | | |
| Polychlorinated Biphenyl-Arochlor 1260 (W) | X | | W | W,B,S | | | | | | | |
| Pyrene (W) | X | | W | W,B,S | X | | | X | S | | See Group IIE |
| Selenium (W) | X | | W,S | W,B,S | | X | X | | S | | See Group IIA |
| Silver (S,W) | X | | W,S | W,B,S | | X | X | | | | |
| TCDD (B,W) | X | | W,B | W,B,S | | X | | | | | |
| Tetrachlorobiphenyl (S) | X | | S | W,B,S | | X | | | | | |
| Tetrachloroethene (W) | X | | W,S | W,B,S | | | | | S | | See Group IIA |
| Trichlorobiphenyl (S) | X | | S | W,B,S | | X | | | | | |
| 2,4,5-Trichlorophenol (B) | X | | W,B | W,B,S | | | | | B | | See Group IIA |
| 2,4,6-Trichlorophenol (B,S) | X | | B,S | W,B,S | | X | | X | B,S | | |
| Zinc (S,W) | X | | W,S | W,B,S | | X | X | | B | | See Group IIE |
| GROUP IIA | | | | | | | | | | | |
| Aniline (S) | | | S | W,B,S | | X | | X | S | | |
| Arsenic (B,W) | X | | W,B,S | W,B,S | | | | X | | | See Group I |
| BHC (S) | | | S | W,B,S | | | | X | S | | |
| BHC-($\alpha$) (B) | X | | W,B,S | W,B,S | | | | X | B,S | | See Group I |
| Bromoform (W) | | | W | W,B,S | | | | | | | |
| Chlordane (B) | X | | W,B,S | W,B,S | | | | | S | | See Group I |
| Chlorodibromomethane (S,W) | | | W,S | W,B,S | X | | | X | S | | |
| Chloroform (S) | X | | W,S | W,B,S | | | | X | S | | See Group I |
| Chloronaphthalene (S,W) | W | | W,S | W,B,S | X | | | X | S | | |
| Chromium (B) | X | | W,B,S | W,B,S | | | X | | B | | See Group I |
| 2,4-D (W) | | | W | W,B,S | | | | | | | |
| DDD-(p,p) (B) | X | | W,B,S | W,B,S | | | | | S | | See Group I |

TABLE 6.1 (Continued)

| CHEMICAL GROUP | MONITORING | | | | CHARACTERISTICS | | | | ASSESSMENT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Source | Conf | Trend | Media | LC50 | LD50 | Log Kow | BCF | Crit | HEC | |
| GROUP IIA (Cont'd) | | | | | | | | | | | |
| DDE (B) | X | | W,B,S | W,B,S | X | | | | S | | See Group I |
| DDT (B) | X | | W,B,S | W,B,S | | | | | S | | See Group I |
| 1,2-Dichlorobenzene (S,W) | | | W,S | W,B,S | | X | | | S | | |
| 1,3-Dichlorobenzene (S,W) | | | W,S | W,B,S | | X | | S | | | |
| 1,4-Dichlorobenzene (B,S,W) | | | W,B,S | W,B,S | | X | | | B,S | | |
| 1,2-Dichloroethylene (S) | | | S | W,B,S | | X | | X | S | | |
| Dieldrin (B) | X | | W,B,S | W,B,S | | | | | S | | See Group I |
| Diphenylamine (S) | | | S | W,B,S | X | | | | S | | |
| Endosulphan (B) | X | | W,B,S | W,B,S | | | | | S | | See Group I |
| Endrin (B) | X | | W,B,S | W,B,S | | | | | S | | See Group I |
| Ethylbenzene (S,W) | | | W,S | W,B,S | | | | X | S | | |
| Heptachlor (B) | X | | B,S | W,B,S | | | | | S | | See Group I |
| Heptachlor epoxide (B) | X | | W,B,S | W,B,S | X | | | | S | | See Group I |
| Hexachlorobenzene (W) | X | | W,B,S | W,B,S | X | | | | B,S | | See Group I |
| Lead (B) | X | | W,B,S | W,B,S | | X | X | | | | See Group I |
| Lindane (B) | X | | W,B,S | W,B,S | | | | | S | | See Group I |
| Mirex (B,S) | X | | W,B,S | W,B,S | | | | | S | | See Group I |
| Nickel (B) | X | | W,B,S | W,B,S | | X | X | | B | | See Group I |
| Phenol (S) | X | | W,S | W,B,S | | | | X | S | | See Group I |
| Selenium (S) | X | | W,S | W,B,S | | | | | S | | See Group I |
| Silvex (W) | | | W | W,B,S | | | | X | | | |
| Styrene (W) | | | W | W,B,S | | | | X | W | | |
| 2,4,5-T (W) | | | W | W,B,S | | | | X | W | | |
| Tetrachloroethene (S) | X | | W,S | W,B,S | | | | | S | | See Group I |
| Tribromomethane (S) | | | S | W,B,S | | X | | X | S | | |
| Trichloroethene (W) | | | W | W,B,S | | X | | X | | | |
| Trichlorophenol (W) | X | | W,B | W,B,S | | | | | B | | See Group I |
| GROUP IIB | | | | | | | | | | | |
| Benzo(B)fluoranthene (S) | X | | W | W,B,S | X | X | | X | S | | See Group I |
| Chrysene (S) | X | | W | W,B,S | X | X | | X | S | | See Group I |
| Dibenz(A,H)anthracene (S,W) | | | | B | X | X | | X | W,S | | |
| Dichlorobromomethane (W) | | | | B,S | X | X | | X | | | |
| Dichloronaphthalene (S,W) | | W | | W,B | X | X | | | S | | |
| Trichloronaphthalene (S) | | | | | X | X | | | S | | |

