MALCOLM PIRNIE

CITY OF ROCHESTER
REMEDIAL INVESTIGATION REPORT - APPENDICES

ROCHESTER FIRE ACADEMY SITE

MAY 1991
Revised DECEMBER 1991

MALCOLM PIRNIE, INC.

S-3515 Abbott Road
P. O. Box 1938
Buffalo, New York 14219

0965-04-1

MALCOLM PIRNIE

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APPENDIX A

ORDER ON CONSENT

KLB

City of Rochester

Department of Environmental Services

Office of the Commissioner

City Hall
30 Church Street
Rochester, New York 14614

January 10, 1990

Paul Werthman
Malcolm Pirnie, Inc.
S 3515 Abbott Road
Box 1938
Buffalo, New York 14219

Re: Fire Academy Consent Order (828015)

Dear Paul:

Attached is the copy of the order on consent for the Fire Academy site. I apologize for not sending a copy of the order to you sooner.

Sincerely,

Mark Gregor
Environmental Analyst

MG:K
Encl.

EEO Employer/Handicapped

STATE OF NEW YORK: DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of the Development and Implementation of a Remedial Investigation, Feasibility Study and a Remedial Program For an Inactive Hazardous Waste Disposal Site Under Article 27, Title 13, of the Environmental Conservation Law of the State of New York (the "ECL") by:

ORDER
ON
CONSENT

THE CITY OF ROCHESTER

Respondent

INDEX NO. B8-0205-87-09
SITE #828015

WHEREAS:

1. The New York State Department of Environmental Conservation (the "Department") is responsible for the enforcement of Article 27, Title 13 of the Environmental Conservation Law of the State of New York (the "ECL"), entitled "Inactive Hazardous Waste Disposal Sites".

2. The City of Rochester ("Respondent") is a municipality in the State of New York, located within Monroe County.

3. Respondent owns real property located at 1190 Scottsville Road, in the City of Rochester, Monroe County, and operates a facility known as the Rochester Fire Academy at that location (the "Site"). A map of the Site is attached hereto as Appendix "A".

4. The Department alleges that during the course of operations at the Rochester Fire Academy, certain hazardous wastes were disposed of at the Site while Respondent was the owner and operator of the Site.

5. The Department has listed the Site in the Registry of Inactive Hazardous Waste Disposal Sites in the State of New York as Site Number 8-28-015, and has classified it pursuant to ECL §27-1305 under Classification 2, a "significant threat to the public health or environment - action required".

6. Initial investigations at the Site have identified areas at the Site which exhibit elevated levels of some metals, other inorganic constituents, and organic constituents.

7. Pursuant to ECL Section 27-1313(3)(a), whenever the Commissioner of Environmental Conservation (the "Commissioner") "finds that hazardous wastes at an inactive hazardous waste disposal site constitute a significant threat to the environment, he may order the owner of such site and/or any person responsible for the disposal of hazardous wastes at such site (i) to develop an inactive hazardous waste disposal site remedial program subject to the approval of the department, at such site, and (ii) to implement such program within reasonable time limits specified in the order."

8. The Department and Respondent acknowledge that the goals of this Order shall be that Respondent shall develop and implement a remedial investigation, feasibility study and remedial program for an inactive hazardous waste disposal site, subject to the approval of the Department, and shall implement such program within the time limits specified

hereinafter. The program shall be developed and implemented to abate and eliminate any significant threat to the public health or environment.

9. Respondent, having waived its right to a hearing herein as provided by law, and having consented to the issuance and entry of this Order without any adjudication of fact or law and without admitting any liability except as may be incurred hereunder, agrees to be bound by the terms and conditions of this Order.

NOW, THEREFORE, having considered this matter and been duly advised, it is ORDERED THAT:

I. Respondent shall retain a third-party professional consultant, contractor and/or laboratory to perform the technical, engineering and analytical obligations required by this Order. The qualifications and professional expertise of any third party so employed shall be subject to the approval of the Department.

II. All submittals made by Respondent pursuant to this Order shall be subject to Departmental review and approval.

If the Department approves a submittal, Respondent shall perform the specified work or continue with Respondent's obligations under the Order in accordance with the terms of the approval and under the Department's supervision. The submittal once approved by the Department shall be appended to and made a part of this Order.

If the Department disapproves a submittal, the Department shall notify Respondent in writing of the reasons for such disapproval. Within 30 days of receipt of such notice, or such greater period as the Department may allow, the Respondent shall revise and resubmit the submittal, addressing each of the Department's objections. If the Department approves the revised submittal, Respondent shall perform the specified work or continue with Respondent's obligations under the Order in accordance with the terms of the approval and under the Department's supervision.

In the event that the approved Remedial Design requires modification during implementation, such modification must receive the prior written approval of the Department before incorporation of such modification into the approved Remedial Design.

If the Department disapproves any revised submittal, Respondent shall be in violation of this Order, not having submitted an approvable document in accordance with the terms of this Order.

III. Respondent shall undertake and complete the Remedial Investigation and Feasibility Study program for the Site in accordance with the plan which has been approved by the Department (the "Approved Proposal"). The Approved Proposal shall be attached hereto as Appendix "B" and shall be incorporated as a part of this Order. Respondent and any consultant, contractor or subcontractor shall conduct all activities in accordance with the procedures and protocols as specified in the Approved Proposal.

IV. Within 90 days of the date specified for completion of the Remedial Investigation, Respondent shall submit to the Department a Remedial Investigation Report (the "Report"), founded upon its performance of the Remedial Investigation in accordance with the Approved Proposal. The Report shall include a certification by the project manager or supervisor that the work conducted was performed in accordance with the Approved Proposal, a copy of all data generated, and all other information obtained, during the Remedial Investigation and shall provide all assessments and evaluations as set forth in the most current United States Environmental Protection Agency ("EPA") guidance documents for projects pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, 42 U.S.C. §9601 et seq. ("CERCLA") and shall be consistent with the national contingency plan as developed pursuant to that statute.

V. The Department reserves the right to require a modification and/or amplification and expansion of the Remedial Investigation and Report by Respondent to address specific areas if the Department determines that further investigation is necessary, as a result of reviewing data generated by the Remedial Investigation or as a result of reviewing other data or facts, provided that such modification, amplification or expansion is consistent with the requirements of the Report as specified in Paragraph IV above.

VI. Within the time provided therefor in the Approved Work Plan, but not more than six months after receipt of the Department's approval of the Report, Respondent shall submit to the Department a feasibility study (the "Feasibility Study") evaluating on-Site and off-Site remedial actions to eliminate or mitigate the health and environmental hazards and potential hazards attributable to the Site. The Feasibility Study shall be prepared and certified by a licensed professional engineer registered in the State of New York. The Feasibility Study shall be in accordance with the most current EPA guidance documents for projects pursuant to CERCLA and shall be consistent with the national contingency plan as developed pursuant to that statute.

VII. After submission of the proposed Feasibility Study, the Respondent shall publish a notice prepared by the Department, advising of the availability of this Order and its Appendices and all proposals and reports concerning the Site and shall announce a location where documents are provided for public review and comment. The Department and Respondent will accept written comments from the public for a period of 30 days following the notice. The Respondent shall provide for oral comments at a public hearing during the comment period and shall submit a transcript of these proceedings to the Department.

At the conclusion of the comment period, the Department will review such documents and comments which it has received. The Department shall then determine whether or not Respondent's proposed Feasibility Study adequately addresses those comments and concerns raised during the comment period and shall provide a written record of such review to Respondent and the public.

If the Department determines that the proposed Feasibility Study adequately addresses remediation of the Site as consistent with CERCLA and in view of the public comments received, then Respondent shall develop and submit a proposal for the construction of the Remedial Design for approval by the Department.

If the Department determines that the Feasibility Study requires modification, expansion or adjustment, the Department shall identify the elements of adjustment determined to be necessary and shall so inform the public and Respondent.

Respondent shall modify the Feasibility Study in accordance with the comments received and shall submit the modified Feasibility Study to the Department for review and approval. The Department shall provide written notice to Respondent of its approval or disapproval of the modified Feasibility Study and its reasons for such determination.

If the Department approves the modified Feasibility Study, Respondent shall submit the Remedial Design. If the Department disapproves the modified Feasibility Study, the Department shall take whatever action the Department deems appropriate.

VIII. Within 180 days after receipt of the Department's approval of the Feasibility Study, Respondent shall submit to the Department an engineering report, plans and specifications for a remedial program (the "Remedial Design").

The Remedial Design shall include, but not be limited to, the following:

a. A description of the means of effectuating the combination of technologies which has been selected from the alternatives by the approved Feasibility Study, and which collectively constitutes the Remedial Program ("Remedial Program") to include but not be limited to, as necessary or appropriate as determined by the Department:

(1) the disposition of hazardous wastes, constituents and degradation products, and any soil or other materials contaminated thereby;

(2) the collection, treatment, and disposition of any contaminated groundwater, leachate and air;

(3) physical security and posting of the Site;

(4) health and safety of persons living and/or working at or in the vicinity of the areas being remediated;

(5) quality control and quality assurance procedures and protocols to be applied to Remedial Program construction operations;

(6) integrated air monitoring on and off-Site during implementation of the Remedial Program.

b. "Contract-ready" documents for the construction of the elements of the Remedial Program, including plans and specifications prepared and certified by a licensed professional engineer registered in the State of New York, which plans shall satisfy all applicable state and federal laws, rules and regulations;

c. A time schedule for construction of the elements of the Remedial Program and provisions for periodic work-in-progress reports during the implementation of the Remedial Program;

d. The parameters, conditions, procedures and protocols to determine the effectiveness of the Remedial Program, including a schedule for periodic sampling of existing and planned groundwater monitoring wells;

e. A description of the maintenance and monitoring activities, procedures and protocols to be undertaken during the period commencing upon completion of the construction of the elements of the Remedial Program, including a provision for submission to the Department of periodic monitoring reports ("post-closure monitoring");

f. A contingency plan to be implemented in the event that any element of the Remedial Program fails to operate in accordance with the Remedial Design prior to the date 30 years after satisfactory completion of construction pursuant thereto ("Supplemental Remedial Program"); and

g. An evaluation of the need to take measures to provide for the health and safety of human beings working or residing at and in the vicinity of the Site during a 30-year period following completion of the implementation of the Remedial Program, and a plan for the implementation of such measures.

IX. Within such period as may be allowed by the approved Remedial Design and any modifications thereto which have been approved by the Department or any Supplemental Remedial Program which may be required, Respondent shall complete construction pursuant to the approved Remedial Design and any modifications to the Remedial Design which have been approved by the Department. Within 45 days of completion of construction, Respondent shall submit to the Department record drawings and a certification that construction was completed in accordance with the approved Remedial Design and any approved modifications. Such certification shall be by a licensed professional engineer registered in the State of New York.

X. Within 45 days after receipt of the record drawings and certification, the Department shall review the same and provide comments to Respondent. In the event that the Department is not satisfied with the quality and completeness of construction, the Department may take any action and pursue any remedy to which it may be entitled by law.

If the Department acknowledges that the implementation is complete and in accordance with the Approved Remedial Design, then unless a Supplemental Remedial Program is required hereof, and except for the requirements of paragraphs XII, XIII and the conditions set forth in paragraph XIV hereof, such acknowledgement shall constitute a full and complete satisfaction and release of each and every claim, demand, remedy or action whatsoever against Respondent, its directors, officers, employees, agents, successors and assigns, which the Department has or may have pursuant to Article 27, Title 13, of the ECL relative to or arising from the disposal of hazardous waste at the Site which caused the Site to be listed in the Registry.

This release shall inure only to the benefit of Respondent, its directors, officers, employees, agents, successors and assigns, with respect to the aforesaid matter.

Nothing herein shall be construed as barring, diminishing, adjudicating or in any way affecting any legal or equitable rights or claims, interests, defenses, actions, suits, causes of action or demands whatsoever that the Department or Respondent may have against anyone other than the parties to this Order.

XI. The right of the Department to enforce the terms of this Order shall not be affected by any release contained herein.

XII. Notwithstanding any provision contained in this Order to the contrary, for a period of 30 years from the date of the Department's written acknowledgement that Respondent has completed the implementation of the construction and other elements in accordance with the approved Remedial Design, or for such other period of time as may be designated commensurate with Respondent's obligations pursuant to this Order, Respondent shall maintain and monitor the areas at which the elements of the Remedial Program were implemented in accordance with the approved Remedial Design ("Post-Closure Period"). During such Post-Closure Period, respondent shall provide the Department with the periodic monitoring reports, as set forth in the approved Remedial Design and shall provide immediate notice to the Department of any failure of the Remedial Program. In the event of any failure of the Remedial Program or any element thereof during the implementation of the Remedial Program or during the Post Closure Period, Respondent shall develop and submit a Supplemental Remedial Program.

XIII. Nothing contained in this Order shall be construed as barring, diminishing, adjudicating or in any way affecting:

a. any legal or equitable rights or claims, actions, suits, causes of action or demands whatsoever that the Department may have against anyone other other than Respondent, its directors, officers, employees, servants, agents, successors and assigns;

b. the Department's right to enforce at law or in equity the terms and conditions of this Order against Respondent, its directors, officers, employees, servants, agents, successors and assigns in the event that Respondent shall fail to satisfy any of the terms hereof;

c. the Department's right to bring any action at law or in equity against Respondent, its directors, officers, employees, servants, agents, successors and assigns with respect to areas or resources that may have been affected or contaminated as a result of the disposal of hazardous wastes, including, but not limited to, the release or migration of hazardous or industrial wastes from the Site or from activities related to the Site.

XIV. Notwithstanding any other provision in this Order, the Department reserves the right to institute proceedings in this matter or in any other matter which are (1) seeking to compel the Respondent and/or third parties to perform additional response work at the Site or (2) seeking reimbursement of the Department's response costs if:

a. for proceedings initiated prior to the acknowledgement by the Department that the implementation is complete and in accordance with the Approved Remedial Design, such proceedings shall be founded upon (i) conditions at the Site which were previously unknown to the Department or (ii) information received by the Department after the execution of this Order, and such conditions or information indicates that the Remedial Design will not be sufficiently protective of human health or the environment; or

b. for proceedings initiated subsequent to the acknowledgement by the Department that the implementation is complete and in accordance with the Approved Remedial Design, such proceedings shall be founded upon (i) conditions at the Site which were previously unknown to the Department or, (ii) information which is received, in whole or in part after such acknowledgement by the Department, and such conditions or information indicates that the Remedial Design is not protective of human health or the environment.

XV. Respondent shall provide notice to the Department of any field work (including, but not limited to, any excavating, drilling or sampling) to be conducted pursuant to the terms of this Order at least five (5) working days in advance of such activities.

XVI. Respondent shall permit any duly designated officer, employee, consultant, contractor or agent of the Department to enter upon the Site or areas in the vicinity of the Site which may be under the control of Respondent, and any areas necessary to gain access thereto, for inspection purposes and for the purpose of making or causing to be made such sampling and tests as the Department deems necessary, and for ascertaining Respondent's compliance with the provisions of this Order.

XVII. The Department shall have the right to obtain "split samples" or "duplicate samples" or both, at the Department's option, of all substances and materials sampled by Respondent pursuant to this Order.

XVIII. Respondent shall obtain whatever permits, easements, rights-of-way, rights-of-entry, approvals or authorizations which are necessary in order to perform Respondent's other obligations pursuant to this Order. However, for any permit administered and issued by the

Department, the Department's approval of plans and specifications as a part of the remedial programs encompassed by this Order shall constitute authorization in lieu of a permit, provided that the affected program, regulations or specific applicable permit are identified and that such plans and specifications are included in the appendices to this Order and incorporated as a part of this Order.

XIX. Within 30 days after the effective date of this Order, Respondent shall have filed a Declaration of Covenants and Restrictions with the Monroe County Clerk's Office for the purpose of providing notice of this Order to all potential future purchasers of any portion or all of the Site. This Declaration must indicate that any successor in title to any portion or all of the Site shall be responsible for implementing the provisions of this Order. A certified copy of this filing shall be provided to the Department.

XX. As used in this Order, "hazardous waste" shall mean a waste which appears on the list, or satisfies the characteristics promulgated by the Commissioner pursuant to Section 27-0903 of the ECL and found at 6 NYCRR Part 371, and any hazardous constituents or hazardous degredation products of a waste or combination of wastes which, because of its quantity, concentration, or physical, chemical or infectious characteristics may pose a substantial present or potential hazard to human health or the environment.

XXI. Respondent shall not suffer any penalty under any of the terms hereof, or be subject to any proceedings or actions for any remedy or relief, if it cannot comply with any requirements of the terms hereof because of an act of God, war, riot or other condition as to which negligence or willful misconduct on the part of Respondent was not the proximate cause, provided, however, that Respondent shall immediately notify the Department in writing when it obtains knowledge of any such condition and request an appropriate extension or modification of the terms of this Order.

XXII. The failure of Respondent to comply with any terms of this Order shall constitute a default and a failure to perform an obligation under this Order and under the ECL. In the event of default by the Respondent, the Department may initiate any action and pursue any remedy which may be available to it.

XXIII. The terms of this Order shall not be construed to prohibit the Commissioner or his duly authorized representative from exercising any summary abatement powers, either at common law or as granted pursuant to statute or regulation.

XXIV. Respondent shall indemnify and hold the Department, the State of New York, and their representatives and employees harmless for all claims, suits, actions, damages and costs of every name and description arising out of or resulting from the fulfillment or attempted fulfillment of the terms of this Order by Respondent, its directors, officers, employees, servants, agents, successors or assigns.

XXV. Respondent, having conducted a record search to identify sources of materials utilized at the Site and to identify other parties who have used the Site and having reported thereon to the Department, shall have a continuing obligation to submit to the Department any data or information of which Respondent becomes aware and which may be applicable to identifying other parties who may be held liable for costs of the remedial program.

Respondent shall notify each other party so identified by Respondent or the Department of that party's potential liability and shall provide the Department with a copy of such notification, and copies of any other correspondence related thereto or resulting therefrom.

Respondent shall provide the Department with any information concerning, and provide an accounting of, any contributions, liability, reimbursements or indemnifications by or from any other parties related to expenditures undertaken by Respondent pursuant to this Order. The Department shall not be bound by any cost allocation or contribution agreements among any parties unless the Department has approved such allocations in writing.

XXVI. The effective date of this Order shall be the date this Order is signed by the Commissioner or his designee.

XXVII. If, for any reason, Respondent desires that any terms of this Order be changed, Respondent shall make timely written application therefor to the Commissioner setting forth reasonable grounds for the relief sought.

XXVIII. A. All communication required hereby to be made between the Department and Respondent shall be made in writing and transmitted by United States Postal Service return receipt requested, or hand delivered or delivered via a similar carrier service which records delivery, to each of the addresses listed below.

B. Submissions to be made by Respondent to the Department shall be submitted in two copies to each of the following addresses:

1. New York State Department of
   Environmental Conservation
   Division of Hazardous Waste Remediation
   Region 8
   6274 E. Avon-Lima Road
   Avon, New York 14414

2. New York State Department of
   Environmental Conservation
   Division of Environmental Enforcement
   600 Delaware Avenue
   Buffalo, New York 14202-1073

3. New York State Department of
   Environmental Conservation
   Division of Hazardous Waste Remediation
   Bureau of Eastern Remediation
   50 Wolf Road
   Albany, New York 12233

4. New York State Department of Health
   Bureau of Environmental Exposure
   Investigation
   2nd Floor
   2 University Place
   Albany, New York 12237

C. Communication to be made from the Department to Respondent shall be made in duplicate as follows:

Edward J. Doherty
Commissioner of Environmental Services
Room 300 B
City Hall
30 Church Street
Rochester, New York 14614

Johanna F. Brennan, Esq.
4th Floor - Law Department
City Hall
30 Church Street
Rochester, New York 14614

D. The Department and Respondent respectively reserve the right to designate other or different addresses on notice to the other.

XXIX. The terms of this Order shall be deemed to bind Respondent, its officers, directors, agents, servants, employees, successors and assigns.

XXX. Nothing herein shall be construed to bind any entity not specifically bound by the terms of this Order.

XXXI. The terms hereof shall constitute the complete and entire Order between Respondent and the Department concerning the Site. No terms, conditions, understandings or agreements purporting to modify or vary the terms hereof shall be binding unless made in writing and subscribed by the party to be bound. No informal advice, guidance, suggestions or comments by the Department regarding reports, proposals, plans, specifications, schedules or any other writing

CONSENT BY RESPONDENT

Respondent hereby consents to the issuing and entering of the foregoing Order, waives its right to a hearing herein as provided by law, and agrees to be bound by the provisions, terms and conditions contained herein.

THE CITY OF ROCHESTER

BY: [signature]

TITLE: Corporation Counsel

DATE: 5/5/89

State of New York)
County of) s.s.:
)

On this 5th day of May, 1989, before me personally came Louis Kash to me known, who, being by me duly sworn, did depose and say that he resides in Rochester; that he is the Corp. Counsel of the City of Rochester, the municipality described in and which executed the foregoing instrument; that he knew the seal of said municipality; that the seal affixed to said instrument was such seal; that it was so affixed by the appropriate order in accordance with the Charter of the municipality, and that he signed his name thereto by like order.

Brenda A. Teachout (Patyzack)
NOTARY PUBLIC

BRENDA A. TEACHOUT (Patyzack)
Notary Public in the State of New York
MONROE COUNTY
Commission Expires July 31, 1989

APPENDIX B

WORK PLAN MODIFICATION DOCUMENTATION

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.
ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

May 31, 1990

Mr. Mark Gregor
Environmental Analyst
Department of Environmental Services
City Hall
30 Church Street
Rochester, New York 14614

Re: Scope of Work Changes Pertaining to Rochester Fire Academy RI

Dear Mr. Gregor:

The purpose of this letter is to summarize all changes to the scope of work that have been approved by the City of Rochester and the New York State Department of Environmental Conservation since the start of the Rochester Fire Academy remedial investigation field work. Many of these changes have been previously documented (see attached) however, some changes were mutually agreed upon field based decisions that occurred during progression of the RI program that were not formally documented. These changes include:

1. The excavation location of a test pit (TP-9) was relocated from E 1075, N 1150 to E 1070, N 1150. The original location was adjacent to an empty drum lying in a pond in the South disposal area and was not accessible with the backhoe. This change was mutually agreed upon by Malcolm Pirnie and the NYSDEC on 4/4/90.

2. Permanent steel surface casing was installed for all down gradient bedrock wells (intermediate as well as deep) in order to minimize the potential for down-hole contamination during drilling of the bedrock boreholes. This was mutually agreed upon by Malcolm Pirnie, the City of Rochester, and the NYSDEC on 4/5/90.

3. In order to demonstrate hydraulic communication between the lower overburden and upper bedrock hydrostratigraphic zones (requested by the NYSDEC), a piezometer was added to the upgradient well couplet MW-9 (agreed on-site 4/10/90 and documented by NYSDEC on 4/19/90). A short-term pumping test was to be performed in the bedrock well and water level changes were to be monitored in the adjacent piezometer. During development, a maximum pumping rate of five (5) gpm was attained for 30 minutes with a suction-lift pump; however, water level drawdown did not occur in either the well or piezometer. Pressure packer testing has indicated that the

S. 3515 ABBOTT ROAD P.O. BOX 1938 BUFFALO, NY 14219 716-828-1300 FAX 716-828-0431

upper portion of the bedrock is capable of producing in excess of 15 gpm. This rate is beyond the range of most conventional two-inch diameter pumps necessary for water level drawdown in the well. Field determined water quality data collected during well development show similarities between the lower overburden and upper bedrock ground water. This data is presented in the attached Table.

4. Frequent borehole collapse during bedrock coring required the use of temporary 3-inch diameter steel casing to prevent further collapse of the borehole. At those locations,(MW-7I, MW-7D, and MW-12I), an Nx core barrel (2-7/8-inch diameter) was used to advance the borehole through the 3-inch casing. Upon borehole completion, the screen, riser and sandpack were installed within the temporary 3-inch casing. A bentonite seal was installed subsequent to retrieval of the temporary casing. The remainder of the monitoring wells were installed in accordance with the Work Plan. These changes were agreed upon by the City of Rochester and NYSDEC on 4/26/90.

5. A pressure packer test could not be performed in the upper portion of the bedrock in MW-7D due to the borehole collapse described above.

6. A five foot screen was substituted for a ten foot screen in MW-12I due to the partial in-filling of the borehole from collapsing material described in item 4 above. This substitution was mutually agreed upon by Malcolm Pirnie, Inc., and the NYSDEC on 5/4/90.

If you have any questions regarding any of the changes described above or previously documented changes, do not hesitate to contact myself or Kent Bainbridge at (716) 828-1300.

Very truly yours,

Richard H. Frappa
Project Hydrogeologist

Attachment

c. K. Bainbridge (MPI)
File: C-1

0965-04-1
plb/RHF05290.L

TABLE
ROCHESTER FIRE ACADEMY RI/FS
WELL DEVELOPMENT DATA

WELL #	pH	TEMP oC	SPECIFIC CONDUCTANCE (uhmos)	TURBIDITY (NTU)	FIELD OBSERVSERVATION	TOTAL VOL REMOVED/WELL VOLUMES	METHOD	COMPLETION DATE
MW-6S	7.02	10.4	1850	48	CLEAR	5.3 / 5	BAILER	5/4/90
MW-6I	7.76	16.7	1150	25	CLEAR, SULFIDE ODOR	30.5 / 6	BAILER/SUCTION PUMP	5/2/90
MW-6D	7.42	14.2	1225	35	CLEAR, SULFIDE ODOR	49.5 / 7	BAILER/SUCTION PUMP	5/2/90
MW-7S	6.53	12.2	990	53	CLEAR, SOLVENT ODOR	21 / 10	BAILER	5/9/90
MW-7I	7.56	12.5	1150	20	CLEAR, OIL SHEEN	63 / 10	BAILER/SUCTION PUMP	5/9/90
MW-7D	7.50	16.7	1500	32	CLEAR, SULFIDE ODOR	45 / 6	BAILER/SUCTION PUMP	5/9/90
MW-8S	6.11	11.1	300	30	CLEAR	45.5 / 28	BAILER	5/8/90
MW-8I	7.11	12.7	1150	100	TURBID, LIGHT GRAY	83 / 14	BAILER	5/8/90
MW-8D	7.28	12.9	2200	19	CLEAR, SULFIDE ODOR	38 / 6		5/8/90
PZ-9	7.11	14.6	1050	24	CLEAR	50.5 / 10	BAILER/SUCTION PUMP	5/2/90
MW-9S	7.06	8.7	600	47	CLEAR	10.8 / 6	BAILER	5/1/90
MW-9I	7.19	12.5	1100	46	CLEAR, SULFIDE ODOR	185 / 29	BAILER/SUCTION PUMP	5/1/90
MW-10S	7.08	9.8	800	15	CLEAR	10 / 4	BAILER	5/4/90
MW-10I	7.14	13.3	1050	46	CLEAR, SULFIDE ODOR	25.4 / 5	BAILER	5/3/90
MW-11S	6.74	9.2	1350	>100	TURBID, LIGHT BROWN	18 / 10	BAILER	5/8/90
MW-11I	7.15	11.0	1300	42	SLIGHTLY CLOUDY	55 / 11	BAILER	5/8/90
MW-12S	6.00	9.8	760	46	CLEAR	19.5 / 13	BAILER	5/9/90
MW-12I	6.79	15.1	1475	35	CLEAR, SULFIDE ODOR	50 / 11	BAILER/SUCTION PUMP	5/9/90
MW-13S	7.02	9.4	1800	33	CLEAR	9.2 / 4	BAILER	5/10/90
MW-14S	6.71	10.2	1900	>100	TURBID, FUEL OIL ODOR	24 / 12	BAILER	5/11/90
MW-15S	6.60	10.5	750	41	CLEAR	13 / 7	BAILER	5/10/90
MW-16I	7.12	10.6	1200	>100	TURBID, SULFIDE ODOR	81 / 19	BAILER	5/8/90

PRELIMINARY

	pH				Specific Conductance			
	mean	std dev	min	max	mean	std dev	min	max
'S' series wells (shallow overburden)	6.69	0.39	6.00	7.08	1110	576	300	1900
'PZ' piezometer (lower overburden)	7.11	0.00	7.11	7.11	1050	0	1050	1050
'I' series wells (upper bedrock)	7.23	0.30	6.79	7.76	1197	134	1050	1475
'D' series wells (deeper bedrock)	7.40	0.1[illegible]	7.28	7.50	1642	503	1225	2200

PRELIMINARY

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 - 7010

Thomas C. Jorling
Commissioner

MAY 3 1990

Mr. Mark Gregor
Environmental Analyst
Department of Environmental Services
City Hall
30 Church Street
Rochester, New York 14614

Dear Mr. Gregor:

Re: Rochester Fire Academy
(Site #:828015)

During field investigations at the Rochester Fire Academy, I requested an additional soil boring with a split spoon soil sample analysis. This was completed on Wednesday, May 2. The boring and sample was not stated in the scope of work of the approved revised work plan.

Per your request, I investigated the requirements of receipts for reimbursement. Receipts must be submitted by the City of Rochester for any costs it seeks to have reimbursed. The State of New York does not use a per diem method for reimbursement in the EQBA Title 3 Program.

If you have any questions, please contact me at (518) 457-1641.

Sincerely,

Gerard W Burke

Gerard W. Burke
Project Manager
Bureau of Eastern Remedial Action
Division of Hazardous Waste Remediation

cc: J. Chairenzelli
R. Elliott
T. Caffoe
K. Bainbridge

XC Gunther

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 - 7010

Thomas C. Jorling
Commissioner

APR 10 1990

Mr. Mark Gregor
Environmental Analyst
Department of Environmental Services
City Hall
30 Church Street
Rochester, New York 14614

Dear Mr. Gregor:

Re: Rochester Fire Academy
(Site #828015)

As mutually agreed upon by the City of Rochester and the New York State Department of Environmental Conservation, the following tasks are added to the revised scope of work that was approved on April 2, 1990:

1) A background soil boring sample will be taken from an upgradient monitoring well location and analyzed for metals (agreed by telephone-4/6/90).

2) All monitoring wells will remain as stated in the revised scope of work, except: The upgradient well couplet located at E2440,N1210 will be shifted to location E2550,N1210 (agreed at meeting on site-4/5/90).

3) An additional monitoring well will be installed at the overburden/bedrock interface at a point north of the north disposal area (agreed at meeting on site-4/5/90).

4) Sampling of surface soils to detect 2,3,7,8 Tetrachloro-dibenzo-p-dioxin (2,3,7,8 TCDD) will be conducted at six locations on the Fire Academy property (agreed at meeting on site-4/5/90). If 2,3,7,8-TCDD is detected at a sampling location, a full Dioxin series will be run at that location.

If you disagree with any of the above, please contact me at (518)457-1641.

Sincerely,

Gerard W Burke

Gerard W. Burke
Project Manager
Bureau of Eastern Remedial Action
Division of Hazardous Waste
Remediation

cc: T. Caffoe, Region 8
J. Chairenzelli, NYSDOH
R. Elliott, Monroe County DOH

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.
ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

April 3, 1990

Mr. Gerard Burke
Bureau of Eastern Remedial Action
Division of Hazardous Waste Remediation
New York State Department
of Environmental Conservation
50 Wolf Road
Albany, New York 12233

Dear Mr. Burke:

This letter documents changes to our decontamination procedure as described in Appendix G of the Rochester Fire Academy RI/FS Work Plan (dated December 1987 and revised June 1988). Appendix G states that steam cleaning, followed by a soap and water wash, a tap water rinse, an acetone rinse, a hexane rinse, and a tap water rinse would be used to decontaminate the split-spoon samplers. It is my understanding, based on a telephone conversation between you and Kent Bainbridge on March 29, 1990 that a detergent wash followed by a clean water rinse (tap water followed by distilled water) is suitable. If oily materials are encountered, the following wash sequence will apply: a detergent wash, an isopropanol rinse and a clean water rinse (as described above).

If you have any questions in regard to this matter, please contact myself or Kent Bainbridge at (716) 828-1300.

Very truly yours,

MALCOLM PIRNIE, INC.

Richard Frappa (KCB)

Richard Frappa
Project Hydrogeologist

c: M. Gregor (C-Rochester)
K. Bainbridge (MPI)
G. Funk
File: C-6

0965-04-1
plb/RHF03300.L2

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 - 7010

Thomas C. Jorling
Commissioner

APR 02 1990

Mr. Mark Gregor
Environmental Analyst
Department of Environmental Services
City Hall
30 Church Street
Rochester, New York 14614

Dear Mr. Gregor:

Re: Rochester Fire Academy
(Site #828015)

The New York State Department of Environmental Conservation approves the changes in the scope of work proposed by the City of Rochester for remedial activities at the Rochester Fire Academy.

The final locations for monitoring wells will be established at a meeting with all the parties that are involved prior to the beginning of drilling activities at this site. If you have any questions please contact me at (518) 457-1641.

Sincerely,

Gerard W. Burke

Gerard W. Burke
Project Manager
Bureau of Eastern Remedial Action
Division of Hazardous Waste
Remediation

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 -7010

Thomas C. Jorling
Commissioner

APR 19 1990

Mr. Mark Gregor
Environmental Analyst
Department of Environmental Services
City Hall
30 Church Street
Rochester, New York 14614

Dear Mr. Gregor:

Re: Rochester Fire Academy
(Site #828015)

As mutually agreed upon by the City of Rochester and the New York State Department of Environmental Conservation, the following task is added to the revised scope of work that was approved on April 2, 1990:

1) A piezometer will be added to the upgradient monitoring well couplet located to the west of the south disposal area (agreed on site-4/10/90). This piezometer will be used to demonstrate that the overburden soil is in hydraulic communication with the fractured bedrock.

If you have any comments, please contact me at (518)457-1641.

Sincerely,

Gerard W Burke

Gerard W. Burke
Project Manager
Bureau of Eastern Remedial Action
Division of Hazardous Waste
Remediation

cc: T. Caffoe, Region 8
J. Chairenzelli, NYSDOH
R. Elliott, Monroe County DOH

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 - 7010

JUN 1 1 1990

Thomas C. Jorling
Commissioner

Mr. Kent Bainbridge
Project Manager
Malcolm Pirnie Inc.
S. 3515 Abbott Road
Buffalo, New York 14219

Dear Mr. Bainbridge:

RE: Rochester Fire Academy
Site #828015

This correspondence is to confirm that the Department of Environmental Conservation (DEC) has authorized a deviation from the quality assurance/quality control (QA/QC) sampling analysis requirements.

The requirements of the DEC's QA/QC protocols states that for every 20 samples analyzed, there must be a mass spike and mass spike duplicate (MS/MSD). Malcolm Pirnie, Inc., sent 21 samples for analysis. The DEC waives the requirement for a second MS/MSD for the 21 samples, in this case only.

If you have any questions, please contact me at 518-457-1641.

Sincerely,

Gerard W Burke

Gerard W. Burke
Project Manager
Bureau of Eastern Remedial Action
Division of Hazardous Waste
Remediation

cc: M. Gregor, City of Rochester
B. Seeley, QA/QC, BHSC
T. Caffoe, Region 8

APPENDIX C

GEOLOGY/HYDROGEOLOGY

APPENDIX C.1

BOREHOLE LOGS

BOREHOLE LOG MW-6D

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1171.90, E1987.59
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/6/90-4/9/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: RHF
SURFACE ELEVATION: 526.30 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
1	525.3	FILL Black, gravelly ballast, loose, moist	1 SS	3 2 3 4	12	5	JHS=0.1
2	524.3	Red brown silty clay, trace fine sand, occasional silt varve and subangular gravel, firm, moist					
3	523.3		2 SS	5 6 7 8	8	13	JHS=0
4	522.3	4.0 ft					
		BROWN CLAYEY SILT Red brown silty clay, trace fine sand, occasional silt varve, subangular fine gravel, and vegetative matter, very plastic, moist becoming wet					
5	521.3		3 SS	4 3 5 7	11	8	JHS=0
6	520.3	Red brown silty sandy clay with occasional silt and fine to medium sand varves, moderately to very plastic, moist, wet at varves					
7	519.3		4 SS	6 9 7 8	16	16	JHS=0
8	518.3	Red brown sandy silt, trace coarse sand and clay, moderately plastic, wet; Red brown sandy clay, moist to wet					
9	517.3		5 SS	3 7 11 14	15	18	JHS=0
10	516.3	Red brown silt, little clay, trace fine sand, occasional coarse sand and fine gravel, firm, moist					
11	515.3		6 SS	3 11 16 21	19	27	JHS=0
12	514.3	Red brown clayey silt, occasional fine subrounded gravel, moderately plastic, moist					
13	513.3		7 SS	16 22 29 40	20	51	JHS=0
14	512.3	Red brown silty clay, occasional fine subrounded gravel, very plastic, moist					
15	511.3		8 SS	9 11 14 14	16	25	JHS=0
16	510.3	Red brown clay, little silt, very plastic, moist to wet					
17	509.3		9 SS	3 3 2 3	24	5	JHS=0
18	508.3						

BOREHOLE LOG MW-6D

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1171.90, E1987.59
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/6/90-4/9/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: RHF
SURFACE ELEVATION: 526.30 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	GRAPHIC LOG	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
		GRAY CLAYEY SILT Gray clay, litle silt, very plastic, peanut butter like texture						
19	507.3			10 SS	WH 2 1 2	24	3	
20	506.3							
21	505.3			11 SS	WH WH WH WH	24	0	
22	504.3							
23	503.3	Gray fine sand, some silt, little clay, moderately loose, wet		12 SS	WR WR 2 2	24	2	
24	502.3	Gray silt, little clay and very fine sand, plastic, wet						
25	501.3			13 SS	WH WH WH WH	24	0	
26	500.3							
27	499.3			14 SS	WR WR WR WH	24	0	
28	498.3	Same, except grading to very plastic clay with little silt						
29	497.3			15 SS	WR WR WH 3	24	0	
30	496.3							
31	495.3	GRAY SAND AND GRAVEL Gray fine sand and silt, some fine to medium subrounded gravel, trace clay, wet		16 SS	WH 10 4 3	19	14	
32	494.3	Gray fine sand and silt, some fine subrounded gravel, loose, wet						
33	493.3			17 SS	WH WH 2 100	7	2	
34	492.3	TOP OF BEDROCK AT 34.0 FT BGS						100 blow counts/4" 50 blow counts/0"
35	491.3			18 SS	50 - - -	0	0	
36	490.3							

BOREHOLE LOG MW-6D

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1171.90, E1987.59
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/6/90-4/9/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: RHF
SURFACE ELEVATION: 526.30 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	GRAPHIC LOG	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	'N'-VALUE (0–100)	COMMENTS
37	489.3	Hard gray to dark gray, coarse grained laminated dolostone, upper 2' broken to moderately broken, rest massive, calcite and chalcopyrite mineralization occuring along some fractures, slightly weathered, serveral 1/4 to 1" vugs, some mineralized, styolites present							
38	488.3								
39	487.3								
40	486.3	BOREHOLE COMPLETED TO 54.4 FT BGS							
41	485.3								
42	484.3								
43	483.3								
44	482.3								
45	481.3								
46	480.3								
47	479.3								
48	478.3								
49	477.3								
50	476.3								
51	475.3								
52	474.3								
53	473.3								
54	472.3								

PAGE 1 OF 1

PRELIMINARY STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PROJECT NAME: Rochester Fire Academy RI/FS
GROUND ELEVATION:
HOLE DESIGNATION: MW-6D
PROJECT NO.: 0965-04-1
REFERENCE ELEVATION:
DATE LOGGED: 4/11/90
SUPERVISOR: C. Funk
CLIENT: City of Rochester
GEOLOGIST: R. Frappa / M. Rothstein
LOCATION:

FROM	AT	TO	RUN	INT	DESCRIPTION AND REMARKS	H_2O	REC. FT	REC. %	RQD FT	RQD %
34'	34'	44'	1	10'	Hard Gray to Dk Gray coarse grained laminated Dolostone Broken to moderately Broken (upper 2') laminated or massive, Calcite & chalcopyrite mineralization occurring along some fractures generally horizontal along bedding planes slightly weathered several 1/4" to 1" Vugs (some mineralized)	0% Return 300 gal	9.5	95	6.1	64
44'	44	54'	2	10'	Same as previous except massive; Vugs generally mineralized	0% Return 30 gal	10	100	9.1	91
6I 4/17/90 36.6	36.6	44.6	1	8'	Hard Gray to dark gray coarse grained, laminated dolostone, moderately broken, weathered along fractures (mixed) some vugs, occ'l mineralized		8	100	6.4	80
44.6	44.6	45.1	2	.5'	same as above, but not fractured		.5	100	.5	100
-										

BOREHOLE LOG MW-7D

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1019.44, E1042.33
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/19/90-4/20/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: RHF
SURFACE ELEVATION: 517.30 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
		FILL Black, loose, organic-rich silt, abundant rootlets, occasional cinders					
1	516.3	BROWN SILTY SAND (ALLUVIUM) Black organic-rich silt with abundant roots grading to dark brown to medium brown silty fine sand, little clay, moderately plastic, moist	1 SS	3 5 50 -	19	55	JHS=0.4 50 blow counts/5"
2	515.3						
3	514.3	Brown fine sand and silt mottled with gray fine sand, trace clay, some black staining, wet	2 SS	2 2 3 16	20	5	JHS=100 Strong sweet odor noted
4	513.3	MOTTLED BROWN/GRAY SILTY SAND (ALLUVIUM) Gray medium sand, some silt, little medium to coarse subangular gravel, moderately loose, wet					
5	512.3		3 SS	11 33 30 18	17	63	JHS=170
6	511.3	Gray brown silty fine to medium sand, little subrounded fine to coarse gravel, moderately dense, wet					
7	510.3		4 SS	13 36 14 19	10	50	JHS=14
8	509.3	Gray fine sand and silt, mottled with orange brown, some fine to coarse subangular gravel, dense, wet					
9	508.3		5 SS	14	16	45	JHS=15
10	507.3	GRAY SAND AND GRAVEL Gray fine to medium sand, some fine to coarse subangular gravel, dense, wet					
11	506.3		6 SS	5 7 11 16	20	18	JHS=20
12	505.3	Same, except moderately loose					
13	504.3		7 SS	8 10 12 10	8	22	JHS=20
14	503.3	Gray fine to coarse subangular gravel in a fine sand matrix, moderately dense, wet					
15	502.3		8 SS	6 25 15 15	20	40	JHS=350
16	501.3	Gray fine to coarse subangular gravel, some fine to medium sand and silt, moderately dense, wet					
17	500.3		9 SS	8 13 35 50	12	48	JHS=40 50 blow counts/1"
18	499.3						

BOREHOLE LOG MW-7D

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1019.44, E1042.33
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/19/90-4/20/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: RHF
SURFACE ELEVATION: 517.30 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
		Gray silty fine to medium sand and fine to coarse gravel, moderately dense, wet					
19	498.3		10 SS	7 12 15 13	18	27	JHS=50
20	497.3						
21	496.3		11 SS	13 25 50 -	16	75	JHS=30 50 blow counts/5"
22	495.3						
23	494.3		12 SS	8 10 14 26	18	24	JHS=15
24	493.3						
25	492.3		13 SS	20 28 44 50	17	62	JHS=10 50 blow counts/4"
26	491.3	Gray fine sand and silt, some fine to coarse subrounded gravel, dense, moist					
27	490.3		14 SS	36 35 42 44	16	76	JHS=5
28	489.3						
29	488.3		15 SS	9 14 28 39	19	42	JHS=5
30	487.3	TOP OF BEDROCK AT 30.2 FT BGS.					50 blow counts/2" No recovery
31	486.3	Hard, gray, slightly weathered dolostone, laminated, moderately broken 31.5 to 33 feet, very broken from 33 to 34 feet, rest moderately broken to massive, some dolomite gravel from solution cavity, slight diesel fuel odor noted	16 SS	50 - - -	0	50	
32	485.3						Strong oily sheen on rods Black grease-like blebs on return water with oily sheen halos
33	484.3						
34	483.3						
35	482.3	BOREHOLE COMPLETED TO 50.2 FT BGS.					
36	481.3						

MALCOLM PIRNIE

PRELIMINARY STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PAGE ____ OF ____

PROJECT NAME: ____ GROUND ELEVATION: ____ HOLE DESIGNATION: MW-7I

PROJECT NO.: ____ REFERENCE ELEVATION: ____ DATE LOGGED: 4/90

CLIENT: ____ SUPERVISOR: G. Funk

LOCATION: ____ NX CORE GEOLOGIST: R. Frappa

FROM	AT	TO	RUN	INT	DESCRIPTION AND REMARKS	H_2O	REC. FT	REC. %	RQD FT	RQD %
31	31	41	1	10'	Same rock as described in 7D, with small vugs,		9.45	95	8.5	90
					some mineralized, some horizontal fractures					

MALCOLM PIRNIE

PRELIMINARY STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PAGE 1 OF 1

PROJECT NAME: Fire Academy RI/FS
GROUND ELEVATION:
HOLE DESIGNATION: MW-7D
PROJECT NO.: 0965-04-1
REFERENCE ELEVATION:
DATE LOGGED:
CLIENT: City of Rochester
SUPERVISOR: G. Funk
LOCATION: Rochester, NY
GEOLOGIST: R. Frappa

4/24/90 drilling

Site	FROM	AT	TO	RUN	INT	DESCRIPTION AND REMARKS	H_2O	REC. FT	REC. %	RQD FT	RQD %
HQ	31.5	31.5	34	1	2.5	* Hard Gray Slightly weathered Dolostone, Coarse grained, laminated	return 75%	2.9	110	2.1	75
						31.5 - 33 Mod. Broken 33 - 34 V. Broken - some subrounded					
						dolomitic gravel from solution cavity? - Slight diesel fuel					
						odor - strong oily sheen on rods. Black grease-like					
						Blebs on return water w/ oil sheen Halos					
NX	34		41	2	7		return 50%				
		37				Solution cavity - 6" Void in Rock	return 0%				
	41		50	3	9		return 0%	8.0	89	6.8	84

* Top of Rock 30.2'

BOREHOLE LOG MW-8D

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N819.00, E2299.75
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/12/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: RHF
SURFACE ELEVATION: 517.20 ft.AMSL

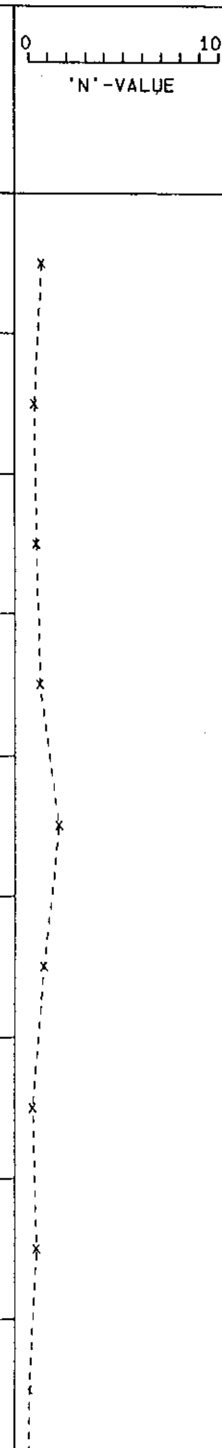
SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
1	516.2	BROWN SILTY SAND (ALLUVIUM) Brown fine sand and silt, with vegetative matter, upper 6" organic-rich, moist	1 SS	2 2 5 5	16	7	JHS=0
2	515.2	Brown silty fine sand, occasional roots, moderately loose, moist becoming wet					
3	514.2		2 SS	1 1 2 1	17	3	JHS=0
4	513.2	MOTTLED BROWN/GRAY SILTY SAND (ALLUVIUM) Brown silty fine sand, occasional mottling with gray fine sand, moderately loose, wet					
5	512.2		3 SS	2 2 2 2	8	4	JHS=0
6	511.2	Same, grading to silt, trace clay					
7	510.2		4 SS	WH 1 5 5	24	6	JHS=0
8	509.2	Brown silty fine sand, trace clay, slightly mottled with gray silt, moderately dense, wet					
9	508.2		5 SS	4 7 9 9	16	16	JHS=0
10	507.2						
11	506.2	GRAY SAND AND GRAVEL Gray fine sand, little silt, loose, wet	6 SS	3 4 4 4	24	8	JHS=0
12	505.2	Gray silty fine sand, some medium sand, trace clay and vegetative material, wet					
13	504.2		7 SS	WH WH 2 2	24	2	JHS=0
14	503.2						
15	502.2		8 SS	1 2 2 2	24	4	JHS=0.1
16	501.2	Same, with increasing amounts of sand					
17	500.2		9 SS	WR WR WR 3	24	0	JHS=0
18	499.2						



BOREHOLE LOG MW-8D

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N819.00, E2299.75
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/12/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: RHF
SURFACE ELEVATION: 517.20 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
		Gray medium sand, loose, wet					
19	498.2		10 SS	WR WR WR WR	24	0	JHS=0
20	497.2	Gray medium sand, some fine subrounded gravel, moderately loose					
21	496.2	Gray medium to coarse sand and fine to coarse subangular gravel	11 SS	24 54 47 27	24	101	JHS=0
22	495.2						
23	494.2						
24	493.2	Gray silty fine sand, some fine to medium subrounded gravel, slightly plastic, wet					
25	492.2		12 SS	2 4 5 3	16	9	JHS=0
26	491.2	Gray silt and fine sand, some medium sand and fine to coarse subangular gravel, slightly plastic, wet					
27	490.2		13 SS	11 9 10 12	8	19	JHS=0
28	489.2						
29	488.2		14 SS	12 24 34 100	10	58	JHS=0
30	487.2	TOP OF BEDROCK AT 30.0 FT BGS					100 blow counts/3"
							100 blow counts/1"
31	486.2	Hard gray, coarse grained, laminated, dolostone, moderately broken, vuggy in areas with gypsum mineralization, fractures occur along bedding planes	15 SS	100 - - -		100	
32	485.2						
33	484.2						
34	483.2	BOREHOLE COMPLETED TO 50.0 FT BGS.					
35	482.2						
36	481.2						

MALCOLM PIRNIE

PRELIMINARY STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PROJECT NAME: Rochester Fire Academy RI/FS

GROUND ELEVATION:

HOLE DESIGNATION: MW-8D

PROJECT NO.: 0965-04-1

REFERENCE ELEVATION:

DATE LOGGED: 4/13/90

CLIENT: City of Rochester

SUPERVISOR:

LOCATION: Rochester, N.Y.

GEOLOGIST: R. Frappa

FROM	AT	TO	RUN	INT	DESCRIPTION AND REMARKS	H_2O	REC. FT	REC. %	RQD FT	RQD %
31.2	31.2	41.2	1	10'	Hard Gray coursegrained, laminated Dolostone	lost return @ 31' 25 gal				
					Moderately Broken Vuggy in areas w/ gypsum mineralization		9.8	98	6.9	70
					fractures occur along bedding planes					
41.2	41.2	50	2	8.8	Same as previous less broken, massive 4.1' continuous (No Breaks)	Variable 20-90% return 100 gal	8.8	100	7.2	82
					For MW-8I					
31.8	31.8	41.8	1	10'	Same as previous large Calcite x/s in Vug	Lost 70 gal	10	100%	7.4	74
					some sphalerite x/s along fracture					

BOREHOLE LOG MW-9I

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1242.68, E1034.92
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/5/90-4/6/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 526.50 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	GRAPHIC LOG	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	'N'-VALUE (0–100)	COMMENTS
1	525.5	FILL Black, coarse sand and slag, trace vegetation, moist		1 SS	2 2 2 2	6	4		
2	524.5	Same, except moist to wet, trace brick							
3	523.5			2 SS	3 3 4 4	8	7		
4	522.5	Same, except trace coal and silt, wet							
5	521.5			3 SS	3 4 16 5	5	20		
6	520.5	6.0 BROWN CLAYEY SILT							
7	519.5	Gray fine to coarse sand, some silt and clay, trace shell fragments and subangular gravel, wet		4 SS	3 5 4 6	13	9		
8	518.5	Red brown fine sand, some silt, wet; Red brown silty clay, stiff, dry to moist; Varved red brown and gray silty clay, stiff, dry to moist							
9	517.5			5 SS	5 8 13 11	11	21		
10	516.5	Same except not varved							
11	515.5	Red brown sandy clay, moist to wet		6 SS	3 5 6 8	24	11		
12	514.5	Red brown silty clay, stiff, dry to moist; Red brown sandy clay, trace fine subrounded gravel, wet							
13	513.5	Red brown silty clay, some fine sand, plastic, moist to wet		7 SS	2 2 5 4	24	7		
14	512.5	Red brown fine sand, some silt, wet; Red brown silty clay, some fine sand, plastic, moist to wet							
15	511.5			8 SS	3 1 2 3	20	3		
16	510.5								
17	509.5			9 SS	3 2 3 3	23	5		
18	508.5								

BOREHOLE LOG MW-9I

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1242.68, E1034.92
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/5/90-4/6/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 526.50 ft.AMSL

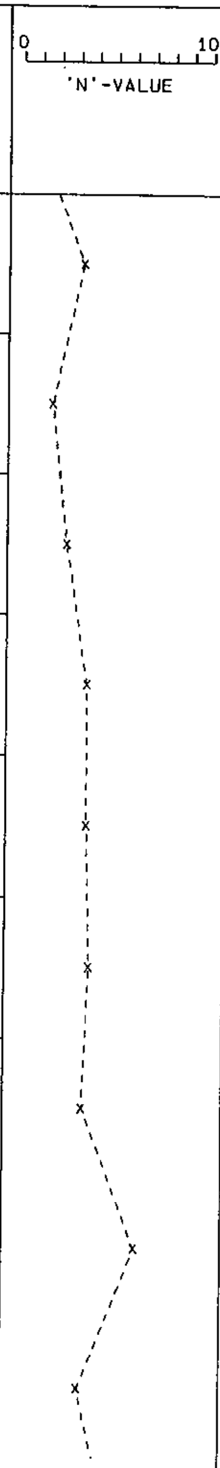
SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
		Brown silty fine sand, some fine to coarse sand seams, wet					
19	507.5	BROWN SAND AND GRAVEL Brown fine to coarse sand, some fine to coarse subangular gravel, trace silt and clay, wet	10 SS	2 10 22 20	20	32	
20	506.5						
21	505.5		11 SS	WR 6 10 7	20	16	
22	504.5	Brown silty fine sand, some subangular gravel, moderately loose, wet					
23	503.5		12 SS	9 9 15 6	8	24	
24	502.5	Same, except moderately dense					
25	501.5		13 SS	8 17 18 22	20	35	
26	500.5						
27	499.5		14 SS	13 17 18 15	13	35	
28	498.5						
29	497.5		15 SS	6 14 23 21	14	37	
30	496.5						
31	495.5		16 SS	8 12 22 18	7	34	
32	494.5						
33	493.5		17 SS	15 34 28 40	12	62	
34	492.5	Brown fine to coarse sand and fine to coarse angular gravel, trace silt, wet					
35	491.5		18 SS	25 20 13 50	15	33	
36	490.5						



BOREHOLE LOG MW-9I

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1242.68, E1034.92
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/5/90-4/6/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 526.50 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	GRAPHIC LOG	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	'N'-VALUE (0–100)	COMMENTS
37	489.5			19 SS	57 50 - -	6	50		50 blow counts/3"
38	488.5	BEDROCK AT 38.1							
39	487.5	Hard, massive, gray dolostone, moderately broken, weathered along fractures, occasional vertical fractures and mud seams, mineralization along some fractures, with calcite crystals 1/4", occasional vugs, some mineralized.		20 SS	75 - - -	0	75		75 blow counts/0"
40	486.5								
41	485.5								
42	484.5	BOREHOLE COMPLETED TO 49.6 ft BGS							
43	483.5								
44	482.5								
45	481.5								
46	480.5								
47	479.5								
48	478.5								
49	477.5								
50	476.5								
51	475.5								
52	474.5								
53	473.5								
54	472.5								

PRELIMINARY STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PROJECT NAME: Rochester Fire Academy RD/RI

GROUND ELEVATION:

HOLE DESIGNATION: MW-9I

PROJECT NO.: 0565-04-1

REFERENCE ELEVATION:

DATE LOGGED: 4/11/90

CLIENT: City of Rochester

SUPERVISOR: G. Funk

LOCATION: Rochester, NY

GEOLOGIST: M. Rothstein

FROM	AT	TO	RUN	INT	DESCRIPTION AND REMARKS	H_2O	REC. FT	REC. %	RQD FT	RQD %
39	39	40	1	1'	Hard moderately weathered gray Dolostone Broken, Some mineralization	Return to 46' lugs below	1.0	100	0	0
40	40	49.6	2	9.6'	Hard Massive gray Dolostone broken weathered along fractures Occl Vertical fractures mineralization along large fractures (Calcite xls ¼" dia) Occl Vugs Some mineralization occuring occl mud seams	↓	9.3	97	5.4	58

BOREHOLE LOG MW-10I

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1220.31, E2549.44
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/18/90-4/19/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 523.90 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Jar Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	GRAPHIC LOG	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	'N'-VALUE (0–100)	COMMENTS
1	522.9	FILL Black, coarse sand and fine cinders, loose, coffee grounds texture, dry		1 SS	2 3 3 1	12	6	x	
2	521.9	Grey fine sand, some fine to coarse subangular gravel, wet							
3	520.9	Black coarse sand and fine subangular gravel, dry 2.3 ft		2 SS	2 3 5 6	12	8	x	
4	519.9	BROWN CLAYEY SILT Red brown clayey silt, moderately dense, stiff, dry to moist, occasional roots, native							
5	518.9	Same, except occasional fine sand, no roots, stiff, moist		3 SS	2 3 6 8	14	9	x	
6	517.9								
7	516.9			4 SS	4 5 6 8	20	11	x	
8	515.9	Same, except occasional fine subangular gravel							
9	514.9			5 SS	3 3 4 5	24	7	x	
10	513.9	Same, except some plasticity, trace fine sand							
11	512.9			6 SS	2 3 3 2	24	6	x	
12	511.9								
13	510.9	Red brown fine sand, some silt, wet Red brown clayey silt, moderately dense, moderately stiff, moist		7 SS	2 4 4 4	24	8	x	
14	509.9	Red brown clayey, sandy, silt, loose, wet							
15	508.9	Same, except moderately stiff GRAY CLAYEY SILT Grey and red brown silty clay, soft, plastic, wet		8 SS	WR 1 1 1	24	2	x	
16	507.9	Same, except with occasional fine subangular gravel, wet							
17	506.9			9 SS	WR WH 5 3	24	5	x	
18	505.9								

MALCOLM PIRNIE, INC.

BOREHOLE LOG MW-10I

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1220.31, E2549.44
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/18/90-4/19/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 523.90 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Jar Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
19	504.9	GRAY SAND AND GRAVEL Gray fine sand, some fine to coarse subangular gravel, trace silt, loose, wet	10 SS	WH 3 4 11	12	7	
20	503.9						
21	502.9		11 SS	2 3 4 12	11	7	
22	501.9						100 blows/4"
23	500.9		12 SS	100 - - -	4	100	
24	499.9	Boulder or dolostone bedrock shelf encountered from 24.0 to 27.5 ft. BGS					
25	498.9						
26	497.9						
27	496.9						
28	495.9	Highly fractured gray dolostone and red brown coarse subrounded very coarse gravel					
29	494.9						
30	493.9	Basal fluvial coarse subrounded gravel, multicolored and multicomposotional, some fine white to clear quartz gravel					
31	492.9	TOP OF BEDROCK AT 31.0 FT BGS					
32	491.9	Hard, gray to dark gray coarse grained, laminated, dolostone, moderately broken, weathered along fractures, one gypsum layer, occasional vugs, most mineralized					
33	490.9						
34	489.9						
35	488.9	BOREHOLE COMPLETED TO 43.0 FT BGS.					
36	487.9						

PRELIMINARY STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PROJECT NAME: Rochester Fire Academy RI/FS
GROUND ELEVATION:
HOLE DESIGNATION: MW-10I

PROJECT NO.: 0965-04-1
REFERENCE ELEVATION:
DATE LOGGED: 4/23/90

CLIENT: City of Rochester
SUPERVISOR: G. Funk

LOCATION: Rochester, NY
GEOLOGIST: M. Rothstein

FROM	AT	TO	RUN	INT	DESCRIPTION AND REMARKS	H_2O	REC. FT	REC. %	RQD FT	RQD %
24.5	24.5	27.5	1	3'	Hard, Gray to dark gray coarse grained laminated dolostone, moderately broken, weathered along fractures very weathered at bottom.		1.1	33	.55	50
27.5	27.5	29	2	1.7	Same rock as above, except highly fractured in pieces. Several ~~pieces~~ fragments are a brown-maroon color, ~~and~~ generally weathered. Maroon fragments react vigourously to HCl. Dark grey show mild reaction.		1.7	18	0	0
31.8	31.8	33.3	3	1.5	Hard Dk Gray to gray coarse grained, laminated dolostone top 1' very broken in fragments. The rest is moderately ~~broken~~ fractured along bedding planes.		1.5	100	.45	30
33.3	33.3	43	4	10	Hard, Gray to dark gray coarse grained, laminated dolostone moderately broken, weathered along fractures, one gypsum layer, occ'l vugs, most mineral filled ~~top 1' highly fractured~~		9.65	97	8.7	90

BOREHOLE LOG MW-11I

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N916.14, E2564.54
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/23/90-4/24/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 517.40 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Jar Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
		BROWN SILTY SAND (ALLUVIUM)					
1	516.4	Dark brown sandy silt, organic-rich, roots, moist Yellow brown silty fine sand, wet	1 SS	2 3 2 3	12	5	JHS=0
2	515.4	Ochre fine sandy silt, moderately plastic grading to fine sand, little silt, becoming less plastic, moist					
3	514.4		2 SS	2 3 3 4	12	6	JHS=0
4	513.4	MOTTLED BROWN/GRAY SILTY SAND (ALLUVIUM) Ochre and gray mottled fine sand, occasional roots, moist to very moist at bottom					
5	512.4		3 SS	3 5 5 5	18	10	JHS=0
6	511.4	Same, except trace clay, no roots, moist to wet					
7	510.4		4 SS	2 3 4 5	14	7	JHS=0
8	509.4	Ochre and gray mottled fine sandy silt, trace clay, orange iron staining, black blebs or concretions 1-2 mm, moderately stiff, wet					
9	508.4		5 SS	2 3 2 3	21	5	JHS=0
10	507.4						
11	506.4	GRAY SAND AND GRAVEL Dark gray fine sand, trace silt and clay, uniform, wet	6 SS	1 WR 2 1	22	2	JHS=0
12	505.4						
13	504.4	Same, with tree parts up to 0.15' long	7 SS	WH WH 1 2	20	1	JHS=0
14	503.4	Same, with occasional tree parts and subrounded fine gravel					
15	502.4		8 SS	1 1 2 2	15	3	
16	501.4	Dark gray silty fine to coarse sand, some fine to coarse subrounded gravel, loose, wet					
17	500.4		9 SS	10 12 11 10	18	23	JHS=0
18	499.4						

BOREHOLE LOG MW-11I

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
ROCHESTER, N.Y.
SURVEY COORDINATES: N916.14, E2564.54
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/23/90-4/24/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 517.40 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Jar Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
19	498.4		10 SS	4 15 10 3	12	25	JHS=3
20	497.4						
21	496.4		11 SS	WR 2 5 5	10	7	JHS=0
22	495.4						
23	494.4		12 SS	WR 5 6 50	12	11	JHS=0 50 blow counts/4"
24	493.4	TOP OF BEDROCK AT 24.1 FT BGS					100 blow counts/1"
25	492.4	Dark gray to gray coarse grained dolostone, moderately fractured, slight weathering along fractures, occasional vugs up to 1" in diameter, many mineralized	13 SS	100 - - -	1	100	
26	491.4						
27	490.4						
28	489.4	BOREHOLE COMPLETED TO 35.2 FT BGS					
29	488.4						
30	487.4						
31	486.4						
32	485.4						
33	484.4						
34	483.4						
35	482.4						
36	481.4						

MALCOLM PIRNIE, INC.