TABLE 6.1 (Continued)

| CHEMICAL GROUP | MONITORING | | | | CHARACTERISTICS | | | | ASSESSMENT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Source | Conf | Trend | Media | LC50 | LD50 | Log Kow | BCF | Crit | HEC | |
| GROUP IIC | | | | | | | | | | | |
| Benzaldehyde (B,S,W) | | | | S | | X | | X | W,B,S | X | |
| BHC-($\beta$) (B,W) | | | | B,S | X | | | X | B | X | |
| Benzene sulphonamide (W) | | | | B,S | | | | X | W | X | |
| Butanal (W) | | | | B,S | | | | X | W | X | |
| Butanol (W) | | W | | W,B,S | X | | | | W | X | |
| Butylphenol-(T) (W) | | | | B | | | | | W | X | |
| Chlorobenzene (S,W) | | | | B | | | | | S | X | |
| Chlorotoluene (S,W) | | | | | | X | | X | W,S | X | |
| DCPA (B,S) | | | | | X | | | X | B,S | X | |
| DDT-(o,p) (S) | | | | B,S | | | | X | S | X | |
| 1,1-Dichloroethane (S) | | | | S | X | | | X | S | X | |
| Dichlorophenol (W) | | S | | | | | | X | W | X | |
| 2,4-Dichloro-4-phenoxybutyric acid (S) | | | | | | | | X | S | X | |
| Dichloropropane (W) | | W | | W,B,S | | | | X | | X | |
| 1,2-Dichloropropane (S) | | | | | | | | X | S | X | |
| Dichloropropene (W) | | W | | W,B,S | X | | | X | | X | |
| 2,6-Dichlorotoluene (B,S,W) | | B | | B | X | | | | W,B,S | X | |
| Diethyl disulphide (W) | | W | | W,B,S | X | | | X | W | X | |
| Diethyl phthalate (S) | | | | | X | | | X | S | X | |
| Dimethylheptadienone (S) | | | | | | | | | S | X | |
| Dimethyl phthalate (S) | | | | | X | | | X | S | X | |
| Dinitroanisole (S) | | | | | | | | X | S | X | |
| Dioctyl phthalate (S) | X | | W | W,B,S | X | | | X | S | X | |
| 1,2-Diphenylhydrazine (S) | | | | | X | | | | S | X | See Group I |
| Hexanal (W) | | | | B,S | | X | | X | S | X | |
| Hexenone (W) | | | | B,S | X | | | X | W | X | |
| Isobutanal (W) | | W | | W,B,S | X | | | X | W | X | |
| Isobutanol (W) | | W | | W,B,S | | | | X | W | X | |
| Isophorone (B) | | | | S | | X | | X | B | X | |
| Manganese (S) | | | | | | X | X | | S | X | |
| Methylcoumarin (S) | | | | | X | | | X | S | X | |
| Methylfuran (W) | | W | | W,B,S | X | | | X | W | X | |
| Methylnaphthalene (B,S,W) | | W | | W,B,S | | X | | | W,B,S | X | |
| Methylpentene (W) | | | | | X | | | X | W | X | |
| Methyl pivalate (S) | | | | | | | | | S | X | |
| N-Nitrosodiphenylamine (S) | | | | | | X | | X | S | X | |
| Octachlorostyrene (B,S) | | | | | X | | | | B,S | X | |
| Pentachloroanisole (W) | | | | B,S | X | | | X | W | X | |

TABLE 6.1 (Continued)

| CHEMICAL GROUP | MONITORING | | | | CHARACTERISTICS | | | | ASSESSMENT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Source | Conf | Trend | Media | LC50 | LD50 | Log Kow | BCF | Crit | HEC | |
| **GROUP IIC (Cont'd)** | | | | | | | | | | | |
| Pentachlorobenzene (B,S,W) | | | | | | X | | | B,S | X | |
| Phenothiazine (S,W) | | | | B | X | | | X | W,S | X | |
| Tetrachlorobenzene (B) | | | | S | | | | X | B | X | |
| 1,2,3,4-Tetrachlorobenzene (S,W) | | | | B | | | | X | S | X | |
| 1,2,4,5-Tetrachlorobenzene (S,W) | | | | B | | | | X | S | X | |
| 1,1,2,2-Tetrachloroethane (S,W) | | | | B | | X | | X | S | X | |
| 2,3,4,6-Tetrachlorophenol (B) | | | | S | | X | | X | B | X | |
| Tetrahydrofuran (W) | | | | B,S | | X | | X | | X | |
| (Tetramethylbutyl)phenol (W) | | | | B,S | X | | | X | W | X | |
| Trichlorobenzene (B) | | | | S | | | | | B | X | |
| 1,2,3-Trichlorobenzene (S,W) | | | | B | | X | | X | S | X | |
| 1,2,4-Trichlorobenzene (S,W) | | | | B | | | | | S | X | |
| 1,3,5-Trichlorobenzene (S,W) | | | | B | | X | | X | S | X | |
| 2,4,5-Trichlorotoluene (S,W) | | | | B | X | | | X | W,S | X | |
| Trimethylbenzene (W) | | W | | W,B,S | X | | | X | | X | |
| 2,4-Xylenol (S) | | | | | | X | | X | | X | |
| **GROUP IID** | | | | | | | | | | | |
| Acenaphthylene (S) | | | | | X | X | | X | S | X | |
| 1-Aminonaphthalene (S) | | | | | X | X | | X | S | X | |
| Antimony (S) | X | | W | W,B,S | | X | X | X | S | X | See Group I |
| Barium (S,W) | | | | B | | X | X | X | S | X | |
| Benzo(G,H,I)perylene (S,W) | | | | B | X | X | | X | W,S | X | |
| Benzo(E)pyrene (S) | | | | | X | X | | X | S | X | |
| Benzyl benzoate (S) | | | | | X | X | | X | S | X | |
| Benzylidene-4,4'-bis(N,N-dimethylaniline (S) | | | | | X | X | | X | S | X | |
| N-Benzyl-N-ethylaniline (S) | | | | | X | X | | X | S | X | |
| Beryllium (S) | X | | W | W,B,S | | X | X | X | S | X | See Group I |
| Chloroanthracene (W) | | W | | W,B,S | X | X | | | W | X | |
| Chlorodibromoethane (W) | | | | B,S | X | X | | | W | X | |
| Chloro(difluorochloromethyl) benzene (W) | | W | | W,B,S | X | X | | | W | X | |
| Chlorohydroxybenzophenone (S,W) | | W | | W,B | X | X | | | W,S | X | |
| Chlorohydroxyphenothiazine (W) | | W | | W,B,S | X | X | | | W | X | |
| Chloromethoxybenzophenone (W) | | W | | W,B,S | X | X | | | W | X | |
| Chloromethylbis(phenylmethyl) benzene (S,W) | | W | | W,B | X | X | | | W,S | X | |

TABLE 6.1 (Continued)

| CHEMICAL GROUP | MONITORING | | | | CHARACTERISTICS | | | | ASSESSMENT | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Source | Conf | Trend | Media | LC50 | LD50 | Log Kow | BCF | Crit | HEC |
| GROUP IID (Cont'd) | | | | | | | | | | |
| Chloromethyldiphenylmethane (S,W) | | W | | W,B | X | X | | | W,S | X |
| Chloronitrobenzene (S) | | | | | X | X | X | | S | X |
| (Chlorophenyl)cyclohexene (S) | | | | | X | X | X | | S | X |
| 2-Chloro(trifluoromethyl) benzene (B) | | | | S | X | X | X | | B | X |
| 3-Chloro(trifluoromethyl) benzene (W) | | | | B,S | X | X | X | | W | X |
| 4-Chloro(trifluoromethyl) benzene (B) | | | | S | X | X | X | | B | X |
| 2,4-Decadienal (B) | | | | S | X | X | X | | B | X |
| Dibenzofuran (S) | | | | | X | X | X | | S | X |
| Dibromomethane (W) | | | | B,S | X | X | X | | | X |
| Dichloroanthracene (W) | | W | | W,B,S | X | X | X | | W | X |
| Dichlorobromoethane (W) | | | | B,S | X | X | | | W | X |
| Dichloromethylbis(phenylmethyl) benzene (S,W) | | W | | W,B | X | X | | | W,S | X |
| Dichloromethyldiphenyl-methane (S,W) | | W | | W,B | X | X | | | W,S | X |
| Dichlorophenanthrene (S) | | | | | X | X | | X | S | X |
| 2,4-Dichloro-2-phenoxyethanol (W) | | W | | W,B,S | X | X | | | W | X |
| Dichloroquinone (S) | | | | | X | X | | X | S | X |
| Dichloro(trifluoromethyl) benzene (W) | | W | | W,B,S | X | X | | | W | X |
| 2,3-Dichloro(trifluoromethyl) benzene (B) | | | | S | X | X | | | B | X |
| 2,4-Dichloro(trifluoromethyl) benzene (B) | | | | S | X | X | | X | B | X |
| 3,4-Dichloro(trifluoromethyl) benzene (B) | | | | S | X | X | | X | B | X |
| Dichloro(trifluoromethyl) benzophenone (S,W) | | W | | W,B | X | X | | X | W,S | X |
| Dicyclohexyl phthalate (S) | | | | | X | X | | X | S | X |
| Diethylcyclohexanone (S) | | | | | X | X | | X | S | X |
| 4 (Dimethylamino)benzophenone (S) | | | | | X | X | | X | S | X |
| Dimethyl disulphide (W) | | | | B,S | X | X | | X | W | X |
| Dimethylphenanthrene (S) | | | | | X | X | | | S | X |
| N,N-Dimethyl 2-propenoamide (W) | | | | B,S | X | X | | X | W | X |
| Diphenylcyclohexane (S) | | | | | X | X | | | S | X |