Malcolm Pirnie

PRELIMINARY STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PAGE ____ OF ____

PROJECT NAME: Fire Academy RI/FS
GROUND ELEVATION: ____
HOLE DESIGNATION: MW-11 I

PROJECT NO.: 0965 04 1
REFERENCE ELEVATION: ____
DATE LOGGED: ____

CLIENT: City of Rochester
SUPERVISOR: G. Funk

LOCATION: Rochester, NY
GEOLOGIST: M. Rothstein

FROM	AT	TO	RUN	INT	DESCRIPTION AND REMARKS	H_2O	REC. FT	REC. %	RQD FT	RQD %
25	25	32.9	1	7.9	Dk. gray to gray coarse grained dolostone, mod. fractured, slight		7.1	90	4.4	62%
					weathering along horizontal fractures, occl. vugs, some					
					~1", many mineralized					
32.9	32.9	35.3	2	2.4	same as above		2.4	100	1.42	59

BOREHOLE LOG MW-12I

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N746.31, E1604.34
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 5/2/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 518.80 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
- Sampler Refusal

JHS Total VOC Detected in the Sample Jar Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg

x---x Penetration Resistance ('N' Blows/6in)
o---o Moisture Content ('W' %)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
1	517.8	BROWN SILTY SAND (ALLUVIUM) Dark brown organic rich soil, occasional roots and gravel, dry; Yellow brown fine sandy silt, occasional roots, dry	1 SS	3 6 12 12	14	18	JHS=0
2	516.8	Yellow brown silty fine sand, occasional roots, moist to wet at bottom					
3	515.8		2 SS	4 6 4 6	16	10	JHS=0
4	514.8	Same, with some iron staining, wet					
5	513.8		3 SS	1 4 5 6	19	9	JHS=0
6	512.8						
7	511.8	MOTTLED BROWN/GRAY SILTY SAND (ALLUVIUM) Ochre and gray mottled fine sandy silt with varves of fine sand, orange and black iron staining, wet	4 SS	2 4 6 6	21	10	JHS=0
8	510.8	Ochre and gray mottled silty fine sand with 1" thick varves of stiffer sandy silt, orange and black iron staining, wet					
9	509.8		5 SS	2 3 5 4	21	8	JHS=0
10	508.8	Same, except no black staining					
11	507.8		6 SS	1 2 2 2	24	4	JHS=0
12	506.8	GRAY AND BROWN SAND AND GRAVEL					
13	505.8	Dark gray fine sand, uniform, wet	7 SS	1 1 2 2	24	3	JHS=0
14	504.8	Same, with occasional subrounded gravel; Brown fine to coarse sand and fine to coarse subangular gravel, wet					
15	503.8		8 SS	5 49 40 40	22	89	JHS=0
16	502.8						
17	501.8		9 SS	9 41 24 9	22	65	
18	500.8						

BOREHOLE LOG MW-12I (Overburden)

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N746.31, E1604.34
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 5/2/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 518.80 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Jar Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
19	499.8	Pinkish gray clayey silt, some fine to coarse subangular gravel, trace fine sand, soft, plastic, wet	10 SS	7 15 20 14	14	35	JHS=0.6
20	498.8	Pinkish gray fine sandy silt, some fine to coarse subangular gravel, trace clay, soupy, wet					
21	497.8	Brown fine to coarse sand and fine to coarse subrounded gravel, trace silt, wet	11 SS	29 16 27 22	14	43	JHS=0.6
22	496.8						
23	495.8		12 SS	29 17 21 61	14	38	JHS=0.8
24	494.8	TOP OF BEDROCK AT 24.0 FT BGS.					
25	493.8	Dark gray to gray coarse grained dolostone, hard, massive, moderately fractured, occasional vertical fractures and small vugs, most mineralized, weathered along fractures, 1/2" thick clay seam at 35 ft BGS.	13 SS	50 - - -	3	50	JHS=0.4 50 Blow Counts/0"
26	492.8						
27	491.8						
28	490.8	BOREHOLE COMPLETED TO 35 FT BGS.					
29	489.8						
30	488.8						
31	487.8						
32	486.8						
33	485.8						
34	484.8						
35	483.8						
36	482.8						

MALCOLM PIRNIE

PRELIMINARY STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PAGE ____ OF ____

PROJECT NAME: ____ GROUND ELEVATION: ____ HOLE DESIGNATION: MW-12I

PROJECT NO.: ____ REFERENCE ELEVATION: ____ DATE LOGGED: 5/90

CLIENT: ____ SUPERVISOR: G. Funk

LOCATION: ____ NX CORE GEOLOGIST: M. Rothstein

FROM	AT	TO	RUN	INT	DESCRIPTION AND REMARKS	H_2O	REC. FT	REC. %	RQD FT	RQD %
25	25	32	1	7'	Dk. gray to gray, coarse grained dolostone, hard, massive, mod. fractures, occl vertical fractures, occl small vugs, most mineralized, weathering along horizontal fractures		5.75	82	4.8	83
32	32	35	2	3	Broken, fragments of rock above, gray clay-mud seams, 1/2" thick clay on bottom of core, weathered		1.3	33	0	0

BOREHOLE LOG MW-13S (Overburden)

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1038.13, E1700.25
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 5/1/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 519.40 ft.AMSL

SYMBOLS AND DEFINITIONS

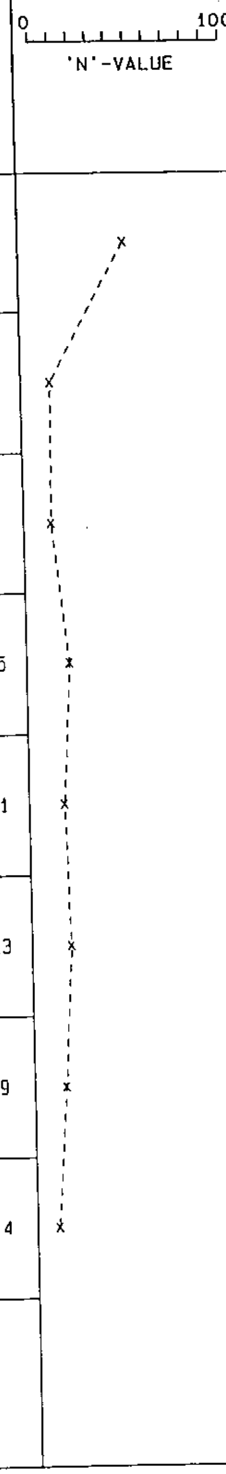
SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Jar Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg

x---x Penetration Resistance ('N' Blows/6in)
o---o Moisture Content ('W' %)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	GRAPHIC LOG	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
1	518.4	FILL Sand, silt and coarse gravel, fill material; Burnt layer of charcoal material; Brown fine sand, dry to moist		1 SS	11 22 26 15	14	48	JHS=1.8
2	517.4	2.0 ft						
3	516.4	BROWN CLAYEY SILT Olive brown fine sand, wet		2 SS	3 4 4 4	15	8	JHS=0
4	515.4	Red brown silt, trace fine sand and clay, stiff, moist						
5	514.4			3 SS	1 2 5 8	17	7	JHS=0
6	513.4	Same, with 7 varves of red brown sandy silt about 1/2" wide, varves are wet						
7	512.4			4 SS	6 7 8 11	24	15	JHS=0
8	511.4							
9	510.4			5 SS	5 6 5 8	22	11	JHS=0
10	509.4	Same, grading to brown fine sandy, clayey, silt, plastic, wet						
11	508.4			6 SS	3 5 8 6	22	13	JHS=0
12	507.4	Red brown silty fine sand, wet						
13	506.4	Red brown silty fine sand, some clay, soft, plastic, wet		7 SS	WR 4 5 4	21	9	JHS=0
14	505.4							
15	504.4			8 SS	WR 2 2 3	21	4	JHS=0
16	503.4	BOREHOLE COMPLETED TO 16.1 FT BGS						
17	502.4							
18	501.4							

'N'-VALUE



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BOREHOLE LOG MW-14S (Overburden)

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1000.87, E2248.79
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/30/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 518.10 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Jar Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg

x---x Penetration Resistance ('N' Blows/6in)
o---o Moisture Content ('W' %)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
0	518.1	FILL Silty, sandy, gravely fill, dry					
1	517.1		1 SS	17 100 - -	8	100	100 blow counts/4" JHS=120
2	516.1	Brown silty fine sand, some gravel; 2.9 ft					
3	515.1	BROWN SILTY SAND (ALLUVIUM) Dark brown silt, some clay, trace fine sand, occasional roots, native, moist	2 SS	3 7 3 5	15	10	JHS=200
4	514.1	MOTTLED BROWN/GRAY SILTY SAND (ALLUVIUM) Ochre and gray mottled fine sandy silt, stiff, moist becoming wet at bottom					
5	513.1		3 SS	3 5 7 6	18	12	JHS=130
6	512.1	Same with fine sandy varves 1" thick					
7	511.1		4 SS	3 3 3 3	20	6	JHS=65
8	510.1	Brown medium to fine sand, wet					
9	509.1		5 SS	3 2 1 2	22	3	JHS=45
10	508.1	GRAY SAND AND GRAVEL					
11	507.1	Dark gray fine sand, wet	6 SS	WR 2 2 3	11	4	JHS=10
12	506.1						
13	505.1		7 SS	2 2 2 1	23	4	JHS=35
14	504.1	BOREHOLE COMPLETED TO 14.4 FT BGS.					
15	503.1						
16	502.1						
17	501.1						
18	500.1						

BOREHOLE LOG MW-15S (Overburden)

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N1432.44, E1861.81
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 5/1/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 517.70 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Jar Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg

x---x Penetration Resistance ('N' Blows/6in)
o---o Moisture Content ('W' %)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	COMMENTS
1	516.7	BROWN SILTY SAND (ALLUVIUM) Brown organic-rich fine to medium sand, some fine to coarse gravel, occasional roots, dry	1 SS	11 31 33 19	17	64	JHS=1.8
2	515.7	Olive gray fine sand, trace silt and clay, occasional roots, moist					
3	514.7		2 SS	4 4 3 4	9	7	JHS=1.2
4	513.7	MOTTLED BROWN/GRAY SILTY SAND (ALLUVIUM) Brown fine to medium sand, occasional gray mottling and roots, wet					
5	512.7		3 SS	1 2 1 1	21	3	JHS=1.2
6	511.7						
7	510.7	Ochre and gray mottled fine sandy silt, iron staining- orange and dark brown, moderately dense, moderately stiff, wet	4 SS	WR 2 2 3	18	4	JHS=2.2
8	509.7	Ochre and gray mottled fine sand, iron staining, wet					
9	508.7	Same, with more silt and moderately stiff	5 SS	2 2 3 4	18	5	JHS=3.5
10	507.7	Same, with occasional small roots					
11	506.7		6 SS	WH 2 2 3	21	4	JHS=12
12	505.7	GRAY SAND AND GRAVEL Dark grey fine sand, uniform, wet					
13	504.7		7 SS	WR 2 2 2	22	4	JHS=17
14	503.7	BOEHOLE COMLETED TO 14.0 FT BGS.					
15	502.7						
16	501.7						
17	500.7						
18	499.7						

BOREHOLE LOG MW-16I

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N956.82, E2805.92
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/26/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 516.10 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Jar Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	'N'-VALUE (0–100)	COMMENTS
1	515.1	BROWN SILTY SAND (ALLUVIUM) Yellow brown silty fine sand, occasional roots, wet	1 SS	1 1 2 2	13	3		JHS=0
2	514.1							
3	513.1		2 SS	1 1 WR 2	14	1		JHS=0
4	512.1	MOTTLED BROWN/GRAY SILTY SAND (ALLUVIUM) Ochre and gray mottled silty fine sand, occasional roots and iron staining						
5	511.1	Same, with no roots	3 SS	WR 2 2 2	18	4		JHS=0
6	510.1	Ochre and gray mottled fine sandy silt, trace clay, iron staining (orange) and dark iron blebs (1-2mm), moderately stiff, wet						
7	509.1		4 SS	2 3 3 4	19	6		JHS=0
8	508.1							
9	507.1		5 SS	1 1 2 1	21	3		JHS=0
		GRAY AND BROWN SAND AND GRAVEL						
10	506.1	Dark gray fine sand, trace silt and clay, uniform, loose, wet						
11	505.1		6 SS	WR 1 1 1	22	2		
12	504.1	Same, with tree part 0.5" thick in sampler						
13	503.1	Red brown fine sandy silt, some fine to coarse subrounded gravel, moderately dense and stiff, wet	7 SS	2 10 7 4	14	17		
14	502.1							
15	501.1		8 SS	3 5 8 8	15	13		JHS=0
16	500.1							
17	499.1		9 SS	7 9 6 8	9	15		
18	498.1							

BOREHOLE LOG MW-16I

PROJECT: ROCHESTER FIRE ACADEMY RI/FS
PROJECT NO.: 0965-04-1
LOCATION: ROCHESTER, N.Y.
SURVEY COORDINATES: N956.82, E2805.92
SURVEY DATUM: TBM1, TBM2

CLIENT: CITY OF ROCHESTER
DRILLING DATES: 4/26/90
DRILLING METHOD: 6.25-inch ID HSA
LOGGED/CHECKED BY: MKR
SURFACE ELEVATION: 516.10 ft.AMSL

SYMBOLS AND DEFINITIONS

SS Split Spoon (2in.ID)
ST Shelby Tube (2.8in.ID)
WR Weight of Rods
WH Weight of Hammer
NR No Recovery
\- Sampler Refusal

JHS Total VOC Detected in the Sample Jar Head Space (ppm)
GSD Grain Size Dist.
ATT Atterberg Limit

x---x Penetration Resistance ('N' Blows/6in)

DEPTH (ft.BGS)	ELEVATION (ft AMSL)	SOIL DESCRIPTION	GRAPHIC LOG	SAMPLE NO. & SAMPLE TYPE	BLOWS / 6"	RECOVERY (in)	'N'-VALUE	'N'-VALUE (0–100)	COMMENTS
		Same, with more gravel Fine to coarse angular gravel, trace fine to coarse sand, loose, bedrock fragments, wet		10 SS	50 50 100 -	6	100		50 blow counts/0" at 18.5'. Augered from 18.5 to 19.5 ft. Sampled at 19.5 ft. 100 blow counts/0.5"
19	497.1	TOP OF BEDROCK AT 18.5 FT BGS							
20	496.1	Dark gray to gray, coarse grained dolostone, hard, massive, moderately fractured, occasional vugs, some mineralized, weathered along fractures							
21	495.1								
22	494.1	BOREHOLE COMPLETED TO 29.4 FT BGS.							
23	493.1								
24	492.1								
25	491.1								
26	490.1								
27	489.1								
28	488.1								
29	487.1								
30	486.1								
31	485.1								
32	484.1								
33	483.1								
34	482.1								
35	481.1								
36	480.1								

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PAGE ____ OF ____

PRELIMINARY STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PROJECT NAME: Fire Academy RI/FS

PROJECT NO.: 0965 04 1

CLIENT: City of Rochester

LOCATION: Rochester, NY

GROUND ELEVATION: ____

REFERENCE ELEVATION: ____

HOLE DESIGNATION: MW-16I

DATE LOGGED: 5/90

SUPERVISOR: G. Funk

GEOLOGIST: M. Rothstein

FROM	AT	TO	RUN	INT	DESCRIPTION AND REMARKS	H_2O	REC. FT	REC. %	RQD FT	RQD %
19.4	19.4	29.4	1	10'	DK gray to gray, coarse grained dolostone, hard, massive, moderately fractured, occl vugs, some mineralized, weathered along fractures.	9.7 (?)	9.1	91	6.6	73

FIELD BOREHOLE LOG

PROJECT NAME: Rochester Fire Academy RI/FS
SURFACE ELEV.: ____
BOREHOLE NO.: B-1 E2500,N1050

PROJECT NO.: 0965 041
REFERENCE ELEV.: ____
DATE STARTED: 5-1-90

CLIENT: City of Rochester
CONTRACTOR: Buffalo Drilling
DATE FINISHED: 5-1-90

LOCATION: Rochester, NY
LOGGED BY: RHF
METHOD OF BORING: 3 1/4" HSA

DEPTH (BGS)	SAMPLE NO.	SAMPLE TYPE	BLOWS (6")	REC. (")	SOIL CLASSIFICATION	DESCRIPTION AND REMARKS Density/Consistency, Color, Plasticity, Soil Types, Texture, Fabric, Bedding, Moisture, Other Characteristics	SAMPLES	MOISTURE (%)	PENETROMETER	HNu (ppm)
0			20			0-8" - Black Organic-Rich silt w/abundant				
	1	SS	30	14"		rootlets some fn sand	A*			1.4
			8			8-14" - Firm Brown silt tr clay slightly				
2			9			Plastic moist some Black charcoal				
2			3			Firm Brown silt tr clay and fn sand	VOA			
	2	SS	6	16"		occl Subangular gravel	A*			.2
			6			some Black charcoal-like cinders				
4			7			moist → wet in shoe				
						Saturated conditions encountered 4'				

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* A zone composite

SHEET NO. 1 OF 1

FIELD BOREHOLE LOG

PROJECT NAME: Fire Academy RI/FS SURFACE ELEV.: ______ BOREHOLE NO.: B-2

PROJECT NO.: 0965 041 REFERENCE ELEV.: ______ DATE STARTED: 5-2-90

CLIENT: City of Rochester CONTRACTOR: Buffalo Drilling DATE FINISHED: ______

LOCATION: Rochester NY LOGGED BY: RHF METHOD OF BORING: 3¼" HSA

DEPTH (BGS)	SAMPLE NO.	SAMPLE TYPE	BLOWS (6")	REC. (")	SOIL CLASSIFICATION	DESCRIPTION AND REMARKS Density/Consistency, Color, Plasticity, Soil Types, Texture, Fabric, Bedding, Moisture, Other Characteristics	SAMPLES	MOISTURE (%)	PENETROMETER	HNu (ppm)
0			9			Crushed Stone Fill - Subangular Cs gravel				
	SS	1	16	6"		with some silt and fn sand - loose	VOA			500 ppm
			9				o/s,			
2			25			* moist	metals CN			
2										
	SS	2		6"		Same as Previous				100
						wet				
4										
				100						
						* More sample volume needed; pulled and				
						1' - Down 2 4" VOA sample taken				
						1 extra spoon				

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SHEET NO. ___ OF ___

FIELD BOREHOLE LOG

PROJECT NAME: Fire Academy RI/FS
SURFACE ELEV.: ______
BOREHOLE NO.: B-3

PROJECT NO.: 0965 04.1
REFERENCE ELEV.: ______
DATE STARTED: 5-2-90

CLIENT: City of Rochester
CONTRACTOR: Buffalo Drilling
DATE FINISHED: 5-2-90

LOCATION: Rochester, New York
LOGGED BY: RHF
METHOD OF BORING: 3¼" HSA

DEPTH (BGS)	SAMPLE NO.	SAMPLE TYPE	BLOWS (6")	REC. (")	SOIL CLASSIFICATION	DESCRIPTION AND REMARKS Density/Consistency, Color, Plasticity, Soil Types, Texture, Fabric, Bedding, Moisture, Other Characteristics	SAMPLES	MOISTURE (%)	PENETROMETER	HNu (ppm)
0		3	6			Loose Gray brown silty fn-med sand				
		SS	6	16"						
			7				Y			45
2			8			dry to moist				
2			8			Loose Gray silty fn sand tr clay moist	Y VOA			10
		SS	7	21"		Bottom 8" wet				
			4				N			
4			3							
						4 spoons to make enough volume				

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SHEET NO. ____ OF ____

FIELD BOREHOLE LOG

PROJECT NAME: Fire Academy RI/FS
PROJECT NO.: 0965 041
CLIENT: City of Rochester
LOCATION: Rochester NY

SURFACE ELEV.:
REFERENCE ELEV.:
CONTRACTOR: Buff Drilling
LOGGED BY: RHF

BOREHOLE NO.: B-4 E1850 N950
DATE STARTED: 5-2-90
DATE FINISHED: 5-2-90
METHOD OF BORING: 3¼" HSA

DEPTH (BGS)	SAMPLE NO.	SAMPLE TYPE	BLOWS (6")	REC. (")	SOIL CLASSIFICATION	DESCRIPTION AND REMARKS Density/Consistency, Color, Plasticity, Soil Types, Texture, Fabric, Bedding, Moisture, Other Characteristics	SAMPLES	MOISTURE (%)	PENETROMETER	HNu (ppm)
0			2			Loose fine-cs subangular gravel some gray				
	1		3	8"		Silt + fine-cs Sand. Black Oily Material in areas	VOA			50
			4			Strong disel fuel Odor wet @ spoon shoe	VOA/pH/pH			
2			4							
2			3			Firm Gray silty fn Sand Saturated				
	2		2	16						20
			3							
4			3							
						4 Spoons to make enough Volume				

MALCOLM PIRNIE

SHEET NO. ___ OF ___

FIELD BOREHOLE LOG

PROJECT NAME: Fire Academy RI/FS
SURFACE ELEV.:
BOREHOLE NO.: B-5
PROJECT NO.: 0965 04 1
REFERENCE ELEV.:
DATE STARTED: 5/4/90
CLIENT: City of Rochester
CONTRACTOR: Buf. Drilling
DATE FINISHED: 5/4/90
LOCATION: Rochester, NY
LOGGED BY: RHF
METHOD OF BORING: Split spoon only

DEPTH (BGS)	SAMPLE NO.	SAMPLE TYPE	BLOWS (6")	REC. (")	SOIL CLASSIFICATION	DESCRIPTION AND REMARKS Density/Consistency, Color, Plasticity, Soil Types, Texture, Fabric, Bedding, Moisture, Other Characteristics	SAMPLES	MOISTURE (%)	PENETROMETER	HNu (ppm)
0						Organic Rich Dk Brown silt, native				0
2.3						wet in shoe				

MALCOLM PIRNIE

SHEET NO. ___ OF ___

FIELD BOREHOLE LOG

PROJECT NAME: Rochester Fire Academy Elks SURFACE ELEV.: ______ BOREHOLE NO.: B-6

PROJECT NO.: 0965 04 1 REFERENCE ELEV.: ______ DATE STARTED: 5/4/90

CLIENT: City of Rochester CONTRACTOR: Buffalo Drilling DATE FINISHED: 5/4/90

LOCATION: Rochester, NY LOGGED BY: RHF METHOD OF BORING: Split Spoon Only

DEPTH (BGS)	SAMPLE NO.	SAMPLE TYPE	BLOWS (6")	REC. (")	SOIL CLASSIFICATION	DESCRIPTION AND REMARKS Density/Consistency, Color, Plasticity, Soil Types, Texture, Fabric, Bedding, Moisture, Other Characteristics	SAMPLES	MOISTURE (%)	PENETROMETER	HNu (ppm)
0						Black cindery material 0-1' dry				
						Dense Brown silt moist mat in shoe				20
2.2						Bottle set 31				

MALCOLM PIRNIE

SHEET NO. ____ OF ____

FIELD BOREHOLE LOG

PROJECT NAME: Fire Academy RI/FS
SURFACE ELEV.:
BOREHOLE NO.: B-7

PROJECT NO.: 0965 041
REFERENCE ELEV.:
DATE STARTED: 5/4/90

CLIENT: City of Rochester
CONTRACTOR: Buffalo Drilling
DATE FINISHED: 5/4/90

LOCATION: Rochester, NY
LOGGED BY: RHF
METHOD OF BORING: Split spoon only

DEPTH (BGS)	SAMPLE NO.	SAMPLE TYPE	BLOWS (6")	REC. (")	SOIL CLASSIFICATION	DESCRIPTION AND REMARKS Density/Consistency, Color, Plasticity, Soil Types, Texture, Fabric, Bedding, Moisture, Other Characteristics	SAMPLES	MOISTURE (%)	PENETROMETER	HNu (ppm)
0						Dense Brown silt with inshes [illegible]				
				18		Native				1.4
2						Bottle Set 32				

MALCOLM PIRNIE

SHEET NO. ____ OF ____

FIELD BOREHOLE LOG

PROJECT NAME: Fire Academy RI/FS
PROJECT NO.: 0965 041
CLIENT: City of Rochester
LOCATION: Rochester N.Y.
SURFACE ELEV.:
REFERENCE ELEV.:
CONTRACTOR: Buff. Drilling
LOGGED BY: RHF
BOREHOLE NO.: B-8
DATE STARTED: 5/2/90
DATE FINISHED: 5/2/90
METHOD OF BORING: 3 1/4" HSA

DEPTH (BGS)	SAMPLE NO.	SAMPLE TYPE	BLOWS (6")	REC. (")	SOIL CLASSIFICATION	DESCRIPTION AND REMARKS Density/Consistency, Color, Plasticity, Soil Types, Texture, Fabric, Bedding, Moisture, Other Characteristics	SAMPLES	MOISTURE (%)	PENETROMETER	HNu (ppm)
0			5			Firm Brown ~~Gray~~ silt and fn sand tr subrd				
	SS	1	7	18"		gravel some Black Staining observed				
			7				X			8.12
2			8			moist				
2			3			0-8" Same as previous moist				
	SS	2	4	16"		8-16" Loose silty fn sand Gray ~~wet~~	X			1.2
			3			moist	X			
4			4							
4			2			Same as 8-16" Wet				
	SS	3	3	9"			X			.8
			2							
6			3							

Location - swampy area adjacent to fence & Bike path

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SHEET NO. ____ OF ____

APPENDIX C.2

WELL CONSTRUCTION PROCEDURES

UPGRADIENT WELLS

Deep and Intermediate Bedrock Wells (9I, 6I, 6D, 10I):

Borings were advanced by 6¼" hollow stem augers to the top of bedrock. The deepest well at each location (MW-6D, MW-10I, and MW-9I) was continuously sampled through the overburden to the top of bedrock. Four (4)-inch I.D. temporary steel casing was inserted into the borehole and advanced two feet into bedrock to minimize the potential for down-hole contamination during bedrock drilling. The boring was then advanced through the temporary steel casing by means of an HQ core (3 7/8" diameter hole) to a depth of 12 feet below the top of bedrock for the intermediate wells or 20 feet below the top of bedrock for the deep wells.

Upon completion of the borehole, the screen and riser were installed within the 4-inch casing. The 4-inch casing was removed as the sandpack was emplaced. The screen, riser and sandpack were used in accordance with Work Plan specifications. Above the sandpack, a 4-foot bentonite seal was emplaced and allowed to hydrate before a cement-bentonite grout was tremied to the surface. In many of the wells several inches of fine sand was placed above the bentonite seal before grout emplacement to prevent grout invasion. A lockable 4" steel protective casing was installed at each well site.

SHALLOW WELLS (9S, 6S, 10S AND PZ-9):

All shallow boreholes were drilled using 6¼-inch hollow stem augers to a depth where the screen would straddle the water table based on saturated conditions in adjacent deep or intermediate wells. All wells were installed using 10 foot lengths of 2-inch I.D. 0.010-inch PVC screens, and 2-inch I.D. PVC riser as stated in the Interim Report. The sand pack consists of #2QROK sand to a maximum depth of two feet above the top of the screen. A one to three foot thick bentonite pellet seal was placed above the sandpack and allowed to hydrate. The borehole was then grouted to the surface using a bentonite-cement. Protective casing was installed as described in the Work Plan.

A piezometer (P2-9) was added to the scope of project (documentation presented in Appendix B) to determine if hydraulic communication exists between the lower overburden and upper bedrock (MW-9I). This piezometer was constructed as described above except that a five foot screen was used to better define the zone to be monitored.

DOWN GRADIENT WELLS

Deep and Intermediate Bedrock Wells (7I, 7D, 8I, 8D, 11I, 12I, 16I)

Borings were advanced by 6¼" hollow stem augers to the top of bedrock. The deepest well at each site (MW-7D, MW-8D, MW-11I, and MW-16I) were continuously sampled through the overburden to the top of bedrock. Four (4)-inch I.D. permanent steel casing was inserted into the borehole and advanced two feet into bedrock to minimize the potential for downhole contamination during bedrock drilling. The casing was then grouted in place and allowed to set overnight. The boring was then advanced through the permanent steel casing by means of and HQ core barrel (3 7/8-inch diameter hole) to a depth of 12 feet below the top of rock for the intermediate wells or 20 feet below the top of bedrock for the deep wells. Frequent borehole collapse during bedrock coring required the use of temporary 3-inch diameter steel casing to prevent further collapse of the borehole. At those locations, (MW-8I, MW-7D, and MW-12I), an Nx core barrel (2 7/8-inch diameter) was used to advance the borehole through the 3-inch casing. Upon borehole completion, the screen, riser and sandpack were installed within the temporary 3-inch casing (as documented in Appendix B).

Upon completion of the borehole, the well screen and riser were installed as specified in the Work Plan. Five foot screen lengths were placed in the deep wells. All intermediate wells have ten foot screens except MW-12I which has a five foot screen due to collapse of the borehole. This change is documented in Appendix B.

For the intermediate wells, the top of the screen is at the bottom of the 4-inch permanent casing. The sand pack (#4QROK as specified) extends to a maximum of two feet above the top of the screen, inside the casing. In the deep wells, the sand extends to a maximum of two feet above the screen. A four foot bentonite pellet seal was emplaced in all wells, allowed to hydrate and then the well was grouted to the surface except for M-7D. Due to the problems of borehole collapse and the use of temporary 3-inch casing, a 5 foot bentonite slurry was tremied in MW-7D. Locking 6-inch protective steel casing was installed at each well.

SHALLOW WELLS

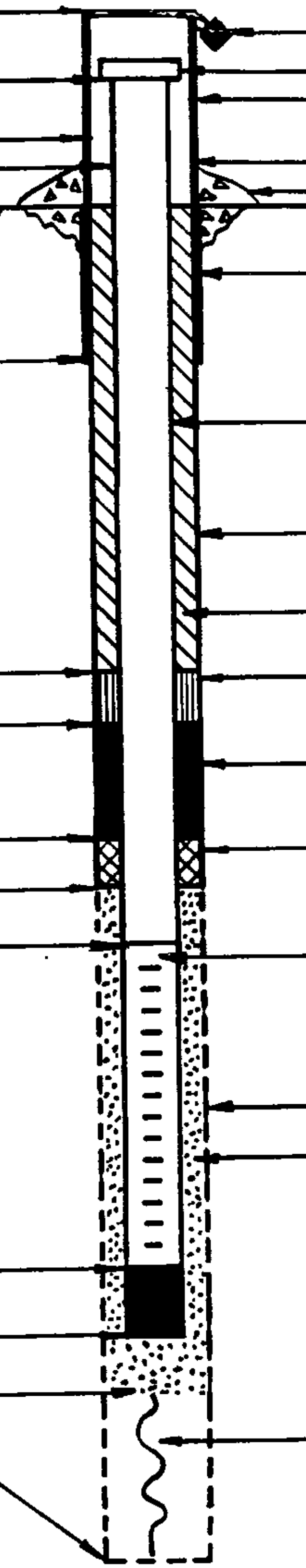
These wells were installed following the same procedure described for upgradient shallow wells. Since MW-13S, MW-14S, and MW-15S are single wells at different locations, each was continuously sampled in accordance with the Work Plan.

APPENDIX C.3

MONITORING WELL CONSTUCTION DETAILS

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch. Fire Academy RI/FS
LOCATION: Rochester, NY
DRILLER: Buffalo Drilling Co
PROJECT NO.: 0965 041
BORING: MW-65
DRILLING METHOD: 6 1/4 HSA
GROUND ELEV.: 526.3
DATE: 4/17/90
DEVELOPMENT METHOD: Bailing
FIELD GEOLOGIST: MKR



ELEV. OF TOP OF PROTECTIVE CASING: 528.17 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 527.86 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 1.87 ft.
STICK-UP RISER PIPE: 1.56 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: NA ft.
DEPTH TOP OF GROUT INVASION BARRIER: NA ft.
DEPTH TOP OF SEAL: 2.4 ft.
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
DEPTH TOP OF PRIMARY SAND PACK: 4.4 ft.
DEPTH TOP OF SCREEN 6.3 ft.
DEPTH BOTTOM OF SCREEN: 16.3 ft.
DEPTH BOTTOM OF SCREEN CAP: 16.4 ft.
DEPTH BOTTOM OF SAND PACK: ~~16.4~~ 17.1 ft.
DEPTH OF HOLE: 17.1 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: NA ft.
TYPE OF SURFACE CASING: NA
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 10 1/4" ft.
TYPE OF BACKFILL: Grout
TYPE OF BARRIER: NA
TYPE OF SEAL: Bentonite Pellets
TYPE OF SAND PACK: NA
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010 x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 10 1/4" ft.
TYPE OF SAND PACK: #2 Q Rok
TYPE OF BACKFILL BELOW OBSERVATION WELL: #2 Q Rok

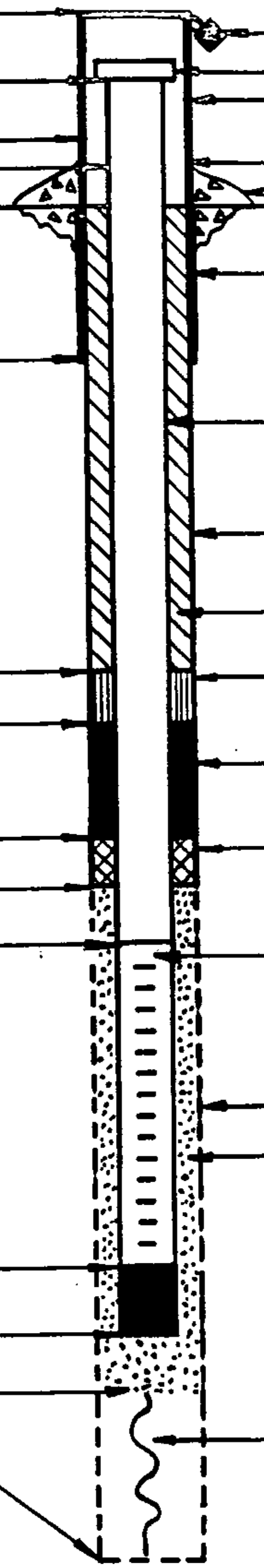
MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch. Fire Academy RI/FS
PROJECT NO.: 0965-04-1
GROUND ELEV.: 526.2
FIELD GEOLOGIST: MKR

LOCATION: Rochester, NY
BORING: MW6I
DATE: 4/17/90

DRILLER: Buffalo Drilling
DRILLING METHOD: 6 1/4 HSA/ NQ Core
DEVELOPMENT METHOD:



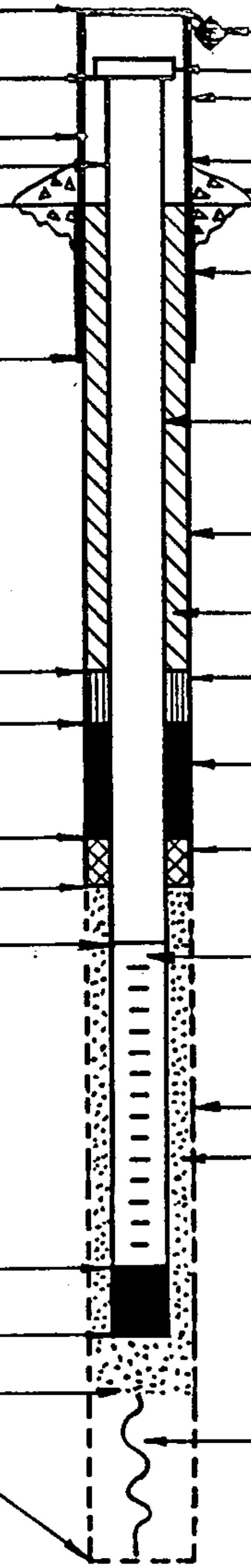
ELEV. OF TOP OF PROTECTIVE CASING: 528.20 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 528.01 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 200 ft.
STICK-UP RISER PIPE: 1.81 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: NA ft.
DEPTH TOP OF GROUT INVASION BARRIER: 30.0 ft.
DEPTH TOP OF SEAL: 30.5 ft.
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
DEPTH TOP OF PRIMARY SAND PACK: 34.0 ft.
DEPTH TOP OF SCREEN 35.0 ft.
DEPTH BOTTOM OF SCREEN: 45.0 ft.
DEPTH BOTTOM OF SCREEN CAP: 45.1 ft.
DEPTH BOTTOM OF SAND PACK: 45.1 ft.
DEPTH OF HOLE: 45.1 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: Cement
I.D. OF SURFACE CASING: NA ft.
TYPE OF SURFACE CASING: NA
RISER PIPE I.D. PVC 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 10 1/4 ft.
TYPE OF BACKFILL: Grout
TYPE OF BARRIER: #4 Q ROK
TYPE OF SEAL: Bentonite Pellets
TYPE OF SAND PACK: NA ~~#4 Q ROK~~
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010 x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 4" ft.
TYPE OF SAND PACK: #4 QROK
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Rochester Fire Academy, RI/FS
LOCATION: 1190 Scottsville Rd
DRILLER: Buffalo Drilling Co
PROJECT NO.: 0565-04-1
BORING: MW-6D
DRILLING METHOD: 6¼" HSA; 4" HQ Rock Coring
GROUND ELEV.: 526.3
DATE: 4/11/90
FIELD GEOLOGIST: R. Frappa
DEVELOPMENT METHOD: ______



ELEV. OF TOP OF PROTECTIVE CASING: 528.39 ft. AMSL

ELEV. OF TOP OF RISER PIPE: 528.19 ft. AMSL

STICK-UP TOP OF PROTECTIVE CASING: 2.09 ft.

STICK-UP RISER PIPE: 1.89 ft.

GROUND SURFACE ELEV.

DEPTH BOTTOM OF SURFACE CASING: N/A ft.

DEPTH TOP OF GROUT INVASION BARRIER: 38.0 ft.

DEPTH TOP OF SEAL: 37.5 ft.

DEPTH TOP OF SECONDARY SAND PACK: N/A ft.

DEPTH TOP OF PRIMARY SAND PACK: 43 ft.

DEPTH TOP OF SCREEN 44 ft.

DEPTH BOTTOM OF SCREEN: 54.0 ft.

DEPTH BOTTOM OF SCREEN CAP: 54.1 ft.

DEPTH BOTTOM OF SAND PACK: 54.4 ft.

DEPTH OF HOLE: 54.4 ft.

LOCKING COVER

WELL CAP

I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.

1/4" WEEP HOLE

TYPE OF SURFACE SEAL: Cement

I.D. OF SURFACE CASING: N/A ft.

TYPE OF SURFACE CASING: ______

RISER PIPE I.D. 2" ft.

TYPE OF RISER PIPE: SCH 40 PVC

BOREHOLE DIA.: 10" ft. to 34.0'

TYPE OF BACKFILL: Cement/Bentonite Grout

TYPE OF BARRIER: Bentonite Pellets with #4 sand

TYPE OF SEAL: Bentonite Pellets

TYPE OF SAND PACK: N/A

TYPE OF SCREEN: SCH 40 PVC

SLOT SIZE x LENGTH: 10-Slot x 10 ft.

I.D. OF SCREEN: 2" ft.

BOREHOLE DIA.: 3 7/8" ft.

TYPE OF SAND PACK: QROK #4 Silica Sand

TYPE OF BACKFILL BELOW OBSERVATION WELL: N/A

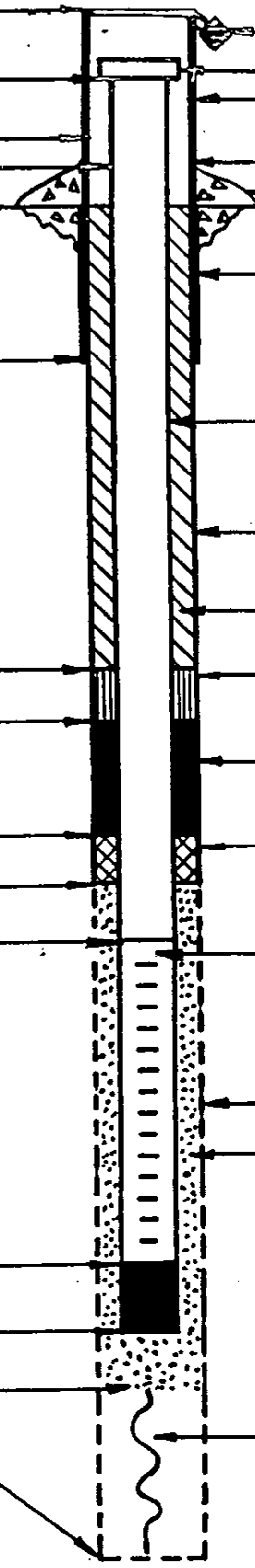
MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Fire Academy RI/FS
PROJECT NO.: 0965 041
GROUND ELEV.: 517.4
FIELD GEOLOGIST: R. Frappa

LOCATION: City of Rochester
BORING: MW-75
DATE: 4/20/10

DRILLER: Buffalo Drilling
DRILLING METHOD: 6 1/4" HSA
DEVELOPMENT METHOD:



ELEV. OF TOP OF PROTECTIVE CASING: 519.69 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 519.38 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.29 ft.
STICK-UP RISER PIPE: 1.98 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: N/A ft.
DEPTH TOP OF GROUT INVASION BARRIER: N/A ft.
DEPTH TOP OF SEAL: 1.5 ft.
DEPTH TOP OF SECONDARY SAND PACK: N/A ft.
DEPTH TOP OF PRIMARY SAND PACK: 2.8 ft.
DEPTH TOP OF SCREEN: 3.0 ft.
DEPTH BOTTOM OF SCREEN: 13.0 ft.
DEPTH BOTTOM OF SCREEN CAP: 13.2 ft.
DEPTH BOTTOM OF SAND PACK: 13.6 ft.
DEPTH OF HOLE: 13.6 ft.

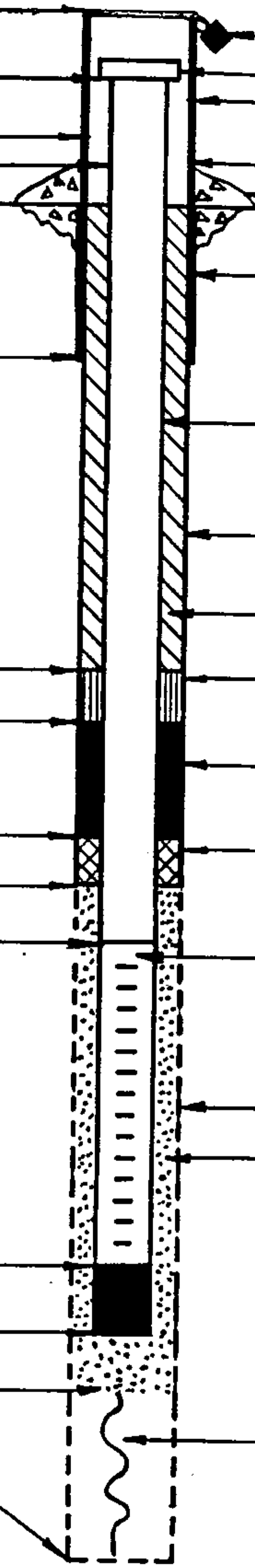
LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: 4" ft.
TYPE OF SURFACE CASING: Thick walled steel casing
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: Sch 40 pvc
BOREHOLE DIA.: 10" ft.
TYPE OF BACKFILL: Cement/Bentonite
TYPE OF BARRIER: N/A
TYPE OF SEAL: Bentonite Pellet
TYPE OF SAND PACK: N/A
TYPE OF SCREEN: PVC SCH40
SLOT SIZE x LENGTH: .025 slot x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 10" ft.
TYPE OF SAND PACK: Silica Sand QROK #2
TYPE OF BACKFILL BELOW OBSERVATION WELL: N/A

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Rochester Fire Academy RI/FS LOCATION: ______
PROJECT NO.: 0965-04-1 BORING: MW-7I
GROUND ELEV.: 517.4 DATE: 5/1/90
FIELD GEOLOGIST: R. Flagg

DRILLER: Buffalo Drilling
DRILLING METHOD: 6 1/4" HSA, Nx Core
DEVELOPMENT METHOD: ______



ELEV. OF TOP OF PROTECTIVE CASING: 519.85 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 519.57 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.48 ft.
STICK-UP RISER PIPE: 2.17 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: 31.0 ft.
DEPTH TOP OF GROUT INVASION BARRIER: 24.3 ft.
DEPTH TOP OF SEAL: 24.8 ft.
DEPTH TOP OF SECONDARY SAND PACK: N/A ft.
DEPTH TOP OF PRIMARY SAND PACK: 28.8 ft.
DEPTH TOP OF SCREEN 30.8 ft.
DEPTH BOTTOM OF SCREEN: 40.8 ft.
DEPTH BOTTOM OF SCREEN CAP: 41.0 ft.
DEPTH BOTTOM OF SAND PACK: 41.0 ft.
DEPTH OF HOLE: 41.0 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 5" X 6' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: 4" ft.
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: SCH 40 PVC
BOREHOLE DIA.: 10" ft.
TYPE OF BACKFILL: Cement Bentonite
TYPE OF BARRIER: #2 Silica Sand
TYPE OF SEAL: Bentonite
TYPE OF SAND PACK: N/A
TYPE OF SCREEN: SCH 40 PVC
SLOT SIZE x LENGTH: 10-Slot x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 3" ft.
TYPE OF SAND PACK: Silica Sand QROK 4
TYPE OF BACKFILL BELOW OBSERVATION WELL: N/A

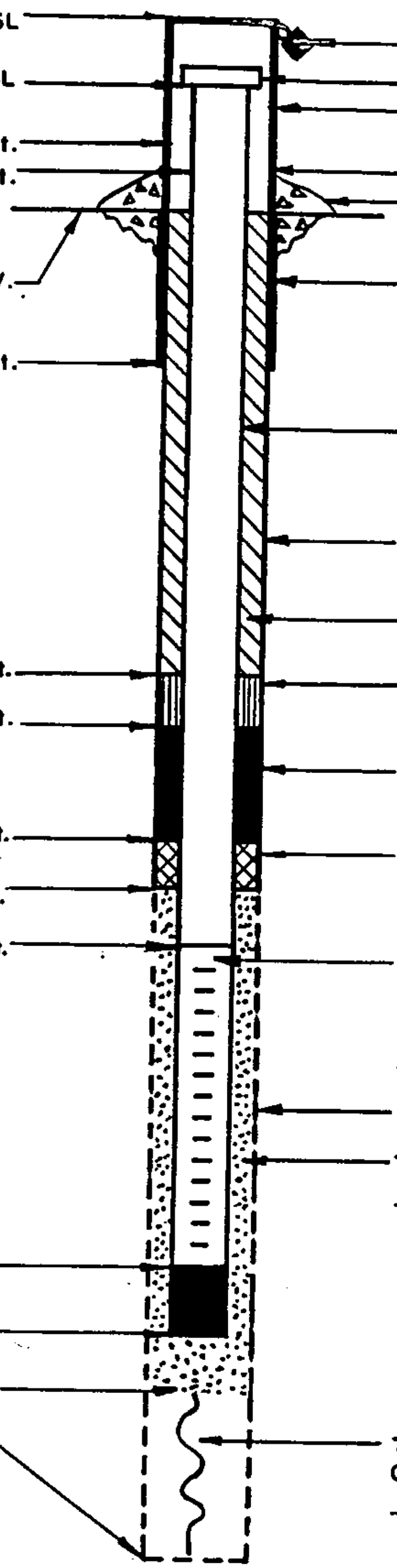
MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Fr. Academy RI/FS
PROJECT NO.: 0565-04-1
GROUND ELEV.: 517.3
FIELD GEOLOGIST: R. Frappa

LOCATION: Rochester, NY
BORING: MW-7D
DATE: 4/30/90

DRILLER: Buffalo Drilling
DRILLING METHOD: 6¼" HSA; 3" flush joint NX core
DEVELOPMENT METHOD: ______



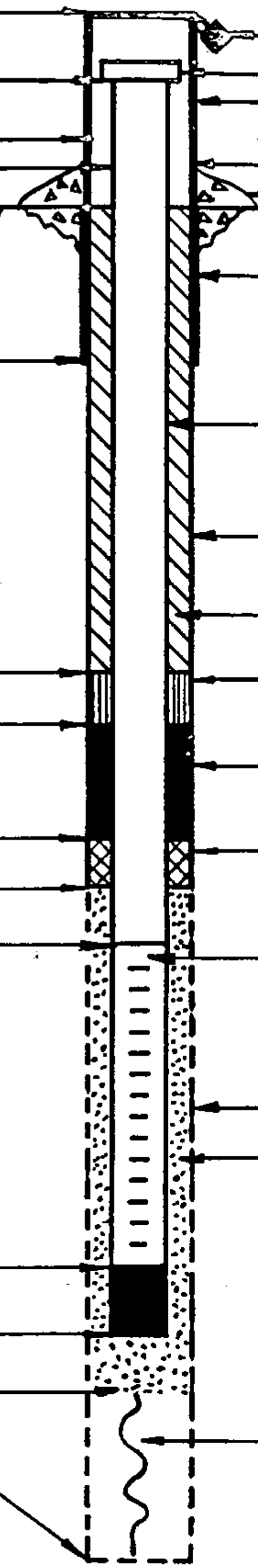
ELEV. OF TOP OF PROTECTIVE CASING: 520.31 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 519.54 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 3.01 ft.
STICK-UP RISER PIPE: 2.24 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: 31 ft.
DEPTH TOP OF GROUT INVASION BARRIER: 37.0 ft.
DEPTH TOP OF SEAL: 37.5 ft.
5' slurry
DEPTH TOP OF SECONDARY SAND PACK: 42.5 ft.
DEPTH TOP OF PRIMARY SAND PACK: 43.0 ft.
DEPTH TOP OF SCREEN ~~45.5~~ ft.
45.0
DEPTH BOTTOM OF SCREEN: ~~49.0~~ ~~44~~ 50 ft.
DEPTH BOTTOM OF SCREEN CAP: ~~49.2~~ 50.2 ft.
DEPTH BOTTOM OF SAND PACK: ~~49.2~~ 50.2 ft.
DEPTH OF HOLE: 50.2 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 6" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: 4" ft.
TYPE OF SURFACE CASING: 4" steel
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 10" ft.
TYPE OF BACKFILL: grout
TYPE OF BARRIER: N/A
TYPE OF SEAL: Bentonite Slurry 85% Bentonite Powder 15% cement
TYPE OF SAND PACK: Silica Sand Q-ROK #1
TYPE OF SCREEN: SCH 40 PVC
SLOT SIZE x LENGTH: 10 slot x 5 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 3" ft.
TYPE OF SAND PACK: Silica Sand Q-ROK #4
TYPE OF BACKFILL BELOW OBSERVATION WELL: cuttings

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Fire Academy
LOCATION: City of Rochester
DRILLER: Buffalo Drilling
PROJECT NO.: 0965-04-1
BORING: MW-8S
DRILLING METHOD: 6¼" HSA
GROUND ELEV.: 517.5
DATE: 4-18-90
FIELD GEOLOGIST: R. Frappa
DEVELOPMENT METHOD: ______



ELEV. OF TOP OF PROTECTIVE CASING: 519.95 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 519.73 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.55 ft.
STICK-UP RISER PIPE: 2.23 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: N/A ft.
DEPTH TOP OF GROUT INVASION BARRIER: 1.4 ft.
DEPTH TOP OF SEAL: 1.5 ft.
DEPTH TOP OF SECONDARY SAND PACK: N/A ft.
DEPTH TOP OF PRIMARY SAND PACK: 3.0 ft.
DEPTH TOP OF SCREEN 4.0 ft.
– Flushmount
DEPTH BOTTOM OF SCREEN: 14.0 ft.
DEPTH BOTTOM OF SCREEN CAP: 14.0 ft.
DEPTH BOTTOM OF SAND PACK: 14.2 ft.
DEPTH OF HOLE: 14.2 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5 ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: N/A ft.
TYPE OF SURFACE CASING: ______
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: SCH 40 PVC
BOREHOLE DIA.: 10" ft.
TYPE OF BACKFILL: Cement/Bentonite
TYPE OF BARRIER: #2 Silica Sand
TYPE OF SEAL: Bentonite Pellet
TYPE OF SAND PACK: N/A
TYPE OF SCREEN: SCH 40 PVC
SLOT SIZE x LENGTH: 10 slot x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 10" ft.
TYPE OF SAND PACK: #2 QROK Silica Sand
TYPE OF BACKFILL BELOW OBSERVATION WELL: N/A

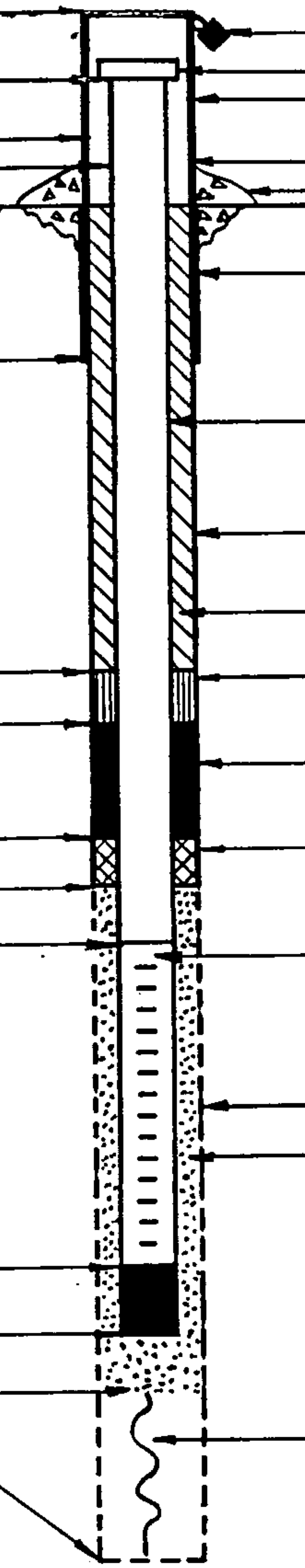
MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Fire Academy RI/FS
PROJECT NO.: 0965-044
GROUND ELEV.: 517.3
FIELD GEOLOGIST: R. Frappa

LOCATION: City of Rochester
BORING: MW-8I
DATE: 4/18/90

DRILLER: Buffalo Drilling Co.
DRILLING METHOD: 6¼" HSA; 4" Rock core
DEVELOPMENT METHOD:



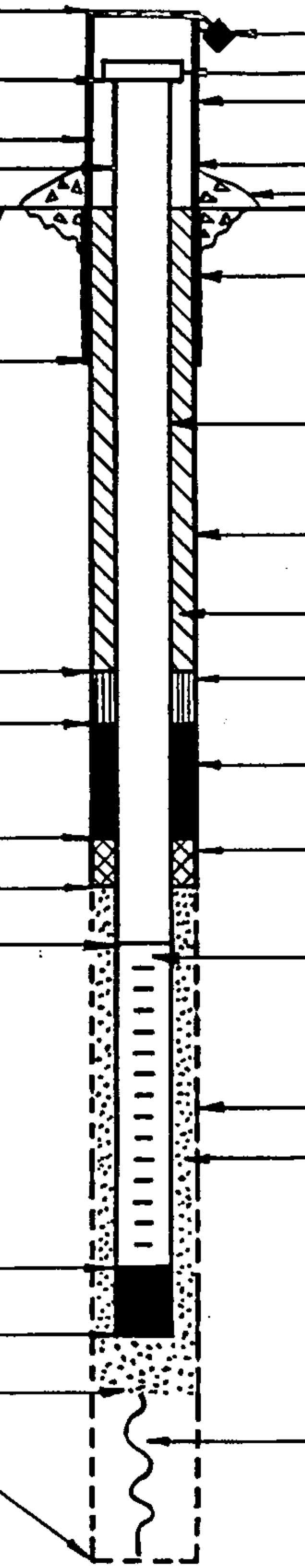
ELEV. OF TOP OF PROTECTIVE CASING: 520.14 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 520.0 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.84 ft.
STICK-UP RISER PIPE: 2.7 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: 31.0 ft.
DEPTH TOP OF GROUT INVASION BARRIER: 24 ft.
DEPTH TOP OF SEAL: 25.0 ft.
DEPTH TOP OF SECONDARY SAND PACK: N/A ft.
DEPTH TOP OF PRIMARY SAND PACK: 27.5 ft.
DEPTH TOP OF SCREEN: 30.3 ft.
DEPTH BOTTOM OF SCREEN: (Flushmount) 40.3 ft.
DEPTH BOTTOM OF SCREEN CAP: 40.3 ft.
DEPTH BOTTOM OF SAND PACK: 40.5 ft.
DEPTH OF HOLE: 41.5 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 6" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: 4" ft.
TYPE OF SURFACE CASING: Thick wall Steel
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: SCH 40 PVC
BOREHOLE DIA.: 10" ft.
TYPE OF BACKFILL: Cement/Bentonite
TYPE OF BARRIER: #2 Silica Sand
TYPE OF SEAL: Bentonite Pellet
TYPE OF SAND PACK: N/A
TYPE OF SCREEN: SCH 40 PVC
SLOT SIZE x LENGTH: 10 slot x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 4" ft.
TYPE OF SAND PACK: Silica Sand QROK #4
TYPE OF BACKFILL BELOW OBSERVATION WELL: Cuttings from coring

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Fire Academy RI/FS
LOCATION: Rochester, N.Y.
DRILLER: Buffalo Drilling
PROJECT NO.: 0965-04-1
BORING: MW-8D
DRILLING METHOD: 6¼" HSA
GROUND ELEV.: 517.2
DATE: 4/17/90
FIELD GEOLOGIST: R. Frappa
DEVELOPMENT METHOD:



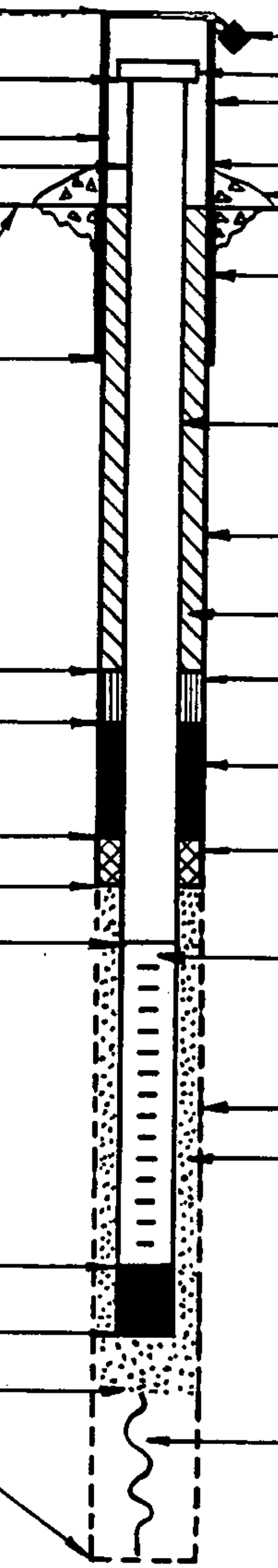
- ELEV. OF TOP OF PROTECTIVE CASING: 520.17 ft. AMSL
- ELEV. OF TOP OF RISER PIPE: 519.77 ft. AMSL
- STICK-UP TOP OF PROTECTIVE CASING: 2.97 ft.
- STICK-UP RISER PIPE: 2.57 ft.
- GROUND SURFACE ELEV.
- DEPTH BOTTOM OF SURFACE CASING: 31 ft.
- DEPTH TOP OF GROUT INVASION BARRIER: 31 ft.
- DEPTH TOP OF SEAL: 38.5 ft.
- DEPTH TOP OF SECONDARY SAND PACK: N/A ft.
- DEPTH TOP OF PRIMARY SAND PACK: 42.5 ft.
- DEPTH TOP OF SCREEN: 43.8 ft.
- DEPTH BOTTOM OF SCREEN: 48.8 ft.
- DEPTH BOTTOM OF SCREEN CAP: 49 ft.
- DEPTH BOTTOM OF SAND PACK: 49 ft.
- DEPTH OF HOLE: 50 ft.

- LOCKING COVER
- WELL CAP
- I.D. x LENGTH OF PROTECTIVE CASING: 6" x 5' ft.
- 1/4" WEEP HOLE
- TYPE OF SURFACE SEAL: cement
- I.D. OF SURFACE CASING: 4" ft.
- TYPE OF SURFACE CASING: Thin walled Steel
- RISER PIPE I.D. 2" ft.
- TYPE OF RISER PIPE: SCH 40 PVC
- BOREHOLE DIA.: 10" ft.
- TYPE OF BACKFILL: Cement/Bentonite
- TYPE OF BARRIER: Silica Sand QRok #2
- TYPE OF SEAL: Bentonite Pellets
- TYPE OF SAND PACK: N/A
- TYPE OF SCREEN: SCH 40 PVC
- SLOT SIZE x LENGTH: 10 slot x 5 ft.
- I.D. OF SCREEN: 2" ft.
- BOREHOLE DIA.: 4" ft.
- TYPE OF SAND PACK: Silica QRok #4
- TYPE OF BACKFILL BELOW OBSERVATION WELL: cuttings

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Rochester Fire Academy
LOCATION: Rochester, NY
DRILLER: Buffalo Drilling
PROJECT NO.: 0965-04-1 RI/FS
BORING: PZ-9
DRILLING METHOD: 6 1/4 HSA, 4" casing
GROUND ELEV.: 526.5
DATE: 4/12/9
FIELD GEOLOGIST: MKR / RHO
DEVELOPMENT METHOD:



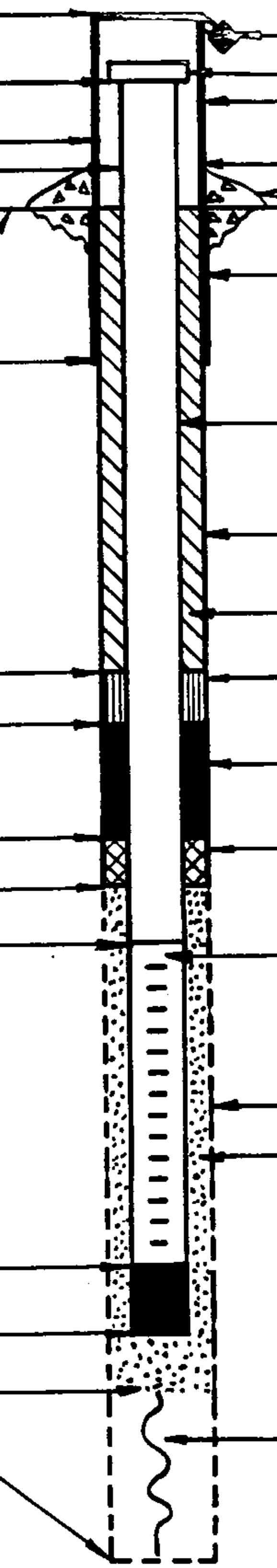
ELEV. OF TOP OF PROTECTIVE CASING: 525.57 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 525.73 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.07 ft.
STICK-UP RISER PIPE: 1.93 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: NA ft.
DEPTH TOP OF GROUT INVASION BARRIER: 28.5 ft.
DEPTH TOP OF SEAL: 29.0 ft.
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
DEPTH TOP OF PRIMARY SAND PACK: 31.8 ft.
DEPTH TOP OF SCREEN: 33.1 ft.
DEPTH BOTTOM OF SCREEN: 38.1 ft.
DEPTH BOTTOM OF SCREEN CAP: 38.2 ft.
DEPTH BOTTOM OF SAND PACK: 38.6 ft.
DEPTH OF HOLE: 38.6 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: NA ft.
TYPE OF SURFACE CASING: NA
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 10 1/4 ft.
TYPE OF BACKFILL: Grout
TYPE OF BARRIER: #2 sand
TYPE OF SEAL: Bentonite
TYPE OF SAND PACK: NA
TYPE OF SCREEN: PVC 2"
SLOT SIZE x LENGTH: .010 x 5 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 10 1/4 ft.
TYPE OF SAND PACK: #2 OROK
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch Fire Academy RI/FS
LOCATION: Rochester, NY
DRILLER: Buffalo Drilling
PROJECT NO.: 0965-04-1
BORING: 95
DRILLING METHOD: 6 1/4 HSA
GROUND ELEV.: 526.6
DATE: 4/10/90
DEVELOPMENT METHOD:
FIELD GEOLOGIST: M. Rothstein



ELEV. OF TOP OF PROTECTIVE CASING: 528.86 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 528.22 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.26 ft.
STICK-UP RISER PIPE: 1.62 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: NA ft.
DEPTH TOP OF GROUT INVASION BARRIER: NA ft.
DEPTH TOP OF SEAL: 1.9 ft.
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
DEPTH TOP OF PRIMARY SAND PACK: 3.9 ft.
DEPTH TOP OF SCREEN 4.8 ft.
DEPTH BOTTOM OF SCREEN: 14.8 ft.
DEPTH BOTTOM OF SCREEN CAP: 14.9 ft.
DEPTH BOTTOM OF SAND PACK: 14.9 ft.
DEPTH OF HOLE: 14.9 ft.