TABLE 6.1 (Continued)

| CHEMICAL GROUP | MONITORING | | | | CHARACTERISTICS | | | | ASSESSMENT | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Source | Conf | Trend | Media | LC50 | LD50 | Log Kow | BCF | Crit | HEC |
| GROUP IID (Cont'd) | | | | | | | | | | |
| Diphenyldifluoromethane (W) | | W | | W,B,S | X | X | | X | W | X |
| Di-t-butylquinone (S) | | | | | X | X | | X | S | X |
| 3-Ethyl-4-methylmaleic anhydride (S) | | | | | X | X | | X | S | X |
| Ethyltoluene (W) | | W | | W,B,S | X | X | | X | W | X |
| (2-Fluoroethyl)-pentachlorobenzene (S) | | | | | X | X | | X | S | X |
| Furan (W) | | W | | W,B,S | X | X | | X | W | X |
| Heptachlorodibenzofuran (S) | | | | | X | X | X | | S | X |
| Heptachlorotoluene (S) | | | | | X | X | X | | S | X |
| Hexachlorodibenzofuran (S) | | | | | X | X | X | | S | X |
| Hexachlorotoluene (S,W) | | W | | W,B | X | X | | | W,S | X |
| 4-Hydroxybenzaldehyde (B) | | | | S | X | X | X | | B | X |
| Indeno(1,2,3-CD)pyrene (S) | | | | | X | X | X | | S | X |
| 2-Methylbutanoic acid (B) | | | | S | X | X | X | | B | X |
| Methyldibenzofuran (S) | | | | | X | X | X | | S | X |
| Methylene-4,4'-bis (N,N-dimethylaniline) (S) | | | | | X | X | X | | S | X |
| Methylfluorene (S) | | S | | S | X | X | | X | S | X |
| 5-Methyl-3-hexen-2-one (B) | | | | S | X | X | | X | B | X |
| o-Methyloxime-3-pentanone (S) | | | | | X | X | | X | S | X |
| Methylpyrene (S) | | | | | X | X | | X | S | X |
| 3-Nonen-2-one (B) | | | | S | X | X | | X | B | X |
| Octachlorodibenzofuran (S) | | | | | X | X | | X | S | X |
| Pentachlorobiphenylene (S) | | | | | X | X | | X | S | X |
| Pentachlorocarbazole (S) | | | | | X | X | | X | S | X |
| Pentachlorodibenzofuran (S) | | | | | X | X | | X | S | X |
| Pentachlorodifluoronaphthalene (S) | | | | | X | X | | X | S | X |
| Pentachlorofluorene (S) | | | | | X | X | | X | S | X |
| Pentachloromethylbis (phenylmethyl)benzene (S,W) | | | | B | X | X | | | W,S | X |
| Pentachlorophenylfluoromethyl ether (S) | | | | | X | X | | X | S | X |
| Pentachlorotoluene (S,W) | | | | B | X | X | | X | W,S | X |
| Phenylacetaldehyde (B) | | | | S | X | X | | X | B | X |
| Phenylacetic acid (B) | | | | S | X | X | | X | B | X |
| Phenylnaphthalene (S) | | | | | X | X | | X | S | X |
| Piperidinone (B) | | | | S | X | X | | X | B | X |

TABLE 6.1 (Continued)

| CHEMICAL GROUP | MONITORING | | | | CHARACTERISTICS | | | | ASSESSMENT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Source | Conf | Trend | Media | LC50 | LD50 | Log Kow | BCF | Crit | HEC | |
| **GROUP IID (Cont'd)** | | | | | | | | | | | |
| Tetrachlorocarbazole (S) | | | | | X | X | | X | S | X | |
| Tetrachlorodibenzofuran (S) | | | | | X | X | | X | S | X | |
| Tetrachloromethylbis(phenylmethyl) benzene (S,W) | | | | B | X | X | | | W,S | X | |
| Tetrachlorophenanthrene (S) | | | | | X | X | | X | S | X | |
| Tetrachlorotoluene (S,W) | | | | B | X | X | | X | W,S | X | |
| N,N,N',N'-Tetramethylbenzidene (S) | | | | | X | X | | X | S | X | |
| Thallium (S) | | | | | | X | X | X | S | X | |
| Trichloroanthracene (W) | | | | B,S | X | X | | | W | X | |
| Trichlorodiphenylmethane (W) | | | | B,S | X | X | | X | W | X | |
| Trichloromethylbis(phenylmethyl) benzene (S,W) | | | | B | X | X | | | W,S | X | |
| Trichlorophenanthrene (S) | | | | | X | X | | X | S | X | |
| (Trifluoromethyl)benzene (W) | | | | B,S | X | X | | X | W | X | |
| Trimethylbiphenyl (B) | | | | S | X | X | | X | B | X | |
| Trimethylphenanthrene (S) | | | | | X | X | | X | S | X | |
| 3A,6,6-Trimethyl-3A,4,5,6-tetrahydro-2-coumaranone (S) | | | | | X | X | | X | S | X | |
| Zytron (B,S) | | | | | X | X | | X | B,S | X | |
| **GROUP IIE** | | | | | | | | | | | |
| Di-n-butyl phthalate (S,W) | | | | B | | X | | | S | | |
| Diethylbenzene (W) | | | | B,S | | | | | W | | |
| Fluoranthene (S) | X | | W | W,B,S | | | | X | | | See Group I |
| Methylene chloride (S) | X | | W | W,B,S | | | | X | | | See Group I |
| Methyl phenanthrene (S) | | | | | | X | | X | S | | |
| Pyrene (S) | X | | W | W,B,S | X | | | X | | | See Group I |
| 1,1,1-Trichloroethane (S,W) | | | | B | | X | | X | S | | |
| Zinc (B) | X | | W,S | W,B,S | | X | X | | B | | See Group I |
| **GROUP IIF** | | | | | | | | | | | |
| Benz(A)anthracene (S) | X | | W | W,B,S | X | X | | | S | | See Group I |
| Benzo(K)fluoranthene (S) | X | | W | W,B,S | X | X | | X | | | See Group I |
| Benzofluorene (S) | | | | | X | X | | X | S | | |
| Copper (B) | X | | W,S | W,B,S | | X | X | X | | | See Group I |
| Coronene (S) | | | | | X | X | | X | S | | |

TABLE 6.1 (Continued)

| CHEMICAL GROUP | MONITORING | | | | CHARACTERISTICS | | | | ASSESSMENT | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Source | Conf | Trend | Media | LC50 | LD50 | Log Kow | BCF | Crit | HEC | |
| **GROUP IIF (Cont'd)** | | | | | | | | | | | |
| Methylanthracene (S) | | | | | X | | X | | X | S | |
| Methyl palmitate (S) | | | | | X | | X | | X | S | |
| Perylene (S) | | | | | X | | X | | X | S | |
| Phenanthrene (S,W) | | | | B | X | X | | | W,S | | |
| **GROUP IIG** | | | | | | | | | | | |
| Anthracene (S,W) | | W | | W,B | X | X | | X | W,S | | |
| Dimethyl adipate (S) | | | | | | X | X | | X | S | |
| Fluorene (S,W) | | | | B | X | X | | X | W,S | | |
| Fluorotrichloromethane (S) | | | | | | X | X | | X | S | |
| Hexane (W) | | | | B,S | X | X | | X | W | | |
| **GROUP III** | | | | | | | | | | | |
| Acenaphthene (S) | | | | | | X | | X | S | | |
| Acetone (W) | | | | B,S | | X | | X | W | | |
| Benzene (S) | X | | W | W,B,S | | | | | S | | See Group I |
| Benzothiazole (S,W) | | | | B | X | | | X | W,S | | |
| Benzyl alcohol (S) | | | | | | | | X | S | | |
| Benzylbutyl phthalate (S) | | | | | | | | | S | | |
| Biphenyl (S,W) | | W | | W,B | | | | | W,S | | |
| Butanol-(I) (W) | | | | B,S | | X | | X | W | | |
| 2-Butanone (W) | | | | B,S | | X | | X | W | | |
| Carbon disulphide (W) | | | | B,S | | X | | X | W | | |
| Cumene (W) | | | | B,S | | | | X | W | | |
| Diethylether (W) | | | | B,S | | | | X | W | | |
| Dimethylaniline (W) | | | | B,S | X | | | X | W | | |
| Naphthalene (S,W) | | | | B | | | | | S | | |
| Pentane (W) | | | | B,S | | | | X | W | | |
| Propanol (W) | | | | B,S | | X | | X | W | | |
| Toluene (S,W) | | | | B | | | | | S | | |
| Trichlorotrifluoroethane (W) | | W | | W,B,S | X | | | X | W | | |
| m-Xylene (S) | | | | | | | | X | S | | |
| o-Xylene (W) | | | | | | | | X | | | |