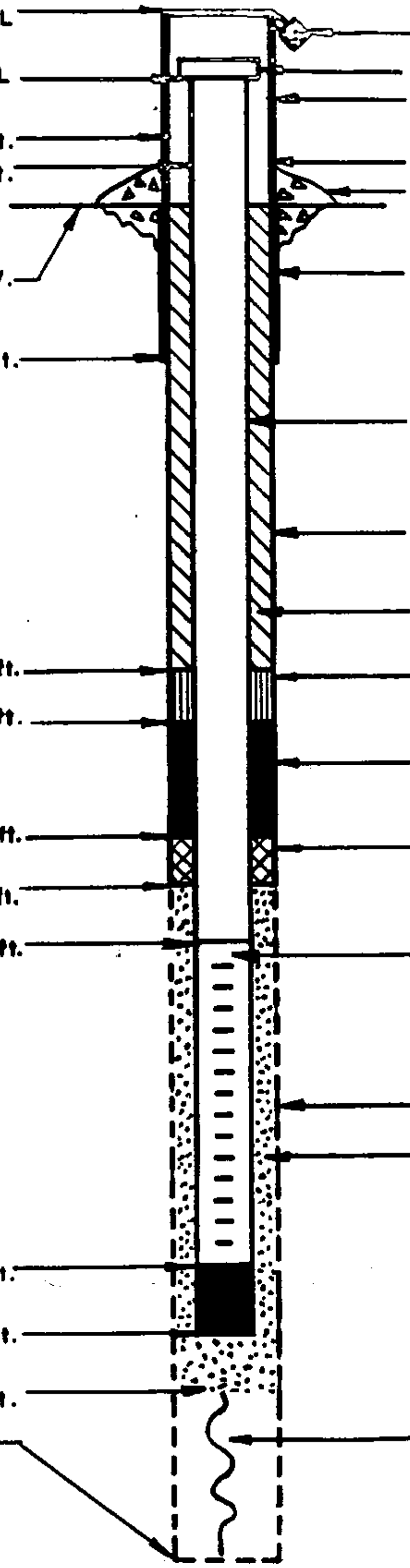
LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 3.5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: NA ft.
TYPE OF SURFACE CASING: NA
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 10 1/4 ft.
TYPE OF BACKFILL: Grout
TYPE OF BARRIER: Na
TYPE OF SEAL: Bentonite Pellets
TYPE OF SAND PACK: #2 QROK
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010 x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 10 1/4" ft.
TYPE OF SAND PACK: #2 QROK
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch. Fire Academy RI/FS
LOCATION: ______
PROJECT NO.: 0965-04-1
BORING: MW-9I
GROUND ELEV.: 526.5
DATE: 4/10/90
FIELD GEOLOGIST: M. Rothstein

DRILLER: Buffalo Drilling
DRILLING METHOD: 6 1/4 HSA/NQ CORE
DEVELOPMENT METHOD: ______



ELEV. OF TOP OF PROTECTIVE CASING: 528.71 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 528.55 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.21 ft.
STICK-UP RISER PIPE: 2.05 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: N/A ft.
DEPTH TOP OF GROUT INVASION BARRIER: 33.7 ft.
DEPTH TOP OF SEAL: 34.1 ft.
DEPTH TOP OF SECONDARY SAND PACK: Na ft.
DEPTH TOP OF PRIMARY SAND PACK: 38.1 ft.
DEPTH TOP OF SCREEN 39.5 ft.
DEPTH BOTTOM OF SCREEN: 49.5 ft.
DEPTH BOTTOM OF SCREEN CAP: 49.6 ft.
DEPTH BOTTOM OF SAND PACK: 49.6 ft.
DEPTH OF HOLE: 49.6 ft.

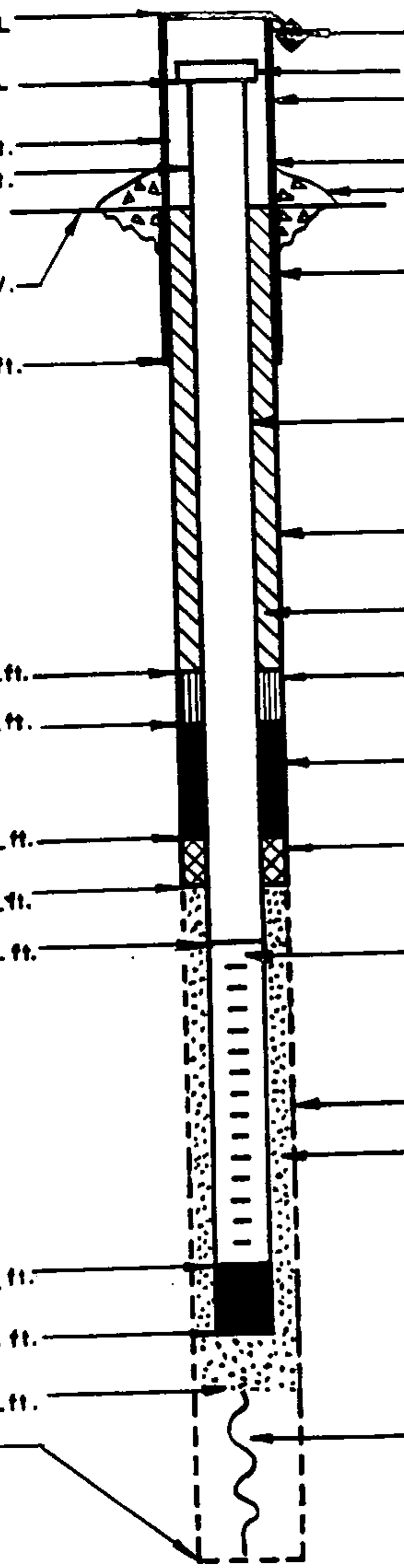
LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: NA ft.
TYPE OF SURFACE CASING: NA
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: SCH 40 PVC
BOREHOLE DIA.: 6 1/4 ft.
TYPE OF BACKFILL: Grout
TYPE OF BARRIER: #4 QROK
TYPE OF SEAL: Bentonite Pellets
TYPE OF SAND PACK: #4 QROK
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010 X 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 4" ft.
TYPE OF SAND PACK: #4 QROK
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch. Fire Academy RI/FS
LOCATION: ______
PROJECT NO.: 0965 041
BORING: MW-105
GROUND ELEV.: ~~589~~ 523.9
DATE: 4/23/90
FIELD GEOLOGIST: M. Rothstein

DRILLER: Buffalo Drilling Co
DRILLING METHOD: 6 1/4 HSA
DEVELOPMENT METHOD: ______



ELEV. OF TOP OF PROTECTIVE CASING: 525.77 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 525.62 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 1.87 ft.
STICK-UP RISER PIPE: 1.72 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: NA ft.
DEPTH TOP OF GROUT INVASION BARRIER: 4.8 ft.
DEPTH TOP OF SEAL: 5.1 ft.
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
7.10 DEPTH TOP OF PRIMARY SAND PACK: 7.9 ft.
DEPTH TOP OF SCREEN: 9.8 ft.
DEPTH BOTTOM OF SCREEN: 19.8 ft.
DEPTH BOTTOM OF SCREEN CAP: 20.0 ft.
DEPTH BOTTOM OF SAND PACK: 20.0 ft.
DEPTH OF HOLE: 20.0 ft.

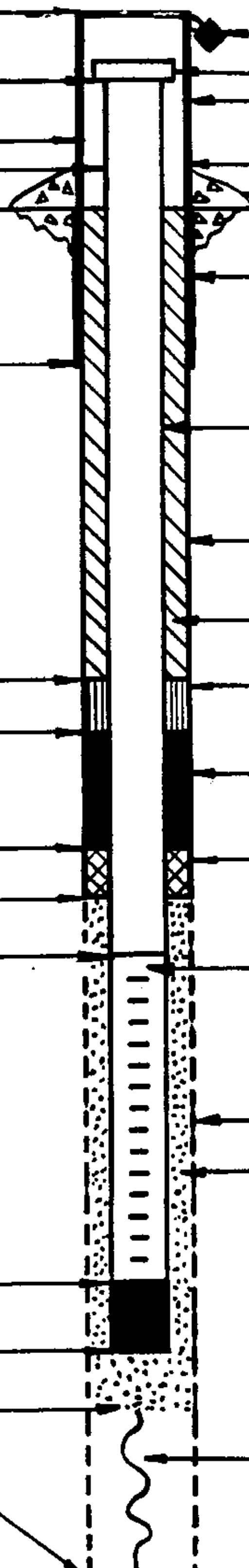
LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: NA ft.
TYPE OF SURFACE CASING: NA
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 10 1/4 ft.
TYPE OF BACKFILL: grout
TYPE OF BARRIER: #2 sand
TYPE OF SEAL: Bentonite Pellets
TYPE OF SAND PACK: NA
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: 0.010 x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 10 1/4 ft.
TYPE OF SAND PACK: #2 QROK
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch Fire Academy RI/FS
LOCATION: Rochester, NY
PROJECT NO.: 0965 041
BORING: MW-10I
GROUND ELEV.: 523.9
DATE: 4/20/90
FIELD GEOLOGIST: M. Rothstein
DRILLER: Buffalo Drilling Co
DRILLING METHOD: 6 1/4 HSA HQ CORE
DEVELOPMENT METHOD:

ELEV. OF TOP OF PROTECTIVE CASING: 526.24 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 525.61 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.34 ft.
STICK-UP RISER PIPE: 1.71 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: NA ft.
DEPTH TOP OF GROUT INVASION BARRIER: 26.7 ft.
DEPTH TOP OF SEAL: 26.9 ft.
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
DEPTH TOP OF PRIMARY SAND PACK: 31.1 ft.
DEPTH TOP OF SCREEN 32.8 ft.
DEPTH BOTTOM OF SCREEN: 42.8 ft.
DEPTH BOTTOM OF SCREEN CAP: 43.0 ft.
DEPTH BOTTOM OF SAND PACK: 43.0 ft.
DEPTH OF HOLE: 43.0 ft.



LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: NA ft.
TYPE OF SURFACE CASING: NA
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 10 1/4" ft.
TYPE OF BACKFILL: grout
TYPE OF BARRIER: Q-ROK #4
TYPE OF SEAL: Bentonite pellets
TYPE OF SAND PACK: NA
TYPE OF SCREEN:
SLOT SIZE x LENGTH: .010X10' ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 4" ft.
TYPE OF SAND PACK: Q Rock #4
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

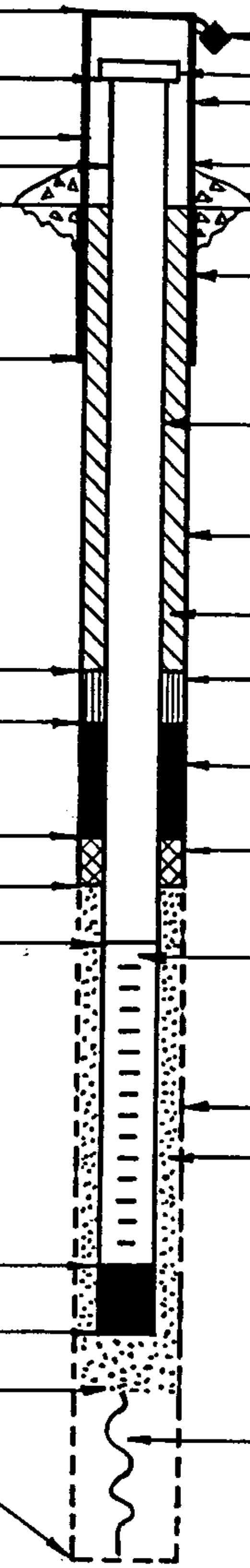
MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch Fire Academy RI/FS
PROJECT NO.: 0965-04-1
GROUND ELEV.: 517.3
FIELD GEOLOGIST: M. Rothstein

LOCATION: Rochester, N.Y.
BORING: MW-115
DATE: 4/24/90

DRILLER: Buffalo Drilling
DRILLING METHOD: 6 1/4 HSA
DEVELOPMENT METHOD: Bailing



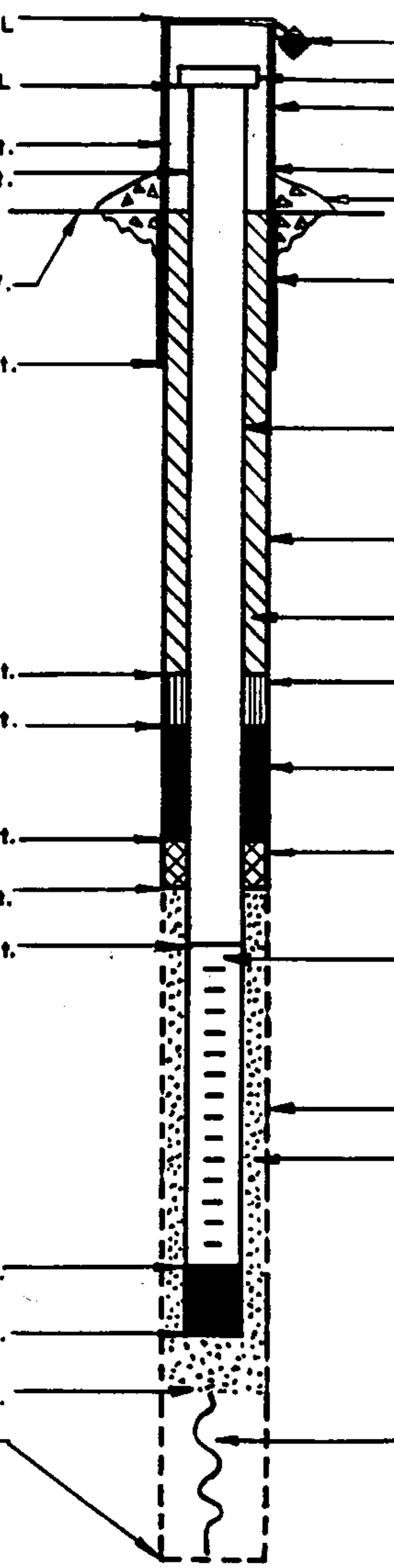
ELEV. OF TOP OF PROTECTIVE CASING: 519.20 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 518.94 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 1.9 ft.
STICK-UP RISER PIPE: 1.64 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: N/A ft.
DEPTH TOP OF GROUT INVASION BARRIER: NA ft.
DEPTH TOP OF SEAL: 1.5 ft.
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
DEPTH TOP OF PRIMARY SAND PACK: 3.0 ft.
DEPTH TOP OF SCREEN 4.1 ft.
DEPTH BOTTOM OF SCREEN: 14.1 ft.
DEPTH BOTTOM OF SCREEN CAP: 14.3 ft.
DEPTH BOTTOM OF SAND PACK: 14.3 ft.
DEPTH OF HOLE: 14.3 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: NA ft.
TYPE OF SURFACE CASING: NA
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 8 1/4" ft.
TYPE OF BACKFILL: Grout
TYPE OF BARRIER: N/A
TYPE OF SEAL: Bentonite pellets
TYPE OF SAND PACK: NA
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010 x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 8 1/4" ft.
TYPE OF SAND PACK: #2 Q ROK
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch Fire Academy RI/FS
LOCATION:
DRILLER: Buffalo Drilling Co
PROJECT NO.: 0965-04-1
BORING: MW-11I
DRILLING METHOD: 6 1/4 HSA, HQ Core
GROUND ELEV.: 517.4
DATE: 4/26/90
FIELD GEOLOGIST: M. Rothstein
DEVELOPMENT METHOD:



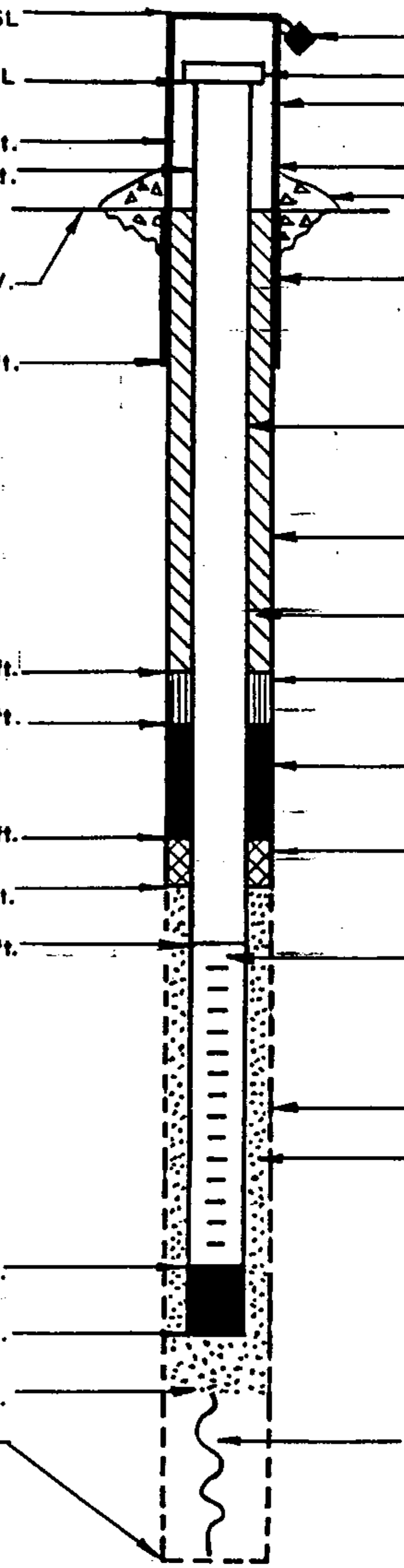
ELEV. OF TOP OF PROTECTIVE CASING: 519.92 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 519.79 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.52 ft.
STICK-UP RISER PIPE: ______ ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: 25.0 ft.
DEPTH TOP OF GROUT INVASION BARRIER: NA ft.
DEPTH TOP OF SEAL: 18.7 ft.
DEPTH TOP OF SECONDARY SAND PACK: Na ft.
DEPTH TOP OF PRIMARY SAND PACK: 22.7 ft.
DEPTH TOP OF SCREEN 25.0 ft.
DEPTH BOTTOM OF SCREEN: 35.0 ft.
DEPTH BOTTOM OF SCREEN CAP: 35.2 ft.
DEPTH BOTTOM OF SAND PACK: 35.2 ft.
DEPTH OF HOLE: 35.2 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 6" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: 4" ft.
TYPE OF SURFACE CASING: steel
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 10 1/4" ft.
TYPE OF BACKFILL: Grout
TYPE OF BARRIER: NA
TYPE OF SEAL: Bentonite Pellets
TYPE OF SAND PACK: NA
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: 0.010 x 2" ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 4" ft.
TYPE OF SAND PACK: #4 Q Rok
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch Fire Academy RI/FS
LOCATION: Rochester, N.Y.
DRILLER: Buffalo Drilling
PROJECT NO.: 0965-04-1
BORING: MW-12S
DRILLING METHOD: 6 1/4 HSA
GROUND ELEV.: 518.6
DATE: 5/4/90
DEVELOPMENT METHOD: Bailing
FIELD GEOLOGIST: M. Rothstein



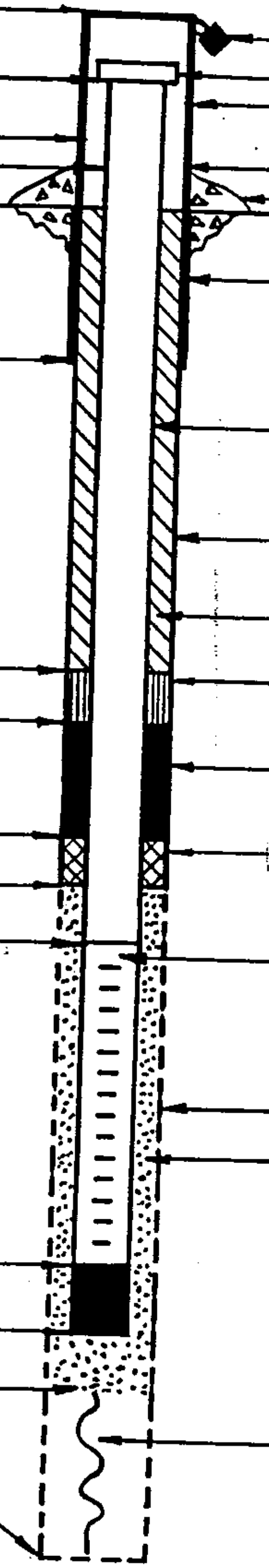
ELEV. OF TOP OF PROTECTIVE CASING: 521.63 ft. AMSL
LOCKING COVER
ELEV. OF TOP OF RISER PIPE: 521.23 ft. AMSL
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" X 5' ft.
STICK-UP TOP OF PROTECTIVE CASING: 3.03 ft.
STICK-UP RISER PIPE: 2.63 ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
GROUND SURFACE ELEV.
I.D. OF SURFACE CASING: NA ft.
TYPE OF SURFACE CASING: NA
DEPTH BOTTOM OF SURFACE CASING: NA ft.
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 8 1/4 ft.
TYPE OF BACKFILL: Grout
DEPTH TOP OF GROUT INVASION BARRIER: NA ft.
TYPE OF BARRIER: NA
DEPTH TOP OF SEAL: 1.5 ft.
TYPE OF SEAL: Bentonite pellets
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
TYPE OF SAND PACK: NA
DEPTH TOP OF PRIMARY SAND PACK: 3.0 ft.
DEPTH TOP OF SCREEN 3.8 ft.
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010 x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 8 1/4 ft.
TYPE OF SAND PACK: #2
DEPTH BOTTOM OF SCREEN: 13.8 ft.
DEPTH BOTTOM OF SCREEN CAP: 14.0 ft.
DEPTH BOTTOM OF SAND PACK: 14.0 ft.
DEPTH OF HOLE: 14.0 ft.
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch. Fire Academy RI/FS
LOCATION: Rochester, NY
DRILLER: Buffalo Drilling Co
PROJECT NO.: 0965-04-1
BORING: MW-12I
DRILLING METHOD: 6¼ HSA / NX Core
GROUND ELEV.: 518.8
DATE: 5/4/90
FIELD GEOLOGIST: M. Rothstein
DEVELOPMENT METHOD: Bailing / Purge Pump

ELEV. OF TOP OF PROTECTIVE CASING: 521.50 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 521.36 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.70 ft.
STICK-UP RISER PIPE: 2.56 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: 25.0 ft.



LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 6" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: 4" ft.
TYPE OF SURFACE CASING: steel
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 8¼" ft.
TYPE OF BACKFILL: Grout

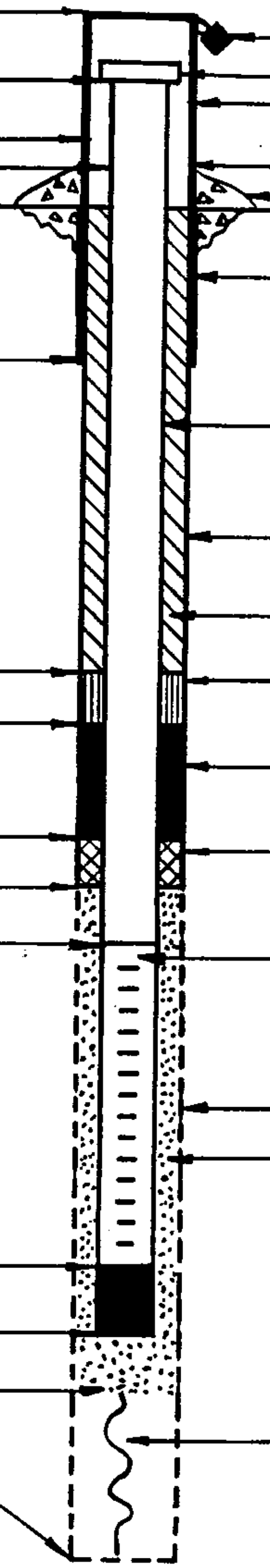
DEPTH TOP OF GROUT INVASION BARRIER: NA ft.
TYPE OF BARRIER: NA
DEPTH TOP OF SEAL: 19.0 ft.
TYPE OF SEAL: Bentonite Pellets
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
TYPE OF SAND PACK: NA
DEPTH TOP OF PRIMARY SAND PACK: 23.0 ft.
DEPTH TOP OF SCREEN 26.8 ft.
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010 x 5 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 3" ft.
TYPE OF SAND PACK: #4 Q Rok

DEPTH BOTTOM OF SCREEN: 31.8 ft.
DEPTH BOTTOM OF SCREEN CAP: 32.0 ft.
DEPTH BOTTOM OF SAND PACK: 32.5 ft.
DEPTH OF HOLE: 35.0 ft.
TYPE OF BACKFILL BELOW OBSERVATION WELL: blow-in, cuttings

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch Fire Academy RI/FS
LOCATION: Rochester, N.Y.
DRILLER: Buffalo Drilling
PROJECT NO.: 0965 04 1
BORING: MW-13S
DRILLING METHOD: 6 1/4 HSA
GROUND ELEV.: 519.4
DATE: 5/1/90
DEVELOPMENT METHOD: Bailing
FIELD GEOLOGIST: M. Rothstein



ELEV. OF TOP OF PROTECTIVE CASING: 522.03 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 521.75 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.63 ft.
STICK-UP RISER PIPE: 2.35 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: NA ft.
DEPTH TOP OF GROUT INVASION BARRIER: NA ft.
DEPTH TOP OF SEAL: 2 ft.
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
DEPTH TOP OF PRIMARY SAND PACK: 4 ft.
DEPTH TOP OF SCREEN 5.9 ft.
DEPTH BOTTOM OF SCREEN: 15.9 ft.
DEPTH BOTTOM OF SCREEN CAP: 16.1 ft.
DEPTH BOTTOM OF SAND PACK: 16.1 ft.
DEPTH OF HOLE: 16.1 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: NA ft.
TYPE OF SURFACE CASING: NA
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 8 1/4" ft.
TYPE OF BACKFILL: Grout
TYPE OF BARRIER: NA
TYPE OF SEAL: Bentonite seal
TYPE OF SAND PACK: NA
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010 x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 8 1/4 ft.
TYPE OF SAND PACK: #2
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

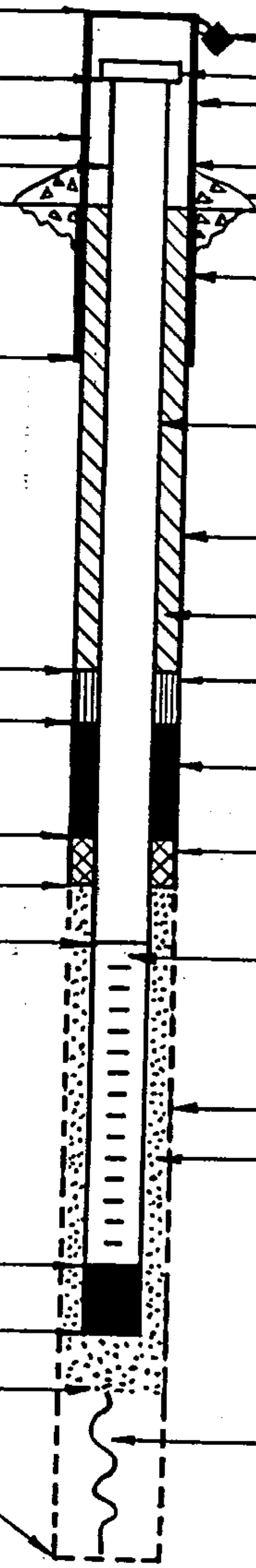
MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch Fire Academy RI/FS
PROJECT NO.: 0965-04-1
GROUND ELEV.: 518.1
FIELD GEOLOGIST: M. Rothstein

LOCATION: Rochester, NY
BORING: MW-14S
DATE: 4/30/90

DRILLER: Buffalo Drilling Co
DRILLING METHOD: 6 1/4 HSA
DEVELOPMENT METHOD: Bailing



ELEV. OF TOP OF PROTECTIVE CASING: 520.82 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 520.55 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 2.72 ft.
STICK-UP RISER PIPE: 2.45 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: NA ft.
DEPTH TOP OF GROUT INVASION BARRIER: NA ft.
DEPTH TOP OF SEAL: 1.5 ft.
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
DEPTH TOP OF PRIMARY SAND PACK: 3.4 ft.
DEPTH TOP OF SCREEN 4.2 ft.
DEPTH BOTTOM OF SCREEN: 14.2 ft.
DEPTH BOTTOM OF SCREEN CAP: 14.4 ft.
DEPTH BOTTOM OF SAND PACK: 14.4 ft.
DEPTH OF HOLE: 14.4 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: cement
I.D. OF SURFACE CASING: NA ft.
TYPE OF SURFACE CASING: NA
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 8 1/4 ft.
TYPE OF BACKFILL: Grout
TYPE OF BARRIER: NA
TYPE OF SEAL: Bentonite Pellets
TYPE OF SAND PACK: NA
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010 x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 8 1/4 ft.
TYPE OF SAND PACK: #2
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

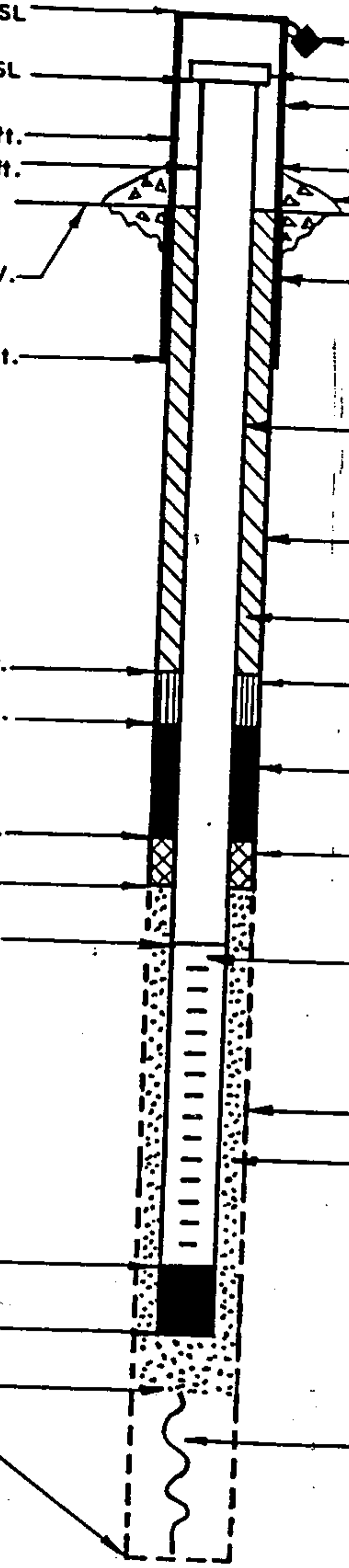
MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch. Fire Academy
PROJECT NO.: 0965-04-1
GROUND ELEV.: 517.7
FIELD GEOLOGIST: M. Rothstein

LOCATION: Rochester, NY
BORING: MW-15S
DATE: 5/1/90

DRILLER: Buffalo Drilling
DRILLING METHOD: 6 1/4 HSA
DEVELOPMENT METHOD: Bailing



ELEV. OF TOP OF PROTECTIVE CASING: 520.45 ft. AMSL

ELEV. OF TOP OF RISER PIPE: 520.18 ft. AMSL

STICK-UP TOP OF PROTECTIVE CASING: 2.75 ft.

STICK-UP RISER PIPE: 2.48 ft.

GROUND SURFACE ELEV.

DEPTH BOTTOM OF SURFACE CASING: NA ft.

DEPTH TOP OF GROUT INVASION BARRIER: NA ft.

DEPTH TOP OF SEAL: 1.5 ft.

DEPTH TOP OF SECONDARY SAND PACK: NA ft.

DEPTH TOP OF PRIMARY SAND PACK: 3.0 ft.

DEPTH TOP OF SCREEN 3.8 ft.

DEPTH BOTTOM OF SCREEN: 13.8 ft.

DEPTH BOTTOM OF SCREEN CAP: 14.0 ft.

DEPTH BOTTOM OF SAND PACK: 14.0 ft.

DEPTH OF HOLE: 14.0 ft.

LOCKING COVER

WELL CAP

I.D. x LENGTH OF PROTECTIVE CASING: 4" x 5' ft.

1/4" WEEP HOLE

TYPE OF SURFACE SEAL: cement

I.D. OF SURFACE CASING: NA ft.

TYPE OF SURFACE CASING: NA

RISER PIPE I.D. 2" ft.

TYPE OF RISER PIPE: PVC

BOREHOLE DIA.: 8 1/4" ft.

TYPE OF BACKFILL: Grout

TYPE OF BARRIER: NA

TYPE OF SEAL: Bentonite Pellets

TYPE OF SAND PACK: NA

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: .010 x 10 ft.

I.D. OF SCREEN: 2" ft.

BOREHOLE DIA.: 8 1/4" ft.

TYPE OF SAND PACK: #2

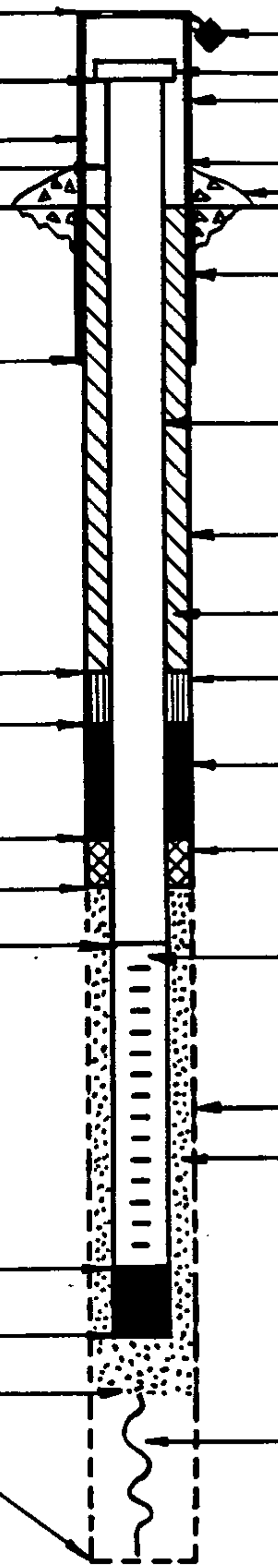
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

MALCOLM PIRNIE

MONITORING WELL CONSTRUCTION LOG

PROJECT: Roch. Fire Academy RI/FS LOCATION: Rochester, N.Y.
PROJECT NO.: 0965 04 1 BORING: MW-16 I
GROUND ELEV.: 516.1 DATE: 4/27/90
FIELD GEOLOGIST: M. Rothstein

DRILLER: Buffalo Drilling Co
DRILLING METHOD: 6 1/4 HSA NQ Core
DEVELOPMENT METHOD:



ELEV. OF TOP OF PROTECTIVE CASING: 519.51 ft. AMSL
ELEV. OF TOP OF RISER PIPE: 519.43 ft. AMSL
STICK-UP TOP OF PROTECTIVE CASING: 3.41 ft.
STICK-UP RISER PIPE: 3.33 ft.
GROUND SURFACE ELEV.
DEPTH BOTTOM OF SURFACE CASING: 19.5 ft.
DEPTH TOP OF GROUT INVASION BARRIER: 10.5 ft.
DEPTH TOP OF SEAL: 12.7 ft.
DEPTH TOP OF SECONDARY SAND PACK: NA ft.
DEPTH TOP OF PRIMARY SAND PACK: 16.9 ft.
DEPTH TOP OF SCREEN: 19.2 ft.
DEPTH BOTTOM OF SCREEN: 29.2 ft.
DEPTH BOTTOM OF SCREEN CAP: 29.4 ft.
DEPTH BOTTOM OF SAND PACK: 29.4 ft.
DEPTH OF HOLE: 29.4 ft.

LOCKING COVER
WELL CAP
I.D. x LENGTH OF PROTECTIVE CASING: 6" x 5 ft.
1/4" WEEP HOLE
TYPE OF SURFACE SEAL: Cement
I.D. OF SURFACE CASING: 4" ft.
TYPE OF SURFACE CASING: Steel
RISER PIPE I.D. 2" ft.
TYPE OF RISER PIPE: PVC
BOREHOLE DIA.: 10 1/4 ft.
TYPE OF BACKFILL: Grout
TYPE OF BARRIER: #4 sand
TYPE OF SEAL: Bentonite
TYPE OF SAND PACK: #N/A
TYPE OF SCREEN: PVC
SLOT SIZE x LENGTH: .010 x 10 ft.
I.D. OF SCREEN: 2" ft.
BOREHOLE DIA.: 4" ft.
TYPE OF SAND PACK: #4
TYPE OF BACKFILL BELOW OBSERVATION WELL: NA

MALCOLM PIRNIE

APPENDIX C.4

WELL DEVELOPMENT DATA

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Dubisz, S. McConnaghy

DATE: 5-2-90 5-4-90

WELL NO.: MW 6-S

① TOTAL CASING AND SCREEN LENGTH (FT.): 17.80

② CASING INTERNAL DIAMETER (in.): 2

③ WATER LEVEL BELOW TOP OF CASING (FT.) 12.05

④ VOLUME OF WATER IN CASING (GAL.) 1.0

$V = 0.0408 (②)^2 \times (① - ③) =$ ______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	Int	1.0	2.0	3.0	4.25	5.00	5.25				
pH	6.74 ~~9.02~~	6.73	6.87	6.85	6.92	6.97	7.02 ~~6.99~~				
conductivity	2000 ~~975~~	2000	2000	1950	1850	1850	1850				
Temp	10.0 ~~10.2~~	9.6	9.8	9.8	10.1	10.1	10.4				
Appearance	cloudy ~~cloudy GRAY~~	cloudy	Less turbid	cloudy	clear	clear	clear				
Turbidity	>100 ~~>100~~	>100	47	67	50	45	48				

COMMENTS: purged with pvc BAiLER

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Dubisz, S. McConnaghy

DATE: 5-2-90

WELL NO.: MW-6I

	WELL I.D.	VOL. GAL./FT.
① TOTAL CASING AND SCREEN LENGTH (FT.): 45.60	1"	0.04
	2"	0.17
② CASING INTERNAL DIAMETER (in.): 2	3"	0.38
	4"	0.66
③ WATER LEVEL BELOW TOP OF CASING (FT.) 13.56	5"	1.04
	6"	1.50
④ VOLUME OF WATER IN CASING (GAL.) 5.50	8"	2.60

$V = 0.0408\,(②)^2 \times (① - ③) =$ ________ GAL.

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)											
	Inital	10.50	20.50	30.50								
pH	8.66	7.96	7.95	7.76								
Conductivity	940	1100	1100	1150								
Temp	11.5	14.0	14.9	16.7								
Appearance	Turbid Gray	Less Turbid	Less Turbid Slightly cloudy	clear								
Turbidity	>100	71	52	25								

COMMENTS:

* Well purged with Honda WB-15 pump

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Dubisz, S. McConnaghy

DATE: 5-2-90

WELL NO.: MW-6D

① TOTAL CASING AND SCREEN LENGTH (FT.): 56.20

② CASING INTERNAL DIAMETER (in.): 2"

③ WATER LEVEL BELOW TOP OF CASING (FT.) 13.96

④ VOLUME OF WATER IN CASING (GAL.) 6.80

$V = 0.0408 (②)^2 \times (① - ③) =$ _______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	in	6.80	* 21.80	35.80	49.50						
pH	8.26	8.17	7.71	7.49	7.42						
conductivity	875	850	1050	1100	1225						
Temp	12.0	11.6	13.9	14.1	14.2						
Appearance	Brown	Brown	Gray cloudy	Less turbid Gray	Less turbid						
Turbidity	>100	>100	>100	>100	35						

COMMENTS:

Honda WB-15 pump used for purging.
Sulfide odor detected

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-041

STAFF: R. Dubisz, S. McConnaghy

DATE: 5-9-90

WELL NO.: MW-7S

	WELL I.D.	VOL. GAL./FT.
① TOTAL CASING AND SCREEN LENGTH (FT.): ______	1"	0.04
② CASING INTERNAL DIAMETER (in.): 2"	2"	0.17
	3"	0.38
③ WATER LEVEL BELOW TOP OF CASING (FT.) 3.11	4"	0.66
	5"	1.04
④ VOLUME OF WATER IN CASING (GAL.) 2.00	6"	1.50
	8"	2.60

V = 0.0408 (②)^2 x (① - ③) = ______ GAL.

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)									
	* Init	2	5	7	13	17	19	21			
pH	6.66	6.77	6.61	6.89	6.92	6.85	6.91	6.53			
Conductivity	1000	1000	990	990	1075	1050	1150	990 1050			
Temp	13.0	13.9	15.0	13.1	12.1	11.5	10.9	12.2			
Appearance	Light Brown	Light Brown	Light Gray	Light Brown	Light Brown	Light Brown	Light Gray	Clear			
Turbidity	>100	>100	>100	>100	>100	>100	75	53			

COMMENTS: Slight odor of solvents or oil.

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0465-04-1

STAFF: R. Dubisz, S. McConnaghy

DATE: 5-4-90

WELL NO.: MW-7I

① TOTAL CASING AND SCREEN LENGTH (FT.): 43.10

② CASING INTERNAL DIAMETER (in.): 2

③ WATER LEVEL BELOW TOP OF CASING (FT.) ~~4.80~~ 4.76

④ VOLUME OF WATER IN CASING (GAL.) 6.50

$V = 0.0408 (②)^2 \times (① - ③) =$ ______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	* 6.50	13	53	58	63						
pH	11.27	9.31	7.58	7.69	7.56						
conductivity	825	850	1150	1450	1150						
Temp	14.8	14.0	14.0	11.9	12.[illegible]						
Appearance	CAR'Y GRAY	GRAY	clear	clear	clear						
Turbidity	>100	>100	25	52	20						

COMMENTS: * oil from 1st measurement sample

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. DuBois S. McConaughy

DATE: 5-4-90

WELL NO.: MW-7D

	WELL I.D.	VOL. GAL./FT.
① TOTAL CASING AND SCREEN LENGTH (FT.): 51.75	1"	0.04
	2"	0.17
② CASING INTERNAL DIAMETER (in.): 2	3"	0.38
	4"	0.66
③ WATER LEVEL BELOW TOP OF CASING (FT.) 4.80	5"	1.04
	6"	1.50
④ VOLUME OF WATER IN CASING (GAL.) 8.00	8"	2.60

$V = 0.0408\,(②)^2 \times (① - ③) =$ ________ GAL.

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	Int	23	33	45							
pH	9.74	7.50	7.52	7.50							
conductivity	2100	1600	1550	1500							
Temp	20.2	18.2	17.3	16.7							
Appearance	clear	BLACK	clear	clear							
Turbidity	62	>100	~~#~~ 60	32							

COMMENTS: Sulfide odor (Detected)
Purged with Honda WB-15 pump

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Cubisz / R. Fappa

DATE: 5-4-90, 5-8-90

WELL NO.: MW 8S

① TOTAL CASING AND SCREEN LENGTH (FT.): 16.3

② CASING INTERNAL DIAMETER (in.): 2

③ WATER LEVEL BELOW TOP OF CASING (FT.) 6.90

④ VOLUME OF WATER IN CASING (GAL.) 1.60

$V = 0.0408 (②)^2 \times (① - ③) =$ ________ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)									
	Int	1.60	4.80	9.00	12.00	13.60	16.9	31.9 ~~27.4~~	39.4	45.5
pH	6.54	6.31	6.08	6.08	6.19	6.19	6.15	6.14	6.13	6.11
conductivity	325	350	350	340	350	300	310 ~~35~~	300	300	300
Temp	10.1	9.6	9.4	9.3	9.0	9.7	9.5	11.0	10.3	11.1
Appearance	Turbid drk gray	Turbid dark gray	Less turbid light brown	Less turbid light brown	more turbid dark	Light gray	light gray	slightly cloudy	lt. gray	lt gray
Turbidity	>100	>100	>100	>100	>100	>100	>100	79	<100	30

COMMENTS: purged with PVC BAILER

Development discontinued
pH + Conductivity stable
Turbidity below 50 NTU

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: 5-4-90 R. Dubisz / R. Grappa

DATE: 5-4-90, 5-8-90

WELL NO.: MW-8I

① TOTAL CASING AND SCREEN LENGTH (FT.): 42' (10' screen, 32')

② CASING INTERNAL DIAMETER (in.): 2

③ WATER LEVEL BELOW TOP OF CASING (FT.): 8.00

④ VOLUME OF WATER IN CASING (GAL.): 6.00

$V = 0.0408 (②)^2 \times (① - ③) =$ ______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	Initial	12.0	18.0	38.0	53.0	68	83				
pH	8.51	7.91	7.63	7.15	7.17	7.11	7.11				
conductivity	950	1075	1050	1130	1060	1100	1150				
Temp	12.3	11.4	11.2	12.5	12.2	12.2	12.7				
Appearance	DARK GRAY	TURBID GRAY	TURBID GRAY	lt gray	lt gray	lt gray	lt gray				
Turbidity	>100	>100	>100	>100	>100	>100	>100				

COMMENTS: H_2S Odor

Development suspend after 83 gal purged 5/8/90 and stabilization of parameters (pH + conductivity)

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: S. McConnaghy

DATE: 5/8/90

WELL NO.: MW-8D

	WELL I.D.	VOL. GAL./FT.
① TOTAL CASING AND SCREEN LENGTH (FT.): 52' - 5' screen 47'	1"	0.04
	2"	0.17
② CASING INTERNAL DIAMETER (in.): 2"	3"	0.38
	4"	0.66
③ WATER LEVEL BELOW TOP OF CASING (FT.) 6.98	5"	1.04
	6"	1.50
④ VOLUME OF WATER IN CASING (GAL.) 6.8	8"	2.60

-7
40'
x.17
280
40
6.8

V = 0.0408 (②)^2 x (①-③) = ________ GAL.

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)									
gallons	INT	5 gal	15.5	25.5	32	38				
pH	11.34	10.19	7.23	7.37	7.3	7.28				
conductivity	1010	930	2500	2100	2080	2200				
Temp	11.6	11.5	11.7	12.7	12.5	12.4				
Appearance	LT Brown	LT [illegible]	dk gray	Lt gray	lt gray	clear				
turbidity	>100	>100	>100	>100	50	19				

COMMENTS: strong H_2S odor

Development Discontinued after 38 gal purged

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Dubisz, S. McConnaghy

DATE: 5-1-90, 5-2-90

WELL NO.: PZ-9

① TOTAL CASING AND SCREEN LENGTH (FT.): 40.00'

② CASING INTERNAL DIAMETER (in.): 2"

③ WATER LEVEL BELOW TOP OF CASING (FT.) 9.56

④ VOLUME OF WATER IN CASING (GAL.) 5.17

$V = 0.0408 (②)^2 \times (① - ③) =$ ______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	Int	5.17	15.50	20.50	30.50	40.50	50.50				
pH	9.54	7.19	7.16	7.23	7.07	7.04	7.11				
Conductivity	525	850	850	1000	950	1000	1050				
Temp	13.0	12.1	11.6	10.3	13.6	13.8	14.6				
Appearance	Turbid Brown	Turbid Brown	Turbid Brown	Turbid Light Brown	Less Turbid Cloudy	clear	Clear				
Turbidity	>100	>100	>100	>100	>100	29	24				

COMMENTS:

* - Water Level on 5-2-90 - 13.09'

First three volumes purged with Bailer.

Remaining volumes purged with Honda WB15 pump.

Water level after 50 gal - 14.60'

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Dubisz, S. McConnaghy

DATE:

WELL NO.: MW-9S

① TOTAL CASING AND SCREEN LENGTH (FT.): 16.35

② CASING INTERNAL DIAMETER (in.): 2"

③ WATER LEVEL BELOW TOP OF CASING (FT.) 5.80

④ VOLUME OF WATER IN CASING (GAL.) 1.78

$V = 0.0408\,(②)^2 \times (① - ③) =$ ______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	Int	1.78	2.56	6.56	8.56	10.81					
pH	7.22	7.15	7.06	7.10	7.23	7.06					
conductivity	750	750	710	675	600	600					
Temperature	13.3	8.6	8.9	9.0	8.7	8.7					
Appearance	Light Brown	Brown	Brown	Brown	Less Turbid Cloudy	clear					
Turbidity	>100	>100	>100	>100	52	47					

COMMENTS:

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Dubisz, S. McConnaghy

DATE: 5-1-90

WELL NO.: MW-9I

	WELL I.D.	VOL. GAL./FT.
① TOTAL CASING AND SCREEN LENGTH (FT.): 50.8	1"	0.04
	2"	0.17
② CASING INTERNAL DIAMETER (in.): 3"	3"	0.38
	4"	0.66
③ WATER LEVEL BELOW TOP OF CASING (FT.) 13.89	5"	1.04
	6"	1.50
④ VOLUME OF WATER IN CASING (GAL.) 6.28	8"	2.60

$V = 0.0408 (②)^2 \times (① - ③) =$ ______ GAL.

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	~~[illegible]~~	6.28	12.46	18.74	30.74	42.74	48.94	68.95	* 118.95	165.95	185.00
pH	7.90	7.42	7.27	7.32	7.03	7.01	7.01	7.29	7.15	7.18	7.19
conductivity	975	1140	1100	1150	1350	950	925	1050	1100	1100	1100
Temp	12	12.2	12.0	11.4	15.4	20.7	18.3	11.6	12.0	13.5	12.5
Appearance	Turbid Light Brown	Turbid Light Brown	Turbid Light Brown	Turbid Light Brown	Less Turbid	Less Turbid	Less Turbid	Cloudy Turbid	Cloudy Turbid	Turbid Less Cloudy	Clear
Turbidity	>100	>100	>100	>100	>100	>100	>100	>100	>100	~~>100~~ 76	46

COMMENTS: * Sulfur odor

Purging rate - 5 gal/min - with Honda WB15 pump

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Dubisz

DATE: 5-3-90 5-4-90

WELL NO.: MW-10S

① TOTAL CASING AND SCREEN LENGTH (FT.): 21.6

② CASING INTERNAL DIAMETER (in.): 2

③ WATER LEVEL BELOW TOP OF CASING (FT.) 7.25

④ VOLUME OF WATER IN CASING (GAL.) 2.4

$V = 0.0408\,(②)^2 \times (① - ③) =$ ______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)									
	Int	2.4	4.8	7.2	9.95*					
pH	7.02	7.20	7.11	7.10	7.08					
conductivity	775	750	825	875	800					
Temp	10.2	9.9	11.6	12.7	9.8					
Appearance	cloudy GRAY	cloudy	TURBID cloudy	more TURBID Brown	clear					
Turbidity	>100	>100	>100	>100	15					

COMMENTS: purged with PVC BAILER
SLOW recharge

* FINAL measurements taken on 5-4-90, due to slow Recharge

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Dubisz

DATE: 5/3/90

WELL NO.: MW-10I

① TOTAL CASING AND SCREEN LENGTH (FT.): 44.40

② CASING INTERNAL DIAMETER (in.): 2

③ WATER LEVEL BELOW TOP OF CASING (FT.) 12.75

④ VOLUME OF WATER IN CASING (GAL.) 5.4

$V = 0.0408 (②)^2 \times (① - ③) =$ ______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	* Int	5.4	15.4 ☆	25.4							
pH	7.20	7.00	7.13	7.04							
conductivity	1275	1000	1025	1050							
Temp	10.5	10.9	12.3	13.3							
Appearance	cloudy dark gray	less turbid	less turbid light gray	clear							
Turbidity	>100	>100	83	46							

COMMENTS:

* SULFIDE odor Detected

☆ PVC Shavings Found in water. ~~[illegible]~~

purged with PVC BAILER

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy RI/FS

PROJECT NO.: 0965-04-1

STAFF: R. Frappa / M. Rotstein

DATE: 5/8/90

WELL NO.: MW-11S

① TOTAL CASING AND SCREEN LENGTH (FT.): 16.15

② CASING INTERNAL DIAMETER (in.): 2" stickup 2'

③ WATER LEVEL BELOW TOP OF CASING (FT.) 4.14

④ VOLUME OF WATER IN ~~CASING~~ screen (GAL.) 2 gal.

$V = 0.0408 (②)^2 \times (① - ③) =$ ______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
Gallons	INT	6	12	14	18						
pH	6.6	6.47	6.58	6.57	6.74						
conductivity	1160	1250	1325	[illegible]	1350						
Temp	10.7	11.3	9.7	[illegible]	9.2						
Appearance	v. turbid yellow-brown	v. turbid yellow brown	[illegible] Brown	[illegible]	Lt Brown						
Turbidity	>100	>100	>100	>100	>100						

COMMENTS:

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy RI/FS

PROJECT NO.: 0965-04-1

STAFF: R. Frappa / M. Rothshin

DATE: 5/8/10

WELL NO.: MW-11I

		WELL I.D.	VOL. GAL./FT.
① TOTAL CASING AND SCREEN LENGTH (FT.):	37.80	1"	0.04
		2"	0.17
② CASING INTERNAL DIAMETER (in.):	2"	3"	0.38
		4"	0.66
③ WATER LEVEL BELOW TOP OF CASING (FT.)	7.89	5"	1.04
		6"	1.50
④ VOLUME OF WATER IN CASING (GAL.)	5.1	8"	2.60

$V = 0.0408\,(②)^2 \times (① - ③) =$ ______ GAL.

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	Initial	8.5	17	25.5	33	41.5	49	55			
pH	7.18	7.04	6.90	6.96	6.96	7.14	7.16	7.15			
Conductivity	1430	1175	1350	1325	1310	1260	1290	1300			
Temp	13.1	12.3	12.2	12.4	12.4	11.5	11.5	11			
Turbidity	>100	>100	>100	>100	>100	84	54	52			
Appearance	Dk gray v. turbid	Dk. gray v. turbid	lt. gray	lt gray	lt gray	lt gray	(cloudy)	slightly cloudy			

COMMENTS: Slight H_2S odor By/w

Development Discontinued after stabilization of pH + conductivity, + Turbidity below 50 NTU

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Quinz, S. McConnaughy

DATE: 5/9/90 5-10-90*

WELL NO.: 125

	WELL I.D.	VOL. GAL./FT.
① TOTAL CASING AND SCREEN LENGTH (FT.): 15.89	1"	0.04
	2"	0.17
② CASING INTERNAL DIAMETER (in.): 2	3"	0.38
	4"	0.66
③ WATER LEVEL BELOW TOP OF CASING (FT.) 7.01	5"	1.04
	6"	1.50
④ VOLUME OF WATER IN CASING (GAL.) 1.50	8"	2.60

V = 0.0408 (②)^2 x (① - ③) = ________ GAL.

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	INT	15	16.50*	18	17.50	19.50					
pH	6.01	6.21	6.01	6.02	6.08	6.00					
conductivity	800	840	775	800	760	750					
Temp	13.2	12.9	10.5	10.2	9.9	9.8					
Appearance	Lt Brn Turbid	Lt Brn turbid	Lt Gray [illegible]	Lt Brown	Lt GRAY	Clear					
Turbidity	>100	>100	>100	>100	>100	45					

COMMENTS:

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: ____________________

PROJECT NO.: ____________________

STAFF: ____________________

DATE: 5/8/90

WELL NO.: 121

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

① TOTAL CASING AND SCREEN LENGTH (FT.): 34.65

② CASING INTERNAL DIAMETER (in.): 2

③ WATER LEVEL BELOW TOP OF CASING (FT.) 8.35

④ VOLUME OF WATER IN CASING (GAL.) 4.5

$V = 0.0408\,(②)^2 \times (① - ③) =$ ________ GAL.

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	20	30	40	50							
pH	6.82	6.73	6.79	6.79							
conductivity	1475	1475	1475	1475							
Temp	15.8	14.9	13.5	15.1							
Appearance	cloudy	cloudy	cloudy less turbid	clear							
Turbidity	>100	>100	>100	35							

COMMENTS: H_2S odor

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Dubisz, S. McConaughy

DATE: 5-10-90

WELL NO.: 13S

① TOTAL CASING AND SCREEN LENGTH (FT.): 16

② CASING INTERNAL DIAMETER (in.): 2

③ WATER LEVEL BELOW TOP OF CASING (FT.) 2.30

④ VOLUME OF WATER IN CASING (GAL.) 2.38

$V = 0.0408 (②)^2 \times (① - ③) =$ ______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	2.30	4.60	6.90	9.20							
pH	6.79	6.81	7.07	7.02							
conductivity	1800	1875	1750	1800							
Temp	10.1	9.2	9.3	9.4							
Appearance	Slightly TURBID	Slightly TURBID	clear	clear							
Turbidity	71	86	37	33							

COMMENTS:

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0965-04-1

STAFF: R. Dubisz, S. McConnaghy

DATE: 5-11-90

WELL NO.: MW-14S

① TOTAL CASING AND SCREEN LENGTH (FT.): 16.1

② CASING INTERNAL DIAMETER (in.): 2

③ WATER LEVEL BELOW TOP OF CASING (FT.) 4.4

④ VOLUME OF WATER IN CASING (GAL.) 2.00

$V = 0.0408\,(②)^2 \times (① - ③) =$ ______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	2	6	14	20	24						
pH	6.75	6.74	6.83	6.78	6.71						
conductivity	2000	2000	1900	1900	1900						
Temp	10.1	9.7	10.1	9.9	10.2						
Appearance	Brown	Brown	Brown	Brown	Brown						
Turbidity	>100	>100	>100	>100	>100						

COMMENTS: Solvent, Fuel oil odor dectected

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy

PROJECT NO.: 0963-04-1

STAFF: R. Dubisz, S. McConnaghy

DATE: 5-10-90

WELL NO.: 15 S

① TOTAL CASING AND SCREEN LENGTH (FT.): 16.88

② CASING INTERNAL DIAMETER (in.): 2

③ WATER LEVEL BELOW TOP OF CASING (FT.) 5.82

④ VOLUME OF WATER IN CASING (GAL.) 1.80

$V = 0.0408 (②)^2 \times (① - ③) =$ ______ GAL.

WELL I.D.	VOL. GAL./FT.
1"	0.04
2"	0.17
3"	0.38
4"	0.66
5"	1.04
6"	1.50
8"	2.60

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
	1.7	9.40	11.40	12.20	13						
pH	6.30	6.17	6.29	6.35	6.60						
Conductivity	640	725	700	750	750						
Temp	11.4	11.6	10.5	10.4	10.5						
Appearance	Brown	GRAY	GRAY	Light GRAY	Clear						
Turbidity	>100	>100	>100	>100	41						

COMMENTS:

MALCOLM PIRNIE

WELL DEVELOPMENT/PURGING LOG

PROJECT TITLE: Rochester Fire Academy RI/FS

PROJECT NO.: 0965 041

STAFF: R. Frappa / M. Rothstein

DATE: 5/8/90

WELL NO.: 16 I

	WELL I.D.	VOL. GAL./FT.
① TOTAL CASING AND SCREEN LENGTH (FT.): 32.7	1"	0.04
	2"	0.17
② CASING INTERNAL DIAMETER (in.): 2"	3"	0.38
	4"	0.66
③ WATER LEVEL BELOW TOP OF CASING (FT.) 7.95	5"	1.04
	6"	1.50
④ VOLUME OF WATER IN CASING (GAL.) 4.2	8"	2.60

V = 0.0408 (②)^2 x (① - ③) = ______ GAL.

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)									
	INT	8	13	21	41	76	81			
pH	8.12	7.54	7.32	7.19	6.79	7.14	7.12			
conductivity		1150	1175	1250	1200	1200	1200			
temp	13.0	11.5	11.8	11.4	11.5	11.1	10.6			
turbidity	100<	>100	>100	>100	>100	>100	>100			
Appearance	dk grey v. turbid	grey turbid	lt gray turbid	lt. gray turbid	gray turbid	gray turbid	gray turbid			

COMMENTS: slight H_2S odor

MALCOLM PIRNIE

APPENDIX C.5

HYDRAULIC CONDUCTIVITY TESTING

APPENDIX C.5.1

PRESSURE PACKER TESTING

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY RHF DATE 5-31-90 SHEET NO. ____ OF ____

CHKD. BY MKF DATE 8-10-90 JOB NO. ____

SUBJECT Roch. Fire Academy - Packer Press. Test Calc.