# APPENDIX G

# CHEMICAL LOADING CALCULATIONS

# APPENDIX G

## CHEMICAL LOADING CALCULATIONS

The estimated chemical load in pounds per day and pounds per year migrating from the Cherry Farm site into the Niagara River was calculated using ground water discharge values and contaminant concentrations measured in the downgradient monitoring wells nests MW-4, MW-5, MW-6 and MW-7. The loading rate were calculated for the following groups of chemicals: volatile organics; phenols; polynuclear aromatic hydrocarbons (PAHs); polychlorinated biphenyls (PCBs); and inorganics (priority pollutant metals and cyanide).

The downgradient side (Niagara River side) of the landfill was divided into four segments each containing one cluster of monitoring wells (Figure G-1). To determine the ground water discharge volume from each segment, the saturated cross-sectional areas perpendicular to ground water flow in the shallow, intermediate and deep ground water flow zones were calculated for each segment as shown in Table G-1. The cross-sectional areas, hydraulic gradients, and median hydraulic conductivities for each ground water flow zone were then used to calculate the ground water discharge through each segment as shown in Table G-2.

The estimated amount of chemicals within the ground water in each of the segments was calculated using the highest concentrations observed at the downgradient well nest within each of the segments (MW-4, MW-5, MW-6 and MW-7). The total concentration of each group of chemicals within each segment was then multiplied by the discharge of the zones within which the chemicals were observed (Table G-2).

As shown on Table G-3, organic compound load calculations for segment C were calculated using both the shallow and intermediate ground water flow zone discharge. Both zones were used for these calculations as the highest levels of organic compounds (volatile organics, phenols and PAHs) appeared in both the shallow and intermediate monitoring wells of that well cluster. Otherwise, the highest concentrations of organic compounds and PCBs occurred only in the shallow wells, therefore, only the discharge through the shallow ground water flow zone was used in calculating the chemical loading.

Inorganic compounds appeared in the shallow, intermediate and/or deep monitoring wells of the well cluster within each segment. Because of this, the chemical loading rate was calculated for each individual inzone using the highest concentrations of inorganic contaminants in that particular zone, and then summed to yield the total inorganic loading for that segment.

The chemical loading values for each segment were added together to produce the total loading rate for each of the five groups of chemicals into the Niagara River. The results are presented below:

| Chemical Class | Loading lbs/day | lbs/year |
|---|---|---|
| Volatile Organics | $3.07 \times 10^{-2}$ | 11.2 |
| Phenols | $7.24 \times 10^{-2}$ | 26.4 |
| PNA | $2.26 \times 10^{-2}$ | 8.24 |
| PCB | $1.49 \times 10^{-3}$ | 0.54 |
| Inorganics (metals & cyanide) | $1.11 \times 10^{-2}$ | 4.05 |

TABLE G-1

SEGMENT AREA CALCULATIONS

Cherry Farm Site
Niagara Mohawk Power Company
Tonawanda, New York

| SEGMENT | DEPTH | LENGTH (Ft.) | X | THICKNESS (Ft.) | = | AREA (Ft.) |
|---|---|---|---|---|---|---|
| A | S | 640 | | 5 | | 3200 |
| | I | 640 | | 15 | | 9600 |
| | D | 640 | | 15 | | 9600 |
| B | S | 620 | | 5 | | 3100 |
| | I | 620 | | 15 | | 9300 |
| | D | 620 | | 15 | | 9300 |
| C | S | 680 | | 5 | | 3400 |
| | I | 680 | | 15 | | 10200 |
| | D | 680 | | 15 | | 10200 |
| D | S | 460 | | 5 | | 2300 |
| | I | 460 | | 15 | | 6900 |
| | D | 460 | | 15 | | 6900 |

TABLE G-2

GROUND WATER DISCHARGE CALCULATIONS

Cherry Farm Site
Niagara Mohawk Power Company
Tonawanda, New York

| SEGMENT | DEPTH | K (gpd/ft2) | X | I (ft/ft) | X | A (ft2) | = | Q(gpd) |
|---|---|---|---|---|---|---|---|---|
| A | S | 1.4E+02 | | 0.006 | | 3200 | | 2688 |
| | I | 3.8E+01 | | 0.0016 | | 9600 | | 584 |
| | D | 4.0E+01 | | 0.0003 | | 9600 | | 115 |
| B | S | 1.4E+02 | | 0.006 | | 3100 | | 2604 |
| | I | 3.8E+01 | | 0.0016 | | 9300 | | 565 |
| | D | 4.0E+01 | | 0.0003 | | 9300 | | 112 |
| C | S | 1.4E+02 | | 0.006 | | 3400 | | 2856 |
| | I | 3.8E+01 | | 0.0016 | | 10200 | | 620 |
| | D | 4.0E+01 | | 0.0003 | | 10200 | | 122 |
| D | S | 1.4E+02 | | 0.006 | | 2300 | | 1932 |
| | I | 3.8E+01 | | 0.0016 | | 6900 | | 420 |
| | D | 4.0E+01 | | 0.0003 | | 6900 | | 83 |

TABLE G-3

CHEMICAL LOADING CALCULATIONS

Cherry Farm Site
Niagara Mohawk Power Company
Tonawanda, New York

VOLATILE LOADING

| SEGMENTS | ZONE | CONC.(ug/l) | (lb/gal) | X | Q(gpd)= | LOAD(lb/day) | |
|---|---|---|---|---|---|---|---|
| A | S | 102 | 8.51E-07 | | 2688 | 2.29E-03 | |
| B | S | 219 | 1.83E-06 | | 2604 | 4.76E-03 | |
| C | S&I | 792 | 6.61E-06 | | 3476 | 2.30E-02 | |
| D | S | 40 | 3.34E-07 | | 1932 | 6.45E-04 | |
| | | | | | | --------- | |
| | | | TOTAL VOLATILE LOADING | | | 3.07E-02 | (11.2 lbs/yr) |

PHENOLS LOADING

| SEGMENTS | ZONE | CONC.(ug/l) | (lb/gal) | X | Q(gpd) | = | LOAD(lb/day) | |
|---|---|---|---|---|---|---|---|---|
| A | S | 2789 | 2.33E-05 | | 2688 | | 6.26E-02 | |
| B | S | 178 | 1.49E-06 | | 2688 | | 3.88E-03 | |
| C | S&I | 100 | 8.35E-07 | | 3476 | | 2.90E-03 | |
| D | S | 186 | 1.55E-06 | | 1932 | | 3.00E-03 | |
| | | | | | | | --------- | |
| | | | TOTAL PHENOL LOADING | | | | 7.24E-2 | (26.4 lbs/yr) |

PAH LOADING

| SEGMENTS | ZONE | CONC.(ug/l) | (lb/gal) | X | Q(gpd) | = | LOAD(lb/day) | |
|---|---|---|---|---|---|---|---|---|
| A | S | 0 | 0 | | 2688 | | 0 | |
| B | S | 105 | 8.76E-07 | | 2604 | | 2.28E-03 | |
| C | S&I | 699 | 5.83E-06 | | 3476 | | 2.03E-02 | |
| D | S | 2 | 1.67E-08 | | 1932 | | 3.23E-05 | |
| | | | | | | | --------- | |
| | | | TOTAL PAH LOADING | | | | 2.26E-02 | (8.24 lbs/yr) |

PCB LOADING

| SEGMENTS | ZONE | CONC.(ug/l) | (lb/gal) | X | Q(gpd) | = | LOAD(lb/day) | |
|---|---|---|---|---|---|---|---|---|
| A | S | 14 | 1.17E-07 | | 2688 | | 3.14E-04 | |
| B | S | 27.5 | 2.30E-07 | | 2604 | | 5.99E-04 | |
| C | S | 24 | 2.00E-07 | | 2856 | | 5.71E-04 | |
| D | S | 0.5 | 4.14E-09 | | 1932 | | 8.06E-06 | |
| | | | | | | | --------- | |
| | | | TOTAL PCB LOADING | | | | 1.49E-03 | (0.54 lbs/yr) |