Borehole No. MW-6D

Test Interval: 44.0 - 54.4

Single Packer test
Bottom of Hole @ 54.4

Conversion from: 1 gpm/ft² = 0.0679 cm/sec

$$K = \frac{Q}{2\pi L H} \ln \frac{L}{r} (0.0679 \text{ cm/sec})$$

K = Hydraulic Conductivity
Q = Flow rate
L = Length of test section
H = differential Head
r = radius of Borehole

Q = 0.37 gpm
L = 10.4'
r = 0.167' - 4" dia
H = 4' + 9.7 + (27 × 2.31) = 75.97'

H = height of gauge + W.L. + (water press × 2.31)
2.31 × psi = ft of water

$$K = \frac{0.37}{2\pi\ 10.4 \times 75.97} \times \ln \frac{10.4}{0.167} (0.0679 \text{ cm/sec})$$

$7.45E^{-5} \times 4.13\ (0.0679)$

Test Interval: 44'-54.4' $K = 2.09 \times 10^{-5}$ cm/sec

Test Interval: 34 - 44'

$$K = \frac{Q}{2\pi L H} \times \ln \frac{L}{r} (0.0679 \text{ cm/sec})$$

Q = 15.3
L = 10'
r = 0.167'
H = 4' + 9.7 + (27 × 2.31) = 75.97

$$K = \frac{15.3}{2\pi \times 10 \times 75.97} \times \ln\left(\frac{10}{.167}\right) \times 0.0679 \text{ cm/sec}$$

$.0032 \times 4.092 \times 0.0679$

Test Interval: 34 - 44' $K = > 8.8 \times 10^{-4}$ cm/sec

PRESSURE TEST REPORT

SHT ____ OF ____

ROJECT Rochester Fire Academy RI/FS SITE Fire Academy DATE 4-11-90 BORING No. MW-6D

OCATION City of Rochester GROUND ELEV. ____ TOTAL DEPTH 54.4 TOP OF ROCK; DEPTH 34.0

ONTRACTOR Buffalo Drilling DRILLER Ken Krieger INSPECTOR R. Frappa CHEK'D BY ____

ATER LEVEL; DEPTH 9.7 ELEV. ____ WATER PIPE LENGTH 40 WATER PIPE I.D. ½

LOW METER No. 006820 Hershey PRESSURE GAUGE No. - TEST INTERVAL; DEPTH 34-44 ELEV. ____

UGE PRESS. 27
CKER INFL'T'N PRESS. 120

APSED IME Min.	FLOW READING Gal.	Δ FLOW
0	7602.4	
.5	7605	2.4
1.0	7612	7
1.5	7620	8
2.0	7628	8
2.5	7638	10
3.0	7645	8
3.5	7652	7
4.0	7660	8
4.5	7670	10
5.0	7678	8
		rate-15.3

ARKS:

Q=15.3 gpm

- Could not increase gauge pressure
- Flow rate is in excess of 153 gpm

GAUGE PRESS. ____
PACKER INFL'T'N PRESS. ____

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

REMARKS:

GAUGE PRESS. ____
PACKER INFL'T'N PRESS. ____

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

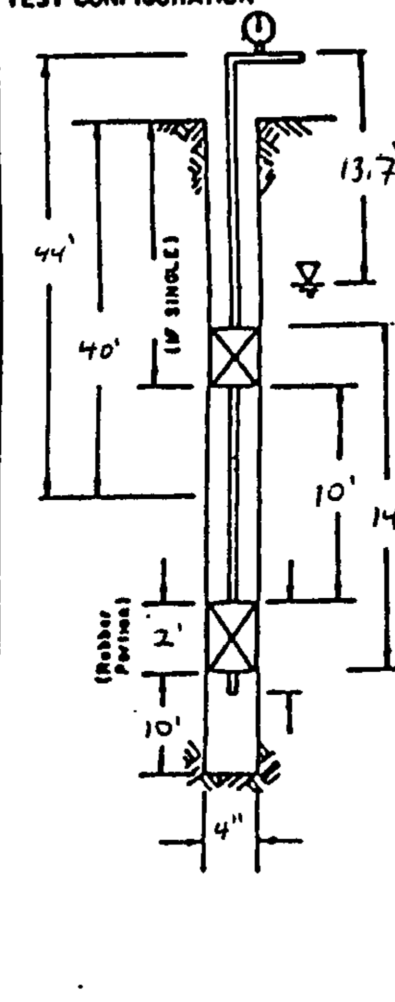
REMARKS:

GAUGE PRESS. ____
PACKER INFL'T'N PRESS. ____

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

REMARKS:

TEST CONFIGURATION



SINGLE ☐
DOUBLE ☒

PRESSURE TEST REPORT

SHT ____ OF ____

PROJECT Rochester Fire Academy RI/FS SITE Fire Training Academy DATE 4-11-90 BORING No. MW-6D

LOCATION City of Rochester GROUND ELEV. ____ TOTAL DEPTH 54.4 TOP OF ROCK; DEPTH 34.0

CONTRACTOR Buffalo Drilling DRILLER Kenkrieger INSPECTOR R. Frappa CHEK'D BY ____

WATER LEVEL; DEPTH 9.7 ELEV. ____ WATER PIPE LENGTH 50 WATER PIPE I.D. ½"

FLOW METER No. 006820 Hershey PRESSURE GAUGE No. — TEST INTERVAL; DEPTH 44.4–54.4 ELEV. ____

GAUGE PRESS. 13
PACKER INFL'T'N PRESS. 120

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW
0	7600.0	
.5	.2	.2
1.0	.3	.1
2.0	.3	0
3.0	.4	.1
4.0	.5	.1

REMARKS:
Q = 0.125 gpm

GAUGE PRESS. 27
PACKER INFL'T'N PRESS. 120

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW
0	7600.5	
1	.9	.4
2	1.3	.3
3	1.7	.4
4	2.0	.3
5	2.4	.4
		Rate - .38

REMARKS:
Q = 0.38 gpm

GAUGE PRESS. ____
PACKER INFL'T'N PRESS. ____

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

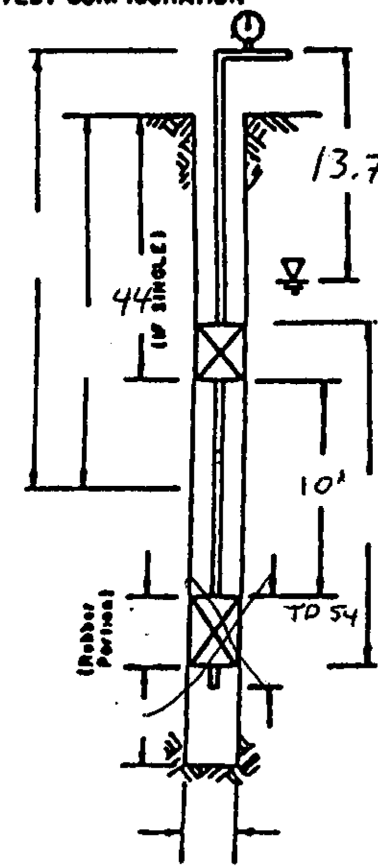
REMARKS:

GAUGE PRESS. ____
PACKER INFL'T'N PRESS. ____

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

REMARKS:

TEST CONFIGURATION



SINGLE ☒
DOUBLE ☐

BOREHOLE MW-7D

Interval 43-50.2

$$K = \frac{Q}{2\pi L H} \ln \frac{L}{r} \; (0.0679 \text{ cm/s})$$

Q = 5.59 gpm

L = 7.2

r = 0.125

H = (4' + 4.3 + (19 x 2.31) = 52.19 (ht gauge + w.l. + (psi x 2.31)

$$K = \frac{5.59}{2\pi(7.2)(52.19)} \ln \frac{7.2}{0.125} \; (0.0679 \text{ cm/s})$$

$K = 6.52 \times 10^{-4}$

PRESSURE TEST REPORT

SHT ____ OF ____

PROJECT Rochester Fire Academy RI/FS SITE Fire Academy DATE 4/25/90 BORING No. MW-7D

LOCATION City of Rochester GROUND ELEV. ____ TOTAL DEPTH 50.2 TOP OF ROCK; DEPTH 30.2

CONTRACTOR Buffalo Drilling DRILLER Ken Krieger INSPECTOR R. Frappa CHEK'D BY ____

WATER LEVEL; DEPTH 4.B ELEV. ____ WATER PIPE LENGTH ____ WATER PIPE I.D. ½"

FLOW METER No. 006820 Hershey PRESSURE GAUGE No. ____ TEST INTERVAL; DEPTH 43-50 ELEV. ____

Test 1 — GAUGE PRESS. 14 — PACKER INFL'T'N PRESS. 150

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW
0	1	
0.5	4	3
1	6.8	2.8
1.5	9.4	2.6
2	12.0	2.6
2.5	14.5	2.5
3	17.2	2.7
3.5	19.4	2.2
4	22.6	3.2
4.5		

REMARKS: Q= 4.8 gpm

Test 2 — GAUGE PRESS. 19 — PACKER INFL'T'N PRESS. ____

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW
0	4.5	
0.5	6.5	2.0
1	9.4	2.9
1.5	12.2	2.8
2	15.2	3.0
2.5	18.0	2.8
3	20.8	2.8
3.5	23.7	2.9
4	26.6	2.9
4.5	29.6	3.0
5	32.4	2.8
5.5	35.1	2.7
6	38.0	2.9.
6.5	40.8	2.8
7	43.6	2.8

REMARKS: 5.59 gpm

Test 3 — GAUGE PRESS. ____ — PACKER INFL'T'N PRESS. ____

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

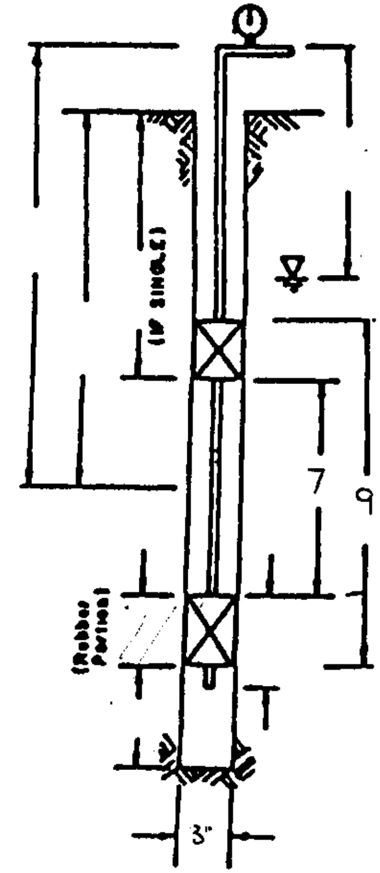
REMARKS:

Test 4 — GAUGE PRESS. ____ — PACKER INFL'T'N PRESS. ____

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

REMARKS:

TEST CONFIGURATION



SINGLE ☒
DOUBLE ☐

Borehole MW-8D

Test Interval 43-50'

Single Packer Test
Bottom of hole @ 50.0

Conversion 1 gpm/ft² = 0.0679 cm/sec

$$K = \frac{Q}{2\pi L H} \ln \frac{L}{r} \left(0.0679 \text{ cm/sec}\right)$$

Q = 1.15

L = 7

d=3" r=1.5 r = 0.125

H = height of gauge + W.L. + (water pressure x 2.31)

4' + 4.6' + (30 x 2.31) = 77.9

$$K = \frac{1.15}{2\pi(7)(77.9)} \ln \frac{7}{.125} \left(0.0679 \text{ cm/sec}\right) = \boxed{9.17 \times 10^{-5} \text{ cm/s}}$$

TEST INTERVAL 31-41

Double Packer

$$K = \frac{Q}{2\pi L H} \ln \frac{L}{r} \left(0.0679 \text{ cm/s}\right)$$

Q = 12.82 gpm

L = 10

diam = 3" r = 0.125

H = 4' + 12.7 + (15 x 2.31) = 51.35

$$K = \frac{12.82}{2\pi(10)(51.35)} \ln \frac{10}{0.125} \left(0.0679 \text{ cm/s}\right)$$

$$\boxed{K = 1.18 \times 10^{-3} \text{ cm/s}}$$

PRESSURE TEST REPORT

SHT ____ OF ____

PROJECT Rochester Fire Academy RT/FS SITE Fire Academy DATE 4/16/90 BORING No. MW-8D

LOCATION City of Rochester GROUND ELEV. ____ TOTAL DEPTH 50.0 TOP OF ROCK; DEPTH 30'

CONTRACTOR Buffalo Drilling DRILLER Ken Krieger INSPECTOR R. Frappa CHEK'D BY ____

WATER LEVEL; DEPTH 4.6' ELEV. ____ WATER PIPE LENGTH 45 WATER PIPE I.D. 1/2"

FLOW METER No. 006820 Hershey PRESSURE GAUGE No. ____ TEST INTERVAL; DEPTH 43-50 ELEV. ____

GAUGE PRESS. 15
PACKER INFL'T'N PRESS. 150

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW
0	0.8	
0.5	0.4	.4
1.0	1.8	1.4
1.5	2.4	.6
2.0	2.8	.4
2.5	3.3	.5
3.0	3.7	.4
3.5	4.2	.5
4.0	4.6	.4

REMARKS: Q= .95 gpm

GAUGE PRESS. 30
PACKER INFL'T'N PRESS. 150

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW
0	5.2	
0.5	5.8	.6
1.0	6.4	.6
1.5	6.9	.5
2.0	7.5	.6
2.5	8.0	.5
3.0	8.6	.6
3.5	9.2	.6
4.0	9.8	.6

REMARKS: Q= 1.15 gpm

GAUGE PRESS. ____
PACKER INFL'T'N PRESS. ____

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

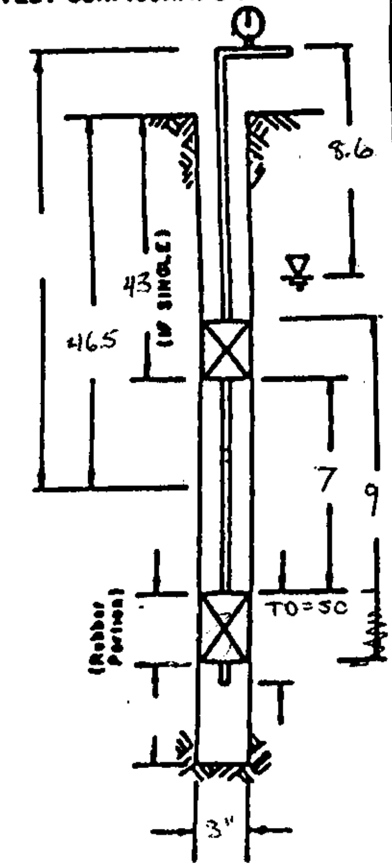
REMARKS:

GAUGE PRESS. ____
PACKER INFL'T'N PRESS. ____

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

REMARKS:

TEST CONFIGURATION



SINGLE ☒
DOUBLE ☐

PRESSURE TEST REPORT

SHT ______ OF ______

PROJECT Rochester Fire Academy RI/FS SITE Fire Academy DATE 4/16/90 BORING No. MW-8D

LOCATION City of Rochester GROUND ELEV. ______ TOTAL DEPTH 50' TOP OF ROCK; DEPTH 30'

CONTRACTOR Buffalo Drilling DRILLER Ken Krieger INSPECTOR R. Frappa CHEK'D BY ______

WATER LEVEL; DEPTH 12.7 ELEV. ______ WATER PIPE LENGTH ______ WATER PIPE I.D. 1/2

FLOW METER No. 006820 Hershey PRESSURE GAUGE No. ______ TEST INTERVAL; DEPTH 31-41 ELEV. ______

GAUGE PRESS. 15
PACKER INFL'T'N PRESS. 150

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW
0	2.0	
0.5	3.8	1.8
1.0	6.0	2.2
1.5	11.0	5.0
max pressure at 15 psi		
2	20	
2.5	26	6
3	33.5	7.5
3.5	41.0	7.5
4	48.5	7.5
4.5	56.5	8.0
5	63.5	7.0
5.5	71.0	7.5
6	78.9	7.9

REMARKS:
Q=12.82 gpm

GAUGE PRESS. ______
PACKER INFL'T'N PRESS. ______

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

REMARKS:

GAUGE PRESS. ______
PACKER INFL'T'N PRESS. ______

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

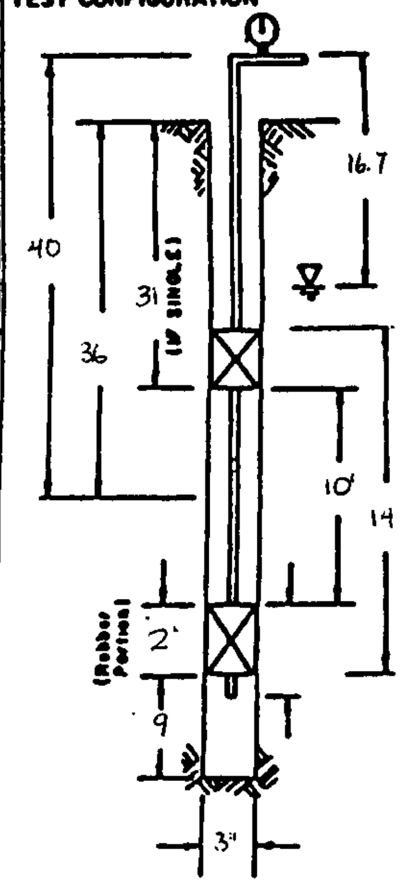
REMARKS:

GAUGE PRESS. ______
PACKER INFL'T'N PRESS. ______

ELAPSED TIME Min.	FLOW READING Gal.	Δ FLOW

REMARKS:

TEST CONFIGURATION



SINGLE ☐
DOUBLE ☒

APPENDIX C.5.2

SLUG TESTING

FIELD SLUG TEST LOG

PROJECT:
CLIENT:
WELL/BOREHOLE NO.: MW-6S
JOB NO.:
COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:
Ground Elevation: ft. AMSL
Reference Point (RP):
RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: no slug, monitored water level recovery after development
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 12.7 ft. r_s (Radius of Borehole at Screen) ~~.083~~ .417 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume

TEST:

Start Date: 5/7/90
Static Level (H): 7.58 ft. BRP
Start Time (To):
Initial Pressure Head (Ho): 14.32 ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) ____ (No) X

~~CLOCK TIME~~ Date	ELAPSED TIME t(h=m=s) clock time	elapsed time min	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho	CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho
5/7	11:00	0	14.32	6.74						
5/8	17:00	1760 min	13.81	6.23						
5/9	16:00	3100	13.38	5.8						
5/10	16:10	4540	12.78	5.2						
5/11	12:30	5610	12.70	5.12						
5/14	11:05	9845	11.81	4.23						
5/18	12:00	15500	7.58	0						

COMMENTS: Recharge rate after Development

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT: Fire Academy RI/FS

CLIENT: City of Rochester

JOB NO.:

WELL/BOREHOLE NO.: MW-6I

COMPLETED BY: R. Frappa

WELL/BOREHOLE DETAILS:

Installation Date: ______ Ground Elevation: ______ ft. AMSL

Reference Point (RP): TOR RP Elevation: ______ ft. AMSL

Stratigraphic Unit Monitored: Upper Bedrock

Hydrostratigraphic Unit Monitored: Bedrock

Slug Test Method: Rising Head w/ 5' slug & Pressure Transducer / data logger

Riser Length: 10 ft. Riser I.D.: .167 ft. Riser Material: pvc

Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 11.1 ft. r_s (Radius of Borehole at Screen) .167 ft. r_c (Radius of Screen) .083 ft.

Slug Dimensions or Volume 2.19' displacement

TEST:

Start Date: 5/7/90 Static Level (H): 13.07 ft. BRP

Start Time (To): 14:28 Initial Pressure Head (Ho): 15.26 ft. BRP

Will Water Level Remain Above the Screen During the Test? (Yes) X (No) ______

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	15.26		1
	.0022	14.87		.82
	.0189	14.59		.69
	.0356 ~~.0644~~	14.18		.51
	.0522	13.76		.32
	.0856	13.32		.11
	.1356	13.11		.02
	.2522	13.07		0
		1		

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho

COMMENTS:

Test # 0 slug out

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT: ____________________

CLIENT: ____________________ WELL/BOREHOLE NO.: MW-6D

JOB NO.: ____________________ COMPLETED BY: ____________________

WELL/BOREHOLE DETAILS:

Installation Date: ____________________ Ground Elevation: ____________________ ft. AMSL

Reference Point (RP): ____________________ RP Elevation: ____________________ ft. AMSL

Stratigraphic Unit Monitored: ____________________

Hydrostratigraphic Unit Monitored: ____________________

Slug Test Method: 5' slug out

Riser Length: ______ ft. Riser I.D.: .167 ft. Riser Material: PVC

Screen Length: 10' ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 11.4 ft. r_s (Radius of Borehole at Screen) .167 ft. r_c (Radius of Screen) .083 ft.

Slug Dimensions or Volume 2.19' displacement

TEST:

Start Date: 05/09/90 Static Level (H): 13.93 ft. BRP

Start Time (To): 14:43 Initial Pressure Head (Ho): 15.99 ft. BRP

Will Water Level Remain Above the Screen During the Test? (Yes) X (No) ______

CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho		CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	15.99		1				~~13.99~~		
	.0167	15.87		.94						
	.0333	15.76		.89						
	.05	15.65		.83						
	.0667	15.57		.80						
	.0833	15.49		.76						
	.1167	15.33		.68						
	.15	15.20		.62						
	.1833	15.09		.56						
	.2333	14.94		.49						
	.3334	14.71		.38						
	.5	14.43		.24						
	.75	14.21		.14						
	1.0834	14.07		.07						
	1.9167	13.99		.03						

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:
CLIENT:
WELL/BOREHOLE NO.: 7S
JOB NO.:
COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:
Ground Elevation: ft. AMSL
Reference Point (RP):
RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: 2' slug in
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 10' ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 10.8 ft. r_s (Radius of Borehole at Screen) .417 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume .85' displacement

TEST:

Start Date: 5/11/90
Static Level (H): 3.26 ft. BRP
Start Time (To):
Initial Pressure Head (Ho): 2.70 ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) ____ (No) X

CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho	CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	2.70	.56						
	.25	2.78	.48						
	.5	2.81	.45						
	.75	2.83	.42						
	1.0	2.85	.41						
	1.5	2.89	.37						
	2.0	2.91	.35						
	2.5	2.94	.32						
	3.0	2.95	.31						
	4.0	2.98	.28						
	5.0	3.01	.25						
	6.0	3.03	.23						
	8.0	3.07	.19						
	10.0	3.09	.17						
	15.0	3.14	.12						

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:
CLIENT:
WELL/BOREHOLE NO.: 7I
JOB NO.:
COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:
Ground Elevation: ft. AMSL
Reference Point (RP):
RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: 5' slug out
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010
L (Length of Sand Pack) 12.2 ft. r_s (Radius of Borehole at Screen) .125 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume 2.19' displacement

TEST:

Start Date: 5/10/90
Static Level (H): 4.70 ft. BRP
Start Time (To): 17:23
Initial Pressure Head (Ho): 6.89 ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) X (No)

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	6.89		1.0
	.0333	6.55		.84
	.05	6.22		.69
	.0666	5.95		.57
	.0833	5.73		.47
	.10	5.54		.38
	.1166	5.39		.32
	.1333	5.28		.26
	.15	5.17		.21
	.1666	5.09		.18
	.20	4.99		.13
	.2333	4.93		.11
	.40	4.84		.07
	.65	4.81		.05
	1.15	4.81		.05

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:
CLIENT:
WELL/BOREHOLE NO.: 7D
JOB NO.:
COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:
Ground Elevation: ft. AMSL
Reference Point (RP):
RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: 5' slug out
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 5 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 7.7 ft. r_s (Radius of Borehole at Screen) .125 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume 2.19' displacement

1.63

TEST:

Start Date: 5/10/90
Static Level (H): 4.71 ft. BRP
Start Time (To): 17:06
Initial Pressure Head (Ho): ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) X (No)

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft.BRP)	H-h (ft.)	H-h / H-Ho
	0 min	6.91		1
	.0167	6.86		.98
	.0333	6.78		.94
	.05	6.72		.91
	.0667	6.66		.89
	.10	6.56		.84
	.1333	6.47		.80
	.1667	6.39		.76
	.2167	6.26		.70
	.3334	6.01		.59
	.5834	5.62		.41
	.75	5.44		.33
	1.0	5.22		.23
	1.25	5.08		.17
	1.667	4.94		.10

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft.BRP)	H-h (ft.)	H-h / H-Ho
	2.917	4.78		.03

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:
CLIENT:
WELL/BOREHOLE NO.: 85
JOB NO.:
COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:
Ground Elevation: ft. AMSL
Reference Point (RP):
RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: 2' slug out
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 11.2 ft. r_s (Radius of Borehole at Screen) .417 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume 0.85' displacement

TEST:

Start Date: 5/10/90
Static Level (H): 6.51 ft. BRP
Start Time (To): 12:23
Initial Pressure Head (Ho): 7.36 ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) (No) X

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	7.36	.85	
	.0833	6.99	.48	
	.1	6.88	.47	
	.1167	6.96	.45	
	.1667	6.92	.41	
	.2	6.90	.39	
	.3667	6.82	.31	
	.6167	6.76	.25	
	.8667	6.71	.20	
	1.1167	6.66	.15	
	1.3667	6.63	.12	
	1.7834	6.60	.09	

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:

CLIENT: | WELL/BOREHOLE NO.: 8I

JOB NO.: | COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date: | Ground Elevation: ft. AMSL

Reference Point (RP): | RP Elevation: ft. AMSL

Stratigraphic Unit Monitored:

Hydrostratigraphic Unit Monitored:

Slug Test Method: 5' slug out

Riser Length: ft. | Riser I.D.: .167 ft. | Riser Material: PVC

Screen Length: 10 ft. | Screen I.D.: .167 ft. | Screen Material: PVC | Slot: 0.010

L (Length of Sand Pack) 11 ft. | r_s (Radius of Borehole at Screen) .167 ft. | r_c (Radius of Screen) .083 ft.

Slug Dimensions or Volume 2.19' displacement

TEST:

Start Date: 5/10/90 | Static Level (H): 7.32 ft. BRP

Start Time (To): 12:37 | Initial Pressure Head (Ho): 9.51 ft. BRP

Will Water Level Remain Above the Screen During the Test? (Yes) X (No)

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho	CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	9.51							
	.1166	8.02		.31					
	[illegible]	[illegible]		[illegible]					
	[illegible]	[illegible]							
	[illegible]	[illegible]		[illegible]					
	.1833	7.68		.16					
	.2	7.49		.08					
	.2833	7.38		.03					
	.5833	7.35		.01					

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT: ______
CLIENT: ______
JOB NO.: ______

WELL/BOREHOLE NO.: 8D
COMPLETED BY: ______

WELL/BOREHOLE DETAILS:

Installation Date: ______
Reference Point (RP): ______
Ground Elevation: ______ ft. AMSL
RP Elevation: ______ ft. AMSL
Stratigraphic Unit Monitored: ______
Hydrostratigraphic Unit Monitored: ______
Slug Test Method: 2' slug out
Riser Length: ______ ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 5 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 6.5 ft. r_s (Radius of Borehole at Screen) .167 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume 0.85' displacement

TEST:

Start Date: 05/10/90
Start Time (To): 13:54
Static Level (H): 7.1 ft. BRP
Initial Pressure Head (Ho): 9.3 ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) X (No) ______

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft.BRP)	H-h (ft.)	H-h / H-Ho
	0	9.3		1
	.0133	8.06		.43
	.0533	8.02		.42
	.0966	7.99		.40
	.1633	7.94		.38
	.2967	7.83		.33
	.5467	7.70		.27
	.7967	7.61		.23
	1.13	7.48		.17
	1.4633	7.40		.13
	1.7967	7.33		.10
	3.88	7.14		.01

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft.BRP)	H-h (ft.)	H-h / H-Ho

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:

CLIENT:

WELL/BOREHOLE NO.: P2-9

JOB NO.:

COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:

Ground Elevation: ______ ft. AMSL

Reference Point (RP):

RP Elevation: ______ ft. AMSL

Stratigraphic Unit Monitored:

Hydrostratigraphic Unit Monitored:

Slug Test Method: slug out 2' slug

Riser Length: ______ ft. Riser I.D.: .167 ft. Riser Material: PVC

Screen Length: 5 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 6.8 ft. r_s (Radius of Borehole at Screen) .417 ft. r_c (Radius of Screen) .083 ft.

Slug Dimensions or Volume 0.85' displacement

TEST:

Start Date: 5/9/90

Static Level (H): 11.73 ft. BRP

Start Time (To): 15:26

Initial Pressure Head (Ho): 12.61 ft. BRP

Will Water Level Remain Above the Screen During the Test? (Yes) ______ (No) ______

CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0 min	12.61		1.0
	.0167	12.51		.89
	.0334	12.45		.82
	.0834	12.32		.67
	.1334	12.23		.57
	.1834	12.15		.48
	.25	12.07		.32
	.5167	11.91		.20
	.8501	11.84		.125
	1.2667	11.49		.068
	1.6	11.77		.045
	1.9334	11.77		.045

CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:

CLIENT:

WELL/BOREHOLE NO.: ~~10B~~ mw-95

JOB NO.:

COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:

Ground Elevation: ft. AMSL

Reference Point (RP):

RP Elevation: ft. AMSL

Stratigraphic Unit Monitored:

Hydrostratigraphic Unit Monitored:

Slug Test Method: 2' slug out

Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC

Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 11 ft. r_s (Radius of Borehole at Screen) .417 ft. r_c (Radius of Screen) .083 ft.

Slug Dimensions or Volume 0.85' displacement

TEST:

Start Date: 5/9/90

Static Level (H): 5.68 ft. BRP

Start Time (To): 14:07

Initial Pressure Head (Ho): 6.62 ft. BRP

Will Water Level Remain Above the Screen During the Test? (Yes) ____ (No) X

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	6.62	.94	
	.0166	6.41	.73	
	.0333	6.34	.66	
	.05	6.30	.62	
	.10	6.23	.55	
	.15	6.16	.48	
	.2	6.10	.42	
	.4	5.94	.26	
	.5667	5.88	.20	

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:

CLIENT:

WELL/BOREHOLE NO.: 9I

JOB NO.:

COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:

Ground Elevation: ____ ft. AMSL

Reference Point (RP):

RP Elevation: ____ ft. AMSL

Stratigraphic Unit Monitored:

Hydrostratigraphic Unit Monitored:

Slug Test Method: 5' slug out

Riser Length: ____ ft. Riser I.D.: .167 ft. Riser Material: PVC

Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 11.5 ft. r_s (Radius of Borehole at Screen) .167 ft. r_c (Radius of Screen) .083 ft.

Slug Dimensions or Volume 2.19' displacement

TEST:

Start Date: 5/9/90

Static Level (H): 13.70 ft. BRP

Start Time (To): 15:16

Initial Pressure Head (Ho): 15.89 ft. BRP

Will Water Level Remain Above the Screen During the Test? (Yes) ____ (No) ____

CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	15.89		1
	~~.0167~~ .01	15.28		.72
	~~.0334~~ .0266	14.75		.48
	~~.0834~~ .0433	14.34		.29
	~~.1334~~ .06	14.06		.16
	~~.1834~~ .0766	13.90		.09
	~~.25~~ .0933	13.81		.05
	~~.5167~~ .11	13.77		.03
	~~.6501~~ .2766	13.76		.03
	~~1.2667~~ .3767	13.74		.02
Delete	~~1.6~~ .7933	13.71		.004
	~~1.8334~~ 2.96	13.68		

CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:

CLIENT:

WELL/BOREHOLE NO.: 105

JOB NO.:

COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:

Ground Elevation: ft. AMSL

Reference Point (RP):

RP Elevation: ft. AMSL

Stratigraphic Unit Monitored:

Hydrostratigraphic Unit Monitored:

Slug Test Method: 2' slug out

Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC

Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: .010

L (Length of Sand Pack) 12.1 ft. r_s (Radius of Borehole at Screen) .417 ft. r_c (Radius of Screen) .083 ft.

Slug Dimensions or Volume 0.85' displacement

TEST:

Start Date: 5/10/90

Static Level (H): 7.15 ft. BRP

Start Time (To): 9:33

Initial Pressure Head (Ho): 7.54 ft. BRP

Will Water Level Remain Above the Screen During the Test? (Yes) x (No) [illegible]

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho	CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	7.84	.69			14.9167	7.38	.23	
	.05	7.71	.56			18.9167	7.35	.20	
	.0667	7.66	.51						
	.1167	7.65	.50						
	.1667	7.63	.48						
	.3334	7.60	.45						
	.5	7.57	.42						
	.8334	7.55	.40						
	1.33	7.54	.39						
	2.4167	7.51	.36						
	4.4167	7.48	.33						
	4.9167	7.46	.31						
	5.9167	7.44	.29						
	7.9167	7.43	.28						

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT: ____________________

CLIENT: ____________________ WELL/BOREHOLE NO.: 10I

JOB NO.: ____________________ COMPLETED BY: ____________________

WELL/BOREHOLE DETAILS:

Installation Date: ____________________ Ground Elevation: ____________________ ft. AMSL

Reference Point (RP): ____________________ RP Elevation: ____________________ ft. AMSL

Stratigraphic Unit Monitored: ____________________

Hydrostratigraphic Unit Monitored: ____________________

Slug Test Method: 5' slug out

Riser Length: ______ ft. Riser I.D.: .167 ft. Riser Material: PVC

Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 11.9 ft. r_s (Radius of Borehole at Screen) .167 ft. r_c (Radius of Screen) .083 ft.

Slug Dimensions or Volume 2.19' displacement

TEST:

Start Date: 5/10/90 Static Level (H): 12.62 ft. BRP

Start Time (To): 9:18 Initial Pressure Head (Ho): 14.81 ft. BRP

Will Water Level Remain Above the Screen During the Test? (Yes) X (No) ______

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	14.81		1
	.0017	14.39		.81
	.0383	13.97		.62
	.055	13.70		.49
	.0717	13.45		.38
	.0883	13.28		.30
	.105	13.17		.25
	.1217	13.07		.21
	.1717	12.95		.15
	.2217	12.88		.12
	.2717	12.85		.11
	.3884	12.77		.07
	1.1384	12.73		.05
	1.305	12.69		.03

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:
CLIENT: WELL/BOREHOLE NO.: 11S
JOB NO.: COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date: Ground Elevation: ft. AMSL
Reference Point (RP): RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: 2' slug out
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 11.3 ft. r_s (Radius of Borehole at Screen) .417 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume 2' slug out 0.85' ~~ste~~ displacement

TEST:

Start Date: 5/14/90 Static Level (H): 2.94 ft. BRP
Start Time (To): 9:10 am Initial Pressure Head (Ho): 3.54 ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) (No)

CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho		CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	3.54	.6							
	.25 min	3.53	.59							
	.50	3.50	.56							
	.75	3.48	.54							
	1.00	3.46	.52							
	1.5	3.43	.49							
	2.0	3.40	.46							
	3.0	3.35	.41							
	4.0	3.31	.37							
	6.0	3.25	.31							
	8.0	3.20	.26							
	13.0	3.12	.18							
	18.0	3.08	.14							
	~~26.0~~ 27.0	3.05	.11							

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:
CLIENT:
WELL/BOREHOLE NO.: 11 I
JOB NO.:
COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:
Ground Elevation: ft. AMSL
Reference Point (RP):
RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: 5' slug out
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 12.5 ft. r_s (Radius of Borehole at Screen) .167 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume 2.19' displacement

TEST:

Start Date: 5/10/90
Static Level (H): 7.48 ft. BRP
Start Time (To): 14:30
Initial Pressure Head (Ho): 9.67 ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) x (No)

CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	9.67		1
	~~.0183~~ .0133	9.16		.77
	.03	8.65		.53
	.0466	8.31		.38
	.0633	8.07		.27
	.08	7.9		.19
	.0966	7.79		.14
	.13	7.7		.10
	.18	7.66		.08
	.23	7.65		.08
	.43	7.60		.05
	.847	7.59		.05

CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:
CLIENT:
WELL/BOREHOLE NO.: 125
JOB NO.:
COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:
Ground Elevation: ft. AMSL
Reference Point (RP):
RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: 2' slug out
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: .010

L (Length of Sand Pack) 11 ft. r_s (Radius of Borehole at Screen) .417 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume 2' slug out 0.85' displacement

TEST:

Start Date: 5/14/90
Static Level (H): 5.54 ft. BRP
Start Time (To): 10:20
Initial Pressure Head (Ho): ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) (No)

CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho	CLOCK TIME	ELAPSED TIME t(h-m-s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0 min	6.03	.49						
	.25	6.01	.47						
	.5	5.98	.44						
	.75	5.95	.41						
	1.00	5.92	.38						
	1.5	5.87	.33						
	2.0	5.82	.28						
	3.0	5.76	.22						
	4.0	5.72	.18						
	5.0	5.70	.16						
	7.0	5.64	.10						
	9.0	5.61	.07						
	11.0	5.59	.05						

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:
CLIENT: WELL/BOREHOLE NO.: 12 I
JOB NO.: COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date: Ground Elevation: ft. AMSL
Reference Point (RP): RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: 5' slug out
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 5' ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: .010
L (Length of Sand Pack) 9.5 ft. r_s (Radius of Borehole at Screen) .125 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume 2.19' displacement

TEST:

Start Date: 5/10/90 Static Level (H): 8.31 ft. BRP
Start Time (To): 15:31 Initial Pressure Head (Ho): 11.5 ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) x (No)

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0 min	11.5		1
	.03	9.5		.54
	.0533	9.45		.52
	.0966	9.41		.50
	.1133	9.26		.43
	.14	9.19		.40
	.1466	9.09		.36
	.18	8.97		.30
	.2133	8.86		.25
	.38	8.54		.11
	.63	8.43		.05
	.88	8.33		.03
	1.13	8.35		.02
	1.29	8.34		.01
	1.7133	8.32		.005

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho
	2.38	8.31		0

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:
CLIENT: WELL/BOREHOLE NO.: 135
JOB NO.: COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date: Ground Elevation: ft. AMSL
Reference Point (RP): RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: 5' slug in
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 12.1 ft. r_s (Radius of Borehole at Screen) .417 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume 0.85' displacement

TEST:

Start Date: 5/11/90 Static Level (H): 4.66 ft. BRP
Start Time (To): Initial Pressure Head (Ho): 3.10 ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) (No)

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho	CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	3.10	1.56						
	.25	3.3	1.36						
	.5	3.34	1.32						
	.75	3.36	1.3						
	1.0	3.39	1.27						
	1.5	3.41	1.25						
	2.0	3.45	1.21						
	3.0	3.50	1.16						
	4.0	3.55	1.11						
	5.0	3.59	1.07						
	7.0	3.67	.99						
	12.0	3.84	.82						
	20.0	4.02	.64						
	30.0	4.20	.46						

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:
CLIENT:
JOB NO.:
WELL/BOREHOLE NO.: 145
COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:
Ground Elevation: ft. AMSL
Reference Point (RP):
RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: 2' slug out
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 11 ft. r_s (Radius of Borehole at Screen) .417 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume 2' slug out 0.85' displacement

TEST:

Start Date: 5/14/90
Static Level (H): 4.14 ft. BRP
Start Time (To): 11:20
Initial Pressure Head (Ho): 4.78 ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) (No)
2

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft BRP)	H-h (ft.)	H-h / H-Ho
	0 min	4.78	.64	
	.25	4.70	.56	
	.5	4.63	.49	
	.75	4.58	.44	
	1.0	4.54	.40	
	1.5	4.46	.32	
	2.0	4.40	.26	
	2.5	4.36	.22	
	3.0	4.31	.17	
	3.5	4.30	.16	
	4.0	4.28	.14	
	5.0	4.24	.10	
	6.0	4.21	.07	
	7.0	4.20	.06	

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:

CLIENT:

JOB NO.:

WELL/BOREHOLE NO.: 155

COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:

Ground Elevation: ft. AMSL

Reference Point (RP):

RP Elevation: ft. AMSL

Stratigraphic Unit Monitored:

Hydrostratigraphic Unit Monitored:

Slug Test Method: 2' slug in

Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC

Screen Length: 10' ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 11 ft. r_s (Radius of Borehole at Screen) .417 ft. r_c (Radius of Screen) .083 ft.

Slug Dimensions or Volume .85' displacement

TEST:

Start Date: 5/11/90

Static Level (H): 6.06 ft. BRP

Start Time (To):

Initial Pressure Head (Ho): 5.67 ft. BRP

Will Water Level Remain Above the Screen During the Test? (Yes) \ (No)

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	5.67	.39	
	.25	5.74	.32	
	.5	5.75	.31	
	.75	5.76	.30	
	1.0	5.77	.29	
	2.0	5.80	.26	
	3.0	5.81	.25	
	4.0	5.84	.22	
	5.0	5.85	.21	
	7.0	5.88	.18	
	10.0	5.90	.16	
	15.0	5.93	.13	
	20.0	5.94	.12	

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho

COMMENTS:

MALCOLM PIRNIE

FIELD SLUG TEST LOG

PROJECT:
CLIENT:
WELL/BOREHOLE NO.: 16 I
JOB NO.:
COMPLETED BY:

WELL/BOREHOLE DETAILS:

Installation Date:
Ground Elevation: ft. AMSL
Reference Point (RP):
RP Elevation: ft. AMSL
Stratigraphic Unit Monitored:
Hydrostratigraphic Unit Monitored:
Slug Test Method: 5' slug out
Riser Length: ft. Riser I.D.: .167 ft. Riser Material: PVC
Screen Length: 10 ft. Screen I.D.: .167 ft. Screen Material: PVC Slot: 0.010

L (Length of Sand Pack) 12.5 ft. r_s (Radius of Borehole at Screen) .167 ft. r_c (Radius of Screen) .083 ft.
Slug Dimensions or Volume 2.19' displacement

TEST:

Start Date: 5/10/90
Static Level (H): 7.65 ft. BRP
Start Time (To): 14:54
Initial Pressure Head (Ho): ft. BRP
Will Water Level Remain Above the Screen During the Test? (Yes) x (No)

CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH H(ft. BRP)	H-h (ft.)	H-h / H-Ho	CLOCK TIME	ELAPSED TIME t(h=m=s)	DEPTH h(ft. BRP)	H-h (ft.)	H-h / H-Ho
	0	9.84		1					
	~~.01~~	~~8.48~~		~~.38~~					
	.0433	8.37		.33					
	.06	7.85		.09					
	.1266	7.76		.05					
	.1433	7.72		.03					
	.1933	7.71		.03					
	.2266	7.69		.01					
	.4600	7.66		0					

COMMENTS:

MALCOLM PIRNIE

Ready 6D

SE1000B
Environmental Logger
05/09 14:46

Unit# 00554 Test# 3

INPUT 1: Level (F) TOC

Reference	13.93
Scale factor	49.99
Offset	0.00

Step# 0 05/09 14:43

Elapsed Time	Value
0.0000	13.93
0.0033	13.93
0.0066	13.93
0.0099	13.94
0.0133	13.94
0.0166	13.94
0.0200	13.94
0.0233	13.93
0.0266	14.00
0.0300	14.24
0.0333	14.62
0.0500	16.56
0.0666	15.05
0.0833	15.99
0.1000	15.87
0.1166	15.76
0.1333	15.65
0.1500	15.57
0.1666	15.49
0.1833	15.39
0.2000	15.33
0.2166	15.27
0.2333	15.20
0.2500	15.14
0.2666	15.09
0.2833	15.05
0.3000	14.98
0.3166	14.94
0.3333	14.90
0.4167	14.71
0.5000	14.56
0.5833	14.43
0.6667	14.35
0.7500	14.27
0.8333	14.21
0.9167	14.16
1.0000	14.13
1.0833	14.10
1.1667	14.07
1.2500	14.05
1.3333	14.04
1.4166	14.04
1.5000	14.02
1.5833	14.02
1.6667	14.00
1.7500	14.00
1.8333	14.00
1.9167	14.00
2.0000	13.99

END

Ready 6I

SE1000B
Environmental Logger
05/07 14:34

Unit# 00554 Test# 0

INPUT 1: Level (F) TOC

Reference	13.07
Scale factor	49.82
Offset	0.00

Step# 0 05/07 14:28

Elapsed Time	Value
0.0000	13.00
0.0033	13.00
0.0066	13.02
0.0099	13.02
0.0133	13.91
0.0166	14.87
0.0200	14.26
0.0233	14.17
0.0266	13.96
0.0300	14.54
0.0333	14.59
0.0500	14.18
0.0666	13.76
0.0833	13.49
0.1000	13.32
0.1166	13.21
0.1333	13.14
0.1500	13.11
0.1666	13.10
0.1833	13.08
0.2000	13.08
0.2166	13.08
0.2333	13.08
0.2500	13.08
0.2666	13.07
0.2833	13.07
0.3000	13.05
0.3166	13.05
0.3333	13.05
0.4167	13.05
0.5000	13.05
0.5833	13.05
0.6667	13.00
0.7500	12.99
0.8333	12.99
0.9167	12.99
1.0000	12.99
1.0833	12.99
1.1667	12.99

END

MW

SE1000B
Environmental Logger
05/10 16:09

Unit# 00554 Test# 6

INPUT 1: Level (F) TOC

Reference	4.71
Scale factor	49.82
Offset	0.00

Step# 0 05/10 16:06

Elapsed Time	Value
0.0000	4.71
0.0033	4.72
0.0066	4.74
0.0099	4.74
0.0133	4.74
0.0166	4.75
0.0200	4.75
0.0233	4.75
0.0266	4.75
0.0300	4.75
0.0333	4.75
0.0500	4.82
0.0666	5.96
0.0833	6.91
0.1000	6.86
0.1166	6.78
0.1333	6.72
0.1500	6.66
0.1666	6.62
0.1833	6.56
0.2000	6.51
0.2166	6.47
0.2333	6.42
0.2500	6.39
0.2666	6.34
0.2833	6.31
0.3000	6.26
0.3166	6.23
0.3333	6.20
0.4166	6.01
0.5000	5.85
0.5833	5.73
0.6667	5.62
0.7500	5.52
0.8333	5.44
0.9167	5.37
1.0000	5.29
1.0833	5.22
1.1667	5.18
1.2500	5.13
1.3333	5.08
1.4166	5.05
1.5000	5.02
1.5833	4.99
1.6667	4.97
1.7500	4.94
1.8333	4.93
1.9167	4.91
2.0000	4.89
2.5000	4.82
[illegible]	4.78

END

mw-II

SE1000B
Environmental Logger
05/10 16:25

Unit# 00554 Test# 6

INPUT 1: Level (F) TOC

Reference	4.70
Scale factor	49.82
Offset	0.00

Step# 0 05/10 16:23

Elapsed Time	Value
0.0000	4.70
0.0033	4.71
0.0066	4.73
0.0099	4.73
0.0133	4.73
0.0166	4.73
0.0200	4.74
0.0233	4.74
0.0266	4.74
0.0300	4.74
0.0333	4.74
0.0500	4.73
0.0666	4.73
0.0833	4.73
0.1000	4.82
0.1166	5.86
0.1333	6.55
0.1500	6.22
0.1666	5.95
0.1833	5.73
0.2000	5.54
0.2166	5.39
0.2333	5.28
0.2500	5.17
0.2666	5.09
0.2833	5.04
0.3000	4.99
0.3166	4.95
0.3333	4.93
0.4167	4.85
0.5000	4.84
0.5833	4.82
0.6667	4.82
0.7500	4.81
0.8333	4.81
0.9167	4.81
1.0000	4.81
1.0833	4.81
1.1667	4.81
1.2500	4.81

END

8S

3E10[illegible]
Environmental Logger
05/12 [illegible]

Unit# 2055 Test# 2

INPUT 1: Level (F) TOC

Reference 6.51
Scale factor 49.99
Offset 0.00

Step# 0 05/12 12:23

Elapsed Time	Value
0.0000	6.51
0.0033	6.52
0.0066	6.51
0.0099	6.51
0.0133	6.51
0.0166	6.51
0.0200	6.51
0.0233	6.51
0.0266	6.51
0.0300	6.51
0.0333	6.51
0.0500	6.51
0.0666	6.51
0.0833	6.51
0.1000	6.51
0.1166	6.49
0.1333	7.36
[illegible]	6.79
[illegible]	6.86
[illegible]	6.76
[illegible]	6.88
0.2166	6.99
0.2333	6.98
0.2500	6.96
0.2666	6.95
0.2833	6.93
0.3000	6.92
0.3166	6.92
0.3333	6.90
0.4167	6.85
0.5000	6.82
0.5833	6.80
0.6667	6.77
0.7500	6.76
0.8333	6.74
0.9167	6.73
1.0000	6.71
1.0833	6.69
1.1667	6.68
1.2500	6.66
1.3333	6.66
1.4166	6.65
1.5000	6.63
1.5833	6.63
1.6667	6.62
1.7500	6.62
[illegible]	6.62
[illegible]	6.60
[illegible]	6.59

END

8D

3E10
Environmental Logger
05/12 13:5[illegible]

Unit# 2055 Test# 4

INPUT 1: Level (F) TOC

Reference 7.11
Scale factor 49.82
Offset 0.00

Step# 0 05/12 13:54

Elapsed Time	Value
0.0000	7.09
0.0033	7.11
0.0066	7.12
0.0099	7.12
0.0133	7.12
0.0166	7.15
0.0200	7.14
0.0233	7.14
0.0266	7.17
0.0300	7.17
0.0333	7.06
0.0500	7.14
0.0666	7.09
0.0833	7.15
0.1000	7.17
0.1166 .12	7.40
9.3 0.1333	8.06
0.1500	8.05
0.1666	8.03
0.1833	8.02
0.2000	8.00
0.2166	7.99
0.2333	7.97
0.2500	7.95
0.2666	7.95
0.2833	7.94
0.3000	7.92
0.3166	7.91
0.3333	7.91
0.4167	7.83
0.5000	7.78
0.5833	7.75
0.6667	7.70
0.7500	7.67
0.8333	7.64
0.9167	7.61
1.0000	7.58
1.0833	7.55
1.1667	7.51
1.2500	7.48
1.3333	7.47
1.4166	7.44
1.5000	7.42
1.5833	7.40
1.6667	7.37
1.7500	7.36
1.8333	7.34
1.9167	7.33
2.0000	7.31
2.5000	7.23
3.0000	7.18
3.5000	7.15
4.0000	7.14

END

MW-8I

3E10
Environmental Logger
05/1[illegible] [illegible]

Unit# 2055 Test# 3

INPUT 1: Level (F) TOC

Reference 7.35
Scale factor 49.99
Offset 0.00

Step# 0 05/1[illegible] [illegible]2:37

Elapsed Time	Value
0.0000	7.33
0.0033	7.35
0.0066	7.37
0.0099	7.35
0.0133	7.35
0.0166	7.35
0.0200	7.35
0.0233	7.35
0.0266	7.35
0.0300	7.35
0.0333	7.35
0.0500	7.35
0.0666	7.33
0.0833	7.35
0.1000	7.35
0.1166	8.02
[illegible]	7.55
[illegible]	7.31
[illegible]	7.64
[illegible]	7.60
[illegible]	7.49
[illegible]	7.33
[illegible]	7.33
[illegible]	7.33
[illegible]	7.29
[illegible]	7.38
[illegible]	7.33
0.3166	7.36
0.3333	7.36
0.4167	7.36
0.5000	7.36
0.5833	7.35
0.6667	7.35
0.7500	7.35
0.8333	7.35
0.9167	7.35
1.0000	7.35
1.0833	7.35
[illegible]	[illegible]

END

PZ-9

SE1000B
Environmental Logger
05/09 14:28

Unit# 00554 Test# 2

INPUT 1: Level (F) TOC

Reference	11.73
Scale factor	49.99
Offset	0.00

Step# 0 05/09 14:26

Elapsed Time	Value
0.0000	11.74
0.0033	11.76
0.0066	11.69
0.0099	11.73
0.0133	11.77
0.0166	11.73
0.0200	11.76
0.0233	11.77
0.0266	11.69
0.0300	11.74
0.0333	11.71
0.0500	12.53
0.0666	12.61
0.0833	12.51
0.1000	12.45
0.1166	12.42
0.1333	12.37
0.1500	12.32
0.1666	12.29
0.1833	12.26
0.2000	12.23
0.2166	12.20
0.2333	12.17
0.2500	12.15
0.2666	12.14
0.2833	12.12
0.3000	12.09
0.3166	12.07
0.3333	12.06
0.4167	11.99
0.5000	11.95
0.5833	11.91
0.6667	11.88
0.7500	11.87
0.8333	11.85
0.9167	11.84
1.0000	11.82
1.0833	11.80
1.1667	11.79
1.2500	11.80
1.3333	11.79
1.4166	11.79
1.5000	11.79
1.5833	11.79
1.6667	11.77
1.7500	11.77
1.8333	11.77
1.9167	11.77
2.0000	11.77

Ready **9I**

SE1000B
Environmental Logger
05/09 14:20

Unit# 00554 Test# 1

INPUT 1: Level (F) TOC

Reference	13.70
Scale factor	49.82
Offset	0.00

Step# 0 05/09 14:16

Elapsed Time	Value
0.0000	13.70
0.0033	13.71
0.0066	13.71
0.0099	13.74
0.0133	13.81
0.0166	13.88
0.0200	13.92
0.0233	14.04
0.0266	14.28
0.0300	14.51
0.0333 (→ .04)	14.32
0.0500	15.28
0.0666	14.75
0.0833	14.34
0.1000	14.06
0.1166	13.90
0.1333	13.81
0.1500	13.77
0.1666	13.77
0.1833	13.77
0.2000	13.77
0.2166	13.77
0.2333	13.77
0.2500	13.77
0.2666	13.77
0.2833	13.77
0.3000	13.77
0.3166	13.76
0.3333	13.76
0.4167	13.74
0.5000	13.73
0.5833	13.73
0.6667	13.73
0.7500	13.73
0.8333	13.71
0.9167	13.71
1.0000	13.71
1.0833	13.71
1.1667	13.71
1.2500	13.71
1.3333	13.71
1.4166	13.71
1.5000	13.71
1.5833	13.71
1.6667	13.71
1.7500	13.71
1.8333	13.71
1.9167	13.71
2.0000	13.71
2.5000	13.71
3.0000	13.68

END

9S

SE1000B
Environmental Logger
05/09 14:08

Unit# 00554 Test# 0

INPUT 1: Level (F) TOC

Reference	5.68
Scale factor	49.82
Offset	0.00

Step# 0 05/09 14:07

Elapsed Time	Value
0.0000	5.74
0.0033	5.75
0.0066	5.75
0.0099	5.75
0.0133	5.75
0.0166	5.75
0.0200	5.75
0.0233	5.75
0.0266	5.75
0.0300	5.75
0.0333	5.77
0.0500	5.75
0.0666	5.75
0.0833	6.41
0.1000	6.62
0.1166	6.41
0.1333	6.34
0.1500	6.30
0.1666	6.27
0.1833	6.24
0.2000	6.23
0.2166	6.21
0.2333	6.18
0.2500	6.16
0.2666	6.13
0.2833	6.12
0.3000	6.10
0.3166	6.08
0.3333	6.07
0.4167	5.99
0.5000	5.94
0.5833	5.91
0.6667	5.88

END

11I

Logger

Value

Elapsed Time	Value
[illegible]	7.51
[illegible]	7.54
[illegible]	7.55
[illegible]	7.55
[illegible]	7.57
[illegible]	7.57
[illegible]	7.57
[illegible]	7.57
[illegible]	7.57
[illegible]	7.57
[illegible]	7.57
[illegible]	7.55
[illegible]	9.29
[illegible]	9.16
[illegible]	8.65
[illegible]	8.31
[illegible]	8.07
[illegible]	7.90
[illegible]	7.79
[illegible]	7.73
[illegible]	7.70
[illegible]	7.68
[illegible]	7.68
[illegible]	7.66
[illegible]	7.65
[illegible]	7.65
[illegible]	7.65
[illegible]	7.63
[illegible]	7.63
[illegible]	7.62
[illegible]	7.60
[illegible]	7.60
[illegible]	7.60
[illegible]	7.60
[illegible]	7.60
[illegible]	7.59
[illegible]	7.59
[illegible]	7.59

MW-12I

E1000

1.5^2^0 .12

MW-16I

Logger

Reference 7.65

Scale factor

Offset 0.00

Step# 0

Elapsed Time	Value
[illegible]	7.65
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	7.65
[illegible]	7.69
[illegible]	7.69
[illegible]	7.74
[illegible]	7.74
[illegible]	7.61
[illegible]	7.69
[illegible]	7.69
[illegible]	8.45
[illegible]	8.13
[illegible]	8.0[illegible]
[illegible]	7.85
[illegible]	7.81
[illegible]	7.83
[illegible]	7.74
[illegible]	7.76
[illegible]	[illegible]
[illegible]	7.69
[illegible]	7.69
[illegible]	7.71
[illegible]	7.71
[illegible]	7.69
[illegible]	7.69
[illegible]	7.69
[illegible]	7.69
[illegible]	7.69
[illegible]	7.68
[illegible]	7.66
[illegible]	7.66
[illegible]	7.66
[illegible]	7.66
[illegible]	7.68
[illegible]	7.66
[illegible]	7.66

END

11I

E10?0?
[illegible] Logger

Reference 7.48
Scale factor -9.82
Offset 0.00

Step# 0 05 [illegible] 14:30

Elapsed Time	Value
[illegible]	7.51
[illegible]	7.54
[illegible]	7.55
[illegible]	7.55
[illegible]	7.57
0.0166	7.57
0.0200	7.57
0.0233	7.57
0.0266	7.57
0.0300	7.57
[illegible]	7.57
[illegible]	7.55
[illegible]	8.29
[illegible]	8.16
[illegible]	8.55
[illegible]	8.31
[illegible]	8.07
[illegible]	7.90
[illegible]	7.79
[illegible]	7.77
[illegible]	7.70
[illegible]	7.68
[illegible]	7.68
[illegible]	7.66
[illegible]	7.65
[illegible]	7.65
[illegible]	7.65
[illegible]	7.63
[illegible]	7.63
[illegible]	7.62
[illegible]	7.60
[illegible]	7.60
[illegible]	7.60
[illegible]	7.60
[illegible]	7.60
[illegible]	7.59
[illegible]	7.59
[illegible]	7.59

mw-12I

E10?08

1.5:0? .12

mw-16I

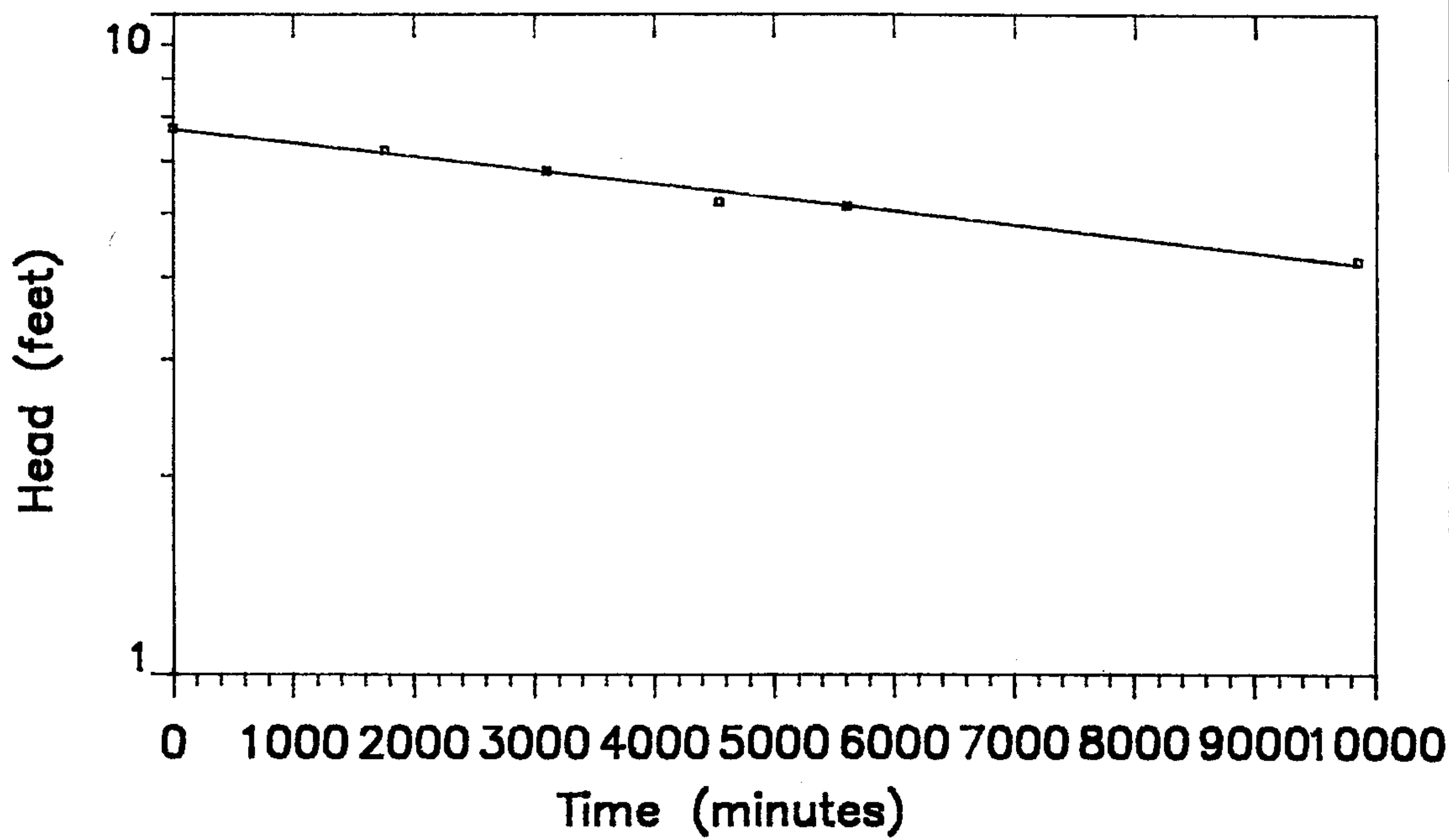
E10?0?
[illegible] Logger

Reference 7.65
Scale factor -9.82
Offset 0.00

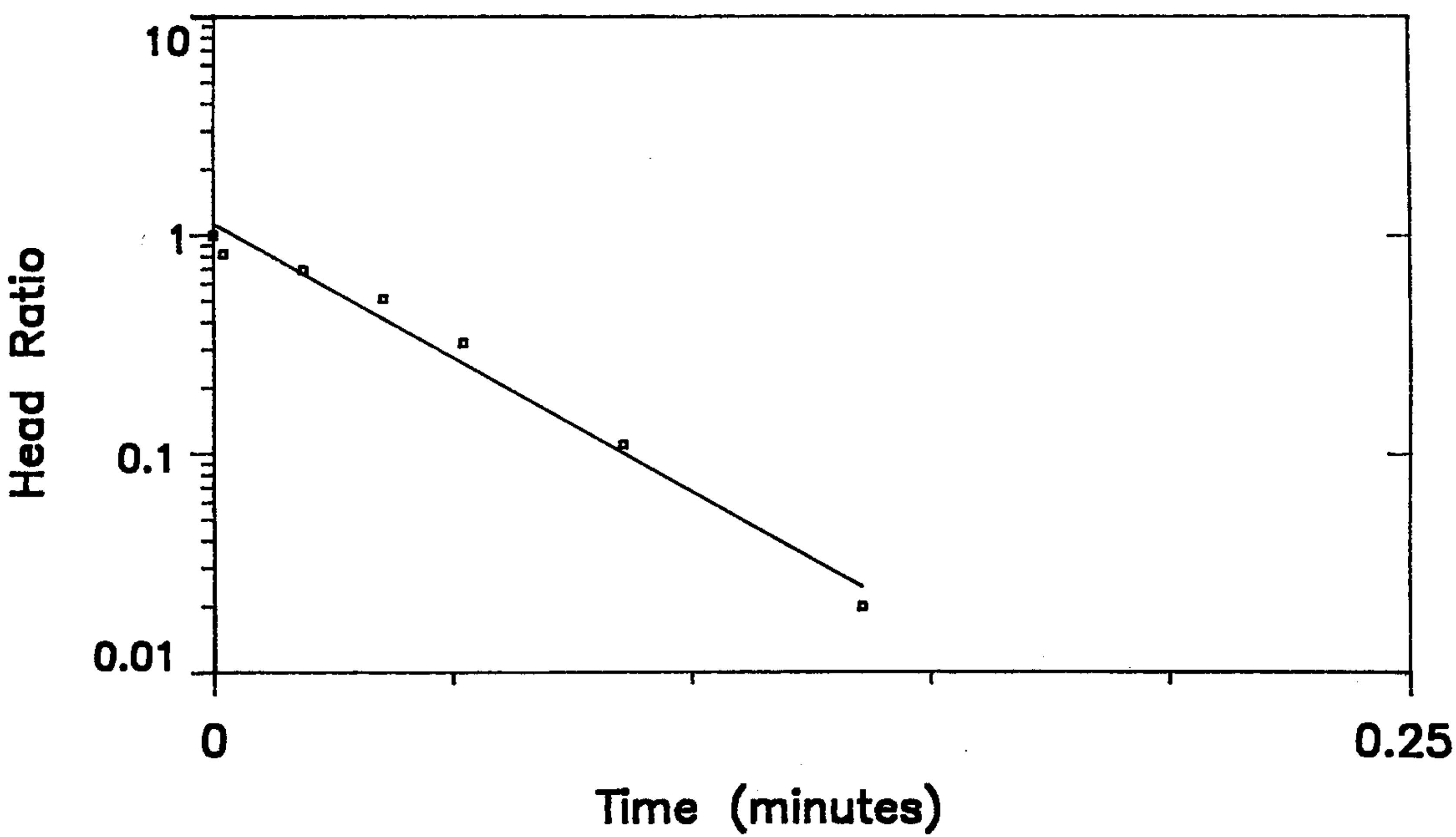
Step# 0 05 [illegible] 14:54

Elapsed Time	Value
0.0000	7.65
[illegible]	[illegible]
[illegible]	7.72
0.0066	7.65
0.0099	7.69
0.0133	7.69
0.0166	7.74
0.0200	7.74
[illegible]	7.81
0.0266	7.69
0.0300	7.69
0.0333	8.48
0.0500	8.13
0.0666	[illegible]
0.0833	7.85
0.1000	7.81
0.1166	7.85
[illegible]	7.74
[illegible]	7.76
0.1666	[illegible]
[illegible]	7.69
0.2000	7.69
0.2166	7.71
[illegible]	7.71
0.2500	7.69
[illegible]	7.69
0.2833	7.69
0.3000	7.69
0.3166	7.69
[illegible]	7.68
0.4166	7.66
0.5000	7.66
[illegible]	7.66
0.6666	7.66
0.7500	7.66
[illegible]	7.66
[illegible]	7.66
1.0000	

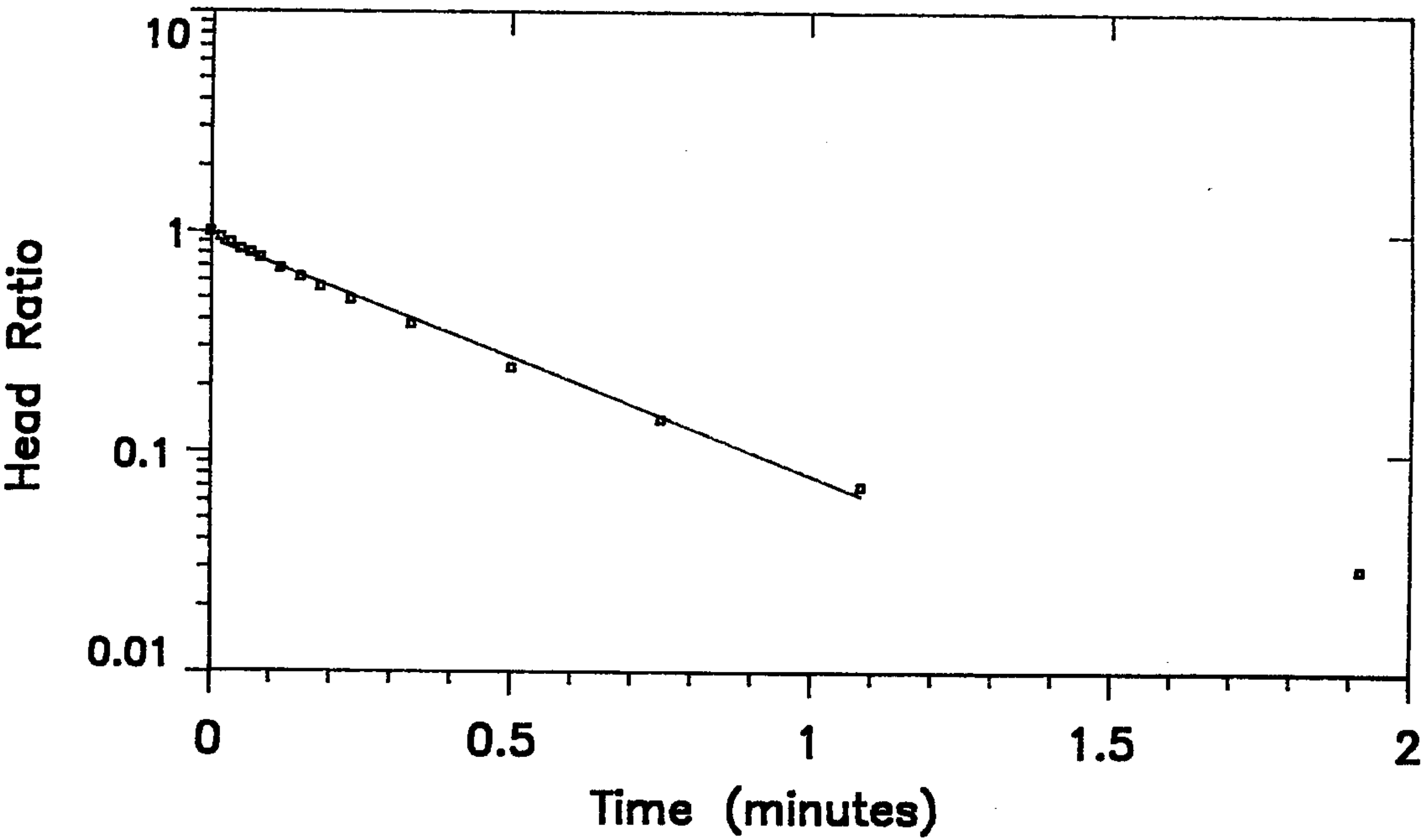
END



MODEL TYPE: BOUWER and RICE	for: City of Rochester	**Well Slug Test Data**
CONDUCTIVITY: 4.834E-8 cm/sec	by: Malcolm Pirnie, Inc.	**Well: MW-6S**
TRANSMISSIVITY: 1.871E-5 sq. cm/sec	WELL DATA: Units: ft AQUIFER: Endless THICKNESS: 12.70 SCREEN: top: 8.300 base: 18.30 DIAMETER: casing: .1660 intake: .8340 DEPTH: Water Table: 7.380 TD: 19.10	**Rochester, N.Y.**
INITIAL HEAD: 14.32 ft		**Monroe Co.**
Data Set: RF6S — Date: 7-MAY-90		



MODEL TYPE: HVORSLEV		for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: .03399 cm/sec		by: Malcolm Pirnie, Inc.	Well: MW-6I
TRANSMISSIVITY: 11.50 sq. cm/sec		WELL DATA: Units: ft	Rochester, N.Y.
INITIAL HEAD: 15.28 ft		AQUIFER: Endless	Monroe Co.
		THICKNESS: 11.10	
		SCREEN: top: 37.00 base: 47.00	
Data Set: RF6I	Date: 7-MAY-90	DIAMETER: casing: .1660 intake: .3340	
		DEPTH: Water Table: 13.07 TD: 47.10	



MODEL TYPE: HVORSLEV

CONDUCTIVITY: .003655 cm/sec

TRANSMISSIVITY: 1.270 sq. cm/sec

INITIAL HEAD: 15.99 ft

Data Set: RF6D | Date: 9-MAY-90

for: City of Rochester

by: Malcolm Pirnie, Inc.

WELL DATA: Units: ft

AQUIFER: Endless

THICKNESS: 11.40

SCREEN: top: 46.00 base: 56.00

DIAMETER: casing: .1660 intake: .3340

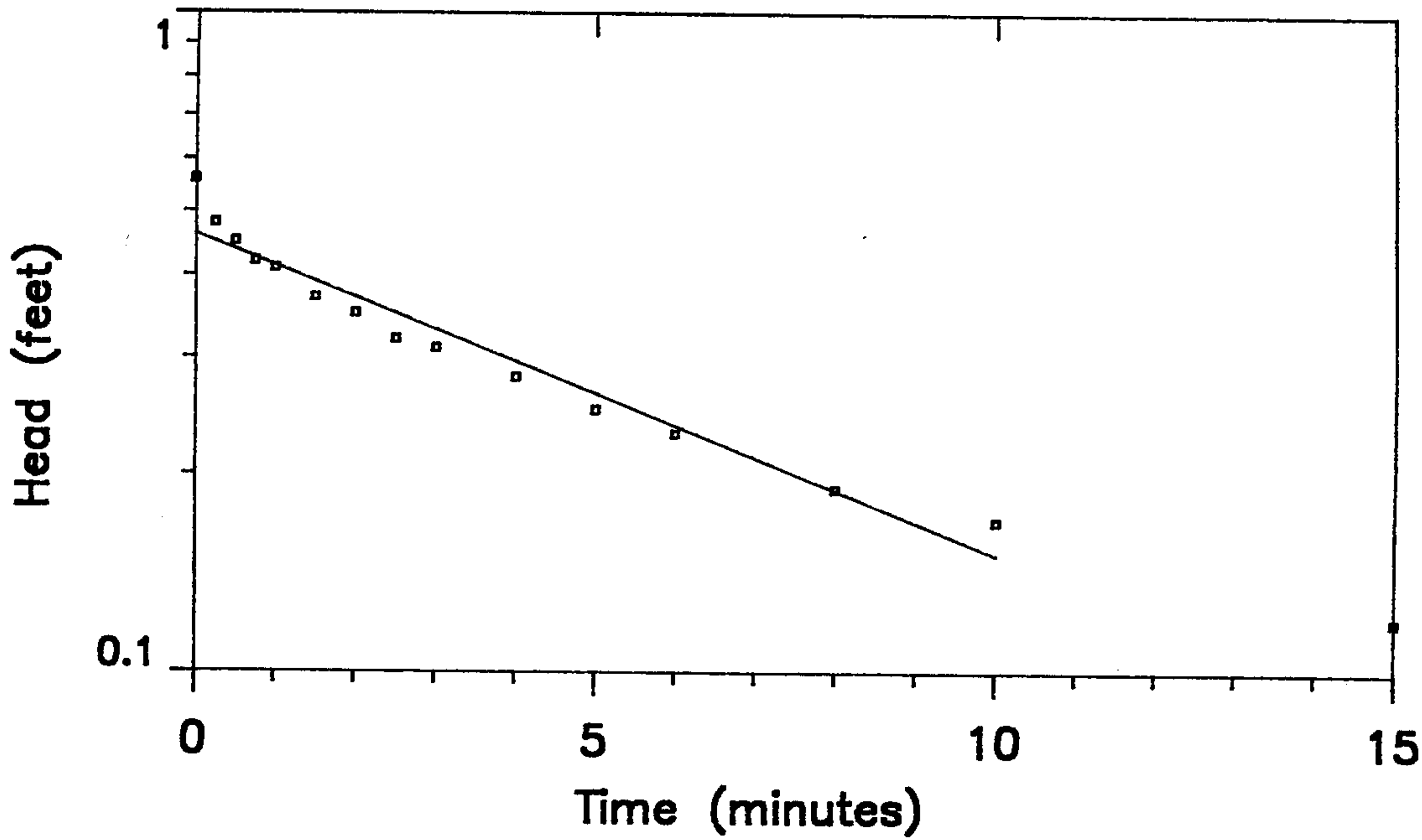
DEPTH: Water Table: 13.93 TD: 56.40

Well Slug Test Data

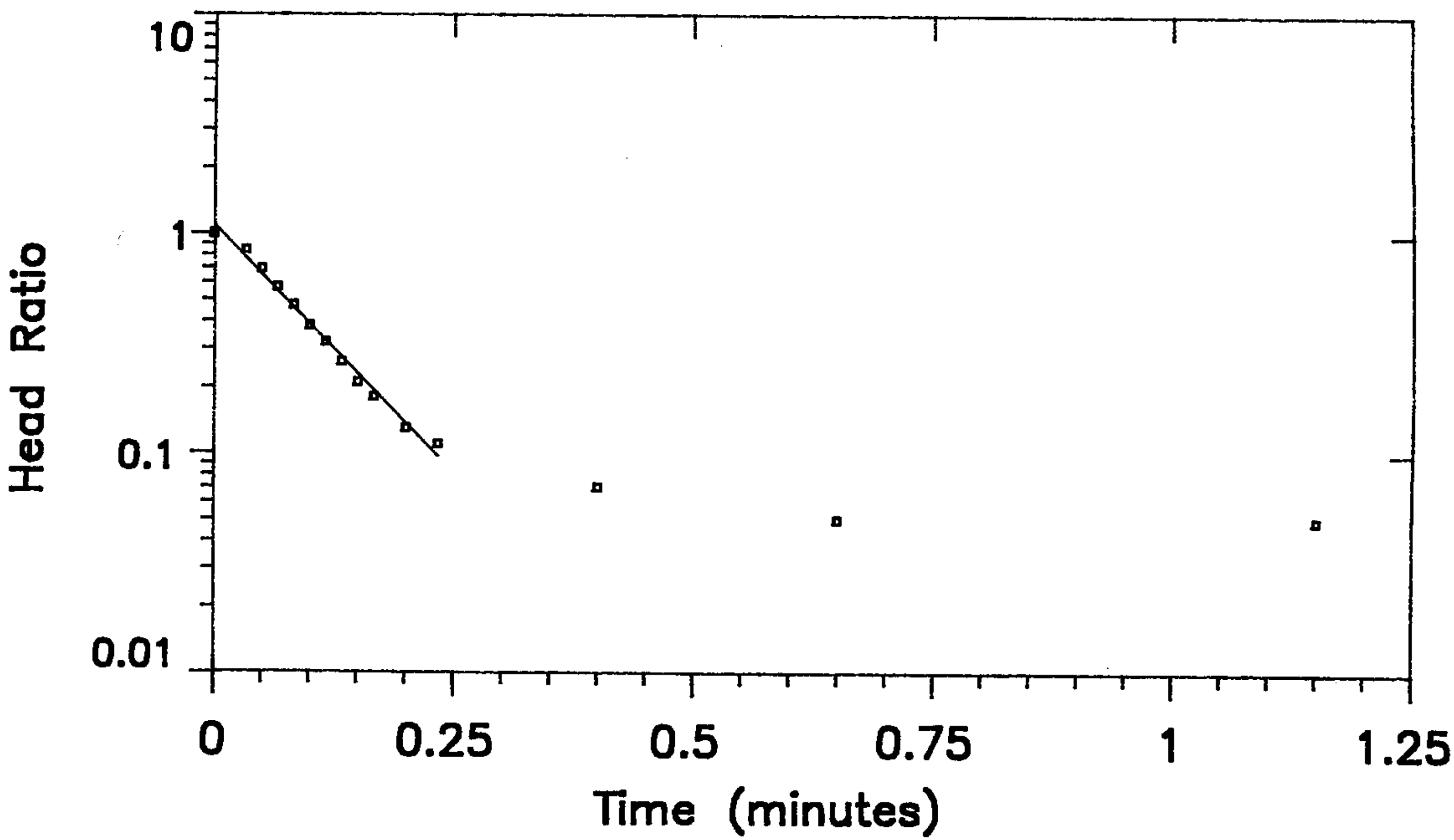
Well: MW-6D

Rochester, N.Y.

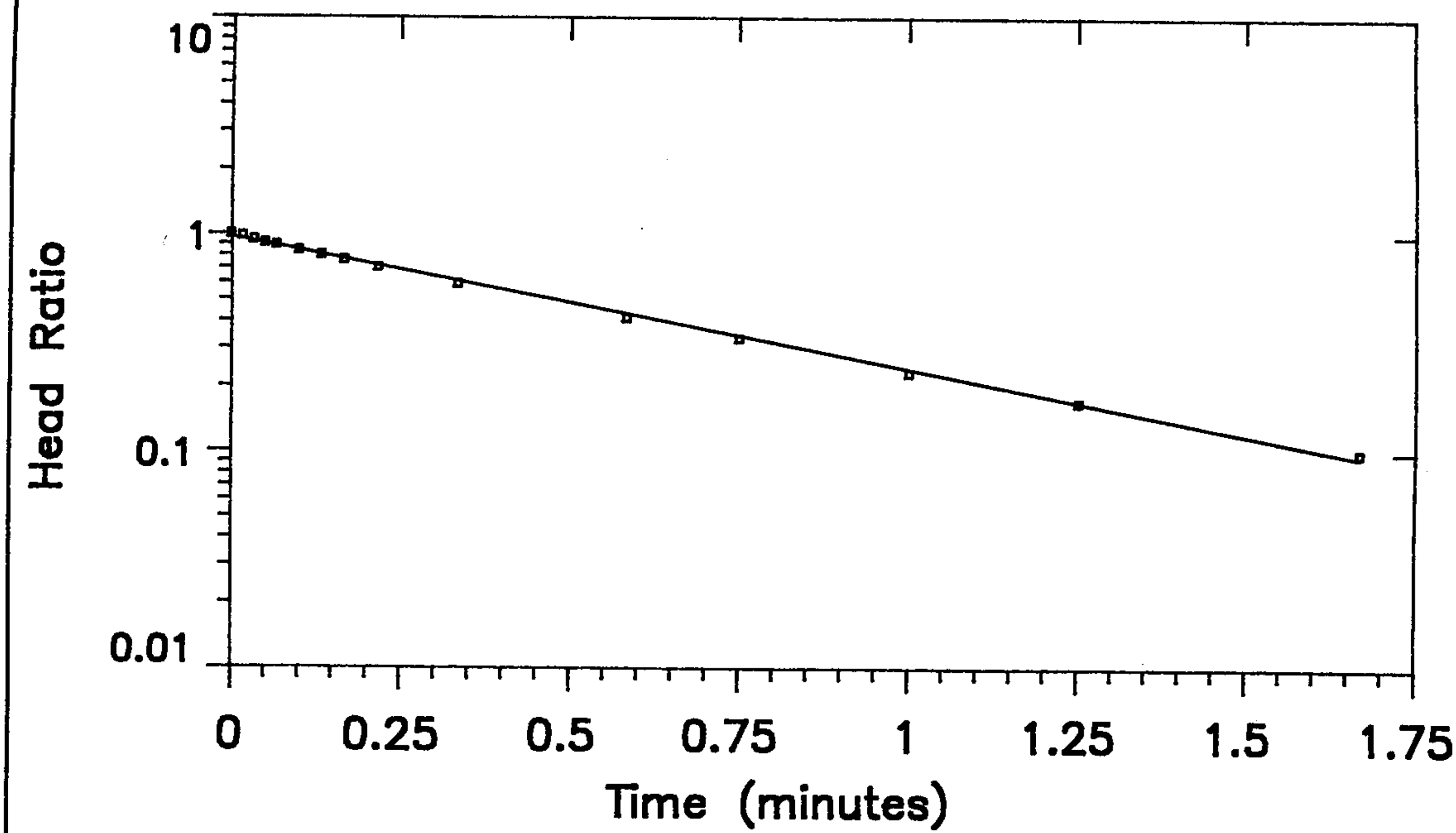
Monroe Co.



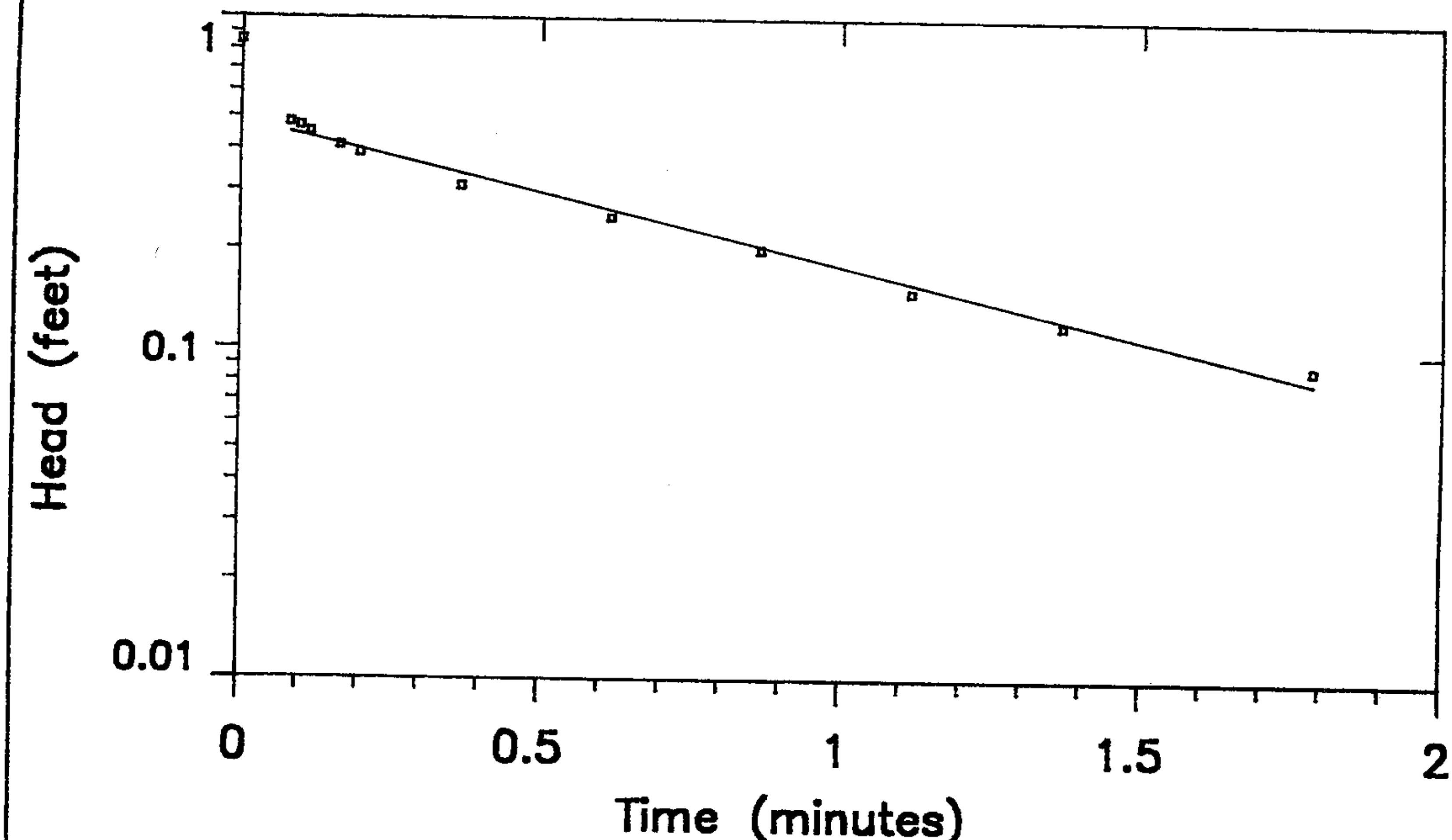
MODEL TYPE: BOUWER and RICE	for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: .0001243 cm/sec	by: Malcolm Pirnie, Inc.	Well: MW—7S
TRANSMISSIVITY: .04094 sq. cm/sec	WELL DATA: Units: ft	Rochester, N.Y.
INITIAL HEAD: 2.700 ft	AQUIFER: Endless	Monroe Co.
Data Set: RF7S	THICKNESS: 10.80	
Date: 11—MAY—90	SCREEN: top: 5.000 base: 15.00	
	DIAMETER: casing: .1660 intake: .8340	
	DEPTH: Water Table: 3.280 TD: 15.80	



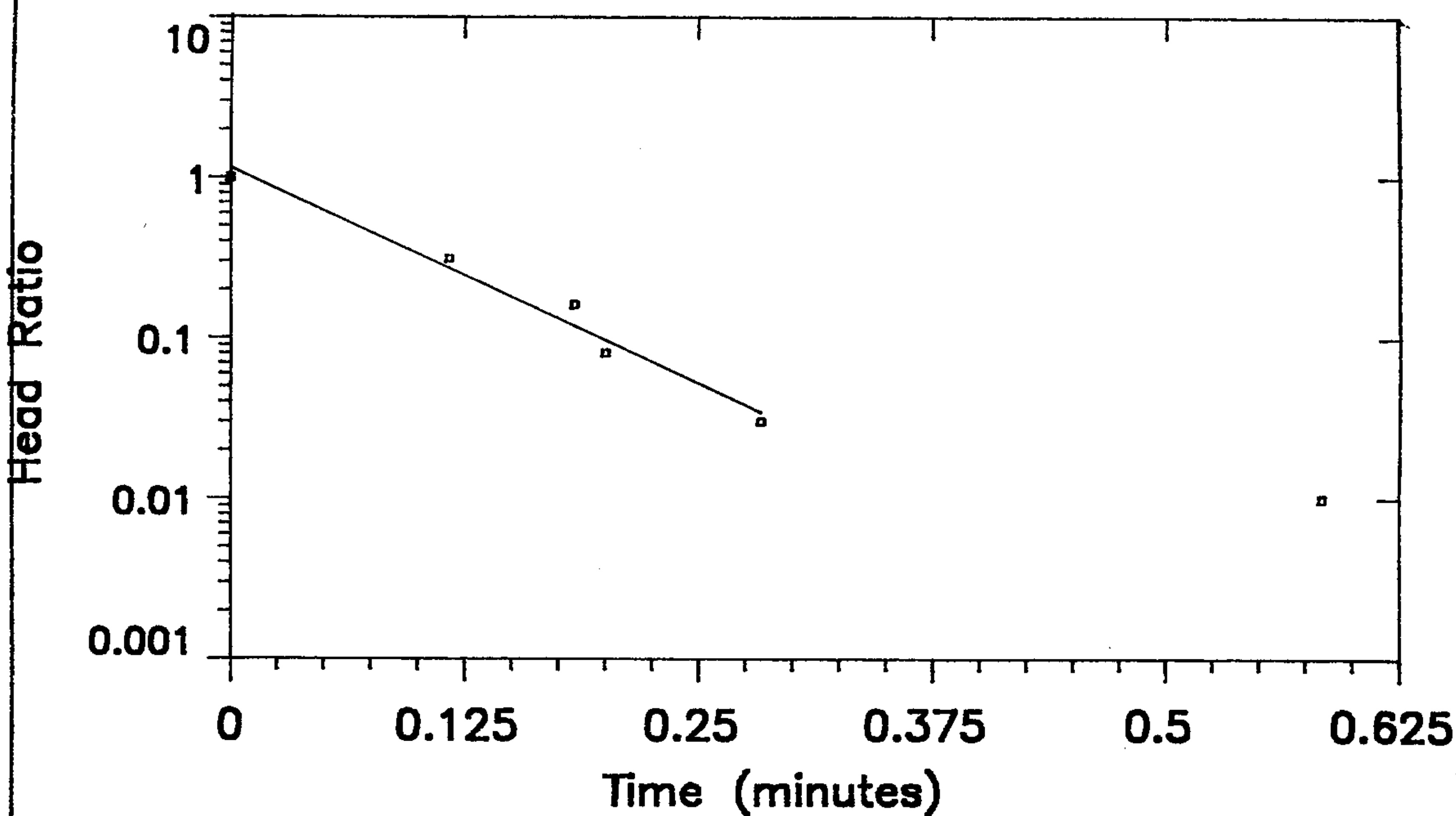
MODEL TYPE: HVORSLEV CONDUCTIVITY: .01403 cm/sec TRANSMISSIVITY: 5.219 sq. cm/sec INITIAL HEAD: 6.890 ft Data Set: RF7I — Date: 10-MAY-90	for: City of Rochester by: Malcolm Pirnie, Inc. WELL DATA: Units: ft AQUIFER: Endless THICKNESS: 12.20 SCREEN: top: 32.80 base: 42.80 DIAMETER: casing: .1660 intake: .2500 DEPTH: Water Table: 4.700 TD: 43.00	**Well Slug Test Data** Well: MW-7I Rochester, N.Y. Monroe Co.



MODEL TYPE: HVORSLEV		for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: .003323 cm/sec		by: Malcolm Pirnie, Inc.	Well: MW—7D
TRANSMISSIVITY: .7801 sq. cm/sec		WELL DATA: Units: ft AQUIFER: Endless THICKNESS: 7.700	Rochester, N.Y.
INITIAL HEAD: 6.910 ft		SCREEN: top: 47.00 base: 52.00	Monroe Co.
Data Set: RF7D	Date: 10—MAY—90	DIAMETER: casing: .1880 intake: .2500 DEPTH: Water Table: 4.710 TD: 52.20	



MODEL TYPE: BOUWER and RICE CONDUCTIVITY: .0009518 cm/sec TRANSMISSIVITY: .3249 sq. cm/sec INITIAL HEAD: 7.380 ft	for: City of Rochester by: Malcolm Pirnie, Inc.	Well Slug Test Data
Data Set: RF8S / Date: 5-MAY-90	WELL DATA: Units: ft AQUIFER: Endless THICKNESS: 11.20 SCREEN: top: 8.000 base: 18.00 DIAMETER: casing: .1880 intake: .8340 DEPTH: Water Table: 8.510 TD: 18.20	Well: MW-8S Rochester, N.Y. Monroe Co.



MODEL TYPE: HVORSLEV

CONDUCTIVITY: .01423 cm/sec

TRANSMISSIVITY: 4.772 sq. cm/sec

INITIAL HEAD: 9.510 ft

Data Set: RF8I | Date: 10-MAY-90

for: City of Rochester

by: Malcolm Pirnie, Inc.

WELL DATA: Units: ft

AQUIFER: Endless

THICKNESS: 11.00

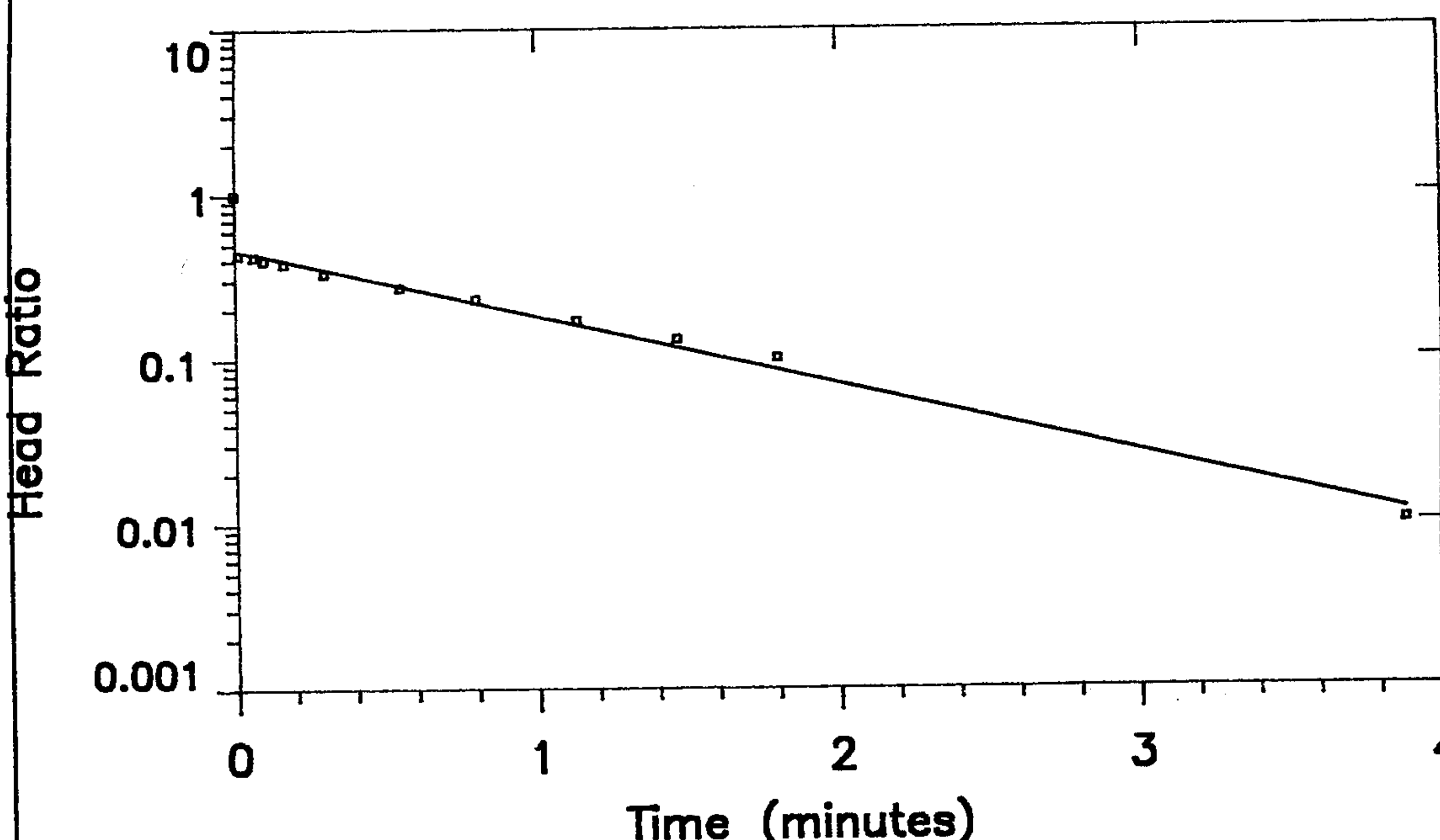
SCREEN: top: 32.30 base: 42.30

DIAMETER: casing: .1660 intake: .3340

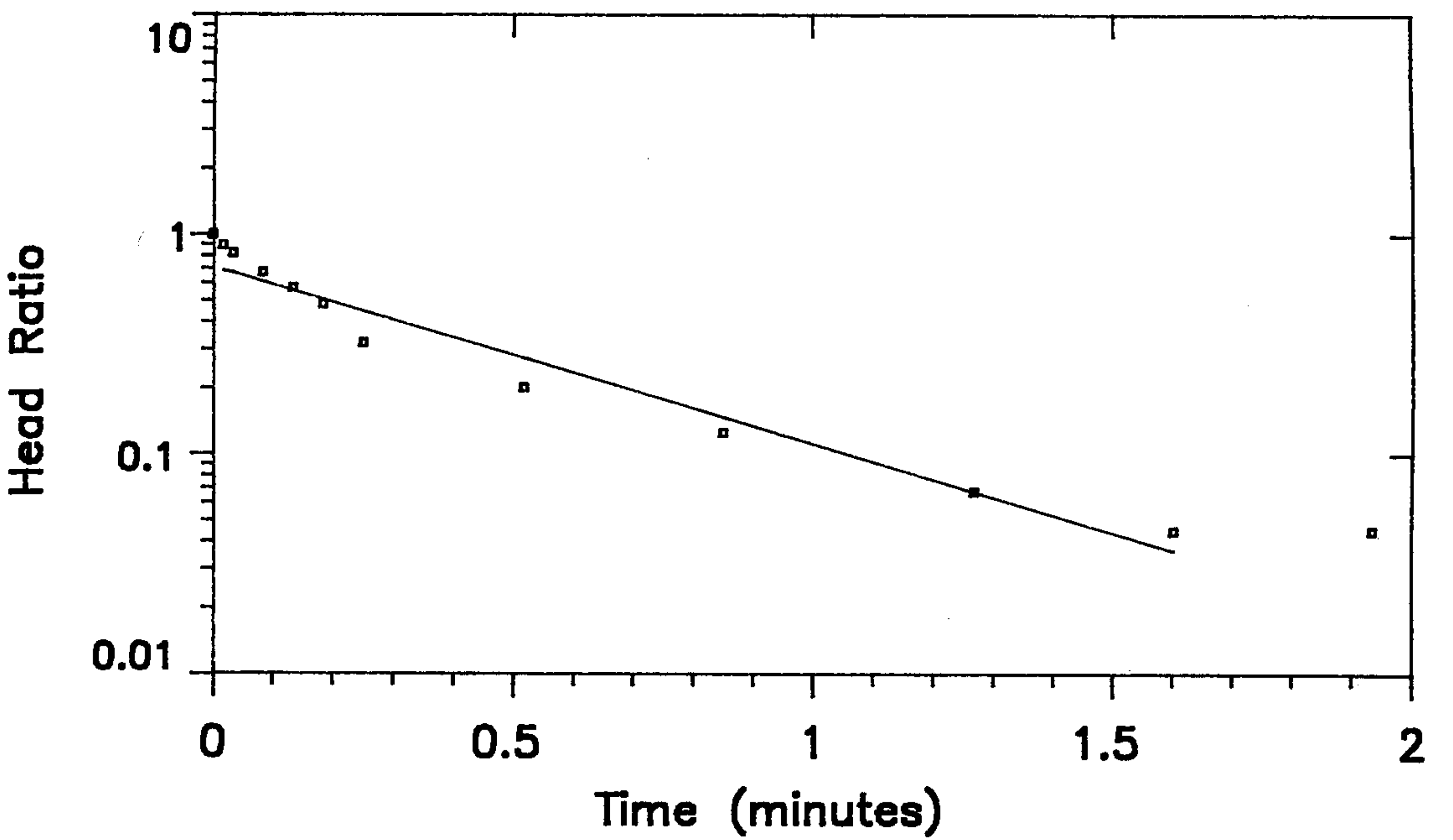
DEPTH: Water Table: 7.320 TD: 42.50

Well Slug Test Data

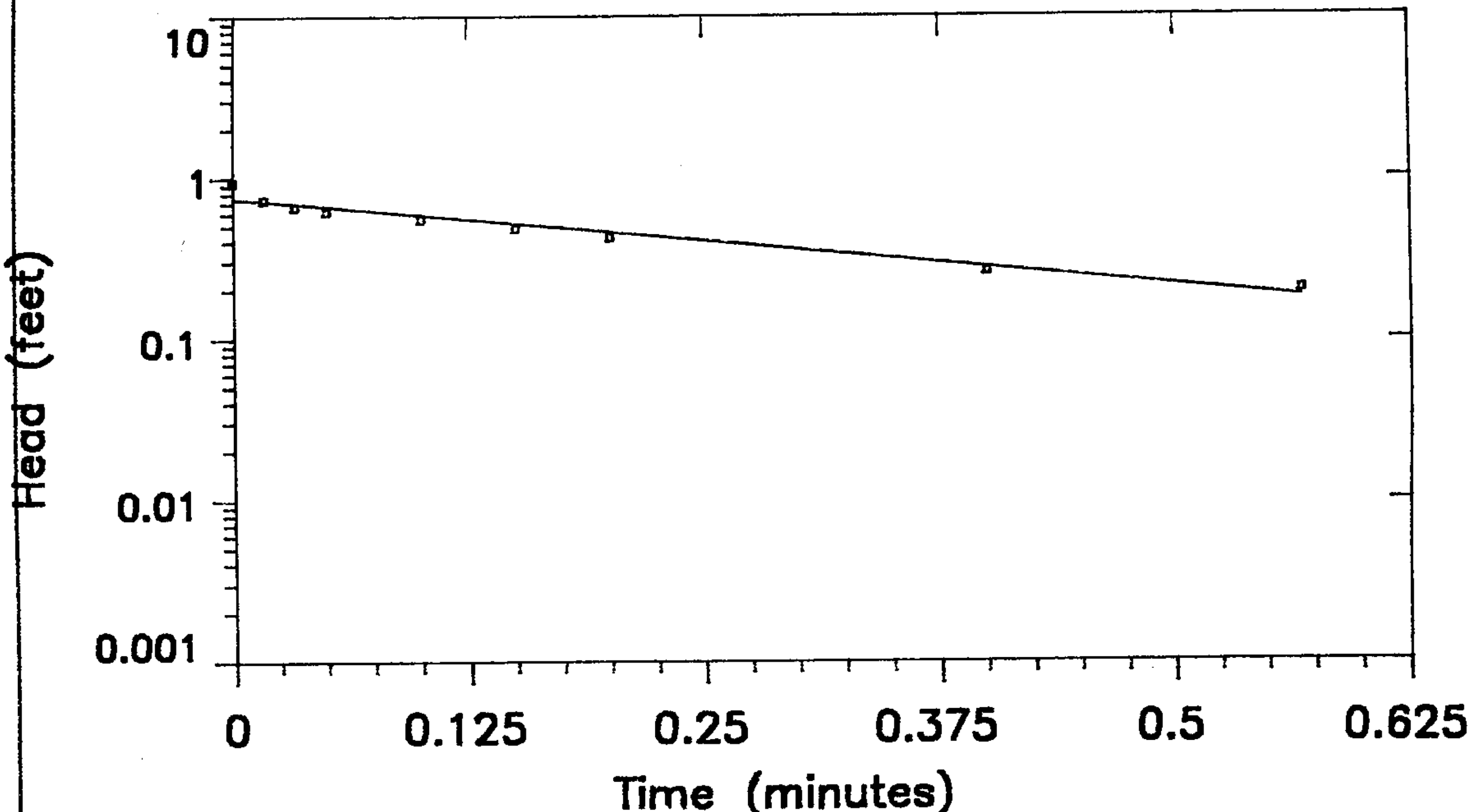
Well: MW-8I
Rochester, N.Y.
Monroe Co.



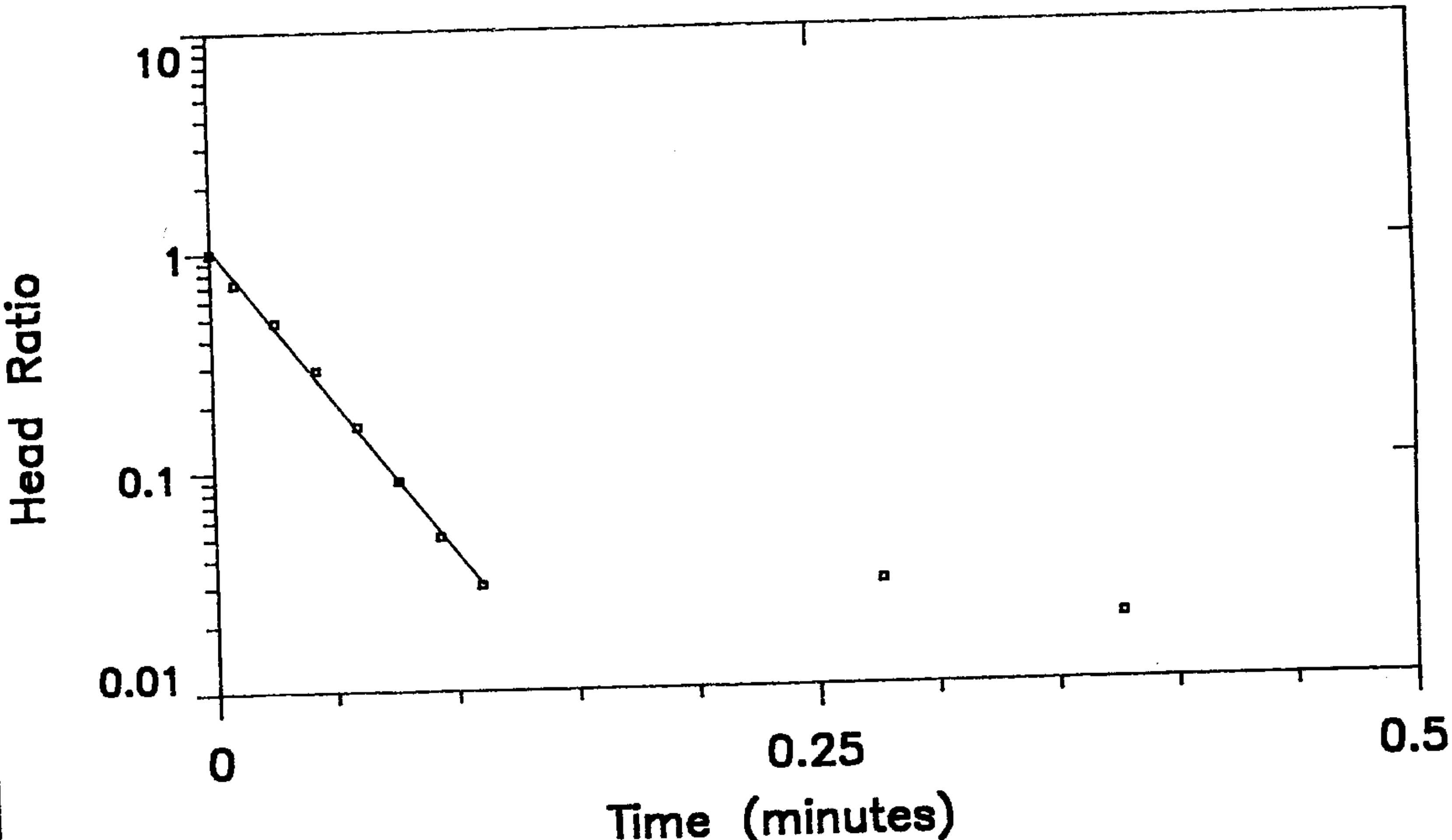
MODEL TYPE: HVORSLEV CONDUCTIVITY: .002050 cm/sec TRANSMISSIVITY: .4062 sq. cm/sec INITIAL HEAD: 9.300 ft Data Set: RF8D — Date: 10-MAY-90	for: City of Rochester by: Malcolm Pirnie, Inc. WELL DATA: Units: ft AQUIFER: Endless THICKNESS: 6.500 SCREEN: top: 45.80 base: 50.80 DIAMETER: casing: .1660 intake: .3340 DEPTH: Water Table: 7.110 TD: 52.00	**Well Slug Test Data** Well: MW-8D Rochester, N.Y. Monroe Co.



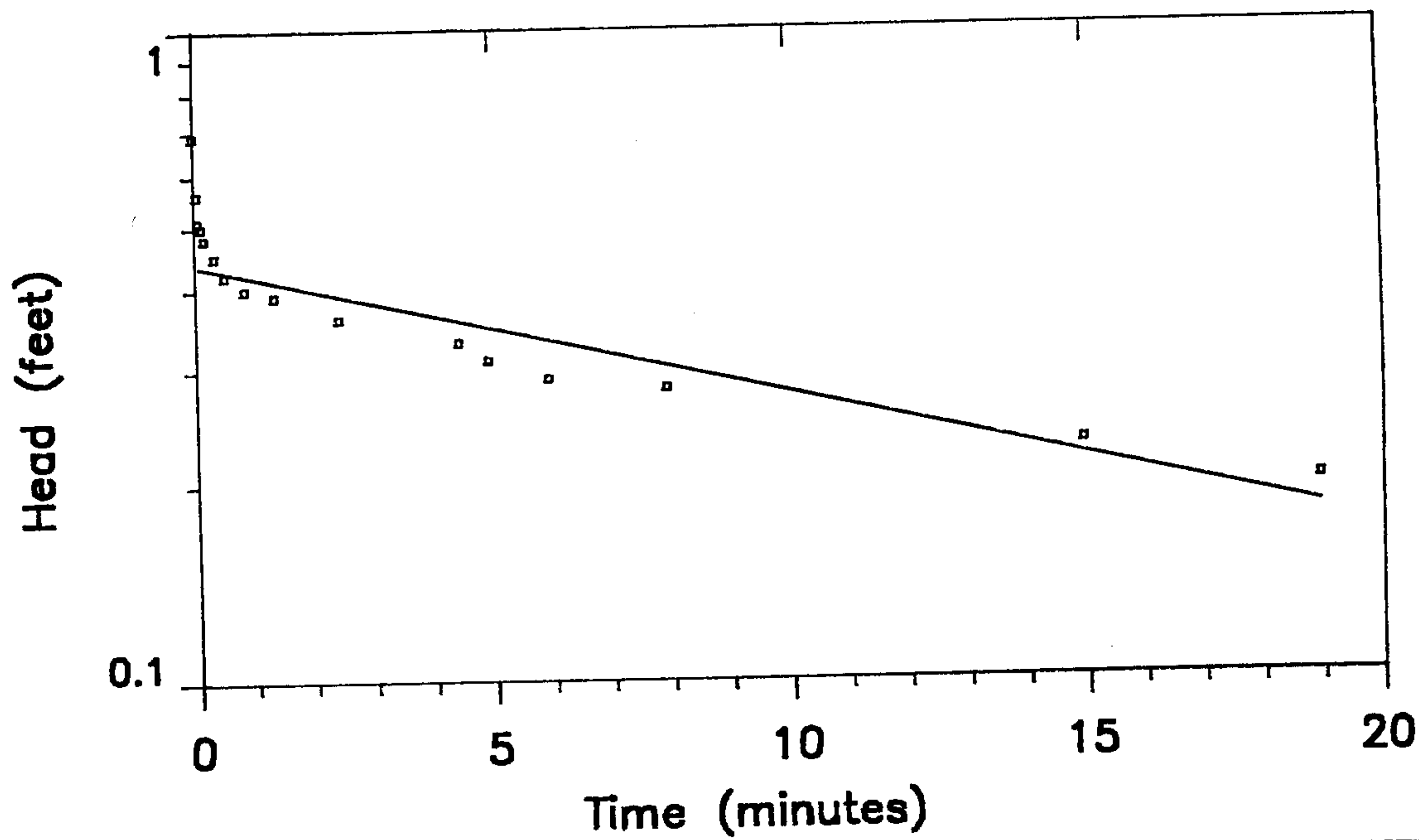
MODEL TYPE: HVORSLEV		for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: .003178 cm/sec		by: Malcolm Pirnie, Inc.	Well: PZ—9
TRANSMISSIVITY: .6588 sq. cm/sec		WELL DATA: Units: ft	Rochester, N.Y.
INITIAL HEAD: 12.61 ft		AQUIFER: Endless	Monroe Co.
		THICKNESS: 6.800	
		SCREEN: top: 35.10 base: 40.10	
Data Set: RFPZ9	Date: 9—MAY—90	DIAMETER: casing: .1660 intake: .8340	
		DEPTH: Water Table: 11.73 TD: 40.60	



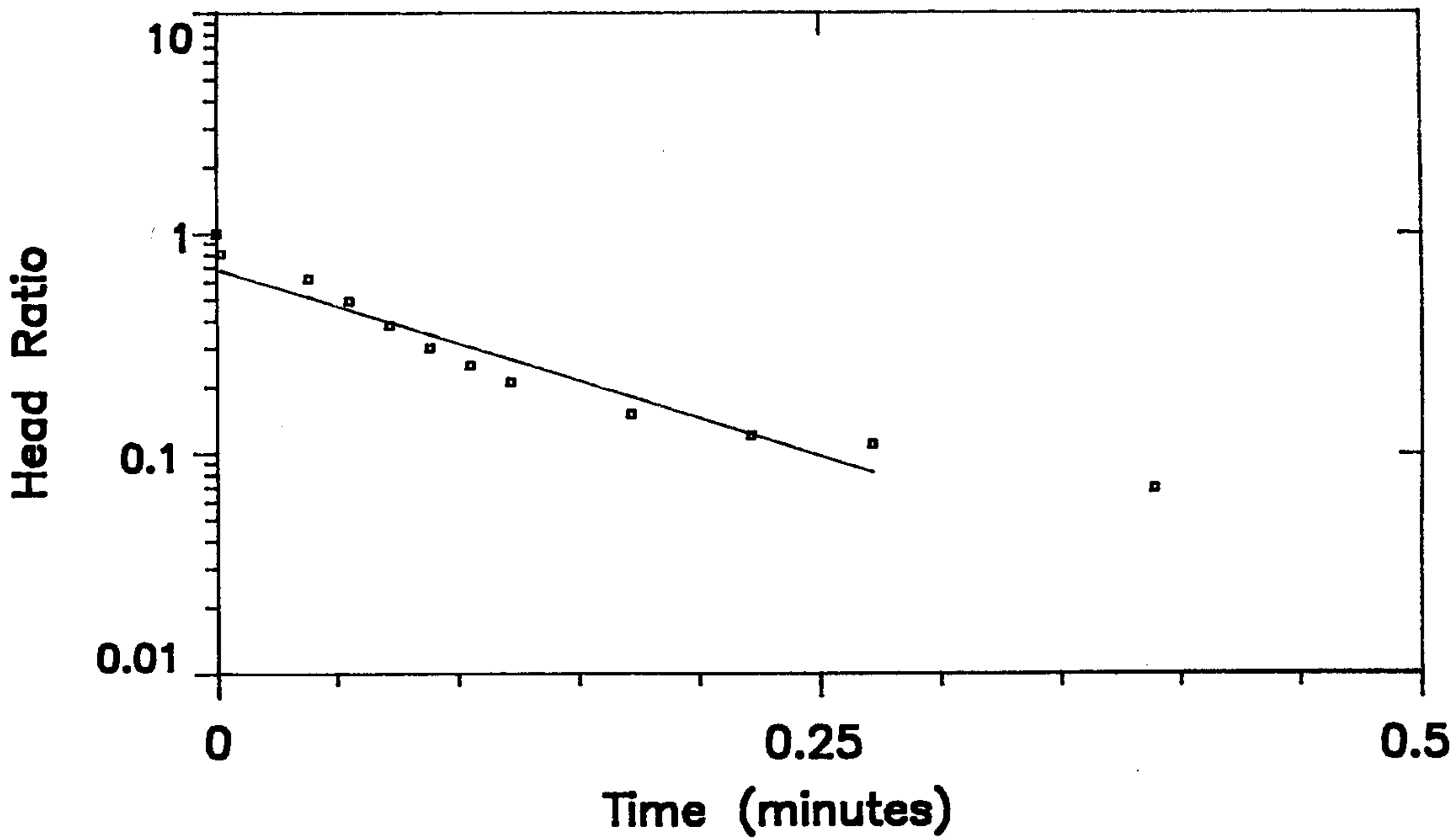
MODEL TYPE: BOUWER and RICE	for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: .002702 cm/sec	by: Malcolm Pirnie, Inc.	Well: MW—9S
TRANSMISSIVITY: .9062 sq. cm/sec	WELL DATA: Units: ft	Rochester, N.Y.
INITIAL HEAD: 6.620 ft	AQUIFER: Endless	Monroe Co.
Data Set: RF9S — Date: 9—MAY—90	THICKNESS: 11.00	
	SCREEN: top: 6.800 base: 16.80	
	DIAMETER: casing: .1660 intake: .8340	
	DEPTH: Water Table: 5.660 TD: 16.90	



MODEL TYPE: HVORSLEV		for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: .04067 cm/sec		by: Malcolm Pirnie, Inc.	Well: MW-91
TRANSMISSIVITY: 14.25 sq. cm/sec		WELL DATA: Units: ft AQUIFER: Endless THICKNESS: 11.50 SCREEN: top: 41.50 base: 51.50 DIAMETER: casing: .1660 intake: .3340	Rochester, N.Y.
INITIAL HEAD: 15.89 ft			Monroe Co.
Data Set: RF91	Date: 9-MAY-90	DEPTH: Water Table: 13.70 TD: 51.60	



MODEL TYPE: BOUWER and RICE	for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: 9.039E-5 cm/sec	by: Malcolm Pirnie, Inc.	Well: MW--10S
TRANSMISSIVITY: .03333 sq. cm/sec	WELL DATA: Units: ft	Rochester, N.Y.
INITIAL HEAD: 7.840 ft	AQUIFER: Endless	Monroe Co.
Data Set: RF10S	THICKNESS: 12.10	
Date: 10-MAY-90	SCREEN: top: 11.80 base: 21.80	
	DIAMETER: casing: .1660 intake: .8340	
	DEPTH: Water Table: 7.150 TD: 22.00	



MODEL TYPE: HVORSLEV

CONDUCTIVITY: .01370 cm/sec

TRANSMISSIVITY: 4.971 sq. cm/sec

INITIAL HEAD: 14.81 ft

Data Set: RF101 | Date: 10-MAY-90

for: City of Rochester

by: Malcolm Pirnie, Inc.

WELL DATA: Units: ft

AQUIFER: Endless

THICKNESS: 11.90

SCREEN: top: 34.80 base: 44.80

DIAMETER: casing: .1660 intake: .3340

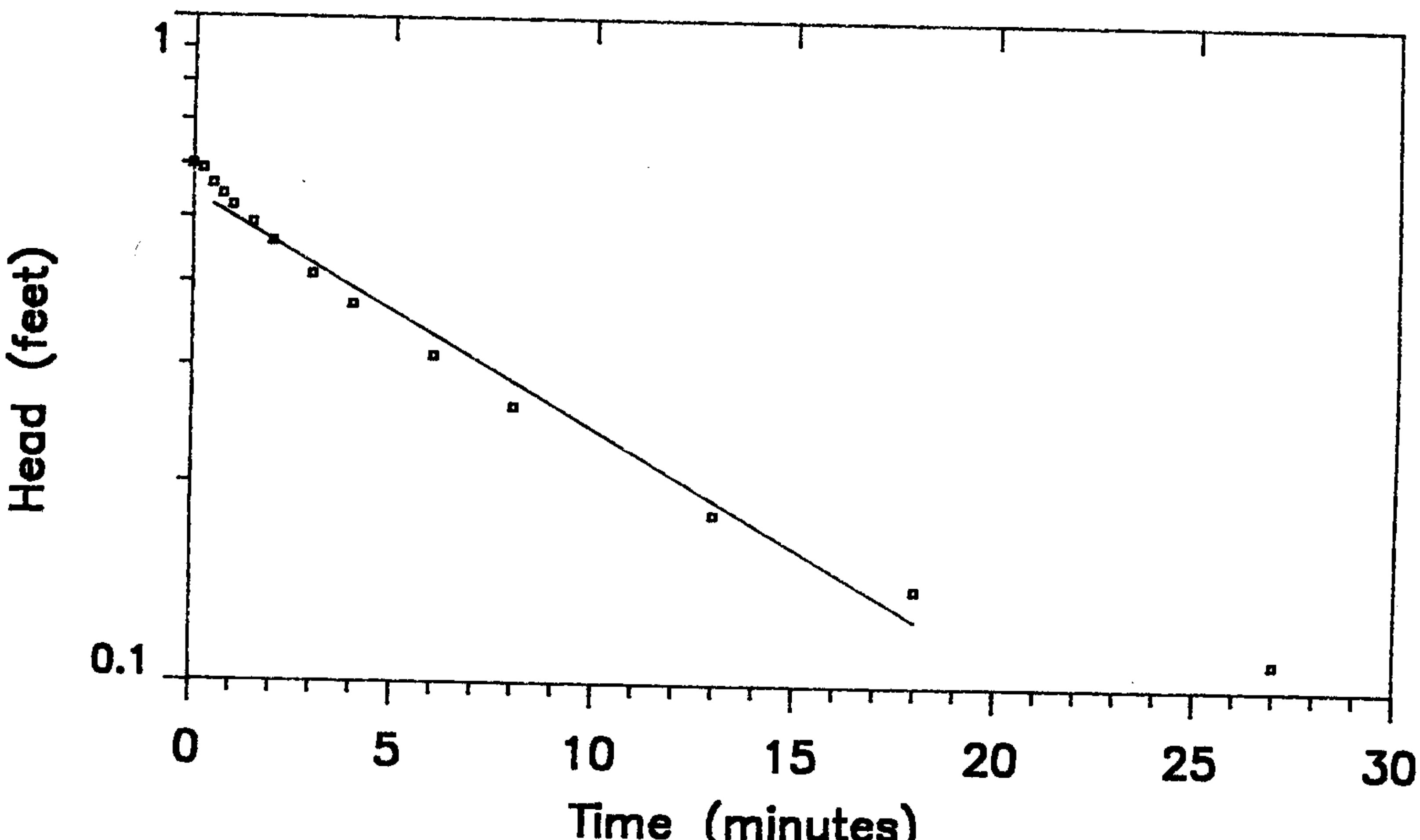
DEPTH: Water Table: 12.82 TD: 46.00

Well Slug Test Data

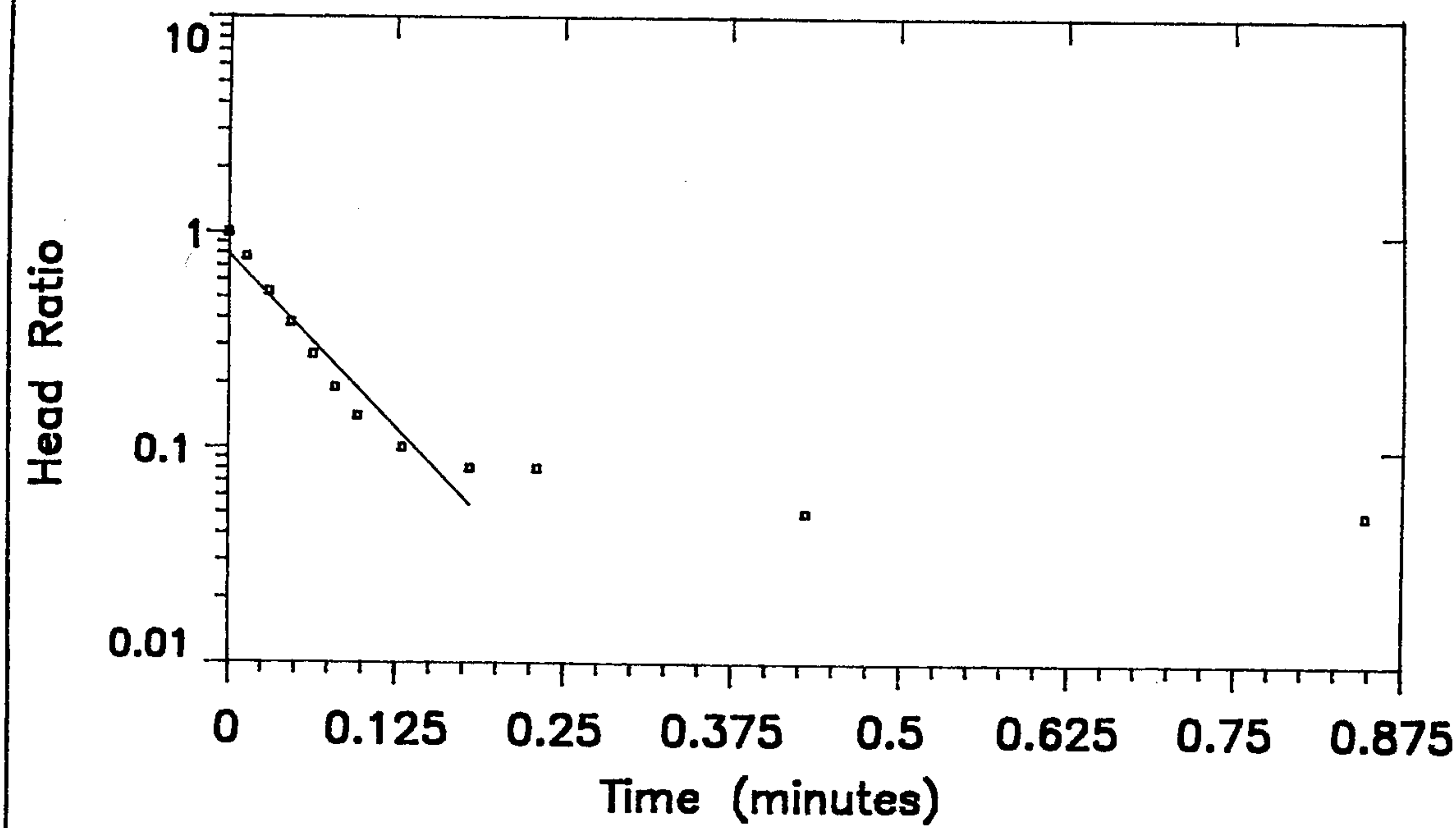
Well: MW-101

Rochester, N.Y.

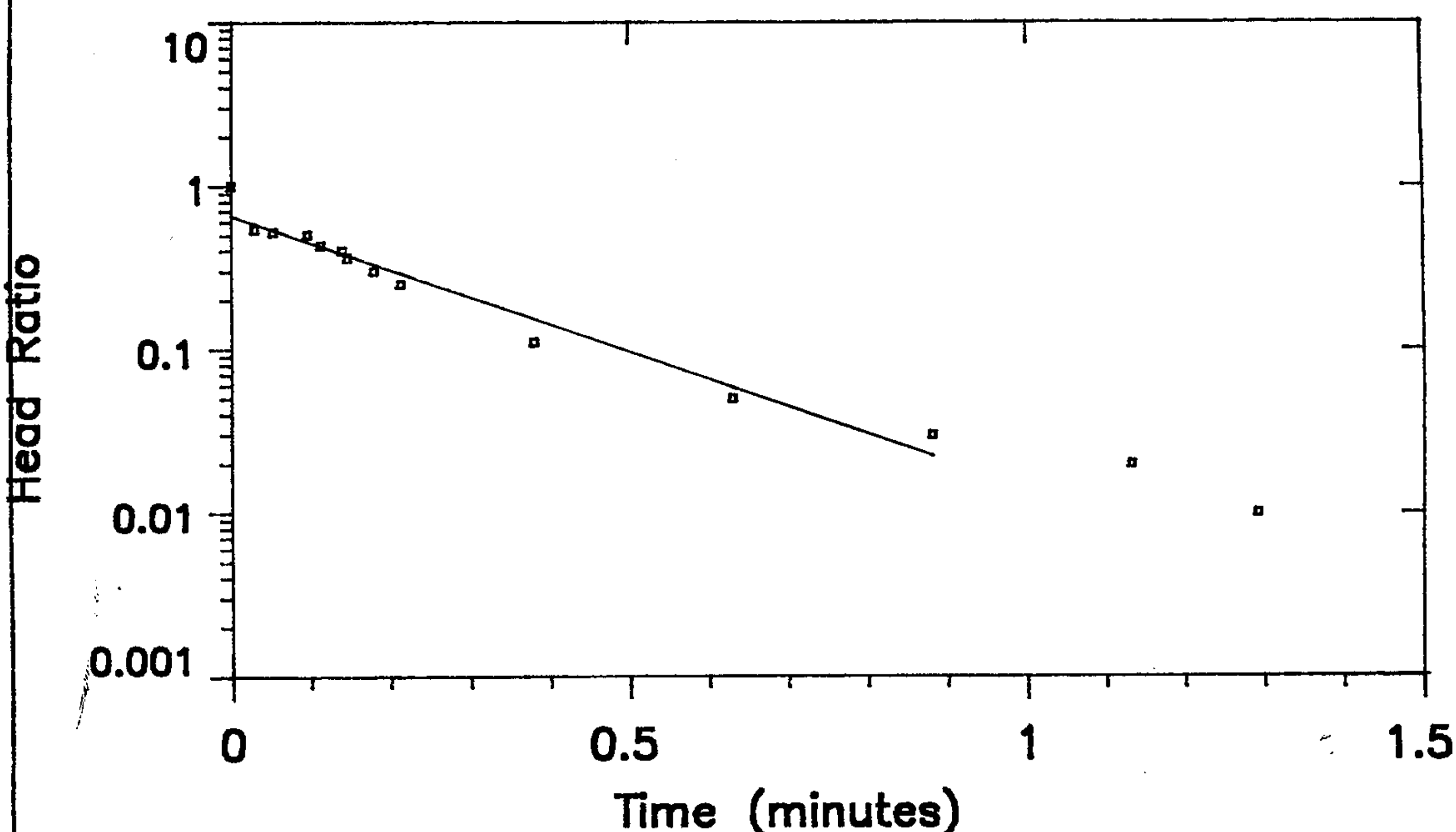
Monroe Co.