TABLE G-3

CHEMICAL LOADING CALCULATIONS

Cherry Farm Site
Niagara Mohawk Power Company
Tonawanda, New York

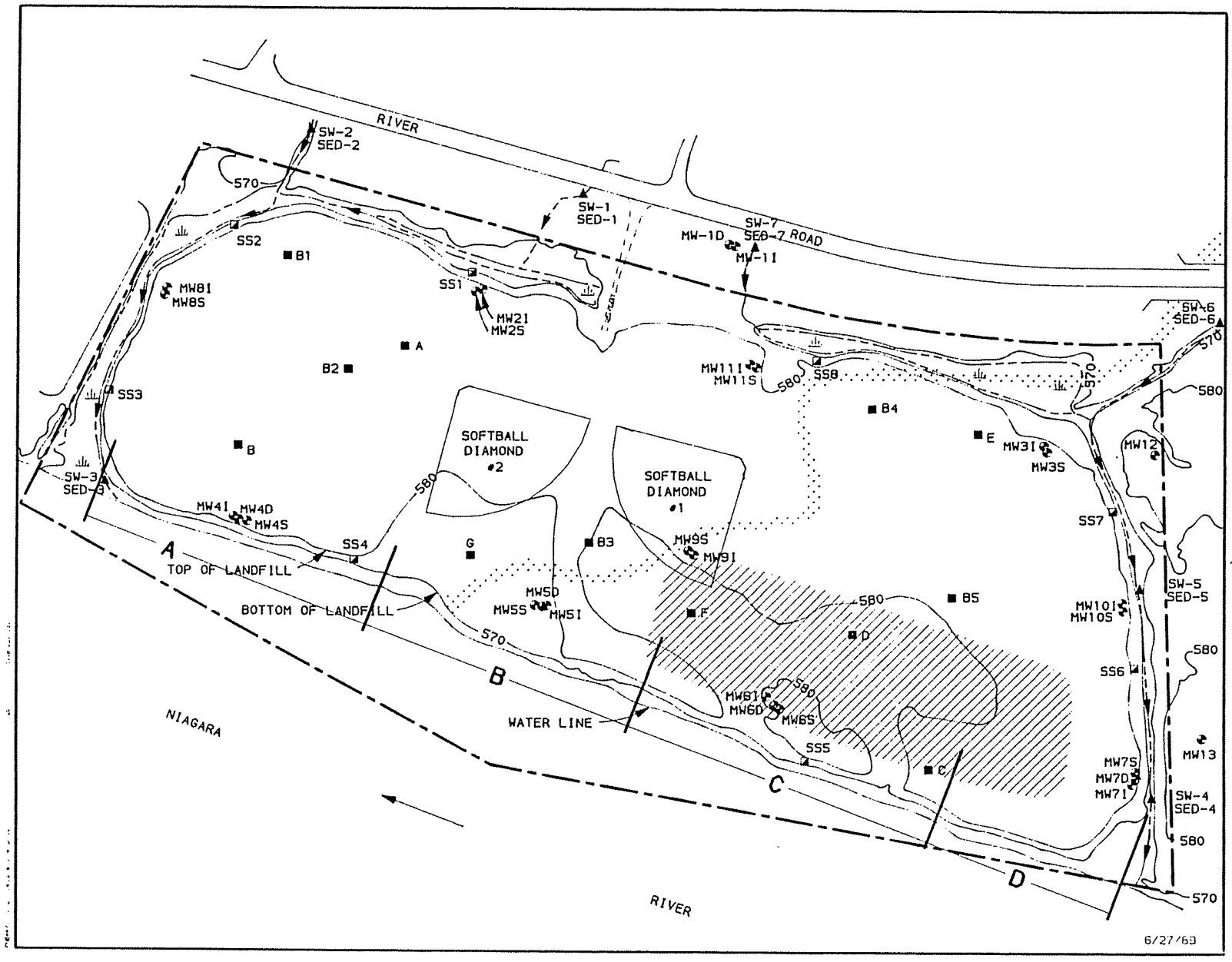
INORGANIC LOADING

| SEGMENTS | ZONE | CONC.(ug/l) | (lb/gal) | X Q(gpd) | = LOAD(lb/day) | |
|---|---|---|---|---|---|---|
| A | S | 61.8 | 5.16E-07 | 2688 | 1.39E-03 | |
| | I | 17 | 1.42E-07 | 584 | 8.29E-05 | |
| | D | 87 | 7.26E-07 | 115 | 8.35E-05 | |
| | | | | | 1.55E-03 | |
| B | S | 83.7 | 6.99E-07 | 2604 | 1.82E-03 | |
| | I | 43 | 3.59E-07 | 565 | 2.03E-04 | |
| | D | 0 | 0 | 112 | 0 | |
| | | | | | 2.02E-03 | |
| C | S | 255 | 2.13E-06 | 2856 | 6.08E-03 | |
| | I | 208.6 | 1.74E-06 | 620 | 1.08E-03 | |
| | D | 177 | 1.48E-06 | 122 | 1.80E-04 | |
| | | | | | 7.34E-03 | |
| D | S | 5.8 | 4.84E-08 | 1932 | 9.35E-05 | |
| | I | 11 | 9.18E-08 | 420 | 3.86E-05 | |
| | D | 96.84 | 8.08E-07 | 83 | 6.71E-05 | |
| | | | | | 1.99E-04 | |
| | | | TOTAL INORGANIC LOADING | | 1.11E-02 | (4.05 lbs/yr) |

FIGURE G-1

REMEDIAL / INVESTIGATION
CHERRY FARM SITE
TONAWANDA, NEW YORK

SITE MAP
CHEMICAL LOADING SEGMENTS




LEGEND

- DRAINAGE DITCH
- APPROXIMATE PROPERTY LINE
- GENERAL AREA OF FORMER SETTLING PONDS
- FORMER STREAM CHANNEL
- MONITORING WELL
- LANDFILL FACE SAMPLE
- SOIL BORING
- SURFACE WATER/SEDIMENT SAMPLING

0 200 400

SCALE IN FEET

O'BRIEN & GERE
ENGINEERS, INC.