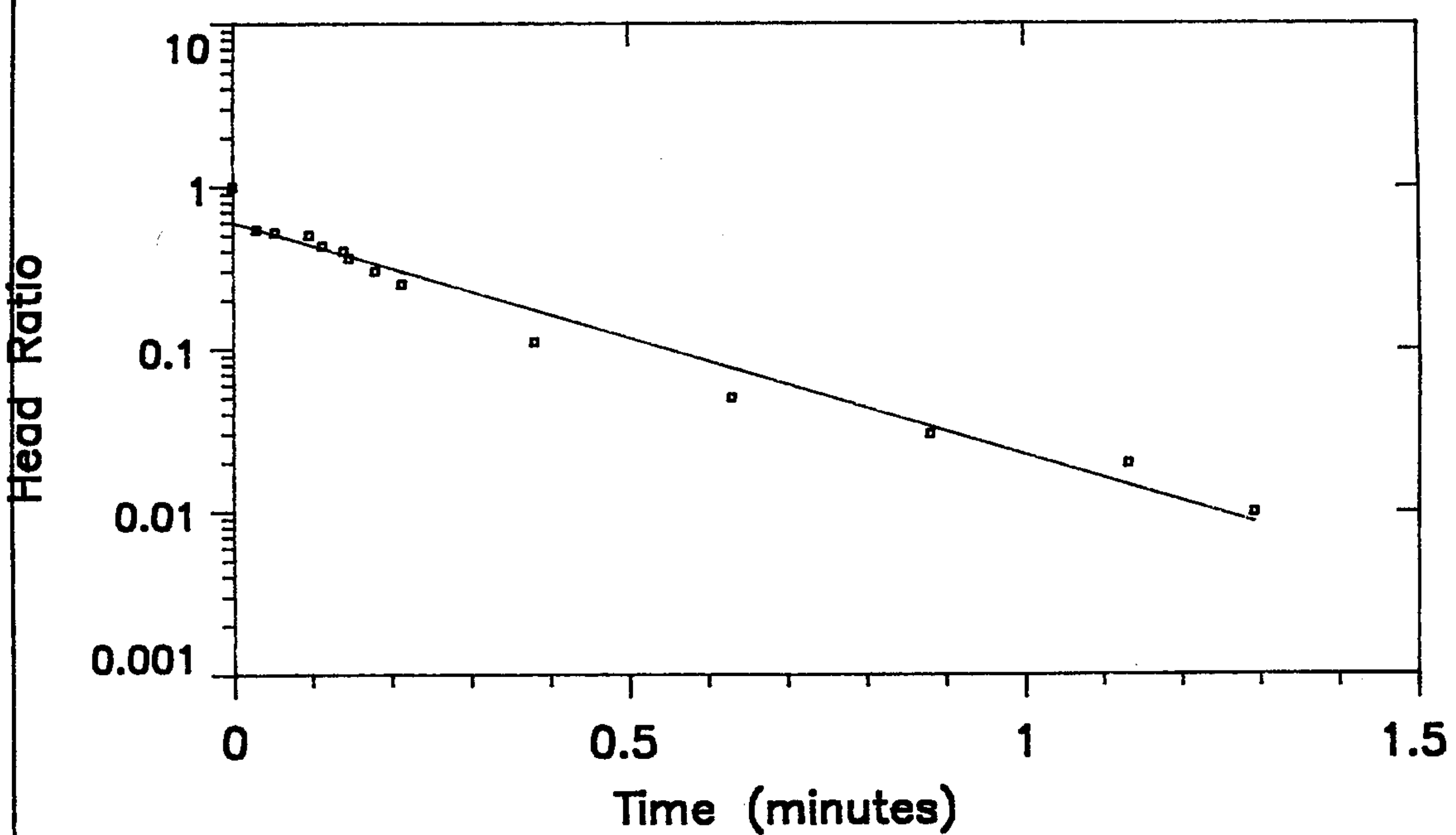
MODEL TYPE: BOUWER and RICE		for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: 8.216E-5 cm/sec		by: Malcolm Pirnie, Inc.	Well: MW-11S
TRANSMISSIVITY: .02830 sq. cm/sec		WELL DATA: Units: ft AQUIFER: Endless THICKNESS: 11.30	Rochester, N.Y.
INITIAL HEAD: 3.540 ft		SCREEN: top: 6.100 base: 16.10	Monroe Co.
Data Set: RF11S	Date: 14-MAY-90	DIAMETER: casing: .1660 intake: .8340 DEPTH: Water Table: 2.940 TD: 16.30	



MODEL TYPE: HVORSLEV	for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: .02064 cm/sec	by: Malcolm Pirnie, Inc.	Well: MW-11I
TRANSMISSIVITY: 7.865 sq. cm/sec	WELL DATA: Units: ft	Rochester, N.Y.
INITIAL HEAD: 9.670 ft	AQUIFER: Endless	Monroe Co.
Data Set: RF11I	THICKNESS: 12.50	
Date: 11-MAY-90	SCREEN: top: 27.00 base: 37.00	
	DIAMETER: casing: .1660 intake: .3340	
	DEPTH: Water Table: 7.480 TD: 37.20	



MODEL TYPE: HVORSLEV		for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: .009183 cm/sec		by: Malcolm Pirnie, Inc.	Well: MW-12I
TRANSMISSIVITY: 2.853 sq. cm/sec		WELL DATA: Units: ft	Rochester, N.Y.
INITIAL HEAD: 11.50 ft		AQUIFER: Endless	Monroe Co.
		THICKNESS: 9.500	
		SCREEN: top: 28.80 base: 33.80	
Data Set: RF12I	Date: 10-MAY-90	DIAMETER: casing: .1680 intake: .2500	
		DEPTH: Water Table: 8.310 TD: 34.50	



MODEL TYPE: HVORSLEV

CONDUCTIVITY: .007200 cm/sec

TRANSMISSIVITY: 2.085 sq. cm/sec

INITIAL HEAD: 11.50 ft

Data Set: RF12I | Date: 10–MAY–90

for: City of Rochester

by: Malcolm Pirnie, Inc.

WELL DATA: Units: ft

AQUIFER: Endless

THICKNESS: 9.500

SCREEN: top: 28.80 base: 33.80

DIAMETER: casing: .1660 intake: .2500

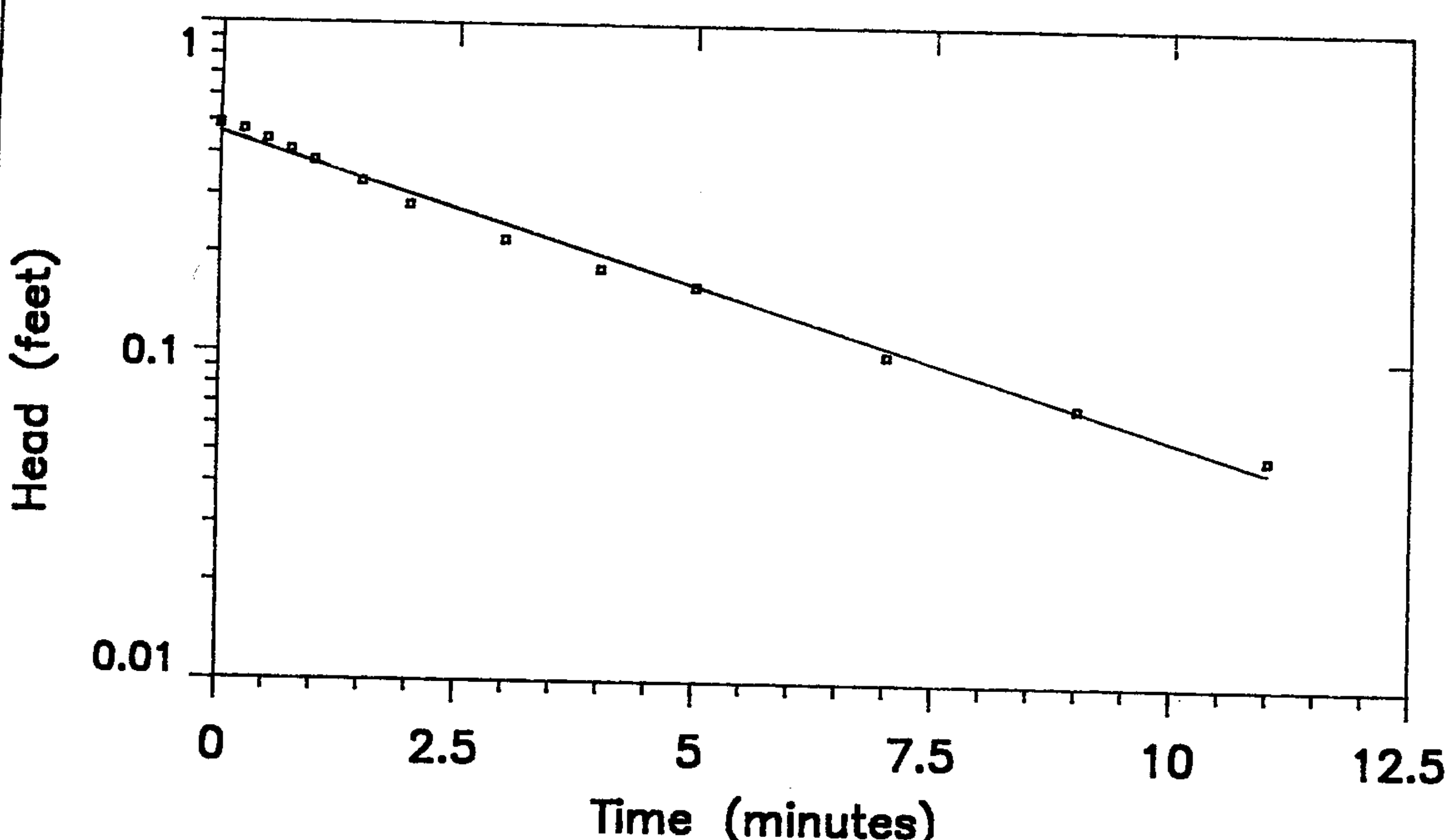
DEPTH: Water Table: 8.310 TD: 34.50

Well Slug Test Data

Well: MW–12I

Rochester, N.Y.

Monroe Co.



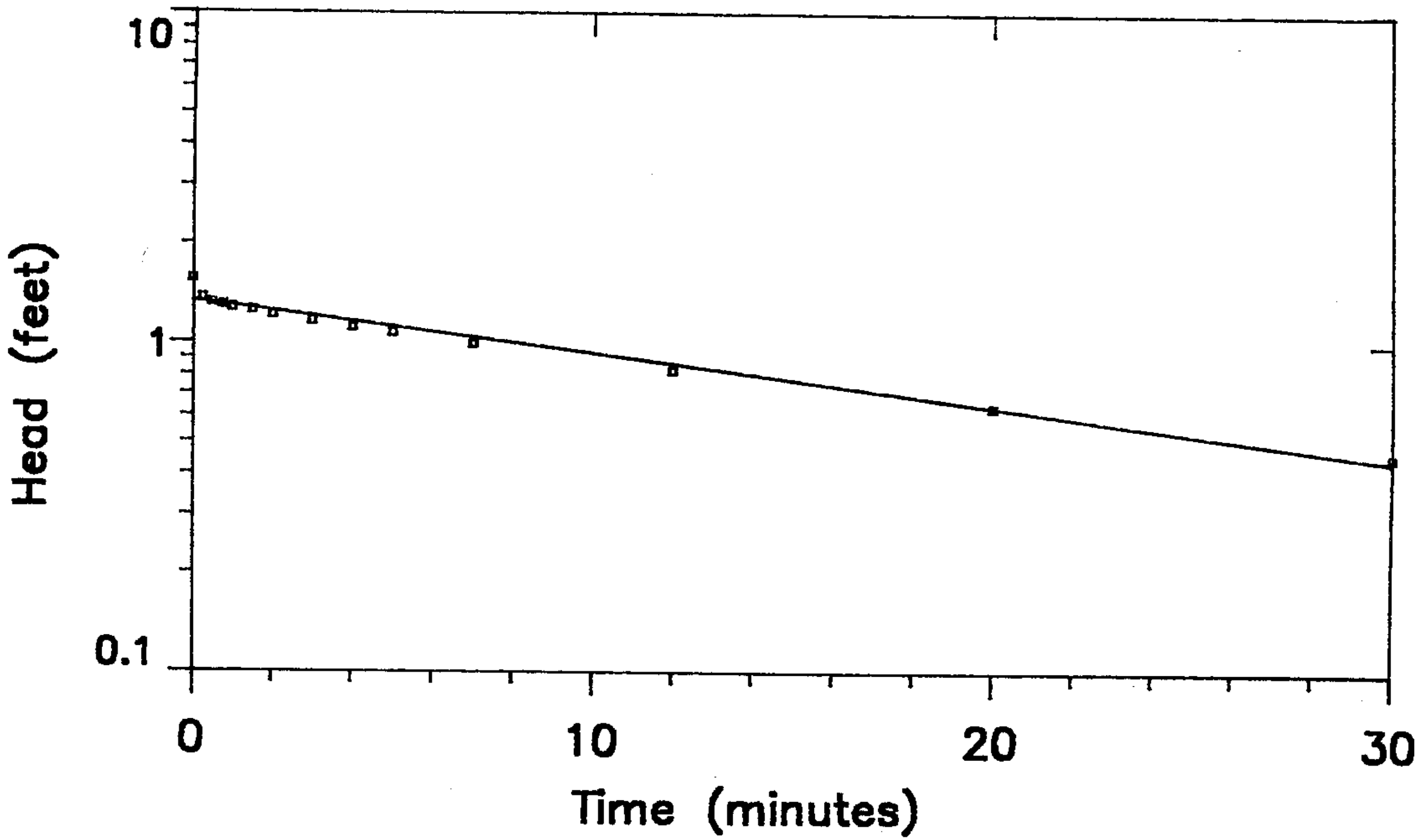
MODEL TYPE: BOUWER and RICE	
CONDUCTIVITY: .0001752 cm/sec	
TRANSMISSIVITY: .05874 sq. cm/sec	
INITIAL HEAD: 6.030 ft	
Data Set: RF12S	Date: 14-MAY-90

for: City of Rochester
by: Malcolm Pirnie, Inc.

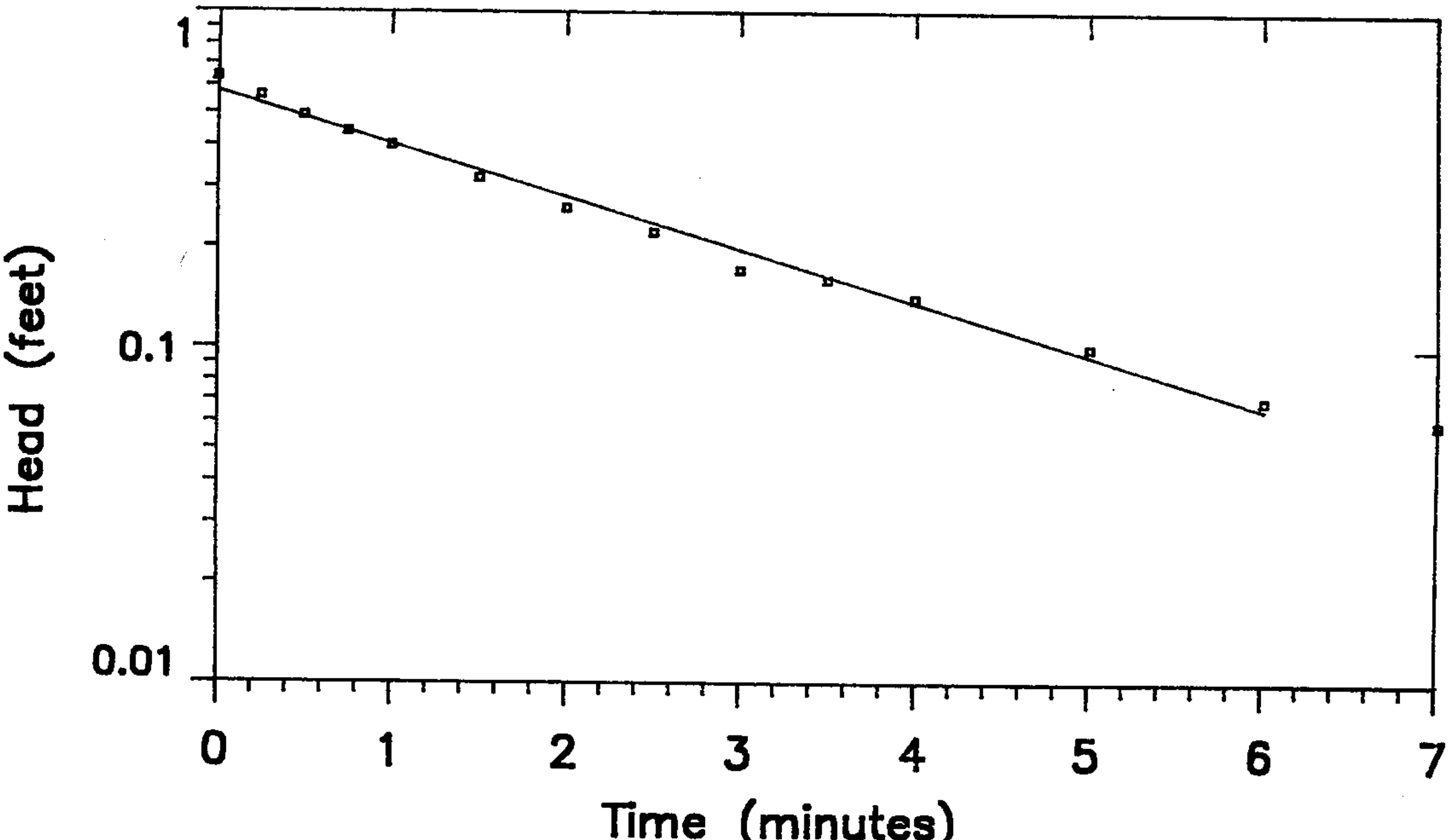
WELL DATA: Units: ft
AQUIFER: Endless
THICKNESS: 11.00
SCREEN: top: 5.800 base: 15.80
DIAMETER: casing: .1660 intake: .8340
DEPTH: Water Table: 5.540 TD: 16.00

Well Slug Test Data

Well: MW-12S
Rochester, N.Y.
Monroe Co.



MODEL TYPE: BOUWER and RICE CONDUCTIVITY: 2.884E-5 cm/sec TRANSMISSIVITY: .01063 sq. cm/sec INITIAL HEAD: 3.100 ft Data Set: RF13S Date: 11-MAY-90	for: City of Rochester by: Malcolm Pirnie, Inc. WELL DATA: Units: ft AQUIFER: Endless THICKNESS: 12.10 SCREEN: top: 7.900 base: 17.90 DIAMETER: casing: .1660 intake: .8340 DEPTH: Water Table: 4.660 TD: 18.10	Well Slug Test Data Well: MW-13S Rochester, N.Y. Monroe Co.



MODEL TYPE: BOUWER and RICE

CONDUCTIVITY: .0003102 cm/sec

TRANSMISSIVITY: .1040 sq. cm/sec

INITIAL HEAD: 4.780 ft

Data Set: RF14S | Date: 14–MAY–90

for: City of Rochester

by: Malcolm Pirnie, Inc.

WELL DATA: Units: ft

AQUIFER: Endless

THICKNESS: 11.00

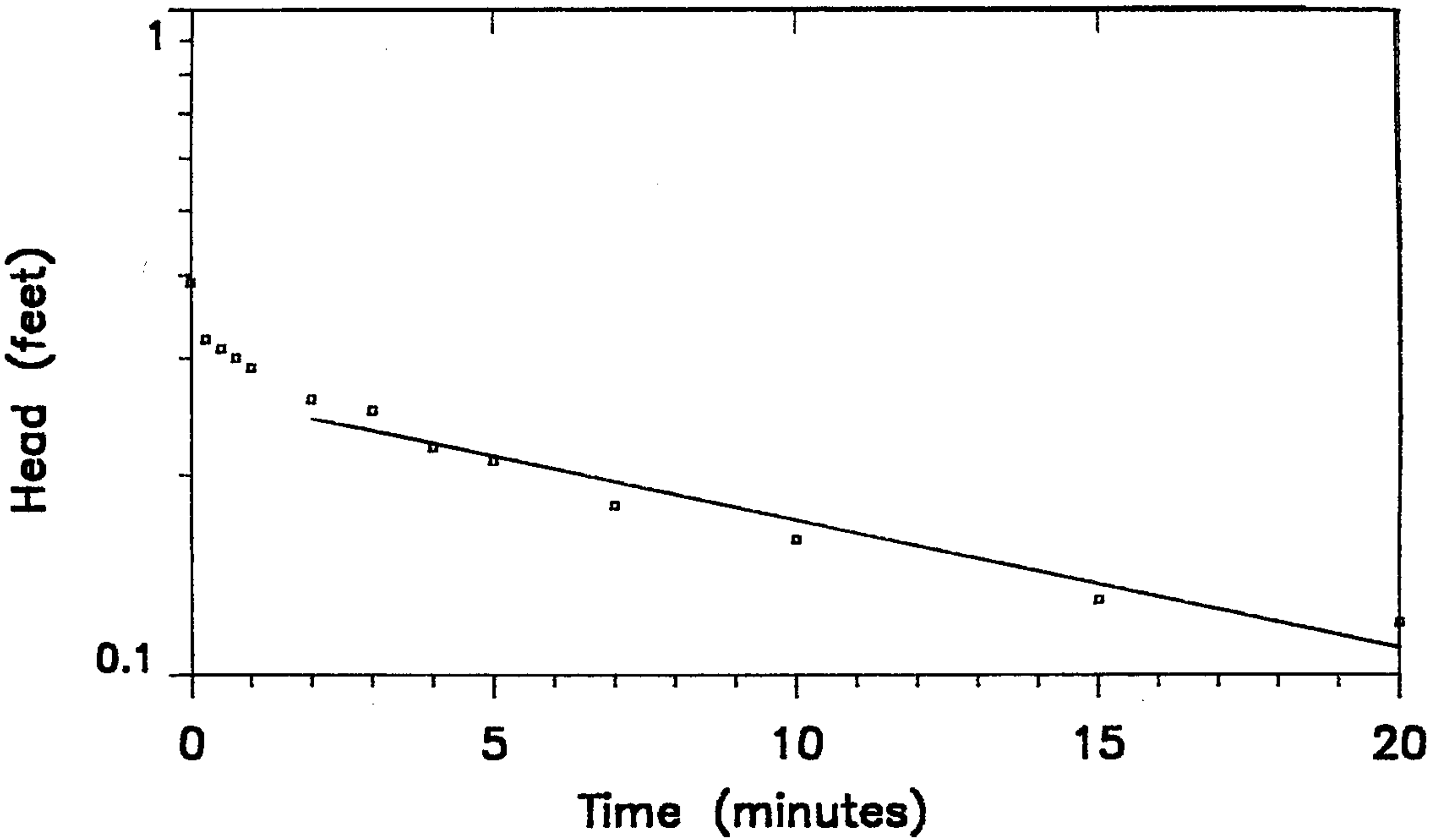
SCREEN: top: 6.200 base: 16.20

DIAMETER: casing: .1660 intake: .8340

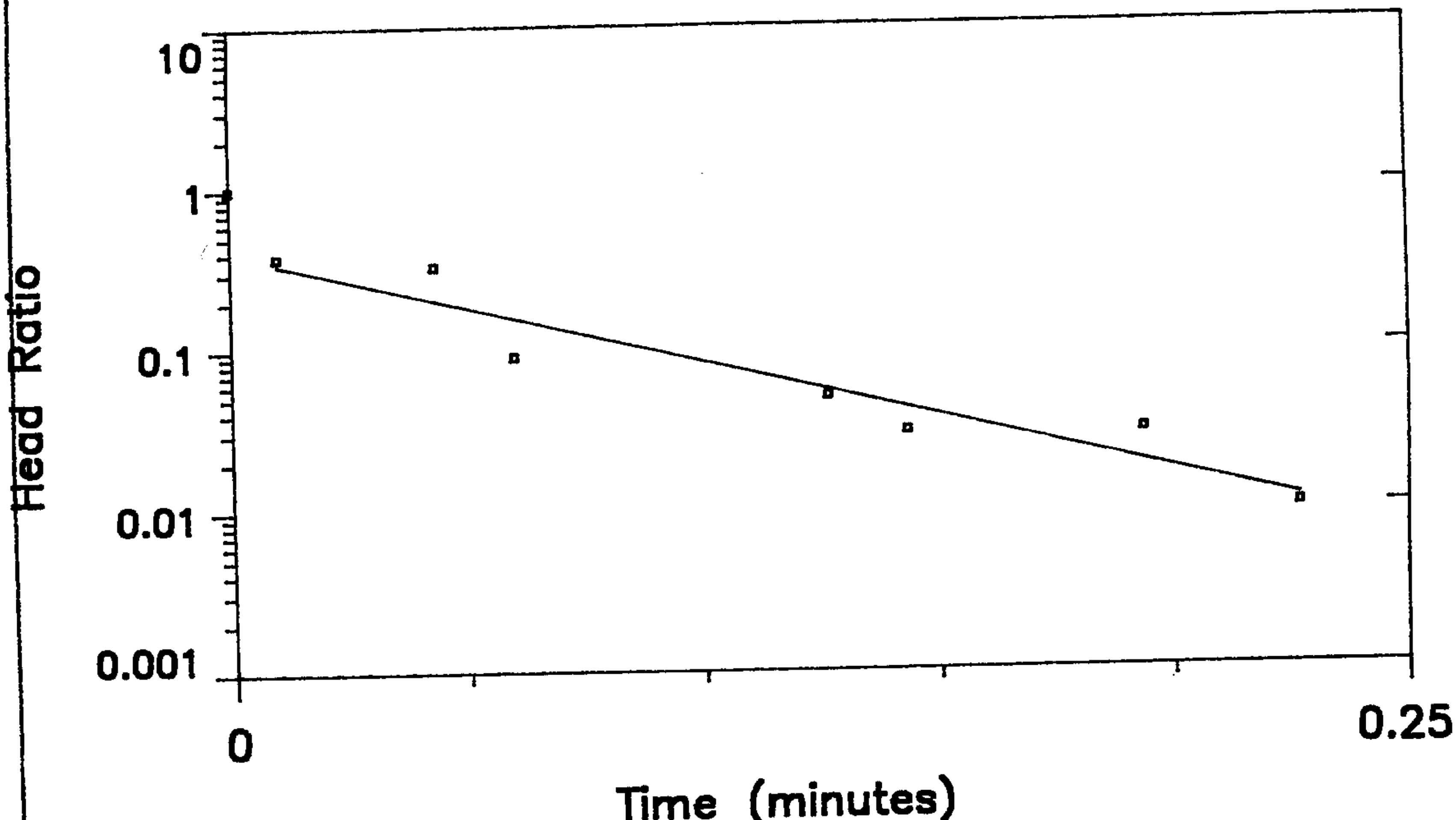
DEPTH: Water Table: 4.140 TD: 16.40

Well Slug Test Data

Well: MW–14S
Rochester, N.Y.
Monroe Co.



MODEL TYPE: BOUWER and RICE		for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: 7.551E-5 cm/sec		by: Malcolm Pirnie, Inc.	Well: MW-15S
TRANSMISSIVITY: .02531 sq. cm/sec		WELL DATA: Units: ft	Rochester, N.Y.
INITIAL HEAD: 5.670 ft		AQUIFER: Endless	Monroe Co.
Data Set: RF15S	Date: 11-MAY-90	THICKNESS: 11.00	
		SCREEN: top: 5.800 base: 15.80	
		DIAMETER: casing: .1660 intake: .8340	
		DEPTH: Water Table: 8.060 TD: 14.00	



MODEL TYPE: HVORSLEV		for: City of Rochester	Well Slug Test Data
CONDUCTIVITY: .02145 cm/sec		by: Malcolm Pirnie, Inc.	Well: MW-16I
TRANSMISSIVITY: 8.175 sq. cm/sec		WELL DATA: Units: ft	Rochester, N.Y.
INITIAL HEAD: 9.840 ft		AQUIFER: Endless	Monroe Co.
		THICKNESS: 12.50	
		SCREEN: top: 21.20 base: 31.20	
		DIAMETER: casing: .1660 intake: .3340	
Data Set: RF16I	Date: 10-MAY-90	DEPTH: Water Table: 7.650 TD: 31.40	

APPENDIX C.6

SOIL TESTING REPORT

MALCOLM PIRNIE, INC.

Project......... Rochester Fire Academy
Project Number.. 0965-04-1
Location........ Rochester Fire Academy

Sample Number	permeability cm/sec
MW 9S,12	2.0 E-7
MW 6I,12	4.7 E-8
MW-6I,32	Unable to test

NOTE: There currently is no approved ASTM method for permeability testing, therefore NVLAP accreditation cannot extend to these data.

MALCOLM PIRNIE, INC.

Project......... Rochester Fire Academy
Project Number.. 0965-04-1
Location........ Rochester Fire Academy, MW 9S,12-14'

PERMEABILITY TEST RESULTS

SAMPLE PARAMETERS	INITIAL	FINAL
Height..................(in)	4.67	4.42
Diameter................(in)	2.72	2.74
Wet Density............(pcf)	138.9	143.4
Moisture Content..........(%)	24.9	23.5
Optimum Moisture Content..(%)	NA	NA
Dry Density............(pcf)	111.2	116.1

TEST PARAMETERS	
Test Type.............	UNDISTURBED FALLING HEAD
Head Pressure.....(psi)	55
Back Pressure.....(psi)	50
Chamber Pressure..(psi)	60
Fluid.................	DEAIRED WATER
Permeation Time..(days)	7

TEST RESULTS	
Coefficient of Permeability, K..(cm/sec)	2.0 E-7

NOTE: There currently is no approved ASTM method for permeability testing, therefore NVLAP accreditation cannot extend to these data.

MALCOLM PIRNIE, INC.

Project......... Rochester Fire Academy
Project Number.. 0965-04-1
Location........ Rochester Fire Academy, MW 6I,12-14'

PERMEABILITY TEST RESULTS

SAMPLE PARAMETERS	INITIAL	FINAL
Height..................(in)	4.78	4.88
Diameter................(in)	2.83	2.78
Wet Density............(pcf)	139.7	143.6
Moisture Content..........(%)	16.0	17.5
Optimum Moisture Content..(%)	NA	NA
Dry Density............(pcf)	120.4	122.2

TEST PARAMETERS	
Test Type.............	UNDISTURBED FALLING HEAD
Head Pressure.....(psi)	55
Back Pressure.....(psi)	50
Chamber Pressure..(psi)	60
Fluid.................	DEAIRED WATER
Permeation Time..(days)	7

TEST RESULTS

Coefficient of Permeability, K..(cm/sec) 4.7 E-8

NOTE: There currently is no approved ASTM method for permeability testing, therefore NVLAP accreditation cannot extend to these data.

MALCOLM PIRNIE, INC.

Project......... Rochester Fire Academy
Project Number.. 0965-04-1
Location........ Rochester Fire Academy

Sample Number	gravel %	sand %	silt %	clay %
MW-6S,4-10'	0.0	15.7	58.8	25.5
MW-6S,10-16'	1.3	11.2	53.6	33.9
MW-9S,4-8'	6.8	39.4	45.3	8.5
PZ-9,32-38'	38.3	37.6	21.8	2.3
MW-10S,16-20'	19.5	27.7	37.4	15.4

NOTE: The Atterberg Limits Analysis was not performed on these samples due to lack of material.

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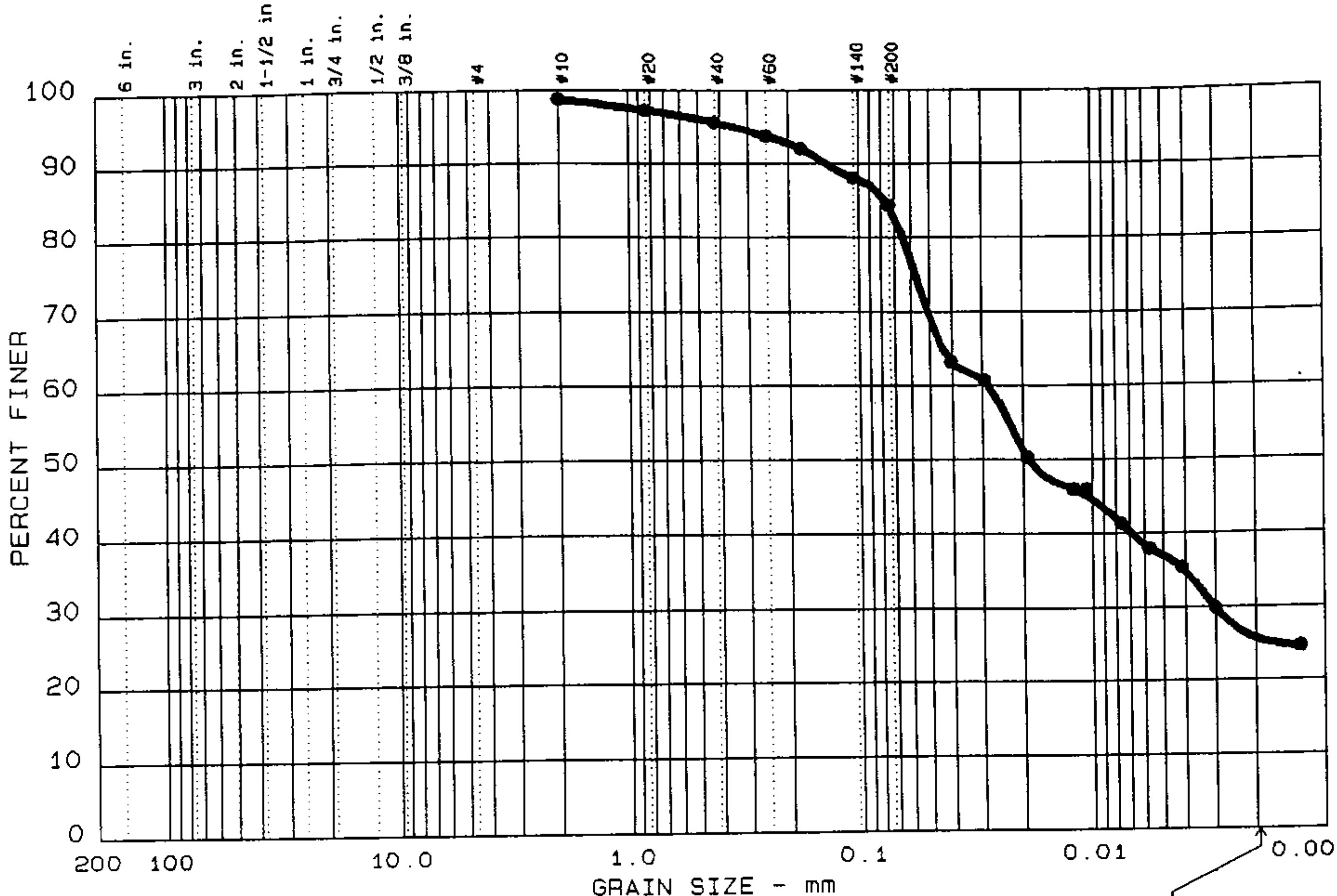
GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	6	0.0	0.0	15.7	58.8	25.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.08		0.02	0.003				

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN MOSTLY SILT WITH LITTLE CLAY AND SAND		

Project No.: 0965-04-1
Project: ROCHESTER FIRE ACADEMY
● Location: MW-6S, 4-10'

Date: 5-22-90

GRAIN SIZE DISTRIBUTION TEST REPORT
MALCOLM PIRNIE, INC.

Remarks:

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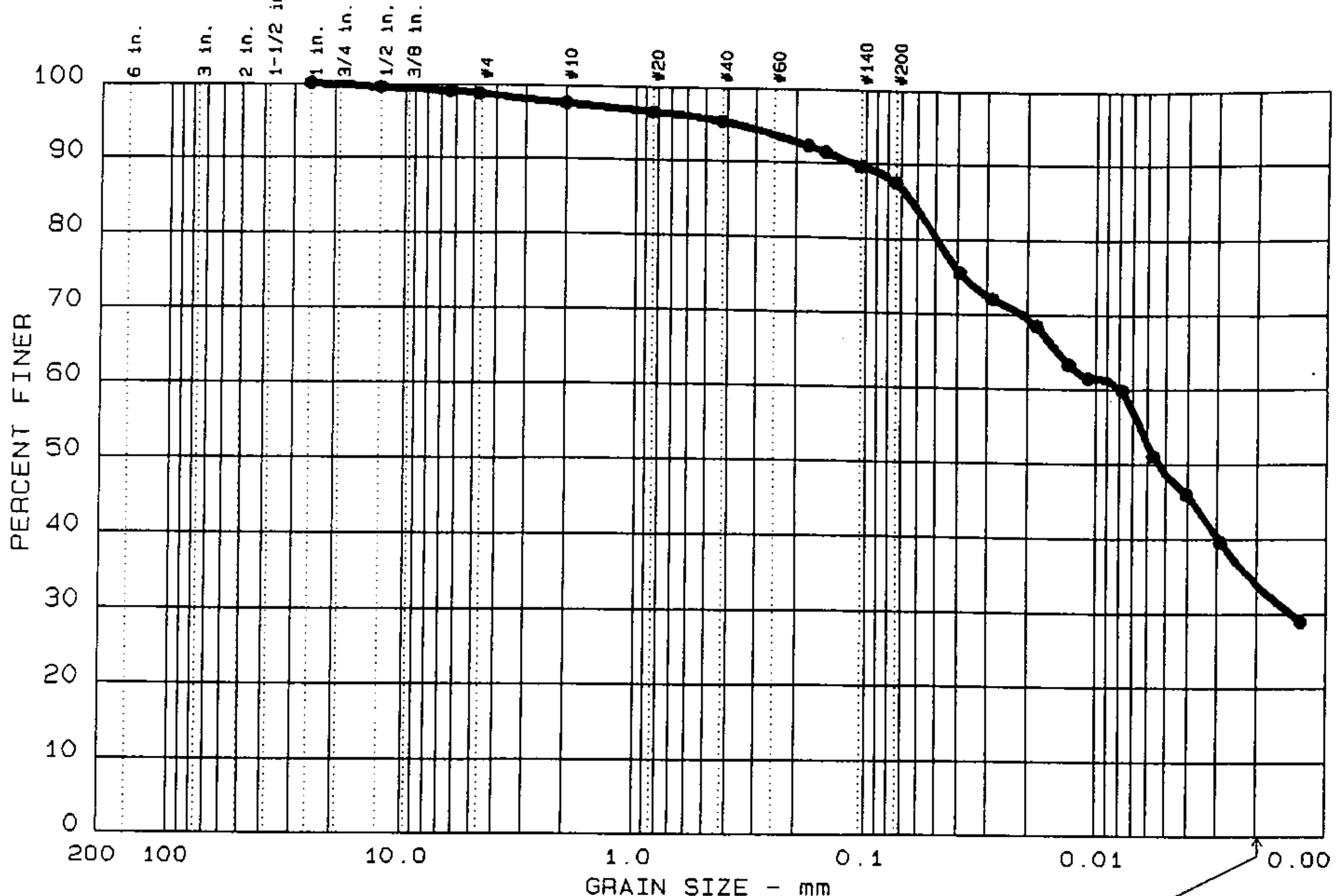
Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	1.3	11.2	53.6	33.9

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●					0.01	0.001				

MATERIAL DESCRIPTION	USCS	AASHTO
● REDDISH BROWN CLAYEY SILT WITH LITTLE SAND		

Project No.: 0965-04-1
Project: ROCHESTER FIRE ACADEMY
● Location: MW 6S, 10-16'

Date: 5-21-90

GRAIN SIZE DISTRIBUTION TEST REPORT
MALCOLM PIRNIE, INC.

Remarks:

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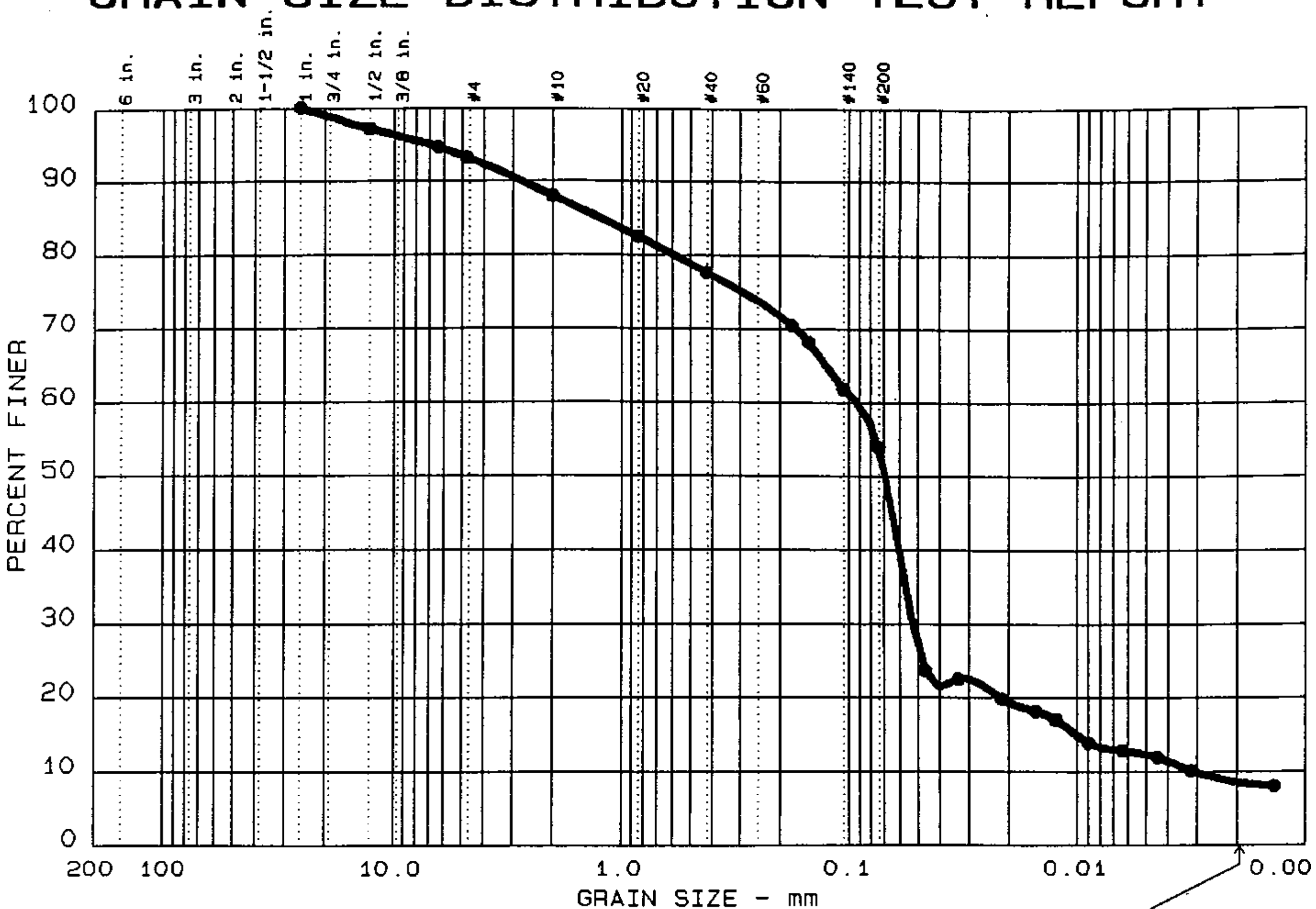
Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	2	0.0	6.8	39.4	45.3	8.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			1.23	0.09	0.07	0.052	0.0101	0.0031	9.76	29.5

MATERIAL DESCRIPTION	USCS	AASHTO
● DARK BROWN SANDY SILT WITH TRACE GRAVEL AND CLAY		

Project No.: 0965-04-1

Project: ROCHESTER FIRE ACADEMY

● Location: MW-9S, 4-8'

Date: 5-18-90

GRAIN SIZE DISTRIBUTION TEST REPORT

MALCOLM PIRNIE, INC.

Remarks:

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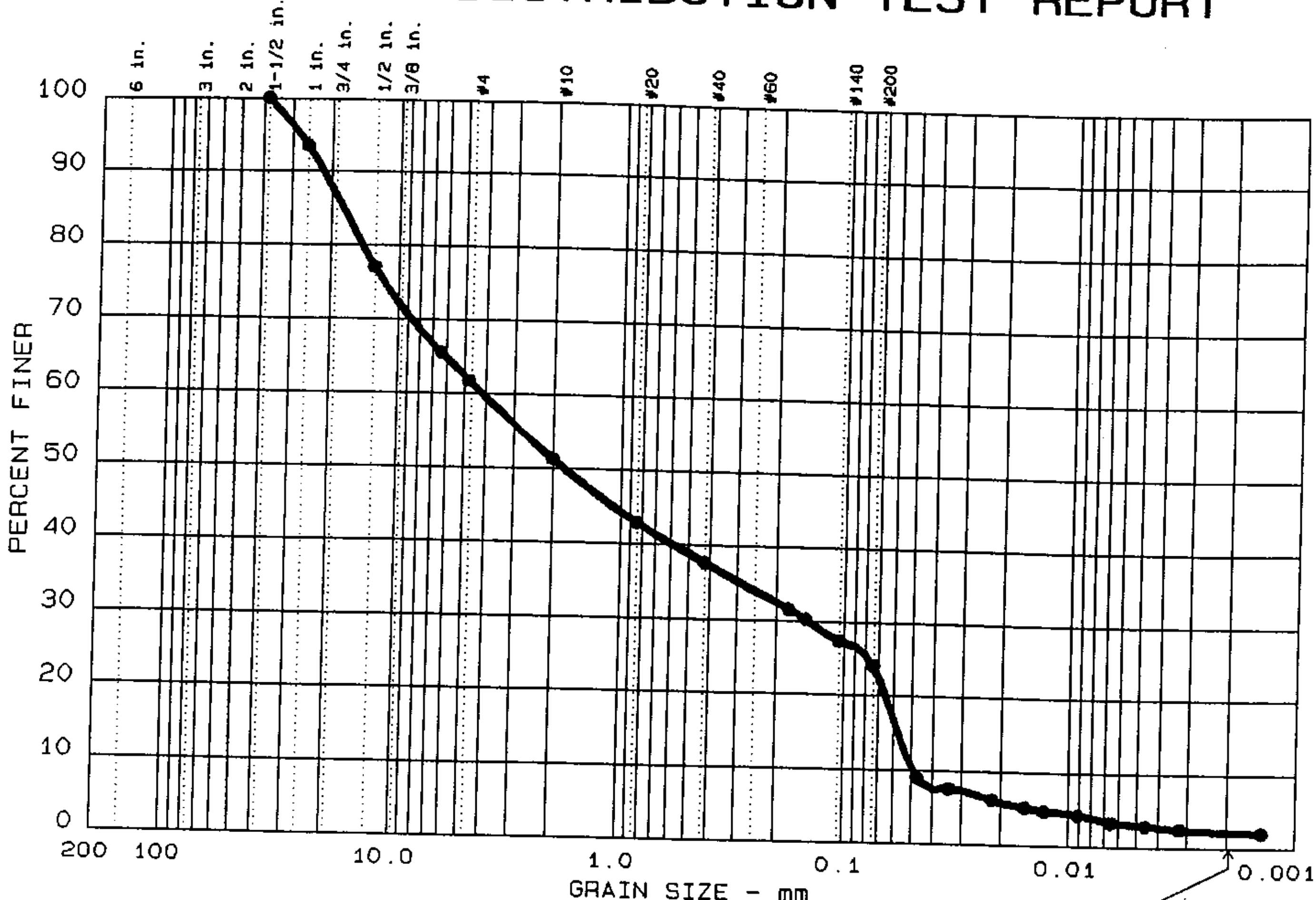
Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	1	0.0	38.3	37.6	21.8	2.3

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			17.58	4.17	1.78	0.146	0.0569	0.0490	0.10	85.1

MATERIAL DESCRIPTION	USCS	AASHTO
● GREYISH BROWN GRAVEL AND SAND WITH LITTLE SILT	GM	

Project No.: 0965-04-1
Project: ROCHESTER FIRE ACADEMY
● Location: PZ-9, 32-38'

Date: 5-18-90

GRAIN SIZE DISTRIBUTION TEST REPORT
MALCOLM PIRNIE, INC.

Remarks:

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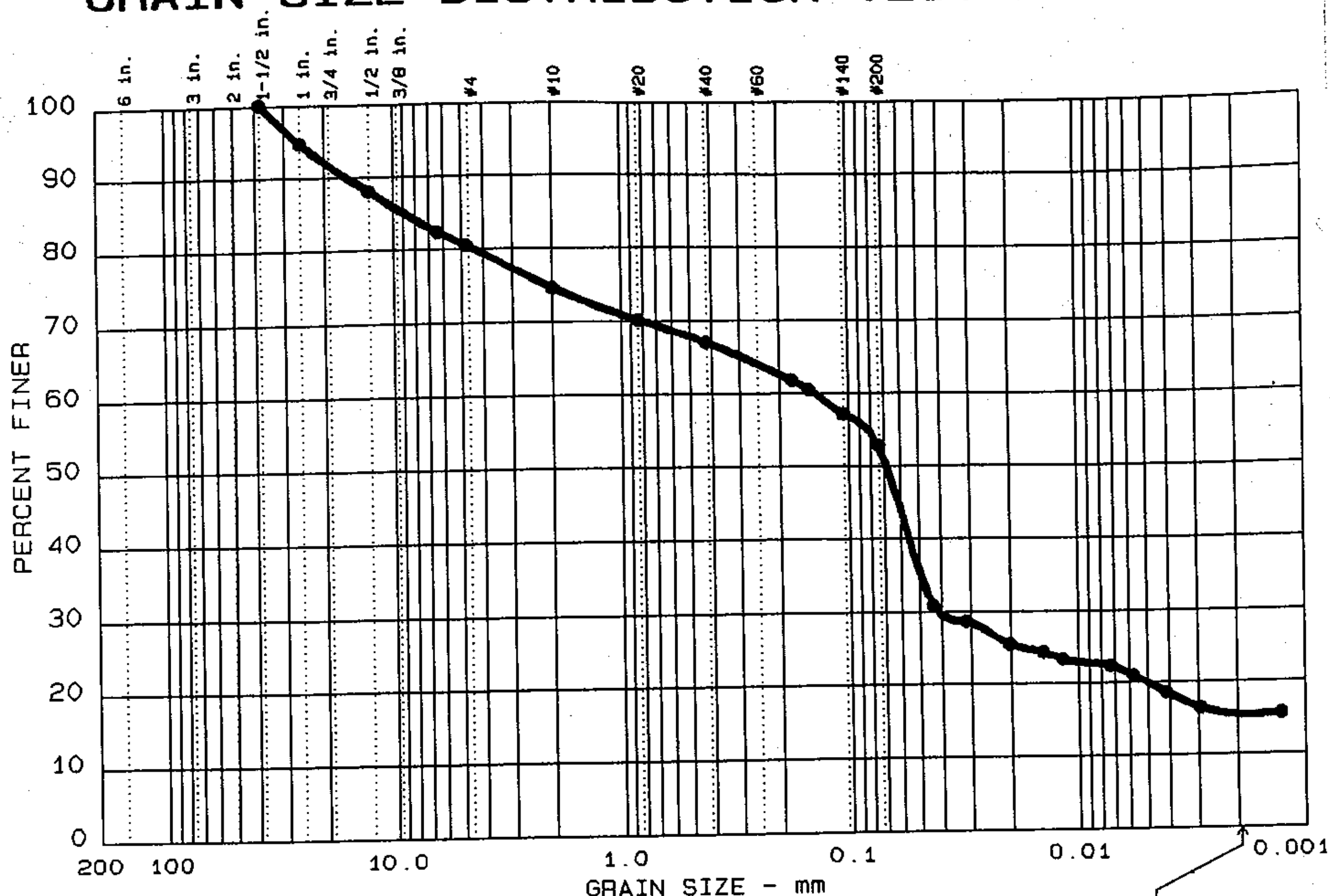
NVLAP

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	3	0.0	19.5	27.7	37.4	15.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			8.91	0.14	0.07	0.042				

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SANDY SILT WITH LITTLE GRAVEL AND CLAY		

Project No.: 0965-04-1
Project: ROCHESTER FIRE ACADEMY
● Location: MW-10S, 16-20'

Date: 5-21-90

Remarks:

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GRAIN SIZE DISTRIBUTION TEST REPORT
MALCOLM PIRNIE, INC.

Figure No.

MALCOLM PIRNIE, INC.

Project......... Rochester Fire Academy
Project Number.. 0965-04-1
Location........ Rochester Fire Academy

Sample Number	Gravel %	Sand %	Silt %	Clay %	Classification	Liquid Limit %
MW-9S,8-16'	5.2	2.4	61.5	30.9	CL	26
MW-10S,8-16'	0.0	1.4	83.4	15.2	ML	21

Sample Number	Plasticity Index
MW-9S,8-16'	11
MW-10S,8-16'	3

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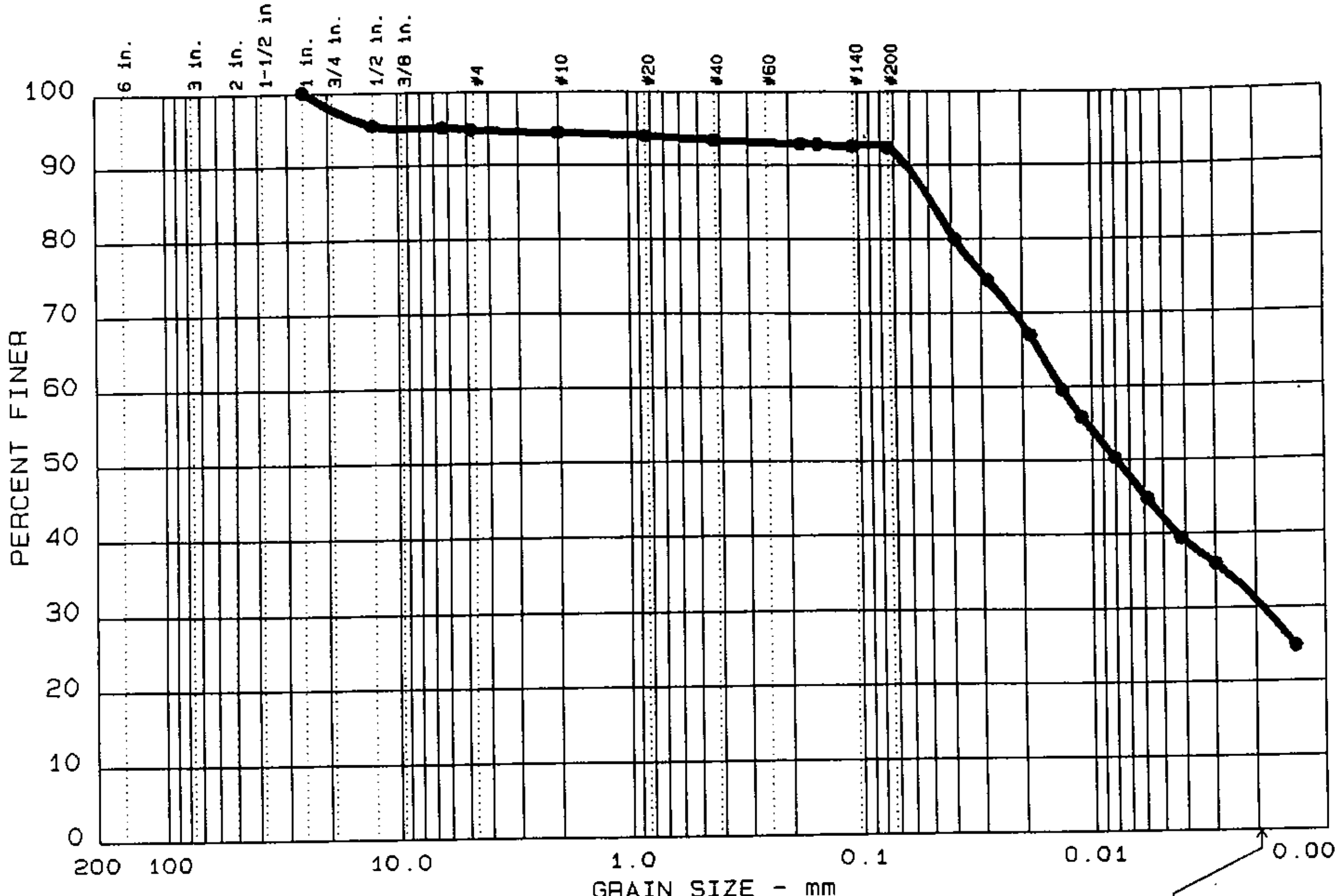
GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	5	0.0	5.2	2.4	61.5	30.9

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	26	11			0.01	0.002				

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN LEAN CLAY	CL	

Project No.: 0965-04-1
Project: ROCHESTER FIRE ACADEMY
◆ Location: MW 9S, 8-16'

Date: 5-21-90

GRAIN SIZE DISTRIBUTION TEST REPORT
MALCOLM PIRNIE, INC.

Remarks:

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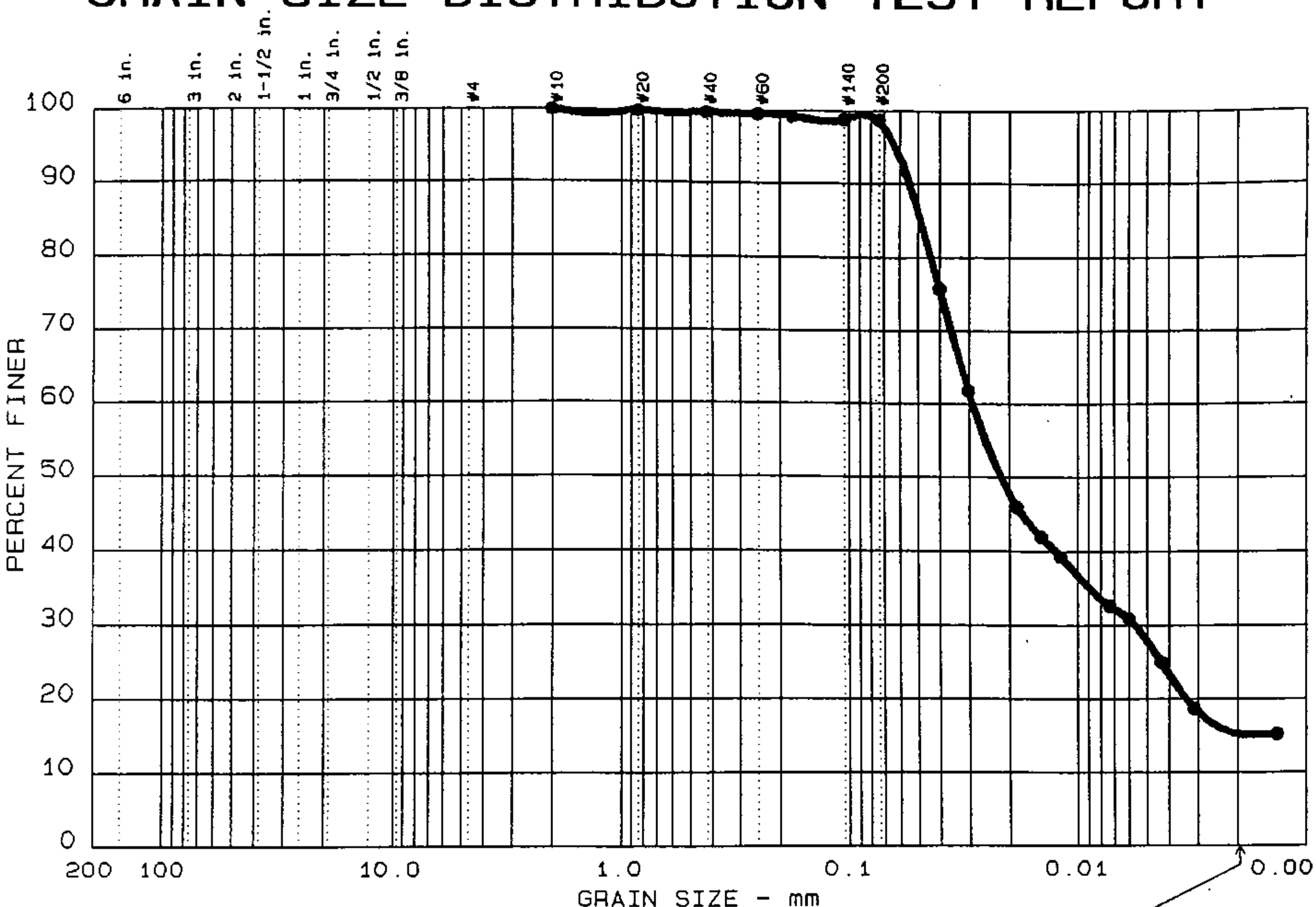
Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	7	0.0	0.0	1.4	83.4	15.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	21	3			0.02	0.006				

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SILT	ML	

Project No.: 0965-04-1
Project: ROCHESTER FIRE ACADEMY
● Location: MW-10S, 8-16'

Date: 5-22-90

GRAIN SIZE DISTRIBUTION TEST REPORT
MALCOLM PIRNIE, INC.

Remarks:

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Figure No.

APPENDIX C.7

TEST PIT LOGS

FIELD TEST PIT LOG

PROJECT: Rochester Fire Academy
EXCAVATION DATES: 4/3/90
PROJECT NO.: 0965-04-1
EXCAVATION METHOD: Back hoe
CLIENT: City of Rochester
LOGGED/CHECKED BY: RHF
LOCATION: TP-1

TEST PIT LOCATION TP-1
E2700, ~~N~~
N975

NOT TO SCALE

TEST PIT PLAN VIEW

NOT TO SCALE

DEPTH (ft. BGS)	SOIL DESCRIPTION	GRAPHIC LOG	PHOTOS Y OR N	SAMPLES	COMMENTS (INCLUDE SEEPAGE HORIZONS)
0	Loose organic rich, Dk brown silt				Instrument Reading
	little clay, tr fn sand, moist				
			Y		- ludlum Bkgd
1.5					- Dust (193-6) x .001 = ug/mg³
1.5	Plastic lt. Brown silt, tr. f. sand,				- HNU BkD
	moist to wet Native				- Combust gas - 0
3.7					Water Seeps @ 4.0 BGS
	Sample collect @ unsat/saturated				
	interface				
	1 Amber Bottle 8270/8080				
	1 Clear Glass 8240				
	1 Clear Glass 8270/8080				
	2 Clear Glass Metals				

BGS = BELOW GROUND SURFACE

* transcribed

SHEET NO. 1 OF 1

MALCOLM PIRNIE

FIELD TEST PIT LOG

PROJECT: Roch. Fire Academy
PROJECT NO.: 0965-04-1
CLIENT: City of Rochester
LOCATION: TP-2

EXCAVATION DATES: 4/3/90
EXCAVATION METHOD: Back hoe
LOGGED/CHECKED BY: RHF

TEST PIT LOCATION TP-2

E2600, N970

NOT TO SCALE

TEST PIT PLAN VIEW

NOT TO SCALE

DEPTH (ft. BGS)	SOIL DESCRIPTION	GRAPHIC LOG	PHOTOS Y OR N	SAMPLES	COMMENTS (INCLUDE SEEPAGE HORIZONS)
0	V DK Brown to Black loose silty		Y	Y	
	f-med-sand, Fill, with abundant				
	Debris, car fender, tail pipe, oil filter,				Ludlum reading - No reading
2.5	crushed 20t hydraulic oil can,				HNU 0.0
	crushed 25 gal barrel, All highly				Dust (207-6) x (.001) = ug/m³
	oxidized, bricks, glass bottles				Combustible Gas - no reading
	No odor or organic contamination				
	observed				
	Area filled w/ what appears to				
	be construction + demolition debris				
	- tires in vicinity				
	Samples Collected				
	-1 Amber bottle 8270/8080				
	-1 Clear glass 8270/8080				
	1 clear glass 8240				
	2 clear glass metals				

BGS = BELOW GROUND SURFACE

MALCOLM PIRNIE

SHEET NO. 1 OF 1

FIELD TEST PIT LOG

PROJECT: Roch. Fire Academy
PROJECT NO.: 0965-04-1
CLIENT: City of Rochester
LOCATION: TP-3

EXCAVATION DATES: 4/3/90
EXCAVATION METHOD: Backhoe
LOGGED/CHECKED BY: RHF

TEST PIT LOCATION TP-3

E 2575, N 1075

NOT TO SCALE

TEST PIT PLAN VIEW

NOT TO SCALE

DEPTH (BGS)	SOIL DESCRIPTION	GRAPHIC LOG	PHOTOS Y OR N	SAMPLES	COMMENTS (INCLUDE SEEPAGE HORIZONS)
0	Loose, med sand, Brown Foundry				
	Sand w/ drums and other metal +				Instrument Reading
	cement debris - large fragment ~		Y	Y	-HNU no reading
2	1 cu ft. of slag present				-Dust 182
					-Explosimeter No reading
	Drums present along perimeter of				-ludlum 0-0.5 mr/hr
	1 ft filled area, approx 10 drums				
	present				
	Samples collected:				
	1 Amber bottle 8270/8080				
	1 Clear " "				
	1 Clear 8240				
	2 metals				

BGS = BELOW GROUND SURFACE

MALCOLM PIRNIE

SHEET NO. 1 OF 1

FIELD TEST PIT LOG

PROJECT: 0965-04-1
PROJECT NO.: Roch Fire Acad
CLIENT: city of Rochester
LOCATION: TP-4

EXCAVATION DATES: 4/3/90
EXCAVATION METHOD: Back hoe
LOGGED/CHECKED BY: RHF

TEST PIT LOCATION TP-4

E 2520, N 10,80

NOT TO SCALE

TEST PIT PLAN VIEW

NOT TO SCALE

DEPTH (ft.BGS)	SOIL DESCRIPTION	GRAPHIC LOG	PHOTOS Y OR N	SAMPLES	COMMENTS (INCLUDE SEEPAGE HORIZONS)
0	Loose Black + Brown sandy fill				Ludlom Meter 4.2
	material @ 1.0-1.4 ft ash layer from			Y	HNU 0.0
	burnt wood abundant metal frags +				Explosimeter 0.0
4	bricks, wood pieces, C+D fill. No visual sign of contamination		Y		Dust 206 cts/15min
4	Med Brown firm silt little fn sand				
	moist				
			Y	N	
5					
	Samples collected:				
	1 Amber 8270/8080				
	1 Clear "				
	1 Clear 8240				
	2 Clear metals				

BGS = BELOW GROUND SURFACE

MALCOLM PIRNIE

SHEET NO. 1 OF 1

PROJECT: Roch Fire Acad

PROJECT NO.: 0965 04 1

CLIENT: City of Rochester

LOCATION: TP-5

EXCAVATION DATES: 4/3/90

EXCAVATION METHOD: Backhoe

LOGGED/CHECKED BY: RHF

TEST PIT LOCATION TP-5

E2460, N 1125

NOT TO SCALE

TEST PIT PLAN VIEW

NOT TO SCALE

DEPTH (ft. BGS)	SOIL DESCRIPTION	GRAPHIC LOG	PHOTOS Y OR N	SAMPLES	COMMENTS (INCLUDE SEEPAGE HORIZONS)
0	Highly decomposed drum in				
	same black fill, Only 1/2 drum				no reading on HNU, Explosimeter
	present				Dust 138 cts/15min
2			Y	Y	Ludlum <.2 mR/hr
	Soil Sample collected from				
	Soil beneath drum				

BGS = BELOW GROUND SURFACE

MALCOLM PIRNIE

SHEET NO. 1 OF 1

PROJECT: Roch Fire Academy
PROJECT NO.: 0965 04 1
CLIENT: City of Rochester
LOCATION: TP-6

EXCAVATION DATES: 4/4/90
EXCAVATION METHOD: Backhoe
LOGGED/CHECKED BY: RHF

TEST PIT LOCATION

TP-6

E 2320, N 1060

NOT TO SCALE

TEST PIT PLAN VIEW

NOT TO SCALE

DEPTH (ft.BGS)	SOIL DESCRIPTION	GRAPHIC LOG	PHOTOS Y OR N	SAMPLES	COMMENTS (INCLUDE SEEPAGE HORIZONS)
0	25 gal empty barrel (top ~~[illegible]~~				
	location of anomaly) loose gray-				HNU - Breathing Zone 0.8
	brown stoney fill Cs subang cobbles		Y	Y	at Ground Surface 10.0 ppm
2	and gravel in silty fn sand matrix				
	@ 2' Native soil				Explosimeter - No Reading
	0.1 sheen on surface, water				Ludlum - Background
	entering test pit				dust - 186 cts/15 min
	Samples collected w/ respirator				
	1 Amber 8027/8080				
	1 Clear 8240				
	1 Clear 8027/8080				
	2 Clear Metals/TCN				

BGS = BELOW GROUND SURFACE

MALCOLM PIRNIE

SHEET NO. 1 OF 1

FIELD TEST PIT LOG

PROJECT: Roch Fire Academy
PROJECT NO.: 0965 04 1
CLIENT: City of Rochester
LOCATION: TP-7

EXCAVATION DATES: 4/4/90
EXCAVATION METHOD: Back hoe
LOGGED/CHECKED BY: Richard H Frappa

TEST PIT LOCATION

TP-7

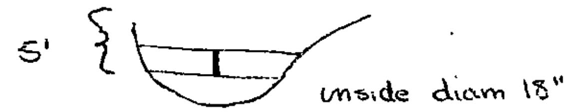
E 1795, N 708

Bottom of Pipe 5'

Bedding of Sewer near River

NOT TO SCALE

TEST PIT PLAN VIEW



NOT TO SCALE

DEPTH (ft.BGS)	SOIL DESCRIPTION	GRAPHIC LOG	PHOTOS Y OR N	SAMPLES	COMMENTS (INCLUDE SEEPAGE HORIZONS)
0	Brown Recompacted silty fill material,				
	no bedding present, Sewer pipe		Y	Y	No meter readings above background
	encountered at Bell Joint Concrete				
6	Construction. No bedding beneath				
	pipe.				
	Samples collected from materials				
	adjacent to Pipe				
	1 amber				
	1 cl glass				
	1 cl glass				
	2 cl glass - metals				

BGS = BELOW GROUND SURFACE

SHEET NO. 1 OF 1

MALCOLM PIRNIE

FIELD TEST PIT LOG

PROJECT: Roch Fire Acad
PROJECT NO.: 0965 04 1
CLIENT: City of Rochester
LOCATION: TP-8

EXCAVATION DATES: 4/4/90
EXCAVATION METHOD: Back hoe
LOGGED/CHECKED BY: RHF

TEST PIT LOCATION TP-8

E 1660, N820
standing water present

NOT TO SCALE

TEST PIT PLAN VIEW

NOT TO SCALE

DEPTH (ft.BGS)	SOIL DESCRIPTION	GRAPHIC LOG	PHOTOS Y OR N	SAMPLES	COMMENTS (INCLUDE SEEPAGE HORIZONS)
0	Gravelly Fill - Cs gravel + cobbles				
	(subangular) in Gray to Black silt Matrix		Y	Y	HNU 0.0 ppm
	w/ Vegetative matter (Surface water enters				Explosimeter, Ludlum - Background
.3'	pit				
.3	Brown silty fn sand tr fn			Y	
	subangular gravel : Large tree				
	Stump encountered (cause of anomaly?)				
3.5'					
	Samples collected from fill/Native				
	material interface				

BGS = BELOW GROUND SURFACE

MALCOLM PIRNIE

SHEET NO. 1 OF 1

FIELD TEST. PIT LOG

PROJECT: Fire Academy RI/FS
PROJECT NO.: 0965-04-1
CLIENT: City of Rochester
LOCATION: Rochester, NY

EXCAVATION DATES: 4/4/10
EXCAVATION METHOD: Backhoe
LOGGED/CHECKED BY: R. Ecappa

TEST PIT LOCATION

TP-9
E 1075, N1150
pos. moved from N 1125

NOT TO SCALE

TEST PIT PLAN VIEW

NOT TO SCALE

DEPTH (ft. BGS)	SOIL DESCRIPTION	GRAPHIC LOG	PHOTOS Y OR N	SAMPLES	COMMENTS (INCLUDE SEEPAGE HORIZONS)
	Test Pit location in accurate. After excavating @ E1075, N1075 No Contamination encountered		Y	Y	Both discarded
	moved to E1075, N1150 - Position in Pond at location of Empty drums - After conferring w/ NYSDEC moved location N ~25 ft in fill				
0	Loose brown silt some fn sand material from burned area No visual sign of contamination				
2.5			Y		
2.5	Dense laminated brown silt tr clay Native				HNU Breathing zone 0.5ppm
	Water seep @ 5.0 BGS Oily sheen			Y	HNU Ground surface max 20ppm
6.0	on surface				Explosimeter also @ background
	Sample collected from saturated soil				

BGS = BELOW GROUND SURFACE

MALCOLM PIRNIE

SHEET NO. ____ OF ____

FIELD TEST PIT LOG

PROJECT: RI/FS
PROJECT NO.: 0965-04-1
CLIENT: City of Rochester
LOCATION: Rochester, NY

EXCAVATION DATES: 4/4/90
EXCAVATION METHOD: Backhoe
LOGGED/CHECKED BY: RHF

TEST PIT LOCATION

TP-10

E 1030, W 1100

NOT TO SCALE

TEST PIT PLAN VIEW

NOT TO SCALE

DEPTH (ft.BGS)	SOIL DESCRIPTION	GRAPHIC LOG	PHOTOS Y OR N	SAMPLES	COMMENTS (INCLUDE SEEPAGE HORIZONS)
0	Loose Black Sandy silty fill material				- HNU @ ground surface 15 ppm
	adjacent to drum - Ash/cinder material		Y	Y	Breathing zone @ Background
	from burning - Oily sheen observed				- Explosimeter + Lindlam - @ Background
2	on surficial water in pit				
2	Native Brown compact silt				
3					
	Samples collected in fill				
	5/4/90 GenTesting				
	exceeded holding				
	times				
	resampled 5/4/90				
	TP-10A				

BGS = BELOW GROUND SURFACE

SHEET NO. 1 OF 1

MALCOLM PIRNIE

FIELD TEST PIT LOG

PROJECT: RI/FS
PROJECT NO.: 0965-04-1
CLIENT: City of Rochester
LOCATION: Rochester, NY

EXCAVATION DATES: 4/4/90
EXCAVATION METHOD: Backhoe
LOGGED/CHECKED BY: RHF

TEST PIT LOCATION

TP-11

E 1010, N 1075

NOT TO SCALE

TEST PIT PLAN VIEW

NOT TO SCALE

DEPTH (ft.BGS)	SOIL DESCRIPTION	GRAPHIC LOG	PHOTOS Y OR N	SAMPLES	COMMENTS (INCLUDE SEEPAGE HORIZONS)
0	Loose Black ash/cindery fill				HNU, Explosimeter, ludlum
	abundant metallic objects - nails				Background
	springs, wire - Metal Objects		Y	Y	
1	only				
1	Native Brown silt				
2					
	Samples collected from fill				
	5/4/90 Gen testing				
	exceeded holding				
	time tp resampled				
	5/4/90				
	Testpit labeled TP11A				

BGS = BELOW GROUND SURFACE

SHEET NO. 1 OF 1

MALCOLM PIRNIE

APPENDIX D

HELP MODEL SIMULATIONS

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***************************************************************************
HYDROLOGIC SIMULATION - HELP MODEL
***************************************************************************


 ROCHESTER FIRE ACADEMY RI (TRAINING GROUNDS)

 OPEN LANDFILL WITH SIX-INCHES OF COVER

 JUNE 28, 1990

***************************************************************************

***************************************************************************

                                BARE GROUND

                                  LAYER  1
                                  --------

                        VERTICAL PERCOLATION LAYER
   THICKNESS                             =       6.00 INCHES
   POROSITY                              =       0.4170 VOL/VOL
   FIELD CAPACITY                        =       0.0454 VOL/VOL
   WILTING POINT                         =       0.0200 VOL/VOL
   INITIAL SOIL WATER CONTENT            =       0.0454 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY      =       0.009999999776 CM/SEC


                                  LAYER  2
                                  --------

                        VERTICAL PERCOLATION LAYER
   THICKNESS                             =      18.00 INCHES
   POROSITY                              =       0.4370 VOL/VOL
   FIELD CAPACITY                        =       0.0624 VOL/VOL
   WILTING POINT                         =       0.0245 VOL/VOL
   INITIAL SOIL WATER CONTENT            =       0.0624 VOL/VOL
   SATURATED HYDRAULIC CONDUCTIVITY      =       0.005799999926 CM/SEC
```

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	70.00
TOTAL AREA OF COVER	=	262500. SQ FT
EVAPORATIVE ZONE DEPTH	=	8.00 INCHES
POTENTIAL RUNOFF FRACTION	=	0.100000
UPPER LIMIT VEG. STORAGE	=	3.3760 INCHES
INITIAL VEG. STORAGE	=	0.7676 INCHES
INITIAL SNOW WATER CONTENT	=	0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN SOIL AND WASTE LAYERS	=	1.3956 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR BUFFALO, NEW YORK WITH 30 YEAR AVERAGES FROM ROCHESTER, NEW YORK

MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	138
END OF GROWING SEASON (JULIAN DATE)	=	279

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
24.60	24.50	32.90	45.10	56.90	66.40
71.40	69.30	62.50	51.40	39.80	28.90

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.65	2.71	2.73	2.51	3.18	3.33
	3.17	2.80	2.65	2.74	3.13	2.81
STD. DEVIATIONS	0.46	0.62	1.10	0.78	0.85	0.98
	0.97	1.13	1.17	1.32	1.10	0.28
RUNOFF						
TOTALS	0.014	0.017	0.019	0.011	0.017	0.014
	0.017	0.023	0.021	0.016	0.018	0.013
STD. DEVIATIONS	0.013	0.013	0.013	0.012	0.009	0.011
	0.008	0.012	0.011	0.004	0.019	0.011
EVAPOTRANSPIRATION						
TOTALS	0.498	0.600	1.860	2.007	2.862	2.696
	2.273	1.958	1.786	1.519	0.864	0.525
STD. DEVIATIONS	0.110	0.128	0.366	0.697	0.630	0.869
	0.566	0.542	0.952	0.629	0.097	0.198
PERCOLATION FROM LAYER 2						
TOTALS	2.3859	1.8326	1.9470	0.5809	0.4444	0.5511
	0.8784	0.8418	0.4941	1.2531	1.7292	1.8358
STD. DEVIATIONS	0.8656	0.5788	1.0525	0.4314	0.3397	0.2093
	0.6381	0.5614	0.2839	0.9485	0.8719	0.5222

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	34.43	(1.540)	753069.	100.00
RUNOFF	0.200	(0.038)	4373.	0.58
EVAPOTRANSPIRATION	19.449	(1.620)	425447.	56.50
PERCOLATION FROM LAYER 2	14.7743	(1.1162)	323187.	42.92
CHANGE IN WATER STORAGE	0.003	(0.584)	62.	0.01

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	1.93	42218.7
RUNOFF	0.017	363.8
PERCOLATION FROM LAYER 2	0.8000	17499.5
SNOW WATER	1.96	42796.3
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.1625	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0092	

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	0.56	0.0940
2	2.45	0.1359
SNOW WATER	0.00	

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ROCHESTER FIRE ACADEMY RI (SOUTH DISPOSAL)

OPEN LANDFILL WITH SIX-INCHES OF LOOSE COVER

JUNE 29, 1990

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FAIR GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	6.00 INCHES
POROSITY	=	0.4170 VOL/VOL
FIELD CAPACITY	=	0.0454 VOL/VOL
WILTING POINT	=	0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0454 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.029989998788 CM/SEC

LAYER 2

VERTICAL PERCOLATION LAYER

THICKNESS	=	18.00 INCHES
POROSITY	=	0.4170 VOL/VOL
FIELD CAPACITY	=	0.0454 VOL/VOL
WILTING POINT	=	0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0454 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.029989998788 CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	60.00
TOTAL AREA OF COVER	=	24000. SQ FT
EVAPORATIVE ZONE DEPTH	=	8.00 INCHES
POTENTIAL RUNOFF FRACTION	=	0.200000
UPPER LIMIT VEG. STORAGE	=	3.3360 INCHES
INITIAL VEG. STORAGE	=	0.6177 INCHES
INITIAL SNOW WATER CONTENT	=	0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN SOIL AND WASTE LAYERS	=	1.0896 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR BUFFALO, NEW YORK WITH 30 YEAR AVERAGES FROM ROCHESTER, NEW YORK.

MAXIMUM LEAF AREA INDEX	=	2.00
START OF GROWING SEASON (JULIAN DATE)	=	138
END OF GROWING SEASON (JULIAN DATE)	=	279

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
24.60	24.50	32.90	45.10	56.90	66.40
71.40	69.30	62.50	51.40	39.80	28.90

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.65	2.71	2.73	2.51	3.18	3.33
	3.17	2.80	2.65	2.74	3.13	2.81
STD. DEVIATIONS	0.46	0.62	1.10	0.78	0.85	0.98
	0.97	1.13	1.17	1.32	1.10	0.28
RUNOFF						
TOTALS	0.054	0.066	0.094	0.047	0.060	0.109
	0.140	0.091	0.070	0.086	0.063	0.053
STD. DEVIATIONS	0.035	0.037	0.079	0.045	0.041	0.058
	0.078	0.075	0.053	0.039	0.054	0.032
EVAPOTRANSPIRATION						
TOTALS	0.493	0.594	1.752	1.935	2.752	2.688
	2.430	2.184	1.803	1.449	0.836	0.517
STD. DEVIATIONS	0.105	0.126	0.371	0.655	0.670	0.824
	0.485	0.670	0.880	0.580	0.089	0.191
PERCOLATION FROM LAYER 2						
TOTALS	2.3629	1.8295	1.7326	0.5961	0.4982	0.5115
	0.6314	0.6524	0.3170	1.2660	1.8677	1.7632
STD. DEVIATIONS	0.9358	0.5591	1.0203	0.4811	0.3085	0.2392
	0.5770	0.4998	0.2470	0.9669	0.8796	0.5105

****

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	34.43	(1.540)	68852.	100.00
RUNOFF	0.933	(0.098)	1867.	2.71
EVAPOTRANSPIRATION	19.435	(1.658)	38869.	56.45
PERCOLATION FROM LAYER 2	14.0284	(0.8670)	28057.	40.75
CHANGE IN WATER STORAGE	0.030	(0.588)	59.	0.09

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	1.93	3860.0
RUNOFF	0.129	258.3
PERCOLATION FROM LAYER 2	0.7784	1556.8
SNOW WATER	1.96	3923.7
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.1969	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0082	

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	0.55	0.0912
2	1.56	0.0869
SNOW WATER	0.00	

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ROCHESTER FIRE ACADEMY RI (NORTH DISPOSAL AREA)

OPEN LANDFILL WITH SIX-INCHES OF LOOSE COVER

JUNE 28, 1990

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FAIR GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	6.00 INCHES
POROSITY	=	0.4170 VOL/VOL
FIELD CAPACITY	=	0.0454 VOL/VOL
WILTING POINT	=	0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0454 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.029989998788 CM/SEC

LAYER 2

VERTICAL PERCOLATION LAYER

THICKNESS	=	18.00 INCHES
POROSITY	=	0.4170 VOL/VOL
FIELD CAPACITY	=	0.0454 VOL/VOL
WILTING POINT	=	0.0200 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0454 VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.029989998788 CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	60.00
TOTAL AREA OF COVER	=	60000. SQ FT
EVAPORATIVE ZONE DEPTH	=	8.00 INCHES
POTENTIAL RUNOFF FRACTION	=	0.200000
UPPER LIMIT VEG. STORAGE	=	3.3360 INCHES
INITIAL VEG. STORAGE	=	0.6177 INCHES
INITIAL SNOW WATER CONTENT	=	0.0000 INCHES
INITIAL TOTAL WATER STORAGE IN SOIL AND WASTE LAYERS	=	1.0896 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR BUFFALO, NEW YORK WITH 30 YEAR AVERAGES FROM ROCHESTER, NEW YORK

MAXIMUM LEAF AREA INDEX	=	2.00
START OF GROWING SEASON (JULIAN DATE)	=	138
END OF GROWING SEASON (JULIAN DATE)	=	279

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
24.60	24.50	32.90	45.10	56.90	66.40
71.40	69.30	62.50	51.40	39.80	28.90

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.65	2.71	2.73	2.51	3.18	3.33
	3.17	2.80	2.65	2.74	3.13	2.81
STD. DEVIATIONS	0.46	0.62	1.10	0.78	0.85	0.98
	0.97	1.13	1.17	1.32	1.10	0.28
RUNOFF						
TOTALS	0.054	0.066	0.094	0.047	0.060	0.109
	0.140	0.091	0.070	0.086	0.063	0.053
STD. DEVIATIONS	0.035	0.037	0.079	0.045	0.041	0.058
	0.078	0.075	0.053	0.039	0.054	0.032
EVAPOTRANSPIRATION						
TOTALS	0.493	0.594	1.752	1.935	2.752	2.688
	2.430	2.184	1.803	1.449	0.836	0.517
STD. DEVIATIONS	0.105	0.126	0.371	0.655	0.670	0.824
	0.485	0.670	0.880	0.580	0.089	0.191
PERCOLATION FROM LAYER 2						
TOTALS	2.3629	1.8295	1.7326	0.5961	0.4982	0.5115
	0.6314	0.6524	0.3170	1.2660	1.8677	1.7632
STD. DEVIATIONS	0.9358	0.5591	1.0203	0.4811	0.3085	0.2392
	0.5770	0.4998	0.2470	0.9669	0.8796	0.5105

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	34.43	(1.540)	172130.	100.00
RUNOFF	0.933	(0.098)	4667.	2.71
EVAPOTRANSPIRATION	19.435	(1.658)	97173.	56.45
PERCOLATION FROM LAYER 2	14.0284	(0.8670)	70142.	40.75
CHANGE IN WATER STORAGE	0.030	(0.588)	148.	0.09

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	1.93	9650.0
RUNOFF	0.129	645.9
PERCOLATION FROM LAYER 2	0.7784	3892.1
SNOW WATER	1.96	9809.3

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.1969

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0082

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	0.55	0.0912
2	1.56	0.0869
SNOW WATER	0.00	

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APPENDIX E

LABORATORY DATA AND REPORTS DOCUMENTATION PACKAGES

THE LABORATORY DATA REPORTS AND DOCUMENTATION PACKAGES
HAVE BEEN SUBMITTED UNDER A SEPARATE COVER
DUE TO THEIR VOLUMINOUS SIZE

APPENDIX F

LABORATORY DATA VALIDATION

APPENDIX F.1

FIRST ROUND DATA VALIDATION

QUALITY CONTROL

INTRODUCTION

The following sections detail an assessment and validation of analytical results reported for surficial and subsurface soils, sediment, surface water and ground water samples which were collected at the Rochester Fire Academy Site. All samples were collected by Malcolm Pirnie personnel from April 5 - May 24, 1990.

The data assessment/validation is a measure of data quality and reliability which provides the data user with an explanation of the qualitative confidence and quantitative error associated with individual results. The evaluation is based upon information obtained from completed laboratory data sheets, document control forms, blank data, duplicate data and recovery data for both matrix and surrogate spikes. The USEPA "Functional Guidelines for Evaluating Organic Analyses" (February 1988) and "Functional Guidelines for Evaluating Inorganic Analyses" (June 1988), hereinafter referred to as "guidelines", were used for the validation. In addition, the NYS CLP 1987 statement of work was used to evaluate laboratory conformance to NYS CLP protocol.

ORGANIC ANALYSES

The following sections detail the validation of analytical results for all samples analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides and PCBs and dioxin (2, 3, 7, 8-TCDD).

SAMPLE HOLDING TIMES

Protocols mandated by the 1987 NYS CLP stipulate that the maximum holding time for aqueous and soil/sediment samples submitted for volatile organic analyses, is seven (7) days from Verified Time of Sample Receipt (VTSR) to date of analysis. For semivolatile and pesticide/pcb analyses, the maximum holding time is five (5) days from VTSR to date of extraction for aqueous samples and ten (10) days from VTSR to date of extraction for soil/sediment samples. The federal guidelines for evaluating organic analyses, define the holding time as the number of days from sample collection to the date of analysis or extraction. The federal guidelines recommend a maximum holding time of seven (7) days.

Because the laboratory had no control over sample shipment from the field, the NYS CLP guidelines were used to evaluate holding times. By comparing the actual dates of sample receipt to the dates of analysis or extraction, it was noted that all samples were analyzed/extracted within the prescribed holding times. However, the following samples were originally extracted and analyzed within holding time criteria, but were re-extracted and re-analyzed due to non-compliant surrogate recoveries. The re-extraction was performed after the prescribed holding time had expired.

SAMPLE	MATRIX	FRACTION AFFECTED	# DAYS EXCEEDED
MW-15S	aqueous	semi-volatile	18
MW-6S	aqueous	semi-volatile	18
MW-7S	aqueous	semi-volatile	18
MW-12I	aqueous	semi-volatile	18
MW-8S	aqueous	pesticide/PCB	12
MW-14S	soil	semi-volatile	10
TP-1	soil	semi-volatile	6
TP-4	soil	semi-volatile	9
SS-15	soil	semi-volatile	18

The analytical results reported for the original samples and the re-extracted samples were very similar. Only phthalates were detected above laboratory detection limits in these samples with the exception of sample MW-7S. Both phenol and 4-methylphenol were detected in the re-extracted sample MW-7S at slightly greater concentrations than in the original sample.

According to the guidelines, all positive results for each fraction which exceeded the established holding time should be considered to be estimates. Therefore, such results are qualified with a "J" on the analytical data summary tables presented herein.

GC/MS TUNING AND INSTRUMENT CALIBRATION

Tuning and performance criteria for the GC/MS are established to ensure mass resolution and identification of compounds (qualitative data). Conformance is determined using standard materials (i.e. bromofluorobenzene (BFB) for volatile organic analyses and decafluorotriphenylphosphine (DFTPP) for semi-volatile organic analyses). All BFB and DFTPP generated by GC/MS was reviewed and found to be within performance criteria. Therefore, no qualification to the data due to improper tuning of the GC/MS is necessary.

Instrument calibration requirements are established to ensure that the instrument is capable of producing acceptable quantitative data. Initial calibration demonstrates that a particular instrument is capable of acceptable performance at the beginning of an analytical run, and continuing calibration documents satisfactory maintenance and adjustment of the instrument on a day-to-day basis.

All initial calibration data was within established criteria for relative response factors (RRF) and relative percent difference (RPD) given in the guidelines. The only deviation from required protocol involved the use of standards for the initial five-point calibration curve which differed from the concentrations specified in the NYS CLP protocol. For example, the NYS CLP mandates an initial calibration curve for volatile organics consisting of 20 ppb, 50 ppb, 100 ppb, 150 ppb and 200 ppb standards. The laboratory used an initial concentration curve for volatiles which consisted of 20 ppb, 40 ppb, 80 ppb, 120 ppb and 200 ppb standards. However, the concentrations of all standards analyzed by the laboratory were within the range of the specified concentrations given in the protocol. Furthermore, the concentration of analytes detected in the samples were also within the range of the standard concentrations.

All continuing calibration data was within specified RRF criteria and it is noted that calibration was performed within the specified time period of every twelve hours. Most of the continuing calibration data was within the 25% difference requirement stated in the 1987 NYS CLP protocol with the exception of the following compounds:

VOLATILE ORGANIC COMPOUNDS:

vinyl acetate
bromoform
1,2-dichloroethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
carbon tetrachloride
acrolein
styrene
2-butanone

SEMI-VOLATILE COMPOUNDS:

2-nitroaniline
3-nitroaniline
anthracene
2,6-dinitrotoluene
2-methylphenol
2,4-dinitrophenol
diethylphthalate

In addition, the following Continuing Calibration Check Compounds (CCC) exceeded the 25% difference criteria in different Sample Delivery Groups (SDGs) and at different times throughout the analyses:

fluoranthene
di-n-octyl phthalate
benzo(a)pyrene
pentachlorophenol
2,4,6-trichlorophenol

It is noted that the laboratory had established a 30% difference requirement (rather than 25%) and that the above-mentioned compounds did not exceed 30% difference. The laboratory used the 30% criteria as this is the criteria given in the methodology (8270, USEPA SW-846). The sample data are not being qualified for continuing calibration as the individual samples associated with each individual calibration for the particular SDG would be extremely cumbersome and beyond the scope of this validation. However, it is noted that only a few of these specific compounds (viz., 1,2-dichloroethane, 2-butanone, 2-methylphenol, fluoranthene, and di-n-octyl phthalate) were detected in the environmental samples collected at the site. Nevertheless, the data-user is cautioned to the limitations associated with the continuing calibration of the specific compounds noted above.

BLANK ANALYSES

The purpose of assessing the results of blank analyses is to determine the existence and magnitude of contamination which may potentially be introduced during preparation of sample containers, sample collection and/or sample analysis. Many types of blanks are analyzed such as laboratory/method blanks, field/equipment blanks and trip blanks. Each type of blank will give the data-user an indication of the source of contamination, if any.

The following compounds were detected in the laboratory/method blanks which were analyzed for organic compounds:

BLANK	COMPOUND	MATRIX	CONCENTRATION
SWB41	di-n-butlyphthalate	aqueous	0.60 ug/l
	bis(2-ethylhexyl)phthalate	aqueous	4.0 ug/l
TR004	acetone	aqueous	10 ug/l
TR027	chloroform	aqueous	6.0 ug/l
VN271	methylene chloride	soil	9.0 ug/kg
VN178	acetone	soil	17 ug/kg
SWB21	bis(2-ethylhexyl)phthalate	soil	150 ug/kg
VSB11	acetone	soil	16 ug/kg
	methylene chloride	soil	7.0 ug/kg
VSB31	(medium level)		
	methylene chloride	soil	930 ug/kg
	acetone	soil	1500 ug/kg

BLANK	COMPOUND	MATRIX	CONCENTRATION
SSB21	bis(2-ethylhexyl)phthalate	soil	200 ug/kg
	di-n-butyl phthalate	soil	43 ug/kg
	fluorene	soil	50 ug/kg
VN771	acetone	soil	10 ug/kg
	methylene chloride	soil	3.0 ug/kg
VQ414	(medium level)		
	acetone	soil	330 ug/kg
SSB41	bis(2-ethylhexyl)phthalate	soil	140 ug/kg

In accordance with the guidelines, positive results for these compounds reported at a concentration of less than ten (10) times the associated blank contamination value (five (5) times for less common contaminants), were qualified as not detected (ND) and the method detection limit set equal to the value detected in the sample. This estimated detection limit was then qualified with a "B". The blank evaluation criteria applies to any blank associated with the samples. When more than one blank was associated with a given sample, qualification was based on a comparison with the associated blank having the highest concentration of a contaminant.

SURROGATE SPIKE RECOVERY

Laboratory performance, in terms of accuracy, on individual samples is established by spiking activities. All samples submitted for volatile organic, semi-volatile organic and pesticide/PCB analyses were spiked with surrogate compounds prior to sample preparation. According to the guidelines, surrogate recoveries for compounds in each of the organic fractions must be within the respective recovery limits established for that compound. If any two surrogates within the base neutral or acid fraction, or if any one surrogate in the volatile fraction are out of specification, or if any one surrogate recovery is less than 10%, all positive results for the non-compliant fraction of the same matrix must be estimated and qualified with a "J".

The following surrogate spike recoveries were outside of the required recovery criteria and the associated affected sample results have been qualified with a "J" on the analytical data summary tables presented herein:

VOLATILE ORGANIC FRACTION

Surrogate Compound	Matrix	Samples Affected
bromofluorobenzene	soil	SS10-SS14, SS16, SS18, B1-B4, B8

SEMI-VOLATILE FRACTION

Surrogate Compound	Matrix	Samples Affected
phenol	aqueous	All groundwater samples
fluorophenol	aqueous	All groundwater samples

PESTICIDE/PCB

Surrogate Compound	Matrix	Samples Affected
dibutylchlorendate	soil	SS15, SS17, SS19, SS20, B5-B7, TP3A, TP11A

It should be noted that bromofluorobenzene recovery was slightly lower than the recovery limit established in the guidelines for two of the seventeen investigative samples in the particular sample delivery group (SDG). This indicates a low bias in any reported results for this compound. Both phenol and fluorophenol surrogate recoveries were also slightly lower than the recovery limits established in the guidelines, thus indicating a low bias in any reported results for these compounds. Both of these surrogate compounds were below recovery criteria in four of eighteen samples in the particular SDG. In three of ten samples in the particular SDG, the pesticide surrogate, dibutylchlorendate, exhibited recoveries greater than the highest limit of recovery established in the guidelines which indicates a positive bias. However, there were no pesticides detected in any of the samples submitted for pesticide analysis, and therefore no qualifications of the pesticide fraction due to surrogate recovery is necessary.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ANALYSES

MS/MSD data are generated to determine the effect of the sample matrix on precision and accuracy of the analytical method. Matrix spike recoveries (REC) must be within advisory limits given in the guidelines. The relative percent difference (RPD) between the MS and the MSD must also be within the advisory limits given in the guidelines. The following matrix spike/matrix spike duplicate sample results were outside of the advisory limits:

MS/MSD SAMPLE	MATRIX	ANALYTE	CRITERIA OUT
SS10	soil	1,2,4-trichlorobenzene	RPD
		acenaphthene	RPD
		4-nitrophenol	RPD
		pyrene	RPD
SS15	soil	1,1-dichloroethene	REC,RPD
		1,4-dichlorobenzene	RPD
		1,2,4-trichlorobenzene	RPD
		4-chloro-3-methylphenol	RPD
		acenaphthene	RPD
		endrin	RPD
SS9	soil	endrin	REC
		dieldrin	REC
TP1	soil	pentachlorophenol	RPD
		pyrene	RPD
MW6I	aqueous	all pesticides	RPD,REC

The MS/MSD data alone can not be used to evaluate the precision and accuracy of individual samples. In general, no action is taken on MS/MSD data to qualify an entire case. Qualification is limited to the unspiked sample associated with the MS/MSD. Therefore, any positive results for the above-mentioned compounds detected in the unspiked samples (SS10, SS15, SS9, TP1 and MW6I), have been qualified with a "J" to indicate that the results are estimated.

FIELD DUPLICATE PRECISION

An aqueous field duplicate sample (MW17) was collected from location MW7S for full organic analyses in order to assess the aggregate analytical and sampling protocol precision. The results differed by more than 30% for several of the analytical parameters indicating poor analytical and sampling protocol precision. Most of the volatile organic compounds which were detected in sample MW7S did not agree with those concentrations detected in sample MW17. However, the difficulty in obtaining a duplicate aqueous sample should be noted (the sample is actually a replicate).

The concentrations of 4-nitrophenol and Arochlor 1254 also differed by more than 30% between the two samples. According to the guidelines, any compounds exhibiting greater than 30 % relative difference between the sample and the duplicate sample should be estimated. The qualification is limited to only the duplicate sample set. Therefore, the positive results for the volatile organic compounds, 4-nitrophenol and Arochlor 1254 have been qualified with a "J" in samples MW17 and MW7 to indicate that these results are estimated.

INTERNAL STANDARDS

Internal standard performance criteria ensure that instrument response and sensitivity is stable during every analytical run. A general review of all submitted internal standard data indicated acceptable instrument response and sensitivity.

INORGANIC ANALYSES

The following sections detail an evaluation of results for all samples analyzed for inorganic elements and cyanide.

SAMPLE HOLDING TIMES

Technical requirements for sample holding times for inorganics in soil matrices have not yet been established. According to the guidelines, holding times for water matrices should be applied to soil matrices. The following holding times have been established under 40 CFR Part 136 (Clean Water Act). Preservation refers to aqueous samples only.

METALS: 6 months; preserved at pH <2
MERCURY: 28 days; preserved at pH <2
CYANIDE 14 days; preserved at pH >12

By comparing the actual dates of sample collection to the dates of analyses, it is noted that all groundwater, surface water, sediment and soil samples were analyzed prior to expiration of the established holding times. In addition, all water samples were preserved with the appropriate preservatives. Consequently, no qualification of the data based on holding times is required.

CALIBRATION

Requirements for satisfactory instrument calibration are established to ensure that a particular instrument (ICP, AA) is capable of producing acceptable quantitative data. Initial calibration and continuing calibration data are needed to document acceptable performance at the beginning of an analytical run and to verify that the initial calibration is still valid at a later time during the analytical run. An EPA certified standard is normally used for the calibration verification.

In assessing the calibration data for all inorganic analyses, it is noted that the proper number of calibration standards were analyzed at the beginning of each run and at the appropriate frequency throughout the analytical run. In addition, recoveries for each analyte in the EPA verification standard were within established criteria. Therefore, no qualification of the data due to calibration problems is necessary.

BLANKS

The purpose of assessing the results of blank analyses is to determine the existence and magnitude of contamination which may potentially be introduced during preparation of sample containers, sample collection and/or sample analysis. Many types of blanks are analyzed such as laboratory/method blanks, field/equipment blanks and trip blanks. Each type of blank will give the data-user an indication of the source of contamination, if any.

According to the guidelines, blank evaluation criteria apply to any blank associated with the samples. When more than one blank is associated with a given sample, qualification is based on a comparison with the associated blank having the highest concentration of a contaminant. Positive results for compounds reported in the samples at a concentration of less than five (5) times the associated blank contamination value, must be qualified as not detected (ND) and the method detection limit set equal to the value detected in the sample. The detection limit is then qualified with a "B".

In evaluating all blank data for inorganic analyses, it is noted that no inorganic elements were detected at concentrations greater than contract required detection limits. Although low levels of contaminants were detected at concentrations greater than instrument detection limits, no sample results were affected by the contamination due to the "5X" criteria discussed above.

MATRIX SPIKE

The analysis of an inorganic matrix spike sample provides the data user with information regarding sample matrix effects on the digestion procedure and analytical methodology. According to the guidelines, matrix spike recoveries for inorganic elements must be within the 75% to 125% recovery "window." Any positive sample results for analytes which are detected outside of this established window should be estimated and therefore qualified with a "J". The following table presents the analytes which were outside of established recovery criteria:

MATRIX SPIKE SAMPLE	MATRIX	ANALYTE	% RECOVERY	AFFECTED SAMPLES
SS-9	soil	Antimony Cadmium Manganese	61.5 65 68	SS1-SS9, TP1-TP11
SS-10	soil	Antimony Manganese Mercury Selenium	45.3 320 126 65.2	SS10-SS14, SS16, SS18, B1-B4, B8, BKGD
SS-15	soil	Antimony Cadmium	51.4 14.8	SS15, SS17, SS19-SS20, B5-B7

It should be noted that all aqueous matrix spike recoveries of inorganic elements were within established criteria.

LABORATORY DUPLICATE

Laboratory duplicate analysis is an indicator of the precision of sample results and a measure of laboratory performance. During the review of laboratory duplicate analyses it was noted that the following elements were outside of the 30% relative percent difference criteria established in the guidelines.

SAMPLE	MATRIX	ELEMENT	AFFECTED SAMPLES
SS-9	soil	cadmium calcium magnesium zinc	SS1-SS9, TP1-TP11
SS-10	soil	aluminum barium calcium chromium cobalt iron lead magnesium manganese nickel zinc	SS10-SS14, SS16, SS18 B1-B4, B8, BKGD

SAMPLE	MATRIX	ELEMENT	AFFECTED SAMPLES
SS-15	soil	lead	SS15, SS17, SS19-SS20, B5-B7
MW6I	aqueous	calcium iron magnesium thallium	All groundwater samples
GRS4	sediment	chromium lead	GRS1-GRS4

According to the guidelines, positive results for elements which do not meet criteria for duplicate precision should be regarded as estimates and therefore qualified with a "J". The qualification applies to all samples analyzed within the particular sample delivery group of the same matrix type.

SUMMARY OF DATA QUALIFICATIONS

Some of the analytical results which are summarized in Table 6-2 through Table 6-12 have been qualified with a "J" or "B" in accordance with the data validation presented above. In particular, analytical results have been qualified due to non-compliance with the criteria established for the following:

sample holding time
instrument tuning and calibration
surrogate and matrix spike recovery
internal standard area
field duplicate precision
blank analysis

The laboratory conformance to NYS CLP protocol was also reviewed and it was determined that some deviations from the protocol exist. The concentrations of standards analyzed for the five-point initial calibration curves for certain volatile and semi-volatile analytical runs did not conform to those concentrations specified in the protocol. However, since the range of concentrations analyzed was identical to the range specified in the protocol, the validity and usefulness of the analytical data has not been adversely impacted by this deviation. In addition, certain continuing calibration compounds exceeded the 25% difference criteria specified in the protocol but did not exceed the 30% difference criteria established in method 8270 (USEPA SW-846). Again, the validity and usefulness of the analytical results associated with the non-compliant continuing calibration have not been severely impacted.

CONCLUSION

Based on the above assessment, the analytical data generated for the Rochester Fire Academy site is considered to be valid and useful for the purpose of conducting the RI/FS. It is recommended that the analytical data generated for the Rochester Fire Academy site be accepted with the specific qualifications noted herein.

APPENDIX F.2

SECOND ROUND DATA VALIDATION

MALCOLM PIRNIE

INTRODUCTION

The following sections detail an assessment and validation of analytical results reported for ten (10) aqueous investigative samples which were collected at the Rochester Fire Academy Site. All aqueous samples were collected by Malcolm Pirnie, Inc. and General Testing Corporation (GTC) personnel during the period of November 15-16, 1990 and analyzed by GTC.

This data validation is based upon information obtained from completed laboratory data sheets, document control forms, blank data, duplicate data, and recovery data for both matrix and surrogate spikes. The USEPA "Functional Guidelines for Evaluating Organic Analyses" (February 1988), hereinafter referred to as "guidelines," were used for the validation. In addition, the New York State Department of Environmental Conservation Contract Laboratory Protocol, (NYSDEC CLP), November 1987, was used to evaluate laboratory compliance with the specific analytical protocol, reporting and deliverable requirements.

ORGANIC ANALYSES

The following sections present the findings of the validation of analytical results for all samples analyzed for volatile organic compounds (Method 8240), semi-volatile organic compounds (Method 8270) and polychlorinated biphenyls (PCBs) (Method 8080).

SAMPLE HOLDING TIMES

According to the NYSDEC CLP, the following maximum holding times are recommended for the specified analyses:

Aqueous Samples

• Volatile organic compounds	Analyze within 7 days from verified time of sample receipt (VTSR).
• Semi-volatile organic compounds and PCBs	Extract within 5 days from VTSR and analyze within 40 days of VTSR.

In comparing the dates of analyses and/or extraction for each sample with the dates of sample receipt (from the chain-of-custody documentation), it is noted that all samples were analyzed/extracted within recommended holding times. Therefore, no qualification of the data due to holding time exceedance is necessary.

GC/MS TUNING

Conformance with tuning and performance criteria for the GC/MS is determined using standard materials [i.e., bromofluorobenzene (BFB) for volatile organic analyses and decafluorotriphenylphophine (DFTPP)] for semi-volatile organic analyses. A review of the BFB and DFTPP tuning and performance results indicates that all criteria were met. Therefore, no qualification of the data based upon tuning of the GC/MS is necessary.

INSTRUMENT CALIBRATION

Calibration requirements for volatile organic analyses (Method 8240) utilizing 1987 NYSDEC CLP include the analysis of five (5) calibration standards, each containing all of the analytes of interest. The concentrations of the calibration standards are required to be 20 ppb, 50 ppb, 100 ppb, 150 ppb, and 200 ppb. Inspection of the calibration curves and re-calculation of standard concentrations used for the volatile organic calibration determined that all standards were run at the required concentration levels. In addition, to determine whether the five point initial calibration curve is linear, the 1987 NYSDEC CLP requires that the percent relative standard deviation (%RSD) must not vary by greater than 30% when comparing calibration factors for calibration check compounds (CCCs) and that the relative response factors (RRFs) for system performance check compounds (SPCCs) must be greater than 0.30 (>0.25 for bromoform). It is noted that all initial calibration data met these criteria.

Continuing calibration criteria, which includes the analysis of a calibration standard every twelve (12) hours during a volatile organic analytical run, requires that the percent difference (%D) in response factors for each CCC be less than 25%. In addition, the minimum RRF criteria stated above must also be met. Review of all volatile organic continuing calibration data indicated that all CCC and SPCC criteria were met. However, the following non-CCC and non-SPCC compounds exhibited less than satisfactory response:

Date	Compound	% D
11/20/90, 11/21/90	acetone	32.9, 156
11/20/90, 11/21/90	2-butanone	30.3, 138
11/20/90, 11/21/90	4-methyl-2-pentanone (MEK)	54.1, 154
11/20/90, 11/21/90	2-hexanone	50.9, 197
11/20/90, 11/21/90	bromoform	26.9, 43.6
11/20/90, 11/21/90	1,1,2,2-tetrachloroethane	27.6, 38.0
11/21/90	1,1,2,-trichloroethane	35.8
11/21/90	ortho-xylene	66.2
11/21/90	styrene	69.3

The 1987 NYSDEC CLP does not require corrective action for non-CCC and non-SPCC compounds which are outside of criteria. However, according to the federal validation guidelines, any positive results for these compounds in samples associated with the particular calibration shall be estimated. Therefore, the positive results for acetone and MEK detected in samples MW-7I and MW-15S have been qualified with a "J".

For semi-volatile analysis (Method 8270), the initial calibration standard concentration requirements are similar to the requirements for volatile organic analyses. An evaluation of the semi-volatile calibration standards indicates that all standards were run at concentrations of 20 ppb, 50 ppb, 80 ppb, 120 ppb and 160 ppb. The average response factor (RF) and the %RSD was calculated for each compound contained in the calibration standards. According to 1987 NYSDEC CLP, the %RSD for each individual Calibration Check Compound (CCC) must be less than 30%, and the minimum acceptable average RF for System Performance Check Compounds (SPCCs) is 0.050. A review of the initial calibration data for the semi-volatile analyses indicates that all CCC and SPCC criteria were met. However, the following compound exhibited less than satisfactory response:

Date	Compound	Criteria Out
12/05/90	Benzidine	$\overline{RF}$ = 0.01224

As stated previously, the 1987 NYSDEC CLP does not require corrective action for non-CCC and non-SPCC compounds which are outside of criteria.
Benzidine is not an SPCC and, therefore, the initial calibration is still valid according to NYSDEC CLP.

Continuing calibration standards for semi-volatiles are analyzed every 12 hours to check the continued validity of the initial calibration. According to the NYSDEC each SPCC must meet the 0.05 average RF criteria and each CCC must meet the 25%D criteria. A review of the continuing calibration data for the semi-volatile analyses determined that none of the SPCCs or CCCs were outside of criteria. It is noted, however, that the %D exceeded 25% for the following non-CCC compounds at various times throughout the analyses:

Compound	% D
hexachlorocyclopentadiene	27.5, 40.2, 57.8
2,4-dinitrophenol	25.6, 26.0,
bis(2-chloroisopropyl)ether	29.9
nitrobenzene	25.6
2,4,6-tribromophenol	25.4
aniline	52.4
benzyl alcohol	27.3
benzoic acid	32.9
4-chloroaniline	58.3
4-nitrophenol	74.1
benzo(g,h,i)perylene	25.2

Again, the 1987 NYSDEC CLP does not address corrective action necessary for these compounds. In addition, these compounds were not detected in any of the samples. Therefore, no qualification of the data is necessary.

A review of the pesticide/PCB calibration data indicated that all compounds met the 10% RSD criteria on the quantitation column (capillary), a mid-level standard (Evaluation B) had been analyzed after every five (5) samples, and an individual standard mix was analyzed at the conclusion of each sequence as required by the 1987 NYSDEC CLP. In addition, the retention time shift for dibutylchlorendate (DBC), and the percent breakdown for 4,4'-DDT and endrin met all criteria as specified in the 1987 NYSDEC CLP.

INTERNAL STANDARDS

Internal standard performance criteria were evaluated to ensure that the GC/MS response and sensitivity remained stable throughout the analyses of the volatile and semi-volatile compounds. The internal standard areas, extracted ion current profiles (EICPs), and retention times, as documented on Form VIII and included in the CLP data package, demonstrates that satisfactory response was exhibited and sensitivity was maintained throughout the analyses.

BLANK ANALYSES

Laboratory method blanks, equipment blanks and trip blanks were analyzed with each batch of samples extracted/analyzed to determine the existence and/or extent of contamination which may have potentially been introduced during preparation of sample containers, sample collection and/or analysis. The following compounds were detected in the blanks:

Date	Blank	Compound	Matrix	Concentration
11/19/90	EB1115	di-n-butylphthalate	aqueous	0.4 μg/L
11/19/90	SBLK02	di-n-butylphthalate	aqueous	0.6 μg/L
11/20/90	VBLK01	methylene chloride	aqueous	2 μg/L
11/21/90	VBLK02	methylene chloride	aqueous	2 μg/L
11/22/90	TB1115	chloroform	aqueous	2 μg/L
11/22/90	TB1116	methyl chloride	aqueous	2 μg/L

The 1987 NYSDEC CLP requires that method blanks contain no more than five (5) times the quantitation limit for common solvents and phthalate esters. The concentration of the compounds listed above are below these limits and therefore, are compliant with the CLP criteria. For validation purposes, and in accordance with the federal guidelines, positive results for these compounds reported at a concentration of less than ten (10) times the associated blank contamination value (five (5) times for less common contaminants), were qualified as not detected (ND) and the method detection limit set equal to the value detected in the sample. This estimated detection limit was then qualified with a "B." The blank evaluation criteria applies to any blank associated with the samples. When more than one blank was associated with a given sample, qualification was based on a comparison with the associated blank having the highest concentration of a contaminant.

SURROGATE SPIKE RECOVERY

To evaluate laboratory performance in terms of accuracy, all samples submitted for volatile organic, semi-volatile organic, and PCB analyses, as well as all blanks, standards and matrix spikes, were spiked with surrogate compounds prior to sample preparation. The following samples exhibited surrogate recoveries which did not meet criteria specified in the NYSDEC CLP:

Sample	Surrogate Compound	% REC	% REC Limits
SEMI-VOLATILES:			
MW-7I	2-fluorobiphenyl	42	43-116
MW-15S	phenol-d_6	0	10-94
	2,4,6-tribromophenol	0	10-123
	2-fluorophenol	0	21-100
MW-15SRe	phenol-d_6	0	10-94
	2,4,6-tribromophenol	0	10-123
	2-fluorophenol	0	21-100
PEST/PCB:			
MW-6I	dibutylchlorendate	0	24-154
MW-7S	dibutylchlorendate	22	24-154
MW-7I	dibutylchlorendate	302	24-154
MW-8S	dibutylchlorendate	221	24-154
MW-8I	dibutylchlorendate	243	24-154
MW-8IMSD	dibutylchlorendate	219	24-154
MW-11S	dibutylchlorendate	178	24-154
MW-11I	dibutylchlorendate	184	24-154
MW-12I	dibutylchlorendate	0	24-154
MW-12S	dibutylchlorendate	160	24-154

According to the guidelines, if any two surrogates within either the acid fraction or base neutral fraction, or if any one surrogate in the volatile fraction are out of specification, or if any one surrogate recovery is less than 10%, all positive results for the noncompliant fraction of the sample must be estimated and qualified with a "J." Since no acid extractable compounds were detected in sample MW-15S, the detection limit should be estimated. The data-user is cautioned that acid extractable compounds may or may not be present at the particular detection limit in sample MW-15S.

As noted in the above table, DBC recovery was outside of advisory limits in most samples. According to NYSDEC CLP, these limits are advisory and are not used to determine if a sample should be reanalyzed. Inspection of the chromatograms indicated that the DBC peak was "over-integrated" in most of the samples listed above, and was not integrated for samples MW-6I and MW-12I, due to matrix interference. However, it is noted that the recoveries of the secondary surrogate, tetrachlorometaxylene (TCMX) was within advisory limits for all samples. No qualification of the PCB results is necessary since the detection of PCB has not been impacted by this interference.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ANALYSES

MS/MSD data are generated to determine the effect of the sample matrix on precision and accuracy of the analytical method. Matrix spike recoveries (REC) must be within advisory limits established in the methodology. The relative percent difference (RPD) between the MS and the MSD must also be within the advisory limits established in the methodology. The following matrix spike/matrix spike duplicate sample results were outside of the advisory limits:

MS/MSD Sample	Analyte	Criteria Out	QC Limits
MW-8IMS	acenaphthene	44% REC	46-118%
	endrin	144% REC	56-121%
MW-8IMSD	endrin	44% RPD	21%
SBLK02 MS	acenaphthene	44% REC	46-118%
PBLK01 MS	endrin	136% REC	56-121%

The MS/MSD data cannot be used alone to evaluate the precision and accuracy of individual samples. In general, no action is taken on MS/MSD data to qualify an entire case. Qualification is limited to the unspiked sample associated with the MS/MSD. However, these compounds were not detected in sample MW-8I and, consequently, no qualification to the analytical results is necessary.

FIELD DUPLICATE

As a further means to assess overall precision (both laboratory and field precision), a "blind" duplicate sample was collected from MW-7I and analyzed for all parameters which the investigative samples were analyzed. This sample was labeled "FD". In general, there was good agreement between the results of samples FD and MW-7I indicating acceptable overall precision.

SUMMARY OF DATA QUALIFICATIONS

Some of the analytical results which are summarized on the following tables have been qualified with a "J" or "B" in accordance with the data validation presented above. In particular the detection limits for acid extractable compounds in sample MW-15S have been qualified due to poor surrogate recoveries. However, most matrix spike recoveries, internal standard areas, and retention times were within acceptable criteria set forth in the 1987 NYSDEC CLP. In addition, acceptable accuracy and precision in terms of 1987 NYSDEC CLP was demonstrated throughout the analyses as well as acceptable performance of both the GC/MS and GC systems. Calibration and tuning of the instruments were performed within criteria and were well-documented.

Laboratory compliance with specific reporting and deliverable requirements contained in the 1987 NYSDEC CLP was carefully scrutinized and found to be compliant with these requirements. All procedures, including the establishment of retention time windows, the analysis of QC reference check samples, and confirmation analyses performed on dissimilar columns, were conducted in accordance with the 1987 NYSDEC CLP. In addition, all reported quantitation limits met the contract required quantitation limits (CRQLs) set forth in the 1987 NYSDEC CLP.

In addition, the analytical results of the supplemental third round of ground water sampling generally correlate very well with the analytical results generated for the second round of ground water sampling.

MALCOLM PIRNIE

CONCLUSION

Based on the above assessment, the analytical data generated for the supplemental third round of sampling at the Rochester Fire Academy Site is considered to be valid and useful for the purpose of conducting the RI/FS. It is recommended that the analytical data be accepted with the specific qualifications noted herein.

APPENDIX F.3

THIRD ROUND DATA VALIDATION

INTRODUCTION

The following sections detail an assessment and validation of analytical results reported for twenty-one (21) aqueous and four (4) sediment investigative samples which were collected at the Rochester Fire Academy Site. All aqueous samples were collected by Malcolm Pirnie, Inc. personnel during the period of August 27-30, 1990. The sediment samples were collected on September 6, 1990.

This data validation is based upon information obtained from completed laboratory data sheets, document control forms, blank data, duplicate data, and recovery data for both matrix and surrogate spikes. The USEPA "Functional Guidelines for Evaluating Organic Analyses" (February 1988) and "Functional Guidelines for Evaluating Inorganic Analyses (June 1988), hereinafter referred to as "guidelines," were used for the validation. In addition, USEPA SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," Third Edition, September 1986, was used to evaluate laboratory compliance with the specific analytical protocol, reporting and deliverable requirements.

ORGANIC ANALYSES

The following sections detail the validation of analytical results for all samples analyzed for volatile organic compounds (Methods 8010, 8020), acid-extractable compounds (Method 8270) and polychlorinated biphenyls (PCBs) (Method 8080).

SAMPLE HOLDING TIMES

According to the federal guidelines and SW-846, the following maximum holding times are recommended for the specified analyses:

<u>Aqueous Samples</u>

• Volatile organic compounds	Analyze within 7 days from date of collection
• Semi-volatile organic compounds	Extract within 7 days of collection and analyze within 40 days of extraction.
• PCBs	

Soil/Sediment Samples

- Volatile organic compounds — Analyze within 14 days from date of collection
- Semi-volatile organic compounds — Extract within 7 days of collection and analyze within 40 days of extraction.
- PCBs

In comparing the dates of analyses and/or extraction for each sample with the dates of sample collection (from the chain-of-custody documentation), it is noted that all samples were analyzed/extracted within recommended holding times. Therefore, no qualification of the data due to holding time exceedance is necessary.

GC/MS TUNING

Conformance with tuning and performance criteria for the GC/MS is determined using standard materials (i.e., bromofluorobenzene (BFB) for volatile organic analyses and decafluorotriphenylphophine (DFTPP) for semi-volatile organic analyses. Since the GC/MS was utilized only for the analysis of acid-extractable compounds (Method 8270: semi-volatile organics), only the DFTPP performance results were required. A review of the DFTPP tuning and performance results indicates that all criteria were met. Therefore, no qualification of the data due to improper tuning of the GC/MS is necessary.

INSTRUMENT CALIBRATION

Calibration requirements for volatile organic analyses utilizing Methods 8010 and 8020 include the analysis of five (5) calibration standards, each containing all of the analytes of interest. One of the concentration levels should be at a level near, but above, the method detection limit, and the remaining concentration levels should correspond to the expected range of concentrations detected in the investigative samples. Inspection of the calibration curves associated with the volatile organic analyses determined that all analytes of interest were run at concentration levels of approximately 5 ppb, 20 ppb, 50 ppb, 100 ppb and 200 ppb. In addition, to determine whether the five point initial calibration curve is linear, Methods 8010 and 8020 require that the percent relative standard deviation (%RSD) should not vary by greater than 20% when comparing calibration factors. It is noted that all initial calibration data met this criteria.

Continuing calibration criteria, which includes the analysis of a calibration standard each day that volatiles are analyzed, requires that the percent difference (%D) in response factors for each analyte must be less than 15%. Review of all volatile organic continuing calibration data indicated that the following compounds did not meet this criteria:

Date	Compound	% D
08/30/90	chloromethane	86.5%
	bromoform	17.2%
	1,3-dichlorobenzene	17.3%
	1,4-dichlorobenzene	17.8%
08/31/90	chloromethane	34.8%
09/05/90	chlorobenzene	15.8%
09/14/90	1,2-dichloroethane	17.9%

According to the guidelines, any positive results for these compounds in samples associated with the particular calibration, shall be estimated and qualified with a "J." However, none of the noncompliant compounds were detected in the samples associated with the noncompliant calibration run. Consequently, no qualification of the data is necessary.

For semi-volatile analysis (Method 8270), the initial calibration standard concentration requirements are similar to the requirements for volatile organic analyses. An evaluation of the semi-volatile calibration standards indicates that all analytes of interest (phenols) were run at concentrations of approximately 20 ppb, 50 ppb, 80 ppb, 120 ppb and 160 ppb. The average response factor (RF) and the %RSD was calculated for each compound contained in the calibration standards. According to Method 8270, the %RSD for each compound <u>should</u> be less than 30% and the %RSD for each individual Calibration Check Compound (CCC) <u>must</u> be less than 30%. In addition, the minimum acceptable average RF for System Performance Check Compounds (SPCCs) is 0.050. A review of the initial calibration data for the semi-volatile (acid extractable) analyses indicates that the following compound was outside of criteria:

Date	Compound	Criteria Out
09/13/90	2,4-dinitrophenol	32.3% RSD

2,4-dinitrophenol is not a CCC and, therefore, the initial calibration is still valid according to Method 8270. However, all positive results for 2,4-dinitrophenol are estimated as this exceedance indicates less than satisfactory performance in the quantification of this compound. (It is noted that 2,4-dinitrophenol is an SPCC which met specific SPCC criteria).

Continuing calibration standards for semi-volatiles are analyzed every 12 hours to verify the validity of the initial calibration. According to the methodology each SPCC must meet the 0.05 average RF criteria and each CCC must meet the 30% D criteria. A review of the continuing calibration data for the acid-extractable analyses determined that none of the SPCCs or CCCs were outside of criteria. It is noted, however, that the %D exceeded 30% for the following non-CCC compounds at various times throughout the analyses:

Compound	% D
2,4-dinitrophenol	36.6, 43.5, 40.6
2,4,6-tribromophenol (Surr.)	44.1

However, no positive results for 2,4-dinitrophenol were detected in any of the samples, and 2,4,6-tribromophenol is a surrogate compound. Therefore, no qualification of the data is necessary.

A review of the pesticide/PCB calibration data indicated that all compounds met the %RSD criteria on the quantitation column, a mid-level standard had been analyzed after every ten (10) samples, and a standard was analyzed at the conclusion of each sequence as required by the analytical methodology (Method 8080). In addition, the retention time shift for dibutylchlorendate (DBC), and the percent breakdown for 4,4'-DDT and endrin met all criteria as specified in Method 8080.

INTERNAL STANDARDS

Internal standard performance criteria were evaluated to ensure that the GC/MS response and sensitivity remained stable throughout the analyses of the acid extractable compounds (Method 8270). The following samples exhibited internal standard areas which fell outside of criteria:

Date	Sample	Internal Standard	Area	Acceptable Range
09/20/90	MW-14S	1,4-dichlorobenzene - d_4 naphthalene - d_8 acenaphthene - d_{10}	8538 8531 11574	11197-44788 23104-92416 14098-56392

According to the guidelines, any positive acid extractable results are to be estimated in sample MW-14S, as these compounds are quantitated using the noncompliant internal standards. In addition, "nondetects" are to be estimated since the low internal standard areas impart a potentially low bias on the quantitation of these compounds. Therefore, it is questionable as to whether the acid extractable compounds are present/absent at the stated limits of detection. Since no positive results for acid extractable compounds were reported in sample MW-14S, the detection limits for these compounds in sample MW-14S are therefore qualified with a "J".

Other internal standards, perylene-d_{12} and chrysene-d_{12}, also exhibited low sensitivity; however the data is not affected as the acid extractable analytes were not quantitated using these particular internal standards.

BLANK ANALYSES

Laboratory method blanks, equipment blanks and trip blanks were analyzed with each batch of samples analyzed/extracted to determine the existence and/or extent of contamination which may have potentially been introduced during preparation of sample containers, sample collection and/or analysis. The following compounds were detected in the blanks:

Date	Blank	Compound	Matrix	Concentration
08/30/90	VBLK01	methylene chloride	aqueous	2 μg/L
08/31/90	VBLK02	methylene chloride	"	1 μg/L
09/04/90	VBLK03	methylene chloride	"	1 μg/L
09/05/90	VBLK04	methylene chloride	"	1 μg/L
08/31/90	TB-1	methylene chloride	"	1 μg/L
09/05/90	TB-08/28/90	methylene chloride	"	2 μg/L
09/05/90	TB-08/30/90	methylene chloride	"	1 μg/L
09/05/90	EQBLK	methylene chloride	"	2 μg/L
09/10/90	EQBLK	chloroform	"	2 μg/L
09/13/90	VBLK01	methylene chloride	soil	4 μg/L
	TB-09/06/90	methylene chloride	aqueous	1 μg/L

In accordance with the guidelines, positive results for these compounds reported at a concentration of less than ten (10) times the associated blank contamination value (five (5) times for less common contaminants), were qualified as not detected (ND) and the method detection limit set equal to the value detected in the sample. This estimated detection limit was then qualified with a "B." The blank evaluation criteria applies to any blank associated with the samples. When more than one blank was associated with a given sample, qualification was based on a comparison with the associated blank having the highest concentration of a contaminant.

SURROGATE SPIKE RECOVERY

To evaluate laboratory performance in terms of accuracy, all samples submitted for volatile organic, acid-extractable, and PCB analyses, as well as all blanks, standards and matrix spikes, were spiked with surrogate compounds prior to sample preparation. The following samples exhibited surrogate recoveries which did not meet criteria specified in the analytical methodology:

Sample	Surrogate Compound	% REC	% REC Limits
SEMI-VOLATILES:			
SBLK04	2,4,6-tribromophenol	16	19-122
SBLKMS1	2,4,6-tribromophenol	129	10-123
MW7S	2,4,6-tribromophenol	221	10-123
	2-fluorobiphenyl	8	21-100
MW7SRE	2,4,6-tribromophenol	154	10-123
	2-fluorophenol	15	21-100
MW-14S	phenol-d_6	diluted	
	2,4,6-tribromophenol	diluted	
	2-fluorophenol	diluted	
MW-14S prod	phenol-d_6	diluted	
	2,4,6-tribromophenol	diluted	
	2-fluorophenol	diluted	
PEST/PCB:			
MW7S	2,4,5,6-tetrachloro-meta xylene	124	27-119
MW14S	dibutylchlorendate	480	24-154
MW14S prod	dibutylchlorendate	280	24-154

According to the guidelines, if any two surrogates within the acid fraction, or if any one surrogate in the volatile fraction are out of specification, or if any one surrogate recovery is less than 10%, all positive results for the noncompliant fraction of the same matrix must be estimated and qualified with a "J." Therefore, positive results for the acid extractables in samples MW-7S and MW14S are qualified with a "J." It is noted that no qualification of the PCB results for samples MW-7S and MW-14S is necessary as only one of two surrogate spikes exceeded criteria.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ANALYSES

MS/MSD data are generated to determine the effect of the sample matrix on precision and accuracy of the analytical method. Matrix spike recoveries (REC) must be within advisory limits established in the methodology. The relative percent difference (RPD) between the MS and the MSD must also be within the advisory limits established in the methodology. The following matrix spike/matrix spike duplicate sample results were outside of the advisory limits:

MS/MSD Sample	Analyte	Criteria Out	QC Limits
GRS-1	phenol	23% REC	26-90%
	2-chlorophenol	19% REC	25-102%
	4-chloro-3-methylphenol	20% REC	26-103%
	4-chloro-3-methylphenol	51% RPD	33%
	4-nitrophenol	6% REC	11-114%
	4-nitrophenol	104% RPD	50%
	pentachlorophenol	5% REC	17-109%
	pentachlorophenol	147% RPD	47%

The MS/MSD data cannot be used alone to evaluate the precision and accuracy of individual samples. In general, no action is taken on MS/MSD data to qualify an entire case. Qualification is limited to the unspiked sample associated with the MS/MSD. Therefore, any positive results for the acid-extractable compounds detected in the unspiked sample, GRS-1, are estimated and qualified with a "J."

INORGANIC ANALYSES

The following sections detail an evaluation of results for all samples analyzed for the inorganic elements: arsenic, cadmium, iron, lead, manganese and mercury. All inorganic analyses were performed by Energy and Environmental Engineering, Inc. in Somerville, Massachusetts.

HOLDING TIMES

The following holding time requirements for inorganic elements have been established under 40 CFR Part 136:

metals: 6 months; preserved at pH <2

mercury: 28 days; preserved at pH <2

In addition, holding times for water matrices shall be applied to soil matrices.

By comparing the actual dates of sample collection to the dates of analyses, it is noted that all samples were analyzed prior to expiration of the established holding times. In addition, all aqueous samples were properly preserved. Consequently, no qualification of the data based on holding time exceedance is required.

CALIBRATION

Initial calibration and continuing calibration data were reviewed to assess instrument performance and to verify the validity of the initial calibration. In assessing the calibration data for all inorganic analyses, it is noted that the proper number of calibration standards were analyzed at the beginning of each run and at the appropriate frequency throughout the analytical run. For all ICP analyses, standards were also analyzed at two(2) times the CRDL, as required.

In addition, an EPA certified standard was used for calibration verification. Recoveries for each analyte in the EPA verification standard were within established criteria. Therefore, no qualification of the data due to calibration problems is necessary.

BLANKS

As previously stated, the results of blank analyses are used to determine the existence and magnitude of contamination which may potentially be introduced during preparation of sample containers, sample collection, and/or sample analysis. The following compounds were detected in the blanks:

Blank	Element	Concentration
Initial Calibration Blank (ICB)	aluminum	144 μg/L
Prep. blk	sodium	169 μg/L
TB-08/29/90	manganese	3.30 μg/L

According to the guidelines, blank evaluation criteria apply to any blank associated with the samples. When more than one blank is associated with a given sample, qualification is based on a comparison with the associated blank having the highest concentration of a contaminant.

Positive results for compounds reported in the samples at a concentration of less than five (5) times the associated blank contamination value, must be qualified as not detected (ND) and the method detection limit set equal to the value detected in the sample. The detection limit is then qualified with a "B."

Since manganese is the only above-mentioned analyte which pertains to this investigation, any positive results for manganese at concentrations of 16.5 μg/L or less are qualified with a "B."

MATRIX SPIKE

The analysis of an inorganic matrix spike sample provides the data user with information regarding sample matrix effects on the digestion procedure and analytical methodology. According to the guidelines, matrix spike recoveries for inorganic elements must be within the 75% to 125% recovery "window." Any positive sample results for analytes which are detected outside of this established window should be estimated and therefore qualified with a "J." A review of the inorganic matrix spike results utilizing ICP, AA, and Hg cold vapor techniques indicates that satisfactory accuracy was obtained for all analyses. Therefore, no qualification of the data is necessary.

LABORATORY DUPLICATE

Laboratory duplicate analysis is an indicator of the precision of sample results and a measure of laboratory performance. During the review of laboratory duplicate analyses it was noted that lead results were outside of the 20% RPD criteria established in the guidelines for aqueous samples. Therefore, any positive results for lead in the aqueous samples are estimated and qualified with a "J."

SUMMARY OF DATA QUALIFICATIONS

Some of the analytical results which are summarized on the following tables have been qualified with a "J" or "B" in accordance with the data validation presented above. In particular, some of the organic analytical results (primarily acid extractables) have been qualified due to noncompliance with criteria established for continuing calibration data, matrix spike recoveries and internal standard areas. Inorganic analytical results have been qualified due to exceedance of relative percent difference criteria for duplicate analyses, and both organic and inorganic data have been qualified due to blank contaminants.

Laboratory compliance with specific methodology contained in SW-846, third edition, was carefully scrutinized. All procedures, including the establishment of daily retention time windows, the analysis of QC reference check samples, and confirmation analyses performed on dissimilar columns, were conducted in accordance with the specific methodology.

Although "cross-outs" and typing errors were noted in the organic data package, no data has been impacted.

CONCLUSION

Based on the above assessment, the analytical data generated for the second round of sampling at the Rochester Fire Academy Site is considered to be valid and useful for the purpose of conducting the RI/FS. It is recommended that the analytical data be accepted with the specific qualifications noted herein.

APPENDIX G

CONTAMINANT LOADING CALCULATIONS

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY RHO DATE 3-12-91 SHEET NO. 1 OF 3

CHKD. BY .... DATE .... JOB NO. 0965-04-1

SUBJECT GROUND WATER LOADING VIA UPPER BEDRK

BEDROCK AQUIFER - AVERAGE CONCENTRATIONS

NORTH DISPOSAL AREA - MW-11I and MW-16I

PARAMETER	NO. OF ANALYSES	AVERAGE (mg/L)
TOTAL VOCs	5	.028
Total Semi-VOCs	5	.001
TOTAL PCBs	5	0
TOTAL Fe, Mn	4	4.7
Total Trace Metals	2	0.14

TRAINING GROUNDS AREA - MW-8I, MW-12I

TOTAL VOCs	6	1.73
TOTAL Semi-VOCs	6	0.004
Total PCBs	6	0
TOTAL Fe, Mn	6	3.4
TOTAL Trace Metals	2	.14

SOUTH DISPOSAL AREA - MW-7I

TOTAL VOCs	3	7.0
TOTAL Semi-VOCs	3	0.012
TOTAL PCBs	3	0.001
TOTAL Fe, Mn	2	0.35
TOTAL Trace Metals	1	0

BEDROCK AQUIFER : GROUNDWATER DISCHARGE

$Q = KiA$

K = Mean hydraulic conductivity of bedrock wells in the Area - from Table 5-10

i = Hydraulic Gradient from Table 5-10

A = Saturated Thickness x Width of Area
use 10 feet as the thickness of the monitored intervals - Contaminant concentrations are substantially lower in the 10-20 foot interval of rock

Parameter	NORTH DISPOSAL AREA	TRAINING GROUNDS AREA	SOUTH DISPOSAL AREA
K cm/sec	1.9×10^{-2}	1.9×10^{-2}	2.8×10^{-2}
i ft/ft	0.004	0.006	0.003
A ft^2	2000	7400	2000
Q ft^3/day	431	2392	476

	AREA WIDTH (ft)
NORTH DISPOSAL AREA	200
TRAINING GROUNDS AREA	740
SOUTH DISPOSAL AREA	200

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY RHO DATE 3-12-91 SHEET NO. 3 OF 3

CHKD. BY ...... DATE ...... JOB NO. 0965-04-1

SUBJECT ......

LOADING CALCULATIONS

PARAMETER	CONCENTR. x	DISCHARGE x	CONVERSION	= LOADING
	mg/L x	ft³/day x	L/ft³ x Kg/mg x day/yr =	Kg/yr
NORTH DISPOSAL AREA				
TVOCs	0.028 x	431 x	28.3 x 10^{-6} x 365 =	0.12
Semi-VOCs	0.001 x	(4,452)	=	0.004
TOTAL PCBs	0		=	0
TOTAL Fe Mn	4.7		=	21
TOTAL TRACE METALS	0.14		=	0.62
TRAINING GROUNDS AREA				
TVOCs	1.73 x	2392 x	28.3 x 10^{-6} x 365 =	43.
Semi VOCs	0.004 x	(24,708)	=	0.10
Total PCBs	0		=	0
Total Fe Mn	3.4		=	84
TOTAL TRACE METALS	0.14		=	3.5
SOUTH DISPOSAL AREA				
TVOCs	7.0 x	476 x	28.3 x 10^{-6} x 365 =	34
Semi-VOCs	0.012 x	(4,917)	=	0.06
TOTAL PCBs	0.001		=	0.005
TOTAL Fe Mn	0.35		=	1.72
TOTAL TRACE METALS	0		=	0

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY RHO DATE 3-12-91 SHEET NO. 1 OF 4

CHKD. BY ...... DATE ...... JOB NO. 0965-04-1

SUBJECT GROUND WATER LOADING TO THE GENESEE RIVER VIA OVERBURDEN

SITE IS DIVIDED INTO 3 AREAS. GROUND WATER LOADING IS CALCULATED SEPARATELY FOR EACH AREA.

ASSUMPTIONS:

1. PRIMARY CONTRIBUTION OF CONTAMINANTS TO RIVER IS THROUGH THE OVERBURDEN WATER BEARING ZONE.

2. MAY 1990 WATER LEVELS REPRESENT AN AVERAGE OR STEADY STATE CONDITION

3. USE GROUND WATER DISCHARGE IN CUBIC FT/DAY AVERAGED ANNUALLY AS PRESENTED IN SECTION 6.1.2.

4. USE CONTAMINANT CONCENTRATIONS AVERAGED FROM OVERBURDEN WELLS ALONG THE RIVER IN EACH AREA

AVERAGE CONCENTRATIONS

NORTH DISPOSAL AREA: AVERAGE RESULTS FROM MW-11S

PARAMETER	NUMBER OF ANALYSES	AVERAGE (mg/L)
TOTAL VOCs	3	0
TOTAL SEMI-VOCs	3	0.013
TOTAL PCBs	3	0
TOTAL Fe + Mn	2	17.2
TOTAL TRACE METALS (Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, Zn, V)	1	0.167

AVERAGE CONCENTRATIONS

TRAINING GROUNDS AREA: AVERAGE RESULTS FROM MW-8S, MW-12S AND MW-15S

PARAMETER	NO. OF ANALYSES	AVERAGE (mg/L)
TOTAL VOCs	9	0.026
TOTAL SEMI-VOCs	1	0.005
TOTAL PCBs		0
TOTAL Fe and Mn	6	10.4
Total Trace Metals	3	0.081

SOUTH DISPOSAL AREA: AVERAGE RESULTS FROM MW-7S

PARAMETER	NO. OF ANALYSES	AVERAGE (mg/L)
TOTAL VOCs	3	28.7
TOTAL SEMI-VOCs	3	0.114
TOTAL PCBs	2	0.004
TOTAL Fe and Mn	2	17.8
TOTAL TRACE METALS	1	0.254

LOADING CALCULATIONS

NORTH DISPOSAL AREA

PARAMETER	CONCENTR.		DISCHARGE		CONVERSION					LOADING
	mg/L	x	ft³/day	x	L/ft³	x	Kg/mg	x	day/yr	= Kg/yr
TVOCs	0	x	207	x	28.3	x	10^{-6}	x	365	= 0
Semi-VOCs	0.013	x	(2.138)							= 0.028
TOTAL PCBs	0									= 0
Total FeMn	17.2									= 36.8
TOTAL TRACE METALS	0.167									= 0.36
UPGRADIENT, TOTAL FeMn	5.4	x	18	x	28.3	x	10^{-6}	x	365	= 1.0

TRAINING GROUNDS AREA

TVOCs	0.026	x	1,033	x	28.3	x	10^{-6}	x	365	= 0.28
Semi-VOCs	0.005	x	(10.670)							0.05
PCBs	0	x								0
FeMn	10.4	x								111
Total Trace Metals	0.081	x								0.86
UPGRADIENT FeMn	1.1	x	161	x	28.3	x	10^{-6}	x	365	= 1.8

SOUTH DISPOSAL AREA

PARAMETER	CONCEN. $\frac{mg}{L}$	×	DISCHARGE $\frac{ft^3}{Day}$	×	CONVERSION $\frac{L}{ft^3}$	×	$\frac{Kg}{mg}$	×	$\frac{Day}{yr}$	=	LOADING $\frac{Kg}{yr}$
TVOCs	28.7	x	573	x	28.3	x	10^{-6}	x	365	=	170
SEMI-VOCs	0.114	x	(5.919)							=	0.67
PCBs	0.004										0.02
Fe Mn	17.8										105
TRACE METALS	0.254										1.5
UPGRADIENT FE Mn	3.1	x	497	x	28.3	x	10^{-6}	x	365	=	16.

APPENDIX H

ENVIRONMENTAL FATE AND TRANSPORT

ENVIRONMENTAL FATE AND TRANSPORT

Arsenic

Arsenic is widely distributed in the environment, and all humans are exposed to low levels via air, water and food. Typical "background" exposure levels range from 20 to 70 μg/day, with most of it coming from food. Higher levels of exposure that may lead to significant human health consequences are most often associated with drinking water contaminated from natural mineral deposits, pesticide use, or improper disposal of arsenic chemicals. The amount of arsenic capable of causing harmful effects depends on its chemical form. In general, organic forms of arsenic are less toxic than inorganic forms. Marine plants, crustaceans, and some fish ("fish arsenic") often contain naturally high concentrations of arsenic, but this is in an organic form which has very low toxicity, and is not dangerous. Arsenic found in air and water is mostly inorganic. It is this form that is of principal health concern. Despite all the adverse health effects associated with arsenic exposure, there is some evidence that low levels of exposure may be beneficial to good health, as indicated by various laboratory animal studies.

Barium

Barium is extremely reactive, decomposes in water, and readily forms insoluble carbonate and sulfate salts. Barium is generally present in solution in surface or ground water only in trace amounts. Large amounts will not dissolve because natural waters usually contain sulfate, and the solubility of barium sulfate is generally low. Barium is not soluble at more than a few parts per million in water that contains sulfate. However, barium sulfate may become considerably more soluble in the presence of chloride and other anions. Atmospheric transport of barium, in the form of particulates, can occur. Bioaccumulation is not an important process for barium.

Since the transport and fate of barium depends, in part, on the presence of other materials such as sulfates and chloride, it is difficult to determine how this compound will migrate and how persistent it will be in the environment surrounding the site. Barium is not known to bioaccumulate to any significant degree.

Benzene

In the atmosphere, benzene is degraded by reaction with photochemically-produced hydroxyl radicals, limiting its residence time to only a few days (ATSDR, 1989b). Wet deposition is also a means by which it is removed from the atmosphere. Benzene is quite soluble in water, having a water solubility of 1,000 mg/l, and highly volatile, having a vapor pressure of 95 mm Hg under standard conditions. It volatilizes from soils and surface waters. Benzene has an estimated soil sorption coefficient (K_{oc}) of 60 to 83, indicating that it is mobile in soil. Benzene is subject to aerobic biodegradation in soils and surface waters, and may also be degraded anaerobically, but at a slower rate.

Beryllium

In soil and sediment, beryllium will probably be retained in an insoluble form and be generally immobile. Beryllium concentration in surface, ground and rain-water are generally well below 1,000 ng/l.

2-Butanone

This compound, also known as methyl ethyl ketone (MEK), is generally absent from the ambient air. If it is released into the soil it will partially evaporate into the atmosphere from near surface soil. MEK may degrade slowly in soil after a long acclimation period and may, therefore, leach into the groundwater. However, it will not significantly hydrolyze in soil or water under normal environmental conditions. If released into the water MEK will be lost by evaporation or be slowly biodegraded. MEK will not adsorb to sediment or bioconcentrate in aquatic organisms. If released to the atmosphere it will exist primarily as a gas. It biodegrades slowly in both fresh and salt water.

Cadmium

In surface water and ground water, cadmium is often present as the hydrated ion or as ionic complexes with other inorganic or organic compounds (ATSDR, 1989c). Insoluble complexes or cadmium adsorbed to sediments are relatively immobile. Cadmium in soil may be dissolved in soil water, or in insoluble complexes with inorganic and organic soil substituents. Compared to lead, cadmium is relatively mobile in surface water. Concentrations in ground water are generally low, due to sorption by mineral matter and clay, binding by humic substances, precipitation as cadmium sulfide, and precipitation as the carbonate at high alkalinities. Cadmium is not reduced or methylated by microorganisms.

Chromium

In surface water, most trivalent chromium precipitates in sediments (ATSDR, 1989d). Hexavalent chromium will be mainly soluble in surface waters, but will eventually be reduced to trivalent chromium by organic matter in water. Chromium does not bioaccumulate to any significant degree in aquatic organisms. Runoff and leaching may transport chromium to surface water and ground water. Flooding of soils and anaerobic decomposition of plant matter may increase the mobilization of chromium in soil resulting in the formation of chromium complexes.

1,1-Dichloroethane

1,1-Dichloroethane may be subject to long range transport in the atmosphere, before being washed out in precipitation (ATSDR, 1989e). It is oxidized by reaction with hydroxyl radicals in the atmosphere. The 1,1-isomer has higher volatility and lower aqueous solubility than the 1,2-isomer, hence physical removal (wet deposition) of 1,1-dichloroethane is less likely than removal of 1,2-dichloroethane. Its relatively high vapor pressure indicates that it volatilizes readily from surface waters and soil, before undergoing significant chemical or biological degradation. It does not sorb significantly to soils or sediments, unless the organic content is high. In the atmosphere, hydroxyl radicals oxidize 1,1-dichloroethane. 1,1-

Dichloroethane is believed to be an anaerobic biodegradation product of 1,1,1-trichloroethane in ground water. The bioconcentration potential of 1,1-dichloroethane is very low.

Di-n-Butyl Phthalate

Di-n-butyl phthalate does not evaporate easily, but small amounts do enter the air as a gas. This compound also gets into the air by attaching to dust particles. In air, di-n-butyl phthalate breaks down within a few days. It can be transferred from air to water and soil by wet or dry deposition. It does not dissolve easily in water, but can get into water by attaching to dirt particles. In water and soil, di-n-butyl phthalate is broken down by bacteria. Di-n-butyl phthalate can be taken up and bioaccumulates in a variety of aquatic organisms. Although di-n-butyl phthalate is only poorly soluble in water, it may be transported in water following formation of chemical complexes between di-n-butyl phthalate and humic substances. Adsorption onto soils and sediments appear to be a significant sink for di-n-butyl phthalate. It has been demonstrated that di-n-butyl phthalate is rapidly adsorbed from seawater onto marine sediment. The highest exposure of the general population to di-n-butyl phthalate may be from consuming fish and seafood containing it.

The presence of common organic solvents such as alcohols and ketones may increase the solubility of relatively water insoluble compounds such as di-n-butyl phthalate, thus increasing the amounts that may leach from the site into the subsoil and into the groundwater.

1,2-Dichloroethene

1,2-Dichloroethene is subject to wet deposition, however, due to its volatility, it may reenter the atmosphere by volatilization (1989e). In surface waters, the dominant removal mechanism for 1,2-dichloroethene is volatilization, with half-lives on the order of hours. 1,2-Dichloroethene does not bioconcentrate significantly in fish, with bioconcentration factors estimated at between 5 and 23. 1,2-Dichloroethene does not sorb strongly to soil, but may leach readily to ground water, particularly in sandy soils. The relatively low K_{oc} (soil adsorption coefficient) for 1,2-dichloroethene isomers (ranging from 32 to 49) and high vapor pressure indicate that volatilization is a major loss mechanism from soils. In the atmosphere, 1,2-dichloroethene is subject to removal by photochemically generated hydroxyl radicals. 1,2-dichloroethene undergoes slow reductive dechlorination under anaerobic conditions in water. Additionally, anaerobic biodegradation is believed to be the sole mechanism by which 1,2-dichloroethenes degrade in soil, and are associated with the formation of vinyl chloride as a degradation product.

Ethyl Benzene

Ethyl benzene dissolved in surface water, soil pore water or ground water will readily volatilize to the atmosphere (ATSDR, 1989h). It does not strongly sorb to soil organic carbon; in fact, the mobility of solvent spills will be enhanced by the presence of ethyl benzene in the mixture. Ethyl benzene is removed from the atmosphere by dry and wet precipitation. It does not significantly bioaccumulate. A bioconcentration factor in fish of 37.5 has been estimated. In the atmosphere, ethyl benzene reacts with photolytically-generated hydroxyl radicals, which limits its half-life to about 35 daylight hours. In surface water, ethyl benzene may be transformed by photo-oxidation and biodegradation. In soils, ethyl benzene may be transformed or degraded either by volatilization, loss to ground water, or aerobic biodegradation.

Lead

In water, lead chemistry is highly complex because lead can be present in a number of forms (ATSDR, 1990b). Lead may form compounds of low solubility with the major anions in natural water; the divalent form (Pb^{+2} is the most stable ionic species in the natural environment. Hydroxide, sulfide and carbonate may form complexes with lead, precipitating it from water. In aquatic species, lead concentrations are usually highest in benthic organisms and algae, and lowest in upper trophic level predators. Most lead in soil is retained strongly, transported to surface water bound to soils only during heavy rains. The downward leaching of lead in soil to ground water is very slow under natural conditions, unless lead is present at concentrations that exceed the sorption capacity of the soil, or there are materials in soil which are capable of forming soluble chelates with lead. A low pH favors leaching. The fate of lead in soil is determined by adsorption at mineral interfaces, precipitation, or formation of relatively stable organic-metal complexes or chelates with soil organic matter.

Manganese

Manganese is widely distributed in foods and water. It is found in every kind of plant and animal. It is present in urban air and in most water supplies. It also occurs in a great variety of minerals widely scattered over the earth and on the floor of the Pacific, Atlantic and Indian oceans. Manganese is a multi-valent element. The +2 oxidation state is the most thermodynamically stable aqueous oxidation state. Sorption of manganese is complicated by redox reactions that produce aqueous compounds of different oxidation states. Specific adsorption, ion exchange, and organic complexation all affect the retention of manganese by soil, but it is not clear which of these processes are more important (Rai, 1984).

Mercury

In soils and surface waters, mercury can exist in the mercuric (Hg^{++}) and mercurous (Hg^{+}) states as a number of complex ions with varying water solubilities. Mercuric mercury, present as complexes and chelates with ligands, is probably the predominant form of mercury present in surface waters. Mercury also forms stable complexes with organic compounds. Inorganic mercury can be methylated by micro-organisms indigenous to soils, fresh water, and salt water. Methylmercury in surface waters is rapidly accumulated by aquatic organisms. The transport and partitioning of mercury in surface waters and soils is influenced by the particular form of the compound. Volatile forms (e.g., metallic mercury and dimethylmercury) are expected to evaporate to the atmosphere, whereas solid forms partition to particulates or are transported in the water column, depending upon their solubility. However, the dominant process controlling the distribution of mercury compounds in the environment appears to be sorption of nonvolatile forms to soil and sediment particulates. The sorption process has been found to be related to the organic matter content of the soil or sediment. Inorganic mercury sorbed to particulate material is not readily desorbed; thus, fresh water and marine sediments are important repositories for inorganic forms of the compound, and leaching is a relatively insignificant transport process in soils.

Nickel

Nickel is continuously transferred between air, water and soil by natural chemical and physical processes, such as weathering, erosion, runoff, precipitation, stream/river flow, and leaching (ATSDR, 1988b). In organically rich polluted waters, organic materials will keep nickel solubilized by complexation. In water with anaerobic conditions, nickel will precipitate as nickel sulfide. Nickel is relatively immobile in soil, but it also has the potential to leach through soil to ground water. Organic complexing agents in soil restrict the mobility in soil. Bioaccumulation in fish is not significant.

Polynuclear Aromatic Hydrocarbons - Benzo[a]pyrene and Naphthalene

Polynuclear aromatic hydrocarbons (PAHs) constitute a class of compounds whose structures are based on multiple benzene rings. The compounds range in complexity from naphthalene, consisting of two benzene rings, to benzo(a)pyrene, consisting of five benzene rings. Naphthalene (CAS 91-20-3) is a product recovered from the coal gas stream. It is the lightest of the PAHs and is one of the least toxic. Benzo(a)pyrene (CAS 50-32-8) is one of the heaviest PAHs and is the most hazardous, being a carcinogen.

PAHs have low water solubilities and are relatively immobile when adsorbed to soil particles. They can be mobilized in the presence of organic solvents. Some biodegradation and bioaccumulation occurs. Various environmental fate tests suggest that PAHs are photo-oxidized and react with oxidants and oxides of sulfur. PAHs are highly soluble in adipose tissue and lipids. Most of the PAHs taken in by mammals are oxidized, therefore low bioaccumulation and the metabolites are excreted.

Benzo[a]pyrene, B[a]P, which is toxicologically active relative to other PAHs and is characterized here as representative of the class of carcinogenic PAHs. The environmental fate of B[a]P is determined, to large degree, by the chemical's low water solubility (3.8 μg/L at 20°C) and high propensity for binding to particulate or organic matter. The majority of B[a]P in aquatic systems is strongly bound to suspended particles or bed sediments. Dispersion of particle-bound B[a]P is the primary transport process within air, water, and land. B[a]P can leach through soils, but low water solubility and strong sorption to soil limit the relative importance of this intramedia transport process. B[a]P will be partitioned primarily to soil and sediment, where it is very persistent. The dominant degradation process for B[a]P in soil/sediment is bio-degradation. Bio-degradation is a slow process, with a half-life of 290 days being estimated for B[a]P in soil. Soil/particle adsorption or biotic uptake are the primary transport processes for the removal of waterborne B[a]P. Desorption into water from soil is very unlikely, and erosion of contaminated soils by surficial runoff is the most probable process for transport of soil-bound B[a]P to aquatic systems.

Polychlorinated Biphenyls (PCBs)

The environmental persistence of PCBs generally increases with the increase in the degree of chlorination of the biphenyl molecule; those which are highly chlorinated (1248, 1254 and 1260) are resistant to biodegradation (ATSDR, 1989i). In the environment, the chemical composition of original Aroclor products change over time as the individual congeners degrade and/or partition to different environmental compartments at different rates. PCBs, particularly the more chlorinated compounds, adsorb readily to sediments and suspended matter in surface water. PCBs can be sequestered for a relatively long period of time on sediment. A small fraction of PCBs may be redistributed to the water column, and eventually volatilize from the surface. Bioconcentration factors (in fish, shrimp, oysters and other aquatic species) are significantly high.

The low water solubility, high octanol-water partition coefficients (log K_{ow} ranging from 5.9 to 6.9) and strong adsorption of PCBs to soils and sediment indicate that leaching from soil is not a significant process, unless mediated by the presence of organic solvents.

PCBs in the atmosphere have been found to be predominantly in the vapor phase, with less than 15% adsorbed onto particulate, hence fugitive dust may be of less interest than volatilization from soil surfaces. PCBs are removed from the atmosphere by wet and dry deposition.

PCBs are infrequently encountered in ground water, due to their strong sorption to soils and relative insolubility in water.

Tetrachloroethene

Tetrachloroethene is removed from the atmosphere by wet deposition (ATSDR, 1989j). The relatively high vapor pressure of tetrachloroethylene indicates that it is extremely volatile. Laboratory studies have demonstrated that tetrachloroethylene volatilizes rapidly from water, with a rate dependent upon such factors as temperature, water movement and depth, associated air movement, etc. Volatilization is the dominant elimination process from surface water.

Toluene

Although a liquid at room temperature, toluene is highly volatile. Its high vapor pressure accounts for its rapid volatilization from soils and surface water (ATSDR, 1989k). Toluene is fairly soluble in water, and so may be washed out in precipitation. The rate of volatilization from surface water is a function of turbidity, with half-lives normally ranging from hours to days. Ninety percent or more of toluene in upper soil layers volatilizes to the air within 24 hours. Toluene is moderately retarded by adsorption to organic soils, but is readily leached from soils having low organic content. Toluene bioaccumulates to a slight degree in fish, with an estimated bioconcentration factor of about 10.7. In the atmosphere, toluene is rapidly degraded by reaction with hydroxyl radicals. Photolysis is not a major degradation route for toluene. Microbial biodegradation is the prime degradation process for toluene in soils and surface water.

1,1,1-Trichloroethane

1,1,1-Trichloroethane is removed from the atmosphere by wet deposition; when removed by this process, it is expected to rapidly re-volatilize (ATSDR, 1989l). It is a volatile organic compound with a moderate water solubility (1500 mg/l at 25 deg. C). 1,1,1-Trichloroethane readily volatilizes from surface water.

Trichloroethene

Trichloroethene reacts with hydroxyl radicals in the atmosphere, and has a half-life of approximately 7 days in air. It may be removed from the atmosphere by wet deposition (ATSDR, 1989m). Trichloroethene volatilizes readily from surface waters and soil. Its soil sorption coefficient of about 41 indicates it is highly mobile in soil. Trichloroethene does not partition significantly from the water column to sediment in surface waters.

Trichloroethene may be removed from the atmosphere by wet deposition. In the atmosphere, trichloroethylene reacts with photochemically-produced hydroxyl radicals. Trichloroethene volatilizes rapidly from water. Experimentally-measured soil sorption coefficients (K_{oc}) for trichloroethylene (41 - 42), indicate high soil mobility; trichloroethylene leaches rapidly to ground water, in some cases before evaporation can occur. It does not partition significantly to sediment in surface water. An experimentally-measured bioconcentration factor of 17 in fish indicates a relatively low bioconcentration potential for trichloroethene. Biodegradation is an important transformation process in surface waters and soils, however it is not a rapid process. Trichloroethene biodegradation products include vinyl chloride and dichloroethene.

Vinyl Chloride

Vinyl chloride has a high air:water partition coefficient (H=50), indicating that vinyl chloride is not removed by wet deposition (ATSDR, 1989n). The primary degradation process in the atmosphere is reaction with photochemically-formed hydroxyl radicals. Vinyl chloride volatilizes readily from surface water, with half-lives in water estimated on the order of hours to days. In waters containing photosensitizers, such as humic materials, photodegradation of vinyl chloride may be rapid. It is resistant to aerobic biodegradation. It does not sorb significantly to soils or sediments in water, nor does it bioaccumulate significantly. Its high vapor pressure (2660 mm Hg) accounts for its rapid volatilization from soils. It has an estimated soil adsorption coefficient (K_{oc}) of between 17 and 131, indicating it has great mobility in soil, having the potential to leach to ground water. Co-solvation in other organic solvents may reduce vinyl chloride's volatility, causing it to have even greater mobility through soil.

Xylenes

The dominant transport mechanism for xylene is volatilization; and the main transformation process in the atmosphere is photo-oxidation by hydroxyl radicals (ATSDR, 1989o). Xylenes are relatively mobile in soil and may leach into ground water. Xylenes are sorbed to soils high in organic content. In ground water, xylenes may persist for several years, although they are known to biodegrade in soil and ground water. Xylene moves through unsaturated soil faster than water and other polar solvents. Because it is hydrophobic, it does not easily diffuse through water films into the soil matrix, and so tends to move as a separate organic phase floating on the water film in soil pores. Bioconcentration of xylenes is not significant. Hydrolysis and oxidation of xylenes in surface water are not significant.

APPENDIX B
TOXICOLOGICAL SUMMARIES

Arsenic

Inorganic arsenic has been recognized as a human poison since ancient times, and large doses can produce death. Lower levels of exposure may produce injury in a number of different body tissues or systems. Arsenic enters the body principally through the mouth, either in food or in water. Most ingested arsenic is quickly absorbed through the stomach and intestines and enters the blood stream. Most arsenic which is inhaled is also quickly absorbed through the lungs into the blood stream. Some arsenic may enter the body through the skin, but this is not usually an important consideration. Effects characteristic of oral exposure include decreased production of red and white blood cells, abnormal heart function, blood-vessel damage, liver and/or kidney injury, and impaired nerve function causing a "pins and needles" sensation in the feet and hands (ATSDR, 1989a).

Barium

Barium may affect human health after oral exposure, drinking contaminated water, and inhalation. The toxicity of barium compounds depends on their solubility. The soluble compounds of barium are absorbed, and small amounts are accumulated in the skeleton. Acute exposure to barium results in a variety of cardiac and neuromuscular effects. Accidental poisoning from ingestion of soluble barium salts has resulted in gastroenteritis, muscular paralysis and decreased pulse rate. Inadequate data are available regarding both long-term effects and potential carcinogenicity of barium.

Benzene

The most significant health effects of benzene are toxicity to the blood, immune system and nervous system (ATSDR, 1989b). Inhalation of benzene has been associated with a decrease in various cells of the circulating blood resulting from bone marrow depression, which may lead to myelogenous leukemia. Benzene metabolites are believed to be the source of the hematological effects as agents known to alter benzene metabolism (toluene, Aroclor-1254, phenobarbitol, ethanol) have also altered benzene toxicity. Ethanol generally increases benzene toxicity. Aplastic anemia has also been associated with benzene exposure. Benzene also alters the immune system; symptoms of immune stimulation (allergy) have been reported as a result of occupational exposures. Central nervous system effects such as drowsiness, dizziness, headache, vertigo, delirium have also been associated with benzene exposure. Benzene has been classified as a known human carcinogen (Group A), in USEPA's IRIS database.

Beryllium

Beryllium is a toxic substance and can be harmful, depending on the amount and duration of exposure to it. Not all of the effects that beryllium may have on human health are well understood, and not all beryllium compounds are equally toxic. The primary organ that beryllium affects is the lung. Short-term human and animal exposure to high levels of beryllium leads to the development of inflammation or reddening and swelling of the lungs (similar to pneumonia). Removal from exposure results in a reversal of symptoms. Long-term exposure to beryllium at much lower levels has been reported to cause berylliosis (noncancerous growths in the lung of humans). Both the short-term effects and berylliosis can be fatal, depending on the severity of the exposure. In addition, a skin allergy has been shown to develop when beryllium comes in contact with the skin. Inhalation of beryllium and its compounds is presumed to have some cancer-causing potential in humans (ATSDR, 1988a).

132-Butanone

Methyl ethyl ketone (2-butanone) is readily absorbed by all routes of exposure. It is eliminated unchanged in expired air and its metabolites are eliminated in the urine. Methyl ethyl ketone is irritating to the mucous membranes. Central nervous system depression can occur at high atmospheric concentrations but good warning properties should prevent over exposure. The principle routes of exposure are by inhalation and skin contact. Prolonged contact with the skin may produce dermatitis.

Cadmium

Cadmium can enter the body by absorption from the stomach or intestines after ingestion (ATSDR, 1989c). Very little cadmium enters the body through the skin. However, once cadmium enters the body, it is very strongly retained; therefore, even low doses may build up significant cadmium levels in the body if exposure continues for a long time. Ingestion of high doses causes severe irritation to the stomach, leading to vomiting and diarrhea. Kidney and lung damage, and high blood pressure are effects that may result from chronic, low doses of exposure to cadmium. The USEPA has classified cadmium as a probable human carcinogen (B1) by the inhalation route. There are not sufficient data to consider cadmium to be carcinogenic by the oral route.

Chromium

Chromium is considered to be an essential nutrient that helps maintain normal metabolism of glucose, cholesterol and fat in humans (ATSDR, 1989d). Chromium can occur in oxidation states ranging from Cr^{2+} to Cr^{6+} but only the trivalent and hexavalent forms are of biological significance. The trivalent form is more common. There is no evidence that trivalent chromium is converted to hexavalent in biologic systems. Kidney damage is the major acute effect associated with accidental ingestion of large amounts of chromium. Trivalent chromium is considerably less toxic than hexavalent chromium, which is not believed to be present on-site. There is no data available to evaluate the possible carcinogenicity of trivalent chromium in humans (IRIS, 1990).

1,1-Dichloroethane

1,1-Dichloroethane is believed to be less toxic than the 1,2-dichloroethane isomer (ATSDR, 1989e). Generally, it is associated with central nervous system effects, and is known to induce cardiac arrhythmias. Central nervous system depression, respiratory tract and dermal irritation are symptoms associated with exposure to 1,1-dichloroethane. There is evidence to suggest that 1,1-dichloroethane may cause cancer in humans. The USEPA ranks 1,1-dichloroethane as a Group C in the IRIS database.

Reliable information on the health effects of 1,1-dichloroethane is not available. Brief exposures to this chemical has caused death in animals. Therefore it is likely that exposure to high levels of 1,1-dichloroethane in the air can cause death in humans. Some animal studies have shown that kidney disease can occur after long term, high level exposure in the air. This chemical has been shown to cause cancer in animals given very high doses by mouth for a lifetime. Also observed was delayed growth in the offspring of animals exposed to high concentrations during pregnancy. It is possible that such effects could also be seen in humans exposed to high levels of 1,1-dichloroethane. However, at this time there is no information to indicate that these effects do occur in humans.

1,2-Dichloroethene

Exposure to 1,2-dichloroethene has been associated with nausea, drowsiness, fatigue, intracranial pressure and ocular irritation (ATSDR, 1989g). Central nervous system depression is a prime effect of inhalation exposure; symptoms of overexposure do not persist when exposure ceases. No association between increased cancer incidence in humans and exposure to 1,2-dichloroethene is reported. USEPA's IRIS database classifies 1,2-dichloroethene as a Group B2 agent.

Di-n-Butyl Phthalate

Di-n-butyl phthalate is an odorless and colorless oily liquid. It is a man-made chemical that is used mostly to help make plastics soft and flexible. Adverse effects on humans from exposure to di-n-butyl phthalate have not been reported. In animals, ingestion large amounts of this compound affects the ability to reproduce. Di-n-butyl phthalate causes death of unborn animals. In male animals, sperm production decreases after eating large amounts of di-n-butyl phthalate. once exposure to di-n-butyl phthalate stops sperm production seems to return to near normal levels. There is no evidence that di-n-butyl phthalate causes cancer, but this has not been thoroughly studied.

Di-n-butyl phthalate appears to have relatively low toxicity and large amounts are needed to cause injury. The levels which cause toxic effects in animals are about 10,000 times higher than the levels of di-n-butyl phthalate found in air, food or water. Large amounts of di-n-butyl phthalates repeatedly applied to the skin for a long time may also cause mild irritation.

Ethyl Benzene

The main effects of ethyl benzene exposure are neurological and respiratory depression (ATSDR, 1989h). High concentrations over short periods of time have resulted in central nervous system toxicity (eg., dizziness), with complete recovery if exposure is not prolonged. Moderate irritation of the upper respiratory tract with chest constriction has been reported following inhalation exposure. No hepatotoxic effects have been reported. No association between increased cancer incidence in humans and exposure to ethyl benzene is reported. USEPA's IRIS database classifies ethyl benzene as a Group D agent (not classified as to carcinogenicity).

Lead

Available evidence suggests that effects of lead on the formation of hemoglobin and other hemo-proteins are detectible at lower levels of lead exposure than are effects on any other organ or system (ATSDR, 1990b). Neurological effects in children are indicators of lead toxicity, although the threshold for noticeable effects has not been well defined. The USEPA has classified lead as a probably human carcinogen because some lead compounds cause tumors in experimental animals, and has assigned a value of zero for the current MCLG for lead. Despite these actions, the USEPA recommends that quantitative estimates of the carcinogenic potency of lead not be used for the purposes of the risk assessment; "quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence the absorption, release and excretion of lead ... thus the Carcinogen Assessment Group recommends that a numerical estimate not be used" (IRIS, 1990).

Manganese

Manganese toxicity has only been shown on exposure to high levels in the air (NAS, 1980). Inhalation to large doses of manganese compounds, especially the higher oxides, can be lethal. The mechanism of this seems to be local irritation and the reaction to it (Stokinger, 1981). Ingested manganese exhibits low toxicity in animals. Chronic manganese toxicity is well known in miners, millworkers and others exposed to dust and fumes, as well as excessive manganese in well-water. The usual signs and symptoms involve the central nervous system. Onset is insidious, with apathy, anorexia, and asthenia. This is typically followed by manganese psychosis with unaccountable laughter, euphoria, impulsiveness and insomnia, followed by somnolence. Other symptoms include headache, recurring leg cramps, sexual excitement followed by impotence and/or other rarer effects. After that the victim exhibits behavior typically seen in Parkinson's disease - speech disturbances, masklike facial expression and general clumsiness of movement. The patient may be totally disabled but this syndrome is not fatal. Manganese pneumonia, primarily a lobar pneumonia may result from the inhalation of manganese and can be fatal. Fibrosis of the lung tissue has been reported (NAS, 1973, Stokinger, 1981).

Mercury

Mercury can easily enter the body if its vapor is inhaled or if it is eaten in organic forms in contaminated fish or other foods. It is also believed that mercury can enter the body through the skin. Once mercury has entered the body it can take months for all of it to be eliminated. It leaves the body primarily through the urine and feces. Long-term exposure to either organic or inorganic mercury can irreversibly damage the brain, kidney, or developing fetuses. The form of mercury and the way people are exposed to it influence which of these health effects will be more severe. Effects in adults exposed to mercury include shakiness (tremors), memory loss, and kidney disease. Brief exposure to high levels of inorganic and organic mercury will have similar health effects; however, full recovery is more likely following brief exposures, once the body has cleared itself of the contamination. Mercury has not been shown to cause cancer.

Nickel

Nickel or its compounds can affect the immune system. Continued contact with the skin can cause skin allergies. By inhalation, nickel refinery dust including nickel subsulfide has been shown to cause cancer in the lung, nasal cavity, and voice box in humans and is classified "A" -human carcinogen. Metallic nickel and nickel carbonyl are shown to be carcinogenic in humans, again via inhalation. The carcinogenic effect of oral exposure has not been established.

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs may enter the body quickly and easily by all routes of exposure (ATSDR, 1990). The lungs are typically the most significant route of exposure. PAHs tend to be stored in the kidneys, liver and fat, with smaller amounts in the spleen, adrenal glands and ovaries. Results from animal studies show that PAHs do not tend to be stored in the body for a long time, with loss within a few days, primarily in the feces and urine. Several PAHs have caused cancer in laboratory animals through ingestion, inhalation or dermal contact. Reports in humans show that individuals exposed by breathing or skin contact for long periods of time to mixtures of other compounds and PAHs may also develop cancer.

Polychlorinated Biphenyls

PCBs are mixtures with a variety of different congeners and impurities (ATSDR, 1989i). The general population is exposed to PCBs, primarily through consumption of fish. Dermal absorption of PCBs may occur, but there is not adequate data to determine rates of absorption. Due to their lipophilicity, PCBs are distributed to the fat, skin, and other fat-containing organs. Occupational exposure to PCBs has been associated with reversible skin lesions and subclinical alterations of serum enzymes suggestive of liver enzyme induction and possible hepatocellular damage. The USEPA has determined that the positive evidence for carcinogenicity of Aroclor 1254 in animals, along with inadequate evidence in humans, places it in Category B2, as a probably human carcinogen. USEPA has recommended that all commercial PCB mixtures be considered to have equivalent carcinogenic potential and has classified all PCB mixtures in Category B2.

Tetrachloroethene

The effects of tetrachloroethene on humans have been established primarily from individuals accidentally or occupationally exposed to very high concentrations (ATSDR, 1989j). Exposure to high concentrations of tetrachloroethene causes a variety of toxicological effects in humans. Effects upon the central nervous system are generally the most noticeable following acute or excessive occupational exposures. Effects upon the kidney and liver have been observed and generally occur after an elapsed period of exposure to high concentrations. Liver effects attributed to exposure to tetrachloroethene at high levels include cirrhosis of the liver, toxic hepatitis, liver cell necrosis and enlarged liver. Symptoms of renal dysfunction include diminished excretion of urine, uremia, elevated serum creatinine, proteinuria and hematuria. Over exposure to high but unknown concentrations of tetrachloroethene have also been associated with pulmonary damage.

Toluene

Inhalation of toluene results in depression of the central nervous system; toluene does not appear to exert other systemic effects at low concentrations (ATSDR, 1989k). Humans exposed to toluene in the range of 100 to 500 ppm experience fatigue, confusion, incoordination, impairment to reaction time, perception, and motor control and function effects. The liver and kidney do not appear to be primary target organs for toluene exposure. There is no evidence that toluene is a carcinogen. The USEPA ranks toluene as Group D (not classified as to carcinogenicity).

1,1,1-Trichloroethane

The principal health effect of over-exposure involves the central nervous system (ATSDR, 1989l). While thresholds for such effects are difficult to characterize, levels around 1000 ppm may result in coordination problems. At much higher levels, anesthesia becomes apparent and death may occur at 1 to 3 percent due to anesthesia and/or cardiac toxicity. Unlike other chlorinated hydrocarbons, 1,1,1-trichloroethane has not been associated with clearly evident liver or kidney damage.

Trichloroethene

Inhalation exposure to trichloroethene is associated with central nervous system effects including depression (narcosis) (ATSDR, 1989m). Other symptoms include drowsiness, headache, dizziness, nausea, confusion, facial numbness and blurred vision. Effects attributed to long term exposure include decreased appetite and sleep disturbances. Liver damage, including necrosis, has resulted from acute occupational exposure. EPA has concluded however, that chronic exposure to trichloroethene at concentrations found or expected in ambient air, are unlikely to result in liver damage. Kidney dysfunction and failure have also been associated with acute occupational and intentional exposure. Anorexia, nausea, vomiting and intolerance of fatty foods have been associated with long term occupational exposures. Trichloroethene may also be associated with mild eye irritation and dry throats. Skin contact may result in irritation, burns and rashes; it may also act as a sensitizer as well as a primary irritant. Available evidence indicates that trichloroethene is carcinogenic in animals. The USEPA has classified it as Group C.

Vinyl Chloride

"Vinyl chloride disease" is the name given to a syndrome observed as a result of occupational exposure, which is characterized by dissolution of the fingertips, circulatory disturbance in the extremities, Raynaud syndrome, scleroderma, liver, kidney and lung damage (ATSDR, 1989n). Inhalation exposures to vinyl chloride have been associated with impaired liver function or liver damage. Symptoms and signs of liver disease have included pain in the abdomen, evidence of fibrosis and cirrhosis, and hepatomegaly. Severity of the disease appears to correlate with duration of exposure. Acute inhalation exposure to vinyl chloride results in central nervous system effects such as dizziness, giddiness, euphoria, ataxia, headache and narcosis. Subtle neurotoxicity may be associated with occupational exposure. Paternal occupational exposure may be associated with fetal loss. Several reports link liver cancer with occupational exposure to vinyl chloride. USEPA has designated vinyl chloride as Group A, known human carcinogen.

Xylenes

Short and long term exposure may result in nervous system effects including headache, mental confusion, narcosis, dizziness, impaired short-term memory (ATSDR, 1989o). Other short-term effects may include nose and throat irritation; at high doses, lung congestion has been reported. Nausea, vomiting and gastric discomfort have been reported as symptoms resulting from inhalation exposure. There are no indications that xylene is associated with adverse hematological effects. Dermal effects may include skin irritation, dryness and scaling. Exposure to vapors may cause ocular irritation. No data are available regarding development of cancer in humans following inhalation, oral or dermal exposure to xylene.

In the IRIS database, USEPA has classified xylene as a Group D agent (not classified as to carcinogenicity).

APPENDIX I

TOXICOLOGICAL SUMMARIES

TOXICOLOGICAL SUMMARIES

Arsenic

Inorganic arsenic has been recognized as a human poison since ancient times, and large doses can produce death. Lower levels of exposure may produce injury in a number of different body tissues or systems. Arsenic enters the body principally through the mouth, either in food or in water. Most ingested arsenic is quickly absorbed through the stomach and intestines and enters the blood stream. Most arsenic which is inhaled is also quickly absorbed through the lungs into the blood stream. Some arsenic may enter the body through the skin, but this is not usually an important consideration. Effects characteristic of oral exposure include decreased production of red and white blood cells, abnormal heart function, blood-vessel damage, liver and/or kidney injury, and impaired nerve function causing a "pins and needles" sensation in the feet and hands (ATSDR, 1989a).

Barium

Barium may affect human health after oral exposure, drinking contaminated water, and inhalation. The toxicity of barium compounds depends on their solubility. The soluble compounds of barium are absorbed, and small amounts are accumulated in the skeleton. Acute exposure to barium results in a variety of cardiac and neuromuscular effects. Accidental poisoning from ingestion of soluble barium salts has resulted in gastroenteritis, muscular paralysis and decreased pulse rate. Inadequate data are available regarding both long-term effects and potential carcinogenicity of barium.

Benzene

The most significant health effects of benzene are toxicity to the blood, immune system and nervous system (ATSDR, 1989b). Inhalation of benzene has been associated with a decrease in various cells of the circulating blood resulting from bone marrow depression, which may lead to myelogenous leukemia. Benzene metabolites are believed to be the source of the hematological effects as agents known to alter benzene metabolism (toluene, Aroclor-1254, phenobarbitol, ethanol) have also altered benzene toxicity. Ethanol generally increases benzene toxicity. Aplastic anemia has also been associated with benzene exposure. Benzene also alters the immune system; symptoms of immune stimulation (allergy) have been reported as a result of occupational exposures. Central nervous system effects such as drowsiness, dizziness, headache, vertigo, delirium have also been associated with benzene exposure. Benzene has been classified as a known human carcinogen (Group A), in USEPA's IRIS database.

Beryllium

Beryllium is a toxic substance and can be harmful, depending on the amount and duration of exposure to it. Not all of the effects that beryllium may have on human health are well understood, and not all beryllium compounds are equally toxic. The primary organ that beryllium affects is the lung. Short-term human and animal exposure to high levels of beryllium leads to the development of inflammation or reddening and swelling of the lungs (similar to pneumonia). Removal from exposure results in a reversal of symptoms. Long-term exposure to beryllium at much lower levels has been reported to cause berylliosis (noncancerous growths in the lung of humans). Both the short-term effects and berylliosis can be fatal, depending on the severity of the exposure. In addition, a skin allergy has been shown to develop when beryllium comes in contact with the skin. Inhalation of beryllium and its compounds is presumed to have some cancer-causing potential in humans (ATSDR, 1988a).

2-Butanone

Methyl ethyl ketone (2-butanone) is readily absorbed by all routes of exposure. It is eliminated unchanged in expired air and its metabolites are eliminated in the urine. Methyl ethyl ketone is irritating to the mucous membranes. Central nervous system depression can occur at high atmospheric concentrations but good warning properties should prevent over exposure. The principle routes of exposure are by inhalation and skin contact. Prolonged contact with the skin may produce dermatitis.

Cadmium

Cadmium can enter the body by absorption from the stomach or intestines after ingestion (ATSDR, 1989c). Very little cadmium enters the body through the skin. However, once cadmium enters the body, it is very strongly retained; therefore, even low doses may build up significant cadmium levels in the body if exposure continues for a long time. Ingestion of high doses causes severe irritation to the stomach, leading to vomiting and diarrhea. Kidney and lung damage, and high blood pressure are effects that may result from chronic, low doses of exposure to cadmium. The USEPA has classified cadmium as a probable human carcinogen (B1) by the inhalation route. There are not sufficient data to consider cadmium to be carcinogenic by the oral route.

Chromium

Chromium is considered to be an essential nutrient that helps maintain normal metabolism of glucose, cholesterol and fat in humans (ATSDR, 1989d). Chromium can occur in oxidation states ranging from Cr^{2+} to Cr^{6+} but only the trivalent and hexavalent forms are of biological significance. The trivalent form is more common. There is no evidence that trivalent chromium is converted to hexavalent in biologic systems. Kidney damage is the major acute effect associated with accidental ingestion of large amounts of chromium. Trivalent chromium is considerably less toxic than hexavalent chromium, which is not believed to be present on-site. There is no data available to evaluate the possible carcinogenicity of trivalent chromium in humans (IRIS, 1990).

1,1-Dichloroethane

1,1-Dichloroethane is believed to be less toxic than the 1,2-dichloroethane isomer (ATSDR, 1989e). Generally, it is associated with central nervous system effects, and is known to induce cardiac arrhythmias. Central nervous system depression, respiratory tract and dermal irritation are symptoms associated with exposure to 1,1-dichloroethane. There is evidence to suggest that 1,1-dichloroethane may cause cancer in humans. The USEPA ranks 1,1-dichloroethane as a Group C in the IRIS database.

Reliable information on the health effects of 1,1-dichloroethane is not available. Brief exposures to this chemical has caused death in animals. Therefore it is likely that exposure to high levels of 1,1-dichloroethane in the air can cause death in humans. Some animal studies have shown that kidney disease can occur after long term, high level exposure in the air. This chemical has been shown to cause cancer in animals given very high doses by mouth for a lifetime. Also observed was delayed growth in the offspring of animals exposed to high concentrations during pregnancy. It is possible that such effects could also be seen in humans exposed to high levels of 1,1-dichloroethane. However, at this time there is no information to indicate that these effects do occur in humans.

1,2-Dichloroethene

Exposure to 1,2-dichloroethene has been associated with nausea, drowsiness, fatigue, intracranial pressure and ocular irritation (ATSDR, 1989g). Central nervous system depression is a prime effect of inhalation exposure; symptoms of overexposure do not persist when exposure ceases. No association between increased cancer incidence in humans and exposure to 1,2-dichloroethene is reported. USEPA's IRIS database classifies 1,2-dichloroethene as a Group B2 agent.

Di-n-Butyl Phthalate

Di-n-butyl phthalate is an odorless and colorless oily liquid. It is a man-made chemical that is used mostly to help make plastics soft and flexible.Adverse effects on humans from exposure to di-n-butyl phthalate have not been reported. In animals, ingestion large amounts of this compound affects the ability to reproduce. Di-n-butyl phthalate causes death of unborn animals. In male animals, sperm production decreases after eating large amounts of di-n-butyl phthalate. once exposure to di-n-butyl phthalate stops sperm production seems to return to near normal levels. There is no evidence that di-n-butyl phthalate causes cancer, but this has not been thoroughly studied.

Di-n-butyl phthalate appears to have relatively low toxicity and large amounts are needed to cause injury. The levels which cause toxic effects in animals are about 10,000 times higher than the levels of di-n-butyl phthalate found in air, food or water. Large amounts of di-n-butyl phthalates repeatedly applied to the skin for a long time may also cause mild irritation.

Ethyl Benzene

The main effects of ethyl benzene exposure are neurological and respiratory depression (ATSDR, 1989h). High concentrations over short periods of time have resulted in central nervous system toxicity (eg., dizziness), with complete recovery if exposure is not prolonged. Moderate irritation of the upper respiratory tract with chest constriction has been reported following inhalation exposure. No hepatotoxic effects have been reported. No association between increased cancer incidence in humans and exposure to ethyl benzene is reported. USEPA's IRIS database classifies ethyl benzene as a Group D agent (not classified as to carcinogenicity).

Lead

Available evidence suggests that effects of lead on the formation of hemoglobin and other hemo-proteins are detectible at lower levels of lead exposure than are effects on any other organ or system (ATSDR, 1990b). Neurological effects in children are indicators of lead toxicity, although the threshold for noticeable effects has not been well defined. The USEPA has classified lead as a probably human carcinogen because some lead compounds cause tumors in experimental animals, and has assigned a value of zero for the current MCLG for lead. Despite these actions, the USEPA recommends that quantitative estimates of the carcinogenic potency of lead not be used for the purposes of the risk assessment; "quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence the absorption, release and excretion of lead...thus the Carcinogen Assessment Group recommends that a numerical estimate not be used" (IRIS, 1990).

Manganese

Manganese toxicity has only been shown on exposure to high levels in the air (NAS, 1980). Inhalation to large doses of manganese compounds, especially the higher oxides, can be lethal. The mechanism of this seems to be local irritation and the reaction to it (Stokinger, 1981). Ingested manganese exhibits low toxicity in animals. Chronic manganese toxicity is well known in miners, millworkers and others exposed to dust and fumes, as well as excessive manganese in well-water. The usual signs and symptoms involve the central nervous system. Onset is insidious, with apathy, anorexia, and asthenia. This is typically followed by manganese psychosis with unaccountable laughter, euphoria, impulsiveness and insomnia, followed by somnolence. Other symptoms include headache, recurring leg cramps, sexual excitement followed by impotence and/or other rarer effects. After that the victim exhibits behavior typically seen in Parkinson's disease - speech disturbances, masklike facial expression and general clumsiness of movement. The patient may be totally disabled but this syndrome is not fatal. Manganese pneumonia, primarily a lobar pneumonia may result from the inhalation of manganese and can be fatal. Fibrosis of the lung tissue has been reported (NAS, 1973, Stokinger, 1981).

Mercury

Mercury can easily enter the body if its vapor is inhaled or if it is eaten in organic forms in contaminated fish or other foods. It is also believed that mercury can enter the body through the skin. Once mercury has entered the body it can take months for all of it to be eliminated. It leaves the body primarily through the urine and feces. Long-term exposure to either organic or inorganic mercury can irreversibly damage the brain, kidney, or developing fetuses. The form of mercury and the way people are exposed to it influence which of these health effects will be more severe. Effects in adults exposed to mercury include shakiness (tremors), memory loss, and kidney disease. Brief exposure to high levels of inorganic and organic mercury will have similar health effects; however, full recovery is more likely following brief exposures, once the body has cleared itself of the contamination. Mercury has not been shown to cause cancer.

Nickel

Nickel or its compounds can affect the immune system. Continued contact with the skin can cause skin allergies. By inhalation, nickel refinery dust including nickel subsulfide has been shown to cause cancer in the lung, nasal cavity, and voice box in humans and is classified "A" -human carcinogen. Metallic nickel and nickel carbonyl are shown to be carcinogenic in humans, again via inhalation. The carcinogenic effect of oral exposure has not been established.

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs may enter the body quickly and easily by all routes of exposure (ATSDR, 1990). The lungs are typically the most significant route of exposure. PAHs tend to be stored in the kidneys, liver and fat, with smaller amounts in the spleen, adrenal glands and ovaries. Results from animal studies show that PAHs do not tend to be stored in the body for a long time, with loss within a few days, primarily in the feces and urine. Several PAHs have caused cancer in laboratory animals through ingestion, inhalation or dermal contact. Reports in humans show that individuals exposed by breathing or skin contact for long periods of time to mixtures of other compounds and PAHs may also develop cancer.

Polychlorinated Biphenyls

PCBs are mixtures with a variety of different congeners and impurities (ATSDR, 1989i). The general population is exposed to PCBs, primarily through consumption of fish. Dermal absorption of PCBs may occur, but there is not adequate data to determine rates of absorption. Due to their lipophilicity, PCBs are distributed to the fat, skin, and other fat-containing organs. Occupational exposure to PCBs has been associated with reversible skin lesions and subclinical alterations of serum enzymes suggestive of liver enzyme induction and possible hepatocellular damage. The USEPA has determined that the positive evidence for carcinogenicity of Aroclor 1254 in animals, along with inadequate evidence in humans, places it in Category B2, as a probably human carcinogen. USEPA has recommended that all commercial PCB mixtures be considered to have equivalent carcinogenic potential and has classified all PCB mixtures in Category B2.

Tetrachloroethene

The effects of tetrachloroethene on humans have been established primarily from individuals accidentally or occupationally exposed to very high concentrations (ATSDR, 1989j). Exposure to high concentrations of tetrachloroethene causes a variety of toxicological effects in humans. Effects upon the central nervous system are generally the most noticeable following acute or excessive occupational exposures. Effects upon the kidney and liver have been observed and generally occur after an elapsed period of exposure to high concentrations. Liver effects attributed to exposure to tetrachloroethene at high levels include cirrhosis of the liver, toxic hepatitis, liver cell necrosis and enlarged liver. Symptoms of renal dysfunction include diminished excretion of urine, uremia, elevated serum creatinine, proteinuria and hematuria. Over exposure to high but unknown concentrations of tetrachloroethene have also been associated with pulmonary damage.

Toluene

Inhalation of toluene results in depression of the central nervous system; toluene does not appear to exert other systemic effects at low concentrations (ATSDR, 1989k). Humans exposed to toluene in the range of 100 to 500 ppm experience fatigue, confusion, incoordination, impairment to reaction time, perception, and motor control and function effects. The liver and kidney do not appear to be primary target organs for toluene exposure. There is no evidence that toluene is a carcinogen. The USEPA ranks toluene as Group D (not classified as to carcinogenicity).

1,1,1-Trichloroethane

The principal health effect of over-exposure involves the central nervous system (ATSDR, 1989l). While thresholds for such effects are difficult to characterize, levels around 1000 ppm may result in coordination problems. At much higher levels, anesthesia becomes apparent and death may occur at 1 to 3 percent due to anesthesia and/or cardiac toxicity. Unlike other chlorinated hydrocarbons, 1,1,1-trichloroethane has not been associated with clearly evident liver or kidney damage.

Trichloroethene

Inhalation exposure to trichloroethene is associated with central nervous system effects including depression (narcosis) (ATSDR, 1989m). Other symptoms include drowsiness, headache, dizziness, nausea, confusion, facial numbness and blurred vision. Effects attributed to long term exposure include decreased appetite and sleep disturbances. Liver damage, including necrosis, has resulted from acute occupational exposure. EPA has concluded however, that chronic exposure to trichloroethene at concentrations found or expected in ambient air, are unlikely to result in liver damage. Kidney dysfunction and failure have also been associated with acute occupational and intentional exposure. Anorexia, nausea, vomiting and intolerance of fatty foods have been associated with long term occupational exposures. Trichloroethene may also be associated with mild eye irritation and dry throats. Skin contact may result in irritation, burns and rashes; it may also act as a sensitizer as well as a primary irritant. Available evidence indicates that trichloroethene is carcinogenic in animals. The USEPA has classified it as Group C.

Vinyl Chloride

"Vinyl chloride disease" is the name given to a syndrome observed as a result of occupational exposure, which is characterized by dissolution of the fingertips, circulatory disturbance in the extremities, Raynaud syndrome, scleroderma, liver, kidney and lung damage (ATSDR, 1989n). Inhalation exposures to vinyl chloride have been associated with impaired liver function or liver damage. Symptoms and signs of liver disease have included pain in the abdomen, evidence of fibrosis and cirrhosis, and hepatomegaly. Severity of the disease appears to correlate with duration of exposure. Acute inhalation exposure to vinyl chloride results in central nervous system effects such as dizziness, giddiness, euphoria, ataxia, headache and narcosis. Subtle neurotoxicity may be associated with occupational exposure.

Paternal occupational exposure may be associated with fetal loss. Several reports link liver cancer with occupational exposure to vinyl chloride. USEPA has designated vinyl chloride as Group A, known human carcinogen.

Xylenes

Short and long term exposure may result in nervous system effects including headache, mental confusion, narcosis, dizziness, impaired short-term memory (ATSDR, 1989o). Other short-term effects may include nose and throat irritation; at high doses, lung congestion has been reported. Nausea, vomiting and gastric discomfort have been reported as symptoms resulting from inhalation exposure. There are no indications that xylene is associated with adverse hematological effects. Dermal effects may include skin irritation, dryness and scaling. Exposure to vapors may cause ocular irritation. No data are available regarding development of cancer in humans following inhalation, oral or dermal exposure to xylene. In the IRIS database, USEPA has classified xylene as a Group D agent (not classified as to carcinogenicity).